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TECHNICAL NOTE

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HEAT-TRANSFER AND PRESSURE MEASUREMENTS ON A FLAT-PLATE SURFACE AND HEAT-TRANSFER MEASUREMENTS ON ATTACHED PROTUBERANCES IN A SUPERSONIC TURBULENT BOUNDARY LAYER AT MACH NUMBERS OF 2.65, 3.51, AND 4.44

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SUMMARY

The influence of surface projections, both totally and partially immersed in a turbulent boundary layer, on the distribution of heat-transfer coefficients has been determined on 20 configurations. Surface projections cause separations of the local flow; the extent of these separations both upstream and downstream and the magnitude of the resultant interference heat-transfer coefficients are dependent upon the size and cross-sectional shape of the projection, Mach number, Reynolds number, and boundary-layer thickness. The configurations of this investigation include both three-dimensional simple shapes and hardware-type configurations tested on a flat plate with a turbulent-boundary-layer-thickness variation of approximately 10 to 1. The extent of the interference region can be defined by static-pressure measurements, oil-flow technique, or by heat-transfer measurements.

The windward heating rates increase with decreasing boundary-layer thickness. A maximum value occurs when the projection height is equal to or greater than the boundary-layer thickness. The effects of Mach number and Reynolds number are confined to the immediate vicinity of the windward face of the projection. The magnitude of interference heating expressed as the ratio (at a particular thermocouple) of the heat-transfer coefficient with a protuberance to the heat-transfer coefficient without a protuberance increases with decreasing Reynolds number and increasing Mach number.

Interference heating in the vicinity of swept cylindrical projections depends upon direction of sweep (forward or back); for example, a cylinder swept back 45° has an interference heating rate 2.07 times that of the undisturbed flat plate, at 0° sweep an interference heating 6.83 times that of the flat plate, and swept forward 45° an interference

heating 11.14 times that of the undisturbed flat plate. On the cylindrical projection the lambda-footed bow shock causes a localized region of high heating. The location of this region is dependent upon the free-stream Mach number, boundary-layer thickness, and the ratio of cylinder diameter to boundary-layer thickness. Except for the sweptback cylinder the stagnation-line heating rates outside the interference region are predictable by existing theory. The flat-plate boundary layer on the sweptback cylinder increases the stagnation heat-transfer coefficients.

Location of a protuberance in the influence of another protuberance can cause large variation in the interference heating distribution. The most critical location is in the vicinity of the upstream projection shocks.

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In the wake of a projection placed immediately behind another projection the heating rates are negligible. Further downstream, the wake heat-transfer distribution is greater than that in the undisturbed flow. Cylinders mounted in the wake of other projections and alined with the flow so that the space between cylinder wall and flat-plate surface is less than 0.01 of the boundary-layer thickness still have heating rates higher than those of the undisturbed region.

INTRODUCTION

The design of an efficient launch vehicle of long-range capabilities requires minimum structural weight and maximum fuel volume. The present concept of missile design is to utilize extremely thin skin with internal pressure to prevent shape deformation. To provide maximum fuel volume, the piping, instrumentation, antenna, and so forth, are located on the exterior portion of the missile; this thus produces protuberances partially or completely immersed in the missile boundary layer. The effect on heat transfer of surface roughness and protuberances completely immersed in the boundary layer has been the subject of several investigations (refs. 1 to 5). It is the purpose of this investigation to obtain experimentally more detailed information on the distribution of heat transfer on the protuberance and adjacent skin area for large protuberances that are totally or only partially immersed in a turbulent boundary layer. Two classes of protuberances were investigated: one group consists of simple geometric shapes to simplify the shock—boundary-layer interaction and the analysis of the resultant flow field and the second group consists of scaled models of specific components of a typical launch vehicle.

Each protuberance was tested at Mach numbers of 2.65, 3.51, and 4.44 through a range of Reynolds number per foot from 1.3×10^6 to 4.7×10^6.

The models were tested on a flat plate with a turbulent-boundary-layer-thickness variation of 10 to 1. Pressure distributions in the vicinity of the projections were also obtained. The oil-flow-visualization technique (ref. 6) was used to determine the nature of the flow in the vicinity of the projections.

SYMBOLS

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b	local skin thickness, ft
c	specific heat of skin material, Btu/lb-^{o}R
c_f	local turbulent skin-friction coefficient
c_p	specific heat of air at constant pressure, Btu/lb-^{o}R
C_p	pressure coefficient
ΔC_p	variation in pressure coefficient
d	diameter of cylinder, in.
g	acceleration due to gravity, ft/sec^2
h	measured heat-transfer coefficient, Btu/ft^2-sec-^{o}R
h_c	measured heat-transfer coefficient including conduction term, Btu/ft^2-sec-^{o}R
h_L	theoretical heat-transfer coefficient for laminar flow on cylinder of infinite length, Btu/ft^2-sec-^{o}R
h_o	measured heat-transfer coefficient on flat plate alone, Btu/ft^2-sec-^{o}R
$h_{o,c}$	measured heat-transfer coefficient on flat plate alone, including conduction term, Btu/ft^2-sec-^{o}R
K	protuberance height, in.
k	coefficient of thermal conductivity, Btu/ft-sec-^{o}R
l	length, ft

M	free-stream Mach number
ΔM	variation in free-stream Mach number
N_{St}	Stanton number, $\frac{h}{(\rho V c_p g)_\infty}$
$N_{St,c}$	Stanton number including conduction, $\frac{h_c}{(\rho V c_p g)_\infty}$
p_s	static pressure, lb/sq ft
$p_{t,2}$	total pressure just downstream from a normal shock wave, lb/sq ft
R	Reynolds number per foot, $\frac{\rho V l}{\mu}$ $(l = 1 \text{ ft})$
R_x	Reynolds number based on distance x
T_e	effective stream air temperature at wall, some temperature which gives a thermal potential that is independent of heat-transfer coefficient (sometimes noted as recovery temperature), $^\circ R$
T_w	wall temperature, $^\circ R$
T_t	stagnation temperature, $^\circ R$
t	time, sec
Δt	variation in time, sec
V	velocity, ft/sec
w	specific weight of skin material, lb/sq ft
x	distance along longitudinal axis, in.
y	distance from longitudinal axis, in.
z	vertical distance from flat plate, in.
δ	boundary-layer thickness, in.

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μ dynamic viscosity coefficient, lb-sec/sq ft

ρ free-stream density of air, slugs/cu ft

ϕ circumferential angle, deg

Subscripts:

i indices of summation

0,1,2,3, . . . m time sequence

∞ free-stream condition

l local condition

max maximum

APPARATUS, MODELS, AND HEAT-TRANSFER AND PRESSURE INSTRUMENTATION

Wind Tunnel

This investigation was conducted in the high Mach number test section of the Langley Unitary Plan wind tunnel. This variable-pressure, continuous-flow tunnel has an asymmetrical sliding-block nozzle that permits continuous variation in the test-section Mach number from 2.3 to 4.65; this facility is described in reference 7.

Flat Plate and Support Structure

To determine the effect of projections on the distribution of heat transfer on the adjacent skin, the projections are mounted on a 4-foot by 5-foot flat plate instrumented with both thermocouples and static-pressure orifices. The location of the 84 thermocouples and the 10 pressure orifices on the test surface and the relative position of several projections are given in table I and illustrated in figure 1. (An index to the tabular data is included immediately before the tables.)

The laminated flat plate, as illustrated in figure 2, consists of a 0.050-inch-thick stainless-steel test surface insulated from the support surface by a 3/8-inch-thick hexagonal fiber-glass honeycomb. The honeycomb was bonded to the test surface and to a 1/8-inch-thick filler plate. To prevent shearing of the bond due to thermal gradients, the filler plate was cut, after bonding, into 8-inch by 8-inch sections and each section was secured to a steel backing plate by a button that allowed each segment to slide relative to the backing plate.

The test plate, as an integral unit, was mounted at three positions in the tunnel to obtain a range of boundary-layer thicknesses. The maximum boundary-layer thickness was obtained by mounting the flat plate on the test-section access door and flush with the tunnel side wall to utilize the normal tunnel side-wall boundary layer. Two other boundary-layer thicknesses were obtained by positioning the test plate at two positions on a 4-foot by 10-foot wing-shaped support assembly. The wing-type support was attached to the tunnel side walls and spanned the test section on the horizontal center plane. The leading-edge wedge of the support assembly, as illustrated in the view of the upper surface in figure 3, was alined so that no flow deviation occurred on the test surface and the pneumatic seals, illustrated in the assembly photograph of the wing support in figure 4, prevented the flow from the structural support side from influencing the test surface. The test surface mounted flush with the bottom of the support assembly is illustrated in figure 5. The lower surface of the wing support contained two interchangeable panels (test plate and filler plate) that positioned the instrumented flat plate either 1 foot or 5 feet downstream from the leading edge, as illustrated in figure 6. The filler plate is similar in construction to the test plate and had eight thermocouples located at the positions shown in figure 7.

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Four inches from the leading edge of the support structure a 1-inch band of No. 60 carborundum grit was used as a boundary-layer trip (fig. 6) for all tests conducted on the flat plate mounted along the horizontal center plane of the tunnel.

Projections

Two types of projections were included in this investigation: Three-dimensional simple geometric shapes and more detailed hardware-type models. Each model had a uniform skin thickness of 0.050-inch stainless steel with a backing of 0.25-inch-thick micarta that was relieved in the vicinity of each thermocouple. The backing material acted as a skin stiffener and prevented distortion or buckling of the models. All models were secured to the flat plate and were insulated from the test surface by a 1/16-inch-thick sheet of micarta.

Thin-walled pressurized missiles require circumferential stiffener rings. From an analysis of the data obtained in a narrow band (in this analysis 5 inches wide) along the flat-plate center line, the three-dimensional models in figure 8 show a two-dimensional section to the flow. The four stiffener models were tested in the maximum thickness boundary layer. The basic model (fig. 8(a)) represents the external stiffener with the minimum weight. The 2-inch by 4-inch rectangular stiffener is mounted on the flat plate with the 4-inch dimension normal to the flat plate and the 2-inch by 4-inch surface parallel to the

direction of flow. To decrease the abrupt flow on the windward face, the 2-inch by 4-inch model was faired by a 1/4 round cylinder (fig. 8(b)). Minimum flow deviation for this investigation was obtained by fairing the upstream face with a 30° wedge as shown in figure 8(c). To eliminate discontinuities of surface joints between the upstream fairing and the basic 2-inch by 4-inch rectangular stiffener, a separate model was made for each configuration. Each model was instrumented with 24 thermocouples. The location of the 12 thermocouples on the 1-inch by 2-inch rectangular stiffener is shown in figure 8(d) and is listed in table I.

The junction of the externally mounted piping with the skin was simulated by the 2.8-inch-diameter right circular cylinder illustrated in figure 9. The cylinder was mounted normal to the flat plate and was instrumented with 24 thermocouples; 8 thermocouples were located along the stagnation line and the remaining thermocouples were located at meridian angles of 45°, 90°, and 180° at four axial stations along the cylinder. A dummy cylinder was located at four positions upstream from the instrumented cylinder to determine the effect of wake on the heat-transfer coefficients. The dummy and instrumented cylinders were tested in tandem at spacings of 3.2 and 6.4 diameters. The instrumented cylinder was also tested with dummy cylinders at two offset locations 3.2 diameters upstream; a line connecting the centers of the cylinders forms angles of $26\frac{1}{2}^{\circ}$ and 45° with the tunnel center line. The location of the instrumented and dummy cylinders is shown in figure 1.

The instrumented cylinder was also tested with a 9-inch by 14.10-inch cap plate having a 10° wedge (fig. 10) to eliminate tip effects and more closely simulate an infinite cylinder.

The effect of aspect ratio on both single and multiple right-circular-cylinder configurations was determined by tests with 1.4-inch-diameter cylinders. The 1.4-inch-diameter instrumented cylinder illustrated in figure 11 had 12 thermocouples.

The variation of heat transfer with sweep was evaluated on the 2.8-inch-diameter cylinder instrumented with 24 thermocouples illustrated in figure 12. The sweep angle was 45° forward and 45° back.

The aforementioned projections are applicable to a fundamental approach and understanding of the parameters that are important in the flow field of a flat-plate boundary layer. However, detailed information of the distribution of heat transfer on complex configurations (that is, the lox line and helium pressurization lines on a typical launch vehicle) is of considerable importance to the entire field of aerodynamic heating. Consequently, the following hardware shapes were also tested.

The stiffener model with a trapezoidal cross section (fig. 13) simulates the circumferential conduit fairing typical of that used with some launch vehicles. The windward face of the 8.68-inch by 1.00-inch rectangular stiffener was faired with a 30° wedge to simulate a cableway; the model was instrumented with 12 thermocouples.

The influence of external piping, with its axis alined to the flow, on the flat-plate local heat-transfer coefficients was determined on the configurations illustrated in figures 14(a), 14(b), and 14(c). On the configurations in figures 14(a) and (b), fairings have been used to diminish the abrupt flow discontinuity resulting from external piping mounted normal to the surface. The model in figure 14(a) duplicates a helium line; it has a hemicylindrical leading edge swept 45° and also a spherical segment for clearance of an internal valve. The external pipe of the model has a cylindrical shroud 2.02 diameters long for a simulated cover of a pipe expansion joint. The axis of the external pipe was 1.13 inches from the plate. The configuration in figure 14(b) has a 26° cone cylinder to further attenuate the flow discontinuity at the pipe-plate juncture. The axis of the streamwise pipe model is 1.32 inches from the plate surface. Both of these configurations had 24 thermocouples installed on the fairing and piping and are relatively aerodynamically clean. The prerequisite of minimum weight precludes the use of large fairings, and on some of the piping normal to the surface, the elbows, valves, circumferential rings, and expansion bellows are exposed to the airflow. The uninstrumented model in figure 14(c) is a representative lox line with a nominal diameter of 2.75 inches. The cylindrical axis of this model was located 1.605 inches above the flat-plate surface.

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Photographs of typical protuberances are presented as figures 15 to 31.

Thermocouple Instrumentation

All thermocouples were 24-gage iron-constantan wire; each thermocouple was soldered with pure tin in a 0.030-inch-diameter hole through the model surface.

The thermocouple outputs were recorded on a multichannel sequential analog to digital conversion system described in reference 8. The thermocouple voltages were sampled every 1/2 second, converted into digital form, recorded on magnetic tape, and converted to punchcards for machine calculation.

The stagnation temperatures for tests utilizing the wing-type support structure were determined by temperature probes mounted on the sting support system downstream from the models as illustrated in figure 3. The sidewall-mounting probes were 12 inches from the tunnel side wall for the tests in the tunnel side-wall boundary layer.

Pressure Instrumentation

The primary purpose of the present investigation was to determine heating rates; consequently, only a slight amount of pressure instrumentation was incorporated in the tests. The static-pressure orifices in the test surface were used to determine the extent of the effect of the projection on the flat-plate surface pressures. The static pressures were measured with individual electrical transducers. Total-pressure profiles were obtained to determine the nature and magnitude of the boundary layer at the three test plate positions. The 30-tube rake illustrated in figure 32 was used to determine the boundary-layer thickness at 40.47 and 116.47 inches from the leading edge on the 10-foot flat plate. The tunnel side-wall boundary layer was measured at the position of the instrumented right circular cylinder with the large pressure rake shown in figures 33 and 34. Boundary-layer-rake static- and total-pressure tubes were connected to valves that sequentially sampled 48 pressures on a single electrical transducer. The transducer output was digitized and recorded on punchcards for machine calculation. The free-stream and stagnation pressures were measured by precision mercury manometers.

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ACCURACY

The precision mercury manometers have an accuracy of 1/2 lb/sq ft and therefore the accuracy of the pressure system is limited to the electrical transducer. The deviation in test-section Mach number without the horizontal support structure is listed as follows:

M	R	$\pm\Delta C_p$	$\pm\Delta M$
2.65	3.98	0.011	0.02
	2.58	.016	.02
	1.33	.032	.02
3.51	4.05	.013	.05
	2.86	.019	.05
	1.65	.033	.05
4.44	4.69	.017	.06
	3.24	.024	.06
	2.16	.037	.06

One of the characteristics of the Langley Unitary Plan wind tunnel (refs. 7 and 9) is that the expansions of the nozzle originate on the lower surface and are canceled on the upper surface. The 10-foot flat surface extends upstream from the test section and apparently intercepts a portion of the nozzle expansion. The resultant compression and reflected expansions cause a deviation in Mach number level that is dependent upon R. The local values of M for two positions on the flat plate are presented in the section entitled "Boundary layer."

Elementary tests conducted on the flat plate and utilizing radiant heat source indicate that losses due to conduction through the fiberglass laminated honeycomb insulation, convection in the honeycomb cells, and the added mass of the glue line and tape bonding the honeycomb to the stainless-steel skin could be as large as 23 percent.

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The accuracy of the temperature measurements based upon thermocouples wire calibration, cold junction, and recorder resolution is $\pm 2^{\circ}$ F as determined in reference 8.

The accuracy of the heat-transfer coefficients also previously determined in this facility (ref. 10) indicates values as shown in the following table:

Heat-transfer coefficient	Accuracy
>0.0150	±10 percent
0.0010 to 0.0150	±15 percent
<0.0010	±20 percent

DATA REDUCTION

Pressure Data

The static pressures on the flat plate are presented as free-stream pressure coefficients. The Mach number distribution in the boundary layer is determined from the total-pressure survey rake by assuming that the static pressure is constant through the boundary layer and of the magnitude determined from the outboard static-pressure tube on the rake of figure 32 and the magnitude of the inboard static-pressure tube on the rake illustrated in figure 33.

Heat-Transfer Data

The heat-transfer coefficients were obtained from transient skin temperatures resulting from a stepwise increase in stagnation temperature as shown in reference 8. The following relation, which assumes constant temperature through the skin, negligible lateral heat flow, negligible heat flow to the model interior, and no heat losses due to radiation, was used:

$$h = \frac{wc\ dT_w/dt}{T_e - T_w}$$

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This equation was rewritten in the following form for complete machine calculation:

$$h = \frac{wc\left(T_{w,m} - T_{w,0}\right)}{\frac{T_e}{T_t}\sum_{0}^{m-1}\left(T_t\right)_i\Delta t - \sum_{0}^{m-1}\left(T_w\right)_i\Delta t}$$

The summations are evaluated over increments of time according to the trapezoidal rule, and the ratio T_e/T_t is experimentally determined. The effect of conduction through the model skin was determined from the following relation:

$$h_c = \frac{wc\left(T_{w,m} - T_{w,0}\right) - kb\sum_{0}^{m-1}\left(\frac{\partial^2 T_w}{\partial x^2} + \frac{\partial^2 T_w}{\partial y^2}\right)}{\frac{T_e}{T_t}\sum_{0}^{m-1}\left(T_t\right)_i\Delta t - \sum_{0}^{m-1}\left(T_w\right)_i\Delta t}$$

A detailed discussion of this method of data reduction is also presented in reference 8.

The Stanton number was determined from free-stream conditions; it is given as

$$N_{St} = \frac{h}{\left(\rho V c_{pg}\right)_\infty}$$

DISCUSSION OF RESULTS

Flow Visualization

The oil-flow technique described in reference 6 was used to define the flow near the flat-plate surface for 10 different protuberances mounted in the maximum boundary-layer thickness. The flow field is made visible by coating the model surfaces with a high-viscosity oil having in suspension a fluorescent green dye that becomes luminescent when exposed to ultraviolet light.

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To obtain oil-flow photographs the instrumented flat plate was mounted in the tunnel side wall with a resultant boundary-layer thickness of 6 inches. The flow field over the entire flat plate was recorded with two wide-angle-lens cameras mounted in the opposite wall. However, the distortion of the wide angle lenses prevented superposition of the two pictures. The oil-flow photographs were made at a free-stream Mach number of 3.51 and a nominal Reynolds number per foot of 3×10^6. The slight asymmetry of the upstream boundary of the interference region indicates that there is some cross flow in the tunnel side-wall boundary layer. The slight effect of free-stream Mach number was determined on the single cylinder that was tested at Mach numbers of 2.65, 3.51, and 4.44. The flow field for the three external stiffener models illustrated in figure 8 are shown in figures 35(a), (b), and (c). The effect of the protuberance on the flow field is discussed in terms of projection height K. The flow field on the leeward side of the models is similar for all three models. Along the leeward face a dead-air region extends downstream about 1/4K. A loop vortex originating at the stiffener ends extends along the leeward side of the models with the vortex filament approximately 1K downstream from the model.

The flow field for a 2-inch by 4-inch rectangular stiffener is shown in figure 35(a). The bow shock wave separates the boundary layer upstream from the model and reverse flow extends a distance of 4K upstream from the front face. In figure 35(b) the flow pattern for the 2-inch by 4-inch rectangular stiffener faired with a 1/4 round fairing of the windward face shows that flow separation extends 2.8K upstream from the front face. The flow field on the windward face was washed clean at a Reynolds number of 3.5×10^6. As shown in figure 35(b), at a reduced Reynolds number of 2.0×10^6 the limit of reverse flow on the windward face is very clear. The effect of fairing the windward face of the rectangular stiffener with a 30° wedge is shown in figure 35(c). The extent of reverse flow is reduced to 1.4K upstream from the leading edge of the wedge. The demarcation line of flow separation, visible on the wedge face, is approximately 0.3K from the flat-plate surface. Downstream, the loop vortex flow for the wedge is more clearly defined than that for the rectangular stiffener.

The oil-flow patterns for a single right circular cylinder mounted normal to the flat plate at free-stream Mach numbers of 2.65, 3.51, and 4.44 are shown in figure 36. The interaction of the cylinder bow shock wave with the boundary layer on the flat plate results in the high-pressure air behind the shock feeding upstream in the subsonic portion of the boundary layer; this causes a local thickening in boundary layer and, consequently, a lambda footed bow shock wave. This lambda footed bow shock wave causes two defined lines in the oil-flow pattern. The outermost line is the limit of reverse flow and the innermost line encloses the region of maximum turbulence in which the oil is almost completely removed. Increasing the Mach number from 2.65 to 4.44 increases the upstream extent of reverse flow from 1 cylinder diameter to 1.2 diameters and also increases the width of the flat-plate area affected by the cylinder. The flow on the leeward side of the cylinder is similar for all three Mach numbers where a dead-air region occurs on each side of the cylinder wake.

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To determine the effect of positioning a cylinder in the wake of another cylinder, a second cylinder was located at various positions upstream from the single cylinder shown in figure 36. In figure 37, the boundary-layer flow field of a single cylinder is compared with the resultant flow of tandem cylinders placed 3.2 diameters apart. The flow pattern of the upstream cylinder is identical to the single cylinder. The wake of the upstream cylinder confines the interference region on the instrumented cylinder to a very localized region.

The effect of extending the spacing of the tandem cylinders to 6.4 diameters is shown in figure 38. The relatively large distance between the two cylinders permits the flow to reestablish a flow field similar to that for the single cylinder. The wake of the upstream cylinder causes only a slight reduction in the extent of reverse flow on the windward face of the downstream cylinder.

In figure 39 the instrumented cylinder is 3.2 diameters downstream from a dummy cylinder and offset so that a line connecting the centers of the cylinders forms an angle of $26\frac{1}{2}^{\circ}$ with the free stream. The flow fields of the two cylinders overlap and the low-energy wake is assimilated by the second cylinder shock wave.

In figure 40 the flow field is shown for a cylinder placed 3.2 diameters downstream from a dummy cylinder, and a line connecting the centers of the cylinders forms an angle of 45° with the free stream. The flow field of the second cylinder is distorted so that the region of high turbulence is at a minimum along a line connecting the centers of the cylinders. The flow-visualization photographs of all cylinder projections show, in the region of the flow field enclosed by the shock boundary-layer interaction, a third line of flow discontinuity forming

a "herringbone" pattern in the oil. In this particular configuration, this third line is directed toward the second cylinder. Heat-transfer tests (ref. 4) indicate that this wake location causes a maximum heat-transfer coefficient on the flat plate just upstream from the second cylinder.

The effect of sweep on the flow pattern of a single circular cylinder is illustrated in figures 41 and 42. The flow field for the 45° sweptback cylinder is illustrated in figure 41. The low Reynolds number photograph (fig. 41(a)) illustrates the streamlines along the windward portion of the cylinder. The area of high shear on the flat plate influenced by the swept cylinder is confined to a very small region, extending upstream less than 0.3d.

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The largest region of high shear from shock boundary-layer interaction for any single cylinder configuration results from sweeping the cylinder 45° forward as illustrated in figure 42. The reverse flow extends 3 diameters upstream, and the area of interaction is comparable to that obtained with the two-dimensional stiffener models. The third line of flow discontinuity resembling a "herringbone" line, noted in figure 40, is well defined to its origin, slightly upstream from the stagnation line of the cylinder. The dead-air region on the leeward side of the cylinder is more extensive than that of any of the other cylinder configurations. The concentration of oil on the leeward side of the cylinder indicates a large region of dead air. Heat-transfer results presented in a subsequent section of this report show that this cylinder configuration gave maximum heat-transfer coefficients on the flat plate at the stagnation line of the cylinder.

Pressures

Boundary layer.- The boundary-layer profile was measured with the rake illustrated in figure 32 at 40.47 inches and 116.47 inches downstream from the leading edge of the flat surface spanning the tunnel on the horizontal center plane. The tunnel side-wall boundary layer was measured at the position of the instrumented cylinder with the large rake shown in figure 33. The boundary-layer profile was determined from $p_{t,2}$ and p_s, with p_s assumed to be constant through the boundary layer and of the magnitude determined by the tube at $z = 3$ inches on the small rake and by the tube at $z = 3\frac{3}{8}$ inches on the large rake. The results are listed in table II-1 and typical Mach number profiles are depicted in figure 43. The inner five tubes of the small rake distorted the boundary-layer profile in the vicinity of the wall. The local free-stream Mach number M and boundary-layer thickness δ are as follows:

M	R	Rake station, in.	M_l	δ, in.
2.65	4.87×10^6	116.47	2.64	1.47
	3.14	116.47	2.66	1.47
	1.60	116.47	2.61	1.47
	4.79	40.47	2.70	.70
	3.09	40.47	2.63	.56
3.51	4.78	116.47	3.41	1.47
	3.33	116.47	3.41	1.67
	1.89	116.47	3.38	1.67
	4.61	40.47	3.37	.70
	3.06	40.47	3.21	.70
4.44	4.34	116.47	4.13	1.67
	3.04	116.47	4.09	1.76

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The measured boundary-layer thicknesses were in good agreement with δ predicted by equation (7) of reference 11. Although the boundary-layer thickness δ varies with M and R, the nominal value of δ at x = 40.47 is 0.7 inch and at x = 116.47 is 1.5. The nominal tunnel side-wall value of δ is 6 inches.

Pressure coefficients.- The distribution of pressure coefficients on the flat plate alone and in the vicinity of the stiffener and cylinder models is listed in table II-2 and is plotted in figures 44 to 48. Conversion of the flat-plate pressure coefficients to local values of M by assuming the local total pressure is the same as that in the free stream and comparison of the pressure data for both the forward and aft positions of the test plate indicate that the value of M along the plate in the aft position is approximately 0.03M higher than that in the forward position.

The flat-plate pressure coefficients for the stiffener models are presented in figure 45. The oil-flow photographs indicate that all orifices are in separated flow. Comparison of the measured pressures with the critical pressures associated with separation of a turbulent boundary layer (ref. 12) shows that measured values are approximately 20 percent below theoretical values for Mach numbers of 2.65 and 3.51 and have fair agreement at a Mach number of 4.44.

Superposition of pressures measured in the vicinity of cylinders located in three positions along the test plate center line (fig. 1) in the nominal 1.5-inch and the nominal 6-inch flat-plate boundary

layers is shown in figure 46 and illustrates the extent of the interaction of the cylindrical bow shock wave with the flat-plate boundary layer. The $2\frac{1}{2}$-inch offset of the pressure orifices from the flat-plate center line prevents the determination of the maximum upstream effect of the cylinders. However, the pressures indicate that the cylindrical bow shock is apparently lambda footed and divided into two pressure hills upstream from the cylinder with the maximum pressure rise occurring in the vicinity of the bow shock. For an approximately constant boundary-layer thickness and Reynolds number per foot, the pressure distributions are similar throughout the test Mach number range.

Increasing the flat-plate boundary layer from 1.5 inches to 6 inches results in an attenuation of the interaction phenomena, but the overall pressure distributions are similar (i.e., maximum C_p at $M = 2.65$ is 0.38 in the 1.5-inch boundary layer and 0.28 in the 6-inch boundary layer).

Dissipation of the interaction phenomena in the lateral plane of the cylinder is defined by superposition of pressures obtained on cylinders located at three spanwise stations with a constant distance from the flat-plate leading edge. (See fig. 47.) The peak pressure coefficients are in the region of the main cylinder shock and decrease in magnitude and occur farther downstream with increasing lateral distance from the cylinder as the bow-shock intensity decreases. The lambda shock also sweeps back, but the decrease in magnitude is slight. The effect of increasing the boundary layer from 1.5 inches to 6 inches is to decrease the measured peak C_p.

Figure 48 illustrates the pressure distribution upstream from a circular cylinder at three angles of sweep: 0°, 45° forward, and 45° back. The pressure orifices extend from 7.5 inches to 16.5 inches upstream. As noted in the preceding discussion, the offset of the pressure orifices from the flat-plate center line prevents determination of the maximum upstream effect of shock interaction. However, the effect of sweep and the slight effect of boundary-layer thickness is readily discernible. At 0° sweep the separated flow extends 2.1 cylinder diameters upstream for all boundary-layer thicknesses. At 45° sweepforward the separation extends 3.4 diameters upstream for the 0.6-inch and 1.5-inch boundary layers and increases to 3.8 diameters upstream for the 6-inch boundary layer.

Heat Transfer

Flat plate.- No theory exists for the prediction of the effect of a projection of arbitrary cross section on the local heat-transfer

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coefficient of the adjacent surface. This investigation experimentally determines the effect of different protuberance configurations on the adjacent surface by dividing, at a particular thermocouple, the local heat-transfer coefficient of the flat plate with a protuberance by the local heat-transfer coefficient of the flat plate without a protuberance. This ratio is referred to hereinafter as h/h_o. The results of this investigation are presented in this form in tables III, IV, and V. The scope of this investigation necessitated testing in three separate phases. At the beginning and conclusion of each phase the basic flat plate was tested at each Mach number and Reynolds number to determine the reliability of each thermocouple and the agreement of each phase. This comparison indicated a shift in the average level of heat transfer between the first and subsequent phases. This shift was attributed to the location of the stagnation-temperature probe. In the first phase the probe was located above the support structure, and the gradient in the stagnation temperature resulted in a temperature lower than that in the region of the test surface. In subsequent phases the probe was located below the support structure on the side of the test surface. Because the stagnation temperature is used in the computation of the heat-transfer coefficient, it is necessary when comparing a flat-plate heat transfer with a model heat transfer that the stagnation temperature be measured at the same location. Consequently all protuberance heat-transfer measurements in phase I are divided by a flat-plate value of phase I and all protuberance heat-transfer measurements in subsequent phases are divided by flat-plate values in the corresponding phase. The final listing of the heat-transfer coefficients of the flat plate alone is taken from those phases in which the stagnation probe is located on the same side of the support structure as the test surface. A comparison of flat-plate heat-transfer coefficients obtained with the probe located on the side opposite the test surface with the flat-plate values, as presented in tables III and IV for the same test conditions, indicates that for a nominal 0.7-inch boundary layer the heat-transfer coefficients were 15 percent higher and for a nominal 1.5-inch boundary layer the coefficients were 20 percent higher than those of the flat plate alone. Although the value of the heat transfer in the first phase is not comparable to that in any other phase, the ratio h/h_o is valid.

The interchangeability and relocation of the test plate in figure 1 on the support assembly spanning the tunnel on the horizontal center plane permitted the location of the projections in two boundary-layer thicknesses. (See fig. 6.) As discussed in the section entitled "Boundary layer," the boundary-layer thickness on the test surface mounted on the tunnel horizontal center plane was measured at the position of the instrumented cylinder on the plate in the forward position and at a station 116.47 inches downstream from the leading edge with the test surface in the aft position. The nominal boundary-layer thickness in the forward position was 0.7 inch and 1.5 inches in the aft

position. With the test surface mounted on the tunnel side wall the nominal side-wall boundary-layer thickness was 6 inches. These boundary-layer thicknesses are used to identify the location of the test surface for each model configuration.

The axial distance x for the thermocouples on the flat plate are always measured from the leading edge of the test flat plate. The leading edge of the test plate is 12 inches from the origin of the boundary layer (leading edge of the wing-type support structure) for the nominal value of δ of 0.7 inch and 60 inches from the boundary-layer origin for the nominal value of δ of 1.5 inches. The flat-plate heat-transfer coefficients for all of the thermocouples on the flat plate mounted in the 0.7-inch and 1.5-inch boundary layers are presented in tables III-1 and IV-1 and are compared with the Van Driest flat-plate theory (ref. 13) in figures 49 and 50. The theory is evaluated for $M_l = M_\infty$, $T_w/T_\infty = 2.0$ for $M_l = 2.65$, $T_w/T_\infty = 3.0$ for $M_l = 3.51$, and $T_w/T_\infty = 4.0$ for $M_l = 4.44$ for an assumed value of N_{St} of $0.6c_f$. In the minimum boundary layer, the differences between measured heat-transfer coefficient and theoretical values are within the accuracy of heat-transfer measurements. In the 1.5-inch boundary layer, the experimental values are less than those predicted by Van Driest theory and the variation of Stanton number with Reynolds number is less than that predicted. The increase in local Mach number associated with the tunnel nozzle expansion, as discussed in the section entitled "Accuracy," causes a reduction in the measured heat-transfer coefficient; however, adjusting the theoretical calculations for this slight Mach number effect decreases the discrepancy between theory and experiment, but the result is not of the proper magnitude.

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Stiffener projections.- Surface projections cause separations of the local flow; the extent of this separation both upstream and downstream and the magnitude of the resultant heat-transfer-coefficient variation are dependent upon size, cross-sectional shape, Mach number, Reynolds number, and boundary-layer thickness. The effect of these variables on the heating distribution in the vicinity of the two-dimensional section (along the flat-plate center line) of the three-dimensional models in figure 8 is illustrated in figures 51 to 57. With the exception of the 1-inch by 2-inch stiffener these models were only tested in the 6-inch boundary layer. The 1-inch by 2-inch stiffener, used with the 2-inch by 4-inch rectangular stiffener to determine scale effect, was also tested in the 1.5-inch boundary layer.

The effect of Mach number and Reynolds number on the heating distribution on the flat plate with the 2-inch by 4-inch stiffener in a nominal 6-inch boundary layer is illustrated in figure 51. As illustrated in figure 51(a), the increase in heat-transfer coefficient at a Mach number of 3.51 and Reynolds number of 2.79×10^6 extends upstream

a distance greater than 3.25 projection heights. The region of low heat transfer in the wake of the projection extends approximately 2 projection heights downstream. It should be noted that the Reynolds number effect and Mach number effect are plotted for all thermocouples within $2\frac{1}{2}$ inches of the center line of the flat plate. Reynolds number effect in figure 51(b) is negligible except in the immediate region upstream from the model. Here with an increase of approximately 60 percent in Reynolds number, the heat-transfer ratio h/h_o increased approximately 25 percent. In the same area for a nominal Reynolds number per foot of 2.9×10^6, the effect of increasing Mach number from 2.65 to 4.44 (fig. 51(c)) increases the value of h/h_o approximately 60 percent. The heat-transfer coefficient in the wake is relatively insensitive to Mach number and Reynolds number. The correlation of the constant h/h_o lines with the oil-flow pattern for the 2-inch by 4-inch rectangular stiffener is illustrated in figure 52. By observing these photographs it is easily seen that high values of h/h_o occur in the regions of high shear (dark area along the windward face of the model).

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The effect of fairing the windward face of the rectangular stiffener on the distribution of the heat transfer is illustrated in figures 53 to 55 and is listed in tables V-3 and V-4. The overall heat-transfer distribution on the flat plate for the 1/4 round fairing (fig. 53) is similar to that on the 2-inch by 4-inch rectangular stiffener. However, the maximum value of h/h_o is reduced 30 percent.

By fairing the 2-inch by 4-inch rectangular stiffener with a 30° wedge (fig. 54), the upstream heating is reduced by 60 percent. The heat-transfer distribution in the wake is the same for all three models. Figure 55 illustrates the correlation between the oil-flow patterns and the lines of constant h/h_o for the 30° wedge fairing. In this photograph, as in the other oil-flow photographs, the regions of high shear and lines of h/h_o coincide. It should be noted that from a weight standpoint the 1/4 round fairing and the 30° wedge fairing incorporate approximately the same amount of material. Comparison of the three stiffener configurations indicates that the 30° wedge shows an appreciable reduction in heating on the flat plate.

The windward heat-transfer distribution on all stiffener models, as shown in figure 56, are of the same magnitude; consequently, the total integrated heat load would be largest for the 30° wedge fairing model and for heat considerations the 2-inch by 4-inch rectangular stiffener would be the optimum configuration.

The Reynolds number and Mach number effect on a 1-inch by 2-inch stiffener is illustrated in figure 57. Comparison of the 1-inch by

2-inch stiffener in figure 57 with the 2-inch by 4-inch stiffener in figure 51 illustrates the scale effect in the 6-inch boundary layer. By increasing the projection size by a factor of 2, the region of elevated heating increases from 1K to $2\frac{1}{2}$K. The extent of low heat transfer in the wake increases from 1K to $1\frac{1}{2}$K.

Comparison of the results of the 1-inch by 2-inch stiffener in both the 1.5- and 6-inch boundary layers with those of the 2-inch by 4-inch stiffener in the 6-inch boundary layer indicates that the ratio of size of the projection to the local boundary layer affects the heat-transfer ratio up to the point where $K/\delta = 1$. This effect is to increase the value of h/h_o approximately 30 percent. There is no appreciable increase for $K/\delta > 1$. L 2 0 2 4

Single cylinder.- As a means of simulating external antenna, or slab surfaces having hemicylindrical leading edges, cylinders of varying diameter and sweep were tested in the three boundary-layer thicknesses. Combinations of multiple cylinders were also tested to determine the heat-transfer distribution on projections at various positions in the wake of a second cylinder. A portion of these results has been presented in reference 4. The extent of the interference region, the effect of unit Reynolds number, and the effect of free-stream Mach number are presented in figure 58 for the 2.8-inch-diameter right circular cylinder in a 6-inch boundary layer. With the exception of a small area immediately downstream from the cylinder, the entire interference region has elevated heat-transfer coefficients. Excluding the cylinder wake, the area where $h/h_o > 2$ is approximately 20 times the cylinder cross-sectional area. The effect of unit Reynolds number and M are confined to the stagnation region of the cylinder, where h/h_o increases with decreasing R and increasing M. The effect of boundary-layer thickness was determined for $M = 3.51$ and $R = 2.86 \times 10^6$; however, the effect should be similar for all Reynolds numbers and Mach numbers of this investigation. By increasing the boundary-layer thickness from 0.7 inch to 1.5 inches, the effect on the area of interaction is imperceptible. However, increasing the boundary-layer thickness by a factor of approximately 10 reduces the interaction area 60 percent. The influence of boundary-layer thickness on h/h_o along the center line of the plates (fig. 59) is confined to the region of $(h/h_o)_{max}$ which increases with decreasing boundary-layer thickness. Within the range of this investigation $(h/h_o)_{max}$ varies from 2.9 (for $M = 2.65$, $R = 4 \times 10^6$, and $\delta = 6$ in.) to 14.2 (for $M = 4.44$, $R = 2.1 \times 10^6$, and $\delta = 0.7$ in.).

The heat-transfer coefficients on the cylinder models h are divided by the theoretical values for laminar flow h_L as predicted by

the method of reference 14. A list of these theoretical values can be found in table VI. The agreement with theory outside of the region of flat plate and cylinder bow shock interaction is only fair. All the data presented in this report for the 2.8-inch-diameter right-circular-cylinder configurations tested in the 0.7-inch and 1.5-inch boundary layers were obtained with the stagnation probe mounted on the side of the wing-type support structure opposite the models, and as was noted in the discussion of the flat-plate heat-transfer coefficients these heat-transfer coefficients are low. A similar test described in reference 5 with a 0.030-inch-thick Inconel cylinder wall as opposed to the present test with a 0.050-inch-thick stainless-steel cylinder wall had good agreement with theory; this agreement indicated that conduction losses could be attributed to the difference in wall thickness. The wide spacing of the thermocouples at $\phi = 0^\circ$, 45°, and 90° was too large to define the circumferential conduction losses; consequently, the conduction losses in the tables are only in the z-direction on the stagnation line of the cylinder.

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The intersection of the cylinder bow shock wave and the flat-plate boundary layer causes the high pressure behind the cylinder bow shock to feed upstream and radially outward in the flat-plate boundary layer which, in turn, causes a local boundary-layer thickening and local shocks. These shocks intersect the cylinder bow shock, and the resultant vortex impinging on the cylinder results in localized high heat transfer. These flow phenomena are illustrated in figure 3 of reference 15 and the flow mechanism is more thoroughly discussed in reference 5. The magnitude of this interaction is depicted in figure 60(a) for a 0.7-inch-thick boundary layer. The value of $\left(h/h_L\right)_{max}$ increases with increasing M from 1.38 at $M = 2.65$ to 2.28 at $M = 3.51$. The value of $\left(h/h_L\right)_{max}$ at $M = 4.44$ cannot be compared with the values at the lower Mach numbers because the thermocouple locations do not coincide with the location of the lambda shock intersection. The increase in shock-angle inclination with decreasing Mach number results in an outward movement of the intersecting shocks with decreasing M. The stagnation-line distribution of h/h_L for the three boundary-layer thicknesses is shown in figure 60(b).

In order to eliminate end effects on the cylinder heat-transfer distribution and to determine the effect of an end plate on the cylinder and the effect of resulting wake on the instrumented flat plate, a 9.0-inch by 14.1-inch flat plate with a 10° wedge was mounted on the right circular cylinder. (See fig. 60(c).) The plate caused a disturbance in the free-stream flow and a shock interaction similar to that encountered on the main support structure. The plate had no effect on the heat-transfer distribution in the wake of the cylinder. The heat-transfer distribution for a 1.4-inch-diameter cylinder, also plotted in this figure, is discussed subsequently.

Multiple cylinders.- The heat-transfer distribution at various positions in the wake of a second cylinder is determined by positioning a dummy cylinder at several locations upstream from the instrumented cylinder. The results given in this report supplement the data presented in reference 4 for the 1.5-inch-thick boundary layer at $M = 3.51$ and $R = 2.8 \times 10^6$ by presenting the data for $M = 2.65$ and 4.44 and three Reynolds numbers at each Mach number and also the results obtained in a boundary layer of 6 inches.

The theoretical stagnation-line heat-transfer distribution on the instrumented cylinder in the 6-inch-thick boundary layer does not show any radical difference for the various cylinder locations depicted in figures 61 to 65. It is evident from a comparison of these results with the results of reference 4 that the thick boundary layer diminishes the interaction heating; however, it is to be noted that the 45° offset cylinder location has the highest heating rates.

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Tandem cylinders 3.2 diameters apart: The interference heating resulting from placement of the cylinders in tandem and spaced 3.2 diameters apart is illustrated in figure 61. The values of $(h/h_o)_{max}$ on the flat plate occur at the stagnation line of the cylinders, and these values are in good agreement when the difference in thermocouple location (x/d of 0.57 upstream from the stagnation element on the forward cylinder and x/d of 0.21 for the instrumented cylinder) is taken into consideration. The $(h/h_o)_{max}$ of the leeward cylinder can be compared with that of the single cylinder; this comparison indicates that the wake of the dummy cylinder causes a large reduction in $(h/h_o)_{max}$. The effects of R and M (figs. 61(b) and 61(c)) are presented for the thermocouples located within a $2\frac{1}{2}$-inch band of the flat-plate center line, and for clarity in the immediate vicinity of the cylinders only the center-line thermocouple data are presented. The trend of increasing h/h_o with decreasing R and increasing M is similar to the trend for the single cylinder, but the wake causes a reduction in the magnitude of this variation. This reduction is dependent upon M, R, and δ. For $M = 2.65$, $R \approx 4 \times 10^6$, and $\delta = 6.0$ inches, $(h/h_o)_{max}$ is reduced only 11 percent. For $M = 4.44$, $R \approx 2.1 \times 10^6$, and $\delta = 1.5$ inches, $(h/h_o)_{max}$ is reduced 66 percent.

Tandem cylinders placed 6.4 diameters apart: Increasing the tandem cylinder spacing to 6.4 diameters (fig. 62) permits the wake of the upstream cylinder to regain most of the free-stream velocity and as a result the $(h/h_o)_{max}$ at the instrumented cylinder and its variation with R and M are of the same magnitude as those of the single cylinder.

Cylinders offset $26\frac{1}{2}^{\circ}$: In figure 63 is shown the h/h_o distribution resulting from placing the instrumented cylinder 3.2 diameters downstream from the dummy cylinder and offset so that a line connecting the centers of the cylinders forms an angle of $26\frac{1}{2}^{\circ}$ with the free stream. The region of elevated heating is very large and for M = 2.65 and 3.51 the $(h/h_o)_{max}$ and its variation with R and M are approximately the same as those for the single cylinder. The $(h/h_o)_{max}$ for M = 4.44 is greater than that for the single cylinder. As is discussed in the next section for the cylinder having the 45° offset, the maximum interference heating is related to the proximity of the cylinder bow shock wave.

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Cylinders offset 45°: In figures 64 and 65 is shown the h/h_o distribution resulting from placing the instrumented cylinder 3.2 diameters downstream from the dummy cylinder and offset so that a line connecting the cylinder centers forms an angle of 45° with the free stream. The maximum heating in the vicinity of the instrumented (leeward) cylinder occurs in the ϕ quadrant that is alined with the herringbone line (in the oil-flow patterns of fig. 40) that originates in the vicinity of the windward portion of the upstream cylinder. Since this pattern is similar to the type of flow limiting the interference region and this pattern converges with increasing M, it is postulated that this is the projection of the bow shock and that $(h/h_o)_{max}$ occurs when the upstream cylinder bow shock impinges on the instrumented cylinder. This postulation is further substantiated by the variation of $(h/h_o)_{max}$ with M. At M = 2.65, $(h/h_o)_{max}$ is of the same magnitude as that for the single cylinder; however, at M = 4.44, $(h/h_o)_{max}$ is 52 percent greater for the 45° offset cylinder than that for the single cylinder. The Reynolds number and Mach number effects are depicted in figures 64(b) and 64(c).

Cylinder scale effect.- In order to determine the scale effect, 1.4-inch-diameter cylinders were tested in the 0.7-inch and 1.5-inch boundary layers. Comparison of the contour plots (not shown herein) for the 1.4-inch-diameter single cylinder with those for the 2.8-inch-diameter single cylinder indicates that the interaction region is proportional to the cross-sectional area of the cylinder.

Single cylinder: The difference in the location of the thermocouple in the flat plate relative to the stagnation line of the cylinders having different diameters prevents any direct comparison of $(h/h_o)_{max}$; however, the variation of $(h/h_o)_{max}$ with R and M, as shown in the tables, is the same for the two cylinders. The h/h_L distribution

along the stagnation line (fig. 60) is considerably different for the smaller cylinders. The value of $(h/h_L)_{max}$ is 1.6 for the small cylinder at M = 3.51 and R = 2.87 as compared with 2.24 for the large cylinder. Also, the location of $(h/h_L)_{max}$ is inboard; this indicates that d/δ must be considered. The larger frontal area of the large cylinder restricts the flow in the vicinity of the lambda shock and causes a larger bump in the boundary layer with a correspondingly higher interaction point.

Tandem cylinders spaced 6.4 diameters apart: The $(h/h_o)_{max}$ at the stagnation line of the leeward cylinder, for all test Mach numbers and Reynolds numbers, is greater than the measured value for the single cylinder; this indicates that the windward cylinder has added considerable turbulence to the flat-plate boundary layer and, as a result, the increase in h/h_L on the stagnation line of the cylinder, associated with the lambda shock interaction, is not discernible.

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Cylinders offset $26\frac{1}{2}^\circ$: The $(h/h_o)_{max}$ on the flat plate exceeds the value for the single cylinder. The increase of $(h/h_o)_{max}$ at the windward cylinder over the single cylinder is greater than the increase noted at the large cylinders in the 45° offset position. The variation of $(h/h_o)_{max}$ with M and R is similar to the results for the large cylinder. The h/h_L distribution on the 1.4-inch-diameter cylinder is the same for the tandem and $26\frac{1}{2}^\circ$ offset positions.

Effect of sweep.- In order to determine the effect of sweep on heating, tests have been made on a 2.8-inch-diameter cylinder swept 45° forward and back.

Cylinder swept forward 45°: Applying the analogy between high shear and high heating to the oil flow for the forward swept cylinder (fig. 42) indicates that this configuration has the largest windward region of high heating of all cylinder configurations studied in this investigation. Superimposing h/h_o at the thermocouple locations on the flat plate on the oil-flow photographs further substantiates the correlation of oil-flow shear to heat-transfer distribution. Comparison of the oil-flow patterns of a single and a 45° sweptforward cylinder (figs. 37(a) and 42) indicates that the region of shock-wave—boundary-layer interaction is larger for the sweptforward cylinder. However, the area bounded by the line of constant h/h_o of 2 (as shown in fig. 66(a)) is the same for both configurations. The variation of h/h_o with M and R shown in figure 66 is the same as that for the

preceding configurations. The magnitude of $(h/h_o)_{max}$ varies from 5.6 in the 6-inch-thick boundary layer at $M = 2.65$ and $R = 3.26 \times 10^6$ to 25.3 at $M = 4.44$ and $R = 2.12 \times 10^6$. The correlation of heat-transfer ratios and oil-flow patterns is illustrated in figure 67.

The h/h_L distribution along the stagnation line of the 2.8-inch-diameter cylinder is shown in figure 68. The decrease of $(h/h_L)_{max}$ with increasing boundary-layer thickness and the inward movement of the location of $(h/h_L)_{max}$ with increasing M is similar to those for the right circular cylinder. In a 0.7-inch-thick boundary layer $(h/h_L)_{max}$ on the swept cylinder is greater than that on the right circular cylinder except at $M = 4.44$.

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Cylinder swept back 45°: The measured h/h_o and h/h_L distributions for the cylinder swept back 45° are shown in figures 69 and 70, respectively. The shock-wave—boundary-layer interaction on the flat plate is confined to a small region in the immediate vicinity of the cylinder. The thermocouple in the flat plate at the stagnation line of the other cylinders is covered by this configuration and, as a result, the thermocouple nearest to the stagnation line is at $x/d = 0.64$ upstream from the cylinder stagnation element as opposed to $x/d = 0.14$ for the cylinder swept forward 45°. Although $(h/h_o)_{max}$ is not measured, the oil-flow patterns indicate a very low value of $(h/h_o)_{max}$. The effect of sweep on interference heating is dependent upon the direction of sweep. For example, $(h/h_o)_{max}$ for a right circular cylinder in a 1.5-inch-thick boundary layer at $M = 3.51$ and $R \approx 3 \times 10^6$ was 6.83; for the same test conditions with the cylinder swept back $(h/h_o)_{max}$ was 2.07 and with the cylinder swept forward $(h/h_o)_{max}$ was 11.14. The configuration in figure 14(a) was used to obtain $(h/h_o)_{max}$ at 45° sweepback. This model has a 45° sweptback hemicylindrical leading edge with a diameter comparable to that of the 2.8-inch-diameter cylinder.

On the stagnation line of the cylinder $(h/h_L)_{max}$ decreases with increasing boundary-layer thickness. In the 6-inch-thick boundary layer only the thermocouples outside the flat-plate boundary layer have values of h/h_L greater than 1. The magnitude and distribution of h/h_L in the 0.7-inch and 1.5-inch boundary layers suggest that a portion of the flat-plate boundary layer flows along the leading edge of the cylinder and that all values of h/h_L are greater than 1. The variation of h/h_L with M is not discernible on this configuration.

Specific protuberances.- The previously discussed configurations are general adaptations of standard geometric shapes. Results of combinations of these shapes produce heating rates that are different from those produced by any one of the single components and are discussed in the following sections. Typical configurations of protuberances, such as those shown in figure 14, are representative of actual fairings for electrical conduits, helium pressure lines, fuel lines, and other external piping of a launch vehicle. The effect of these specific protuberances on the heat-transfer distribution on the flat-plate surface for $M = 3.51$, $R = 2.8 \times 10^6$, and $\delta = 1.5$ inches is illustrated in figure 71.

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26° fairing: The cylindrical-pipe configuration with a 26° conical fairing has a heat-transfer distribution as illustrated in figure 71(a). The upstream interference heating is negligible.

The pipe with axis alined to the free stream and extending downstream from the fairing has a spacing between cylinder wall and flat plate of $0.38z/\delta$ and is completely immersed in the boundary layer. From general observations it might be assumed that the location of this pipe would prevent elevated values of h/h_o in the wake of the upstream fairing. The turbulent wake of the fairing causes the elevated heating pattern shown in figure 71(a) and is similar to that produced by the single cylinder of this report and of reference 4 for the same boundary-layer thickness.

45° fairing: The cylindrical-pipe configuration with a 45° fairing produces a heat-transfer distribution as shown in figure 71(b). The value of $(h/h_o)_{max}$ is increased 100 percent over that for the 26° fairing, and its effect is felt approximately 1K upstream from the protuberance.

The pipe with axis alined to the free stream and extending downstream from the fairing has a maximum spacing between cylinder wall and flat plate of $0.29z/\delta$. A cylindrical shroud diminishes the spacing at one location to a value of z/δ of 0.15. The h/h_o distribution in the wake is similar to that for the 26° fairing.

Lox line: The configuration illustrated in figure 14(c) has a heating distribution as shown in figure 71(c). This fuel-line configuration has many shrouds, fairings, and ring stiffeners and is normal to the flow at the flat-plate surface. The value of K/δ for the lox line has been reduced 66 percent as compared with that for the right circular cylinder of reference 4. Consequently, the interaction phenomena of the bow shock and flat-plate boundary layer are reduced and therefore the value of $(h/h_o)_{max}$ is only 50 percent of that for the right circular cylinder of reference 4 for the same δ.

The portion of the pipe alined with the flow had the space between the cylinder projections and flat-plate surface to vary from $z/\delta = 0.01$ to $z/\delta = 0.15$. High heating rates occurred in the vicinity where the shrouds or ring stiffeners approached the flat-plate surface, and the overall h/h_o pattern in the wake is similar to the patterns for the 26° and 45° fairing models.

30° cableway: The stiffener model illustrated in figure 13 has a flat-plate h/h_o distribution as shown in figure 71(d). This heating distribution is very similar to that for the 30° wedge stiffener model in figure 54. The ratio K/δ is the same and the region of high heating occurs approximately 2K upstream for both models. The downstream distribution of h/h_o in the wake is also similar to that for the large model.

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CONCLUDING REMARKS

Surface protuberances and projections cause separations of the local flow; the extent of this separation both upstream and downstream and the magnitude of the resultant interference heat-transfer coefficients and their distribution are dependent upon size, cross-sectional shape, Mach number, Reynolds number, and boundary-layer thickness. The extent of the interference region can be defined by either static-pressure distributions or by use of the oil-flow technique. In all configurations tested, contour plots of the distribution of heat-transfer ratio h/h_o agreed with the regions defined by the oil-flow photographs.

The heat-transfer distributions in the vicinity of two-dimensional projections having varying cross sections indicate that the upstream heat transfer can be reduced by decreasing the inclination of the front face. The windward interference heating rates increase with decreasing boundary-layer thickness. The maximum heating rate occurs at a ratio of projection height to boundary-layer thickness of 1. The effects of Mach number and Reynolds number are confined to the immediate vicinity of the windward face of the projection. The value of h/h_o increases with decreasing Reynolds number and increasing Mach number. In dead-air regions immediately behind these projections h/h_o is considerably less than that for the undisturbed flow. Downstream from this undisturbed region h/h_o in the wake is greater than that in the undisturbed flow, but the magnitude and distribution are insensitive to Reynolds number and Mach number in the range of this investigation.

On the two-dimensional models totally immersed in the flat-plate boundary layer, the heating rates on the windward face are the same for a front face normal to the flow or swept back 60° (30° cableway).

Interference heating rates in the vicinity of cylinders projecting through the flat-plate boundary layer exhibit the same variation with Mach number, Reynolds number, and boundary-layer thickness as noted for the two-dimensional section models. The effect of sweep on interference heating is dependent upon the direction of sweep (forward or back). For example, the maximum heat-transfer ratio $(h/h_o)_{max}$ for a right circular cylinder in a 1.5-inch-thick boundary layer at a Mach number of 3.51 and a Reynolds number of approximately 3×10^6 was 6.83; for the same test conditions with the cylinder swept back 45° $(h/h_o)_{max}$ was 2.07 and with the cylinder swept forward 45° $(h/h_o)_{max}$ was 11.14.

On the cylindrical projections the lambda footed bow shock causes a localized region of high heating. The location of this high heating region is dependent upon Mach number and boundary-layer thickness. Cylindrical projections also exhibit a scale effect. The size of the bow-shock-wave—boundary-layer interaction increases with frontal area and causes a shift in the location of the interference heating on the cylinder. Locating a cylinder in the influence of a second cylinder causes a large variation in the interference heat-transfer distribution. The most critical location of the cylinder is in the vicinity of the upstream cylinder bow shock.

Three of the specific configurations studied have pipes alined with the free stream and extending downstream from the fairing. Although the spacing between the cylindrical-pipe wall and the flat plate decreased to a value of the ratio of distance from longitudinal axis to boundary-layer thickness of 0.01, the heating distribution in the wake indicated the same increase in heat transfer as was noted in the wake of cylinder projections normal to the flat plate.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., May 3, 1962.

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TABLE I.- LOCATION OF THERMOCOUPLES AND PRESSURE ORIFICES AND RELATIVE POSITION OF PROTUBERANCES

(a) Thermocouple locations on flat plate and protuberances as measured from protuberance origin

Flat plate and filler plate			2-inch by 4-inch rectangular stiffener				2.8-inch-diameter cylinder			26° fairing				
Thermocouple	x, in.	y, in.	Thermocouple	x, in.	y, in.	z, in.	Thermocouple	z, in.	ϕ, deg	Thermocouple	x, in.	y, in.	z, in.	ϕ, deg
1-1	2.0	0.0	11-1	0.0	14.0	2.00	9-1	10.55	0	24-1	0.8	0.0	0.37	
1-2	12.0	.0	11-2	.0	12.0	3.00	9-2	8.55	0	24-2	1.7	.0	.73	
1-3	20.5	.0	11-3	.0	12.0	2.00	9-3	6.55	0	24-3	3.5	.0	1.69	
1-4	28.0	12.0	11-4	.0	12.0	1.00	9-4	4.55	0	24-4	5.3	.0	2.56	
1-5	28.0	4.0	11-5	.0	5.5	2.00	9-5	3.55	0	24-5	6.4	.0	2.57	
1-6	28.0	.0	11-6	.0	3.5	2.00	9-6	2.55	0	24-6	8.4	.0	2.57	
1-7	20.5	-5.0	11-7	.0	1.5	3.00	9-7	1.55	0	24-7	3.5	.2	.73	
1-8	24.5	-5.0	11-8	.0	1.5	2.00	9-8	1.05	0	24-8	5.3	.4	.73	
1-9	30.0	.0	11-9	.0	1.5	1.00	9-9	10.55	45	24-9	8.4	1.1	.73	
1-10	31.0	12.0	11-10	1.0	.0	3.00	9-10	6.55	45	24-10	5.3	.2	1.69	
1-11	34.0	.0	11-11	1.0	.0	2.00	9-11	4.55	45	24-11	6.4	.6	1.69	
2-1	2.0	-12.0	11-12	1.0	.0	1.00	9-12	2.55	45	24-12	8.4	.6	1.69	
2-2	2.0	12.0	12-1	2.0	14.0	2.00	10-1	10.55	90	25-1	10.6		2.32	0
2-3	12.0	-12.0	12-2	2.0	12.0	3.00	10-2	6.55	90	25-2	10.6		2.32	90
2-4	12.0	12.0	12-3	2.0	12.0	2.00	10-3	4.55	90	25-3	10.6		2.32	180
2-5	30.0	1.0	12-4	2.0	12.0	1.00	10-4	2.55	90	25-4	13.6		2.32	0
2-6	31.0	2.0	12-5	2.0	5.5	2.00	10-5	10.55	180	25-5	13.6		2.32	90
2-7	32.0	2.0	12-6	2.0	3.0	2.00	10-6	8.55	180	25-6	13.6		2.32	180
2-8	32.0	3.0	12-7	2.0	1.5	3.00	10-7	6.55	180	25-7	16.6		2.32	0
2-9	32.0	6.0	12-8	2.0	1.5	2.00	10-8	4.55	180	25-8	16.6		2.32	90
2-10	34.0	1.0	12-9	2.0	1.5	1.00	10-9	3.55	180	25-9	16.6		2.32	180
2-11	34.0	2.0	12-10	1.0	12.0	4.00	10-10	2.55	180	25-10	19.6		2.32	0
2-12	34.0	3.0	12-11	1.0	3.5	4.00	10-11	1.55	180	25-11	22.6		2.32	0
4-1	36.0	.0	12-12	1.0	1.5	4.00	10-12	1.05	180	25-12	25.6		2.32	0
4-2	38.0	.0	2-inch by 4-inch stiffener with 1/4 round fairing				2.8-inch-diameter cylinder swept forward 45°			45° fairing				
4-3	40.0	.0												
4-4	44.0	12.0												
4-5	42.0	.0												
4-6	44.0	.0	15-1	-3.9	1.5	1.00	17-1	10.55	180	22-1	0.6	0.0	0.65	
4-7	48.0	.0	15-2	-3.9	8.0	1.00	17-2	8.55	180	22-2	1.4	.0	1.55	
4-8	52.0	.0	15-3	-3.9	12.0	1.00	17-3	6.55	180	22-3	2.6	.0	2.13	
4-9	52.0	12.0	15-4	-2.8	1.5	2.83	17-4	4.55	180	22-4	3.9	.0	2.48	
4-10	55.0	.0	15-5	-2.8	8.0	2.83	17-5	3.55	180	22-5	.6	.6	.65	
4-11	58.0	.0	15-6	-2.8	12.0	2.83	17-6	2.55	180	22-6	1.3	1.3	.65	
4-12	58.0	12.0	15-7	-1.0	1.5	3.87	17-7	1.55	180	22-7	2.3	1.3	.65	
5-1	58.0	-12.0	15-8	-1.0	8.0	3.87	17-8	.55	180	22-8	2.3	1.3	1.35	
5-3	44.0	-12.0	15-9	-1.0	12.0	3.87	17-9	10.55	135	22-9	3.3	1.3	.65	
5-4	36.0	-8.0	15-10	1.0	1.5	4.00	17-10	6.55	135	22-10	3.3	1.3	1.35	
5-5	36.0	-3.0	15-11	1.0	3.5	4.00	17-11	4.55	135	22-11	5.3	1.3	.65	
5-6	34.0	-3.0	15-12	1.0	8.0	4.00	17-12	2.55	135	22-12	5.3	1.3	1.35	
5-7	32.0	-3.0	16-1	1.0	12.0	4.00	18-1	10.55	90	23-1	6.0		1.84	0
5-8	30.0	-3.0	16-2	2.0	1.5	3.00	18-2	6.55	90	23-2	8.0		1.84	90
5-9	28.0	-3.0	16-3	2.0	12.0	3.00	18-3	4.55	90	23-3	8.0		1.84	180
5-10	34.0	-12.0	16-4	2.0	1.5	2.00	18-4	2.55	90	23-4	11.0		1.84	0
5-11	32.0	-12.0	16-5	2.0	3.5	2.00	18-5	10.55	0	23-5	11.0		1.84	90
5-12	30.0	-12.0	16-6	2.0	5.5	2.00	18-6	8.55	0	23-6	11.0		1.84	180
7-1	19.0	-12.5	16-7	2.0	8.0	2.00	18-7	6.55	0	23-7	15.0		1.84	0
7-2	17.5	-11.0	16-8	2.0	12.0	2.00	18-8	4.55	0	23-8	15.0		1.84	90
7-3	15.5	-2.5	16-9	2.0	1.5	1.00	18-9	3.55	0	23-9	15.0		1.84	180
7-4	16.5	-2.5	16-10	2.0	12.0	1.00	18-10	2.55	0	23-10	21.0		1.84	0
7-5	17.5	-2.5	16-11	-2.0	.0	2.00	18-11	1.55	0	23-11	24.0		1.84	0
7-6	18.5	-2.5	16-12	1.0	.0	2.00	18-12	.55	0	23-12	27.0		1.84	0
7-7	19.5	-2.5	2-inch by 4-inch stiffener with 30° wedge				2.8-inch-diameter cylinder swept back 45°			30° cableway				
7-8	20.5	-2.5												
7-9	21.5	-2.5												
7-10	22.5	-2.5												
7-11	23.5	-2.5	13-1	-6.2	1.5	0.54	17-1	10.55	0	20-1	12.0	7.0		0.66
7-12	24.5	-2.5	13-2	-6.2	8.0	.54	17-2	8.55	0	20-2	8.0	7.0		.66
6-1	36.0	-16.0	13-3	-6.2	12.0	.54	17-3	6.55	0	20-3	1.5	7.0		.66
6-2	36.0	-12.0	13-4	-3.7	1.5	1.98	17-4	4.55	0	20-4	12.0	6.2		1.00
6-3	32.0	-18.0	13-5	-3.7	8.0	1.98	17-5	3.55	0	20-5	8.0	6.2		1.00
6-4	32.0	-16.0	13-6	-3.7	12.0	1.98	17-6	2.55	0	20-6	1.5	6.2		1.00
6-5	32.0	-14.0	13-7	-1.2	1.5	3.42	17-7	1.55	0	20-7	12.0	3.6		1.00
6-6	32.0	-10.0	13-8	-1.2	8.0	3.42	17-8	.55	0	20-8	8.0	3.6		1.00
6-7	28.0	-14.0	13-9	-1.2	12.0	3.42	17-9	10.55	45	20-9	1.5	3.6		1.00
6-8	28.0	-12.0	13-10	1.0	1.5	4.00	17-10	6.55	45	20-10	12.0	1.00		1.00
6-9	26.0	-12.5	13-11	1.0	3.5	4.00	17-11	4.55	45	20-11	8.0	1.00		1.00
6-10	24.5	-11.0	13-12	1.0	8.0	4.00	17-12	2.55	45	20-12	1.5	1.00		1.00
6-11	22.0	-12.5	14-1	1.0	12.0	4.00	18-1	10.55	90					
6-12	20.5	-11.0	14-2	2.0	1.5	3.00	18-2	6.55	90					
3-1	34.0	-1.0	14-3	2.0	12.0	3.00	18-3	4.55	90					
3-2	34.0	4.0	14-4	2.0	1.5	2.00	18-4	2.55	90					
3-3	34.0	5.0	14-5	2.0	3.5	2.00	18-5	10.55	180					
3-4	34.0	6.0	14-6	2.0	5.5	2.00	18-6	8.55	180					
3-5	36.0	6.0	14-7	2.0	8.0	2.00	18-7	6.55	180					
3-6	38.0	1.0	14-8	2.0	12.0	2.00	18-8	4.55	180					
3-7	38.0	2.0	14-9	2.0	1.5	1.00	18-9	3.55	180					
3-8	44.0	8.0	14-10	2.0	12.0	1.00	18-10	2.55	180					
3-9	44.0	6.0	14-11	-2.0	.0	2.00	18-11	1.55	180					
3-10	44.0	4.0	14-12	1.0	.0	2.00	18-12	.55	180					
3-11	44.0	2.0	1-inch by 2-inch rectangular stiffener				1.4-inch-diameter cylinder							
3-12	44.0	1.0												
8-1	6.0	.0												
8-2	6.0	5.0	19-1	0.0	13.7	1.00	21-1	1.10	0					
8-3	6.0	10.0	19-2	.0	11.7	1.00	21-2	1.60	0					
8-4	12.0	.0	19-3	1.0	11.7	1.00	21-3	2.60	0					
8-5	12.0	5.0	19-4	.0	7.7	1.00	21-4	3.60	0					
8-6	12.0	10.0	19-5	1.0	7.7	1.00	21-5	4.60	0					
8-7	18.0	.0	19-6	.0	3.2	1.00	21-6	6.60	0					
8-8	30.0	.0	19-7	1.0	3.2	1.00	21-7	8.60	0					
8-9	42.0	.0	19-8	.0	1.2	1.00	21-8	10.60	0					
			19-9	1.0	1.2	1.00	21-9	2.60	90					
			19-10	.5	11.7	2.00	21-10	4.60	90					
			19-11	.5	3.2	2.00	21-11	2.60	180					
			19-12	.5	1.2	2.00	21-12	4.60	180					

TABLE I.- LOCATION OF THERMOCOUPLES AND PRESSURE ORIFICES AND RELATIVE POSITION OF PROJECTIONS - Concluded

(b) Location of pressure orifices in flat-plate surface

x, in.	y, in.
15.5	2.5
16.5	2.5
17.5	2.5
18.5	2.5
19.5	2.5
20.5	2.5
21.5	2.5
22.5	2.5
23.5	2.5
24.5	2.5

(c) Location of model origins relative to test plate origin

Model	x, in.	y, in.
2-inch by 4-inch rectangular stiffener	25.0	-12.0
2-inch by 4-inch stiffener with 1/4 round fairing	25.0	-12.0
2-inch by 4-inch stiffener with 30° wedge	25.0	-12.0
1-inch by 2-inch rectangular stiffener	25.5	-12.0
2.8-inch-diameter instrumented cylinder	32.0	.0
2.8-inch-diameter instrumented cylinder swept forward 45°	32.2	.0
2.8-inch-diameter instrumented cylinder swept back 45°	31.8	.0
1.4-inch-diameter instrumented cylinder	32.0	.0
30° cableway	27.0	-12.0
26° fairing	30.6	.0
45° fairing	30.7	.0
Lox line	30.6	.0

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TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE

1. Local Mach Number Measurements for Boundary-Layer Survey Rake

(a) δ = 0.70 inch

z, in.	M_l					
	M = 2.65			M = 3.51		
	R = 4.79 × 10^6	R = 3.09 × 10^6	R = 1.41 × 10^6	R = 4.61 × 10^6	R = 3.06 × 10^6	R = 1.50 × 10^6
0.01	1.50	1.41	1.15	1.57	1.42	1.11
.09	1.84	1.73	1.49	2.03	1.91	1.55
.15	1.97	1.91	1.67	2.22	2.08	1.73
.21	2.10	2.02	1.78	2.40	2.24	1.88
.27	2.24	2.15	1.91	2.58	2.43	2.05
.36	2.33	2.25	1.98	2.73	2.57	2.15
.52	2.64	2.57	2.30	3.25	3.06	2.58
.60	2.69	2.63	2.33	3.36	3.17	2.68
.67	2.70	2.64	2.35	3.37	3.21	2.74
.77	2.70	2.64	2.36	3.37	3.22	2.75
.86	2.70	2.64	2.35	3.37	3.22	2.75
.93	2.70	2.64	2.36	3.37	3.22	2.75
1.01	2.70	2.64	2.36	3.37	3.22	2.75
1.11	2.70	2.64	2.35	3.38	3.22	2.76
1.19	2.70	2.64	2.37	3.39	3.24	2.78
1.28	2.70	2.65	2.37	3.41	3.25	2.78
1.37	2.70	2.65	2.35	3.33	3.18	2.77
1.47	2.70	2.65	2.37	3.37	3.21	2.74
1.56	2.71	2.65	2.37	3.38	3.23	2.77
1.67	2.71	2.66	2.37	3.39	3.23	2.77
1.76	2.72	2.66	2.37	3.39	3.24	2.77
1.85	2.66	2.60	2.36	3.40	3.24	2.77
1.93	2.68	2.62	2.34	3.39	3.24	2.77
2.02	2.70	2.64	2.35	3.39	3.24	2.77
2.11	2.69	2.64	2.36	3.40	3.25	2.77
2.19	2.70	2.65	2.37	3.42	3.25	2.78
2.28	2.72	2.66	2.37	3.39	3.24	2.78
2.40	2.69	2.64	2.37	3.49	3.32	2.85
2.60	2.69	2.63	2.36	3.38	3.23	2.77

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

1. Local Mach Number Measurements for Boundary-Layer Survey Rake - Continued

(b) δ = 1.50 inches

z, in.	M_l							
	M = 2.65			M = 3.51			M = 4.44	
	R = 4.87×10^6	R = 3.14×10^6	R = 1.60×10^6	R = 4.78×10^6	R = 3.33×10^6	R = 1.89×10^6	R = 4.34×10^6	R = 3.04×10^6
0.01	1.18	1.15	1.12	1.25	1.22	1.28	1.27	1.32
.09	1.51	1.47	1.36	1.73	1.65	1.49	1.81	1.69
.15	1.64	1.62	1.50	1.92	1.83	1.71	2.04	1.92
.21	1.71	1.70	1.57	2.00	1.91	1.83	2.14	2.06
.27	1.76	1.75	1.64	2.08	2.01	1.91	2.23	2.15
.36	1.83	1.80	1.69	2.15	2.07	1.98	2.34	2.25
.52	1.98	1.96	1.86	2.37	2.31	2.18	2.64	2.51
.60	2.09	2.09	1.93	2.49	2.44	2.30	2.78	2.66
.67	2.13	2.14	2.02	2.59	2.53	2.38	2.94	2.81
.77	2.26	2.21	2.10	2.73	2.67	2.54	3.11	2.98
.86	2.32	2.32	2.22	2.87	2.81	2.69	3.30	3.18
.93	2.39	2.38	2.28	2.96	2.91	2.78	3.43	3.33
1.01	2.43	2.44	2.33	3.05	2.98	2.88	3.54	3.44
1.11	2.51	2.50	2.40	3.15	3.10	3.00	3.68	3.58
1.19	2.56	2.56	2.47	3.25	3.19	3.12	3.82	3.72
1.28	2.60	2.61	2.52	3.32	3.28	3.21	3.94	3.84
1.37	2.63	2.64	2.56	3.36	3.33	3.28	4.03	3.94
1.47	2.64	2.66	2.61	3.41	3.38	3.35	4.08	4.03
1.56	2.64	2.67	2.61	3.42	3.39	3.35	4.11	4.05
1.67	2.64	2.67	2.61	3.42	3.41	3.38	4.13	4.08
1.76	2.64	2.67	2.61	3.43	3.41	3.38	4.13	4.09
1.85	2.64	2.67	2.61	3.43	3.41	3.38	4.13	4.09
1.93	2.64	2.67	2.61	3.43	3.41	3.38	4.13	4.09
2.02	2.64	2.66	2.61	3.43	3.41	3.38	4.13	4.09
2.11	2.63	2.68	2.75	3.45	3.47	3.63	4.20	4.24
2.19	2.67	2.71	2.69	3.43	3.41	3.39	4.13	4.10
2.28	2.65	2.67	2.63	3.43	3.41	3.38	4.13	4.09
2.40	2.63	2.65	2.61	3.51	3.49	3.47	4.13	4.09
2.60	2.63	2.66	2.61	3.42	3.41	3.38	4.09	4.06

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

1. Local Mach Number Measurements for Boundary-Layer Survey Rake - Concluded

(c) δ = 6.00 inches

Small rake			Large rake		
z, in.	M_l		z, in.	M_l	
	M = 2.65	M = 3.51		M = 2.65	M = 3.51
	$R = 3.14 \times 10^6$	$R = 4.78 \times 10^6$		$R = 3.14 \times 10^6$	$R = 4.78 \times 10^6$
0.01	0.99	1.05	0.10	1.36	1.46
.09	1.30	1.54	.40	1.50	1.59
.15	1.43	1.67	.85	1.72	1.88
.21	1.49	1.73	1.23	1.89	2.12
.27	1.52	1.76	1.62	2.05	2.33
.36	1.57	1.83	2.00	2.16	2.50
.52	1.66	1.95	2.37	2.33	2.65
.60	1.69	2.00	2.74	2.36	2.81
.67	1.78	2.07	3.74	2.58	3.19
.77	1.77	2.09	4.47	2.66	3.38
.86	1.80	2.14	5.25	2.71	3.46
.93	1.82	2.17	5.98	2.74	3.49
1.01	1.85	2.20	6.73	2.74	3.50
1.11	1.89	2.23	7.47	2.74	3.50
1.19	1.90	2.30	8.24	2.75	3.50
1.28	1.91	2.30	8.98	2.75	3.50
1.37	1.96	2.34	9.97	2.76	3.49
1.47	1.98	2.38	10.97	2.75	3.48
1.56	1.97	2.41	11.98	2.75	3.49
1.67	2.04	2.45			
1.76	2.02	2.48			
1.85	2.10	2.53			
1.93	2.09	2.53			
2.02	2.11	2.57			
2.11	2.16	2.58			
2.19	2.15	2.65			
2.28	2.17	2.67			
2.40	2.19	2.64			
2.60	2.23	2.79			

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate

(a) δ = 0.70 inch

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x = 15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in	22.5 in.	23.5 in.	24.5 in.
Flat plate alone											
2.65	4.00×10^6	0.0031	0.0045	0.0035	0.0040	0.0048	0.0057	0.0045	0.0050	0.0053	0.0026
2.65	2.56	.0061	.0076	.0081	.0081	.0091	.0091	.0085	.0090	.0082	.0064
2.65	1.29	.0125	.0146	.0152	.0152	.0167	.0164	.0149	.0161	.0146	.0146
3.51	4.05	.0034	.0045	.0050	.0040	.0046	.0050	.0040	.0044	.0021	.0010
3.51	2.85	.0066	.0082	.0082	.0078	.0082	.0076	.0069	.0073	.0055	.0046
3.51	1.64	.0190	.0206	.0199	.0193	.0209	.0190	.0178	.0193	.0181	.0196
4.44	4.52	.0132	.0138	.0146	.0132	.0145	.0135	.0135	.0119	.0127	.0133
4.44	3.25	.0196	.0209	.0209	.0207	.0209	.0198	.0191	.0203	.0196	.0221
4.44	2.12	.0308	.0315	.0315	.0308	.0315	.0295	.0281	.0308	.0298	.0349
1-inch by 2-inch rectangular stiffener											
2.65	3.98×10^6	0.0032	0.0567	0.2209	0.2637	0.2797	0.2873	0.2895	0.2791	0.2592	0.2855
2.65	2.55	.0062	.0862	.2318	.2654	.2789	.2856	.2872	.2769	.2568	.2846
2.65	1.29	.0115	.0644	.2433	.2775	.2893	.2953	.2968	.2853	.2636	.2938
3.51	3.98	.0050	.0849	.1789	.2061	.2184	.2249	.2264	.2202	.2039	.2284
3.51	2.80	.0066	.0779	.1832	.2083	.2193	.2259	.2271	.2196	.2035	.2296
3.51	1.63	.0144	.0453	.1872	.2203	.2316	.2366	.2372	.2288	.2119	.2391
4.44	4.39	.0234	.1376	.1741	.1883	.1962	.2018	.2021	.1948	.1830	.2137
4.44	3.15	.0242	.1332	.1792	.1939	.2018	.2063	.2061	.2000	.1867	.2188
4.44	2.11	.0318	.1060	.1890	.2076	.2167	.2198	.2194	.2133	.1984	.2313
2.8-inch-diameter instrumented cylinder											
2.65	2.63×10^6	0.0007	-0.0026	0.0039	0.0039	0.0183	0.0118	-0.0026	0.0002	0.0051	0.0231
2.65	1.33	.0006	-.0104	.0087	.0088	.0342	.0246	-.0009	.0006	.0115	.0310
3.51	2.86	.0057	-.0078	.0037	.0018	.0189	.0112	-.0039	.0001	.0015	.0283
3.51	1.64	.0098	-.0106	.0097	.0063	.0365	.0230	-.0005	.0029	.0092	.0197
4.44	3.28	.0094	-.0028	.0118	.0095	.0311	.0214	.0021	.0070	.0137	.0722
4.44	2.18	.0102	.0087	.0174	.0138	.0465	.0318	.0028	.0138	.0062	.0537
2.8-inch-diameter instrumented cylinder and cap plate											
2.65	2.61×10^6	0.0019	-0.0030	0.0034	0.0035	0.0162	0.0098	-0.0047	0.0002	0.0016	0.0162
2.65	1.34	.0052	.0020	.0115	.0116	.0336	.0241	.0012	.0020	.0080	.0209
3.51	2.84	.0042	-.0055	.0042	.0023	.0175	.0098	-.0055	-.0016	-.0017	.0213
3.51	1.64	.0059	-.0076	.0092	.0059	.0292	.0192	-.0076	-.0009	.0023	.0258
4.44	3.18	.0098	-.0001	.0121	.0097	.0291	.0193	-.0001	.0044	.0140	.0169
4.44	2.12	.0040	-.0034	.0188	.0077	.0443	.0333	-.0070	.0044	.0181	.0223

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(a) S = 0.70 inch - Concluded

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances.]

M	R	C_p at x = 15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
1.4-inch-diameter instrumented cylinder											
2.65	3.83×10^6	0.0034	0.0046	0.0038	0.0042	0.0052	0.0057	0.0045	0.0037	0.0059	0.0033
2.65	2.47	.0041	.0055	.0047	.0058	.0066	.0074	.0062	.0062	.0069	.0055
2.65	1.28	.0112	.0133	.0133	.0145	.0151	.0151	.0139	.0124	.0139	.0136
3.51	3.93	.0031	.0051	.0054	.0049	.0047	.0051	.0042	.0031	.0026	.0009
3.51	2.61	.0063	.0077	.0073	.0073	.0073	.0073	.0063	.0065	.0050	.0052
3.51	1.57	.0137	.0156	.0156	.0147	.0156	.0134	.0121	.0137	.0137	.0162
4.44	4.37	.0118	.0124	.0129	.0122	.0135	.0118	.0121	.1020	.0105	.0113
4.44	3.11	.0192	.0201	.0199	.0199	.0244	.0192	.0190	.0199	.0192	.0212
4.44	2.08	.0359	.0376	.0372	.0369	.0433	.0356	.0356	.0372	.0369	.0420
1.4-inch-diameter instrumented cylinder and dummy cylinder 6.4 diameters upstream, offset 26.5°											
2.65	3.84×10^6	0.0034	0.0051	0.0041	0.0046	0.1059	0.1930	0.1064	0.0691	0.1920	0.2271
2.65	2.51	.0040	.0049	.0047	.0057	.1256	.1944	.0916	.0666	.1952	.2279
2.65	1.28	.0091	.0104	.0110	.0110	.1138	.2083	.0979	.0665	.2022	.2272
3.51	2.79	.0041	.0046	.0052	.0048	.0846	.1457	.0678	.0453	.0888	.1861
3.51	1.56	.0214	.0236	.0230	.0227	.0626	.1584	.0907	.0581	.1048	.1881
4.44	3.11	.0167	.0171	.0160	.0167	.0965	.1377	.0711	.0493	.0711	.1726
4.44	2.10	.0335	.0352	.0345	.0345	.0935	.1571	.0928	.0670	.0914	.1842
2.8-inch-diameter cylinder swept forward 45°											
2.65	2.56×10^6	0.0049	0.0055	0.0055	0.0061	0.0064	0.0071	0.0184	0.1662	0.2293	0.2460
2.65	1.31	.0103	.0127	.0127	.0133	.0142	.0142	.0142	.1137	.2519	.2713
3.51	4.02	.0007	.0024	.0025	.0027	.0030	.0029	.0399	.1370	.1682	.1779
3.51	2.87	.0036	.0046	.0045	.0046	.0041	.0048	.0406	.1414	.1719	.1799
3.51	1.64	.0155	.0168	.0162	.0155	.0162	.0146	.0420	.1483	.1840	.1884
4.44	3.21	.0156	.0156	.0160	.0160	.0156	.0235	.0993	.1542	.1646	.1641
4.44	2.12	.0271	.0281	.0271	.0271	.0278	.0305	.0975	.1646	.1768	.1751
2.8-inch-diameter cylinder swept back 45°											
2.65	2.55×10^6	0.0059	0.0067	0.0070	0.0074	0.0082	0.0088	0.0074	0.0083	0.0088	0.0064
3.51	2.76	.0053	.0059	.0066	.0069	.0069	.0068	.0055	.0059	.0050	.0046
3.51	1.59	.0242	.0257	.0257	.0248	.0260	.0233	.0229	.0245	.0245	.0254
4.44	3.11	.0138	.0140	.0147	.0147	.0147	.0147	.0140	.0144	.0135	.0140
4.44	2.07	.0369	.0386	.0386	.0372	.0386	.0369	.0356	.0372	.0372	.0420
30° cableway											
2.65	3.88×10^6	0.1192	0.2398	0.2692							
2.65	2.49	.1477	.2455	.2683							
2.65	1.24	.1244	.2672	.2879							
3.51	3.88	.0289	.1723	.1996							
3.51	2.75	.0261	.1781	.2028							
3.51	1.57	.0277	.1937	.2258							
4.44	4.41	.0154	.1505	.1773							
4.44	3.07	.0212	.1560	.1860							
4.44	2.06	.0328	.1575	.2042							

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(b) δ = 1.50 inches

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x = 15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
Flat plate alone											
2.65	4.02×10^6	-0.0021	-0.0023	-0.0037	-0.0023	-0.0035	-0.0034	-0.0053	-0.0054	-------	-0.0073
2.65		.0012	.0017	.0015	.0014	.0006	.0005	-.0008	-.0014	-------	-.0049
2.65		.0083	.0083	.0083	.0083	.0077	.0077	.0074	.0086	-------	.0049
2.65		-.0045	-.0040	-.0040	-.0045	-.0045	-.0040	-.0042	-.0052	-------	-.0068
3.51	4.07	-.0034	-.0025	-.0029	-.0023	-.0023	-.0018	-.0018	-.0032	-------	-.0038
3.51	2.82	-.0034	-.0025	-.0029	-.0023	-.0023	-.0018	-.0018	-.0032	-------	-.0038
3.51	1.65	.0061	.0097	.0097	.0094	.0097	.0084	.0094	.0084	-------	.0115
3.51	4.48	.0080	.0090	.0087	.0080	.0080	.0084	.0084	.0074	-------	.0069
4.44	3.23	.0157	.0142	.0137	.0137	.0128	.0128	.0131	.0131	-------	.0146
4.44	2.12	.0219	.0226	.0219	.0219	.0215	.0212	.0215	.0232	-------	.0287
1-inch by 2-inch rectangular stiffener											
2.65	3.95×10^6	-0.0028	0.0379	0.1664	0.2144	0.2466	0.2661	0.2772	0.2740	-------	0.2729
2.65		-.0028	.0628	.1712	.2111	.2383	.2563	.2662	.2677	-------	.2625
2.65		.0131	.1153	.1888	.2184	.2575	.2488	.2572	.2527	-------	.2539
2.65	1.50	.0067	.0945	.1345	.1599	.1782	.1909	.1979	.1960	-------	.1992
3.51	4.01	.0230	.1044	.1599	.1609	.1772	.1884	.1949	.1930	-------	.1970
3.51	2.83	.0415	.1153	.1481	.1646	.1789	.1870	.1926	.1904	-------	.1948
3.51	1.61	.0501	.1105	.1321	.1483	.1613	.1710	.1754	.1742	-------	.1813
4.44	4.63	.0562	.1151	.1361	.1508	.1634	.1707	.1732	.1738	-------	.1804
4.44	3.24	.0685	.1202	.1422	.1563	.1655	.1734	.1765	.1748	-------	.1831
4.44	2.15										
2.8-inch-diameter instrumented cylinder											
2.65	4.03×10^6	-0.0303	-0.0245	-0.0192	-0.0224	-0.0130	-0.0182	-0.0287	-0.0245	-0.0242	0.0575
2.65		-.0198	-.0245	-.0167	-.0214	-.0074	-.0121	-.0291	-.0215	-.0211	.0249
2.65	2.73	-.0217	-.0308	-.0125	-.0217	.0056	-.0035	-.0369	-.0186	-.0154	.0509
2.65	1.41	-.0168	-.0206	-.0142	-.0150	-.0066	-.0092	-.0206	-.0155	-.0142	.0550
3.51	4.34	-.0168	-.0240	-.0132	-.0186	-.0024	-.0078	-.0240	-.0168	-.0132	.0407
3.51	3.05	-.0180	-.0305	-.0085	-.0180	.0102	.0077	-.0274	-.0148	-.0087	.0381
3.51	1.76	-.0054	-.0102	-.0006	.0070	.0105	.0041	-.0118	-.0038	.0016	.0615
4.44	4.84	-.0049	-.0141	-.0002	-.0072	.0157	.0065	-.0141	-.0049	.0170	.0568
4.44	3.38	-.0046	-.0117	.0094	-.0117	.0337	.0198	-.0186	.0024	.0154	.0441
4.44	2.24										
2.8-inch-diameter instrumented cylinder and dummy cylinder 3.2 diameters upstream											
2.65	3.92×10^6	0.0183	0.1421	0.1891	0.1936	0.1167	0.0868	0.0737	0.3089	0.5784	0.2895
2.65	2.55	.0571	.1487	.1899	.1845	.1101	.0886	.0729	.5125	.5832	.3321
2.65	1.30	.0723	.1534	.1927	.1610	.1096	.0905	.0651	.5192	.5828	.2789
3.51	4.12	.0410	.1031	.1299	.1106	.0745	.0690	.0145	.2204	.5134	.2447
3.51	2.80	.0571	.1052	.1324	.1059	.0736	.0676	.0274	.2250	.5146	.2452
3.51	1.95	.0680	.1078	.1584	.0950	.0857	.0701	.0235	.2354	.5244	.2444
4.44	4.59	.0395	.1019	.1156	.0818	.0756	.0602	.0418	.2333	.5127	.2459
4.44	3.26	.0858	.0997	.1144	.0757	.0645	.0576	.0385	.2360	.5140	.2423
4.44	2.14	.0827	.0967	.1190	.0787	.0920	.0628	.0374	.2445	.5217	.2559

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(b) δ = 1.50 inches - Continued

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x =									
		15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
2.8-inch-diameter instrumented cylinder and dummy cylinder 6.4 diameters upstream											
2.65	2.62 x 10^6	0.2326	0.0842	0.0128	-0.0426	-0.0502	-0.0774	-0.1057	-0.0973	-0.0855	-0.0711
2.65	1.33	.2297	.0782	.0178	-.0428	-.0328	-.0642	-.1093	-.0963	-.0829	-.0927
3.51	2.83	.2313	.1115	.0518	.0056	.0035	-.0213	-.0504	-.0521	-.0519	.0671
3.51	1.64	.2338	.1066	.0560	.0054	.0187	-.0115	-.0554	-.0485	-.0434	-.0785
4.44	3.20	.2456	.1343	.0829	.0376	.0396	.0131	-.0208	-.0159	-.0198	-.0446
4.44	1.89	.2450	.1294	.0889	.0325	.0522	.0280	-.0325	-.0082	-.0040	-.0483
2.8-inch-diameter instrumented cylinder and dummy cylinder 3.2 diameters upstream, offset 26.5°											
2.65	4.02 x 10^6	0.0225	0.1434	0.1909	0.1889	0.1016	0.1056	0.1740	0.6030	0.3369	0.1318
2.65	2.50	.0470	.1496	.1905	.1736	.0949	.0996	.1758	.6057	.3338	.1289
2.65	1.37	.1066	.1472	.1848	.1419	.0871	.0838	.1660	.6118	.3248	.1119
3.51	4.13	.0575	.1079	.1334	.1032	.0712	.0590	.1320	.5271	.3245	.1376
3.51	2.86	.0740	.1101	.1333	.0933	.0728	.0553	.1352	.5400	.3202	.1323
3.51	1.67	.0745	.1070	.1336	.0834	.0798	.0500	.1336	.5501	.3075	.1193
4.44	2.14	.0858	.1042	.1164	.0821	.0790	.0480	.1513	.5259	.3149	.1536
4.44	4.45	.0862	.1026	.1149	.0736	.0849	.0458	.2099	.5302	.3056	.1432
4.44	3.16	.0778	.0991	.1176	.0739	.0912	.0472	.1470	.5354	.2977	.1276
2.8-inch-diameter instrumented cylinder and dummy cylinder 3.2 diameters upstream, offset 45°											
2.65	2.64 x 10^6	-0.0103	-0.0119	0.0068	0.1244	0.1463	0.1444	0.1219	0.1152	0.1185	0.1367
2.65	1.32	-.0106	-.0006	.1204	.1508	.1814	.1746	.1335	.1298	.1429	.1455
3.51	2.88	-.0119	.0036	.0830	.0972	.1151	.1072	.0772	.0769	.0990	.1207
3.51	1.63	-.0082	-.0090	.0947	.1022	.1349	.1211	.0844	.0876	.1161	.1212
2.8-inch-diameter instrumented cylinder and cap plate											
2.65	2.57 x 10^6	-0.0089	-0.1587	-0.0072	-0.1068	0.0067	-0.0020	-0.1587	-0.1063	-0.0087	0.0636
3.51	2.92	-.0110	-.0186	-.0090	-.0148	.0008	-.0014	-.0167	-.0109	-.0035	-.0185
3.51	1.34	-.0165	-.0293	-.0068	-.0165	.0123	-.0005	-.0293	-.0164	-.0009	.0501
4.44	3.45	-.0050	-.0143	-.0004	-.0073	.0157	.0065	-.0119	-.0050	.0214	.0593
1.4-inch-diameter instrumented cylinder											
2.65	4.00 x 10^6	-0.0035	-0.0030	-0.0027	-0.0038	-0.0038	-0.0040	-0.0054	-0.0062	-0.0075	-0.0095
2.65	2.55	-.0002	-.0002	.0003	-.0002	-.0008	-.0008	-.0021	-.0026	-.0050	-.0056
2.65	1.29	.0040	.0040	.0040	.0037	.0033	.0027	.0012	.0027	-.0003	.0009
3.51	4.12	-.0075	-.0075	-.0076	-.0076	-.0076	-.0076	-.0076	-.0076	-.0092	-.0090
3.51	2.87	-.0039	-.0034	-.0034	-.0034	-.0032	-.0030	-.0034	-.0034	-.0048	-.0041
3.51	1.65	.0056	.0062	.0062	.0062	.0068	.0059	.0044	.0056	.0047	.0081
4.44	4.61	.0062	.0062	.0060	.0060	.0060	.0062	.0054	.0052	.0040	.0052
4.44	3.24	.0144	.0144	.0144	.0137	.0144	.0128	.0124	.0131	.0117	.0149
4.44	2.14	.0203	.0210	.0203	.0196	.0203	.0186	.0186	.0196	.0186	.0251

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(b) δ = 1.50 inches - Continued

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x = 15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
1.4-inch-diameter instrumented cylinder and dummy cylinder 6.4 diameters upstream											
2.65	3.94×10^6	-0.0037	-0.0030	-0.0025	-0.0033	0.0576	0.1466	0.1275	0.0519	0.0847	0.1471
2.65	2.51	-.0012	-.0008	-.0003	-.0009	.0812	.1492	.1202	.0494	.0875	.1483
2.65	1.28	.0054	.0069	.0075	.0069	.0927	.1548	.1263	.0531	.0936	.1503
3.51	4.07	-.0060	-.0058	-.0056	-.0056	.0602	.1013	.0659	.0310	.0367	.0919
3.51	2.83	-.0023	-.0014	-.0011	-.0011	.0654	.1056	.0681	.0336	.0404	.0957
3.51	1.63	.0199	.0224	.0224	.0221	.0783	.1253	.0970	.0553	.0650	.1169
4.44	4.45	.0064	.0067	.0070	.0086	.0812	.0965	.0528	.0404	.0364	.0806
4.44	3.18	.0160	.0171	.0167	.0182	.0846	.1042	.0612	.0482	.0464	.0891
4.44	2.12	.0315	.0328	.0318	.0332	.0884	.1172	.0833	.0623	.0630	.1046
1.4-inch-diameter instrumented cylinder and dummy cylinder 6.4 diameters upstream, offset 26.5°											
2.65	3.89×10^6	-0.0028	-0.0021	-0.0018	-0.0025	.1016	.1584	.0964	.0667	.1649	.1536
2.65	2.53	.0006	.0011	.0014	.0008	.1159	.1599	.0860	.0673	.1651	.1518
2.65	1.30	.0224	.0243	.0233	.0233	.1385	.1734	.0991	.0840	.1816	.1640
3.51	4.06	-.0056	-.0051	-.0049	-.0045	.0862	.1074	.0470	.0397	.0953	.1313
3.51	2.86	.0004	.0016	.0018	.0027	.0933	.1126	.0492	.0440	.1019	.1347
3.51	1.65	.0208	.0233	.0233	.0242	.1110	.1374	.0724	.0647	.1265	.1545
4.44	4.47	.0073	.0078	.0126	.0917	.0959	.0484	.0387	.0835	.1274	.0022
4.44	3.16	.0111	.0117	.0117	.0151	.0919	.1043	.0517	.0411	.0880	.1294
4.44	2.13	.0246	.0260	.0256	.0276	.0937	.1183	.0674	.0543	.1004	.1372
2.8-inch-diameter cylinder swept forward 45°											
2.65	2.62×10^6	-0.0052	-0.0050	-0.0046	-0.0050	-0.0056	-0.0018	0.0753	0.1635	0.1936	0.2135
2.65	1.31	.0061	.0067	.0061	.0058	.0058	.0212	.1255	.1828	.2025	.2122
3.51	2.90	-.0023	-.0025	-.0025	-.0023	-.0011	.0167	.0875	.1286	.1445	.1526
3.51	1.65	.0096	.0109	.0109	.0109	.0124	.0364	.1069	.1427	.1539	.1576
4.44	3.21	.0110	.0110	.0110	.0113	.0182	.0621	.1085	.1363	.1526	.1290
4.44	2.16	.0152	.0162	.0162	.0162	.0226	.0640	.1122	.1321	.1358	.1315
2.8-inch-diameter cylinder swept back 45°											
2.65	4.02×10^6	-0.0764	-0.0757	-0.0764	-0.0762	-0.0761	-0.0765	-0.0782	-0.0792	-0.0792	-0.0811
2.65	2.57	.0023	.0026	.0030	.0018	.0018	.0018	.0008	.0002	-.0023	-.0030
2.65	1.29	.0042	.0051	.0051	.0042	.0039	.0030	.0021	.0021	-.0003	.0012
3.51	4.03	-.0101	-.0100	-.0096	-.0097	-.0097	-.0097	-.0106	-.0102	-.0117	-.0117
3.51	2.81	.0016	.0022	.0022	.0022	.0022	.0022	.0018	.0018	.0002	.0011
3.51	1.63	.0031	.0044	.0047	.0047	.0047	.0034	.0031	.0034	.0022	.0065
4.44	4.57	.0049	.0059	.0054	.0057	.0054	.0054	.0043	.0051	.0032	.0044
4.44	3.18	.0115	.0124	.0122	.0115	.0115	.0104	.0097	.0104	.0090	.0122
4.44	2.10	.0302	.0309	.0309	.0306	.0309	.0292	.0292	.0302	.0282	.0354

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(b) δ = 1.50 inches - Concluded

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x =									
		15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
30° cableway											
2.65	3.97×10^6	0.1459	0.2057	0.2456							
2.65	2.56	.1550	.2063	.2403							
2.65	1.29	.1652	.2089	.2347							
3.51	4.07	.0862	.1311	.1581							
3.51	2.84	.0975	.1390	.1619							
3.51	1.61	.1050	.1493	.1696							
4.44	4.48	.0776	.1211	.1414							
4.44	3.18	.0779	.1251	.1434							
4.44	2.14	.0742	.1308	.1490							
26° fairing											
2.65	2.60×10^6	-0.0037	-0.0029	-0.0027	-0.0033	-0.0040	-0.0035	-0.0050	-0.0064	-0.0062	-0.0079
2.65	1.30	.0086	.0095	.0095	.0095	.0095	.0086	.0058	.0073	.0070	.0070
3.51	2.87	-.0036	-.0028	-.0030	-.0030	-.0027	-.0025	-.0030	-.0030	-.0041	-.0034
3.51	1.65	.0146	.0165	.0162	.0159	.0171	.0155	.0143	.0155	.0155	.0183
45° fairing											
2.65	4.01×10^6	-0.0025	-0.0023	-0.0022	-0.0029	0.0027	-0.0028	-0.0042	-0.0042	-0.0063	-0.0079
2.65	2.66	-.0019	-.0019	-.0013	-.0019	-.0025	-.0025	-.0035	-.0041	-.0066	-.0075
2.65	1.30	.0073	.0082	.0082	.0070	.0070	.0070	.0067	.0052	.0030	.0043
3.51	4.07	-.0026	-.0027	-.0026	-.0026	-.0031	-.0031	-.0032	-.0032	-.0051	-.0039
3.51	2.88	-.0016	-.0009	-.0005	-.0012	-.0009	-.0009	-.0016	-.0016	-.0039	-.0039
3.51	1.65	.0006	.0016	.0022	.0016	.0025	.0022	.0019	.0025	-.0009	.0003
4.44	4.55	.0078	.0086	.0087	.0087	.0078	.0081	.0081	.0071	.0057	.0073
4.44	3.26	.0128	.0131	.0131	.0124	.0124	.0119	.0119	.0122	.0113	.0162
Lox line											
2.65	3.96×10^6	-0.0036	-0.0027	-0.0031	-0.0036	-0.0036	-0.0039	-0.0050	-0.0059	-0.0078	-0.0092
2.65	2.59	-.0026	-.0020	-.0015	-.0021	-.0026	-.0027	-.0041	-.0046	-.0070	-.0078
2.65	2.41	.0037	.0046	.0052	.0040	.0037	.0033	.0003	-.0003	-.0052	-.0067
3.51	4.36	-.0054	-.0040	-.0051	-.0051	-.0051	-.0051	-.0060	-.0059	-.0066	-.0064
3.51	3.03	-.0023	-.0018	-.0020	-.0014	-.0012	-.0012	-.0018	-.0012	-.0023	-.0020
3.51	1.66	.0031	.0040	.0047	.0047	.0050	.0040	.0040	.0037	.0025	.0065
4.44	4.61	.0067	.0076	.0080	.0072	.0073	.0072	.0064	.0065	.0056	.0067
4.44	3.26	.0126	.0131	.0126	.0126	.0117	.0113	.0108	.0108	.0090	.0126
4.44	2.17	.0216	.0219	.0219	.0209	.0219	.0202	.0202	.0206	.0189	.0256

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(c) b = 6.00 inches

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x =									
		15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
Flat plate alone											
2.65	5.04×10^6	------	-0.0018	-0.0047	-0.0018	-0.0018	-0.0018	-0.0018	-0.0047	-0.0018	-0.0047
2.65	3.27	------	-.0009	-.0009	-.0009	-.0009	-.0009	-.0009	-.0009	-.0009	-.0055
2.65	1.65	------	-.0018	-.0018	-.0018	-.0018	-.0018	-.0018	-.0018	-.0018	-.0018
3.51	5.33	------	.0005	.0005	.0005	.0005	.0005	-.0032	-.0032	-.0032	-.0032
3.51	3.72	------	-.0030	-.0030	-.0030	-.0030	-.0030	-.0030	-.0030	-.0085	-.0085
3.51	2.14	------	-.0031	-.0031	-.0031	-.0031	-.0031	-.0031	-.0031	-.0031	-.0031
4.44	5.57	------	.0044	.0044	-.0005	-.0005	-.0005	-.0005	-.0005	-.0005	-.0005
4.44	3.95	------	.0027	-.0043	-.0043	-.0043	-.0043	-.0043	-.0043	-.0043	-.0043
4.44	2.61	------	.0091	.0091	.0091	.0091	.0091	.0091	-.0010	-.0010	-.0010
2-inch by 4-inch rectangular stiffener											
2.65	3.09×10^6	------	0.2378	0.2423	0.2423	0.2331	0.2148	0.2148	0.2240	0.2653	0.4078
3.51	3.42	------	.1735	.1735	.1682	.1682	.1575	.1522	.1628	.2003	.3290
4.44	3.65	------	.1314	.1314	.1247	.1247	.1177	.1177	.1247	.1654	.2741
2-inch by 4-inch stiffener with 1/4 round fairing											
2.65	4.96×10^6	------	0.2652	0.2622	0.2591	0.2774	0.3504				
2.65	3.28	------	.2352	.2352	.2352	.2448	.3115				
2.65	1.64	------	.2229	.2229	.2135	.2229	.2986				
3.51	5.23	------	.1669	.1669	.1708	.1786	.2405				
3.51	3.61	------	.1659	.1659	.1659	.1769	.2378				
3.51	2.09	------	.1652	.1555	.1555	.1752	.2332				
4.44	5.42	------	.1263	.1263	.1263	.1362	.1859				
4.44	3.74	------	.1238	.1238	.1238	.1308	.1798				
4.44	2.53	------	.1355	.1355	.1250	.1355	.1874				
2-inch by 4-inch stiffener with 30° wedge											
2.65	5.05×10^6	------	0.2287	0.2438							
2.65	3.29	------	.2204	.2391							
2.65	1.64	------	.2097	.2281							
3.51	5.12	------	.1498	.1653							
3.51	3.62	------	.1482	.1648							
3.51	2.11	------	.1436	.1533							
4.44	5.53	------	.1095	.1193							
4.44	3.85	------	.1092	.1161							
4.44	2.56	------	.1052	.1156							
1-inch by 2-inch rectangular stiffener											
2.65	3.31×10^6	------	0.1177	0.1544	0.1728	0.1957	0.2095	0.2232	0.2278	0.2187	0.2324
2.65	1.66	------	.1357	.1535	.1712	.1892	.2070	.2158	.2158	.2070	.2247
3.51	3.61	------	.0831	.1047	.1208	.1317	.1424	.1477	.1531	.1424	.1584
3.51	2.03	------	.0905	.1091	.1184	.1371	.1371	.1467	.1467	.1278	.1467

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Continued

2. Pressure Coefficients Measured on Flat Plate - Continued

(c) $\delta = 6.00$ inches - Continued

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x =									
		15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
2.8-inch-diameter instrumented cylinder											
2.65	4.97×10^6	------	-0.0022	-0.0051	-0.0022	-0.0022	-0.0022	-0.0051	-0.0051	0.0067	0.0807
2.65	3.20	------	.0030	-.0015	.0030	.0030	.0030	-.0015	-.0015	.0215	.1040
2.65	1.59	------	-.0027	-.0027	-.0027	-.0027	-.0027	-.0027	-.0027	.0336	.1067
3.51	5.23	------	-.0036	-.0036	-.0036	-.0036	-.0036	-.0036	-.0036	.0001	.0600
3.51	3.65	------	.0020	.0020	-.0034	-.0034	-.0034	-.0034	-.0034	.0073	.0608
3.51	2.10	------	.0059	.0059	-.0037	.0059	.0059	-.0037	-.0037	.0152	.0712
4.44	5.58	------	-.0003	-.0003	-.0003	-.0003	-.0003	-.0003	-.0003	.0188	.0573
4.44	3.83	------	.0023	-.0045	-.0045	-.0045	-.0045	-.0045	-.0045	.0158	.0565
4.44	2.57	------	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	.0088	.0495
2.8-inch-diameter instrumented cylinder and dummy cylinder 3.2 diameters upstream											
2.65	4.91×10^6	------	0.1369	0.1608	0.1519	0.0922	0.0802	0.1519	0.2832	0.2563	0.1966
2.65	3.23	------	.1423	.1607	.1468	.0823	.0823	.1561	.2806	.2483	.1929
2.65	1.61	------	.1460	.1646	.1369	.0817	.0817	.1551	.2839	.2471	.1919
3.51	5.13	------	.0988	.1101	.0951	.0536	.0536	.0838	.2082	.2156	.1780
3.51	3.59	------	.0998	.1051	.0889	.0512	.0512	.0836	.2022	.2184	.1754
3.51	2.07	------	.1010	.1104	.0914	.0445	.0445	.0821	.2046	.2046	.1669
4.44	5.53	------	.0818	.0818	.0577	.0385	.0432	.0674	.1783	.2025	.1735
4.44	3.76	------	.0795	.0795	.0586	.0379	.0379	.0657	.1761	.1967	.1692
4.44	2.57	------	.0812	.0812	.0607	.0300	.0300	.0607	.1628	.1938	.1628
2.8-inch-diameter instrumented cylinder and dummy cylinder 6.4 diameters upstream											
2.65	4.92×10^6	------	0.0589	0.0052	-0.0246	-0.0425	-0.0543	-0.0574	-0.0454	-0.0365	-0.0246
2.65	3.20	------	.0549	.0087	-.0236	-.0420	-.0467	-.0512	-.0420	-.0328	-.0190
2.65	1.60	------	.0535	.0076	-.0199	-.0475	-.0475	-.0475	-.0475	-.0381	-.0290
3.51	5.04	------	.0810	.0393	.0166	.0015	-.0137	-.0175	-.0212	-.0212	-.0099
3.51	3.54	------	.1332	.0918	.0571	.0363	.0226	.0087	.0087	.0087	.0226
3.51	2.03	------	.0815	.0440	.0251	.0062	-.0031	-.0124	-.0124	-.0124	-.0031
4.44	5.29	------	.0917	.0580	.0358	.0242	.0145	.0048	.0000	.0000	.0097
4.44	3.72	------	.0919	.0576	.0440	.0235	.0165	.0097	.0029	.0097	.0097
4.44	2.45	------	.0819	.0613	.0305	.0200	.0098	-.0003	-.0003	-.0003	.0098
2.8-inch-diameter instrumented cylinder and dummy cylinder 3.2 diameters upstream, offset 26.5°											
2.65	4.92×10^6	------	0.1417	0.1653	0.1476	0.0798	0.0945	0.2420	-------	0.2125	0.1329
2.65	3.22	------	.1436	.1573	.1345	.0752	.0980	.2396	-------	.2077	.1254
2.65	1.61	------	.1523	.1615	.1250	.0702	.0976	.2527	-------	.1980	.1250
3.51	5.17	------	.1007	.1081	.0820	.0484	.0596	.1790	-------	.1828	.1007
3.51	3.62	------	.1033	.1033	.0711	.0445	.0551	.1835	-------	.1782	.0980
3.51	2.07	------	.1082	.1082	.0802	.0519	.0612	.1921	-------	.1735	.0989
4.44	5.46	------	.0822	.0725	.0483	.0386	.0338	.1594	-------	.1786	.0966
4.44	3.85	------	.0846	.0779	.0504	.0437	.0437	.1668	-------	.1735	.0983
4.44	2.59	------	.0918	.0816	.0508	.0406	.0406	.1741	-------	.1639	.1023

TABLE II.- PRESSURES MEASURED ON FLAT PLATE AND BOUNDARY-LAYER SURVEY RAKE - Concluded

2. Pressure Coefficients Measured on Flat Plate - Concluded

(c) δ = 6.00 inches - Concluded

[Dashes used where data are known to be inaccurate; blanks used where orifices are covered by protuberances]

M	R	C_p at x =									
		15.5 in.	16.5 in.	17.5 in.	18.5 in.	19.5 in.	20.5 in.	21.5 in.	22.5 in.	23.5 in.	24.5 in.
2.8-inch-diameter instrumented cylinder and dummy cylinder 3.2 diameters upstream, offset 45°											
2.65	4.89×10^6	------	0.0592	0.1099	0.1248	0.1308	0.1338	0.1279	0.1219	0.1248	0.1547
2.65	3.15	------	.0742	.1158	.1251	.1298	.1343	.1298	.1158	.1251	.1529
2.65	1.57	------	.0933	.1119	.1305	.1305	.1305	.1119	.1119	.1211	.1491
3.51	5.04	------	.0471	.0774	.0850	.0812	.0774	.0622	.0471	.0546	.0812
3.51	3.56	------	.0568	.0785	.0838	.0838	.0730	.0568	.0460	.0515	.0891
3.51	2.03	------	.0637	.0827	.0920	.0827	.0731	.0541	.0448	.0637	.0920
4.44	5.42	------	.0580	.0677	.0677	.0580	.0483	.0291	.0291	.0291	.0532
4.44	3.85	------	.0576	.0644	.0713	.0576	.0509	.0302	.0234	.0371	.0509
4.44	2.55	------	.0613	.0718	.0718	.0613	.0410	.0305	.0305	.0305	.0613
2.8-inch-diameter cylinder swept forward 45°											
2.65	4.98×10^6	------	-0.0017	-0.0046	-0.0017	0.0280	0.0933	0.1438	0.1675	0.1823	0.1735
2.65	3.22	------	-.0012	-.0012	.0035	.0402	.1138	.1505	.1689	.1827	.1643
2.65	1.60	------	.0082	-.0009	.0082	.0633	.1279	.1553	.1647	.1739	.1553
3.51	5.17	------	.0007	-.0031	.0007	.0157	.0684	.1023	.1136	.1249	.1099
3.51	3.62	------	-.0032	-.0032	.0021	.0181	.0718	.0987	.1147	.1200	.1094
3.51	2.07	------	.0053	.0053	.0149	.0331	.0891	.1076	.1172	.1265	.1076
4.44	5.44	------	-.0005	-.0005	-.0005	.0283	.0620	.0763	.0860	.0907	.0763
4.44	3.85	------	.0023	.0023	.0090	.0362	.0632	.0905	.0905	.0905	.0837
4.44	2.57	------	.0091	-.0010	.0091	.0297	.0600	.0806	.0907	.0907	.0806
2.8-inch-diameter cylinder swept back 45°											
2.65	3.95×10^6	------	-0.0028	-0.0057	-0.0028	-0.0028	-0.0028	-0.0028	-0.0057	-0.0057	-0.0057
2.65	3.22	------	-.0024	-.0024	-.0024	.0021	.0021	-.0024	-.0024	-.0070	-.0024
2.65	1.61	------	.0061	-.0030	-.0030	-.0030	.0061	-.0030	-.0030	-.0030	-.0030
3.51	5.18	------	.0000	-.0037	-.0037	.0000	-.0037	-.0037	-.0037	-.0037	-.0037
3.51	3.62	------	-.0037	-.0037	-.0091	-.0091	-.0091	-.0091	-.0091	-.0091	-.0091
3.51	2.06	------	.0056	.0056	-.0037	.0056	-.0037	.0056	-.0037	-.0131	-.0037
4.44	5.36	------	.0040	.0040	.0040	-.0008	-.0008	-.0008	-.0008	-.0008	-.0008
4.44	3.81	------	.0020	.0020	-.0047	-.0047	-.0047	-.0047	-.0047	-.0115	-.0047
4.44	2.57	------	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	-.0118	-.0013

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH

1. Flat Plate Alone

(a) M = 2.65; R = 4.00 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95296	583.9	.00656	.000919		
12.0	.0			.94673	576.9	.00540	.000757		
20.5	.0			.94730	576.5	.00520	.000729		
28.0	12.0			.94163	574.2	.00544	.000762		
28.0	4.0			.94503	575.5	.00537	.000753		
28.0	.0			.94390	574.5	.00526	.000737		
20.5	-5.0			.94730	576.2	.00532	.000746		
24.5	-5.0			.94616	574.9	.00543	.000761		
30.0	.0			.94616	575.2	.00491	.000688	.00491	.000688
31.0	12.0			.94503	575.5	.00520	.000729		
34.0	.0			.94730	575.2	.00507	.000710	.00484	.000678
2.0	-12.0			.95693	589.5	.00630	.000883		
2.0	12.0			.95580	585.2	.00653	.000915		
12.0	-12.0			.95580	581.5	.00547	.000767		
12.0	12.0			.94616	577.9	.00572	.000802		
30.0	1.0			.94390	574.5	.00511	.000716		
31.0	2.0			.94900	577.2	.00508	.000712		
32.0	2.0			.94786	575.5	.00480	.000673	.00478	.000670
32.0	3.0			.94560	575.9	.00527	.000739		
32.0	6.0			.94276	574.5	.00534	.000748		
34.0	1.0			.95126	578.5	.00502	.000703	.00515	.000722
34.0	2.0			.94503	575.5	.00527	.000739	.00525	.000736
34.0	3.0			.94220	573.5	.00530	.000743	.00536	.000751
36.0	.0			.94616	574.9	.00495	.000694	.00496	.000695
38.0	.0			.94220	572.5	.00529	.000741	.00529	.000741
40.0	.0			.94050	571.2	.00489	.000685	.00510	.000715
44.0	12.0			.94786	576.5	.00530	.000743		
42.0	.0			.93993	571.5	.00504	.000706	.00500	.000701
44.0	.0			.95353	579.2	.00490	.000687	.00494	.000692
48.0	.0			.95070	576.9	.00486	.000681	.00486	.000681
52.0	.0			.94106	571.9	.00530	.000743	.00529	.000741
52.0	12.0			.94333	573.2	.00478	.000670		
55.0	.0			.94390	572.9	.00507	.000710	.00507	.000710
58.0	.0			.94560	573.9	.00506	.000709		
58.0	12.0			.94333	573.5	.00491	.000688		
58.0	-12.0			.94843	574.9	.00502	.000703		
44.0	-12.0			.95296	577.2	.00498	.000698		
36.0	-8.0			.94730	574.5	.00485	.000680		
36.0	-3.0			.95296	578.2	.00483	.000677		
34.0	-3.0			.94786	575.5	.00506	.000709	.00505	.000708
32.0	-3.0			.94673	575.2	.00497	.000696	.00496	.000695
30.0	-3.0			.94956	577.2	.00504	.000706	.00503	.000705
28.0	-3.0			.95693	580.9	.00488	.000684		
32.0	-12.0			.94730	574.9	.00497	.000696	.00482	.000675
30.0	-12.0			.95183	577.9	.00494	.000692	.00497	.000696
19.0	-12.5			.95070	577.9	.00518	.000726		
17.5	-11.0			.95126	578.2	.00522	.000731		
15.5	-2.5			.95353	581.2	.00538	.000754		
16.5	-2.5			.94560	575.5	.00516	.000723	.00506	.000709
17.5	-2.5			.94338	574.9	.00535	.000750	.00519	.000727
18.5	-2.5			.95580	581.5	.00522	.000731	.00551	.000772
19.5	-2.5			.94390	574.9	.00537	.000753	.00524	.000734
20.5	-2.5			.94220	574.2	.00532	.000746	.00524	.000734
21.5	-2.5			.94673	576.5	.00526	.000737	.00537	.000753
22.5	-2.5			.94220	573.5	.00527	.000739	.00522	.000731
23.5	-2.5			.94106	572.9	.00528	.000740	.00544	.000762
24.5	-2.5			.94730	576.2	.00520	.000729		
36.0	-16.0			.94560	572.9	.00467	.000654		
36.0	-12.0			.94730	574.5	.00485	.000680	.00485	.000680
32.0	-18.0			.95296	577.9	.00480	.000673		
32.0	-16.0			.94843	575.5	.00493	.000691	.00493	.000691
32.0	-14.0			.94560	572.9	.00484	.000678	.00482	.000675
32.0	-10.0			.94616	574.9	.00527	.000739		
28.0	-14.0			.94503	573.9	.00497	.000696		
28.0	-12.0			.94843	575.9	.00494	.000692		
26.0	-12.5			.95070	577.2	.00496	.000695		
24.5	-11.0			.94730	574.9	.00493	.000691		
22.0	-12.5			.95013	577.2	.00503	.000705	.00503	.000705
20.5	-11.0			.94786	576.2	.00544	.000762	.00544	.000762
34.0	-1.0			.96430	584.5	.00452	.000633	.00471	.000660
34.0	4.0			.95126	579.5	.00523	.000733	.00549	.000769
34.0	5.0			.94390	573.2	.00510	.000715	.00491	.000688
34.0	6.0			.94503	575.9	.00527	.000739	.00526	.000737
36.0	6.0			.95070	579.2	.00526	.000737		
38.0	1.0			.94900	576.9	.00492	.000689	.00506	.000709
38.0	2.0			.94390	574.2	.00496	.000695		
44.0	8.0			.94390	574.5	.00534	.000748	.00534	.000748
44.0	6.0			.94333	574.2	.00508	.000712	.00508	.000712
44.0	4.0			.94276	573.2	.00500	.000701	.00499	.000699
44.0	2.0			.94446	574.5	.00504	.000706	.00503	.000705
44.0	1.0			.94786	575.5	.00469	.000657	.00463	.000649
6.0	.0			.94390	572.5	.00447	.000626		
6.0	10.0			.94220	572.5	.00469	.000657		
12.0	.0			.95296	577.5	.00438	.000614		
12.0	5.0			.94503	573.5	.00448	.000628		
12.0	10.0			.94276	572.5	.00465	.000652		
18.0	.0			.94220	570.9	.00468	.000656		
30.0	.0			.94050	570.2	.00443	.000621		
42.0	.0			.94616	573.9	.00450	.000631		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(b) M = 2.65; R = 2.56 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.96289	581.9	.00474	.001032		
12.0	.0			.95547	573.5	.00386	.000840		
20.5	.0			.95661	573.2	.00361	.000786		
28.0	12.0			.94976	570.2	.00387	.000842		
28.0	4.0			.95433	572.2	.00373	.000812		
28.0	.0			.95261	571.2	.00369	.000803		
20.5	-5.0			.95604	573.2	.00374	.000814		
24.5	-5.0			.95490	571.9	.00360	.000784		
30.0	.0			.95604	572.2	.00343	.000747	.00343	.000747
31.0	12.0			.95376	571.9	.00362	.000788		
34.0	.0			.95718	572.5	.00335	.000729	.00312	.000679
2.0	-12.0			.96746	583.5	.00465	.001012		
2.0	12.0			.96460	583.5	.00488	.001062		
12.0	-12.0			.96517	578.9	.00389	.000847		
12.0	12.0			.95433	574.5	.00419	.000912		
30.0	1.0			.95376	571.5	.00360	.000784		
31.0	2.0			.95832	574.2	.00353	.000768		
32.0	2.0			.95775	572.9	.00337	.000734	.00335	.000729
32.0	3.0			.95490	572.5	.00366	.000797		
32.0	6.0			.95147	570.9	.00373	.000812		
34.0	1.0			.96061	575.5	.00349	.000760	.00360	.000784
34.0	2.0			.95433	572.2	.00359	.000782	.00357	.000777
34.0	3.0			.95147	570.2	.00361	.000786	.00346	.000753
36.0	.0			.95604	572.2	.00347	.000755	.00348	.000758
38.0	.0			.95090	569.2	.00348	.000758	.00347	.000755
40.0	.0			.95033	568.2	.00327	.000712	.00327	.000712
44.0	12.0			.95661	573.2	.00368	.000801		
42.0	.0			.94976	571.5	.00351	.000764	.00347	.000755
44.0	.0			.96289	576.2	.00339	.000738	.00342	.000745
48.0	.0			.96003	574.2	.00335	.000729	.00335	.000729
52.0	.0			.95033	568.5	.00342	.000745	.00341	.000742
52.0	12.0			.95261	570.2	.00339	.000738		
55.0	.0			.95318	569.9	.00323	.000703	.00323	.000703
58.0	.0			.95604	571.5	.00321	.000699		
58.0	12.0			.95376	570.5	.00328	.000714		
58.0	-12.0			.95889	572.9	.00328	.000714		
44.0	-12.0			.96289	574.9	.00317	.000690		
36.0	-8.0			.95661	571.9	.00335	.000729		
36.0	-3.0			.96289	575.5	.00338	.000736		
34.0	-3.0			.95775	572.9	.00335	.000729	.00334	.000727
32.0	-3.0			.95604	572.2	.00340	.000740	.00339	.000738
30.0	-3.0			.95832	574.2	.00359	.000782	.00358	.000779
28.0	-3.0			.98001	577.9	.00314	.000684		
32.0	-12.0			.95946	572.2	.00334	.000727	.00315	.000686
30.0	-12.0			.96346	574.9	.00337	.000734	.00339	.000738
19.0	-12.5			.96289	575.2	.00355	.000773		
17.5	-11.0			.96346	579.2	.00376	.000819		
15.5	-2.5			.96517	578.2	.00387	.000842		
16.5	-2.5			.95718	572.9	.00361	.000786	.00353	.000768
17.5	-2.5			.95433	571.9	.00376	.000819	.00360	.000784
18.5	-2.5			.96689	578.9	.00365	.000795	.00391	.000851
19.5	-2.5			.95490	572.2	.00378	.000823	.00367	.000799
20.5	-2.5			.95318	571.2	.00373	.000812	.00365	.000795
21.5	-2.5			.95775	573.9	.00369	.000803	.00380	.000827
22.5	-2.5			.95261	570.9	.00371	.000808	.00367	.000799
23.5	-2.5			.95090	569.9	.00372	.000810	.00363	.000790
24.5	-2.5			.95718	573.2	.00361	.000786		
36.0	-16.0			.95604	570.9	.00317	.000690		
36.0	-12.0			.95775	572.2	.00334	.000727	.00334	.000727
32.0	-18.0			.96460	575.9	.00328	.000714		
32.0	-16.0			.95889	573.2	.00339	.000738	.00339	.000738
32.0	-14.0			.95604	570.9	.00331	.000721	.00330	.000718
32.0	-10.0			.95604	575.2	.00349	.000760		
28.0	-14.0			.95547	571.5	.00346	.000753		
28.0	-12.0			.95889	573.5	.00344	.000749		
26.0	-12.5			.96061	574.5	.00363	.000790		
24.5	-11.0			.95775	572.5	.00344	.000749		
22.0	-12.5			.95946	574.5	.00361	.000786	.00361	.000786
20.5	-11.0			.95775	573.5	.00355	.000773	.00355	.000773
34.0	-1.0			.97488	582.2	.00310	.000675	.00327	.000712
34.0	4.0			.96003	575.9	.00355	.000773	.00375	.000816
34.0	5.0			.95318	571.2	.00370	.000805	.00359	.000782
34.0	6.0			.95376	572.2	.00371	.000808	.00370	.000805
36.0	6.0			.95946	575.5	.00358	.000779		
38.0	1.0			.95889	574.2	.00345	.000751	.00360	.000784
38.0	2.0			.95318	571.2	.00349	.000760		
44.0	8.0			.95318	571.5	.00352	.000766	.00352	.000766
44.0	6.0			.95204	570.9	.00356	.000775	.00356	.000775
44.0	4.0			.95204	570.2	.00337	.000734	.00336	.000731
44.0	2.0			.95376	571.2	.00347	.000755	.00346	.000753
44.0	1.0			.95832	572.9	.00322	.000701	.00319	.000694
6.0	.0			.95433	569.9	.00310	.000675		
6.0	10.0			.95318	569.9	.00311	.000677		
12.0	.0			.96403	575.2	.00302	.000657		
12.0	5.0			.95547	571.2	.00314	.000684		
12.0	10.0			.95261	569.5	.00316	.000688		
18.0	.0			.95261	568.5	.00304	.000662		
30.0	.0			.95147	568.2	.00309	.000673		
42.0	.0			.95604	571.2	.00317	.000690		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(c) M = 2.65; R = 1.29×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.97647	573.2	.00102	.000442		
12.0	.0			.96499	573.2	.00248	.001075		
20.5	.0			.96786	575.5	.00233	.001010		
28.0	12.0			.96098	569.5	.00218	.000945		
28.0	4.0			.96557	571.9	.00232	.001006		
28.0	.0			.96442	570.9	.00204	.000885		
20.5	-5.0			.96786	573.5	.00224	.000971		
24.5	-5.0			.96671	574.2	.00221	.000958		
30.0	.0			.96786	572.5	.00213	.000924	.00213	.000924
31.0	12.0			.96557	571.5	.00212	.000919		
34.0	.0			.96901	572.5	.00189	.000820	.00175	.000759
2.0	-12.0			.98565	577.9	.00072	.000312		
2.0	12.0			.98335	576.5	.00082	.000356		
12.0	-12.0			.97647	579.9	.00249	.001080		
12.0	12.0			.96385	573.5	.00271	.001175		
30.0	1.0			.96614	571.9	.00214	.000928		
31.0	2.0			.97073	574.2	.00195	.000846		
32.0	2.0			.97016	573.2	.00187	.000811	.00186	.000807
32.0	3.0			.96729	572.5	.00204	.000885		
32.0	6.0			.96327	570.5	.00206	.000893		
34.0	1.0			.97303	575.2	.00212	.000919	.00216	.000937
34.0	2.0			.96671	571.9	.00214	.000928	.00211	.000915
34.0	3.0			.96327	569.9	.00214	.000928	.00202	.000876
36.0	.0			.96844	572.2	.00187	.000811	.00188	.000815
38.0	.0			.96270	568.9	.00194	.000841	.00193	.000837
40.0	.0			.96212	568.5	.00185	.000802	.00185	.000802
44.0	12.0			.96901	572.9	.00212	.000919		
42.0	.0			.96155	568.5	.00189	.000820	.00186	.000807
44.0	.0			.97532	577.9	.00184	.000798	.00187	.000811
48.0	.0			.97245	574.2	.00182	.000789	.00182	.000789
52.0	.0			.96212	568.2	.00187	.000811	.00186	.000807
52.0	12.0			.96499	569.9	.00181	.000785		
55.0	.0			.96614	570.2	.00170	.000737	.00170	.000737
58.0	.0			.97073	572.9	.00179	.000776		
58.0	12.0			.96786	571.5	.00182	.000789		
58.0	-12.0			.97360	574.2	.00178	.000772		
44.0	-12.0			.97532	575.2	.00160	.000694		
36.0	-8.0			.96844	571.5	.00190	.000824		
36.0	-3.0			.97475	575.9	.00185	.000802		
34.0	-3.0			.96958	572.9	.00186	.000807	.00185	.000802
32.0	-3.0			.96786	571.9	.00193	.000837	.00191	.000828
30.0	-3.0			.97073	574.2	.00199	.000863	.00198	.000859
28.0	-3.0			.97704	577.9	.00199	.000863		
32.0	-12.0			.96958	577.9	.00186	.000807	.00162	.000703
30.0	-12.0			.97360	575.5	.00195	.000846	.00196	.000850
19.0	-12.5			.97303	576.2	.00218	.000945		
17.5	-11.0			.97245	576.5	.00223	.000967		
15.5	-2.5			.97417	578.5	.00245	.001062		
16.5	-2.5			.96671	573.2	.00227	.000984	.00220	.000954
17.5	-2.5			.96385	571.9	.00251	.001089	.00237	.001028
18.5	-2.5			.97590	578.5	.00224	.000971	.00249	.001080
19.5	-2.5			.96499	571.9	.00226	.000980	.00215	.000932
20.5	-2.5			.96327	571.2	.00223	.000967	.00215	.000932
21.5	-2.5			.96786	573.5	.00225	.000976	.00235	.001019
22.5	-2.5			.96327	570.5	.00221	.000958	.00217	.000941
23.5	-2.5			.96155	569.9	.00220	.000954	.00212	.000919
24.5	-2.5			.96844	573.2	.00210	.000911		
36.0	-16.0			.96786	571.5	.00185	.000802		
36.0	-12.0			.97016	572.9	.00187	.000811	.00187	.000811
32.0	-18.0			.97647	576.9	.00182	.000789		
32.0	-16.0			.97073	573.5	.00189	.000820	.00189	.000820
32.0	-14.0			.96786	571.5	.00185	.000802	.00184	.000798
32.0	-10.0			.96844	574.5	.00198	.000859		
28.0	-14.0			.96729	572.2	.00213	.000924		
28.0	-12.0			.97130	574.2	.00193	.000837		
26.0	-12.5			.97245	575.2	.00212	.000919		
24.5	-11.0			.96958	573.5	.00197	.000854		
22.0	-12.5			.97188	575.5	.00213	.000924	.00213	.000924
20.5	-11.0			.96958	574.5	.00216	.000937	.00216	.000937
34.0	-1.0			.98680	582.5	.00179	.000776	.00197	.000854
34.0	4.0			.97188	575.2	.00209	.000906	.00227	.000984
34.0	5.0			.96442	570.9	.00204	.000885	.00195	.000846
34.0	6.0			.96499	575.2	.00210	.000911	.00209	.000906
36.0	6.0			.97130	574.9	.00213	.000924		
38.0	2.0			.96557	572.9	.00199	.000863		
44.0	8.0			.96499	571.2	.00197	.000854	.00197	.000854
44.0	6.0			.96442	570.5	.00195	.000846	.00195	.000846
44.0	4.0			.96442	570.2	.00193	.000837	.00192	.000833
44.0	2.0			.96614	571.2	.00192	.000833	.00190	.000824
44.0	1.0			.97073	573.2	.00183	.000794	.00180	.000781
6.0	.0			.96786	570.5	.00160	.000694		
6.0	10.0			.96671	570.9	.00181	.000785		
12.0	.0			.97762	576.2	.00156	.000677		
12.0	5.0			.97016	572.2	.00178	.000772		
12.0	10.0			.96614	570.2	.00180	.000781		
18.0	.0			.96614	569.2	.00158	.000685		
30.0	.0			.96442	568.9	.00160	.000694		
42.0	.0			.96901	571.2	.00178	.000772		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(d) M = 3.51; R = 4.05×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95042	571.9	.00425	.000822		
12.0	.0			.94415	564.9	.00335	.000648		
20.5	.0			.94700	565.5	.00309	.000598		
28.0	12.0			.93902	559.9	.00282	.000546		
28.0	4.0			.94472	563.9	.00298	.000577		
28.0	.0			.94244	562.9	.00308	.000596		
20.5	-5.0			.94814	565.9	.00323	.000625		
24.5	-5.0			.94643	564.2	.00302	.000584		
30.0	.0			.94643	564.5	.00270	.000522	.00270	.000522
31.0	12.0			.94358	562.2	.00274	.000530		
34.0	.0			.94700	564.2	.00278	.000538	.00253	.000490
2.0	-12.0			.95725	575.2	.00406	.000786		
2.0	12.0			.95269	571.2	.00404	.000782		
12.0	-12.0			.95611	571.9	.00332	.000642		
12.0	12.0			.94244	563.5	.00326	.000631		
30.0	1.0			.94472	563.9	.00298	.000577		
31.0	2.0			.94928	566.2	.00289	.000559		
32.0	2.0			.94814	564.9	.00291	.000563	.00291	.000563
32.0	3.0			.94529	564.5	.00298	.000577		
32.0	6.0			.94130	561.9	.00303	.000586		
34.0	1.0			.94985	566.9	.00283	.000548	.00295	.000571
34.0	2.0			.94415	563.5	.00288	.000557	.00285	.000551
34.0	3.0			.94016	561.5	.00308	.000596	.00293	.000567
36.0	.0			.94529	563.5	.00282	.000546	.00283	.000548
38.0	.0			.93959	560.5	.00294	.000569	.00293	.000567
40.0	.0			.93959	559.9	.00294	.000569	.00294	.000569
44.0	12.0			.94586	562.9	.00275	.000532		
42.0	.0			.93959	560.5	.00282	.000546	.00279	.000540
44.0	.0			.95269	570.5	.00283	.000548	.00286	.000553
48.0	.0			.94985	565.5	.00270	.000522	.00270	.000522
52.0	.0			.93902	559.5	.00275	.000532	.00274	.000530
52.0	12.0			.94301	560.9	.00256	.000495		
55.0	.0			.94301	561.5	.00269	.000521	.00269	.000521
58.0	.0			.94586	563.2	.00248	.000480		
58.0	12.0			.94358	561.2	.00244	.000472		
58.0	-12.0			.95042	566.2	.00262	.000507		
44.0	-12.0			.95497	568.5	.00260	.000503		
36.0	-8.0			.94643	563.9	.00277	.000536		
36.0	-3.0			.95269	567.2	.00276	.000534		
34.0	-3.0			.94643	563.9	.00266	.000515	.00265	.000513
32.0	-3.0			.94529	563.2	.00282	.000546	.00281	.000544
30.0	-3.0			.94871	565.9	.00296	.000573	.00295	.000571
28.0	-3.0			.95554	569.9	.00288	.000557		
32.0	-12.0			.94928	564.9	.00276	.000534	.00253	.000490
30.0	-12.0			.95383	567.5	.00274	.000530	.00276	.000534
19.0	-12.5			.95497	569.2	.00300	.000580		
17.5	-11.0			.95440	569.2	.00314	.000608		
15.5	-2.5			.95554	573.2	.00337	.000652		
16.5	-2.5			.94757	565.2	.00324	.000627	.00317	.000613
17.5	-2.5			.94415	563.5	.00329	.000637	.00313	.000606
18.5	-2.5			.95725	570.5	.00307	.000594	.00332	.000642
19.5	-2.5			.94586	564.2	.00300	.000580	.00290	.000561
20.5	-2.5			.94415	563.2	.00313	.000606	.00305	.000590
21.5	-2.5			.94871	565.9	.00311	.000602	.00322	.000623
22.5	-2.5			.94358	562.9	.00311	.000602	.00308	.000596
23.5	-2.5			.94187	561.9	.00313	.000606	.00304	.000588
24.5	-2.5			.94928	565.5	.00297	.000575		
36.0	-16.0			.94871	564.5	.00249	.000482		
36.0	-12.0			.94928	565.2	.00268	.000519	.00268	.000519
32.0	-18.0			.95725	569.9	.00265	.000513		
32.0	-16.0			.95099	566.9	.00272	.000526	.00272	.000526
32.0	-14.0			.94700	563.9	.00269	.000521	.00267	.000517
32.0	-10.0			.94700	564.9	.00280	.000542		
28.0	-14.0			.94814	564.9	.00264	.000511		
28.0	-12.0			.95212	567.2	.00265	.000513		
26.0	-12.5			.95269	568.2	.00280	.000542		
24.5	-11.0			.94928	565.9	.00278	.000538		
22.0	-12.5			.95212	568.2	.00297	.000575	.00297	.000575
20.5	-11.0			.94985	567.2	.00302	.000584	.00302	.000584
34.0	-1.0			.96637	574.9	.00256	.000495	.00276	.000534
34.0	4.0			.95099	567.2	.00284	.000550	.00303	.000586
34.0	5.0			.94358	562.9	.00292	.000565	.00283	.000548
34.0	6.0			.94415	563.2	.00285	.000551	.00284	.000550
36.0	6.0			.94985	566.5	.00295	.000571		
38.0	1.0			.94928	566.2	.00292	.000565	.00302	.000584
38.0	2.0			.94472	563.5	.00292	.000565		
44.0	8.0			.94415	562.5	.00267	.000517	.00267	.000517
44.0	6.0			.94358	562.5	.00267	.000517	.00267	.000517
44.0	4.0			.94358	562.9	.00280	.000542	.00280	.000542
44.0	2.0			.94586	563.9	.00281	.000544	.00279	.000540
44.0	1.0			.95042	566.2	.00270	.000522	.00270	.000522
6.0	.0			.94415	561.9	.00252	.000488		
6.0	10.0			.94415	564.2	.00240	.000464		
12.0	.0			.95497	567.9	.00245	.000474		
12.0	5.0			.94757	563.9	.00259	.000501		
12.0	10.0			.94415	561.5	.00254	.000491		
18.0	.0			.94358	561.5	.00249	.000482		
30.0	.0			.94301	561.5	.00264	.000511		
42.0	.0			.94643	562.9	.00248	.000480		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(e) M = 3.51; R = 2.85 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95417	568.9	.00345	.000952		
12.0	.0			.94901	562.2	.00266	.000734		
20.5	.0			.95245	563.5	.00254	.000701		
28.0	12.0			.94443	557.9	.00229	.000632		
28.0	4.0			.95016	561.5	.00223	.000615		
28.0	.0			.94844	560.9	.00232	.000640		
20.5	-5.0			.95360	563.9	.00236	.000651		
24.5	-5.0			.95188	562.5	.00219	.000604		
30.0	.0			.95245	562.9	.00212	.000585	.00212	.000585
31.0	12.0			.94901	559.9	.00219	.000604		
34.0	.0			.95245	562.5	.00210	.000579	.00190	.000524
2.0	-12.0			.96104	575.5	.00340	.000938		
2.0	12.0			.95589	568.2	.00347	.000957		
12.0	-12.0			.96104	569.5	.00257	.000709		
12.0	12.0			.94672	560.5	.00269	.000742		
30.0	1.0			.95073	564.2	.00226	.000623		
31.0	2.0			.95532	564.5	.00225	.000621		
32.0	2.0			.95360	563.2	.00209	.000577	.00208	.000574
32.0	3.0			.95073	562.2	.00231	.000637		
32.0	6.0			.94615	559.2	.00233	.000643		
34.0	1.0			.95589	564.9	.00217	.000599	.00228	.000629
34.0	2.0			.94959	561.5	.00239	.000659	.00237	.000654
34.0	3.0			.94615	559.2	.00239	.000659	.00226	.000623
36.0	.0			.95073	561.5	.00214	.000590	.00215	.000593
38.0	.0			.94558	558.5	.00216	.000596	.00214	.000590
40.0	.0			.94615	558.5	.00211	.000582	.00211	.000582
44.0	12.0			.95245	561.2	.00204	.000563		
42.0	.0			.94558	560.9	.00226	.000623	.00223	.000615
44.0	.0			.95932	566.5	.00210	.000579	.00212	.000585
48.0	.0			.95646	564.5	.00207	.000571	.00207	.000571
52.0	.0			.94615	558.5	.00207	.000571	.00206	.000568
52.0	12.0			.94901	559.2	.00189	.000521		
55.0	.0			.94959	560.2	.00201	.000554	.00201	.000554
58.0	.0			.95360	562.2	.00200	.000552		
58.0	12.0			.95016	559.9	.00189	.000521		
58.0	-12.0			.95761	565.2	.00189	.000521		
44.0	-12.0			.96162	567.2	.00202	.000557		
36.0	-8.0			.95188	561.9	.00221	.000610		
36.0	-3.0			.95875	565.5	.00198	.000546		
34.0	-3.0			.95245	562.2	.00210	.000579	.00209	.000577
32.0	-3.0			.95131	561.5	.00212	.000585	.00210	.000579
30.0	-3.0			.95474	563.9	.00217	.000599	.00216	.000596
28.0	-3.0			.96162	567.9	.00213	.000588		
32.0	-12.0			.95302	563.2	.00210	.000579	.00190	.000524
30.0	-12.0			.95761	565.9	.00211	.000582	.00212	.000585
19.0	-12.5			.95818	566.5	.00232	.000640		
17.5	-11.0			.95761	566.9	.00254	.000701		
15.5	-2.5			.95875	567.9	.00251	.000692		
16.5	-2.5			.95131	563.2	.00245	.000676	.00239	.000659
17.5	-2.5			.94787	563.9	.00260	.000717	.00244	.000673
18.5	-2.5			.96162	568.5	.00233	.000643	.00258	.000712
19.5	-2.5			.95016	562.2	.00244	.000673	.00234	.000645
20.5	-2.5			.94787	561.2	.00246	.000679	.00237	.000654
21.5	-2.5			.95302	563.9	.00231	.000637	.00241	.000665
22.5	-2.5			.94844	561.2	.00239	.000659	.00236	.000651
23.5	-2.5			.94672	560.2	.00228	.000629	.00220	.000607
24.5	-2.5			.95360	563.5	.00230	.000634		
36.0	-16.0			.95302	562.5	.00205	.000565		
36.0	-12.0			.95417	563.5	.00204	.000563	.00204	.000563
32.0	-18.0			.96219	568.2	.00198	.000546		
32.0	-16.0			.95589	564.5	.00202	.000557	.00201	.000554
32.0	-14.0			.95188	562.2	.00206	.000568	.00205	.000565
32.0	-10.0			.95245	562.9	.00223	.000615		
28.0	-14.0			.95302	563.2	.00222	.000612		
28.0	-12.0			.95703	565.5	.00209	.000577		
26.0	-12.5			.95818	566.5	.00210	.000579		
24.5	-11.0			.95417	563.9	.00214	.000590		
22.0	-12.5			.95703	566.2	.00230	.000634	.00230	.000634
20.5	-11.0			.95474	565.2	.00224	.000618	.00224	.000618
34.0	-1.0			.97135	572.9	.00200	.000552	.00215	.000593
34.0	4.0			.95532	564.9	.00218	.000601	.00237	.000654
34.0	5.0			.94844	560.2	.00220	.000607	.00211	.000582
34.0	6.0			.94844	560.5	.00219	.000604	.00218	.000601
36.0	6.0			.95417	563.9	.00217	.000599		
38.0	1.0			.95532	564.5	.00212	.000585	.00229	.000632
38.0	2.0			.94901	560.9	.00214	.000590		
44.0	8.0			.94901	560.2	.00210	.000579	.00210	.000579
44.0	6.0			.94844	560.2	.00211	.000582	.00211	.000582
44.0	4.0			.94959	560.9	.00212	.000585	.00212	.000585
44.0	2.0			.95131	562.2	.00211	.000582	.00209	.000577
44.0	1.0			.95646	564.5	.00201	.000554	.00202	.000557
6.0	.0			.95073	560.5	.00185	.000510		
6.0	10.0			.95016	560.2	.00191	.000527		
12.0	.0			.96219	567.2	.00177	.000488		
12.0	5.0			.95360	562.2	.00189	.000521		
12.0	10.0			.95016	560.2	.00191	.000527		
18.0	.0			.95073	560.5	.00180	.000497		
30.0	.0			.95016	560.5	.00205	.000565		
42.0	.0			.95245	563.2	.00190	.000524		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; k = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(f) M = 3.51; R = 1.64×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95461	568.5	.00167	.000804		
12.0	.0			.94780	564.2	.00191	.000919		
20.5	.0			.95291	566.5	.00187	.000900		
28.0	12.0			.94497	560.9	.00155	.000746		
28.0	4.0			.95064	564.9	.00158	.000761		
28.0	.0			.94951	564.2	.00156	.000751		
20.5	-5.0			.95404	566.5	.00165	.000794		
24.5	-5.0			.95234	565.5	.00159	.000765		
30.0	.0			.95348	567.5	.00158	.000761	.00158	.000761
31.0	12.0			.94951	563.2	.00152	.000732		
34.0	.0			.95348	565.9	.00152	.000732	.00131	.000631
2.0	-12.0			.96255	573.2	.00159	.000765		
2.0	12.0			.95688	569.2	.00153	.000737		
12.0	-12.0			.95972	571.5	.00189	.000910		
12.0	12.0			.94497	562.5	.00197	.000948		
30.0	1.0			.95177	566.9	.00159	.000765		
31.0	2.0			.95575	567.5	.00152	.000732		
32.0	2.0			.95404	566.2	.00152	.000732	.00151	.000727
32.0	3.0			.95177	565.2	.00160	.000770		
32.0	6.0			.94667	562.2	.00154	.000741		
34.0	1.0			.95688	568.2	.00152	.000732	.00160	.000770
34.0	2.0			.95064	564.5	.00153	.000737	.00150	.000722
34.0	3.0			.94724	562.5	.00156	.000751	.00144	.000693
36.0	.0			.95234	564.9	.00138	.000664	.00139	.000669
38.0	.0			.94724	562.2	.00142	.000684	.00140	.000674
40.0	.0			.94780	562.2	.00152	.000732	.00152	.000732
44.0	12.0			.95404	565.5	.00151	.000727		
42.0	.0			.94780	562.5	.00141	.000679	.00137	.000660
44.0	.0			.96142	570.2	.00150	.000722	.00152	.000732
48.0	.0			.95915	568.5	.00129	.000621	.00130	.000626
52.0	.0			.94894	562.5	.00131	.000631	.00130	.000626
52.0	12.0			.95064	563.2	.00131	.000631		
55.0	.0			.95234	564.5	.00128	.000616	.00128	.000616
58.0	.0			.95688	567.2	.00128	.000616		
58.0	12.0			.95348	564.9	.00128	.000616		
44.0	-12.0			.96142	569.9	.00123	.000592		
36.0	-8.0			.96369	570.9	.00122	.000587		
36.0	-3.0			.95291	565.2	.00151	.000727		
34.0	-3.0			.95915	568.9	.00150	.000722		
32.0	-3.0			.95348	565.5	.00151	.000727	.00150	.000722
30.0	-3.0			.95234	564.9	.00140	.000674	.00138	.000664
28.0	-3.0			.95575	567.5	.00156	.000751	.00155	.000746
32.0	-12.0			.96255	571.2	.00142	.000684		
30.0	-12.0			.95461	566.5	.00152	.000732	.00132	.000635
19.0	-12.5			.95858	569.7	.00140	.000674	.00141	.000679
17.5	-11.0			.95745	569.2	.00161	.000775		
16.5	-2.5			.95688	569.2	.00187	.000900		
16.5	-2.5			.95915	570.2	.00185	.000891		
17.5	-2.5			.95177	565.9	.00170	.000818	.00164	.000790
18.5	-2.5			.94837	563.9	.00188	.000905	.00172	.000828
19.5	-2.5			.96142	571.2	.00164	.000790	.00190	.000915
20.5	-2.5			.95064	564.9	.00166	.000799	.00156	.000751
21.5	-2.5			.94894	563.9	.00167	.000804	.00158	.000761
22.5	-2.5			.95404	566.5	.00169	.000814	.00179	.000862
23.5	-2.5			.94951	563.9	.00170	.000818	.00167	.000804
24.5	-2.5			.94780	563.2	.00161	.000775	.00152	.000732
36.0	-16.0			.95461	566.5	.00153	.000737		
36.0	-12.0			.95404	565.9	.00130	.000626		
32.0	-18.0			.95518	566.9	.00151	.000727	.00151	.000727
32.0	-16.0			.96369	572.9	.00134	.000645		
32.0	-14.0			.95688	567.9	.00133	.000640	.00132	.000635
32.0	-12.0			.95348	565.5	.00132	.000635	.00130	.000626
28.0	-14.0			.95348	566.2	.00152	.000732		
28.0	-12.0			.95404	566.5	.00141	.000679		
26.0	-12.5			.95802	568.5	.00134	.000645		
24.5	-11.0			.95915	569.5	.00151	.000727		
22.0	-12.5			.95518	567.2	.00141	.000679		
20.5	-11.2			.95802	569.2	.00157	.000756	.00157	.000756
34.0	-1.0			.95518	567.5	.00161	.000775	.00161	.000775
34.0	4.0			.97163	575.9	.00116	.000558	.00133	.000640
34.0	5.0			.95631	567.9	.00153	.000737	.00172	.000828
34.0	6.0			.94894	563.5	.00145	.000698	.00137	.000660
36.0	6.0			.94894	563.5	.00145	.000698	.00144	.000693
38.0	1.0			.95461	566.9	.00144	.000693		
38.0	2.0			.95688	567.9	.00151	.000727	.00165	.000794
44.0	8.0			.95007	564.2	.00153	.000737		
44.0	6.0			.95064	563.9	.00152	.000732	.00152	.000732
44.0	4.0			.95007	563.9	.00141	.000679	.00141	.000679
44.0	2.0			.95121	564.2	.00137	.000660	.00137	.000660
44.0	1.0			.95291	565.5	.00152	.000732	.00150	.000722
44.0	.0			.95802	568.2	.00151	.000727	.00152	.000732
6.0	10.0			.95291	565.9	.00118	.000568		
6.0	.0			.95177	563.9	.00118	.000568		
12.0	.0			.96482	573.9	.00117	.000563		
12.0	5.0			.95631	566.5	.00127	.000611		
12.0	10.0			.95177	564.2	.00126	.000607		
18.0	.0			.95348	565.9	.00123	.000592		
30.0	.0			.95291	564.9	.00126	.000607		
42.0	.0			.95575	566.2	.00125	.000602		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(g) M = 4.44; R = 4.52×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.93886	571.5	.00180	.000455		
12.0	.0			.93281	566.9	.00149	.000377		
20.5	.0			.93666	569.9	.00136	.000344		
28.0	12.0			.92895	565.2	.00151	.000382		
28.0	4.0			.93446	569.9	.00159	.000402		
28.0	.0			.93281	566.5	.00119	.000301		
20.5	-5.0			.93666	570.2	.00155	.000392		
24.5	-5.0			.93556	569.2	.00155	.000392		
30.0	.0			.93611	569.2	.00115	.000291	.00116	.000293
31.0	12.0			.93225	567.2	.00151	.000382		
34.0	.0			.93666	571.2	.00136	.000344	.00095	.000240
2.0	-12.0			.94327	576.2	.00255	.000645		
2.0	12.0			.94052	573.9	.00245	.000620		
12.0	-12.0			.94272	574.5	.00194	.000491		
12.0	12.0			.93115	567.2	.00194	.000491		
30.0	1.0			.93391	568.2	.00116	.000293		
31.0	2.0			.93831	570.2	.00119	.000301		
32.0	2.0			.93721	571.5	.00136	.000344	.00135	.000342
32.0	3.0			.93446	569.5	.00144	.000364		
32.0	6.0			.93115	565.9	.00150	.000380		
34.0	1.0			.93996	572.5	.00143	.000362	.00162	.000410
34.0	2.0			.93336	567.2	.00120	.000304	.00114	.000288
34.0	3.0			.93060	567.2	.00145	.000367	.00119	.000301
36.0	.0			.93501	568.5	.00115	.000291	.00116	.000293
38.0	.0			.93060	567.5	.00137	.000347	.00135	.000342
40.0	.0			.93060	567.5	.00137	.000347	.00137	.000347
44.0	12.0			.93666	569.5	.00120	.000304		
42.0	.0			.93060	565.9	.00116	.000293	.00109	.000276
44.0	.0			.94382	575.5	.00135	.000342	.00140	.000354
48.0	.0			.94052	571.5	.00114	.000288	.00115	.000291
52.0	.0			.93115	565.9	.00116	.000293	.00114	.000288
52.0	12.0			.93336	567.2	.00149	.000377		
55.0	.0			.93446	567.2	.00127	.000321	.00127	.000321
58.0	.0			.93831	569.2	.00087	.000220		
58.0	12.0			.93501	571.5	.00143	.000362		
58.0	-12.0			.93996	570.5	.00147	.000372		
44.0	-12.0			.94327	572.5	.00146	.000369		
36.0	-8.0			.93501	567.5	.00147	.000372		
36.0	-3.0			.94107	572.2	.00135	.000342		
34.0	-3.0			.93611	568.2	.00118	.000299	.00133	.000337
32.0	-3.0			.93501	567.5	.00118	.000299	.00116	.000293
30.0	-3.0			.93831	569.5	.00118	.000299	.00117	.000296
28.0	-3.0			.94547	573.5	.00116	.000293		
32.0	-12.0			.93721	569.2	.00171	.000433	.00133	.000337
30.0	-12.0			.94052	571.5	.00171	.000433	.00173	.000438
19.0	-12.5			.94217	572.5	.00170	.000430		
17.5	-11.0			.94107	570.9	.00174	.000440		
15.5	-2.5			.94437	572.9	.00145	.000367		
16.5	-2.5			.93666	568.2	.00146	.000369	.00140	.000354
17.5	-2.5			.93281	567.2	.00154	.000390	.00120	.000304
18.5	-2.5			.94602	573.9	.00116	.000293	.00160	.000405
19.5	-2.5			.93501	567.2	.00118	.000299	.00101	.000256
20.5	-2.5			.93336	567.5	.00154	.000390	.00140	.000354
21.5	-2.5			.93776	568.9	.00117	.000296	.00133	.000337
22.5	-2.5			.93336	567.5	.00154	.000390	.00149	.000377
23.5	-2.5			.93115	565.2	.00119	.000301	.00105	.000266
24.5	-2.5			.93721	568.9	.00147	.000372		
36.0	-16.0			.93501	567.5	.00125	.000316		
36.0	-12.0			.93611	568.2	.00147	.000372	.00147	.000372
32.0	-18.0			.94327	572.9	.00120	.000304		
32.0	-16.0			.93776	573.9	.00137	.000347	.00136	.000344
32.0	-14.0			.93501	567.5	.00147	.000372	.00145	.000367
32.0	-10.0			.93501	567.9	.00148	.000374		
28.0	-14.0			.93446	567.5	.00119	.000301		
28.0	-12.0			.93831	570.2	.00148	.000374		
26.0	-12.5			.93996	571.2	.00148	.000374		
24.5	-11.0			.93721	569.2	.00147	.000372		
22.0	-12.5			.93941	572.2	.00175	.000443	.00175	.000443
20.5	-11.0			.93666	569.5	.00178	.000450	.00178	.000450
34.0	-1.0			.95318	578.5	.00116	.000293	.00146	.000369
34.0	4.0			.93941	571.9	.00136	.000344	.00167	.000423
34.0	5.0			.93336	567.2	.00120	.000304	.00108	.000273
34.0	6.0			.93281	567.2	.00150	.000380	.00149	.000377
36.0	6.0			.93831	570.2	.00149	.000377		
38.0	1.0			.93886	572.9	.00137	.000347	.00165	.000417
38.0	2.0			.93336	568.9	.00144	.000364		
44.0	8.0			.93336	567.2	.00149	.000377	.00148	.000374
44.0	6.0			.93336	568.9	.00145	.000367	.00145	.000367
44.0	4.0			.93336	567.2	.00120	.000304	.00120	.000304
44.0	2.0			.93446	568.5	.00116	.000293	.00110	.000278
44.0	1.0			.93996	570.5	.00126	.000319	.00128	.000324
6.0	.0			.93556	568.2	.00114	.000288		
6.0	10.0			.93446	570.2	.00138	.000349		
12.0	.0			.94547	573.5	.00086	.000218		
12.0	5.0			.93721	569.9	.00115	.000291		
12.0	10.0			.93391	570.2	.00138	.000349		
18.0	.0			.93391	566.5	.00087	.000220		
30.0	.0			.93336	566.2	.00087	.000220		
42.0	.0			.93666	567.9	.00087	.000220		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Continued

(h) M = 4.44; R = 3.25 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.94231	569.2	.00191	.000680		
12.0	.0			.93842	567.2	.00139	.000495		
20.5	.0			.94341	569.9	.00137	.000488		
28.0	12.0			.93509	566.9	.00135	.000481		
28.0	4.0			.94175	567.2	.00124	.000442		
28.0	.0			.94064	565.9	.00123	.000438		
20.5	-5.0			.94286	567.9	.00119	.000424		
24.5	-5.0			.94286	567.2	.00116	.000413		
30.0	.0			.94397	567.9	.00084	.000299	.00085	.000303
31.0	12.0			.93898	567.2	.00134	.000477		
34.0	.0			.94452	568.2	.00114	.000406	.00078	.000278
2.0	-12.0			.94674	574.5	.00199	.000709		
2.0	12.0			.94286	571.5	.00231	.000823		
12.0	-12.0			.94896	573.9	.00152	.000541		
12.0	12.0			.93509	567.2	.00159	.000566		
30.0	1.0			.94120	568.5	.00124	.000442		
31.0	2.0			.94619	569.2	.00124	.000442		
32.0	2.0			.94452	568.2	.00117	.000417	.00117	.000417
32.0	3.0			.94064	566.9	.00126	.000449		
32.0	6.0			.93787	566.9	.00125	.000445		
34.0	1.0			.94785	570.2	.00117	.000417	.00134	.000477
34.0	2.0			.94064	567.2	.00132	.000470	.00126	.000449
34.0	3.0			.93787	564.5	.00125	.000445	.00102	.000363
36.0	.0			.94286	567.2	.00117	.000417	.00118	.000420
38.0	.0			.93787	564.5	.00119	.000424	.00117	.000417
40.0	.0			.93842	565.5	.00111	.000395	.00111	.000395
44.0	12.0			.94452	569.2	.00113	.000402		
44.0	.0			.95229	572.9	.00084	.000299	.00088	.000313
48.0	.0			.94952	571.5	.00109	.000388	.00110	.000392
52.0	.0			.94064	565.2	.00084	.000299	.00082	.000292
52.0	12.0			.94120	567.2	.00113	.000402		
55.0	.0			.94341	567.2	.00084	.000299	.00084	.000299
58.0	.0			.94674	569.5	.00084	.000299		
58.0	12.0			.94286	568.2	.00113	.000402		
58.0	-12.0			.94896	571.5	.00092	.000328		
44.0	-12.0			.95174	573.5	.00110	.000392		
36.0	-8.0			.94231	567.2	.00111	.000395		
36.0	-3.0			.94896	572.2	.00108	.000385		
34.0	-3.0			.94341	567.5	.00111	.000395	.00109	.000388
32.0	-3.0			.94231	566.9	.00111	.000395	.00110	.000392
30.0	-3.0			.94563	568.9	.00117	.000417	.00115	.000410
28.0	-3.0			.95229	572.9	.00084	.000299		
32.0	-12.0			.94231	567.5	.00113	.000402	.00081	.000288
30.0	-12.0			.94563	571.2	.00124	.000442	.00126	.000449
19.0	-12.5			.94619	570.5	.00145	.000516		
17.5	-11.0			.94563	570.5	.00131	.000466		
15.5	-2.5			.94952	575.2	.00135	.000481		
16.5	-2.5			.94175	569.5	.00131	.000466	.00122	.000434
17.5	-2.5			.93842	567.5	.00131	.000466	.00107	.000381
18.5	-2.5			.95229	572.9	.00120	.000427	.00155	.000552
19.5	-2.5			.94064	568.2	.00124	.000442	.00114	.000406
20.5	-2.5			.93953	565.5	.00121	.000431	.00117	.000417
21.5	-2.5			.94397	569.9	.00123	.000438	.00131	.000466
22.5	-2.5			.93953	565.5	.00121	.000431	.00118	.000420
23.5	-2.5			.93787	564.5	.00124	.000442	.00110	.000392
24.5	-2.5			.94452	568.2	.00117	.000417		
36.0	-16.0			.94231	569.5	.00109	.000388		
36.0	-12.0			.94341	567.9	.00112	.000399	.00112	.000399
32.0	-18.0			.95063	572.9	.00112	.000399		
32.0	-16.0			.94563	570.5	.00131	.000466	.00130	.000463
32.0	-14.0			.94231	567.5	.00112	.000399	.00110	.000392
32.0	-10.0			.94286	568.2	.00111	.000395		
28.0	-14.0			.94175	568.2	.00132	.000470		
28.0	-12.0			.94563	570.5	.00131	.000466		
26.0	-12.5			.94785	572.2	.00123	.000438		
24.5	-11.0			.94452	568.5	.00121	.000431		
22.0	-12.5			.94619	572.9	.00131	.000466	.00131	.000466
20.5	-11.0			.94397	569.5	.00132	.000470	.00132	.000470
34.0	-1.0			.96117	577.9	.00109	.000388	.00138	.000491
34.0	4.0			.94619	570.2	.00126	.000449	.00161	.000573
34.0	5.0			.94009	569.2	.00132	.000470	.00120	.000427
34.0	6.0			.94009	567.2	.00132	.000470	.00131	.000466
36.0	6.0			.94508	571.9	.00131	.000466		
38.0	1.0			.94674	569.9	.00117	.000417	.00144	.000513
38.0	2.0			.94064	566.5	.00117	.000417		
44.0	8.0			.94064	567.5	.00113	.000402	.00112	.000399
44.0	6.0			.94064	566.9	.00119	.000424	.00119	.000424
44.0	4.0			.94120	568.5	.00125	.000445	.00125	.000445
44.0	2.0			.94231	567.5	.00118	.000420	.00112	.000399
44.0	1.0			.94785	571.2	.00110	.000392	.00111	.000395
6.0	.0			.94341	567.5	.00084	.000299		
6.0	10.0			.94231	569.9	.00109	.000388		
12.0	.0			.95506	574.5	.00091	.000324		
12.0	5.0			.94563	570.2	.00111	.000395		
12.0	10.0			.94231	567.5	.00085	.000303		
18.0	.0			.94341	567.5	.00092	.000328		
30.0	.0			.94286	566.9	.00087	.000310		
42.0	.0			.94563	568.5	.00079	.000281		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

1. Flat Plate Alone - Concluded

(i) M = 4.44; R = 2.12 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95091	573.5	.00171	.000921		
12.0	.0			.94421	568.9	.00118	.000635		
20.5	.0			.95091	573.2	.00113	.000609		
28.0	12.0			.94198	565.9	.00102	.000549		
28.0	4.0			.94812	569.2	.00097	.000522		
28.0	.0			.94812	568.9	.00094	.000506		
20.5	-5.0			.94979	573.2	.00111	.000598		
24.5	-5.0			.94923	570.5	.00093	.000501		
30.0	.0			.95147	570.5	.00097	.000522	.00098	.000528
31.0	12.0			.94589	570.2	.00105	.000565		
34.0	.0			.95147	570.5	.00077	.000415	.00046	.000248
2.0	-12.0			.95649	576.2	.00154	.000829		
2.0	12.0			.95314	578.2	.00184	.000991		
12.0	-12.0			.95426	573.9	.00109	.000587		
12.0	12.0			.94031	566.2	.00136	.000732		
30.0	1.0			.94923	570.2	.00109	.000587		
31.0	2.0			.95258	571.5	.00098	.000528		
32.0	2.0			.95091	570.2	.00096	.000517	.00095	.000512
32.0	3.0			.94812	569.2	.00097	.000522		
32.0	6.0			.94477	567.9	.00110	.000592		
34.0	1.0			.95426	575.5	.00102	.000549	.00124	.000668
34.0	2.0			.94756	568.9	.00098	.000528	.00093	.000501
34.0	3.0			.94421	567.5	.00110	.000592	.00090	.000485
36.0	.0			.94979	569.5	.00098	.000528	.00099	.000533
38.0	.0			.94589	567.2	.00094	.000506	.00092	.000495
40.0	.0			.94645	567.2	.00083	.000447	.00083	.000447
42.0	.0			.94645	567.5	.00095	.000512	.00090	.000485
44.0	.0			.96039	575.9	.00090	.000485	.00094	.000506
48.0	.0			.95649	573.5	.00089	.000479	.00089	.000479
52.0	.0			.94812	568.2	.00092	.000495	.00091	.000490
52.0	12.0			.94923	569.2	.00088	.000474		
55.0	.0			.95091	569.9	.00075	.000404	.00075	.000404
58.0	.0			.95537	572.5	.00089	.000479		
58.0	12.0			.95091	570.5	.00089	.000479		
58.0	-12.0			.95704	573.2	.00069	.000372		
44.0	-12.0			.95928	574.5	.00078	.000420		
36.0	-8.0			.94923	568.9	.00092	.000495		
36.0	-3.0			.95649	573.2	.00092	.000495		
34.0	-3.0			.95035	569.9	.00092	.000495	.00090	.000485
32.0	-3.0			.94923	569.2	.00096	.000517	.00094	.000506
30.0	-3.0			.95258	571.2	.00099	.000533	.00098	.000528
28.0	-3.0			.95983	575.2	.00094	.000506		
32.0	-12.0			.95147	569.2	.00089	.000479	.00067	.000361
30.0	-12.0			.95481	571.2	.00076	.000409	.00077	.000415
19.0	-12.5			.95481	571.5	.00094	.000506		
17.5	-11.0			.95370	571.9	.00107	.000576		
15.5	-2.5			.95760	574.5	.00107	.000576		
16.5	-2.5			.94979	569.9	.00108	.000582	.00109	.000587
17.5	-2.5			.94589	567.9	.00109	.000587	.00083	.000447
18.5	-2.5			.95928	577.9	.00111	.000598	.00128	.000689
19.5	-2.5			.94868	571.2	.00112	.000603	.00089	.000479
20.5	-2.5			.94756	567.9	.00102	.000549	.00091	.000490
21.5	-2.5			.95202	570.5	.00097	.000522	.00118	.000635
22.5	-2.5			.94756	567.9	.00102	.000549	.00105	.000565
23.5	-2.5			.94589	567.9	.00093	.000501	.00080	.000431
24.5	-2.5			.95147	570.5	.00095	.000512		
36.0	-16.0			.94923	568.9	.00084	.000452		
36.0	-12.0			.95091	569.5	.00072	.000388	.00072	.000388
32.0	-18.0			.95760	574.5	.00090	.000485		
32.0	-16.0			.95202	571.2	.00086	.000463	.00085	.000458
32.0	-14.0			.94923	568.9	.00071	.000382	.00069	.000372
32.0	-10.0			.94923	569.2	.00092	.000495		
28.0	-14.0			.94868	568.9	.00085	.000458		
28.0	-12.0			.95258	571.2	.00077	.000415		
26.0	-12.5			.95370	571.9	.00082	.000442		
24.5	-11.0			.95091	570.2	.00092	.000495		
22.0	-12.5			.95258	571.9	.00091	.000490	.00091	.000490
20.5	-11.0			.95035	570.2	.00095	.000512	.00095	.000512
34.0	-1.0			.96764	580.2	.00089	.000479	.00114	.000614
34.0	4.0			.95314	572.2	.00100	.000539	.00131	.000705
34.0	5.0			.94700	568.5	.00099	.000533	.00085	.000458
34.0	6.0			.94645	568.2	.00099	.000533	.00098	.000528
36.0	6.0			.95202	571.2	.00098	.000528		
38.0	1.0			.95426	572.2	.00080	.000431	.00114	.000614
38.0	2.0			.94812	568.9	.00094	.000506		
44.0	8.0			.94756	568.9	.00093	.000501	.00092	.000495
44.0	6.0			.94812	568.9	.00096	.000517	.00096	.000517
44.0	4.0			.94868	569.2	.00093	.000501	.00093	.000501
44.0	2.0			.95035	570.2	.00091	.000490	.00087	.000469
44.0	1.0			.95537	572.9	.00093	.000501	.00093	.000501
6.0	.0			.95147	570.2	.00077	.000415		
6.0	10.0			.95091	569.9	.00063	.000339		
12.0	.0			.96318	576.9	.00069	.000372		
12.0	5.0			.95370	571.9	.00068	.000366		
12.0	10.0			.95035	569.9	.00086	.000463		
18.0	.0			.95202	570.2	.00077	.000415		
30.0	.0			.95147	570.2	.00083	.000447		
42.0	.0			.95370	571.2	.00069	.000372		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener

(a) M = 2.65; R = 3.98 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95156	586.9	.00632	.000887			.96
12.0	.0			.94537	579.5	.00538	.000755			1.00
20.5	.0			.98592	607.2	.00634	.000890			1.22
28.0	12.0			.88962	543.5	.00386	.000542			.71
28.0	4.0			.97803	582.9	.00122	.000171			.23
28.0	.0			.97634	581.5	.00108	.000152			.21
20.5	-5.0			.98423	606.9	.00648	.000909			1.22
24.5	-5.0			.99605	625.2	.01029	.001444			1.90
30.0	.0			.94424	574.2	.00408	.000572	.00409	.000574	.83
31.0	12.0			.89525	552.9	.00649	.000911			1.25
34.0	.0			.91552	561.2	.00529	.000742	.00525	.000737	1.04
2.0	-12.0			.95607	588.2	.00622	.000873			.99
2.0	12.0			.95494	588.5	.00627	.000880			.96
12.0	-12.0			.95382	584.5	.00546	.000766			1.00
12.0	12.0			.94424	580.5	.00576	.000808			1.01
30.0	1.0			.94199	579.5	.00420	.000589			.82
31.0	2.0			.92848	569.2	.00525	.000737			1.03
32.0	2.0			.92116	564.2	.00517	.000725	.00512	.000718	1.08
32.0	3.0			.91721	564.2	.00585	.000821			1.11
32.0	6.0			.91890	566.2	.00610	.000856			1.14
34.0	1.0			.91721	563.5	.00568	.000797	.00577	.000810	1.13
34.0	2.0			.91383	561.9	.00584	.000819	.00583	.000818	1.11
34.0	3.0			.91102	560.2	.00585	.000821			1.10
36.0	.0			.91552	561.9	.00551	.000773	.00552	.000774	1.11
38.0	.0			.91327	560.9	.00569	.000798	.00568	.000797	1.08
40.0	.0			.91552	561.2	.00540	.000758	.00541	.000759	1.10
44.0	12.0			.93129	575.2	.00651	.000913			1.23
42.0	.0			.91271	560.5	.00557	.000782	.00553	.000776	1.11
44.0	.0			.92341	566.9	.00560	.000786	.00562	.000789	1.14
48.0	.0			.92116	565.5	.00549	.000770	.00549	.000770	1.13
52.0	.0			.91496	561.9	.00569	.000798	.00568	.000797	1.07
52.0	12.0			.93073	574.2	.00625	.000877			1.31
55.0	.0			.91834	563.2	.00540	.000758	.00540	.000758	1.07
58.0	.0			.92228	565.5	.00544	.000763			1.08
58.0	12.0			.93242	575.9	.00644	.000904			1.31
58.0	-12.0			.93974	578.2	.00641	.000899			1.28
44.0	-12.0			.93354	573.9	.00606	.000850			1.22
36.0	-8.0			.92003	564.5	.00609	.000854			1.26
36.0	-3.0			.92059	564.5	.00545	.000765			1.13
34.0	-3.0			.91609	561.9	.00541	.000759	.00538	.000755	1.07
32.0	-3.0			.92003	564.5	.00560	.000786	.00557	.000782	1.13
30.0	-3.0			.94087	574.5	.00463	.000650	.00465	.000652	.92
28.0	-3.0			.97634	582.9	.00142	.000199			.29
34.0	-12.0			1.01802	603.5	.00055	.000077			
32.0	-12.0			.90032	554.5	.00630	.000884	.00600	.000842	1.27
30.0	-12.0			.89863	551.2	.00545	.000766	.00546	.000766	1.10
19.0	-12.5			.97071	599.2	.00655	.000919			1.26
17.5	-11.0			.95663	587.2	.00586	.000822			1.12
15.5	-2.5			.95269	584.2	.00549	.000770			1.02
16.5	-2.5			.95213	583.9	.00544	.000763	.00511	.000717	1.05
17.5	-2.5			.96677	598.5	.00735	.001031	.00746	.001047	1.37
18.5	-2.5			.98423	606.9	.00633	.000888	.00654	.000918	1.21
19.5	-2.5			.98254	605.2	.00613	.000860	.00607	.000852	1.14
20.5	-2.5			.98197	605.9	.00634	.000890	.00627	.000880	1.19
21.5	-2.5			.98535	609.2	.00683	.000958	.00686	.000963	1.30
22.5	-2.5			.98423	610.5	.00750	.001052	.00740	.001038	1.42
23.5	-2.5			.98817	616.2	.00874	.001226	.00869	.001219	1.66
24.5	-2.5			.99662	624.9	.00986	.001383			1.90
36.0	-16.0			.91609	558.9	.00473	.000664			1.01
36.0	-12.0			.91440	563.2	.00639	.000897	.00639	.000897	1.32
32.0	-18.0			.93636	570.2	.00451	.000633			.94
32.0	-16.0			.91947	562.2	.00503	.000706	.00501	.000703	1.02
32.0	-14.0			.91440	557.9	.00475	.000666	.00475	.000666	.98
32.0	-10.0			.91440	560.2	.00540	.000758			1.02
28.0	-14.0			.91609	562.5	.00576	.000808			1.16
28.0	-12.0			.90088	545.5	.00343	.000481			.69
26.0	-12.5			.94650	587.5	.00751	.001054			1.51
24.5	-11.0			.98254	617.9	.01033	.001449			2.10
22.0	-12.5			.96902	601.5	.00767	.001076	.00769	.001079	1.52
20.5	-11.0			.97803	604.5	.00683	.000958	.00684	.000960	1.26
.0	13.7	1.00		1.00675	641.9	.01270	.001782			
.0	11.7	1.00		1.00168	643.9	.01151	.001615			
1.0	11.7	1.00		1.01802	603.5	.00061	.000086			
.0	7.7	1.00		.99380	633.9	.01303	.001828			
1.0	7.7	1.00		1.01633	602.2	.00059	.000083			
.0	3.2	1.00		.99493	636.9	.01436	.002015			
1.0	3.2	1.00		1.00056	594.9	.00105	.000147			
.0	1.2	1.00		.98592	632.2	.01486	.002085	.01509	.002117	
1.0	1.2	1.00		.99324	590.5	.00089	.000125	.00070	.000098	
.5	11.7	2.00		.93805	594.5	.00903	.001267	.00903	.001267	
.5	3.2	2.00		.93298	586.5	.01009	.001416	.01004	.001409	
.5	1.2	2.00		.93129	589.2	.01152	.001616	.01201	.001685	
6.0	.0			.92397	566.2	.00510	.000716			1.14
6.0	10.0			.94143	579.9	.00587	.000824			1.25
12.0	.0			.93073	570.2	.00501	.000703			1.14
12.0	5.0			.92960	569.5	.00506	.000710			1.13
12.0	10.0			.93861	578.2	.00582	.000817			1.25
18.0	.0			.92791	568.2	.00506	.000710			1.08
30.0	.0			.93017	569.9	.00519	.000728			1.17
42.0	.0			.94312	583.2	.00679	.000953			1.51

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(b) M = 2.65; R = 2.55 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_c}$
2.0	.0			.96151	586.9	.00465	.001016			.98
12.0	.0			.95471	578.5	.00377	.000823			.98
20.5	.0			.99320	604.2	.00431	.000941			1.19
28.0	12.0			.90208	542.9	.00262	.000572			.68
28.0	4.0			.99660	589.2	.00078	.000170			.21
28.0	.0			.99377	587.2	.00074	.000162			.20
20.5	-5.0			.99094	603.9	.00457	.000998			1.22
24.5	-5.0			1.00169	620.2	.00695	.001518			1.93
30.0	.0			.95528	575.2	.00281	.000614	.00282	.000616	.82
31.0	12.0			.90604	553.5	.00465	.001016			1.28
34.0	.0			.92698	561.5	.00362	.000791	.00359	.000784	1.08
2.0	-12.0			.96717	589.2	.00464	.001013			1.00
2.0	12.0			.96434	589.5	.00480	.001048			.98
12.0	-12.0			.96377	583.9	.00384	.000839			.99
12.0	12.0			.95245	579.5	.00410	.000895			.98
30.0	1.0			.95358	574.5	.00293	.000640			.81
31.0	2.0			.93887	569.2	.00374	.000817			1.06
32.0	2.0			.93151	564.5	.00375	.000819	.00371	.000810	1.11
32.0	3.0			.92698	563.5	.00407	.000889			1.11
32.0	6.0			.92755	564.9	.00455	.000994			1.22
34.0	1.0			.92811	563.5	.00391	.000854	.00398	.000869	1.12
34.0	2.0			.92415	561.5	.00407	.000889	.00407	.000889	1.13
34.0	3.0			.92132	560.2	.00414	.000904			1.15
36.0	.0			.92698	562.2	.00379	.000828	.00380	.000830	1.09
38.0	.0			.92472	561.2	.00385	.000841	.00384	.000839	1.11
40.0	.0			.92698	561.9	.00378	.000826	.00379	.000828	1.16
44.0	12.0			.94000	573.5	.00448	.000978			1.22
42.0	.0			.92358	560.5	.00386	.000843	.00382	.000834	1.10
44.0	.0			.93434	566.9	.00379	.000828	.00382	.000834	1.12
48.0	.0			.93151	564.9	.00384	.000839	.00384	.000839	1.15
52.0	.0			.92528	561.2	.00384	.000839	.00383	.000836	1.12
52.0	12.0			.93887	572.2	.00439	.000959			1.29
55.0	.0			.92924	562.9	.00370	.000808	.00370	.000808	1.15
58.0	.0			.93377	565.5	.00361	.000788			1.12
58.0	12.0			.94113	573.9	.00439	.000959			1.34
58.0	-12.0			.94905	576.9	.00418	.000913			1.27
44.0	-12.0			.94339	572.9	.00428	.000935			1.35
36.0	-8.0			.93038	564.5	.00403	.000880			1.20
36.0	-3.0			.93207	564.5	.00373	.000815			1.10
34.0	-3.0			.92641	561.5	.00372	.000812	.00370	.000808	1.11
32.0	-3.0			.92811	563.2	.00386	.000843	.00381	.000832	1.14
30.0	-3.0			.95075	574.2	.00332	.000725	.00330	.000721	.92
28.0	-3.0			.99716	589.5	.00087	.000190			.28
34.0	-12.0			1.04924	617.2	.00026	.000057			
32.0	-12.0			.91340	555.2	.00444	.000970	.00425	.000928	1.33
30.0	-12.0			.91283	552.2	.00375	.000819	.00375	.000819	1.11
19.0	-12.5			.98075	596.9	.00453	.000989			1.28
17.5	-11.0			.96830	587.5	.00408	.000891			1.09
15.5	-2.5			.96377	583.9	.00374	.000817			.97
16.5	-2.5			.96490	584.9	.00382	.000834	.00360	.000786	1.06
17.5	-2.5			.97792	597.2	.00503	.001099	.00489	.001068	1.34
18.5	-2.5			.99377	604.2	.00420	.000917	.00435	.000950	1.15
19.5	-2.5			.99207	602.5	.00413	.000902	.00409	.000893	1.09
20.5	-2.5			.99094	603.2	.00443	.000967	.00437	.000954	1.19
21.5	-2.5			.99433	606.5	.00471	.001029	.00475	.001037	1.28
22.5	-2.5			.99264	607.5	.00516	.001127	.00509	.001112	1.39
23.5	-2.5			.99603	612.2	.00565	.001234	.00559	.001221	1.52
24.5	-2.5			1.00396	619.9	.00646	.001411			1.79
36.0	-16.0			.92868	559.9	.00312	.000681			.98
36.0	-12.0			.92585	562.9	.00441	.000963	.00441	.000963	1.32
32.0	-18.0			.94792	570.9	.00302	.000660			.92
32.0	-16.0			.93151	562.5	.00342	.000747	.00340	.000743	1.01
32.0	-14.0			.92528	558.5	.00324	.000708	.00324	.000708	.98
32.0	-10.0			.92585	561.2	.00382	.000834			1.09
28.0	-14.0			.92585	561.9	.00404	.000882			1.17
28.0	-12.0			.91453	548.2	.00245	.000535			.71
26.0	-12.5			.95188	583.9	.00543	.001186			1.50
24.5	-11.0			.98584	611.9	.00747	.001631			2.17
22.0	-12.5			.97566	598.2	.00550	.001201	.00553	.001208	1.52
20.5	-11.0			.98471	601.2	.00485	.001059	.00486	.001061	1.37
.0	13.7	1.00		1.01415	648.2	.00805	.001758			
.0	11.7	1.00		1.00849	632.2	.00873	.001907			
1.0	11.7	1.00		1.04188	613.2	.00027	.000059			
.0	7.7	1.00		1.00000	639.2	.00832	.001817			
1.0	7.7	1.00		1.03962	612.5	.00040	.000087			
.0	3.2	1.00		1.00113	631.9	.01043	.002278			
1.0	3.2	1.00		1.02150	603.2	.00050	.000109			
.0	1.2	1.00		.99150	633.2	.01021	.002230	.01041	.002274	
1.0	1.2	1.00		1.01584	599.5	.00052	.000114	.00045	.000098	
.5	11.7	2.00		.94962	588.2	.00685	.001496	.00680	.001485	
.5	3.2	2.00		.94283	585.2	.00752	.001642	.00748	.001634	
.5	1.2	2.00		.94113	587.2	.00830	.001813	.00828	.001808	
6.0	.0			.93434	565.5	.00346	.000756			1.12
6.0	10.0			.94962	577.9	.00409	.000893			1.32
12.0	.0			.94113	569.5	.00339	.000740			1.12
12.0	5.0			.93943	568.9	.00342	.000747			1.09
12.0	10.0			.94679	575.9	.00395	.000863			1.25
18.0	.0			.93773	567.2	.00341	.000745			1.12
30.0	.0			.94113	569.5	.00347	.000758			1.12
42.0	.0			.95019	580.5	.00477	.001042			1.50

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(c) M = 2.65; R = 1.29×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97553	579.2	.00104	.000451			1.02
12.0	.0			.96415	580.2	.00265	.001148			1.07
20.5	.0			1.00000	599.5	.00264	.001144			1.13
28.0	12.0			.91523	544.2	.00160	.000693			.73
28.0	4.0			1.00796	592.2	.00049	.000212			.21
28.0	.0			1.00398	589.5	.00047	.000204			.23
20.5	-5.0			.99829	598.9	.00277	.001200			1.24
24.5	-5.0			1.00625	611.5	.00444	.001924			2.01
30.0	.0			.96415	574.2	.00182	.000788	.00182	.000788	.85
31.0	12.0			.92092	553.5	.00288	.001248			1.36
34.0	.0			.93741	559.9	.00214	.000927	.00212	.000918	1.13
2.0	-12.0			.98520	583.2	.00090	.000390			1.25
2.0	12.0			.98407	581.5	.00080	.000347			.98
12.0	-12.0			.97383	585.9	.00263	.001139			1.06
12.0	12.0			.96188	577.9	.00269	.001165			.99
30.0	1.0			.96358	573.9	.00182	.000788			.85
31.0	2.0			.94879	567.5	.00240	.001040			1.23
32.0	2.0			.94140	562.5	.00234	.001014	.00230	.000996	1.25
32.0	3.0			.93685	561.5	.00254	.001100			1.25
32.0	6.0			.93628	561.5	.00272	.001178			1.32
34.0	1.0			.93855	563.5	.00237	.001027	.00243	.001053	1.12
34.0	2.0			.93514	559.9	.00238	.001031	.00237	.001027	1.11
34.0	3.0			.93229	558.2	.00247	.001070			1.15
36.0	.0			.93969	561.5	.00221	.000957	.00222	.000962	1.18
38.0	.0			.93912	560.9	.00234	.001014	.00233	.001009	1.21
40.0	.0			.94310	562.2	.00206	.000892	.00207	.000897	1.11
44.0	12.0			.95278	571.5	.00268	.001161			1.26
42.0	.0			.93798	560.5	.00223	.000966	.00219	.000949	1.18
44.0	.0			.94766	566.2	.00208	.000901	.00210	.000910	1.13
48.0	.0			.94595	564.9	.00216	.000936	.00216	.000936	1.19
52.0	.0			.93912	569.9	.00209	.000905	.00208	.000901	1.12
52.0	12.0			.95107	570.2	.00253	.001096			1.40
55.0	.0			.94310	562.9	.00204	.000884	.00204	.000884	1.20
58.0	.0			.94993	566.5	.00201	.000871			1.12
58.0	12.0			.95562	572.9	.00253	.001096			1.39
58.0	-12.0			.96358	576.5	.00233	.001009			1.31
44.0	-12.0			.95676	572.5	.00235	.001018			1.47
36.0	-8.0			.94367	564.2	.00233	.001009			1.23
36.0	-3.0			.94481	563.9	.00212	.000918			1.15
34.0	-3.0			.93685	559.5	.00215	.000931	.00212	.000918	1.16
32.0	-3.0			.93685	560.2	.00230	.000996	.00224	.000970	1.19
30.0	-3.0			.96188	573.5	.00205	.000888	.00202	.000875	1.03
28.0	-3.0			1.00910	593.2	.00055	.000238			.28
34.0	-12.0			1.05859	620.2	.00016	.000069			
32.0	-12.0			.92717	556.2	.00268	.001161	.00235	.001018	1.44
30.0	-12.0			.92604	553.2	.00221	.000957	.00221	.000957	1.13
19.0	-12.5			.98691	593.9	.00327	.001417			1.50
17.5	-11.0			.97724	584.5	.00239	.001035			1.07
15.5	-2.5			.97439	583.2	.00246	.001066			1.00
16.5	-2.5			.97496	582.9	.00238	.001031	.00225	.000975	1.05
17.5	-2.5			.98407	593.5	.00332	.001438	.00340	.001473	1.32
18.5	-2.5			.99943	598.9	.00265	.001148	.00276	.001196	1.18
19.5	-2.5			.99829	597.9	.00257	.001113	.00252	.001092	1.14
20.5	-2.5			.99772	598.5	.00272	.001178	.00267	.001157	1.22
21.5	-2.5			1.00113	601.5	.00292	.001265	.00297	.001287	1.30
22.5	-2.5			1.00000	601.9	.00307	.001330	.00302	.001308	1.39
23.5	-2.5			1.00170	604.5	.00351	.001521	.00354	.001534	1.60
24.5	-2.5			1.00853	611.5	.00399	.001729			1.90
36.0	-16.0			.94481	561.9	.00179	.000775			.97
36.0	-12.0			.94026	563.2	.00256	.001109	.00256	.001109	1.37
32.0	-18.0			.96188	571.9	.00173	.000749			.95
32.0	-16.0			.94652	563.9	.00212	.000918	.00210	.000910	1.12
32.0	-14.0			.93969	559.5	.00192	.000832	.00191	.000827	1.04
32.0	-10.0			.93855	560.9	.00230	.000996			1.16
28.0	-14.0			.93571	559.9	.00246	.001066			1.15
28.0	-12.0			.92774	550.2	.00149	.000646			.77
26.0	-12.5			.95676	577.9	.00353	.001529			1.67
24.5	-11.0			.98862	602.2	.00485	.002101			2.46
22.0	-12.5			.98350	593.2	.00339	.001469	.00341	.001477	1.59
20.5	-11.0			.99203	596.2	.00301	.001304	.00302	.001308	1.39
.0	13.7	1.00		1.01592	625.9	.00606	.002625			
.0	11.7	1.00		1.01024	623.9	.00525	.002274			
.0	7.7	1.00		1.00227	620.2	.00557	.002413			
1.0	7.7	1.00		.91181	553.5	.00330	.001430			
.0	3.2	1.00		1.00341	619.5	.00673	.002916			
1.0	3.2	1.00		1.01592	599.2	.00042	.000182			
.0	1.2	1.00		.99374	614.2	.00683	.002959	.00694	.003007	
1.0	1.2	1.00		1.01649	595.9	.00023	.000100			
.5	11.7	2.00		.95960	582.5	.00404	.001750	.00398	.001724	
.5	3.2	2.00		.95391	579.9	.00426	.001846	.00423	.001833	
.5	1.2	2.00		.95221	581.5	.00475	.002058	.00512	.002218	
6.0	.0			.94879	565.5	.00191	.000827			1.19
6.0	10.0			.96188	575.9	.00230	.000996			1.27
12.0	.0			.95562	569.5	.00195	.000845			1.25
12.0	5.0			.95448	569.2	.00195	.000845			1.10
12.0	10.0			.95903	575.9	.00232	.001005			1.29
18.0	.0			.95164	566.9	.00190	.000823			1.20
30.0	.0			.95334	572.2	.00258	.001118			1.61
42.0	.0			.95960	575.5	.00262	.001135			1.47

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(d) M = 3.51; R = 3.98 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$
2.0	.0			.95027	577.5	.00427	.000832			1.00
12.0	.0			.94405	570.5	.00347	.000676			1.04
20.5	.0			.99773	606.2	.00427	.000832			1.38
28.0	12.0			.89998	538.2	.00203	.000395			.72
28.0	4.0			1.00508	594.5	.00074	.000144			.25
28.0	.0			1.00113	591.5	.00061	.000119			.20
20.5	-5.0			.99717	606.5	.00434	.000845			1.34
24.5	-5.0			1.00339	619.5	.00671	.001307			2.22
30.0	.0			.94518	568.5	.00286	.000557	.00287	.000559	1.06
31.0	12.0			.89433	540.5	.00378	.000736			1.38
34.0	.0			.91976	554.2	.00301	.000586	.00300	.000584	1.08
2.0	-12.0			.95762	585.5	.00420	.000818			1.03
2.0	12.0			.95366	577.2	.00428	.000833			1.06
12.0	-12.0			.95536	577.5	.00352	.000685			1.06
12.0	12.0			.94179	568.5	.00360	.000701			1.10
30.0	1.0			.94349	567.5	.00286	.000557			.96
31.0	2.0			.92541	562.2	.00345	.000672			1.19
32.0	2.0			.92032	554.9	.00328	.000639	.00325	.000633	1.13
32.0	3.0			.91524	553.2	.00344	.000670			1.15
32.0	6.0			.91298	551.5	.00345	.000672			1.14
34.0	1.0			.91976	554.9	.00314	.000611	.00319	.000621	1.11
34.0	2.0			.91524	552.9	.00333	.000648	.00332	.000648	1.16
34.0	3.0			.91241	550.9	.00333	.000648			1.08
36.0	.0			.92032	554.5	.00303	.000590	.00303	.000590	1.07
38.0	.0			.92032	554.5	.00304	.000592	.00303	.000590	1.03
40.0	.0			.92371	556.5	.00297	.000578	.00298	.000580	1.01
44.0	12.0			.93049	561.9	.00367	.000715			1.33
42.0	.0			.92145	555.9	.00310	.000604	.00306	.000596	1.10
44.0	.0			.93275	562.2	.00298	.000580	.00300	.000584	1.05
48.0	.0			.93219	561.5	.00300	.000584	.00300	.000584	1.11
52.0	.0			.92541	557.5	.00291	.000567	.00290	.000565	1.06
52.0	12.0			.92936	561.2	.00362	.000705			1.41
55.0	.0			.92823	558.5	.00284	.000553	.00284	.000553	1.06
58.0	.0			.93162	560.5	.00287	.000559			1.16
58.0	12.0			.93275	563.5	.00364	.000709			1.49
58.0	-12.0			.94405	571.2	.00349	.000680			1.33
44.0	-12.0			.93840	567.5	.00344	.000670			1.32
36.0	-8.0			.92371	556.9	.00309	.000602			1.12
36.0	-3.0			.92710	557.9	.00284	.000553			1.03
34.0	-3.0			.91919	553.5	.00288	.000561	.00286	.000557	1.08
32.0	-3.0			.91637	553.2	.00332	.000647	.00325	.000633	1.18
30.0	-3.0			.93840	566.5	.00321	.000625	.00321	.000625	1.08
28.0	-3.0			1.00452	594.5	.00087	.000169			.30
32.0	-12.0			.90111	545.5	.00375	.000730	.00333	.000648	1.36
30.0	-12.0			.90111	542.9	.00302	.000588	.00300	.000584	1.10
19.0	-12.5			.98474	598.9	.00445	.000867			1.48
17.5	-11.0			.96835	588.2	.00394	.000767			1.25
15.5	-2.5			.95592	577.2	.00341	.000664			1.01
16.5	-2.5			.96383	584.2	.00384	.000748	.00370	.000721	1.19
17.5	-2.5			.98361	603.2	.00457	.000890	.00468	.000911	1.39
18.5	-2.5			1.00113	607.2	.00417	.000812	.00428	.000833	1.36
19.5	-2.5			.99886	606.2	.00403	.000785	.00401	.000781	1.34
20.5	-2.5			.99717	605.9	.00414	.000806	.00409	.000796	1.32
21.5	-2.5			.99943	608.5	.00447	.000870	.00450	.000876	1.44
22.5	-2.5			.99773	609.5	.00495	.000964	.00490	.000954	1.59
23.5	-2.5			1.00000	613.2	.00546	.001063	.00540	.001052	1.74
24.5	-2.5			1.00621	620.2	.00647	.001260			2.18
36.0	-16.0			.92654	556.5	.00248	.000483			1.00
36.0	-12.0			.91580	554.5	.00355	.000691	.00354	.000689	1.32
32.0	-18.0			.94010	564.5	.00244	.000475			.92
32.0	-16.0			.92654	557.2	.00266	.000518	.00265	.000516	.98
32.0	-14.0			.91919	552.2	.00250	.000487	.00251	.000489	.93
32.0	-10.0			.91580	552.5	.00309	.000602			1.10
28.0	-14.0			.91976	556.2	.00336	.000654			1.27
28.0	-12.0			.91185	544.9	.00180	.000351			.68
26.0	-12.5			.95140	581.2	.00486	.000946			1.74
24.5	-11.0			.98361	609.5	.00734	.001429			2.64
22.0	-12.5			.97400	596.2	.00512	.000997	.00514	.001001	1.72
20.5	-11.0			.98869	602.9	.00463	.000902	.00464	.000904	1.53
.0	13.7	1.00		1.01073	634.9	.00987	.001922			
.0	11.7	1.00		1.00621	631.2	.00966	.001881			
1.0	11.7	1.00		1.05481	620.5	.00018	.000035			
.0	7.7	1.00		.99830	625.5	.00933	.001817			
1.0	7.7	1.00		.90563	556.2	.00543	.001057			
.0	3.2	1.00		.99943	630.2	.01053	.002051			
.0	1.2	1.00		.98982	625.9	.01099	.002140	.01113	.002167	
1.0	1.2	1.00		1.02938	607.2	.00037	.000072			
.5	11.7	2.00		.94292	582.9	.00695	.001353	.00683	.001330	
.5	3.2	2.00		.93614	580.5	.00746	.001453	.00744	.001449	
.5	1.2	2.00		.93106	581.2	.00849	.001653	.00840	.001636	
6.0	.0			.92767	558.2	.00268	.000522			1.06
6.0	10.0			.94066	567.2	.00334	.000650			1.39
12.0	.0			.93332	561.5	.00266	.000518			1.09
12.0	5.0			.93219	560.5	.00289	.000563			1.12
12.0	10.0			.93784	565.9	.00334	.000650			1.31
18.0	.0			.92936	558.9	.00268	.000522			1.08
30.0	.0			.93162	561.2	.00294	.000573			1.11
42.0	.0			.93614	563.5	.00276	.000537			1.11

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{o}R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(e) M = 3.51; R = 2.80×10^6

x, in.	y, in.	z, in. [a]	ϕ, deg [a]	$\frac{T_e}{T_t}$	T_w, °R	h [b]	N_{St}	h_c [b]	$N_{St,c}$	$\frac{h}{h_0}$
2.0	.0			.95557	574.5	.00340	.000943			.99
12.0	.0			.95044	567.9	.00266	.000737			1.00
20.5	.0			1.00056	600.5	.00323	.000895			1.27
28.0	12.0			.90944	539.2	.00148	.000410			.65
28.0	4.0			1.01594	595.5	.00046	.000128			.21
28.0	.0			1.01139	592.5	.00038	.000105			.16
20.5	-5.0			1.00170	600.5	.00314	.000871			1.33
24.5	-5.0			1.00626	611.5	.00505	.001400			2.31
30.0	.0			.95329	567.2	.00208	.000577	.00210	.000582	.98
31.0	12.0			.90260	539.2	.00272	.000754			1.24
34.0	.0			.92595	551.5	.00221	.000613	.00221	.000613	1.05
2.0	-12.0			.96354	578.5	.00326	.000904			.96
2.0	12.0			.95765	573.9	.00337	.000934			.97
12.0	-12.0			.96240	574.5	.00255	.000707			.99
12.0	12.0			.94760	565.2	.00263	.000729			.98
30.0	1.0			.95215	566.5	.00207	.000574			.92
31.0	2.0			.93222	556.5	.00259	.000718			1.15
32.0	2.0			.92538	551.9	.00243	.000674	.00239	.000663	1.16
32.0	3.0			.92026	549.9	.00267	.000740			1.16
32.0	6.0			.91741	547.5	.00257	.000712			1.10
34.0	1.0			.92538	551.9	.00229	.000635	.00234	.000649	1.06
34.0	2.0			.92140	549.5	.00238	.000660	.00238	.000660	1.00
34.0	3.0			.91855	547.5	.00243	.000674			1.02
36.0	.0			.92823	552.5	.00216	.000599	.00216	.000599	1.01
38.0	.0			.92937	553.5	.00222	.000615	.00221	.000613	1.03
40.0	.0			.93393	555.5	.00220	.000610	.00221	.000613	1.04
44.0	12.0			.93962	560.2	.00260	.000721			1.27
42.0	.0			.93165	554.9	.00230	.000638	.00226	.000627	1.02
44.0	.0			.94304	561.5	.00218	.000604	.00220	.000610	1.04
48.0	.0			.94247	560.9	.00212	.000588	.00213	.000591	1.02
52.0	.0			.93563	556.5	.00212	.000588	.00212	.000588	1.02
52.0	12.0			.93791	559.2	.00258	.000715			1.37
55.0	.0			.93791	557.9	.00207	.000574	.00207	.000574	1.03
58.0	.0			.94247	560.5	.00205	.000568			1.03
58.0	12.0			.94190	561.5	.00256	.000710			1.35
58.0	-12.0			.95386	569.5	.00251	.000696			1.33
44.0	-12.0			.94760	565.9	.00258	.000715			1.28
36.0	-8.0			.93165	554.5	.00229	.000635			1.04
36.0	-3.0			.93507	555.9	.00209	.000579			1.06
34.0	-3.0			.92538	550.5	.00214	.000593	.00212	.000588	1.02
32.0	-3.0			.92083	549.5	.00245	.000679	.00238	.000660	1.16
30.0	-3.0			.95044	564.2	.00232	.000643	.00225	.000624	1.07
28.0	-3.0			1.01480	595.5	.00060	.000166			.28
32.0	-12.0			.91000	544.5	.00274	.000760	.00241	.000668	1.30
30.0	-12.0			.91057	542.2	.00217	.000603	.00214	.000593	1.03
19.0	-12.5			.98803	593.2	.00316	.000876			1.36
17.5	-11.0			.97380	583.9	.00296	.000821			1.17
15.5	-2.5			.96297	574.9	.00255	.000707			1.02
16.5	-2.5			.97038	580.9	.00287	.000796	.00275	.000762	1.17
17.5	-2.5			.98803	594.2	.00341	.000945	.00351	.000973	1.31
18.5	-2.5			1.00455	602.2	.00302	.000837	.00318	.000882	1.30
19.5	-2.5			1.00284	600.9	.00303	.000840	.00301	.000834	1.24
20.5	-2.5			1.00056	600.5	.00316	.000876	.00311	.000862	1.28
21.5	-2.5			1.00341	603.2	.00342	.000948	.00346	.000959	1.48
22.5	-2.5			1.00170	603.5	.00372	.001031	.00367	.001017	1.56
23.5	-2.5			1.00341	606.5	.00409	.001134	.00403	.001117	1.79
24.5	-2.5			1.00911	612.9	.00486	.001347			2.11
36.0	-16.0			.93677	555.9	.00182	.000505			.89
36.0	-12.0			.92538	553.2	.00267	.000740	.00267	.000740	1.31
32.0	-18.0			.94987	563.5	.00178	.000493			.90
32.0	-16.0			.93620	556.2	.00186	.000516	.00185	.000513	.92
32.0	-14.0			.92823	550.9	.00188	.000521	.00189	.000524	.91
32.0	-10.0			.92254	549.9	.00234	.000649			1.05
28.0	-14.0			.92595	552.9	.00250	.000693			1.13
28.0	-12.0			.92197	545.2	.00132	.000366			.63
26.0	-12.5			.95443	575.2	.00379	.001051			1.80
24.5	-11.0			.98462	601.2	.00563	.001561			2.63
22.0	-12.5			.97835	594.2	.00397	.001101	.00398	.001103	1.73
20.5	-11.0			.99202	596.5	.00346	.000959	.00348	.000965	1.54
.0	13.7	1.00		1.01309	627.2	.00772	.002140			
.0	11.7	1.00		1.00740	636.9	.00736	.002040			
.0	7.7	1.00		.99943	621.2	.00685	.001899			
1.0	7.7	1.00		.91228	551.9	.00412	.001142			
.0	3.2	1.00		1.00170	620.9	.00833	.002309			
1.0	3.2	1.00		1.03417	610.2	.00020	.000055			
.0	1.2	1.00		.99259	616.5	.00851	.002359	.00861	.002387	
1.0	1.2	1.00		1.03303	603.9	.00024	.000067			
.5	11.7	2.00		.94930	578.5	.00528	.001464	.00517	.001433	
.5	3.2	2.00		.94361	575.9	.00568	.001575	.00566	.001569	
.5	1.2	2.00		.93905	576.9	.00616	.001708	.00652	.001808	
6.0	.0			.93734	556.9	.00201	.000557			1.09
6.0	10.0			.94873	564.9	.00242	.000671			1.27
12.0	.0			.94361	560.9	.00190	.000527			1.07
12.0	5.0			.94076	558.9	.00202	.000560			1.07
12.0	10.0			.94589	563.2	.00246	.000682			1.29
18.0	.0			.93905	557.9	.00198	.000549			1.10
30.0	.0			.94133	560.2	.00208	.000577			1.01
42.0	.0			.94532	561.9	.00205	.000568			1.08

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(f) M = 3.51; R = 1.64×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95428	571.5	.00153	.000740			.92
12.0	.0			.95202	569.9	.00186	.000900			.97
20.5	.0			.99717	598.5	.00219	.001059			1.17
28.0	12.0			.91082	541.9	.00104	.000503			.67
28.0	4.0			1.01185	598.2	.00034	.000164			.22
28.0	.0			1.01072	596.9	.00029	.000140			.19
20.5	-5.0			.99717	598.5	.00213	.001030			1.29
24.5	-5.0			.99774	605.5	.00369	.001785			2.32
30.0	.0			.95654	571.2	.00163	.000788	.00164	.000793	1.03
31.0	12.0			.90630	542.9	.00189	.000914			1.24
34.0	.0			.92436	551.9	.00144	.000696	.00144	.000696	.95
2.0	-12.0			.96274	576.2	.00141	.000682			.89
2.0	12.0			.95710	572.5	.00137	.000663			.90
12.0	-12.0			.96274	576.5	.00181	.000875			.96
12.0	12.0			.94807	567.5	.00193	.000933			.98
30.0	1.0			.95597	570.9	.00149	.000721			.94
31.0	2.0			.93339	558.9	.00177	.000856			1.16
32.0	2.0			.92323	552.2	.00167	.000808	.00160	.000774	1.10
32.0	3.0			.91928	550.5	.00185	.000895			1.16
32.0	6.0			.91590	548.5	.00190	.000919			1.23
34.0	1.0			.92380	552.2	.00158	.000764	.00163	.000788	1.04
34.0	2.0			.91928	549.9	.00165	.000798	.00164	.000793	1.08
34.0	3.0			.91646	548.2	.00163	.000788			1.04
36.0	.0			.92831	554.2	.00140	.000677	.00140	.000677	1.01
38.0	.0			.93227	556.5	.00150	.000725	.00150	.000725	1.06
40.0	.0			.93904	559.9	.00148	.000716	.00150	.000725	.97
44.0	12.0			.94638	565.9	.00165	.000798			1.09
42.0	.0			.93735	559.2	.00136	.000658	.00133	.000643	.96
44.0	.0			.94920	566.5	.00135	.000653	.00138	.000667	.90
48.0	.0			.94976	566.2	.00129	.000624	.00130	.000629	1.00
52.0	.0			.94299	561.9	.00131	.000634	.00130	.000629	1.00
52.0	12.0			.94468	564.5	.00165	.000798			1.26
56.0	.0			.94468	563.2	.00147	.000711	.00147	.000711	1.15
58.0	.0			.94976	568.5	.00132	.000638			1.03
58.0	12.0			.94807	566.9	.00166	.000803			1.30
58.0	-12.0			.95879	573.5	.00163	.000788			1.33
44.0	-12.0			.95371	570.2	.00163	.000788			1.34
36.0	-8.0			.93170	556.2	.00150	.000725			.99
36.0	-3.0			.93509	557.5	.00149	.000721			.99
34.0	-3.0			.92323	551.2	.00141	.000682	.00138	.000667	.93
32.0	-3.0			.91985	549.9	.00170	.000822	.00162	.000783	1.21
30.0	-3.0			.94920	567.9	.00182	.000880	.00176	.000851	1.17
28.0	-3.0			1.01241	598.9	.00046	.000222			.32
32.0	-12.0			.91420	548.2	.00192	.000929			1.26
30.0	-12.0			.91477	546.2	.00135	.000653	.00133	.000643	.96
19.0	-12.5			.98363	591.9	.00238	.001151			1.48
17.5	-11.0			.97234	582.9	.00186	.000900			.99
15.5	-2.5			.96557	577.5	.00179	.000866			.97
16.5	-2.5			.97008	580.5	.00175	.000846	.00165	.000798	1.03
17.5	-2.5			.98306	587.2	.00255	.001233	.00265	.001282	1.36
18.5	-2.5			1.00056	600.2	.00223	.001078	.00238	.001151	1.36
19.5	-2.5			.99943	599.2	.00196	.000948	.00194	.000938	1.18
20.5	-2.5			.99774	598.9	.00208	.001006	.00205	.000991	1.25
21.5	-2.5			1.00000	600.9	.00233	.001127	.00238	.001151	1.38
22.5	-2.5			.99661	600.2	.00249	.001204	.00244	.001180	1.46
23.5	-2.5			.99717	601.9	.00280	.001354	.00274	.001325	1.74
24.5	-2.5			1.00112	606.5	.00338	.001635			2.21
36.0	-16.0			.94073	560.9	.00121	.000585			.93
36.0	-12.0			.93001	556.9	.00187	.000904	.00187	.000904	1.24
32.0	-18.0			.95258	569.5	.00115	.000556			.86
32.0	-16.0			.93960	560.2	.00121	.000585	.00120	.000580	.91
32.0	-14.0			.93114	554.5	.00119	.000575	.00120	.000580	.90
32.0	-10.0			.92098	551.2	.00161	.000779			1.06
28.0	-14.0			.92380	552.9	.00170	.000822			1.21
28.0	-12.0			.92380	549.5	.00092	.000445			.69
26.0	-12.5			.94853	571.9	.00255	.001233			1.69
24.5	-11.0			.97742	595.2	.00401	.001939			2.84
22.0	-12.5			.97573	590.9	.00270	.001306	.00272	.001315	1.72
20.5	-11.0			.98814	594.5	.00236	.001141	.00237	.001146	1.47
.0	13.7	1.00		.99943	623.5	.00519	.002510			
.0	11.7	1.00		.99379	613.9	.00496	.002399			
.0	7.7	1.00		.98701	604.5	.00495	.002394			
1.0	7.7	1.00		.89953	547.2	.00277	.001340			
.0	3.2	1.00		.98984	614.5	.00571	.002761			
.0	1.2	1.00		.98193	605.5	.00562	.002718	.00574	.002776	
1.0	1.2	1.00		1.00507	593.2	.00014	.000068			
.5	11.7	2.00		.94468	573.9	.00359	.001736	.00365	.001765	
.5	3.2	2.00		.94130	573.2	.00398	.001925	.00397	.001920	
.5	1.2	2.00		.93904	573.9	.00440	.002128	.00459	.002220	
6.0	.0			.94468	562.9	.00124	.000600			1.05
6.0	10.0			.95315	569.5	.00180	.000870			1.53
12.0	.0			.95146	566.9	.00124	.000600			1.06
12.0	5.0			.94807	565.2	.00125	.000605			.98
12.0	10.0			.95033	567.9	.00160	.000774			1.27
18.0	.0			.94694	563.9	.00120	.000580			.98
30.0	.0			.94863	565.5	.00130	.000629			1.03
42.0	.0			.95202	567.2	.00127	.000614			1.02

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^\circ R$.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(g) M = 4.44; R = 4.39 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.93831	579.5	.00241	.000616			1.34
12.0	.0			.93394	573.5	.00181	.000462			1.21
20.5	.0			.99945	615.5	.00237	.000605			1.74
28.0	12.0			.89354	547.9	.00145	.000370			.96
28.0	.0			.99235	604.5	.00031	.000079			.26
20.5	-5.0			.99344	612.2	.00268	.000685			1.73
24.5	-5.0			.99781	618.9	.00427	.001091			2.75
30.0	.0			.93339	574.9	.00159	.000406	.00157	.000401	1.38
31.0	12.0			.88644	547.9	.00257	.000657			1.70
34.0	.0			.91046	559.9	.00149	.000381	.00149	.000381	1.10
2.0	-12.0			.94322	580.9	.00252	.000644			.99
2.0	12.0			.94103	580.9	.00282	.000720			1.15
12.0	-12.0			.94267	579.2	.00224	.000572			1.15
12.0	12.0			.93012	573.2	.00230	.000588			1.19
30.0	1.0			.93503	574.9	.00163	.000416			1.41
31.0	2.0			.91592	564.5	.00207	.000529			1.74
32.0	2.0			.90828	558.2	.00181	.000462	.00173	.000442	1.33
32.0	3.0			.90446	560.2	.00200	.000511			1.39
32.0	6.0			.90064	554.5	.00209	.000534			1.39
34.0	1.0			.91046	560.2	.00168	.000429	.00176	.000450	1.17
34.0	2.0			.90610	557.9	.00170	.000434	.00167	.000427	1.42
34.0	3.0			.90337	555.2	.00184	.000470			1.27
36.0	.0			.91428	560.9	.00153	.000391	.00153	.000391	1.33
38.0	.0			.91811	562.9	.00113	.000289	.00112	.000286	.82
40.0	.0			.92357	566.9	.00127	.000324	.00130	.000332	.93
44.0	12.0			.92739	571.5	.00225	.000575			1.88
42.0	.0			.92247	566.5	.00146	.000373	.00140	.000358	1.26
44.0	.0			.93394	574.5	.00145	.000370	.00149	.000381	1.07
48.0	.0			.93230	576.5	.00148	.000378	.00147	.000376	1.30
52.0	.0			.92575	568.2	.00127	.000324	.00126	.000322	1.09
52.0	12.0			.92793	571.5	.00218	.000557			1.46
55.0	.0			.92739	569.2	.00127	.000324	.00126	.000322	1.00
58.0	.0			.93175	571.9	.00126	.000322			1.45
58.0	12.0			.93121	575.2	.00244	.000623			1.71
58.0	-12.0			.93776	577.2	.00182	.000465			1.24
44.0	-12.0			.93012	572.2	.00182	.000465			1.25
36.0	-8.0			.91374	560.5	.00166	.000424			1.13
36.0	-3.0			.92029	565.2	.00128	.000327			.95
34.0	-3.0			.90992	558.2	.00143	.000365	.00140	.000358	1.21
32.0	-3.0			.90555	558.5	.00179	.000457	.00164	.000419	1.52
30.0	-3.0			.93230	572.2	.00182	.000465	.00166	.000424	1.54
28.0	-3.0			1.00054	609.9	.00044	.000112			.38
32.0	-12.0			.89190	548.5	.00225	.000575	.00174	.000445	1.32
30.0	-12.0			.89245	547.5	.00161	.000411	.00162	.000414	.94
19.0	-12.5			.98689	608.5	.00267	.000682			1.57
17.5	-11.0			.97488	601.2	.00274	.000700			1.57
15.5	-2.5			.95687	589.2	.00178	.000455			1.23
16.5	-2.5			.97816	604.2	.00231	.000590	.00241	.000616	1.58
17.5	-2.5			.99617	615.2	.00227	.000580	.00243	.000621	1.47
18.5	-2.5			1.00655	620.9	.00206	.000526	.00232	.000593	1.78
19.5	-2.5			1.00054	617.9	.00226	.000577	.00221	.000565	1.92
20.5	-2.5			.99781	616.5	.00246	.000628	.00239	.000611	1.60
21.5	-2.5			.99836	617.5	.00248	.000634	.00253	.000646	2.12
22.5	-2.5			.99617	614.9	.00292	.000746	.00285	.000728	1.90
23.5	-2.5			.99781	621.5	.00332	.000848	.00326	.000833	2.79
24.5	-2.5			1.00109	622.9	.00366	.000935			2.49
36.0	-16.0			.92247	565.5	.00141	.000360			1.13
36.0	-12.0			.90610	556.9	.00205	.000524	.00203	.000519	1.39
32.0	-18.0			.93285	571.9	.00139	.000355			1.16
32.0	-16.0			.92138	565.9	.00147	.000376	.00146	.000373	1.07
32.0	-14.0			.91155	559.9	.00130	.000332	.00134	.000342	.88
32.0	-10.0			.89900	553.5	.00190	.000485			1.28
28.0	-14.0			.91101	560.2	.00205	.000524			1.72
28.0	-12.0			.90337	553.9	.00129	.000330			.87
26.0	-12.5			.94486	584.2	.00339	.000866			2.29
24.5	-11.0			.97597	607.2	.00493	.001259			3.35
22.0	-12.5			.96724	598.2	.00336	.000858	.00336	.000858	1.92
20.5	-11.0			.98362	607.5	.00297	.000759	.00299	.000764	1.67
.0	13.7	1.00		1.00600	632.2	.00585	.001494			
.0	11.7	1.00		.99835	624.5	.00494	.001262			
.0	7.7	1.00		.99344	619.5	.00597	.001525			
1.0	7.7	1.00		.89136	553.9	.00263	.000672			
.0	3.2	1.00		.99126	619.2	.00632	.001615			
.0	1.2	1.00		.98416	616.2	.00729	.001862	.00743	.001898	
.5	11.7	2.00		.93721	583.2	.00389	.000994	.00362	.000925	
.5	3.2	2.00		.93012	577.5	.00476	.001216	.00473	.001208	
.5	1.2	2.00		.92629	577.2	.00628	.001604	.00626	.001599	
6.0	.0			.92520	567.9	.00127	.000324			1.11
6.0	10.0			.93448	574.5	.00199	.000508			1.44
12.0	.0			.92957	571.2	.00118	.000301			1.37
12.0	5.0			.92902	572.9	.00137	.000350			1.19
12.0	10.0			.93121	572.5	.00200	.000511			1.45
18.0	.0			.92411	567.9	.00119	.000304			1.37
30.0	.0			.92520	567.9	.00127	.000324			1.46
42.0	.0			.92848	569.5	.00126	.000322			1.45

[a]Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(h) M = 4.44; R = 3.15 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ$R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94311	574.5	.00180	.000648			.94
12.0	.0			.93980	570.5	.00124	.000447			.89
20.5	.0			1.00055	609.5	.00170	.000612			1.24
28.0	12.0			.90114	546.2	.00091	.000328			.67
20.5	-5.0			.99502	605.2	.00213	.000767			1.79
24.5	-5.0			.99723	615.2	.00363	.001308			3.13
30.0	.0			.94146	571.2	.00124	.000447	.00128	.000461	1.48
31.0	12.0			.89341	543.2	.00167	.000602			1.25
34.0	.0			.91440	554.5	.00108	.000389	.00108	.000389	.95
2.0	-12.0			.94753	576.5	.00209	.000753			1.05
2.0	12.0			.94422	575.5	.00215	.000775			.93
12.0	-12.0			.94864	577.5	.00157	.000566			1.03
12.0	12.0			.93483	568.5	.00162	.000584			1.02
30.0	1.0			.94422	574.5	.00122	.000440			.98
31.0	2.0			.92213	560.5	.00146	.000526			1.18
32.0	2.0			.91274	555.2	.00135	.000486	.00124	.000447	1.15
32.0	3.0			.90832	554.5	.00152	.000548			1.21
32.0	6.0			.90445	549.5	.00162	.000584			1.30
34.0	1.0			.91384	553.9	.00109	.000393	.00117	.000422	.93
34.0	2.0			.90887	551.9	.00129	.000465	.00130	.000468	.98
34.0	3.0			.90666	552.5	.00129	.000465			1.03
36.0	.0			.91992	556.9	.00110	.000396	.00111	.000400	.94
38.0	.0			.92434	559.2	.00108	.000389	.00107	.000385	.91
40.0	.0			.93152	563.5	.00106	.000382	.00109	.000393	.95
44.0	12.0			.93538	569.2	.00145	.000522			1.28
42.0	.0			.93096	563.2	.00078	.000281	.00083	.000299	
44.0	.0			.94311	570.5	.00077	.000277	.00091	.000328	.92
48.0	.0			.94201	569.9	.00077	.000277	.00078	.000281	.71
52.0	.0			.93538	565.5	.00077	.000277	.00076	.000274	.92
52.0	12.0			.93593	569.5	.00145	.000522			1.28
55.0	.0			.93538	565.5	.00077	.000277	.00084	.000303	.92
58.0	.0			.94201	569.9	.00103	.000371			1.23
58.0	12.0			.93980	571.9	.00144	.000519			1.27
58.0	-12.0			.94698	574.5	.00149	.000537			1.62
44.0	-12.0			.93925	570.9	.00130	.000468			1.18
36.0	-8.0			.91881	556.2	.00119	.000429			1.07
36.0	-3.0			.92544	560.2	.00109	.000393			1.01
34.0	-3.0			.91329	555.9	.00127	.000458	.00123	.000443	1.14
32.0	-3.0			.90942	552.5	.00147	.000530	.00131	.000472	1.32
30.0	-3.0			.94256	570.5	.00152	.000548	.00139	.000501	1.30
32.0	-12.0			.90114	546.2	.00192	.000692			1.70
30.0	-12.0			.90280	548.5	.00127	.000458	.00122	.000440	1.02
19.0	-12.5			.99061	601.5	.00204	.000735			1.41
17.5	-11.0			.97846	597.5	.00219	.000789			1.67
15.5	-2.5			.96410	584.5	.00137	.000494			1.01
16.5	-2.5			.98067	595.9	.00215	.000775	.00221	.000796	1.64
17.5	-2.5			.99834	607.5	.00186	.000670	.00187	.000674	1.42
18.5	-2.5			1.00938	614.9	.00172	.000620	.00191	.000688	1.43
19.5	-2.5			1.00441	611.5	.00173	.000623	.00168	.000605	1.40
20.5	-2.5			1.00110	607.9	.00176	.000634	.00171	.000616	1.45
21.5	-2.5			1.00110	608.9	.00207	.000746	.00214	.000771	1.68
22.5	-2.5			.99779	607.5	.00240	.000865	.00233	.000839	1.98
23.5	-2.5			.99889	608.9	.00264	.000951	.00257	.000926	2.13
24.5	-2.5			1.00220	614.5	.00318	.001146			2.72
36.0	-16.0			.93152	563.2	.00103	.000371			.94
36.0	-12.0			.91495	554.9	.00153	.000551	.00151	.000544	1.37
32.0	-18.0			.94090	569.2	.00099	.000357			.88
32.0	-16.0			.92875	562.2	.00132	.000476	.00131	.000472	1.01
32.0	-14.0			.91937	556.2	.00105	.000378	.00108	.000389	.94
32.0	-10.0			.90445	548.9	.00153	.000551			1.38
28.0	-14.0			.91495	555.5	.00157	.000566			1.19
28.0	-12.0			.91219	552.2	.00089	.000321			.68
26.0	-12.5			.94643	577.5	.00267	.000962			2.17
24.5	-11.0			.97680	599.5	.00427	.001538			3.53
22.0	-12.5			.97017	592.2	.00295	.001063	.00295	.001063	2.25
20.5	-11.0			.98619	600.9	.00244	.000879	.00246	.000886	1.85
.0	13.7	1.00		1.00386	617.5	.00423	.001524			
.0	11.7	1.00		.99668	611.2	.00391	.001409			
.0	7.7	1.00		.99171	610.9	.00514	.001852			
1.0	7.7	1.00		.89728	551.9	.00268	.000965			
.0	3.2	1.00		.99061	610.5	.00537	.001935			
.0	1.2	1.00		.98398	607.9	.00595	.002144	.00607	.002187	
.5	11.7	2.00		.94146	574.9	.00299	.001077	.00277	.000998	
.5	3.2	2.00		.93538	577.2	.00388	.001398	.00385	.001387	
.5	1.2	2.00		.93262	573.5	.00489	.001762	.00502	.001809	
6.0	.0			.93483	565.5	.00084	.000303			1.00
6.0	10.0			.94256	572.5	.00124	.000447			1.14
12.0	.0			.93980	568.2	.00083	.000299			.91
12.0	5.0			.93814	567.9	.00078	.000281			.70
12.0	10.0			.93925	571.2	.00131	.000472			1.54
18.0	.0			.93372	565.2	.00087	.000313			.95
30.0	.0			.93483	565.5	.00104	.000375			1.20
42.0	.0			.93704	567.2	.00087	.000313			1.10

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

2. 1-inch by 2-inch rectangular stiffener - Concluded

(i) M = 4.44; R = 2.11×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95174	576.5	.00172	.000928			1.01
12.0	.0			.94508	572.2	.00112	.000604			.95
20.5	.0			1.00055	605.5	.00153	.000826			1.35
28.0	12.0			.90902	548.9	.00076	.000410			.75
28.0	4.0			1.01220	607.9	.00033	.000178			.34
20.5	-5.0			.99500	602.5	.00160	.000863			1.44
24.5	-5.0			.99445	605.9	.00265	.001430			2.85
30.0	.0			.95229	574.5	.00108	.000583	.00106	.000572	1.11
31.0	12.0			.90070	545.5	.00143	.000772			1.36
34.0	.0			.91679	552.9	.00084	.000453	.00084	.000453	1.09
2.0	-12.0			.95728	580.9	.00170	.000917			1.10
2.0	12.0			.95562	579.5	.00184	.000993			1.00
12.0	-12.0			.95340	575.9	.00107	.000577			.98
12.0	12.0			.94009	571.2	.00121	.000653			.89
30.0	1.0			.95562	576.5	.00104	.000561			.95
31.0	2.0			.93121	566.2	.00127	.000685			1.30
32.0	2.0			.91790	554.2	.00113	.000610	.00101	.000545	1.18
32.0	3.0			.91402	554.9	.00124	.000669			1.28
32.0	6.0			.90958	551.5	.00130	.000701			1.18
34.0	1.0			.91623	553.9	.00121	.000653	.00130	.000701	1.19
34.0	2.0			.91124	551.5	.00116	.000626	.00110	.000594	1.18
34.0	3.0			.90902	548.9	.00110	.000594			1.00
36.0	.0			.92289	556.9	.00085	.000459	.00086	.000464	.87
38.0	.0			.92788	559.2	.00078	.000421	.00076	.000410	.83
40.0	.0			.93731	565.2	.00083	.000448	.00087	.000469	1.00
44.0	12.0			.94286	571.2	.00113	.000610			
42.0	.0			.93787	565.5	.00083	.000448	.00078	.000421	.87
44.0	.0			.95063	572.9	.00072	.000389	.00076	.000410	.80
48.0	.0			.95063	572.5	.00072	.000389	.00073	.000394	.81
52.0	.0			.94452	568.9	.00068	.000367	.00067	.000362	.74
52.0	12.0			.94508	571.5	.00118	.000637			1.34
55.0	.0			.94286	568.9	.00073	.000394	.00071	.000383	.97
58.0	.0			.95174	573.2	.00072	.000389			.81
58.0	12.0			.94896	575.9	.00119	.000642			1.34
58.0	-12.0			.95617	578.5	.00098	.000529			1.42
44.0	-12.0			.94730	572.9	.00099	.000534			1.27
36.0	-8.0			.92123	555.9	.00085	.000459			.92
36.0	-3.0			.92844	559.5	.00073	.000394			.79
34.0	-3.0			.91623	552.5	.00099	.000534	.00086	.000464	1.08
32.0	-3.0			.91457	553.5	.00115	.000621	.00098	.000529	1.20
30.0	-3.0			.95063	573.9	.00110	.000594	.00102	.000550	1.11
32.0	-12.0			.90847	547.5	.00111	.000599	.00062	.000335	1.25
30.0	-12.0			.91180	549.2	.00085	.000459	.00082	.000442	1.12
19.0	-12.5			.99056	598.9	.00149	.000804			1.59
17.5	-11.0			.98003	593.5	.00163	.000880			1.52
15.5	-2.5			.96838	583.2	.00105	.000567			.98
16.5	-2.5			.98113	593.5	.00161	.000869	.00162	.000874	1.49
17.5	-2.5			.99778	603.5	.00160	.000863	.00169	.000912	1.47
18.5	-2.5			1.01053	610.2	.00135	.000728	.00160	.000863	1.22
19.5	-2.5			1.00554	607.2	.00134	.000723	.00122	.000658	1.20
20.5	-2.5			1.00221	605.5	.00144	.000777	.00140	.000755	1.41
21.5	-2.5			1.00221	606.2	.00162	.000874	.00167	.000901	1.67
22.5	-2.5			.99778	605.5	.00180	.000971	.00173	.000934	1.76
23.5	-2.5			.99778	605.2	.00198	.001068	.00192	.001036	2.13
24.5	-2.5			1.00110	613.2	.00237	.001279			2.49
36.0	-16.0			.93731	564.2	.00057	.000308			.68
36.0	-12.0			.92178	556.2	.00102	.000550	.00101	.000545	1.42
32.0	-18.0			.94563	569.9	.00066	.000356			.73
32.0	-16.0			.93343	562.5	.00067	.000362	.00066	.000356	.78
32.0	-14.0			.92345	556.5	.00068	.000367	.00070	.000378	.96
32.0	-10.0			.90902	549.5	.00105	.000567			1.14
28.0	-14.0			.91734	553.9	.00110	.000594			1.29
28.0	-12.0			.92012	553.9	.00058	.000313			.75
26.0	-12.5			.94674	576.9	.00181	.000977			2.21
24.5	-11.0			.97503	594.9	.00304	.001640			3.30
22.0	-12.5			.97226	589.9	.00189	.001020	.00190	.001025	2.08
20.5	-11.0			.98724	598.2	.00156	.000842	.00158	.000853	1.64
.0	13.7	1.00		1.00055	613.9	.00404	.002180			
.0	11.7	1.00		.99389	607.5	.00329	.001775			
.0	7.7	1.00		.98835	605.2	.00380	.002050			
1.0	7.7	1.00		1.02607	546.9	.00078	.000421			
.0	3.2	1.00		.98890	605.5	.00374	.002018			
.0	1.2	1.00		.98224	602.9	.00414	.002234	.00423	.002282	
.5	11.7	2.00		.94563	575.2	.00243	.001311	.00225	.001214	
.5	3.2	2.00		.94064	572.5	.00259	.001398	.00254	.001371	
.5	1.2	2.00		.93898	573.9	.00332	.001791	.00341	.001840	
6.0	.0			.94452	569.9	.00073	.000394			.95
6.0	10.0			.95118	573.9	.00097	.000523			1.54
12.0	.0			.95007	572.9	.00072	.000389			1.04
12.0	5.0			.94730	570.9	.00068	.000367			1.00
12.0	10.0			.94785	572.2	.00098	.000529			1.14
18.0	.0			.94397	568.5	.00067	.000362			.87
30.0	.0			.94508	569.2	.00068	.000367			.82
42.0	.0			.94619	569.9	.00065	.000351			.94

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^\circ R$.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder

(a) M = 2.65; R = 2.63×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			1.02	
12.0	.0			.96	
20.5	.0			.99	
28.0	12.0			.96	
28.0	4.0			1.92	
28.0	.0			2.41	
20.5	-5.0			.95	
24.5	-5.0			.98	
30.0	.0			4.58	
31.0	12.0			1.04	
34.0	.0			.39	
2.0	-12.0			.91	
2.0	12.0			.90	
12.0	-12.0			.92	
12.0	12.0			.98	
30.0	1.0			3.27	
31.0	2.0			3.64	
32.0	2.0			3.74	
32.0	3.0			2.82	
32.0	6.0			1.67	
34.0	1.0			.64	
34.0	2.0			1.89	
34.0	3.0			2.91	
36.0	.0			1.71	
38.0	.0			1.79	
40.0	.0			1.57	
44.0	12.0			1.39	
42.0	.0			1.64	
44.0	.0			1.67	
48.0	.0			1.51	
52.0	.0			1.34	
52.0	12.0			1.47	
55.0	.0			1.25	
58.0	.0			1.25	
58.0	12.0			1.21	
44.0	-12.0			1.36	
36.0	-8.0			1.46	
36.0	-3.0			1.83	
34.0	-3.0			2.81	
32.0	-3.0			2.84	
30.0	-3.0			2.06	
28.0	-3.0			2.11	
34.0	-12.0			1.01	
32.0	-12.0			1.07	
30.0	-12.0			.98	
		10.55	90		.63
		6.55	90		.70
		4.55	90		1.13
		2.55	90		.77
		8.55	180		
		6.55	180		
		4.55	180		
		3.55	180		
		2.55	180		
		1.55	180		
		1.05	180		
		10.55	0		.70
		8.55	0		.75
		6.55	0		.75
		4.55	0		1.38
		3.55	0		1.25
		2.55	0		1.21
		1.55	0		.97
		1.05	0		.95
		10.55	45		.65
		6.55	45		.67
		4.55	45		1.23
		2.55	45		.96
34.0	-1.0			.62	
34.0	4.0			2.87	
34.0	5.0			2.25	
34.0	6.0			1.74	
36.0	6.0			2.23	
38.0	1.0			1.15	
38.0	2.0			.99	
44.0	8.0			1.81	
44.0	6.0			1.42	
44.0	4.0			1.01	
44.0	2.0			1.01	
44.0	1.0			1.50	
6.0	.0			1.17	
6.0	5.0			1.03	
6.0	10.0			.92	
12.0	.0			1.11	
12.0	5.0			1.11	
12.0	10.0			1.01	
18.0	.0			1.14	
30.0	.0			1.30	
42.0	.0			1.80	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(b) M = 2.65; R = 1.33×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.97	
12.0	.0									1.02	
20.5	.0									1.01	
28.0	12.0									.96	
28.0	4.0									2.04	
28.0	.0									2.48	
20.5	-5.0									1.03	
24.5	-5.0									.96	
30.0	.0									5.98	
31.0	12.0									.93	
34.0	.0									.36	
2.0	-12.0									1.51	
2.0	12.0									1.67	
12.0	-12.0									1.06	
12.0	12.0									1.05	
30.0	1.0									4.18	
31.0	2.0									4.65	
32.0	2.0									4.43	
32.0	3.0									2.71	
32.0	6.0									1.69	
34.0	1.0									.57	
34.0	2.0									1.72	
34.0	3.0									2.88	
36.0	.0									1.87	
38.0	.0									2.04	
40.0	.0									1.68	
44.0	12.0									1.44	
42.0	.0									1.84	
44.0	.0									1.75	
48.0	.0									1.45	
52.0	.0									1.38	
52.0	12.0									1.42	
55.0	.0									1.19	
58.0	.0									1.39	
58.0	12.0									1.31	
44.0	-12.0									1.46	
36.0	-8.0									1.52	
36.0	-3.0									1.75	
34.0	-3.0									2.75	
32.0	-3.0									3.10	
30.0	-3.0									2.08	
28.0	-3.0									2.34	
34.0	-12.0									1.02	
32.0	-12.0									1.14	
30.0	-12.0									.97	
		10.55	90								.57
		6.55	90								.68
		4.55	90								1.05
		2.55	90								.71
		8.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								.79
		10.55	0								.83
		8.55	0								.88
		6.55	0								1.53
		4.55	0								1.27
		3.55	0								1.33
		2.55	0								1.01
		1.55	0								1.03
		1.05	0								.74
		10.55	45								.73
		6.55	45								1.28
		4.55	45								1.06
		2.55	45								
34.0	-1.0									.58	
34.0	4.0									3.04	
34.0	5.0									2.10	
34.0	6.0									1.77	
36.0	6.0									2.51	
38.0	1.0									1.18	
38.0	2.0									.93	
44.0	8.0									1.87	
44.0	6.0									1.42	
44.0	4.0									.94	
44.0	2.0									1.00	
44.0	1.0									1.54	
6.0	.0									1.24	
6.0	5.0									1.15	
6.0	10.0									.97	
12.0	.0									1.19	
12.0	5.0									1.19	
12.0	10.0									1.08	
18.0	.0									1.23	
30.0	.0									1.39	
42.0	.0									2.00	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(c) M = 3.51; R = 2.86 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.06	
12.0	.0									1.13	
20.5	.0									1.14	
28.0	12.0									1.11	
28.0	4.0									2.78	
28.0	.0									3.15	
20.5	-5.0									1.02	
24.5	-5.0									1.03	
30.0	.0									7.39	
31.0	12.0									1.20	
34.0	.0									.43	
2.0	-12.0									1.07	
2.0	12.0									1.09	
12.0	-12.0									1.17	
12.0	12.0									1.12	
30.0	1.0									4.81	
31.0	2.0									6.80	
32.0	2.0									6.10	
32.0	3.0									3.27	
32.0	6.0									2.16	
34.0	1.0									.76	
34.0	2.0									2.95	
34.0	3.0									4.42	
36.0	.0									1.95	
38.0	.0									2.04	
40.0	.0									1.83	
44.0	12.0									1.56	
42.0	.0									2.25	
44.0	.0									2.25	
48.0	.0									2.03	
52.0	.0									1.73	
52.0	12.0									2.48	
55.0	.0									1.46	
58.0	.0									1.37	
58.0	12.0									2.21	
44.0	-12.0									1.58	
36.0	-8.0									1.75	
36.0	-3.0									2.68	
34.0	-3.0									4.73	
32.0	-3.0									3.36	
30.0	-3.0									2.63	
28.0	-3.0									2.68	
34.0	-12.0									1.17	
32.0	-12.0									1.40	
30.0	-12.0									1.21	
		10.55	90								.57
		6.55	90								.64
		4.55	90								.97
		2.55	90								.92
		8.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
		10.55	0								.82
		8.55	0								.84
		6.55	0								.82
		4.55	0								1.37
		3.55	0								2.12
		2.55	0								2.28
		1.55	0								1.45
		1.05	0								1.42
		10.55	45								.72
		6.55	45								.68
		4.55	45								1.10
		2.55	45								1.64
34.0	-1.0									.79	
34.0	4.0									3.86	
34.0	5.0									2.55	
34.0	6.0									1.94	
36.0	6.0									2.57	
38.0	1.0									1.25	
38.0	2.0									1.28	
44.0	8.0									3.16	
44.0	6.0									2.34	
44.0	4.0									1.48	
44.0	2.0									1.27	
44.0	1.0									1.87	
6.0	.0									1.34	
6.0	5.0									1.04	
6.0	10.0									1.22	
12.0	.0									1.15	
12.0	5.0									.98	
12.0	10.0									1.29	
18.0	.0									1.21	
30.0	.0									1.04	
42.0	.0									1.27	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(d) M = 3.51; R = 1.64 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.07	
12.0	.0									.91	
20.5	.0									.91	
28.0	12.0									.89	
28.0	4.0									2.09	
28.0	.0									2.49	
20.5	-5.0									.87	
24.5	-5.0									.89	
30.0	.0									7.05	
31.0	12.0									1.00	
34.0	.0									.29	
2.0	-12.0									1.01	
2.0	12.0									1.01	
12.0	-12.0									.88	
12.0	12.0									.94	
30.0	1.0									4.98	
31.0	2.0									5.16	
32.0	2.0									5.44	
32.0	3.0									2.92	
32.0	6.0									1.61	
34.0	1.0									.60	
34.0	2.0									2.36	
34.0	3.0									3.25	
36.0	.0									1.54	
38.0	.0									1.63	
40.0	.0									1.60	
44.0	12.0									1.15	
42.0	.0									1.50	
44.0	.0									1.48	
48.0	.0									1.18	
52.0	.0									2.09	
52.0	12.0									1.24	
55.0	.0									.95	
58.0	.0									1.97	
58.0	12.0									1.11	
44.0	-12.0									1.33	
36.0	-8.0									2.08	
36.0	-3.0									3.30	
34.0	-3.0									2.10	
30.0	-3.0									2.18	
28.0	-3.0									.93	
34.0	-12.0									1.02	
32.0	-12.0									.84	
30.0	-12.0										.49
		10.55	90								.61
		6.55	90								.89
		4.55	90								.84
		2.55	90								
		1.05	180								.68
		10.55	0								.79
		8.55	0								.80
		6.55	0								1.23
		4.55	0								1.96
		3.55	0								2.09
		2.55	0								1.30
		1.55	0								1.23
		1.05	0								.62
		10.55	45								.66
		6.55	45								1.02
		4.55	45								1.54
		2.55	45								
34.0	-1.0									.59	
34.0	4.0									3.02	
34.0	5.0									1.90	
34.0	6.0									1.59	
36.0	6.0									1.98	
38.0	1.0									.96	
38.0	2.0									.93	
44.0	8.0									2.12	
44.0	6.0									1.65	
44.0	2.0									1.01	
44.0	1.0									1.31	
6.0	.0									1.05	
6.0	5.0									.71	
6.0	10.0									.85	
12.0	.0									1.13	
12.0	5.0									.82	
12.0	10.0									1.02	
18.0	.0									.92	
30.0	.0									.90	
42.0	.0									1.04	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(e) $M = 4.44$; $R = 3.28 \times 10^6$

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.89	
12.0	.0									.92	
20.5	.0									.75	
28.0	12.0									.78	
28.0	4.0									2.12	
28.0	.0									2.56	
20.5	-5.0									.79	
24.5	-5.0									.89	
30.0	.0									8.28	
31.0	12.0									1.13	
34.0	.0									.35	
2.0	-12.0									.78	
2.0	12.0									.93	
12.0	-12.0									.82	
12.0	12.0									.82	
30.0	1.0									5.30	
31.0	2.0									5.82	
32.0	2.0									6.53	
32.0	3.0									2.39	
32.0	6.0									1.43	
34.0	2.0									3.12	
34.0	3.0									4.13	
36.0	.0									1.45	
38.0	.0									1.65	
40.0	.0									1.61	
44.0	12.0									.79	
42.0	.0										
44.0	.0									1.95	
48.0	.0									1.70	
52.0	.0									1.57	
52.0	12.0									1.72	
55.0	.0									1.96	
58.0	.0									1.02	
58.0	12.0									1.93	
44.0	-12.0									.99	
36.0	-8.0									1.10	
36.0	-3.0									2.46	
34.0	-3.0									4.05	
32.0	-3.0									3.43	
30.0	-3.0									1.80	
28.0	-3.0									1.92	
34.0	-12.0									.95	
32.0	-12.0									.75	
30.0	-12.0									.75	
		6.55	90								.37
		4.55	90								.39
		2.55	90								.41
		10.55	0								.55
		8.55	0								.63
		6.55	0								.60
		4.55	0								.85
		3.55	0								1.37
		2.55	0								2.04
		1.55	0								1.29
		1.05	0								1.24
		10.55	45								.52
		6.55	45								.48
		4.55	45								.68
		2.55	45								1.43
34.0	-1.0									.65	
34.0	4.0									3.34	
34.0	5.0									1.50	
34.0	6.0									1.55	
36.0	6.0									1.49	
38.0	1.0									1.07	
38.0	2.0									1.06	
44.0	8.0									2.88	
44.0	6.0									2.46	
44.0	2.0									1.03	
44.0	1.0									1.49	
6.0	5.0									.65	
6.0	10.0									1.01	
12.0	.0									.78	
12.0	5.0									.63	
12.0	10.0									.92	
18.0	.0									.69	
42.0	.0									.63	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, δ = 0.70 INCH - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Concluded

(f) M = 4.44; R = 2.18 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.21	
12.0	.0									1.12	
20.5	.0									.96	
28.0	12.0									.68	
28.0	4.0									2.47	
28.0	.0									3.42	
24.5	-5.0									.82	
30.0	.0									14.21	
31.0	12.0									.95	
2.0	-12.0									.91	
2.0	12.0									.80	
12.0	-12.0									.87	
12.0	12.0									.67	
30.0	1.0									6.93	
31.0	2.0									9.48	
32.0	2.0									9.60	
32.0	3.0									3.66	
32.0	6.0									1.94	
34.0	1.0									.66	
34.0	2.0									4.49	
34.0	3.0									5.47	
36.0	.0									1.90	
38.0	.0									2.15	
40.0	.0									2.18	
44.0	12.0									1.01	
42.0	.0									2.52	
44.0	.0									2.15	
48.0	.0									.98	
52.0	.0									2.32	
52.0	12.0									1.11	
55.0	.0									1.32	
58.0	.0									2.99	
58.0	12.0									.95	
44.0	-12.0									1.73	
36.0	-8.0									3.47	
36.0	-3.0									5.31	
34.0	-3.0									4.97	
32.0	-3.0									2.73	
30.0	-3.0									2.74	
28.0	-3.0									.98	
34.0	-12.0									1.11	
32.0	-12.0									.99	
30.0	-12.0										.43
		10.55	90								.47
		6.55	90								.65
		4.55	90								.73
		2.55	90								.59
		10.55	0								.78
		8.55	0								.72
		6.55	0								1.01
		4.55	0								1.81
		3.55	0								2.83
		2.55	0								1.73
		1.55	0								1.63
		1.05	0								.58
		10.55	45								.60
		6.55	45								.80
		4.55	45								1.93
		2.55	45								
34.0	-1.0									.80	
34.0	4.0									4.35	
34.0	5.0									2.11	
34.0	6.0									1.56	
36.0	6.0									2.01	
38.0	1.0									1.46	
38.0	2.0									1.23	
44.0	8.0									3.29	
44.0	6.0									2.60	
44.0	2.0									1.22	
44.0	1.0									1.97	
6.0	.0									1.18	
6.0	5.0									.94	
6.0	10.0									1.14	
12.0	.0									.91	
12.0	5.0									.86	
12.0	10.0									.98	
18.0	.0									.84	
30.0	.0									.67	
42.0	.0										

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate

(a) M = 2.65; R = 2.61 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									1.07	
12.0	.0									1.03	
20.5	.0									1.02	
28.0	12.0									1.02	
28.0	4.0									2.06	
28.0	.0									2.57	
20.5	-5.0									.99	
24.5	-5.0									1.04	
30.0	.0									5.61	
31.0	12.0									1.08	
34.0	.0									.41	
2.0	-12.0									1.04	
2.0	12.0									.96	
12.0	-12.0									.97	
12.0	12.0									1.03	
30.0	1.0									3.89	
31.0	2.0									4.37	
32.0	2.0									4.38	
32.0	3.0									3.11	
32.0	6.0									1.77	
34.0	1.0									.60	
34.0	2.0									2.04	
34.0	3.0									3.14	
36.0	.0									1.88	
38.0	.0									1.88	
40.0	.0									1.68	
44.0	12.0									1.63	
42.0	.0									1.87	
44.0	.0									2.00	
48.0	.0									1.83	
52.0	.0									1.45	
52.0	12.0									1.64	
55.0	.0									1.26	
58.0	.0									1.31	
58.0	12.0									1.29	
44.0	-12.0									1.56	
36.0	-8.0									1.61	
36.0	-3.0									1.98	
34.0	-3.0									3.09	
32.0	-3.0									3.18	
30.0	-3.0									2.23	
28.0	-3.0									2.29	
34.0	-12.0									1.05	
32.0	-12.0									1.09	
30.0	-12.0									1.01	
		10.55	90								1.00
		6.55	90								.72
		4.55	90								1.20
		2.55	90								.79
		8.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
		10.55	0								1.47
		8.55	0								1.02
		6.55	0								.92
		4.55	0								1.52
		3.55	0								1.44
		2.55	0								1.30
		1.55	0								1.08
		1.05	0								1.08
		10.55	45								1.34
		6.55	45								.78
		4.55	45								1.08
		2.55	45								.87
34.0	-1.0									.66	
34.0	4.0									3.15	
34.0	5.0									2.51	
34.0	6.0									1.89	
36.0	6.0									2.49	
38.0	1.0									1.23	
38.0	2.0									1.06	
44.0	8.0									2.04	
44.0	6.0									1.61	
44.0	2.0									1.26	
44.0	1.0									1.93	
6.0	.0									.99	
6.0	5.0									1.03	
6.0	10.0									.98	
12.0	.0									1.15	
12.0	5.0									1.20	
12.0	10.0									1.00	
18.0	.0									1.22	
30.0	.0									1.45	
42.0	.0									1.98	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Continued

(b) M = 2.65; R = 1.34 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.97	
12.0	.0									1.03	
20.5	.0									1.01	
28.0	12.0									.99	
28.0	4.0									2.09	
28.0	.0									2.45	
20.5	-5.0									.94	
24.5	-5.0									.98	
30.0	.0									5.85	
31.0	12.0									.97	
34.0	.0									.31	
2.0	-12.0									1.53	
2.0	12.0									1.77	
12.0	-12.0									1.00	
12.0	12.0									1.10	
30.0	1.0									4.25	
31.0	2.0									4.63	
32.0	2.0									4.47	
32.0	3.0									2.74	
32.0	6.0									1.68	
34.0	1.0									.56	
34.0	2.0									1.69	
34.0	3.0									2.74	
36.0	.0									1.93	
38.0	.0									2.15	
40.0	.0									1.78	
44.0	12.0									1.68	
42.0	.0									2.07	
44.0	.0									2.02	
48.0	.0									1.69	
52.0	.0									1.46	
52.0	12.0									1.74	
56.0	.0									1.20	
58.0	.0									1.31	
58.0	12.0									1.23	
44.0	-12.0									1.52	
36.0	-8.0									1.58	
36.0	-3.0									1.76	
34.0	-3.0									2.87	
32.0	-3.0									3.90	
30.0	-3.0									1.96	
28.0	-3.0									2.45	
34.0	-12.0									1.04	
32.0	-12.0									1.05	
30.0	-12.0									.94	
		10.55	90								.94
		6.55	90								.68
		4.55	90								1.11
		2.55	90								.67
		4.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
		10.55	0								1.65
		8.55	0								.93
		6.55	0								.90
		4.55	0								1.59
		3.55	0								1.31
		2.55	0								1.38
		1.55	0								1.03
		1.05	0								1.01
		10.55	45								1.27
		6.55	45								.77
		4.55	45								1.35
		2.55	45								1.11
34.0	-1.0									.56	
34.0	4.0									3.18	
34.0	5.0									2.20	
34.0	6.0									1.85	
36.0	6.0									2.74	
38.0	1.0									1.26	
38.0	2.0									.94	
44.0	8.0									1.94	
44.0	6.0									1.50	
44.0	4.0									1.08	
44.0	2.0									1.30	
44.0	1.0									1.86	
6.0	.0									1.03	
6.0	5.0									1.00	
6.0	10.0									.99	
12.0	.0									1.27	
12.0	5.0									1.18	
12.0	10.0									.97	
18.0	.0									1.16	
30.0	.0									1.42	
42.0	.0									2.03	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Continued

(c) M = 3.51; R = 2.84 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.13	
12.0	.0									1.15	
26.5	.0									1.12	
28.0	12.0									1.11	
28.0	4.0									2.62	
28.0	.0									3.13	
25.5	-5.0									1.05	
24.5	-5.0									1.03	
30.0	.0									8.15	
31.0	12.0									1.25	
34.0	.0									.44	
2.0	-12.0									1.15	
2.0	12.0									1.14	
12.0	-12.0									1.06	
12.0	12.0									1.17	
30.0	1.0									5.19	
31.0	2.0									6.40	
32.0	2.0									6.35	
32.0	3.0									3.31	
32.0	6.0									2.16	
34.0	1.0									.69	
34.0	2.0									2.96	
34.0	3.0									4.56	
36.0	.0									1.96	
38.0	.0									1.96	
40.0	.0									1.72	
44.0	12.0									1.64	
42.0	.0									2.37	
44.0	.0									2.67	
48.0	.0									2.45	
52.0	.0									1.94	
52.0	12.0									2.84	
55.0	.0									1.58	
58.0	.0									1.35	
58.0	12.0									2.60	
44.0	-12.0									1.57	
36.0	-8.0									1.58	
36.0	-3.0									2.66	
34.0	-3.0									4.75	
32.0	-3.0									3.40	
30.0	-3.0									2.84	
28.0	-3.0									2.66	
34.0	-12.0									1.16	
32.0	-12.0									1.18	
30.0	-12.0									1.16	
		10.55	90								1.00
		6.55	90								.60
		4.55	90								.93
		2.55	90								.88
		8.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		10.55	0								1.71
		8.55	0								1.01
		6.55	0								.92
		4.55	0								1.39
		3.55	0								2.25
		2.55	0								2.57
		1.55	0								1.47
		1.05	0								1.45
		10.55	45								1.59
		6.55	45								.71
		4.55	45								1.13
		2.55	45								1.76
34.0	-1.0									.74	
34.0	4.0									4.17	
34.0	5.0									2.61	
34.0	6.0									1.98	
36.0	6.0									2.64	
38.0	1.0									1.24	
38.0	2.0									1.24	
44.0	8.0									3.33	
44.0	6.0									2.42	
44.0	2.0									1.34	
44.0	1.0									2.10	
6.0	.0									1.30	
6.0	5.0									1.48	
6.0	10.0									1.42	
12.0	.0									.89	
12.0	5.0									1.18	
12.0	10.0									1.22	
18.0	.0									1.11	
30.0	.0									1.05	
42.0	.0									1.19	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Continued

(d) M = 3.51; R = 1.64 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.21	
12.0	.0									.95	
20.5	.0									.98	
28.0	12.0									.79	
28.0	4.0									2.16	
28.0	.0									2.67	
20.5	-5.0									.99	
24.5	-5.0									.99	
30.0	.0									8.92	
31.0	12.0									.84	
34.0	.0									.30	
2.0	-12.0									1.07	
2.0	12.0									1.25	
12.0	-12.0									.89	
12.0	12.0									.87	
30.0	1.0									4.88	
31.0	2.0									5.85	
32.0	2.0									6.44	
32.0	3.0									3.07	
32.0	6.0									1.73	
34.0	1.0									.60	
34.0	2.0									2.51	
34.0	3.0									3.58	
36.0	.0									1.81	
38.0	.0									2.14	
40.0	.0									1.75	
44.0	12.0									1.16	
42.0	.0									1.82	
44.0	.0									1.90	
48.0	.0									1.43	
52.0	.0									2.32	
52.0	12.0									1.38	
55.0	.0									.99	
58.0	.0									2.01	
58.0	12.0									1.20	
44.0	-12.0									1.40	
36.0	-8.0									2.17	
36.0	-3.0									3.91	
34.0	-3.0									2.94	
32.0	-3.0									2.35	
30.0	-3.0									2.33	
28.0	-3.0									.93	
34.0	-12.0									1.16	
32.0	-12.0									.86	
30.0	-12.0										
		10.55	90								.96
		6.55	90								.61
		4.55	90								.92
		2.55	90								.83
		8.55	180								
		4.55	180								
		3.55	180								
		1.55	180								
		10.55	0								1.79
		8.55	0								1.16
		6.55	0								.99
		4.55	0								1.42
		3.55	0								2.28
		2.55	0								2.76
		1.55	0								1.45
		1.05	0								1.43
		10.55	45								1.47
		6.55	45								.75
		4.55	45								1.13
		2.55	45								1.87
34.0	-1.0									.52	
34.0	4.0									3.29	
34.0	5.0									2.04	
34.0	6.0									1.68	
36.0	6.0									2.11	
38.0	1.0									1.03	
38.0	2.0									.99	
44.0	8.0									2.36	
44.0	6.0									1.76	
44.0	2.0									1.05	
44.0	1.0									1.53	
6.0	.0									.97	
6.0	5.0									.94	
6.0	10.0									.98	
12.0	.0									.74	
12.0	5.0									.89	
12.0	10.0									.90	
18.0	.0									.87	
30.0	.0									.92	
42.0	.0									1.02	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Continued

(e) M = 4.44; R = 3.18×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.17	
12.0	.0									1.27	
20.5	.0									1.12	
28.0	4.0									3.00	
28.0	.0									3.10	
20.5	-5.0									1.12	
24.5	-5.0									1.11	
30.0	.0									11.87	
31.0	12.0									1.51	
34.0	.0									.45	
2.0	-12.0									.79	
2.0	12.0									1.02	
12.0	-12.0									.84	
12.0	12.0									.97	
30.0	1.0									7.44	
31.0	2.0									7.51	
32.0	2.0									8.59	
32.0	3.0									3.37	
32.0	6.0									1.84	
34.0	1.0									.77	
34.0	2.0									4.28	
34.0	3.0									6.02	
36.0	.0									1.93	
38.0	.0									2.40	
40.0	.0									1.73	
44.0	12.0									1.13	
42.0	.0										
44.0	.0									2.55	
48.0	.0									2.50	
52.0	.0									2.16	
52.0	12.0									2.61	
55.0	.0									1.98	
58.0	.0									1.68	
58.0	12.0									2.80	
44.0	-12.0									1.22	
36.0	-8.0									1.54	
36.0	-3.0									3.13	
34.0	-3.0									5.55	
32.0	-3.0									4.14	
30.0	-3.0									2.27	
28.0	-3.0									2.63	
34.0	-12.0									1.31	
32.0	-12.0									1.07	
30.0	-12.0									.96	
		10.55	90								.89
		6.55	90								.49
		4.55	90								.59
		2.55	90								.72
		8.55	180								
		10.55	0								1.65
		8.55	0								.94
		6.55	0								.83
		4.55	0								1.21
		3.55	0								2.03
		2.55	0								3.12
		1.55	0								1.86
		1.05	0								1.78
		10.55	45								1.46
		6.55	45								.67
		4.55	45								.93
		2.55	45								2.08
34.0	-1.0									.89	
34.0	4.0									3.96	
34.0	5.0									1.94	
34.0	6.0									2.01	
36.0	6.0									1.92	
38.0	1.0									1.93	
38.0	2.0									1.32	
44.0	8.0									3.70	
44.0	6.0									3.02	
44.0	2.0									1.70	
44.0	1.0									2.10	
6.0	.0									1.29	
6.0	5.0									1.18	
6.0	10.0									1.50	
12.0	.0									1.14	
12.0	5.0									1.34	
12.0	10.0									1.38	
18.0	.0									.78	
30.0	.0									.81	
42.0	.0									.81	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Concluded

(f) M = 4.44; R = 2.12 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.61	
12.0	.0									.90	
28.0	12.0									.82	
28.0	4.0									1.70	
28.0	.0									1.97	
20.5	-5.0									.90	
24.5	-5.0									.78	
30.0	.0									8.53	
31.0	12.0									1.23	
2.0	-12.0									.81	
2.0	12.0									.82	
12.0	-12.0									.86	
12.0	12.0									.75	
30.0	1.0									3.75	
31.0	2.0									6.12	
32.0	2.0									5.60	
32.0	3.0									2.32	
32.0	6.0									1.51	
34.0	2.0									2.81	
34.0	3.0									3.40	
38.0	.0									1.21	
40.0	.0									1.27	
44.0	12.0									.89	
42.0	.0									1.76	
44.0	.0									1.68	
48.0	.0									1.67	
52.0	.0									1.77	
52.0	12.0									1.07	
55.0	.0									2.97	
58.0	12.0									.96	
44.0	-12.0									1.40	
36.0	-8.0									2.65	
36.0	-3.0									2.92	
34.0	-3.0									2.77	
32.0	-3.0									1.64	
30.0	-3.0									1.63	
28.0	-3.0									.86	
34.0	-12.0									.92	
32.0	-12.0									.84	
30.0	-12.0										
		10.55	90								.44
		6.55	90								.42
		4.55	90								.43
		10.55	0								.85
		8.55	0								.51
		6.55	0								.38
		4.55	0								.62
		3.55	0								.87
		2.55	0								1.32
		1.55	0								.84
		1.05	0								.93
		10.55	45								.70
		6.55	45								.40
		4.55	45								.51
		2.55	45								1.11
34.0	4.0									2.92	
34.0	5.0									1.70	
34.0	6.0									.94	
36.0	6.0									1.70	
38.0	1.0									1.13	
38.0	2.0									1.15	
44.0	8.0									2.30	
44.0	6.0									1.63	
44.0	2.0									1.23	
44.0	1.0									1.28	
6.0	.0									1.18	
6.0	10.0									1.10	
12.0	10.0									.87	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

5. 1.4-Inch-Diameter Instrumented Cylinder

(a) M = 2.65; R = 3.83×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95126	596.9	.00629	.000898			.96	
12.0	.0			.94462	589.2	.00545	.000778			1.01	
20.5	.0			.94462	588.5	.00531	.000758			1.02	
28.0	12.0			.93963	586.5	.00575	.000821			1.06	
28.0	4.0			.94240	587.5	.00542	.000774			1.01	
28.0	.0			.94905	594.2	.00620	.000886			1.18	
20.5	-5.0			.94517	589.2	.00535	.000764			1.01	
24.5	-5.0			.94351	587.2	.00518	.000740			.95	
30.0	.0			.96621	624.9	.01214	.001734	.01227	.001753	2.47	
31.0	12.0			.94185	586.9	.00531	.000758			1.02	
34.0	.0			.92856	587.5	.00733	.001047	.00701	.001001	1.45	
2.0	-12.0			.95625	598.9	.00624	.000891			.99	
2.0	12.0			.95569	599.2	.00619	.000884			.95	
12.0	-12.0			.95015	592.5	.00543	.000776			.99	
12.0	12.0			.94129	589.2	.00584	.000834			1.02	
30.0	1.0			.95901	620.2	.01199	.001713			2.35	
31.0	2.0			.94905	609.2	.01042	.001488			2.05	
32.0	2.0			.94074	588.9	.00598	.000854	.00552	.000788	1.25	
32.0	3.0			.94129	600.2	.00911	.001301			1.73	
32.0	6.0			.94572	591.5	.00579	.000827			1.08	
34.0	1.0			.94129	594.5	.00753	.001076	.00738	.001054	1.50	
34.0	2.0			.93797	607.9	.01181	.001687	.01246	.001780	2.24	
34.0	3.0			.93576	603.2	.01097	.001567	.01108	.001583	2.07	
36.0	.0			.90807	576.2	.00799	.001141	.00787	.001124	1.61	
38.0	.0			.92246	597.9	.00846	.001208	.00860	.001228	1.60	
40.0	.0			.92800	588.9	.00813	.001161	.00814	.001163	1.66	
44.0	12.0			.95514	593.5	.00479	.000684			.90	
42.0	.0			.93077	589.9	.00834	.001191	.00832	.001188	1.65	
44.0	.0			.94129	594.5	.00736	.001051	.00738	.001054	1.50	
48.0	.0			.94406	592.5	.00652	.000931	.00649	.000927	1.34	
52.0	.0			.94960	609.9	.01112	.001588	.01080	.001543	2.10	
52.0	12.0			.93631	583.5	.00527	.000753			1.10	
55.0	.0			.94351	588.2	.00547	.000781	.00541	.000773	1.08	
58.0	.0			.94683	590.2	.00533	.000761			1.05	
58.0	12.0			.93133	579.5	.00493	.000704			1.00	
58.0	-12.0			.93631	581.5	.00479	.000684			.95	
44.0	-12.0			.94739	588.9	.00509	.000727			1.02	
36.0	-8.0			.95348	592.2	.00488	.000697			1.01	
36.0	-3.0			.94019	599.5	.00902	.001288			1.87	
34.0	-3.0			.93908	603.2	.00998	.001426	.01002	.001431	1.97	
32.0	-3.0			.94462	600.5	.00859	.001227	.00855	.001221	1.73	
30.0	-3.0			.96123	604.2	.00735	.001050	.00744	.001063	1.46	
28.0	-3.0			.95237	591.2	.00495	.000707			1.01	
34.0	-12.0			.94683	587.2	.00491	.000701	.00464	.000663		
32.0	-12.0			.94739	587.5	.00487	.000696	.00423	.000604	.98	
30.0	-12.0			.94960	589.5	.00520	.000743	.00468	.000668	1.05	
19.0	-12.5			.95071	590.9	.00512	.000731			.99	
17.5	-11.0			.94905	589.9	.00515	.000736			.99	
15.5	-2.5			.95182	593.2	.00540	.000771			1.00	
16.5	-2.5			.95735	593.5	.00454	.000648	.00464	.000663	.88	
17.5	-2.5			.94572	588.9	.00534	.000763	.00517	.000738	1.00	
18.5	-2.5			.95237	592.5	.00517	.000738	.00533	.000761	.99	
19.5	-2.5			.94517	588.2	.00520	.000743	.00511	.000730	.97	
20.5	-2.5			.94406	587.9	.00519	.000741	.00516	.000737	.98	
21.5	-2.5			.94572	588.5	.00514	.000734	.00519	.000741	.98	
22.5	-2.5			.94351	587.2	.00510	.000728	.00517	.000738	.97	
23.5	-2.5			.96843	583.5	.00085	.000121	.00067	.000096	.16	
24.5	-2.5			.94517	588.2	.00511	.000730			.98	
		1.10	0	.98227	670.5	.02333	.003332				.99
		1.60	0	.98449	671.2	.02618	.003740	.02637	.003767		1.11
		2.60	0	1.00387	688.5	.02357	.003367				1.00
		3.60	0	.99612	658.9	.01779	.002541	.01767	.002524		.76
		4.60	0	.99446	655.2	.01659	.002370	.01697	.002424		.71
		6.60	0	.99446	657.9	.01743	.002490				.74
		8.60	0	.99501	657.2	.01714	.002448				.73
		10.60	0	.99501	657.2	.01735	.002478				.74
		2.60	90	.94129	588.9	.00689	.000984				1.23
		4.60	90	.94406	583.9	.00502	.000717				.90
		2.60	180	.95846	577.5	.00076	.000109	.00072	.000103		
		4.60	180	.94406	587.5	.00517	.000738	.00517	.000738		
34.0	-1.0			.95071	597.2	.00672	.000960	.00683	.000976	1.49	
34.0	4.0			.93908	595.2	.00791	.001130	.00779	.001113	1.51	
34.0	5.0			.93852	591.9	.00708	.001011	.00695	.000993	1.39	
34.0	6.0			.94794	594.5	.00609	.000870	.00614	.000877	1.16	
36.0	6.0			.93963	589.5	.00639	.000913			1.21	
38.0	1.0			.93354	585.5	.00635	.000907	.00626	.000894	1.29	
38.0	2.0			.94572	587.9	.00489	.000698			.99	
44.0	8.0			.91859	576.5	.00665	.000950	.00661	.000944	1.25	
44.0	6.0			.91859	579.5	.00698	.000997	.00699	.000998	1.37	
44.0	4.0			.92966	580.9	.00569	.000813	.00565	.000807	1.14	
44.0	2.0			.93742	588.9	.00637	.000910	.00640	.000914	1.26	
44.0	1.0			.93797	590.5	.00662	.000946	.00657	.000938	1.41	
6.0	.0			.94462	587.9	.00502	.000717			1.12	
6.0	5.0			.82278	495.2	.00013	.000019				
6.0	10.0			.93299	578.2	.00414	.000591			.88	
12.0	.0			.95182	591.9	.00483	.000690	.00529	.000756	1.10	
12.0	5.0			.93742	583.9	.00491	.000701			1.10	
12.0	10.0			.93188	578.5	.00452	.000646	.00444	.000634	.97	
18.0	.0			.94683	587.9	.00473	.000676	.00480	.000686	1.01	
30.0	.0			.93409	583.5	.00569	.000813			1.28	
42.0	.0			.95237	593.5	.00509	.000727	.00459	.000656	1.13	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(b) M = 2.65; R = 2.47×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94718	584.5	.00532	.001201			1.12	
12.0	.0			.94162	577.5	.00419	.000946			1.09	
20.5	.0			.94329	577.9	.00402	.000908			1.11	
28.0	12.0			.93829	575.9	.00412	.000930			1.06	
28.0	4.0			.94107	576.9	.00405	.000914			1.09	
28.0	.0			.94885	584.5	.00508	.001147			1.38	
20.5	-5.0			.94329	577.9	.00402	.000908			1.07	
24.5	-5.0			.94162	576.5	.00390	.000880			1.08	
30.0	.0			.96330	604.9	.00905	.002043	.00918	.002073	2.64	
31.0	12.0			.93940	575.9	.00396	.000894			1.09	
34.0	.0			.93495	583.5	.00590	.001332	.00579	.001307	1.76	
2.0	-12.0			.94940	584.9	.00518	.001169			1.11	
2.0	12.0			.94718	585.2	.00563	.001271			1.15	
12.0	-12.0			.94607	580.2	.00430	.000971			1.11	
12.0	12.0			.93773	576.9	.00458	.001034			1.09	
30.0	1.0			.95608	600.9	.00912	.002059			2.53	
31.0	2.0			.94996	593.9	.00807	.001822			2.29	
32.0	2.0			.93995	577.5	.00437	.000987	.00396	.000894	1.30	
32.0	3.0			.94329	586.9	.00716	.001616			1.96	
32.0	6.0			.94107	578.2	.00452	.001020			1.21	
34.0	1.0			.93940	579.5	.00554	.001251	.00523	.001181	1.59	
34.0	2.0			.93884	595.9	.00961	.002170	.01006	.002271	2.68	
34.0	3.0			.93662	587.5	.00941	.002124	.00943	.002129	2.61	
36.0	.0			.91160	565.9	.00671	.001515	.00658	.001486	1.93	
38.0	.0			.92161	576.9	.00685	.001546	.00687	.001551	1.97	
40.0	.0			.92995	576.9	.00639	.001443	.00641	.001447	1.95	
44.0	12.0			.95218	582.2	.00379	.000856			1.03	
42.0	.0			.93217	577.5	.00608	.001373	.00604	.001364	1.73	
44.0	.0			.94496	583.9	.00562	.001269	.00566	.001278	1.66	
48.0	.0			.94440	581.5	.00497	.001122	.00495	.001118	1.48	
52.0	.0			.94718	592.5	.00847	.001912	.00854	.001928	2.48	
52.0	12.0			.93384	572.5	.00400	.000903			1.18	
55.0	.0			.94218	577.5	.00403	.000910	.00398	.000899	1.25	
58.0	.0			.94774	580.5	.00397	.000896			1.24	
58.0	12.0			.92939	568.9	.00362	.000817			1.10	
58.0	-12.0			.93439	573.9	.00363	.000820			1.11	
44.0	-12.0			.94051	576.9	.00407	.000919			1.28	
36.0	-8.0			.94996	580.9	.00365	.000824			1.09	
36.0	-3.0			.94162	585.9	.00702	.001585			2.08	
34.0	-3.0			.94218	589.5	.00873	.001971	.00875	.001975	2.61	
32.0	-3.0			.94885	589.2	.00672	.001517	.00670	.001513	1.98	
30.0	-3.0			.95330	591.5	.00647	.001461	.00655	.001479	1.80	
28.0	-3.0			.94829	580.5	.00376	.000849			1.20	
34.0	-12.0			.94273	576.5	.00364	.000822	.00313	.000707		
32.0	-12.0			.94273	576.5	.00383	.000865	.00323	.000729	1.15	
30.0	-12.0			.94496	578.2	.00386	.000871	.00354	.000799	1.15	
19.0	-12.5			.94440	578.5	.00396	.000894			1.12	
17.5	-11.0			.94496	579.2	.00400	.000903			1.06	
15.5	-2.5			.94440	579.9	.00417	.000941			1.08	
16.5	-2.5			.95388	582.2	.00324	.000731	.00342	.000772	.90	
17.5	-2.5			.94051	576.9	.00433	.000978	.00409	.000923	1.15	
18.5	-2.5			.94940	582.2	.00403	.000910	.00433	.000978	1.10	
19.5	-2.5			.93717	574.9	.00407	.000919	.00391	.000883	1.08	
20.5	-2.5			.93495	573.9	.00438	.000989	.00427	.000964	1.17	
21.5	-2.5			.94051	576.9	.00405	.000914	.00415	.000937	1.10	
22.5	-2.5			.93884	575.5	.00402	.000908	.00419	.000946	1.08	
23.5	-2.5			.94496	568.5	.00064	.000144			.17	
24.5	-2.5			.94273	577.5	.00382	.000862			1.06	
		1.10	0	.97665	637.5	.02135	.004820				1.12
		1.60	0	.98165	648.5	.02616	.005906	.02634	.005947		1.37
		2.60	0	.99610	656.2	.02486	.005612				1.37
		3.60	0	.99054	637.5	.01574	.003554	.01560	.003522		.82
		4.60	0	.98832	634.5	.01483	.003348	.01532	.003459		.78
		6.60	0	.98776	636.2	.01631	.003682				.85
		8.60	0	.98776	634.9	.01509	.003407				.79
		10.60	0	.99054	636.9	.01520	.003432				.79
		2.60	90	.93384	575.9	.00586	.001323				1.29
		4.60	90	.93773	573.9	.00418	.000944				.92
		2.60	180	.93995	565.2	.00070	.000158	.00065	.000147		
		4.60	180	.93606	574.2	.00409	.000923	.00408	.000921		
34.0	-1.0			.95052	584.5	.00472	.001066	.00476	.001075	1.52	
34.0	4.0			.93995	582.9	.00621	.001402	.00617	.001393	1.75	
34.0	5.0			.93773	579.2	.00545	.001230	.00529	.001194	1.47	
34.0	6.0			.94496	581.9	.00471	.001063	.00476	.001075	1.27	
36.0	6.0			.93662	576.9	.00490	.001106			1.37	
38.0	1.0			.93439	575.2	.00492	.001111	.00496	.001120	1.43	
38.0	2.0			.94162	576.5	.00365	.000824			1.05	
44.0	8.0			.91772	565.2	.00472	.001066	.00467	.001054	1.34	
44.0	6.0			.91938	568.2	.00527	.001190	.00527	.001190	1.48	
44.0	4.0			.93161	571.9	.00424	.000957	.00422	.000953	1.26	
44.0	2.0			.93829	577.9	.00478	.001079	.00479	.001081	1.38	
44.0	1.0			.94051	580.5	.00514	.001160	.00511	.001154	1.60	
6.0	.0			.94273	577.2	.00386	.000871			1.25	
6.0	10.0			.92772	566.9	.00321	.000725	.00449	.001014	1.03	
12.0	.0			.95163	582.2	.00381	.000860	.00426	.000962	1.26	
12.0	5.0			.93606	573.2	.00390	.000880			1.24	
12.0	10.0			.92995	571.2	.00350	.000790	.00343	.000774	1.11	
18.0	.0			.94162	576.2	.00347	.000783	.00354	.000799	1.14	
30.0	.0			.93217	572.2	.00435	.000982			1.41	
42.0	.0			.94829	581.2	.00391	.000883	.00334	.000754	1.23	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(c) M = 2.65; R = 1.28 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96874	584.2	.00108	.000468			1.06	
12.0	.0			.95479	583.9	.00280	.001213			1.13	
20.5	.0			.95814	582.2	.00248	.001075			1.06	
28.0	12.0			.95200	578.9	.00235	.001018			1.08	
28.0	4.0			.95590	580.9	.00234	.001014			1.01	
28.0	.0			.96149	585.9	.00267	.001157			1.31	
20.5	-5.0			.95758	582.2	.00251	.001088			1.12	
24.5	-5.0			.95702	581.2	.00224	.000971			1.01	
30.0	.0			.96539	599.2	.00528	.002288	.00535	.002318	2.48	
31.0	12.0			.95367	579.5	.00231	.001001			1.09	
34.0	.0			.94809	583.2	.00293	.001270	.00295	.001278	1.55	
2.0	-12.0			.97600	589.9	.00102	.000442			1.42	
2.0	12.0			.97488	588.2	.00091	.000394			1.11	
12.0	-12.0			.96093	587.5	.00278	.001205			1.12	
12.0	12.0			.95088	580.9	.00322	.001395			1.19	
30.0	1.0			.96037	596.5	.00549	.002379			2.57	
31.0	2.0			.95590	590.2	.00473	.002050			2.43	
32.0	2.0			.95590	581.2	.00234	.001014	.00215	.000932	1.25	
32.0	3.0			.95367	586.9	.00419	.001816			2.03	
32.0	6.0			.95479	581.9	.00278	.001205			1.35	
34.0	1.0			.94753	577.2	.00294	.001274	.00251	.001088	1.39	
34.0	2.0			.94753	588.2	.00517	.002240	.00552	.002392	2.42	
34.0	3.0			.94753	587.9	.00515	.002232	.00522	.002262	2.41	
36.0	.0			.92744	572.2	.00361	.001564	.00351	.001521	1.93	
38.0	.0			.93414	574.2	.00367	.001590	.00367	.001590	1.89	
40.0	.0			.94307	578.5	.00374	.001621	.00376	.001629	2.02	
44.0	12.0			.96707	585.5	.00189	.000819			.89	
42.0	.0			.94530	579.5	.00344	.001491	.00341	.001478	1.82	
44.0	.0			.95814	585.9	.00320	.001387	.00323	.001400	1.74	
48.0	.0			.95925	584.5	.00276	.001196	.00275	.001192	1.52	
52.0	.0			.95200	588.5	.00489	.002119	.00492	.002132	2.61	
52.0	12.0			.94921	575.9	.00220	.000953			1.22	
55.0	.0			.95869	581.9	.00222	.000962	.00219	.000949	1.31	
58.0	.0			.96651	586.5	.00230	.000997			1.28	
58.0	12.0			.94809	574.5	.00193	.000836			1.06	
58.0	-12.0			.95423	581.2	.00205	.000888			1.15	
44.0	-12.0			.95535	580.2	.00230	.000997			1.44	
36.0	-8.0			.96483	584.5	.00208	.000901			1.09	
36.0	-3.0			.95479	586.9	.00393	.001703			2.12	
34.0	-3.0			.95367	589.9	.00495	.002145	.00497	.002154	2.66	
32.0	-3.0			.95814	588.9	.00392	.001699	.00389	.001686	2.03	
30.0	-3.0			.96428	591.9	.00376	.001629	.00382	.001655	1.89	
28.0	-3.0			.96372	584.9	.00230	.000997			1.16	
34.0	-12.0			.96818	585.9	.00182	.000789				
32.0	-12.0			.95925	581.9	.00230	.000997			1.24	
30.0	-12.0			.96093	583.2	.00221	.000958	.00193	.000836	1.13	
19.0	-12.5			.96037	585.5	.00248	.001075			1.14	
17.5	-11.0			.96093	584.2	.00253	.001096			1.13	
15.5	-2.5			.95981	583.9	.00246	.001066			1.00	
16.5	-2.5			.96986	586.5	.00178	.000771	.00196	.000849	.78	
17.5	-2.5			.95535	580.5	.00232	.001005	.00207	.000897	.92	
18.5	-2.5			.96428	585.9	.00225	.000975	.00251	.001088	1.00	
19.5	-2.5			.95311	578.9	.00234	.001014	.00223	.000966	1.04	
20.5	-2.5			.95088	577.9	.00229	.000992	.00216	.000936	1.03	
21.5	-2.5			.95590	580.9	.00217	.000940	.00227	.000984	.96	
22.5	-2.5			.95479	579.5	.00221	.000958	.00235	.001018	1.00	
23.5	-2.5			.95646	572.2	.00052	.000225			.24	
24.5	-2.5			.95814	581.5	.00232	.001005			1.10	
		1.10	0	.97655	633.5	.01424	.006171				1.05
		1.60	0	.98214	650.9	.01617	.007007	.01635	.007085		1.20
		2.60	0	.99386	654.2	.01476	.006396				1.09
		3.60	0	.98883	645.5	.01000	.004333	.00987	.004277		.74
		4.60	0	.98995	631.2	.00984	.004264	.01022	.004429		.73
		6.60	0	.98883	632.5	.01012	.004385				.75
		8.60	0	.98939	632.2	.01020	.004420				.75
		10.60	0	.99051	633.5	.01043	.004520				.77
		2.60	90	.94251	576.9	.00397	.001720				1.24
		4.60	90	.94865	576.9	.00288	.001248				.90
		2.60	180	.95032	568.5	.00041	.000178				
		4.60	180	.95200	578.2	.00226	.000979	.00225	.000975		
34.0	-1.0			.96037	583.9	.00264	.001144	.00263	.001140	1.47	
34.0	4.0			.95423	585.2	.00359	.001556	.00359	.001556	1.72	
34.0	5.0			.95256	582.2	.00323	.001400	.00314	.001361	1.58	
34.0	6.0			.95758	583.9	.00265	.001148	.00269	.001166	1.26	
36.0	6.0			.95200	580.2	.00270	.001170			1.27	
38.0	1.0			.94976	578.9	.00270	.001170	.00274	.001187		
38.0	2.0			.95925	581.5	.00208	.000901			1.05	
44.0	8.0			.93302	568.5	.00264	.001144	.00260	.001127	1.34	
44.0	6.0			.93525	571.2	.00301	.001304	.00300	.001300	1.54	
44.0	4.0			.94809	575.9	.00235	.001018	.00235	.001018	1.22	
44.0	2.0			.95311	580.9	.00253	.001096	.00253	.001096	1.32	
44.0	1.0			.95590	583.5	.00291	.001261	.00292	.001265	1.59	
6.0	.0			.96093	582.5	.00208	.000901			1.30	
6.0	5.0			.94976	574.5	.00163	.000706			.90	
6.0	10.0			.96930	587.5	.00209	.000906	.00250	.001083	1.34	
12.0	.0			.95479	578.9	.00192	.000832			1.08	
12.0	5.0			.94976	575.2	.00171	.000741	.00166	.000719	.95	
12.0	10.0			.95925	584.5	.00205	.000888	.00209	.000906	1.20	
18.0	.0			.94697	574.9	.00234	.001014			1.46	
30.0	.0			.96651	585.9	.00210	.000910	.00165	.000715	1.18	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

L-2024

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; ℓ = 0.70 INCH - Continued

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(d) M = 3.51; R = 3.93×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95352	587.2	.00402	.000787			.95	
12.0	.0			.94680	578.9	.00326	.000638			.97	
20.5	.0			.94792	578.5	.00305	.000597			.99	
28.0	12.0			.94120	574.2	.00293	.000574			1.04	
28.0	4.0			.94680	577.5	.00296	.000580			.99	
28.0	.0			.95408	586.9	.00388	.000760			1.26	
20.5	-5.0			.95016	580.2	.00300	.000587			.93	
24.5	-5.0			.94904	578.9	.00276	.000540			.91	
30.0	.0			.96248	606.2	.00722	.001414	.00730	.001429	2.67	
31.0	12.0			.94568	576.2	.00280	.000548			1.02	
34.0	.0			.93672	578.2	.00394	.000772	.00361	.000707	1.42	
2.0	-12.0			.96248	592.2	.00375	.000734			.92	
2.0	12.0			.95912	589.9	.00405	.000793			1.00	
12.0	-12.0			.95632	585.2	.00318	.000623			.96	
12.0	12.0			.94344	577.9	.00343	.000672			1.05	
30.0	1.0			.95856	605.2	.00701	.001373			2.35	
31.0	2.0			.94512	593.2	.00635	.001243			2.20	
32.0	2.0			.94736	579.9	.00326	.000638	.00300	.000587	1.12	
32.0	3.0			.93952	585.9	.00558	.001093			1.87	
32.0	6.0			.94792	581.2	.00348	.000681			1.15	
34.0	1.0			.93728	581.9	.00518	.001014	.00506	.000991	1.83	
34.0	2.0			.92776	601.2	.00825	.001616	.00894	.001751	2.86	
34.0	3.0			.92608	581.5	.00653	.001279	.00632	.001238	2.12	
36.0	.0			.91376	566.5	.00452	.000885	.00442	.000866	1.60	
38.0	.0			.92328	574.2	.00499	.000977	.00501	.000981	1.70	
40.0	.0			.93168	577.5	.00481	.000942	.00482	.000944	1.64	
44.0	12.0			.95576	581.2	.00260	.000509			.95	
42.0	.0			.93560	578.9	.00459	.000899	.00457	.000895	1.63	
44.0	.0			.94568	583.2	.00419	.000820	.00420	.000822	1.48	
48.0	.0			.95016	582.9	.00358	.000701	.00358	.000701	1.33	
52.0	.0			.94120	587.9	.00633	.001240	.00636	.001245	2.30	
52.0	12.0			.94288	575.2	.00264	.000517			1.03	
55.0	.0			.95184	580.9	.00295	.000578	.00292	.000572	1.10	
58.0	.0			.95912	583.5	.00263	.000515			1.06	
58.0	12.0			.92776	567.2	.00312	.000611			1.28	
58.0	-12.0			.93280	570.2	.00303	.000593			1.16	
44.0	-12.0			.95016	579.5	.00296	.000580			1.14	
36.0	-8.0			.95408	581.2	.00276	.000540			1.00	
36.0	-3.0			.93168	586.2	.00675	.001322			2.45	
34.0	-3.0			.92832	581.5	.00611	.001196	.00607	.001189	2.30	
32.0	-3.0			.93896	584.2	.00531	.001040	.00527	.001032	1.88	
30.0	-3.0			.95800	594.5	.00502	.000983	.00514	.001007	1.70	
28.0	-3.0			.95688	582.5	.00281	.000550			.98	
34.0	-12.0			.95352	579.9	.00262	.000513	.00211	.000413		
32.0	-12.0			.95240	579.9	.00260	.000509			.94	
30.0	-12.0			.95520	581.5	.00263	.000515	.00247	.000484	.96	
19.0	-12.5			.95520	582.5	.00287	.000562			.96	
17.5	-11.0			.95408	582.5	.00291	.000570			.93	
15.5	-2.5			.95408	582.9	.00317	.000621			.94	
16.5	-2.5			.96126	584.2	.00233	.000456	.00244	.000478	.72	
17.5	-2.5			.94792	578.9	.00312	.000611	.00296	.000580	.95	
18.5	-2.5			.95408	581.9	.00303	.000593	.00316	.000619	.99	
19.5	-2.5			.94848	578.5	.00300	.000587	.00294	.000576	1.00	
20.5	-2.5			.94736	578.2	.00297	.000582	.00293	.000574	.95	
21.5	-2.5			.94960	579.5	.00296	.000580	.00302	.000591	.95	
22.5	-2.5			.94680	576.9	.00295	.000578	.00297	.000582	.95	
23.5	-2.5			.96472	574.9	.00038	.000074			.12	
24.5	-2.5			.94904	578.2	.00288	.000564			.97	
		1.10	0	.97750	671.2	.02812	.005506				1.45
		1.60	0	.96920	677.8	.02832	.005546	.02869	.005618		1.41
		2.60	0	1.00559	671.2	.01897	.003715				.96
		3.60	0	.99608	657.5	.01601	.003135	.01594	.003121		.80
		4.60	0	.99552	655.2	.01538	.003012	.01578	.002992		.77
		6.60	0	.99384	667.5	.01455	.002849				.73
		8.60	0	.99384	663.2	.01558	.003051				.78
		10.60	0	.99160	653.5	.01537	.003010				.77
		2.60	90	.94568	582.9	.00519	.001016				1.09
		4.60	90	.94568	579.9	.00436	.000854				.92
		2.60	180	.95688	570.9	.00056	.000110	.00053	.000104		
		4.60	180	.94792	578.2	.00296	.000580	.00295	.000578		
34.0	-1.0			.94848	586.2	.00456	.000893	.00470	.000920	1.78	
34.0	4.0			.93784	580.5	.00463	.000907	.00459	.000899	1.63	
34.0	5.0			.94064	581.2	.00437	.000856	.00437	.000856	1.50	
34.0	6.0			.94792	581.9	.00366	.000717	.00367	.000719	1.28	
36.0	6.0			.94456	580.5	.00364	.000713			1.23	
38.0	1.0			.93784	575.9	.00375	.000734	.00364	.000713	1.28	
38.0	2.0			.96360	583.9	.00217	.000425			.74	
44.0	8.0			.92664	570.5	.00396	.000775	.00392	.000768	1.48	
44.0	6.0			.92776	577.5	.00519	.001016	.00524	.001026	1.94	
44.0	4.0			.93560	575.2	.00379	.000742	.00377	.000738	1.35	
44.0	2.0			.93840	576.5	.00371	.000726	.00365	.000715	1.32	
44.0	1.0			.94456	581.5	.00390	.000764	.00397	.000777	1.44	
6.0	.0			.96080	582.5	.00227	.000445			.90	
6.0	10.0			.92832	566.5	.00290	.000568			1.21	
12.0	.0			.96864	586.5	.00205	.000401			.84	
12.0	6.0			.95184	578.5	.00249	.000488			.96	
12.0	10.0			.92608	564.5	.00283	.000554	.00267	.000523	1.11	
18.0	.0			.96416	583.5	.00211	.000413	.00224	.000439	.86	
30.0	.0			.93112	572.9	.00383	.000750			1.45	
42.0	.0			.96640	585.2	.00211	.000413	.00169	.000331	.86	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. HEAT TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, [illegible] INCH [illegible]

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(e) M = 3.51; R = 2.61 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.94962	579.5	.00356	.001062			1.03	
12.0	.0			.94291	571.9	.00270	.000806			1.02	
20.5	.0			.94683	573.2	.00245	.000731			.96	
28.0	12.0			.94067	568.9	.00235	.000701			1.03	
28.0	4.0			.94515	571.9	.00231	.000689			1.04	
28.0	.0			.95242	579.2	.00313	.000934			1.35	
28.5	-5.0			.94739	573.5	.00259	.000773			1.10	
24.5	-5.0			.94739	572.9	.00229	.000683			1.05	
30.0	.0			.95746	593.2	.00606	.001808	.00614	.001832	2.86	
31.0	12.0			.94291	569.9	.00217	.000647			.99	
34.0	.0			.93899	572.5	.00313	.000934	.00302	.000901	1.49	
2.0	-12.0			.95466	581.9	.00342	.001020			1.01	
2.0	12.0			.95130	579.9	.00375	.001119			1.08	
12.0	-12.0			.95074	576.5	.00266	.000794			1.04	
12.0	12.0			.93899	570.2	.00292	.000871			1.09	
30.0	1.0			.95130	589.5	.00605	.001805			2.68	
31.0	2.0			.94235	581.2	.00527	.001572			2.34	
32.0	2.0			.94739	573.9	.00257	.000767	.00250	.000746	1.23	
32.0	3.0			.93731	575.5	.00453	.001351			1.96	
32.0	6.0			.94235	574.2	.00288	.000859			1.24	
34.0	1.0			.93339	570.9	.00405	.001208	.00384	.001146	1.87	
34.0	2.0			.92724	582.2	.00712	.002124	.00746	.002226	2.98	
34.0	3.0			.92556	571.2	.00548	.001635	.00524	.001563	2.29	
36.0	.0			.91716	561.5	.00416	.001241	.00407	.001214	1.94	
38.0	.0			.92332	565.9	.00438	.001307	.00438	.001307	2.03	
40.0	.0			.93283	570.5	.00391	.001167	.00393	.001172	1.85	
44.0	12.0			.95522	576.2	.00214	.000638			1.05	
42.0	.0			.93619	571.5	.00366	.001092	.00362	.001080	1.62	
44.0	.0			.94906	578.2	.00332	.000990	.00335	.000999	1.58	
48.0	.0			.95186	577.9	.00293	.000874	.00293	.000874	1.42	
52.0	.0			.93507	574.9	.00531	.001584	.00530	.001581	2.57	
52.0	12.0			.94179	569.2	.00225	.000671			1.19	
55.0	.0			.95186	575.5	.00232	.000692	.00231	.000689	1.15	
58.0	.0			.96082	579.9	.00212	.000632			1.06	
58.0	12.0			.92892	562.2	.00264	.000788			1.40	
58.0	-12.0			.93395	565.2	.00231	.000689			1.22	
44.0	-12.0			.94403	571.5	.00252	.000752			1.25	
36.0	-8.0			.95130	574.5	.00218	.000650			.99	
36.0	-3.0			.93451	577.2	.00587	.001751			2.96	
34.0	-3.0			.93115	573.5	.00515	.001536	.00512	.001528	2.45	
32.0	-3.0			.94011	576.5	.00438	.001307	.00435	.001298	2.07	
30.0	-3.0			.95522	585.5	.00428	.001277	.00439	.001310	1.97	
28.0	-3.0			.95466	576.9	.00230	.000686			1.08	
34.0	-12.0			.94906	573.2	.00217	.000647				
32.0	-12.0			.94906	573.2	.00214	.000638			1.02	
30.0	-12.0			.95074	574.9	.00219	.000653			1.04	
19.0	-12.5			.94962	574.5	.00239	.000713			1.03	
17.5	-11.0			.95130	576.2	.00240	.000716			.94	
15.5	-2.5			.94962	575.5	.00266	.000794			1.06	
16.5	-2.5			.95970	578.2	.00192	.000573	.00211	.000629	.78	
17.5	-2.5			.94515	572.2	.00256	.000764	.00236	.000704	.98	
18.5	-2.5			.95410	577.5	.00257	.000767	.00274	.000817	1.10	
19.5	-2.5			.94347	572.9	.00243	.000725	.00232	.000692	1.00	
20.5	-2.5			.94067	569.9	.00243	.000725	.00230	.000686	.99	
21.5	-2.5			.94627	574.5	.00242	.000722	.00259	.000773	1.05	
22.5	-2.5			.94403	571.2	.00234	.000698	.00242	.000722	.98	
23.5	-2.5			.95018	566.5	.00042	.000125			.18	
24.5	-2.5			.94739	572.9	.00227	.000677			.99	
		1.10	0	.96865	652.9	.02843	.008482				1.69
		1.60	0	.96362	656.2	.03346	.009982	.03380	.010084		1.99
		2.60	0	.99832	649.9	.01787	.005331				1.06
		3.60	0	.98992	637.9	.01548	.004618	.01541	.004597		.92
		4.60	0	.98824	635.5	.01447	.004317	.01503	.004484		.86
		6.60	0	.98656	633.9	.01419	.004233				.85
		8.60	0	.98712	634.9	.01445	.004311				.86
		10.60	0	.98768	634.9	.01430	.004266				.86
		2.60	90	.94011	573.5	.00464	.001384				1.17
		4.60	90	.94123	572.2	.00382	.001140				.96
		2.60	180	.94403	563.2	.00061	.000182	.00056	.000167		
		4.60	180	.94123	569.9	.00239	.000713	.00237	.000707		
34.0	-1.0			.94795	577.9	.00362	.001080	.00374	.001116	1.81	
34.0	4.0			.93899	573.5	.00382	.001140	.00386	.001152	1.75	
34.0	5.0			.94067	573.5	.00348	.001038	.00347	.001035	1.58	
34.0	6.0			.94515	574.2	.00297	.000886	.00299	.000892	1.36	
36.0	6.0			.94291	572.9	.00300	.000895			1.38	
38.0	1.0			.93787	569.9	.00298	.000889	.00289	.000862	1.41	
38.0	2.0			.95970	577.9	.00164	.000489			.77	
44.0	8.0			.92892	564.9	.00310	.000925	.00306	.000913	1.48	
44.0	6.0			.92836	568.9	.00435	.001298	.00426	.001271	2.06	
44.0	4.0			.93675	569.2	.00301	.000898	.00300	.000895	1.42	
44.0	2.0			.94011	571.2	.00296	.000883	.00285	.000850	1.40	
44.0	1.0			.94515	575.2	.00311	.000928	.00313	.000934	1.55	
6.0	.0			.95914	577.9	.00180	.000537			.97	
6.0	10.0			.92668	560.5	.00244	.000728	.00326	.000973	1.28	
12.0	.0			.97033	584.2	.00158	.000471	.00236	.000704	.89	
12.0	5.0			.95186	573.9	.00191	.000570			1.01	
12.0	10.0			.92780	560.5	.00209	.000624	.00191	.000570	1.09	
18.0	.0			.96082	577.9	.00156	.000465	.00172	.000513	.87	
30.0	.0			.93004	565.2	.00294	.000877			1.43	
42.0	.0			.96362	579.5	.00153	.000456			.81	

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE III - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, ℓ = 0.70 INCH - Concluded

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(f) M = 3.51; R = 1.27×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96531	583.9	.00190	.000943			1.14	
12.0	.0			.95413	576.2	.00188	.000933			.98	
20.5	.0			.95972	578.5	.00173	.000858			.93	
28.0	12.0			.95245	573.5	.00153	.000759			.99	
28.0	4.0			.95860	577.5	.00152	.000754			.96	
28.0	.0			.96308	582.2	.00214	.001062			1.37	
20.5	-5.0			.96028	578.5	.00158	.000784			.96	
24.5	-5.0			.96084	578.5	.00150	.000744			.94	
30.0	.0			.96028	590.5	.00405	.002009	.00410	.002034	2.56	
31.0	12.0			.95581	574.9	.00145	.000719			.95	
34.0	.0			.94630	573.5	.00198	.000982	.00192	.000952	1.30	
2.0	-12.0			.97147	587.2	.00177	.000878			1.11	
2.0	12.0			.96867	585.2	.00167	.000828			1.09	
12.0	-12.0			.96308	581.9	.00184	.000913			.97	
12.0	12.0			.94965	573.5	.00200	.000992			1.02	
30.0	1.0			.95525	587.9	.00409	.002029			2.57	
31.0	2.0			.94574	579.2	.00352	.001746			2.32	
32.0	2.0			.96028	579.5	.00159	.000789	.00161	.000799	1.05	
32.0	3.0			.94294	575.2	.00296	.001468			1.85	
32.0	6.0			.95357	576.5	.00196	.000972			1.27	
34.0	1.0			.93847	570.9	.00276	.001369	.00257	.001275	1.82	
34.0	2.0			.93287	576.2	.00454	.002252	.00467	.002317	2.97	
34.0	3.0			.93287	571.9	.00391	.001940	.00373	.001850	2.51	
36.0	.0			.92784	565.2	.00273	.001354	.00267	.001325	1.98	
38.0	.0			.93399	568.9	.00273	.001354	.00273	.001354	1.92	
40.0	.0			.94294	572.9	.00265	.001315	.00266	.001320	1.74	
44.0	12.0			.96811	584.2	.00132	.000655			.87	
42.0	.0			.94686	574.5	.00234	.001161	.00231	.001146	1.66	
44.0	.0			.96028	581.9	.00218	.001081	.00220	.001091	1.45	
48.0	.0			.96476	582.9	.00185	.000918	.00186	.000923	1.43	
52.0	.0			.93847	573.5	.00360	.001786	.00357	.001771	2.75	
52.0	12.0			.95581	574.9	.00149	.000739			1.14	
55.0	.0			.96699	582.2	.00148	.000734	.00149	.000739	1.16	
58.0	.0			.97594	589.2	.00131	.000650			1.02	
58.0	12.0			.94406	568.9	.00152	.000754			1.19	
58.0	-12.0			.94965	571.9	.00144	.000714			1.17	
44.0	-12.0			.95692	576.2	.00172	.000853			1.41	
36.0	-8.0			.96252	581.9	.00152	.000754			1.01	
36.0	-3.0			.94406	578.2	.00358	.001776			2.39	
34.0	-3.0			.93902	574.2	.00339	.001682	.00336	.001667	2.25	
32.0	-3.0			.94574	576.2	.00283	.001404	.00278	.001379	2.02	
30.0	-3.0			.96252	586.2	.00279	.001384	.00287	.001424	1.79	
26.0	-3.0			.97147	582.5	.00147	.000729			1.04	
34.0	-12.0			.96420	579.5	.00143	.000709	.00122	.000605		
32.0	-12.0			.96420	581.9	.00132	.000655			.87	
30.0	-12.0			.96587	580.9	.00143	.000709	.00130	.000645	1.02	
19.0	-12.5			.96364	582.5	.00143	.000709			.89	
17.5	-11.0			.96476	581.5	.00172	.000853			.92	
15.5	-2.5			.96364	580.5	.00174	.000863			.94	
16.5	-2.5			.97315	584.5	.00114	.000566	.00137	.000680	.67	
17.5	-2.5			.95916	579.2	.00179	.000888	.00148	.000734	.95	
18.5	-2.5			.96811	582.9	.00156	.000774	.00181	.000898	.95	
19.5	-2.5			.95692	576.2	.00172	.000853	.00161	.000799	1.04	
20.5	-2.5			.95525	575.2	.00172	.000853	.00161	.000799	1.03	
21.5	-2.5			.96084	578.5	.00154	.000764	.00164	.000814	.91	
22.5	-2.5			.95860	576.9	.00155	.000769	.00169	.000838	.91	
23.5	-2.5			.95469	569.2	.00043	.000213			.27	
24.5	-2.5			.96084	580.5	.00152	.000754			.99	
		1.10	0	.96755	641.2	.02160	.010716				1.69
		1.60	0	.96308	643.5	.02384	.011827	.02403	.011921		1.87
		2.60	0	.99720	643.9	.01355	.006722				1.06
		3.60	0	.98937	639.2	.01086	.005388	.01076	.005338		.85
		4.60	0	.98881	631.9	.01111	.005512	.01105	.005482		.87
		6.60	0	.98657	630.5	.01119	.005551				.88
		8.60	0	.98657	630.9	.01150	.005705				.90
		10.60	0	.98713	628.9	.01110	.005507				.87
		2.60	90	.94518	575.2	.00355	.001761				1.17
		4.60	90	.94741	574.5	.00311	.001543				1.02
		2.60	180	.94853	565.9	.00043	.000213				
		4.60	180	.95636	575.9	.00157	.000779	.00156	.000774		
34.0	-1.0			.95357	578.5	.00255	.001265	.00266	.001320	2.20	
34.0	4.0			.94853	575.5	.00242	.001201	.00248	.001230	1.58	
34.0	5.0			.95133	576.5	.00223	.001106	.00224	.001111	1.54	
34.0	6.0			.95525	577.2	.00186	.000923	.00187	.000928	1.28	
36.0	6.0			.95469	577.2	.00189	.000938			1.31	
38.0	1.0			.94909	573.2	.00189	.000938	.00173	.000858	1.25	
38.0	2.0			.97482	584.9	.00112	.000556			.73	
44.0	8.0			.94294	570.2	.00197	.000977	.00194	.000962	1.30	
44.0	6.0			.94070	572.2	.00267	.001325	.00267	.001326	1.89	
44.0	4.0			.95021	574.2	.00189	.000938	.00189	.000938	1.38	
44.0	2.0			.95413	576.9	.00194	.000962	.00192	.000952	1.28	
44.0	1.0			.95748	579.2	.00196	.000972	.00195	.000967	1.30	
6.0	.0			.97482	585.2	.00109	.000541			.92	
6.0	10.0			.94238	569.5	.00136	.000675			1.15	
12.0	.0			.98657	591.9	.00106	.000526			.91	
12.0	4.0			.96755	581.2	.00118	.000585			.93	
12.0	10.0			.94350	567.5	.00136	.000675	.00120	.000595	1.08	
18.0	.0			.97594	587.5	.00111	.000551	.00128	.000635	.90	
30.0	.0			.94126	568.5	.00182	.000903			1.44	
42.0	.0			.97986	587.5	.00106	.000526			.85	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

L-2024

TABLE III. HEAT TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, $\frac{k}{}$ = 0.75 INCH (Cont'd)

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(g) M = 4.44; R = 4.37×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94151	584.5	.00248	.000634			1.38	
12.0	.0			.93718	580.5	.00181	.000463			1.21	
20.5	.0			.94043	584.2	.00177	.000453			1.30	
28.0	12.0			.93339	578.9	.00166	.000425			1.10	
28.0	4.0			.94097	582.2	.00164	.000419			1.03	
28.0	.0			.95289	593.2	.00284	.000726			2.39	
20.5	-5.0			.94151	582.5	.00167	.000427			1.08	
24.5	-5.0			.94043	582.9	.00152	.000389			.98	
30.0	.0			.94964	595.9	.00471	.001205	.00475	.001215	4.10	
31.0	12.0			.93664	580.2	.00155	.000396			1.03	
34.0	.0			.92744	576.5	.00265	.000678	.00252	.000644	1.95	
2.0	-12.0			.94639	587.9	.00216	.000552			.85	
2.0	12.0			.94585	588.9	.00245	.000627			1.00	
12.0	-12.0			.94368	584.5	.00160	.000409			.82	
12.0	12.0			.93447	582.9	.00185	.000473			.95	
30.0	1.0			.94693	593.9	.00443	.001133			3.82	
31.0	2.0			.93123	582.9	.00411	.001051			3.45	
32.0	2.0			.92527	577.2	.00359	.000918	.00349	.000893	2.64	
32.0	3.0			.92635	578.2	.00354	.000905			2.46	
32.0	6.0			.94097	583.9	.00212	.000542			1.41	
34.0	1.0			.92148	575.5	.00367	.000939	.00366	.000936	2.57	
34.0	2.0			.91281	574.9	.00584	.001493	.00617	.001578	4.87	
34.0	3.0			.91065	568.9	.00363	.000928	.00335	.000857	2.50	
36.0	.0			.90957	566.2	.00314	.000803	.00303	.000775	2.73	
38.0	.0			.91715	571.5	.00302	.000772	.00302	.000772	2.20	
40.0	.0			.92689	577.2	.00304	.000777	.00307	.000785	2.22	
44.0	12.0			.94639	586.2	.00134	.000343			1.12	
42.0	.0			.93123	579.2	.00284	.000726	.00281	.000719	2.45	
44.0	.0			.94206	585.2	.00261	.000667	.00263	.000673	1.93	
48.0	.0			.94639	586.5	.00210	.000537	.00211	.000540	1.84	
52.0	.0			.94368	587.2	.00179	.000458	.00178	.000455	1.54	
52.0	12.0			.93935	580.9	.00154	.000394			1.03	
55.0	.0			.95234	587.2	.00162	.000414	.00162	.000414	1.28	
58.0	.0			.95559	590.5	.00152	.000389			1.75	
58.0	12.0			.92744	576.5	.00192	.000491			1.34	
58.0	-12.0			.93231	577.2	.00181	.000463			1.23	
44.0	-12.0			.94909	588.2	.00124	.000317			.85	
36.0	-8.0			.94368	583.5	.00161	.000412			1.10	
36.0	-3.0			.91661	574.9	.00490	.001253			3.63	
34.0	-3.0			.91336	570.5	.00371	.000949	.00361	.000923	3.14	
32.0	-3.0			.92689	578.2	.00339	.000867	.00332	.000849	2.87	
30.0	-3.0			.95072	595.2	.00353	.000903	.00372	.000951	2.99	
28.0	-3.0			.94964	587.9	.00151	.000386			1.30	
34.0	-12.0			.94206	583.2	.00134	.000343				
32.0	-12.0			.94151	582.2	.00142	.000363	.00141	.000361	.83	
30.0	-12.0			.94368	583.9	.00144	.000368			.84	
19.0	-12.5			.94260	583.9	.00149	.000381			.88	
17.5	-11.0			.94206	583.2	.00157	.000402			.90	
15.5	-2.5			.94422	588.9	.00194	.000496			1.34	
16.5	-2.5			.94097	584.9	.00178	.000455	.00173	.000442	1.22	
17.5	-2.5			.93935	584.2	.00179	.000458	.00168	.000430	1.16	
18.5	-2.5			.94476	584.9	.00170	.000435	.00196	.000501	1.47	
19.5	-2.5			.93935	582.9	.00169	.000432	.00160	.000409	1.43	
20.5	-2.5			.93881	581.2	.00168	.000430	.00163	.000417	1.09	
21.5	-2.5			.94097	585.2	.00179	.000458	.00191	.000488	1.53	
22.5	-2.5			.93772	582.9	.00178	.000455	.00164	.000419	1.16	
23.5	-2.5			.93989	581.9	.00153	.000391	.00157	.000402	1.29	
24.5	-2.5			.94043	583.2	.00152	.000389			1.03	
		1.10	0	.96751	636.5	.02564	.006557				1.59
		1.60	0	.96751	640.2	.02939	.007516	.02931	.007496		1.72
		2.60	0	1.00000	644.5	.01424	.003642	.01576	.004030		.84
		3.60	0	.99241	637.2	.01248	.003192	.01222	.003125		.73
		4.60	0	.99187	636.5	.01200	.003069	.01283	.003281		.70
		6.60	0	.99079	634.5	.01078	.002757	.01076	.002752		.64
		8.60	0	.99079	634.5	.01049	.002683	.01052	.002690		.62
		10.60	0	.98754	631.9	.00966	.002470				.76
		2.60	90	.93826	584.9	.00268	.000685	.00239	.000611		.66
		4.60	90	.93826	585.9	.00266	.000680	.00234	.000598		.66
		2.60	180	.94097	579.2	.00049	.000125				
34.0	-1.0			.93177	583.5	.00328	.000839	.00349	.000893	2.83	
34.0	4.0			.92635	576.5	.00285	.000729	.00296	.000757	2.10	
34.0	5.0			.93285	580.5	.00266	.000680	.00268	.000685	2.22	
34.0	6.0			.93935	583.5	.00232	.000593	.00233	.000596	1.55	
36.0	6.0			.93772	582.2	.00235	.000601			1.58	
38.0	1.0			.92906	576.9	.00225	.000575	.00259	.000662	1.64	
38.0	2.0			.91715	572.2	.00253	.000647			1.76	
44.0	8.0			.93014	577.2	.00217	.000555	.00215	.000550	1.46	
44.0	6.0			.92419	577.9	.00370	.000946	.00372	.000951	2.55	
44.0	4.0			.92635	576.5	.00268	.000685	.00267	.000683	2.23	
44.0	2.0			.92852	576.9	.00234	.000598	.00225	.000575	2.02	
44.0	1.0			.93610	583.2	.00245	.000627	.00248	.000634	1.94	
6.0	.0			.95668	592.2	.00122	.000312			1.07	
6.0	10.0			.92581	575.5	.00227	.000581			1.64	
12.0	.0			.96588	595.5	.00102	.000261			1.19	
12.0	5.0			.94693	585.5	.00148	.000378			1.29	
12.0	10.0			.92581	574.9	.00186	.000476			1.35	
18.0	.0			.96317	593.2	.00083	.000212			.95	
30.0	.0			.96317	593.5	.00096	.000246			1.10	
42.0	.0			.96426	593.9	.00078	.000199			.90	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

5. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(h) $M = 4.44$; $R = 3.11 \times 10^6$

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.94180	585.2	.00195	.000706			1.02	
12.0	.0			.93908	580.5	.00137	.000496			.99	
20.5	.0			.94343	579.5	.00109	.000394			.80	
28.0	12.0			.93636	576.9	.00127	.000459			.94	
28.0	4.0			.94398	582.2	.00131	.000474			1.06	
28.0	.0			.95377	592.2	.00217	.000785			1.76	
20.5	-5.0			.94452	581.9	.00117	.000423			.98	
24.5	-5.0			.94398	581.2	.00117	.000423			1.01	
30.0	.0			.94561	587.9	.00360	.001302	.00363	.001313	4.29	
31.0	12.0			.93908	577.5	.00111	.000402			.83	
34.0	.0			.92712	574.5	.00193	.000698	.00189	.000684	1.69	
2.0	-12.0			.94724	585.2	.00182	.000658			.91	
2.0	12.0			.94452	583.9	.00201	.000727			.87	
12.0	-12.0			.94615	582.5	.00125	.000452			.82	
12.0	12.0			.93528	578.9	.00164	.000593			1.03	
30.0	1.0			.94343	591.2	.00364	.001317			2.94	
31.0	2.0			.92821	580.2	.00320	.001158			2.58	
32.0	2.0			.92222	575.2	.00288	.001042	.00279	.001009	2.46	
32.0	3.0			.92494	576.5	.00273	.000988			2.17	
32.0	6.0			.94126	579.9	.00139	.000503			1.11	
34.0	1.0			.91896	573.2	.00290	.001049	.00283	.001024	2.48	
34.0	2.0			.91135	568.9	.00451	.001632	.00466	.001686	3.42	
34.0	3.0			.91080	568.5	.00309	.001118	.00254	.000919	2.47	
34.0	3.0			.91080	568.5	.00309	.001118			2.64	
38.0	.0			.91896	571.9	.00257	.000930	.00257	.000930	2.16	
40.0	.0			.92821	576.5	.00223	.000807	.00225	.000814	2.01	
44.0	12.0			.94942	585.5	.00113	.000409			1.00	
42.0	.0			.93256	580.2	.00220	.000796	.00216	.000781		
44.0	.0			.94452	584.9	.00189	.000684	.00192	.000695	2.25	
48.0	.0			.94942	586.5	.00146	.000528	.00147	.000532	1.34	
52.0	.0			.94779	584.9	.00131	.000474	.00130	.000470	1.56	
52.0	12.0			.94670	581.5	.00114	.000412			1.01	
55.0	.0			.95268	586.9	.00116	.000420	.00115	.000416	1.38	
58.0	.0			.95975	590.9	.00102	.000369			1.21	
58.0	12.0			.93310	576.5	.00149	.000539			1.32	
58.0	-12.0			.93854	578.5	.00119	.000431			1.29	
44.0	-12.0			.95322	584.5	.00073	.000264			.66	
36.0	-8.0			.94561	581.2	.00105	.000380			.95	
36.0	-3.0			.91733	574.5	.00344	.001245			3.19	
34.0	-3.0			.91407	573.2	.00291	.001053	.00281	.001017	2.62	
32.0	-3.0			.92494	572.5	.00256	.000926	.00249	.000901	2.31	
30.0	-3.0			.95105	592.5	.00264	.000955	.00280	.001013	2.26	
28.0	-3.0			.95322	587.2	.00104	.000376			1.24	
34.0	-12.0			.94561	581.9	.00104	.000376				
32.0	-12.0			.94507	580.2	.00108	.000391	.00107	.000387	.96	
30.0	-12.0			.94724	583.2	.00104	.000376			.84	
19.0	-12.5			.94615	582.2	.00125	.000452			.86	
17.5	-11.0			.94507	580.9	.00114	.000412			.87	
15.5	-2.5			.94724	584.2	.00130	.000470			.96	
16.5	-2.5			.94452	581.9	.00130	.000470	.00124	.000449	.99	
17.5	-2.5			.94289	579.2	.00109	.000394	.00100	.000362	.83	
18.5	-2.5			.94779	582.2	.00080	.000289			.67	
19.5	-2.5			.94289	581.2	.00131	.000474	.00121	.000438	1.06	
20.5	-2.5			.94235	578.9	.00081	.000293	.00076	.000275	.67	
21.5	-2.5			.94507	584.2	.00129	.000467	.00141	.000510	1.05	
22.5	-2.5			.94235	580.5	.00130	.000470	.00120	.000434	1.07	
23.5	-2.5			.94398	579.5	.00080	.000289	.00083	.000300	.65	
24.5	-2.5			.94507	579.9	.00080	.000289			.68	
		1.10	0	.96029	623.9	.02047	.007406				1.45
		1.60	0	.96029	626.5	.02307	.008347	.02288	.008278		1.64
		2.60	0	.99347	633.2	.01127	.004078				.80
		3.60	0	.98585	626.2	.01023	.003701	.00997	.003607		.73
		4.60	0	.98531	631.2	.00984	.003560	.01060	.003835		.70
		6.60	0	.98422	633.9	.00939	.003397	.00937	.003390		.67
		8.60	0	.98368	633.5	.00927	.003354	.00930	.003365		.66
		10.60	0	.98096	634.5	.00881	.003187				.63
		2.60	90	.93582	584.9	.00281	.001017	.00245	.000886		.83
		4.60	90	.93636	581.9	.00235	.000850	.00202	.000731		.69
34.0	-1.0			.92929	578.5	.00256	.000926	.00274	.000991	2.35	
34.0	4.0			.92821	573.2	.00220	.000796	.00234	.000847	1.75	
34.0	5.0			.93582	580.2	.00206	.000745	.00211	.000763	1.56	
34.0	6.0			.94072	582.2	.00175	.000633	.00175	.000633	1.33	
36.0	6.0			.94126	582.5	.00175	.000633			1.34	
38.0	1.0			.93147	576.2	.00163	.000590			1.39	
38.0	2.0			.92005	570.2	.00196	.000709			1.68	
44.0	8.0			.93473	578.2	.00175	.000633	.00174	.000630	1.55	
44.0	6.0			.92712	578.2	.00287	.001038	.00287	.001038	2.41	
44.0	4.0			.92984	576.9	.00208	.000753	.00206	.000745	1.66	
44.0	2.0			.93310	578.2	.00192	.000695	.00186	.000673	1.63	
44.0	1.0			.93908	581.2	.00175	.000633	.00175	.000633	1.59	
6.0	.0			.96138	589.2	.00073	.000264			.87	
6.0	10.0			.93038	575.9	.00177	.000640			1.62	
12.0	.0			.97171	594.9	.00055	.000199			.60	
12.0	6.0			.95268	586.5	.00116	.000420			1.05	
12.0	10.0			.93038	575.2	.00163	.000590			1.92	
18.0	.0			.96900	592.9	.00051	.000185			.55	
30.0	.0			.96900	592.9	.00053	.000192			.61	
42.0	.0			.96900	592.9	.00046	.000166			.58	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

5. 1.4-Inch-Diameter Instrumented Cylinder - Concluded

(i) M = 4.44; R = 2.08 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95901	587.9	.00162	.000880			.95	
12.0	.0			.95627	583.9	.00104	.000565			.88	
20.5	.0			.96174	587.2	.00092	.000500			.81	
28.0	12.0			.95463	583.2	.00090	.000489			.88	
28.0	4.0			.96283	587.9	.00087	.000473			.90	
28.0	.0			.96939	593.9	.00143	.000777			1.52	
20.5	-5.0			.96228	587.2	.00089	.000483			.80	
24.5	-5.0			.96283	586.9	.00083	.000451			.89	
30.0	.0			.95409	589.2	.00280	.001521	.00282	.001532	2.89	
31.0	12.0			.95737	584.5	.00080	.000435			.76	
34.0	.0			.93824	575.5	.00134	.000728	.00140	.000761	1.74	
2.0	-12.0			.96502	591.5	.00149	.000809			.97	
2.0	12.0			.96283	592.9	.00168	.000913			.91	
12.0	-12.0			.96228	587.9	.00095	.000516			.87	
12.0	12.0			.95135	582.2	.00100	.000543			.74	
30.0	1.0			.95190	587.9	.00292	.001586			2.68	
31.0	2.0			.93660	576.9	.00242	.001315			2.47	
32.0	2.0			.92895	571.9	.00228	.001239	.00220	.001195	2.38	
32.0	3.0			.93277	573.9	.00206	.001119			2.12	
32.0	6.0			.95573	586.5	.00124	.000674			1.13	
34.0	1.0			.92731	570.9	.00223	.001211	.00217	.001179	2.19	
34.0	2.0			.91856	569.5	.00363	.001972	.00368	.001999	3.70	
34.0	3.0			.92020	566.5	.00226	.001228	.00188	.001021	2.05	
36.0	.0			.92512	567.9	.00170	.000923	.00161	.000875	1.73	
38.0	.0			.93332	572.9	.00188	.001021	.00189	.001027	2.00	
40.0	.0			.94206	577.5	.00161	.000875	.00162	.000880	1.94	
44.0	12.0			.96830	590.2	.00075	.000407				
42.0	.0			.94753	580.5	.00148	.000804	.00145	.000788	1.56	
44.0	.0			.96065	587.9	.00139	.000755	.00142	.000771	1.54	
48.0	.0			.96775	591.9	.00112	.000608	.00113	.000614	1.26	
52.0	.0			.96775	590.9	.00095	.000516	.00094	.000511	1.03	
52.0	12.0			.96392	587.9	.00075	.000407			.85	
55.0	.0			.97212	592.9	.00089	.000483	.00088	.000478	1.19	
58.0	.0			.97868	596.9	.00070	.000380			.79	
58.0	12.0			.95354	582.5	.00094	.000511			1.06	
58.0	-12.0			.95901	584.9	.00085	.000462			1.23	
44.0	-12.0			.97212	592.5	.00061	.000331			.78	
36.0	-8.0			.96228	586.5	.00084	.000456			.91	
36.0	-3.0			.92840	572.9	.00271	.001472			2.95	
34.0	-3.0			.92294	567.9	.00215	.001168	.00207	.001124	2.34	
32.0	-3.0			.93332	573.5	.00197	.001070	.00189	.001027	2.05	
30.0	-3.0			.96065	590.5	.00203	.001103	.00214	.001162	2.05	
28.0	-3.0			.97158	592.5	.00071	.000386			.76	
34.0	-12.0			.96556	587.9	.00062	.000337				
32.0	-12.0			.96556	587.5	.00071	.000386	.00070	.000380	.80	
30.0	-12.0			.96720	588.9	.00072	.000391			.95	
19.0	-12.5			.96556	588.2	.00085	.000462			.90	
17.5	-11.0			.96447	587.5	.00079	.000429			.74	
15.5	-2.5			.96720	589.2	.00094	.000511			.88	
16.5	-2.5			.96447	587.2	.00091	.000494	.00086	.000467	.84	
17.5	-2.5			.96283	586.9	.00093	.000505	.00084	.000456	.85	
18.5	-2.5			.96830	589.9	.00076	.000413			.68	
19.5	-2.5			.96283	586.5	.00084	.000456	.00076	.000413	.75	
20.5	-2.5			.96228	586.5	.00077	.000418	.00072	.000391	.75	
21.5	-2.5			.96502	587.9	.00071	.000386	.00080	.000435	.73	
23.5	-2.5			.96392	587.5	.00074	.000402	.00077	.000418	.80	
24.5	-2.5			.96447	587.5	.00066	.000359			.69	
		1.10	0	.96010	625.9	.02121	.011522				1.83
		1.60	0	.96119	628.2	.02227	.012097	.02215	.012032		1.93
		2.60	0	.99398	632.5	.01092	.005932				.94
		3.60	0	.98688	625.5	.00976	.005302	.00951	.005166		.84
		4.60	0	.98688	625.2	.00971	.005275	.01043	.005666		.84
		6.60	0	.98524	623.5	.00904	.004911	.00903	.004905		.78
		8.60	0	.98524	622.9	.00820	.004454	.00821	.004460		.71
		10.60	0	.98196	621.2	.00806	.004378				.70
		2.60	90	.94316	583.9	.00238	.001293	.00206	.001119		.87
		4.60	90	.94534	582.2	.00204	.001108				.74
		2.60	180	.95081	577.5	.00028	.000152				
34.0	-1.0			.93714	576.2	.00209	.001135	.00220	.001195	2.35	
34.0	4.0			.93988	576.2	.00156	.000847	.00169	.000918	1.56	
34.0	5.0			.94862	581.2	.00153	.000831	.00159	.000864	1.55	
34.0	6.0			.95409	585.5	.00124	.000674	.00122	.000663	1.25	
36.0	6.0			.95682	586.9	.00123	.000668			1.26	
38.0	1.0			.94534	577.9	.00105	.000570			1.31	
38.0	2.0			.93496	574.9	.00132	.000717			1.40	
44.0	8.0			.95299	582.2	.00106	.000576	.00106	.000576	1.14	
44.0	6.0			.94152	579.2	.00200	.001086	.00198	.001076	2.08	
44.0	4.0			.94644	579.9	.00148	.000804	.00147	.000799	1.59	
44.0	2.0			.95190	582.5	.00142	.000771	.00140	.000761	1.56	
44.0	1.0			.95573	586.5	.00123	.000668	.00120	.000652	1.32	
6.0	.0			.98141	597.9	.00047	.000255			.61	
6.0	10.0			.94862	580.2	.00101	.000549			1.60	
12.0	.0			.99234	604.2	.00044	.000239			.64	
12.0	5.0			.97322	593.5	.00060	.000326			.88	
12.0	10.0			.94917	580.2	.00099	.000538			1.15	
18.0	.0			.98906	602.2	.00045	.000244			.58	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5°

(a) M = 2.65; R = 3.84 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95353	596.5	.00668	.000953			1.02	
12.0	.0			.94634	588.2	.00571	.000815			1.06	
20.5	.0			.94855	589.9	.00574	.000819			1.10	
28.0	12.0			.94744	592.2	.00627	.000894			1.15	
28.0	4.0			.92034	580.5	.00814	.001161			1.52	
28.0	.0			.93030	593.9	.01072	.001529			2.04	
20.5	-5.0			.94634	587.9	.00562	.000802			1.06	
24.5	-5.0			.94689	587.9	.00545	.000777			1.00	
30.0	.0			.96293	634.9	.01943	.002772	.01976	.002819	3.96	
31.0	12.0			.92974	582.5	.00692	.000987			1.33	
34.0	.0			.92476	571.5	.00445	.000635	.00399	.000569	.88	
2.0	-12.0			.95961	598.5	.00653	.000932			1.04	
2.0	12.0			.95795	599.5	.00651	.000929			1.00	
12.0	-12.0			.95353	592.9	.00570	.000813			1.04	
12.0	12.0			.94357	588.9	.00606	.000864			1.06	
30.0	1.0			.95353	630.5	.01618	.002308			3.17	
31.0	2.0			.94136	599.9	.01081	.001542			2.13	
32.0	2.0			.94468	589.2	.00619	.000883	.00587	.000837	1.29	
32.0	3.0			.93749	602.9	.01265	.001805			2.40	
32.0	6.0			.93361	590.9	.00875	.001248			1.64	
34.0	1.0			.93804	583.9	.00597	.000852	.00573	.000817	1.19	
34.0	2.0			.94523	606.9	.01217	.001736	.01283	.001830	2.31	
34.0	3.0			.94025	611.5	.01606	.002291	.01558	.002222	3.03	
36.0	.0			.90706	566.9	.00636	.000907	.00624	.000890	1.28	
38.0	.0			.91702	581.2	.00943	.001345	.00949	.001354	1.78	
40.0	.0			.92144	584.2	.00912	.001301	.00913	.001302	1.87	
44.0	12.0			.93527	587.9	.00749	.001068			1.41	
42.0	.0			.92753	585.9	.00849	.001211	.00847	.001208	1.68	
44.0	.0			.93915	591.2	.00767	.001094	.00769	.001097	1.57	
48.0	.0			.94468	591.5	.00688	.000981	.00685	.000977	1.42	
52.0	.0			.94357	611.9	.01495	.002133	.01503	.002144	2.82	
52.0	12.0			.92642	577.9	.00599	.000854			1.25	
55.0	.0			.94910	589.9	.00546	.000779	.00540	.000770	1.08	
58.0	.0			.95132	591.9	.00583	.000832			1.15	
58.0	12.0			.92864	574.5	.00471	.000672			.96	
58.0	-12.0			.92808	577.9	.00581	.000829			1.16	
44.0	-12.0			.94855	589.5	.00542	.000773			1.09	
36.0	-8.0			.95076	593.2	.00615	.000877			1.27	
36.0	-3.0			.93693	597.5	.01067	.001522			2.21	
34.0	-3.0			.93970	604.2	.01226	.001749	.01232	.001757	2.42	
32.0	-3.0			.94246	602.9	.01107	.001579	.01110	.001583	2.23	
30.0	-3.0			.94357	596.9	.00875	.001248	.00871	.001242	1.74	
28.0	-3.0			.95906	598.2	.00614	.000876			1.26	
34.0	-12.0			.99225	606.5	.00277	.000395				
32.0	-12.0			.94910	588.2	.00511	.000729	.00501	.000715	1.03	
30.0	-12.0			.95021	589.5	.00527	.000752			1.07	
19.0	-12.5			.95132	590.9	.00547	.000780			1.06	
17.5	-11.0			.95021	590.5	.00545	.000777			1.04	
15.5	-2.5			.95353	593.5	.00569	.000812			1.06	
16.5	-2.5			.95021	591.2	.00574	.000819	.00575	.000820	1.11	
17.5	-2.5			.94634	588.9	.00556	.000793	.00543	.000775	1.04	
18.5	-2.5			.95242	592.2	.00546	.000779	.00561	.000800	1.05	
19.5	-2.5			.94634	588.9	.00562	.000802	.00556	.000793	1.05	
20.5	-2.5			.94523	588.2	.00547	.000780	.00541	.000772	1.03	
21.5	-2.5			.94800	589.5	.00554	.000790	.00558	.000796	1.05	
22.5	-2.5			.94855	589.5	.00544	.000776	.00547	.000780	1.03	
23.5	-2.5			.97621	589.5	.00099	.000141	.00083	.000118	.19	
24.5	-2.5			.95242	592.9	.00571	.000815			1.10	
		1.10	0	.97953	674.2	.04010	.005720				1.71
		1.60	0	.97178	664.2	.03498	.004990	.03448	.004919		1.49
		2.60	0	.99944	666.5	.02353	.003357	.02429	.003465		1.[illegible]
		3.60	0	.99114	650.2	.01764	.002516	.01703	.002429		.[illegible]
		4.60	0	.99280	653.5	.01841	.002626	.01959	.002795		.78
		6.60	0	.99059	649.5	.01727	.002464	.01723	.002458		.74
		8.60	0	.99225	650.2	.01728	.002465	.01728	.002465		.74
		10.60	0	.99170	651.5	.01785	.002546				.76
		2.60	90	.94136	583.2	.00410	.000585	.00403	.000575		.73
		4.60	90	.94634	585.9	.00357	.000509	.00314	.000448		.64
		2.60	180	.96238	578.9	.00046	.000066				
		4.60	180	.95076	592.9	.00599	.000854	.00613	.000874		
34.0	-1.0			.94634	591.9	.00651	.000929	.00674	.000961	1.44	
34.0	4.0			.94468	609.5	.01294	.001846	.01330	.001897	2.47	
34.0	5.0			.93030	595.5	.01113	.001588	.01067	.001522	2.18	
34.0	6.0			.92808	604.2	.01222	.001743	.01205	.001719	2.32	
36.0	6.0			.92808	593.9	.01059	.001511			2.01	
38.0	1.0			.92808	583.5	.00740	.001056	.00714	.001019	1.50	
38.0	2.0			.95132	596.5	.00687	.000980			1.39	
44.0	8.0			.93915	591.5	.00771	.001100	.00779	.001111	1.44	
44.0	6.0			.92200	572.9	.00513	.000732	.00496	.000708	1.01	
44.0	4.0			.93693	583.5	.00570	.000813	.00574	.000819	1.14	
44.0	2.0			.93195	586.5	.00789	.001126	.00766	.001093	1.57	
44.0	1.0			.93306	586.9	.00749	.001068	.00748	.001053	1.60	
6.0	.0			.94910	590.2	.00533	.000760			1.19	
6.0	10.0			.94136	586.5	.00565	.000806			1.2	
12.0	.0			.95629	593.9	.00522	.000745			1.19	
12.0	5.0			.95795	592.9	.00452	.000645			1.01	
12.0	10.0			.93749	586.2	.00608	.000867			1.31	
18.0	.0			.94966	589.2	.00519	.000740			1.11	
30.0	.0			.94357	584.9	.00505	.000720			.88	
42.0	.0			.95685	599.9	.00693	.000989			1.54	

[a]Thermocouple locations for which z and/or ø stations are provided are for models. x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(b) M = 2.65; R = 2.51 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95082	589.9	.00521	.001147			1.10	
12.0	.0			.94474	582.5	.00407	.000896			1.05	
20.5	.0			.94971	585.2	.00422	.000929			1.17	
28.0	12.0			.94916	586.5	.00439	.000966			1.13	
28.0	4.0			.92374	575.2	.00590	.001299			1.58	
28.0	.0			.93313	586.2	.00808	.001779			2.19	
20.5	-5.0			.94584	582.9	.00396	.000872			1.06	
24.5	-5.0			.94695	582.5	.00382	.000841			1.06	
30.0	.0			.96518	622.2	.01431	.003150	.01460	.003214	4.17	
31.0	12.0			.93037	576.2	.00478	.001052			1.32	
34.0	.0			.92650	568.2	.00305	.000671	.00263	.000579	.91	
2.0	-12.0			.95524	591.5	.00511	.001125			1.10	
2.0	12.0			.95358	592.2	.00564	.001242			1.16	
12.0	-12.0			.95247	587.2	.00424	.000933			1.09	
12.0	12.0			.94308	582.9	.00470	.001035			1.12	
30.0	1.0			.95524	616.9	.01170	.002576			3.25	
31.0	2.0			.94308	591.2	.00771	.001697			2.18	
32.0	2.0			.94032	580.9	.00437	.000962	.00428	.000942	1.30	
32.0	3.0			.94198	595.9	.00936	.002060			2.56	
32.0	6.0			.93479	584.2	.00664	.001462			1.78	
34.0	1.0			.93700	577.5	.00415	.000914			1.19	
34.0	2.0			.94529	595.2	.00825	.001816	.00870	.001915	2.30	
34.0	3.0			.94253	600.5	.01100	.002421	.01118	.002461	3.05	
36.0	.0			.90993	566.5	.00486	.001070	.00478	.001052	1.40	
38.0	.0			.91545	571.5	.00655	.001442	.00657	.001446	1.88	
40.0	.0			.92098	582.5	.00633	.001393	.00634	.001396	1.94	
44.0	12.0			.94032	583.5	.00519	.001142			1.41	
42.0	.0			.92595	577.2	.00601	.001323	.00596	.001312	1.71	
44.0	.0			.94142	585.2	.00575	.001266	.00557	.001226	1.70	
48.0	.0			.94419	588.2	.00498	.001096	.00496	.001092	1.49	
52.0	.0			.94363	600.5	.01102	.002426	.01108	.002439	3.22	
52.0	12.0			.92982	573.5	.00413	.000909			1.22	
55.0	.0			.94640	583.5	.00421	.000927	.00417	.000918	1.30	
58.0	.0			.94916	585.5	.00421	.000927			1.31	
58.0	12.0			.93037	571.2	.00337	.000742			1.03	
58.0	-12.0			.92871	572.5	.00428	.000942			1.30	
44.0	-12.0			.94529	582.5	.00392	.000863			1.24	
36.0	-8.0			.94805	585.5	.00466	.001026			1.39	
36.0	-3.0			.94087	590.5	.00761	.001675			2.25	
34.0	-3.0			.94308	601.2	.00910	.002003	.00916	.002016	2.72	
32.0	-3.0			.94253	593.5	.00826	.001818	.00827	.001820	2.43	
30.0	-3.0			.94529	590.2	.00645	.001420	.00641	.001411	1.80	
28.0	-3.0			.96021	596.2	.00439	.000966			1.40	
34.0	-12.0			.95413	585.9	.00353	.000777	.00323	.000711		
32.0	-12.0			.94805	582.9	.00373	.000821	.00316	.000696	1.12	
30.0	-12.0			.95082	584.9	.00374	.000823	.00346	.000762	1.11	
19.0	-12.5			.95026	584.9	.00383	.000843			1.08	
17.5	-11.0			.94861	584.5	.00394	.000867			1.05	
15.5	-2.5			.95192	587.2	.00403	.000887			1.04	
16.5	-2.5			.94916	585.2	.00402	.000885	.00404	.000889	1.11	
17.5	-2.5			.94419	582.5	.00403	.000887	.00383	.000843	1.07	
18.5	-2.5			.95413	588.2	.00392	.000863	.00422	.000929	1.07	
19.5	-2.5			.94198	580.9	.00423	.000931	.00409	.000900	1.12	
20.5	-2.5			.94087	580.5	.00402	.000885	.00391	.000861	1.08	
21.5	-2.5			.94640	583.2	.00390	.000859	.00400	.000881	1.06	
22.5	-2.5			.94474	582.2	.00393	.000865	.00396	.000872	1.06	
23.5	-2.5			.95966	580.9	.00077	.000170	.00060	.000132	.21	
24.5	-2.5			.95026	585.9	.00403	.000887			1.12	
		1.10	0	.98010	658.5	.03113	.006853				1.63
		1.60	0	.97181	648.5	.02744	.006040	.02756	.006067		1.44
		2.60	0	.99668	650.9	.01871	.004119				.98
		3.60	0	.98894	638.2	.01446	.003183	.01500	.003302		.76
		4.60	0	.98894	646.9	.01533	.003375	.01556	.003425		.80
		6.60	0	.98673	636.5	.01509	.003322				.79
		8.60	0	.99115	639.2	.01497	.003295				.78
		10.60	0	.98894	639.2	.01474	.003245				.77
		2.60	90	.93756	574.5	.00348	.000766				.77
		4.60	90	.94198	575.2	.00260	.000572				.57
		2.60	180	.94584	571.2	.00046	.000101				
		4.60	180	.94529	584.2	.00432	.000951	.00434	.000955		
34.0	-1.0			.94529	583.9	.00442	.000973	.00458	.001008	1.43	
34.0	4.0			.94750	600.2	.00987	.002173	.01031	.002270	2.78	
34.0	5.0			.92761	573.2	.00601	.001323			1.62	
34.0	6.0			.93092	595.9	.00807	.001776	.00814	.001792	2.18	
36.0	6.0			.92650	581.5	.00727	.001600			2.03	
38.0	1.0			.93148	578.9	.00529	.001164	.00522	.001149	1.53	
38.0	2.0			.95026	588.9	.00482	.001061			1.38	
44.0	8.0			.93811	582.9	.00524	.001153	.00531	.001169	1.49	
44.0	6.0			.91987	566.5	.00374	.000823	.00355	.000781	1.05	
44.0	4.0			.93977	580.2	.00427	.000940	.00435	.000958	1.27	
44.0	2.0			.93535	583.9	.00509	.001120	.00508	.001118	1.47	
44.0	1.0			.93645	581.5	.00524	.001153	.00517	.001138	1.63	
6.0	.0			.94861	584.9	.00382	.000841			1.23	
6.0	5.0			.94695	581.9	.00318	.000700	.00309	.000680		
6.0	10.0			.94253	582.2	.00404	.000889	.00378	.000832	1.30	
12.0	.0			.95634	588.9	.00374	.000823	.00391	.000861	1.24	
12.0	5.0			.95524	586.5	.00310	.000682			.99	
12.0	10.0			.93866	580.2	.00452	.000995	.00446	.000982	1.43	
18.0	.0			.94861	583.9	.00362	.000797	.00366	.000806	1.19	
30.0	.0			.94363	580.2	.00354	.000779			1.15	
42.0	.0			.95524	591.9	.00483	.001063	.00442	.000973	1.52	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. HEAT TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(c) M = 2.65; R = 1.28×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.97252	584.5	.00103	.000449			1.01	
12.0	.0			.95851	579.2	.00297	.001295			1.20	
20.5	.0			.96412	581.2	.00253	.001103			1.09	
28.0	12.0			.96187	580.5	.00256	.001116			1.17	
28.0	4.0			.94113	570.5	.00321	.001399			1.38	
28.0	.0			.94618	578.5	.00490	.002136			2.40	
20.5	-5.0			.96243	580.2	.00253	.001103			1.13	
24.5	-5.0			.96355	580.2	.00233	.001016			1.05	
30.0	.0			.96916	606.2	.00933	.004067	.00952	.004149	4.38	
31.0	12.0			.94562	571.9	.00284	.001238			1.34	
34.0	.0			.94730	569.5	.00167	.000728	.00141	.000615	.88	
2.0	-12.0			.98262	589.5	.00099	.000432			1.38	
2.0	12.0			.98149	587.2	.00083	.000362			1.01	
12.0	-12.0			.96804	587.2	.00288	.001255			1.16	
12.0	12.0			.95571	578.9	.00305	.001329			1.13	
30.0	1.0			.96131	597.2	.00785	.003421			3.67	
31.0	2.0			.95122	579.9	.00430	.001874			2.21	
32.0	2.0			.95290	577.2	.00264	.001151	.00253	.001103	1.41	
32.0	3.0			.95627	587.5	.00572	.002493			2.80	
32.0	6.0			.94954	578.5	.00402	.001752			1.95	
34.0	1.0			.94954	571.2	.00212	.000924	.00195	.000850	1.00	
34.0	2.0			.95290	581.5	.00450	.001961	.00462	.002014	2.10	
34.0	3.0			.95290	588.5	.00695	.003029	.00704	.003068	3.25	
36.0	.0			.92880	565.5	.00269	.001172	.00262	.001142	1.44	
38.0	.0			.93104	565.5	.00356	.001552	.00357	.001556	1.84	
40.0	.0			.93440	567.5	.00376	.001639	.00376	.001639	2.03	
44.0	12.0			.95571	578.2	.00282	.001229			1.33	
42.0	.0			.93777	569.2	.00348	.001517	.00344	.001499	1.84	
44.0	.0			.95346	577.5	.00310	.001351	.00312	.001360	1.68	
48.0	.0			.95739	578.5	.00273	.001190	.00272	.001186	1.50	
52.0	.0			.95066	584.9	.00616	.002685	.00618	.002694	3.29	
52.0	12.0			.95010	571.9	.00216	.000941			1.19	
55.0	.0			.96131	579.5	.00235	.001024	.00233	.001016	1.38	
58.0	.0			.96580	582.2	.00252	.001098			1.41	
58.0	12.0			.95402	572.9	.00174	.000758			.96	
58.0	-12.0			.94954	572.2	.00226	.000985			1.27	
44.0	-12.0			.96243	581.9	.00259	.001129			1.62	
36.0	-8.0			.96187	580.5	.00259	.001129			1.36	
36.0	-3.0			.95515	582.9	.00461	.002009			2.49	
34.0	-3.0			.95515	586.2	.00561	.002445	.00565	.002463	3.02	
32.0	-3.0			.95178	582.5	.00489	.002131	.00487	.002123	2.53	
30.0	-3.0			.95851	582.9	.00384	.001674	.00382	.001665	1.93	
28.0	-3.0			.97421	587.5	.00240	.001046			1.21	
34.0	-12.0			.97309	584.2	.00191	.000832	.00156	.000680		
32.0	-12.0			.96804	581.5	.00212	.000924			1.14	
30.0	-12.0			.97028	582.9	.00204	.000889	.00183	.000798	1.05	
19.0	-12.5			.96860	582.9	.00249	.001085			1.14	
17.5	-11.0			.96748	582.5	.00238	.001037			1.07	
15.5	-2.5			.96916	584.2	.00261	.001138			1.07	
16.5	-2.5			.96468	580.5	.00213	.000928	.00208	.000907	.94	
17.5	-2.5			.96131	581.2	.00259	.001129	.00242	.001055	1.03	
18.5	-2.5			.97196	585.2	.00249	.001085	.00273	.001190	1.11	
19.5	-2.5			.95963	578.2	.00253	.001103	.00240	.001046	1.12	
20.5	-2.5			.95907	577.5	.00252	.001098	.00243	.001059	1.13	
21.5	-2.5			.96412	580.5	.00251	.001094	.00259	.001129	1.12	
22.5	-2.5			.96299	579.5	.00250	.001090	.00254	.001107	1.13	
23.5	-2.5			.96692	575.5	.00049	.000214			.22	
24.5	-2.5			.96580	582.2	.00255	.001111			1.21	
		1.10	0	.97925	638.9	.02166	.009441				1.60
		1.60	0	.97140	636.2	.01824	.007950	.01833	.007989		1.42
		2.60	0	.99551	630.5	.01285	.005601				.95
		3.60	0	.99046	628.2	.01051	.004581	.01045	.004555		.78
		4.60	0	.98990	622.5	.01110	.004838	.01133	.004938		.82
		6.60	0	.98822	620.9	.01079	.004703				.80
		8.60	0	.99215	623.2	.01074	.004681				.79
		10.60	0	.98934	622.5	.01039	.004529				.77
		2.60	90	.94842	571.2	.00218	.000950				.68
		4.60	90	.95346	572.9	.00190	.000828				.59
		4.60	180	.95627	568.5	.00032	.000139				
		4.60	180	.96187	580.2	.00265	.001155	.00266	.001159		
34.0	-1.0			.95907	581.2	.00225	.000981	.00232	.001011	1.26	
34.0	4.0			.96131	590.5	.00560	.002441	.00619	.002698	2.68	
34.0	5.0			.94337	572.2	.00357	.001556	.00288	.001255	1.75	
34.0	6.0			.94562	578.5	.00474	.002066	.00476	.002075	2.26	
36.0	6.0			.94225	574.5	.00430	.001874			2.02	
38.0	1.0			.94674	575.9	.00325	.001417	.00322	.001403		
38.0	2.0			.96412	582.5	.00269	.001172			1.35	
44.0	8.0			.94954	575.2	.00310	.001351	.00313	.001364	1.57	
44.0	6.0			.93945	569.2	.00204	.000889	.00191	.000832	1.05	
44.0	4.0			.95907	577.9	.00235	.001024	.00242	.001055	1.22	
44.0	2.0			.95346	576.9	.00283	.001233	.00282	.001229	1.47	
44.0	1.0			.95459	577.2	.00297	.001295	.00296	.001290	1.62	
6.0	.0			.96524	581.2	.00224	.000976			1.40	
6.0	5.0			.96580	581.5	.00178	.000776	.00168	.000732		
6.0	10.0			.96412	580.9	.00225	.000981	.00211	.000920	1.24	
12.0	.0			.97309	585.9	.00218	.000950	.00233	.001016	1.40	
12.0	5.0			.97365	583.9	.00169	.000737			.95	
12.0	10.0			.95795	577.5	.00220	.000959	.00217	.000946	1.22	
18.0	.0			.96468	580.5	.00202	.000880	.00207	.000902	1.28	
30.0	.0			.95851	575.2	.00171	.000745			1.07	
42.0	.0			.97028	586.5	.00294	.001281	.00248	.001081	1.65	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(d) M = 3.51; R = 2.79 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.95253	584.5	.00375	.001044			1.09	
12.0	.0			.94806	575.2	.00302	.000841			1.14	
20.5	.0			.95365	578.2	.00271	.000754			1.07	
28.0	12.0			.95197	577.9	.00276	.000768			1.21	
28.0	4.0			.93131	569.2	.00359	.000999			1.61	
28.0	.0			.93354	576.5	.00516	.001437			2.22	
20.5	-5.0			.95253	584.5	.00240	.000668			1.02	
24.5	-5.0			.95309	577.2	.00237	.000660			1.08	
30.0	.0			.97487	619.5	.01148	.003196	.01168	.003252	5.42	
31.0	12.0			.94192	572.2	.00279	.000777			1.27	
34.0	.0			.93689	566.5	.00221	.000615	.00189	.000526	1.05	
2.0	-12.0			.95867	585.2	.00350	.000974			1.03	
2.0	12.0			.95588	586.2	.00386	.001075			1.11	
12.0	-12.0			.95755	581.2	.00272	.000757			1.06	
12.0	12.0			.94471	573.9	.00305	.000849			1.13	
30.0	1.0			.96928	623.5	.00931	.002592			4.12	
31.0	2.0			.94583	585.2	.00572	.001592			2.54	
32.0	2.0			.94918	576.5	.00283	.000788	.00251	.000699	1.35	
32.0	3.0			.93298	590.2	.00657	.001829			2.84	
32.0	6.0			.93689	580.5	.00420	.001169			1.80	
34.0	1.0			.93801	569.5	.00288	.000802	.00250	.000696	1.33	
34.0	2.0			.93913	596.2	.00729	.002030	.00800	.002227	3.05	
34.0	3.0			.93243	594.2	.00952	.002650	.00959	.002670	3.98	
36.0	.0			.91791	565.5	.00341	.000949	.00333	.000927	1.59	
38.0	.0			.93075	573.9	.00368	.001025	.00371	.001033	1.70	
40.0	.0			.93243	574.9	.00423	.001178	.00424	.001180	2.00	
44.0	12.0			.94471	577.5	.00392	.001091			1.92	
42.0	.0			.93578	577.2	.00436	.001214	.00433	.001206	1.93	
44.0	.0			.95141	581.2	.00363	.001011	.00366	.001019	1.73	
48.0	.0			.95309	580.2	.00346	.000963	.00347	.000966	1.67	
52.0	.0			.93578	576.9	.00577	.001606	.00576	.001604	2.79	
52.0	12.0			.93745	570.5	.00314	.000874			1.66	
55.0	.0			.95588	586.2	.00238	.000663	.00237	.000660	1.18	
58.0	.0			.96146	581.5	.00229	.000638			1.15	
58.0	12.0			.93969	568.9	.00243	.000677			1.29	
58.0	-12.0			.93410	571.9	.00399	.001111			2.11	
44.0	-12.0			.95085	583.2	.00239	.000665			1.18	
36.0	-8.0			.94750	579.5	.00330	.000919			1.49	
36.0	-3.0			.94527	595.2	.00648	.001804			3.27	
34.0	-3.0			.94359	597.2	.00711	.001979	.00717	.001996	3.39	
32.0	-3.0			.94471	582.9	.00536	.001492	.00529	.001473	2.53	
30.0	-3.0			.94862	593.5	.00542	.001509	.00545	.001517	2.50	
28.0	-3.0			.96537	587.5	.00316	.000880			1.48	
34.0	-12.0			1.02122	610.9	.00067	.000187	.00059	.000164		
32.0	-12.0			.95532	577.5	.00217	.000604			1.03	
30.0	-12.0			.95755	579.2	.00236	.000657	.00209	.000582	1.12	
19.0	-12.5			.95644	581.2	.00251	.000699			1.08	
17.5	-11.0			.95532	582.5	.00240	.000668			.94	
15.5	-2.5			.95811	584.9	.00260	.000724			1.04	
16.5	-2.5			.95253	576.5	.00239	.000665	.00231	.000643	.98	
17.5	-2.5			.94862	575.2	.00259	.000721	.00236	.000657	1.00	
18.5	-2.5			.96091	585.5	.00247	.000688	.00285	.000793	1.06	
19.5	-2.5			.94862	581.9	.00240	.000668	.00226	.000629	.98	
20.5	-2.5			.94750	575.9	.00241	.000671	.00230	.000640	.98	
21.5	-2.5			.95309	584.2	.00238	.000663	.00265	.000738	1.03	
22.5	-2.5			.95030	575.5	.00241	.000671	.00251	.000699	1.01	
23.5	-2.5			.95532	570.2	.00050	.000139			.22	
24.5	-2.5			.95309	582.2	.00273	.000760			1.19	
		1.10	0	.96426	653.9	.03160	.008798				1.88
		1.60	0	.98213	665.2	.02854	.007946	.02888	.008040		1.70
		2.60	0	.99888	650.9	.01496	.004165				.89
		3.60	0	.99385	649.9	.01585	.004413	.01585	.004413		.94
		4.60	0	.99385	653.5	.01446	.004026	.01507	.004196		.86
		6.60	0	.98938	643.2	.01424	.003965				.85
		8.60	0	.99329	645.2	.01443	.004017				.86
		10.60	0	.99162	644.9	.01461	.004068				.87
		2.60	90	.94192	572.5	.00280	.000780				.70
		4.60	90	.94304	570.5	.00308	.000857				.77
		2.60	180	.94806	565.5	.00045	.000125	.00041	.000114		
		4.60	180	.94918	576.5	.00277	.000771	.00277	.000771		
34.0	-1.0			.95141	580.5	.00356	.000991	.00371	.001033	1.78	
34.0	4.0			.94024	596.2	.00723	.002013	.00781	.002174	3.32	
34.0	5.0			.93354	571.9	.00524	.001459	.00462	.001286	2.38	
34.0	6.0			.93689	587.9	.00561	.001562	.00569	.001584	2.56	
38.0	1.0			.94024	577.2	.00368	.001025	.00363	.001011	1.74	
38.0	2.0			.96426	586.9	.00203	.000565			.95	
44.0	8.0			.92796	575.5	.00437	.001217	.00435	.001211	2.08	
44.0	6.0			.93745	574.2	.00282	.000785	.00275	.000766	1.34	
44.0	4.0			.95979	582.2	.00251	.000699	.00259	.000721	1.18	
44.0	2.0			.95030	584.2	.00325	.000905	.00321	.000894	1.54	
44.0	1.0			.95365	581.2	.00332	.000924	.00335	.000933	1.65	
6.0	.0			.96202	581.2	.00198	.000551			1.07	
6.0	5.0			.96202	582.5	.00206	.000574	.00218	.000607		
6.0	10.0			.95141	578.9	.00219	.000610	.00173	.000482	1.15	
12.0	.0			.97152	589.2	.00192	.000535	.00232	.000646	1.08	
12.0	5.0			.96816	589.5	.00175	.000487			.93	
12.0	10.0			.94694	573.5	.00259	.000721	.00250	.000696	1.36	
18.0	.0			.96314	582.2	.00192	.000535	.00199	.000554	1.07	
30.0	.0			.94862	574.9	.00244	.000679			1.19	
42.0	.0			.96872	584.2	.00195	.000543			1.03	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(e) M = 3.51; R = 1.56 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96921	585.5	.00205	.001023			1.23	
12.0	.0			.96194	579.2	.00169	.000843			.88	
20.5	.0			.96921	582.5	.00163	.000813			.87	
28.0	12.0			.96474	581.9	.00171	.000853			1.10	
28.0	4.0			.94627	571.5	.00210	.001048			1.33	
28.0	.0			.94571	575.9	.00303	.001511			1.94	
20.5	-5.0			.96977	582.5	.00145	.000723			.88	
24.5	-5.0			.97033	582.9	.00140	.000698			.88	
30.0	.0			.97593	615.2	.00690	.003442	.00705	.003517	4.37	
31.0	12.0			.95746	575.9	.00158	.000788			1.04	
34.0	.0			.95466	573.2	.00119	.000594	.00110	.000549	.78	
2.0	-12.0			.97593	589.2	.00182	.000908			1.14	
2.0	12.0			.97257	587.2	.00176	.000878			1.15	
12.0	-12.0			.97201	586.9	.00171	.000853			.90	
12.0	12.0			.95802	576.9	.00182	.000908			.92	
30.0	1.0			.97257	611.2	.00635	.003167			3.99	
31.0	2.0			.95354	582.9	.00350	.001746			2.30	
32.0	2.0			.96809	582.5	.00164	.000818	.00166	.000828	1.08	
32.0	3.0			.94683	585.5	.00424	.002115			2.65	
32.0	6.0			.95018	579.2	.00274	.001367			1.78	
34.0	1.0			.94906	571.2	.00161	.000803			1.06	
34.0	2.0			.94739	582.9	.00442	.002205	.00446	.002225	2.89	
34.0	3.0			.94347	585.9	.00622	.003103	.00623	.003108	3.99	
36.0	.0			.93507	570.2	.00210	.001048	.00203	.001013	1.52	
38.0	.0			.94683	572.5	.00220	.001097	.00221	.001102	1.55	
40.0	.0			.94906	575.9	.00256	.001277	.00257	.001282	1.68	
44.0	12.0			.96026	580.5	.00203	.001013			1.34	
42.0	.0			.95242	577.2	.00250	.001247	.00247	.001232	1.77	
44.0	.0			.96865	585.2	.00213	.001062	.00215	.001072	1.42	
48.0	.0			.97145	585.9	.00177	.000883	.00179	.000893	1.37	
52.0	.0			.94291	574.5	.00349	.001741	.00345	.001721	2.66	
52.0	12.0			.95634	575.9	.00177	.000883			1.35	
55.0	.0			.97481	589.5	.00138	.000688	.00140	.000698	1.08	
58.0	.0			.98209	589.2	.00119	.000594			.93	
58.0	12.0			.96082	576.9	.00136	.000678			1.06	
58.0	-12.0			.95130	576.2	.00250	.001247			2.03	
44.0	-12.0			.96809	581.2	.00162	.000808			1.33	
36.0	-8.0			.96641	583.2	.00187	.000933			1.24	
36.0	-3.0			.95634	586.2	.00381	.001900			2.54	
34.0	-3.0			.95298	586.5	.00430	.002145	.00435	.002170	2.85	
32.0	-3.0			.95018	579.2	.00319	.001591	.00311	.001551	2.28	
30.0	-3.0			.95914	586.2	.00361	.001801	.00362	.001806	2.31	
28.0	-3.0			.98097	589.9	.00197	.000983			1.39	
34.0	-12.0			1.03693	617.5	.00044	.000219	.00046	.000229		
32.0	-12.0			.97425	583.5	.00125	.000624			.82	
30.0	-12.0			.97761	585.2	.00124	.000619	.00106	.000529	.89	
19.0	-12.5			.97425	584.2	.00138	.000688			.86	
17.5	-11.0			.97201	583.5	.00149	.000743			.80	
15.5	-2.5			.97537	585.9	.00161	.000803			.87	
16.5	-2.5			.97481	585.2	.00138	.000688	.00146	.000728	.81	
17.5	-2.5			.96641	580.2	.00149	.000743	.00118	.000589	.79	
18.5	-2.5			.97873	587.5	.00160	.000798	.00180	.000898	.98	
19.5	-2.5			.96697	580.2	.00141	.000703	.00131	.000653	.85	
20.5	-2.5			.96641	579.9	.00145	.000723	.00135	.000673	.87	
21.5	-2.5			.97089	582.5	.00139	.000693	.00148	.000738	.82	
22.5	-2.5			.96809	580.9	.00139	.000693	.00152	.000758	.82	
23.5	-2.5			.96474	573.5	.00033	.000165			.20	
24.5	-2.5			.96809	583.9	.00170	.000848			1.11	
		1.10	0	.96418	642.5	.02068	.010216				1.60
		1.60	0	.97985	652.2	.01797	.008964	.01816	.009059		1.41
		2.60	0	.99888	641.5	.01052	.005248				.82
		3.60	0	.99384	634.9	.01174	.005856	.01174	.005856		.92
		4.60	0	.99328	639.2	.01077	.005372	.01112	.005547		.84
		6.60	0	.98992	635.5	.01028	.005128				.80
		8.60	0	.99328	637.9	.01027	.005123				.80
		10.60	0	.99160	637.2	.01034	.005158				.81
		2.60	90	.95074	571.9	.00204	.001018				.67
		4.60	90	.95130	572.5	.00204	.001018				.67
		2.60	180	.95858	568.5	.00024	.000120				
		4.60	180	.96585	582.2	.00170	.000848	.00171	.000853		
34.0	-1.0			.96194	580.9	.00204	.001018	.00211	.001053	1.76	
34.0	4.0			.95410	587.2	.00460	.002295	.00485	.002419	3.01	
34.0	5.0			.94739	574.2	.00325	.001621	.00283	.001412	2.24	
34.0	6.0			.94906	580.2	.00365	.001821	.00368	.001836	2.52	
36.0	6.0			.94739	577.2	.00313	.001561			2.17	
38.0	1.0			.95634	581.2	.00201	.001003	.00189	.000943	1.33	
38.0	2.0			.98376	590.9	.00106	.000529			.69	
44.0	8.0			.94739	574.2	.00261	.001302	.00260	.001297	1.72	
44.0	6.0			.95802	575.9	.00165	.000823	.00161	.000803	1.17	
44.0	4.0			.97705	586.5	.00141	.000703	.00149	.000743	1.03	
44.0	2.0			.96530	582.2	.00204	.001018	.00198	.000988	1.34	
44.0	1.0			.96977	584.9	.00203	.001013	.00208	.001038	1.34	
6.0	.0			.98209	588.5	.00110	.000549			.93	
6.0	5.0			.98209	590.2	.00106	.000529	.00115	.000574		
6.0	10.0			.97425	583.9	.00116	.000579			.98	
12.0	.0			.99216	594.2	.00103	.000514	.00129	.000643	.88	
12.0	5.0			.98880	591.9	.00097	.000484			.76	
12.0	10.0			.98809	582.2	.00132	.000658	.00123	.000614	1.05	
18.0	.0			.98209	588.2	.00104	.000519	.00113	.000564	.85	
30.0	.0			.96250	577.5	.00122	.000609			.97	
42.0	.0			.99104	593.2	.00104	.000519			.83	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(f) M = 4.44; R = 3.11×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95947	594.5	.00187	.000675			.98	
12.0	.0			.95731	591.9	.00122	.000441			.88	
20.5	.0			.96325	597.2	.00131	.000473			.96	
28.0	12.0			.95731	593.2	.00131	.000473			.97	
28.0	4.0			.93840	581.9	.00175	.000632			1.41	
28.0	.0			.93624	582.5	.00238	.000860			1.93	
20.5	-5.0			.96163	593.2	.00109	.000394			.92	
24.5	-5.0			.96433	594.5	.00102	.000368			.88	
30.0	.0			.97730	617.9	.00616	.002225	.00621	.002243	7.33	
31.0	12.0			.95569	591.2	.00123	.000444			.92	
34.0	.0			.95245	587.5	.00104	.000376	.00091	.000329	.91	
2.0	-12.0			.96325	596.9	.00152	.000549			.76	
2.0	12.0			.96217	597.9	.00180	.000650			.78	
12.0	-12.0			.96433	595.2	.00104	.000376			.68	
12.0	12.0			.95353	590.2	.00124	.000448			.78	
30.0	1.0			.98162	622.2	.00643	.002322			5.19	
31.0	2.0			.95569	598.5	.00359	.001297			2.90	
32.0	2.0			.94056	587.2	.00310	.001120	.00282	.001018	2.65	
32.0	3.0			.94272	589.9	.00365	.001318			2.90	
32.0	6.0			.94326	586.9	.00241	.000870			1.93	
34.0	1.0			.94488	588.5	.00193	.000697	.00172	.000621	1.65	
34.0	2.0			.93678	589.5	.00482	.001741	.00510	.001842	3.65	
34.0	3.0			.92543	585.9	.00619	.002235	.00598	.002160	4.95	
36.0	.0			.93948	584.9	.00194	.000701	.00181	.000654	1.66	
38.0	.0			.95785	594.2	.00178	.000643	.00194	.000701	1.50	
40.0	.0			.95623	594.5	.00200	.000722	.00202	.000730	1.80	
44.0	12.0			.94650	587.9	.00214	.000773			1.89	
42.0	.0			.95461	591.9	.00204	.000737	.00199	.000719		
44.0	.0			.96379	596.5	.00160	.000578	.00162	.000585	1.90	
48.0	.0			.96758	598.2	.00147	.000531	.00147	.000531	1.35	
52.0	.0			.96866	598.9	.00103	.000372	.00102	.000368	1.23	
52.0	12.0			.94596	584.5	.00159	.000574			1.41	
55.0	.0			.97298	599.9	.00102	.000368	.00101	.000365	1.21	
58.0	.0			.98054	604.9	.00084	.000303			1.00	
58.0	12.0			.94920	587.5	.00118	.000426			1.04	
58.0	-12.0			.93300	579.9	.00232	.000838			2.52	
44.0	-12.0			.96001	592.9	.00121	.000437			1.10	
36.0	-8.0			.95731	592.9	.00159	.000574			1.43	
36.0	-3.0			.94650	592.9	.00412	.001488			3.81	
34.0	-3.0			.94326	592.2	.00436	.001575	.00434	.001567	3.93	
32.0	-3.0			.95353	595.5	.00264	.000953	.00263	.000950	2.38	
30.0	-3.0			.95623	597.2	.00327	.001181	.00326	.001177	2.79	
28.0	-3.0			.96866	600.9	.00213	.000769			2.54	
32.0	-12.0			.96758	598.5	.00086	.000311	.00068	.000246	.76	
30.0	-12.0			.96758	596.5	.00075	.000271			.60	
19.0	-12.5			.96595	596.2	.00089	.000321			.61	
17.5	-11.0			.96541	594.9	.00102	.000368			.78	
15.5	-2.5			.96758	597.2	.00119	.000430			.88	
16.5	-2.5			.96433	594.2	.00103	.000372	.00100	.000361	.79	
17.5	-2.5			.96217	592.9	.00104	.000376	.00090	.000325	.79	
18.5	-2.5			.96812	597.9	.00101	.000365	.00119	.000430	.84	
20.5	-2.5			.96271	593.2	.00103	.000372	.00097	.000350	.85	
21.5	-2.5			.96595	595.2	.00102	.000368	.00108	.000390	.83	
22.5	-2.5			.96541	594.9	.00104	.000376	.00103	.000372	.86	
23.5	-2.5			.96325	596.9	.00129	.000466	.00130	.000469	1.04	
24.5	-2.5			.96217	596.5	.00125	.000451			1.07	
		1.10	0	.96866	638.2	.01855	.006699				1.32
		1.60	0	.98757	638.9	.01430	.005164	.01441	.005204		1.02
		2.60	0	.99783	641.2	.01127	.004070	.01246	.004500		.80
		3.60	0	.99351	638.2	.01127	.004070	.01118	.004038		.80
		4.60	0	.99405	637.2	.01050	.003792	.01143	.004128		.75
		6.60	0	.99027	633.2	.00962	.003474	.00960	.003467		.68
		8.60	0	.99135	631.5	.00869	.003138	.00869	.003138		.62
		10.60	0	.98973	629.5	.00807	.002914				.57
		2.60	90	.94650	586.5	.00162	.000585	.00131	.000473		.48
		4.60	90	.94542	586.9	.00163	.000589	.00128	.000462		.48
34.0	-1.0			.95353	592.9	.00216	.000780	.00228	.000823	1.98	
34.0	4.0			.93678	587.9	.00416	.001502	.00422	.001524	3.30	
34.0	5.0			.94056	588.2	.00345	.001246	.00348	.001257	2.61	
34.0	6.0			.93894	587.5	.00343	.001239	.00346	.001250	2.60	
36.0	6.0			.93786	585.2	.00296	.001069			2.26	
38.0	1.0			.95947	594.2	.00141	.000509	.00150	.000542	1.21	
38.0	2.0			.95677	592.2	.00117	.000423			1.00	
44.0	8.0			.92489	574.2	.00217	.000784	.00203	.000733	1.92	
44.0	6.0			.95947	594.2	.00165	.000596	.00170	.000614	1.39	
44.0	4.0			.97190	601.2	.00121	.000437	.00130	.000469	.97	
44.0	2.0			.96217	595.2	.00157	.000567	.00153	.000553	1.33	
44.0	1.0			.96109	594.9	.00157	.000567	.00150	.000542	1.43	
6.0	.0			.98054	603.2	.00057	.000206			.68	
6.0	10.0			.96595	595.9	.00082	.000296			.75	
12.0	.0			.98919	608.5	.00054	.000195			.59	
12.0	5.0			.99297	611.5	.00062	.000224			.56	
12.0	10.0			.96433	595.9	.00082	.000296			.96	
18.0	.0			.98162	603.9	.00051	.000184			.55	
30.0	.0			.98433	605.5	.00051	.000184			.59	
42.0	.0			.98865	607.9	.00050	.000181			.63	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES: δ = 0.70 INCH - Continued

6. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Concluded

(g) M = 4.44; R = 2.10 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96373	597.5	.00159	.000859			.93	
28.0	12.0			.95670	590.5	.00104	.000562			1.02	
28.0	4.0			.93938	581.2	.00134	.000724			1.38	
28.0	.0			.93776	582.5	.00195	.001054			2.07	
20.5	-5.0			.96482	594.9	.00103	.000557			.93	
30.0	.0			.97185	617.9	.00514	.002778	.00818	.002800	5.30	
31.0	12.0			.95670	590.5	.00104	.000562			.99	
2.0	-12.0			.97023	600.5	.00131	.000708			.85	
2.0	12.0			.96861	601.2	.00160	.000865			.87	
12.0	12.0			.95453	589.9	.00105	.000568			.77	
30.0	1.0			.97564	619.5	.00528	.002854			4.84	
31.0	2.0			.95562	601.2	.00295	.001594			3.01	
32.0	2.0			.94100	588.2	.00269	.001454	.00233	.001259	2.80	
32.0	3.0			.94533	590.9	.00289	.001562			2.98	
32.0	6.0			.94642	587.9	.00193	.001043			1.75	
34.0	1.0			.94425	585.2	.00162	.000876	.00146	.000789	1.59	
34.0	2.0			.93667	588.9	.00380	.002054	.00398	.002151	3.88	
34.0	3.0			.92964	588.2	.00507	.002740	.00498	.002692	4.61	
36.0	.0			.94317	585.2	.00146	.000789	.00136	.000735	1.49	
38.0	.0			.95886	593.5	.00132	.000713	.00137	.000740	1.40	
40.0	.0			.95995	595.5	.00161	.000870	.00163	.000881	1.94	
44.0	12.0			.95129	589.9	.00190	.001027				
42.0	.0			.96049	595.5	.00142	.000768	.00138	.000746	1.49	
44.0	.0			.97023	599.9	.00129	.000697	.00131	.000708	1.43	
48.0	.0			.97510	601.9	.00102	.000551	.00102	.000553	1.15	
52.0	.0			.97456	601.5	.00101	.000546	.00100	.000541	1.10	
52.0	12.0			.95075	587.9	.00132	.000713			1.50	
58.0	.0			.98538	607.2	.00071	.000384			.80	
58.0	-12.0			.93992	585.5	.00195	.001054			2.83	
36.0	-8.0			.96482	596.9	.00122	.000659			1.33	
36.0	-3.0			.94750	592.9	.00291	.001573			3.16	
34.0	-3.0			.94317	591.9	.00360	.001946	.00359	.001940	3.91	
32.0	-3.0			.95075	592.2	.00251	.001357	.00248	.001340	2.61	
30.0	-3.0			.95616	598.5	.00269	.001454	.00269	.001454	2.72	
28.0	-3.0			.97023	602.5	.00160	.000865			1.70	
32.0	-12.0			.96969	596.5	.00063	.000341	.00045	.000243	.71	
17.5	-11.0			.96698	596.5	.00085	.000459			.79	
15.5	-2.5			.96915	597.9	.00102	.000551			.95	
16.5	-2.5			.96536	595.5	.00103	.000557	.00100	.000541	.95	
19.5	-2.5			.96157	596.9	.00096	.000519	.00077	.000416	.86	
23.5	-2.5			.96536	597.2	.00122	.000659	.00128	.000692	1.31	
24.5	-2.5			.96265	594.9	.00130	.000703			1.37	
		1.10	0	.96157	636.5	.01852	.010010				1.60
		1.60	0	.97943	640.2	.01388	.007502	.01411	.007626		1.20
		2.60	0	.98971	640.2	.01046	.005654	.01171	.006329		.90
		3.60	0	.98592	637.2	.01033	.005583	.01024	.005535		.89
		4.60	0	.98647	636.9	.00980	.005297	.01085	.005864		.85
		6.60	0	.98322	632.2	.00888	.004800	.00884	.004778		.77
		8.60	0	.98376	631.5	.00853	.004610	.00854	.004616		.74
		10.60	0	.98214	628.9	.00802	.004335				.69
		2.60	90	.94425	586.9	.00182	.000984	.00147	.000795		.66
		4.60	90	.94317	584.9	.00191	.001032	.00161	.000870		.69
34.0	-1.0			.95237	592.2	.00194	.001049	.00202	.001092	2.18	
34.0	4.0			.93992	589.9	.00362	.001957	.00369	.001994	3.62	
34.0	5.0			.94317	589.5	.00289	.001562	.00293	.001584	2.92	
34.0	6.0			.94100	589.5	.00293	.001584	.00295	.001594	2.96	
36.0	6.0			.93992	585.9	.00256	.001384			2.61	
38.0	1.0			.96103	595.2	.00105	.000568	.00115	.000622	1.31	
44.0	8.0			.93451	579.5	.00193	.001043	.00183	.000989	2.08	
44.0	6.0			.96265	598.2	.00125	.000676	.00133	.000719	1.30	
44.0	4.0			.97456	601.5	.00102	.000551	.00109	.000589	1.10	
44.0	2.0			.96590	597.2	.00130	.000703	.00124	.000670	1.43	
44.0	1.0			.96644	599.5	.00131	.000708	.00128	.000692	1.41	
6.0	10.0			.97185	598.9	.00068	.000368			1.08	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45°

(a) M = 2.65; R = 2.56 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95902	588.9	.00462	.001006			.97	
12.0	.0			.95510	582.5	.00374	.000815			.97	
20.5	.0			.95790	583.2	.00354	.000771			.98	
28.0	12.0			.95397	583.5	.00416	.000906			1.07	
28.0	4.0			.94892	592.5	.00753	.001640			2.02	
28.0	.0			.98989	658.5	.01746	.003804			4.73	
20.5	-5.0			.95959	584.2	.00352	.000767			.94	
24.5	-5.0			.95397	588.2	.00532	.001159			1.48	
30.0	.0			1.00561	671.2	.01621	.003531	.01673	.003645	4.73	
31.0	12.0			.95453	587.9	.00511	.001113			1.41	
34.0	.0			1.01515	602.2	.00043	.000094			.13	
2.0	-12.0			.96520	591.5	.00454	.000989			.98	
2.0	12.0			.96239	591.2	.00473	.001030			.97	
12.0	-12.0			.96408	587.5	.00367	.000800			.94	
12.0	12.0			.95229	585.5	.00412	.000898			.98	
30.0	1.0			.98933	652.5	.01551	.003379			4.31	
31.0	2.0			.97362	618.5	.01021	.002224			2.89	
32.0	2.0			.96576	593.5	.00503	.001096	.00477	.001039	1.49	
32.0	3.0			.96295	608.5	.00923	.002011			2.52	
32.0	6.0			.94612	599.5	.00974	.002122			2.61	
34.0	1.0			.99887	604.9	.00207	.000451			.59	
34.0	2.0			.96464	580.2	.00222	.000484			.62	
34.0	3.0			.95173	582.9	.00442	.000963	.00416	.000906	1.22	
36.0	.0			.96744	584.2	.00200	.000436	.00199	.000434	.58	
38.0	.0			.93489	567.9	.00220	.000479	.00209	.000455	.63	
40.0	.0			.93377	566.9	.00319	.000695	.00319	.000695	.98	
44.0	12.0			.94387	585.5	.00607	.001322			1.65	
42.0	.0			.93433	571.9	.00341	.000743	.00341	.000743	.97	
44.0	.0			.93657	572.5	.00277	.000821	.00378	.000823	1.11	
48.0	.0			.92984	572.2	.00478	.001041	.00478	.001041	1.43	
52.0	.0			.92647	571.9	.00527	.001148	.00527	.001148	1.54	
52.0	12.0			.94163	577.2	.00448	.000976			1.32	
55.0	.0			.93040	573.2	.00513	.001118	.00513	.001118	1.59	
58.0	.0			.93433	574.9	.00509	.001109			1.59	
58.0	12.0			.94219	574.2	.00351	.000765			1.07	
58.0	-12.0			.95004	578.5	.00341	.000743			1.04	
44.0	-12.0			.94499	584.2	.00559	.001218			1.76	
36.0	-8.0			.94892	595.9	.00819	.001784			2.44	
36.0	-3.0			.96351	582.2	.00260	.000566			.77	
34.0	-3.0			.95790	585.5	.00411	.000895	.00401	.000874	1.23	
32.0	-3.0			.96632	608.5	.00876	.001908	.00873	.001902	2.58	
30.0	-3.0			.97642	638.2	.01592	.003468	.01632	.003555	4.43	
28.0	-3.0			.96520	606.5	.00844	.001839			2.69	
34.0	-12.0			.94106	579.5	.00514	.001120	.00516	.001124		
32.0	-12.0			.95341	586.9	.00510	.001111	.00500	.001089	1.53	
30.0	-12.0			.96295	590.9	.00466	.001015	.00461	.001004	1.38	
19.0	-12.5			.96295	585.2	.00341	.000743			.96	
17.5	-11.0			.96015	583.9	.00349	.000760			.93	
15.5	-2.5			.96351	587.2	.00367	.000800			.95	
16.5	-2.5			.95622	582.2	.00353	.000769	.00347	.000756	.98	
17.5	-2.5			.95285	580.5	.00363	.000791	.00345	.000752	.97	
18.5	-2.5			.96576	587.9	.00349	.000760	.00377	.000821	.96	
19.5	-2.5			.95510	581.5	.00354	.000771	.00341	.000743	.94	
20.5	-2.5			.95453	581.2	.00346	.000754	.00339	.000739	.93	
21.5	-2.5			.95846	583.5	.00357	.000778	.00352	.000767	.97	
22.5	-2.5			.95790	587.9	.00457	.000996	.00464	.001011	1.23	
23.5	-2.5			.95397	589.2	.00551	.001200	.00549	.001196	1.48	
24.5	-2.5			.95229	591.2	.00626	.001364			1.73	
		10.55	180	.94219	562.2	.00114	.000248				
		8.55	180	.95397	570.5	.00146	.000318				
		6.55	180	.96464	580.9	.00165	.000359				
		4.55	180	.97586	601.2	.00374	.000815				
		3.55	180	.99214	596.2	.00188	.000410	.00181	.000394		
		2.55	180	.99775	601.2	.00215	.000468	.00221	.000481		
		1.55	180	1.00897	600.9	.00068	.000148	.00062	.000135		
		.55	180	1.01683	606.5	.00088	.000192				
		6.55	135	.97362	580.2	.00079	.000172				
		4.55	135	.97193	581.5	.00123	.000268				
		2.55	135	.97418	587.9	.00198	.000431				
34.0	-1.0			1.01010	608.5	.00191	.000416	.00210	.000457	.62	
34.0	4.0			.96015	597.9	.00676	.001473	.00697	.001518	1.90	
34.0	5.0			.95397	603.9	.00962	.002096	.00964	.002100	2.60	
34.0	6.0			.95285	625.5	.01046	.002279	.01099	.002394	2.82	
36.0	6.0			.95510	600.2	.00812	.001769			2.27	
38.0	1.0			.95678	572.9	.00150	.000327	.00158	.000344	.43	
38.0	2.0			.96183	577.2	.00164	.000357			.47	
44.0	8.0			.94780	581.9	.00454	.000989	.00456	.000993	1.29	
44.0	6.0			.94948	576.2	.00302	.000658	.00300	.000654	.85	
44.0	4.0			.95566	573.9	.00185	.000403	.00183	.000399	.55	
44.0	2.0			.95397	574.2	.00200	.000436	.00206	.000449	.58	
44.0	1.0			.94163	568.9	.00255	.000556	.00238	.000518	.79	
		10.55	90	.94948	567.2	.00130	.000283				.59
		6.55	90	.95229	571.5	.00165	.000359				.75
		4.55	90	.94836	571.5	.00228	.000497				1.04
		2.55	90	.94836	574.2	.00312	.000680				1.42
		10.55	0	.98877	618.5	.00611	.001331				.66
		8.55	0	.98260	608.5	.00574	.001250				.62
		6.55	0	.97923	606.2	.00575	.001253				.62
		4.55	0	.97698	605.2	.00545	.001187				.59
		3.55	0	.97586	611.2	.00806	.001756	.00813	.001771		.87
		2.55	0	.99102	648.9	.01671	.003640	.01847	.004024		1.81
		.55	0	1.00168	665.5	.01896	.004130				2.05

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45° - Continued

(b) M = 2.65; R = 1.31×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96254	577.5	.00074	.000319			.73	
12.0	.0			.95192	577.2	.00249	.001072			1.00	
20.5	.0			.95583	578.2	.00227	.000977			.97	
28.0	12.0			.95136	576.9	.00250	.001076			1.15	
28.0	4.0			.94689	581.2	.00439	.001890			1.89	
28.0	.0			.98378	627.5	.01163	.005007			5.70	
20.5	-5.0			.95639	579.9	.00220	.000947			.98	
24.5	-5.0			.95024	578.5	.00317	.001365			1.43	
30.0	.0			.99944	642.2	.00958	.004124	.01008	.004340	4.50	
31.0	12.0			.95303	579.5	.00292	.001257			1.38	
34.0	.0			.99049	589.9	.00035	.000151			.19	
2.0	-12.0			.96981	581.2	.00064	.000276			.89	
2.0	12.0			.97037	581.2	.00055	.000237			.67	
12.0	-12.0			.95974	583.2	.00250	.001076			1.00	
12.0	12.0			.94912	576.2	.00277	.001193			1.02	
30.0	1.0			.98322	618.2	.00832	.003582			3.89	
31.0	2.0			.96254	590.9	.00433	.001864			2.22	
32.0	2.0			.95359	575.9	.00205	.000883	.00183	.000788	1.10	
32.0	3.0			.95695	586.9	.00411	.001769			2.01	
32.0	6.0			.94744	584.9	.00518	.002230			2.51	
34.0	1.0			.98490	592.2	.00117	.000504			.55	
34.0	2.0			.95807	574.5	.00104	.000448			.49	
34.0	3.0			.94800	573.2	.00230	.000990	.00205	.000883	1.07	
36.0	.0			.96533	578.9	.00113	.000486	.00115	.000495	.60	
38.0	.0			.94241	566.2	.00120	.000517	.00113	.000486	.62	
40.0	.0			.93570	566.5	.00166	.000715	.00166	.000715	.90	
44.0	12.0			.94744	578.2	.00336	.001447			1.58	
42.0	.0			.93235	563.5	.00199	.000857	.00197	.000848	1.05	
44.0	.0			.93626	566.9	.00235	.001012	.00236	.001016	1.28	
48.0	.0			.93011	565.5	.00282	.001214	.00282	.001214	1.55	
52.0	.0			.92844	565.5	.00326	.001403	.00325	.001399	1.74	
52.0	12.0			.94241	571.5	.00257	.001106			1.42	
55.0	.0			.93347	569.9	.00307	.001322	.00307	.001322	1.81	
58.0	.0			.93906	570.9	.00285	.001227			1.59	
58.0	12.0			.94521	570.9	.00198	.000852			1.09	
58.0	-12.0			.95248	574.5	.00186	.000801			1.04	
44.0	-12.0			.94744	576.9	.00313	.001347			1.96	
36.0	-8.0			.95136	588.2	.00462	.001989			2.43	
36.0	-3.0			.95863	578.5	.00140	.000603			.76	
34.0	-3.0			.95359	575.9	.00200	.000861	.00193	.000831	1.08	
32.0	-3.0			.95918	590.2	.00402	.001731	.00396	.001705	2.08	
30.0	-3.0			.96645	612.5	.00813	.003500	.00824	.003547	4.09	
28.0	-3.0			.95918	594.9	.00529	.002277			2.66	
34.0	-12.0			.94409	576.5	.00305	.001313	.00304	.001309		
32.0	-12.0			.95248	579.2	.00292	.001257	.00284	.001223	1.57	
30.0	-12.0			.95918	582.2	.00258	.001111	.00253	.001089	1.32	
19.0	-12.5			.95863	579.2	.00227	.000977			1.04	
17.5	-11.0			.95583	578.2	.00229	.000986			1.03	
15.5	-2.5			.96030	581.2	.00239	.001029			.98	
16.5	-2.5			.95303	576.5	.00232	.000999	.00225	.000969	1.02	
17.5	-2.5			.94968	574.5	.00230	.000990	.00210	.000904	.92	
18.5	-2.5			.96310	583.9	.00218	.000939	.00252	.001085	.97	
19.5	-2.5			.95192	575.5	.00229	.000986	.00215	.000926	1.01	
20.5	-2.5			.95192	575.5	.00214	.000921	.00207	.000891	.96	
21.5	-2.5			.95583	577.9	.00208	.000895	.00208	.000895	.92	
22.5	-2.5			.95527	579.9	.00275	.001184	.00281	.001210	1.24	
23.5	-2.5			.94968	579.5	.00341	.001468	.00340	.001464	1.55	
24.5	-2.5			.94800	579.9	.00378	.001627			1.80	
		10.55	180	.94409	562.5	.00067	.000288				
		8.55	180	.95974	571.5	.00058	.000250				
		6.55	180	.96422	576.9	.00076	.000327				
		4.55	180	.96477	582.5	.00183	.000788				
		3.55	180	.97484	584.9	.00116	.000499	.00114	.000491		
		2.55	180	.98099	590.5	.00142	.000611	.00148	.000637		
		1.55	180	.98546	588.2	.00046	.000198				
		.55	180	.99776	594.9	.00039	.000168				
		6.55	135	.96198	572.9	.00038	.000164				
		4.55	135	.95974	572.9	.00053	.000228				
		2.55	135	.95918	576.2	.00097	.000418				
34.0	-1.0			.99273	597.9	.00095	.000409			.53	
34.0	4.0			.95807	584.5	.00335	.001442	.00385	.001657	1.60	
34.0	5.0			.94689	575.5	.00386	.001662	.00327	.001408	1.89	
34.0	6.0			.95303	594.5	.00573	.002467	.00580	.002497	2.73	
36.0	6.0			.95527	586.9	.00430	.001851			2.02	
38.0	1.0			.95863	572.5	.00075	.000323	.00089	.000383		
38.0	2.0			.95751	572.9	.00097	.000418			.49	
44.0	8.0			.94912	577.5	.00255	.001098	.00256	.001102	1.29	
44.0	6.0			.95080	572.5	.00160	.000689	.00158	.000680	.82	
44.0	4.0			.95527	572.2	.00090	.000387	.00090	.000387	.47	
44.0	2.0			.95192	571.2	.00118	.000508	.00127	.000547	.61	
44.0	1.0			.93962	567.2	.00143	.000616	.00122	.000525	.78	
		10.55	90	.94689	565.9	.00090	.000387				.58
		4.55	90	.93235	558.5	.00121	.000521				.78
		2.55	90	.93850	564.2	.00164	.000706				1.06
		10.55	0	.98211	605.9	.00442	.001903				.68
		8.55	0	.97596	597.9	.00436	.001877				.67
		6.55	0	.97316	598.5	.00395	.001701				.60
		4.55	0	.96869	593.9	.00404	.001739				.62
		3.55	0	.97260	598.2	.00509	.002191	.00482	.002075		.78
		2.55	0	.98434	623.2	.01009	.004344	.01194	.005140		1.54
		.55	0	.99552	649.5	.01326	.005709				2.03

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45° - Continued

(c) M = 3.51; R = 4.02×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_f}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.95748	582.5	.00388	.000752			.91	
12.0	.0			.95245	578.9	.00311	.000603			.93	
20.5	.0			.95581	576.9	.00287	.000556			.93	
28.0	12.0			.94462	574.2	.00389	.000754			1.38	
28.0	4.0			.92336	577.5	.00704	.001364			2.36	
28.0	.0			.96867	632.5	.01508	.002922			4.90	
20.5	-5.0			.95525	576.2	.00281	.000545			.87	
24.5	-5.0			.94574	579.9	.00514	.000996			1.70	
30.0	.0			.99776	688.2	.03289	.006373	.03400	.006588	12.18	
31.0	12.0			.93958	575.2	.00489	.000948			1.78	
2.0	-12.0			.96420	587.5	.00383	.000742			.94	
2.0	12.0			.96028	582.5	.00363	.000703			.90	
12.0	-12.0			.96196	582.5	.00301	.000583			.91	
12.0	12.0			.94797	572.9	.00302	.000585			.93	
30.0	1.0			.96699	656.5	.02657	.005149			8.92	
31.0	2.0			.95133	616.2	.01792	.003472			6.20	
32.0	2.0			.94574	587.5	.00752	.001457	.00725	.001405	2.58	
32.0	3.0			.93791	611.5	.01464	.002837			4.91	
32.0	6.0			.91441	564.9	.00646	.001252			2.13	
34.0	1.0			.99552	591.9	.00048	.000093			.17	
34.0	2.0			.94909	571.2	.00242	.000469			.84	
34.0	3.0			.93175	576.2	.00671	.001300	.00656	.001271	2.18	
36.0	.0			.97482	581.2	.00127	.000246	.00127	.000246	.45	
38.0	.0			.94462	566.2	.00199	.000386	.00197	.000382	.68	
40.0	.0			.92392	555.5	.00233	.000451	.00230	.000446	.79	
44.0	12.0			.92896	567.2	.00445	.000862			1.62	
42.0	.0			.91553	551.2	.00247	.000479	.00242	.000469	.88	
44.0	.0			.92616	557.9	.00247	.000479	.00250	.000484	.87	
48.0	.0			.91218	549.5	.00262	.000508	.00268	.000519	.97	
52.0	12.0			1.00279	611.5	.00466	.000903			1.82	
55.0	.0			.96196	581.2	.00261	.000506	.00278	.000539	.97	
58.0	.0			.95301	576.5	.00274	.000531			1.10	
58.0	12.0			.96531	586.5	.00396	.000767			1.62	
58.0	-12.0			.96028	582.5	.00390	.000756			1.49	
44.0	-12.0			.94294	571.2	.00393	.000762			1.51	
36.0	-8.0			.92560	566.5	.00551	.001068			1.99	
36.0	-3.0			.94853	573.9	.00347	.000672			1.26	
34.0	-3.0			.93511	575.5	.00611	.001184	.00600	.001163	2.30	
32.0	-3.0			.94126	609.2	.01341	.002599	.01350	.002616	4.76	
30.0	-3.0			.94406	618.2	.01602	.003104	.01625	.003149	5.41	
28.0	-3.0			.94294	578.5	.00592	.001147			2.06	
34.0	-12.0			.90770	553.2	.00460	.000891	.00457	.000886		
32.0	-12.0			.92784	566.5	.00478	.000926	.00448	.000868	1.73	
30.0	-12.0			.94630	576.5	.00445	.000862	.00436	.000845	1.62	
19.0	-12.5			.95748	576.5	.00269	.000521			.90	
17.5	-11.0			.95636	576.2	.00271	.000525			.86	
15.5	-2.5			.96084	578.9	.00280	.000543			.83	
16.5	-2.5			.95301	573.9	.00272	.000527	.00267	.000517	.84	
17.5	-2.5			.94909	571.5	.00276	.000535	.00257	.000498	.84	
18.5	-2.5			.96420	580.2	.00266	.000515	.00295	.000572	.87	
19.5	-2.5			.94965	571.5	.00280	.000543	.00275	.000533	.93	
20.5	-2.5			.94853	571.2	.00281	.000545	.00278	.000539	.90	
21.5	-2.5			.95581	576.5	.00298	.000577	.00299	.000579	.96	
22.5	-2.5			.95245	580.5	.00432	.000837	.00440	.000853	1.39	
23.5	-2.5			.94686	580.2	.00518	.001004	.00517	.001002	1.65	
24.5	-2.5			.94294	580.5	.00606	.001174			2.04	
		10.55	180	.97538	580.2	.00082	.000159				
		8.55	180	1.00167	594.5	.00052	.000101				
		6.55	180	1.00167	594.9	.00041	.000079				
		4.55	180	.97259	580.5	.00127	.000246				
		3.55	180	.98545	589.5	.00133	.000258	.00135	.000262		
		2.55	180	.98993	591.5	.00099	.000192	.00091	.000176		
		1.55	180	1.00671	597.2	.00032	.000062				
		.55	180	1.02405	607.9	.00039	.000076				
		4.55	135	.97818	581.2	.00052	.000101				
		2.55	135	.96252	572.5	.00077	.000149				
34.0	-1.0			1.00335	595.2	.00043	.000083	.00049	.000095	.17	
34.0	4.0			.93679	596.9	.01006	.001949	.01024	.001984	3.54	
34.0	5.0			.92392	593.2	.01174	.002275	.01164	.002256	4.02	
34.0	6.0			.91553	575.5	.00951	.001843	.00953	.001847	3.34	
36.0	6.0			.92504	589.5	.00996	.001930			3.38	
38.0	1.0			.94909	567.9	.00168	.000326	.00172	.000333	.58	
38.0	2.0			.95189	566.9	.00115	.000223			.39	
44.0	8.0			.92280	567.5	.00568	.001101	.00569	.001103	2.13	
44.0	6.0			.93231	564.2	.00326	.000632	.00323	.000626	1.22	
44.0	4.0			.94406	565.9	.00197	.000382	.00200	.000388	.70	
44.0	2.0			.93735	559.9	.00150	.000291	.00154	.000298	.53	
44.0	1.0			.92001	552.9	.00220	.000426	.00199	.000386	.81	
		10.55	90	.95804	572.5	.00150	.000291				.66
		6.55	90	.94518	567.5	.00212	.000411				.93
		4.55	90	.94518	567.9	.00229	.000444				1.00
		2.55	90	.94797	575.5	.00380	.000736				1.67
		10.55	0	.98377	633.9	.01331	.002579				1.39
		8.55	0	.97147	628.5	.01423	.002757				1.48
		6.55	0	.96587	627.5	.01499	.002905				1.56
		4.55	0	.95860	626.2	.01606	.003112				1.67
		3.55	0	.96308	629.2	.01597	.003095	.01565	.003033		1.66
		2.55	0	.97482	658.9	.02590	.005019	.02871	.005563		2.70
		.55	0	.97370	646.5	.02005	.003885				2.09

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45° - Continued

(d) M = 3.51; R = 2.87 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95175	576.2	.00342	.000942			.99	
12.0	.0			.94895	573.5	.00256	.000705			.96	
20.5	.0			.95456	573.9	.00228	.000628			.90	
28.0	12.0			.94783	572.9	.00308	.000848			1.34	
28.0	4.0			.92932	568.5	.00518	.001426			2.32	
28.0	.0			.97083	619.2	.01197	.003295			5.16	
20.5	-5.0			.95568	574.5	.00231	.000636			.98	
24.5	-5.0			.94671	575.2	.00415	.001143			1.89	
30.0	.0			1.00168	668.8	.02429	.006687	.02536	.006982	11.46	
31.0	12.0			.94390	572.9	.00381	.001049			1.74	
2.0	-12.0			.95793	582.5	.00334	.000920			.98	
2.0	12.0			.95344	576.5	.00344	.000947			.99	
12.0	-12.0			.95736	576.9	.00238	.000655			.93	
12.0	12.0			.94390	568.9	.00261	.000719			.97	
30.0	1.0			.97027	637.9	.02009	.005531			8.89	
31.0	2.0			.95063	606.9	.01201	.003306			5.34	
32.0	2.0			.94558	578.5	.00549	.001511	.00525	.001445	2.63	
32.0	3.0			.93941	595.9	.01048	.002885			4.54	
32.0	6.0			.91866	560.5	.00477	.001313			2.05	
34.0	1.0			.99102	589.5	.00067	.000184			.31	
34.0	2.0			.94615	567.2	.00184	.000507			.77	
34.0	3.0			.93044	568.2	.00500	.001377	.00485	.001335	2.09	
36.0	.0			.97531	580.9	.00099	.000273	.00099	.000273	.46	
38.0	.0			.94502	564.5	.00158	.000435	.00155	.000427	.73	
40.0	.0			.92595	554.5	.00199	.000548	.00196	.000540	.94	
44.0	12.0			.93044	563.5	.00344	.000947			1.69	
42.0	.0			.91754	550.5	.00205	.000564	.00205	.000564	.91	
44.0	.0			.92315	553.5	.00201	.000553	.00203	.000559	.96	
48.0	.0			.91305	547.5	.00204	.000562	.00204	.000562	.99	
52.0	.0			.90464	542.9	.00224	.000617	.00223	.000614	1.08	
52.0	12.0			.92932	564.9	.00408	.001123			2.16	
55.0	.0			.90520	545.5	.00227	.000625	.00227	.000625	1.13	
58.0	.0			.90969	546.5	.00219	.000603			1.10	
58.0	12.0			.93324	564.5	.00338	.000931			1.79	
58.0	-12.0			.94166	569.9	.00314	.000864			1.66	
44.0	-12.0			.92988	562.2	.00327	.000900			1.62	
36.0	-8.0			.92203	560.9	.00439	.001209			1.99	
36.0	-3.0			.94446	569.2	.00275	.000757			1.39	
34.0	-3.0			.93605	570.5	.00467	.001286	.00457	.001258	2.22	
32.0	-3.0			.94222	595.9	.01008	.002775	.01015	.002794	4.75	
30.0	-3.0			.94615	604.9	.01235	.003400	.01256	.003458	5.69	
28.0	-3.0			.94390	574.9	.00466	.001283			2.19	
34.0	-12.0			.91922	556.9	.00356	.000980	.00336	.000925		
32.0	-12.0			.93605	571.2	.00385	.001060	.00368	.001013	1.83	
30.0	-12.0			.95288	577.5	.00349	.000961	.00339	.000933	1.65	
19.0	-12.5			.95736	575.5	.00209	.000575			.90	
17.5	-11.0			.95456	578.2	.00229	.000630			.90	
15.5	-2.5			.95849	576.5	.00241	.000663			.96	
16.5	-2.5			.95119	571.9	.00236	.000650	.00231	.000636	.96	
17.5	-2.5			.94783	569.9	.00238	.000655	.00221	.000608	.92	
18.5	-2.5			.96129	577.5	.00220	.000606	.00247	.000680	.94	
19.5	-2.5			.95063	571.5	.00235	.000647	.00216	.000595	.96	
20.5	-2.5			.95063	571.5	.00233	.000641	.00218	.000600	.95	
21.5	-2.5			.95680	575.5	.00244	.000672	.00247	.000680	1.06	
22.5	-2.5			.95344	577.9	.00370	.001019	.00377	.001038	1.55	
23.5	-2.5			.94783	576.5	.00418	.001151	.00415	.001143	1.83	
24.5	-2.5			.94446	576.5	.00502	.001382			2.18	
		10.55	180	.96129	571.5	.00084	.000231				
		8.55	180	.98205	582.9	.00031	.000085				
		6.55	180	.99831	592.9	.00032	.000088				
		4.55	180	.98261	585.2	.00102	.000281				
		3.55	180	.97700	583.5	.00084	.000231	.00080	.000220		
		2.55	180	.98261	585.5	.00084	.000231	.00079	.000217		
		1.55	180	1.00112	594.9	.00036	.000099				
		.55	180	1.02131	606.2	.00035	.000096				
		4.55	135	.97419	578.2	.00039	.000107				
		2.55	135	.95624	568.9	.00061	.000168				
34.0	-1.0			1.00168	595.5	.00060	.000165	.00072	.000198	.30	
34.0	4.0			.93941	581.2	.00767	.002112	.00772	.002125	3.52	
34.0	5.0			.92820	577.9	.00860	.002368	.00871	.002398	3.91	
34.0	6.0			.92203	570.9	.00727	.002001	.00731	.002012	3.32	
36.0	6.0			.92876	575.2	.00780	.002147			3.59	
38.0	1.0			.95063	567.9	.00139	.000383	.00152	.000418	.66	
38.0	2.0			.94727	564.5	.00101	.000278			.47	
44.0	8.0			.92763	565.2	.00437	.001203	.00439	.001209	2.08	
44.0	6.0			.93268	564.2	.00262	.000721	.00260	.000716	1.24	
44.0	4.0			.94278	564.2	.00151	.000416	.00154	.000424	.71	
44.0	2.0			.93829	560.5	.00138	.000380	.00143	.000394	.65	
44.0	1.0			.92539	554.2	.00176	.000485	.00164	.000452	.88	
		10.55	90	.94278	560.9	.00086	.000237				.45
		6.55	90	.94615	565.9	.00139	.000383				.73
		4.55	90	.94615	566.5	.00153	.000421				.80
		2.55	90	.94446	568.9	.00278	.000765				1.46
		10.55	0	.97924	598.9	.00580	.001597				.72
		8.55	0	.97251	600.2	.00573	.001578				.71
		6.55	0	.96914	599.5	.00586	.001613				.73
		4.55	0	.96802	600.9	.00627	.001726				.78
		3.55	0	.96858	601.9	.00643	.001770	.00593	.001633		.80
		2.55	0	.97756	650.9	.02515	.006924	.02872	.007907		3.13
		.55	0	.97419	624.2	.01812	.004989				2.26

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45° - Continued

(e) M = 3.51; R = 1.64×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96202	581.5	.00175	.000842			1.05	
12.0	.0			.95700	577.2	.00168	.000808			.88	
20.5	.0			.96481	580.9	.00159	.000765			.85	
28.0	12.0			.95476	576.9	.00196	.000943			1.26	
28.0	4.0			.93298	569.5	.00331	.001592			2.09	
28.0	.0			.96705	607.9	.00836	.004021			5.36	
20.5	-5.0			.96649	581.9	.00159	.000765			.96	
24.5	-5.0			.95197	578.5	.00275	.001323			1.73	
30.0	.0			.99720	653.5	.01717	.008257	.01797	.008642	10.87	
31.0	12.0			.95253	578.2	.00245	.001178			1.61	
2.0	-12.0			.96928	585.5	.00154	.000741			.97	
2.0	12.0			.96481	583.2	.00167	.000803			1.09	
12.0	-12.0			.96593	582.2	.00177	.000851			.94	
12.0	12.0			.95141	574.2	.00176	.000846			.89	
30.0	1.0			.96928	622.5	.01375	.006613			8.65	
31.0	2.0			.94806	591.9	.00757	.003641			4.98	
32.0	2.0			.94359	575.2	.00323	.001553	.00308	.001481	2.13	
32.0	3.0			.93913	583.2	.00584	.002809			3.65	
32.0	6.0			.92461	562.9	.00295	.001419			1.92	
34.0	1.0			.99497	594.5	.00042	.000202			.28	
34.0	2.0			.95197	571.9	.00115	.000553			.75	
34.0	3.0			.93354	568.5	.00296	.001424	.00265	.001274	1.90	
36.0	.0			.98994	592.9	.00067	.000322	.00068	.000327	.49	
38.0	.0			.96761	579.5	.00077	.000370	.00077	.000370	.54	
40.0	.0			.94639	567.9	.00106	.000510	.00103	.000495	.70	
44.0	12.0			.94304	572.9	.00225	.001082			1.49	
42.0	.0			.93578	563.5	.00133	.000640	.00129	.000620	.94	
44.0	.0			.94080	567.5	.00127	.000611	.00129	.000620	.85	
48.0	.0			.92852	558.2	.00119	.000572	.00119	.000572	.92	
52.0	.0			.92070	555.5	.00130	.000625	.00129	.000620	.99	
52.0	12.0			.94024	573.5	.00269	.001294			2.05	
55.0	.0			.92126	554.2	.00139	.000668	.00138	.000664	1.09	
58.0	.0			.92628	558.5	.00148	.000712			1.16	
58.0	12.0			.94639	572.9	.00205	.000986			1.60	
58.0	-12.0			.95532	577.9	.00202	.000971			1.64	
44.0	-12.0			.94359	570.5	.00203	.000976			1.66	
36.0	-8.0			.93131	565.9	.00269	.001294			1.78	
36.0	-3.0			.95085	573.5	.00168	.000808			1.12	
34.0	-3.0			.93913	570.9	.00278	.001337	.00279	.001342	1.84	
32.0	-3.0			.94136	583.2	.00587	.002823	.00564	.002712	4.19	
30.0	-3.0			.94248	595.5	.00781	.003756	.00796	.003828	5.01	
28.0	-3.0			.94304	574.2	.00312	.001500			2.20	
34.0	-12.0			.93522	566.5	.00244	.001173	.00227	.001092		
32.0	-12.0			.94806	574.9	.00246	.001183	.00232	.001116	1.62	
30.0	-12.0			.96035	582.2	.00238	.001145	.00222	.001068	1.70	
19.0	-12.5			.96649	582.9	.00142	.000683			.88	
17.5	-11.0			.96370	580.5	.00160	.000769			.86	
15.5	-2.5			.96761	583.2	.00164	.000789			.89	
16.5	-2.5			.96035	578.5	.00160	.000769	.00155	.000745	.94	
17.5	-2.5			.95811	577.2	.00145	.000697	.00124	.000596	.77	
18.5	-2.5			.97096	584.9	.00159	.000765	.00177	.000851	.97	
19.5	-2.5			.96146	578.9	.00160	.000769	.00149	.000717	.96	
20.5	-2.5			.96146	578.9	.00160	.000769	.00152	.000731	.96	
21.5	-2.5			.96649	582.5	.00149	.000717	.00155	.000745	.88	
22.5	-2.5			.96091	582.9	.00235	.001130	.00244	.001173	1.38	
23.5	-2.5			.95197	579.2	.00284	.001366	.00278	.001337	1.76	
24.5	-2.5			.94806	578.2	.00318	.001529			2.08	
		10.55	180	.97877	586.5	.00068	.000327				
		6.55	180	1.00614	600.2	.00022	.000106				
		4.55	180	.99329	593.5	.00041	.000197				
		3.55	180	.98771	590.5	.00039	.000188				
		2.55	180	.98436	588.9	.00042	.000202				
		1.55	180	1.00055	597.5	.00025	.000120				
		.55	180	1.02345	610.5	.00018	.000087				
		4.55	135	.97989	584.9	.00028	.000135				
		2.55	135	.96091	574.2	.00042	.000202				
34.0	-1.0			1.00614	600.9	.00029	.000139			.25	
34.0	4.0			.94192	579.9	.00447	.002150	.00480	.002308	2.92	
34.0	5.0			.93187	576.9	.00533	.002563	.00540	.002597	3.68	
34.0	6.0			.92740	571.2	.00450	.002164	.00453	.002179	3.10	
36.0	6.0			.93354	575.9	.00461	.002217			3.20	
38.0	1.0			.97096	581.5	.00074	.000356			.49	
38.0	2.0			.96035	574.2	.00056	.000269			.37	
44.0	8.0			.93633	569.5	.00267	.001284	.00267	.001284	1.76	
44.0	6.0			.94359	568.9	.00164	.000789	.00162	.000779	1.16	
44.0	4.0			.95588	574.9	.00088	.000423	.00091	.000438	.64	
44.0	2.0			.95532	572.5	.00079	.000380	.00086	.000414	.52	
44.0	1.0			.94304	566.2	.00105	.000505	.00094	.000452	.70	
		10.55	90	.95253	569.5	.00070	.000337				.48
		6.55	90	.95365	571.2	.00078	.000375				.54
		4.55	90	.94750	569.2	.00088	.000423				.61
		2.55	90	.94639	570.9	.00179	.000861				1.23
		10.55	0	.97766	603.9	.00455	.002188				.74
		8.55	0	.97152	601.9	.00416	.002001				.68
		6.55	0	.96816	599.2	.00396	.001904				.65
		4.55	0	.96705	596.9	.00433	.002082				.71
		3.55	0	.96761	599.9	.00410	.001972	.00401	.001929		.67
		2.55	0	.97654	647.5	.01812	.008714	.02048	.009849		2.96
		.55	0	.97319	623.2	.01401	.006738				2.29

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45° - Continued

(f) M = 4.44; R = 3.21×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94709	573.2	.00169	.000605			.88	
12.0	.0			.94041	565.5	.00087	.000311			.63	
20.5	.0			.95155	573.9	.00124	.000444			.91	
28.0	12.0			.94208	568.9	.00190	.000680			1.41	
28.0	4.0			.91368	553.5	.00269	.000963			2.17	
28.0	.0			.95656	587.9	.00646	.002312			5.25	
20.5	-5.0			.94876	570.2	.00085	.000304			.71	
24.5	-5.0			.94264	573.5	.00250	.000895			2.16	
30.0	.0			.99053	629.9	.01648	.005899	.01759	.006296	19.62	
31.0	12.0			.92927	565.9	.00222	.000795			1.66	
2.0	-12.0			.95433	577.9	.00169	.000605			.85	
2.0	12.0			.95155	579.2	.00195	.000698			.84	
12.0	-12.0			.95155	575.2	.00132	.000472			.87	
12.0	12.0			.93651	565.9	.00138	.000494			.87	
30.0	1.0			.95545	598.5	.01408	.005040			11.35	
31.0	2.0			.93595	586.9	.00883	.003161			7.12	
32.0	2.0			.93039	565.9	.00322	.001153	.00301	.001077	2.75	
32.0	3.0			.92816	580.2	.00782	.002799			6.21	
32.0	6.0			.90310	545.2	.00157	.000562			1.26	
34.0	2.0			.93428	563.9	.00110	.000394			.83	
34.0	3.0			.91981	558.9	.00322	.001153			2.58	
36.0	.0			.96547	577.9	.00044	.000157	.00049	.000175	.38	
38.0	.0			.92593	556.2	.00115	.000412	.00107	.000383	.97	
40.0	.0			.90477	545.9	.00130	.000465	.00123	.000440	1.17	
44.0	12.0			.92370	558.2	.00143	.000512			1.27	
42.0	.0			.89809	542.9	.00139	.000498	.00129	.000462		
44.0	.0			.91090	549.2	.00129	.000462	.00134	.000480	1.54	
48.0	.0			.90366	543.2	.00090	.000322	.00090	.000322	.83	
52.0	.0			.89586	538.2	.00122	.000437	.00120	.000430	1.45	
52.0	12.0			.91813	557.5	.00210	.000752			1.86	
55.0	.0			.90199	544.2	.00114	.000408	.00113	.000404	1.36	
58.0	.0			.91090	547.2	.00115	.000412			1.37	
58.0	12.0			.91981	556.5	.00220	.000787			1.95	
58.0	-12.0			.92649	559.9	.00231	.000827			2.51	
44.0	-12.0			.92426	557.9	.00142	.000508			1.29	
36.0	-8.0			.91090	552.5	.00175	.000626			1.58	
36.0	-3.0			.93428	563.9	.00187	.000669			1.73	
34.0	-3.0			.92482	565.5	.00327	.001170	.00333	.001192	2.95	
32.0	-3.0			.93039	581.5	.00796	.002849	.00816	.002921	7.17	
30.0	-3.0			.92426	567.9	.00634	.002269	.00631	.002259	5.42	
28.0	-3.0			.93373	566.5	.00219	.000784			2.61	
34.0	-12.0			.90867	549.9	.00205	.000734	.00175	.000626		
32.0	-12.0			.92370	559.5	.00218	.000780			1.93	
30.0	-12.0			.94598	572.2	.00213	.000762	.00197	.000705	1.72	
19.0	-12.5			.95155	572.9	.00122	.000437			.84	
17.5	-11.0			.95043	572.5	.00123	.000440			.94	
15.5	-2.5			.95433	573.9	.00130	.000465			.96	
16.5	-2.5			.94654	569.5	.00122	.000437	.00115	.000412	.93	
17.5	-2.5			.94097	564.5	.00085	.000304	.00072	.000258	.65	
18.5	-2.5			.95879	575.2	.00083	.000297			.69	
19.5	-2.5			.94431	568.2	.00123	.000440			.99	
20.5	-2.5			.94709	568.2	.00084	.000301	.00064	.000229	.69	
21.5	-2.5			.95767	578.2	.00188	.000673	.00221	.000791	1.53	
22.5	-2.5			.95322	578.2	.00227	.000813	.00213	.000762	1.88	
23.5	-2.5			.94486	574.9	.00264	.000945	.00254	.000909	2.13	
24.5	-2.5			.94264	574.5	.00297	.001063			2.54	
34.0	4.0			.93206	570.5	.00508	.001818	.00601	.002151	4.03	
34.0	5.0			.91368	553.2	.00224	.000802			1.70	
34.0	6.0			.90978	553.9	.00318	.001138	.00317	.001135	2.41	
36.0	6.0			.92036	565.2	.00417	.001493			3.18	
38.0	1.0			.94097	563.9	.00071	.000254	.00084	.000301	.61	
38.0	2.0			.93874	561.9	.00050	.000179			.43	
44.0	8.0			.91646	557.2	.00270	.000966	.00267	.000956	2.39	
44.0	6.0			.92816	559.5	.00151	.000541	.00153	.000548	1.27	
44.0	4.0			.93540	564.2	.00121	.000433	.00128	.000458	.97	
44.0	2.0			.92704	555.5	.00057	.000204	.00067	.000240	.48	
44.0	1.0			.91312	549.2	.00099	.000354	.00073	.000261	.90	
		10.55	90	.92426	552.9	.00048	.000172				.30
		6.55	90	.93150	560.5	.00095	.000340				.59
		4.55	90	.93763	566.2	.00110	.000394				.68
		2.55	90	.93874	566.5	.00151	.000541				.94
		10.55	0	.96380	585.5	.00310	.001110				.46
		8.55	0	.95600	580.5	.00301	.001077				.44
		6.55	0	.95489	583.9	.00302	.001081				.44
		4.55	0	.95489	580.5	.00283	.001013				.42
		3.55	0	.95655	583.2	.00288	.001031	.00249	.000891		.42
		2.55	0	.96825	609.9	.01162	.004159	.01547	.005537		1.71
		.55	0	.97048	601.5	.00972	.003479				1.43

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

7. 2.8-inch-diameter cylinder swept forward 45° - Concluded

(g) M = 4.44; R = 2.12×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95436	575.9	.00175	.000943			1.02	
12.0	.0			.94657	569.5	.00099	.000533			.84	
20.5	.0			.95992	576.9	.00088	.000474			.78	
28.0	12.0			.94823	572.2	.00150	.000808			1.47	
28.0	4.0			.91762	555.5	.00213	.001148			2.20	
28.0	.0			.95436	587.9	.00575	.003098			6.12	
20.5	-5.0			.95603	574.5	.00082	.000442			.74	
24.5	-5.0			.94823	573.5	.00204	.001099			2.19	
30.0	.0			.98608	626.2	.01428	.007694	.01529	.008238	14.72	
31.0	12.0			.93933	567.2	.00179	.000964			1.70	
2.0	-12.0			.96326	583.9	.00172	.000927			1.12	
2.0	12.0			.96048	582.2	.00184	.000991			1.00	
12.0	-12.0			.95770	577.9	.00120	.000647			1.10	
12.0	12.0			.94156	568.5	.00133	.000717			.98	
30.0	1.0			.95380	599.9	.01174	.006326			10.77	
31.0	2.0			.93265	577.2	.00699	.003766			7.13	
32.0	2.0			.92820	564.2	.00298	.001606	.00273	.001471	3.10	
32.0	3.0			.92542	571.2	.00635	.003421			6.55	
32.0	6.0			.90816	549.2	.00173	.000932			1.57	
34.0	2.0			.93599	563.5	.00097	.000523			.99	
34.0	3.0			.92096	559.2	.00269	.001449			2.45	
36.0	.0			.97105	581.9	.00053	.000286	.00058	.000313	.54	
38.0	.0			.93877	563.9	.00079	.000426	.00075	.000404	.84	
40.0	.0			.91762	551.9	.00127	.000684	.00122	.000657	1.53	
44.0	12.0			.93599	564.2	.00132	.000711				
42.0	.0			.90983	549.9	.00116	.000625	.00106	.000571	1.22	
44.0	.0			.92263	555.2	.00116	.000625	.00121	.000652	1.29	
48.0	.0			.91540	550.2	.00102	.000550	.00102	.000550	1.15	
52.0	.0			.90816	545.5	.00102	.000550	.00100	.000539	1.11	
52.0	12.0			.92876	560.9	.00170	.000916			1.93	
55.0	.0			.91540	549.5	.00101	.000544	.00100	.000539	1.35	
58.0	.0			.92542	555.5	.00100	.000539			1.12	
58.0	12.0			.93098	562.5	.00171	.000921			1.92	
58.0	-12.0			.93822	567.5	.00185	.000997			2.68	
44.0	-12.0			.93655	564.9	.00122	.000657			1.56	
36.0	-8.0			.91874	554.2	.00135	.000727			1.47	
36.0	-3.0			.93877	567.9	.00149	.000803			1.62	
34.0	-3.0			.92597	562.2	.00276	.001487	.00266	.001433	3.00	
32.0	-3.0			.92709	571.9	.00599	.003227	.00609	.003281	6.24	
30.0	-3.0			.92263	567.2	.00557	.003001	.00555	.002990	5.63	
28.0	-3.0			.93209	563.9	.00208	.001121			2.21	
34.0	-12.0			.92096	555.5	.00181	.000975	.00163	.000878		
32.0	-12.0			.93376	564.5	.00186	.001002	.00155	.000835	2.09	
30.0	-12.0			.95324	577.9	.00174	.000938	.00168	.000905	2.29	
19.0	-12.5			.95714	576.9	.00107	.000577			1.14	
17.5	-11.0			.95603	575.9	.00113	.000609			1.06	
15.5	-2.5			.96048	578.2	.00112	.000603			1.05	
16.5	-2.5			.95269	573.9	.00107	.000577	.00102	.000550	.99	
17.5	-2.5			.94768	569.5	.00122	.000657			1.12	
18.5	-2.5			.96604	580.2	.00087	.000469			.78	
19.5	-2.5			.95102	572.9	.00107	.000577			.96	
20.5	-2.5			.95436	573.2	.00097	.000523			.95	
21.5	-2.5			.96382	580.9	.00146	.000787	.00170	.000916	1.51	
22.5	-2.5			.95770	578.9	.00207	.001115	.00214	.001153	2.03	
23.5	-2.5			.94935	574.5	.00230	.001239	.00222	.001196	2.47	
24.5	-2.5			.94545	573.2	.00259	.001396			2.73	
34.0	4.0			.93209	570.9	.00438	.002360	.00529	.002850	4.38	
34.0	5.0			.91484	554.9	.00268	.001444	.00227	.001223	2.71	
34.0	6.0			.91373	554.5	.00270	.001455	.00269	.001449	2.73	
36.0	6.0			.92319	562.5	.00341	.001837			3.48	
38.0	1.0			.95324	571.2	.00063	.000339			.79	
44.0	8.0			.92263	559.5	.00240	.001293	.00237	.001277	2.58	
44.0	6.0			.93376	564.5	.00168	.000905	.00169	.000911	1.75	
44.0	4.0			.94267	566.2	.00086	.000463	.00102	.000550	.92	
44.0	2.0			.93766	562.5	.00076	.000409	.00091	.000490	.84	
44.0	1.0			.92375	555.2	.00082	.000442			.88	
		6.55	90	.93321	559.9	.00061	.000329				.47
		4.55	90	.93432	560.9	.00068	.000366				.52
		2.55	90	.93933	568.2	.00167	.000900				1.27
		10.55	0	.96215	585.9	.00316	.001703				.57
		8.55	0	.95547	581.2	.00316	.001703				.57
		6.55	0	.95436	580.9	.00317	.001708				.57
		4.55	0	.95324	580.9	.00346	.001864				.63
		3.55	0	.95547	581.9	.00333	.001794	.00292	.001573		.60
		2.55	0	.96660	609.9	.01243	.006697				2.25
		.55	0	.96883	603.5	.00923	.004973				1.67

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

8. 2.8-inch-diameter cylinder swept back 45°

(a) M = 2.65; R = 2.55 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95861	581.9	.00537	.001168			1.13	
12.0	.0			.94953	573.2	.00443	.000963			1.15	
20.5	.0			.94897	571.9	.00418	.000909			1.16	
28.0	12.0			.94386	569.9	.00427	.000929			1.10	
28.0	4.0			.94727	571.2	.00430	.000935			1.15	
28.0	.0			.94727	571.2	.00420	.000913			1.14	
20.5	-5.0			.95067	572.9	.00428	.000931			1.14	
24.5	-5.0			.94897	571.5	.00405	.000881			1.13	
30.0	.0			.96711	575.9	.00286	.000622	.00278	.000605	.83	
31.0	12.0			.94727	571.2	.00419	.000911			1.16	
34.0	.0			.94046	553.9	.00049	.000107	.00056	.000122	.15	
2.0	-12.0			.96484	584.5	.00534	.001161			1.15	
2.0	12.0			.96201	584.5	.00555	.001207			1.14	
12.0	-12.0			.95747	577.5	.00473	.001029			1.22	
12.0	12.0			.94727	573.2	.00473	.001029			1.13	
30.0	1.0			.95124	588.2	.00675	.001468			1.88	
31.0	2.0			.94273	575.9	.00688	.001496			1.95	
32.0	2.0			.94216	574.2	.00641	.001394	.00646	.001405	1.90	
32.0	3.0			.94500	572.9	.00520	.001131			1.42	
32.0	6.0			.94840	571.9	.00416	.000905			1.12	
34.0	1.0			.91835	548.2	.00274	.000596	.00222	.000483	.79	
34.0	2.0			.92062	564.2	.00695	.001511	.00715	.001555	1.94	
34.0	3.0			.93763	572.5	.00640	.001392	.00655	.001425	1.77	
36.0	.0			.92062	557.5	.00486	.001057	.00490	.001066	1.40	
38.0	.0			.90474	551.9	.00613	.001333	.00605	.001316	1.76	
40.0	.0			.91722	560.9	.00673	.001464	.00673	.001464	2.06	
44.0	12.0			.95350	574.9	.00408	.000887			1.11	
42.0	.0			.92799	569.9	.00760	.001653	.00760	.001653	2.17	
44.0	.0			.94273	578.5	.00699	.001520	.00702	.001527	2.06	
48.0	.0			.94727	583.2	.00657	.001429	.00658	.001431	1.96	
52.0	.0			.93479	577.9	.00709	.001542	.00708	.001540	2.07	
52.0	12.0			.94897	572.5	.00399	.000868			1.18	
55.0	.0			.94500	574.5	.00567	.001233	.00567	.001233	1.76	
58.0	.0			.94783	575.5	.00549	.001194			1.71	
58.0	12.0			.94386	568.9	.00395	.000859			1.20	
58.0	-12.0			.94953	571.5	.00396	.000861			1.21	
44.0	-12.0			.95124	573.9	.00427	.000929			1.35	
36.0	-8.0			.95407	573.9	.00394	.000857			1.18	
36.0	-3.0			.94330	573.5	.00560	.001218			1.66	
34.0	-3.0			.93990	577.5	.00616	.001340	.00617	.001342	1.84	
32.0	-3.0			.94216	570.5	.00504	.001096	.00500	.001087	1.48	
30.0	-3.0			.95294	575.9	.00449	.000976	.00452	.000983	1.25	
28.0	-3.0			.95577	575.5	.00402	.000874			1.28	
34.0	-12.0			.95237	572.5	.00391	.000850	.00378	.000822		
32.0	-12.0			.95180	572.5	.00387	.000842	.00328	.000713	1.16	
30.0	-12.0			.95464	574.5	.00400	.000870	.00396	.000861	1.19	
19.0	-12.5			.95577	575.9	.00420	.000913			1.18	
17.5	-11.0			.95407	575.2	.00429	.000933			1.14	
15.5	-2.5			.95634	577.5	.00442	.000961			1.14	
16.5	-2.5			.95747	575.5	.00377	.000820	.00378	.000822	1.04	
17.5	-2.5			.94897	572.5	.00431	.000937	.00431	.000937	1.15	
18.5	-2.5			.95464	575.5	.00410	.000892	.00423	.000920	1.12	
19.5	-2.5			.94840	572.2	.00432	.000940	.00426	.000926	1.14	
20.5	-2.5			.94783	572.2	.00422	.000918	.00418	.000909	1.13	
21.5	-2.5			.95067	573.5	.00425	.000924	.00432	.000940	1.15	
22.5	-2.5			.94840	571.9	.00412	.000896	.00351	.000763	1.11	
23.5	-2.5			.95067	600.9	.01452	.003158	.01558	.003388	3.90	
24.5	-2.5			.95010	572.5	.00410	.000892			1.14	
		10.55	0	.96768	617.5	.01659	.003608				1.79
		8.55	0	.97108	627.5	.01600	.003480				1.73
		6.55	0	.97732	623.9	.01690	.003675				1.83
		4.55	0	.97108	632.5	.01855	.004034				2.01
		3.55	0	.96654	623.2	.02041	.004439	.02043	.004443		2.21
		2.55	0	.95974	620.9	.02144	.004663	.02144	.004663		2.32
		1.55	0	.95237	618.9	.02321	.005048	.02309	.005022		2.51
		.55	0	.95577	624.2	.02394	.005206				2.59
		10.55	45	.96371	602.5	.01154	.002510				1.63
		6.55	45	.96144	602.2	.01154	.002510				1.63
		4.55	45	.96314	604.5	.01225	.002664				1.73
		2.55	45	.94783	575.2	.00427	.000929				.60
34.0	-1.0			.93026	554.5	.00233	.000507	.00222	.000483	.75	
34.0	4.0			.95067	574.9	.00453	.000985	.00480	.001044	1.28	
34.0	5.0			.94670	564.5	.00280	.000609	.00244	.000531	.76	
34.0	6.0			.95180	575.5	.00442	.000961	.00443	.000963	1.19	
36.0	6.0			.95747	577.9	.00401	.000872			1.12	
38.0	1.0			.92629	556.5	.00347	.000755	.00384	.000835	1.01	
38.0	2.0			.92005	545.9	.00130	.000283			.37	
44.0	8.0			.94613	570.5	.00404	.000879	.00405	.000881	1.15	
44.0	6.0			.93876	566.5	.00421	.000916	.00425	.000924	1.18	
44.0	4.0			.92175	555.5	.00388	.000844	.00378	.000822	1.15	
44.0	2.0			.93536	562.2	.00366	.000796	.00360	.000783	1.05	
44.0	1.0			.94103	569.2	.00482	.001048	.00478	.001040	1.50	
		10.55	90	.94727	565.2	.00273	.000594				1.24
		6.55	90	.93819	560.2	.00277	.000602				1.26
		4.55	90	.93763	560.2	.00285	.000620				1.30
		2.55	90	.93536	560.9	.00332	.000722				1.51
		10.55	180	1.01247	595.5	.00054	.000117				
		8.55	180	.99433	586.5	.00090	.000196				
		6.55	180	.95861	566.9	.00100	.000217				
		4.55	180	.93253	561.2	.00363	.000789				
		3.55	180	.91778	544.5	.00130	.000283	.00113	.000246		
		2.55	180	.91722	542.9	.00124	.000270	.00123	.000268		
		1.55	180	.91778	543.2	.00124	.000270	.00108	.000235		
		.55	180	.95124	560.5	.00054	.000117				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

8. 2.8-inch-diameter cylinder swept back 45° - Continued

(b) M = 2.65; R = 1.23 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97189	582.2	.00127	.000547			1.25	
12.0	.0			.96233	580.5	.00274	.001179			1.10	
20.5	.0			.96345	579.9	.00259	.001115			1.11	
28.0	12.0			.95952	577.5	.00260	.001119			1.19	
28.0	4.0			.96345	579.5	.00232	.000999			1.00	
28.0	.0			.96345	579.2	.00228	.000981			1.12	
20.5	-5.0			.96514	580.9	.00239	.001029			1.07	
24.5	-5.0			.96458	579.5	.00224	.000964			1.01	
30.0	.0			.97695	583.5	.00176	.000758	.00173	.000745	.83	
31.0	12.0			.96289	579.2	.00226	.000973			1.07	
2.0	-12.0			.98032	587.9	.00110	.000473			1.53	
2.0	12.0			.97807	584.5	.00098	.000422			1.20	
12.0	-12.0			.96964	584.5	.00281	.001209			1.13	
12.0	12.0			.95895	579.9	.00303	.001304			1.12	
30.0	1.0			.96233	592.5	.00382	.001644			1.79	
31.0	2.0			.95165	577.5	.00398	.001713			2.04	
32.0	2.0			.96008	581.2	.00323	.001390	.00337	.001451	1.73	
32.0	3.0			.95446	576.5	.00293	.001261			1.44	
32.0	6.0			.96570	580.5	.00231	.000994			1.12	
34.0	1.0			.93759	560.2	.00137	.000590	.00112	.000482	.65	
34.0	2.0			.93197	566.9	.00412	.001773	.00402	.001730	1.93	
34.0	3.0			.94715	580.5	.00351	.001511	.00367	.001580	1.64	
36.0	.0			.94265	571.5	.00264	.001136	.00268	.001154	1.41	
38.0	.0			.92410	563.9	.00352	.001515	.00345	.001485	1.81	
40.0	.0			.93197	566.5	.00374	.001610	.00374	.001610	2.02	
44.0	12.0			.97357	584.2	.00220	.000947			1.04	
42.0	.0			.94040	572.9	.00430	.001851	.00429	.001847	2.28	
44.0	.0			.95671	584.5	.00377	.001623	.00373	.001605	2.05	
48.0	.0			.96345	587.2	.00358	.001541	.00360	.001550	1.97	
52.0	.0			.94209	573.5	.00427	.001838	.00424	.001825	2.28	
52.0	12.0			.96626	579.9	.00207	.000891			1.14	
55.0	.0			.96289	581.9	.00303	.001304	.00304	.001308	1.78	
58.0	.0			.96626	583.9	.00316	.001360			1.77	
58.0	12.0			.96345	578.5	.00200	.000861			1.10	
58.0	-12.0			.96795	582.5	.00203	.000874			1.14	
44.0	-12.0			.96795	581.9	.00248	.001067			1.55	
36.0	-8.0			.97301	583.5	.00198	.000852			1.04	
36.0	-3.0			.95558	577.9	.00303	.001304			1.64	
34.0	-3.0			.94996	575.5	.00333	.001433	.00332	.001429	1.79	
32.0	-3.0			.95277	574.9	.00275	.001184	.00270	.001162	1.42	
30.0	-3.0			.97301	582.2	.00241	.001037	.00244	.001050	1.21	
28.0	-3.0			.97357	583.9	.00222	.000956			1.12	
34.0	-12.0			.97076	581.2	.00197	.000848	.00182	.000783		
32.0	-12.0			.97020	581.2	.00217	.000934	.00194	.000835	1.17	
30.0	-12.0			.97245	582.9	.00208	.000895	.00192	.000826	1.07	
19.0	-12.5			.97132	583.2	.00254	.001093			1.17	
17.5	-11.0			.97020	582.9	.00255	.001098			1.14	
15.5	-2.5			.97189	589.5	.00259	.001115			1.06	
16.5	-2.5			.97582	585.2	.00217	.000934	.00226	.000973	.96	
17.5	-2.5			.96570	580.9	.00243	.001046	.00229	.000986	.97	
18.5	-2.5			.97189	583.9	.00254	.001093	.00256	.001102	1.13	
19.5	-2.5			.96626	580.5	.00256	.001102	.00251	.001080	1.13	
20.5	-2.5			.96514	580.2	.00257	.001106	.00254	.001093	1.15	
21.5	-2.5			.96795	581.5	.00233	.001003	.00238	.001024	1.04	
22.5	-2.5			.96570	580.2	.00228	.000981	.00203	.000874	1.03	
23.5	-2.5			.95390	591.9	.00756	.003254	.00817	.003517	3.44	
24.5	-2.5			.96739	580.9	.00225	.000968			1.07	
		10.55	0	.97301	609.2	.00953	.004102				1.46
		8.55	0	.97638	622.5	.00874	.003762				1.34
		6.55	0	.98088	620.9	.00933	.004016				1.43
		4.55	0	.97357	625.5	.01006	.004330				1.54
		3.55	0	.96964	625.2	.01078	.004640	.01081	.004653		1.65
		2.55	0	.96233	616.9	.01176	.005062	.01177	.005066		1.80
		1.55	0	.95221	619.5	.01243	.005350	.01222	.005260		1.90
		.55	0	.95783	616.5	.01561	.006719				2.39
		10.55	45	.97020	597.2	.00588	.002531				1.17
		6.55	45	.96570	595.2	.00609	.002621				1.21
		4.55	45	.96683	596.5	.00642	.002763				1.28
		2.55	45	.96570	580.2	.00228	.000981				.45
34.0	-1.0			.94940	566.2	.00129	.000555	.00120	.000517	.72	
34.0	4.0			.96514	580.5	.00238	.001024	.00262	.001128	1.14	
34.0	5.0			.96120	573.9	.00182	.000783	.00151	.000650	.89	
34.0	6.0			.96907	583.5	.00256	.001110	.00258	.001110	1.23	
36.0	6.0			.97470	585.9	.00224	.000964			1.05	
38.0	1.0			.94602	566.9	.00182	.000783	.00195	.000839		
38.0	2.0			.95165	565.5	.00060	.000258			.30	
44.0	8.0			.96458	579.2	.00222	.000956	.00222	.000956	1.13	
44.0	6.0			.95783	575.2	.00223	.000960	.00225	.000968	1.14	
44.0	4.0			.94378	565.5	.00187	.000805	.00183	.000788	.97	
44.0	2.0			.95558	573.2	.00200	.000861	.00199	.000857	1.04	
44.0	1.0			.95895	577.5	.00254	.001093	.00255	.001098	1.39	
		10.55	90	.96626	576.2	.00129	.000555				.83
		6.55	90	.95333	569.2	.00136	.000585				.88
		4.55	90	.95165	568.2	.00139	.000598				.90
		2.55	90	.94940	567.9	.00171	.000736				1.10
		10.55	180	1.02698	608.2	.00022	.000095				
		8.55	180	1.01180	599.9	.00040	.000172				
		6.55	180	.98144	582.2	.00048	.000207				
		4.55	180	.94996	569.5	.00193	.000831				
		3.55	180	.95108	564.9	.00053	.000228	.00046	.000198		
		2.55	180	.95446	566.9	.00054	.000232	.00055	.000237		
		.55	180	.98369	583.5	.00027	.000116				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

8. 2.8-inch-diameter cylinder swept back 45° - Continued

(c) M = 3.51; R = 2.76 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96224	584.5	.00377	.001052			1.09	
12.0	.0			.95661	576.5	.00253	.000706			.95	
20.5	.0			.95886	576.9	.00258	.000720			1.02	
28.0	12.0			.95323	572.2	.00233	.000650			1.02	
28.0	4.0			.95886	575.9	.00240	.000669			1.08	
28.0	.0			.95717	575.5	.00228	.000636			.98	
20.5	-5.0			.96168	577.9	.00256	.000714			1.08	
24.5	-5.0			.96112	576.9	.00238	.000664			1.09	
30.0	.0			.97520	582.9	.00207	.000577	.00207	.000577	.98	
31.0	12.0			.95717	573.9	.00215	.000600			.98	
2.0	-12.0			.96957	588.5	.00336	.000937			.99	
2.0	12.0			.96450	584.2	.00353	.000985			1.02	
12.0	-12.0			.96506	581.9	.00256	.000714			1.00	
12.0	12.0			.95210	573.9	.00283	.000789			1.05	
30.0	1.0			.95548	584.5	.00431	.001202			1.91	
31.0	2.0			.94140	576.9	.00415	.001158			1.84	
32.0	2.0			.95830	581.9	.00377	.001052	.00378	.001054	1.80	
32.0	3.0			.94534	572.2	.00311	.000867			1.35	
32.0	6.0			.95830	575.9	.00229	.000639			.98	
34.0	1.0			.93576	557.5	.00133	.000371			.61	
34.0	2.0			.91942	565.9	.00449	.001252	.00435	.001213	1.88	
34.0	3.0			.93576	568.5	.00387	.001079	.00385	.001074	1.62	
36.0	.0			.94759	567.5	.00188	.000524	.00190	.000530	.88	
38.0	.0			.92336	558.5	.00294	.000820	.00287	.000801	1.36	
40.0	.0			.92900	566.2	.00325	.000907	.00324	.000904	1.54	
44.0	12.0			.96450	577.2	.00217	.000605			1.06	
42.0	.0			.93463	573.9	.00411	.001146	.00410	.001144	1.82	
44.0	.0			.95041	580.2	.00428	.001194	.00430	.001199	2.04	
48.0	.0			.96055	584.5	.00399	.001113	.00401	.001119	1.93	
52.0	.0			.92956	568.2	.00442	.001233	.00437	.001219	2.14	
52.0	12.0			.96675	579.2	.00201	.000561			1.06	
55.0	.0			.96055	581.9	.00327	.000912	.00330	.000920	1.63	
58.0	.0			.96450	583.5	.00306	.000854			1.53	
58.0	12.0			.95999	575.5	.00206	.000575			1.09	
58.0	-12.0			.96562	579.2	.00197	.000550			1.04	
44.0	-12.0			.96168	578.5	.00240	.000669			1.19	
36.0	-8.0			.96619	578.9	.00218	.000608			.99	
36.0	-3.0			.94590	574.9	.00384	.001071			1.94	
34.0	-3.0			.93801	568.9	.00339	.000946	.00335	.000934	1.61	
32.0	-3.0			.94196	569.9	.00304	.000848	.00300	.000837	1.43	
30.0	-3.0			.96055	577.5	.00253	.000706	.00256	.000714	1.17	
28.0	-3.0			.96619	580.2	.00223	.000622			1.05	
34.0	-12.0			.96393	578.5	.00220	.000614	.00202	.000563		
32.0	-12.0			.96337	578.5	.00205	.000572			.98	
30.0	-12.0			.96619	580.2	.00206	.000575	.00186	.000519	.98	
19.0	-12.5			.96506	580.9	.00227	.000633			.98	
17.5	-11.0			.96393	580.5	.00258	.000720			1.02	
15.5	-2.5			.96506	581.2	.00259	.000722			1.03	
16.5	-2.5			.97126	581.5	.00192	.000536	.00200	.000558	.78	
17.5	-2.5			.95886	577.2	.00242	.000675	.00228	.000636	.93	
18.5	-2.5			.96450	579.9	.00240	.000669	.00250	.000697	1.03	
19.5	-2.5			.95999	577.2	.00257	.000717	.00253	.000706	1.05	
20.5	-2.5			.95886	576.9	.00258	.000720	.00254	.000708	1.05	
21.5	-2.5			.96224	580.9	.00242	.000675	.00249	.000695	1.05	
22.5	-2.5			.95999	579.2	.00242	.000675	.00182	.000508	1.01	
23.5	-2.5			.95154	613.9	.01172	.003269	.01325	.003696	5.14	
24.5	-2.5			.96168	577.9	.00226	.000630			.98	
		10.55	0	.96393	623.2	.01556	.004340				1.94
		8.55	0	.96731	625.2	.01525	.004254				1.90
		6.55	0	.97239	629.2	.01535	.004282				1.91
		4.55	0	.97239	630.9	.01588	.004430				1.98
		3.55	0	.97239	640.2	.01624	.004530	.01633	.004555		2.02
		2.55	0	.95943	629.9	.01933	.005392	.01940	.005411		2.41
		1.55	0	.93801	622.2	.02260	.006304	.02242	.006254		2.81
		.55	0	.93914	623.9	.02109	.005883				2.63
		10.55	45	.96055	612.2	.00978	.002728				1.59
		6.55	45	.95886	606.5	.01052	.002934				1.71
		4.55	45	.96506	609.9	.01018	.002840				1.65
		2.55	45	.95999	579.2	.00242	.000675				.39
34.0	-1.0			.94759	564.2	.00113	.000315	.00102	.000285	.57	
34.0	4.0			.95492	575.2	.00241	.000672	.00266	.000742	1.11	
34.0	5.0			.95323	568.9	.00190	.000530	.00159	.000444	.86	
34.0	6.0			.96224	580.9	.00242	.000675	.00242	.000675	1.11	
36.0	6.0			.96675	581.2	.00239	.000667			1.10	
38.0	1.0			.94196	564.5	.00160	.000446			.75	
38.0	2.0			.98365	582.2	.00038	.000106			.18	
44.0	8.0			.96450	579.9	.00204	.000569	.00207	.000577	.97	
44.0	6.0			.94872	570.9	.00230	.000642	.00229	.000639	1.09	
44.0	4.0			.93632	565.2	.00269	.000750	.00264	.000736	1.27	
44.0	2.0			.95154	569.2	.00170	.000474	.00164	.000457	.81	
44.0	1.0			.95605	575.5	.00239	.000667	.00242	.000675	1.19	
		10.55	90	.95548	572.5	.00212	.000591				1.11
		6.55	90	.95323	571.5	.00220	.000614				1.15
		4.55	90	.95323	571.2	.00206	.000575				1.08
		2.55	90	.95210	572.2	.00236	.000658				1.24
		6.55	180	1.00901	595.5	.00029	.000081				
		4.55	180	.93970	565.9	.00236	.000658				
		3.55	180	.98478	582.2	.00043	.000120	.00055	.000153		
		2.55	180	.98647	583.5	.00043	.000120	.00045	.000126		
		1.55	180	.98253	582.2	.00043	.000120	.00032	.000089		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

8. 2.8-inch-diameter cylinder swept back 45° - Continued

(d) M = 3.51; R = 1.59 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96844	582.2	.00182	.000885			1.09	
12.0	.0			.96224	581.9	.00185	.000900			.97	
20.5	.0			.96675	582.9	.00161	.000783			.86	
28.0	12.0			.96112	574.9	.00154	.000749			.99	
28.0	4.0			.96675	582.2	.00147	.000715			.93	
28.0	.0			.96562	581.5	.00154	.000749			.99	
20.5	-5.0			.96957	580.2	.00163	.000793			.99	
24.5	-5.0			.96900	579.2	.00140	.000681			.88	
30.0	.0			.97689	581.9	.00145	.000705	.00146	.000710	.92	
31.0	12.0			.96562	580.9	.00146	.000710			.96	
2.0	-12.0			.97689	592.2	.00185	.000900			1.16	
2.0	12.0			.97126	583.9	.00168	.000817			1.10	
12.0	-12.0			.97126	582.5	.00189	.000919			1.00	
12.0	12.0			.95774	575.2	.00195	.000948			.99	
30.0	1.0			.96055	582.2	.00276	.001342			1.74	
31.0	2.0			.94647	571.9	.00272	.001323			1.79	
32.0	2.0			.96900	583.2	.00227	.001104	.00250	.001216	1.49	
32.0	3.0			.94928	571.2	.00212	.001031			1.33	
32.0	6.0			.96675	577.9	.00142	.000690			.92	
34.0	1.0			.94252	563.5	.00093	.000452			.61	
34.0	2.0			.92505	562.5	.00280	.001361	.00255	.001240	1.83	
34.0	3.0			.93970	565.5	.00218	.001060	.00210	.001021	1.40	
36.0	.0			.95661	575.5	.00127	.000618	.00133	.000647	.92	
38.0	.0			.93576	563.9	.00181	.000880	.00175	.000851	1.27	
40.0	.0			.93689	564.2	.00203	.000987	.00201	.000977	1.34	
44.0	12.0			.97295	581.9	.00135	.000656			.89	
42.0	.0			.93914	567.5	.00259	.001259	.00257	.001250	1.84	
44.0	.0			.95379	575.9	.00254	.001235	.00255	.001240	1.69	
48.0	.0			.96844	583.5	.00231	.001123	.00234	.001138	1.79	
52.0	.0			.93407	565.9	.00300	.001459	.00294	.001430	2.29	
52.0	12.0			.97520	581.9	.00129	.000627			.98	
55.0	.0			.97239	584.2	.00208	.001011	.00211	.001026	1.63	
58.0	.0			.97746	587.2	.00195	.000948			1.52	
58.0	12.0			.97013	578.9	.00126	.000613			.98	
58.0	-12.0			.97633	586.2	.00130	.000632			1.06	
44.0	-12.0			.96844	579.9	.00163	.000793			1.34	
36.0	-8.0			.97464	581.2	.00127	.000618			.84	
36.0	-3.0			.95097	572.9	.00232	.001128			1.55	
34.0	-3.0			.94196	571.9	.00215	.001045	.00210	.001021	1.42	
32.0	-3.0			.94647	568.2	.00200	.000972	.00195	.000948	1.43	
30.0	-3.0			.97464	579.2	.00147	.000715	.00150	.000729	.94	
28.0	-3.0			.97520	582.5	.00138	.000671			.97	
34.0	-12.0			.97239	580.5	.00135	.000656	.00123	.000598		
32.0	-12.0			.97239	580.5	.00133	.000647			.88	
30.0	-12.0			.97464	582.5	.00151	.000734	.00142	.000690	1.08	
19.0	-12.5			.97239	584.5	.00146	.000710			.91	
17.5	-11.0			.97126	581.5	.00160	.000778			.86	
15.5	-2.5			.97182	582.5	.00171	.000831			.92	
16.5	-2.5			.98027	587.9	.00122	.000593	.00135	.000656	.72	
17.5	-2.5			.96619	578.2	.00163	.000793	.00146	.000710	.87	
18.5	-2.5			.97182	581.5	.00162	.000788	.00173	.000841	.99	
19.5	-2.5			.96675	578.9	.00164	.000797	.00160	.000778	.99	
20.5	-2.5			.96619	582.9	.00155	.000754	.00149	.000725	.93	
21.5	-2.5			.97013	584.9	.00154	.000749	.00165	.000802	.91	
22.5	-2.5			.96788	583.2	.00154	.000749			.91	
23.5	-2.5			.95154	595.2	.00767	.003729	.00832	.004046	4.76	
24.5	-2.5			.96957	579.5	.00142	.000690			.93	
		10.55	0	.96168	619.2	.00914	.004444				1.49
		8.55	0	.96619	611.9	.00982	.004775				1.60
		6.55	0	.97295	616.5	.01003	.004877				1.64
		4.55	0	.97239	617.5	.01037	.005042				1.69
		3.55	0	.97239	618.9	.01080	.005251	.01086	.005281		1.76
		2.55	0	.95943	615.2	.01235	.006005	.01242	.006039		2.02
		1.55	0	.93463	605.9	.01473	.007162	.01452	.007060		2.41
		.55	0	.93689	609.9	.01455	.007075				2.38
		10.55	45	.95830	594.5	.00641	.003117				1.36
		6.55	45	.95999	604.2	.00611	.002971				1.30
		4.55	45	.96506	598.5	.00606	.002947				1.29
		2.55	45	.96788	583.2	.00154	.000749				.33
34.0	-1.0			.95323	566.2	.00077	.000374	.00070	.000340	.66	
34.0	4.0			.95886	574.5	.00161	.000783	.00186	.000900	1.05	
34.0	5.0			.95886	572.5	.00135	.000656			.93	
34.0	6.0			.96844	584.2	.00155	.000754	.00155	.000754	1.07	
36.0	6.0			.97295	582.5	.00156	.000759			1.08	
38.0	1.0			.95041	569.2	.00111	.000540			.74	
38.0	2.0			.99436	587.9	.00028	.000136			.18	
44.0	8.0			.97126	581.2	.00135	.000656	.00137	.000666	.89	
44.0	6.0			.95774	578.5	.00149	.000725	.00149	.000725	1.06	
44.0	4.0			.94590	566.5	.00160	.000778	.00153	.000744	1.17	
44.0	2.0			.95943	571.9	.00119	.000579	.00119	.000579	.78	
44.0	1.0			.96055	575.2	.00161	.000783	.00166	.000807	1.07	
		10.55	90	.95323	572.2	.00139	.000676				.96
		6.55	90	.95661	570.9	.00137	.000666				.94
		4.55	90	.95717	570.9	.00136	.000661				.94
		2.55	90	.95492	573.5	.00148	.000720				1.02
		4.55	180	.94703	566.9	.00157	.000763				
		3.55	180	.99098	586.2	.00030	.000146	.00048	.000233		
		2.55	180	.98985	585.5	.00028	.000136				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

8. 2.8-inch-diameter cylinder swept back 45° - Continued

(e) M = 4.44; R = 3.11 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95352	583.9	.00168	.000607			.88	
12.0	.0			.95078	581.9	.00119	.000430			.86	
20.5	.0			.95461	583.5	.00118	.000426			.86	
28.0	12.0			.94805	580.2	.00120	.000434			.89	
28.0	4.0			.95406	582.2	.00111	.000401			.90	
28.0	.0			.95406	581.2	.00102	.000369			.83	
20.5	-5.0			.95625	582.9	.00095	.000343			.80	
24.5	-5.0			.95570	582.2	.00094	.000340			.81	
30.0	.0			.96117	586.5	.00094	.000340	.00101	.000365	1.12	
31.0	12.0			.95133	580.2	.00103	.000372			.77	
2.0	-12.0			.95789	586.5	.00172	.000622			.86	
2.0	12.0			.95516	588.9	.00199	.000719			.86	
12.0	-12.0			.95734	585.2	.00127	.000459			.84	
12.0	12.0			.94695	578.9	.00149	.000539			.94	
30.0	1.0			.94586	581.5	.00238	.000860			1.92	
31.0	2.0			.93000	570.5	.00221	.000799			1.78	
32.0	2.0			.91524	562.5	.00236	.000853	.00224	.000810	2.02	
32.0	3.0			.93328	573.5	.00175	.000632			1.39	
32.0	6.0			.95406	582.5	.00127	.000459			1.02	
34.0	1.0			.92945	564.9	.00055	.000199			.47	
34.0	2.0			.90868	558.5	.00233	.000842			1.77	
34.0	3.0			.92344	565.5	.00170	.000614	.00159	.000575	1.36	
36.0	.0			.95078	578.5	.00071	.000257	.00078	.000282	.61	
38.0	.0			.93164	567.5	.00107	.000387	.00101	.000365	.90	
40.0	.0			.92781	567.5	.00122	.000441	.00121	.000437	1.10	
44.0	12.0			.95898	584.5	.00099	.000358			.88	
42.0	.0			.92399	567.5	.00176	.000636	.00169	.000611		
44.0	.0			.93656	573.9	.00192	.000694	.00194	.000701	2.29	
48.0	.0			.94914	581.2	.00188	.000679	.00189	.000683	1.72	
52.0	.0			.95133	584.2	.00171	.000618	.00171	.000618	2.04	
52.0	12.0			.96281	589.5	.00100	.000361			.88	
55.0	.0			.95516	583.9	.00159	.000575	.00159	.000575	1.89	
58.0	.0			.96008	586.9	.00151	.000546			1.80	
58.0	12.0			.95953	584.2	.00097	.000351			.86	
58.0	-12.0			.96500	587.2	.00067	.000242			.73	
44.0	-12.0			.96390	586.5	.00074	.000267			.67	
36.0	-8.0			.96008	584.2	.00089	.000322			.80	
36.0	-3.0			.93492	572.9	.00193	.000698			1.79	
34.0	-3.0			.92563	568.5	.00163	.000589	.00144	.000520	1.47	
32.0	-3.0			.93110	570.5	.00166	.000600	.00159	.000575	1.50	
30.0	-3.0			.95516	584.5	.00113	.000408	.00119	.000430	.97	
28.0	-3.0			.96172	587.7	.00093	.000336			1.11	
34.0	-12.0			.95680	582.5	.00099	.000358	.00084	.000304		
32.0	-12.0			.95680	582.5	.00098	.000354			.87	
30.0	-12.0			.95898	584.2	.00098	.000354	.00095	.000343	.79	
19.0	-12.5			.95789	587.5	.00118	.000426			.81	
17.5	-11.0			.95734	587.2	.00118	.000426			.90	
15.5	-2.5			.95953	585.9	.00111	.000401			.82	
16.5	-2.5			.95625	586.5	.00113	.000408	.00111	.000401	.86	
17.5	-2.5			.95461	583.5	.00118	.000426	.00100	.000361	.90	
18.5	-2.5			.95953	587.2	.00112	.000405	.00128	.000463	.93	
19.5	-2.5			.95516	584.5	.00113	.000408	.00106	.000383	.91	
20.5	-2.5			.95461	581.9	.00101	.000365	.00096	.000347	.83	
21.5	-2.5			.95789	584.5	.00111	.000401	.00121	.000437	.90	
22.5	-2.5			.95516	582.2	.00099	.000358	.00094	.000340	.82	
23.5	-2.5			.95570	582.5	.00098	.000354	.00097	.000351	.79	
24.5	-2.5			.95680	584.5	.00106	.000383			.91	
		10.55	0	.95352	601.9	.00893	.003227				1.31
		8.55	0	.95734	605.2	.00929	.003358				1.37
		6.55	0	.96117	608.9	.00997	.003603				1.47
		4.55	0	.95953	608.5	.01029	.003719				1.51
		3.55	0	.96445	612.5	.01052	.003802	.01062	.003838		1.55
		2.55	0	.95953	611.2	.01168	.004221	.01189	.004297		1.72
		1.55	0	.93328	608.5	.01376	.004973	.01374	.004966		2.02
		.55	0	.91578	592.9	.01422	.005139				2.09
		10.55	45	.94969	592.5	.00595	.002150				1.14
		6.55	45	.94805	593.5	.00634	.002291				1.21
		4.55	45	.95187	595.5	.00626	.002262				1.20
		2.55	45	.94969	596.2	.00722	.002609				1.38
34.0	-1.0			.93820	570.5	.00051	.000184			.47	
34.0	4.0			.94313	579.9	.00129	.000466			1.02	
34.0	5.0			.94367	574.2	.00073	.000264			.55	
34.0	6.0			.95570	584.9	.00119	.000430	.00119	.000430	.90	
36.0	6.0			.95898	585.2	.00132	.000477			1.01	
38.0	1.0			.93875	571.2	.00062	.000224	.00076	.000275	.53	
38.0	2.0			.93110	569.2	.00141	.000510			1.21	
44.0	8.0			.95844	584.2	.00099	.000358	.00102	.000369	.88	
44.0	6.0			.94750	580.5	.00114	.000412	.00115	.000416	.96	
44.0	4.0			.93110	569.5	.00156	.000564	.00147	.000531	1.25	
44.0	2.0			.94258	573.9	.00082	.000296	.00083	.000300	.69	
44.0	1.0			.94367	575.5	.00101	.000365	.00109	.000394	.92	
		10.55	90	.93930	576.2	.00120	.000434				.75
		6.55	90	.94094	575.5	.00114	.000412				.71
		4.55	90	.94149	577.2	.00115	.000416				.71
		2.55	90	.94586	579.5	.00121	.000437				.75

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

8. 2.8-inch-diameter cylinder swept back 45° - Concluded

(f) M = 4.44; R = 2.07 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97077	588.2	.00234	.001269			1.37	
12.0	.0			.96857	587.5	.00133	.000721			1.13	
20.5	.0			.97353	587.9	.00116	.000629			1.03	
28.0	12.0			.96691	584.5	.00118	.000640			1.16	
28.0	4.0			.97353	587.9	.00116	.000629			1.20	
28.0	.0			.97408	589.9	.00095	.000515			1.01	
24.5	-6.0			.97518	589.2	.00089	.000483			.96	
31.0	12.0			.97022	586.2	.00117	.000635			1.11	
2.0	-12.0			.97739	592.5	.00298	.001616			1.94	
2.0	12.0			.97408	591.2	.00257	.001394			1.40	
12.0	-12.0			.97574	589.2	.00141	.000765			1.29	
12.0	12.0			.96416	583.9	.00180	.000976			1.32	
30.0	1.0			.96140	584.5	.00286	.001551			2.62	
31.0	2.0			.94541	573.2	.00243	.001318			2.48	
32.0	2.0			.96967	586.2	.00144	.000781			1.50	
32.0	3.0			.94817	574.5	.00185	.001004			1.91	
34.0	2.0			.92336	563.5	.00260	.001410			2.65	
34.0	3.0			.93714	567.9	.00187	.001014			1.70	
40.0	.0			.94927	573.5	.00121	.000656	.00123	.000667	1.46	
44.0	12.0			.97904	591.2	.00115	.000624				
42.0	.0			.94376	571.5	.00184	.000998	.00173	.000938	1.94	
44.0	.0			.95368	578.5	.00192	.001041	.00195	.001058	2.13	
48.0	.0			.96526	584.5	.00180	.000976	.00188	.001020	2.02	
52.0	.0			.92997	565.5	.00295	.001600	.00274	.001486	3.21	
52.0	12.0			.98125	593.2	.00090	.000488			1.02	
55.0	.0			.97408	589.5	.00177	.000960	.00206	.001117	2.36	
58.0	.0			.97904	593.5	.00165	.000895			1.85	
58.0	-12.0			.98345	593.2	.00092	.000499			1.33	
36.0	-3.0			.94927	575.5	.00218	.001183			2.37	
34.0	-3.0			.93990	569.9	.00172	.000933	.00158	.000857	1.87	
32.0	-3.0			.94651	572.5	.00201	.001090	.00170	.000922	2.09	
34.0	-12.0			.97629	589.2	.00115	.000624	.00104	.000564		
32.0	-12.0			.97629	589.2	.00115	.000624			1.29	
30.0	-12.0			.97849	590.2	.00139	.000754	.00158	.000857	1.83	
19.0	-12.5			.97739	591.9	.00106	.000575			1.13	
17.5	-11.0			.97684	589.5	.00139	.000754			1.30	
15.5	-2.5			.97849	590.9	.00115	.000624			1.07	
16.5	-2.5			.98401	593.9	.00084	.000456			.78	
19.5	-2.5			.97463	588.2	.00115	.000624	.00101	.000548	1.03	
20.5	-2.5			.97408	588.2	.00116	.000629	.00108	.000586	1.14	
22.5	-2.5			.97518	588.5	.00115	.000624	.00101	.000548	1.13	
23.5	-2.5			.95699	592.9	.00943	.005115	.00957	.005191	10.14	
24.5	-2.5			.97684	589.5	.00115	.000624			1.21	
		10.55	0	.96250	599.2	.01226	.006650				2.22
		8.55	0	.96636	602.2	.01291	.007003				2.33
		6.55	0	.96967	605.5	.01418	.007692				2.56
		4.55	0	.96857	605.2	.01477	.008012				2.67
		3.55	0	.97353	608.9	.01540	.008353	.01564	.008484		2.78
		2.55	0	.96691	606.9	.01761	.009552	.01813	.009834		3.18
		1.55	0	.93714	592.9	.02469	.013393	.02439	.013230		4.46
		.55	0	.92281	583.9	.02584	.014016				4.67
		10.55	45	.95920	590.9	.00713	.003868				1.68
		6.55	45	.95699	591.2	.00822	.004459				1.93
		4.55	45	.96140	593.2	.00767	.004160				1.80
34.0	4.0			.95975	579.5	.00143	.000776			1.43	
34.0	5.0			.96085	580.5	.00091	.000494			.92	
34.0	6.0			.97463	588.9	.00117	.000635	.00116	.000629	1.18	
36.0	6.0			.97739	590.5	.00116	.000629			1.18	
44.0	8.0			.97794	590.5	.00115	.000624	.00120	.000651	1.24	
44.0	4.0			.95037	574.9	.00152	.000824	.00133	.000721	1.63	
		10.55	90	.95037	574.2	.00120	.000651				.92
		4.55	90	.95423	576.9	.00121	.000656				.92
		2.55	90	.95754	581.5	.00136	.000738				1.04
		4.55	180	.94872	573.2	.00146	.000792				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES: δ = 0.70 INCH - Continued

9. 30° Cableway

(a) M = 2.65; R = 3.88 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_c}$
2.0	.0			.95301	591.2	.00697	.000989			1.06
12.0	.0			.94574	583.2	.00584	.000828			1.08
28.0	12.0			.92784	564.5	.00373	.000529			.69
28.0	4.0			.97818	584.9	.00082	.000116			.15
28.0	.0			.98042	584.5	.00039	.000055			.07
30.0	.0			.94238	578.5	.00480	.000681	.00482	.000684	.98
31.0	12.0			.92616	571.9	.00603	.000855			1.16
34.0	.0			.92616	570.9	.00575	.000816			1.13
2.0	-12.0			.95804	593.2	.00690	.000979			1.10
2.0	12.0			.95748	593.9	.00685	.000972			1.05
12.0	-12.0			.95189	586.9	.00595	.000844			1.09
12.0	12.0			.94238	582.9	.00621	.000881			1.09
30.0	1.0			.93958	577.5	.00492	.000698			.96
31.0	2.0			.92616	571.9	.00600	.000851			1.18
32.0	2.0			.92392	569.9	.00616	.000874	.00613	.000870	1.28
32.0	3.0			.92168	570.2	.00622	.000882			1.18
32.0	6.0			.91721	567.5	.00626	.000888			1.17
34.0	1.0			.92616	572.9	.00624	.000885	.00632	.000897	1.24
34.0	2.0			.92280	570.9	.00630	.000894	.00629	.000892	1.20
34.0	3.0			.91945	568.5	.00624	.000885			1.18
36.0	.0			.92616	572.2	.00613	.000870	.00614	.000871	1.24
38.0	.0			.92672	572.5	.00606	.000860	.00607	.000861	1.15
40.0	.0			.92560	570.5	.00573	.000813	.00571	.000810	1.17
44.0	12.0			.93623	580.9	.00728	.001033			1.37
42.0	.0			.92560	571.2	.00599	.000850	.00597	.000847	1.19
44.0	.0			.93455	576.2	.00572	.000811	.00574	.000814	1.17
48.0	.0			.93455	575.2	.00559	.000793	.00559	.000793	1.15
52.0	.0			.93175	573.9	.00568	.000806	.00567	.000804	1.07
52.0	12.0			.93791	580.2	.00643	.000912			1.35
55.0	.0			.93455	574.9	.00533	.000756	.00533	.000756	1.05
58.0	.0			.93902	577.5	.00544	.000772			1.08
58.0	12.0			.93902	581.2	.00623	.000884			1.27
58.0	-12.0			.94182	581.5	.00605	.000858			1.21
44.0	-12.0			.93511	578.5	.00661	.000938			1.33
36.0	-8.0			.93175	572.9	.00560	.000794			1.15
36.0	-3.0			.92728	571.9	.00590	.000837			1.22
34.0	-3.0			.92224	568.9	.00597	.000847	.00595	.000844	1.18
32.0	-3.0			.92224	568.9	.00577	.000819	.00577	.000813	1.16
30.0	-3.0			.93735	576.5	.00527	.000748	.00527	.000748	1.05
28.0	-3.0			.97874	589.2	.00096	.000136			.20
34.0	-12.0			.92784	573.2	.00621	.000881			1.22
32.0	-12.0			.92896	573.2	.00604	.000857	.00606	.000860	.97
30.0	-12.0			.93063	569.9	.00480	.000681			1.78
19.0	-12.5			.92952	583.9	.00921	.001307			1.73
17.5	-11.0			.96140	601.2	.00901	.001278			1.23
15.5	-2.5			.95860	593.2	.00664	.000942			1.42
16.5	-2.5			.96643	601.2	.00733	.001040	.00741	.001051	1.47
17.5	-2.5			.97315	606.5	.00784	.001112	.00818	.001160	.47
18.5	-2.5			.99384	603.2	.00246	.000349	.00230	.000326	1.04
36.0	-16.0			.93735	574.5	.00484	.000687			1.42
36.0	-12.0			.92112	573.9	.00689	.000977	.00659	.000935	1.11
32.0	-18.0			.95189	584.9	.00532	.000755	.00564	.000800	1.06
32.0	-16.0			.94406	583.9	.00523	.000742	.00526	.000746	1.07
32.0	-14.0			.93455	573.9	.00520	.000738	.00482	.000684	1.47
32.0	-12.0			.93679	583.5	.00770	.001092	.00780	.001107	1.15
28.0	-14.0			.93902	578.9	.00572	.000811	.00577	.000819	.69
28.0	-12.0			.93175	565.5	.00340	.000482			1.31
26.0	-12.5			.94797	587.9	.00652	.000925	.00654	.000928	1.63
22.0	-12.5			.93902	586.5	.00819	.001162	.00818	.001160	.14
20.5	-11.0			.97650	585.5	.00076	.000108	.00062	.000088	3.49
34.0	-1.0			.97818	633.2	.01579	.002240	.01736	.002463	3.05
34.0	4.0			.97259	629.9	.01593	.002260	.01753	.002487	3.32
34.0	5.0			.96420	635.2	.01694	.002403	.01838	.002607	1.28
34.0	6.0			.93735	582.2	.00674	.000956	.00681	.000966	1.24
36.0	6.0			.94182	588.9	.00653	.000926			1.33
38.0	1.0			.93567	580.9	.00656	.000931	.00669	.000949	1.06
38.0	2.0			.94797	584.5	.00528	.000749			1.06
44.0	8.0			.94741	584.5	.00567	.000804	.00569	.000807	.98
44.0	6.0			.94574	581.5	.00497	.000705	.00493	.000699	1.06
44.0	4.0			.95077	589.5	.00528	.000749	.00524	.000743	1.05
44.0	2.0			.95021	589.2	.00530	.000752	.00531	.000753	1.09
44.0	1.0			.95189	584.5	.00512	.000726	.00527	.000748	
12.0	7.0	.66		.93902	576.9	.00507	.000719			
1.5	7.0	.66		.94238	583.9	.00628	.000891			
12.0	6.2	1.00		.94518	580.2	.00481	.000682			
8.0	6.2	1.00		.94238	578.2	.00480	.000681			
1.5	6.2	1.00		.93847	582.2	.00658	.000933			
12.0	3.6	1.00		.94070	576.9	.00478	.000678			
8.0	3.6	1.00		.94182	578.2	.00496	.000704			
1.5	3.6	1.00		.94741	585.5	.00621	.000881			

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30^0 Cableway - Continued

(b) M = 2.65; R = 2.49×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_c}{T_t}$	T_w, ^0R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96252	593.9	.00506	.001113			1.07
12.0	.0			.95525	585.2	.00406	.000893			1.05
28.0	12.0			.94406	571.9	.00255	.000561			.66
28.0	4.0			1.00055	597.9	.00062	.000136			.17
28.0	.0			1.00167	598.2	.00041	.000090			.11
30.0	.0			.95189	582.2	.00359	.000790	.00360	.000792	1.05
31.0	12.0			.93455	573.5	.00438	.000964			1.21
34.0	.0			.93847	574.9	.00395	.000869			1.18
2.0	-12.0			.96867	596.5	.00505	.001111			1.09
2.0	12.0			.96699	597.5	.00524	.001153			1.07
12.0	-12.0			.96252	589.5	.00419	.000922			1.08
12.0	12.0			.95133	584.9	.00447	.000983			1.07
30.0	1.0			.94965	584.2	.00378	.000832			1.05
31.0	2.0			.93679	574.9	.00416	.000915			1.18
32.0	2.0			.93623	573.2	.00401	.000882	.00398	.000876	1.19
32.0	3.0			.93287	572.9	.00434	.000955			1.19
32.0	6.0			.92896	570.9	.00429	.000944			1.15
34.0	1.0			.93847	575.9	.00416	.000915	.00423	.000931	1.19
34.0	2.0			.93455	573.9	.00426	.000937	.00424	.000933	1.19
34.0	3.0			.93119	571.9	.00442	.000972			1.22
36.0	.0			.93847	575.2	.00406	.000893	.00406	.000893	1.17
38.0	.0			.93847	575.2	.00406	.000893	.00406	.000893	1.17
40.0	.0			.93735	573.9	.00383	.000843	.00382	.000840	1.17
44.0	12.0			.94462	581.9	.00477	.001049			1.30
42.0	.0			.93735	574.2	.00390	.000858	.00387	.000851	1.11
44.0	.0			.94686	579.5	.00391	.000860	.00393	.000865	1.15
48.0	.0			.94686	578.9	.00374	.000823	.00374	.000823	1.12
52.0	.0			.94462	577.2	.00396	.000871	.00396	.000871	1.16
52.0	12.0			.94686	582.2	.00444	.000977			1.31
55.0	.0			.94741	578.5	.00364	.000801	.00364	.000801	1.13
58.0	.0			.95301	581.9	.00358	.000788			1.12
58.0	12.0			.94965	583.2	.00430	.000946			1.31
58.0	-12.0			.95413	584.5	.00423	.000931			1.29
44.0	-12.0			.94686	580.9	.00455	.001001			1.44
36.0	-8.0			.94797	578.2	.00367	.000807			1.10
36.0	-3.0			.94070	575.5	.00393	.000865			1.16
34.0	-3.0			.93511	572.5	.00390	.000858	.00388	.000854	1.16
32.0	-3.0			.93399	572.2	.00406	.000893	.00401	.000882	1.19
30.0	-3.0			.94797	580.9	.00389	.000856	.00385	.000847	1.08
28.0	-3.0			1.00391	599.5	.00062	.000136			.20
34.0	-12.0			.93958	576.2	.00441	.000970			
32.0	-12.0			.93958	575.9	.00432	.000950	.00432	.000950	1.29
30.0	-12.0			.94350	574.2	.00336	.000739			1.00
19.0	-12.5			.93902	588.5	.00610	.001342			1.72
17.5	-11.0			.96755	600.2	.00613	.001349			1.63
15.5	-2.5			.96867	596.2	.00473	.001041			1.22
16.5	-2.5			.97482	601.5	.00504	.001109	.00504	.001109	1.40
17.5	-2.5			.98321	610.9	.00518	.001140	.00519	.001142	1.38
18.5	-2.5			1.01789	609.5	.00101	.000222	.00087	.000191	.28
36.0	-16.0			.95077	578.5	.00319	.000702			1.01
36.0	-12.0			.93958	576.5	.00478	.001052	.00450	.000990	1.43
32.0	-18.0			.96420	588.2	.00352	.000774	.00383	.000843	1.07
32.0	-16.0			.95581	582.9	.00351	.000772	.00351	.000772	1.04
32.0	-14.0			.94797	577.5	.00353	.000777	.00315	.000693	1.07
32.0	-10.0			.94741	585.2	.00517	.001137	.00523	.001151	1.48
28.0	-14.0			.95133	581.9	.00394	.000867	.00396	.000871	1.14
28.0	-12.0			.94909	573.5	.00236	.000519			.69
26.0	-12.5			.96196	595.9	.00472	.001038	.00463	.001019	1.30
22.0	-12.5			.95581	591.2	.00565	.001243	.00564	.001241	1.57
20.5	-11.0			1.00839	599.9	.00023	.000051			.06
34.0	-1.0			.98098	628.9	.01115	.002453	.01174	.002583	3.60
34.0	4.0			.97594	632.2	.01077	.002369	.01203	.002647	3.03
34.0	5.0			.96867	631.2	.01245	.002739	.01356	.002983	3.36
34.0	6.0			.94853	587.2	.00429	.000944	.00433	.000953	1.16
36.0	6.0			.95357	586.9	.00431	.000948			1.20
38.0	1.0			.94741	582.9	.00436	.000959	.00437	.000961	1.26
38.0	2.0			.96420	592.9	.00361	.000794			1.03
44.0	8.0			.96364	595.5	.00349	.000768	.00356	.000783	.99
44.0	6.0			.96308	587.9	.00351	.000772	.00349	.000768	.99
44.0	4.0			.96755	591.9	.00372	.000818	.00374	.000823	1.10
44.0	2.0			.96699	594.5	.00348	.000766	.00348	.000766	1.00
44.0	1.0			.96979	591.5	.00322	.000708	.00344	.000757	1.00
12.0	7.0	.66		.95189	580.9	.00355	.000781			
1.5	7.0	.66		.95413	586.5	.00429	.000944			
12.0	6.2	1.00		.95916	584.5	.00318	.000700			
8.0	6.2	1.00		.95692	582.9	.00304	.000669			
1.5	6.2	1.00		.94909	583.9	.00442	.000972			
12.0	3.6	1.00		.95413	581.2	.00322	.000708			
8.0	3.6	1.00		.95581	582.5	.00322	.000708			
1.5	3.6	1.00		.95804	587.2	.00402	.000884			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^0R$.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30° Cableway - Continued

(c) M = 2.65; R = 1.24×10^6

x, in.	y, in.	z, in. (a)	∅, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97768	591.2	.00126	.000557			1.24
12.0	.0			.96932	591.2	.00264	.001167			1.06
28.0	12.0			.96764	583.5	.00152	.000672			.70
28.0	4.0			1.02789	614.2	.00031	.000137			.13
28.0	.0			1.02677	613.5	.00029	.000128			.14
30.0	.0			.96764	588.9	.00225	.000994	.00226	.000999	1.06
31.0	12.0			.94923	578.2	.00251	.001109			1.18
34.0	.0			.95593	580.9	.00228	.001008			1.21
2.0	-12.0			.98772	598.9	.00117	.000517			1.63
2.0	12.0			.98605	594.9	.00099	.000438			1.21
12.0	-12.0			.97768	595.5	.00253	.001118			1.02
12.0	12.0			.96485	589.9	.00282	.001246			1.04
30.0	1.0			.96541	588.2	.00232	.001025			1.08
31.0	2.0			.95258	580.5	.00240	.001061			1.23
32.0	2.0			.95202	578.9	.00224	.000990	.00222	.000981	1.20
32.0	3.0			.94868	578.2	.00241	.001065			1.18
32.0	6.0			.94589	576.2	.00230	.001016			1.12
34.0	1.0			.95426	581.5	.00222	.000981	.00227	.001003	1.05
34.0	2.0			.95202	579.5	.00237	.001047	.00233	.001030	1.11
34.0	3.0			.94923	577.5	.00235	.001039			1.10
36.0	.0			.95649	581.5	.00215	.000950	.00215	.000950	1.15
38.0	.0			.95760	581.9	.00211	.000932	.00211	.000932	1.09
40.0	.0			.95760	581.2	.00199	.000879	.00198	.000875	1.08
44.0	12.0			.96318	586.9	.00245	.001083			1.16
42.0	.0			.95760	581.5	.00202	.000893	.00199	.000879	1.07
44.0	.0			.96708	586.9	.00199	.000879	.00201	.000888	1.08
48.0	.0			.96820	586.9	.00181	.000800	.00181	.000800	.99
52.0	.0			.96653	587.2	.00183	.000809	.00183	.000809	.98
52.0	12.0			.96541	587.2	.00230	.001016			1.27
55.0	.0			.96987	587.5	.00179	.000791	.00178	.000787	1.05
58.0	.0			.97713	591.9	.00174	.000769			.97
58.0	12.0			.96987	589.5	.00213	.000941			1.17
58.0	-12.0			.97489	591.5	.00202	.000893			1.13
44.0	-12.0			.96653	587.2	.00223	.000985			1.39
36.0	-8.0			.96987	587.2	.00185	.000818			.97
36.0	-3.0			.95983	582.5	.00208	.000919			1.12
34.0	-3.0			.95314	578.9	.00207	.000915	.00206	.000910	1.11
32.0	-3.0			.95035	577.9	.00224	.000990	.00225	.000994	1.16
30.0	-3.0			.96764	589.2	.00229	.001012	.00221	.000977	1.15
34.0	-12.0			.95704	582.5	.00243	.001074			1.28
32.0	-12.0			.95537	581.5	.00238	.001052	.00238	.001052	.89
30.0	-12.0			.96039	580.5	.00173	.000765			1.55
19.0	-12.5			.95537	587.5	.00337	.001489			1.70
17.5	-11.0			.98047	602.9	.00379	.001675			1.01
15.5	-2.5			.98438	599.5	.00248	.001096			1.38
16.5	-2.5			.98717	605.5	.00313	.001383	.00316	.001396	1.10
17.5	-2.5			.99832	612.2	.00277	.001224	.00266	.001176	1.01
36.0	-16.0			.97099	587.5	.00187	.000826			1.27
36.0	-12.0			.95872	583.2	.00238	.001052	.00206	.000910	1.08
32.0	-18.0			.98215	595.2	.00196	.000866	.00223	.000985	1.02
32.0	-16.0			.97489	591.2	.00193	.000853	.00197	.000871	.85
32.0	-14.0			.96764	584.9	.00157	.000694			1.38
32.0	-10.0			.95872	585.5	.00273	.001206	.00273	.001206	.87
28.0	-14.0			.97099	588.2	.00185	.000818	.00187	.000826	.68
28.0	-12.0			.97099	585.2	.00132	.000583			1.14
26.0	-12.5			.98159	599.2	.00241	.001065	.00244	.001078	1.30
22.0	-12.5			.97266	600.5	.00276	.001220	.00273	.001206	3.92
34.0	-1.0			.98661	624.2	.00702	.003102	.00756	.003341	3.49
34.0	4.0			.98159	621.5	.00730	.003226	.00791	.003496	3.90
34.0	5.0			.97434	619.2	.00796	.003518	.00858	.003792	.98
34.0	6.0			.96485	587.2	.00206	.000910	.00210	.000928	1.00
36.0	6.0			.96932	589.9	.00212	.000937			.90
38.0	1.0			.96374	587.9	.00211	.000932	.00196	.000866	.95
38.0	2.0			.98549	601.2	.00180	.000795			.83
44.0	8.0			.98549	597.9	.00187	.000826	.00183	.000809	.96
44.0	6.0			.98549	599.5	.00161	.000711	.00158	.000698	.96
44.0	4.0			.99107	601.2	.00185	.000818	.00187	.000826	1.01
44.0	2.0			.99163	601.5	.00185	.000818	.00184	.000813	
44.0	1.0			.99386	602.2	.00184	.000813	.00203	.000897	
12.0	7.0	.66		.97565	590.2	.00161	.000711			
1.5	7.0	.66		.97489	592.9	.00214	.000946			
12.0	6.2	1.00		.98270	594.2	.00155	.000685			
8.0	6.2	1.00		.98159	593.2	.00144	.000636			
1.5	6.2	1.00		.96876	589.5	.00216	.000955			
12.0	3.6	1.00		.97824	590.9	.00150	.000663			
8.0	3.6	1.00		.97936	592.2	.00159	.000703			
1.5	3.6	1.00		.97824	593.2	.00193	.000853			

[a] Thermocouple locations for which z and/or ∅ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30° Cableway - Continued

(d) M = 3.51; R = 3.88×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96015	584.9	.00500	.000984			1.18
12.0	.0			.95453	578.2	.00355	.000698			1.06
28.0	12.0			.95453	571.9	.00205	.000403			.73
28.0	4.0			1.04097	617.6	.00040	.000079			.13
28.0	.0			1.04209	617.9	.00032	.000063			.10
30.0	.0			.95397	579.9	.00310	.000610	.00313	.000616	1.15
31.0	12.0			.93714	565.9	.00317	.000624			1.16
34.0	.0			.94331	574.5	.00293	.000576			1.05
2.0	-12.0			.96800	593.5	.00459	.000903			1.13
2.0	12.0			.96351	586.5	.00445	.000875			1.10
12.0	-12.0			.96351	590.2	.00346	.000681			1.04
12.0	12.0			.95004	575.9	.00403	.000793			1.24
30.0	1.0			.95173	579.2	.00346	.000681			1.16
31.0	2.0			.93657	573.5	.00346	.000681			1.20
32.0	2.0			.93714	572.2	.00324	.000637	.00322	.000633	1.11
32.0	3.0			.93265	571.2	.00357	.000702			1.20
32.0	6.0			.92816	565.5	.00368	.000724			1.21
34.0	1.0			.94163	575.5	.00332	.000653	.00337	.000663	1.17
34.0	2.0			.93770	567.5	.00369	.000726	.00366	.000720	1.28
34.0	3.0			.93433	571.2	.00336	.000661			1.09
36.0	.0			.94275	573.2	.00336	.000661	.00336	.000661	1.19
38.0	.0			.94387	574.2	.00359	.000706	.00359	.000706	1.22
40.0	.0			.94499	570.9	.00345	.000679	.00345	.000679	1.17
44.0	12.0			.94499	579.5	.00380	.000748			1.38
42.0	.0			.94555	574.5	.00333	.000655	.00331	.000651	1.18
44.0	.0			.95397	579.2	.00317	.000624	.00319	.000628	1.12
48.0	.0			.95510	581.5	.00296	.000582	.00307	.000604	1.10
52.0	12.0			.97306	613.5	.00491	.000966			1.92
55.0	.0			.97249	604.9	.00361	.000710	.00389	.000765	1.34
58.0	.0			.97193	604.5	.00285	.000561			1.15
58.0	12.0			.96071	589.9	.00354	.000696			1.45
58.0	-12.0			.96688	589.9	.00329	.000647			1.26
44.0	-12.0			.95453	583.9	.00377	.000742			1.45
36.0	-8.0			.95117	581.2	.00310	.000610			1.12
36.0	-3.0			.94724	574.5	.00318	.000626			1.15
34.0	-3.0			.93882	567.5	.00315	.000620	.00314	.000618	1.18
32.0	-3.0			.93265	563.2	.00326	.000641	.00319	.000628	1.16
30.0	-3.0			.95622	573.2	.00307	.000604	.00291	.000572	1.04
28.0	-3.0			1.04489	614.5	.00032	.000063			.11
34.0	-12.0			.94163	569.2	.00346	.000681			
32.0	-12.0			.93994	566.9	.00333	.000655	.00332	.000653	1.21
30.0	-12.0			.94780	563.9	.00224	.000441			.82
19.0	-12.5			.93657	573.2	.00492	.000968			1.64
17.5	-11.0			.97025	595.5	.00562	.001106			1.79
15.5	-2.5			.96688	583.9	.00358	.000704			1.06
16.5	-2.5			.97867	596.5	.00471	.000927	.00472	.000928	1.45
17.5	-2.5			.99382	604.9	.00451	.000887	.00440	.000866	1.37
36.0	-16.0			.95341	573.2	.00269	.000529			1.08
36.0	-12.0			.94219	572.2	.00345	.000679	.00316	.000622	1.29
32.0	-18.0			.96688	581.5	.00312	.000614	.00341	.000671	1.18
32.0	-16.0			.95790	575.9	.00297	.000584	.00292	.000574	1.09
32.0	-14.0			.95397	573.2	.00297	.000584	.00257	.000506	1.10
32.0	-10.0			.94331	573.2	.00357	.000702	.00352	.000692	1.28
28.0	-14.0			.95846	577.2	.00317	.000624	.00321	.000631	1.20
28.0	-12.0			.96015	574.2	.00205	.000403			.77
26.0	-12.5			.96464	587.9	.00464	.000913	.00467	.000919	1.66
22.0	-12.5			.96071	586.5	.00489	.000962	.00488	.000960	1.65
34.0	-1.0			.97418	631.5	.01418	.002789	.01572	.003092	5.54
34.0	4.0			.96969	628.2	.01475	.002902	.01625	.003197	5.19
34.0	5.0			.95790	627.9	.01624	.003195	.01769	.003480	5.56
34.0	6.0			.93882	573.5	.00484	.000952	.00496	.000976	1.70
38.0	1.0			.93714	572.9	.00504	.000991	.00482	.000948	1.73
38.0	2.0			.96632	584.5	.00357	.000702			1.22
44.0	8.0			.96632	584.5	.00357	.000702	.00359	.000706	1.34
44.0	6.0			.96744	584.5	.00302	.000594	.00300	.000590	1.13
44.0	4.0			.97418	591.5	.00290	.000570	.00292	.000574	1.04
44.0	2.0			.97586	592.2	.00310	.000610	.00309	.000608	1.10
44.0	1.0			.97929	590.2	.00278	.000547	.00305	.000600	1.03
12.0	7.0	.66		.95566	574.5	.00247	.000486			
1.5	7.0	.66		.95453	578.5	.00354	.000696			
12.0	6.2	1.00		.96295	583.9	.00239	.000470			
8.0	6.2	1.00		.96015	577.5	.00263	.000517			
1.5	6.2	1.00		.94948	579.2	.00385	.000757			
12.0	3.6	1.00		.95846	576.5	.00243	.000478			
8.0	3.6	1.00		.95959	580.2	.00265	.000521			
1.5	3.6	1.00		.96239	579.2	.00264	.000519			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30° Cableway - Continued

(e) M = 3.51; R = 2.75 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96272	584.9	.00379	.001059			1.10
12.0	.0			.95764	574.9	.00272	.000760			1.02
28.0	12.0			.96329	572.2	.00151	.000422			.66
28.0	4.0			1.04913	617.9	.00030	.000084			.13
30.0	.0			.96046	578.2	.00255	.000712	.00258	.000721	1.20
31.0	12.0			.94296	564.5	.00244	.000682			1.11
34.0	.0			.94522	565.5	.00255	.000712			1.21
2.0	-12.0			.97119	586.2	.00379	.001059			1.11
2.0	12.0			.96555	582.5	.00358	.001000			1.03
12.0	-12.0			.96781	580.9	.00286	.000799			1.11
12.0	12.0			.95256	571.9	.00284	.000793			1.06
30.0	1.0			.95820	574.5	.00271	.000757			1.20
31.0	2.0			.94013	564.5	.00295	.000824			1.31
32.0	2.0			.94013	562.9	.00258	.000721	.00256	.000715	1.23
32.0	3.0			.93562	563.9	.00274	.000765			1.19
32.0	6.0			.93110	558.5	.00280	.000782			1.20
34.0	1.0			.94409	567.9	.00248	.000693	.00252	.000704	1.14
34.0	2.0			.94013	563.5	.00259	.000724	.00256	.000715	1.08
34.0	3.0			.93731	564.2	.00261	.000729			1.09
36.0	.0			.94635	571.2	.00244	.000682	.00244	.000682	1.14
38.0	.0			.94747	567.5	.00273	.000763	.00273	.000763	1.26
40.0	.0			.94917	567.9	.00254	.000710	.00254	.000710	1.20
44.0	12.0			.95143	570.5	.00290	.000810			1.42
42.0	.0			.94973	570.5	.00245	.000684	.00243	.000679	1.08
44.0	.0			.95933	573.2	.00226	.000631	.00228	.000637	1.08
48.0	.0			.96046	575.9	.00219	.000612	.00228	.000637	1.06
52.0	12.0			1.01976	613.5	.00240	.000670			1.27
55.0	.0			1.01129	606.5	.00208	.000581	.00231	.000645	1.03
58.0	.0			1.00282	601.9	.00200	.000559			1.00
58.0	12.0			.98305	588.9	.00231	.000645			1.22
58.0	-12.0			.98362	590.5	.00236	.000659			1.25
44.0	-12.0			.96668	579.2	.00284	.000793			1.41
36.0	-8.0			.95933	572.5	.00248	.000693			1.12
36.0	-3.0			.95256	570.9	.00231	.000645			1.17
34.0	-3.0			.94013	563.5	.00234	.000654	.00233	.000651	1.11
32.0	-3.0			.93110	558.5	.00248	.000693	.00240	.000670	1.17
30.0	-3.0			.94973	571.2	.00257	.000718	.00241	.000673	1.18
28.0	-3.0			1.04743	615.5	.00026	.000073			.12
34.0	-12.0			.94239	566.9	.00281	.000785			
32.0	-12.0			.93900	564.5	.00270	.000754	.00269	.000751	1.29
30.0	-12.0			.94578	561.5	.00164	.000458			.78
19.0	-12.5			.93392	568.2	.00371	.001036			1.60
17.5	-11.0			.96498	588.5	.00441	.001232			1.74
15.5	-2.5			.96329	576.9	.00278	.000777			1.11
16.5	-2.5			.97289	590.9	.00396	.001106	.00401	.001120	1.62
17.5	-2.5			.98644	594.9	.00387	.001081	.00372	.001039	1.49
18.5	-2.5			1.03670	608.9	.00023	.000064			.10
36.0	-16.0			.95312	570.2	.00197	.000550			.96
36.0	-12.0			.94578	567.5	.00292	.000816	.00269	.000751	1.43
32.0	-18.0			.96837	581.2	.00218	.000609	.00242	.000676	1.10
32.0	-16.0			.95933	576.9	.00205	.000573	.00199	.000556	1.01
32.0	-14.0			.95538	570.2	.00217	.000606	.00183	.000511	1.05
32.0	-10.0			.94126	564.9	.00277	.000774	.00270	.000754	1.24
28.0	-14.0			.96103	576.5	.00219	.000612	.00224	.000626	.99
28.0	-12.0			.96611	574.2	.00155	.000433			.74
26.0	-12.5			.97063	585.5	.00344	.000961	.00347	.000969	1.64
22.0	-12.5			.96442	585.9	.00345	.000967	.00344	.000961	1.50
34.0	-1.0			.97063	614.2	.01214	.003391	.01225	.003422	6.07
34.0	4.0			.96781	618.9	.01132	.003162	.01260	.003520	5.19
34.0	5.0			.95820	617.5	.01243	.003472	.01351	.003774	5.65
34.0	6.0			.94189	571.9	.00352	.000983	.00356	.000994	1.61
36.0	6.0			.94747	571.5	.00352	.000983			1.62
38.0	1.0			.94126	568.2	.00338	.000944	.00313	.000874	1.59
38.0	2.0			.97063	581.9	.00251	.000701			1.17
44.0	8.0			.97176	584.5	.00241	.000673	.00243	.000679	1.15
44.0	5.0			.97402	582.5	.00215	.000601	.00213	.000595	1.02
44.0	4.0			.98079	587.2	.00232	.000648	.00234	.000654	1.09
44.0	2.0			.98305	592.2	.00210	.000587	.00210	.000587	1.00
44.0	1.0			.98644	593.9	.00173	.000483	.00211	.000589	.86
12.0	7.0	.66		.96046	574.5	.00184	.000514			
1.5	7.0	.66		.96046	575.9	.00259	.000724			
12.0	6.2	1.00		.96893	577.2	.00180	.000503			
8.0	6.2	1.00		.96611	577.5	.00182	.000508			
1.5	6.2	1.00		.95538	573.2	.00262	.000732			
12.0	3.6	1.00		.96385	576.2	.00183	.000511			
8.0	3.6	1.00		.96555	575.9	.00197	.000550			
1.5	3.6	1.00		.96837	577.2	.00196	.000548			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30° Cableway - Continued

(f) M = 3.51; R = 1.57×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97676	581.9	.00196	.000957			1.17
12.0	.0			.97280	577.5	.00185	.000903			.97
28.0	12.0			.98356	579.9	.00100	.000488			.65
28.0	4.0			1.06403	623.9	.00015	.000073			.09
28.0	.0			1.06573	625.2	.00012	.000059			.08
30.0	.0			.98923	586.9	.00182	.000889	.00185	.000903	1.15
31.0	12.0			.96316	572.2	.00145	.000708			.95
34.0	.0			.95976	568.2	.00140	.000684			.92
2.0	-12.0			.98583	587.2	.00175	.000854			1.10
2.0	12.0			.98016	585.2	.00190	.000928			1.24
12.0	-12.0			.98300	583.5	.00183	.000893			.97
12.0	12.0			.96713	574.9	.00220	.001074			1.12
30.0	1.0			.98696	587.2	.00164	.000801			1.03
31.0	2.0			.96033	572.2	.00192	.000937			1.26
32.0	2.0			.95580	569.5	.00151	.000737	.00166	.000810	.99
32.0	3.0			.95070	564.9	.00190	.000928			1.19
32.0	6.0			.94730	562.2	.00172	.000840			1.12
34.0	1.0			.95920	571.2	.00150	.000732	.00155	.000757	.99
34.0	2.0			.95523	569.2	.00151	.000737	.00148	.000723	.99
34.0	3.0			.95183	564.2	.00151	.000737			.97
36.0	.0			.96203	570.2	.00141	.000688	.00141	.000688	1.02
38.0	.0			.96430	572.9	.00156	.000762	.00156	.000762	1.10
40.0	.0			.96656	572.2	.00150	.000732	.00150	.000732	.99
44.0	12.0			.97166	579.9	.00165	.000806			1.09
42.0	.0			.96770	575.5	.00139	.000679	.00137	.000669	.99
44.0	.0			.97790	579.5	.00130	.000635	.00131	.000640	.87
48.0	.0			.98016	579.5	.00131	.000640	.00140	.000684	1.02
52.0	12.0			.99376	616.2	.00237	.001157			1.81
56.0	.0			.99546	608.9	.00154	.000752	.00183	.000893	1.20
58.0	.0			.99943	607.2	.00135	.000659			1.05
58.0	12.0			.98526	593.9	.00155	.000757			1.21
58.0	-12.0			.99093	593.5	.00122	.000596			.99
44.0	-12.0			.98073	585.5	.00158	.000771			1.30
36.0	-8.0			.96996	574.9	.00132	.000644			.87
36.0	-3.0			.96656	573.2	.00133	.000649			.89
34.0	-3.0			.95580	564.5	.00118	.000576	.00117	.000571	.78
32.0	-3.0			.94956	561.5	.00143	.000698	.00132	.000644	1.02
30.0	-3.0			.98300	582.9	.00151	.000737	.00152	.000742	.97
34.0	-12.0			.96656	570.2	.00164	.000801			
32.0	-12.0			.96430	570.5	.00163	.000796	.00163	.000796	1.07
30.0	-12.0			.97166	568.5	.00069	.000337			.49
19.0	-12.5			.95750	572.2	.00202	.000986			1.25
17.5	-11.0			.98356	590.9	.00276	.001348			1.48
15.5	-2.5			.98526	580.5	.00154	.000752			.83
16.5	-2.5			.99036	591.5	.00253	.001235	.00259	.001265	1.49
17.5	-2.5			1.00339	594.5	.00216	.001055	.00209	.001020	1.15
36.0	-16.0			.97563	573.9	.00107	.000522			.82
36.0	-12.0			.96940	573.5	.00163	.000796	.00144	.000703	1.08
32.0	-18.0			.98923	584.9	.00117	.000571	.00144	.000703	.87
32.0	-16.0			.98016	578.5	.00130	.000635	.00126	.000615	.98
32.0	14.0			.97676	577.2	.00095	.000464			.72
32.0	-10.0			.95693	565.9	.00148	.000723	.00138	.000674	.97
28.0	-14.0			.98073	578.9	.00130	.000635	.00126	.000615	.92
28.0	-12.0			.98753	581.5	.00091	.000444			.68
26.0	-12.5			.99036	590.5	.00198	.000967	.00202	.000986	1.31
22.0	-12.5			.97846	585.2	.00204	.000996	.00200	.000976	1.30
34.0	-1.0			.97676	604.5	.00804	.003925	.00877	.004282	6.93
34.0	4.0			.97336	603.2	.00814	.003974	.00899	.004389	5.32
34.0	5.0			.96316	604.5	.00806	.003935	.00871	.004252	5.56
34.0	6.0			.95523	568.9	.00192	.000937	.00194	.000947	1.32
36.0	6.0			.96090	571.9	.00190	.000928			1.32
38.0	1.0			.95523	571.5	.00171	.000835			1.13
38.0	2.0			.98810	585.2	.00125	.000610			.82
44.0	8.0			.98923	586.2	.00148	.000723	.00149	.000727	.97
44.0	6.0			.99093	586.5	.00105	.000513	.00102	.000498	.74
44.0	4.0			1.00056	592.5	.00125	.000610	.00127	.000620	.91
44.0	2.0			1.00283	594.2	.00146	.000713	.00146	.000713	.96
44.0	1.0			1.00509	594.5	.00113	.000552			.75
12.0	7.0	.66		.98243	579.9	.00104	.000508			
1.5	7.0	.66		.98073	584.2	.00147	.000718			
12.0	6.2	1.00		.99093	585.2	.00113	.000552			
8.0	6.2	1.00		.98810	583.2	.00093	.000454			
1.5	6.2	1.00		.97563	578.9	.00159	.000776			
12.0	3.6	1.00		.98640	581.9	.00097	.000474			
8.0	3.6	1.00		.98753	583.2	.00114	.000557			
1.5	3.6	1.00		.99093	584.9	.00097	.000474			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30° Cableway - Continued

(g) M = 4.44; R = 4.41 x 10^6

x, in.	y, in.	z, in. (a)	∅, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	n_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94479	587.9	.00243	.000621			1.35
12.0	.0			.94209	583.9	.00169	.000432			1.13
28.0	12.0			.94317	585.5	.00123	.000314			.81
30.0	.0			.95183	591.2	.00166	.000424	.00168	.000429	1.44
31.0	12.0			.93072	577.5	.00182	.000465			1.21
34.0	.0			.92802	574.5	.00155	.000396			1.14
2.0	-12.0			.95020	590.9	.00216	.000552			.85
2.0	12.0			.94750	594.2	.00254	.000649			1.04
12.0	-12.0			.94912	590.5	.00169	.000432			.87
12.0	12.0			.93776	583.2	.00223	.000570			1.15
30.0	1.0			.94966	589.2	.00175	.000447			1.51
31.0	2.0			.92639	574.9	.00190	.000485			1.60
32.0	3.0			.91936	570.9	.00189	.000483			1.31
32.0	6.0			.91719	569.9	.00191	.000488			1.27
34.0	1.0			.92747	574.9	.00183	.000467	.00188	.000480	1.28
34.0	2.0			.92423	573.2	.00188	.000480	.00222	.000567	1.57
34.0	3.0			.92098	571.5	.00190	.000485			1.31
36.0	.0			.93180	579.5	.00171	.000437	.00171	.000437	1.49
38.0	.0			.93667	582.2	.00170	.000434	.00171	.000437	1.24
40.0	.0			.93938	581.5	.00156	.000398	.00156	.000398	1.14
44.0	12.0			.94425	588.2	.00213	.000544			1.78
42.0	.0			.94046	584.5	.00169	.000432	.00166	.000424	1.46
44.0	.0			.94966	590.5	.00152	.000388	.00154	.000393	1.13
48.0	.0			.95075	587.9	.00150	.000383	.00153	.000391	1.32
52.0	.0			.92314	574.5	.00174	.000444	.00167	.000427	1.50
52.0	12.0			.94479	587.2	.00146	.000373			.98
55.0	.0			.94750	586.2	.00125	.000319	.00130	.000332	.98
58.0	.0			.95237	588.2	.00132	.000337			1.52
58.0	12.0			.94588	588.9	.00196	.000501			1.37
58.0	-12.0			.95183	589.5	.00167	.000427			1.14
44.0	-12.0			.97564	607.5	.00262	.000669			1.79
36.0	-8.0			.93451	577.9	.00142	.000363			.97
36.0	-3.0			.93776	579.5	.00151	.000386			1.12
34.0	-3.0			.92747	573.9	.00154	.000393	.00152	.000388	1.31
32.0	-3.0			.92206	570.9	.00180	.000460	.00160	.000409	1.53
30.0	-3.0			.94966	587.5	.00174	.000444			1.47
34.0	-12.0			.93667	580.9	.00181	.000462			
32.0	-12.0			.93451	581.5	.00171	.000437	.00169	.000432	1.00
30.0	-12.0			.93992	581.9	.00117	.000299			.68
19.0	-12.5			.93018	579.9	.00237	.000605			1.39
17.5	-11.0			.96644	603.2	.00279	.000713			1.60
15.5	-2.5			.96157	595.5	.00179	.000457			1.23
16.5	-2.5			.94804	588.2	.00179	.000457			1.23
17.5	-2.5			.98701	614.5	.00267	.000682	.00315	.000805	1.73
36.0	-16.0			.94100	581.9	.00130	.000332			1.04
36.0	-12.0			.93938	582.9	.00176	.000450	.00154	.000393	1.20
32.0	-18.0			.95399	590.9	.00141	.000360			1.18
32.0	-16.0			.94696	585.5	.00134	.000342			.98
32.0	-14.0			.94696	585.5	.00134	.000342	.00115	.000294	.91
32.0	-10.0			.92639	574.2	.00148	.000378	.00131	.000335	1.00
28.0	-14.0			.95020	587.9	.00133	.000340	.00144	.000368	1.12
28.0	-12.0			.94696	584.5	.00095	.000243			.64
26.0	-12.5			.95291	594.5	.00230	.000587	.00228	.000582	1.55
22.0	-12.5			.94479	588.5	.00224	.000572	.00219	.000559	1.28
34.0	-1.0			.95778	615.9	.00969	.002475	.01080	.002759	8.35
34.0	4.0			.95345	610.9	.00934	.002386	.01152	.002942	6.87
34.0	5.0			.92802	590.5	.00590	.001507	.00551	.001407	4.92
34.0	6.0			.91990	574.9	.00297	.000759	.00299	.000764	1.98
36.0	6.0			.92477	576.5	.00272	.000695			1.83
38.0	1.0			.91503	570.9	.00246	.000628			1.80
38.0	2.0			.95075	588.2	.00116	.000296			.81
44.0	8.0			.95291	590.5	.00160	.000409	.00162	.000414	1.07
44.0	6.0			.95183	589.2	.00140	.000358	.00133	.000340	.97
44.0	4.0			.96482	597.5	.00147	.000375	.00152	.000388	1.23
44.0	2.0			.96644	598.2	.00150	.000383	.00160	.000409	1.29
44.0	1.0			.96319	596.5	.00124	.000317	.00139	.000355	.98
12.0	7.0	.66		.94804	587.5	.00112	.000286			
1.5	7.0	.66		.95129	592.2	.00170	.000434			
12.0	6.2	1.00		.95399	588.5	.00100	.000255			
8.0	6.2	1.00		.95075	588.9	.00117	.000299			
1.5	6.2	1.00		.94642	589.5	.00159	.000406			
12.0	3.6	1.00		.94912	587.2	.00116	.000296			
8.0	3.6	1.00		.95183	591.5	.00176	.000450			
1.5	3.5	1.00		.95237	587.2	.00097	.000248			

[a] Thermocouple locations for which z and/or ∅ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Continued

9. 30° Cableway - Continued

(h) M = 4.44; R = 3.07×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94961	588.2	.00221	.000802			1.16
12.0	.0			.94961	585.9	.00140	.000508			1.01
28.0	12.0			.95286	588.9	.00085	.000308			.63
30.0	.0			.97291	601.2	.00138	.000501	.00140	.000508	1.64
31.0	12.0			.94257	584.2	.00117	.000425			.87
34.0	.0			.93606	578.5	.00119	.000432			1.04
2.0	-12.0			.95503	591.2	.00192	.000697			.96
2.0	12.0			.95123	595.9	.00197	.000715			.85
12.0	-12.0			.95719	591.9	.00117	.000425			.77
12.0	12.0			.94419	586.9	.00139	.000504			.87
30.0	1.0			.97128	600.9	.00121	.000439			.98
31.0	2.0			.94094	582.5	.00133	.000483			1.07
32.0	3.0			.92902	576.2	.00139	.000504			1.10
32.0	6.0			.92631	574.9	.00140	.000508			1.12
34.0	1.0			.93498	579.2	.00127	.000461	.00137	.000497	1.09
34.0	2.0			.93227	577.5	.00127	.000461			.96
34.0	3.0			.92902	575.9	.00128	.000464			1.02
36.0	.0			.93986	579.2	.00105	.000381	.00105	.000381	.90
38.0	.0			.94527	582.2	.00104	.000377	.00105	.000381	.87
40.0	.0			.94744	585.5	.00118	.000428	.00119	.000432	1.06
44.0	12.0			.95232	589.5	.00172	.000624			1.52
42.0	.0			.94907	584.5	.00103	.000374	.00100	.000363	
44.0	.0			.95828	590.2	.00100	.000363	.00102	.000370	1.19
48.0	.0			.95990	590.9	.00097	.000352	.00100	.000363	.89
52.0	.0			.93281	577.2	.00121	.000439	.00114	.000414	1.44
52.0	12.0			.95449	593.2	.00130	.000472			1.15
55.0	.0			.95719	588.9	.00087	.000316	.00089	.000323	1.04
58.0	.0			.96207	591.9	.00077	.000279			.92
58.0	12.0			.95503	592.2	.00133	.000483			1.18
58.0	-12.0			.96153	592.9	.00104	.000377			1.13
44.0	-12.0			.97995	606.2	.00206	.000747			1.87
36.0	-8.0			.94419	580.9	.00102	.000370			.92
36.0	-3.0			.94582	582.2	.00102	.000370			.94
34.0	-3.0			.93552	576.2	.00105	.000381	.00102	.000370	.95
32.0	-3.0			.93173	576.2	.00120	.000435			1.08
30.0	-3.0			.97128	599.9	.00126	.000457	.00117	.000425	1.08
34.0	-12.0			.94961	585.2	.00167	.000606			
32.0	-12.0			.94907	584.5	.00135	.000490	.00134	.000486	1.19
30.0	-12.0			.95449	585.5	.00062	.000225			.50
19.0	-12.5			.93769	580.2	.00192	.000697			1.32
17.5	-11.0			.97182	601.9	.00213	.000773			1.63
15.5	-2.5			.97074	599.5	.00126	.000457			.93
16.5	-2.5			.95882	591.5	.00135	.000490			1.03
17.5	-2.5			.98970	614.9	.00198	.000718	.00239	.000867	1.51
36.0	-16.0			.95178	585.5	.00089	.000323			.82
36.0	-12.0			.95178	586.9	.00167	.000606	.00152	.000552	1.49
32.0	-18.0			.96370	593.9	.00117	.000425	.00138	.000501	1.04
32.0	-16.0			.95719	588.9	.00096	.000348	.00083	.000301	.73
32.0	-14.0			.95774	589.2	.00080	.000290			.71
32.0	-10.0			.93606	577.5	.00112	.000406	.00097	.000352	1.01
28.0	-14.0			.95936	590.5	.00083	.000301	.00103	.000374	.63
28.0	-12.0			.95828	589.2	.00070	.000254			.53
26.0	-12.5			.96099	596.5	.00168	.000610	.00172	.000624	1.37
22.0	-12.5			.94853	587.5	.00163	.000591	.00156	.000566	1.24
34.0	-1.0			.95449	607.2	.00775	.002812	.00888	.003222	7.11
34.0	4.0			.95015	603.9	.00701	.002543	.00864	.003135	5.56
34.0	5.0			.92631	580.9	.00465	.001687	.00468	.001698	3.52
34.0	6.0			.92360	573.2	.00211	.000766	.00210	.000762	1.60
36.0	6.0			.92848	575.5	.00201	.000729			1.53
38.0	1.0			.91927	572.2	.00179	.000649			1.53
38.0	2.0			.96153	590.9	.00080	.000290			.68
44.0	8.0			.95882	594.2	.00115	.000417	.00116	.000421	1.02
44.0	6.0			.95828	590.5	.00102	.000370	.00096	.000348	.86
44.0	4.0			.97128	600.9	.00116	.000421	.00121	.000439	.93
44.0	2.0			.97345	600.2	.00093	.000337	.00097	.000352	.79
44.0	1.0			.97074	597.9	.00078	.000283	.00096	.000348	.71
12.0	7.0	.66		.95828	589.2	.00087	.000316			
1.5	7.0	.66		.96207	595.5	.00105	.000381			
12.0	6.2	1.00		.96478	593.2	.00066	.000239			
8.0	6.2	1.00		.96153	591.2	.00068	.000247			
1.5	6.2	1.00		.95719	592.5	.00118	.000428			
12.0	3.6	1.00		.96044	590.2	.00066	.000239			
8.0	3.6	1.00		.95719	592.5	.00118	.000428			
1.5	3.6	1.00		.96261	591.5	.00064	.000232			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE III. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.70 INCH - Concluded

9. 30° Cableway - Concluded

(i) M = 4.44; R = 2.06×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96123	593.2	.00167	.000908			.98
12.0	.0			.95741	586.5	.00108	.000587			.92
28.0	12.0			.96287	588.5	.00058	.000315			.57
30.0	.0			.99727	609.5	.00086	.000468	.00088	.000478	.89
31.0	12.0			.95577	584.5	.00080	.000435			.76
34.0	.0			.94376	576.9	.00081	.000440			1.05
2.0	-12.0			.96833	595.5	.00167	.000908			1.08
2.0	12.0			.96506	597.2	.00170	.000924			.92
12.0	-12.0			.96506	590.5	.00115	.000625			1.06
12.0	12.0			.95141	583.5	.00103	.000560			.76
30.0	1.0			.99563	608.5	.00088	.000478			.81
31.0	2.0			.96233	588.9	.00100	.000544			1.02
32.0	3.0			.94267	577.2	.00118	.000641			1.22
32.0	6.0			.93940	575.5	.00097	.000527			.88
34.0	1.0			.94322	576.9	.00095	.000516	.00100	.000544	.93
34.0	2.0			.93994	575.2	.00093	.000506			.95
34.0	3.0			.93667	573.2	.00094	.000511			.85
36.0	.0			.94759	579.2	.00087	.000473	.00086	.000468	.89
38.0	.0			.95250	582.2	.00078	.000424	.00079	.000429	.83
40.0	.0			.95523	583.9	.00078	.000424	.00079	.000429	.94
44.0	12.0			.96233	590.2	.00102	.000555			
42.0	.0			.95632	584.5	.00084	.000457	.00081	.000440	.88
44.0	.0			.96560	589.9	.00085	.000462	.00087	.000473	.94
48.0	.0			.96724	590.5	.00074	.000402	.00076	.000413	.83
52.0	.0			.94649	579.2	.00093	.000506	.00088	.000478	1.01
56.0	.0			.96560	589.5	.00060	.000326	.00062	.000337	.80
58.0	.0			.97106	592.9	.00070	.000381			.79
58.0	12.0			.96560	591.9	.00091	.000495			1.02
58.0	-12.0			.97215	594.9	.00081	.000440			1.17
44.0	-12.0			.98253	605.2	.00179	.000973			2.29
36.0	-8.0			.95141	581.2	.00076	.000413			.83
36.0	-3.0			.95250	581.9	.00078	.000424			.85
34.0	-3.0			.94322	576.5	.00071	.000386	.00066	.000359	.77
32.0	-3.0			.94595	578.5	.00093	.000506			.97
30.0	-3.0			1.00163	608.9	.00075	.000408	.00080	.000435	.76
34.0	-12.0			.95850	587.2	.00094	.000511			
32.0	-12.0			.96014	588.2	.00092	.000500	.00092	.000500	1.03
30.0	-12.0			.96506	588.5	.00059	.000321			.78
19.0	-12.5			.94376	581.5	.00147	.000799			1.56
17.5	-11.0			.97597	602.2	.00175	.000951			1.64
15.5	-2.5			.97652	597.2	.00090	.000489			.84
16.5	-2.5			.96833	592.9	.00115	.000625			1.06
17.5	-2.5			.99071	610.5	.00155	.000843	.00185	.001006	1.42
36.0	-16.0			.95905	585.9	.00072	.000391			.86
36.0	-12.0			.96069	588.5	.00117	.000636	.00110	.000598	1.63
32.0	-18.0			.97106	593.9	.00077	.000419			.86
32.0	-16.0			.96396	589.2	.00069	.000375	.00058	.000315	.80
32.0	-14.0			.96396	588.5	.00062	.000337			.87
32.0	-10.0			.94540	578.9	.00087	.000473	.00073	.000397	.95
28.0	-14.0			.96506	589.9	.00071	.000386	.00078	.000424	.84
28.0	-12.0			.96779	591.2	.00063	.000342			.82
26.0	-12.5			.96779	594.9	.00110	.000598	.00114	.000620	1.34
22.0	-12.5			.95414	588.2	.00120	.000652	.00104	.000565	1.32
34.0	-1.0			.95250	604.5	.00562	.003055	.00657	.003572	6.31
34.0	4.0			.94813	600.9	.00539	.002930	.00722	.003925	5.39
34.0	5.0			.92575	578.2	.00427	.002321	.00387	.002104	4.31
34.0	6.0			.92739	570.9	.00149	.000810	.00144	.000788	1.51
36.0	6.0			.93175	573.2	.00140	.000761			1.43
38.0	1.0			.92411	570.9	.00130	.000707			1.63
38.0	2.0			.97051	592.2	.00061	.000332			.65
44.0	8.0			.96396	590.2	.00093	.000506	.00093	.000506	1.00
44.0	8.0			.96342	589.9	.00077	.000419	.00070	.000381	.80
44.0	4.0			.97816	598.9	.00085	.000462	.00091	.000495	.91
44.0	2.0			.97980	599.9	.00079	.000429	.00084	.000457	.87
44.0	1.0			.97761	597.9	.00065	.000353	.00076	.000413	.70
12.0	7.0	.66		.96669	590.2	.00064	.000348			
8.0	7.0	.66		.81001	494.9	.00020	.000109			
1.5	7.0	.66		.97215	594.5	.00073	.000397			
12.0	6.2	1.00		.97379	594.2	.00062	.000337			
8.0	6.2	1.00		.96997	592.2	.00062	.000337			
1.5	6.2	1.00		.96833	592.5	.00080	.000435			
12.0	3.6	1.00		.96942	591.2	.00052	.000283			
8.0	3.6	1.00		.96233	589.5	.00085	.000462			
1.5	3.6	1.00		.97161	592.5	.00061	.000332			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES

1. Flat Plate Alone

(a) M = 2.65; R = 3.93 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.94937	578.9	.00475	.000671		
12.0	.0			.94768	576.5	.00444	.000627		
20.5	.0			.94824	577.2	.00446	.000630		
28.0	12.0			.94206	574.9	.00463	.000654		
28.0	4.0			.94543	576.2	.00475	.000671		
28.0	.0			.94599	576.2	.00447	.000631		
20.5	-5.0			.94768	577.2	.00453	.000640		
24.5	-5.0			.94712	576.2	.00428	.000604		
30.0	.0			.94656	575.9	.00453	.000640	.00453	.000640
31.0	12.0			.94431	575.9	.00457	.000645		
34.0	.0			.94768	575.9	.00416	.000587	.00403	.000569
2.0	-12.0			.95162	579.2	.00455	.000642		
2.0	12.0			.95106	580.2	.00477	.000673		
12.0	-12.0			.95443	581.2	.00468	.000661		
12.0	12.0			.94487	577.2	.00479	.000676		
30.0	1.0			.94374	574.5	.00438	.000618		
31.0	2.0			.94712	576.2	.00441	.000623		
32.0	2.0			.94656	575.2	.00434	.000613	.00433	.000611
32.0	3.0			.94318	575.2	.00459	.000648		
32.0	6.0			.94318	574.9	.00455	.000642		
34.0	1.0			.94768	577.5	.00448	.000633	.00456	.000644
34.0	2.0			.94318	574.9	.00458	.000647	.00454	.000641
34.0	3.0			.94206	573.9	.00456	.000644	.00443	.000625
38.0	.0			.94656	575.9	.00431	.000609		
44.0	12.0			.94993	578.9	.00450	.000635		
42.0	.0			.94487	574.9	.00427	.000603	.00467	.000659
44.0	.0			.95274	579.5	.00434	.000613	.00432	.000610
48.0	.0			.95331	579.5	.00432	.000610	.00432	.000610
52.0	.0			.94993	578.5	.00446	.000630	.00445	.000628
52.0	12.0			.94881	578.2	.00444	.000627		
55.0	.0			.95218	579.9	.00448	.000633	.00448	.000633
58.0	.0			.95218	580.5	.00489	.000690		
58.0	12.0			.94881	579.5	.00496	.000700		
58.0	-12.0			.95106	579.2	.00455	.000642		
44.0	-12.0			.95218	578.2	.00430	.000607		
36.0	-8.0			.94824	576.2	.00422	.000596		
36.0	-3.0			.95049	577.5	.00419	.000592		
34.0	-3.0			.94712	575.9	.00419	.000592	.00418	.000590
32.0	-3.0			.94824	580.9	.00437	.000617	.00437	.000617
30.0	-3.0			.94881	577.5	.00440	.000621	.00440	.000621
28.0	-3.0			.95106	578.9	.00434	.000613		
34.0	-12.0			.94543	575.5	.00438	.000618	.00438	.000618
32.0	-12.0			.94543	574.9	.00435	.000614	.00435	.000614
30.0	-12.0			.94824	577.2	.00443	.000625	.00445	.000628
19.0	-12.5			.95049	578.9	.00470	.000664		
17.5	-11.0			.94937	578.2	.00447	.000631		
15.5	-2.5			.95331	581.2	.00472	.000666		
16.5	-2.5			.94824	577.5	.00442	.000624	.00435	.000614
17.5	-2.5			.94656	576.5	.00456	.000644	.00448	.000633
18.5	-2.5			.95274	580.2	.00441	.000623	.00456	.000644
19.5	-2.5			.94599	576.5	.00454	.000641	.00447	.000631
20.5	-2.5			.94487	575.9	.00453	.000640	.00447	.000631
21.5	-2.5			.94881	578.2	.00452	.000638	.00460	.000649
22.5	-2.5			.94656	576.5	.00444	.000627	.00441	.000623
23.5	-2.5			.94656	576.9	.00448	.000633	.00445	.000628
24.5	-2.5			.94993	577.9	.00434	.000613		
36.0	-16.0			.94487	574.2	.00414	.000585		
36.0	-12.0			.94599	575.2	.00431	.000609	.00431	.000609
32.0	-18.0			.95218	578.5	.00419	.000592		
32.0	-16.0			.94768	576.5	.00434	.000613	.00434	.000613
32.0	-14.0			.94712	575.2	.00415	.000586	.00414	.000585
32.0	-10.0			.94487	575.2	.00435	.000614		
28.0	-14.0			.94712	576.2	.00439	.000620		
28.0	-12.0			.94712	576.2	.00425	.000600		
26.0	-12.5			.95049	578.2	.00436	.000616		
24.5	-11.0			.94768	576.2	.00451	.000637		
22.0	-12.5			.94937	578.5	.00447	.000631	.00447	.000631
20.5	-11.0			.94824	577.2	.00434	.000613	.00434	.000613
34.0	-1.0			.95668	580.9	.00388	.000548	.00398	.000562
34.0	4.0			.94993	579.2	.00447	.000631	.00482	.000681
34.0	5.0			.94206	571.2	.00356	.000494	.00305	.000431
34.0	6.0			.94431	576.2	.00454	.000648	.00458	.000647
36.0	6.0			.94824	578.5	.00457	.000645		
38.0	1.0			.94768	576.9	.00427	.000603	.00433	.000611
38.0	2.0			.94431	574.9	.00439	.000620		
44.0	8.0			.94543	576.9	.00453	.000640	.00453	.000640
44.0	6.0			.94599	576.9	.00450	.000635	.00451	.000637
44.0	4.0			.94487	575.5	.00432	.000610	.00432	.000610
44.0	2.0			.94543	575.9	.00443	.000625	.00441	.000623
44.0	1.0			.94937	577.2	.00409	.000577	.00406	.000573
6.0	.0			.95106	583.9	.00577	.000815		
6.0	10.0			.94937	589.5	.00617	.000871		
12.0	.0			.95387	584.5	.00527	.000744		
12.0	5.0			.94824	582.2	.00557	.000786		
12.0	10.0			.94543	581.2	.00558	.000788		
18.0	.0			.94712	579.5	.00517	.000730		
30.0	.0			.94656	578.9	.00514	.000726		
42.0	.0			.94599	577.2	.00477	.000673		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(b) M = 2.65; R = 2.53 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.96133	577.5	.00314	.000687		
12.0	.0			.95792	574.5	.00301	.000659		
20.5	.0			.95906	575.2	.00291	.000637		
28.0	12.0			.95223	572.2	.00314	.000687		
28.0	4.0			.95621	573.9	.00303	.000663		
28.0	.0			.95621	573.9	.00297	.000650		
20.5	-5.0			.95906	575.2	.00301	.000659		
24.5	-5.0			.95849	574.5	.00293	.000641		
30.0	.0			.95735	573.9	.00278	.000608	.00278	.000608
31.0	12.0			.95451	572.9	.00307	.000672		
34.0	.0			.95906	574.5	.00279	.000610	.00268	.000586
2.0	-12.0			.96474	578.9	.00307	.000672		
2.0	12.0			.96417	579.2	.00326	.000713		
12.0	-12.0			.96588	579.2	.00301	.000659		
12.0	12.0			.95565	574.2	.00316	.000691		
30.0	1.0			.95508	572.9	.00296	.000648		
31.0	2.0			.95792	574.9	.00294	.000643		
32.0	2.0			.95792	573.9	.00277	.000606	.00277	.000606
32.0	3.0			.95451	573.2	.00296	.000648		
32.0	6.0			.95394	572.9	.00309	.000676		
34.0	1.0			.95906	575.5	.00290	.000635	.00297	.000650
34.0	2.0			.95394	572.5	.00304	.000665	.00300	.000656
34.0	3.0			.95280	571.9	.00304	.000665	.00294	.000643
38.0	.0			.95678	573.9	.00296	.000648	.00000	.000000
44.0	12.0			.95906	575.9	.00303	.000663		
42.0	.0			.95508	572.9	.00294	.000643	.00329	.000720
44.0	.0			.96361	577.5	.00281	.000615	.00282	.000617
48.0	.0			.96361	578.2	.00295	.000645	.00295	.000645
52.0	.0			.96019	576.2	.00303	.000663	.00302	.000661
52.0	12.0			.95906	575.2	.00299	.000654		
55.0	.0			.96190	577.5	.00302	.000661	.00302	.000661
58.0	.0			.96304	578.2	.00303	.000663		
58.0	12.0			.95906	576.2	.00314	.000687		
58.0	-12.0			.96247	577.2	.00303	.000663		
44.0	-12.0			.96417	576.9	.00273	.000597		
36.0	-8.0			.96019	574.5	.00287	.000628		
36.0	-3.0			.96190	576.2	.00279	.000610		
34.0	-3.0			.95849	573.9	.00286	.000626	.00285	.000624
32.0	-3.0			.95963	574.9	.00281	.000615	.00281	.000615
30.0	-3.0			.95963	575.5	.00297	.000650	.00297	.000650
28.0	-3.0			.97270	576.9	.00273	.000597		
34.0	-12.0			.95735	573.5	.00286	.000626	.00286	.000626
32.0	-12.0			.95678	573.2	.00282	.000617	.00280	.000613
30.0	-12.0			.95963	575.2	.00294	.000643	.00296	.000648
19.0	-12.5			.96247	576.9	.00293	.000641		
17.5	-11.0			.96076	576.2	.00300	.000656		
15.5	-2.5			.96417	578.9	.00303	.000663		
16.5	-2.5			.95906	575.5	.00299	.000654	.00294	.000643
17.5	-2.5			.95735	574.9	.00302	.000661	.00294	.000643
18.5	-2.5			.96361	578.2	.00298	.000652	.00311	.000680
19.5	-2.5			.95735	574.5	.00300	.000656	.00294	.000643
20.5	-2.5			.95565	574.2	.00307	.000672	.00301	.000659
21.5	-2.5			.95963	576.2	.00300	.000656	.00307	.000672
22.5	-2.5			.95735	574.5	.00300	.000656	.00297	.000650
23.5	-2.5			.95735	574.5	.00300	.000656	.00297	.000650
24.5	-2.5			.96019	576.2	.00293	.000641		
36.0	-16.0			.95678	572.5	.00272	.000595		
36.0	-12.0			.95792	573.9	.00291	.000637	.00291	.000637
32.0	-18.0			.96474	577.5	.00285	.000624		
32.0	-16.0			.95906	574.5	.00289	.000632	.00288	.000630
32.0	-14.0			.95849	573.5	.00289	.000632	.00289	.000632
32.0	-10.0			.95678	573.5	.00294	.000643		
28.0	-14.0			.95849	574.5	.00292	.000639		
28.0	-12.0			.95906	574.5	.00280	.000613		
26.0	-12.5			.96247	576.5	.00288	.000630		
24.5	-11.0			.95906	574.2	.00289	.000632		
22.0	-12.5			.96133	576.5	.00294	.000643	.00294	.000643
20.5	-11.0			.96019	575.9	.00293	.000641	.00293	.000641
34.0	-1.0			.96815	579.5	.00267	.000584	.00277	.000606
34.0	4.0			.96019	576.5	.00303	.000663	.00330	.000722
34.0	5.0			.95280	566.5	.00255	.000558	.00225	.000492
34.0	6.0			.95508	573.5	.00302	.000661	.00301	.000659
36.0	6.0			.95906	578.5	.00307	.000672		
38.0	1.0			.95849	574.9	.00296	.000648	.00301	.000659
38.0	2.0			.95508	572.9	.00288	.000630		
44.0	8.0			.95621	574.2	.00301	.000659	.00301	.000659
44.0	6.0			.95678	574.5	.00300	.000656	.00301	.000659
44.0	4.0			.95565	573.5	.00298	.000652	.00297	.000650
44.0	2.0			.95621	573.9	.00297	.000650	.00295	.000645
44.0	1.0			.96076	575.9	.00275	.000602	.00275	.000602
6.0	.0			.95906	580.9	.00412	.000901		
6.0	10.0			.95792	581.2	.00436	.000954		
12.0	.0			.96247	581.5	.00373	.000816		
12.0	5.0			.95678	578.9	.00384	.000840		
12.0	10.0			.95394	577.2	.00404	.000884		
18.0	.0			.95565	576.2	.00353	.000772		
30.0	.0			.95565	576.2	.00350	.000766		
42.0	.0			.95565	574.5	.00315	.000689		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(c) M = 2.65; R = 1.27×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.97788	583.5	.00160	.000699		
12.0	.0			.97391	579.9	.00150	.000656		
20.5	.0			.97618	581.2	.00152	.000664		
28.0	12.0			.96938	577.9	.00156	.000682		
28.0	4.0			.97448	580.2	.00146	.000638		
28.0	.0			.97335	579.5	.00149	.000651		
20.5	-5.0			.97618	581.2	.00149	.000651		
24.5	-5.0			.97562	580.9	.00135	.000590		
30.0	.0			.97505	580.2	.00148	.000647	.00148	.000647
31.0	12.0			.97165	578.9	.00142	.000621		
34.0	.0			.97618	580.9	.00131	.000573	.00121	.000529
2.0	-12.0			.98185	585.5	.00156	.000682		
2.0	12.0			.98128	585.5	.00183	.000800		
12.0	-12.0			.98242	585.2	.00141	.000616		
12.0	12.0			.97165	579.5	.00159	.000695		
30.0	1.0			.97335	579.2	.00132	.000577		
31.0	2.0			.97618	581.2	.00148	.000647		
32.0	2.0			.97618	580.5	.00130	.000568	.00130	.000568
32.0	3.0			.97278	579.5	.00153	.000669		
32.0	6.0			.97221	579.2	.00142	.000621		
34.0	1.0			.97675	581.5	.00134	.000586	.00141	.000616
34.0	2.0			.97165	578.9	.00142	.000621	.00137	.000599
34.0	3.0			.97051	578.2	.00143	.000625	.00133	.000581
38.0	.0			.97391	583.5	.00134	.000586		
44.0	12.0			.97788	587.5	.00135	.000590		
42.0	.0			.97221	578.5	.00136	.000594		
44.0	.0			.98128	584.2	.00136	.000594	.00138	.000603
48.0	.0			.98072	583.9	.00145	.000634	.00145	.000634
52.0	.0			.97675	581.5	.00147	.000642	.00146	.000638
52.0	12.0			.97562	580.9	.00147	.000642		
55.0	.0			.97958	582.9	.00139	.000608	.00139	.000608
58.0	.0			.98299	584.9	.00140	.000612		
58.0	12.0			.97675	581.9	.00153	.000669		
58.0	-12.0			.98015	584.9	.00154	.000673		
44.0	-12.0			.98242	584.2	.00147	.000642		
36.0	-8.0			.97902	581.9	.00147	.000642		
36.0	-3.0			.97958	582.5	.00147	.000642		
34.0	-3.0			.97562	580.2	.00132	.000577	.00130	.000568
32.0	-3.0			.97675	581.2	.00148	.000647	.00148	.000647
30.0	-3.0			.97732	581.5	.00148	.000647	.00148	.000647
28.0	-3.0			.98015	582.9	.00147	.000642		
34.0	-12.0			.97562	580.2	.00132	.000577	.00132	.000577
32.0	-12.0			.97618	579.9	.00136	.000594	.00134	.000586
30.0	-12.0			.97902	581.5	.00146	.000638	.00147	.000642
19.0	-12.5			.98072	582.9	.00137	.000599		
17.5	-11.0			.97958	582.5	.00138	.000603		
15.5	-2.5			.98242	584.2	.00146	.000638		
16.5	-2.5			.97788	581.2	.00147	.000642	.00143	.000625
17.5	-2.5			.97675	580.5	.00147	.000642	.00140	.000612
18.5	-2.5			.98242	584.2	.00138	.000603	.00151	.000660
19.5	-2.5			.97562	580.2	.00147	.000642	.00143	.000625
20.5	-2.5			.97448	579.9	.00140	.000612	.00135	.000590
21.5	-2.5			.97845	581.9	.00148	.000647	.00155	.000677
22.5	-2.5			.97562	580.5	.00138	.000603	.00135	.000590
23.5	-2.5			.97562	580.5	.00148	.000647	.00146	.000638
24.5	-2.5			.97788	581.9	.00148	.000647		
36.0	-16.0			.97448	579.2	.00130	.000568		
36.0	-12.0			.97618	580.5	.00148	.000647	.00148	.000647
32.0	-18.0			.98128	583.9	.00147	.000642		
32.0	-16.0			.97675	580.9	.00130	.000568	.00129	.000564
32.0	-14.0			.97618	580.2	.00129	.000564	.00129	.000564
32.0	-10.0			.97505	580.2	.00136	.000594		
28.0	-14.0			.97618	580.9	.00148	.000647		
28.0	-12.0			.97675	580.9	.00131	.000573		
26.0	-12.5			.97958	582.9	.00133	.000581		
24.5	-11.0			.97675	580.9	.00130	.000568		
22.0	-12.5			.97845	582.5	.00148	.000647	.00148	.000647
20.5	-11.0			.97788	582.2	.00148	.000647	.00148	.000647
34.0	-1.0			.98582	585.9	.00128	.000559	.00138	.000603
34.0	4.0			.97845	582.9	.00148	.000647	.00169	.000739
34.0	5.0			.96938	574.9	.00146	.000638	.00125	.000546
34.0	6.0			.97335	579.9	.00141	.000616	.00140	.000612
36.0	6.0			.97732	582.2	.00149	.000651		
38.0	1.0			.97618	581.2	.00148	.000647	.00153	.000669
38.0	2.0			.97335	579.5	.00138	.000603		
44.0	8.0			.97505	580.9	.00141	.000616	.00141	.000616
44.0	6.0			.97505	581.2	.00154	.000673	.00155	.000677
44.0	4.0			.97391	580.2	.00141	.000616	.00140	.000612
44.0	2.0			.97448	580.5	.00140	.000612	.00138	.000603
44.0	1.0			.97902	582.5	.00135	.000590	.00135	.000590
6.0	.0			.96711	578.5	.00136	.000594		
6.0	10.0			.96541	573.5	.00085	.000371		
12.0	.0			.97391	584.9	.00226	.000988		
12.0	5.0			.96768	582.2	.00234	.001023		
12.0	10.0			.96371	579.9	.00230	.001005		
18.0	.0			.96824	579.9	.00200	.000874		
30.0	.0			.97051	580.2	.00187	.000817		
42.0	.0			.97108	580.9	.00168	.000734		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(d) M = 3.51; R = 3.98 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95357	577.5	.00259	.000505		
12.0	.0			.94686	572.5	.00236	.000460		
20.5	.0			.94909	573.9	.00248	.000483		
28.0	12.0			.94238	569.9	.00261	.000509		
28.0	4.0			.94741	572.9	.00249	.000485		
28.0	.0			.94630	572.5	.00249	.000485		
20.5	-5.0			.95077	574.5	.00234	.000456		
24.5	-5.0			.95021	576.2	.00241	.000470		
30.0	.0			.94909	573.5	.00229	.000446	.00230	.000448
31.0	12.0			.94518	570.9	.00253	.000493		
34.0	.0			.95077	574.2	.00238	.000464	.00228	.000444
2.0	-12.0			.95860	579.9	.00247	.000481		
2.0	12.0			.95636	577.5	.00253	.000493		
12.0	-12.0			.95636	578.5	.00247	.000481		
12.0	12.0			.94518	571.2	.00258	.000503		
30.0	1.0			.94686	574.5	.00243	.000473		
31.0	2.0			.94965	574.2	.00235	.000458		
32.0	2.0			.94965	573.5	.00238	.000464	.00239	.000466
32.0	3.0			.94574	572.5	.00256	.000499		
32.0	6.0			.94518	571.5	.00254	.000495		
34.0	1.0			.95077	574.9	.00248	.000483	.00255	.000497
34.0	2.0			.94462	571.9	.00251	.000489	.00246	.000479
34.0	3.0			.94350	571.2	.00258	.000503	.00248	.000483
38.0	.0			.94797	573.2	.00248	.000483		
44.0	12.0			.95860	573.2	.00226	.000440		
42.0	.0			.94574	572.2	.00249	.000485	.00285	.000555
44.0	.0			.95413	576.5	.00234	.000456	.00235	.000458
48.0	.0			.95413	576.5	.00234	.000456	.00234	.000456
52.0	.0			.94965	574.2	.00247	.000481	.00246	.000479
52.0	12.0			.94797	572.2	.00232	.000452		
55.0	.0			.95133	575.2	.00247	.000481	.00247	.000481
58.0	.0			.95189	575.5	.00248	.000483		
58.0	12.0			.94853	572.9	.00248	.000483		
58.0	-12.0			.95245	578.2	.00242	.000472		
44.0	-12.0			.95469	576.9	.00225	.000438		
36.0	-8.0			.95077	574.5	.00234	.000456		
36.0	-3.0			.95245	577.5	.00240	.000468		
34.0	-3.0			.94909	573.2	.00232	.000452	.00230	.000448
32.0	-3.0			.94965	573.9	.00233	.000454	.00233	.000454
30.0	-3.0			.95021	574.5	.00247	.000481	.00247	.000481
28.0	-3.0			.95301	575.9	.00243	.000473		
34.0	-12.0			.94909	573.9	.00234	.000456	.00234	.000456
32.0	-12.0			.94797	575.5	.00243	.000473	.00241	.000470
30.0	-12.0			.95133	577.5	.00242	.000472	.00243	.000473
19.0	-12.5			.95357	576.5	.00229	.000446		
17.5	-11.0			.95245	578.2	.00242	.000472		
15.5	-2.5			.95357	576.9	.00244	.000475		
16.5	-2.5			.94965	573.9	.00235	.000458	.00230	.000448
17.5	-2.5			.94797	573.2	.00249	.000485	.00241	.000470
18.5	-2.5			.95357	578.5	.00241	.000470	.00254	.000495
19.5	-2.5			.94797	573.2	.00246	.000479	.00240	.000468
20.5	-2.5			.94686	572.5	.00239	.000466	.00232	.000452
21.5	-2.5			.95133	575.2	.00243	.000473	.00251	.000489
22.5	-2.5			.94853	573.5	.00256	.000499	.00253	.000493
23.5	-2.5			.94853	573.5	.00247	.000481	.00244	.000475
24.5	-2.5			.95189	575.2	.00232	.000452		
36.0	-16.0			.94853	573.5	.00227	.000442		
36.0	-12.0			.95021	574.5	.00229	.000446	.00229	.000446
32.0	-18.0			.95581	577.9	.00227	.000442		
32.0	-16.0			.95077	577.2	.00242	.000472	.00241	.000470
32.0	-14.0			.95077	574.2	.00238	.000464	.00238	.000464
32.0	-10.0			.94909	576.2	.00243	.000473		
28.0	-14.0			.95189	577.5	.00241	.000470		
28.0	-12.0			.95245	575.9	.00229	.000446		
26.0	-12.5			.95581	577.9	.00231	.000450		
24.5	-11.0			.95301	575.5	.00221	.000431		
22.0	-12.5			.95525	579.5	.00240	.000468	.00240	.000468
20.5	-11.0			.95413	576.9	.00229	.000446	.00229	.000446
34.0	-1.0			.96028	579.9	.00223	.000434	.00234	.000456
34.0	4.0			.95077	575.2	.00249	.000485	.00275	.000536
34.0	5.0			.94238	566.2	.00184	.000358	.00160	.000312
34.0	6.0			.94518	571.9	.00256	.000487	.00249	.000485
36.0	6.0			.94853	574.2	.00252	.000491		
38.0	1.0			.94965	574.2	.00247	.000481	.00253	.000493
38.0	2.0			.94630	572.5	.00239	.000466		
44.0	8.0			.94574	571.9	.00250	.000487	.00249	.000485
44.0	6.0			.94686	572.9	.00245	.000477	.00246	.000479
44.0	4.0			.94630	572.5	.00249	.000485	.00248	.000483
44.0	2.0			.94741	573.2	.00248	.000483	.00246	.000479
44.0	1.0			.95189	575.2	.00238	.000464	.00240	.000468
6.0	.0			.94518	576.5	.00357	.000696		
6.0	10.0			.94462	576.2	.00381	.000742		
12.0	.0			.95077	578.2	.00319	.000622		
12.0	5.0			.94518	575.2	.00328	.000639		
12.0	10.0			.94126	572.9	.00340	.000662		
18.0	.0			.94518	574.2	.00302	.000588		
30.0	.0			.94518	573.9	.00295	.000575		
42.0	.0			.94574	572.9	.00276	.000538		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(e) M = 3.51; R = 2.80 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.96460	579.5	.00186	.000516		
12.0	.0			.95785	574.5	.00169	.000469		
20.5	.0			.96066	576.2	.00168	.000466		
28.0	12.0			.95336	571.5	.00184	.000511		
28.0	4.0			.95898	574.9	.00176	.000488		
28.0	.0			.95842	574.9	.00168	.000466		
20.5	-5.0			.96179	576.9	.00181	.000502		
24.5	-5.0			.96179	576.5	.00165	.000458		
30.0	.0			.96066	577.5	.00166	.000461	.00167	.000463
31.0	12.0			.95617	572.9	.00179	.000497		
34.0	.0			.96235	576.9	.00159	.000441	.00148	.000411
2.0	-12.0			.96965	581.9	.00175	.000486		
2.0	12.0			.96684	579.5	.00181	.000502		
12.0	-12.0			.96741	580.5	.00165	.000458		
12.0	12.0			.95504	572.5	.00182	.000505		
30.0	1.0			.95898	575.2	.00181	.000502		
31.0	2.0			.96235	576.9	.00175	.000486		
32.0	2.0			.96179	576.2	.00163	.000452	.00164	.000455
32.0	3.0			.95785	574.5	.00180	.000499		
32.0	6.0			.95673	573.5	.00181	.000502		
34.0	1.0			.96291	577.5	.00176	.000488	.00183	.000508
34.0	2.0			.95729	574.2	.00181	.000502	.00176	.000488
34.0	3.0			.95561	573.2	.00181	.000502	.00172	.000477
38.0	.0			.96010	575.9	.00166	.000461		
44.0	12.0			.96010	575.2	.00171	.000474		
42.0	.0			.95729	574.2	.00166	.000461		
44.0	.0			.96628	579.2	.00162	.000449	.00163	.000452
48.0	.0			.96628	579.2	.00179	.000497	.00179	.000497
52.0	.0			.96123	576.2	.00163	.000452	.00163	.000452
52.0	12.0			.95842	573.9	.00165	.000458		
55.0	.0			.96291	577.2	.00163	.000452	.00163	.000452
58.0	.0			.96460	578.2	.00163	.000452		
58.0	12.0			.95898	574.9	.00176	.000488		
58.0	-12.0			.96347	578.2	.00181	.000502		
58.0	-12.0			.96347	578.2	.00181	.000502		
44.0	-12.0			.96628	580.5	.00164	.000455		
36.0	-8.0			.96235	576.9	.00159	.000441		
36.0	-3.0			.96460	578.2	.00179	.000497		
34.0	-3.0			.96066	575.9	.00159	.000441	.00158	.000438
32.0	-3.0			.96179	577.9	.00165	.000458	.00165	.000458
30.0	-3.0			.96179	576.9	.00181	.000502	.00181	.000502
28.0	-3.0			.96460	578.2	.00162	.000449		
34.0	-12.0			.96010	575.9	.00162	.000449	.00162	.000449
32.0	-12.0			.95954	575.5	.00181	.000502	.00179	.000497
30.0	-12.0			.96291	577.5	.00180	.000499	.00181	.000502
19.0	-12.5			.96460	578.2	.00159	.000441		
17.5	-11.0			.96347	577.9	.00161	.000447		
15.5	-2.5			.96460	578.5	.00175	.000486		
16.5	-2.5			.96066	575.9	.00163	.000452	.00159	.000441
17.5	-2.5			.95954	575.5	.00169	.000469	.00162	.000449
18.5	-2.5			.96516	578.5	.00163	.000452	.00175	.000486
19.5	-2.5			.95954	575.2	.00164	.000455	.00158	.000438
20.5	-2.5			.95842	574.9	.00177	.000491	.00176	.000488
21.5	-2.5			.96291	577.2	.00163	.000452	.00170	.000472
22.5	-2.5			.96010	575.9	.00166	.000461	.00163	.000452
23.5	-2.5			.96010	575.9	.00168	.000466	.00165	.000458
24.5	-2.5			.96347	577.2	.00160	.000444		
36.0	-16.0			.96010	575.5	.00158	.000438		
36.0	-12.0			.96179	576.5	.00159	.000441	.00159	.000441
32.0	-18.0			.96628	579.9	.00156	.000433		
32.0	-16.0			.96179	576.9	.00160	.000444	.00159	.000441
32.0	-14.0			.96179	576.2	.00163	.000452	.00163	.000452
32.0	-10.0			.96066	576.2	.00161	.000447		
28.0	-14.0			.96291	577.2	.00159	.000441		
28.0	-12.0			.96347	577.5	.00159	.000441		
26.0	-12.5			.96684	581.2	.00165	.000458		
24.5	-11.0			.96403	577.5	.00158	.000438		
22.0	-12.5			.96628	579.2	.00159	.000441	.00159	.000441
20.5	-11.0			.96516	580.2	.00165	.000458	.00165	.000458
34.0	-1.0			.97190	582.2	.00156	.000433	.00166	.000461
34.0	4.0			.96235	577.2	.00167	.000463	.00190	.000527
34.0	5.0			.95392	569.2	.00145	.000402	.00122	.000339
34.0	6.0			.95617	573.9	.00172	.000477	.00171	.000474
36.0	6.0			.96066	576.2	.00172	.000477		
38.0	1.0			.96179	576.9	.00181	.000502	.00186	.000516
38.0	2.0			.95842	574.9	.00181	.000502		
44.0	8.0			.95729	573.9	.00165	.000458	.00164	.000455
44.0	6.0			.95842	574.9	.00177	.000491	.00177	.000491
44.0	4.0			.95842	574.9	.00169	.000469	.00168	.000466
44.0	2.0			.95954	575.5	.00164	.000455	.00162	.000449
44.0	1.0			.96403	577.9	.00159	.000441	.00160	.000444
6.0	.0			.95167	575.5	.00270	.000749		
6.0	10.0			.94999	574.9	.00292	.000810		
12.0	.0			.95898	580.5	.00239	.000663		
12.0	5.0			.95280	575.2	.00248	.000688		
12.0	10.0			.94886	572.5	.00259	.000719		
18.0	.0			.95392	574.5	.00212	.000588		
30.0	.0			.95561	574.9	.00211	.000585		
42.0	.0			.95617	574.5	.00188	.000522		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(f) M = 3.51; R = 1.59 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.97384	586.9	.00104	.000507		
12.0	.0			.96716	582.2	.00100	.000487		
20.5	.0			.97050	584.5	.00122	.000595		
28.0	12.0			.96326	580.2	.00103	.000502		
28.0	4.0			.96883	585.5	.00106	.000517		
28.0	.0			.96883	584.2	.00105	.000512		
20.5	-5.0			.97161	585.9	.00104	.000507		
24.5	-5.0			.97161	586.2	.00087	.000424		
30.0	.0			.97105	586.2	.00087	.000424	.00088	.000429
31.0	12.0			.96549	581.5	.00100	.000487		
34.0	.0			.97272	587.9	.00091	.000443	.00080	.000390
2.0	-12.0			.97773	589.9	.00093	.000453		
2.0	12.0			.97495	587.5	.00100	.000487		
12.0	-12.0			.97551	590.2	.00092	.000448		
12.0	12.0			.96438	580.9	.00101	.000492		
30.0	1.0			.96938	583.9	.00097	.000473		
31.0	2.0			.97217	585.5	.00097	.000473		
32.0	2.0			.97217	585.2	.00096	.000468	.00097	.000473
32.0	3.0			.96827	583.2	.00100	.000487		
32.0	6.0			.96604	582.2	.00099	.000482		
34.0	1.0			.97272	588.5	.00092	.000448	.00105	.000512
34.0	2.0			.96771	583.2	.00123	.000599	.00119	.000580
34.0	3.0			.96549	581.9	.00100	.000487	.00090	.000439
38.0	.0			.96994	583.9	.00089	.000434		
44.0	12.0			.97050	583.9	.00101	.000492		
42.0	.0			.96771	582.9	.00123	.000599		
44.0	.0			.97662	588.5	.00092	.000448	.00094	.000458
48.0	.0			.97606	587.9	.00096	.000468	.00096	.000468
52.0	.0			.97161	584.9	.00102	.000497	.00101	.000492
52.0	12.0			.9677:	582.5	.00104	.000507		
55.0	.0			.97272	588.2	.00092	.000448	.00092	.000448
58.0	.0			.97662	589.5	.00096	.000468		
58.0	12.0			.96938	584.5	.00093	.000453		
58.0	-12.0			.97328	588.9	.00092	.000448		
44.0	-12.0			.97551	589.5	.00091	.000443		
36.0	-8.0			.97217	587.5	.00091	.000443		
36.0	-3.0			.97439	586.9	.00097	.000473		
34.0	-3.0			.97105	584.5	.00098	.000478	.00097	.000473
32.0	-3.0			.97161	587.5	.00092	.000448	.00092	.000448
30.0	-3.0			.97161	586.2	.00105	.000512	.00105	.000512
28.0	-3.0			.97495	586.9	.00099	.000482		
34.0	-12.0			.96883	586.2	.00092	.000448	.00092	.000448
32.0	-12.0			.96827	584.9	.00088	.000429	.00086	.000419
30.0	-12.0			.97217	587.9	.00092	.000448	.00093	.000453
19.0	-12.5			.97272	588.2	.00092	.000448		
17.5	-11.0			.97161	587.9	.00092	.000448		
15.5	-2.5			.97384	586.5	.00101	.000492		
16.5	-2.5			.96994	586.2	.00085	.000414	.00081	.000395
17.5	-2.5			.96938	583.5	.00100	.000487	.00093	.000453
18.5	-2.5			.97439	589.2	.00092	.000448	.00107	.000521
19.5	-2.5			.96883	585.9	.00092	.000448	.00086	.000419
20.5	-2.5			.96827	585.5	.00092	.000448	.00085	.000414
21.5	-2.5			.97161	587.9	.00092	.000448	.00105	.000512
22.5	-2.5			.96994	586.5	.00099	.000482	.00096	.000468
23.5	-2.5			.96994	584.2	.00099	.000482	.00096	.000468
24.5	-2.5			.97217	587.9	.00092	.000448		
36.0	-16.0			.96771	584.2	.00088	.000429		
36.0	-12.0			.97050	585.9	.00087	.000424	.00087	.000424
32.0	-18.0			.97272	587.9	.00088	.000429		
32.0	-16.0			.96994	585.9	.00097	.000473	.00096	.000468
32.0	-14.0			.96994	585.5	.00087	.000424	.00087	.000424
32.0	-10.0			.96994	586.5	.00092	.000448		
28.0	-14.0			.97105	587.2	.00092	.000448		
28.0	-12.0			.97161	587.5	.00092	.000448		
26.0	-12.5			.97439	588.5	.00087	.000424		
24.5	-11.0			.97105	586.5	.00088	.000429		
22.0	-12.5			.97384	586.5	.00101	.000492	.00101	.000492
20.5	-11.0			.97328	588.5	.00092	.000448	.00092	.000448
34.0	-1.0			.98052	590.5	.00080	.000390	.00091	.000443
34.0	4.0			.97217	585.9	.00099	.000482		
34.0	5.0			.96215	579.5	.00087	.000424		
34.0	6.0			.96604	582.9	.00094	.000458	.00093	.000453
36.0	6.0			.97050	584.9	.00123	.000599		
38.0	1.0			.97217	586.9	.00096	.000468	.00103	.000502
38.0	2.0			.96771	585.9	.00093	.000453		
44.0	8.0			.96716	582.9	.00099	.000482	.00098	.000478
44.0	6.0			.96883	583.9	.00123	.000599	.00124	.000604
44.0	4.0			.96771	583.2	.00099	.000482	.00098	.000478
44.0	2.0			.96994	585.9	.00097	.000473	.00095	.000463
44.0	1.0			.97384	586.5	.00097	.000473	.00099	.000482
6.0	.0			.95436	579.2	.00198	.000965		
6.0	10.0			.95269	578.9	.00217	.001058		
12.0	.0			.96438	584.9	.00156	.000760		
12.0	5.0			.95825	580.5	.00164	.000799		
12.0	10.0			.95380	579.2	.00183	.000892		
18.0	.0			.96104	580.5	.00138	.000673		
30.0	.0			.96382	582.9	.00118	.000575		
42.0	.0			.96549	581.9	.00123	.000599		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(g) M = 4.44; R = 4.47×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95070	579.2	.00084	.000214		
12.0	.0			.94468	574.9	.00084	.000214		
20.5	.0			.94687	577.2	.00092	.000234		
28.0	12.0			.94029	573.5	.00126	.000320		
28.0	4.0			.94522	575.5	.00084	.000214		
28.0	.0			.94468	576.2	.00096	.000244		
20.5	-5.0			.94796	576.5	.00083	.000211		
24.5	-5.0			.94741	576.9	.00074	.000188		
30.0	.0			.94632	576.5	.00092	.000234	.00092	.000234
31.0	12.0			.94303	574.9	.00125	.000318		
34.0	.0			.94796	577.2	.00074	.000188	.00062	.000158
2.0	-12.0			.95399	581.2	.00111	.000282		
12.0	-12.0			.95234	580.9	.00095	.000242		
12.0	12.0			.94194	574.5	.00126	.000320		
30.0	1.0			.94522	575.2	.00084	.000214		
31.0	2.0			.94796	576.9	.00084	.000214		
32.0	2.0			.94741	576.5	.00084	.000214	.00085	.000216
32.0	3.0			.94413	575.9	.00111	.000282		
32.0	6.0			.94413	574.9	.00115	.000292		
34.0	1.0			.94851	577.2	.00084	.000214	.00093	.000236
34.0	2.0			.94358	574.5	.00084	.000214	.00078	.000198
34.0	3.0			.94194	574.5	.00112	.000285		
38.0	.0			.94577	575.9	.00074	.000188		
44.0	12.0			.94851	577.5	.00119	.000303		
42.0	.0			.94303	574.2	.00085	.000216		
44.0	.0			.95180	579.2	.00083	.000211	.00085	.000216
48.0	.0			.95234	579.2	.00088	.000224	.00084	.000214
52.0	.0			.94741	576.9	.00092	.000234	.00088	.000224
52.0	12.0			.94577	578.5	.00121	.000308		
55.0	.0			.94906	577.2	.00076	.000193	.00076	.000193
58.0	.0			.95234	578.9	.00084	.000214		
58.0	12.0			.94796	577.9	.00118	.000300		
58.0	-12.0			.95180	579.2	.00107	.000272		
44.0	-12.0			.95344	579.5	.00088	.000224		
36.0	-8.0			.94906	576.9	.00088	.000224		
36.0	-3.0			.95070	578.2	.00079	.000201		
34.0	-3.0			.94741	576.2	.00083	.000211	.00081	.000206
32.0	-3.0			.94796	577.2	.00074	.000188	.00074	.000188
30.0	-3.0			.94851	577.5	.00074	.000188	.00078	.000198
28.0	-3.0			.95070	578.5	.00083	.000211		
34.0	-12.0			.94687	576.2	.00110	.000280	.00110	.000280
32.0	-12.0			.94577	575.5	.00084	.000214	.00087	.000221
30.0	-12.0			.94906	577.5	.00110	.000280	.00112	.000285
19.0	-12.5			.94960	577.9	.00084	.000214		
17.5	-11.0			.94851	577.2	.00084	.000214		
15.5	-2.5			.95070	578.5	.00083	.000211		
16.5	-2.5			.94687	576.2	.00084	.000214	.00079	.000201
17.5	-2.5			.94632	576.2	.00074	.000188	.00068	.000173
18.5	-2.5			.95125	578.5	.00078	.000198		
19.5	-2.5			.94577	575.5	.00084	.000214	.00082	.000209
20.5	-2.5			.94522	575.9	.00092	.000234		
21.5	-2.5			.94851	577.9	.00074	.000188	.00086	.000219
22.5	-2.5			.94632	575.9	.00084	.000214	.00079	.000201
23.5	-2.5			.94687	576.5	.00074	.000188	.00075	.000191
24.5	-2.5			.94906	577.5	.00084	.000214		
36.0	-16.0			.94577	575.9	.00111	.000282		
36.0	-12.0			.94741	576.5	.00104	.000264	.00104	.000264
32.0	-18.0			.95070	579.5	.00120	.000305		
32.0	-16.0			.94741	576.9	.00111	.000282	.00110	.000280
32.0	-14.0			.94741	576.9	.00092	.000234	.00092	.000234
32.0	-10.0			.94632	575.9	.00106	.000270		
28.0	-14.0			.94741	576.9	.00111	.000282		
28.0	-12.0			.94796	576.9	.00084	.000214		
26.0	-12.5			.95125	578.9	.00107	.000272		
24.5	-11.0			.94796	576.5	.00083	.000211		
22.0	-12.5			.94960	579.2	.00096	.000244	.00096	.000244
20.5	-11.0			.94906	577.5	.00110	.000280	.00110	.000280
34.0	-1.0			.95618	581.9	.00082	.000209	.00098	.000249
34.0	4.0			.94851	578.5	.00111	.000282		
34.0	5.0			.93975	571.2	.00077	.000196		
34.0	6.0			.94358	574.5	.00117	.000298	.00115	.000292
36.0	6.0			.94741	577.9	.00111	.000282		
38.0	1.0			.94687	576.2	.00084	.000214	.00091	.000231
38.0	2.0			.94413	574.5	.00084	.000214		
44.0	8.0			.94522	575.5	.00113	.000287	.00112	.000285
44.0	6.0			.94632	576.9	.00111	.000282	.00112	.000285
44.0	4.0			.94522	576.2	.00111	.000282	.00110	.000280
44.0	2.0			.94577	575.5	.00084	.000214	.00080	.000203
44.0	1.0			.94960	577.5	.00088	.000224	.00084	.000214
6.0	.0			.93810	575.5	.00158	.000402		
6.0	10.0			.93701	574.5	.00213	.000542		
12.0	.0			.94577	577.9	.00132	.000336		
12.0	5.0			.94029	574.5	.00147	.000374		
12.0	10.0			.93646	572.9	.00190	.000483		
18.0	.0			.94139	574.9	.00132	.000336		
30.0	.0			.94248	576.9	.00132	.000336		
42.0	.0			.94303	576.2	.00111	.000282		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Continued

(h) M = 4.44; R = 3.19×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^0R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95579	577.5	.00108	.000387		
12.0	.0			.94861	572.9	.00087	.000312		
20.5	.0			.95137	574.5	.00087	.000312		
28.0	12.0			.94529	572.2	.00093	.000334		
28.0	4.0			.95026	573.9	.00082	.000294		
28.0	.0			.94916	573.5	.00091	.000326		
20.5	-5.0			.95247	575.5	.00090	.000323		
24.5	-5.0			.95192	575.5	.00080	.000287		
30.0	.0			.95137	574.2	.00082	.000294	.00082	.000294
31.0	12.0			.94805	573.9	.00092	.000330		
34.0	.0			.95247	575.5	.00090	.000323		
2.0	-12.0			.95855	580.5	.00095	.000341		
2.0	12.0			.95690	579.2	.00105	.000377		
12.0	-12.0			.95690	578.9	.00094	.000337		
12.0	12.0			.94584	572.2	.00107	.000384		
30.0	1.0			.94971	573.5	.00084	.000301		
31.0	2.0			.95303	575.9	.00090	.000323		
32.0	2.0			.95247	575.5	.00090	.000323	.00091	.000326
32.0	3.0			.94916	573.9	.00091	.000326		
32.0	6.0			.94861	573.5	.00091	.000326		
34.0	1.0			.95358	576.2	.00090	.000323		
34.0	2.0			.94861	573.5	.00091	.000326	.00085	.000305
34.0	3.0			.94695	571.9	.00086	.000309		
38.0	.0			.95082	573.9	.00083	.000298		
44.0	12.0			.95524	575.9	.00078	.000280		
42.0	.0			.94861	573.2	.00091	.000326		
44.0	.0			.95690	578.2	.00090	.000323	.00092	.000330
48.0	.0			.95745	577.9	.00080	.000287	.00081	.000291
52.0	.0			.95192	574.5	.00079	.000283	.00078	.000280
52.0	12.0			.95026	575.2	.00095	.000341		
55.0	.0			.95358	575.5	.00079	.000283	.00079	.000283
58.0	.0			.95690	577.5	.00076	.000273		
58.0	12.0			.95303	576.5	.00091	.000326		
58.0	-12.0			.95690	577.9	.00076	.000273		
44.0	-12.0			.95800	579.2	.00080	.000287		
36.0	-8.0			.95358	575.5	.00076	.000273		
36.0	-3.0			.95579	576.9	.00079	.000283		
34.0	-3.0			.95192	575.2	.00090	.000323	.00088	.000316
32.0	-3.0			.95247	575.5	.00090	.000323	.00090	.000323
30.0	-3.0			.95303	575.5	.00080	.000287	.00079	.000283
28.0	-3.0			.95524	577.5	.00091	.000326		
34.0	-12.0			.95192	575.9	.00081	.000291	.00081	.000291
32.0	-12.0			.95137	574.9	.00091	.000326	.00089	.000319
30.0	-12.0			.95413	578.2	.00080	.000287	.00082	.000294
19.0	-12.5			.95358	576.5	.00091	.000326		
17.5	-11.0			.95303	575.5	.00079	.000283		
15.5	-2.5			.95468	576.5	.00081	.000291		
16.5	-2.5			.95082	575.2	.00095	.000341	.00089	.000319
17.5	-2.5			.94971	573.5	.00084	.000301	.00073	.000262
18.5	-2.5			.95468	576.5	.00081	.000291		
19.5	-2.5			.94971	573.5	.00081	.000291	.00073	.000262
20.5	-2.5			.94916	573.2	.00084	.000301	.00075	.000269
21.5	-2.5			.95303	576.5	.00095	.000341	.00109	.000391
22.5	-2.5			.95026	574.5	.00091	.000326	.00087	.000312
23.5	-2.5			.95082	574.2	.00082	.000294	.00078	.000280
24.5	-2.5			.95303	576.2	.00091	.000326		
36.0	-16.0			.95026	574.2	.00074	.000265		
36.0	-12.0			.95247	575.2	.00074	.000265	.00074	.000265
32.0	-18.0			.95524	578.2	.00092	.000330		
32.0	-16.0			.95137	575.5	.00092	.000330	.00090	.000323
32.0	-14.0			.95192	574.9	.00073	.000262	.00073	.000262
32.0	-10.0			.95137	575.5	.00081	.000291		
28.0	-14.0			.95247	576.2	.00081	.000291		
28.0	-12.0			.95303	576.2	.00091	.000326		
26.0	-12.5			.95579	578.2	.00080	.000287		
24.5	-11.0			.95247	575.2	.00074	.000265		
22.0	-12.5			.95413	576.5	.00077	.000276	.00077	.000276
20.5	-11.0			.95358	576.5	.00091	.000326	.00091	.000326
34.0	-1.0			.96076	580.2	.00080	.000287		
34.0	4.0			.95303	575.9	.00087	.000312		
34.0	5.0			.94474	569.9	.00064	.000230		
34.0	6.0			.94805	573.2	.00091	.000326	.00089	.000319
36.0	6.0			.95192	576.2	.00095	.000341		
38.0	1.0			.95192	574.9	.00081	.000291	.00090	.000323
38.0	2.0			.94916	572.9	.00074	.000265		
44.0	8.0			.94971	574.2	.00091	.000326	.00090	.000323
44.0	6.0			.95082	574.9	.00091	.000326	.00092	.000330
44.0	4.0			.95026	573.5	.00076	.000273	.00075	.000269
44.0	2.0			.95082	574.2	.00081	.000291	.00078	.000280
44.0	1.0			.95413	576.5	.00090	.000323	.00090	.000323
6.0	.0			.93977	569.9	.00169	.000606		
6.0	10.0			.93811	570.5	.00177	.000635		
12.0	.0			.94805	577.5	.00138	.000495		
12.0	5.0			.94308	572.2	.00151	.000542		
12.0	10.0			.93866	570.5	.00154	.000552		
18.0	.0			.94419	572.9	.00138	.000495		
30.0	.0			.94584	573.5	.00123	.000441		
42.0	.0			.94695	572.9	.00092	.000330		

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^0R$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

1. Flat Plate Alone - Concluded

(i) M = 4.44; R = 2.13 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.96779	582.9	.00075	.000403		
12.0	.0			.96223	577.9	.00058	.000312		
20.5	.0			.96501	579.5	.00057	.000306		
28.0	12.0			.95946	576.2	.00055	.000296		
28.0	4.0			.96390	578.9	.00058	.000312		
28.0	.0			.96334	578.5	.00074	.000398		
20.5	-5.0			.96612	579.9	.00062	.000333		
24.5	-5.0			.96556	579.5	.00074	.000398		
30.0	.0			.96556	579.5	.00052	.000280	.00052	.000280
31.0	12.0			.96168	577.9	.00051	.000274		
34.0	.0			.96668	580.2	.00057	.000306		
2.0	-12.0			.97056	582.9	.00056	.000301		
2.0	12.0			.96779	582.2	.00064	.000344		
12.0	-12.0			.97001	582.2	.00060	.000323		
12.0	12.0			.95890	576.2	.00063	.000339		
30.0	1.0			.96390	578.9	.00074	.000398		
31.0	2.0			.96668	580.5	.00074	.000398		
32.0	2.0			.96612	579.9	.00057	.000306	.00058	.000312
32.0	3.0			.96334	578.5	.00074	.000398		
32.0	6.0			.96279	578.2	.00062	.000333		
34.0	1.0			.96723	581.2	.00061	.000328	.00070	.000376
34.0	2.0			.96279	578.5	.00061	.000328	.00057	.000306
34.0	3.0			.96057	577.2	.00064	.000344		
38.0	.0			.96501	579.5	.00074	.000398		
44.0	12.0			.96612	580.2	.00049	.000263		
42.0	.0			.96279	578.2	.00061	.000328		
44.0	.0			.97167	583.2	.00050	.000269	.00053	.000285
48.0	.0			.97167	583.2	.00050	.000269	.00051	.000274
52.0	.0			.96612	579.9	.00050	.000269	.00049	.000263
52.0	12.0			.96334	578.5	.00050	.000269		
55.0	.0			.96723	580.5	.00049	.000263	.00049	.000263
58.0	.0			.97112	582.9	.00049	.000263		
58.0	12.0			.96612	580.5	.00061	.000328		
58.0	-12.0			.97056	582.2	.00049	.000263		
44.0	-12.0			.97223	582.9	.00049	.000263		
36.0	-8.0			.96779	580.5	.00049	.000263		
36.0	-3.0			.97001	581.9	.00053	.000285		
34.0	-3.0			.96612	579.9	.00061	.000328	.00059	.000317
32.0	-3.0			.96668	580.2	.00052	.000280	.00052	.000280
30.0	-3.0			.96723	580.9	.00066	.000355	.00073	.000393
28.0	-3.0			.97056	582.2	.00060	.000323		
34.0	-12.0			.96723	579.5	.00049	.000263		
32.0	-12.0			.96723	579.2	.00060	.000323	.00058	.000312
30.0	-12.0			.97001	580.9	.00051	.000274	.00052	.000280
19.0	-12.5			.96945	580.2	.00053	.000285		
17.5	-11.0			.96834	579.9	.00054	.000290		
15.5	-2.5			.97001	581.2	.00070	.000376		
16.5	-2.5			.96612	578.9	.00052	.000280	.00047	.000253
17.5	-2.5			.96501	578.5	.00073	.000393	.00064	.000344
18.5	-2.5			.97001	581.5	.00069	.000371		
19.5	-2.5			.96445	578.2	.00057	.000306	.00048	.000258
20.5	-2.5			.96390	578.2	.00071	.000382	.00064	.000344
21.5	-2.5			.96723	580.2	.00054	.000290	.00064	.000344
22.5	-2.5			.96556	578.9	.00053	.000285	.00048	.000258
23.5	-2.5			.96556	579.2	.00071	.000382	.00068	.000366
24.5	-2.5			.96779	580.5	.00070	.000376		
36.0	-16.0			.96390	578.2	.00055	.000296		
36.0	-12.0			.96668	579.9	.00049	.000263	.00049	.000263
32.0	-18.0			.96834	581.5	.00055	.000296		
32.0	-16.0			.96556	579.2	.00055	.000296	.00053	.000285
32.0	-14.0			.96612	579.2	.00058	.000312	.00058	.000312
32.0	-10.0			.96556	579.5	.00049	.000263		
28.0	-14.0			.96612	579.9	.00049	.000263		
26.0	-12.5			.96945	581.9	.00049	.000263		
24.5	-11.0			.96668	579.9	.00049	.000263		
22.0	-12.5			.96834	580.9	.00054	.000290	.00054	.000290
20.5	-11.0			.96723	580.5	.00050	.000269	.00050	.000269
34.0	-1.0			.97501	585.2	.00049	.000263		
34.0	4.0			.96723	581.2	.00062	.000333		
34.0	5.0			.95835	574.9	.00074	.000398		
34.0	6.0			.96223	577.9	.00074	.000398	.00069	.000371
36.0	6.0			.96612	580.2	.00074	.000398		
38.0	1.0			.96612	580.2	.00057	.000306	.00065	.000350
38.0	2.0			.96334	578.5	.00051	.000274		
44.0	8.0			.96334	578.9	.00075	.000403	.00074	.000398
44.0	6.0			.96501	579.5	.00051	.000274	.00052	.000280
44.0	4.0			.96390	578.9	.00055	.000296	.00054	.000290
44.0	2.0			.96501	579.5	.00052	.000280	.00049	.000263
44.0	1.0			.96834	581.2	.00057	.000306	.00057	.000306
6.0	.0			.94946	573.5	.00122	.000656		
6.0	10.0			.94724	573.2	.00142	.000764		
12.0	.0			.95946	577.9	.00103	.000554		
12.0	5.0			.95390	575.5	.00103	.000554		
12.0	10.0			.94891	572.2	.00102	.000548		
18.0	.0			.95668	575.5	.00079	.000425		
30.0	.0			.95946	576.9	.00074	.000398		
42.0	.0			.96057	578.2	.00075	.000403		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener

(a) M = 2.65; R = 3.95×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94808	588.9	.00446	.000631			.94
12.0	.0			.94698	587.2	.00417	.000590			.94
20.5	.0			.98343	615.2	.00579	.000820			1.30
28.0	12.0			.90114	555.5	.00326	.000462			.70
28.0	4.0			.91558	595.2	.00196	.000278			.41
28.0	.0			.91742	595.9	.00149	.000211			.33
20.5	-5.0			.98343	615.5	.00599	.000848			1.32
24.5	-5.0			1.00000	632.9	.00787	.001114			1.84
30.0	.0			.94698	584.9	.00351	.000497	.00351	.000497	.77
31.0	12.0			.90059	562.5	.00523	.000740			1.14
34.0	.0			.91881	570.2	.00440	.000623	.00438	.000620	1.06
2.0	-12.0			.95140	589.9	.00433	.000613			.95
2.0	12.0			.95029	590.2	.00442	.000626			.93
12.0	-12.0			.95195	590.2	.00428	.000606			.91
12.0	12.0			.94808	588.9	.00438	.000620			.91
30.0	1.0			.94587	584.9	.00366	.000518			.84
31.0	2.0			.93207	579.2	.00453	.000641			1.03
32.0	2.0			.92323	573.5	.00446	.000631	.00438	.000620	1.03
32.0	3.0			.92102	573.9	.00490	.000694			1.07
32.0	6.0			.92489	577.2	.00517	.000732			1.14
32.0	12.0			.91826	571.2	.00471	.000667	.00475	.000673	1.05
34.0	1.0			.91716	570.9	.00485	.000687	.00485	.000687	1.06
34.0	2.0			.91771	571.2	.00490	.000694			1.07
34.0	3.0			.91992	571.5	.00452	.000640	.00453	.000641	
36.0	.0			.92102	572.2	.00449	.000636	.00450	.000637	1.04
38.0	.0			.92157	571.9	.00444	.000629	.00443	.000627	
40.0	.0			.93317	583.2	.00539	.000763			1.20
44.0	12.0			.92323	573.9	.00452	.000640	.00450	.000637	1.06
42.0	.0			.93041	578.2	.00449	.000636	.00451	.000639	1.03
44.0	.0			.92931	577.9	.00474	.000671	.00474	.000671	1.10
48.0	.0			.93152	579.5	.00475	.000673	.00475	.000673	1.07
52.0	.0			.93869	586.5	.00557	.000789			1.25
52.0	12.0			.93152	579.9	.00481	.000681	.00481	.000681	1.07
55.0	.0			.93207	580.2	.00483	.000684			.99
58.0	.0			.93814	587.2	.00546	.000773			1.10
58.0	12.0			.93980	587.2	.00539	.000763			1.18
58.0	-12.0			.93428	581.9	.00508	.000719			1.18
44.0	-12.0			.92323	573.5	.00474	.000671			1.12
36.0	-8.0			.91992	578.9	.00436	.000617			1.04
36.0	-3.0			.91826	570.5	.00445	.000630	.00443	.000627	1.06
34.0	-3.0			.92213	573.2	.00461	.000653	.00456	.000646	1.05
32.0	-3.0			.94311	584.2	.00401	.000568	.00402	.000569	.91
30.0	-3.0			.90589	593.9	.00241	.000341			.56
28.0	-3.0			.90998	567.5	.00522	.000739	.00522	.000739	1.19
34.0	-12.0			.90501	564.2	.00509	.000721	.00502	.000711	1.17
32.0	-12.0			.90501	562.9	.00500	.000708	.00501	.000709	1.13
30.0	-12.0			.96244	601.5	.00550	.000779			1.17
19.0	-12.5			.95471	592.9	.00461	.000653			1.03
17.5	-11.0			.95140	593.5	.00436	.000617			.92
15.5	-2.5			.95195	593.9	.00442	.000626	.00419	.000593	1.00
16.5	-2.5			.96023	601.2	.00558	.000790	.00560	.000793	1.22
17.5	-2.5			.97514	610.5	.00568	.000804	.00583	.000825	1.29
18.5	-2.5			.97901	613.2	.00588	.000833	.00587	.000831	1.30
19.5	-2.5			.98398	616.2	.00579	.000820	.00581	.000823	1.28
20.5	-2.5			.98785	618.5	.00597	.000845	.00600	.000850	1.32
21.5	-2.5			.98785	619.9	.00620	.000878	.00609	.000862	1.40
22.5	-2.5			.99337	625.2	.00684	.000968	.00679	.000961	1.53
23.5	-2.5			1.00110	633.2	.00763	.001080			1.76
24.5	-2.5			.92434	571.2	.00386	.000547			.93
36.0	-16.0			.91660	571.5	.00530	.000750	.00530	.000750	1.23
36.0	-12.0			.93649	578.2	.00367	.000520			.88
32.0	-18.0			.92489	572.5	.00403	.000571	.00402	.000569	.93
32.0	-16.0			.91992	568.9	.00399	.000565	.00400	.000566	.96
32.0	-14.0			.91660	569.9	.00466	.000660			1.07
32.0	-10.0			.92378	574.5	.00481	.000681			1.10
28.0	-14.0			.90998	559.2	.00291	.000412			.68
28.0	-12.0			.94808	593.9	.00591	.000837			1.36
26.0	-12.5			.98785	625.5	.00822	.001164			1.82
24.5	-11.0			.97293	610.9	.00633	.000896	.00638	.000903	1.42
22.0	-12.5			.97680	611.9	.00592	.000838	.00594	.000841	1.36
20.5	-11.0			1.00883	647.2	.00995	.001409			
.0	13.7	1.00		1.00165	641.5	.00968	.001371			
.0	11.7	1.00		.91235	619.2	.00144	.000204			
1.0	11.7	1.00		1.00000	647.2	.00985	.001395			
.0	7.7	1.00		.99834	649.2	.01100	.001557			
.0	3.2	1.00		.90404	610.5	.00245	.000347			
1.0	3.2	1.00		.99282	645.5	.01105	.001565	.01133	.001604	
.0	1.2	1.00		.99282	645.5	.01105	.001565			
.0	1.2	1.00		.94643	607.2	.00697	.000987	.00694	.000983	
.5	11.7	2.00		.94201	602.2	.00790	.001119	.00790	.001119	
.5	3.2	2.00		.93649	596.9	.00928	.001314	.00966	.001368	
.5	1.2	2.00		.95140	594.5	.00548	.000776			.95
6.0	.0			.95195	596.2	.00547	.000774			.89
6.0	10.0			.95084	592.9	.00495	.000701			.94
12.0	.0			.94919	592.9	.00521	.000738			.94
12.0	5.0			.94919	593.2	.00523	.000740			.94
12.0	10.0			.94808	590.2	.00485	.000687			.94
18.0	.0			.94864	590.9	.00520	.000736			1.01
30.0	.0			.94888	588.9	.00448	.000634			.94
42.0	.0									

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(b) M = 2.65; R = 2.65 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95874	586.5	.00314	.000660			1.00
12.0	.0			.95540	583.5	.00300	.000631			1.00
20.5	.0			.98940	609.2	.00423	.000889			1.45
28.0	12.0			.91247	555.2	.00243	.000511			.77
28.0	4.0			.90903	599.9	.00177	.000372			.58
28.0	.0			.91042	599.9	.00124	.000261			.42
20.5	-5.0			.98940	609.9	.00436	.000917			1.45
24.5	-5.0			1.00501	625.2	.00616	.001295			2.10
30.0	.0			.95651	583.2	.00270	.000568	.00271	.000570	.97
31.0	12.0			.91080	560.2	.00389	.000818			1.27
34.0	.0			.92864	567.9	.00335	.000704	.00335	.000704	1.20
2.0	-12.0			.96320	588.2	.00321	.000675			1.05
2.0	12.0			.96153	587.9	.00326	.000685			1.00
12.0	-12.0			.96097	586.9	.00306	.000643			1.02
12.0	12.0			.95540	584.5	.00329	.000692			1.04
30.0	1.0			.95484	582.5	.00274	.000576			.93
31.0	2.0			.94034	576.2	.00338	.000711			1.15
32.0	2.0			.93198	570.5	.00334	.000702	.00328	.000690	1.21
32.0	3.0			.92919	570.2	.00369	.000776			1.25
32.0	6.0			.93254	572.9	.00383	.000805			1.24
34.0	1.0			.92752	568.5	.00341	.000717	.00344	.000723	1.18
34.0	2.0			.92641	568.2	.00354	.000744	.00353	.000742	1.16
34.0	3.0			.92641	567.9	.00351	.000738			1.15
36.0	.0			.92975	569.2	.00325	.000683	.00325	.000683	
38.0	.0			.93031	569.5	.00330	.000694	.00330	.000694	1.11
40.0	.0			.93142	569.5	.00311	.000654	.00310	.000652	
44.0	12.0			.94090	578.5	.00405	.000851			1.34
42.0	.0			.93254	571.2	.00338	.000711	.00337	.000708	1.15
44.0	.0			.94034	575.5	.00324	.000681	.00326	.000685	1.15
48.0	.0			.93867	574.9	.00343	.000721	.00343	.000721	1.16
52.0	.0			.93979	575.9	.00348	.000732	.00348	.000732	1.15
52.0	12.0			.94536	581.2	.00402	.000845			1.34
55.0	.0			.93979	575.9	.00341	.000717	.00341	.000717	1.13
58.0	.0			.94146	579.5	.00351	.000738			1.16
58.0	12.0			.94480	581.5	.00400	.000841			1.27
58.0	-12.0			.94815	582.9	.00405	.000851			1.34
44.0	-12.0			.94369	581.9	.00377	.000793			1.38
36.0	-8.0			.93365	571.5	.00345	.000725			1.20
36.0	-3.0			.93031	568.9	.00316	.000664			1.13
34.0	-3.0			.92752	567.9	.00337	.000708	.00336	.000706	1.18
32.0	-3.0			.92919	569.9	.00354	.000744	.00349	.000734	1.26
30.0	-3.0			.95261	581.9	.00294	.000618	.00293	.000616	.99
28.0	-3.0			.90211	596.5	.00185	.000389			.68
34.0	-12.0			.92083	568.5	.00401	.000843	.00401	.000843	1.40
32.0	-12.0			.91581	562.5	.00384	.000807	.00397	.000835	1.36
30.0	-12.0			.91693	561.5	.00339	.000713	.00340	.000715	1.15
19.0	-12.5			.97045	596.9	.00421	.000885			1.44
17.5	-11.0			.96487	590.5	.00359	.000755			1.20
15.5	-2.5			.96097	587.5	.00308	.000647			1.02
16.5	-2.5			.96209	588.5	.00320	.000673	.00305	.000641	1.07
17.5	-2.5			.96878	596.9	.00413	.000868	.00414	.000870	1.37
18.5	-2.5			.98216	604.9	.00421	.000885	.00433	.000910	1.41
19.5	-2.5			.98550	607.2	.00427	.000898	.00426	.000896	1.42
20.5	-2.5			.98996	610.2	.00426	.000896	.00427	.000898	1.39
21.5	-2.5			.99442	613.2	.00469	.000986	.00473	.000994	1.56
22.5	-2.5			.99386	613.9	.00464	.000975	.00455	.000956	1.55
23.5	-2.5			.99888	618.5	.00506	.001064	.00500	.001051	1.69
24.5	-2.5			1.00613	625.9	.00577	.001213			1.97
36.0	-16.0			.93588	570.2	.00290	.000610			1.07
36.0	-12.0			.92696	568.9	.00383	.000805	.00382	.000803	1.32
32.0	-18.0			.94703	576.5	.00265	.000557			.93
32.0	-16.0			.93588	571.2	.00294	.000618	.00293	.000616	1.02
32.0	-14.0			.93031	567.2	.00283	.000595	.00283	.000595	.98
32.0	-10.0			.92752	568.2	.00345	.000725			1.17
28.0	-14.0			.93254	571.2	.00347	.000729			1.19
28.0	-12.0			.92195	559.2	.00217	.000456			.78
26.0	-12.5			.95428	588.2	.00441	.000927			1.53
24.5	-11.0			.99163	617.5	.00616	.001295			2.13
22.0	-12.5			.97881	604.9	.00473	.000994	.00477	.001003	1.61
20.5	-11.0			.98271	605.9	.00439	.000923	.00440	.000925	1.50
.0	13.7	1.00		1.01449	643.5	.00725	.001524			
.0	11.7	1.00		1.00668	633.2	.00738	.001551			
1.0	11.7	1.00		.90626	623.2	.00095	.000200			
.0	7.7	1.00		1.00501	638.5	.00751	.001579			
1.0	7.7	1.00		.90165	620.2	.00217	.000456			
.0	3.2	1.00		1.00334	634.2	.00882	.001854			
1.0	3.2	1.00		.90118	614.9	.00205	.000431			
.0	1.2	1.00		.99721	630.9	.00872	.001833	.00887	.001865	
1.0	1.2	1.00		.89564	609.5	.00155	.000326	.00129	.000271	
.5	11.7	2.00		.95595	594.9	.00573	.001205	.00566	.001190	
.5	3.2	2.00		.95094	592.9	.00621	.001305	.00621	.001305	
.5	1.2	2.00		.94536	592.2	.00703	.001478	.00734	.001543	
6.0	.0			.95763	589.9	.00419	.000881			1.02
6.0	10.0			.95818	590.9	.00434	.000912			1.00
12.0	.0			.95763	588.2	.00376	.000790			1.01
12.0	5.0			.95595	587.9	.00384	.000807			1.00
12.0	10.0			.95540	587.9	.00399	.000839			.99
18.0	.0			.95484	585.9	.00367	.000771			1.04
30.0	.0			.95540	586.2	.00350	.000736			1.00
42.0	.0			.95540	584.5	.00316	.000664			1.00

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(c) M = 2.65; R = 1.30×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.98052	594.5	.00153	.000654			.96
12.0	.0			.97606	592.2	.00146	.000625			.97
20.5	.0			1.00333	610.5	.00201	.000860			1.32
28.0	12.0			.93488	565.2	.00120	.000513			.77
28.0	4.0			.89971	613.5	.00151	.000646			1.03
20.5	-5.0			1.00278	610.9	.00205	.000877			1.38
24.5	-5.0			1.01447	622.5	.00306	.001309			2.27
30.0	.0			.97606	592.5	.00147	.000629	.00148	.000633	.99
31.0	12.0			.93098	567.5	.00218	.000933			1.54
34.0	.0			.94601	573.9	.00171	.000731	.00171	.000731	1.31
2.0	-12.0			.98497	596.2	.00150	.000642			.96
2.0	12.0			.98274	596.2	.00154	.000659			.84
12.0	-12.0			.98107	593.5	.00143	.000612			1.01
12.0	12.0			.97495	591.2	.00151	.000646			.95
30.0	1.0			.97439	590.9	.00142	.000607			1.08
31.0	2.0			.95825	582.5	.00177	.000757			1.20
32.0	2.0			.94935	576.5	.00171	.000731	.00165	.000706	1.32
32.0	3.0			.94601	575.5	.00187	.000800			1.22
32.0	6.0			.94935	577.9	.00189	.000808			1.33
34.0	1.0			.94490	574.2	.00161	.000689	.00163	.000697	1.20
34.0	2.0			.94378	573.5	.00174	.000744	.00173	.000740	1.23
34.0	3.0			.94378	573.5	.00176	.000753			1.23
36.0	.0			.94935	575.9	.00153	.000654	.00154	.000659	
38.0	.0			.95157	577.2	.00151	.000646	.00151	.000646	1.13
40.0	.0			.95269	577.9	.00149	.000637	.00149	.000637	
44.0	12.0			.96048	585.2	.00211	.000903			1.56
42.0	.0			.95380	578.9	.00151	.000646	.00149	.000637	1.11
44.0	.0			.96215	584.2	.00158	.000676	.00160	.000684	1.16
48.0	.0			.95992	582.5	.00158	.000676	.00158	.000676	1.09
52.0	.0			.95937	582.2	.00169	.000723	.00169	.000723	1.15
52.0	12.0			.96326	586.5	.00191	.000817			1.30
55.0	.0			.96048	582.9	.00156	.000667	.00156	.000667	1.12
58.0	.0			.96326	584.5	.00168	.000719			1.20
58.0	12.0			.96382	586.5	.00186	.000796			1.22
58.0	-12.0			.96771	587.9	.00180	.000770			1.17
44.0	-12.0			.96438	586.2	.00207	.000885			1.41
36.0	-8.0			.95491	579.2	.00170	.000727			1.16
36.0	-3.0			.94990	576.2	.00170	.000727			1.16
34.0	-3.0			.94490	573.5	.00171	.000731	.00169	.000723	1.30
32.0	-3.0			.94601	574.9	.00180	.000770	.00173	.000740	1.22
30.0	-3.0			.97328	590.2	.00147	.000629	.00144	.000616	.99
28.0	-3.0			.89878	612.9	.00151	.000646			1.03
34.0	-12.0			.94267	572.9	.00190	.000813	.00190	.000813	1.44
32.0	-12.0			.93766	569.9	.00191	.000817	.00184	.000787	1.40
30.0	-12.0			.93766	569.2	.00173	.000740	.00173	.000740	1.18
19.0	-12.5			.98719	600.9	.00206	.000881			1.50
17.5	-11.0			.98441	597.5	.00170	.000727			1.23
15.5	-2.5			.98274	595.2	.00163	.000697			1.12
16.5	-2.5			.98274	596.5	.00174	.000744	.00166	.000710	1.18
17.5	-2.5			.98664	601.5	.00209	.000894	.00207	.000885	1.42
18.5	-2.5			.99833	607.5	.00191	.000817	.00201	.000860	1.38
19.5	-2.5			1.00000	608.9	.00202	.000864	.00200	.000856	1.37
24.5	-2.5			1.01614	623.5	.00288	.001232			1.95
36.0	-16.0			.96215	582.5	.00134	.000573			1.03
36.0	-12.0			.94823	576.2	.00187	.000800	.00186	.000796	1.26
32.0	-18.0			.97105	587.5	.00120	.000513			.82
32.0	-16.0			.96048	583.2	.00130	.000556	.00129	.000552	1.00
32.0	-14.0			.95380	576.5	.00133	.000569	.00134	.000573	1.03
32.0	-10.0			.94823	575.5	.00176	.000753			1.29
28.0	-14.0			.94990	576.2	.00170	.000727			1.15
28.0	-12.0			.94323	569.2	.00107	.000458			.82
26.0	-12.5			.96660	591.2	.00230	.000984			1.73
24.5	-11.0			.99833	613.2	.00327	.001399			2.52
22.0	-12.5			.99165	604.9	.00234	.001001	.00238	.001018	1.58
20.5	-11.0			.99610	606.9	.00210	.000898	.00211	.000903	1.42
.0	13.7	1.00		1.02615	634.9	.00390	.001668			
.0	11.7	1.00		1.01780	631.9	.00356	.001523			
.0	7.7	1.00		1.01558	628.5	.00395	.001690			
.0	3.2	1.00		1.01113	627.5	.00462	.001976			
1.0	3.2	1.00		.89878	624.9	.00217	.000928			
.0	1.2	1.00		1.00612	624.5	.00465	.001989	.00423	.001809	
.5	11.7	2.00		.97551	601.2	.00291	.001245	.00279	.001193	
.5	3.2	2.00		.96883	596.2	.00316	.001352	.00314	.001343	
.5	1.2	2.00		.96549	595.2	.00366	.001566	.00385	.001647	
6.0	.0			.96827	588.5	.00143	.000612			1.05
6.0	10.0			.96827	586.5	.00098	.000419			1.15
12.0	.0			.97217	592.5	.00210	.000898			.93
12.0	5.0			.96938	592.2	.00250	.001069			1.07
12.0	10.0			.96771	591.5	.00224	.000958			.97
18.0	.0			.97105	590.5	.00187	.000800			.94
30.0	.0			.97384	591.5	.00185	.000791			.99
42.0	.0			.97439	590.9	.00155	.000663			.92

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(d) M = 3.51; R = 4.01×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95258	584.5	.00245	.000475			.95
12.0	.0			.94707	580.2	.00235	.000456			1.00
20.5	.0			.99834	616.9	.00366	.000710			1.48
28.0	12.0			.91233	556.5	.00177	.000343			.68
28.0	4.0			.91297	607.5	.00194	.000376			.78
28.0	.0			.91343	608.5	.00134	.000260			.54
20.5	-5.0			.99669	616.5	.00402	.000780			1.72
24.5	-5.0			1.00716	628.9	.00558	.001082			2.32
30.0	.0			.94762	581.2	.00259	.000502	.00261	.000506	1.13
31.0	12.0			.90296	555.9	.00326	.000632			1.29
34.0	.0			.92446	566.9	.00236	.000458	.00236	.000458	.99
2.0	-12.0			.95699	586.5	.00234	.000454			.95
2.0	12.0			.95423	584.5	.00249	.000483			.98
12.0	-12.0			.95258	583.5	.00234	.000454			.95
12.0	12.0			.94596	579.5	.00247	.000479			.96
30.0	1.0			.94541	580.2	.00252	.000489			1.04
31.0	2.0			.93053	572.2	.00287	.000557			1.22
32.0	2.0			.92446	567.5	.00262	.000508	.00256	.000497	1.10
32.0	3.0			.92060	566.2	.00308	.000597			1.20
32.0	6.0			.91950	566.2	.00312	.000605			1.23
34.0	1.0			.92281	566.5	.00256	.000497	.00257	.000498	1.03
34.0	2.0			.92115	567.9	.00272	.000528	.00272	.000528	1.08
34.0	3.0			.92005	565.5	.00268	.000520			1.04
36.0	.0			.92611	568.2	.00234	.000454	.00234	.000454	
38.0	.0			.92777	568.9	.00238	.000462	.00238	.000462	.96
40.0	.0			.92997	571.2	.00227	.000440	.00227	.000440	
44.0	12.0			.93273	574.2	.00317	.000615			1.40
42.0	.0			.93163	571.2	.00243	.000471	.00241	.000467	.98
44.0	.0			.93880	575.9	.00241	.000467	.00243	.000471	1.03
48.0	.0			.93714	574.9	.00246	.000477	.00246	.000477	1.05
52.0	.0			.93659	574.5	.00246	.000477	.00246	.000477	1.00
52.0	12.0			.93659	576.2	.00315	.000611			1.36
55.0	.0			.93714	574.5	.00248	.000481	.00248	.000481	1.00
58.0	.0			.93824	575.2	.00242	.000469			.98
58.0	12.0			.93659	576.9	.00326	.000632			1.31
58.0	-12.0			.94266	580.9	.00313	.000607			1.29
44.0	-12.0			.93880	580.2	.00307	.000595			1.36
36.0	-8.0			.92832	569.9	.00254	.000493			1.09
36.0	-3.0			.92777	568.9	.00248	.000481			1.03
34.0	-3.0			.92336	566.5	.00252	.000489	.00251	.000487	1.09
32.0	-3.0			.92170	566.5	.00287	.000557	.00280	.000543	1.23
30.0	-3.0			.94486	580.2	.00280	.000543	.00274	.000531	1.13
28.0	-3.0			.90924	606.2	.00166	.000322			.68
34.0	-12.0			.91343	566.9	.00302	.000586	.00302	.000586	1.29
32.0	-12.0			.90792	559.2	.00315	.000611	.00307	.000595	1.30
30.0	-12.0			.91013	559.2	.00265	.000514	.00264	.000512	1.10
19.0	-12.5			.97518	605.2	.00353	.000685			1.54
17.5	-11.0			.96416	597.5	.00341	.000661			1.41
15.5	-2.5			.95534	588.2	.00260	.000504			1.07
16.5	-2.5			.96250	598.5	.00328	.000636	.00350	.000679	1.40
17.5	-2.5			.97574	602.9	.00355	.000689	.00354	.000687	1.43
18.5	-2.5			.99172	612.5	.00350	.000679	.00366	.000710	1.45
19.5	-2.5			.99503	614.9	.00370	.000718	.00370	.000718	1.50
20.5	-2.5			.99834	617.2	.00370	.000718	.00370	.000718	1.55
21.5	-2.5			1.00165	619.5	.00377	.000731	.00381	.000739	1.55
22.5	-2.5			1.00110	620.2	.00405	.000786	.00398	.000772	1.58
23.5	-2.5			1.00441	624.2	.00454	.000881	.00451	.000875	1.84
24.5	-2.5			1.00937	629.5	.00520	.001009			2.24
36.0	-16.0			.93163	569.9	.00208	.000403			.92
36.0	-12.0			.92005	566.2	.00296	.000574	.00295	.000572	1.29
32.0	-18.0			.94045	575.2	.00209	.000405			.92
32.0	-16.0			.93163	572.2	.00226	.000438	.00226	.000438	.93
32.0	-14.0			.92446	569.9	.00214	.000415	.00215	.000417	.90
32.0	-10.0			.91950	567.2	.00273	.000530			1.12
28.0	-14.0			.92777	570.5	.00284	.000551			1.18
28.0	-12.0			.92060	561.2	.00156	.000322			.72
26.0	-12.5			.95313	593.5	.00406	.000787			1.76
24.5	-11.0			.98897	617.9	.00563	.001092			2.55
22.0	-12.5			.97960	607.9	.00452	.000877	.00445	.000883	1.88
20.5	-11.0			.98787	611.5	.00382	.000741	.00385	.000747	1.67
.0	13.7	1.00		1.00882	637.2	.00766	.001486			
.0	11.7	1.00		1.00220	631.9	.00724	.001404			
1.0	11.7	1.00		.91064	628.9	.00078	.000151			
.0	7.7	1.00		1.00110	632.9	.00797	.001546			
1.0	7.7	1.00		.90785	628.2	.00102	.000198			
.5	3.2	2.00		.94155	600.2	.00551	.001069	.00553	.001073	
.5	1.2	2.00		.93549	588.5	.00681	.001321	.00671	.001301	
6.0	.0			.94375	582.9	.00349	.000677			.98
6.0	10.0			.94431	583.5	.00382	.000741			1.00
12.0	.0			.94596	582.9	.00307	.000595			.96
12.0	5.0			.94431	581.9	.00341	.000661			1.04
12.0	10.0			.94321	581.5	.00343	.000665			1.01
18.0	.0			.94486	581.2	.00292	.000566			.97
30.0	.0			.94596	581.5	.00282	.000547			.96
42.0	.0			.94651	580.5	.00253	.000491			.92

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^\circ R$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(e) M = 3.51; R = 2.82 x 10^6

x, in.	y, in.	z, in. [a]	ϕ, deg [a]	T_e/T_t	T_w, °R	h [b]	N_{St}	h_c [b]	$N_{St,c}$	h/h_o
2.0	.0			.96340	585.5	.00185	.000510			.99
12.0	.0			.95731	580.9	.00168	.000463			.99
20.5	.0			1.00388	613.5	.00273	.000752			1.63
28.0	12.0			.92238	558.2	.00134	.000369			.73
28.0	4.0			.90743	612.2	.00141	.000389			.80
28.0	.0			.90789	610.9	.00121	.000334			.72
20.5	-5.0			1.00166	613.2	.00273	.000752			1.51
24.5	-5.0			1.01108	623.9	.00419	.001155			2.54
30.0	.0			.95731	582.2	.00186	.000513	.00188	.000518	1.12
31.0	12.0			.91295	556.5	.00258	.000711			1.44
34.0	.0			.93291	568.2	.00179	.000493	.00180	.000496	1.13
2.0	-12.0			.96784	587.9	.00167	.000460			.95
2.0	12.0			.96451	585.2	.00172	.000474			.95
12.0	-12.0			.96285	584.5	.00166	.000458			1.01
12.0	12.0			.95509	579.5	.00172	.000474			.95
30.0	1.0			.95509	581.2	.00198	.000546			1.09
31.0	2.0			.93846	571.9	.00232	.000639			1.33
32.0	2.0			.93180	567.2	.00205	.000565	.00199	.000548	1.26
32.0	3.0			.92737	565.5	.00236	.000650			1.31
32.0	6.0			.92626	565.2	.00236	.000650			1.30
34.0	1.0			.93125	566.5	.00200	.000551	.00201	.000554	1.14
34.0	2.0			.92959	565.9	.00200	.000551	.00200	.000551	1.10
34.0	3.0			.92848	565.2	.00205	.000565			1.13
36.0	.0			.93624	569.2	.00176	.000485	.00176	.000485	
38.0	.0			.93901	571.9	.00178	.000491	.00178	.000491	1.07
40.0	.0			.94178	571.5	.00175	.000482	.00175	.000482	
44.0	12.0			.94289	574.5	.00236	.000650			1.38
42.0	.0			.94289	572.9	.00193	.000532	.00191	.000526	1.16
44.0	.0			.95121	577.9	.00174	.000480	.00176	.000485	1.07
48.0	.0			.94899	576.5	.00192	.000529	.00192	.000529	1.07
52.0	.0			.94788	575.9	.00173	.000477	.00173	.000477	1.06
52.0	12.0			.94566	576.2	.00235	.000648			1.42
55.0	.0			.94844	577.5	.00176	.000485	.00176	.000485	1.08
58.0	.0			.95121	577.5	.00169	.000466			1.04
58.0	12.0			.94622	576.9	.00236	.000650			1.34
58.0	-12.0			.95343	581.5	.00226	.000623			1.25
44.0	-12.0			.94954	578.5	.00210	.000579			1.28
36.0	-8.0			.93846	570.5	.00190	.000524			1.19
36.0	-3.0			.93790	570.9	.00178	.000491			.99
34.0	-3.0			.93125	566.2	.00196	.000540	.00195	.000537	1.23
32.0	-3.0			.92903	565.5	.00205	.000565	.00197	.000543	1.24
30.0	-3.0			.95509	581.2	.00198	.000546	.00192	.000529	1.09
28.0	-3.0			.90650	611.5	.00141	.000389			.87
34.0	-12.0			.92404	563.5	.00237	.000653	.00236	.000650	1.46
32.0	-12.0			.91850	560.5	.00239	.000659	.00231	.000637	1.32
30.0	-12.0			.92072	560.5	.00199	.000548	.00197	.000543	1.11
19.0	-12.5			.98170	599.9	.00244	.000673			1.53
17.5	-11.0			.97283	596.5	.00248	.000684			1.54
15.5	-2.5			.96618	586.9	.00185	.000510			1.06
16.5	-2.5			.97117	595.2	.00248	.000684	.00245	.000675	1.52
17.5	-2.5			.98336	600.9	.00261	.000719	.00258	.000711	1.54
18.5	-2.5			.99833	609.9	.00257	.000708	.00271	.000747	1.58
19.5	-2.5			1.00055	614.2	.00276	.000761	.00276	.000761	1.68
20.5	-2.5			1.00388	613.9	.00267	.000736	.00266	.000733	1.51
21.5	-2.5			1.00720	616.5	.00281	.000776	.00286	.000788	1.72
22.5	-2.5			1.00609	616.5	.00308	.000849	.00303	.000835	1.86
23.5	-2.5			1.00887	619.5	.00344	.000948	.00340	.000937	2.05
24.5	-2.5			1.01330	628.2	.00404	.001114			2.52
36.0	-16.0			.94455	572.5	.00140	.000386			.89
36.0	-12.0			.93125	567.9	.00217	.000598	.00216	.000595	1.36
32.0	-16.0			.95232	577.2	.00139	.000383			.89
32.0	-16.0			.94345	572.5	.00159	.000438	.00159	.000438	.99
32.0	-14.0			.93679	568.2	.00150	.000413	.00151	.000416	.92
32.0	-10.0			.92903	565.9	.00202	.000557			1.25
28.0	-14.0			.93624	570.2	.00215	.000593			1.35
28.0	-12.0			.93236	564.2	.00123	.000339			.77
26.0	-12.5			.95897	587.9	.00295	.000813			1.79
24.5	-11.0			.99168	612.9	.00434	.001196			2.75
22.0	-12.5			.98503	609.5	.00309	.000852	.00319	.000879	1.94
20.5	-11.0			.99279	608.2	.00281	.000775	.00283	.000780	1.70
.0	13.7	1.00		1.01386	636.2	.00556	.001532			
.0	11.7	1.00		1.00665	637.2	.00490	.001351			
.0	7.7	1.00		1.00498	627.2	.00600	.001654			
.0	3.2	1.00		1.00110	627.2	.00673	.001855			
.0	1.2	1.00		.99556	628.5	.00636	.001758	.00645	.001789	
.5	11.7	2.00		.95620	590.2	.00381	.001050	.00383	.001061	
.5	3.2	2.00		.95010	592.2	.00456	.001262	.00457	.001260	
.5	1.2	2.00		.94455	587.5	.00530	.001461	.00544	.001499	
6.0	.0			.95010	581.2	.00272	.000750			1.01
6.0	10.0			.95010	581.2	.00296	.000816			1.01
12.0	.0			.95398	582.2	.00235	.000648			.98
12.0	5.0			.95176	580.9	.00239	.000659			.96
12.0	10.0			.94954	579.9	.00252	.000695			.97
18.0	.0			.95287	580.9	.00214	.000590			1.01
30.0	.0			.95509	583.2	.00212	.000584			1.00
42.0	.0			.95564	580.9	.00186	.000513			.99

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(f) M = 3.51; R = 1.61×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97616	592.5	.00117	.000567			1.13
12.0	.0			.97006	586.9	.00103	.000499			1.03
20.5	.0			1.00887	613.2	.00166	.000804			1.36
28.0	12.0			.93458	564.9	.00084	.000407			.82
28.0	.0			.90475	618.5	.00090	.000436			.86
20.5	-5.0			1.00720	612.5	.00168	.000814			1.62
24.5	-5.0			1.01330	620.9	.00301	.001459			3.46
36.0	.0			.97006	592.5	.00121	.000586	.00122	.000591	1.39
31.0	12.0			.92515	562.5	.00187	.000906			1.87
34.0	.0			.94067	569.9	.00128	.000620	.00128	.000620	1.41
2.0	-12.0			.98004	593.5	.00122	.000591			1.31
2.0	12.0			.97671	592.5	.00116	.000562			1.16
12.0	-12.0			.97560	590.5	.00122	.000591			1.33
12.0	12.0			.96784	586.2	.00124	.000601			1.23
30.0	1.0			.96895	589.2	.00131	.000635			1.35
31.0	2.0			.94899	576.5	.00142	.000688			1.46
32.0	2.0			.94012	575.5	.00125	.000606	.00119	.000577	1.30
32.0	3.0			.93624	570.2	.00161	.000780			1.61
32.0	6.0			.93513	568.5	.00143	.000693			1.44
34.0	1.0			.93901	570.9	.00122	.000591	.00123	.000596	1.33
34.0	2.0			.93790	570.2	.00122	.000591	.00122	.000591	.99
34.0	3.0			.93679	568.5	.00129	.000625			1.29
36.0	.0			.94622	573.2	.00127	.000615	.00128	.000620	
38.0	.0			.95065	579.2	.00095	.000460	.00095	.000460	1.07
40.0	.0			.95453	577.9	.00107	.000518	.00107	.000518	
44.0	12.0			.95675	581.2	.00139	.000674			1.38
42.0	.0			.95620	579.2	.00102	.000494	.00100	.000485	.83
44.0	.0			.96507	585.2	.00106	.000514	.00103	.000499	1.15
48.0	.0			.96396	583.5	.00124	.000601	.00124	.000601	1.29
52.0	.0			.96285	583.2	.00124	.000601	.00124	.000601	1.22
52.0	12.0			.95952	582.9	.00137	.000664			1.32
55.0	.0			.96340	583.5	.00101	.000489	.00101	.000489	1.10
58.0	.0			.96784	585.9	.00105	.000509			1.09
58.0	12.0			.96174	584.2	.00162	.000785			1.74
58.0	-12.0			.96784	587.9	.00136	.000659			1.48
44.0	-12.0			.96285	584.2	.00136	.000659			1.49
36.0	-8.0			.94844	574.9	.00127	.000615			1.40
36.0	-3.0			.94733	574.5	.00108	.000523			1.11
34.0	-3.0			.93957	570.5	.00121	.000586	.00119	.000577	1.23
32.0	-3.0			.93735	571.2	.00130	.000630	.00119	.000577	1.41
30.0	-3.0			.96895	588.2	.00130	.000630	.00120	.000581	1.24
34.0	-12.0			.93735	570.5	.00148	.000717	.00148	.000717	1.61
32.0	-12.0			.93125	566.2	.00168	.000814	.00161	.000780	1.91
30.0	-12.0			.93236	565.9	.00130	.000630	.00128	.000620	1.41
19.0	-12.5			.98891	602.9	.00165	.000800			1.79
17.5	-11.0			.98225	599.2	.00167	.000809			1.82
15.5	-2.5			.97948	593.2	.00122	.000591			1.21
16.5	-2.5			.98115	600.9	.00153	.000741	.00150	.000727	1.80
17.5	-2.5			.99112	602.9	.00167	.000809	.00163	.000790	1.67
18.5	-2.5			1.00443	612.2	.00162	.000785	.00167	.000809	1.76
19.5	-2.5			1.00665	612.2	.00158	.000766	.00157	.000761	1.72
20.5	-2.5			1.00942	613.9	.00172	.000833	.00172	.000833	1.87
21.5	-2.5			1.01219	616.2	.00207	.001003	.00212	.001027	2.25
22.5	-2.5			1.01053	615.5	.00208	.001008	.00204	.000989	2.10
23.5	-2.5			1.01164	617.2	.00202	.000979	.00195	.000945	2.04
24.5	-2.5			1.01607	622.5	.00261	.001265			2.84
36.0	-16.0			.96008	580.5	.00105	.000509			1.19
36.0	-12.0			.94511	574.9	.00134	.000649	.00133	.000644	1.54
32.0	-18.0			.96618	584.2	.00087	.000422			.99
32.0	-16.0			.95731	580.2	.00107	.000518	.00107	.000518	1.10
32.0	-14.0			.94954	574.2	.00083	.000402	.00084	.000407	.95
32.0	-10.0			.93790	570.5	.00136	.000659			1.48
28.0	-14.0			.94400	576.2	.00126	.000611			1.37
28.0	-12.0			.94400	570.5	.00072	.000349			.78
26.0	-12.5			.96396	587.9	.00202	.000979			2.32
24.5	-11.0			.99279	611.9	.00296	.001434			3.36
22.0	-12.5			.99002	603.9	.00197	.000955	.00200	.000969	1.95
20.5	-11.0			.99833	607.9	.00171	.000829	.00173	.000838	1.86
.0	13.7	1.00		1.01607	627.9	.00371	.001798			
.0	11.7	1.00		1.00887	625.5	.00351	.001701			
.0	7.7	1.00		1.00665	622.5	.00413	.002001			
.0	3.2	1.00		1.00332	621.5	.00456	.002210			
.0	1.2	1.00		.99722	621.5	.00442	.002142	.00447	.002166	
.5	11.7	2.00		.96729	595.2	.00277	.001342	.00263	.001274	
.5	3.2	2.00		.96119	590.5	.00322	.001560	.00322	.001560	
.5	1.2	2.00		.95675	589.5	.00368	.001783	.00373	.001807	
6.0	.0			.95620	586.5	.00197	.000955			.99
6.0	10.0			.95564	583.9	.00210	.001018			.97
12.0	.0			.96285	585.5	.00162	.000785			1.04
12.0	5.0			.96008	585.9	.00171	.000829			1.04
12.0	10.0			.95786	583.2	.00182	.000882			.99
18.0	.0			.96340	584.9	.00138	.000669			1.00
30.0	.0			.96673	587.9	.00131	.000635			1.11
42.0	.0			.96784	586.5	.00124	.000601			1.01

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(g) M = 4.44; R = 4.64×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94291	574.5	.00122	.000306			1.45
12.0	.0			.93742	570.9	.00125	.000314			1.49
20.5	.0			.99835	612.5	.00203	.000509			2.21
28.0	12.0			.90613	551.9	.00103	.000258			.82
28.0	4.0			.91353	601.2	.00268	.000672			3.19
20.5	-5.0			.99945	610.5	.00205	.000514			2.47
24.5	-5.0			1.00329	617.2	.00318	.000798			4.30
30.0	.0			.93577	572.2	.00151	.000379	.00152	.000381	1.64
31.0	12.0			.89680	547.9	.00185	.000464			1.48
34.0	.0			.91327	556.5	.00133	.000334	.00133	.000334	1.80
2.0	-12.0			.94620	576.2	.00129	.000324			1.16
2.0	12.0			.94455	576.5	.00141	.000354			
12.0	-12.0			.94126	574.9	.00134	.000336			1.41
12.0	12.0			.93632	572.5	.00136	.000341			1.08
30.0	1.0			.93467	570.9	.00163	.000409			1.94
31.0	2.0			.91875	560.9	.00187	.000469			2.23
32.0	2.0			.91327	557.5	.00146	.000366	.00137	.000344	1.74
32.0	3.0			.90997	555.5	.00181	.000454			1.63
32.0	6.0			.90887	554.9	.00160	.000401			1.39
34.0	1.0			.91272	556.5	.00135	.000339	.00136	.000341	1.61
34.0	2.0			.91217	556.9	.00146	.000366	.00145	.000364	1.74
34.0	3.0			.91162	557.9	.00156	.000391			1.39
36.0	.0			.91930	560.9	.00122	.000306	.00123	.000309	
38.0	.0			.92315	562.2	.00124	.000311	.00124	.000311	1.68
40.0	.0			.92699	564.2	.00091	.000228	.00091	.000228	
44.0	12.0			.93028	568.2	.00172	.000431			1.45
42.0	.0			.92973	565.9	.00091	.000228	.00088	.000221	1.07
44.0	.0			.93797	571.5	.00100	.000251	.00103	.000258	1.20
48.0	.0			.93687	570.2	.00090	.000226	.00090	.000226	1.02
52.0	.0			.93522	569.9	.00119	.000298	.00119	.000298	1.29
52.0	12.0			.93522	572.5	.00153	.000384			1.26
55.0	.0			.93577	569.5	.00090	.000226	.00090	.000226	1.18
58.0	.0			.93852	571.2	.00120	.000301			1.43
58.0	12.0			.93687	572.2	.00170	.000426			1.44
58.0	-12.0			.94016	573.5	.00169	.000424			1.58
44.0	-12.0			.93303	570.5	.00151	.000379			1.72
36.0	-8.0			.91985	560.2	.00131	.000329			1.49
36.0	-3.0			.92040	560.2	.00125	.000314			1.58
34.0	-3.0			.91327	556.2	.00125	.000314	.00123	.000309	1.51
32.0	-3.0			.90997	556.2	.00154	.000386	.00144	.000361	2.08
30.0	-3.0			.93412	569.5	.00154	.000386	.00141	.000354	2.08
34.0	-12.0			.90668	554.5	.00156	.000391	.00155	.000389	1.42
32.0	-12.0			.90064	549.5	.00183	.000459	.00168	.000421	2.18
30.0	-12.0			.90119	551.2	.00157	.000394	.00152	.000381	1.43
19.0	-12.5			.98023	601.2	.00207	.000519			2.46
17.5	-11.0			.96871	591.5	.00211	.000529			2.51
15.5	-2.5			.95443	581.5	.00150	.000376			1.81
16.5	-2.5			.96706	590.2	.00179	.000449	.00175	.000439	2.13
17.5	-2.5			.98243	599.9	.00192	.000482	.00196	.000492	2.59
18.5	-2.5			.99615	608.2	.00193	.000484	.00229	.000574	2.47
19.5	-2.5			.99725	609.2	.00175	.000439	.00173	.000434	2.08
20.5	-2.5			.99945	613.2	.00203	.000509	.00203	.000509	2.21
21.5	-2.5			1.00219	612.5	.00206	.000517	.00213	.000534	2.78
22.5	-2.5			1.00054	612.2	.00236	.000592	.00230	.000577	2.81
23.5	-2.5			1.00219	613.5	.00262	.000657	.00258	.000647	3.54
24.5	-2.5			1.00494	618.5	.00318	.000798			3.79
36.0	-16.0			.92699	564.9	.00101	.000253			.91
36.0	-12.0			.91381	558.5	.00154	.000386	.00152	.000381	1.48
32.0	-18.0			.93303	568.5	.00100	.000251			.83
32.0	-16.0			.92589	563.9	.00122	.000306	.00123	.000309	1.10
32.0	-14.0			.91766	558.5	.00123	.000309	.00125	.000314	1.34
32.0	-10.0			.90887	555.9	.00156	.000391			1.47
28.0	-14.0			.92095	563.2	.00154	.000386			1.39
28.0	-12.0			.91162	555.5	.00091	.000228			1.08
26.0	-12.5			.94730	579.5	.00240	.000602			2.24
24.5	-11.0			.98298	603.5	.00340	.000853			4.10
22.0	-12.5			.97859	598.5	.00252	.000632	.00256	.000642	2.63
20.5	-11.0			.99011	605.2	.00208	.000522	.00212	.000532	1.89
.0	13.7	1.00		1.00000	617.2	.00476	.001194			
.0	11.7	1.00		.99286	612.2	.00445	.001116			
.0	7.7	1.00		.99286	614.5	.00463	.001161			
.0	3.2	1.00		.98902	610.9	.00507	.001272			
.0	1.2	1.00		.98408	607.9	.00534	.001339	.00549	.001377	
.5	11.7	2.00		.94016	578.9	.00341	.000855	.00317	.000795	
.5	3.2	2.00		.93632	575.2	.00385	.000966	.00388	.000973	
.5	1.2	2.00		.93083	573.2	.00436	.001094	.00438	.001099	
6.0	.0			.93358	570.2	.00195	.000489			1.23
6.0	10.0			.93412	571.5	.00223	.000559			1.05
12.0	.0			.93632	571.2	.00154	.000386			1.17
12.0	5.0			.93522	571.2	.00185	.000464			1.26
12.0	10.0			.93412	571.2	.00189	.000474			.99
18.0	.0			.93522	570.2	.00154	.000386			1.17
30.0	.0			.93577	572.2	.00151	.000379			1.14
42.0	.0			.93687	573.2	.00144	.000361			1.30

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Continued

(h) M = 4.44; R = 3.24×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94820	574.9	.00087	.000310			.81
12.0	.0			.94214	571.5	.00078	.000278			.90
20.5	.0			.99724	607.5	.00170	.000607			1.95
28.0	12.0			.91128	551.9	.00078	.000278			.84
28.0	.0			.91524	603.2	.00156	.000557			1.71
20.5	-5.0			.99834	607.5	.00150	.000535			1.67
24.5	-5.0			1.00165	613.9	.00246	.000878			3.08
30.0	.0			.94269	571.9	.00124	.000443	.00126	.000450	1.51
31.0	12.0			.90136	549.2	.00154	.000550			1.67
34.0	.0			.91513	554.9	.00090	.000321	.00101	.000360	1.00
2.0	-12.0			.95095	576.5	.00111	.000396			1.17
2.0	12.0			.94875	575.9	.00097	.000346			.92
12.0	-12.0			.94654	573.9	.00096	.000343			1.02
12.0	12.0			.94103	570.9	.00097	.000346			.91
30.0	1.0			.94158	574.9	.00147	.000525			1.75
31.0	2.0			.92285	561.5	.00142	.000507			1.58
32.0	2.0			.91513	555.5	.00126	.000450	.00116	.000414	1.40
32.0	3.0			.91238	557.5	.00153	.000546			1.68
32.0	6.0			.91073	555.9	.00147	.000525			1.62
34.0	1.0			.91458	557.2	.00133	.000475	.00134	.000478	1.48
34.0	2.0			.91403	556.9	.00133	.000475	.00132	.000471	1.46
34.0	3.0			.91348	556.9	.00133	.000475			1.55
36.0	.0			.92230	561.5	.00109	.000389	.00110	.000393	
38.0	.0			.92726	563.9	.00106	.000378	.00106	.000378	1.28
40.0	.0			.93222	564.5	.00079	.000282	.00080	.000286	
44.0	12.0			.93663	568.2	.00123	.000439			1.58
42.0	.0			.93552	566.5	.00087	.000310	.00084	.000300	.96
44.0	.0			.94489	571.9	.00077	.000275	.00080	.000286	.86
48.0	.0			.94379	573.9	.00095	.000339	.00095	.000339	1.19
52.0	.0			.94214	572.5	.00095	.000339	.00095	.000339	1.20
52.0	12.0			.94048	570.5	.00122	.000435			1.28
55.0	.0			.94214	570.2	.00079	.000282	.00078	.000278	1.00
58.0	.0			.94599	572.5	.00079	.000282			1.04
58.0	12.0			.94269	572.2	.00122	.000435			1.34
58.0	-12.0			.94654	576.9	.00140	.000500			1.84
44.0	-12.0			.93993	569.9	.00118	.000421			1.48
36.0	-8.0			.92285	561.2	.00106	.000378			1.39
36.0	-3.0			.92285	560.2	.00088	.000314			1.11
34.0	-3.0			.91458	555.2	.00100	.000357	.00097	.000346	1.11
32.0	-3.0			.91238	553.2	.00090	.000321	.00075	.000268	1.00
30.0	-3.0			.94103	571.9	.00118	.000421	.00106	.000378	1.48
28.0	-3.0			.91524	603.2	.00190	.000678			2.09
34.0	-12.0			.91183	555.9	.00146	.000521	.00145	.000517	1.80
32.0	-12.0			.90577	550.5	.00144	.000514	.00130	.000464	1.58
30.0	-12.0			.90632	549.9	.00126	.000450	.00121	.000432	1.58
19.0	-12.5			.98016	596.2	.00153	.000546			1.68
17.5	-11.0			.96969	589.2	.00146	.000521			1.85
15.5	-2.5			.95867	584.2	.00138	.000492			1.70
16.5	-2.5			.96803	588.9	.00136	.000485	.00129	.000460	1.43
17.5	-2.5			.98236	597.5	.00134	.000478	.00136	.000485	1.60
18.5	-2.5			.99559	605.5	.00132	.000471	.00155	.000553	1.63
19.5	-2.5			.99669	605.5	.00142	.000507	.00140	.000500	1.75
20.5	-2.5			.99834	607.9	.00151	.000539	.00151	.000539	1.80
21.5	-2.5			1.00110	609.9	.00169	.000603	.00177	.000632	1.78
22.5	-2.5			.99944	609.2	.00170	.000607	.00163	.000582	1.87
23.5	-2.5			1.00055	610.5	.00191	.000682	.00186	.000664	2.33
24.5	-2.5			1.00385	613.9	.00232	.000828			2.55
36.0	-16.0			.93442	565.5	.00079	.000282			1.07
36.0	-12.0			.91954	557.9	.00120	.000428	.00118	.000421	1.62
32.0	-18.0			.93883	568.5	.00076	.000271			.83
32.0	-16.0			.93167	566.5	.00097	.000346	.00098	.000350	1.05
32.0	-14.0			.92285	558.9	.00085	.000303	.00091	.000325	1.16
32.0	-10.0			.91238	555.5	.00120	.000428			1.48
28.0	-14.0			.92285	559.9	.00131	.000468			1.62
28.0	-12.0			.91789	555.5	.00066	.000236			.73
26.0	-12.5			.94820	576.5	.00184	.000657			2.30
24.5	-11.0			.98181	599.2	.00280	.000999			3.78
22.0	-12.5			.97850	595.2	.00187	.000667	.00192	.000685	2.43
20.5	-11.0			.98953	602.5	.00171	.000610	.00175	.000625	1.88
.0	13.7	1.00		.99944	613.2	.00392	.001399			
.0	11.7	1.00		.99228	607.9	.00358	.001278			
.0	7.7	1.00		.99228	609.5	.00323	.001153			
.0	3.2	1.00		.98897	606.2	.00387	.001381			
.0	1.2	1.00		.98346	603.2	.00405	.001445	.00416	.001485	
.5	11.7	2.00		.94489	578.2	.00248	.000885	.00226	.000807	
.5	3.2	2.00		.94158	574.5	.00297	.001060	.00299	.001067	
.5	1.2	2.00		.93718	572.9	.00331	.001181	.00331	.001181	
6.0	.0			.93552	569.5	.00161	.000575			
6.0	10.0			.93497	568.5	.00152	.000542			.95
12.0	.0			.93938	573.9	.00148	.000528			.86
12.0	5.0			.93773	570.5	.00140	.000500			1.07
12.0	10.0			.93607	570.5	.00149	.000532			.93
18.0	.0			.93828	572.2	.00142	.000507			.97
30.0	.0			.93993	570.2	.00122	.000435			1.03
42.0	.0			.94103	570.5	.00115	.000410			.99
										1.25

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

2. 1-inch by 2-inch rectangular stiffener - Concluded

(i) M = 4.44; R = 2.15×10^6

x, in.	y, in.	z, in. (a)	∅, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95922	580.5	.00079	.000427			1.05
12.5	.0			.95536	577.5	.00066	.000357			1.14
20.5	.0			1.00110	608.9	.00136	.000735			2.39
28.0	12.0			.92395	558.9	.00058	.000312			1.05
20.5	-5.0			1.00220	607.5	.00136	.000735			2.19
24.5	-5.0			1.00275	613.2	.00226	.001221			3.05
30.0	.0			.95867	581.7	.00094	.000508	.00096	.000519	1.81
31.0	12.0			.91183	553.9	.00101	.000546			1.98
34.0	.0			.92285	558.2	.00079	.000427	.00079	.000427	1.39
2.0	-12.0			.96087	581.5	.00063	.000340			1.13
2.0	12.0			.95812	580.5	.00077	.000416			1.20
12.0	-12.0			.95867	579.5	.00061	.000330			1.02
30.0	1.0			.95701	581.2	.00113	.000611			1.53
31.0	2.0			.93497	566.9	.00121	.000654			1.64
32.0	2.0			.92450	561.9	.00105	.000567	.00091	.000492	1.84
32.0	3.0			.92120	559.9	.00118	.000638			1.59
32.0	6.0			.92009	559.9	.00118	.000638			1.90
34.0	1.0			.92175	558.9	.00098	.000530	.00099	.000535	1.61
34.0	2.0			.92120	558.5	.00098	.000530	.00097	.000524	1.61
34.0	3.0			.92120	558.5	.00088	.000475			1.38
36.0	.0			.93001	562.9	.00077	.000416	.00077	.000416	
38.0	.0			.93664	566.5	.00066	.000357	.00066	.000357	.89
40.0	.0			.94269	569.9	.00069	.000367	.00069	.000373	
44.0	12.0			.94820	575.5	.00096	.000519			1.96
42.0	.0			.94654	572.5	.00076	.000411	.00073	.000395	1.25
44.0	.0			.95701	578.5	.00064	.000346	.00068	.000367	1.28
48.0	.0			.95646	578.2	.00062	.000335	.00062	.000335	1.24
52.0	.0			.95536	577.5	.00062	.000335	.00062	.000335	1.24
52.0	12.0			.95261	576.9	.00091	.000492			1.82
56.0	.0			.95536	577.5	.00064	.000346	.00063	.000340	1.31
58.0	.0			.96032	580.5	.00064	.000346			1.31
58.0	12.0			.95536	580.2	.00100	.000540			1.64
58.0	-12.0			.95922	580.5	.00076	.000411			1.55
44.0	-12.0			.95261	576.5	.00077	.000416			1.57
36.0	-8.0			.93167	563.5	.00067	.000362			1.37
36.0	-3.0			.93056	562.9	.00075	.000405			1.42
34.0	-3.0			.92230	558.9	.00098	.000530	.00094	.000508	1.61
32.0	-3.0			.92230	559.9	.00103	.000557	.00085	.000459	1.98
30.0	-3.0			.95646	579.5	.00111	.000600	.00104	.000562	1.68
34.0	-12.0			.92285	558.9	.00086	.000465	.00085	.000459	1.76
32.0	-12.0			.91679	556.5	.00104	.000562	.00090	.000486	1.73
30.0	-12.0			.91844	557.5	.00093	.000503	.00088	.000476	1.82
19.0	-12.5			.98512	596.9	.00117	.000632			2.21
17.5	-11.0			.97630	593.5	.00124	.000671			2.33
15.5	-2.5			.97024	586.9	.00075	.000405			1.07
16.5	-2.5			.97520	591.5	.00124	.000670	.00116	.000627	2.38
17.5	-2.5			.98787	599.5	.00148	.000800	.00146	.000789	2.03
18.5	-2.5			1.00055	606.5	.00118	.000638			1.71
19.5	-2.5			1.00110	606.9	.00118	.000638			2.07
20.5	-2.5			1.00275	609.9	.00136	.000735	.00137	.000740	1.92
21.5	-2.5			1.00440	610.2	.00129	.000697	.00145	.000784	2.39
22.5	-2.5			1.00165	610.9	.00143	.000773	.00136	.000735	2.70
23.5	-2.5			1.00220	608.9	.00166	.000897	.00158	.000854	2.34
24.5	-2.5			1.00495	613.2	.00205	.001124			2.97
36.0	-12.0			.93111	564.5	.00086	.000465	.00084	.000454	1.76
32.0	-16.0			.94324	569.9	.00052	.000281	.00053	.000286	.95
32.0	-14.0			.93387	564.5	.00057	.000308	.00060	.000324	.98
32.0	-13.0			.92120	559.2	.00103	.000557			2.10
28.0	-14.0			.93056	563.2	.00080	.000432			1.63
28.0	-12.0			.93001	561.9	.00060	.000324			
26.0	-12.5			.95316	578.2	.00125	.000676			2.55
24.5	-11.0			.98346	601.2	.00199	.001075			4.06
22.0	-12.5			.98291	598.2	.00139	.000751	.00143	.000773	2.57
20.5	-11.0			.99393	604.5	.00137	.000740	.00141	.000762	2.74
.0	13.7	1.00		1.00110	622.2	.00325	.001756			
.0	11.7	1.00		.99399	607.5	.00326	.001762			
.0	7.7	1.00		.99338	607.2	.00300	.001621			
.0	3.7	1.00		.99063	605.9	.00306	.001654			
.5	1.2	1.00		.98567	602.9	.00326	.001762	.00332	.001794	
.5	11.7	2.00		.95371	580.9	.00224	.001211	.00194	.001048	
.5	3.2	2.00		.94984	578.5	.00232	.001254	.00232	.001254	
.5	1.2	2.00		.94710	578.9	.00260	.001406	.00253	.001367	
6.0	.0			.94324	574.9	.00139	.000751			1.14
6.0	10.0			.94269	575.5	.00154	.000832			1.08
12.0	.0			.94930	575.2	.00115	.000621			1.12
12.0	5.0			.94654	574.9	.00116	.000627			1.13
12.0	10.0			.94489	574.2	.00137	.000740			1.34
18.0	.0			.94985	576.2	.00099	.000535			1.25
30.0	.0			.95205	577.5	.00099	.000535			1.34
42.0	.0			.95316	577.2	.00094	.000508			1.25

[a] Thermocouple locations for which z and/or ∅ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder

(a) M = 2.65; R = 4.03 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									.99	
12.0	.0									.96	
20.5	.0									.98	
28.0	12.0									.97	
28.0	4.0									1.86	
28.0	.0									2.29	
20.5	-5.0									1.00	
24.5	-5.0									.99	
30.0	.0									4.84	
31.0	12.0									1.01	
34.0	.0									.50	
2.0	-12.0									1.00	
2.0	12.0									.99	
12.0	-12.0									.98	
12.0	12.0									.99	
30.0	1.0									3.58	
31.0	2.0									3.99	
32.0	2.0									4.04	
32.0	3.0									2.79	
32.0	6.0									1.62	
34.0	1.0									.67	
34.0	2.0									2.12	
34.0	3.0									2.73	
36.0	.0									1.82	
38.0	.0									1.77	
40.0	.0									1.82	
44.0	12.0									1.27	
42.0	.0										
48.0	.0									1.56	
52.0	.0									1.34	
52.0	12.0									1.31	
55.0	.0									1.28	
58.0	.0									1.25	
58.0	12.0									1.10	
44.0	-12.0									1.32	
36.0	-8.0									1.42	
36.0	-3.0									1.90	
34.0	-3.0									2.92	
32.0	-3.0									2.78	
30.0	-3.0									2.05	
28.0	-3.0									2.16	
34.0	-12.0									1.08	
32.0	-12.0									1.06	
30.0	-12.0									.98	
19.0	-12.5									.99	
17.5	-11.0									.97	
15.5	-2.5									1.06	
16.5	-2.5									.98	
17.5	-2.5									.99	
18.5	-2.5									.98	
19.5	-2.5									.96	
20.5	-2.5									.98	
21.5	-2.5									.99	
22.5	-2.5									.97	
23.5	-2.5									.96	
24.5	-2.5									1.05	
		10.55	90								.72
		6.55	90								.73
		4.55	90								1.29
		2.55	90								.83
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.71	
34.0	4.0									2.56	
34.0	5.0									2.06	
34.0	6.0									1.68	
36.0	6.0									1.97	
38.0	1.0									1.24	
38.0	2.0									1.09	
44.0	8.0									1.64	
44.0	6.0									1.39	
44.0	4.0									1.03	
44.0	2.0									1.12	
44.0	1.0									1.55	
		10.55	0								.81
		8.55	0								.91
		6.55	0								.82
		4.55	0								1.63
		3.55	0								1.42
		2.55	0								1.28
		1.55	0								1.11
		1.05	0								1.06
		10.55	45								.72
		6.55	45								.77
		4.55	45								1.46
		2.55	45								1.05

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{o}R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(b) M = 2.65; R = 2.73×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.96	
12.0	.0									1.00	
20.5	.0									.98	
28.0	12.0									.96	
28.0	4.0									1.86	
28.0	.0									2.30	
20.5	-5.0									.93	
24.5	-5.0									.90	
30.0	.0									5.14	
31.0	12.0									1.04	
34.0	.0									.50	
2.0	-12.0									.96	
2.0	12.0									1.01	
12.0	-12.0									.97	
12.0	12.0									.96	
30.0	1.0									3.87	
31.0	2.0									4.11	
32.0	2.0									4.15	
32.0	3.0									2.63	
32.0	6.0									1.59	
34.0	1.0									.72	
34.0	2.0									2.17	
34.0	3.0									2.77	
36.0	.0									1.89	
38.0	.0									1.85	
40.0	.0									1.73	
44.0	12.0									1.32	
42.0	.0									1.72	
48.0	.0									1.46	
52.0	.0									1.38	
52.0	12.0									1.36	
55.0	.0									1.28	
58.0	.0									1.29	
58.0	12.0									1.09	
44.0	-12.0									1.37	
36.0	-8.0									1.48	
36.0	-3.0									1.92	
34.0	-3.0									2.60	
32.0	-3.0									2.87	
30.0	-3.0									1.98	
28.0	-3.0									2.17	
34.0	-12.0									1.11	
32.0	-12.0									1.02	
30.0	-12.0									.92	
19.0	-12.5									.92	
17.5	-11.0									.94	
15.5	-2.5									.94	
16.5	-2.5									.86	
17.5	-2.5									.98	
18.5	-2.5									.93	
19.5	-2.5									.93	
20.5	-2.5									.98	
21.5	-2.5									.96	
22.5	-2.5									.98	
23.5	-2.5									.87	
24.5	-2.5									1.08	
		10.55	90								.65
		6.55	90								.71
		4.55	90								1.16
		2.55	90								.70
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.73	
34.0	4.0									2.52	
34.0	5.0									2.08	
34.0	6.0									1.64	
36.0	6.0									2.01	
38.0	1.0									1.29	
38.0	2.0									1.00	
44.0	8.0									1.54	
44.0	6.0									1.28	
44.0	4.0									1.01	
44.0	2.0									1.15	
44.0	1.0									1.65	
		10.55	0								.76
		8.55	0								.83
		6.55	0								.82
		4.55	0								1.54
		3.55	0								1.30
		2.55	0								1.17
		1.55	0								1.03
		1.05	0								.95
		10.55	45								.73
		6.55	45								.73
		4.55	45								1.36
		2.55	45								.90

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(c) M = 2.65; R = 1.41×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.89	
12.0	.0									.99	
20.5	.0									1.03	
28.0	12.0									.97	
28.0	4.0									2.13	
28.0	.0									2.39	
20.5	-5.0									1.05	
24.5	-5.0									.93	
30.0	.0									6.33	
31.0	12.0									1.22	
34.0	.0									.42	
2.0	-12.0									1.00	
2.0	12.0									.91	
12.0	-12.0									.99	
12.0	12.0									.89	
30.0	1.0									4.48	
31.0	2.0									4.96	
32.0	2.0									4.63	
32.0	3.0									3.02	
32.0	6.0									1.63	
34.0	1.0									.68	
34.0	2.0									2.09	
34.0	3.0									2.91	
36.0	.0									2.08	
38.0	.0									2.21	
40.0	.0									1.83	
44.0	12.0									1.40	
42.0	.0										
48.0	.0									1.64	
52.0	.0									1.33	
52.0	12.0									1.46	
55.0	.0									1.35	
58.0	.0									1.33	
58.0	12.0									1.26	
44.0	-12.0									1.56	
36.0	-8.0									1.47	
36.0	-3.0									1.93	
34.0	-3.0									3.00	
32.0	-3.0									3.01	
30.0	-3.0									2.10	
28.0	-3.0									2.21	
34.0	-12.0									1.03	
32.0	-12.0									1.10	
30.0	-12.0									1.02	
19.0	-12.5									.93	
17.5	-11.0									1.05	
15.5	-2.5									1.01	
16.5	-2.5									.93	
17.5	-2.5									.94	
18.5	-2.5									.93	
19.5	-2.5									1.00	
20.5	-2.5									.99	
21.5	-2.5									1.07	
22.5	-2.5									.93	
23.5	-2.5									1.00	
24.5	-2.5									1.17	
		10.55	90								.64
		6.55	90								.67
		4.55	90								1.03
		2.55	90								.72
		10.55	180								
		8.55	180								
		4.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.68	
34.0	4.0									2.85	
34.0	5.0									2.35	
34.0	6.0									1.86	
36.0	6.0									2.20	
38.0	1.0									1.31	
38.0	2.0									1.02	
44.0	8.0									1.76	
44.0	6.0									1.39	
44.0	4.0									1.07	
44.0	2.0									1.26	
44.0	1.0									1.57	
		10.55	0								.76
		8.55	0								.82
		6.55	0								.88
		4.55	0								1.49
		3.55	0								1.25
		2.55	0								.98
		1.55	0								.97
		1.05	0								.86
		10.55	45								.72
		6.55	45								.70
		4.55	45								1.27
		2.55	45								.85

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(d) M = 4.44; R = 4.84×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.87	
20.5	.0									.99	
28.0	12.0									.94	
28.0	4.0									2.07	
28.0	.0									2.57	
20.5	-5.0									.81	
24.5	-5.0									1.08	
30.0	.0									7.03	
31.0	12.0									1.11	
2.0	-12.0									1.13	
2.0	12.0									1.20	
12.0	-12.0									1.14	
12.0	12.0									.88	
30.0	1.0									4.55	
31.0	2.0									5.33	
32.0	2.0									5.70	
32.0	3.0									3.11	
32.0	6.0									1.36	
34.0	2.0									3.15	
34.0	3.0									3.76	
38.0	.0									1.63	
40.0	.0									1.85	
44.0	12.0									.92	
42.0	.0									1.98	
48.0	.0									1.27	
52.0	.0									1.45	
52.0	12.0									1.91	
55.0	.0									1.97	
58.0	.0									1.06	
58.0	12.0									1.77	
44.0	-12.0									1.40	
36.0	-8.0									1.68	
36.0	-3.0									2.48	
34.0	-3.0									3.41	
32.0	-3.0									3.10	
28.0	-3.0									2.66	
34.0	-12.0									1.18	
32.0	-12.0									1.37	
30.0	-12.0									1.38	
19.0	-12.5									1.54	
15.5	-2.5									.91	
16.5	-2.5									.95	
17.5	-2.5									.93	
19.5	-2.5									1.10	
20.5	-2.5									1.28	
22.5	-2.5									.98	
23.5	-2.5									1.28	
24.5	-2.5									1.10	
		10.55	90								.54
34.0	4.0									2.90	
34.0	5.0									1.91	
34.0	6.0									1.36	
36.0	6.0									1.96	
38.0	1.0									1.40	
38.0	2.0									1.46	
44.0	8.0									2.52	
44.0	6.0									2.31	
44.0	4.0									1.63	
44.0	2.0									1.30	
44.0	1.0									1.44	
		10.55	0								.41
		8.55	0								.60
		6.55	0								.46
		4.55	0								.69
		3.55	0								1.08
		2.55	0								1.52
		1.55	0								1.15
		1.05	0								.80
		10.55	45								.33
		6.55	45								.36
		4.55	45								.54
		2.55	45								1.09

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE IV.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(e) M = 4.44; R = 3.38×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.71	
28.0	12.0									.79	
28.0	4.0									1.67	
28.0	.0									2.09	
20.5	-5.0									.76	
24.5	-5.0									.82	
30.0	.0									6.76	
31.0	12.0									.96	
34.0	.0									.41	
2.0	-12.0									.80	
2.0	12.0									.88	
12.0	-12.0									.80	
12.0	12.0									.95	
30.0	1.0									4.17	
31.0	2.0									4.87	
32.0	2.0									5.68	
32.0	3.0									2.71	
32.0	6.0									1.32	
34.0	2.0									2.75	
34.0	3.0									2.86	
36.0	.0									1.15	
38.0	.0									1.19	
40.0	.0									1.19	
44.0	12.0									.73	
42.0	.0										
44.0	.0									.87	
48.0	.0									1.38	
52.0	.0									1.15	
52.0	12.0									1.79	
55.0	.0									1.19	
58.0	.0									.82	
58.0	12.0									1.76	
44.0	-12.0									.71	
36.0	-8.0									1.02	
34.0	-3.0									3.34	
32.0	-3.0									3.09	
30.0	-3.0									1.56	
28.0	-3.0									1.93	
34.0	-12.0									.96	
32.0	-12.0									.95	
30.0	-12.0									1.05	
19.0	-12.5									.79	
17.5	-11.0									.98	
17.5	-2.5									.82	
24.5	-2.5									1.12	
		10.55	90								.31
		4.55	90								.37
		2.55	90								.38
34.0	4.0									2.29	
34.0	5.0									1.53	
34.0	6.0									.99	
36.0	6.0									1.54	
38.0	1.0									1.17	
38.0	2.0									.74	
44.0	8.0									2.07	
44.0	6.0									1.92	
44.0	4.0									1.02	
44.0	2.0									.73	
44.0	1.0									1.27	
		10.55	0								.45
		8.55	0								.54
		6.55	0								.51
		4.55	0								.71
		3.55	0								1.17
		2.55	0								1.68
		1.55	0								1.18
		1.05	0								.79
		10.55	45								.38
		6.55	45								.40
		4.55	45								.55
		2.55	45								1.07

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

3. 2.8-Inch-Diameter Instrumented Cylinder - Concluded

(f) M = 4.44; R = 2.24 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									.99	
12.0	.0									.86	
28.0	12.0									.77	
28.0	4.0									1.51	
28.0	.0									2.76	
20.5	-5.0										
30.0	.0									9.19	
31.0	12.0									1.32	
2.0	12.0									.88	
12.0	-12.0									1.07	
12.0	12.0									.78	
30.0	1.0									5.99	
31.0	2.0									6.13	
32.0	2.0									5.35	
32.0	3.0									2.78	
34.0	2.0									3.22	
34.0	3.0									3.48	
36.0	.0									1.32	
38.0	.0									1.38	
44.0	12.0									1.35	
42.0	.0									1.88	
44.0	.0									1.17	
48.0	.0									1.34	
52.0	12.0									1.59	
58.0	12.0									1.71	
44.0	-12.0									1.32	
36.0	-8.0									1.25	
36.0	-3.0									2.97	
34.0	-3.0									3.60	
32.0	-3.0									3.87	
30.0	-3.0									1.33	
28.0	-3.0									2.50	
34.0	-12.0									1.16	
32.0	-12.0									1.20	
30.0	-12.0									1.30	
19.0	-12.5									1.00	
17.5	-11.0									.97	
15.5	-2.5									1.01	
16.5	-2.5									.91	
17.5	-2.5									1.05	
18.5	-2.5									2.05	
19.5	-2.5									.90	
20.5	-2.5									1.01	
21.5	-2.5									.95	
22.5	-2.5									.95	
24.5	-2.5									.98	
		10.55	90								.39
		6.55	90								.43
		4.55	90								.49
		2.55	90								.50
34.0	4.0									3.40	
34.0	5.0									1.80	
34.0	6.0									1.56	
36.0	6.0									1.39	
38.0	1.0									1.54	
38.0	2.0									1.01	
44.0	8.0									2.09	
44.0	6.0									1.75	
44.0	2.0									1.36	
		10.55	0								.50
		8.55	0								.62
		6.55	0								.52
		4.55	0								.84
		3.55	0								1.14
		2.55	0								1.66
		1.55	0								1.10
		1.05	0								.70
		10.55	45								.44
		6.55	45								.41
		4.55	45								.52
		2.55	45								1.04

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream

(a) M = 2.65; R = 3.92×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.01	
12.0	.0									1.01	
20.5	.0									2.58	
28.0	12.0									1.20	
28.0	4.0									2.40	
28.0	.0									1.69	
20.5	-5.0									2.10	
24.5	-5.0									2.17	
30.0	.0									2.42	
31.0	12.0									1.21	
34.0	.0									.47	
2.0	-12.0									1.08	
2.0	12.0									1.02	
12.0	-12.0									1.08	
12.0	12.0									1.06	
30.0	1.0									2.40	
31.0	2.0									2.34	
32.0	2.0									1.94	
32.0	3.0									1.78	
32.0	6.0									2.00	
34.0	1.0									.51	
34.0	2.0									.89	
34.0	3.0									1.35	
36.0	.0									1.25	
38.0	.0									1.65	
40.0	.0									1.51	
44.0	12.0									1.39	
42.0	.0										
44.0	.0									1.30	
48.0	.0									1.22	
52.0	.0									1.17	
52.0	12.0									1.29	
55.0	.0									1.13	
58.0	.0									1.19	
58.0	12.0									1.15	
44.0	-12.0									1.56	
36.0	-8.0									1.70	
36.0	-3.0									1.03	
34.0	-3.0									1.35	
32.0	-3.0									1.77	
30.0	-3.0									1.75	
28.0	-3.0									2.06	
34.0	-12.0									1.32	
32.0	-12.0									1.23	
30.0	-12.0									1.31	
19.0	-12.5									1.02	
17.5	-11.0									.99	
15.5	-2.5									1.07	
16.5	-2.5									1.37	
17.5	-2.5									1.86	
18.5	-2.5									2.39	
19.5	-2.5									2.40	
20.5	-2.5									2.21	
21.5	-2.5									2.26	
22.5	-2.5									3.53	
23.5	-2.5									3.93	
24.5	-2.5									3.59	
		10.55	90								1.81
		6.55	90								1.51
		4.55	90								1.97
		2.55	90								1.28
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0										
34.0	4.0									.55	
34.0	5.0									1.69	
34.0	6.0									1.71	
36.0	6.0									1.77	
38.0	1.0									1.57	
38.0	2.0									1.06	
44.0	8.0									.74	
44.0	6.0									1.48	
44.0	4.0									1.23	
44.0	2.0									.91	
44.0	1.0									1.18	
		10.55	0							1.45	
		8.55	0								.58
		6.55	0								.65
		4.55	0								1.04
		3.55	0								.62
		2.55	0								.60
		1.55	0								.58
		1.05	0								.69
		10.55	45								.87
		6.55	45								1.05
		4.55	45								1.70
		2.55	45								1.45
											.69

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(b) M = 2.65; R = 2.55 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.01	
12.0	.0									1.03	
20.5	.0									2.77	
28.0	12.0									1.18	
28.0	4.0									2.08	
28.0	.0									1.75	
20.5	-5.0									1.90	
24.5	-5.0									1.98	
30.0	.0									2.35	
31.0	12.0									1.22	
34.0	.0									.46	
2.0	-12.0									1.02	
2.0	12.0									1.00	
12.0	-12.0									1.00	
12.0	12.0									.99	
30.0	1.0									2.35	
31.0	2.0									2.15	
32.0	2.0									1.81	
32.0	3.0									1.68	
32.0	6.0									1.79	
34.0	1.0									.54	
34.0	2.0									.84	
34.0	3.0									1.34	
36.0	.0									1.24	
38.0	.0									1.63	
40.0	.0									1.46	
44.0	12.0									1.47	
42.0	.0									1.42	
44.0	.0									1.31	
48.0	.0									1.14	
52.0	.0									1.21	
52.0	12.0									1.20	
58.0	.0									1.14	
58.0	12.0									1.13	
44.0	-12.0									1.50	
36.0	-8.0									1.61	
36.0	-3.0									1.01	
34.0	-3.0									1.24	
32.0	-3.0									1.82	
30.0	-3.0									1.67	
28.0	-3.0									2.06	
34.0	-12.0									1.31	
32.0	-12.0									1.15	
30.0	-12.0									1.22	
19.0	-12.5									.97	
17.5	-11.0									.98	
15.5	-2.5									1.08	
16.5	-2.5									1.33	
17.5	-2.5									1.84	
18.5	-2.5									2.16	
19.5	-2.5									2.33	
20.5	-2.5									2.28	
21.5	-2.5									2.35	
22.5	-2.5									3.41	
23.5	-2.5									3.55	
24.5	-2.5									3.27	
		10.55	90								1.52
		6.55	90								1.39
		4.55	90								1.79
		2.55	90								1.12
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.56	
34.0	4.0									1.53	
34.0	5.0									1.58	
34.0	6.0									1.60	
36.0	6.0									1.61	
38.0	1.0									1.09	
38.0	2.0									.67	
44.0	8.0									1.27	
44.0	6.0									1.07	
44.0	4.0									.91	
44.0	2.0									1.17	
44.0	1.0									1.45	
		10.55	0								.52
		8.55	0								.55
		6.55	0								.87
		4.55	0								.54
		3.55	0								.49
		2.55	0								.49
		1.55	0								.59
		1.05	0								.77
		10.55	45								.95
		6.55	45								1.50
		4.55	45								1.23
		2.55	45								.53

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(c) M = 2.65; R = 1.30 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									.87	
12.0	.0									.93	
20.5	.0									3.19	
28.0	12.0									1.30	
28.0	4.0									2.29	
28.0	.0									1.98	
20.5	-5.0									2.05	
24.5	-5.0									2.13	
30.0	.0									2.77	
31.0	12.0									1.20	
34.0	.0									.39	
2.0	-12.0									1.10	
2.0	12.0									.93	
12.0	-12.0									1.00	
12.0	12.0									.87	
30.0	1.0									2.49	
31.0	2.0									2.71	
32.0	2.0									1.94	
32.0	3.0									1.96	
32.0	6.0									1.80	
34.0	1.0									.40	
34.0	2.0									.95	
34.0	3.0									1.38	
36.0	.0									1.22	
38.0	.0									1.74	
40.0	.0									1.75	
44.0	12.0									1.54	
42.0	.0										
44.0	.0									1.35	
48.0	.0									1.28	
52.0	.0									1.27	
52.0	12.0									1.30	
55.0	.0									1.20	
58.0	.0									1.21	
58.0	12.0									1.23	
44.0	-12.0									1.52	
36.0	-8.0									1.65	
36.0	-3.0									.93	
34.0	-3.0									1.44	
32.0	-3.0									1.97	
30.0	-3.0									1.78	
28.0	-3.0									1.96	
34.0	-12.0									1.39	
32.0	-12.0									1.24	
30.0	-12.0									1.22	
19.0	-12.5									.97	
17.5	-11.0									.97	
15.5	-2.5									1.17	
16.5	-2.5									1.60	
17.5	-2.5									2.03	
18.5	-2.5									2.39	
19.5	-2.5									2.37	
20.5	-2.5									2.23	
21.5	-2.5									2.45	
22.5	-2.5									3.45	
23.5	-2.5									4.18	
24.5	-2.5									3.23	
		10.55	90								1.31
		6.55	90								1.24
		4.55	90								1.62
		2.55	90								.88
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.52	
34.0	4.0									1.68	
34.0	5.0									1.71	
34.0	6.0									1.70	
36.0	6.0									1.63	
38.0	1.0									1.14	
38.0	2.0									.65	
44.0	8.0									1.49	
44.0	6.0									1.17	
44.0	4.0									.95	
44.0	2.0									1.16	
44.0	1.0									1.47	
		10.55	0								.41
		8.55	0								.48
		6.55	0								.78
		4.55	0								.45
		3.55	0								.40
		2.55	0								.39
		1.55	0								.52
		1.05	0								.65
		10.55	45								.78
		6.55	45								1.43
		4.55	45								1.12
		2.55	45								.40

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(d) M = 3.51; R = 4.12×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.05	
12.0	.0									1.10	
20.5	.0									3.20	
28.0	12.0									1.35	
28.0	4.0									3.32	
28.0	.0									2.12	
20.5	-5.0									2.40	
24.5	-5.0									2.10	
30.0	.0									2.74	
31.0	12.0									1.46	
34.0	.0									.55	
2.0	-12.0									1.09	
2.0	12.0									1.03	
12.0	-12.0									1.04	
12.0	12.0									1.03	
30.0	1.0									2.93	
31.0	2.0									2.96	
32.0	2.0									2.34	
32.0	3.0									2.31	
32.0	6.0									2.91	
34.0	1.0									.61	
34.0	2.0									1.02	
34.0	3.0									1.69	
36.0	.0									1.42	
38.0	.0									1.64	
40.0	.0									1.52	
44.0	12.0									1.98	
42.0	.0									1.38	
44.0	.0									1.20	
48.0	.0									1.11	
52.0	.0									1.95	
52.0	12.0									1.12	
58.0	.0									1.61	
58.0	12.0									1.96	
44.0	-12.0									2.68	
36.0	-8.0									1.15	
36.0	-3.0									1.64	
34.0	-3.0									2.33	
32.0	-3.0									2.39	
30.0	-3.0									2.81	
28.0	-3.0									1.36	
34.0	-12.0									1.34	
32.0	-12.0									1.34	
30.0	-12.0									.99	
19.0	-12.5									1.00	
17.5	-11.0									1.25	
15.5	-2.5									1.70	
16.5	-2.5									2.33	
17.5	-2.5									2.49	
18.5	-2.5									2.53	
19.5	-2.5									2.65	
20.5	-2.5									2.45	
21.5	-2.5									4.48	
22.5	-2.5									5.47	
23.5	-2.5									5.04	
24.5	-2.5										1.49
		10.55	90								1.31
		6.55	90								1.60
		4.55	90								1.16
		2.55	90								
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.66	
34.0	4.0									2.25	
34.0	5.0									2.41	
34.0	6.0									2.56	
36.0	6.0									2.18	
38.0	1.0									1.41	
38.0	2.0									.90	
44.0	8.0									2.01	
44.0	6.0									1.52	
44.0	4.0									1.11	
44.0	2.0									1.13	
44.0	1.0									1.50	
		10.55	0								.36
		8.55	0								.52
		6.55	0								.87
		4.55	0								.70
		3.55	0								.53
		2.55	0								.56
		1.55	0								.51
		1.05	0								.61
		10.55	45								.95
		6.55	45								1.45
		4.55	45								1.60
		2.55	45								.69

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(e) M = 3.51; R = 1.95×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			1.03	
12.0	.0			.89	
20.5	.0			3.88	
28.0	12.0			1.41	
28.0	4.0			3.06	
28.0	.0			2.00	
20.5	-5.0			1.92	
24.5	-5.0			2.16	
30.0	.0			2.91	
31.0	12.0			1.22	
34.0	.0			.80	
2.0	-12.0			.86	
2.0	12.0			1.14	
12.0	-12.0			.93	
12.0	12.0			.99	
30.0	1.0			2.83	
31.0	2.0			2.84	
32.0	2.0			2.36	
32.0	3.0			2.50	
32.0	6.0			2.81	
34.0	1.0			.45	
34.0	2.0			.89	
34.0	3.0			1.70	
36.0	.0			1.48	
38.0	.0			1.72	
40.0	.0			1.64	
44.0	12.0			2.20	
42.0	.0				
44.0	.0			1.31	
48.0	.0			.78	
52.0	.0			1.19	
52.0	12.0			1.95	
58.0	.0			1.02	
58.0	12.0			1.52	
44.0	-12.0			2.02	
36.0	-8.0			2.65	
36.0	-3.0			.99	
34.0	-3.0			1.62	
32.0	-3.0			2.39	
30.0	-3.0			2.43	
28.0	-3.0			2.80	
34.0	-12.0			1.38	
32.0	-12.0			1.36	
30.0	-12.0			1.32	
19.0	-12.5			1.09	
17.5	-11.0			1.05	
15.5	-2.5			1.44	
16.5	-2.5			1.93	
17.5	-2.5			2.04	
18.5	-2.5			2.60	
20.5	-2.5			2.68	
21.5	-2.5			2.34	
22.5	-2.5			4.21	
23.5	-2.5			4.92	
24.5	-2.5			4.85	
		10.55	90		1.16
		6.55	90		1.13
		4.55	90		1.43
		2.55	90		.89
		10.55	180		
		8.55	180		
		6.55	180		
		4.55	180		
		3.55	180		
		2.55	180		
		1.55	180		
		1.05	180		
34.0	-1.0			.90	
34.0	4.0			2.11	
34.0	5.0			2.12	
34.0	6.0			2.37	
36.0	6.0			1.88	
38.0	1.0			1.29	
38.0	2.0			.73	
44.0	8.0			1.87	
44.0	6.0			1.57	
44.0	4.0			1.11	
44.0	2.0			.98	
44.0	1.0			1.49	
		10.55	0		.30
		8.55	0		.42
		6.55	0		.83
		4.55	0		.51
		3.55	0		.38
		2.55	0		.41
		1.55	0		.38
		1.05	0		.49
		10.55	45		.79
		6.55	45		1.25
		4.55	45		1.33
		2.55	45		.46

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(f) M = 4.44; R = 4.59×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.25	
12.0	.0									1.05	
20.5	.0									3.95	
28.0	12.0									1.50	
28.0	4.0									4.24	
28.0	.0									2.88	
20.5	-5.0									2.54	
24.5	-5.0									2.83	
30.0	.0									3.09	
31.0	12.0									1.62	
34.0	.0									.78	
2.0	-12.0									1.34	
2.0	12.0									1.42	
12.0	-12.0									1.35	
12.0	12.0									1.13	
30.0	1.0									3.33	
31.0	2.0									3.59	
32.0	2.0									2.78	
32.0	3.0									3.27	
32.0	6.0									3.60	
34.0	1.0									.79	
34.0	2.0									1.25	
34.0	3.0									1.95	
36.0	.0									1.95	
38.0	.0									1.70	
40.0	.0									1.67	
44.0	12.0									2.24	
42.0	.0									1.71	
44.0	.0									1.69	
48.0	.0									1.55	
52.0	.0									1.11	
52.0	12.0									2.91	
58.0	.0									1.17	
58.0	12.0									2.30	
44.0	-12.0									2.75	
36.0	-8.0									3.91	
36.0	-3.0									1.54	
34.0	-3.0									2.24	
32.0	-3.0									3.11	
30.0	-3.0									3.43	
28.0	-3.0									4.40	
34.0	-12.0									1.44	
32.0	-12.0									1.69	
30.0	-12.0									1.66	
19.0	-12.0									1.82	
17.5	-11.0									1.26	
15.5	-2.5									1.83	
16.5	-2.5									2.20	
17.5	-2.5									2.73	
18.5	-2.5									2.79	
19.5	-2.5									5.02	
20.5	-2.5									4.19	
21.5	-2.5									2.55	
22.5	-2.5									6.13	
23.5	-2.5									9.98	
24.5	-2.5									5.64	
		10.55	90								.92
		6.55	90								.71
		4.55	90								1.07
		2.55	90								.85
		10.55	180								
		8.55	180								
		4.55	180								
		3.55	180								
		1.55	180								
34.0	-1.0									.72	
34.0	4.0									2.57	
34.0	5.0									3.27	
34.0	6.0									2.98	
36.0	6.0									2.49	
38.0	1.0									1.39	
38.0	2.0									1.05	
44.0	8.0									2.66	
44.0	6.0									2.01	
44.0	4.0									1.37	
44.0	2.0									1.40	
44.0	1.0									1.69	
		10.55	0								.24
		8.55	0								.35
		6.55	0								.61
		4.55	0								.41
		3.55	0								.29
		2.55	0								.30
		1.55	0								.27
		1.05	0								.35
		10.55	45								.61
		6.55	45								.98
		4.55	45								.96
		2.55	45								.40

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(g) M = 4.44; R = 3.26×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.82	
20.5	.0									2.44	
28.0	12.0									1.18	
28.0	4.0									2.86	
28.0	.0									1.69	
20.5	-5.0									1.93	
24.5	-5.0									1.54	
30.0	.0									2.36	
31.0	12.0									1.08	
34.0	.0									.54	
2.0	-12.0									.88	
2.0	12.0									1.02	
12.0	-12.0									1.06	
12.0	12.0									1.01	
30.0	1.0									2.29	
31.0	2.0									2.10	
32.0	2.0									2.13	
32.0	3.0									2.04	
32.0	6.0									2.46	
34.0	1.0									.52	
34.0	2.0									.84	
34.0	3.0									1.28	
36.0	.0									.89	
38.0	.0									1.63	
40.0	.0									.92	
44.0	12.0									2.05	
42.0	.0										
44.0	.0									.94	
52.0	.0									.95	
52.0	12.0									2.39	
55.0	.0									.83	
58.0	12.0									1.88	
44.0	-12.0									1.66	
36.0	-8.0									2.17	
36.0	-3.0									1.05	
34.0	-3.0									1.51	
32.0	-3.0									2.18	
30.0	-3.0									2.44	
28.0	-3.0									2.44	
34.0	-12.0									.77	
32.0	-12.0									1.23	
30.0	-12.0									1.22	
19.0	-12.5									.87	
17.5	-11.0									.91	
15.5	-2.5									1.53	
16.5	-2.5									1.91	
17.5	-2.5									2.63	
19.5	-2.5									1.94	
20.5	-2.5									2.34	
21.5	-2.5									1.89	
22.5	-2.5									4.81	
23.5	-2.5									4.63	
24.5	-2.5									4.83	
		10.55	90								.67
		6.55	90								.57
		4.55	90								.69
34.0	4.0									1.68	
34.0	5.0									2.01	
34.0	6.0									2.07	
36.0	6.0									2.16	
38.0	1.0									.90	
38.0	2.0									.82	
44.0	8.0									1.64	
44.0	6.0									1.38	
44.0	4.0									.92	
44.0	2.0									.74	
44.0	1.0									1.24	
		10.55	0								.13
		8.55	0								.24
		6.55	0								.39
		4.55	0								.38
		3.55	0								.23
		2.55	0								.26
		1.55	0								.21
		1.05	0								.28
		10.55	45								.53
		6.55	45								.69
		4.55	45								.73
		2.55	45								.33

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

4. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Concluded

(h) M = 4.44; R = 2.14 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.01	
20.5	.0									4.49	
28.0	12.0									1.08	
28.0	4.0									3.47	
28.0	.0									2.65	
20.5	-5.0									2.01	
24.5	-5.0									2.93	
30.0	.0									1.22	
31.0	12.0									.85	
2.0	12.0									1.01	
12.0	-12.0									.87	
12.0	12.0									2.81	
30.0	1.0									2.83	
31.0	2.0									1.96	
32.0	2.0									2.52	
32.0	3.0									3.69	
32.0	6.0									.44	
34.0	1.0									1.09	
34.0	2.0									1.66	
34.0	3.0									1.18	
36.0	.0									1.06	
38.0	.0									2.95	
44.0	12.0									1.65	
42.0	.0									1.39	
44.0	.0									.86	
48.0	.0									1.15	
52.0	.0									1.74	
52.0	12.0									1.43	
58.0	12.0									2.19	
44.0	-12.0									3.18	
36.0	-8.0									1.53	
34.0	-3.0									2.53	
32.0	-3.0									2.42	
30.0	-3.0									3.21	
28.0	-3.0									1.38	
34.0	-12.0									1.55	
32.0	-12.0									1.13	
19.0	-12.5									1.03	
17.5	-11.0									2.16	
15.5	-2.5									2.15	
16.5	-2.5									2.42	
17.5	-2.5									2.23	
18.5	-2.5									2.81	
19.5	-2.5									2.63	
20.5	-2.5									2.79	
21.5	-2.5									5.65	
22.5	-2.5									5.39	
23.5	-2.5									4.53	
24.5	-2.5										
		10.55	90								.72
		6.55	90								.52
		4.55	90								.86
		4.55	180								
		2.55	180								
34.0	4.0									2.64	
34.0	5.0									2.92	
34.0	6.0									3.08	
36.0	6.0									1.83	
38.0	2.0									.72	
44.0	8.0									1.79	
44.0	6.0									1.52	
44.0	4.0									.94	
44.0	2.0									1.24	
44.0	1.0									1.51	
		10.55	0								.19
		8.55	0								.24
		6.55	0								.46
		4.55	0								.37
		3.55	0								.22
		2.55	0								.27
		1.55	0								.24
		1.05	0								.30
		10.55	45								.49
		6.55	45								.88
		4.55	45								.75
		2.55	45								.33

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{0}R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

5. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream

(a) M = 2.65; R = 2.62 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									.94	
12.0	.0									5.33	
20.5	.0									1.83	
28.0	12.0									1.34	
28.0	4.0									1.64	
28.0	.0									3.32	
20.5	-5.0									1.88	
24.5	-5.0									1.24	
30.0	.0									4.32	
31.0	12.0									1.36	
34.0	.0									.43	
2.0	-12.0									.95	
2.0	12.0									.93	
12.0	-12.0									.93	
12.0	12.0									.94	
30.0	1.0									3.11	
31.0	2.0									3.38	
32.0	2.0									3.27	
32.0	3.0									2.42	
32.0	6.0									1.61	
34.0	1.0									.63	
34.0	2.0									1.62	
34.0	3.0									2.44	
36.0	.0									1.45	
38.0	.0									1.59	
40.0	.0									1.56	
44.0	12.0									1.47	
42.0	.0									1.62	
44.0	.0									.17	
48.0	.0									1.44	
52.0	.0									1.47	
52.0	12.0									1.11	
58.0	.0									1.51	
58.0	12.0									1.08	
44.0	-12.0									1.46	
36.0	-8.0									1.41	
36.0	-3.0									1.63	
34.0	-3.0									2.24	
32.0	-3.0									2.76	
30.0	-3.0									1.86	
28.0	-3.0									1.87	
34.0	-12.0									1.49	
32.0	-12.0									1.33	
30.0	-12.0									1.34	
19.0	-12.5									1.04	
17.5	-11.0									1.16	
15.5	-2.5									2.87	
16.5	-2.5									2.05	
17.5	-2.5									1.80	
18.5	-2.5									1.39	
19.5	-2.5									1.21	
20.5	-2.5									1.11	
21.5	-2.5									1.00	
22.5	-2.5									.93	
23.5	-2.5									.80	
24.5	-2.5									.91	
		10.55	90								.37
		6.55	90								.68
		4.55	90								.98
		2.55	90								.86
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.61	
34.0	4.0									2.52	
34.0	5.0									1.99	
34.0	6.0									1.51	
36.0	6.0									1.82	
38.0	1.0									1.10	
38.0	2.0									.85	
44.0	8.0									1.28	
44.0	6.0									1.16	
44.0	4.0									.95	
44.0	2.0									1.13	
44.0	1.0									1.43	
		10.55	0								.88
		8.55	0								1.04
		6.55	0								.84
		4.55	0								.87
		3.55	0								.95
		2.55	0								1.04
		1.55	0								1.56
		1.05	0								1.65
		10.55	45								.55
		6.55	45								.65
		4.55	45								.92
		2.55	45								.97

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

5. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(b) M = 2.65; R = 1.33 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.86	
12.0	.0									6.27	
20.5	.0									1.98	
28.0	12.0									1.35	
28.0	4.0									2.05	
28.0	.0									3.82	
20.5	-5.0									2.08	
24.5	-5.0									1.18	
30.0	.0									5.20	
31.0	12.0									1.40	
34.0	.0									.28	
2.0	-12.0									.96	
2.0	12.0									.82	
12.0	-12.0									.93	
12.0	12.0									.86	
30.0	1.0									3.33	
31.0	2.0									3.88	
32.0	2.0									3.38	
32.0	3.0									2.70	
32.0	6.0									1.49	
34.0	1.0									.53	
34.0	2.0									1.65	
34.0	3.0									2.55	
36.0	.0									1.50	
38.0	.0									1.75	
40.0	.0									1.66	
44.0	12.0									1.40	
42.0	.0									1.68	
48.0	.0									1.39	
52.0	.0									1.18	
52.0	12.0									1.27	
55.0	.0									1.55	
58.0	.0									1.10	
58.0	12.0									1.53	
44.0	-12.0									1.49	
36.0	-8.0									1.50	
36.0	-3.0									2.28	
34.0	-3.0									2.69	
32.0	-3.0									1.78	
30.0	-3.0									1.84	
28.0	-3.0									1.42	
34.0	-12.0									1.41	
32.0	-12.0									1.52	
30.0	-12.0									.97	
19.0	-12.5									1.24	
17.5	-11.0									2.97	
15.5	-2.5									2.00	
16.5	-2.5									1.59	
17.5	-2.5									1.92	
18.5	-2.5									1.20	
19.5	-2.5									.97	
20.5	-2.5									.94	
21.5	-2.5									.75	
22.5	-2.5									.79	
23.5	-2.5									.79	
24.5	-2.5										
		10.55	90								.35
		6.55	90								.57
		4.55	90								.85
		2.55	90								.71
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.48	
34.0	4.0									2.77	
34.0	5.0									2.04	
34.0	6.0									1.51	
36.0	6.0									1.96	
38.0	1.0									.97	
38.0	2.0									.72	
44.0	8.0									1.42	
44.0	6.0									1.20	
44.0	4.0									.88	
44.0	2.0									1.16	
44.0	1.0									1.46	
		10.55	0								.93
		8.55	0								.97
		6.55	0								.81
		4.55	0								.81
		3.55	0								.79
		2.55	0								.86
		1.55	0								1.47
		1.05	0								1.54
		10.55	45								.64
		6.55	45								.66
		4.55	45								.84
		2.55	45								.90

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{o}R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

5. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(c) M = 3.51; R = 1.64×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.94	
12.0	.0									7.63	
20.5	.0									2.02	
28.0	12.0									1.55	
28.0	4.0									2.31	
28.0	.0									3.59	
20.5	-5.0									2.49	
24.5	-5.0									1.80	
30.0	.0									6.47	
31.0	12.0									1.64	
34.0	.0									.27	
2.0	-12.0									.78	
2.0	12.0									1.01	
12.0	-12.0									.88	
12.0	12.0									.85	
30.0	1.0									4.35	
31.0	2.0									4.80	
32.0	2.0									5.11	
32.0	3.0									2.93	
32.0	6.0									2.16	
34.0	1.0									.53	
34.0	2.0									1.87	
34.0	3.0									3.42	
36.0	.0									1.39	
38.0	.0									2.08	
40.0	.0									2.12	
44.0	12.0									1.81	
42.0	.0										
48.0	.0									.93	
52.0	.0									1.53	
52.0	12.0									1.50	
55.0	.0									2.46	
58.0	.0									1.15	
58.0	12.0									1.15	
44.0	-12.0									1.79	
36.0	-8.0									1.86	
36.0	-3.0									1.71	
34.0	-3.0									3.04	
32.0	-3.0									3.01	
30.0	-3.0									2.25	
28.0	-3.0									2.27	
34.0	-12.0									2.08	
32.0	-12.0									2.06	
30.0	-12.0									1.84	
19.0	-12.5									1.17	
17.5	-11.0									1.37	
15.5	-2.5									4.31	
16.5	-2.5									3.00	
17.5	-2.5									1.98	
18.5	-2.5									1.79	
19.5	-2.5									1.46	
20.5	-2.5									1.24	
21.5	-2.5									.99	
22.5	-2.5									.83	
23.5	-2.5									.86	
24.5	-2.5									.88	
		10.55	90								.49
		6.55	90								.60
		4.55	90								.69
		10.55	180								
		8.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.05	180								
34.0	-1.0									.63	
34.0	4.0									3.05	
34.0	5.0									1.85	
34.0	6.0									1.71	
36.0	6.0									1.55	
38.0	1.0									.98	
38.0	2.0									.74	
44.0	8.0									1.67	
44.0	6.0									1.52	
44.0	4.0									1.04	
44.0	2.0									1.01	
44.0	1.0									1.40	
		10.55	0								1.12
		8.55	0								.83
		6.55	0								.67
		4.55	0								.97
		3.55	0								.91
		2.55	0								.82
		1.55	0								1.58
		1.05	0								1.64
		10.55	45								.70
		6.55	45								.54
		4.55	45								.81
		2.55	45								.77

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

5. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(d) M = 4.44; R = 3.20 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									.89	
12.0	.0									9.83	
20.5	.0									1.77	
28.0	12.0									1.21	
28.0	4.0									2.26	
28.0	.0									3.67	
20.5	-5.0									3.73	
24.5	-5.0									2.28	
30.0	.0									6.07	
31.0	12.0									1.62	
2.0	-12.0									.86	
2.0	12.0									.87	
12.0	-12.0									1.23	
12.0	12.0									1.04	
30.0	1.0									3.10	
31.0	2.0									3.77	
32.0	2.0									5.09	
32.0	3.0									2.51	
32.0	6.0									2.25	
34.0	1.0									.55	
34.0	2.0									1.95	
34.0	3.0									3.05	
36.0	.0									1.51	
38.0	.0									1.91	
40.0	.0									2.21	
44.0	12.0									1.95	
42.0	.0									.19	
44.0	.0									1.54	
48.0	.0									1.38	
52.0	.0									2.00	
52.0	12.0									1.27	
55.0	.0									1.35	
58.0	.0									1.30	
58.0	12.0									1.85	
44.0	-12.0									1.85	
36.0	-8.0									2.41	
36.0	-3.0									3.79	
34.0	-3.0									3.13	
32.0	-3.0									2.21	
30.0	-3.0									2.34	
28.0	-3.0									2.00	
34.0	-12.0									1.66	
32.0	-12.0									1.30	
30.0	-12.0									1.05	
19.0	-12.5									1.32	
17.5	-11.0									5.10	
15.5	-2.5									4.04	
16.5	-2.5									3.68	
17.5	-2.5									1.88	
19.5	-2.5									1.69	
20.5	-2.5									1.30	
21.5	-2.5									1.16	
22.5	-2.5									.97	
23.5	-2.5									.88	
24.5	-2.5										.27
		10.55	90								.35
		4.55	90								.41
		2.55	90								
34.0	4.0									2.99	
34.0	5.0									1.64	
34.0	6.0									1.73	
36.0	6.0									1.68	
38.0	1.0									.82	
38.0	2.0									.73	
44.0	8.0									1.47	
44.0	6.0									1.47	
44.0	4.0									.90	
44.0	2.0									.89	
44.0	1.0									1.38	
		10.55	0								.52
		8.55	0								.54
		6.55	0								.42
		4.55	0								.69
		3.55	0								.80
		2.55	0								.68
		1.55	0								1.16
		1.05	0								1.28
		10.55	45								.34
		6.55	45								.33
		4.55	45								.53
		2.55	45								.67

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

5. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Concluded

(e) M = 4.44; R = 1.89×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.84	
12.0	.0									8.19	
20.5	.0									1.68	
28.0	12.0									.90	
28.0	4.0									2.09	
28.0	.0									4.47	
20.5	-5.0										
24.5	-5.0									2.03	
30.0	.0									6.19	
31.0	12.0									1.40	
2.0	-12.0									.82	
2.0	12.0									.64	
12.0	-12.0									1.23	
12.0	12.0									1.02	
30.0	1.0									3.90	
31.0	2.0									4.84	
32.0	2.0									4.11	
32.0	3.0									2.20	
32.0	6.0									2.42	
34.0	2.0									2.19	
34.0	3.0									2.73	
38.0	.0									1.49	
40.0	.0									1.72	
44.0	12.0									2.28	
42.0	.0									1.68	
48.0	.0									1.02	
52.0	.0									1.14	
52.0	12.0									1.25	
58.0	.0									1.13	
58.0	12.0									.90	
44.0	-12.0									2.07	
36.0	-8.0									1.75	
36.0	-3.0									1.79	
34.0	-3.0									2.79	
32.0	-3.0									2.49	
30.0	-3.0									1.66	
28.0	-3.0									2.31	
34.0	-12.0									1.96	
32.0	-12.0									1.79	
30.0	-12.0									1.35	
19.0	-12.5									1.14	
17.5	-11.0									1.29	
15.5	-2.5									5.03	
16.5	-2.5									3.66	
17.5	-2.5									2.71	
18.5	-2.5									1.61	
19.5	-2.5									1.16	
21.5	-2.5									1.14	
24.5	-2.5									.61	
		6.55	90								.29
		4.55	90								.34
		2.55	90								.51
		1.05	180								
34.0	4.0									2.86	
34.0	5.0									1.61	
34.0	6.0									1.39	
36.0	6.0									1.23	
38.0	1.0									.85	
44.0	8.0									1.04	
44.0	6.0									.91	
44.0	4.0									.74	
44.0	1.0									1.23	
		10.55	0								.41
		8.55	0								.50
		6.55	0								.38
		4.55	0								.56
		3.55	0								.58
		2.55	0								.53
		1.55	0								.96
		1.05	0								1.06
		10.55	45								.28
		6.55	45								.31
		4.55	45								.45
		2.55	45								.50

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5°

(a) M = 2.65; R = 4.02 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									1.02	
12.0	.0									.96	
20.5	.0									2.07	
28.0	12.0									1.71	
28.0	4.0									1.97	
28.0	.0									3.83	
20.5	-5.0									1.24	
24.5	-5.0									1.44	
30.0	.0									4.63	
31.0	12.0									1.92	
34.0	.0									.28	
2.0	-12.0									1.03	
2.0	12.0									1.02	
12.0	-12.0									1.01	
12.0	12.0									1.00	
30.0	1.0									3.40	
31.0	2.0									3.87	
32.0	2.0									3.62	
32.0	3.0									2.56	
32.0	6.0									2.82	
34.0	1.0									.30	
34.0	2.0									.95	
34.0	3.0									1.37	
36.0	.0									.54	
38.0	.0									.65	
40.0	.0									.59	
44.0	12.0									1.53	
42.0	.0									1.04	
44.0	.0									1.77	
48.0	.0									1.89	
52.0	.0									1.10	
52.0	12.0									1.64	
55.0	.0									1.48	
58.0	.0									1.08	
58.0	12.0									1.74	
44.0	-12.0									1.92	
36.0	-8.0									1.81	
36.0	-3.0									2.89	
34.0	-3.0									3.77	
32.0	-3.0									2.70	
30.0	-3.0									2.21	
28.0	-3.0									1.40	
34.0	-12.0									1.27	
32.0	-12.0									1.17	
30.0	-12.0									1.00	
19.0	-12.5									.98	
17.5	-11.0									1.02	
15.5	-2.5									1.01	
16.5	-2.5									1.06	
17.5	-2.5									1.22	
18.5	-2.5									1.31	
19.5	-2.5									1.48	
20.5	-2.5									1.64	
21.5	-2.5									1.70	
22.5	-2.5									1.64	
23.5	-2.5									1.62	
24.5	-2.5										
		10.55	90								.50
		6.55	90								.47
		4.55	90								.55
		2.55	90								.70
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.05	180								
34.0	-1.0									.56	
34.0	4.0									2.03	
34.0	5.0									2.67	
34.0	6.0									2.45	
36.0	6.0									2.07	
38.0	1.0									.95	
38.0	2.0									.42	
44.0	8.0									1.10	
44.0	6.0									.92	
44.0	4.0									1.08	
44.0	2.0									1.82	
44.0	1.0									2.06	
		10.55	0								.67
		8.55	0								.73
		6.55	0								.77
		4.55	0								.90
		3.55	0								1.16
		2.55	0								1.69
		1.55	0								1.48
		1.05	0								1.71
		10.55	45								.56
		6.55	45								.54
		4.55	45								.63
		2.55	45								1.15

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(b) M = 2.65; R = 2.50 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.00	
12.0	.0									1.01	
20.5	.0									2.15	
28.0	12.0									1.75	
28.0	4.0									1.94	
28.0	.0									4.11	
20.5	-5.0									1.12	
24.5	-5.0									1.38	
30.0	.0									5.07	
31.0	12.0									1.93	
34.0	.0									.25	
2.0	-12.0									1.01	
2.0	12.0									1.02	
12.0	-12.0									1.01	
12.0	12.0									1.01	
30.0	1.0									3.61	
31.0	2.0									3.54	
32.0	2.0									3.63	
32.0	3.0									2.25	
32.0	6.0									2.83	
34.0	1.0									.27	
34.0	2.0									.81	
34.0	3.0									1.26	
36.0	.0									.49	
38.0	.0									.67	
40.0	.0									.57	
44.0	12.0									1.59	
42.0	.0									.58	
44.0	.0									1.05	
48.0	.0									1.48	
52.0	.0									2.17	
52.0	12.0									1.08	
55.0	.0									1.68	
58.0	.0									1.57	
58.0	12.0									1.07	
44.0	-12.0									1.78	
36.0	-8.0									1.85	
36.0	-3.0									1.80	
34.0	-3.0									2.64	
32.0	-3.0									3.77	
30.0	-3.0									2.65	
28.0	-3.0									2.21	
34.0	-12.0									1.38	
32.0	-12.0									1.19	
30.0	-12.0									1.08	
19.0	-12.5									.90	
17.5	-11.0									1.02	
15.5	-2.5									1.00	
16.5	-2.5									.90	
17.5	-2.5									1.07	
18.5	-2.5									1.23	
19.5	-2.5									1.29	
20.5	-2.5									1.55	
21.5	-2.5									1.68	
22.5	-2.5									1.71	
23.5	-2.5									1.57	
24.5	-2.5									1.66	
		10.55	90								.49
		6.55	90								.42
		4.55	90								.52
		2.55	90								.63
		10.55	180								
		8.55	180								
		6.55	180								
		3.55	180								
		2.55	180								
		1.05	180								
34.0	-1.0									.53	
34.0	4.0									1.93	
34.0	5.0									2.73	
34.0	6.0									2.44	
36.0	6.0									2.09	
38.0	1.0									.87	
38.0	2.0									.34	
44.0	8.0									1.00	
44.0	6.0									.82	
44.0	4.0									1.13	
44.0	2.0									1.83	
44.0	1.0									1.90	
		10.55	0								.68
		8.55	0								.75
		6.55	0								.69
		4.55	0								.84
		3.55	0								1.03
		2.55	0								1.46
		1.55	0								1.47
		1.05	0								1.70
		10.55	45								.56
		6.55	45								.54
		4.55	45								.61
		2.55	45								1.01

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(c) M = 2.65; R = 1.37 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									1.00	
12.0	.0									.94	
20.5	.0									2.23	
28.0	12.0									1.84	
28.0	4.0									2.36	
28.0	.0									4.59	
20.5	-5.0									1.22	
24.5	-5.0									1.55	
30.0	.0									6.14	
31.0	12.0									2.14	
34.0	.0									.20	
2.0	-12.0									1.01	
2.0	12.0									.94	
12.0	-12.0									1.00	
12.0	12.0									.88	
30.0	1.0									3.97	
31.0	2.0									4.25	
32.0	2.0									3.46	
32.0	3.0									2.41	
32.0	6.0									3.27	
34.0	1.0									.24	
34.0	2.0									.83	
34.0	3.0									1.08	
36.0	.0									.42	
38.0	.0									.64	
40.0	.0									.55	
44.0	12.0									1.51	
42.0	.0									1.07	
44.0	.0									1.64	
48.0	.0									1.89	
52.0	.0									1.22	
52.0	12.0									1.82	
55.0	.0									1.65	
58.0	.0									1.15	
58.0	12.0									1.90	
44.0	-12.0									2.06	
36.0	-8.0									1.66	
36.0	-3.0									2.66	
34.0	-3.0									3.91	
32.0	-3.0									2.82	
30.0	-3.0									2.29	
28.0	-3.0									1.38	
34.0	-12.0									1.29	
32.0	-12.0									1.18	
30.0	-12.0									.96	
19.0	-12.5									1.00	
17.5	-11.0									1.02	
15.5	-2.5									.99	
16.5	-2.5									1.18	
17.5	-2.5									1.39	
18.5	-2.5									1.42	
19.5	-2.5									1.62	
20.5	-2.5									1.84	
21.5	-2.5									1.71	
22.5	-2.5									1.82	
23.5	-2.5									1.66	
24.5	-2.5										.47
		10.55	90								.44
		6.55	90								.45
		4.55	90								.56
		2.55	90								
		3.55	180								
		1.05	180							.49	
34.0	-1.0									1.88	
34.0	4.0									3.07	
34.0	5.0									2.78	
34.0	6.0									2.31	
36.0	6.0									.89	
38.0	1.0									.27	
38.0	2.0									1.05	
44.0	8.0									.90	
44.0	6.0									1.26	
44.0	4.0									1.90	
44.0	2.0									2.08	
44.0	1.0										.68
		10.55	0								.72
		8.55	0								.66
		6.55	0								.85
		4.55	0								1.01
		3.55	0								1.28
		2.55	0								1.31
		1.55	0								1.53
		1.05	0								.54
		10.55	45								.54
		6.55	45								.58
		4.55	45								.86
		2.55	45								

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(d) M = 3.51; R = 4.13 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			1.01	
12.0	.0			1.01	
20.5	.0			2.20	
28.0	12.0			1.66	
28.0	4.0			2.21	
28.0	.0			5.31	
20.5	-5.0			1.27	
24.5	-5.0			1.54	
30.0	.0			6.29	
31.0	12.0			2.37	
34.0	.0			.21	
2.0	-12.0			1.03	
2.0	12.0			1.00	
12.0	-12.0			1.02	
12.0	12.0			1.00	
30.0	1.0			4.00	
31.0	2.0			4.50	
32.0	2.0			5.30	
32.0	3.0			3.38	
32.0	6.0			3.52	
34.0	1.0			.36	
34.0	2.0			1.11	
34.0	3.0			1.78	
36.0	.0			.62	
38.0	.0			.78	
40.0	.0			.71	
44.0	12.0			1.94	
42.0	.0				
44.0	.0			1.24	
48.0	.0			1.87	
52.0	.0			1.60	
52.0	12.0			1.29	
55.0	.0			1.46	
58.0	.0			1.50	
58.0	12.0			.99	
44.0	-12.0			1.85	
36.0	-8.0			1.97	
36.0	-3.0			2.12	
34.0	-3.0			3.80	
32.0	-3.0			5.42	
30.0	-3.0			2.97	
28.0	-3.0			2.60	
34.0	-12.0			1.62	
32.0	-12.0			1.54	
30.0	-12.0			1.38	
19.0	-12.5			.78	
17.5	-11.0			1.01	
15.5	-2.5			1.08	
16.5	-2.5			1.03	
17.5	-2.5			1.20	
18.5	-2.5			1.44	
19.5	-2.5			1.54	
20.5	-2.5			1.72	
21.5	-2.5			1.80	
22.5	-2.5			1.84	
23.5	-2.5			1.75	
24.5	-2.5			1.75	
		10.55	90		.28
		6.55	90		.37
		4.55	90		.38
		2.55	90		.52
		10.55	180		
		8.55	180		
		4.55	180		
		1.05	180		
34.0	-1.0				
34.0	4.0			.44	
34.0	5.0			2.48	
34.0	6.0			3.31	
36.0	6.0			2.99	
38.0	1.0			2.39	
38.0	2.0			.82	
44.0	8.0			.31	
44.0	6.0			1.14	
44.0	4.0			.99	
44.0	2.0			1.11	
44.0	1.0			1.83	
				2.32	
		10.55	0		.65
		8.55	0		.82
		6.55	0		.82
		4.55	0		.82
		3.55	0		1.37
		2.55	0		1.51
		1.55	0		1.92
		1.05	0		2.52
		10.55	45		.43
		6.55	45		.54
		4.55	45		.56
		2.55	45		.78

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(e) M = 3.51; R = 1.67×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.03	
12.0	.0									.94	
20.5	.0									2.44	
28.0	12.0									1.76	
28.0	4.0									2.49	
28.0	.0									5.84	
20.5	-5.0									1.25	
24.5	-5.0									1.75	
30.0	.0									8.23	
31.0	12.0									2.17	
34.0	.0									.24	
2.0	-12.0									.91	
2.0	12.0									1.09	
12.0	-12.0									.98	
12.0	12.0									.94	
30.0	1.0									5.00	
31.0	2.0									5.54	
32.0	2.0									5.90	
32.0	3.0									3.71	
32.0	6.0									4.25	
34.0	1.0									.30	
34.0	2.0									.96	
34.0	3.0									1.59	
36.0	.0									.56	
38.0	.0									.79	
40.0	.0									.81	
44.0	12.0									2.09	
42.0	.0									1.20	
48.0	.0									1.72	
52.0	.0									1.30	
52.0	12.0									1.55	
55.0	.0									1.49	
58.0	.0									1.03	
58.0	12.0									2.05	
44.0	-12.0									2.08	
36.0	-8.0									1.81	
36.0	-3.0									3.76	
34.0	-3.0									5.61	
32.0	-3.0									3.27	
30.0	-3.0									2.84	
28.0	-3.0									1.82	
34.0	-12.0									1.78	
32.0	-12.0									1.48	
30.0	-12.0									1.13	
19.0	-12.5									1.16	
17.5	-11.0									1.09	
15.5	-2.5									1.09	
16.5	-2.5									1.34	
17.5	-2.5									1.77	
18.5	-2.5									1.77	
19.5	-2.5									1.94	
20.5	-2.5									1.77	
21.5	-2.5									1.69	
22.5	-2.5									1.70	
23.5	-2.5									1.87	
24.5	-2.5										.33
		10.55	90								.36
		6.55	90								.39
		4.55	90								.48
		2.55	90								
		10.55	180								
		1.05	180							.47	
34.0	-1.0									2.41	
34.0	4.0									3.55	
34.0	5.0									3.43	
34.0	6.0									2.35	
36.0	6.0									.88	
38.0	1.0									.21	
38.0	2.0									1.12	
44.0	8.0									1.03	
44.0	6.0									1.18	
44.0	4.0									1.82	
44.0	2.0									2.40	
44.0	1.0										.64
		10.55	0								.77
		8.55	0								.83
		6.55	0								.83
		4.55	0								1.17
		3.55	0								1.32
		2.55	0								1.57
		1.55	0								2.26
		1.05	0								.44
		10.55	45								.54
		6.55	45								.57
		4.55	45								.77
		2.55	45								

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(f) M = 4.44; R = 4.45 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.01	
12.0	.0									.74	
20.5	.0									2.31	
28.0	12.0									1.46	
28.0	4.0									2.01	
28.0	.0									5.92	
20.5	-5.0									1.30	
24.5	-5.0									2.12	
30.0	.0									5.89	
31.0	12.0									2.61	
2.0	-12.0									1.27	
2.0	12.0									1.23	
12.0	-12.0									1.28	
12.0	12.0									1.07	
30.0	1.0									3.50	
31.0	2.0									5.37	
32.0	2.0									5.40	
32.0	3.0									4.69	
32.0	6.0									3.27	
34.0	2.0									1.10	
34.0	3.0									2.01	
38.0	.0									1.32	
40.0	.0									1.17	
44.0	12.0									2.38	
42.0	.0									1.38	
48.0	.0									1.91	
52.0	.0									1.06	
52.0	12.0									1.61	
55.0	.0									1.34	
58.0	.0									1.21	
58.0	12.0									1.31	
44.0	-12.0									1.85	
36.0	-8.0									1.83	
36.0	-3.0									2.32	
34.0	-3.0									3.82	
32.0	-3.0									5.53	
30.0	-3.0									2.68	
28.0	-3.0									3.42	
34.0	-12.0									1.94	
32.0	-12.0									2.23	
30.0	-12.0									1.71	
17.5	-11.0									1.17	
15.5	-2.5									.87	
16.5	-2.5									.91	
17.5	-2.5									1.45	
18.5	-2.5									1.66	
19.5	-2.5									2.53	
20.5	-2.5									3.02	
21.5	-2.5									2.22	
22.5	-2.5									1.90	
23.5	-2.5									2.85	
24.5	-2.5									1.73	
		4.55	90								.22
34.0	-1.0									.69	
34.0	4.0									2.83	
34.0	5.0									4.05	
34.0	6.0									3.44	
36.0	6.0									2.85	
38.0	1.0									1.47	
44.0	8.0									1.45	
44.0	6.0									1.42	
44.0	4.0									1.08	
44.0	2.0									2.24	
44.0	1.0									2.06	
		10.55	0								.36
		8.55	0								.50
		6.55	0								.55
		4.55	0								.56
		3.55	0								.82
		2.55	0								1.06
		1.55	0								.85
		1.05	0								1.47
		10.55	45								.24
		6.55	45								.29
		4.55	45								.35
		2.55	45								.61

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(g) M = 4.44; R = 3.16 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
20.5	.0									2.05	
28.0	12.0									1.54	
28.0	4.0									2.13	
28.0	.0									5.62	
20.5	-5.0									1.33	
24.5	-5.0									1.30	
30.0	.0									6.05	
31.0	12.0									2.27	
2.0	-12.0									.93	
2.0	12.0									1.11	
12.0	-12.0									.92	
12.0	12.0									1.07	
30.0	1.0									3.16	
31.0	2.0									4.77	
32.0	2.0									5.17	
32.0	3.0									3.96	
32.0	6.0									2.97	
34.0	2.0									.97	
34.0	3.0									1.59	
36.0	.0									.90	
38.0	.0									.96	
40.0	.0									.88	
44.0	12.0									2.42	
48.0	.0									1.61	
52.0	12.0									1.60	
55.0	.0									1.10	
58.0	12.0									.97	
44.0	-12.0									1.56	
36.0	-8.0									1.50	
36.0	-3.0									1.68	
34.0	-3.0									3.68	
32.0	-3.0									5.59	
30.0	-3.0									2.83	
28.0	-3.0									2.60	
34.0	-12.0									1.10	
32.0	-12.0									1.52	
30.0	-12.0									1.41	
19.0	-12.5									1.87	
16.5	-2.5									1.10	
17.5	-2.5									1.81	
18.5	-2.5									1.57	
19.5	-2.5									1.30	
20.5	-2.5									1.98	
21.5	-2.5									1.81	
22.5	-2.5									1.65	
23.5	-2.5									1.74	
24.5	-2.5									1.63	
34.0	4.0									1.97	
34.0	5.0									2.65	
34.0	6.0									2.86	
36.0	6.0									2.20	
38.0	1.0									1.12	
38.0	2.0									.43	
44.0	8.0									.93	
44.0	6.0									.92	
44.0	4.0									1.00	
44.0	2.0									1.63	
44.0	1.0									1.75	
		10.55	0								.36
		8.55	0								.45
		6.55	0								.48
		4.55	0								.60
		3.55	0								.84
		2.55	0								1.15
		1.55	0								.90
		1.05	0								1.40
		10.55	45								.24
		6.55	45								.31
		4.55	45								.35
		2.55	45								.54

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Concluded

(h) M = 4.44; R = 2.14×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			1.11	
12.0	.0			.92	
20.5	.0			2.97	
28.0	12.0			1.52	
28.0	4.0			2.58	
28.0	.0			9.16	
20.5	-5.0				
24.5	-5.0			2.00	
30.0	.0			10.08	
31.0	12.0			2.51	
2.0	-12.0			.98	
2.0	12.0			.93	
12.0	-12.0			.96	
12.0	12.0			.92	
30.0	1.0			5.15	
31.0	2.0			8.05	
32.0	2.0			5.70	
32.0	3.0			5.24	
32.0	6.0			5.06	
34.0	1.0			.31	
34.0	2.0			1.33	
34.0	3.0			1.82	
36.0	.0			.82	
38.0	.0			1.06	
40.0	.0			1.16	
44.0	12.0			3.15	
42.0	.0			1.01	
48.0	.0			1.50	
52.0	.0			1.74	
52.0	12.0			1.24	
55.0	.0			1.30	
58.0	.0			1.18	
58.0	12.0			.83	
44.0	-12.0			1.94	
36.0	-8.0			1.82	
36.0	-3.0			2.80	
34.0	-3.0			4.86	
32.0	-3.0			6.20	
30.0	-3.0			3.09	
28.0	-3.0			3.28	
34.0	-12.0			2.01	
32.0	-12.0			2.27	
30.0	-12.0			1.87	
17.5	-11.0			.89	
15.5	-2.5			1.03	
16.5	-2.5			1.05	
17.5	-2.5			1.97	
18.5	-2.5			1.69	
19.5	-2.5			2.04	
20.5	-2.5			2.16	
21.5	-2.5			2.27	
22.5	-2.5			2.25	
23.5	-2.5			1.72	
24.5	-2.5			1.65	
		6.55	90		.21
		4.55	90		.25
		2.55	90		.30
34.0	-1.0			.59	
34.0	4.0			2.97	
34.0	5.0			4.52	
34.0	6.0			3.79	
36.0	6.0			2.66	
38.0	1.0			1.45	
44.0	8.0			1.04	
44.0	6.0			.91	
44.0	4.0			1.01	
44.0	2.0			2.26	
44.0	1.0			2.13	
		10.55	0		.46
		8.55	0		.55
		6.55	0		.63
		4.55	0		.73
		3.55	0		1.08
		2.55	0		1.47
		1.55	0		1.04
		1.05	0		1.71
		10.55	45		.29
		6.55	45		.39
		4.55	45		.45
		2.55	45		.69

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45°

(a) M = 2.65; R = 2.64 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									1.00	
12.0	.0									1.05	
20.5	.0									1.25	
28.0	12.0									1.69	
28.0	4.0									2.54	
28.0	.0									2.57	
20.5	-5.0									.95	
24.5	-5.0									1.23	
31.0	12.0									1.14	
34.0	.0									1.19	
2.0	-12.0									.99	
2.0	12.0									1.01	
12.0	-12.0									1.00	
12.0	12.0									1.00	
31.0	2.0									4.87	
32.0	2.0									5.20	
32.0	3.0									2.63	
32.0	6.0									1.63	
34.0	1.0									1.62	
34.0	2.0									2.96	
34.0	3.0									2.68	
36.0	.0									2.08	
38.0	.0									2.05	
40.0	.0									1.62	
44.0	12.0									2.20	
42.0	.0									1.42	
44.0	.0									1.15	
48.0	.0									.90	
52.0	.0									.93	
52.0	12.0									1.38	
55.0	.0									.93	
58.0	.0									1.52	
58.0	12.0									1.12	
44.0	-12.0									1.95	
36.0	-8.0									1.89	
36.0	-3.0									2.74	
34.0	-3.0									3.24	
32.0	-3.0									4.07	
30.0	-3.0									2.46	
28.0	-3.0									2.24	
34.0	-12.0									1.43	
32.0	-12.0									1.29	
30.0	-12.0									1.16	
19.0	-12.5									.99	
17.5	-11.0									.96	
15.5	-2.5									1.00	
16.5	-2.5									.95	
17.5	-2.5									1.00	
18.5	-2.5									.95	
19.5	-2.5									1.02	
20.5	-2.5									1.05	
21.5	-2.5									1.21	
22.5	-2.5									1.23	
23.5	-2.5									1.22	
24.5	-2.5									1.43	
		10.55	90								.79
		6.55	90								.89
		4.55	90								.86
		2.55	90								.87
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.91	
34.0	4.0									1.93	
34.0	5.0									1.67	
34.0	6.0									1.57	
36.0	6.0									1.99	
38.0	1.0									1.36	
38.0	2.0									1.04	
44.0	8.0									1.31	
44.0	6.0									.89	
44.0	4.0									.85	
44.0	2.0									.99	
44.0	1.0									1.10	
		10.55	0								.96
		8.55	0								1.03
		6.55	0								1.20
		4.55	0								1.35
		3.55	0								1.12
		2.55	0								1.10
		1.55	0								.67
		1.05	0								.72
		10.55	45								.86
		6.55	45								1.06
		4.55	45								1.15
		2.55	45								1.01

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(b) M = 2.65; R = 1.32 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.93	
12.0	.0									.91	
20.5	.0									1.24	
28.0	12.0									1.56	
28.0	4.0									2.74	
28.0	.0									2.46	
20.5	-5.0									.91	
24.5	-5.0									1.19	
30.0	.0									7.51	
31.0	12.0									1.21	
34.0	.0									1.11	
2.0	-12.0									.97	
2.0	12.0									.90	
12.0	-12.0									.96	
12.0	12.0									.88	
30.0	1.0									5.58	
31.0	2.0									5.48	
32.0	2.0									5.38	
32.0	3.0									2.91	
32.0	6.0									1.58	
34.0	1.0									1.37	
34.0	2.0									3.04	
34.0	3.0									2.74	
36.0	.0									2.19	
38.0	.0									2.07	
40.0	.0									1.63	
44.0	12.0									2.22	
42.0	.0										
44.0	.0									1.08	
48.0	.0									1.04	
52.0	.0									.85	
52.0	12.0									1.38	
55.0	.0									1.36	
58.0	.0									1.95	
58.0	12.0									1.44	
44.0	-12.0									1.95	
36.0	-8.0									1.95	
36.0	-3.0									2.36	
34.0	-3.0									3.88	
32.0	-3.0									4.21	
30.0	-3.0									2.44	
28.0	-3.0									2.19	
34.0	-12.0									1.34	
32.0	-12.0									1.34	
30.0	-12.0									1.22	
19.0	-12.5									.98	
17.5	-11.0									.90	
15.5	-2.5									.93	
16.5	-2.5									.98	
17.5	-2.5									.93	
18.5	-2.5									.91	
19.5	-2.5									.98	
20.5	-2.5									1.08	
21.5	-2.5									1.22	
22.5	-2.5									1.08	
23.5	-2.5									1.26	
24.5	-2.5									1.40	
		10.55	90								.69
		6.55	90								.77
		4.55	90								.75
		2.55	90								.76
		8.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.85	
34.0	4.0									2.02	
34.0	5.0									1.73	
34.0	6.0									1.64	
36.0	6.0									2.04	
38.0	1.0									1.24	
38.0	2.0									.96	
44.0	8.0									1.38	
44.0	6.0									.92	
44.0	4.0									.80	
44.0	2.0									1.03	
44.0	1.0									1.09	
		10.55	0								.66
		8.55	0								.89
		6.55	0								1.02
		4.55	0								1.23
		3.55	0								.97
		2.55	0								.97
		1.55	0								.56
		1.05	0								.56
		10.55	45								.78
		6.55	45								.90
		4.55	45								1.01
		2.55	45								.86

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(c) M = 3.51; R = 1.63×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.95	
12.0	.0									.85	
20.5	.0									1.34	
28.0	12.0									2.12	
28.0	4.0									3.70	
28.0	.0									2.66	
20.5	-5.0									1.10	
24.5	-5.0									1.78	
30.0	.0									12.71	
31.0	12.0									1.15	
34.0	.0									1.73	
2.0	-12.0									.90	
2.0	12.0									.94	
12.0	-12.0									.84	
12.0	12.0									.85	
30.0	1.0									9.36	
31.0	2.0									8.06	
32.0	2.0									9.11	
32.0	3.0									3.81	
32.0	6.0									2.20	
34.0	1.0									2.69	
34.0	2.0									4.17	
34.0	3.0									3.90	
36.0	.0									2.58	
38.0	.0									2.36	
40.0	.0									1.81	
44.0	12.0									2.51	
42.0	.0									.96	
44.0	.0									.50	
48.0	.0									.74	
52.0	.0									1.38	
52.0	12.0									.72	
55.0	.0									.73	
58.0	.0									1.39	
58.0	12.0									1.86	
44.0	-12.0									2.04	
36.0	-8.0									3.02	
36.0	-3.0									5.57	
34.0	-3.0									6.64	
32.0	-3.0									3.68	
30.0	-3.0									2.95	
28.0	-3.0									1.70	
34.0	-12.0									1.71	
32.0	-12.0									1.62	
30.0	-12.0									.86	
19.0	-12.5									1.01	
17.5	-11.0									1.09	
15.5	-2.5									.84	
16.5	-2.5									.74	
17.5	-2.5									.85	
18.5	-2.5									1.02	
19.5	-2.5									1.58	
20.5	-2.5									1.13	
21.5	-2.5									1.15	
22.5	-2.5									1.29	
23.5	-2.5									1.93	
24.5	-2.5										.96
		10.55	90								1.13
		6.55	90								1.03
		4.55	90								1.13
		2.55	90								
		10.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									1.44	
34.0	4.0									2.71	
34.0	5.0									2.28	
34.0	6.0									2.03	
36.0	6.0									1.98	
38.0	1.0									1.54	
38.0	2.0									1.43	
44.0	8.0									1.75	
44.0	6.0									1.09	
44.0	4.0									.88	
44.0	2.0									.72	
44.0	1.0									1.06	
		10.55	0								2.24
		8.55	0								1.46
		6.55	0								1.91
		4.55	0								2.35
		3.55	0								1.94
		2.55	0								1.19
		1.55	0								.47
		1.05	0								.57
		10.55	45								1.77
		6.55	45								1.61
		4.55	45								1.74
		2.55	45								1.59

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Concluded

(d) M = 4.44; R = 3.20 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{h}{h_D}$	$\frac{h}{h_L}$
2.0	.0			4.36	
12.0	.0			3.90	
20.5	.0			2.55	
28.0	12.0			3.51	
28.0	4.0			5.54	
28.0	.0			5.48	
20.5	-5.0			3.13	
24.5	-5.0			2.44	
30.0	.0			8.50	
31.0	12.0			2.16	
34.0	.0			1.73	
2.0	-12.0			5.30	
2.0	12.0			5.30	
12.0	-12.0			3.86	
12.0	12.0			3.93	
30.0	1.0			6.79	
31.0	2.0			6.82	
32.0	2.0			6.38	
32.0	3.0			5.84	
32.0	6.0			2.41	
34.0	1.0			2.18	
34.0	2.0			3.30	
34.0	3.0			3.75	
36.0	.0			2.83	
38.0	.0			2.38	
40.0	.0			1.78	
44.0	12.0			3.45	
42.0	.0				
44.0	.0			1.34	
48.0	.0			1.28	
52.0	.0			1.05	
52.0	12.0			2.32	
55.0	.0			1.09	
58.0	.0			1.02	
58.0	12.0			1.47	
44.0	-12.0			1.85	
36.0	-8.0			2.20	
36.0	-3.0			3.28	
34.0	-3.0			4.58	
32.0	-3.0			5.09	
30.0	-3.0			4.71	
28.0	-3.0			4.21	
34.0	-12.0			2.21	
32.0	-12.0			2.20	
30.0	-12.0			2.20	
19.0	-12.5			3.19	
17.5	-11.0			3.35	
15.5	-2.5			3.69	
16.5	-2.5			3.92	
17.5	-2.5			4.00	
18.5	-2.5			3.67	
19.5	-2.5			3.11	
20.5	-2.5			3.70	
21.5	-2.5			2.74	
22.5	-2.5			2.88	
23.5	-2.5			2.68	
24.5	-2.5			2.39	
		10.55	90		.56
		6.55	90		.68
		4.55	90		.89
		2.55	90		.78
		2.55	180		
		1.55	180		
34.0	-1.0			1.90	
34.0	4.0			4.01	
34.0	5.0			4.06	
34.0	6.0			2.87	
36.0	6.0			3.09	
38.0	1.0			1.77	
38.0	2.0			1.76	
44.0	8.0			2.59	
44.0	6.0			1.78	
44.0	4.0			1.09	
44.0	2.0			.93	
44.0	1.0			1.56	
		10.55	0		.92
		8.55	0		1.24
		6.55	0		1.30
		4.55	0		1.51
		3.55	0		1.57
		2.55	0		1.41
		1.55	0		1.10
		1.05	0		.85
		10.55	45		.89
		6.55	45		.86
		4.55	45		1.07
		2.55	45		1.08

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; b = 1.50 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate

(a) M = 2.65; R = 2.57×10^6

x, in.	y, in.	z, in. [a]	ø, deg [a]							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.89	
12.0	.0									.89	
20.5	.0									.95	
28.0	12.0									.86	
28.0	4.0									1.78	
28.0	.0									2.34	
20.5	-5.0									.83	
24.5	-5.0									.81	
30.0	.0									5.66	
31.0	12.0									.97	
34.0	.0									.41	
2.0	-12.0									.96	
2.0	12.0									.89	
12.0	-12.0									.86	
12.0	12.0									.88	
30.0	1.0									3.77	
31.0	2.0									3.95	
32.0	2.0									4.37	
32.0	3.0									2.72	
32.0	6.0									1.57	
34.0	1.0									.60	
34.0	2.0									2.11	
34.0	3.0									2.82	
36.0	.0									1.77	
38.0	.0									1.87	
40.0	.0									1.66	
44.0	12.0									1.41	
42.0	.0									1.86	
44.0	.0									1.97	
48.0	.0									1.55	
52.0	.0									1.29	
52.0	12.0									1.34	
55.0	.0									1.11	
58.0	.0									1.12	
58.0	12.0									1.10	
46.0	-12.0									1.40	
36.0	-8.0									1.36	
36.0	-3.0									1.90	
34.0	-3.0									2.80	
32.0	-3.0									2.94	
30.0	-3.0									1.97	
28.0	-3.0									2.21	
34.0	-12.0									.98	
32.0	-12.0									.91	
30.0	-12.0									.86	
19.0	-12.5									.82	
17.5	-11.0									.87	
15.5	-2.5									.89	
16.5	-2.5									.82	
17.5	-2.5									.89	
18.5	-2.5									.86	
19.5	-2.5									.85	
20.5	-2.5									.89	
21.5	-2.5									.90	
22.5	-2.5									.90	
23.5	-2.5									.86	
24.5	-2.5									1.05	
		10.55	90								.90
		6.55	90								.62
		4.55	90								1.79
		2.55	90								.68
		10.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.62	
34.0	4.0									2.78	
34.0	5.0									2.27	
34.0	6.0									1.62	
36.0	6.0									2.24	
38.0	1.0									1.20	
38.0	2.0									.95	
44.0	8.0									1.57	
44.0	6.0									1.29	
44.0	4.0									1.00	
44.0	2.0									1.25	
44.0	1.0									1.85	
		10.55	0								1.40
		8.55	0								.96
		6.55	0								.88
		4.55	0								1.65
		3.55	0								1.34
		2.55	0								1.20
		1.55	0								1.03
		1.05	0								.98
		10.55	45								1.18
		6.55	45								.72
		4.55	45								1.27
		2.55	45								.98

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Continued

(b) M = 3.51; R = 2.92×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0									1.12	
12.0	.0									1.03	
20.5	.0									1.02	
28.0	12.0									1.07	
28.0	4.0									2.61	
28.0	.0									2.93	
20.5	-5.0									1.03	
24.5	-5.0									1.07	
30.0	.0									8.09	
31.0	12.0									1.29	
34.0	.0									.47	
2.0	-12.0									1.05	
2.0	12.0									1.10	
12.0	-12.0									1.11	
12.0	12.0									1.02	
30.0	1.0									5.81	
31.0	2.0									6.37	
32.0	2.0									6.53	
32.0	3.0									3.82	
32.0	6.0									2.16	
34.0	1.0									.82	
34.0	2.0									3.64	
34.0	3.0									4.35	
36.0	.0									2.03	
38.0	.0									2.18	
40.0	.0									1.93	
44.0	12.0									1.56	
42.0	.0										
44.0	.0									2.27	
48.0	.0									2.30	
52.0	.0									1.71	
52.0	12.0									2.35	
55.0	.0									1.50	
58.0	.0									1.28	
58.0	12.0									2.05	
44.0	-12.0									1.43	
36.0	-8.0									1.60	
36.0	-3.0									3.05	
34.0	-3.0									4.51	
32.0	-3.0									3.87	
30.0	-3.0									2.77	
28.0	-3.0									2.87	
34.0	-12.0									1.22	
32.0	-12.0									1.26	
30.0	-12.0									1.06	
19.0	-12.5									1.04	
17.5	-11.0									1.11	
15.5	-2.5									1.02	
16.5	-2.5									1.05	
17.5	-2.5									1.04	
18.5	-2.5									1.08	
19.5	-2.5									1.00	
20.5	-2.5									1.03	
21.5	-2.5									1.04	
22.5	-2.5									1.06	
23.5	-2.5									1.04	
24.5	-2.5									1.43	
		10.55	90								1.08
		6.55	90								.64
		4.55	90								1.18
		2.55	90								.84
		10.55	180								
		8.55	180								
		6.55	180								
		4.55	180								
		3.55	180								
		2.55	180								
		1.55	180								
		1.05	180								
34.0	-1.0									.71	
34.0	4.0									3.61	
34.0	5.0									2.56	
34.0	6.0									2.10	
36.0	6.0									2.58	
38.0	1.0									1.60	
38.0	2.0									1.45	
44.0	8.0									2.82	
44.0	6.0									2.22	
44.0	2.0									1.38	
44.0	1.0									2.00	
		10.55	0								2.10
		8.55	0								1.28
		6.55	0								1.11
		4.55	0								1.81
		3.55	0								3.00
		2.55	0								2.89
		1.55	0								1.92
		1.05	0								2.01
		10.55	45								1.76
		6.55	45								.82
		4.55	45								1.41
		2.55	45								1.76

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Continued

(c) M = 3.51; R = 1.34×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.88	
12.0	.0									.79	
20.5	.0									.90	
28.0	12.0									.90	
28.0	4.0									2.31	
28.0	.0									2.50	
20.5	-5.0									.77	
24.5	-5.0									.91	
30.0	.0									9.30	
31.0	12.0									.93	
2.0	-12.0									.86	
2.0	12.0									.94	
12.0	-12.0									.79	
12.0	12.0									.77	
30.0	1.0									6.44	
31.0	2.0									6.99	
32.0	2.0									6.96	
32.0	3.0									3.71	
32.0	6.0									1.86	
34.0	2.0									2.56	
34.0	3.0									3.91	
36.0	.0									1.96	
38.0	.0									2.15	
40.0	.0									1.98	
44.0	12.0									1.33	
42.0	.0										
44.0	.0									1.82	
48.0	.0									1.42	
52.0	.0									1.58	
52.0	12.0									1.97	
55.0	.0									1.42	
58.0	.0									.91	
58.0	12.0									1.73	
44.0	-12.0									1.33	
36.0	-8.0									1.47	
36.0	-3.0									2.07	
34.0	-3.0									3.90	
32.0	-3.0									3.90	
30.0	-3.0									2.27	
28.0	-3.0									2.57	
34.0	-12.0									1.07	
32.0	-12.0									1.33	
30.0	-12.0									1.00	
19.0	-12.5									.92	
17.5	-11.0									.84	
15.5	-2.5									.92	
16.5	-2.5									.91	
17.5	-2.5									.73	
18.5	-2.5									.88	
19.5	-2.5									.93	
20.5	-2.5									.92	
21.5	-2.5									.77	
22.5	-2.5									.74	
23.5	-2.5									.79	
24.5	-2.5									1.41	
		10.55	90								.86
		6.55	90								.57
		4.55	90								.93
		2.55	90								.74
		3.55	180								
		1.55	180								
34.0	-1.0									.73	
34.0	4.0									3.39	
34.0	5.0									2.20	
34.0	6.0									1.77	
36.0	6.0									2.08	
38.0	1.0									1.30	
38.0	2.0									.88	
44.0	8.0									2.26	
44.0	6.0									1.88	
44.0	4.0									1.29	
44.0	2.0									1.07	
44.0	1.0									1.76	
		10.55	0								1.62
		8.55	0								1.06
		6.55	0								.79
		4.55	0								1.36
		3.55	0								2.12
		2.55	0								2.01
		1.55	0								1.54
		1.05	0								1.15
		10.55	45								1.35
		6.55	45								.63
		4.55	45								1.19
		2.55	45								1.27

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{0}R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Cap Plate - Concluded

(d) M = 4.44; R = 3.45×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)							$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0									.77	
12.0	.0									.93	
20.5	.0									.66	
28.0	12.0									.64	
28.0	4.0									2.00	
28.0	.0									2.36	
20.5	-5.0									.74	
24.5	-5.0									.93	
30.0	.0									7.74	
31.0	12.0									.92	
2.0	-12.0									.80	
2.0	12.0									.86	
12.0	-12.0									.79	
12.0	12.0									.73	
30.0	1.0									4.88	
31.0	2.0									5.68	
32.0	2.0									6.24	
32.0	3.0									3.09	
32.0	6.0									1.57	
34.0	1.0									.63	
34.0	2.0									2.98	
34.0	3.0									3.48	
36.0	.0									1.58	
38.0	.0									1.71	
40.0	.0									1.68	
44.0	12.0									1.07	
42.0	.0										
44.0	.0									1.65	
48.0	.0									2.04	
52.0	.0									1.58	
52.0	12.0									2.03	
55.0	.0									1.33	
58.0	.0									1.18	
58.0	12.0									2.02	
44.0	-12.0									.92	
36.0	-8.0									1.25	
36.0	-3.0									2.72	
34.0	-3.0									3.89	
32.0	-3.0									3.46	
30.0	-3.0									1.64	
28.0	-3.0									2.12	
34.0	-12.0									.92	
32.0	-12.0									.80	
30.0	-12.0									1.01	
19.0	-12.5									.85	
17.5	-11.0									.67	
15.5	-2.5									.77	
16.5	-2.5									.87	
17.5	-2.5									.83	
18.5	-2.5									.87	
19.5	-2.5									.87	
20.5	-2.5									.94	
21.5	-2.5									.76	
22.5	-2.5									.72	
23.5	-2.5									.88	
24.5	-2.5									1.58	
		10.55	90								.44
		6.55	90								.37
		4.55	90								.42
		2.55	90								.59
34.0	-1.0									.75	
34.0	4.0									2.66	
34.0	5.0									1.72	
34.0	6.0									1.40	
36.0	6.0									1.59	
38.0	1.0									1.27	
38.0	2.0									.98	
44.0	8.0									2.37	
44.0	6.0									2.05	
44.0	4.0									1.30	
44.0	2.0									1.08	
44.0	1.0									1.81	
		10.55	0								1.08
		8.55	0								.62
		6.55	0								.57
		4.55	0								.84
		3.55	0								1.43
		2.55	0								1.75
		1.55	0								1.28
		1.05	0								.89
		10.55	45								.93
		6.55	45								.50
		2.55	45								1.23

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder

(a) M = 2.65; R = 4.00 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	T_e/T_t	T_w, °R	h (b)	N_{St}	t_c (b)	$N_{St,c}$	h/h_U	h/h_L
2.0	.0			.94715	574.9	.00474	.000667			1.00	
12.0	.0			.94544	572.2	.00438	.000617			.99	
20.5	.0			.94544	572.5	.00453	.000638			1.02	
28.0	12.0			.94090	570.5	.00468	.000656			1.01	
28.0	4.0			.94544	572.5	.00459	.000646			.97	
28.0	.0			.95169	580.9	.00562	.000791			1.26	
20.5	-5.0			.94544	572.2	.00454	.000639			1.00	
24.5	-5.0			.94431	571.5	.00447	.000629			1.04	
30.0	.0			.97385	608.2	.00992	.001396	.00804	.001413	2.19	
31.0	12.0			.94317	571.5	.00449	.000632			.98	
34.0	.0			.93010	580.2	.00742	.001044	.00720	.001014	1.78	
2.0	-12.0			.94885	574.5	.00472	.000664			1.04	
2.0	12.0			.94771	574.9	.00482	.000679			1.01	
12.0	-12.0			.95112	576.7	.00458	.000645			.98	
12.0	12.0			.94431	572.9	.00470	.000662			.98	
30.0	1.0			.96540	603.2	.00980	.001380			2.24	
31.0	2.0			.95794	594.9	.00896	.001261			2.03	
32.0	2.0			.95681	595.5	.00898	.001264	.00907	.001277	2.07	
32.0	3.0			.94431	582.9	.00770	.001084			1.68	
32.0	6.0			.94771	575.9	.00503	.000708			1.11	
34.0	1.0			.94146	578.2	.00693	.000976	.00682	.000960	1.55	
34.0	2.0			.93919	586.2	.00983	.001384	.01004	.001413	2.15	
34.0	3.0			.93749	583.5	.00948	.001334	.00952	.001340	2.08	
36.0	.0			.91305	563.2	.00680	.000957	.00669	.000942		
38.0	.0			.92214	568.5	.00714	.001005	.00716	.001008	1.66	
40.0	.0			.92783	570.5	.00723	.001018	.00723	.001018		
44.0	12.0			.95453	578.5	.00459	.000646			1.02	
42.0	.0			.93124	572.5	.00702	.000988	.00700	.000985	1.64	
44.0	.0			.94317	578.9	.00647	.000911	.00650	.000915	1.49	
48.0	.0			.94601	578.5	.00603	.000849	.00603	.000849	1.40	
52.0	.0			.94487	576.2	.00558	.000785	.00558	.000785	1.25	
52.0	12.0			.93976	570.5	.00491	.000691			1.11	
56.0	.0			.94715	577.2	.00569	.000801	.00569	.000801	1.27	
58.0	.0			.94999	578.5	.00536	.000755			1.10	
58.0	12.0			.93521	566.5	.00462	.000650			.93	
58.0	-12.0			.93635	566.9	.00458	.000645			1.01	
44.0	-12.0			.95794	578.5	.00422	.000594			.98	
36.0	-8.0			.95226	576.2	.00454	.000639			1.08	
36.0	-3.0			.93805	578.5	.00734	.001032			1.75	
34.0	-3.0			.93976	583.5	.00876	.001233	.00878	.001236	2.09	
32.0	-3.0			.94658	583.9	.00734	.001033	.00732	.001030	1.68	
30.0	-3.0			.95397	586.9	.00680	.000957	.00588	.000968	1.55	
28.0	-3.0			.95112	575.2	.00444	.000625			1.02	
34.0	-12.0			.94658	572.9	.00439	.000618	.00439	.000618	1.00	
32.0	-12.0			.94658	572.9	.00431	.000607	.00431	.000607	.99	
30.0	-12.0			.94885	573.9	.00434	.000611	.00434	.000611	.98	
19.0	-12.5			.94828	574.2	.00430	.000633			.96	
17.5	-11.0			.94828	574.5	.00440	.000619			.98	
15.5	-2.5			.95056	576.5	.00467	.000657			.99	
16.5	-2.5			.94431	572.2	.00443	.000624	.00434	.000611	1.00	
17.5	-2.5			.94317	571.9	.00458	.000645	.00450	.000633	1.00	
18.5	-2.5			.95056	575.5	.00447	.000629	.00461	.000649	1.01	
19.5	-2.5			.94374	571.9	.00455	.000640	.00449	.000632	1.00	
20.5	-2.5			.94260	571.2	.00457	.000643	.00451	.000635	1.01	
21.5	-2.5			.94601	573.2	.00452	.000636	.00461	.000649	1.00	
22.5	-2.5			.94260	570.9	.00436	.000614	.00430	.000605	.98	
23.5	-2.5			.94317	571.2	.00439	.000618	.00438	.000617	.98	
24.5	2.5			.94487	572.2	.00447	.000629			1.03	
36.0	-16.0			.94431	570.2	.00421	.000593			1.02	
36.0	-12.0			.94374	570.5	.00444	.000625	.00443	.000624	1.05	
32.0	-18.0			.94885	572.9	.00440	.000619			1.06	
12.0	-16.0			.94544	571.9	.00462	.000650	.00462	.000650	1.00	
32.0	-14.0			.94658	571.2	.00414	.000583	.00413	.000581	1.00	
32.0	-10.0			.94487	571.5	.00432	.000608			.99	
28.0	-14.0			.94431	570.9	.00432	.000608			.98	
28.0	-12.0			.95567	574.2	.00421	.000592			.76	
26.0	-12.5			.94715	572.9	.00442	.000622			1.01	
24.5	-11.0			.94544	571.2	.00412	.000580			.91	
22.0	-12.5			.94715	572.9	.00447	.000629	.00447	.000629	1.00	
20.5	11.0			.94601	572.2	.00444	.000625	.00444	.000625	1.02	
14.0	-1.0			.95169	581.9	.00609	.000857	.00617	.000869	1.57	
14.0	4.0			.94090	578.2	.00675	.000947	.00671	.000945	1.51	
34.0	5.0			.93805	574.2	.00611	.000860	.00630	.000887	1.75	
34.0	6.0			.94601	576.9	.00540	.000760	.00544	.000766	1.18	
34.0	6.0			.93805	571.9	.00547	.000770			1.20	
36.0	6.0			.93294	569.2	.00579	.000815	.00585	.000823	1.36	
38.0	1.0			.93521	567.5	.00497	.000700			1.13	
48.0	2.0			.92365	562.5	.00521	.000733	.00519	.000731	1.15	
44.0	8.0			.91987	561.5	.00591	.000832	.00589	.000829	1.31	
44.0	6.0			.93010	565.2	.00509	.000717	.00507	.000714	1.18	
44.0	4.0			.94090	573.5	.00537	.000756	.00540	.000760	1.21	
44.0	2.0			.94203	575.9	.00582	.000819	.00581	.000818	1.42	
44.0	1.0			.94090	575.9	.00582	.000819	.00581	.000818	1.42	
		1.10	0	.98352	647.9	.02335	.001667				.99
		1.60	0	.99033	657.2	.02563	.001552	.02527	.003557		1.11
		2.60	0	.99772	664.8	.02617	.003684	.02831	.003985		1.11
		3.60	0	1.00284	670.9	.01719	.002420	.01687	.002375		.73
		4.60	0	.99843	667.9	.01590	.002252	.01567	.002206		.69
		6.60	0	1.00000	669.2	.01660	.002337	.01661	.002338		.71
		8.60	0	1.00000	669.2	.01703	.002397	.01703	.002397		.72
		10.60	0	.99829	668.2	.01777	.002501				.76
		2.60	90	.93805	574.2	.00692	.000974	.00656	.000923		1.24
		4.60	90	.94771	575.9	.00491	.000691	.00462	.000650		.88
		2.60	180	.94953	567.9	.00086	.000121	.00076	.000107		
		4.60	180	.97045	576.2	.00089	.000125	.00088	.000124		

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(b) M = 2.65; R = 2.55 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96342	575.5	.00326	.000714			1.04	
12.0	.0			.95885	571.9	.00289	.000633			.96	
20.5	.0			.95999	572.5	.00293	.000641			1.01	
28.0	12.0			.95485	570.5	.00309	.000677			.98	
28.0	4.0			.95885	572.5	.00291	.000637			.96	
20.5	-5.0			.95999	572.5	.00307	.000672			1.02	
24.5	-5.0			.95942	571.9	.00297	.000650			1.01	
30.0	.0			.97999	600.5	.00667	.001460	.00677	.001482	2.40	
31.0	12.0			.95713	571.2	.00309	.000677			1.01	
34.0	.0			.94342	574.2	.00557	.001219	.00547	.001198	2.00	
2.0	-12.0			.96685	576.5	.00318	.000696			1.04	
2.0	12.0			.96456	576.2	.00326	.000714			1.00	
12.0	-12.0			.96685	576.5	.00305	.000668			1.01	
12.0	12.0			.95713	572.5	.00327	.000716			1.03	
30.0	1.0			.97428	601.9	.00660	.001445			2.23	
31.0	2.0			.96685	589.9	.00615	.001346			2.09	
32.0	2.0			.96456	590.2	.00651	.001425	.00659	.001443	2.35	
32.0	3.0			.95599	580.2	.00528	.001156			1.78	
32.0	6.0			.95999	574.9	.00353	.000773			1.14	
34.0	1.0			.95085	574.2	.00483	.001057	.00469	.001027	1.67	
34.0	2.0			.94799	586.2	.00669	.001465	.00675	.001478	2.20	
34.0	3.0			.94742	579.5	.00616	.001349	.00619	.001355	2.03	
36.0	.0			.92513	565.5	.00517	.001132	.00508	.001112		
38.0	.0			.93199	569.9	.00524	.001147	.00525	.001149	1.77	
40.0	.0			.93770	568.2	.00488	.001068	.00488	.001068		
44.0	12.0			.96742	577.5	.00301	.000659			.99	
42.0	.0			.94227	570.2	.00467	.001022	.00464	.001016	1.59	
44.0	.0			.95562	576.9	.00478	.001047	.00458	.001003	1.70	
48.0	.0			.95827	577.2	.00438	.000959	.00438	.000959	1.48	
52.0	.0			.95770	575.5	.00391	.000856	.00391	.000856	1.29	
52.0	12.0			.95256	569.2	.00309	.000677			1.03	
55.0	.0			.96113	576.5	.00367	.000803	.00367	.000803	1.22	
58.0	.0			.96456	577.9	.00376	.000823			1.24	
58.0	12.0			.94799	566.2	.00306	.000670			.97	
58.0	-12.0			.95085	567.2	.00293	.000641			.97	
44.0	-12.0			.97199	578.9	.00286	.000626			1.05	
36.0	-8.0			.96570	575.9	.00301	.000659			1.05	
36.0	-3.0			.94970	575.5	.00509	.001114			1.82	
34.0	-3.0			.95085	584.9	.00603	.001320	.00605	.001325	2.11	
32.0	-3.0			.95827	580.9	.00517	.001132	.00516	.001130	1.84	
30.0	-3.0			.96513	584.2	.00490	.001073	.00496	.001086	1.65	
28.0	-3.0			.96570	575.9	.00300	.000657			1.10	
34.0	-12.0			.96285	573.2	.00289	.000633	.00289	.000633	1.01	
32.0	-12.0			.96228	573.2	.00283	.000620	.00283	.000620	1.00	
30.0	-12.0			.96342	574.5	.00298	.000652	.00297	.000650	1.01	
19.0	-12.5			.96456	574.5	.00298	.000652			1.02	
17.5	-11.0			.96399	574.9	.00321	.000703			1.07	
15.5	-2.5			.96570	576.5	.00315	.000690			1.04	
16.5	-2.5			.95999	572.5	.00302	.000661	.00295	.000646	1.01	
17.5	-2.5			.95827	572.2	.00305	.000668	.00298	.000652	1.01	
18.5	-2.5			.96570	575.9	.00301	.000659	.00314	.000687	1.01	
19.5	-2.5			.95942	572.2	.00323	.000707	.00318	.000696	1.08	
20.5	-2.5			.95713	571.5	.00309	.000677	.00305	.000668	1.01	
21.5	-2.5			.96113	573.5	.00301	.000659	.00308	.000674	1.00	
22.5	-2.5			.95770	571.2	.00307	.000672	.00303	.000663	1.02	
23.5	-2.5			.95827	571.5	.00323	.000707	.00322	.000705	1.08	
24.5	-2.5			.95999	572.5	.00292	.000639			1.00	
36.0	-16.0			.96113	571.5	.00269	.000589			.99	
36.0	-12.0			.96056	571.5	.00289	.000633	.00288	.000631	.99	
32.0	-18.0			.96570	574.5	.00274	.000600			.96	
32.0	-16.0			.96113	572.5	.00290	.000635	.00289	.000633	1.00	
32.0	-14.0			.96228	572.2	.00282	.000617	.00286	.000626	.98	
32.0	-10.0			.95999	572.2	.00294	.000644			1.00	
28.0	-14.0			.96056	571.9	.00292	.000639			1.00	
28.0	-12.0			.97428	577.9	.00232	.000508			.83	
26.0	-12.5			.96285	573.5	.00304	.000666			1.06	
24.5	-11.0			.96170	572.2	.00273	.000598			.94	
22.0	-12.5			.96228	573.5	.00285	.000624	.00285	.000624	.97	
20.5	-11.0			.96113	572.9	.00296	.000648	.00296	.000648	1.01	
34.0	-1.0			.96228	579.2	.00432	.000946	.00438	.000959	1.62	
34.0	4.0			.95370	576.5	.00465	.001018	.00467	.001022	1.53	
34.0	5.0			.95027	572.5	.00425	.000930	.00415	.000909	1.67	
34.0	6.0			.95770	574.9	.00369	.000808	.00371	.000812	1.22	
36.0	6.0			.96142	576.9	.00377	.000825			1.23	
38.0	1.0			.94570	568.9	.00406	.000889	.00416	.000911	1.37	
38.0	2.0			.94684	566.9	.00333	.000729			1.16	
44.0	8.0			.93655	561.2	.00355	.000777	.00353	.000773	1.18	
44.0	6.0			.93513	560.9	.00411	.000900	.00409	.000895	1.37	
44.0	4.0			.94399	565.2	.00351	.000768	.00350	.000766	1.18	
44.0	2.0			.95513	572.5	.00380	.000832	.00381	.000834	1.28	
44.0	1.0			.95542	574.9	.00437	.000957	.00438	.000959	1.59	
		1.10	0	.98285	645.5	.01750	.003831				.92
		1.60	0	.99142	656.9	.01914	.004190	.01925	.004214		1.00
		2.60	0	.99428	656.5	.02159	.004727	.02321	.005081		1.13
		3.60	0	1.00400	638.6	.01383	.003028	.01357	.002971		.72
		4.60	0	1.00171	642.5	.01247	.002730	.01278	.002798		.65
		6.60	0	1.00285	638.2	.01376	.003010	.01377	.003015		.72
		8.60	0	1.00342	638.5	.01373	.003006	.01372	.003004		.72
		10.60	0	1.00000	640.5	.01508	.003302				.79
		2.60	90	.94342	570.5	.00542	.001187	.00511	.001119		1.19
		4.60	90	.95713	571.5	.00381	.000834	.00356	.000779		.84
		2.60	180	.96342	563.9	.00065	.000142	.00059	.000129		
		4.60	180	.97885	572.9	.00062	.000136	.00062	.000136		

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(c) M = 2.65; R = 1.29×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.98746	586.5	.00154	.000669			.96	
12.0	.0			.98176	580.9	.00152	.000661			1.01	
20.5	.0			.98461	582.2	.00141	.000613			.93	
28.0	12.0			.97891	578.9	.00158	.000687			1.01	
28.0	4.0			.98461	582.2	.00148	.000643			1.01	
20.5	-5.0			.98461	583.5	.00153	.000665			1.03	
24.5	-5.0			.98518	581.9	.00137	.000595			1.01	
30.0	.0			.98461	592.9	.00392	.001704	.00396	.001721	2.65	
31.0	12.0			.98062	579.9	.00152	.000661			1.07	
34.0	.0			.95611	576.5	.00304	.001321	.00296	.001287	2.32	
2.0	-12.0			.99145	586.5	.00156	.000678			1.00	
2.0	12.0			.98803	585.5	.00165	.000717			.90	
12.0	-12.0			.98974	585.5	.00151	.000656			1.07	
12.0	12.0			.98005	583.2	.00158	.000687			.99	
30.0	1.0			.98062	590.5	.00364	.001582			2.76	
31.0	2.0			.97435	585.2	.00340	.001478			2.30	
32.0	2.0			.97150	584.9	.00364	.001582	.00369	.001604	2.80	
32.0	3.0			.96808	579.2	.00290	.001260			1.90	
32.0	6.0			.98119	581.9	.00188	.000817			1.32	
34.0	1.0			.96010	573.2	.00269	.001169	.00258	.001121	2.01	
34.0	2.0			.95896	577.5	.00353	.001534	.00361	.001569	2.49	
34.0	3.0			.96124	580.9	.00364	.001582	.00362	.001573	2.55	
36.0	.0			.94358	567.5	.00291	.001265	.00285	.001239		
38.0	.0			.95042	568.5	.00304	.001321	.00304	.001321	2.27	
40.0	.0			.95554	573.2	.00284	.001234	.00284	.001234		
44.0	12.0			.99088	585.9	.00149	.000648			1.10	
42.0	.0			.95896	572.9	.00282	.001226	.00279	.001213	2.07	
44.0	.0			.97321	580.5	.00260	.001130	.00262	.001139	1.91	
46.0	.0			.97891	582.5	.00204	.000887	.00204	.000887	1.41	
52.0	.0			.98119	583.9	.00201	.000874	.00201	.000874	1.37	
52.0	12.0			.97492	577.9	.00155	.000674			1.05	
55.0	.0			.98461	583.9	.00199	.000865	.00199	.000865	1.43	
58.0	.0			.98917	586.5	.00185	.000804			1.32	
58.0	12.0			.97207	574.9	.00144	.000626			.94	
58.0	-12.0			.97492	576.2	.00132	.000574			.86	
44.0	-12.0			.99544	587.9	.00145	.000630			.99	
36.0	-8.0			.98860	584.2	.00140	.000608			.95	
36.0	-3.0			.96580	577.2	.00268	.001165			1.82	
34.0	-3.0			.96409	579.5	.00334	.001452	.00335	.001456	2.53	
32.0	-3.0			.97093	580.2	.00287	.001247	.00285	.001239	1.94	
30.0	-3.0			.98005	585.5	.00253	.001100	.00255	.001108	1.71	
28.0	-3.0			.99031	584.9	.00148	.000643			1.01	
34.0	-12.0			.98746	583.2	.00137	.000595	.00137	.000595	1.04	
32.0	-12.0			.98689	582.9	.00146	.000635	.00146	.000635	1.07	
30.0	-12.0			.98803	585.2	.00152	.000661	.00151	.000656	1.04	
19.0	-12.5			.98803	583.9	.00138	.000600			1.01	
17.5	-11.0			.98860	584.2	.00150	.000652			1.09	
15.5	-2.5			.98974	585.2	.00163	.000708			1.12	
16.5	-2.5			.98404	581.5	.00136	.000591	.00130	.000565	.93	
17.5	-2.5			.98290	581.5	.00140	.000608	.00132	.000574	.95	
18.5	-2.5			.99031	586.9	.00152	.000661	.00164	.000713	1.10	
19.5	-2.5			.98404	581.5	.00137	.000595	.00132	.000574	.93	
20.5	-2.5			.98290	580.9	.00139	.000604	.00133	.000578	.99	
21.5	-2.5			.98632	583.2	.00163	.000708	.00171	.000743	1.10	
22.5	-2.5			.98347	580.9	.00139	.000604	.00133	.000578	1.01	
23.5	-2.5			.98347	581.2	.00147	.000639	.00147	.000639	.99	
24.5	-2.5			.98461	583.5	.00153	.000665			1.03	
36.0	-16.0			.98461	581.2	.00130	.000565			1.00	
36.0	-12.0			.98632	582.2	.00146	.000635	.00146	.000635	.99	
32.0	-18.0			.98860	583.9	.00146	.000635			.99	
32.0	-16.0			.98518	581.9	.00147	.000639	.00146	.000635	1.13	
32.0	-14.0			.98689	582.5	.00146	.000635	.00146	.000635	1.13	
32.0	-10.0			.98575	584.9	.00138	.000600			1.01	
28.0	-14.0			.98461	581.5	.00147	.000639			.99	
28.0	-12.0			.99715	589.9	.00112	.000487			.85	
26.0	-12.5			.98746	585.9	.00138	.000600			1.04	
24.5	-11.0			.98632	582.5	.00130	.000565			1.00	
22.0	-12.5			.98689	584.5	.00141	.000613	.00141	.000613	.95	
20.5	-11.0			.98575	583.9	.00141	.000613	.00141	.000613	.95	
34.0	-1.0			.97207	578.9	.00237	.001030	.00243	.001056	1.85	
34.0	4.0			.97036	579.2	.00263	.001143	.00269	.001169	1.78	
34.0	5.0			.97036	577.2	.00206	.000895	.00197	.000856	1.41	
34.0	6.0			.97663	579.9	.00196	.000852	.00196	.000852	1.39	
36.0	6.0			.97264	577.2	.00190	.000826			1.28	
38.0	1.0			.96523	574.2	.00227	.000987	.00241	.001047	1.53	
38.0	2.0			.96637	572.5	.00170	.000739			1.23	
44.0	8.0			.95896	568.5	.00185	.000804	.00182	.000791	1.31	
44.0	6.0			.95497	569.2	.00196	.000852	.00193	.000839	1.27	
44.0	4.0			.96637	572.9	.00187	.000813	.00187	.000813	1.33	
44.0	2.0			.97321	578.2	.00188	.000817	.00190	.000826	1.34	
44.0	1.0			.97435	579.5	.00221	.000961	.00214	.000930	1.64	
		1.10	0	.97891	627.2	.01204	.005233				.89
		1.60	0	.98803	631.9	.01455	.006324	.01476	.006415		1.08
		2.60	0	.98803	634.5	.01491	.006480	.01590	.006911		1.10
		3.60	0	1.00284	631.9	.00930	.004042	.00914	.003973		.69
		4.60	0	1.00056	629.5	.00895	.003890	.00939	.004081		.66
		6.60	0	1.00113	626.2	.00992	.004312	.00993	.004316		.73
		8.60	0	1.00113	632.2	.00946	.004112	.00947	.004116		.70
		10.60	0	.99715	624.5	.01006	.004372				.74
		2.60	90	.95099	569.5	.00344	.001495	.00317	.001378		1.07
		4.60	90	.96580	574.5	.00263	.001143	.00241	.001047		.82
		2.60	180	.97435	569.2	.00024	.000104				
		4.60	180	.98803	578.5	.00034	.000148				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(d) M = 3.51; R = 4.12×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96072	573.2	.00262	.000503			1.01	
12.0	.0			.95332	567.9	.00247	.000475			1.05	
20.5	.0			.95616	569.2	.00246	.000473			.99	
28.0	12.0			.94933	565.5	.00260	.000500			1.00	
28.0	4.0			.95503	569.2	.00239	.000459			.96	
20.5	-5.0			.95673	569.9	.00245	.000471			1.05	
24.5	-5.0			.95673	571.5	.00239	.000459			.99	
30.0	.0			.97438	595.9	.00574	.001103	.00583	.001120	2.51	
31.0	12.0			.95161	567.2	.00243	.000467			.96	
34.0	.0			.94079	569.5	.00459	.000882	.00444	.000853	1.93	
2.0	-12.0			.96584	575.9	.00244	.000469			.99	
2.0	12.0			.96015	571.9	.00241	.000463			.95	
12.0	-12.0			.96299	574.2	.00274	.000526			1.11	
12.0	12.0			.95047	565.9	.00256	.000492			.99	
30.0	1.0			.96812	591.9	.00583	.001120			2.40	
31.0	2.0			.95673	582.9	.00537	.001032			2.29	
32.0	2.0			.95275	580.5	.00568	.001091	.00569	.001093	2.39	
32.0	3.0			.94478	572.9	.00484	.000930			1.89	
32.0	6.0			.95275	570.5	.00298	.000573			1.17	
34.0	1.0			.94136	571.5	.00487	.000936	.00484	.000930	1.96	
34.0	2.0			.93396	574.9	.00708	.001360	.00698	.001341	2.82	
34.0	3.0			.93112	568.2	.00559	.001074	.00542	.001041	2.17	
36.0	.0			.91859	556.2	.00470	.000903	.00462	.000888		
38.0	.0			.92429	560.2	.00455	.000874	.00456	.000876	1.83	
40.0	.0			.93055	562.2	.00427	.000820	.00427	.000820		
44.0	12.0			.95958	571.5	.00254	.000488			1.12	
42.0	.0			.93396	567.5	.00419	.000805	.00417	.000801	1.68	
44.0	.0			.94706	570.5	.00383	.000736	.00385	.000740	1.64	
48.0	.0			.95161	571.2	.00328	.000630	.00328	.000630	1.40	
52.0	.0			.95161	572.5	.00316	.000607	.00316	.000607	1.28	
52.0	12.0			.94990	566.9	.00263	.000505			1.13	
55.0	.0			.95559	570.5	.00294	.000565	.00294	.000565	1.19	
58.0	.0			.96072	572.5	.00257	.000494			1.04	
58.0	12.0			.93624	559.9	.00277	.000532			1.12	
58.0	-12.0			.93795	561.2	.00278	.000534			1.15	
44.0	-12.0			.96584	575.5	.00228	.000438			1.01	
36.0	-8.0			.95844	571.9	.00260	.000500			1.11	
36.0	-3.0			.93510	573.5	.00559	.001074			2.33	
34.0	-3.0			.93510	573.5	.00558	.001072	.00556	.001068	2.41	
32.0	-3.0			.94649	576.9	.00477	.000917	.00475	.000913	2.05	
30.0	-3.0			.96072	581.5	.00483	.000928	.00473	.000909	1.96	
28.0	-3.0			.96186	574.5	.00248	.000477			1.02	
34.0	-12.0			.95901	570.9	.00242	.000465	.00242	.000465	1.03	
32.0	-12.0			.95844	573.2	.00251	.000482	.00251	.000482	1.03	
30.0	-12.0			.95958	571.9	.00227	.000436	.00225	.000432	.94	
19.0	-12.5			.96072	572.5	.00237	.000455			1.03	
17.5	-11.0			.96129	572.5	.00232	.000446			.96	
15.5	-2.5			.96072	572.2	.00235	.000452			.96	
16.5	-2.5			.95559	568.5	.00234	.000450	.00228	.000438	1.00	
17.5	-2.5			.95332	567.9	.00259	.000498	.00251	.000482	1.04	
18.5	-2.5			.96072	571.9	.00225	.000432	.00238	.000457	.93	
19.5	-2.5			.95559	568.9	.00243	.000467	.00239	.000459	.99	
20.5	-2.5			.95332	567.9	.00259	.000498	.00253	.000486	1.08	
21.5	-2.5			.95844	570.5	.00257	.000494	.00265	.000509	1.06	
22.5	-2.5			.95446	567.9	.00242	.000465	.00237	.000455	.95	
23.5	-2.5			.95503	568.2	.00242	.000465	.00241	.000463	.98	
24.5	-2.5			.95673	569.5	.00242	.000465			1.04	
36.0	-16.0			.95730	569.9	.00242	.000465			1.07	
36.0	-12.0			.95673	569.9	.00243	.000467	.00243	.000467	1.06	
32.0	-18.0			.96129	572.2	.00225	.000432			.99	
32.0	-16.0			95844	570.5	.00236	.000453	.00235	.000452	.98	
32.0	-14.0			.95958	572.9	.00227	.000436	.00227	.000436	.95	
32.0	-10.0			.95730	570.2	.00224	.000430			.92	
28.0	-14.0			.95844	570.9	.00237	.000455			.98	
28.0	-12.0			.97495	578.2	.00177	.000340			.77	
26.0	-12.5			.96015	572.2	.00239	.000459			1.03	
24.5	-11.0			.95958	570.9	.00234	.000450			1.06	
22.0	-12.5			.96015	571.9	.00236	.000453	.00236	.000453	.98	
20.5	-11.0			.95901	573.5	.00240	.000461	.00240	.000461	1.05	
34.0	-1.0			.95389	576.2	.00433	.000832	.00448	.000861	1.94	
34.0	4.0			.94364	569.2	.00404	.000776	.00409	.000786	1.62	
34.0	5.0			.94307	567.5	.00393	.000755	.00387	.000744	2.14	
34.0	6.0			.94933	572.2	.00330	.000634	.00331	.000636	1.32	
36.0	6.0			.94478	566.9	.00338	.000649			1.34	
38.0	1.0			.93738	563.2	.00360	.000692	.00371	.000713	1.46	
38.0	2.0			.93396	560.5	.00359	.000690			1.50	
44.0	8.0			.93112	559.5	.00324	.000623	.00321	.000617	1.30	
44.0	6.0			.92827	561.2	.00444	.000853	.00445	.000855	1.81	
44.0	4.0			.93567	561.5	.00323	.000621	.00320	.000615	1.30	
44.0	2.0			.94136	566.2	.00360	.000692	.00360	.000692	1.45	
44.0	1.0			.94535	568.5	.00375	.000721	.00376	.000722	1.58	
		1.10	0	.97836	661.9	.02677	.005144				1.34
		1.60	0	.98349	672.8	.03018	.005799	.03127	.006008		1.51
		2.60	0	1.00740	660.2	.02172	.004173	.02284	.004389		1.08
		3.60	0	1.00341	652.5	.01529	.002938	.01497	.002876		.76
		4.60	0	1.00056	640.9	.01564	.003005	.01555	.002988		.78
		6.60	0	1.00056	641.2	.01572	.003020	.01571	.003019		.78
		8.60	0	1.00056	643.9	.01719	.003303	.01724	.003313		.86
		10.60	0	.99715	636.9	.01461	.002807				.73
		2.60	90	.94478	571.9	.00542	.001041	.00510	.000980		1.14
		4.60	90	.95047	570.2	.00383	.000736	.00378	.000726		.80
		2.60	180	.95844	561.2	.00048	.000092	.00039	.000075		
		4.60	180	.97096	568.5	.00037	.000071				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(e) M = 3.51; R = 2.87×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.97086	574.5	.00197	.000542			1.06	
12.0	.0			.96173	569.9	.00184	.000506			1.09	
20.5	.0			.96515	571.5	.00183	.000503			1.09	
28.0	12.0			.95773	566.2	.00184	.000506			1.00	
28.0	4.0			.96401	569.9	.00179	.000492			1.02	
20.5	-5.0			.96630	570.5	.00173	.000476			.96	
24.5	-5.0			.96572	569.9	.00168	.000462			1.02	
30.0	.0			.97429	588.2	.00472	.001299	.00477	.001312	2.84	
31.0	12.0			.96058	567.9	.00177	.000487			.99	
34.0	.0			.94630	566.9	.00358	.000985	.00348	.000957	2.25	
2.0	-12.0			.97658	577.2	.00175	.000481			1.00	
2.0	12.0			.96915	573.5	.00196	.000539			1.08	
12.0	-12.0			.97258	574.5	.00180	.000495			1.09	
12.0	12.0			.95830	566.2	.00183	.000503			1.01	
30.0	1.0			.96972	585.5	.00449	.001235			2.48	
31.0	2.0			.95830	577.2	.00422	.001161			2.41	
32.0	2.0			.95373	574.5	.00446	.001227	.00446	.001227	2.74	
32.0	3.0			.94859	572.5	.00376	.001034			2.09	
32.0	6.0			.95944	569.9	.00237	.000652			1.31	
34.0	1.0			.94516	567.2	.00386	.001062	.00382	.001051	2.19	
34.0	2.0			.93831	574.2	.00546	.001502	.00561	.001543	3.02	
34.0	3.0			.93602	564.5	.00440	.001210	.00424	.001166	2.43	
36.0	.0			.92574	558.2	.00351	.000966	.00344	.000946		
38.0	.0			.93088	561.2	.00348	.000957	.00348	.000957	2.10	
40.0	.0			.93602	560.2	.00344	.000946	.00344	.000946		
44.0	12.0			.96687	572.2	.00196	.000539			1.15	
42.0	.0			.94002	561.9	.00312	.000858	.00309	.000850	1.88	
44.0	.0			.95373	568.5	.00287	.000790	.00289	.000795	1.77	
48.0	.0			.96001	570.5	.00256	.000704	.00256	.000704	1.43	
52.0	.0			.95944	569.2	.00218	.000600	.00218	.000600	1.34	
52.0	12.0			.95773	566.9	.00184	.000506			1.12	
55.0	.0			.96344	570.5	.00206	.000567	.00205	.000564	1.26	
58.0	.0			.97086	573.9	.00193	.000531			1.18	
58.0	12.0			.94516	559.9	.00193	.000531			1.10	
58.0	-12.0			.94745	561.2	.00203	.000558			1.12	
44.0	-12.0			.97486	575.9	.00170	.000468			1.04	
36.0	-8.0			.96630	571.2	.00194	.000534			1.22	
36.0	-3.0			.94116	566.5	.00410	.001128			2.29	
34.0	-3.0			.94002	565.9	.00433	.001191	.00431	.001186	2.72	
32.0	-3.0			.95030	569.2	.00351	.000966	.00348	.000957	2.13	
30.0	-3.0			.96515	578.2	.00350	.000963	.00367	.000982	1.93	
28.0	-3.0			.97029	572.9	.00177	.000487			1.09	
34.0	-12.0			.96858	571.9	.00171	.000470	.00171	.000470	1.06	
32.0	-12.0			.96744	571.9	.00171	.000470	.00171	.000470	.94	
30.0	-12.0			.96972	572.9	.00180	.000495	.00181	.000498	1.00	
19.0	-12.5			.97029	573.2	.00171	.000470			1.08	
17.5	-11.0			.97029	573.5	.00180	.000495			1.12	
15.5	-2.5			.96915	572.5	.00178	.000490			1.02	
16.5	-2.5			.96458	568.9	.00169	.000465	.00164	.000451	1.04	
17.5	-2.5			.96287	570.5	.00183	.000503	.00175	.000481	1.08	
18.5	-2.5			.97029	572.9	.00179	.000492	.00191	.000525	1.10	
19.5	-2.5			.96458	569.5	.00176	.000484	.00172	.000473	1.07	
20.5	-2.5			.96287	572.2	.00178	.000490	.00171	.000470	1.01	
21.5	-2.5			.96744	571.2	.00180	.000495	.00188	.000517	1.10	
22.5	-2.5			.96401	572.5	.00177	.000487	.00173	.000476	1.07	
23.5	-2.5			.96458	569.2	.00165	.000454	.00163	.000448	.98	
24.5	-2.5			.96687	570.5	.00180	.000495			1.13	
36.0	-16.0			.96687	571.2	.00166	.000457			1.05	
36.0	-12.0			.96687	571.2	.00162	.000446	.00162	.000446	1.02	
32.0	-18.0			.97086	573.9	.00168	.000462			1.08	
32.0	-16.0			.96744	571.5	.00167	.000459	.00166	.000457	1.04	
32.0	-14.0			.96858	571.5	.00163	.000448	.00163	.000448	1.00	
32.0	-10.0			.96744	571.2	.00166	.000457			1.03	
28.0	-14.0			.96744	571.5	.00166	.000457			1.04	
28.0	-12.0			.96915	572.2	.00167	.000459			1.05	
26.0	-12.5			.96972	572.9	.00180	.000495			1.09	
24.5	-11.0			.96858	571.5	.00164	.000451			1.04	
22.0	-12.5			.96972	572.9	.00171	.000470	.00171	.000470	1.08	
20.5	-11.0			.96915	572.2	.00171	.000470	.00171	.000470	1.04	
34.0	-1.0			.95716	572.5	.00346	.000952	.00357	.000982	2.22	
34.0	4.0			.95087	567.5	.00293	.000806	.00300	.000825	1.75	
34.0	5.0			.95030	566.5	.00276	.000759	.00272	.000748	1.90	
34.0	6.0			.95544	572.5	.00242	.000666	.00242	.000666	1.41	
36.0	6.0			.95316	566.5	.00250	.000688			1.45	
38.0	1.0			.94402	562.5	.00276	.000759	.00288	.000792	1.52	
38.0	2.0			.94116	559.5	.00269	.000740			1.49	
44.0	8.0			.93945	558.9	.00246	.000677	.00243	.000669	1.49	
44.0	6.0			.93545	562.9	.00333	.000916	.00331	.000911	1.88	
44.0	4.0			.94345	560.9	.00245	.000674	.00243	.000669	1.45	
44.0	2.0			.94916	565.9	.00273	.000751	.00274	.000754	1.66	
44.0	1.0			.95259	567.2	.00263	.000724	.00263	.000724	1.65	
		1.10	0	.97486	642.5	.02397	.006594				1.43
		1.60	0	.98057	665.5	.02721	.007486	.02826	.007775		1.62
		2.60	0	1.00285	649.5	.01883	.005180	.01871	.005147		1.12
		3.60	0	1.00114	642.9	.01294	.003560	.01268	.003488		.77
		4.60	0	.99828	639.5	.01285	.003535	.01326	.003648		.77
		6.60	0	.99828	639.9	.01280	.003521	.01279	.003519		.76
		8.60	0	.99771	642.5	.01399	.003849	.01404	.003863		.83
		10.60	0	.99428	627.9	.01268	.003488				.76
		2.60	90	.94630	567.5	.00438	.001205	.00409	.001125		1.10
		4.60	90	.95373	567.9	.00332	.000913	.00309	.000850		.83
		2.60	180	.95887	559.9	.00040	.000110	.00034	.000094		
		4.60	180	.97258	567.9	.00038	.000105				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(f) M = 3.51; R = 1.65×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.98690	583.2	.00121	.000581			1.16	
12.0	.0			.97664	577.9	.00107	.000514			1.07	
20.5	.0			.98063	579.9	.00107	.000514			.88	
28.0	12.0			.97266	573.2	.00116	.000557			1.13	
28.0	4.0			.98006	578.5	.00111	.000533			1.05	
20.5	-5.0			.98291	578.5	.00095	.000456			.91	
24.5	-5.0			.98234	578.2	.00094	.000451			1.08	
30.0	.0			.97380	583.9	.00311	.001493	.00314	.001508	3.57	
31.0	12.0			.97550	575.9	.00112	.000538			1.12	
34.0	.0			.95101	566.5	.00203	.000975	.00194	.000931	2.23	
2.0	-12.0			.99145	584.5	.00114	.000547			1.23	
2.0	12.0			.98348	579.9	.00112	.000538			1.12	
12.0	-12.0			.98803	583.2	.00100	.000480			1.09	
12.0	12.0			.97266	572.9	.00116	.000557			1.15	
30.0	1.0			.97095	581.9	.00304	.001460			3.13	
31.0	2.0			.95899	572.9	.00274	.001316			2.82	
32.0	2.0			.95329	571.2	.00315	.001512	.00315	.001512	3.28	
32.0	3.0			.95671	570.2	.00235	.001128			2.35	
32.0	6.0			.97152	577.5	.00149	.000715			1.51	
34.0	1.0			.94703	565.5	.00261	.001253	.00258	.001239	2.84	
34.0	2.0			.94133	566.5	.00352	.001690	.00358	.001719	2.86	
34.0	3.0			.94190	564.2	.00290	.001392	.00267	.001282	2.90	
36.0	.0			.93563	558.2	.00221	.001061	.00215	.001032		
38.0	.0			.94190	561.2	.00248	.001191	.00248	.001191	2.79	
40.0	.0			.94817	563.5	.00214	.001028	.00214	.001028		
44.0	12.0			.98234	580.9	.00114	.000547			1.13	
42.0	.0			.95158	565.5	.00194	.000931	.00191	.000917	1.58	
44.0	.0			.96696	573.5	.00189	.000907	.00191	.000917	2.05	
48.0	.0			.97493	576.5	.00170	.000816	.00170	.000816	1.77	
52.0	.0			.97493	575.9	.00141	.000677	.00141	.000677	1.38	
52.0	12.0			.97380	575.9	.00107	.000514			1.03	
55.0	.0			.97892	577.9	.00125	.000600	.00124	.000595	1.36	
58.0	.0			.98917	584.2	.00110	.000528			1.15	
58.0	12.0			.96240	567.9	.00123	.000591			1.32	
58.0	-12.0			.96582	571.2	.00114	.000547			1.24	
44.0	-12.0			.99088	586.2	.00097	.000466			1.07	
36.0	-8.0			.98063	577.9	.00121	.000581			1.33	
36.0	-3.0			.95044	567.5	.00260	.001248			2.68	
34.0	-3.0			.94646	565.9	.00275	.001320	.00273	.001311	2.81	
32.0	-3.0			.95443	568.5	.00244	.001172	.00241	.001157	2.65	
30.0	-3.0			.97266	578.9	.00239	.001148	.00242	.001162	2.48	
28.0	-3.0			.98633	580.9	.00100	.000480			1.01	
34.0	-12.0			.98462	579.5	.00106	.000509	.00106	.000509	1.15	
32.0	-12.0			.98405	580.5	.00100	.000480	.00100	.000480	1.14	
30.0	-12.0			.98576	580.5	.00106	.000509	.00107	.000514	1.15	
19.0	-12.5			.98633	580.5	.00105	.000504			1.14	
17.5	-11.0			.98633	580.9	.00106	.000509			1.15	
15.5	-2.5			.98519	580.5	.00113	.000543			1.12	
16.5	-2.5			.98006	577.2	.00106	.000509	.00102	.000490	1.25	
17.5	-2.5			.98006	578.2	.00111	.000533	.00099	.000475	1.11	
18.5	-2.5			.98690	581.2	.00098	.000471	.00113	.000543	1.07	
19.5	-2.5			.98120	579.5	.00106	.000509	.00101	.000485	1.15	
20.5	-2.5			.97892	577.5	.00111	.000533	.00103	.000495	1.21	
21.5	-2.5			.98405	581.9	.00106	.000509	.00117	.000562	1.15	
22.5	-2.5			.98063	578.5	.00100	.000480	.00096	.000461	1.01	
23.5	-2.5			.98063	580.9	.00098	.000471	.00096	.000461	.99	
24.5	-2.5			.98291	578.9	.00106	.000509			1.15	
36.0	-16.0			.98234	579.5	.00100	.000480			1.14	
36.0	-12.0			.98348	580.9	.00098	.000471	.00098	.000471	1.13	
32.0	-18.0			.98519	580.5	.00098	.000471			1.11	
32.0	-16.0			.98291	579.9	.00111	.000533	.00110	.000528	1.14	
32.0	-14.0			.98462	580.5	.00100	.000480	.00100	.000480	1.15	
32.0	-10.0			.98348	579.2	.00091	.000437			.99	
28.0	-14.0			.98348	580.2	.00110	.000528			1.20	
28.0	-12.0			.98576	579.9	.00091	.000437			.99	
26.0	-12.5			.98576	580.2	.00105	.000504			1.21	
24.5	-11.0			.98519	579.5	.00095	.000456			1.08	
22.0	-12.5			.98519	580.2	.00091	.000437	.00091	.000437	.90	
20.5	-11.0			.98405	579.5	.00095	.000456	.00095	.000456	1.03	
34.0	-1.0			.95899	571.5	.00242	.001162	.00253	.001215	3.03	
34.0	4.0			.95899	569.2	.00190	.000912	.00199	.000955	1.92	
34.0	5.0			.96070	569.9	.00180	.000864	.00176	.000845	2.07	
34.0	6.0			.96753	572.2	.00151	.000725	.00150	.000720	1.61	
36.0	6.0			.96582	571.5	.00156	.000749			1.27	
38.0	1.0			.95443	570.5	.00169	.000811	.00187	.000898	1.76	
38.0	2.0			.95215	563.2	.00155	.000744			1.67	
44.0	8.0			.95671	565.5	.00157	.000754	.00156	.000749	1.59	
44.0	6.0			.94873	563.5	.00210	.001008	.00208	.000999	1.71	
44.0	4.0			.95671	566.2	.00158	.000759	.00147	.000706	1.60	
44.0	2.0			.96297	570.9	.00164	.000787	.00164	.000787	1.69	
44.0	1.0			.96582	572.2	.00163	.000783	.00162	.000778	1.68	
		1.10	0	.96696	628.5	.01808	.008681				1.41
		1.60	0	.97493	646.9	.02291	.011000	.02383	.011442		1.79
		2.60	0	.99487	636.5	.01405	.006746	.01427	.006852		1.10
		3.60	0	.99544	625.2	.00984	.004725	.00963	.004624		.77
		4.60	0	.99202	622.2	.01039	.004987	.01040	.004994		.81
		6.60	0	.99202	622.2	.00965	.004633	.00964	.004629		.76
		8.60	0	.99145	624.5	.01039	.004980	.01042	.005003		.81
		10.60	0	.98746	621.2	.01021	.004902				.80
		2.60	90	.94646	565.9	.00328	.001575	.00302	.001450		1.08
		4.60	90	.95557	568.2	.00261	.001253	.00240	.001152		.86
		2.60	180	.95956	561.2	.00034	.000163				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

L-2024

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(g) M = 4.44; R = 4.61 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.95579	578.9	.00178	.000447			2.12	
12.0	.0			.94750	574.5	.00136	.000342			1.62	
20.5	.0			.95026	577.9	.00134	.000337			1.46	
28.0	12.0			.94474	573.9	.00128	.000322			1.02	
28.0	4.0			.95137	576.5	.00135	.000339			1.61	
20.5	-5.0			.95082	577.5	.00123	.000309			1.48	
24.5	-5.0			.95082	577.5	.00132	.000332			1.78	
30.0	.0			.96187	590.2	.00389	.000978	.00397	.000998	4.23	
31.0	12.0			.94805	574.9	.00136	.000342			1.09	
34.0	.0			.93535	570.9	.00268	.000673	.00249	.000626	3.62	
2.0	-12.0			.95690	582.2	.00133	.000334			1.20	
2.0	12.0			.95247	578.5	.00137	.000344				
12.0	-12.0			.95524	579.9	.00125	.000314			1.32	
12.0	12.0			.94419	572.2	.00130	.000327			1.03	
30.0	1.0			.95634	586.9	.00372	.000935			4.43	
31.0	2.0			.94142	576.9	.00363	.000912			4.32	
32.0	2.0			.93590	573.9	.00384	.000965	.00385	.000968	4.57	
32.0	3.0			.93092	568.9	.00302	.000759			2.72	
32.0	6.0			.94419	573.5	.00193	.000485			1.68	
34.0	1.0			.92816	569.5	.00380	.000955	.00384	.000965	4.52	
34.0	2.0			.91877	566.5	.00511	.001284	.00499	.001254	6.08	
34.0	3.0			.91545	560.9	.00364	.000915	.00336	.000844	3.25	
36.0	.0			.91324	557.5	.00310	.000779	.00299	.000751		
38.0	.0			.91490	562.5	.00313	.000787	.00312	.000784	4.23	
40.0	.0			.92153	562.2	.00271	.000681	.00272	.000684		
44.0	12.0			.95303	578.5	.00112	.000281			.94	
42.0	.0			.92540	563.5	.00229	.000575	.00225	.000565	2.69	
44.0	.0			.93866	573.5	.00226	.000568	.00229	.000575	2.72	
48.0	.0			.94529	575.9	.00182	.000457	.00190	.000477	2.07	
52.0	.0			.94584	572.9	.00156	.000392	.00155	.000390	1.70	
52.0	12.0			.94253	570.9	.00141	.000354			1.17	
55.0	.0			.94916	574.5	.00150	.000377	.00149	.000374	1.97	
58.0	.0			.95690	580.5	.00124	.000312			1.48	
58.0	12.0			.93148	565.2	.00186	.000467			1.58	
58.0	-12.0			.93424	566.2	.00167	.000420			1.56	
44.0	-12.0			.95855	580.2	.00116	.000292			1.32	
36.0	-8.0			.94916	574.5	.00152	.000382			1.73	
36.0	-3.0			.91987	563.9	.00380	.000955			4.81	
34.0	-3.0			.92043	563.2	.00367	.000922	.00361	.000907	4.42	
32.0	-3.0			.93369	570.2	.00303	.000761	.00299	.000751	4.09	
30.0	-3.0			.95579	584.2	.00298	.000749	.00312	.000784	4.03	
28.0	-3.0			.95855	581.2	.00134	.000337			1.61	
34.0	-12.0			.95358	579.5	.00120	.000302	.00121	.000304	1.09	
32.0	-12.0			.95303	576.5	.00101	.000254	.00101	.000254	1.20	
30.0	-12.0			.95468	579.2	.00125	.000314	.00127	.000319	1.14	
19.0	-12.5			.95413	577.2	.00101	.000254			1.20	
17.5	-11.0			.95468	579.9	.00132	.000332			1.57	
15.5	-2.5			.95413	577.5	.00143	.000359			1.72	
16.5	-2.5			.95026	574.5	.00126	.000317	.00121	.000304	1.50	
17.5	-2.5			.95026	577.2	.00132	.000332	.00119	.000299	1.78	
18.5	-2.5			.95634	580.2	.00125	.000314			1.60	
19.5	-2.5			.94971	575.2	.00134	.000337	.00127	.000319	1.60	
20.5	-2.5			.94640	573.5	.00135	.000339	.00110	.000276	1.47	
21.5	-2.5			.95358	579.2	.00132	.000332	.00156	.000392	1.78	
22.5	-2.5			.95026	576.5	.00126	.000317	.00120	.000302	1.50	
23.5	-2.5			.94971	576.2	.00126	.000317	.00121	.000304	1.70	
24.5	-2.5			.95247	578.2	.00138	.000347			1.64	
36.0	-16.0			.95137	575.5	.00102	.000256			.92	
36.0	-12.0			.95192	577.9	.00112	.000281	.00112	.000281	1.08	
32.0	-18.0			.95413	579.9	.00123	.000309			1.03	
32.0	-16.0			.95082	576.9	.00113	.000284	.00111	.000279	1.02	
32.0	-14.0			.95303	576.2	.00104	.000261	.00104	.000261	1.13	
32.0	-10.0			.95192	576.2	.00117	.000294			1.10	
28.0	-14.0			.95192	575.9	.00126	.000317			1.14	
28.0	-12.0			.95358	577.2	.00117	.000294			1.39	
26.0	-12.5			.95358	577.5	.00117	.000294			1.09	
24.5	-11.0			.95247	576.5	.00117	.000294			1.41	
22.0	-12.5			.95303	578.2	.00125	.000314	.00125	.000314	1.30	
20.5	-11.0			.95192	577.5	.00125	.000314	.00125	.000314	1.14	
34.0	-1.0			.94087	577.9	.00335	.000842	.00368	.000925	4.09	
34.0	4.0			.93258	567.9	.00233	.000586	.00251	.000631	2.10	
34.0	5.0			.93479	569.2	.00242	.000608	.00238	.000598	3.14	
34.0	6.0			.94032	571.9	.00201	.000505	.00200	.000503	1.72	
36.0	6.0			.93977	570.5	.00194	.000488			1.75	
38.0	1.0			.92816	564.5	.00213	.000535	.00244	.000613	2.54	
38.0	2.0			.91932	559.9	.00223	.000560			2.65	
44.0	8.0			.93203	567.5	.00177	.000445	.00175	.000440	1.57	
44.0	6.0			.92479	564.9	.00308	.000774	.00307	.000772	2.77	
44.0	4.0			.92650	564.2	.00218	.000548	.00215	.000540	1.96	
44.0	2.0			.93092	567.9	.00215	.000540	.00211	.000530	2.56	
44.0	1.0			.93590	570.2	.00212	.000533	.00215	.000540	2.41	
		1.10	0	.96739	632.2	.02785	.006999				1.63
		1.60	0	.97181	640.2	.03202	.008047	.03283	.008250		1.88
		2.60	0	.99668	638.2	.01710	.004297	.01813	.004556		1.00
		3.60	0	.99557	632.9	.01357	.003410	.01347	.003385		.80
		4.60	0	.99226	630.9	.01362	.003423	.01406	.003533		.80
		6.60	0	.99171	629.5	.01251	.003144	.01249	.003139		.73
		8.60	0	.99171	629.9	.01255	.003154	.01260	.003166		.74
		10.60	0	.98950	625.5	.01131	.002842				.66
		2.60	90	.93756	574.5	.00391	.000983	.00353	.000887		.97
		4.60	90	.94363	576.2	.00329	.000827	.00293	.000736		.81
		4.60	180	.96132	578.2	.00037	.000093	.00037	.000093		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Continued

(h) M = 4.44; R = 3.24×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95772	575.5	.00108	.000385			1.00	
20.5	.0			.95216	571.9	.00085	.000303			.98	
28.0	12.0			.94659	569.2	.00108	.000385			1.16	
28.0	4.0			.95327	572.5	.00104	.000370			1.27	
20.5	-5.0			.95327	572.5	.00089	.000317			.99	
30.0	.0			.95772	580.9	.00265	.000944	.00271	.000965	3.23	
31.0	12.0			.94993	573.2	.00088	.000313			.96	
34.0	.0			.93491	568.2	.00192	.000684	.00185	.000659	2.13	
2.0	-12.0			.95994	577.9	.00093	.000331			.98	
2.0	12.0			.95438	574.2	.00111	.000395			1.06	
12.0	-12.0			.95772	576.5	.00106	.000377			1.13	
12.0	12.0			.94548	568.5	.00109	.000388			1.02	
30.0	1.0			.95271	577.5	.00277	.000986			3.30	
31.0	2.0			.93825	568.2	.00248	.000883			2.76	
32.0	2.0			.93380	567.5	.00256	.000912	.00259	.000922	2.84	
32.0	3.0			.92991	562.2	.00223	.000794			2.45	
32.0	6.0			.94437	572.2	.00136	.000484			1.49	
34.0	1.0			.92713	561.9	.00274	.000976	.00277	.000986	3.04	
34.0	2.0			.91711	558.2	.00348	.001239	.00345	.001229	3.82	
34.0	3.0			.91600	559.5	.00261	.000929			3.03	
36.0	.0			.91544	552.9	.00179	.000637	.00169	.000602		
38.0	.0			.91767	554.5	.00179	.000637	.00178	.000634	2.16	
40.0	.0			.92323	557.5	.00177	.000630	.00178	.000634		
44.0	12.0			.95383	572.9	.00104	.000370			1.33	
42.0	.0			.92601	558.9	.00176	.000627	.00171	.000609	1.93	
44.0	.0			.94103	566.9	.00143	.000509	.00146	.000520	1.59	
48.0	.0			.94771	572.5	.00129	.000459	.00130	.000463	1.61	
52.0	.0			.94659	568.9	.00112	.000399	.00111	.000395	1.42	
52.0	12.0			.94493	568.5	.00094	.000335			.99	
55.0	.0			.94993	570.5	.00082	.000292	.00081	.000288	1.04	
58.0	.0			.95772	577.2	.00086	.000306			1.13	
58.0	12.0			.93547	563.2	.00142	.000506			1.56	
58.0	-12.0			.93936	564.2	.00110	.000392			1.45	
44.0	-12.0			.96050	576.2	.00079	.000281			.99	
36.0	-8.0			.94993	570.9	.00090	.000320			1.18	
36.0	-3.0			.92101	558.2	.00245	.000872			3.10	
34.0	-3.0			.92045	557.2	.00238	.000848	.00232	.000826	2.64	
32.0	-3.0			.93213	563.2	.00207	.000737	.00201	.000716	2.30	
30.0	-3.0			.95383	576.5	.00173	.000616	.00182	.000648	2.16	
28.0	-3.0			.96050	580.2	.00104	.000370			1.14	
34.0	-12.0			.95605	574.5	.00089	.000317	.00090	.000320	1.10	
32.0	-12.0			.95605	574.9	.00079	.000281	.00079	.000281	.87	
30.0	-12.0			.95772	575.5	.00089	.000317	.00091	.000324	1.11	
19.0	-12.5			.95661	574.9	.00089	.000317			.98	
17.5	-11.0			.95661	575.5	.00093	.000331			1.18	
15.5	-2.5			.95494	573.2	.00084	.000299			1.04	
16.5	-2.5			.95160	571.5	.00089	.000317	.00083	.000296	.94	
17.5	-2.5			.95104	571.9	.00079	.000281	.00067	.000239	.94	
18.5	-2.5			.95772	575.2	.00071	.000253			.88	
19.5	-2.5			.95104	572.2	.00106	.000377	.00099	.000353	1.31	
20.5	-2.5			.94771	568.9	.00083	.000296			.99	
21.5	-2.5			.95549	573.5	.00089	.000317			.94	
22.5	-2.5			.95216	571.9	.00089	.000317	.00085	.000303	.98	
23.5	-2.5			.95160	571.5	.00089	.000317	.00082	.000292	1.09	
24.5	-2.5			.95438	572.9	.00081	.000288			.89	
36.0	-16.0			.95438	573.2	.00089	.000317			1.20	
36.0	-12.0			.95494	574.2	.00079	.000281	.00080	.000285	1.07	
32.0	-18.0			.95605	574.5	.00081	.000288			.88	
32.0	-16.0			.95327	572.5	.00080	.000285	.00078	.000278	.87	
32.0	-14.0			.95549	573.5	.00076	.000271	.00076	.000271	1.04	
32.0	-10.0			.95438	573.2	.00089	.000317			1.10	
28.0	-14.0			.95494	574.2	.00093	.000331			1.15	
28.0	-12.0			.95549	573.9	.00081	.000288			.89	
26.0	-12.5			.95605	574.9	.00079	.000281			.99	
22.0	-12.5			.95605	574.9	.00079	.000281	.00079	.000281	1.03	
20.5	-11.0			.95494	573.2	.00073	.000260	.00073	.000260	.80	
34.0	-1.0			.93992	569.2	.00238	.000848	.00259	.000922	2.98	
34.0	4.0			.93324	564.2	.00171	.000609	.00193	.000687	1.97	
34.0	5.0			.93603	564.5	.00173	.000616	.00170	.000605	2.70	
34.0	6.0			.94103	566.9	.00142	.000506	.00141	.000502	1.56	
36.0	6.0			.94159	568.5	.00137	.000488			1.44	
38.0	1.0			.92991	561.2	.00151	.000538	.00184	.000655	1.86	
38.0	2.0			.92212	557.9	.00157	.000559			2.12	
44.0	8.0			.93603	563.2	.00142	.000506	.00141	.000502	1.56	
44.0	6.0			.92768	562.9	.00201	.000716	.00199	.000709	2.21	
44.0	4.0			.92991	563.5	.00157	.000559	.00155	.000552	2.07	
44.0	2.0			.93380	563.9	.00151	.000538	.00149	.000531	1.86	
44.0	1.0			.93825	565.2	.00157	.000559	.00158	.000563	1.74	
		1.10	0	.96273	612.5	.01865	.006641				1.33
		1.60	0	.96829	621.5	.02234	.007955	.02276	.008105		1.59
		2.60	0	.99109	620.9	.01173	.004177	.01272	.004530		.83
		3.60	0	.99109	621.9	.01009	.003593	.01004	.003575		.72
		4.60	0	.98720	614.5	.00963	.003429	.01024	.003647		.68
		6.60	0	.98664	613.2	.00914	.003255	.00913	.003251		.65
		8.60	0	.98664	613.2	.00914	.003255	.00917	.003265		.65
		10.60	0	.98442	609.9	.00828	.002949				.59
		2.60	90	.93491	568.5	.00277	.000986	.00243	.000865		.82
		4.60	90	.94103	570.5	.00231	.000823	.00200	.000712		.68

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

9. 1.4-Inch-Diameter Instrumented Cylinder - Concluded

(i) M = 4.44; R = 2.14×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97506	585.9	.00064	.000343			.85	
12.0	.0			.97063	582.2	.00050	.000268			.86	
20.5	.0			.97395	584.2	.00050	.000268			.88	
28.0	12.0			.96841	581.5	.00050	.000268			.91	
28.0	4.0			.97451	584.5	.00056	.000300			.97	
20.5	-5.0			.97395	584.2	.00053	.000284			.85	
24.5	-5.0			.97395	584.2	.00050	.000268			.68	
30.0	.0			.96620	583.5	.00198	.001062	.00203	.001089	3.81	
31.0	12.0			.97063	582.9	.00050	.000268			.98	
34.0	.0			.94569	570.5	.00125	.000670	.00132	.000708	2.19	
2.0	-12.0			.97561	586.2	.00064	.000343			1.14	
2.0	12.0			.97063	583.5	.00056	.000300			.88	
12.0	-12.0			.97783	586.5	.00051	.000274			.85	
12.0	12.0			.96620	580.2	.00052	.000279			.83	
30.0	1.0			.96176	580.9	.00190	.001019			2.57	
31.0	2.0			.94736	571.5	.00162	.000869			2.19	
32.0	2.0			.93960	567.9	.00196	.001051	.00196	.001051	3.44	
32.0	3.0			.93849	566.5	.00144	.000772			1.95	
32.0	6.0			.96176	578.2	.00085	.000456			1.37	
34.0	1.0			.93517	565.2	.00197	.001056	.00197	.001056	3.23	
34.0	2.0			.92575	564.5	.00250	.001341	.00235	.001260	4.10	
34.0	3.0			.92630	560.2	.00184	.000987			2.88	
36.0	.0			.93073	560.2	.00137	.000735	.00128	.000686		
38.0	.0			.93517	564.2	.00161	.000863	.00161	.000863	2.18	
40.0	.0			.94126	566.2	.00119	.000638	.00120	.000644		
44.0	12.0			.97561	584.9	.00051	.000274			1.04	
42.0	.0			.94569	568.2	.00106	.000568	.00101	.000542	1.74	
44.0	.0			.96232	580.5	.00087	.000467			1.74	
48.0	.0			.96897	581.5	.00070	.000375	.00070	.000375	1.40	
52.0	.0			.97007	581.5	.00075	.000402	.00075	.000402	1.50	
52.0	12.0			.96786	580.2	.00050	.000268			1.00	
55.0	.0			.97229	583.2	.00050	.000268	.00049	.000263	1.02	
58.0	.0			.98005	587.5	.00051	.000274			1.04	
58.0	12.0			.95844	575.5	.00068	.000365			1.11	
58.0	-12.0			.96121	576.9	.00059	.000316			1.20	
44.0	-12.0			.98226	588.5	.00049	.000263			1.00	
36.0	-8.0			.97063	581.9	.00053	.000284			1.08	
36.0	-3.0			.93406	565.2	.00183	.000981			3.45	
34.0	-3.0			.93073	563.9	.00164	.000880	.00142	.000762	2.69	
32.0	-3.0			.94237	569.2	.00132	.000708	.00119	.000638	2.54	
30.0	-3.0			.96453	581.5	.00152	.000815	.00157	.000842	2.30	
34.0	-12.0			.97728	586.2	.00050	.000268	.00050	.000268	1.02	
32.0	-12.0			.97728	586.2	.00050	.000268	.00050	.000268	.83	
30.0	-12.0			.97894	587.2	.00049	.000263	.00051	.000274	.96	
19.0	-12.5			.97783	586.2	.00048	.000257			.91	
17.5	-11.0			.97783	586.5	.00049	.000263			.91	
15.5	-2.5			.97672	585.5	.00055	.000295			.79	
16.5	-2.5			.97340	583.5	.00049	.000263			.94	
17.5	-2.5			.97340	583.9	.00050	.000268			.68	
18.5	-2.5			.98060	587.9	.00049	.000263			.71	
20.5	-2.5			.96952	581.2	.00052	.000279			.73	
21.5	-2.5			.97617	585.5	.00050	.000268	.00066	.000354	.93	
22.5	-2.5			.97395	584.5	.00050	.000268	.00047	.000252	.94	
23.5	-2.5			.97340	583.5	.00050	.000268			.70	
24.5	-2.5			.97617	585.5	.00049	.000263			.70	
36.0	-16.0			.97395	584.5	.00049	.000263			.89	
36.0	-12.0			.97728	585.9	.00049	.000263	.00050	.000268	1.00	
32.0	-18.0			.97506	585.5	.00050	.000268			.91	
32.0	-16.0			.97395	584.5	.00055	.000295	.00054	.000290	1.00	
32.0	-14.0			.97672	585.9	.00045	.000241	.00046	.000247	.78	
32.0	-10.0			.97617	585.5	.00050	.000268			1.02	
28.0	-14.0			.97561	585.5	.00055	.000295			1.12	
28.0	-12.0			.97672	585.9	.00050	.000268				
26.0	-12.5			.97728	586.2	.00049	.000263			1.00	
24.5	-11.0			.97561	585.2	.00049	.000263			1.00	
22.0	-12.5			.97672	585.9	.00050	.000268	.00050	.000268	.93	
20.5	-11.0			.97561	584.9	.00045	.000241	.00045	.000241	.90	
34.0	-1.0			.94791	573.5	.00181	.000971	.00198	.001062	3.69	
34.0	4.0			.94625	570.2	.00124	.000665	.00141	.000756	2.00	
34.0	5.0			.95179	573.2	.00091	.000488	.00087	.000467	1.23	
34.0	6.0			.95844	576.9	.00090	.000483	.00089	.000477	1.22	
36.0	6.0			.95844	575.5	.00077	.000413			1.04	
38.0	1.0			.94680	568.9	.00075	.000402			1.32	
38.0	2.0			.93904	564.5	.00100	.000536			1.96	
44.0	8.0			.95622	574.2	.00072	.000386	.00072	.000386	.96	
44.0	6.0			.94514	569.2	.00135	.000724	.00130	.000697	2.65	
44.0	4.0			.94902	571.5	.00077	.000413	.00075	.000402	1.40	
44.0	2.0			.95511	573.9	.00102	.000547	.00101	.000542	1.96	
44.0	1.0			.95844	575.9	.00082	.000440	.00082	.000440	1.44	
		1.10	0	.96065	605.9	.01700	.009117				1.47
		1.60	0	.96786	616.9	.02261	.012126	.02311	.012394		1.96
		2.60	0	.98947	615.2	.01019	.005465	.01088	.005835		.88
		3.60	0	.99113	613.2	.00820	.004398	.00821	.004403		.71
		4.60	0	.98725	618.5	.00803	.004306	.00871	.004671		.69
		6.60	0	.98725	610.9	.00824	.004419	.00824	.004419		.71
		8.60	0	.98725	611.5	.00808	.004333	.00811	.004349		.70
		10.60	0	.98503	608.5	.00711	.003813				.62
		2.60	90	.94292	571.2	.00183	.000981	.00153	.000821		.67
		4.60	90	.95123	575.2	.00161	.000863	.00134	.000719		.57

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream

(a) M = 2.65; R = 3.94×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95545	587.9	.00465	.000656			.98	
12.0	.0			.95210	585.2	.00434	.000612			.98	
20.5	.0			.97159	614.9	.01022	.001441			2.29	
28.0	12.0			.94654	583.2	.00474	.000668			1.02	
28.0	4.0			.93428	585.2	.00745	.001051			1.57	
28.0	.0			.92148	582.5	.00775	.001093			1.73	
20.5	-5.0			.95377	585.9	.00467	.000659			1.03	
24.5	-5.0			.94431	585.9	.00586	.000826			1.37	
30.0	.0			.96268	621.2	.01422	.002005	.01444	.002036	3.14	
31.0	12.0			.95266	586.9	.00486	.000685			1.06	
34.0	.0			.93094	582.9	.00589	.000831	.00531	.000749	1.42	
2.0	-12.0			.95545	587.2	.00449	.000633			.99	
2.0	12.0			.95489	591.9	.00470	.000663			.99	
12.0	-12.0			.95712	592.2	.00476	.000671			1.02	
12.0	12.0			.94821	584.2	.00466	.000657			.97	
30.0	1.0			.95433	608.9	.01162	.001639			2.65	
31.0	2.0			.95934	604.5	.00897	.001265			2.03	
32.0	2.0			.96547	617.9	.01004	.001416	.01025	.001446	2.31	
32.0	3.0			.95545	600.5	.00879	.001240			1.92	
32.0	6.0			.92370	576.2	.00737	.001039			1.64	
34.0	1.0			.95099	587.9	.00535	.000754	.00529	.000746	1.19	
34.0	2.0			.94932	599.2	.00915	.001290	.00948	.001337	2.00	
34.0	3.0			.94431	603.5	.00977	.001378	.00980	.001382	2.14	
36.0	.0			.92537	580.9	.00841	.001186	.00840	.001185		
38.0	.0			.93317	583.9	.00757	.001068	.00757	.001068	1.76	
40.0	.0			.93763	586.5	.00757	.001068	.00759	.001070		
44.0	12.0			.94876	585.5	.00508	.000716			1.13	
42.0	.0			.93985	586.2	.00697	.000983	.00692	.000976	1.63	
44.0	.0			.95879	594.5	.00606	.000855	.00610	.000860	1.40	
48.0	.0			.95823	592.5	.00549	.000774	.00549	.000774	1.27	
52.0	.0			.95433	589.5	.00522	.000736	.00521	.000735	1.17	
52.0	12.0			.93985	579.2	.00500	.000705			1.13	
55.0	.0			.95879	591.5	.00508	.000716	.00508	.000716	1.13	
58.0	.0			.96101	592.9	.00496	.000699			1.01	
58.0	12.0			.93763	582.9	.00429	.000605			.86	
58.0	-12.0			.93874	576.2	.00418	.000589			.92	
44.0	-12.0			.95266	586.5	.00470	.000663			1.09	
36.0	-8.0			.93150	575.5	.00539	.000760			1.28	
36.0	-3.0			.94709	599.2	.00799	.001127			1.91	
34.0	-3.0			.94876	598.5	.00947	.001336	.00949	.001338	2.26	
32.0	-3.0			.95322	597.9	.00813	.001147	.00811	.001144	1.86	
30.0	-3.0			.95545	605.9	.00829	.001169	.00837	.001180	1.88	
28.0	-3.0			.94709	594.5	.00675	.000952			1.56	
34.0	-12.0			.96101	590.2	.00462	.000652	.00464	.000654	1.05	
32.0	-12.0			.95823	588.9	.00461	.000650	.00462	.000652	1.06	
30.0	-12.0			.96101	590.2	.00460	.000649	.00463	.000653	1.04	
19.0	-12.5			.95823	588.5	.00447	.000630			.95	
17.5	-11.0			.95934	589.2	.00463	.000653			1.04	
15.5	-2.5			.96213	591.5	.00442	.000623			.94	
16.5	-2.5			.95377	585.9	.00445	.000628	.00434	.000612	1.01	
17.5	-2.5			.95210	585.5	.00442	.000623	.00426	.000601	.97	
18.5	-2.5			.96436	592.5	.00440	.000621	.00462	.000652	1.00	
19.5	-2.5			.95489	589.2	.00548	.000773	.00529	.000746	1.21	
20.5	-2.5			.95600	596.5	.00702	.000990	.00698	.000984	1.55	
21.5	-2.5			.96101	604.9	.00883	.001245	.00876	.001235	1.95	
22.5	-2.5			.95545	600.2	.00825	.001163	.00814	.001148	1.86	
23.5	-2.5			.95043	599.5	.00915	.001290	.00832	.001173	2.04	
24.5	-2.5			.95099	602.2	.00941	.001327			2.17	
36.0	-16.0			.95210	583.9	.00424	.000598			1.02	
36.0	-12.0			.95767	588.2	.00429	.000605	.00431	.000608	1.00	
32.0	-18.0			.95545	588.9	.00422	.000595			1.01	
32.0	-16.0			.95210	587.5	.00437	.000616	.00436	.000615	1.01	
32.0	-14.0			.95377	584.5	.00409	.000577	.00407	.000574	.99	
32.0	-10.0			.95767	588.5	.00483	.000681			1.11	
28.0	-14.0			.95155	583.5	.00423	.000597			.98	
28.0	-12.0			.95322	584.9	.00433	.000611			1.02	
26.0	-12.5			.95266	584.2	.00423	.000597			.97	
24.5	-11.0			.95377	584.9	.00416	.000587			.92	
22.0	-12.5			.95600	587.2	.00436	.000615	.00436	.000615	.98	
20.5	-11.0			.95266	584.9	.00448	.000632	.00447	.000630	1.03	
34.0	-1.0			.96770	595.5	.00486	.000685	.00508	.000716	1.15	
34.0	4.0			.94932	594.2	.00756	.001066	.00771	.001087	1.69	
34.0	5.0			.93484	584.9	.00718	.001013	.00703	.000991	1.57	
34.0	6.0			.93206	581.5	.00731	.001031	.00731	.001031	1.59	
36.0	6.0			.94041	586.5	.00665	.000938			1.46	
38.0	1.0			.93874	583.2	.00597	.000842	.00591	.000833	1.30	
38.0	2.0			.94821	584.9	.00486	.000685			1.11	
44.0	8.0			.93651	580.5	.00569	.000802	.00573	.000808	1.26	
44.0	6.0			.92148	568.2	.00498	.000702	.00489	.000690	1.11	
44.0	4.0			.92315	570.5	.00514	.000725	.00510	.000719	1.19	
44.0	2.0			.94431	585.5	.00582	.000821	.00588	.000829	1.31	
44.0	1.0			.94876	588.5	.00607	.000856	.00604	.000849	1.48	
		1.10	0	.99331	662.8	.02501	.003527				1.06
		1.60	0	.98218	655.9	.02013	.002839	.01902	.002682		.86
		2.60	0	1.00612	674.2	.02041	.002878	.02194	.003094		.87
		3.60	0	1.01002	656.5	.01675	.002362	.01676	.002364		.71
		4.60	0	.99832	646.9	.01547	.002182	.01586	.002237		.93
		6.60	0	.99777	657.2	.01591	.002244	.01591	.002244		.88
		8.60	0	.99888	659.2	.01634	.002304	.01628	.002296		.70
		10.60	0	.99554	668.8	.02093	.002952				.89
		2.60	90	.94709	584.9	.00581	.000819	.00548	.000773		1.04
		4.60	90	.95767	587.2	.00444	.000626	.00459	.000647		.80
		2.60	180	.95879	581.2	.00179	.000252	.00175	.000247		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(b) M = 2.65; R = 2.51×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96757	588.9	.00333	.000731			1.06	
12.0	.0			.96366	585.2	.00284	.000624			.94	
20.5	.0			.97763	609.9	.00678	.001489			2.33	
28.0	12.0			.95918	583.5	.00302	.000663			.96	
28.0	4.0			.94353	582.5	.00513	.001126			1.69	
28.0	.0			.93067	575.2	.00538	.001181			1.81	
20.5	-5.0			.96645	587.2	.00298	.000654			.99	
24.5	-5.0			.95471	584.5	.00399	.000876			1.36	
30.0	.0			.96645	613.9	.01010	.002217	.01027	.002255	3.63	
31.0	12.0			.96422	587.2	.00310	.000681			1.01	
34.0	.0			.94577	583.5	.00407	.000894	.00368	.000808	1.46	
2.0	-12.0			.96869	588.5	.00309	.000678			1.01	
2.0	12.0			.96757	589.2	.00307	.000674			.94	
12.0	-12.0			.96925	589.2	.00309	.000678			1.03	
12.0	12.0			.95863	583.5	.00316	.000694			1.00	
30.0	1.0			.96030	603.2	.00835	.001833			2.82	
31.0	2.0			.96310	597.9	.00632	.001388			2.15	
32.0	2.0			.96813	604.5	.00764	.001677	.00777	.001706	2.76	
32.0	3.0			.96086	595.5	.00600	.001317			2.03	
32.0	6.0			.93459	579.2	.00480	.001054			1.55	
34.0	1.0			.96030	585.9	.00352	.000773	.00343	.000753	1.21	
34.0	2.0			.95863	595.9	.00627	.001377	.00653	.001434	2.06	
34.0	3.0			.95192	593.9	.00677	.001486	.00677	.001486	2.23	
36.0	.0			.93570	583.5	.00569	.001249	.00567	.001245		
38.0	.0			.94074	581.2	.00549	.001205	.00549	.001205	1.85	
40.0	.0			.94521	583.5	.00522	.001146	.00523	.001148		
44.0	12.0			.95918	585.2	.00356	.000782			1.17	
42.0	.0			.94689	583.2	.00493	.001082	.00487	.001069	1.68	
44.0	.0			.96645	599.5	.00409	.000898	.00413	.000907	1.46	
48.0	.0			.96813	594.9	.00388	.000852	.00388	.000852	1.32	
52.0	.0			.96310	588.5	.00372	.000817	.00371	.000815	1.23	
52.0	12.0			.94968	581.5	.00333	.000731			1.11	
55.0	.0			.96813	590.9	.00350	.000768	.00350	.000768	1.16	
58.0	.0			.97760	596.2	.00348	.000764			1.15	
58.0	12.0			.94912	577.5	.00288	.000632			.92	
58.0	-12.0			.95136	577.9	.00288	.000632			.95	
44.0	-12.0			.96310	586.9	.00335	.000735			1.23	
36.0	-8.0			.94241	575.5	.00360	.000790			1.25	
36.0	-3.0			.95639	591.5	.00540	.001186			1.94	
34.0	-3.0			.95639	594.5	.00666	.001462	.00667	.001464	2.33	
32.0	-3.0			.96198	595.5	.00561	.001232	.00560	.001229	2.00	
30.0	-3.0			.96254	597.2	.00595	.001306	.00601	.001319	2.00	
28.0	-3.0			.95639	591.5	.00465	.001021			1.70	
34.0	-12.0			.97260	590.9	.00311	.000683	.00312	.000685	1.09	
32.0	-12.0			.97037	592.5	.00312	.000685	.00313	.000687	1.11	
30.0	-12.0			.97372	591.9	.00299	.000656	.00302	.000663	1.02	
19.0	-12.5			.97092	592.5	.00310	.000681			1.06	
17.5	-11.0			.97148	590.2	.00296	.000650			.99	
15.5	-2.5			.97372	592.2	.00296	.000650			.98	
16.5	-2.5			.96589	586.9	.00298	.000654	.00290	.000637	1.00	
17.5	-2.5			.96422	586.2	.00295	.000648	.00286	.000628	.98	
18.5	-2.5			.97651	593.9	.00301	.000661	.00321	.000705	1.01	
19.5	-2.5			.96533	593.2	.00379	.000832	.00363	.000797	1.26	
20.5	-2.5			.96477	594.9	.00507	.001113	.00522	.001146	1.65	
21.5	-2.5			.96981	602.2	.00590	.001295	.00616	.001352	1.97	
22.5	-2.5			.96310	596.5	.00580	.001273	.00573	.001258	1.93	
23.5	-2.5			.95863	601.2	.00657	.001442	.00650	.001427	2.19	
24.5	-2.5			.95974	598.9	.00679	.001491			2.32	
36.0	-16.0			.96533	586.2	.00286	.000628			1.05	
36.0	-12.0			.96981	588.5	.00295	.000648	.00297	.000652	1.01	
32.0	-18.0			.96869	592.5	.00276	.000606			.97	
32.0	-16.0			.96477	585.9	.00313	.000687	.00312	.000685	1.08	
32.0	-14.0			.96701	586.9	.00283	.000621	.00286	.000628	.98	
32.0	-10.0			.96925	588.2	.00296	.000650			1.01	
28.0	-14.0			.96422	584.9	.00279	.000613			.96	
28.0	-12.0			.96645	586.5	.00296	.000650			1.06	
26.0	-12.5			.96477	585.9	.00297	.000652			1.03	
24.5	-11.0			.96589	586.2	.00606	.001330			2.10	
22.0	-12.5			.96869	587.9	.00291	.000639	.00291	.000639	.99	
20.5	-11.0			.96477	588.9	.00312	.000685	.00311	.000683	1.06	
34.0	-1.0			.97596	593.9	.00331	.000727	.00347	.000762	1.24	
34.0	4.0			.95751	591.9	.00534	.001172	.00549	.001205	1.76	
34.0	5.0			.94353	582.5	.00527	.001157	.00516	.001133	2.07	
34.0	6.0			.94129	579.2	.00462	.001014	.00462	.001014	1.53	
36.0	6.0			.94912	584.5	.00454	.000997			1.48	
38.0	1.0			.94968	583.2	.00430	.000944	.00427	.000937	1.45	
38.0	2.0			.96030	585.5	.00353	.000775			1.23	
44.0	8.0			.94577	583.2	.00417	.000916	.00441	.000968	1.39	
44.0	6.0			.93291	568.9	.00334	.000733	.00327	.000718	1.11	
44.0	4.0			.93515	571.9	.00387	.000850	.00383	.000841	1.30	
44.0	2.0			.95415	584.5	.00384	.000843	.00389	.000854	1.29	
44.0	1.0			.95695	590.2	.00413	.000907	.00406	.000891	1.50	
		1.10	0	.99440	653.9	.01911	.004196				1.00
		1.60	0	.98155	645.2	.01530	.003359	.01427	.003133		.80
		2.60	0	1.00503	657.5	.01750	.003842	.01887	.004143		.92
		3.60	0	1.01006	650.5	.01363	.002992	.01368	.003003		.71
		4.60	0	1.00055	641.9	.01259	.002764	.01290	.002832		.66
		6.60	0	1.00000	644.2	.01363	.002992	.01363	.002992		.71
		8.60	0	1.00167	654.9	.01360	.002986	.01356	.002977		.71
		10.60	0	.99776	656.9	.01840	.004040				.96
		2.60	90	.95303	583.2	.00451	.000990	.00422	.000926		.99
		4.60	90	.96701	587.9	.00357	.000784	.00374	.000821		.79
		2.60	180	.96813	582.9	.00110	.000241	.00097	.000213		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(c) M = 2.65; R = 1.28×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.98769	595.2	.00180	.000777			1.13	
12.0	.0			.98210	594.5	.00164	.000708			1.09	
20.5	.0			.98321	604.5	.00433	.001870			2.85	
28.0	12.0			.97874	594.5	.00154	.000665			.99	
28.0	4.0			.95972	584.2	.00284	.001226			1.95	
28.0	.0			.94741	577.2	.00305	.001317			2.05	
20.5	-5.0			.98489	594.9	.00153	.000661			1.03	
24.5	-5.0			.97091	587.9	.00238	.001028			1.76	
30.0	.0			.96755	602.9	.00630	.002721	.00640	.002764	4.26	
31.0	12.0			.98321	593.2	.00167	.000721			1.18	
34.0	.0			.96308	583.9	.00208	.000898	.00188	.000812	1.59	
2.0	-12.0			.98769	595.5	.00163	.000704			1.04	
2.0	12.0			.98713	595.2	.00164	.000708			.90	
12.0	-12.0			.98713	594.5	.00155	.000669			1.10	
12.0	12.0			.97650	588.9	.00163	.000704			1.03	
30.0	1.0			.96531	595.2	.00502	.002168			3.80	
31.0	2.0			.96420	589.9	.00384	.001658			2.59	
32.0	2.0			.96699	595.2	.00479	.002068	.00488	.002107	3.68	
32.0	3.0			.96420	588.2	.00334	.001442			2.18	
32.0	6.0			.95189	577.9	.00264	.001140			1.86	
34.0	1.0			.96979	586.5	.00178	.000769	.00171	.000738	1.33	
34.0	2.0			.96420	592.9	.00362	.001563	.00368	.001589	2.55	
34.0	3.0			.95972	589.5	.00407	.001758	.00404	.001745	2.85	
36.0	.0			.95021	580.9	.00345	.001490	.00343	.001481		
38.0	.0			.95413	581.5	.00295	.001274	.00294	.001270	2.20	
40.0	.0			.95972	583.5	.00279	.001205	.00280	.001209		
44.0	12.0			.97538	588.9	.00184	.000795			1.36	
42.0	.0			.96028	583.2	.00266	.001149	.00261	.001127	1.96	
44.0	.0			.98098	593.9	.00236	.001019	.00239	.001032	1.74	
48.0	.0			.98489	596.5	.00199	.000859	.00200	.000864	1.37	
52.0	.0			.97930	591.2	.00200	.000864	.00199	.000859	1.36	
52.0	12.0			.96755	583.5	.00169	.000730			1.15	
55.0	.0			.98433	597.2	.00183	.000790	.00183	.000790	1.32	
58.0	.0			.98993	598.9	.00186	.000803			1.33	
58.0	12.0			.97035	585.5	.00155	.000669			1.01	
58.0	-12.0			.97259	586.5	.00143	.000618			.93	
44.0	-12.0			.98098	590.9	.00181	.000782			1.23	
36.0	-8.0			.96196	582.9	.00204	.000881			1.39	
36.0	-3.0			.96923	590.9	.00334	.001442			2.27	
34.0	-3.0			.96587	591.9	.00397	.001714	.00398	.001719	3.01	
32.0	-3.0			.96755	589.5	.00321	.001386	.00318	.001373	2.17	
30.0	-3.0			.97035	596.5	.00348	.001503	.00352	.001520	2.35	
28.0	-3.0			.97147	589.2	.00248	.001071			1.69	
34.0	-12.0			.99216	596.5	.00144	.000622	.00145	.000626	1.09	
32.0	-12.0			.99049	596.2	.00152	.000656	.00153	.000661	1.12	
30.0	-12.0			.99272	602.5	.00151	.000652	.00154	.000665	1.03	
19.0	-12.5			.98993	598.5	.00154	.000665			1.12	
17.5	-11.0			.99049	599.5	.00155	.000669			1.12	
15.5	-2.5			.99328	600.9	.00154	.000665			1.05	
16.5	-2.5			.98433	592.5	.00159	.000687	.00150	.000648	1.08	
17.5	-2.5			.98377	594.9	.00156	.000674	.00150	.000648	1.06	
18.5	-2.5			.99664	603.9	.00149	.000643	.00175	.000756	1.08	
19.5	-2.5			.98210	593.9	.00203	.000877	.00190	.000820	1.38	
20.5	-2.5			.97650	597.2	.00302	.001304	.00294	.001270	2.16	
21.5	-2.5			.97874	598.9	.00339	.001464	.00360	.001555	2.29	
22.5	-2.5			.96979	592.2	.00324	.001399	.00312	.001347	2.35	
23.5	-2.5			.96587	594.9	.00388	.001676	.00381	.001645	2.62	
24.5	-2.5			.96755	594.5	.00439	.001896			2.97	
36.0	-16.0			.98433	592.5	.00163	.000704			1.25	
36.0	-12.0			.98881	594.2	.00138	.000596	.00140	.000605	.93	
32.0	-18.0			.98769	595.5	.00152	.000656			1.03	
32.0	-16.0			.98433	593.9	.00153	.000661	.00152	.000656	1.18	
32.0	-14.0			.98657	593.2	.00155	.000669	.00154	.000665	1.20	
32.0	-10.0			.98769	593.5	.00136	.000587			1.00	
28.0	-14.0			.98377	591.5	.00146	.000630			.99	
28.0	-12.0			.98657	593.2	.00138	.000596			1.05	
26.0	-12.5			.98489	592.5	.00151	.000652			1.14	
22.0	-12.5			.98657	596.9	.00147	.000635	.00147	.000635	.99	
20.5	-11.0			.98433	592.2	.00151	.000652	.00151	.000652	1.02	
34.0	-1.0			.98713	596.2	.00174	.000751	.00186	.000803	1.36	
34.0	4.0			.96923	590.6	.00333	.001438	.00349	.001507	2.25	
34.0	5.0			.95860	585.9	.00295	.001274	.00286	.001235	2.02	
34.0	6.0			.95692	580.9	.00267	.001153	.00266	.001149	1.89	
36.0	6.0			.96531	586.5	.00261	.001127			1.75	
38.0	1.0			.96364	585.2	.00252	.001088	.00253	.001093	1.70	
38.0	2.0			.97370	587.5	.00197	.000851			1.43	
44.0	8.0			.96196	582.5	.00222	.000959	.00223	.000963	1.57	
44.0	6.0			.95525	576.9	.00175	.000756	.00171	.000738	1.14	
44.0	4.0			.95748	582.5	.00199	.000859	.00196	.000846	1.41	
44.0	2.0			.97091	587.5	.00238	.001028	.00241	.001041	1.70	
44.0	1.0			.97315	589.2	.00226	.000976	.00220	.000950	1.67	
		1.10	0	.99272	636.5	.01201	.005186				.89
		1.60	0	.97762	627.2	.00995	.004297	.00906	.003912		.74
		2.60	0	.99776	646.9	.01135	.004901	.01241	.005359		.84
		3.60	0	1.00839	653.5	.00956	.004128	.01005	.004340		.71
		4.60	0	1.00000	638.5	.00868	.003748	.00886	.003826		.64
		6.60	0	.99888	641.5	.00973	.004202	.00973	.004202		.72
		8.60	0	1.00000	648.9	.00943	.004072	.00938	.004051		.70
		10.60	0	.99384	646.9	.01385	.005981				1.02
		2.60	90	.95636	581.2	.00324	.001399	.00301	.001300		1.01
		4.60	90	.97147	587.5	.00247	.001067	.00267	.001153		.77
		2.60	180	.97147	579.9	.00052	.000225	.00050	.000216		

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{o}R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(d) M = 3.51; R = 4.07 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95914	579.9	.00244	.000471			.94	
12.0	.0			.95186	577.2	.00252	.000486			1.07	
20.5	.0			.97145	600.2	.00641	.001237			2.58	
28.0	12.0			.94739	572.2	.00249	.000481			.95	
28.0	4.0			.93004	572.5	.00519	.001002			2.08	
28.0	.0			.91996	564.5	.00489	.000944			1.96	
20.5	-5.0			.95634	577.9	.00249	.000481			1.06	
24.5	-5.0			.94179	576.9	.00374	.000722			1.55	
30.0	.0			.96977	610.2	.00949	.001832	.00966	.001865	4.14	
31.0	12.0			.95242	575.5	.00262	.000506			1.04	
34.0	.0			.93731	576.5	.00327	.000631	.00299	.000577	1.37	
2.0	-12.0			.96138	581.2	.00238	.000459			.96	
2.0	12.0			.95802	578.2	.00235	.000454			.93	
12.0	-12.0			.95970	579.5	.00235	.000454			.95	
12.0	12.0			.94689	571.5	.00255	.000492			.99	
30.0	1.0			.96418	604.9	.00712	.001374			2.93	
31.0	2.0			.96026	591.2	.00540	.001042			2.30	
32.0	2.0			.95466	588.9	.00581	.001122	.00580	.001120	2.44	
32.0	3.0			.95242	586.9	.00550	.001062			2.15	
32.0	6.0			.92276	565.9	.00451	.000871			1.78	
34.0	1.0			.94906	577.2	.00351	.000678	.00346	.000668	1.42	
34.0	2.0			.94235	585.5	.00718	.001386	.00723	.001396	2.86	
34.0	3.0			.93451	577.5	.00589	.001137	.00566	.001093	2.28	
36.0	.0			.92780	574.5	.00503	.000971	.00501	.000967		
38.0	.0			.93451	574.5	.00539	.001041	.00540	.001042	2.17	
40.0	.0			.93899	575.2	.00462	.000892	.00462	.000892		
44.0	12.0			.94515	572.5	.00291	.000562			1.29	
42.0	.0			.94235	576.9	.00427	.000824	.00422	.000815	1.71	
44.0	.0			.96194	586.2	.00377	.000728	.00380	.000734	1.61	
48.0	.0			.96362	584.5	.00285	.000550	.00285	.000550	1.22	
52.0	.0			.96026	581.2	.00262	.000506	.00261	.000504	1.06	
52.0	12.0			.93675	569.2	.00333	.000643			1.44	
55.0	.0			.96530	583.2	.00244	.000471	.00244	.000471	.99	
58.0	.0			.96753	584.5	.00246	.000475			.99	
58.0	12.0			.93395	567.2	.00325	.000627			1.31	
58.0	-12.0			.93507	568.5	.00337	.000651			1.39	
44.0	-12.0			.95018	574.9	.00289	.000558			1.28	
36.0	-8.0			.93004	566.5	.00369	.000712			1.58	
36.0	-3.0			.93675	576.9	.00550	.001062			2.29	
34.0	-3.0			.93787	578.2	.00581	.001122	.00579	.001118	2.50	
32.0	-3.0			.95018	584.9	.00552	.001066	.00554	.001069	2.37	
30.0	-3.0			.95410	588.2	.00591	.001141	.00598	.001154	2.39	
28.0	-3.0			.93787	576.5	.00506	.000977			2.08	
34.0	-12.0			.96082	580.9	.00250	.000483	.00251	.000485	1.07	
32.0	-12.0			.95858	579.9	.00270	.000521	.00271	.000523	1.11	
30.0	-12.0			.96250	581.9	.00241	.000465	.00244	.000471	1.00	
19.0	-12.5			.96138	580.6	.00219	.000423			.96	
17.5	-11.0			.96250	580.9	.00228	.000440			.94	
15.5	-2.5			.96250	581.5	.00253	.000488			1.04	
16.5	-2.5			.95364	575.5	.00228	.000440	.00218	.000421	.97	
17.5	-2.5			.95242	574.9	.00253	.000488	.00238	.000459	1.02	
18.5	-2.5			.96585	583.2	.00266	.000513	.00285	.000550	1.10	
19.5	-2.5			.95466	580.5	.00341	.000658	.00332	.000641	1.39	
20.5	-2.5			.95634	586.5	.00463	.000894	.00466	.000900	1.94	
21.5	-2.5			.95970	590.9	.00531	.001025	.00559	.001079	2.19	
22.5	-2.5			.94739	582.5	.00510	.000985	.00499	.000963	1.99	
23.5	-2.5			.94011	578.5	.00556	.001073	.00547	.001056	2.25	
24.5	-2.5			.93899	581.2	.00626	.001208			2.70	
36.0	-16.0			.95410	576.2	.00219	.000423			.96	
36.0	-12.0			.95914	579.2	.00236	.000456	.00237	.000458	1.03	
32.0	-18.0			.95858	581.2	.00249	.000481			1.10	
32.0	-16.0			.95522	576.9	.00232	.000448	.00231	.000446	.96	
32.0	-14.0			.95578	576.2	.00219	.000423	.00217	.000419	.92	
32.0	-10.0			.95690	578.2	.00232	.000448			.95	
28.0	-14.0			.95522	576.5	.00252	.000486			1.05	
28.0	-12.0			.95634	579.5	.00227	.000438			.99	
26.0	-12.5			.95634	579.2	.00238	.000459			1.03	
22.0	-12.5			.95970	579.2	.00231	.000446	.00231	.000446	.96	
20.5	-11.0			.95690	579.5	.00238	.000459	.00237	.000458	1.04	
34.0	-1.0			.96641	585.5	.00283	.000546	.00306	.000591	1.27	
34.0	4.0			.94291	578.9	.00487	.000940	.00502	.000969	1.96	
34.0	5.0			.93339	573.2	.00520	.001004	.00516	.000996	2.83	
34.0	6.0			.92892	570.2	.00484	.000934	.00484	.000934	1.94	
36.0	6.0			.93787	575.2	.00455	.000878			1.81	
38.0	1.0			.94459	576.2	.00376	.000726	.00382	.000737	1.52	
38.0	2.0			.94571	574.5	.00311	.000600			1.30	
44.0	8.0			.93339	572.2	.00449	.000867	.00453	.000874	1.80	
44.0	6.0			.91996	560.9	.00383	.000739	.00382	.000737	1.56	
44.0	4.0			.91101	552.9	.00307	.000593	.00294	.000568	1.23	
44.0	2.0			.94235	574.2	.00357	.000689	.00366	.000707	1.44	
44.0	1.0			.94962	578.5	.00349	.000674	.00343	.000662	1.47	
		1.10	0	.98992	647.5	.01992	.003845				.99
		1.60	0	.98376	644.9	.01610	.003108	.01546	.002984		.80
		2.60	0	1.00335	656.5	.01564	.003019	.01680	.003243		.78
		3.60	0	1.00559	638.5	.01159	.002237	.01138	.002197		.58
		4.60	0	.99776	644.9	.01314	.002537	.01367	.002639		.66
		6.60	0	.99608	638.2	.01445	.002789	.01445	.002789		.72
		8.60	0	.99776	638.9	.01456	.002811	.01457	.002813		.73
		10.60	0	.98880	637.9	.01557	.003006				.78
		2.60	90	.95634	581.5	.00376	.000726	.00348	.000672		.73
		4.60	90	.96306	582.5	.00319	.000616	.00292	.000564		.67
		2.60	180	.97735	585.2	.00085	.000164	.00088	.000170		
		4.60	180	.99944	595.9	.00054	.000104	.00062	.000120		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(e) M = 3.51; R = 2.83 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96414	580.2	.00196	.000542			1.05	
12.0	.0			.95685	574.9	.00178	.000492			1.05	
20.5	.0			.96918	594.2	.00494	.001365			2.94	
28.0	12.0			.95237	571.9	.00191	.000528			1.04	
28.0	4.0			.93388	570.2	.00429	.001186			2.44	
28.0	.0			.92491	563.5	.00374	.001034			2.23	
20.5	-5.0			.96077	577.5	.00193	.000533			1.07	
24.5	-5.0			.94565	572.9	.00302	.000835			1.83	
30.0	.0			.96694	602.5	.00739	.002042	.00753	.002081	4.45	
31.0	12.0			.95685	577.5	.00217	.000600			1.21	
34.0	.0			.94172	572.9	.00266	.000735	.00234	.000647	1.67	
2.0	-12.0			.96750	581.2	.00169	.000467			.97	
2.0	12.0			.96245	578.2	.00184	.000509			1.02	
12.0	-12.0			.96470	579.5	.00176	.000486			1.07	
12.0	12.0			.95125	571.5	.00183	.000506			1.01	
30.0	1.0			.96245	598.2	.00558	.001542			3.08	
31.0	2.0			.95853	585.5	.00412	.001139			2.35	
32.0	2.0			.95125	582.5	.00466	.001288	.00464	.001282	2.86	
32.0	3.0			.95125	582.2	.00444	.001227			2.47	
32.0	6.0			.97884	567.2	.00347	.000959			1.92	
34.0	1.0			.95013	573.9	.00258	.000713	.00250	.000691	1.47	
34.0	2.0			.94284	587.5	.00512	.001415	.00557	.001539	2.83	
34.0	3.0			.97668	573.9	.00508	.001404	.00491	.001357	2.81	
36.0	.0			.93220	569.2	.00430	.001188	.00428	.001183		
38.0	.0			.93724	574.5	.00400	.001105	.00400	.001105	2.41	
40.0	.0			.94228	572.9	.00362	.001000	.00362	.001000		
44.0	12.0			.95013	572.2	.00213	.000589			1.25	
42.0	.0			.94463	576.5	.00340	.000940	.00335	.000926	2.05	
44.0	.0			.96414	583.5	.00280	.000774	.00284	.000785	1.73	
48.0	.0			.96694	582.5	.00228	.000630	.00228	.000630	1.27	
52.0	.0			.96414	579.9	.00194	.000536	.00193	.000533	1.19	
52.0	12.0			.94060	567.9	.00253	.000699			1.53	
55.0	.0			.96806	582.2	.00186	.000514	.00186	.000514	1.14	
58.0	.0			.97198	583.9	.00183	.000506			1.12	
58.0	12.0			.93780	566.5	.00254	.000702			1.44	
58.0	-12.0			.94004	568.5	.00247	.000683			1.36	
44.0	-12.0			.95517	575.2	.00202	.000558			1.23	
36.0	-8.0			.93556	566.2	.00283	.000782			1.78	
36.0	-3.0			.94060	574.9	.00420	.001161			2.35	
34.0	-3.0			.94060	575.9	.00469	.001296	.00467	.001291	2.95	
32.0	-3.0			.95181	584.9	.00423	.001169	.00425	.001175	2.56	
30.0	-3.0			.95461	587.9	.00451	.001246	.00447	.001235	2.49	
28.0	-3.0			.94284	574.2	.00384	.001061			2.37	
34.0	-12.0			.96638	580.5	.00201	.000556	.00202	.000558	1.24	
32.0	-12.0			.96470	580.2	.00193	.000533	.00194	.000536	1.07	
30.0	-12.0			.96806	583.9	.00192	.000531	.00195	.000539	1.07	
19.0	-12.5			.96638	583.5	.00171	.000473			1.08	
17.5	-11.0			.96694	580.9	.00185	.000511			1.15	
15.5	-2.5			.96750	581.2	.00186	.000514			1.06	
16.5	-2.5			.95853	575.9	.00171	.000473	.00162	.000448	1.05	
17.5	-2.5			.95741	575.2	.00192	.000531	.00163	.000450	1.14	
18.5	-2.5			.97086	583.5	.00171	.000473	.00193	.000533	1.05	
19.5	-2.5			.95853	579.5	.00278	.000768	.00265	.000732	1.70	
20.5	-2.5			.95685	583.2	.00398	.001100	.00397	.001097	2.25	
21.5	-2.5			.96021	586.5	.00413	.001141	.00436	.001205	2.53	
22.5	-2.5			.94789	578.2	.00395	.001092	.00394	.001089	2.38	
23.5	-2.5			.94004	578.2	.00443	.001224	.00430	.001188	2.64	
24.5	-2.5			.94004	577.5	.00515	.001423			3.22	
36.0	-16.0			.96021	578.2	.00181	.000500			1.15	
36.0	-12.0			.96470	579.5	.00170	.000470	.00172	.000475	1.07	
32.0	-18.0			.96358	583.2	.00166	.000459			1.06	
32.0	-16.0			.96077	577.2	.00167	.000462	.00166	.000459	1.04	
32.0	-14.0			.96133	576.9	.00161	.000445	.00160	.000442	.99	
32.0	-10.0			.96133	577.9	.00203	.000561			1.26	
28.0	-14.0			.96021	576.5	.00169	.000467			1.06	
28.0	-12.0			.96245	577.9	.00162	.000448			1.02	
26.0	-12.5			.96133	577.2	.00168	.000464			1.02	
24.5	-11.0			.96189	579.2	.00169	.000467			1.07	
22.0	-12.5			.96414	579.5	.00169	.000467	.00169	.000467	1.06	
20.5	-11.0			.96189	577.9	.00172	.000475	.00171	.000473	1.04	
34.0	-1.0			.96806	583.2	.00215	.000594	.00235	.000649	1.38	
34.0	4.0			.94565	576.5	.00370	.001023	.00387	.001070	2.22	
34.0	5.0			.93612	570.5	.00406	.001122	.00400	.001105	2.80	
34.0	6.0			.93276	568.2	.00370	.001023	.00370	.001023	2.15	
36.0	6.0			.94172	572.9	.00382	.001056			2.22	
38.0	1.0			.94733	574.2	.00291	.000804	.00301	.000832	1.61	
38.0	2.0			.94901	574.9	.00247	.000683			1.36	
44.0	8.0			.93556	572.2	.00348	.000962	.00350	.000967	2.11	
44.0	6.0			.92604	569.9	.00308	.000851	.00307	.000848	1.74	
44.0	4.0			.91931	567.9	.00232	.000641	.00221	.000611	1.37	
44.0	2.0			.94565	572.5	.00264	.000729	.00270	.000746	1.60	
44.0	1.0			.95237	581.5	.00272	.000749	.00265	.000732	1.70	
		1.10	0	.98899	645.1	.01536	.004211				.95
		1.60	0	.97926	627.2	.01308	.003615	.01256	.003471		.78
		2.60	0	.99943	663.2	.01501	.004148	.01624	.004488		.89
		3.60	0	1.00056	632.5	.01082	.002990	.01064	.002941		.64
		4.60	0	.99927	638.2	.01145	.003147	.01169	.003231		.68
		6.60	0	.99159	633.2	.01319	.003645	.01320	.003648		.79
		8.60	0	.99215	639.9	.01211	.003347	.01209	.003341		.72
		10.60	0	.98151	636.2	.01203	.004486				.97
		2.50	90	.95461	578.2	.00328	.000907	.00301	.000832		.82
		4.60	90	.94733	580.2	.00270	.000746	.00245	.000677		.68
		2.60	180	.97310	575.9	.00054	.000146	.00053	.000146		
		4.60	180	.99327	589.9	.00049	.000135	.00055	.000152		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(f) M = 3.51; R = 1.63×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97928	587.2	.00134	.000646			1.29	
12.0	.0			.97256	581.9	.00102	.000492			1.02	
20.5	.0			.97032	593.9	.00318	.001534			2.61	
28.0	12.0			.96920	579.9	.00117	.000564			1.14	
28.0	4.0			.94400	572.2	.00245	.001182			2.31	
28.0	.0			.93672	568.5	.00231	.001114			2.20	
20.5	-5.0			.97592	583.9	.00117	.000564			1.13	
24.5	-5.0			.95744	577.9	.00174	.000839			2.00	
30.0	.0			.96472	595.2	.00524	.002528	.00530	.002571	6.02	
31.0	12.0			.97256	583.9	.00123	.000593			1.23	
34.0	.0			.95408	577.9	.00151	.000728	.00135	.000651	1.66	
2.0	-12.0			.98208	589.5	.00122	.000589			1.31	
2.0	12.0			.97648	585.2	.00134	.000646			1.34	
12.0	-12.0			.97984	586.5	.00103	.000497			1.12	
12.0	12.0			.96584	581.9	.00116	.000560			1.15	
30.0	1.0			.96304	591.9	.00376	.001814			3.88	
31.0	2.0			.95856	582.5	.00326	.001573			3.36	
32.0	2.0			.95072	578.5	.00325	.001568	.00321	.001548	3.39	
32.0	3.0			.95240	578.2	.00308	.001486			3.08	
32.0	6.0			.94120	569.9	.00216	.001042			2.18	
34.0	1.0			.95520	576.5	.00157	.000757	.00148	.000714	1.71	
34.0	2.0			.94456	576.2	.00330	.001592	.00346	.001669	2.68	
34.0	3.0			.94008	571.9	.00308	.001486	.00293	.001413	3.08	
36.0	.0			.94232	571.9	.00293	.001413	.00290	.001399		
38.0	.0			.94792	577.2	.00237	.001143	.00246	.001138	2.66	
40.0	.0			.95408	575.5	.00228	.001100	.00229	.001105		
44.0	12.0			.96640	582.5	.00124	.000598			1.23	
42.0	.0			.95520	576.2	.00196	.000945	.00191	.000921	1.59	
44.0	.0			.97704	590.5	.00162	.000781	.00172	.000830	1.76	
48.0	.0			.98040	587.5	.00124	.000598	.00124	.000598	1.29	
52.0	.0			.97872	588.2	.00117	.000564	.00116	.000560	1.15	
52.0	12.0			.95520	576.5	.00157	.000757			1.51	
55.0	.0			.98320	588.5	.00106	.000511	.00106	.000511	1.15	
58.0	.0			.98768	593.2	.00107	.000516			1.11	
58.0	12.0			.95352	572.9	.00172	.000830			1.85	
58.0	-12.0			.95632	575.9	.00138	.000666			1.50	
44.0	-12.0			.97256	584.9	.00126	.000608			1.38	
36.0	-8.0			.95240	572.5	.00174	.000839			1.91	
36.0	-3.0			.94960	575.2	.00250	.001206			2.58	
34.0	-3.0			.94624	574.5	.00292	.001409	.00290	.001399	2.98	
32.0	-3.0			.95408	578.5	.00258	.001245	.00258	.001245	2.80	
30.0	-3.0			.96080	582.2	.00248	.001196	.00253	.001220	2.56	
28.0	-3.0			.95296	576.2	.00223	.001076			2.25	
34.0	-12.0			.98152	587.5	.00116	.000560	.00117	.000564	1.26	
32.0	-12.0			.98040	588.5	.00122	.000589	.00123	.000593	1.39	
30.0	-12.0			.98432	589.5	.00099	.000478	.00101	.000487	1.08	
19.0	-12.5			.98152	587.5	.00099	.000478			1.08	
17.5	-11.0			.98320	588.2	.00095	.000458			1.03	
15.5	-2.5			.98320	590.5	.00116	.000560			1.15	
16.5	-2.5			.97536	583.2	.00099	.000478	.00092	.000444	1.16	
17.5	-2.5			.97312	582.5	.00105	.000507	.00089	.000429	1.25	
18.5	-2.5			.98712	592.2	.00099	.000478	.00128	.000617	1.08	
19.5	-2.5			.97144	584.9	.00159	.000767	.00146	.000704	1.73	
20.5	-2.5			.96416	583.2	.00231	.001114	.00227	.001095	2.51	
21.5	-2.5			.96360	584.2	.00270	.001302	.00290	.001399	2.93	
22.5	-2.5			.95016	575.2	.00253	.001220	.00240	.001158	2.56	
23.5	-2.5			.94288	572.2	.00284	.001370	.00271	.001307	2.87	
24.5	-2.5			.94344	575.2	.00355	.001713			3.86	
36.0	-16.0			.97536	583.9	.00100	.000482			1.14	
36.0	-12.0			.97984	587.9	.00091	.000439	.00093	.000449	1.05	
32.0	-18.0			.97760	586.5	.00089	.000429			1.01	
32.0	-16.0			.97592	584.2	.00099	.000478	.00098	.000473	1.02	
32.0	-14.0			.97816	586.5	.00091	.000439	.00090	.000434	1.05	
32.0	-10.0			.97592	584.2	.00099	.000478			1.08	
28.0	-14.0			.97648	584.2	.00099	.000478			1.08	
28.0	-12.0			.97816	590.2	.00098	.000473			1.07	
26.0	-12.5			.97704	587.5	.00094	.000453			1.08	
24.5	-11.0			.97760	584.9	.00281	.001356			3.19	
22.0	-12.5			.97984	586.2	.00099	.000478	.00099	.000478	.98	
20.5	-11.0			.97760	587.5	.00101	.000487	.00100	.000482	1.10	
34.0	-1.0			.97480	584.5	.00135	.000651	.00153	.000738	1.69	
34.0	4.0			.95128	576.2	.00270	.001302	.00274	.001322	2.73	
34.0	5.0			.94512	572.5	.00238	.001148	.00234	.001129	2.74	
34.0	6.0			.94344	570.5	.00216	.001042	.00215	.001037	2.30	
36.0	6.0			.95184	578.9	.00217	.001047			1.76	
38.0	1.0			.95576	579.5	.00178	.000859	.00193	.000931	1.85	
38.0	2.0			.95800	574.5	.00131	.000632			1.41	
44.0	8.0			.94792	572.5	.00209	.001008	.00209	.001008	2.11	
44.0	6.0			.94288	569.5	.00189	.000912	.00185	.000912	1.54	
44.0	4.0			.94064	565.2	.00128	.000617	.00109	.000526	1.29	
44.0	2.0			.95744	575.9	.00172	.000830	.00174	.000839	1.77	
44.0	1.0			.96416	582.2	.00174	.000839	.00171	.000825	1.79	
		1.10	0	.98544	626.9	.01046	.005046				.82
		1.60	0	.97648	617.2	.00915	.004414	.00813	.003922		.72
		2.60	0	.99664	637.2	.01187	.005726	.01279	.006170		.93
		3.60	0	.99776	626.2	.00794	.003830	.00774	.003734		.62
		4.60	0	.99048	623.2	.00904	.004361	.00934	.004506		.71
		6.60	0	.98824	631.2	.00935	.004510	.00937	.004520		.73
		8.60	0	.98824	623.5	.00868	.004187	.00866	.004178		.68
		10.60	0	.97648	631.5	.01212	.005847				.95
		2.60	90	.95800	578.2	.00228	.001100	.00216	.001042		.75
		4.60	90	.96416	580.9	.00233	.001124	.00213	.001028		.77
		2.60	180	.97536	581.2	.00039	.000188	.00040	.000193		
		4.60	180	.99160	589.5	.00028	.000135				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(g) M = 4.44; R = 4.45 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
7.0	.0			.95092	584.5	.00125	.000318			1.49	
12.0	.0			.94601	580.5	.00124	.000315			1.48	
20.5	.0			.96019	595.5	.00309	.000786			3.36	
28.0	12.0			.94219	577.9	.00136	.000346			1.08	
28.0	4.0			.91710	570.9	.00306	.000778			3.64	
28.0	.0			.91274	567.2	.00267	.000679			2.78	
20.5	-5.0			.94819	580.9	.00146	.000371			1.76	
24.5	-5.0			.93401	577.2	.00215	.000547			2.91	
30.0	.0			.95691	599.2	.00561	.001426	.00583	.001482	6.10	
31.0	12.0			.94546	582.2	.00139	.000353			1.11	
34.0	.0			.93292	576.5	.00203	.000516			2.74	
2.0	-12.0			.95092	583.9	.00128	.000325			1.15	
2.0	12.0			.94873	581.9	.00120	.000305				
12.0	-12.0			.95037	582.2	.00133	.000338			1.40	
12.0	12.0			.94110	578.9	.00127	.000323			1.01	
30.0	1.0			.95964	594.9	.00424	.001078			5.05	
31.0	2.0			.95255	590.5	.00309	.000786			3.68	
32.0	2.0			.93674	578.9	.00285	.000725	.00272	.000692	3.39	
32.0	3.0			.94001	582.5	.00333	.000847			3.00	
32.0	6.0			.91874	565.5	.00251	.000638			2.18	
34.0	1.0			.93510	577.9	.00190	.000483	.00200	.000509	2.26	
34.0	2.0			.92256	575.9	.00396	.001007	.00424	.001078	4.71	
34.0	3.0			.91765	566.9	.00343	.000872	.00304	.000773	3.06	
36.0	.0			.92256	568.9	.00274	.000697	.00267	.000679		
38.0	.0			.92965	574.5	.00248	.000631	.00249	.000633	3.35	
40.0	.0			.93510	576.9	.00243	.000618	.00244	.000620		
44.0	12.0			.94110	577.2	.00135	.000343			1.13	
42.0	.0			.93783	576.9	.00182	.000463	.00174	.000442	2.14	
44.0	.0			.95855	590.9	.00187	.000475	.00194	.000493	2.25	
48.0	.0			.95964	588.5	.00133	.000338	.00133	.000338	1.61	
52.0	.0			.95746	586.2	.00094	.000239	.00093	.000236	1.02	
52.0	12.0			.93019	572.2	.00246	.000626			2.03	
55.0	.0			.96291	588.5	.00084	.000214	.00084	.000214	1.11	
58.0	.0			.96782	592.2	.00110	.000280			1.31	
58.0	12.0			.92801	571.9	.00250	.000636			2.12	
58.0	-12.0			.92965	573.5	.00264	.000671			2.47	
44.0	-12.0			.94546	579.9	.00140	.000356			1.59	
36.0	-8.0			.92747	571.2	.00207	.000526			2.35	
36.0	-3.0			.92147	568.5	.00316	.000803			4.00	
34.0	-3.0			.92365	570.5	.00328	.000834	.00320	.000814	3.95	
32.0	-3.0			.94219	583.9	.00311	.000791	.00322	.000819	4.20	
30.0	-3.0			.93892	580.2	.00350	.000890	.00358	.000910	4.73	
28.0	-3.0			.92256	571.2	.00315	.000801			3.80	
34.0	-12.0			.95146	581.5	.00142	.000361	.00143	.000364	1.29	
32.0	-12.0			.95201	582.9	.00134	.000336	.00135	.000343	1.57	
30.0	-12.0			.95528	585.5	.00133	.000338	.00139	.000353	1.21	
19.0	-12.5			.95310	582.9	.00115	.000292			1.37	
17.5	-11.0			.95364	583.2	.00114	.000290			1.36	
15.5	-2.5			.95419	586.2	.00134	.000341			1.61	
16.5	-2.5			.94655	580.9	.00112	.000285	.00098	.000249	1.33	
17.5	-2.5			.94546	578.5	.00113	.000287	.00079	.000201	1.53	
18.5	-2.5			.96128	588.5	.00111	.000282	.00171	.000435	1.42	
19.5	-2.5			.95037	584.9	.00195	.000496	.00170	.000432	2.32	
20.5	-2.5			.95146	586.9	.00287	.000730	.00303	.000770	3.12	
21.5	-2.5			.94873	590.9	.00321	.000816	.00348	.000885	4.34	
22.5	-2.5			.93346	575.9	.00290	.000737	.00273	.000694	3.45	
23.5	-2.5			.92583	576.2	.00301	.000765	.00283	.000720	4.07	
24.5	-2.5			.92256	570.5	.00356	.000905			4.24	
36.0	-16.0			.94819	581.2	.00113	.000287			1.02	
36.0	-12.0			.94873	582.2	.00123	.000313	.00125	.000318	1.18	
32.0	-18.0			.95037	583.2	.00090	.000229			.75	
32.0	-16.0			.94764	581.5	.00127	.000323	.00125	.000318	1.14	
32.0	-14.0			.94928	580.9	.00115	.000292	.00115	.000292	1.25	
32.0	-10.0			.94437	579.2	.00127	.000323			1.20	
28.0	-14.0			.94710	579.9	.00133	.000338			1.20	
28.0	-12.0			.95037	583.2	.00111	.000282			1.32	
26.0	-12.5			.94873	579.9	.00114	.000290			1.07	
24.5	-11.0			.94873	582.2	.00143	.000364			1.72	
22.0	-12.5			.95037	582.2	.00113	.000287	.00113	.000287	1.18	
20.5	-11.0			.94764	581.5	.00112	.000285	.00111	.000282	1.02	
34.0	-1.0			.95255	586.9	.00174	.000442			2.12	
34.0	4.0			.92856	572.9	.00283	.000720	.00315	.000801	2.55	
34.0	5.0			.92147	572.5	.00317	.000806	.00309	.000786	4.12	
34.0	6.0			.92038	567.9	.00303	.000770	.00302	.000768	2.59	
36.0	6.0			.92692	574.9	.00295	.000750			2.66	
38.0	1.0			.93674	576.9	.00200	.000509	.00221	.000562	2.38	
38.0	2.0			.93237	572.2	.00121	.000308			1.44	
44.0	8.0			.92147	568.9	.00301	.000765	.00304	.000773	2.66	
44.0	6.0			.91111	560.5	.00220	.000559	.00220	.000559	1.98	
44.0	4.0			.89965	554.5	.00159	.000404	.00132	.000336	1.43	
44.0	2.0			.93128	573.2	.00180	.000458	.00186	.000473	2.14	
44.0	1.0			.94328	580.2	.00158	.000402	.00151	.000384	1.80	
		1.10	0	.98473	638.9	.01232	.003133				.72
		1.60	0	.98145	619.9	.01040	.002644	.00992	.002522		.61
		2.60	0	.99509	635.5	.00955	.002428	.01070	.002721		.56
		3.60	0	.99672	624.5	.00782	.001988	.00784	.001993		.46
		4.60	0	.99127	621.9	.00851	.002164	.00905	.002301		.50
		6.60	0	.98854	620.9	.00888	.002258	.00940	.002390		.52
		8.60	0	.99072	620.9	.00817	.002077	.00823	.002093		.48
		10.60	0	.98091	613.5	.00764	.001943				.45
		2.60	90	.95310	588.5	.00219	.000557	.00185	.000470		.54
		4.60	90	.95637	589.2	.00201	.000511	.00168	.000427		.50

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(h) M = 4.44; R = 3.18 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t'}$	T_w, °R	h (b)	N_{St}	$^{N}_{St,c}$ (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95975	580.9	.00136	.000482			1.26	
2.5	.0			.96195	586.5	.00280	.001004			3.22	
2.5	12.0			.95148	575.5	.00074	.000265			.80	
2.5	4.0			.92391	562.9	.00244	.000875			2.98	
2.5	.0			.92060	562.4	.00218	.000782			2.40	
2.5	-4.0			.95644	579.2	.00089	.000319			.99	
2.5	-8.0			.93990	571.2	.00149	.000534			1.86	
3.0	.0			.96085	580.7	.00427	.001567	.00452	.001621	5.33	
3.0	12.0			.95478	577.9	.00085	.000305			.92	
3.0	.0			.93935	570.2	.00169	.000606	.00163	.000583	1.88	
2.0	-12.0			.95975	582.5	.00085	.000305			.89	
2.0	12.0			.95644	580.5	.00091	.000341			.90	
12.0	-12.0			.95920	579.9	.00071	.000255			.76	
30.0	1.0			.95864	586.5	.00335	.001201			3.99	
31.0	2.0			.95203	584.2	.00275	.000986			3.06	
32.0	2.0			.93714	571.2	.00262	.000940	.00247	.000886	2.91	
32.0	3.0			.93935	573.2	.00265	.000950			2.91	
32.0	6.0			.92667	562.9	.00181	.000649			1.99	
34.0	1.0			.93714	570.5	.00153	.000549	.00159	.000570	1.70	
34.0	2.0			.92391	564.5	.00318	.001140	.00319	.001144	3.49	
34.0	3.0			.91784	559.5	.00289	.001036	.00252	.000904	3.36	
36.0	.0			.92887	565.5	.00234	.000839	.00228	.000818		
38.0	.0			.93549	571.5	.00214	.000767	.00215	.000771	2.58	
40.0	.0			.94100	571.5	.00189	.000678	.00190	.000681		
44.0	12.0			.95037	575.2	.00081	.000290			1.04	
42.0	.0			.94321	575.2	.00181	.000649	.00159	.000570	1.99	
44.0	.0			.96471	584.9	.00110	.000395	.00116	.000416	1.22	
48.0	.0			.96691	584.5	.00079	.000283	.00079	.000283	.99	
52.0	.0			.96471	583.5	.00078	.000280	.00077	.000276	.99	
52.0	12.0			.93659	569.2	.00181	.000649			1.91	
56.0	.0			.97022	585.5	.00070	.000251	.00070	.000251	.89	
58.0	12.0			.93494	568.9	.00184	.000660			2.02	
58.0	-12.0			.93769	571.2	.00188	.000674			1.47	
44.0	-12.0			.95534	577.9	.00109	.000393			1.38	
36.0	-8.0			.93714	569.5	.00191	.000642			1.99	
36.0	-4.0			.92667	566.2	.00234	.000839			2.96	
34.0	-4.0			.92722	565.2	.00261	.000936	.00254	.000911	2.90	
32.0	-4.0			.94321	575.5	.00263	.000943	.00271	.000972	2.92	
30.0	-4.0			.94321	574.9	.00285	.000735	.00211	.000757	2.56	
28.0	-4.0			.92942	566.2	.00207	.000742			2.27	
34.0	-12.0			.95975	579.9	.00072	.000258	.00072	.000258	.89	
32.0	-12.0			.96085	582.5	.00084	.000301	.00087	.000312	.92	
30.0	-12.0			.96471	583.9	.00082	.000294	.00094	.000337	1.03	
19.0	-12.5			.96140	581.9	.00073	.000262			.80	
15.5	-2.5			.95250	582.2	.00074	.000265			.91	
16.5	-2.5			.95589	577.9	.00088	.000316	.00075	.000269	.93	
17.5	-2.5			.95313	576.2	.00078	.000280			.93	
18.5	-2.5			.96987	585.9	.00075	.000269			.93	
19.5	-2.5			.95534	580.2	.00163	.000585	.00142	.000509	2.01	
20.5	-2.5			.95478	581.2	.00221	.000793	.00230	.000825	2.63	
21.5	-2.5			.95037	580.5	.00228	.000818	.00252	.000904	2.40	
22.5	-2.5			.93494	568.9	.00228	.000818	.00213	.000764	2.51	
23.5	-2.5			.92667	564.5	.00245	.000879	.00228	.000818	2.99	
24.5	-2.5			.92667	568.5	.00282	.001011			3.10	
36.0	-16.0			.95754	579.5	.00089	.000319			1.20	
36.0	-12.0			.95809	578.5	.00072	.000258	.00074	.000265	.97	
32.0	-18.0			.95864	580.9	.00089	.000319			.97	
32.0	-16.0			.95754	578.9	.00139	.000501	.00107	.000384	1.18	
32.0	-14.0			.95920	580.2	.00066	.000237	.00066	.000237	.90	
32.0	-10.0			.95313	576.2	.00079	.000283			.98	
28.0	-14.0			.95644	579.2	.00072	.000265			.98	
28.0	-12.0			.96030	581.2	.00075	.000280			.86	
22.0	-12.5			.95975	582.2	.00079	.000287	.00079	.000283	1.03	
23.5	-11.5			.95699	579.5	.00079	.000283	.00078	.000280	.87	
34.0	-1.5			.95699	580.5	.00111	.000398	.00146	.000524	1.39	
34.0	4.0			.93273	568.7	.00233	.000854	.00274	.000983	2.74	
34.0	5.0			.92832	565.5	.00243	.000863	.00228	.000818	3.67	
34.0	6.0			.92777	567.5	.00232	.000832	.00241	.000828	2.55	
36.0	6.0			.93383	568.2	.00204	.000732			2.15	
38.0	1.0			.94155	572.2	.00167	.000599	.00191	.000685	2.06	
38.0	2.0			.93714	569.9	.00174	.000445			1.68	
44.0	8.0			.92832	564.9	.00223	.000800	.00224	.000803	2.45	
44.0	6.0			.92115	559.2	.00203	.000729	.00204	.000732	2.23	
44.0	4.0			.91288	553.9	.00112	.000402	.00093	.000334	1.47	
44.0	2.0			.93769	569.9	.00149	.000534	.00151	.000542	1.84	
44.0	1.0			.94982	575.9	.00139	.000499	.00133	.000477	1.54	
		1.10	0	.98621	615.9	.01004	.003594				.71
		1.60	0	.98180	611.2	.00902	.003235	.00856	.003070		.64
		2.60	0	.99448	618.2	.00867	.003109	.00963	.003454		.62
		3.60	0	.99669	616.9	.00696	.002496	.00703	.002521		.49
		4.60	0	.99007	613.2	.00742	.002661	.00784	.002812		.53
		6.60	0	.98787	613.5	.00783	.002808	.00784	.002812		.56
		8.60	0	.98952	612.7	.00714	.002561	.00723	.002586		.51
		10.60	0	.97739	604.9	.00642	.002302				.46
		2.60	90	.95534	579.5	.00119	.000429				.41
		4.60	90	.95699	580.5	.00177	.000635	.00150	.000538		.42

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

10. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Concluded

(i) M = 4.44; R = 2.12 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97071	585.5	.00067	.000361			.89	
12.0	.0			.96684	582.5	.00060	.000324			1.03	
20.5	.0			.96574	586.2	.00220	.001186			3.86	
28.0	12.0			.96463	581.9	.00058	.000313			1.05	
28.0	4.0			.93313	566.5	.00181	.000976			3.12	
28.0	.0			.93092	563.2	.00154	.000830			2.08	
20.5	-5.0			.96850	582.9	.00066	.000356			1.06	
24.5	-5.0			.94805	572.5	.00106	.000572			1.43	
37.0	.0			.96021	586.9	.00344	.001855	.00355	.001914	6.62	
31.0	12.0			.96684	583.9	.00063	.000340			1.24	
34.0	.0			.94971	573.5	.00078	.000421	.00079	.000426	1.37	
2.0	-12.0			.97016	584.2	.00060	.000324			1.07	
2.0	12.0			.96574	583.2	.00067	.000361			1.05	
12.0	-12.0			.97181	584.5	.00055	.000297			.92	
12.0	12.0			.95855	578.2	.00060	.000324			.95	
30.0	1.0			.95911	583.9	.00275	.001483			3.72	
31.0	2.0			.95413	579.5	.00231	.001246			3.12	
32.0	2.0			.93811	569.9	.00219	.001181	.00206	.001111	3.84	
32.0	3.0			.94087	573.5	.00205	.001105			2.77	
32.0	6.0			.93756	568.2	.00132	.000712			2.13	
34.0	1.0			.94253	568.9	.00079	.000426	.00084	.000453	1.30	
34.0	2.0			.92595	563.2	.00227	.001224	.00217	.001170	3.72	
34.0	3.0			.91987	559.9	.00206	.001111			3.22	
36.0	.0			.93866	569.9	.00198	.001068	.00192	.001035		
38.0	.0			.94419	570.9	.00152	.000820	.00151	.000814	2.05	
40.0	.0			.95026	577.2	.00123	.000663	.00125	.000674		
44.0	12.0			.96574	581.9	.00067	.000361				
42.0	.0			.95192	579.2	.00128	.000690	.00118	.000636	1.37	
44.0	.0			.97623	589.5	.00088	.000475	.00094	.000507	2.10	
46.0	.0			.97845	589.5	.00082	.000442	.00082	.000442	1.76	
52.0	12.0			.95026	576.2	.00126	.000679			1.64	
58.0	12.0			.94750	574.5	.00160	.000863			2.52	
58.0	-12.0			.95082	574.9	.00104	.000561			2.62	
44.0	-12.0			.97126	584.5	.00066	.000356			2.12	
36.0	-8.0			.94971	573.2	.00103	.000555			1.35	
36.0	-3.0			.93424	565.5	.00136	.000733			2.10	
34.0	-3.0			.93148	567.2	.00193	.001041	.00185	.000998	2.57	
32.0	-3.0			.94584	573.5	.00218	.001176	.00222	.001197	3.16	
30.0	-3.0			.94971	576.2	.00160	.000863	.00166	.000895	4.19	
28.0	-3.0			.93866	568.9	.00164	.000884			2.42	
30.0	-12.0			.97789	588.9	.00061	.000329	.00066	.000356	2.73	
17.5	-11.0			.97623	587.2	.00047	.000253			1.20	
15.5	-2.5			.97623	587.5	.00054	.000291			.87	
18.5	-2.5			.98287	591.5	.00052	.000280			.77	
19.5	-2.5			.96574	584.5	.00103	.000555			.75	
20.5	-2.5			.95966	582.9	.00145	.000782	.00142	.000766	1.81	
21.5	-2.5			.95413	578.2	.00174	.000938			2.04	
22.5	-2.5			.93866	568.2	.00157	.000847	.00135	.000728	3.22	
23.5	-2.5			.93037	563.9	.00193	.001041	.00176	.000949	2.96	
24.5	-2.5			.93037	564.9	.00225	.001213			2.72	
36.0	-16.0			.97071	583.9	.00056	.000302			3.21	
36.0	-12.0			.97016	584.2	.00050	.000270	.00052	.000280	1.02	
32.0	-16.0			.96960	584.2	.00047	.000253	.00045	.000243	1.02	
32.0	-14.0			.97402	585.5	.00041	.000221	.00042	.000226	.85	
28.0	-14.0			.96905	583.5	.00075	.000404			.71	
26.0	-12.5			.97126	584.2	.00050	.000270			1.53	
22.0	-12.5			.97292	585.9	.00049	.000264	.00049	.000264	1.02	
20.5	-11.0			.97016	583.2	.00050	.000270	.00060	.000324	.91	
34.0	-1.0			.96297	582.5	.00090	.000485	.00126	.000679	1.00	
34.0	4.0			.93977	571.5	.00162	.000874			1.84	
34.0	5.0			.93756	567.5	.00169	.000911	.00162	.000874	2.61	
34.0	6.0			.93811	569.2	.00162	.000874	.00160	.000863	2.28	
36.0	6.0			.94419	571.9	.00162	.000874			2.19	
38.0	1.0			.94971	573.5	.00106	.000572	.00122	.000658	2.19	
44.0	8.0			.93866	569.5	.00162	.000874	.00160	.000863	1.86	
44.0	6.0			.93479	566.5	.00120	.000647	.00120	.000647	2.16	
44.0	4.0			.93258	562.5	.00087	.000469	.00077	.000415	2.35	
44.0	2.0			.94916	573.2	.00086	.000464	.00084	.000453	1.58	
44.0	1.0			.95966	579.9	.00120	.000647	.00111	.000599	1.65	
		1.10	0	.98618	612.5	.00796	.004292			2.11	
		1.60	0	.98066	607.5	.00723	.003899	.00677	.003651		.69
		2.60	0	.99281	619.5	.00782	.004217	.00887	.004783		.63
		3.60	0	.99557	614.2	.00595	.003209	.00605	.003262		.48
		4.60	0	.98784	609.9	.00678	.003656	.00701	.003780		.51
		6.60	0	.98673	613.2	.00665	.003586	.00666	.003591		.59
		8.60	0	.98729	609.2	.00648	.003494	.00654	.003527		.58
		10.60	0	.97402	599.5	.00501	.002702				.56
		2.60	90	.95911	580.5	.00132	.000712	.00111	.000599		.43
		4.60	90	.96021	580.9	.00131	.000706				.48
											.48

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5°

(a) M = 2.65; R = 3.89 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95080	585.5	.00460	.000654			.97	
12.0	.0			.94912	583.5	.00447	.000636			1.01	
20.5	.0			.95303	585.9	.00455	.000647			1.02	
28.0	12.0			.94800	585.9	.00510	.000725			1.10	
28.0	4.0			.92285	575.9	.00670	.000953			1.41	
28.0	.0			.93011	583.2	.00723	.001028			1.62	
20.5	-5.0			.95024	583.9	.00445	.000633			.98	
24.5	-5.0			.94800	582.2	.00425	.000604			.99	
30.0	.0			.96366	622.5	.01319	.001876	.01343	.001910	2.91	
31.0	12.0			.93659	577.9	.00533	.000758			1.17	
34.0	.0			.93403	577.9	.00529	.000752	.00487	.000693	1.27	
2.0	-12.0			.95415	586.5	.00455	.000647			1.00	
2.0	12.0			.95359	587.2	.00458	.000651			.96	
12.0	-12.0			.95639	587.9	.00445	.000633			.95	
12.0	12.0			.94689	583.2	.00462	.000657			.96	
30.0	1.0			.95527	612.9	.01174	.001670			2.68	
31.0	2.0			.95751	604.5	.00877	.001247			1.99	
32.0	2.0			.96310	615.9	.01138	.001619	.01164	.001655	2.62	
32.0	3.0			.94968	601.5	.00925	.001316			2.02	
32.0	6.0			.93738	587.5	.00728	.001035			1.60	
34.0	1.0			.94968	587.5	.00551	.000784	.00539	.000767	1.23	
34.0	2.0			.95415	602.9	.00872	.001240	.00902	.001283	1.90	
34.0	3.0			.94968	612.5	.01073	.001526	.01089	.001549	2.35	
36.0	.0			.91614	569.5	.00593	.000843	.00572	.000814		
38.0	.0			.92620	588.2	.00674	.000959	.00713	.001014	1.56	
40.0	.0			.88707	534.9	.00175	.000249	.00135	.000192		
44.0	12.0			.94129	583.2	.00548	.000779			1.22	
42.0	.0			.93515	583.2	.00656	.000933	.00681	.000969	1.54	
44.0	.0			.95024	590.9	.00605	.000860	.00628	.000865	1.39	
48.0	.0			.95024	588.9	.00548	.000779	.00548	.000779	1.27	
52.0	.0			.94800	585.9	.00522	.000742	.00521	.000741	1.17	
52.0	12.0			.93515	575.9	.00469	.000667			1.06	
55.0	.0			.95192	588.2	.00518	.000737	.00518	.000737	1.16	
58.0	.0			.95527	590.2	.00507	.000721			1.04	
58.0	12.0			.93291	571.9	.00387	.000550			.78	
58.0	-12.0			.93123	573.9	.00480	.000683			1.05	
44.0	-12.0			.95303	587.2	.00468	.000666			1.09	
36.0	-8.0			.94912	585.9	.00503	.000715			1.19	
36.0	-3.0			.94018	590.2	.00805	.001145			1.92	
34.0	-3.0			.94297	596.2	.00919	.001307	.00881	.001253	2.19	
30.0	-3.0			.94465	588.9	.00649	.000923	.00659	.000937	1.48	
28.0	-3.0			.96030	592.2	.00488	.000694			1.12	
34.0	-12.0			.95303	584.9	.00421	.000599	.00421	.000599	.96	
32.0	-12.0			.95080	583.2	.00424	.000603	.00423	.000602	.97	
30.0	-12.0			.95303	585.2	.00422	.000600	.00425	.000604	.95	
19.0	-12.5			.95639	587.5	.00462	.000657			.98	
17.5	-11.0			.95471	586.5	.00462	.000657			1.03	
15.5	-2.5			.95751	589.2	.00447	.000636			.95	
16.5	-2.5			.95192	584.9	.00429	.000610	.00423	.000602	.97	
17.5	-2.5			.94912	583.5	.00435	.000619	.00423	.000602	.95	
18.5	-2.5			.95751	588.2	.00428	.000609	.00447	.000636	.97	
19.5	-2.5			.94912	583.5	.00467	.000664	.00458	.000651	1.03	
20.5	-2.5			.94912	583.9	.00449	.000639	.00446	.000634	.99	
21.5	-2.5			.95192	585.2	.00430	.000612	.00434	.000617	.95	
22.5	-2.5			.95136	584.5	.00434	.000617	.00426	.000606	.98	
23.5	-2.5			.95359	587.9	.00466	.000663	.00471	.000670	1.04	
24.5	-2.5			.95583	588.2	.00456	.000649			1.05	
36.0	-16.0			.94800	584.2	.00409	.000582			.99	
36.0	-12.0			.95471	586.5	.00447	.000636	.00448	.000637	1.04	
32.0	-18.0			.95471	585.2	.00400	.000569			.95	
32.0	-16.0			.95080	583.5	.00420	.000597	.00420	.000597	.97	
32.0	-14.0			.94968	581.9	.00424	.000603	.00423	.000602	1.04	
32.0	-10.0			.95192	584.5	.00443	.000630			1.04	
28.0	-14.0			.94912	582.5	.00423	.000602			.96	
28.0	-12.0			.94968	582.5	.00420	.000597			.99	
26.0	-12.5			.95303	584.9	.00426	.000606			.98	
24.5	-11.0			.95024	582.5	.00417	.000593			.92	
22.0	-12.5			.95192	584.9	.00464	.000660	.00464	.000660	1.04	
20.5	-11.0			.94968	583.5	.00465	.000661	.00465	.000661	1.07	
34.0	-1.0			.95248	590.9	.00582	.000828	.00597	.000849	1.50	
34.0	4.0			.95080	602.9	.00969	.001378	.00938	.001334	2.17	
34.0	5.0			.93794	590.2	.00811	.001153	.00778	.001107	2.32	
34.0	6.0			.93626	596.2	.00837	.001190	.00842	.001198	1.82	
36.0	6.0			.93459	586.5	.00737	.001048			1.61	
38.0	1.0			.93738	583.2	.00637	.000906	.00619	.000880	1.49	
38.0	2.0			.95080	583.5	.00418	.000595			.95	
44.0	8.0			.94018	584.5	.00594	.000845	.00600	.000853	1.31	
44.0	6.0			.92173	568.2	.00465	.000661	.00449	.000639	1.03	
44.0	4.0			.94297	585.5	.00490	.000697	.00493	.000701	1.13	
44.0	2.0			.94521	587.2	.00580	.000825	.00580	.000825	1.31	
44.0	1.0			.94800	589.5	.00608	.000865	.00611	.000869	1.49	
		1.10	0	.99217	676.8	.02968	.004221				1.26
		1.60	0	.97651	662.2	.02815	.004004	.02759	.003924		1.20
		2.60	0	.99720	669.2	.01863	.002650	.02022	.002876		.79
		3.60	0	1.00223	659.5	.01459	.002075	.01431	.002035		.62
		4.60	0	.99832	659.5	.01536	.002185	.01600	.002276		.65
		6.60	0	.99608	649.2	.01588	.002259	.01586	.002256		.68
		8.60	0	.99720	649.5	.01577	.002243	.01574	.002239		.67
		10.60	0	.99608	654.2	.01724	.002452				.73
		2.60	90	.93962	573.5	.00402	.000572	.00367	.000522		.72
		4.60	90	.94800	575.5	.00322	.000458	.00337	.000479		.58
		2.60	180	.95639	570.9	.00045	.000064				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(b) M = 2.65; R = 2.53 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96494	582.5	.00313	.000684			1.00	
12.0	.0			.96155	579.5	.00296	.000647			.98	
20.5	.0			.96551	582.5	.00323	.000706			1.11	
28.0	12.0			.95816	580.2	.00346	.000757			1.10	
28.0	4.0			.93441	570.9	.00464	.001015			1.53	
28.0	.0			.94007	576.9	.00517	.001131			1.74	
20.5	-5.0			.96381	580.5	.00288	.000630			.96	
24.5	-5.0			.96212	579.5	.00286	.000625			.98	
30.0	.0			.96781	611.9	.00969	.002119	.00988	.002161	3.49	
31.0	12.0			.94409	572.5	.00355	.000776			1.16	
34.0	.0			.94522	577.2	.00361	.000789	.00327	.000715	1.29	
2.0	-12.0			.96781	584.2	.00326	.000713			1.06	
2.0	12.0			.96833	584.9	.00325	.000711			1.00	
12.0	-12.0			.96946	584.2	.00304	.000665			1.01	
12.0	12.0			.95872	579.2	.00316	.000691			1.00	
30.0	1.0			.96155	603.2	.00870	.001903			2.94	
31.0	2.0			.96494	595.9	.00619	.001354			2.11	
32.0	2.0			.96837	606.2	.00817	.001787	.00805	.001760	2.95	
32.0	3.0			.95820	594.5	.00678	.001483			2.29	
32.0	6.0			.94522	581.5	.00537	.001174			1.74	
34.0	1.0			.95764	581.2	.00386	.000844	.00376	.000822	1.33	
34.0	2.0			.96046	593.2	.00616	.001347	.00633	.001384	2.03	
34.0	3.0			.95759	597.2	.00752	.001645	.00765	.001673	2.47	
36.0	.0			.92932	566.5	.00423	.000925	.00416	.000910		
38.0	.0			.93667	573.9	.00490	.001072	.00517	.001131	1.66	
40.0	.0			.89144	534.5	.00163	.000356	.00101	.000221		
44.0	12.0			.95137	578.2	.00388	.000849			1.28	
42.0	.0			.94409	577.2	.00462	.001010	.00483	.001056	1.57	
44.0	.0			.95933	585.2	.00432	.000945	.00435	.000951	1.54	
48.0	.0			.96046	583.9	.00406	.000888	.00406	.000888	1.38	
52.0	.0			.95820	581.2	.00357	.000781	.00356	.000779	1.18	
52.0	12.0			.94635	572.2	.00314	.000687			1.05	
55.0	.0			.96381	583.5	.00356	.000779	.00356	.000779	1.18	
58.0	.0			.96777	585.9	.00355	.000776			1.17	
58.0	12.0			.94742	570.2	.00265	.000580			.84	
58.0	-12.0			.94233	569.5	.00322	.000704			1.06	
44.0	-12.0			.96329	582.5	.00328	.000717			1.20	
36.0	-8.0			.95877	580.5	.00341	.000746			1.19	
36.0	-3.0			.94973	584.2	.00541	.001183			1.94	
34.0	-3.0			.95143	589.2	.00639	.001397	.00642	.001404	2.23	
32.0	-3.0			.93392	589.9	.00690	.001509	.00695	.001520	2.46	
30.0	-3.0			.95420	582.5	.00455	.000995	.00449	.000982	1.53	
28.0	-3.0			.97060	586.9	.00337	.000737			1.23	
34.0	-12.0			.96777	582.9	.00293	.000641	.00294	.000643	1.02	
32.0	-12.0			.96438	580.5	.00289	.000632	.00287	.000628	1.02	
30.0	-12.0			.96664	581.9	.00282	.000617	.00284	.000621	.96	
19.0	-12.5			.96781	583.9	.00294	.000643			1.00	
17.5	-11.0			.96611	582.5	.00287	.000628			.96	
15.5	-2.5			.96837	585.2	.00308	.000674			1.02	
16.5	-2.5			.96329	581.2	.00288	.000630	.00283	.000619	.96	
17.5	-2.5			.96103	580.2	.00299	.000654	.00288	.000630	.99	
18.5	-2.5			.97060	584.9	.00292	.000639	.00309	.000676	.98	
19.5	-2.5			.96212	580.2	.00296	.000647	.00287	.000628	.99	
20.5	-2.5			.96268	580.5	.00291	.000636	.00288	.000630	.95	
21.5	-2.5			.96551	581.9	.00295	.000645	.00298	.000652	.98	
22.5	-2.5			.96494	581.9	.00304	.000665	.00300	.000656	1.01	
23.5	-2.5			.96442	583.9	.00330	.000722	.00334	.000730	1.10	
24.5	-2.5			.96611	583.9	.00314	.000687			1.07	
36.0	-16.0			.96046	578.2	.00270	.000590			.99	
36.0	-12.0			.96668	583.2	.00292	.000639	.00293	.000641	1.00	
32.0	-18.0			.96724	582.5	.00275	.000601			.96	
32.0	-16.0			.96438	580.2	.00291	.000636	.00291	.000636	1.01	
32.0	-14.0			.96325	579.2	.00274	.000599	.00273	.000597	.95	
32.0	-10.0			.96551	582.5	.00305	.000667			1.04	
28.0	-14.0			.96268	579.5	.00281	.000615			.96	
28.0	-12.0			.96325	579.5	.00291	.000636			1.04	
26.0	-12.5			.96555	581.9	.00281	.000615			.98	
24.5	-11.0			.96272	579.5	.00277	.000606			.96	
22.0	-12.5			.96442	581.5	.00295	.000645	.00294	.000643	1.00	
20.5	-11.0			.96216	580.2	.00286	.000625	.00286	.000625	.98	
34.0	-1.0			.96103	584.5	.00403	.000881	.00414	.000905	1.51	
34.0	4.0			.95872	595.2	.00670	.001465	.00692	.001513	2.21	
34.0	5.0			.94742	583.2	.00573	.001253	.00549	.001201	2.25	
34.0	6.0			.94402	582.2	.00608	.001330	.00610	.001334	2.01	
36.0	6.0			.94402	579.2	.00521	.001139			1.70	
38.0	1.0			.94855	578.5	.00426	.000932	.00433	.000947	1.44	
38.0	2.0			.96159	579.5	.00291	.000636			1.01	
44.0	8.0			.94691	576.9	.00404	.000884	.00408	.000892	1.34	
44.0	6.0			.93336	564.9	.00327	.000715	.00314	.000687	1.09	
44.0	4.0			.95651	579.2	.00341	.000746	.00346	.000757	1.14	
44.0	2.0			.95595	582.5	.00413	.000903	.00412	.000901	1.39	
44.0	1.0			.95985	584.9	.00429	.000938	.00433	.000947	1.56	
		1.10	0	.99095	664.5	.02334	.005104				1.22
		1.60	0	.97625	649.2	.02177	.004761	.02131	.004660		1.14
		2.60	0	.99660	666.2	.01373	.003003	.01569	.003431		.72
		3.60	0	1.00226	640.9	.01230	.002690	.01215	.002657		.64
		4.60	0	.99774	641.2	.01323	.002893	.01315	.002876		.69
		6.60	0	.99604	638.9	.01285	.002810	.01238	.002707		.67
		8.60	0	.99717	646.5	.01233	.002696	.01231	.002692		.64
		10.60	0	.99491	642.9	.01427	.003121				.75
		2.60	90	.94691	569.2	.00311	.000680	.00280	.000612		.69
		4.60	90	.95595	575.5	.00258	.000564	.00263	.000575		.57
		2.60	180	.96555	569.9	.00039	.000085				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(c) M = 2.65; R = 1.30×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c, (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.98248	588.2	.00158	.000683			.99	
12.0	.0			.97852	584.5	.00150	.000649			1.00	
20.5	.0			.98191	587.9	.00168	.000727			1.11	
28.0	12.0			.97287	582.9	.00186	.000804			1.19	
28.0	4.0			.95027	575.5	.00252	.001090			1.73	
28.0	.0			.95366	577.2	.00274	.001185			1.84	
20.5	-5.0			.98191	586.5	.00148	.000640			.99	
24.5	-5.0			.98135	585.9	.00148	.000640			1.10	
30.0	.0			.97061	605.9	.00537	.002323	.00552	.002387	3.63	
31.0	12.0			.96101	576.2	.00187	.000809			1.32	
34.0	.0			.95931	575.9	.00190	.000822	.00171	.000740	1.45	
2.0	-12.0			.98700	590.2	.00155	.000670			.99	
2.0	12.0			.98643	591.9	.00166	.000718			.91	
12.0	-12.0			.98587	589.2	.00141	.000610			1.00	
12.0	12.0			.97570	583.9	.00159	.000688			1.00	
30.0	1.0			.96496	598.2	.00454	.001964			3.44	
31.0	2.0			.96779	589.2	.00355	.001535			2.40	
32.0	2.0			.97231	597.5	.00425	.001838	.00444	.001920	3.27	
32.0	3.0			.96779	590.9	.00379	.001639			2.48	
32.0	6.0			.95818	581.9	.00303	.001311			2.13	
34.0	1.0			.96666	579.9	.00190	.000822	.00182	.000787	1.42	
34.0	2.0			.96722	590.2	.00318	.001375	.00329	.001423	2.24	
34.0	3.0			.96440	591.2	.00415	.001795	.00423	.001830	2.90	
36.0	.0			.94405	573.2	.00258	.001116	.00253	.001094		
38.0	.0			.95084	576.2	.00273	.001181	.00298	.001289	2.04	
40.0	.0			.89829	532.9	.00109	.000471	.00065	.000281		
44.0	12.0			.96666	580.9	.00195	.000843			1.44	
42.0	.0			.95931	579.5	.00247	.001068	.00266	.001150	1.82	
44.0	.0			.97626	588.2	.00229	.000990	.00232	.001003	1.68	
48.0	.0			.97852	588.2	.00199	.000861	.00199	.000861	1.37	
52.0	.0			.97739	586.2	.00174	.000753	.00173	.000748	1.18	
52.0	12.0			.96553	577.5	.00154	.000666			1.05	
55.0	.0			.98191	588.9	.00185	.000800	.00185	.000800	1.33	
58.0	.0			.98700	591.5	.00184	.000796			1.31	
58.0	12.0			.96722	577.9	.00136	.000588			.89	
58.0	-12.0			.96101	575.2	.00159	.000688			1.03	
44.0	-12.0			.98078	586.5	.00159	.000688			1.08	
36.0	-8.0			.97570	584.2	.00165	.000714			1.12	
36.0	-3.0			.96327	584.2	.00298	.001289			2.03	
34.0	-3.0			.96157	586.5	.00352	.001522	.00356	.001540	2.67	
30.0	-3.0			.96666	583.2	.00237	.001025	.00234	.001012	1.60	
28.0	-3.0			.98474	589.9	.00164	.000709			1.12	
34.0	-12.0			.98530	589.5	.00156	.000675	.00158	.000683	1.18	
32.0	-12.0			.98361	586.9	.00130	.000562	.00129	.000558	.96	
30.0	-12.0			.98474	587.9	.00147	.000636	.00148	.000640	1.01	
19.0	-12.5			.98643	588.9	.00147	.000636			1.07	
17.5	-11.0			.98417	587.9	.00139	.000601			1.01	
15.5	-2.5			.98643	589.9	.00141	.000610			.97	
16.5	-2.5			.98248	586.5	.00148	.000640	.00144	.000623	1.01	
17.5	-2.5			.98022	585.5	.00148	.000640	.00138	.000597	1.01	
18.5	-2.5			.98869	592.9	.00140	.000606	.00165	.000714	1.01	
19.5	-2.5			.98022	585.5	.00148	.000640	.00139	.000601	1.01	
20.5	-2.5			.98078	586.2	.00152	.000657	.00150	.000649	1.09	
21.5	-2.5			.98361	587.5	.00148	.000640	.00151	.000653	1.00	
22.5	-2.5			.98248	587.2	.00151	.000653	.00149	.000644	1.09	
23.5	-2.5			.98135	587.9	.00184	.000796	.00185	.000800	1.24	
24.5	-2.5			.98191	587.5	.00158	.000683			1.07	
36.0	-16.0			.97965	585.5	.00132	.000571			1.02	
36.0	-12.0			.98530	588.5	.00150	.000649	.00151	.000653	1.01	
32.0	-18.0			.98530	587.9	.00129	.000558			.88	
32.0	-16.0			.98135	585.9	.00148	.000640	.00147	.000636	1.14	
32.0	-14.0			.98135	586.2	.00131	.000567	.00130	.000562	1.02	
32.0	-10.0			.98304	586.5	.00157	.000679			1.15	
28.0	-14.0			.98078	585.2	.00130	.000562			.88	
28.0	-12.0			.98078	585.5	.00148	.000640			1.13	
26.0	-12.5			.98417	587.5	.00130	.000562			.98	
24.5	-11.0			.98135	587.5	.00124	.000536			.95	
22.0	-12.5			.98304	587.2	.00136	.000588	.00136	.000588	.92	
20.5	-11.0			.98135	586.2	.00137	.000593	.00137	.000593	.93	
34.0	-1.0			.96892	582.9	.00220	.000952	.00227	.000982	1.72	
34.0	4.0			.96779	594.2	.00378	.001635	.00391	.001691	2.55	
34.0	5.0			.95875	582.2	.00313	.001354	.00296	.001280	2.14	
34.0	6.0			.95536	586.2	.00321	.001388	.00321	.001388	2.28	
36.0	6.0			.95762	582.2	.00291	.001259			1.95	
38.0	1.0			.96214	579.5	.00222	.000960	.00225	.000973	1.50	
38.0	2.0			.97513	581.5	.00128	.000554			.93	
44.0	8.0			.96270	579.5	.00223	.000965	.00225	.000973	1.58	
44.0	6.0			.95592	571.9	.00161	.000696	.00150	.000649	1.05	
44.0	4.0			.97400	584.2	.00187	.000809	.00192	.000830	1.33	
44.0	2.0			.97174	584.5	.00207	.000895	.00203	.000878	1.48	
44.0	1.0			.97457	587.2	.00230	.000995	.00234	.001012	1.70	
		1.10	0	.98643	655.2	.01428	.006176				1.06
		1.60	0	.97174	638.5	.01311	.005670	.01256	.005432		.97
		2.60	0	.99039	636.9	.00935	.004044	.00994	.004299		.69
		3.60	0	.99886	630.9	.00797	.003447	.00797	.003447		.59
		4.60	0	.99547	634.9	.00830	.003590	.00887	.003836		.61
		6.60	0	.99434	634.2	.00843	.003646	.00842	.003642		.62
		8.60	0	.99547	634.9	.00841	.003637	.00842	.003642		.62
		10.60	0	.99208	629.2	.00863	.003733				.64
		2.60	90	.95479	570.9	.00201	.000869	.00176	.000761		.63
		4.60	90	.96270	575.5	.00180	.000779	.00191	.000826		.56
		2.60	180	.97231	573.2	.00023	.000099				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(d) M = 3.51; R = 4.06×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95663	581.9	.00257	.000496			.99	
12.0	.0			.95163	579.9	.00242	.000467			1.03	
20.5	.0			.95441	580.9	.00271	.000523			1.09	
28.0	12.0			.94551	576.2	.00315	.000608			1.21	
28.0	4.0			.92327	566.5	.00406	.000784			1.63	
28.0	.0			.92828	572.9	.00491	.000948			1.97	
20.5	-5.0			.95552	579.9	.00232	.000448			.99	
24.5	-5.0			.95385	578.9	.00229	.000442			.95	
30.0	.0			.97609	617.9	.01015	.001961	.01029	.001988	4.43	
31.0	12.0			.93662	570.5	.00296	.000572			1.17	
34.0	.0			.94162	574.9	.00292	.000564	.00272	.000525	1.23	
2.0	-12.0			.96163	583.9	.00254	.000491			1.03	
2.0	12.0			.95997	582.5	.00247	.000477			.98	
12.0	-12.0			.95997	582.5	.00233	.000450			.94	
12.0	12.0			.94885	575.9	.00250	.000483			.97	
30.0	1.0			.97053	619.9	.00947	.001829			3.90	
31.0	2.0			.95774	593.9	.00569	.001099			2.42	
32.0	2.0			.95218	589.2	.00592	.001144	.00582	.001124	2.49	
32.0	3.0			.94273	587.9	.00677	.001308			2.64	
32.0	6.0			.93328	576.2	.00513	.000991			2.02	
34.0	1.0			.94829	579.9	.00348	.000672	.00327	.000632	1.40	
34.0	2.0			.94885	594.5	.00811	.001567	.00813	.001570	3.23	
34.0	3.0			.94107	594.9	.01000	.001932	.01009	.001949	3.88	
36.0	.0			.92327	568.2	.00448	.000865	.00439	.000848		
38.0	.0			.93717	579.5	.00546	.001055	.00551	.001064	2.20	
40.0	.0			.93995	579.2	.00480	.000927	.00480	.000927		
44.0	12.0			.93662	574.9	.00412	.000796			1.82	
42.0	.0			.94159	579.5	.00437	.000844	.00434	.000838	1.76	
44.0	.0			.95549	585.9	.00391	.000755	.00393	.000759	1.67	
48.0	.0			.95549	583.5	.00325	.000628	.00325	.000628	1.39	
52.0	.0			.95438	581.5	.00312	.000603	.00311	.000601	1.26	
52.0	12.0			.93603	571.5	.00336	.000649			1.45	
55.0	.0			.95774	585.5	.00278	.000537	.00278	.000537	1.13	
58.0	.0			.96330	585.5	.00255	.000493			1.03	
58.0	12.0			.93439	568.9	.00285	.000551			1.15	
58.0	-12.0			.92327	566.9	.00426	.000823			1.76	
44.0	-12.0			.94771	576.5	.00267	.000516			1.19	
36.0	-8.0			.94493	577.5	.00343	.000663			1.47	
36.0	-3.0			.94270	591.9	.00663	.001281			2.76	
34.0	-3.0			.94159	588.9	.00752	.001453	.00752	.001453	3.24	
32.0	-3.0			.95327	609.5	.00533	.001030	.00533	.001030	2.29	
30.0	-3.0			.94718	591.2	.00566	.001093	.00565	.001091	2.29	
28.0	-3.0			.95608	584.9	.00353	.000682			1.45	
34.0	-12.0			.95719	586.9	.00265	.000512	.00267	.000516	1.13	
32.0	-12.0			.95496	581.9	.00241	.000466	.00239	.000462	.99	
30.0	-12.0			.95719	583.2	.00241	.000466	.00242	.000467	1.00	
19.0	-12.5			.96050	582.5	.00224	.000433			.98	
17.5	-11.0			.95828	581.5	.00225	.000435			.93	
15.5	-2.5			.95939	582.9	.00238	.000460			.98	
16.5	-2.5			.95549	579.5	.00230	.000444	.00226	.000437	.98	
17.5	-2.5			.95327	578.5	.00255	.000493	.00245	.000473	1.02	
18.5	-2.5			.96108	583.2	.00231	.000446	.00248	.000479	.96	
19.5	-2.5			.95330	580.9	.00242	.000467	.00233	.000450	.98	
20.5	-2.5			.95330	578.9	.00234	.000452	.00231	.000446	.98	
21.5	-2.5			.95608	580.5	.00229	.000442	.00234	.000452	.94	
22.5	-2.5			.95441	579.9	.00247	.000477	.00239	.000462	.96	
23.5	-2.5			.95383	580.9	.00282	.000545	.00284	.000549	1.14	
24.5	-2.5			.95494	580.9	.00266	.000514			1.15	
36.0	-16.0			.95383	578.2	.00224	.000433			.99	
36.0	-12.0			.95661	580.9	.00248	.000479	.00249	.000481	1.08	
32.0	-18.0			.95883	581.5	.00224	.000433			.99	
32.0	-16.0			.95552	581.9	.00241	.000466	.00241	.000466	1.00	
32.0	-14.0			.95552	579.2	.00211	.000408	.00210	.000406	.89	
32.0	-10.0			.95641	583.9	.00280	.000541			1.15	
28.0	-14.0			.95496	579.5	.00226	.000437			.94	
28.0	-12.0			.95552	579.5	.00223	.000431			.97	
26.0	-12.5			.95886	581.9	.00227	.000438			.98	
24.5	-11.0			.95663	579.9	.00217	.000419			.98	
22.0	-12.5			.95830	581.5	.00225	.000435	.00225	.000435	.94	
20.5	-11.0			.95663	580.5	.00226	.000437	.00226	.000437	.99	
34.0	-1.0			.95496	586.9	.00419	.000809	.00434	.000838	1.88	
34.0	4.0			.94103	589.5	.00799	.001543	.00803	.001551	3.21	
34.0	5.0			.93936	582.5	.00589	.001138	.00579	.001118	3.20	
34.0	6.0			.93380	584.2	.00607	.001172	.00609	.001176	2.43	
36.0	6.0			.93769	579.5	.00522	.001008			2.07	
38.0	1.0			.94882	581.5	.00393	.000759	.00387	.000748	1.59	
38.0	2.0			.95608	582.2	.00284	.000549			1.19	
44.0	8.0			.91938	563.9	.00407	.000786	.00402	.000777	1.63	
44.0	6.0			.93662	573.2	.00358	.000692	.00356	.000688	1.46	
44.0	4.0			.96219	585.9	.00284	.000549	.00292	.000564	1.14	
44.0	2.0			.95441	583.5	.00351	.000678	.00349	.000674	1.42	
44.0	1.0			.95385	583.9	.00364	.000703	.00361	.000697	1.53	
		1.10	0	.97943	676.5	.03479	.006720				1.74
		1.60	0	.97609	661.5	.03234	.006247	.03266	.006309		1.61
		2.60	0	.99054	643.2	.01697	.003278	.01628	.003145		.85
		3.60	0	.99722	647.5	.01691	.003266	.01706	.003295		.84
		4.60	0	.99332	654.2	.01641	.003170	.01682	.003249		.82
		6.60	0	.99110	642.5	.01656	.003199	.01655	.003197		.83
		8.60	0	.99166	641.5	.01606	.003102	.01607	.003104		.80
		10.60	0	.98999	639.2	.01542	.002979				.77
		2.60	90	.93995	571.2	.00277	.000535	.00251	.000485		.58
		4.60	90	.94270	573.9	.00295	.000570	.00300	.000579		.62
		2.60	180	.95939	573.5	.00032	.000062				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(e) M = 3.51; R = 2.86 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96849	580.5	.00179	.000493			.96	
12.0	.0			.96287	576.2	.00178	.000491			1.05	
20.5	.0			.96399	579.2	.00214	.000590			1.27	
28.0	12.0			.95443	573.5	.00207	.000571			1.13	
28.0	4.0			.93249	564.2	.00299	.000824			1.70	
28.0	.0			.93699	572.5	.00372	.001025			2.21	
20.5	-5.0			.96737	578.9	.00165	.000455			.91	
24.5	-5.0			.96624	577.9	.00177	.000488			1.07	
30.0	.0			.97637	608.5	.00769	.002120	.00780	.002150	4.63	
31.0	12.0			.94712	568.9	.00218	.000601			1.22	
34.0	.0			.95218	573.2	.00213	.000587	.00201	.000554	1.34	
2.0	-12.0			.97412	583.5	.00177	.000488			1.01	
2.0	12.0			.97074	581.5	.00173	.000477			.96	
12.0	-12.0			.97187	581.9	.00164	.000452			.99	
12.0	12.0			.95893	574.2	.00172	.000474			.95	
30.0	1.0			.97243	610.5	.00714	.001968			3.94	
31.0	2.0			.96174	587.2	.00427	.001177			2.44	
32.0	2.0			.95395	582.9	.00465	.001282	.00456	.001257	2.85	
32.0	3.0			.95002	588.9	.00533	.001469			2.96	
32.0	6.0			.93878	572.9	.00392	.001081			2.17	
34.0	1.0			.95282	575.2	.00265	.000730	.00243	.000670	1.51	
34.0	2.0			.95170	587.9	.00573	.001580	.00604	.001665	3.17	
34.0	3.0			.94656	588.5	.00724	.001996	.00729	.002010	4.00	
36.0	.0			.93362	566.9	.00337	.000929	.00330	.000910		
38.0	.0			.94599	579.5	.00387	.001067	.00392	.001081	2.33	
40.0	.0			.94937	576.5	.00347	.000957	.00347	.000957		
44.0	12.0			.94543	571.9	.00295	.000813			1.73	
42.0	.0			.94889	576.5	.00350	.000965	.00347	.000957	2.11	
44.0	.0			.96349	583.5	.00307	.000846	.00309	.000852	1.90	
48.0	.0			.96462	582.2	.00251	.000692	.00251	.000692	1.40	
52.0	.0			.96349	580.2	.00220	.000606	.00219	.000604	1.35	
52.0	12.0			.94384	569.2	.00247	.000681			1.50	
55.0	.0			.96962	581.9	.00198	.000546	.00198	.000546	1.21	
58.0	.0			.97637	584.5	.00177	.000488			1.09	
58.0	12.0			.94599	567.5	.00198	.000546			1.13	
58.0	-12.0			.93362	564.5	.00295	.000813			1.63	
44.0	-12.0			.95949	575.2	.00192	.000529			1.17	
36.0	-8.0			.95556	575.9	.00258	.000711			1.62	
36.0	-3.0			.94937	582.2	.00497	.001370			2.78	
34.0	-3.0			.94824	583.9	.00576	.001588	.00576	.001588	3.62	
32.0	-3.0			.95724	598.2	.00446	.001229			2.70	
30.0	-3.0			.95443	582.5	.00426	.001174	.00425	.001172	2.35	
28.0	-3.0			.96512	586.5	.00257	.000708			1.59	
34.0	-12.0			.96849	581.5	.00211	.000582	.00213	.000587	1.30	
32.0	-12.0			.96793	579.5	.00162	.000447	.00161	.000444	.90	
30.0	-12.0			.97018	580.5	.00160	.000441	.00161	.000444	.89	
19.0	-12.5			.97187	583.2	.00162	.000447			1.02	
17.5	-11.0			.96962	580.5	.00164	.000452			1.02	
15.5	-2.5			.97018	580.9	.00177	.000488			1.01	
16.5	-2.5			.96624	578.2	.00164	.000452	.00160	.000441	1.01	
17.5	-2.5			.96399	577.2	.00167	.000460	.00156	.000430	.99	
18.5	-2.5			.97299	581.9	.00157	.000433	.00173	.000477	.96	
19.5	-2.5			.96512	577.5	.00165	.000455	.00156	.000430	1.01	
20.5	-2.5			.96512	577.5	.00177	.000488	.00174	.000480	1.00	
21.5	-2.5			.96793	579.2	.00164	.000452	.00169	.000466	1.01	
22.5	-2.5			.96568	578.2	.00182	.000502	.00180	.000496	1.10	
23.5	-2.5			.96343	578.9	.00211	.000582	.00213	.000587	1.26	
24.5	-2.5			.96399	578.2	.00192	.000529			1.20	
36.0	-16.0			.96568	577.9	.00153	.000422			.97	
36.0	-12.0			.96737	579.5	.00179	.000493	.00179	.000493	1.13	
32.0	-18.0			.96962	582.2	.00163	.000449			1.04	
32.0	-16.0			.96737	579.2	.00161	.000444	.00160	.000441	1.01	
32.0	-14.0			.96793	578.9	.00150	.000413	.00149	.000411	.92	
32.0	-10.0			.96512	579.9	.00213	.000587			1.32	
28.0	-14.0			.96737	578.9	.00156	.000430			.98	
28.0	-12.0			.96793	580.5	.00162	.000447			1.02	
26.0	-12.5			.97131	581.2	.00156	.000430			.95	
24.5	-11.0			.96849	579.2	.00154	.000425			.97	
22.0	-12.5			.97018	580.9	.00177	.000488	.00177	.000488	1.11	
20.5	-11.0			.96849	579.9	.00161	.000444	.00161	.000444	.98	
34.0	-1.0			.96174	582.7	.00304	.000838	.00314	.000866	1.95	
34.0	4.0			.94824	585.9	.00581	.001602	.00591	.001629	3.48	
34.0	5.0			.94656	578.5	.00445	.001227	.00436	.001202	3.07	
34.0	6.0			.93981	575.5	.00443	.001221	.00444	.001224	2.58	
36.0	6.0			.94487	575.5	.00393	.001083			2.28	
38.0	1.0			.95837	581.2	.00274	.000755	.00279	.000769	1.51	
38.0	2.0			.96512	579.2	.00193	.000532			1.07	
44.0	8.0			.92912	561.5	.00298	.000821	.00294	.000810	1.81	
44.0	6.0			.94599	570.5	.00256	.000706	.00254	.000700	1.45	
44.0	4.0			.97299	583.9	.00207	.000571	.00214	.000590	1.22	
44.0	2.0			.96512	583.2	.00234	.000645	.00231	.000637	1.43	
44.0	1.0			.96456	582.2	.00270	.000744	.00269	.000742	1.70	
		1.10	0	.97749	661.9	.02946	.008121				1.76
		1.60	0	.97299	651.7	.02511	.006922	.02528	.006969		1.50
		2.60	0	.98818	634.5	.01417	.003906	.01430	.003942		.84
		3.60	0	.99437	638.9	.01396	.003848	.01410	.003887		.83
		4.60	0	.99099	636.9	.01384	.003815	.01389	.003829		.82
		6.60	0	.98818	634.5	.01378	.003799	.01377	.003796		.82
		8.60	0	.98874	633.9	.01360	.003749	.01361	.003752		.81
		10.60	0	.98649	631.5	.01328	.003661				.79
		2.60	90	.94374	571.9	.00257	.000708	.00227	.000626		.65
		4.60	90	.94768	571.9	.00247	.000681	.00252	.000695		.62

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(f) M = 3.51; R = 1.65 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96895	577.2	.00128	.000614			1.23	
12.0	.0			.95936	573.5	.00118	.000566			1.18	
20.5	.0			.96218	573.9	.00138	.000662			1.13	
28.0	12.0			.95202	568.5	.00146	.000700			1.42	
28.0	4.0			.93339	563.2	.00206	.000988			1.94	
28.0	.0			.93791	564.2	.00246	.001179			2.34	
20.5	-5.0			.96500	577.9	.00115	.000551			1.11	
24.5	-5.0			.96444	573.5	.00116	.000556			1.33	
30.0	.0			.96675	594.9	.00560	.002685	.00567	.002718	6.44	
31.0	12.0			.94590	565.5	.00141	.000676			1.41	
34.0	.0			.95097	572.2	.00148	.000709	.00146	.000700	1.63	
2.0	-12.0			.97295	582.9	.00118	.000566			1.27	
2.0	12.0			.97121	578.9	.00126	.000604			1.26	
12.0	-12.0			.96952	579.5	.00117	.000561			1.27	
12.0	12.0			.95710	574.2	.00114	.000546			1.13	
30.0	1.0			.96557	593.2	.00537	.002574			5.54	
31.0	2.0			.95710	577.9	.00300	.001438			3.09	
32.0	2.0			.95315	575.2	.00324	.001553	.00319	.001529	3.38	
32.0	3.0			.95258	578.5	.00385	.001846			3.85	
32.0	6.0			.94242	568.5	.00274	.001314			2.77	
34.0	1.0			.95258	569.2	.00180	.000863	.00161	.000772	1.96	
34.0	2.0			.95146	578.2	.00377	.001807	.00396	.001898	3.07	
34.0	3.0			.94638	579.2	.00498	.002387	.00499	.002392	4.98	
36.0	.0			.93791	568.2	.00228	.001093	.00221	.001059		
38.0	.0			.94750	571.5	.00286	.001371	.00289	.001385	3.21	
40.0	.0			.95146	572.5	.00264	.001266	.00264	.001266		
44.0	12.0			.94638	567.5	.00199	.000954			1.97	
42.0	.0			.95315	572.5	.00224	.001074	.00220	.001055	1.82	
44.0	.0			.96726	583.2	.00198	.000949	.00201	.000964	2.15	
48.0	.0			.96839	579.2	.00185	.000887	.00185	.000887	1.93	
52.0	.0			.96444	576.2	.00158	.000757	.00157	.000753	1.55	
52.0	12.0			.94638	565.5	.00164	.000786			1.58	
55.0	.0			.96952	578.2	.00149	.000714	.00149	.000714	1.62	
58.0	.0			.97516	583.5	.00125	.000599			1.30	
58.0	12.0			.94750	565.5	.00139	.000666			1.49	
58.0	-12.0			.93735	566.5	.00187	.000896			2.03	
44.0	-12.0			.96049	572.5	.00130	.000623			1.43	
36.0	-8.0			.95654	572.2	.00169	.000810			1.86	
36.0	-3.0			.94920	574.9	.00345	.001654			3.56	
34.0	-3.0			.94750	583.2	.00340	.001630	.00340	.001630	3.47	
32.0	-3.0			.95315	586.5	.00271	.001299	.00269	.001290	2.95	
30.0	-3.0			.95428	576.2	.00302	.001448	.00302	.001448	2.88	
28.0	-3.0			.96557	577.5	.00186	.000892			1.88	
34.0	-12.0			.96613	577.2	.00151	.000724	.00153	.000733	1.64	
32.0	-12.0			.96726	578.5	.00101	.000484	.00101	.000484	1.15	
30.0	-12.0			.96839	578.9	.00108	.000518	.00109	.000523	1.17	
19.0	-12.5			.96895	577.2	.00116	.000556			1.26	
17.5	-11.0			.96669	578.9	.00101	.000484			1.10	
15.5	-2.5			.96782	576.2	.00126	.000604			1.25	
16.5	-2.5			.96331	573.5	.00122	.000585	.00114	.000546	1.44	
17.5	-2.5			.96105	574.5	.00118	.000566	.00107	.000513	1.18	
18.5	-2.5			.96895	578.9	.00117	.000561	.00137	.000657	1.27	
19.5	-2.5			.96161	574.9	.00118	.000566	.00109	.000523	1.28	
20.5	-2.5			.96274	573.2	.00122	.000585	.00114	.000546	1.33	
21.5	-2.5			.96557	576.9	.00117	.000561	.00125	.000599	1.27	
22.5	-2.5			.96274	573.5	.00127	.000609	.00123	.000590	1.28	
23.5	-2.5			.96105	576.5	.00145	.000695	.00147	.000705	1.46	
24.5	-2.5			.96105	573.2	.00136	.000652			1.48	
36.0	-16.0			.96387	573.9	.00116	.000556			1.32	
36.0	-12.0			.96444	576.9	.00118	.000566	.00118	.000566	1.36	
32.0	-18.0			.96952	579.2	.00108	.000518			1.23	
32.0	-16.0			.96500	577.5	.00108	.000518	.00107	.000513	1.11	
32.0	-14.0			.96500	574.2	.00116	.000556	.00115	.000551	1.33	
32.0	-10.0			.96274	575.2	.00152	.000729			1.65	
28.0	-14.0			.96500	574.5	.00116	.000556			1.26	
28.0	-12.0			.96613	575.2	.00116	.000556			1.26	
26.0	-12.5			.96895	576.9	.00116	.000556			1.33	
24.5	-11.0			.96557	576.9	.00108	.000518			1.23	
22.0	-12.5			.96782	578.5	.00108	.000518	.00108	.000518	1.07	
20.5	-11.0			.96613	575.2	.00116	.000556	.00116	.000556	1.26	
34.0	-1.0			.95936	575.9	.00214	.001026	.00223	.001069	2.68	
34.0	4.0			.94928	579.2	.00415	.001989	.00427	.002047	4.19	
34.0	5.0			.94703	573.2	.00305	.001462	.00300	.001438	3.51	
34.0	6.0			.93970	569.9	.00315	.001510	.00315	.001510	3.35	
36.0	6.0			.94421	570.2	.00263	.001261			2.14	
38.0	1.0			.95492	572.9	.00191	.000916	.00193	.000925	1.99	
38.0	2.0			.96161	575.5	.00118	.000566			1.27	
44.0	8.0			.93339	560.2	.00207	.000992	.00203	.000973	2.09	
44.0	6.0			.94638	566.5	.00166	.000796	.00164	.000786	1.35	
44.0	4.0			.97065	578.5	.00135	.000647	.00141	.000676	1.36	
44.0	2.0			.96274	575.9	.00168	.000805	.00165	.000791	1.73	
44.0	1.0			.96224	577.5	.00182	.000872	.00181	.000868	1.88	
		1.10	0	.97182	646.9	.02419	.011596				1.89
		1.60	0	.96506	639.2	.01835	.008797	.01825	.008749		1.44
		2.60	0	.98027	625.9	.01056	.005062	.01065	.005105		.83
		3.60	0	.98647	630.5	.01059	.005077	.01064	.005101		.83
		4.60	0	.98419	621.9	.01020	.004890	.01085	.005201		.80
		6.60	0	.98250	619.9	.01067	.005115	.01066	.005110		.83
		8.60	0	.98137	626.2	.01049	.005029	.01050	.005034		.82
		10.60	0	.97911	617.5	.01017	.004875				.80
		2.60	90	.93791	562.5	.00196	.000940	.00173	.000829		.64
		4.60	90	.94130	564.9	.00208	.000997	.00185	.000887		.68
		2.60	180	.94581	558.5	.00031	.000149				
		4.60	180	.95258	565.2	.00037	.000177	.00038	.000182		

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(g) M = 4.44; R = 4.47 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95226	579.5	.00113	.000287			1.35	
12.0	.0			.94733	575.9	.00109	.000277			1.30	
20.5	.0			.95007	580.5	.00162	.000412			1.76	
28.0	12.0			.93745	571.9	.00166	.000422			1.32	
28.0	4.0			.91990	562.9	.00204	.000519			2.43	
28.0	.0			.92703	567.9	.00248	.000631			2.58	
20.5	-5.0			.95062	577.9	.00114	.000290			1.37	
24.5	-5.0			.95007	577.5	.00107	.000272			1.45	
30.0	.0			.97584	604.5	.00527	.001340	.00534	.001358	5.73	
31.0	12.0			.93577	570.2	.00152	.000386			1.22	
34.0	.0			.94675	577.2	.00157	.000399	.00120	.000305	2.12	
2.0	-12.0			.95608	582.9	.00142	.000361			1.28	
2.0	12.0			.95446	583.2	.00133	.000338				
12.0	-12.0			.95446	582.5	.00131	.000333			1.38	
12.0	12.0			.94458	575.2	.00115	.000292			.91	
30.0	1.0			.97805	607.2	.00555	.001411			6.61	
31.0	2.0			.96104	591.5	.00354	.000900			4.21	
32.0	2.0			.94788	584.2	.00308	.000783	.00294	.000747	3.67	
32.0	3.0			.94239	581.5	.00398	.001012			3.59	
32.0	6.0			.92867	570.5	.00306	.000778			2.66	
34.0	1.0			.94733	579.5	.00197	.000501	.00193	.000491	2.35	
34.0	2.0			.94239	583.9	.00503	.001279	.00543	.001381	5.99	
34.0	3.0			.92977	577.9	.00591	.001503	.00578	.001469	5.28	
36.0	.0			.92922	568.2	.00217	.000552	.00204	.000519		
38.0	.0			.94129	575.9	.00235	.000597	.00240	.000610	3.18	
40.0	.0			.94349	577.2	.00231	.000587	.00232	.000590		
44.0	12.0			.93032	570.2	.00239	.000608			2.01	
42.0	.0			.94565	577.5	.00214	.000544	.00210	.000534	2.52	
44.0	.0			.95718	584.2	.00201	.000511	.00204	.000519	2.42	
48.0	.0			.95663	582.9	.00160	.000407	.00160	.000407	1.82	
52.0	.0			.95389	582.2	.00131	.000333	.00130	.000331	1.42	
52.0	12.0			.92534	566.2	.00228	.000580			1.88	
55.0	.0			.95611	581.5	.00116	.000295	.00115	.000292	1.53	
58.0	.0			.96488	587.2	.00103	.000262			1.23	
58.0	12.0			.92319	564.9	.00187	.000475			1.58	
58.0	-12.0			.91660	561.5	.00254	.000646			2.37	
44.0	-12.0			.93745	572.5	.00134	.000341			1.52	
36.0	-8.0			.93690	574.2	.00193	.000491			2.19	
36.0	-3.0			.93800	578.2	.00388	.000986			4.91	
34.0	-3.0			.93526	577.2	.00425	.001081	.00432	.001098	5.12	
18.5	-2.5			.95665	581.2	.00106	.000269			1.43	
30.0	-3.0			.95169	584.5	.00323	.000821	.00338	.000859	4.36	
28.0	-3.0			.95169	582.2	.00227	.000577			2.73	
34.0	-12.0			.95059	578.5	.00143	.000364	.00140	.000356	1.30	
32.0	-12.0			.95224	580.9	.00143	.000364	.00146	.000371	1.70	
30.0	-12.0			.95443	581.9	.00118	.000300	.00120	.000305	1.07	
19.0	-12.5			.95336	581.9	.00132	.000336			1.57	
17.5	-11.0			.95172	580.9	.00132	.000336			1.57	
15.5	-2.5			.95336	579.5	.00114	.000290			1.37	
16.5	-2.5			.95062	578.5	.00105	.000267	.00101	.000257	1.25	
17.5	-2.5			.94897	576.9	.00106	.000269	.00090	.000229	1.43	
18.5	-2.5			.95665	581.2	.00106	.000269	.00131	.000333	1.36	
19.5	-2.5			.94897	576.5	.00114	.000290	.00099	.000252	1.36	
20.5	-2.5			.94897	577.9	.00106	.000269	.00101	.000257	1.15	
21.5	-2.5			.95172	578.5	.00110	.000280	.00119	.000303	1.49	
22.5	-2.5			.94842	578.9	.00132	.000336	.00128	.000325	1.57	
23.5	-2.5			.94730	576.9	.00153	.000389	.00152	.000386	2.07	
24.5	-2.5			.94785	578.9	.00133	.000338			1.58	
36.0	-16.0			.95169	578.5	.00105	.000267			.95	
36.0	-12.0			.95334	581.9	.00132	.000336	.00134	.000341	1.27	
32.0	-18.0			.95389	580.2	.00106	.000269			.88	
32.0	-16.0			.95062	579.9	.00119	.000303	.00117	.000297	1.07	
32.0	-14.0			.95117	579.9	.00118	.000300	.00117	.000297	1.28	
32.0	-10.0			.94952	578.2	.00135	.000343			1.27	
28.0	-14.0			.95062	578.9	.00124	.000315			1.12	
28.0	-12.0			.95062	579.9	.00119	.000303			1.42	
26.0	-12.5			.95391	580.9	.00124	.000315			1.16	
24.5	-11.0			.95062	579.5	.00118	.000300			1.42	
22.0	-12.5			.95226	581.5	.00117	.000297	.00117	.000297	1.22	
20.5	-11.0			.95062	578.9	.00124	.000315	.00124	.000315	1.13	
34.0	-1.0			.95117	583.2	.00266	.000676	.00286	.000727	3.24	
34.0	4.0			.93197	575.9	.00449	.001142	.00443	.001126	4.05	
34.0	5.0			.93581	577.9	.00356	.000903	.00364	.000925	4.61	
34.0	6.0			.92922	572.9	.00376	.000956	.00377	.000958	3.21	
36.0	6.0			.93306	573.9	.00337	.000857			3.04	
38.0	1.0			.95007	579.5	.00163	.000414	.00174	.000442	1.94	
38.0	2.0			.95114	579.2	.00135	.000343			1.61	
44.0	8.0			.91436	559.5	.00233	.000592	.00219	.000557	2.06	
44.0	6.0			.95004	580.9	.00196	.000498	.00208	.000529	1.77	
44.0	4.0			.96047	585.5	.00160	.000407	.00168	.000427	1.44	
44.0	2.0			.95169	581.5	.00162	.000412	.00155	.000394	1.93	
44.0	1.0			.95172	580.9	.00177	.000450	.00169	.000430	2.01	
		1.10	0	.97202	641.2	.02022	.005141				1.19
		1.60	0	.98079	621.9	.01345	.003419	.01306	.003320		.79
		2.60	0	.98847	625.5	.01215	.003089	.01314	.003341		.71
		3.60	0	.99506	629.2	.01163	.002957	.01193	.003033		.68
		4.60	0	.99122	625.5	.01103	.002804	.01191	.003028		.65
		6.60	0	.98847	622.9	.01023	.002601	.01022	.002598		.60
		8.60	0	.98902	625.9	.00924	.002349	.00924	.002349		.54
		10.60	0	.98738	623.9	.00871	.002214				.51
		2.60	90	.93471	574.2	.00210	.000534	.00170	.000432		.52
		4.60	90	.93690	572.9	.00169	.000430	.00135	.000343		.42

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Continued

(h) M = 4.44; R = 3.16 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95848	579.5	.00101	.000364			.94	
12.0	.0			.95240	573.9	.00080	.000288			.92	
20.5	.0			.95461	579.5	.00135	.000486			1.55	
28.0	12.0			.94243	571.2	.00130	.000468			1.40	
28.0	4.0			.92472	561.5	.00180	.000648			2.20	
28.0	.0			.93192	565.9	.00210	.000756			2.31	
20.5	-5.0			.95627	576.2	.00076	.000274			.84	
24.5	-5.0			.95572	575.5	.00076	.000274			.95	
30.0	.0			.97343	597.9	.00462	.001663	.00466	.001678	5.63	
31.0	12.0			.94188	569.9	.00121	.000436			1.32	
34.0	.0			.95129	575.5	.00120	.000432	.00101	.000364	1.33	
2.0	-12.0			.96180	580.5	.00098	.000353			1.03	
2.0	12.0			.96014	579.9	.00102	.000367			.97	
12.0	-12.0			.96014	578.5	.00080	.000288			.85	
12.0	12.0			.94963	573.2	.00099	.000356			.93	
30.0	1.0			.97620	600.9	.00515	.001854			6.13	
31.0	2.0			.96180	586.5	.00290	.001044			3.22	
32.0	2.0			.94963	577.9	.00283	.001019	.00263	.000947	3.14	
32.0	3.0			.94797	579.2	.00319	.001148			3.51	
32.0	6.0			.93302	568.5	.00262	.000943			2.88	
34.0	1.0			.94852	577.5	.00188	.000677	.00174	.000626	2.09	
34.0	2.0			.94520	579.9	.00417	.001501	.00450	.001620	4.58	
34.0	3.0			.93468	575.5	.00503	.001811	.00492	.001771	5.85	
36.0	.0			.93524	566.9	.00197	.000709	.00185	.000666		
38.0	.0			.94465	573.2	.00201	.000724	.00205	.000738	2.42	
40.0	.0			.94907	575.5	.00198	.000713	.00199	.000716		
44.0	12.0			.93634	568.5	.00204	.000734			2.62	
42.0	.0			.95129	577.2	.00173	.000623	.00168	.000605	1.90	
44.0	.0			.96347	582.9	.00155	.000558	.00159	.000572	1.72	
48.0	.0			.96236	584.2	.00134	.000482	.00134	.000482	1.68	
52.0	.0			.96014	579.9	.00117	.000421	.00116	.000418	1.48	
52.0	12.0			.93136	565.9	.00179	.000644			1.88	
55.0	.0			.96291	580.9	.00099	.000356	.00098	.000353	1.25	
58.0	.0			.97121	585.2	.00096	.000346			1.26	
58.0	12.0			.93026	562.9	.00153	.000551			1.68	
58.0	-12.0			.92417	561.9	.00200	.000720			2.63	
44.0	-12.0			.94686	571.2	.00108	.000389			1.35	
36.0	-8.0			.94520	571.5	.00151	.000544			1.99	
36.0	-3.0			.94299	575.5	.00325	.001170			4.11	
34.0	-3.0			.93911	576.2	.00399	.001436	.00396	.001426	4.43	
30.0	-3.0			.95461	581.2	.00260	.000936	.00264	.000950	3.25	
28.0	-3.0			.95682	580.2	.00198	.000713			2.18	
34.0	-12.0			.95572	576.5	.00102	.000367	.00100	.000360	1.26	
32.0	-12.0			.95793	578.2	.00126	.000454	.00121	.000436	1.38	
30.0	-12.0			.96070	580.5	.00081	.000292	.00083	.000299	1.01	
19.0	-12.5			.95904	577.9	.00074	.000266			.81	
17.5	-11.0			.95793	577.2	.00096	.000346			1.22	
15.5	-2.5			.95848	577.5	.00081	.000292			1.00	
16.5	-2.5			.95516	575.5	.00076	.000274	.00072	.000259	.80	
17.5	-2.5			.95406	574.9	.00095	.000342	.00041	.000292	1.13	
18.5	-2.5			.96180	579.2	.00086	.000310			1.06	
19.5	-2.5			.95406	575.2	.00083	.000299	.00071	.000256	1.02	
20.5	-2.5			.95461	575.2	.00095	.000342	.00092	.000331	1.13	
21.5	-2.5			.95682	576.2	.00076	.000274	.00085	.000306	.80	
22.5	-2.5			.95184	573.9	.00100	.000360	.00093	.000335	1.10	
23.5	-2.5			.95074	574.5	.00119	.000428	.00116	.000418	1.45	
24.5	-2.5			.95184	575.2	.00119	.000428			1.31	
36.0	-16.0			.95738	578.5	.00081	.000292			1.09	
36.0	-12.0			.95738	577.5	.00103	.000371	.00104	.000374	1.39	
32.0	-18.0			.95904	578.5	.00076	.000274			.83	
32.0	-16.0			.95682	577.9	.00089	.000320	.00088	.000317	.97	
32.0	-14.0			.95738	576.9	.00073	.000263	.00072	.000259	1.00	
32.0	-10.0			.95461	575.9	.00103	.000371			1.27	
28.0	-14.0			.95682	576.5	.00074	.000266			.91	
28.0	-12.0			.95738	577.9	.00088	.000317			.97	
26.0	-12.5			.96014	579.5	.00088	.000317			1.10	
24.5	-11.0			.95682	576.2	.00074	.000266			1.00	
22.0	-12.5			.95848	578.9	.00088	.000317	.00088	.000317	1.14	
20.5	-11.0			.95682	577.9	.00081	.000292	.00081	.000292	.89	
34.0	-1.0			.95406	579.9	.00220	.000792	.00236	.000850	2.79	
34.0	4.0			.93911	576.9	.00384	.001382	.00400	.001440	4.41	
34.0	5.0			.94243	574.5	.00293	.001055	.00303	.001091	4.58	
34.0	6.0			.93468	570.9	.00320	.001152	.00322	.001159	3.52	
36.0	6.0			.93801	571.5	.00272	.000979			2.86	
38.0	1.0			.95406	578.2	.00129	.000464	.00140	.000504	1.59	
38.0	2.0			.95406	576.2	.00127	.000457			1.72	
44.0	8.0			.92195	561.2	.00193	.000695	.00180	.000648	2.12	
44.0	6.0			.95406	578.9	.00173	.000623	.00183	.000659	1.90	
44.0	4.0			.96513	585.5	.00133	.000479	.00140	.000504	1.75	
44.0	2.0			.95627	578.5	.00148	.000533	.00142	.000511	1.83	
44.0	1.0			.95682	579.2	.00156	.000562	.00148	.000533	1.73	
		1.10	0	.97287	631.9	.02117	.007621				1.50
		1.60	0	.97896	617.9	.01320	.004752	.01270	.004572		.94
		2.60	0	.98671	620.9	.01168	.004205	.01259	.004532		.83
		3.60	0	.99391	624.9	.01131	.004071	.01161	.004179		.80
		4.60	0	.98948	621.2	.01080	.003888	.01162	.004183		.77
		6.60	0	.98726	623.9	.01075	.003870	.01075	.003870		.76
		8.60	0	.98726	621.5	.00952	.003427	.00952	.003427		.68
		10.60	0	.98505	615.9	.00901	.003243				.64
		2.60	90	.93579	568.2	.00177	.000637				.52
		4.60	90	.93856	568.9	.00187	.000673				.55

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

11. 1.4-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream, Offset 26.5° - Concluded

(i) M = 4.44; R = 2.13 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97017	584.9	.00069	.000370			.92	
12.0	.0			.96741	582.2	.00054	.000290			.93	
20.5	.0			.96852	583.9	.00073	.000392			1.28	
28.0	12.0			.95581	578.2	.00078	.000419			1.42	
28.0	4.0			.93593	565.2	.00107	.000574			1.84	
28.0	.0			.94201	572.5	.00142	.000762			1.92	
20.5	-5.0			.97073	584.2	.00054	.000290			.87	
24.5	-5.0			.97073	584.2	.00049	.000263			.66	
30.0	.0			.97183	594.5	.00343	.001840	.00345	.001851	6.60	
31.0	12.0			.95526	576.9	.00078	.000419			1.53	
34.0	.0			.96299	580.5	.00072	.000386	.00073	.000392	1.26	
2.0	-12.0			.97293	586.5	.00054	.000290			.96	
2.0	12.0			.97017	585.9	.00065	.000349			1.02	
12.0	-12.0			.97349	586.2	.00055	.000295			.92	
12.0	12.0			.96355	580.9	.00075	.000402			1.19	
30.0	1.0			.97404	597.5	.00385	.002066			5.20	
31.0	2.0			.96410	585.9	.00220	.001180			2.97	
32.0	2.0			.95305	582.9	.00224	.001202			3.93	
32.0	3.0			.95361	580.2	.00216	.001159			2.92	
32.0	6.0			.94366	572.9	.00200	.001073			3.23	
34.0	1.0			.95637	578.9	.00122	.000655	.00112	.000601	2.00	
34.0	2.0			.94864	578.9	.00280	.001502	.00294	.001578	4.59	
34.0	3.0			.93925	575.2	.00365	.001958	.00333	.001787	5.70	
36.0	.0			.94808	573.9	.00123	.000660	.00114	.000612		
38.0	.0			.95581	579.5	.00133	.000714	.00134	.000719	1.80	
40.0	.0			.96134	582.5	.00132	.000708	.00134	.000719		
44.0	12.0			.95029	576.2	.00134	.000719			2.73	
42.0	.0			.96610	582.2	.00108	.000579	.00103	.000553	1.77	
44.0	.0			.97846	590.2	.00104	.000558	.00107	.000574	2.08	
48.0	.0			.97846	590.5	.00076	.000408	.00076	.000408	1.52	
52.0	.0			.97680	587.9	.00060	.000322	.00059	.000317	1.20	
52.0	12.0			.94698	572.2	.00108	.000579			2.16	
55.0	.0			.97901	589.2	.00062	.000333	.00061	.000327	1.27	
58.0	.0			.98619	593.9	.00052	.000279			1.06	
58.0	12.0			.94643	572.5	.00085	.000456			1.39	
58.0	-12.0			.93759	568.9	.00136	.000730			2.78	
44.0	-12.0			.96852	584.2	.00076	.000408			1.55	
36.0	-8.0			.96299	580.5	.00084	.000451			1.71	
36.0	-3.0			.95029	577.5	.00224	.001202			4.23	
34.0	-3.0			.94256	576.2	.00265	.001422	.00253	.001358	4.34	
32.0	-3.0			.87574	578.9	.00815	.004373	.00809	.004341	15.67	
30.0	-3.0			.96023	582.5	.00172	.000923	.00173	.000928	2.61	
28.0	-3.0			.96852	586.2	.00121	.000649			2.02	
34.0	-12.0			.96907	583.5	.00062	.000333	.00059	.000317	1.27	
32.0	-12.0			.97183	586.9	.00077	.000413	.00080	.000429	1.28	
30.0	-12.0			.97570	587.5	.00046	.000247	.00049	.000263	.90	
19.0	-12.5			.97073	584.5	.00050	.000268			.94	
17.5	-11.0			.97238	585.2	.00050	.000268			.93	
15.5	-2.5			.97349	585.9	.00055	.000295			.79	
16.5	-2.5			.97017	584.2	.00049	.000263	.00058	.000311	.94	
17.5	-2.5			.96907	583.2	.00056	.000300			.77	
19.5	-2.5			.96907	583.2	.00054	.000290			.95	
21.5	-2.5			.97128	584.5	.00052	.000279	.00064	.000343	.96	
22.5	-2.5			.96576	581.5	.00054	.000290	.00050	.000268	1.02	
23.5	-2.5			.96189	579.9	.00073	.000392	.00063	.000338	1.03	
24.5	-2.5			.96520	581.5	.00075	.000402			1.07	
36.0	-16.0			.97128	584.9	.00050	.000268			.91	
36.0	-12.0			.97183	584.9	.00059	.000317	.00060	.000322	1.20	
32.0	-18.0			.97183	585.5	.00050	.000268			.91	
32.0	-16.0			.97073	584.5	.00050	.000268	.00049	.000263	.91	
32.0	-14.0			.97293	585.5	.00044	.000236	.00044	.000236	.76	
32.0	-10.0			.96796	582.9	.00062	.000333			1.27	
28.0	-14.0			.97128	584.5	.00050	.000268			1.02	
28.0	-12.0			.97183	584.9	.00050	.000268				
26.0	-12.5			.97459	586.5	.00050	.000268			1.02	
24.5	-11.0			.97128	584.5	.00050	.000268			1.02	
22.0	-12.5			.97293	585.5	.00050	.000268	.00050	.000268	.93	
20.5	-11.0			.97073	584.5	.00050	.000268	.00050	.000268	1.00	
34.0	-1.0			.96078	582.2	.00161	.000864	.00173	.000928	3.29	
34.0	4.0			.94643	576.9	.00267	.001433	.00271	.001454	4.31	
34.0	5.0			.95140	577.5	.00205	.001100	.00218	.001170	2.77	
34.0	6.0			.94477	574.2	.00218	.001170	.00220	.001180	2.95	
36.0	6.0			.94698	574.2	.00173	.000928			2.34	
38.0	1.0			.96741	582.5	.00069	.000370	.00084	.000451	1.21	
38.0	2.0			.96631	581.5	.00054	.000290			1.06	
44.0	8.0			.93980	567.5	.00111	.000596	.00101	.000542	1.48	
44.0	6.0			.96741	583.9	.00102	.000547	.00110	.000590	2.00	
44.0	4.0			.97901	591.2	.00081	.000435	.00089	.000478	1.47	
44.0	2.0			.96907	585.9	.00091	.000488	.00090	.000483	1.75	
44.0	1.0			.96907	585.2	.00103	.000553	.00090	.000483	1.81	
		1.10	0	.97183	623.5	.01701	.009127				1.47
		1.60	0	.97404	612.9	.01143	.006133	.01088	.005838		.99
		2.60	0	.98177	615.2	.00947	.005081	.01019	.005468		.82
		3.60	0	.98895	619.2	.00920	.004936	.00949	.005092		.80
		4.60	0	.98453	615.9	.00900	.004829	.00970	.005205		.78
		6.60	0	.98288	614.2	.00860	.004615	.00860	.004615		.74
		8.60	0	.98343	612.5	.00782	.004196	.00782	.004196		.68
		10.60	0	.98067	610.5	.00762	.004089				.66
		2.60	90	.94146	570.5	.00143	.000767				.52
		4.60	90	.94366	570.9	.00132	.000708				.48

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

12. 2.8-inch-diameter cylinder swept forward 45°

(a) M = 2.65; R = 2.62 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94618	574.9	.00325	.000703			1.04	
12.0	.0			.94337	572.5	.00296	.000640			.98	
20.5	.0			.94505	573.2	.00292	.000631			1.00	
28.0	12.0			.94449	576.2	.00379	.000819			1.21	
28.0	4.0			.94842	587.9	.00662	.001431			2.18	
28.0	.0			.98766	645.5	.01525	.003296			5.13	
20.5	-5.0			.94449	572.9	.00289	.000625			.96	
24.5	-5.0			.94505	580.2	.00481	.001040			1.64	
30.0	.0			1.00224	666.2	.01801	.003893	.01870	.004042	6.48	
31.0	12.0			.94449	579.2	.00465	.001005			1.51	
2.0	-12.0			.94730	574.9	.00329	.000711			1.07	
2.0	12.0			.94562	574.9	.00320	.000692			.98	
12.0	-12.0			.94505	573.5	.00320	.000692			1.06	
12.0	12.0			.94281	573.2	.00318	.000687			1.01	
30.0	1.0			.98598	646.9	.01641	.003547			5.54	
31.0	2.0			.96804	612.9	.01053	.002276			3.58	
32.0	2.0			.95683	587.9	.00511	.001105	.00482	.001042	1.84	
32.0	3.0			.95907	604.2	.00956	.002066			3.23	
32.0	6.0			.94842	593.9	.00830	.001794			2.69	
34.0	1.0			.97589	588.9	.00180	.000389			.62	
34.0	2.0			.95178	573.9	.00222	.000480			.73	
34.0	3.0			.94786	580.5	.00455	.000984	.00445	.000962	1.50	
36.0	.0			.95907	578.5	.00171	.000370	.00173	.000374		
38.0	.0			.93833	564.2	.00159	.000344	.00155	.000335	.54	
40.0	.0			.92768	560.2	.00219	.000473	.00217	.000469		
44.0	12.0			.94113	579.2	.00525	.001135			1.73	
42.0	.0			.92375	559.9	.00272	.000588	.00274	.000592	.93	
44.0	.0			.91534	557.2	.00343	.000741	.00342	.000739	1.22	
48.0	.0			.90637	556.2	.00451	.000975	.00450	.000973	1.53	
52.0	.0			.90918	559.9	.00522	.001128	.00522	.001128	1.72	
52.0	12.0			.94057	574.5	.00391	.000845			1.31	
55.0	.0			.91366	562.2	.00535	.001156	.00535	.001156	1.77	
58.0	.0			.91814	564.5	.00502	.001085			1.66	
58.0	12.0			.93945	571.9	.00336	.000726			1.07	
58.0	-12.0			.94001	571.5	.00327	.000707			1.08	
44.0	-12.0			.94169	578.5	.00533	.001152			1.95	
36.0	-8.0			.94562	586.9	.00680	.001470			2.37	
36.0	-3.0			.94562	572.9	.00273	.000590			.98	
34.0	-3.0			.94898	580.5	.00440	.000951	.00430	.000929	1.54	
32.0	-3.0			.96075	603.9	.00904	.001954	.00908	.001963	3.22	
30.0	-3.0			.96860	629.2	.01360	.002940	.01395	.003015	4.58	
28.0	-3.0			.95627	597.2	.00789	.001705			2.89	
34.0	-12.0			.93665	574.2	.00459	.000992	.00465	.001005	1.60	
32.0	-12.0			.94281	577.9	.00466	.001007	.00455	.000984	1.65	
30.0	-12.0			.94730	579.9	.00431	.000932	.00427	.000923	1.47	
19.0	-12.5			.94393	572.5	.00289	.000625			.99	
17.5	-11.0			.94449	572.9	.00303	.000655			1.01	
15.5	-2.5			.94505	574.2	.00304	.000657			1.00	
16.5	-2.5			.94393	572.9	.00300	.000648	.00297	.000642	1.00	
17.5	-2.5			.94337	572.9	.00313	.000677	.00313	.000677	1.04	
18.5	-2.5			.94393	573.2	.00309	.000668	.00311	.000672	1.04	
19.5	-2.5			.94337	572.5	.00309	.000668	.00307	.000664	1.03	
20.5	-2.5			.94337	572.9	.00310	.000670	.00292	.000631	1.01	
21.5	-2.5			.94786	576.9	.00341	.000737	.00342	.000739	1.14	
22.5	-2.5			.94786	580.5	.00424	.000916	.00428	.000925	1.41	
23.5	-2.5			.94674	582.2	.00499	.001079	.00500	.001081	1.66	
24.5	-2.5			.94449	583.2	.00590	.001275			2.01	
		10.55	180	.92487	554.2	.00110	.000238				
		8.55	180	.93496	561.5	.00149	.000322				
		6.55	180	.94001	565.5	.00152	.000329				
		4.55	180	.95627	591.9	.00396	.000856				
		3.55	180	.97477	587.9	.00217	.000469	.00218	.000471		
		2.55	180	.97645	588.9	.00206	.000445	.00210	.000454		
		1.55	180	.98149	586.2	.00069	.000149	.00065	.000141		
		.55	180	.98542	591.2	.00096	.000208				
		6.55	135	.95066	567.5	.00059	.000128				
		4.55	135	.94954	570.2	.00120	.000259				
		2.55	135	.95571	575.2	.00181	.000391				
34.0	-1.0			.97589	587.9	.00165	.000357	.00175	.000378	.62	
34.0	4.0			.95066	591.5	.00742	.001604	.00737	.001593	2.45	
34.0	5.0			.94954	598.2	.00912	.001971	.00935	.002021	3.58	
34.0	6.0			.94954	596.9	.00884	.001911	.00890	.001924	2.93	
36.0	6.0			.94674	591.5	.00772	.001669			2.51	
38.0	1.0			.94674	567.9	.00128	.000277	.00125	.000270	.43	
38.0	2.0			.95178	573.2	.00184	.000398			.64	
44.0	8.0			.94393	578.9	.00447	.000966	.00449	.000971	1.49	
44.0	6.0			.94113	572.2	.00326	.000705	.00325	.000703	1.09	
44.0	4.0			.94281	567.9	.00192	.000415	.00190	.000411	.64	
44.0	2.0			.93945	566.9	.00209	.000452	.00227	.000491	.70	
44.0	1.0			.92421	558.2	.00212	.000458	.00197	.000426	.77	
		10.55	90	.93216	560.9	.00130	.000281				.59
		6.55	90	.93496	563.9	.00162	.000350				.74
		4.55	90	.92824	563.2	.00294	.000635				1.34
		2.55	90	.91983	558.5	.00316	.000683				1.44
		10.55	0	.97757	605.2	.00591	.001277				.64
		8.55	0	.97252	600.5	.00565	.001221				.61
		6.55	0	.96972	598.2	.00537	.001161				.58
		4.55	0	.96692	596.9	.00555	.001200				.60
		3.55	0	.96916	620.2	.01458	.003152	.01497	.003236		1.58
		2.55	0	.98206	641.5	.01460	.003156	.01665	.003599		1.58
		.55	0	.98318	653.2	.01515	.003275				1.64

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(b) M = 2.65; R = 1.31×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97620	583.5	.00171	.000737			1.07	
12.0	.0			.97280	579.2	.00154	.000664			1.03	
20.5	.0			.97563	580.5	.00155	.000668			1.02	
28.0	12.0			.96826	578.5	.00198	.000854			1.27	
28.0	4.0			.96090	582.5	.00382	.001647			2.62	
28.0	.0			.99150	626.9	.01068	.004605			7.17	
20.5	-5.0			.97563	580.2	.00152	.000655			1.02	
24.5	-5.0			.96316	579.2	.00288	.001242			2.13	
30.0	.0			1.00679	650.5	.01073	.004626	.01124	.004846	7.25	
31.0	12.0			.96430	579.5	.00262	.001130			1.85	
2.0	-12.0			.97903	584.2	.00169	.000729			1.08	
2.0	12.0			.97620	582.2	.00165	.000711			.90	
12.0	-12.0			.97563	580.5	.00152	.000655			1.08	
12.0	12.0			.97223	578.9	.00162	.000698			1.02	
30.0	1.0			.99093	635.5	.00941	.004057			7.13	
31.0	2.0			.97223	595.2	.00510	.002199			3.45	
32.0	2.0			.96826	580.5	.00233	.001005	.00205	.000884	1.79	
32.0	3.0			.96713	590.5	.00461	.001988			3.01	
32.0	6.0			.96373	589.2	.00507	.002186			3.57	
34.0	1.0			1.00963	599.5	.00114	.000491	.00138	.000595	.85	
34.0	2.0			.97960	582.2	.00107	.000461			.75	
34.0	3.0			.96656	578.9	.00230	.000992	.00206	.000888	1.61	
36.0	.0			.99716	590.5	.00088	.000379	.00088	.000379		
38.0	.0			.98696	583.5	.00067	.000289	.00067	.000289	.50	
40.0	.0			.97166	577.9	.00101	.000435	.00100	.000431		
44.0	12.0			.96430	580.2	.00288	.001242			2.13	
42.0	.0			.96033	571.2	.00154	.000664	.00154	.000664	1.13	
44.0	.0			.94900	569.5	.00178	.000767	.00177	.000763	1.31	
48.0	.0			.93256	560.9	.00279	.001203	.00278	.001199	1.92	
52.0	.0			.93143	561.5	.00319	.001375	.00319	.001375	2.17	
52.0	12.0			.96656	578.5	.00227	.000979			1.54	
55.0	.0			.93540	567.9	.00284	.001224	.00284	.001224	2.04	
58.0	.0			.94276	567.2	.00275	.001186			1.96	
58.0	12.0			.96996	578.5	.00189	.000815			1.24	
58.0	-12.0			.97053	578.9	.00189	.000815			1.23	
44.0	-12.0			.96600	582.5	.00275	.001186			1.87	
36.0	-8.0			.96486	585.5	.00387	.001668			2.63	
36.0	-3.0			.97393	578.5	.00151	.000651			1.03	
34.0	-3.0			.96883	579.5	.00206	.000888	.00201	.000867	1.56	
32.0	-3.0			.96883	590.2	.00457	.001970	.00454	.001957	3.09	
30.0	-3.0			.97223	611.9	.00790	.003406	.00782	.003371	5.34	
28.0	-3.0			.96600	593.2	.00471	.002031			3.20	
34.0	-12.0			.96203	577.9	.00247	.001065	.00242	.001043	1.87	
32.0	-12.0			.96543	581.5	.00251	.001082	.00233	.001005	1.85	
30.0	-12.0			.96883	580.9	.00231	.000996	.00220	.000948	1.58	
19.0	-12.5			.97563	579.9	.00151	.000651			1.10	
17.5	-11.0			.97620	582.9	.00143	.000617			1.04	
15.5	-2.5			.97563	581.2	.00152	.000655			1.04	
16.5	-2.5			.97506	580.2	.00152	.000655	.00151	.000651	1.03	
17.5	-2.5			.97506	582.9	.00144	.000621	.00144	.000621	.98	
18.5	-2.5			.97620	580.5	.00152	.000655	.00136	.000586	1.10	
19.5	-2.5			.97563	582.5	.00144	.000621	.00143	.000617	.98	
20.5	-2.5			.97506	582.9	.00144	.000621	.00148	.000638	1.03	
21.5	-2.5			.97506	584.5	.00196	.000845	.00203	.000875	1.32	
22.5	-2.5			.96996	582.5	.00242	.001043	.00244	.001052	1.75	
23.5	-2.5			.96430	585.2	.00276	.001190	.00274	.001181	1.86	
24.5	-2.5			.95976	585.2	.00320	.001380			2.16	
		10.55	180	.98073	578.5	.00048	.000207				
		8.55	180	.99206	585.2	.00054	.000233				
		6.55	180	.99263	586.9	.00070	.000302				
		4.55	180	.98810	590.9	.00170	.000733				
		3.55	180	1.00339	594.5	.00092	.000397	.00092	.000397		
		2.55	180	1.00963	601.5	.00114	.000491	.00121	.000522		
		1.55	180	1.02209	602.2	.00032	.000138				
		.55	180	1.02719	605.5	.00038	.000164				
		6.55	135	.99546	586.5	.00024	.000103				
		4.55	135	.98810	583.5	.00061	.000263				
		2.55	135	.98698	586.9	.00095	.000410				
34.0	-1.0			1.01019	599.2	.00087	.000375	.00098	.000423	.68	
34.0	4.0			.96543	584.9	.00367	.001582	.00372	.001604	2.48	
34.0	5.0			.96260	589.2	.00511	.002203	.00506	.002182	3.50	
34.0	6.0			.96430	590.5	.00528	.002276	.00531	.002289	3.74	
36.0	6.0			.96203	586.5	.00418	.001802			2.81	
38.0	1.0			.99036	584.9	.00078	.000336	.00082	.000354	.53	
38.0	2.0			.98810	584.5	.00077	.000332			.56	
44.0	8.0			.96883	583.2	.00249	.001074	.00250	.001078	1.77	
44.0	6.0			.97053	578.5	.00163	.000703	.00161	.000694	1.06	
44.0	4.0			.98130	580.5	.00093	.000401	.00094	.000405	.66	
44.0	2.0			.97790	579.9	.00102	.000440	.00111	.000479	.73	
44.0	1.0			.96033	570.2	.00125	.000539	.00107	.000461	.93	
		10.55	90	.97053	573.2	.00072	.000310				.46
		6.55	90	.96826	572.2	.00082	.000354				.53
		4.55	90	.94276	562.9	.00191	.000823				1.23
		2.55	90	.94050	559.9	.00168	.000724				1.08
		10.55	0	.99263	604.2	.00444	.001914				.68
		8.55	0	.98753	602.5	.00384	.001656				.59
		6.55	0	.98526	600.9	.00372	.001604				.57
		4.55	0	.98186	596.2	.00407	.001755				.62
		3.55	0	.98243	634.9	.01083	.004669	.01150	.004958		1.66
		2.55	0	.98753	619.9	.00890	.003837	.00983	.004238		1.36
		.55	0	.98923	641.2	.01185	.005109				1.81

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

12. 2.8-inch-diameter cylinder swept forward 45° - Continued

(c) M = 3.51; R = 2.90 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96174	577.2	.00172	.000472			.92	
12.0	.0			.95499	572.2	.00165	.000453			.98	
20.5	.0			.95837	575.2	.00189	.000519			1.13	
28.0	12.0			.95049	574.2	.00266	.000730			1.45	
28.0	4.0			.93531	571.5	.00416	.001142			2.36	
28.0	.0			.97524	632.9	.01100	.003019			6.55	
20.5	-5.0			.95837	574.9	.00162	.000445			.90	
24.5	-5.0			.94768	576.5	.00348	.000955			2.11	
30.0	.0			1.00000	671.2	.01849	.005075	.01966	.005396	11.14	
31.0	12.0			.94656	574.9	.00331	.000908			1.85	
2.0	-12.0			.96512	578.5	.00162	.000445			.93	
2.0	12.0			.96118	577.5	.00173	.000475			.96	
12.0	-12.0			.95837	574.5	.00160	.000439			.97	
12.0	12.0			.95331	571.2	.00170	.000467			.93	
30.0	1.0			.97018	642.9	.01793	.004921			9.91	
31.0	2.0			.95049	610.2	.01083	.002972			6.19	
32.0	2.0			.94656	580.9	.00491	.001348	.00464	.001273	3.01	
32.0	3.0			.94149	600.9	.00957	.002627			5.32	
32.0	6.0			.92631	567.9	.00463	.001271			2.56	
34.0	1.0			.99493	591.2	.00051	.000140			.29	
34.0	2.0			.95106	569.9	.00166	.000456			.92	
34.0	3.0			.93643	574.2	.00464	.001273	.00454	.001246	2.56	
36.0	.0			.97918	583.2	.00088	.000242	.00086	.000236		
38.0	.0			.95387	569.9	.00128	.000351	.00126	.000346	.77	
40.0	.0			.93362	559.9	.00161	.000442	.00158	.000434		
44.0	12.0			.93587	567.5	.00304	.000834			1.78	
42.0	.0			.92406	554.2	.00170	.000467	.00169	.000464	1.02	
44.0	.0			.92068	553.5	.00170	.000467	.00170	.000467	1.05	
48.0	.0			.91337	549.9	.00184	.000505	.00184	.000505	1.03	
52.0	.0			.90549	544.9	.00204	.000560	.00203	.000557	1.25	
52.0	12.0			.94037	572.9	.00314	.000862			1.90	
55.0	.0			.90437	544.5	.00215	.000590	.00214	.000587	1.32	
58.0	.0			.90774	546.2	.00212	.000582			1.30	
58.0	12.0			.94374	570.5	.00264	.000725			1.50	
58.0	-12.0			.94543	573.9	.00270	.000741			1.49	
44.0	-12.0			.93756	567.9	.00295	.000810			1.80	
36.0	-8.0			.92687	565.9	.00412	.001131			2.59	
36.0	-3.0			.94206	568.2	.00245	.000672			1.37	
34.0	-3.0			.93868	573.5	.00420	.001153	.00412	.001131	2.64	
32.0	-3.0			.94149	598.5	.00901	.002473	.00910	.002498	5.46	
30.0	-3.0			.94431	605.5	.01064	.002920	.01086	.002981	5.88	
28.0	-3.0			.93981	574.9	.00443	.001216			2.73	
34.0	-12.0			.92968	564.2	.00316	.000867	.00299	.000821	1.95	
32.0	-12.0			.94149	574.2	.00327	.000897	.00311	.000854	1.81	
30.0	-12.0			.95106	576.9	.00308	.000845	.00293	.000804	1.71	
19.0	-12.5			.95837	574.5	.00156	.000428			.98	
17.5	-11.0			.95837	575.9	.00162	.000445			1.01	
15.5	-2.5			.95724	575.5	.00174	.000478			.99	
16.5	-2.5			.95668	574.5	.00162	.000445	.00161	.000442	.99	
17.5	-2.5			.95668	573.2	.00162	.000445	.00161	.000442	.96	
18.5	-2.5			.95781	573.5	.00160	.000439	.00161	.000442	.98	
19.5	-2.5			.95724	573.5	.00162	.000445	.00160	.000439	.99	
20.5	-2.5			.95724	575.5	.00174	.000478	.00167	.000458	.98	
21.5	-2.5			.95781	580.2	.00252	.000692	.00260	.000714	1.55	
22.5	-2.5			.95387	578.2	.00303	.000832	.00304	.000834	1.83	
23.5	-2.5			.94993	580.2	.00352	.000966	.00353	.000969	2.10	
24.5	-2.5			.94431	576.9	.00411	.001128			2.57	
		10.55	180	.97243	577.5	.00056	.000154				
		8.55	180	.99324	587.5	.00020	.000055				
		6.55	180	1.00281	594.5	.00025	.000069				
		4.55	180	.99099	590.5	.00085	.000233				
		3.55	180	.98256	585.5	.00086	.000236	.00078	.000214		
		2.55	180	.98987	589.2	.00078	.000214	.00071	.000195		
		1.55	180	1.01237	600.5	.00028	.000077				
		.55	180	1.03093	610.5	.00027	.000074				
		4.55	135	.97637	578.9	.00031	.000085				
		2.55	135	.96287	572.2	.00061	.000167				
34.0	-1.0			.99549	590.9	.00047	.000129	.00046	.000126	.30	
34.0	4.0			.93643	587.5	.00703	.001929	.00732	.002009	4.21	
34.0	5.0			.92912	584.9	.00739	.002028	.00745	.002045	5.10	
34.0	6.0			.92687	573.9	.00595	.001633	.00598	.001641	3.46	
36.0	6.0			.92743	575.2	.00610	.001674			3.55	
38.0	1.0			.94993	567.5	.00126	.000346	.00122	.000335	.70	
38.0	2.0			.95331	568.9	.00085	.000233			.47	
44.0	8.0			.93418	570.2	.00389	.001068	.00391	.001073	2.36	
44.0	6.0			.93643	565.9	.00262	.000719	.00259	.000711	1.48	
44.0	4.0			.94824	567.9	.00156	.000428	.00159	.000436	.92	
44.0	2.0			.94318	563.5	.00126	.000346	.00134	.000368	.77	
44.0	1.0			.92687	555.5	.00166	.000456	.00156	.000428	1.04	
		10.55	90	.94543	561.9	.00079	.000217				.41
		6.55	90	.95049	569.2	.00112	.000307				.59
		4.55	90	.94881	567.9	.00134	.000368				.70
		2.55	90	.93699	563.5	.00223	.000612				1.17
		10.55	0	.97693	607.9	.00501	.001375				.62
		8.55	0	.97018	599.5	.00470	.001290				.59
		6.55	0	.96681	597.5	.00446	.001224				.56
		4.55	0	.96962	600.5	.00452	.001241				.56
		3.55	0	.96849	597.5	.00457	.001254	.00404	.001109		.57
		2.55	0	.97974	650.2	.01808	.004962	.02168	.005950		2.25
		.55	0	.96962	630.2	.01422	.003903				1.77

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

12. 2.8-inch-diameter cylinder swept forward 45° - Continued

(d) M = 3.51; R = 1.65×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.98358	583.9	.00107	.000513			1.03	
12.0	.0			.97566	578.5	.00108	.000518			1.08	
20.5	.0			.97792	583.9	.00126	.000605			1.03	
28.0	12.0			.96547	575.2	.00188	.000902			1.83	
28.0	4.0			.94509	566.9	.00271	.001300			2.56	
28.0	.0			.97679	609.9	.00866	.004155			8.25	
20.5	-5.0			.98075	580.5	.00104	.000499			1.00	
24.5	-5.0			.95981	574.5	.00240	.001152			2.76	
30.0	.0			.99830	650.2	.01689	.008104	.01763	.008459	19.41	
31.0	12.0			.96264	575.5	.00226	.001084			2.26	
2.0	-12.0			.98584	585.5	.00107	.000513			1.15	
2.0	12.0			.98075	585.5	.00110	.000528			1.10	
12.0	-12.0			.97962	580.2	.00099	.000475			1.08	
12.0	12.0			.97283	575.9	.00117	.000561			1.16	
30.0	1.0			.97056	632.5	.01285	.006166			13.25	
31.0	2.0			.95132	588.2	.00700	.003359			7.22	
32.0	2.0			.94075	571.9	.00309	.001483	.00287	.001377	3.22	
32.0	3.0			.94736	580.5	.00620	.002975			6.20	
32.0	6.0			.93830	564.9	.00312	.001497			3.15	
34.0	2.0			.96320	570.5	.00108	.000518			.88	
34.0	3.0			.94453	567.9	.00282	.001353	.00266	.001276	2.82	
36.0	.0			1.00000	589.9	.00063	.000302	.00052	.000297		
38.0	.0			.98415	580.5	.00070	.000336	.00071	.000341	.79	
40.0	.0			.96094	569.5	.00109	.000523	.00107	.000513		
44.0	12.0			.95471	570.2	.00222	.001065			2.20	
42.0	.0			.94849	562.2	.00111	.000533	.00109	.000523	.90	
44.0	.0			.94509	559.9	.00128	.000614	.00128	.000614	1.39	
48.0	.0			.93773	555.5	.00122	.000585	.00122	.000585	1.27	
52.0	.0			.92981	551.5	.00130	.000624	.00130	.000624	1.27	
52.0	12.0			.95868	572.2	.00201	.000964			1.93	
55.0	.0			.92641	550.2	.00147	.000705	.00146	.000701	1.60	
58.0	.0			.92981	553.5	.00149	.000715			1.55	
58.0	12.0			.96320	573.9	.00188	.000902			2.02	
58.0	-12.0			.96717	576.9	.00164	.000787			1.78	
44.0	-12.0			.95811	571.5	.00193	.000926			2.12	
36.0	-8.0			.94283	565.9	.00271	.001300			2.98	
36.0	-3.0			.95528	568.2	.00163	.000782			1.68	
34.0	-3.0			.94679	568.2	.00276	.001324	.00271	.001300	2.82	
32.0	-3.0			.94396	578.9	.00571	.002740	.00574	.002754	6.21	
30.0	-3.0			.94622	586.2	.00761	.003651	.00773	.003709	7.25	
28.0	-3.0			.94622	568.9	.00303	.001454			3.06	
34.0	-12.0			.95188	568.2	.00219	.001051	.00210	.001008	2.38	
32.0	-12.0			.95981	573.5	.00239	.001147	.00225	.001080	2.72	
30.0	-12.0			.96660	577.5	.00219	.001051	.00206	.000988	2.38	
19.0	-12.5			.97962	581.2	.00107	.000513			1.16	
17.5	-11.0			.98018	580.2	.00098	.000470			1.07	
15.5	-2.5			.97962	579.9	.00105	.000504			1.04	
16.5	-2.5			.97905	579.2	.00112	.000537	.00112	.000537	1.32	
17.5	-2.5			.97849	580.2	.00118	.000566	.00116	.000557	1.18	
18.5	-2.5			.97962	579.9	.00097	.000465	.00099	.000475	1.05	
19.5	-2.5			.97905	580.6	.00118	.000566	.00117	.000561	1.28	
20.5	-2.5			.97849	581.9	.00114	.000547	.00110	.000528	1.24	
21.5	-2.5			.97509	585.5	.00170	.000816	.00185	.000888	1.85	
22.5	-2.5			.96773	577.9	.00200	.000960	.00199	.000955	2.02	
23.5	-2.5			.96094	575.2	.00245	.001176	.00244	.001171	2.47	
24.5	-2.5			.95358	575.5	.00297	.001425			3.23	
		10.55	180	.99547	587.5	.00069	.000331				
		8.55	180	1.00339	589.5	.00023	.000110				
		6.55	180	1.01415	596.5	.00023	.000110				
		4.55	180	1.00622	592.2	.00031	.000149				
		2.55	180	1.00113	589.9	.00049	.000235	.00048	.000230		
		2.55	180	.99943	589.2	.00045	.000216	.00036	.000173		
		1.55	180	1.01754	599.2	.00029	.000139				
		.55	180	1.03962	611.2	.00026	.000125				
		4.55	135	.98981	581.5	.00023	.000110				
		2.55	135	.97509	574.5	.00057	.000274				
				1.00849	593.5	.00027	.000130			.34	
34.0	-1.0			.94226	573.5	.00447	.002145	.00463	.002222	4.52	
34.0	4.0			.93717	571.9	.00492	.002361	.00496	.002380	5.66	
34.0	5.0			.93773	568.9	.00405	.001943	.00407	.001953	4.31	
44.0	6.0			.93773	569.2	.00412	.001977			3.35	
36.0	6.0			.97905	577.9	.00077	.000369	.00078	.000374	.80	
38.0	1.0			.97679	574.9	.00065	.000312			.70	
38.0	2.0			.94905	569.5	.00263	.001262	.00264	.001267	2.66	
44.0	8.0			.95358	567.9	.00175	.000840	.00171	.000821	1.42	
44.0	6.0			.97000	573.5	.00096	.000461	.00099	.000475	.97	
44.0	4.0			.97000	572.9	.00074	.000355	.00084	.000403	.76	
44.0	2.0			.95358	566.2	.00108	.000518	.00099	.000475	1.11	
44.0	1.0			.96037	566.2	.00077	.000369				.53
		10.55	90	.96377	569.2	.00071	.000341				.49
		6.55	90	.95841	564.9	.00083	.000398				.57
		4.55	90	.94622	561.2	.00142	.000681				.98
		2.55	90	.98018	597.5	.00433	.002078				.71
		10.55	0	.97396	589.2	.00424	.002034				.65
		8.55	0	.97169	587.2	.00422	.002025				.65
		6.55	0	.97283	589.2	.00392	.001881				.64
		4.55	0	.97339	588.9	.00397	.001905	.00357	.001713		.65
		3.55	0	.98018	627.9	.01553	.007452	.01681	.008066		2.54
		2.55	0	.97226	613.2	.01189	.005705				1.94
		.55	0								

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

12. 2.8-inch-diameter cylinder swept forward 45° - Continued

(e) M = 4.44; R = 3.21 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96725	581.5	.00100	.000358			.93	
12.0	.0			.96170	576.5	.00062	.000222			.71	
20.5	.0			.96669	581.2	.00128	.000458			1.47	
28.0	12.0			.95726	577.2	.00160	.000572			1.72	
28.0	4.0			.92951	561.9	.00213	.000762			2.60	
28.0	.0			.96836	598.5	.00739	.002643			8.12	
20.5	-5.0			.96669	580.5	.00096	.000343			1.07	
24.5	-5.0			.95226	578.2	.00201	.000719			2.51	
30.0	.0			.99555	631.9	.01652	.005909	.01628	.005823	20.15	
31.0	12.0			.94338	569.2	.00190	.000680			2.07	
2.0	-12.0			.96947	582.5	.00083	.000297			.87	
2.0	12.0			.96669	581.2	.00128	.000458			1.22	
12.0	-12.0			.96447	578.2	.00057	.000204			.61	
12.0	12.0			.96003	577.2	.00075	.000268			.70	
30.0	1.0			.95837	603.2	.01294	.004628			15.40	
31.0	2.0			.93672	580.5	.00799	.002858			8.88	
32.0	2.0			.93728	569.9	.00318	.001137	.00295	.001055	3.53	
32.0	3.0			.92951	575.5	.00755	.002701			8.30	
32.0	6.0			.91563	553.5	.00217	.000776			2.38	
34.0	2.0			.94727	569.9	.00076	.000272			.84	
34.0	3.0			.93117	565.9	.00328	.001173	.00321	.001148	3.81	
36.0	.0			.98001	586.2	.00048	.000172	.00049	.000175		
38.0	.0			.94838	568.9	.00104	.000372	.00100	.000358	1.25	
40.0	.0			.92784	558.2	.00091	.000325	.00085	.000304		
44.0	12.0			.93506	562.9	.00134	.000479			1.72	
42.0	.0			.92174	554.5	.00092	.000329	.00089	.000318	1.01	
44.0	.0			.92118	553.9	.00091	.000325	.00091	.000325	1.01	
48.0	.0			.91896	552.5	.00092	.000329	.00092	.000329	1.15	
52.0	.0			.91785	552.2	.00084	.000300	.00083	.000297	1.06	
52.0	12.0			.93617	564.9	.00177	.000633			1.86	
55.0	.0			.92285	553.2	.00065	.000232	.00064	.000229	.82	
58.0	.0			.93006	557.9	.00073	.000261			.96	
58.0	12.0			.94005	568.9	.00160	.000572			1.76	
58.0	-12.0			.94227	569.9	.00145	.000519			1.91	
44.0	-12.0			.93728	565.2	.00130	.000465			1.63	
36.0	-8.0			.92229	556.5	.00165	.000590			2.17	
36.0	-3.0			.96005	566.2	.00134	.000479			1.70	
34.0	-3.0			.93339	569.5	.00268	.000959	.00261	.000934	2.98	
32.0	-3.0			.93062	574.9	.00683	.002443	.00693	.002479	7.59	
30.0	-3.0			.92784	572.2	.00659	.002357	.00664	.002375	8.24	
28.0	-3.0			.93339	564.5	.00225	.000805			2.47	
34.0	-12.0			.92340	558.5	.00148	.000529			1.83	
32.0	-12.0			.93617	564.5	.00175	.000626			1.92	
30.0	-12.0			.95226	574.5	.00173	.000619	.00154	.000551	2.16	
19.0	-12.5			.96503	578.9	.00066	.000236			.73	
17.5	-11.0			.96447	578.2	.00075	.000268			.95	
15.5	-2.5			.96447	579.2	.00074	.000265			.91	
16.5	-2.5			.96392	578.5	.00074	.000265	.00073	.000261	.78	
17.5	-2.5			.96392	577.5	.00060	.000215	.00058	.000207	.71	
19.5	-2.5			.96614	579.2	.00070	.000250	.00068	.000243	.86	
20.5	-2.5			.96558	581.9	.00101	.000361	.00102	.000365	1.20	
21.5	-2.5			.96503	586.5	.00163	.000583	.00172	.000615	1.72	
22.5	-2.5			.96003	581.5	.00184	.000658	.00187	.000669	2.02	
23.5	-2.5			.95393	576.9	.00217	.000776	.00220	.000787	2.65	
24.5	-2.5			.94616	572.9	.00221	.000790			2.43	
		4.55	180	.98556	590.2	.00029	.000104				
		3.55	180	.99000	592.9	.00024	.000086	.00027	.000097		
34.0	4.0			.93006	570.5	.00522	.001867	.00563	.002014	6.00	
34.0	5.0			.92174	564.2	.00451	.001613	.00451	.001613	7.05	
34.0	6.0			.91730	557.9	.00319	.001141	.00319	.001141	3.51	
36.0	6.0			.92174	562.2	.00399	.001427			4.20	
38.0	1.0			.95171	569.9	.00050	.000179			.62	
44.0	8.0			.92895	562.5	.00235	.000841	.00233	.000833	2.58	
44.0	6.0			.93839	566.2	.00174	.000622	.00172	.000615	1.91	
44.0	4.0			.95226	571.5	.00079	.000283	.00086	.000308	1.04	
44.0	2.0			.94616	566.9	.00076	.000272	.00077	.000275	.94	
44.0	1.0			.92951	557.5	.00078	.000279	.00066	.000236	.87	
		10.55	90	.94061	562.9	.00044	.000157				.27
		6.55	90	.94449	566.9	.00053	.000190				.33
		4.55	90	.94505	567.9	.00066	.000236				.41
		2.55	90	.93672	564.5	.00135	.000483				.84
		10.55	0	.97502	592.9	.00320	.001145				.47
		8.55	0	.96780	588.2	.00310	.001109				.46
		6.55	0	.96392	585.5	.00277	.000991				.41
		4.55	0	.96447	586.5	.00309	.001105				.45
		3.55	0	.96392	585.9	.00314	.001123				.46
		2.55	0	.97502	614.2	.01316	.004707				1.94
		.55	0	.96891	601.2	.00883	.003158				1.30

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

12. 2.8-inch-diameter cylinder swept forward 45° - Concluded

(f) M = 4.44; R = 2.16×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97105	581.2	.00058	.000310			.77	
12.0	.0			.96493	576.9	.00053	.000284			.91	
20.5	.0			.96938	581.9	.00103	.000551			1.81	
28.0	12.0			.95992	577.5	.00142	.000760			2.58	
28.0	4.0			.92876	559.5	.00148	.000792			2.55	
28.0	.0			.96493	591.2	.00619	.003311			8.36	
20.5	-5.0			.97050	580.9	.00065	.000348			1.05	
24.5	-5.0			.95324	574.0	.00162	.000867			2.19	
30.0	.0			.98998	625.9	.01334	.007136	.01431	.007655	25.65	
31.0	12.0			.95046	571.9	.00143	.000765			2.80	
2.0	-12.0			.97328	583.2	.00068	.000364			1.21	
2.0	12.0			.96883	581.0	.00086	.000460			1.34	
12.0	-12.0			.96771	578.5	.00053	.000284			.88	
12.0	12.0			.96215	576.2	.00061	.000326			.97	
30.0	1.0			.95547	594.2	.01068	.005713			14.43	
31.0	2.0			.93209	571.2	.00605	.003236			8.18	
32.0	2.0			.93265	565.2	.00248	.001327	.00229	.001225	4.35	
32.0	3.0			.92653	566.5	.00530	.002835			7.16	
32.0	6.0			.91762	564.5	.00168	.000899			2.71	
32.0	9.0			.92931	564.2	.00228	.001220	.00199	.001064	3.56	
34.0	.0			.95436	570.9	.00055	.000294	.00052	.000278	.74	
38.0	.0			.93432	559.5	.00073	.000390	.00067	.000358		
40.0	.0			.94156	565.5	.00107	.000572			2.18	
44.0	12.0			.92764	556.5	.00073	.000390	.00070	.000374	1.20	
42.0	.0			.92764	555.2	.00060	.000321	.00060	.000321	1.20	
44.0	.0			.92653	554.2	.00063	.000337	.00063	.000337	1.26	
48.0	.0			.92597	553.9	.00056	.000300	.00055	.000294	1.12	
52.0	.0			.94100	568.2	.00130	.000695			2.60	
52.0	12.0			.93098	556.9	.00060	.000321	.00059	.000316	1.22	
56.0	.0			.94044	562.9	.00053	.000284			1.08	
58.0	.0			.94545	568.2	.00121	.000647			1.98	
58.0	12.0			.94823	569.2	.00121	.000647			2.47	
58.0	-12.0			.94434	565.5	.00082	.000439			1.67	
44.0	-12.0			.92764	560.2	.00136	.000727			2.78	
36.0	-8.0			.93989	564.2	.00115	.000615			2.17	
36.0	-3.0			.93154	561.9	.00202	.001081	.00198	.001059	3.31	
34.0	-3.0			.92597	555.5	.00510	.002728	.00515	.002755	9.81	
32.0	-3.0			.92486	554.9	.00514	.002749	.00517	.002766	7.79	
30.0	-3.0			.93154	561.9	.00167	.000893			2.78	
28.0	-3.0			.93432	560.5	.00122	.000653	.00105	.000562	2.49	
34.0	-12.0			.94434	567.9	.00143	.000765			2.38	
32.0	-12.0			.95714	577.5	.00138	.000738	.00117	.000626	2.71	
30.0	-12.0			.96771	579.2	.00055	.000294			1.04	
19.0	-12.5			.96827	578.9	.00047	.000251			.87	
17.5	-11.0			.96771	578.5	.00049	.000262			.70	
15.5	-2.5			.96716	577.9	.00053	.000284	.00051	.000273	1.02	
16.0	-2.5			.96716	578.2	.00056	.000300	.00053	.000284	.77	
17.5	-2.5			.96883	579.9	.00050	.000267	.00051	.000273	.72	
18.5	-2.5			.96938	579.9	.00056	.000303	.00055	.000300	.98	
19.5	-2.5			.96883	580.2	.00075	.000401	.00076	.000407	1.06	
20.5	-2.5			.96604	580.9	.00123	.000658	.00131	.000701	2.28	
21.5	-2.5			.96124	578.2	.00141	.000754	.00141	.000754	2.66	
22.5	-2.5			.95436	573.9	.00172	.000920	.00174	.000931	2.42	
23.5	-2.5			.94601	570.2	.00189	.001011			2.70	
24.5	-2.5			.92820	564.5	.00374	.002001	.00404	.002161	6.03	
34.0	4.0			.92208	559.5	.00332	.001776	.00330	.001765	4.49	
34.0	5.0			.91985	555.5	.00237	.001268	.00237	.001268	3.20	
34.0	6.0			.92430	559.2	.00285	.001525			3.85	
36.0	6.0			.93265	561.9	.00176	.000941	.00173	.000925	2.35	
46.0	8.0			.94100	567.2	.00134	.000717	.00132	.000706	2.63	
44.0	6.0			.95547	572.2	.00069	.000369	.00076	.000407	1.25	
44.0	4.0			.94655	559.9	.00051	.000273			.89	
44.0	1.0			.93766	559.9	.00040	.000214				.31
		12.50	90	.94378	564.9	.00052	.000278				.40
		8.50	90	.94267	563.9	.00055	.000294				.42
		4.50	90	.93488	561.9	.00108	.000578				.82
		2.50	90	.96827	588.5	.00300	.001605				.54
		12.50	0	.95215	585.9	.00294	.001573				.53
		8.50	0	.95881	581.5	.00279	.001492				.50
		4.50	0	.95992	581.2	.00295	.001578				.53
		2.50	0	.95992	581.2	.00292	.001562	.00252	.001348		.53
		.50	0	.97105	605.5	.01181	.006317				2.14
		.50	0	.96493	594.2	.00776	.004151				1.40

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45°

(a) M = 2.65; R = 4.02 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_f}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.5	.0			.94566	584.5	.00449	.000631			.95	
12.0	.0			.94345	582.2	.00437	.000614			.98	
20.5	.0			.94455	582.5	.00419	.000588			.94	
28.0	12.0			.94012	581.2	.00441	.000619			.95	
28.0	4.0			.94345	582.5	.00436	.000612			.92	
28.0	.0			.94345	582.5	.00438	.000615			.98	
20.5	-5.0			.94345	581.9	.00435	.000611			.96	
24.5	-5.0			.94234	580.9	.00415	.000583			.97	
30.0	.0			.95398	580.5	.00281	.000395	.00270	.000379	.62	
31.0	12.0			.94123	581.5	.00439	.000616			.96	
34.0	.0			.91850	553.9	.00079	.000111	.00071	.000100	.19	
2.0	-12.0			.94622	583.9	.00449	.000631			.99	
2.0	12.0			.94622	585.2	.00457	.000642			.96	
12.0	-12.0			.95010	586.2	.00439	.000616			.94	
12.0	12.0			.94289	582.9	.00447	.000628			.93	
30.0	1.0			.94400	596.2	.00646	.000907			1.47	
31.0	2.0			.93957	588.5	.00672	.000944			1.52	
32.0	2.0			.93402	590.9	.00713	.001001	.00721	.001013	1.64	
32.0	3.0			.93735	583.2	.00563	.000791			1.23	
32.0	6.0			.94289	582.5	.00432	.000607			.95	
34.0	1.0			.90519	553.9	.00285	.000400	.00244	.000343	.64	
34.0	2.0			.91517	572.5	.00642	.000902	.00667	.000937	1.40	
34.0	3.0			.92903	580.9	.00682	.000958	.00691	.000970	1.50	
36.0	.0			.89410	561.5	.00477	.000670	.00479	.000673		
38.0	.0			.88468	552.2	.00564	.000792	.00557	.000782	1.31	
40.0	.0			.89854	564.5	.00584	.000820	.00583	.000819		
44.0	12.0			.94788	585.9	.00445	.000625			.99	
42.0	.0			.91185	575.5	.00663	.000931	.00663	.000931	1.55	
44.0	.0			.93014	582.9	.00660	.000927	.00663	.000931	1.52	
48.0	.0			.94012	596.9	.00641	.000900	.00641	.000900	1.48	
52.0	.0			.94289	589.2	.00620	.000871	.00620	.000871	1.39	
52.0	12.0			.94677	586.2	.00457	.000642			1.03	
55.0	.0			.94622	590.9	.00613	.000861	.00614	.000862	1.37	
58.0	.0			.94622	590.5	.00607	.000852			1.24	
58.0	12.0			.94178	583.5	.00466	.000654			.94	
58.0	-12.0			.94289	583.2	.00466	.000654			1.02	
44.0	-12.0			.95065	585.5	.00408	.000573			.95	
36.0	-8.0			.94788	584.2	.00419	.000588			.99	
36.0	-3.0			.93069	579.5	.00573	.000805			1.37	
34.0	-3.0			.93125	580.5	.00580	.000815	.00579	.000813	1.38	
32.0	-3.0			.93735	583.5	.00537	.000754	.00537	.000754	1.23	
30.0	-3.0			.94733	586.5	.00462	.000649	.00464	.000652	1.05	
28.0	-3.0			.94844	584.5	.00406	.000570			.94	
34.0	-12.0			.94345	581.5	.00414	.000581	.00383	.000538	.95	
32.0	-12.0			.94400	581.9	.00418	.000587	.00360	.000506	.96	
30.0	-12.0			.94622	583.2	.00423	.000594	.00401	.000563	.95	
19.0	-12.5			.94622	583.9	.00425	.000597			.90	
17.5	-11.0			.94566	583.2	.00420	.000590			.94	
15.5	-2.5			.94899	586.2	.00431	.000605			.91	
16.5	-2.5			.94400	582.5	.00416	.000584	.00408	.000573	.94	
17.5	-2.5			.94289	582.2	.00444	.000624	.00437	.000614	.97	
18.5	-2.5			.94954	585.9	.00426	.000598	.00443	.000622	.97	
19.5	-2.5			.94178	581.5	.00441	.000619	.00422	.000593	.97	
20.5	-2.5			.94123	581.2	.00428	.000601	.00423	.000594	.94	
21.5	-2.5			.94511	583.2	.00424	.000595	.00432	.000607	.94	
22.5	-2.5			.94234	581.2	.00419	.000588	.00414	.000581	.94	
23.5	-2.5			.94234	581.5	.00431	.000605	.00430	.000604	.96	
24.5	-2.5			.94400	584.9	.00414	.000581			.95	
		10.55	0	.97061	636.5	.01750	.002458				1.54
		8.55	0	.97283	644.9	.01664	.002337				1.47
		4.55	0	.96784	646.5	.01898	.002665				1.68
		3.55	0	.95841	634.2	.02038	.002862	.02041	.002866		1.80
		2.55	0	.94622	627.2	.02076	.002915	.02075	.002914		1.83
		1.55	0	.93846	620.9	.01972	.002769	.01956	.002747		1.74
		.55	0	.95564	624.5	.01557	.002187				1.37
		10.55	45	.96396	632.9	.01198	.001682				1.38
		6.55	45	.96174	632.2	.01233	.001732				1.42
		4.55	45	.95731	631.5	.01316	.001848				1.51
		2.55	45	.93347	606.5	.01544	.002168				1.77
34.0	-1.0			.91351	559.9	.00278	.000390	.00264	.000371	.72	
34.0	4.0			.94289	583.5	.00476	.000668	.00483	.000678	1.06	
34.0	5.0			.94511	584.2	.00434	.000609	.00430	.000604	1.24	
34.0	6.0			.94677	585.9	.00462	.000649	.00464	.000652	1.01	
36.0	6.0			.94844	585.9	.00425	.000597			.93	
38.0	1.0			.90353	556.2	.00379	.000532	.00365	.000513	.89	
38.0	2.0			.91739	565.9	.00415	.000583			.95	
44.0	8.0			.94733	585.5	.00449	.000631	.00452	.000635	.99	
44.0	6.0			.93624	578.5	.00464	.000652	.00466	.000654	1.03	
44.0	4.0			.91905	566.9	.00411	.000577	.00403	.000566	.95	
44.0	2.0			.92737	569.9	.00352	.000494	.00351	.000493	.79	
44.0	1.0			.92460	571.5	.00455	.000639	.00434	.000609	1.11	
		10.55	90	.94511	589.2	.00336	.000472				1.25
		6.55	90	.93458	572.2	.00330	.000463				1.23
		4.55	90	.93014	570.2	.00354	.000497				1.32
		2.55	90	.91683	563.5	.00392	.000550				1.46
		10.55	180	.98225	592.9	.00099	.000139				
		8.55	180	.96174	581.5	.00127	.000178				
		6.55	180	.92848	562.5	.00119	.000167				
		4.55	180	.89244	541.9	.00138	.000194				
		3.55	180	.88856	539.5	.00138	.000194	.00137	.000192		
		2.55	180	.88523	536.2	.00131	.000184	.00130	.000183		
		1.55	180	.88302	536.2	.00140	.000197	.00125	.000176		
		.55	180	.90741	550.5	.00096	.000135				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(b) M = 2.65; R = 2.57 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95972	587.2	.00313	.000682			1.00	
12.0	.0			.95525	580.9	.00310	.000675			1.03	
20.5	.0			.95636	584.2	.00301	.000656			1.03	
28.0	12.0			.95021	579.5	.00319	.000695			1.02	
28.0	4.0			.95525	581.2	.00298	.000649			.98	
28.0	.0			.95525	581.2	.00300	.000653			1.01	
20.5	-5.0			.95692	586.9	.00299	.000651			.99	
24.5	-5.0			.95581	580.5	.00286	.000623			.98	
30.0	.0			.96699	583.2	.00230	.000501	.00223	.000486	.83	
31.0	12.0			.95301	585.2	.00302	.000658			.98	
34.0	.0			.93791	560.2	.00050	.000109	.00053	.000115	.18	
2.0	-12.0			.96252	585.2	.00340	.000741			1.11	
2.0	12.0			.96084	585.5	.00310	.000675			.95	
12.0	-12.0			.96364	588.5	.00310	.000675			1.03	
12.0	12.0			.95413	581.9	.00320	.000697			1.01	
30.0	1.0			.95413	592.9	.00467	.001017			1.58	
31.0	2.0			.94797	584.2	.00515	.001122			1.75	
32.0	2.0			.94126	581.9	.00546	.001189	.00551	.001200	1.97	
32.0	3.0			.94686	580.2	.00396	.000863			1.34	
32.0	6.0			.95469	581.5	.00301	.000656			.97	
34.0	1.0			.92001	556.5	.00204	.000444	.00167	.000364	.70	
34.0	2.0			.92392	569.2	.00453	.000987	.00462	.001006	1.49	
34.0	3.0			.93791	576.5	.00441	.000961	.00447	.000974	1.45	
36.0	.0			.91050	558.2	.00394	.000858	.00395	.000860		
38.0	.0			.89595	551.5	.00447	.000974	.00440	.000958	1.51	
40.0	.0			.90882	558.9	.00417	.000908	.00381	.000830		
44.0	12.0			.95916	584.5	.00305	.000664			1.01	
42.0	.0			.92168	572.5	.00481	.001048	.00480	.001046	1.64	
44.0	.0			.94014	583.9	.00483	.001052	.00486	.001059	1.72	
48.0	.0			.95133	590.5	.00489	.001065	.00490	.001067	1.66	
52.0	.0			.95469	587.9	.00460	.001002	.00460	.001002	1.52	
52.0	12.0			.95804	584.2	.00316	.000688			1.06	
55.0	.0			.95860	589.9	.00444	.000967	.00444	.000967	1.47	
58.0	.0			.95916	593.2	.00451	.000982			1.49	
58.0	12.0			.95245	581.5	.00330	.000719			1.05	
58.0	-12.0			.95525	581.9	.00323	.000704			1.07	
44.0	-12.0			.96420	585.5	.00321	.000699			1.18	
36.0	-8.0			.96140	584.2	.00291	.000634			1.01	
36.0	-3.0			.93958	576.2	.00401	.000874			1.44	
34.0	-3.0			.94014	577.2	.00410	.000893	.00409	.000891	1.43	
32.0	-3.0			.94741	580.2	.01096	.002387	.01095	.002385	3.90	
30.0	-3.0			.95804	584.9	.00349	.000760	.00352	.000767	1.18	
28.0	-3.0			.96084	583.9	.00283	.000616			1.04	
34.0	-12.0			.95748	581.5	.00289	.000630	.00250	.000545	1.01	
32.0	-12.0			.95748	581.9	.00285	.000621	.00249	.000542	1.01	
30.0	-12.0			.95972	583.2	.00288	.000627	.00271	.000590	.98	
19.0	-12.5			.96084	584.2	.00282	.000614			.96	
17.5	-11.0			.95972	583.5	.00295	.000643			.98	
15.5	-2.5			.96140	588.2	.00313	.000682			1.03	
16.5	-2.5			.95692	582.2	.00294	.000640	.00288	.000627	.98	
17.5	-2.5			.95525	581.5	.00300	.000653	.00292	.000636	.99	
18.5	-2.5			.96196	585.5	.00295	.000643	.00310	.000675	.99	
19.5	-2.5			.95525	583.5	.00302	.000658	.00295	.000643	1.01	
20.5	-2.5			.95413	580.5	.00311	.000677	.00306	.000667	1.01	
21.5	-2.5			.95804	587.9	.00299	.000651	.00315	.000686	1.00	
22.5	-2.5			.95469	580.5	.00310	.000675	.00306	.000667	1.03	
23.5	-2.5			.95469	580.5	.00290	.000632	.00288	.000627	.97	
24.5	-2.5			.95636	583.9	.00289	.000630			.99	
		10.55	0	.97370	634.9	.01261	.002747				1.36
		8.55	0	.97650	636.2	.01263	.002751				1.37
		4.55	0	.97147	638.2	.01453	.003165				1.57
		3.55	0	.96196	626.2	.01579	.003440	.01581	.003444		1.71
		2.55	0	.94965	626.2	.01502	.003272	.01499	.003265		1.62
		1.55	0	.94294	614.5	.01557	.003392	.01545	.003366		1.68
		.55	0	.96084	623.9	.01139	.002481				1.23
		10.55	45	.96811	612.5	.00970	.002113				1.37
		6.55	45	.96755	623.2	.00894	.001947				1.26
		4.55	45	.96140	617.2	.01019	.002220				1.44
		2.55	45	.93791	604.5	.01062	.002313				1.50
34.0	-1.0			.93007	560.9	.00175	.000381	.00166	.000362	.66	
34.0	4.0			.95301	584.2	.00342	.000745	.00351	.000765	1.13	
34.0	5.0			.95525	581.9	.00312	.000680	.00299	.000651	1.22	
34.0	6.0			.95748	583.9	.00318	.000693	.00319	.000695	1.05	
36.0	6.0			.95860	583.5	.00293	.000638			.95	
38.0	1.0			.91553	556.5	.00297	.000647	.00290	.000632	1.00	
38.0	2.0			.92840	564.9	.00281	.000612			.98	
44.0	8.0			.95804	583.9	.00302	.000658	.00304	.000662	1.00	
44.0	6.0			.94797	577.5	.00301	.000656	.00303	.000660	1.00	
44.0	4.0			.93287	567.2	.00285	.000621	.00277	.000603	.96	
44.0	2.0			.94014	570.9	.00264	.000575	.00264	.000575	.89	
44.0	1.0			.93847	572.5	.00332	.000723	.00320	.000697	1.21	
		10.55	90	.95413	576.5	.00234	.000510				1.06
		6.55	90	.94630	572.2	.00222	.000484				1.01
		4.55	90	.94014	569.2	.00246	.000536				1.12
		2.55	90	.92728	562.2	.00260	.000566				1.18
		10.55	180	1.00279	600.2	.00083	.000181				
		8.55	180	.97762	585.5	.00087	.000190				
		6.55	180	.95357	570.2	.00070	.000152				
		4.55	180	.92112	554.2	.00094	.000205				
		3.55	180	.91665	551.2	.00094	.000205	.00092	.000200		
		2.55	180	.91497	549.2	.00090	.000196				
		.55	180	.93958	562.2	.00065	.000142				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(c) M = 2.65; R = 1.29 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.98200	590.5	.00156	.000672			.98	
12.0	.0			.97582	585.9	.00151	.000651			1.01	
20.5	.0			.97863	587.2	.00150	.000646			.99	
28.0	12.0			.97189	583.9	.00144	.000621			.92	
28.0	4.0			.97751	586.9	.00144	.000621			.99	
28.0	.0			.97638	586.2	.00147	.000634			.99	
20.5	-5.0			.97919	587.5	.00149	.000642			1.00	
24.5	-5.0			.97807	586.5	.00135	.000582			1.00	
30.0	.0			.98313	587.9	.00137	.000590	.00135	.000582	.93	
31.0	12.0			.97413	585.2	.00152	.000655			1.07	
34.0	.0			.95952	568.2	.00026	.000112			.20	
2.0	-12.0			.98538	591.9	.00156	.000672			1.00	
2.0	12.0			.98369	591.5	.00158	.000681			.86	
12.0	-12.0			.98425	591.2	.00155	.000668			1.10	
12.0	12.0			.97470	585.9	.00159	.000685			1.00	
30.0	1.0			.97020	593.5	.00224	.000965			1.70	
31.0	2.0			.96289	586.2	.00257	.001108			1.74	
32.0	2.0			.95390	580.2	.00252	.001086	.00254	.001095	1.94	
32.0	3.0			.96177	580.5	.00200	.000862			1.31	
32.0	6.0			.97695	588.5	.00149	.000642			1.05	
34.0	1.0			.94153	562.9	.00103	.000444			.77	
34.0	2.0			.93815	568.5	.00242	.001043	.00235	.001013	1.70	
34.0	3.0			.95165	575.9	.00214	.000922	.00213	.000918	1.50	
36.0	.0			.93478	565.9	.00205	.000883	.00207	.000892		
38.0	.0			.91791	562.9	.00222	.000957	.00214	.000922	1.66	
40.0	.0			.92747	562.9	.00238	.001026	.00236	.001017		
44.0	12.0			.98088	589.5	.00158	.000681			1.17	
42.0	.0			.93928	570.5	.00246	.001060	.00244	.001052	1.81	
44.0	.0			.95783	582.5	.00253	.001090	.00256	.001103	1.86	
48.0	.0			.96964	588.9	.00262	.001129	.00263	.001133	1.81	
52.0	.0			.97413	590.5	.00236	.001017	.00236	.001017	1.61	
52.0	12.0			.97751	587.5	.00158	.000681			1.07	
55.0	.0			.97863	592.9	.00230	.000991	.00230	.000991	1.65	
58.0	.0			.98088	593.5	.00231	.000996			1.65	
58.0	12.0			.97245	584.9	.00159	.000685			1.04	
58.0	-12.0			.97526	585.9	.00155	.000668			1.01	
44.0	-12.0			.98650	591.9	.00138	.000595			.94	
36.0	-8.0			.98369	590.2	.00149	.000642			1.01	
36.0	-3.0			.95558	576.9	.00199	.000858			1.35	
34.0	-3.0			.95390	576.5	.00217	.000935	.00215	.000927	1.64	
32.0	-3.0			.96233	580.5	.00197	.000849	.00195	.000840	1.33	
30.0	-3.0			.97638	588.9	.00188	.000810	.00192	.000827	1.27	
28.0	-3.0			.98257	589.5	.00135	.000582			.92	
34.0	-12.0			.97919	589.9	.00137	.000590	.00121	.000521	1.04	
32.0	-12.0			.97919	589.9	.00137	.000590	.00117	.000504	1.01	
30.0	-12.0			.98144	588.9	.00152	.000655	.00144	.000621	1.04	
19.0	-12.5			.98257	591.9	.00136	.000586			.99	
17.5	-11.0			.98200	589.2	.00149	.000642			1.08	
15.5	-2.5			.98313	590.5	.00151	.000651			1.03	
16.5	-2.5			.97919	587.5	.00137	.000590	.00132	.000569	.93	
17.5	-2.5			.97807	587.2	.00144	.000621	.00136	.000586	.98	
18.5	-2.5			.98482	590.5	.00138	.000595	.00152	.000655	1.00	
19.5	-2.5			.97751	586.5	.00138	.000595	.00131	.000565	.94	
20.5	-2.5			.97638	586.2	.00150	.000646	.00148	.000638	1.07	
21.5	-2.5			.98032	588.5	.00143	.000616	.00151	.000651	.97	
22.5	-2.5			.97695	586.2	.00140	.000603	.00136	.000586	1.01	
23.5	-2.5			.97695	586.2	.00140	.000603	.00138	.000595	.95	
24.5	-2.5			.97863	587.2	.00153	.000659			1.03	
		10.55	0	.97919	620.5	.00654	.002819				1.00
		8.55	0	.98144	621.9	.00651	.002806				.99
		4.55	0	.97582	624.2	.00779	.003357				1.19
		3.55	0	.96570	614.2	.00846	.003646	.00847	.003650		1.29
		2.55	0	.95390	612.2	.00835	.003599	.00828	.003568		1.28
		1.55	0	.94884	610.5	.00842	.003629	.00833	.003590		1.29
		.55	0	.96739	614.2	.00642	.002767				.98
		10.55	45	.97357	602.2	.00479	.002064				.95
		6.55	45	.97357	602.5	.00447	.001926				.89
		4.55	45	.96683	601.2	.00522	.002250				1.04
		2.55	45	.94265	588.5	.00552	.002379				1.10
34.0	-1.0			.95108	572.5	.00094	.000405	.00088	.000379	.73	
34.0	4.0			.97020	583.5	.00155	.000668	.00175	.000754	1.05	
34.0	5.0			.97413	585.2	.00148	.000638	.00145	.000625	1.01	
34.0	6.0			.97751	587.9	.00158	.000681	.00159	.000685	1.12	
36.0	6.0			.97976	588.2	.00142	.000612			.95	
38.0	1.0			.93647	562.9	.00159	.000685	.00160	.000690	1.07	
38.0	2.0			.94771	568.9	.00143	.000616			1.04	
44.0	8.0			.97929	588.5	.00148	.000638	.00150	.000646	1.05	
44.0	6.0			.97020	582.9	.00153	.000659	.00154	.000664	.99	
44.0	4.0			.95783	574.2	.00138	.000595	.00133	.000573	.98	
44.0	2.0			.96289	577.9	.00139	.000599	.00140	.000603	.99	
44.0	1.0			.96008	578.5	.00191	.000823	.00184	.000793	1.41	
		10.55	90	.96795	579.5	.00112	.000483				.72
		6.55	90	.96120	575.5	.00113	.000487				.73
		4.55	90	.95333	570.9	.00134	.000578				.86
		2.55	90	.94153	564.5	.00146	.000629				.94
		10.55	180	1.01967	604.9	.00036	.000155				
		8.55	180	.99662	591.5	.00043	.000185				
		6.55	180	.97582	579.2	.00041	.000177				
		4.55	180	.94996	565.2	.00058	.000250				
		3.55	180	.94546	562.2	.00056	.000241	.00052	.000224		
		2.55	180	.94771	563.5	.00051	.000220	.00097	.000418		
		.55	180	.97413	578.5	.00034	.000147				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(d) M = 3.51; R = 4.03×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95261	578.5	.00265	.000513			1.02	
12.0	.0			.94480	575.2	.00251	.000486			1.06	
20.5	.0			.94759	574.9	.00244	.000472			.98	
28.0	12.0			.94146	571.2	.00253	.000490			.97	
28.0	4.0			.94592	573.9	.00266	.000515			1.07	
28.0	.0			.94536	575.9	.00252	.000488			1.01	
20.5	-5.0			.94871	577.5	.00250	.000484			1.07	
24.5	-5.0			.94815	574.5	.00237	.000459			.98	
30.0	.0			.96097	579.2	.00191	.000370	.00191	.000370	.83	
31.0	12.0			.94480	572.9	.00249	.000482			.98	
2.0	-12.0			.95651	580.2	.00263	.000509			1.06	
2.0	12.0			.95372	578.2	.00242	.000469			.96	
12.0	-12.0			.95372	578.9	.00244	.000472			.99	
12.0	12.0			.94369	572.5	.00253	.000490			.98	
30.0	1.0			.94257	579.9	.00455	.000881			1.87	
31.0	2.0			.93310	572.5	.00453	.000877			1.93	
32.0	2.0			.92418	572.9	.00477	.000924	.00481	.000931	2.00	
32.0	3.0			.93254	569.9	.00370	.000716			1.45	
32.0	6.0			.94313	572.5	.00267	.000517			1.05	
34.0	1.0			.91135	549.9	.00167	.000323	.00133	.000258	.67	
34.0	2.0			.90634	557.5	.00437	.000846	.00436	.000844	1.74	
34.0	3.0			.92083	564.2	.00417	.000807	.00415	.000804	1.62	
36.0	.0			.90968	559.2	.00223	.000432	.00225	.000436		
38.0	.0			.88682	541.9	.00352	.000682	.00344	.000666	1.42	
40.0	.0			.89519	554.2	.00342	.000662	.00235	.000455		
44.0	12.0			.94648	573.9	.00265	.000513			1.17	
42.0	.0			.90634	556.5	.00430	.000833	.00429	.000831	1.73	
44.0	.0			.92306	567.2	.00461	.000893	.00463	.000897	1.97	
48.0	.0			.92919	573.9	.00472	.000914	.00473	.000916	2.02	
52.0	.0			.93979	575.9	.00410	.000794	.00410	.000794	1.66	
52.0	12.0			.94871	575.5	.00249	.000482			1.07	
55.0	.0			.94480	588.5	.00402	.000778	.00307	.000594	1.63	
58.0	.0			.94592	581.9	.00387	.000749			1.56	
58.0	12.0			.94592	574.9	.00265	.000513			1.07	
58.0	-12.0			.94871	576.9	.00268	.000519			1.11	
44.0	-12.0			.95261	577.5	.00236	.000457			1.05	
36.0	-8.0			.94926	575.5	.00238	.000461			1.02	
36.0	-3.0			.92195	564.5	.00398	.000771			1.66	
34.0	-3.0			.92195	564.2	.00397	.000769	.00360	.000697	1.71	
32.0	-3.0			.93142	568.5	.00340	.000658	.00339	.000656	1.46	
30.0	-3.0			.94648	575.2	.00273	.000529	.00275	.000533	1.11	
28.0	-3.0			.95094	576.5	.00235	.000455			.97	
34.0	-12.0			.94871	575.2	.00239	.000463	.00193	.000374	1.02	
32.0	-12.0			.94815	577.2	.00250	.000484			1.03	
30.0	-12.0			.95038	576.5	.00264	.000511	.00252	.000488	1.09	
19.0	-12.5			.95261	577.9	.00232	.000449			1.01	
17.5	-11.0			.95149	579.2	.00249	.000482			1.03	
15.5	-2.5			.95094	577.5	.00249	.000482			1.02	
16.5	-2.5			.94703	574.2	.00238	.000461	.00233	.000451	1.01	
17.5	-2.5			.94480	573.5	.00267	.000517	.00259	.000502	1.07	
18.5	-2.5			.95205	577.2	.00246	.000476	.00261	.000505	1.02	
19.5	-2.5			.94592	575.9	.00251	.000486	.00245	.000474	1.02	
20.5	-2.5			.94480	573.2	.00244	.000472	.00236	.000457	1.02	
21.5	-2.5			.94926	575.9	.00239	.000463	.00249	.000482	.98	
22.5	-2.5			.94592	575.9	.00251	.000486	.00247	.000478	.98	
23.5	-2.5			.94592	575.9	.00251	.000486	.00249	.000482	1.02	
24.5	-2.5			.94759	574.5	.00247	.000478			1.06	
		10.55	0	.96097	624.5	.01763	.003414				1.83
		8.55	0	.96432	626.2	.01744	.003377				1.81
		4.55	0	.96766	638.9	.01762	.003412				1.83
		3.55	0	.95986	627.9	.01962	.003799	.01966	.003807		2.04
		2.55	0	.94536	621.2	.02102	.004070	.02113	.004092		2.19
		1.55	0	.91804	606.2	.02242	.004342	.02214	.004287		2.33
		.55	0	.93979	608.5	.01546	.002994				1.61
		10.55	45	.95484	607.9	.01208	.002339				1.64
		6.55	45	.95707	615.9	.01143	.002213				1.55
		4.55	45	.95818	610.5	.01230	.002382				1.67
		2.55	45	.93365	605.5	.01317	.002550				1.78
34.0	-1.0			.92306	561.5	.00133	.000258	.00120	.000232	.60	
34.0	4.0			.93923	571.9	.00295	.000571	.00307	.000594	1.18	
34.0	5.0			.94257	577.9	.00278	.000538	.00278	.000538	1.51	
34.0	6.0			.94592	577.5	.00289	.000560	.00290	.000562	1.16	
36.0	6.0			.94648	574.9	.00263	.000509			1.04	
38.0	1.0			.90634	548.5	.00215	.000416	.00215	.000416	.87	
38.0	2.0			.91303	561.5	.00270	.000523			1.13	
44.0	8.0			.94926	576.2	.00265	.000513	.00261	.000505	1.06	
44.0	6.0			.93644	569.2	.00269	.000521	.00269	.000521	1.10	
44.0	4.0			.92139	560.9	.00286	.000554	.00281	.000544	1.15	
44.0	2.0			.93087	563.2	.00200	.000387	.00202	.000391	.81	
44.0	1.0			.92641	562.9	.00266	.000515	.00265	.000513	1.12	
		10.55	90	.93811	568.9	.00268	.000519				1.18
		6.55	90	.93923	569.5	.00250	.000484				1.10
		4.55	90	.93700	567.5	.00254	.000492				1.11
		2.55	90	.92585	562.2	.00279	.000540				1.22
		10.55	180	.99554	593.2	.00018	.000035				
		8.55	180	.97156	580.5	.00039	.000076				
		6.55	180	.95149	569.2	.00056	.000108				
		4.55	180	.93087	557.2	.00048	.000093				
		3.55	180	.92473	553.5	.00063	.000122	.00058	.000112		
		2.55	180	.92641	554.9	.00063	.000122				
		.55	180	.95986	573.9	.00031	.000060				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(e) M = 3.51; R = 2.81 x 10[b]

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96871	583.9	.00183	.000511			.98	
12.0	.0			.96144	578.2	.00161	.000449			.95	
20.5	.0			.96479	580.2	.00181	.000505			1.08	
28.0	12.0			.95809	575.9	.00169	.000472			.92	
28.0	4.0			.96312	579.2	.00163	.000455			.93	
28.0	.0			.96200	578.9	.00164	.000458			.98	
20.5	-5.0			.96535	580.5	.00159	.000444			.88	
24.5	-5.0			.96535	580.2	.00158	.000441			.96	
30.0	.0			.97150	582.2	.00144	.000402	.00145	.000405	.87	
31.0	12.0			.96032	577.5	.00165	.000461			.92	
2.0	-12.0			.97262	587.2	.00166	.000463			.95	
2.0	12.0			.96871	582.9	.00179	.000500			.99	
12.0	-12.0			.97038	583.9	.00159	.000444			.96	
12.0	12.0			.95921	576.9	.00166	.000463			.91	
30.0	1.0			.95418	586.2	.00302	.000843			1.67	
31.0	2.0			.94300	578.5	.00311	.000868			1.78	
32.0	2.0			.93239	571.9	.00358	.000999	.00359	.001002	2.20	
32.0	3.0			.94300	571.2	.00253	.000706			1.41	
32.0	6.0			.95977	577.9	.00184	.000514			1.02	
34.0	1.0			.92680	556.5	.00125	.000349			.71	
34.0	2.0			.91618	558.2	.00332	.000927	.00318	.000888	1.83	
34.0	3.0			.93071	565.2	.00303	.000846	.00299	.000835	1.67	
36.0	.0			.92792	561.2	.00187	.000522	.00189	.000528		
38.0	.0			.90501	548.5	.00273	.000762	.00266	.000743	1.64	
40.0	.0			.91060	551.9	.00272	.000759	.00270	.000754		
44.0	12.0			.96312	579.5	.00182	.000508			1.06	
42.0	.0			.91954	559.5	.00328	.000916	.00306	.000854	1.98	
44.0	.0			.93686	572.5	.00314	.000877	.00316	.000882	1.94	
48.0	.0			.94803	576.5	.00317	.000885	.00317	.000885	1.77	
52.0	.0			.95418	581.9	.00294	.000821	.00294	.000821	1.80	
52.0	12.0			.96424	580.5	.00182	.000508			1.10	
55.0	.0			.95921	582.2	.00281	.000784	.00281	.000784	1.72	
58.0	.0			.96144	585.9	.00278	.000776			1.71	
58.0	12.0			.96088	578.9	.00200	.000558			1.14	
58.0	-12.0			.96424	581.5	.00186	.000519			1.03	
44.0	-12.0			.97038	583.9	.00164	.000458			1.00	
36.0	-8.0			.96815	582.2	.00158	.000441			.99	
36.0	-3.0			.93406	566.9	.00266	.000743			1.49	
34.0	-3.0			.93239	565.5	.00283	.000790	.00280	.000782	1.78	
32.0	-3.0			.94300	570.5	.00237	.000662	.00235	.000656	1.44	
30.0	-3.0			.96144	579.5	.00200	.000558	.00203	.000567	1.10	
28.0	-3.0			.96815	582.2	.00181	.000505			1.12	
34.0	-12.0			.96535	580.9	.00160	.000447	.00140	.000391	.99	
32.0	-12.0			.96535	580.9	.00160	.000447	.00138	.000385	.88	
30.0	-12.0			.96703	582.2	.00182	.000508	.00175	.000489	1.01	
19.0	-12.5			.96926	583.2	.00164	.000458			1.03	
17.5	-11.0			.96815	584.2	.00167	.000466			1.04	
15.5	-2.5			.96815	582.9	.00182	.000508			1.04	
16.5	-2.5			.96479	580.2	.00181	.000505	.00178	.000497	1.11	
17.5	-2.5			.96312	579.5	.00182	.000508	.00174	.000486	1.08	
18.5	-2.5			.97038	583.5	.00158	.000441	.00173	.000483	.97	
19.5	-2.5			.96368	579.9	.00182	.000508	.00177	.000494	1.11	
20.5	-2.5			.96256	579.2	.00161	.000449	.00154	.000430	.91	
21.5	-2.5			.96703	581.9	.00181	.000505	.00189	.000528	1.11	
22.5	-2.5			.96424	579.9	.00159	.000444	.00156	.000436	.96	
23.5	-2.5			.96368	581.2	.00167	.000466	.00165	.000461	.99	
24.5	-2.5			.96591	580.5	.00160	.000447			1.00	
		10.55	0	.96368	623.9	.01260	.003518				1.57
		8.55	0	.96647	618.9	.01312	.003663				1.63
		4.55	0	.96871	623.9	.01431	.003995				1.78
		3.55	0	.96088	627.5	.01432	.003998	.01438	.004015		1.78
		2.55	0	.94468	620.2	.01540	.004299	.01550	.004327		1.92
		1.55	0	.91730	598.9	.01764	.004925	.01737	.004849		2.20
		.55	0	.94300	603.2	.01209	.003375				1.51
		10.55	45	.95865	601.9	.00911	.002543				1.48
		6.55	45	.95865	602.9	.00901	.002515				1.46
		4.55	45	.95977	614.9	.00860	.002401				1.39
		2.55	45	.93406	591.5	.01031	.002878				1.67
34.0	-1.0			.93742	560.9	.00092	.000257	.00083	.000232	.59	
34.0	4.0			.95194	576.2	.00206	.000575	.00219	.000611	1.23	
34.0	5.0			.95697	576.9	.00202	.000564	.00202	.000564	1.39	
34.0	6.0			.96144	579.9	.00190	.000530	.00191	.000533	1.10	
36.0	6.0			.96256	579.5	.00167	.000466			.97	
38.0	1.0			.92401	554.9	.00139	.000388	.00142	.000396	.77	
38.0	2.0			.92792	559.5	.00194	.000542			1.07	
44.0	8.0			.96591	581.2	.00182	.000508	.00180	.000503	1.10	
44.0	6.0			.95306	577.2	.00181	.000505	.00182	.000508	1.02	
44.0	4.0			.93742	565.5	.00195	.000544	.00189	.000528	1.15	
44.0	2.0			.94747	568.9	.00134	.000374	.00137	.000382	.82	
44.0	1.0			.94300	568.2	.00187	.000522	.00183	.000511	1.18	
		10.55	90	.95083	572.2	.00180	.000503				.94
		6.55	90	.94859	570.9	.00177	.000494				.93
		4.55	90	.94636	569.5	.00180	.000503				.94
		2.55	90	.93462	565.5	.00197	.000550				1.03
		8.55	180	.99106	589.9	.00027	.000075				
		6.55	180	.96982	578.2	.00039	.000109				
		4.55	180	.95027	566.9	.00043	.000120				
		3.55	180	.94580	564.2	.00039	.000109				
		2.55	180	.94859	565.9	.00047	.000131				
		.55	180	.97820	582.9	.00023	.000064				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(f) M = 3.51; R = 1.63×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97925	587.5	.00123	.000593			1.18	
12.0	.0			.96972	579.9	.00101	.000487			1.01	
20.5	.0			.97309	583.2	.00111	.000535			.91	
28.0	12.0			.96636	577.9	.00109	.000526			1.06	
28.0	4.0			.97196	581.2	.00117	.000564			1.10	
28.0	.0			.97140	580.9	.00117	.000564			1.11	
20.5	-5.0			.97477	582.9	.00117	.000564			1.13	
24.5	-5.0			.97421	582.2	.00097	.000468			1.11	
30.0	.0			.97477	581.5	.00103	.000497	.00104	.000501	1.18	
31.0	12.0			.96916	580.5	.00111	.000535			1.11	
2.0	-12.0			.98318	589.2	.00110	.000530			1.18	
2.0	12.0			.97869	586.5	.00122	.000588			1.22	
12.0	-12.0			.97925	585.5	.00102	.000492			1.11	
12.0	12.0			.96748	578.5	.00118	.000569			1.17	
30.0	1.0			.96075	582.2	.00214	.001032			2.21	
31.0	2.0			.95010	572.5	.00207	.000998			2.13	
32.0	2.0			.93777	570.9	.00232	.001119	.00232	.001119	2.42	
32.0	3.0			.94898	570.5	.00163	.000786			1.63	
32.0	6.0			.96916	581.9	.00101	.000487			1.02	
34.0	1.0			.93328	557.2	.00086	.000415			.93	
34.0	2.0			.92207	556.9	.00203	.000979	.00177	.000853	1.65	
34.0	3.0			.93608	563.2	.00171	.000825	.00163	.000786	1.71	
36.0	.0			.93833	562.5	.00123	.000593	.00125	.000603		
38.0	.0			.91871	553.2	.00182	.000878	.00177	.000853	2.04	
40.0	.0			.92263	557.9	.00165	.000796	.00163	.000786		
44.0	12.0			.97196	581.5	.00108	.000521			1.07	
42.0	.0			.92936	563.2	.00184	.000887	.00181	.000873	1.50	
44.0	.0			.94562	573.2	.00190	.000916	.00192	.000926	2.07	
48.0	.0			.95683	576.5	.00193	.000931	.00193	.000931	2.01	
52.0	.0			.96412	583.5	.00185	.000892	.00185	.000892	1.81	
52.0	12.0			.97309	582.2	.00107	.000516			1.03	
55.0	.0			.97084	584.2	.00189	.000911	.00189	.000911	2.05	
58.0	.0			.97477	589.2	.00164	.000791			1.71	
58.0	12.0			.97084	582.2	.00123	.000593			1.32	
58.0	-12.0			.97421	588.2	.00104	.000501			1.13	
44.0	-12.0			.97981	585.9	.00116	.000559			1.27	
36.0	-8.0			.97701	584.2	.00117	.000564			1.29	
36.0	-3.0			.94113	565.9	.00163	.000786			1.68	
34.0	-3.0			.93721	563.5	.00163	.000786	.00159	.000767	1.66	
32.0	-3.0			.94842	576.2	.00151	.000728	.00148	.000714	1.64	
30.0	-3.0			.96972	582.2	.00135	.000651	.00139	.000670	1.29	
28.0	-3.0			.97757	584.2	.00098	.000473			.99	
34.0	-12.0			.97477	582.9	.00099	.000477	.00087	.000420	1.08	
32.0	-12.0			.97477	582.9	.00099	.000477			1.13	
30.0	-12.0			.97645	584.2	.00117	.000564	.00115	.000555	1.27	
19.0	-12.5			.97813	584.9	.00098	.000473			1.07	
17.5	-11.0			.97757	584.5	.00117	.000564			1.27	
15.5	-2.5			.97701	584.5	.00117	.000564			1.16	
16.5	-2.5			.97365	581.9	.00098	.000473	.00094	.000453	1.15	
17.5	-2.5			.97196	582.5	.00111	.000535	.00103	.000497	1.11	
18.5	-2.5			.97869	585.2	.00116	.000559	.00129	.000622	1.26	
19.5	-2.5			.97252	581.5	.00117	.000564	.00111	.000535	1.27	
20.5	-2.5			.97140	581.2	.00118	.000569	.00113	.000545	1.28	
21.5	-2.5			.97589	583.5	.00117	.000564	.00124	.000598	1.27	
22.5	-2.5			.97309	582.5	.00100	.000482	.00097	.000468	1.01	
23.5	-2.5			.97309	581.5	.00101	.000487	.00099	.000477	1.02	
24.5	-2.5			.97477	582.5	.00099	.000477			1.08	
		10.55	0	.96355	614.9	.00813	.003920				1.33
		8.55	0	.96692	612.5	.00852	.004108				1.39
		4.55	0	.97028	617.5	.00934	.004504				1.53
		3.55	0	.96131	613.5	.00977	.004711	.00983	.004740		1.60
		2.55	0	.94281	610.2	.01031	.004971	.01038	.005005		1.68
		1.55	0	.91758	586.9	.01248	.006018	.01222	.005892		2.04
		.55	0	.94505	593.2	.00857	.004132				1.40
		10.55	45	.95851	595.2	.00558	.002691				1.19
		6.55	45	.96131	593.5	.00588	.002835				1.25
		4.55	45	.96131	593.9	.00590	.002845				1.26
		2.55	45	.93328	580.5	.00714	.003443				1.52
34.0	-1.0			.94393	562.9	.00067	.000323	.00061	.000294	.84	
34.0	4.0			.95739	573.9	.00134	.000646	.00148	.000714	1.35	
34.0	5.0			.96355	577.5	.00127	.000612	.00127	.000612	1.46	
34.0	6.0			.96916	580.9	.00128	.000617	.00128	.000617	1.36	
36.0	6.0			.97028	581.9	.00124	.000598			1.01	
38.0	1.0			.93440	558.2	.00097	.000468	.00096	.000463	1.01	
38.0	2.0			.93665	563.2	.00123	.000593			1.32	
44.0	8.0			.97421	583.5	.00111	.000535	.00113	.000545	1.12	
44.0	6.0			.96299	576.2	.00105	.000506	.00106	.000511	.85	
44.0	4.0			.94898	571.2	.00112	.000540	.00116	.000559	1.13	
44.0	2.0			.95571	571.5	.00090	.000434	.00093	.000448	.93	
44.0	1.0			.95178	570.2	.00129	.000622	.00128	.000617	1.33	
		10.55	90	.95122	568.5	.00122	.000588				.84
		6.55	90	.95234	569.5	.00110	.000530				.76
		4.55	90	.95010	567.9	.00110	.000530				.76
		2.55	90	.93721	561.9	.00137	.000661				.94
		8.55	180	.98934	586.9	.00017	.000082				
		6.55	180	.96860	575.9	.00026	.000125				
		4.55	180	.95963	570.2	.00022	.000106				
		3.55	180	.95627	568.2	.00030	.000145				
		2.55	180	.95907	570.2	.00029	.000140				
		.55	180	.98037	582.5	.00019	.000092				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(g) M = 4.44; R = 4.57×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95065	581.2	.00135	.000341			1.61	
12.0	.0			.94297	574.9	.00125	.000315			1.49	
20.5	.0			.94516	577.2	.00121	.000305			1.32	
28.0	12.0			.93913	574.9	.00138	.000348			1.10	
28.0	4.0			.94352	575.5	.00126	.000318			1.50	
28.0	.0			.94297	575.2	.00126	.000318			1.31	
20.5	-5.0			.94571	576.5	.00125	.000315			1.51	
24.5	-5.0			.94461	576.5	.00121	.000305			1.64	
30.0	.0			.95065	578.2	.00078	.000197	.00087	.000220	.85	
31.0	12.0			.94187	574.9	.00116	.000293			.93	
2.0	-12.0			.95284	581.5	.00125	.000315			1.13	
2.0	12.0			.95010	582.2	.00137	.000346				
12.0	-12.0			.94955	578.5	.00117	.000295			1.23	
12.0	12.0			.94132	576.5	.00138	.000348			1.10	
30.0	1.0			.93639	573.5	.00240	.000606			2.86	
31.0	2.0			.92323	564.9	.00198	.000500			2.36	
32.0	2.0			.91062	558.5	.00281	.000709	.00278	.000702	3.35	
32.0	3.0			.92323	566.5	.00199	.000502			1.79	
32.0	6.0			.94132	574.9	.00127	.000321			1.10	
34.0	1.0			.90514	550.2	.00070	.000177			.83	
34.0	2.0			.89472	548.5	.00261	.000659	.00223	.000563	3.11	
34.0	3.0			.90897	557.5	.00212	.000535	.00200	.000505	1.89	
36.0	.0			.91391	556.5	.00110	.000278	.00115	.000290		
38.0	.0			.89143	544.2	.00171	.000432	.00160	.000404	2.31	
40.0	.0			.89307	545.2	.00182	.000459	.00185	.000467		
44.0	12.0			.94571	577.9	.00127	.000321			1.07	
42.0	.0			.90075	553.2	.00206	.000520	.00202	.000510	2.42	
44.0	.0			.91720	563.2	.00202	.000510	.00206	.000520	2.43	
48.0	.0			.92871	567.5	.00195	.000492	.00196	.000495	2.22	
52.0	.0			.93310	572.5	.00197	.000497	.00197	.000497	2.14	
52.0	12.0			.94681	578.5	.00127	.000321			1.05	
55.0	.0			.93913	576.2	.00196	.000495	.00196	.000495	2.58	
58.0	.0			.94352	576.2	.00173	.000437			2.06	
58.0	12.0			.94900	579.5	.00126	.000318			1.07	
58.0	-12.0			.95119	579.2	.00113	.000285			1.06	
44.0	-12.0			.95119	579.2	.00106	.000273			1.23	
36.0	-8.0			.94790	576.9	.00111	.000280			1.26	
36.0	-3.0			.91226	559.2	.00211	.000532			2.67	
34.0	-3.0			.91062	559.2	.00203	.000512	.00196	.000495	2.45	
32.0	-3.0			.91720	563.5	.00188	.000474	.00184	.000464	2.54	
30.0	-3.0			.94297	577.2	.00141	.000356	.00149	.000376	1.91	
28.0	-3.0			.94845	579.2	.00121	.000305			1.46	
34.0	-12.0			.94681	577.5	.00125	.000315	.00101	.000255	1.14	
32.0	-12.0			.94626	576.5	.00110	.000278			1.31	
30.0	-12.0			.94790	577.5	.00110	.000278	.00109	.000275	1.00	
19.0	-12.5			.94845	578.2	.00107	.000270			1.27	
17.5	-11.0			.94790	577.2	.00117	.000295			1.39	
15.5	-2.5			.94900	579.9	.00134	.000338			1.61	
16.5	-2.5			.94516	577.2	.00134	.000338	.00129	.000326	1.60	
17.5	-2.5			.94407	577.5	.00130	.000328	.00116	.000293	1.76	
18.5	-2.5			.95065	580.2	.00133	.000336	.00151	.000381	1.71	
19.5	-2.5			.94407	575.5	.00125	.000315	.00118	.000298	1.49	
20.5	-2.5			.94297	576.9	.00130	.000328	.00119	.000300	1.41	
21.5	-2.5			.94736	576.9	.00106	.000268	.00117	.000295	1.43	
22.5	-2.5			.94461	576.5	.00121	.000305	.00115	.000290	1.44	
23.5	-2.5			.94407	576.5	.00121	.000305	.00117	.000295	1.64	
24.5	-2.5			.94626	576.9	.00125	.000315			1.49	
		10.55	0	.95503	599.2	.01092	.002756				1.34
		8.55	0	.95668	601.2	.01108	.002796				1.36
		4.55	0	.95997	605.2	.01210	.003054				1.49
		3.55	0	.95558	602.9	.01245	.003142	.01255	.003167		1.53
		2.55	0	.94297	596.5	.01321	.003334	.01347	.003399		1.62
		1.55	0	.91062	578.9	.01519	.003833	.01473	.003717		1.87
		.55	0	.91665	579.9	.01129	.002849				1.39
		10.55	45	.94790	589.2	.00716	.001807				1.15
		6.55	45	.94845	590.5	.00764	.001928				1.22
		4.55	45	.94955	591.5	.00767	.001936				1.23
		2.55	45	.92981	581.2	.00835	.002107				1.34
34.0	-1.0			.91555	556.2	.00065	.000164	.00051	.000129	.79	
34.0	4.0			.93036	569.5	.00153	.000386	.00177	.000447	1.38	
34.0	5.0			.93749	573.5	.00152	.000384	.00153	.000386	1.97	
34.0	6.0			.94352	577.2	.00136	.000343	.00137	.000346	1.16	
36.0	6.0			.94352	576.9	.00136	.000343			1.23	
38.0	1.0			.90678	551.5	.00082	.000207			.98	
38.0	2.0			.90568	552.5	.00161	.000406			1.92	
44.0	8.0			.94681	577.9	.00126	.000318	.00130	.000328	1.12	
44.0	6.0			.93474	571.2	.00136	.000343	.00136	.000343	1.23	
44.0	4.0			.92159	562.2	.00138	.000348	.00132	.000333	1.24	
44.0	2.0			.92652	564.9	.00096	.000242	.00100	.000252	1.14	
44.0	1.0			.92323	563.2	.00128	.000323	.00133	.000336	1.45	
		10.55	90	.93145	569.2	.00136	.000343				.70
		6.55	90	.93529	571.9	.00137	.000346				.71
		4.55	90	.93145	567.9	.00136	.000343				.70
		2.55	90	.92323	563.2	.00138	.000348				.72

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch-diameter cylinder swept back 45° - Continued

(h) M = 4.44; R = 3.18×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96089	582.2	.00103	.000370			.95	
12.0	.0			.95428	577.2	.00102	.000366			1.17	
20.5	.0			.95704	579.9	.00101	.000363			1.16	
28.0	12.0			.95153	577.2	.00103	.000370			1.11	
28.0	4.0			.95594	579.5	.00089	.000320			1.09	
28.0	.0			.95483	577.5	.00083	.000298			.91	
20.5	-5.0			.95759	578.9	.00103	.000370			1.14	
24.5	-5.0			.95704	579.2	.00101	.000363			1.26	
30.0	.0			.95594	577.9	.00079	.000284	.00091	.000327	.96	
31.0	12.0			.95373	578.5	.00090	.000323			.98	
2.0	-12.0			.96254	582.9	.00111	.000399			1.17	
2.0	12.0			.95979	581.5	.00109	.000391			1.04	
12.0	-12.0			.96144	581.5	.00108	.000388			1.15	
12.0	12.0			.95208	577.5	.00121	.000434			1.13	
30.0	1.0			.94327	574.2	.00191	.000686			2.27	
31.0	2.0			.92950	565.5	.00193	.000693			2.14	
32.0	2.0			.91573	558.2	.00225	.000808	.00220	.000790	2.50	
32.0	3.0			.92950	565.5	.00161	.000578			1.77	
32.0	6.0			.95318	578.9	.00102	.000366			1.12	
34.0	1.0			.91518	552.9	.00067	.000241			.74	
34.0	2.0			.90086	550.2	.00228	.000819			2.51	
34.0	3.0			.91463	559.2	.00176	.000632	.00153	.000549	2.05	
36.0	.0			.92840	561.5	.00370	.001328	.00375	.001346		
38.0	.0			.90802	551.9	.00135	.000485	.00126	.000452	1.63	
40.0	.0			.90637	551.2	.00136	.000488	.00133	.000477		
44.0	12.0			.95869	580.9	.00101	.000363			1.29	
42.0	.0			.91078	554.5	.00151	.000542	.00147	.000528	1.66	
44.0	.0			.92069	563.2	.00354	.001271	.00419	.001504	3.93	
48.0	.0			.93666	569.5	.00160	.000574	.00161	.000578	2.00	
52.0	.0			.94272	571.9	.00157	.000564	.00157	.000564	1.99	
52.0	12.0			.95924	581.5	.00102	.000366			1.07	
55.0	.0			.94933	576.9	.00140	.000503	.00140	.000503	1.77	
58.0	.0			.95539	580.5	.00156	.000560			2.05	
58.0	12.0			.96034	581.2	.00102	.000366			1.12	
58.0	-12.0			.96310	582.2	.00107	.000384			1.41	
44.0	-12.0			.96475	584.2	.00118	.000424			1.48	
36.0	-8.0			.96144	580.9	.00099	.000355			1.30	
36.0	-3.0			.92014	558.5	.00172	.000618			2.18	
34.0	-3.0			.91628	558.5	.00165	.000592	.00157	.000564	1.83	
32.0	-3.0			.92950	563.9	.00134	.000481	.00139	.000499	1.49	
30.0	-3.0			.95373	576.9	.00111	.000399	.00117	.000420	1.39	
28.0	-3.0			.96089	581.5	.00100	.000359			1.10	
34.0	-12.0			.95924	580.2	.00101	.000363	.00087	.000312	1.25	
32.0	-12.0			.95924	580.9	.00101	.000363			1.11	
30.0	-12.0			.96034	581.9	.00119	.000427	.00103	.000370	1.49	
19.0	-12.5			.96089	581.2	.00100	.000359			1.10	
17.5	-11.0			.95979	581.2	.00101	.000363			1.28	
15.5	-2.5			.96089	581.2	.00102	.000366			1.26	
16.5	-2.5			.95704	579.5	.00101	.000363			1.06	
17.5	-2.5			.95649	579.2	.00101	.000363			1.20	
18.5	-2.5			.96254	582.9	.00100	.000359	.00121	.000434	1.23	
19.5	-2.5			.95594	578.2	.00102	.000366	.00092	.000330	1.26	
20.5	-2.5			.95539	577.9	.00107	.000384	.00093	.000334	1.27	
21.5	-2.5			.95979	580.2	.00106	.000381	.00117	.000420	1.12	
22.5	-2.5			.95649	578.5	.00101	.000363	.00096	.000345	1.11	
23.5	-2.5			.95649	579.2	.00101	.000363	.00097	.000348	1.23	
24.5	-2.5			.95869	579.5	.00100	.000359			1.10	
		10.55	0	.95318	596.5	.00898	.003224				1.32
		8.55	0	.95539	598.5	.00908	.003260				1.34
		4.55	0	.95814	602.2	.00988	.003547				1.45
		3.55	0	.95318	599.5	.01011	.003630	.01020	.003662		1.49
		2.55	0	.93941	593.2	.01104	.003964	.01130	.004057		1.62
		1.55	0	.90527	575.2	.01309	.004700	.01300	.004667		1.93
		.55	0	.92179	577.2	.00898	.003224				1.32
		10.55	45	.94712	586.2	.00593	.002129				1.14
		6.55	45	.94657	586.9	.00616	.002212				1.18
		4.55	45	.94823	588.2	.00612	.002197				1.17
		2.55	45	.92730	577.2	.00692	.002484				1.33
34.0	4.0			.93831	570.5	.00131	.000470			1.51	
34.0	5.0			.94657	573.5	.00113	.000406	.00115	.000413	1.77	
34.0	6.0			.95428	577.9	.00111	.000399	.00112	.000402	1.22	
36.0	6.0			.95373	577.5	.00108	.000388			1.14	
38.0	1.0			.91904	555.2	.00076	.000273			.94	
38.0	2.0			.91573	556.9	.00135	.000485			1.82	
44.0	8.0			.95924	581.9	.00091	.000327	.00101	.000363	1.00	
44.0	6.0			.94657	572.9	.00102	.000366	.00102	.000366	1.12	
44.0	4.0			.93225	564.9	.00116	.000416	.00109	.000391	1.53	
44.0	2.0			.93776	566.5	.00066	.000237	.00072	.000258	.81	
44.0	1.0			.93336	565.5	.00104	.000373	.00110	.000395	1.16	
		10.55	90	.93556	567.5	.00123	.000442				.76
		6.55	90	.93886	570.2	.00124	.000445				.77
		4.55	90	.93666	569.2	.00131	.000470				.81
		2.55	90	.92730	564.2	.00134	.000481				.83
		3.55	180	.96034	579.2	.00034	.000122	.00034	.000122		
		2.55	180	.95318	575.2	.00034	.000122				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

13. 2.8-inch diameter cylinder swept back 45° - Concluded

(i) M = 4.44; R = 2.10×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96800	585.2	.00070	.000382			.93	
12.0	.0			.96138	580.5	.00064	.000349			.40	
20.5	.0			.96414	582.2	.00064	.000349			1.12	
28.0	12.0			.95862	579.5	.00070	.000382			1.27	
28.0	4.0			.96303	581.5	.00055	.000300			.95	
28.0	.0			.96248	580.9	.00057	.000311			.97	
20.5	-5.0			.96469	582.2	.00053	.000289			.85	
24.5	-5.0			.96414	581.5	.00058	.000317			.78	
30.0	.0			.95917	579.2	.00056	.000306	.00060	.000327	1.08	
31.0	12.0			.96138	580.9	.00051	.000278			1.00	
2.0	-12.0			.96910	586.2	.00063	.000344			1.13	
2.0	12.0			.96579	584.5	.00066	.000360			1.03	
12.0	-12.0			.96855	584.9	.00053	.000289			.88	
12.0	12.0			.95917	579.9	.00064	.000349			1.02	
30.0	1.0			.94869	577.5	.00135	.000737			1.82	
31.0	2.0			.93600	570.9	.00136	.000742			1.84	
32.0	2.0			.92166	559.9	.00162	.000884	.00155	.000846	2.84	
32.0	3.0			.93490	566.2	.00108	.000589			1.46	
34.0	2.0			.90621	550.5	.00116	.000633			1.90	
34.0	3.0			.91890	556.9	.00111	.000606			1.73	
36.0	.0			.93435	564.9	.00065	.000355	.00070	.000382		
38.0	.0			.91835	555.9	.00091	.000497	.00084	.000458	1.23	
40.0	.0			.91725	555.5	.00092	.000502	.00090	.000491		
44.5	12.0			.96579	583.5	.00051	.000278			1.04	
42.0	.0			.91945	556.5	.00106	.000578	.00100	.000546	1.74	
44.0	.0			.93325	565.2	.00084	.000458	.00087	.000475	1.68	
48.0	.0			.94207	570.2	.00101	.000551	.00101	.000551	2.02	
52.0	.0			.94814	574.9	.00093	.000508	.00093	.000508	1.86	
52.0	12.0			.96524	583.2	.00054	.000295			1.08	
56.0	.0			.95531	577.9	.00071	.000387	.00071	.000387	1.45	
58.0	.0			.96248	582.5	.00077	.000420			1.57	
58.0	-12.0			.96910	586.2	.00076	.000415			1.55	
44.0	-12.0			.97186	586.9	.00046	.000251			.94	
36.0	-8.0			.96855	584.5	.00050	.000273			1.02	
36.0	-3.0			.92442	559.9	.00105	.000573			1.98	
32.0	-3.0			.93490	565.9	.00102	.000557	.00098	.000535	1.96	
30.0	-3.0			.96028	579.9	.00063	.000344	.00070	.000382	.95	
28.0	-3.0			.96800	584.2	.00051	.000278			.85	
34.0	-12.0			.96690	583.5	.00051	.000278			1.04	
32.0	-12.0			.96634	583.5	.00051	.000278			.85	
30.0	-12.0			.96800	584.5	.00051	.000278	.00059	.000322	1.00	
19.0	-12.5			.96800	584.5	.00077	.000420			1.45	
17.5	-11.0			.96690	583.9	.00053	.000289			.98	
15.5	-2.5			.96800	584.5	.00063	.000344			.90	
16.5	-2.5			.96469	581.9	.00058	.000317	.00052	.000284	1.12	
17.5	-2.5			.96359	581.9	.00064	.000349	.00053	.000289	.88	
18.5	-2.5			.96965	585.2	.00054	.000295			.78	
19.5	-2.5			.96359	581.2	.00056	.000306	.00045	.000246	.98	
20.5	-2.5			.96248	581.2	.00052	.000284			.73	
21.5	-2.5			.96690	583.5	.00053	.000289	.00065	.000355	.98	
22.5	-2.5			.96359	581.5	.00055	.000300	.00048	.000262	1.04	
23.5	-2.5			.96414	581.9	.00062	.000338	.00059	.000322	.87	
24.5	-2.5			.96579	582.9	.00052	.000284			.74	
		10.55	0	.95310	592.2	.00673	.003673				1.22
		8.55	0	.95586	594.2	.00687	.003749				1.24
		4.55	0	.95752	596.9	.00747	.004077				1.35
		3.55	0	.95200	593.9	.00764	.004159	.00771	.004208		1.38
		2.55	0	.93656	586.2	.00844	.004606	.00867	.004732		1.53
		1.55	0	.90015	567.5	.01046	.005708	.00985	.005376		1.88
		.55	0	.92221	572.9	.00593	.003236				1.07
		10.55	45	.94704	582.2	.00422	.002303				.99
		6.55	45	.94759	583.5	.00453	.002472				1.07
		4.55	45	.94814	584.2	.00438	.002390				1.03
		2.55	45	.92497	571.9	.00513	.002800				1.21
34.0	5.0			.95200	575.9	.00075	.000409	.00077	.000420	1.01	
34.0	6.0			.96028	580.9	.00066	.000360	.00067	.000366	.89	
36.0	6.0			.95917	579.9	.00057	.000311			.77	
38.0	1.0			.92663	558.9	.00041	.000224			.72	
38.0	2.0			.92276	557.9	.00062	.000338			1.22	
44.0	6.0			.95421	576.2	.00054	.000295	.00055	.000300	1.06	
44.0	4.0			.93987	569.2	.00079	.000431	.00072	.000393	1.44	
44.0	2.0			.94373	569.5	.00046	.000251	.00051	.000278	.88	
44.0	1.0			.94042	567.9	.00065	.000355	.00067	.000366	1.14	
		10.55	90	.93766	566.5	.00074	.000404				.56
		6.55	90	.94152	569.5	.00076	.000415				.58
		4.55	90	.93931	569.5	.00085	.000464				.66
		2.55	90	.92883	562.5	.00091	.000497				.69
		2.55	180	.95862	577.9	.00025	.000136				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway

(a) M = 2.65; R = 3.97×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95100	580.2	.00472	.000663			.99
12.0	.0			.94875	577.5	.00454	.000638			1.02
28.0	12.0			.92735	557.2	.00278	.000391			.60
28.0	4.0			.97916	581.5	.00087	.000122			.18
30.0	.0			.94706	575.2	.00389	.000547	.00391	.000549	.86
31.0	12.0			.92116	563.2	.00523	.000735			1.14
34.0	.0			.93073	566.5	.00443	.000622	.00441	.000620	1.06
2.0	-12.0			.95325	580.9	.00463	.000651			1.02
2.0	12.0			.95044	579.5	.00473	.000665			.99
12.0	-12.0			.95044	579.2	.00460	.000646			.98
12.0	12.0			.94706	577.9	.00474	.000666			.99
30.0	1.0			.94481	574.5	.00427	.000600			.97
31.0	2.0			.93073	568.2	.00481	.000676			1.09
32.0	2.0			.92735	565.2	.00463	.000651	.00458	.000643	1.07
32.0	3.0			.92510	565.2	.00502	.000705			1.09
32.0	6.0			.92453	564.9	.00503	.000707			1.11
34.0	1.0			.92960	567.2	.00496	.000697	.00500	.000702	1.11
34.0	2.0			.92848	566.2	.00482	.000677	.00481	.000676	1.05
34.0	3.0			.92679	565.5	.00485	.000681	.00481	.000676	1.06
36.0	.0			.93242	568.2	.00455	.000639	.00455	.000639	
38.0	.0			.93411	569.5	.00464	.000652	.00465	.000653	1.08
40.0	.0			.93523	568.9	.00439	.000617	.00438	.000615	
44.0	12.0			.93636	575.9	.00607	.000853			1.35
42.0	.0			.93636	570.5	.00445	.000625	.00446	.000627	1.04
44.0	.0			.93805	570.9	.00449	.000631	.00449	.000631	1.03
48.0	.0			.94087	572.9	.00448	.000629	.00448	.000629	1.04
52.0	.0			.94368	574.9	.00461	.000648	.00461	.000648	1.03
52.0	12.0			.94312	579.2	.00573	.000805			1.29
55.0	.0			.94593	576.5	.00465	.000653	.00465	.000653	1.04
58.0	.0			.94762	577.2	.00459	.000645			.94
58.0	12.0			.94481	580.5	.00582	.000818			1.17
58.0	-12.0			.94593	580.9	.00566	.000795			1.24
44.0	-12.0			.93974	576.2	.00559	.000785			1.30
36.0	-8.0			.93805	571.2	.00458	.000643			1.09
36.0	-3.0			.93242	568.2	.00454	.000638			1.08
34.0	-3.0			.92791	565.2	.00447	.000628	.00446	.000627	1.07
32.0	-3.0			.92566	564.5	.00470	.000660	.00465	.000653	1.08
30.0	-3.0			.94143	572.9	.00432	.000607	.00433	.000608	.98
28.0	-3.0			.97634	579.9	.00084	.000118			.19
34.0	-12.0			.92904	568.9	.00538	.000756	.00538	.000756	1.23
32.0	-12.0			.92622	565.9	.00498	.000700	.00489	.000687	1.14
30.0	-12.0			.92566	562.9	.00434	.000610	.00436	.000613	.98
19.0	-12.5			.93354	579.9	.00761	.001069			1.62
17.5	-11.0			.95945	603.5	.00702	.000986			1.57
15.5	-2.5			.95889	589.2	.00573	.000805			1.21
16.5	-2.5			.96621	594.2	.00600	.000843	.00596	.000837	1.36
17.5	-2.5			.97353	614.2	.00636	.000894	.00693	.000974	1.39
18.5	-2.5			.99380	593.5	.00202	.000284	.00183	.000257	.46
19.5	-2.5			1.00901	596.9	.00037	.000052			.08
36.0	-16.0			.94537	572.5	.00367	.000516			.89
36.0	-12.0			.93129	571.2	.00582	.000818	.00574	.000806	1.35
32.0	-18.0			.95325	579.2	.00413	.000580	.00419	.000589	.99
32.0	-16.0			.94819	575.2	.00397	.000558	.00399	.000561	.91
32.0	-14.0			.93918	570.2	.00401	.000563	.00391	.000549	.97
32.0	-10.0			.94030	578.2	.00593	.000833			1.36
28.0	-14.0			.94143	574.5	.00477	.000670			1.09
28.0	-12.0			.93017	558.2	.00245	.000344			.58
26.0	-12.5			.94368	583.5	.00460	.000646			1.06
22.0	-12.5			.93636	575.2	.00585	.000822	.00547	.000769	1.31
20.5	-11.0			.97803	581.5	.00100	.000140			.23
34.0	-1.0			.93185	566.5	.00426	.000599	.00427	.000600	1.10
34.0	4.0			.92848	566.9	.00482	.000677	.00486	.000683	1.08
34.0	6.0			.92960	567.5	.00481	.000676	.00481	.000676	1.05
36.0	6.0			.93298	570.2	.00501	.000704			1.10
38.0	1.0			.93298	568.5	.00465	.000653			1.09
38.0	2.0			.93411	569.5	.00456	.000641			1.04
44.0	8.0			.94255	576.5	.00502	.000705	.00503	.000707	1.11
44.0	6.0			.94143	573.5	.00462	.000649	.00461	.000648	1.03
44.0	4.0			.93918	572.2	.00451	.000634	.00451	.000634	1.04
44.0	2.0			.93805	571.2	.00444	.000624	.00443	.000622	1.00
44.0	1.0			.93861	571.2	.00431	.000606	.00431	.000606	1.05
12.0	7.0	.66		.96790	612.2	.01075	.001510	.01070	.001503	
8.0	7.0	.66		.96846	613.9	.01089	.001530	.01093	.001536	
1.5	7.0	.66		.96452	613.2	.01181	.001659	.01178	.001655	
12.0	6.2	1.00		.94312	579.2	.00562	.000790	.00563	.000791	
8.0	6.2	1.00		.94368	578.9	.00510	.000717	.00517	.000726	
1.5	6.2	1.00		.93692	574.9	.00511	.000718	.00512	.000719	
12.0	3.6	1.00		.95494	593.2	.00382	.000537	.00423	.000594	
8.0	3.6	1.00		.95213	587.2	.00422	.000593	.00409	.000575	
1.5	3.6	1.00		.94988	578.2	.00427	.000600	.00421	.000591	
12.0	1.0	1.00		.95663	582.5	.00426	.000599			
8.0	1.0	1.00		.95607	585.5	.00423	.000594			
1.5	1.0	1.00		.95382	580.2	.00425	.000597			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway - Continued

(b) M = 2.65; R = 2.56 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96770	582.2	.00306	.000666			.97
12.0	.0			.96373	578.9	.00291	.000633			.97
28.0	12.0			.94843	564.2	.00187	.000407			.60
28.0	4.0			1.00793	593.9	.00049	.000107			.16
28.0	.0			1.01019	595.2	.00042	.000091			.14
30.0	.0			.96146	577.9	.00296	.000644	.00297	.000646	1.06
31.0	12.0			.93483	564.5	.00379	.000824			1.23
34.0	.0			.94673	568.5	.00299	.000650	.00298	.000648	1.07
2.0	-12.0			.97053	583.2	.00298	.000648			.97
2.0	12.0			.96713	581.9	.00327	.000711			1.00
12.0	-12.0			.96713	580.9	.00297	.000646			.99
12.0	12.0			.96203	578.9	.00310	.000674			.98
30.0	1.0			.95976	582.2	.00279	.000607			.94
31.0	2.0			.94616	573.2	.00341	.000742			1.16
32.0	2.0			.94390	567.2	.00317	.000690	.00315	.000685	1.14
32.0	3.0			.94050	569.9	.00343	.000746			1.16
32.0	6.0			.94050	572.5	.00323	.000703			1.05
34.0	1.0			.94560	569.2	.00310	.000674	.00312	.000679	1.07
34.0	2.0			.94333	568.2	.00312	.000679	.00311	.000676	1.03
34.0	3.0			.94276	567.5	.00315	.000685	.00312	.000679	1.04
36.0	.0			.94786	569.9	.00299	.000650	.00299	.000650	
38.0	.0			.95013	571.2	.00302	.000657	.00303	.000659	1.02
40.0	.0			.95126	571.2	.00280	.000609	.00279	.000607	
44.0	12.0			.95070	576.5	.00408	.000887			1.35
42.0	.0			.95240	577.5	.00288	.000626	.00288	.000626	.98
44.0	.0			.95353	572.9	.00296	.000644	.00296	.000644	1.05
48.0	.0			.95750	575.2	.00293	.000637	.00293	.000637	.99
52.0	.0			.96146	577.5	.00294	.000640	.00294	.000640	.97
52.0	12.0			.95636	579.2	.00385	.000837			1.29
55.0	.0			.96203	578.2	.00298	.000648	.00298	.000648	.99
58.0	.0			.96543	579.9	.00291	.000633			.96
58.0	12.0			.95750	580.2	.00398	.000866			1.27
58.0	-12.0			.96033	580.9	.00379	.000824			1.25
44.0	-12.0			.95580	577.5	.00374	.000814			1.37
36.0	-8.0			.95693	574.2	.00286	.000622			1.00
36.0	-3.0			.94956	570.5	.00315	.000685			1.13
34.0	-3.0			.94446	572.5	.00290	.000631	.00289	.000629	1.01
32.0	-3.0			.94163	566.9	.00313	.000681	.00308	.000670	1.11
30.0	-3.0			.95920	579.2	.00299	.000650	.00295	.000642	1.01
28.0	-3.0			1.00849	593.5	.00046	.000100			.17
34.0	-12.0			.94560	573.9	.00367	.000798	.00368	.000800	1.28
32.0	-12.0			.94220	567.9	.00342	.000744	.00335	.000729	1.21
30.0	-12.0			.94163	565.9	.00290	.000631	.00290	.000631	.99
19.0	-12.5			.94730	578.5	.00519	.001129			1.77
17.5	-11.0			.97166	591.5	.00513	.001116			1.71
15.5	-2.5			.97280	589.9	.00399	.000868			1.32
16.5	-2.5			.97903	592.9	.00396	.000861	.00389	.000846	1.32
17.5	-2.5			.98866	606.9	.00413	.000898	.00420	.000914	1.37
18.5	-2.5			1.02549	604.2	.00081	.000176	.00067	.000146	.27
36.0	-16.0			.96373	575.5	.00231	.000502			.85
36.0	-12.0			.94730	572.5	.00370	.000805	.00381	.000829	1.27
32.0	-18.0			.96996	580.9	.00265	.000576	.00271	.000589	.93
32.0	-16.0			.96486	579.5	.00258	.000561	.00260	.000566	.89
32.0	-14.0			.95580	574.5	.00261	.000568	.00254	.000553	.90
32.0	-10.0			.95296	583.9	.00389	.000846			1.32
28.0	-14.0			.95693	575.5	.00330	.000718			1.13
28.0	-12.0			.95240	565.2	.00156	.000339			.56
26.0	-12.5			.96260	585.9	.00316	.000687			1.10
22.0	-12.5			.95693	578.9	.00390	.000848	.00341	.000742	1.33
20.5	-11.0			1.00679	591.9	.00029	.000063			.10
34.0	-1.0			.94786	568.9	.00298	.000648	.00299	.000650	1.12
34.0	4.0			.94333	568.2	.00337	.000733	.00340	.000740	1.11
34.0	5.0			.94220	567.5	.00338	.000735	.00334	.000727	1.33
34.0	6.0			.94503	569.2	.00311	.000676	.00311	.000676	1.03
36.0	6.0			.94900	571.9	.00318	.000692			1.04
38.0	1.0			.94900	570.5	.00298	.000648			1.01
38.0	2.0			.94956	571.2	.00299	.000650			1.04
44.0	8.0			.95863	578.2	.00337	.000733	.00338	.000735	1.12
44.0	6.0			.95806	575.5	.00293	.000637	.00285	.000620	.98
44.0	4.0			.95580	574.5	.00297	.000646	.00297	.000646	1.00
44.0	2.0			.95466	576.2	.00300	.000653	.00299	.000650	1.01
44.0	1.0			.95636	573.9	.00273	.000594	.00276	.000600	.99
12.0	7.0	.66		.97790	612.9	.00702	.001527	.00698	.001518	
8.0	7.0	.66		.97790	609.2	.00786	.001710	.00789	.001716	
1.5	7.0	.66		.97393	608.5	.00842	.001832	.00839	.001825	
12.0	6.2	1.00		.96146	584.5	.00353	.000768	.00355	.000772	
8.0	6.2	1.00		.96090	580.9	.00370	.000805	.00376	.000818	
1.5	6.2	1.00		.95410	576.2	.00371	.000807	.00358	.000779	
12.0	3.6	1.00		.97620	588.9	.00272	.000592	.00278	.000605	
8.0	3.6	1.00		.97223	584.5	.00293	.000637	.00292	.000635	
1.5	3.6	1.00		.97166	583.2	.00274	.000596	.00270	.000587	
12.0	1.0	1.00		.98016	592.5	.00245	.000533			
8.0	1.0	1.00		.97846	587.5	.00273	.000594			
1.5	1.0	1.00		.97733	588.5	.00258	.000561			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway - Continued

(c) M = 2.65; R = 1.29×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.98981	590.9	.00154	.000666			.96
12.0	.0			.98529	587.2	.00137	.000593			.91
28.0	12.0			.97567	579.2	.00106	.000459			.68
28.0	4.0			1.03620	610.5	.00024	.000104			.16
28.0	.0			1.03733	611.2	.00037	.000160			.25
30.0	.0			.98246	587.2	.00168	.000727	.00168	.000727	1.14
31.0	12.0			.95700	576.2	.00201	.000870			1.42
34.0	.0			.96718	576.2	.00138	.000597	.00138	.000597	1.05
2.0	-12.0			.99377	592.5	.00151	.000653			.97
2.0	12.0			.98981	590.9	.00157	.000679			.86
12.0	-12.0			.98925	589.5	.00149	.000645			1.06
12.0	12.0			.98359	588.5	.00157	.000679			.99
30.0	1.0			.98076	586.2	.00169	.000731			1.28
31.0	2.0			.96549	577.5	.00171	.000740			1.16
32.0	2.0			.96266	576.2	.00172	.000744	.00168	.000727	1.32
32.0	3.0			.96040	574.2	.00162	.000701			1.06
32.0	6.0			.96153	574.9	.00169	.000731			1.19
34.0	1.0			.96549	576.5	.00145	.000627	.00147	.000636	1.08
34.0	2.0			.96379	575.2	.00156	.000675	.00154	.000666	1.10
34.0	3.0			.96379	574.9	.00156	.000675	.00154	.000666	1.09
36.0	.0			.96775	577.2	.00141	.000610	.00141	.000610	
38.0	.0			.97114	578.9	.00137	.000593	.00137	.000593	1.02
40.0	.0			.97284	579.5	.00134	.000580	.00134	.000580	
44.0	12.0			.97284	584.9	.00212	.000917			1.57
42.0	.0			.97454	580.9	.00135	.000584	.00135	.000584	.99
44.0	.0			.97737	582.5	.00139	.000601	.00139	.000601	1.02
48.0	.0			.98246	585.2	.00137	.000593	.00137	.000593	.94
52.0	.0			.98416	586.2	.00136	.000588	.00136	.000588	.93
52.0	12.0			.97737	585.9	.00196	.000848			1.33
55.0	.0			.98585	587.9	.00136	.000588	.00136	.000588	.98
58.0	.0			.99094	590.2	.00132	.000571			.94
58.0	12.0			.97793	586.2	.00197	.000852			1.29
58.0	-12.0			.98302	587.9	.00187	.000809			1.21
44.0	-12.0			.97963	590.5	.00207	.000896			1.41
36.0	-8.0			.98133	583.9	.00130	.000567			.88
36.0	-3.0			.97114	578.9	.00137	.000593			.93
34.0	-3.0			.96492	575.5	.00140	.000606	.00139	.000601	1.06
32.0	-3.0			.96153	573.9	.00157	.000679	.00150	.000649	1.06
30.0	-3.0			.98133	586.2	.00159	.000688	.00154	.000666	1.07
34.0	-12.0			.96945	583.9	.00183	.000792	.00184	.000796	1.39
32.0	-12.0			.96605	578.2	.00186	.000805	.00183	.000792	1.37
30.0	-12.0			.96492	575.9	.00150	.000649	.00147	.000636	1.03
19.0	-12.5			.96718	583.2	.00252	.001090			1.84
17.5	-11.0			.98925	594.5	.00236	.001021			1.71
15.5	-2.5			.99151	595.9	.00223	.000965			1.53
16.5	-2.5			.99660	597.5	.00202	.000874	.00192	.000831	1.37
17.5	-2.5			1.00735	604.2	.00187	.000809	.00177	.000766	1.27
36.0	-16.0			.98755	586.5	.00102	.000441			.78
36.0	-12.0			.97114	581.5	.00190	.000822	.00179	.000774	1.28
32.0	-18.0			.99208	589.9	.00120	.000519	.00126	.000545	.82
32.0	-16.0			.98755	587.9	.00120	.000519	.00122	.000528	.92
32.0	-14.0			.97963	581.9	.00103	.000446	.00100	.000433	.80
32.0	-10.0			.96718	579.9	.00193	.000835			1.42
28.0	-14.0			.97906	583.9	.00148	.000640			1.00
28.0	-12.0			.97793	579.2	.00090	.000389			.69
26.0	-12.5			.98585	589.2	.00168	.000727			1.26
22.0	-12.5			.98133	587.5	.00166	.000718	.00116	.000502	1.12
34.0	-1.0			.96718	576.5	.00136	.000588	.00137	.000593	1.06
34.0	4.0			.96436	577.2	.00160	.000692	.00162	.000701	1.08
34.0	5.0			.96323	575.2	.00157	.000679	.00152	.000658	1.08
34.0	6.0			.96718	578.9	.00160	.000692	.00160	.000692	1.13
36.0	6.0			.97114	581.5	.00160	.000692			1.07
38.0	1.0			.97058	578.5	.00134	.000580			.91
38.0	2.0			.97114	579.2	.00138	.000597			1.00
44.0	8.0			.98302	587.9	.00169	.000731	.00170	.000735	1.20
44.0	6.0			.98133	586.9	.00145	.000627	.00144	.000623	.94
44.0	4.0			.97906	586.5	.00143	.000619	.00143	.000619	1.01
44.0	2.0			.97793	584.5	.00145	.000627	.00143	.000619	1.04
44.0	1.0			.98020	583.9	.00135	.000584	.00138	.000597	1.00
12.0	7.0	.66		.98812	604.2	.00378	.001635	.00378	.001635	
8.0	7.0	.66		.98755	612.5	.00354	.001532	.00355	.001536	
1.5	7.0	.66		.98416	609.9	.00406	.001757	.00404	.001748	
12.0	6.2	1.00		.98302	587.9	.00158	.000684	.00162	.000701	
8.0	6.2	1.00		.98189	586.5	.00159	.000684	.00163	.000705	
1.5	6.2	1.00		.97454	582.5	.00158	.000684	.00147	.000636	
12.0	3.6	1.00		1.00000	595.9	.00122	.000528	.00127	.000549	
8.0	3.6	1.00		.99717	594.2	.00132	.000571	.00131	.000567	
1.5	3.6	1.00		.99660	593.9	.00131	.000567	.00129	.000558	
12.0	1.0	1.00		1.00565	598.9	.00118	.000511			
8.0	1.0	1.00		1.00565	598.9	.00119	.000515			
1.5	1.0	1.00		1.00395	599.2	.00130	.000562			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway - Continued

(d) M = 3.51; R = 4.07×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_c}$
2.0	.0			.96545	576.5	.00239	.000459			.92
12.0	.0			.95752	571.2	.00259	.000497			1.10
28.0	12.0			.95016	564.5	.00148	.000284			.57
30.0	.0			.95695	571.9	.00252	.000484	.00253	.000486	1.10
31.0	12.0			.93034	556.9	.00278	.000534			1.10
34.0	.0			.94563	564.2	.00228	.000438	.00227	.000436	.96
2.0	-12.0			.96998	579.2	.00237	.000455			.96
2.0	12.0			.96488	575.5	.00225	.000432			.89
12.0	-12.0			.96262	574.9	.00244	.000468			.99
12.0	12.0			.95582	570.2	.00240	.000461			.93
30.0	1.0			.95525	571.2	.00253	.000486			1.04
31.0	2.0			.93883	562.2	.00270	.000518			1.15
32.0	2.0			.93826	560.9	.00254	.000487	.00251	.000482	1.07
32.0	3.0			.93487	559.5	.00272	.000522			1.06
32.0	6.0			.93260	557.9	.00266	.000511			1.05
34.0	1.0			.94393	563.9	.00239	.000459	.00241	.000463	.96
34.0	2.0			.94110	562.2	.00245	.000470	.00243	.000466	.98
34.0	3.0			.93940	561.5	.00254	.000487	.00252	.000484	.98
36.0	.0			.94846	565.9	.00233	.000447	.00233	.000447	
38.0	.0			.95129	567.9	.00234	.000449	.00235	.000451	.94
40.0	.0			.95242	567.9	.00225	.000432	.00224	.000430	
44.0	12.0			.94563	568.5	.00348	.000668			1.54
42.0	.0			.95356	569.2	.00240	.000461	.00239	.000459	.96
44.0	.0			.96035	572.5	.00224	.000430	.00225	.000432	.96
48.0	.0			.96432	574.9	.00219	.000420	.00220	.000422	.94
52.0	.0			.96092	572.5	.00209	.000401	.00209	.000401	.85
52.0	12.0			.95072	570.5	.00310	.000595			1.34
55.0	.0			.96205	573.2	.00206	.000395	.00206	.000395	.83
58.0	.0			.96262	575.5	.00225	.000432			.91
58.0	12.0			.95186	571.2	.00306	.000587			1.23
58.0	-12.0			.95752	575.5	.00316	.000606			1.31
44.0	-12.0			.95469	573.9	.00324	.000622			1.44
36.0	-8.0			.95582	569.9	.00227	.000436			.97
36.0	-3.0			.95072	569.2	.00261	.000501			1.09
34.0	-3.0			.94336	562.5	.00240	.000461	.00240	.000461	1.03
32.0	-3.0			.93657	559.9	.00256	.000491	.00249	.000478	1.10
30.0	-3.0			.95469	570.9	.00255	.000489	.00243	.000466	1.03
34.0	-12.0			.94336	565.5	.00294	.000564	.00294	.000564	1.26
32.0	-12.0			.93826	561.9	.00302	.000580	.00295	.000566	1.24
30.0	-12.0			.94166	560.9	.00205	.000393	.00201	.000386	.85
19.0	-12.5			.94053	574.2	.00420	.000806			1.83
17.5	-11.0			.96941	586.2	.00417	.000800			1.72
15.5	-2.5			.96771	581.5	.00322	.000618			1.32
16.5	-2.5			.97734	587.9	.00350	.000672	.00344	.000660	1.49
17.5	-2.5			.99150	601.2	.00396	.000760	.00382	.000733	1.59
18.5	-2.5			1.04587	613.9	.00030	.000058			.12
36.0	-16.0			.96148	571.9	.00207	.000397			.91
36.0	-12.0			.94676	568.5	.00299	.000574	.00289	.000555	1.31
32.0	-18.0			.96658	576.9	.00218	.000418	.00223	.000428	.96
32.0	-16.0			.96262	573.5	.00195	.000374	.00197	.000378	.81
32.0	-14.0			.95412	568.9	.00222	.000426	.00219	.000420	.93
32.0	-10.0			.94563	567.5	.00294	.000564			1.21
28.0	-14.0			.95525	571.9	.00269	.000516			1.12
28.0	-12.0			.95695	566.5	.00126	.000242			.55
26.0	-12.5			.96035	579.2	.00301	.000578			1.30
22.0	-12.5			.95412	573.9	.00336	.000645			1.40
20.5	-11.0			1.02435	600.5	.00019	.000036			.08
34.0	-1.0			.94789	567.2	.00230	.000441	.00233	.000447	1.03
34.0	4.0			.93940	561.5	.00282	.000541	.00284	.000545	1.13
34.0	5.0			.93770	560.5	.00255	.000489	.00251	.000482	1.39
34.0	6.0			.93996	561.5	.00243	.000466	.00243	.000466	.97
36.0	6.0			.94506	564.5	.00249	.000478			.99
38.0	1.0			.94959	566.9	.00234	.000449			.95
38.0	2.0			.95016	567.2	.00235	.000451			.98
44.0	8.0			.95979	571.9	.00236	.000453	.00237	.000455	.94
44.0	6.0			.95639	570.9	.00231	.000443	.00231	.000443	.94
44.0	4.0			.95525	570.2	.00244	.000468	.00243	.000466	.98
44.0	2.0			.95582	570.5	.00234	.000449	.00232	.000445	.94
44.0	1.0			.95979	572.2	.00218	.000418	.00220	.000422	.92
12.0	7.0	.66		.96545	601.9	.00923	.001771	.00922	.001770	
8.0	7.0	.66		.96602	608.2	.00878	.001685	.00878	.001685	
1.5	7.0	.66		.96262	602.9	.00994	.001908	.00996	.001912	
12.0	6.2	1.00		.94733	574.2	.00357	.000685	.00363	.000697	
8.0	6.2	1.00		.94563	569.5	.00332	.000637	.00334	.000641	
1.5	6.2	1.00		.93826	566.2	.00337	.000647	.00326	.000626	
12.0	3.6	1.00		.96885	579.2	.00236	.000453	.00242	.000464	
8.0	3.6	1.00		.96488	581.5	.00248	.000476	.00258	.000495	
1.5	3.6	1.00		.96488	578.9	.00239	.000459	.00238	.000457	
12.0	1.0	1.00		.97508	584.5	.00225	.000432			
8.0	1.0	1.00		.97564	582.5	.00218	.000418			
1.5	1.0	1.00		.97734	582.9	.00193	.000370			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, δ = 1.50 INCHES - Continued

14. 30° Cableway - Continued

(e) M = 3.51; R = 2.84×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97001	578.2	.00184	.000587			.99
12.0	.0			.96153	572.5	.00177	.000488			1.05
28.0	12.0			.95644	565.9	.00117	.000322			.64
30.0	.0			.96209	578.2	.00204	.000562	.00209	.000576	1.23
31.0	12.0			.93607	558.9	.00226	.000623			1.26
34.0	.0			.94852	565.2	.00177	.000488	.00176	.000485	1.11
2.0	-12.0			.97510	581.2	.00176	.000485			1.01
2.0	12.0			.96888	576.5	.00183	.000504			1.01
12.0	-12.0			.96718	576.2	.00177	.000488			1.07
12.0	12.0			.95927	570.5	.00185	.000510			1.02
30.0	1.0			.96040	577.2	.00204	.000562			1.13
31.0	2.0			.94229	562.9	.00216	.000595			1.23
32.0	2.0			.94116	562.9	.00196	.000540	.00193	.000532	1.20
32.0	3.0			.93664	559.5	.00214	.000590			1.19
32.0	6.0			.93437	557.5	.00209	.000576			1.15
34.0	1.0			.94682	564.5	.00183	.000504	.00185	.000510	1.04
34.0	2.0			.94456	562.9	.00188	.000518	.00187	.000515	1.04
34.0	3.0			.94286	561.9	.00187	.000515	.00185	.000510	1.03
36.0	.0			.95248	567.2	.00177	.000488	.00177	.000488	
38.0	.0			.95531	568.9	.00191	.000526	.00192	.000529	1.15
40.0	.0			.95644	571.2	.00181	.000499	.00181	.000499	
44.0	12.0			.95078	569.5	.00279	.000769			1.63
42.0	.0			.95757	570.5	.00179	.000493	.00177	.000488	1.08
44.0	.0			.96605	574.9	.00170	.000468	.00171	.000471	1.05
48.0	.0			.96888	576.5	.00172	.000474	.00172	.000474	.96
52.0	.0			.96549	574.2	.00173	.000477	.00173	.000477	1.06
52.0	12.0			.95417	570.5	.00248	.000683			1.50
55.0	.0			.96662	574.9	.00172	.000474	.00172	.000474	1.06
58.0	.0			.96832	575.5	.00172	.000474			1.06
58.0	12.0			.95531	571.2	.00246	.000678			1.40
58.0	-12.0			.96153	576.5	.00245	.000675			1.35
44.0	-12.0			.96040	575.9	.00247	.000681			1.51
36.0	-8.0			.95927	570.9	.00174	.000479			1.09
36.0	-3.0			.95417	568.2	.00176	.000485			.98
34.0	-3.0			.94625	563.5	.00168	.000463	.00167	.000460	1.06
32.0	-3.0			.93890	560.2	.00214	.000584	.00205	.000565	1.28
30.0	-3.0			.95927	576.9	.00205	.000565	.00192	.000529	1.13
28.0	-3.0			1.04072	612.5	.00024	.000066			.15
34.0	-12.0			.95021	570.9	.00231	.000636	.00232	.000639	1.43
32.0	-12.0			.94456	567.2	.00232	.000639	.00228	.000628	1.28
30.0	-12.0			.94682	563.2	.00158	.000435	.00154	.000424	.88
19.0	-12.5			.94512	571.2	.00343	.000945			2.16
17.5	-11.0			.97058	584.9	.00346	.000953			2.15
15.5	-2.5			.97058	584.9	.00261	.000719			1.49
16.5	-2.5			.97850	586.9	.00288	.000793	.00281	.000774	1.77
17.5	-2.5			.99208	595.9	.00302	.000832	.00288	.000793	1.79
36.0	-16.0			.96605	576.2	.00134	.000369			.85
36.0	-12.0			.95304	573.2	.00242	.000667	.00234	.000645	1.52
32.0	-18.0			.97114	578.2	.00172	.000474	.00176	.000485	1.10
32.0	-16.0			.96662	574.9	.00145	.000399	.00146	.000402	.91
32.0	-14.0			.95813	570.9	.00160	.000441	.00158	.000435	.98
32.0	-10.0			.94682	568.9	.00232	.000639			1.44
28.0	-14.0			.95983	573.2	.00208	.000573			1.31
28.0	-12.0			.96153	569.9	.00103	.000284			.65
26.0	-12.5			.96492	581.9	.00215	.000592			1.30
22.0	-12.5			.95870	575.2	.00262	.000722			1.65
34.0	-1.0			.95135	566.2	.00176	.000485	.00179	.000493	1.13
34.0	4.0			.94286	561.9	.00186	.000512	.00187	.000515	1.11
34.0	5.0			.94060	560.9	.00193	.000532	.00189	.000521	1.33
34.0	6.0			.94229	561.5	.00186	.000512	.00186	.000512	1.08
36.0	6.0			.94852	565.2	.00185	.000510			1.08
38.0	1.0			.95417	568.2	.00176	.000485			.97
38.0	2.0			.95474	568.5	.00179	.000493			.99
44.0	8.0			.96436	573.2	.00165	.000455	.00166	.000457	1.00
44.0	6.0			.95983	571.5	.00179	.000493	.00178	.000490	1.01
44.0	4.0			.95983	571.2	.00176	.000485	.00176	.000485	1.04
44.0	2.0			.96040	572.2	.00179	.000493	.00178	.000490	1.09
44.0	1.0			.96436	573.9	.00173	.000477	.00174	.000479	1.09
12.0	7.0	.66		.96436	596.5	.00711	.001959	.00709	.001953	
8.0	7.0	.66		.96492	597.2	.00712	.001962	.00712	.001962	
1.5	7.0	.66		.96209	597.9	.00762	.002072	.00754	.002077	
12.0	6.2	1.00		.95078	577.2	.00242	.000667	.00248	.000683	
8.0	6.2	1.00		.94852	569.2	.00265	.000730	.00267	.000736	
1.5	6.2	1.00		.94229	568.5	.00260	.000716	.00251	.000692	
12.0	3.6	1.00		.97228	583.2	.00177	.000488	.00183	.000504	
8.0	3.6	1.00		.96888	578.2	.00176	.000485	.00173	.000477	
1.5	3.6	1.00		.96945	581.2	.00169	.000466	.00169	.000466	
12.0	1.0	1.00		.98020	584.2	.00187	.000515			
8.0	1.0	1.00		.98076	586.2	.00167	.000460			
1.5	1.0	1.00		.98189	584.9	.00147	.000405			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30^{0} Cableway - Continued

(f) M = 3.51; R = 1.61×10^{6}

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^{0}R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.99037	587.2	.00110	.000533			1.06
12.0	.0			.98132	582.5	.00103	.000499			1.03
28.0	12.0			.97792	577.9	.00070	.000339			.68
30.0	.0			.98924	588.9	.00124	.000601	.00125	.000606	1.43
31.0	12.0			.96037	572.9	.00151	.000732			1.51
34.0	.0			.96490	571.9	.00100	.000485	.00103	.000499	1.10
2.0	-12.0			.99433	590.5	.00102	.000494			1.10
2.0	12.0			.98867	586.2	.00110	.000533			1.10
12.0	-12.0			.98754	586.2	.00102	.000494			1.11
12.0	12.0			.97905	581.5	.00114	.000553			1.13
30.0	1.0			.98754	586.9	.00127	.000616			1.31
31.0	2.0			.96264	572.2	.00130	.000630			1.34
32.0	2.0			.95811	568.5	.00114	.000553	.00108	.000523	1.19
32.0	3.0			.95471	568.2	.00139	.000674			1.39
32.0	6.0			.95188	565.2	.00123	.000596			1.24
34.0	1.0			.96320	572.5	.00116	.000562	.00117	.000567	1.26
34.0	2.0			.96094	572.2	.00112	.000543	.00110	.000533	.91
34.0	3.0			.95981	569.2	.00104	.000504	.00103	.000499	1.04
36.0	.0			.97000	574.5	.00109	.000528	.00109	.000528	
38.0	.0			.97339	577.9	.00104	.000504	.00105	.000509	1.17
40.0	.0			.97509	578.5	.00103	.000499	.00103	.000499	
44.0	12.0			.97283	579.5	.00158	.000766			1.56
42.0	.0			.97622	578.2	.00094	.000456	.00092	.000446	.76
44.0	.0			.98471	583.2	.00092	.000446	.00093	.000451	1.00
48.0	.0			.98867	585.5	.00107	.000519	.00107	.000519	1.11
52.0	.0			.98584	583.5	.00091	.000441	.00091	.000441	.89
52.0	12.0			.97452	581.5	.00159	.000771			1.53
55.0	.0			.98754	584.5	.00090	.000436	.00090	.000436	.98
58.0	.0			.99150	587.5	.00091	.000441			.95
58.0	12.0			.97566	580.9	.00153	.000742			1.65
58.0	-12.0			.98301	586.2	.00158	.000766			1.72
44.0	-12.0			.98245	584.5	.00147	.000713			1.62
36.0	-8.0			.97566	577.9	.00109	.000528			1.20
36.0	-3.0			.97169	575.5	.00109	.000528			1.12
34.0	-3.0			.96264	570.2	.00098	.000475	.00097	.000470	1.00
32.0	-3.0			.95641	567.5	.00121	.000587	.00103	.000499	1.32
30.0	-3.0			.98584	585.9	.00140	.000679	.00133	.000645	1.33
34.0	-12.0			.97283	579.9	.00159	.000771	.00159	.000771	1.73
32.0	-12.0			.96830	575.9	.00134	.000650	.00134	.000650	1.52
30.0	-12.0			.97113	574.2	.00082	.000397	.00078	.000378	.89
19.0	-12.5			.96490	577.5	.00181	.000877			1.97
17.5	-11.0			.98698	589.2	.00187	.000906			2.03
15.5	-2.5			.98867	589.5	.00173	.000839			1.71
16.5	-2.5			.99264	591.9	.00188	.000911	.00180	.000872	2.21
17.5	-2.5			1.00509	599.2	.00170	.000824	.00156	.000756	1.70
36.0	-16.0			.98641	582.9	.00075	.000364			.85
36.0	-12.0			.97566	580.2	.00142	.000688	.00130	.000630	1.63
32.0	-18.0			.98981	585.9	.00091	.000441	.00095	.000460	1.03
32.0	-16.0			.98584	583.2	.00084	.000407	.00085	.000412	.87
32.0	-14.0			.97962	579.5	.00108	.000523	.00110	.000533	1.24
32.0	-10.0			.96151	571.5	.00143	.000693			1.55
28.0	-14.0			.97792	581.2	.00115	.000557			1.25
28.0	-12.0			.98245	579.9	.00066	.000320			.72
26.0	-12.5			.98245	585.5	.00126	.000611			1.45
22.0	-12.5			.97396	584.5	.00144	.000698			1.43
34.0	-1.0			.96830	573.5	.00087	.000422	.00091	.000441	1.09
34.0	4.0			.95924	570.2	.00117	.000567	.00118	.000572	1.18
34.0	5.0			.95811	571.2	.00104	.000504	.00109	.000528	1.20
34.0	6.0			.95924	568.9	.00116	.000562	.00116	.000562	1.23
36.0	6.0			.96547	572.5	.00104	.000504			.85
38.0	1.0			.97339	577.5	.00114	.000553			1.19
38.0	2.0			.97283	577.5	.00104	.000504			1.12
44.0	8.0			.98415	582.5	.00092	.000446	.00093	.000451	.93
44.0	6.0			.97962	581.5	.00103	.000499	.00102	.000494	.84
44.0	4.0			.97849	579.9	.00124	.000601	.00124	.000601	1.25
44.0	2.0			.97962	581.5	.00103	.000499	.00101	.000490	1.06
44.0	1.0			.98358	582.5	.00123	.000596	.00125	.000606	1.27
12.0	7.0	.66		.97339	597.5	.00410	.001987	.00408	.001978	
8.0	7.0	.66		.97396	597.9	.00399	.001934	.00402	.001949	
1.5	7.0	.66		.97113	597.2	.00439	.002128	.00435	.002109	
12.0	6.2	1.00		.96886	579.2	.00162	.000785	.00168	.000814	
8.0	6.2	1.00		.96660	577.2	.00151	.000732	.00150	.000727	
1.5	6.2	1.00		.96037	572.2	.00150	.000727	.00141	.000683	
12.0	3.6	1.00		.99150	588.9	.00102	.000494	.00107	.000519	
8.0	3.6	1.00		.98811	586.2	.00108	.000523	.00106	.000514	
1.5	3.6	1.00		.98867	586.9	.00092	.000446	.00092	.000446	
12.0	1.0	1.00		1.00113	594.5	.00091	.000441			
8.0	1.0	1.00		1.00226	594.2	.00106	.000514			
1.5	1.0	1.00		1.00339	594.2	.00086	.000417			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^{0}R$.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway - Continued

(g) M = 4.44; R = 4.48 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95718	583.2	.00124	.000315			1.48
12.0	.0			.95004	577.5	.00082	.000208			.98
28.0	12.0			.94620	575.9	.00086	.000223			.70
30.0	.0			.95004	578.9	.00109	.000277	.00110	.000279	1.18
31.0	12.0			.93303	570.2	.00148	.000376			1.18
34.0	.0			.93577	569.9	.00107	.000272	.00103	.000261	1.45
2.0	-12.0			.96102	584.5	.00159	.000404			1.43
2.0	12.0			.95608	583.5	.00126	.000320			
12.0	-12.0			.95553	581.2	.00105	.000266			1.11
12.0	12.0			.94840	577.9	.00110	.000279			.87
30.0	1.0			.94895	578.9	.00143	.000363			1.70
31.0	2.0			.92863	568.5	.00131	.000332			1.56
32.0	2.0			.92809	566.5	.00122	.000310	.00104	.000264	1.45
32.0	3.0			.92589	563.5	.00119	.000302			1.07
32.0	6.0			.92315	563.5	.00148	.000376			1.29
34.0	1.0			.93522	569.9	.00108	.000274	.00110	.000279	1.29
34.0	2.0			.93303	569.5	.00108	.000274	.00107	.000272	1.29
34.0	3.0			.93138	567.5	.00108	.000274	.00104	.000264	.96
36.0	.0			.94181	573.2	.00106	.000269	.00106	.000269	
38.0	.0			.94675	576.9	.00105	.000266	.00105	.000266	1.42
40.0	.0			.95059	577.9	.00076	.000193	.00077	.000195	
44.0	12.0			.94620	579.5	.00184	.000467			1.55
42.0	.0			.95279	579.5	.00087	.000221	.00085	.000216	1.02
44.0	.0			.95937	583.5	.00087	.000221	.00089	.000226	1.05
48.0	.0			.96157	585.2	.00090	.000228	.00091	.000231	1.02
52.0	.0			.95773	582.5	.00077	.000195	.00068	.000173	.84
52.0	12.0			.94730	580.5	.00164	.000416			1.36
55.0	.0			.95828	582.9	.00077	.000195	.00077	.000195	1.01
58.0	.0			.96047	583.2	.00063	.000160			.75
58.0	12.0			.94785	579.2	.00224	.000569			1.90
58.0	-12.0			.95279	581.2	.00154	.000391			1.44
44.0	-12.0			.95334	581.9	.00161	.000409			1.83
36.0	-8.0			.94565	575.9	.00105	.000266			1.19
36.0	-3.0			.94400	573.5	.00077	.000195			.97
34.0	-3.0			.93412	569.5	.00107	.000272	.00106	.000269	1.29
32.0	-3.0			.92589	564.2	.00128	.000325	.00114	.000289	1.73
30.0	-3.0			.94840	578.5	.00143	.000363	.00118	.000299	1.93
34.0	-12.0			.94181	574.5	.00162	.000411	.00163	.000414	1.47
32.0	-12.0			.93632	571.2	.00145	.000368	.00140	.000355	1.73
30.0	-12.0			.93906	570.2	.00068	.000173	.00064	.000162	.62
19.0	-12.5			.93522	573.5	.00245	.000622			2.92
17.5	-11.0			.96651	590.9	.00212	.000538			2.52
15.5	-2.5			.96431	588.9	.00160	.000406			1.93
16.5	-2.5			.97310	596.2	.00159	.000404	.00152	.000386	1.89
17.5	-2.5			.98627	603.2	.00175	.000444	.00153	.000388	2.36
36.0	-16.0			.95279	579.2	.00077	.000195			.69
36.0	-12.0			.94510	576.5	.00161	.000409	.00150	.000381	1.55
32.0	-18.0			.95608	581.5	.00134	.000340	.00140	.000355	1.12
32.0	-16.0			.95224	579.2	.00105	.000266	.00106	.000269	.95
32.0	-14.0			.94675	576.9	.00125	.000317	.00128	.000325	1.36
32.0	-10.0			.93358	568.9	.00127	.000322			1.20
28.0	-14.0			.94510	575.5	.00137	.000348			1.23
28.0	-12.0			.94840	575.9	.00079	.000200			.94
26.0	-12.5			.94785	579.2	.00181	.000459			1.69
22.0	-12.5			.93687	574.2	.00194	.000492			2.02
34.0	-1.0			.93906	571.2	.00085	.000216	.00087	.000221	1.04
34.0	4.0			.93138	567.2	.00113	.000287	.00115	.000292	1.02
34.0	5.0			.93028	566.9	.00167	.000424	.00165	.000419	2.17
34.0	6.0			.93138	567.9	.00178	.000325	.00128	.000325	1.09
36.0	6.0			.94016	572.2	.00137	.000348			1.23
38.0	1.0			.94785	576.5	.00080	.000203			.95
38.0	2.0			.94620	575.9	.00088	.000223			1.05
44.0	8.0			.95773	582.2	.00078	.000198	.00080	.000203	.69
44.0	6.0			.95443	581.2	.00105	.000266	.00104	.000264	.95
44.0	4.0			.95389	580.2	.00083	.000211	.00082	.000208	.75
44.0	2.0			.95498	581.9	.00104	.000264	.00101	.000256	1.24
44.0	1.0			.95828	583.2	.00077	.000195	.00081	.000206	.88
12.0	7.0	.66		.95663	596.2	.00519	.001317	.00526	.001335	
8.0	7.0	.66		.95553	595.2	.00536	.001360	.00538	.001365	
1.5	7.0	.66		.95059	593.5	.00613	.001556	.00603	.001530	
12.0	6.2	1.00		.93632	573.9	.00207	.000525	.00222	.000563	
8.0	6.2	1.00		.93248	570.2	.00213	.000541	.00217	.000551	
1.5	6.2	1.00		.92479	566.9	.00228	.000579	.00205	.000520	
12.0	3.6	1.00		.95663	584.9	.00120	.000305	.00130	.000330	
8.0	3.6	1.00		.95389	582.9	.00119	.000302	.00116	.000294	
1.5	3.6	1.00		.95334	580.5	.00113	.000287	.00109	.000277	
12.0	1.0	1.00		.96706	590.5	.00117	.000297			
8.0	1.0	1.00		.96816	589.5	.00133	.000338			
1.5	1.0	1.00		.97035	590.5	.00103	.000261			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway - Continued

(h) M = 4.44; R = 3.18 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96473	585.2	.00093	.000241			.86
12.0	.0			.95812	578.9	.00073	.000189			.84
28.0	12.0			.95591	577.9	.00058	.000150			.62
30.0	.0			.96914	587.2	.00104	.000270	.00106	.000275	1.27
31.0	12.0			.94434	572.5	.00138	.000358			1.50
34.0	.0			.94269	571.2	.00084	.000218	.00075	.000194	.93
2.0	-12.0			.96693	585.2	.00101	.000262			1.06
2.0	12.0			.96308	583.2	.00084	.000218			.80
12.0	-12.0			.96308	583.9	.00093	.000241			.99
12.0	12.0			.95591	579.2	.00089	.000231			.83
30.0	1.0			.96803	585.5	.00112	.000290			1.33
31.0	2.0			.94103	571.9	.00107	.000277			1.19
32.0	2.0			.93663	566.5	.00104	.000270	.00101	.000262	1.16
32.0	3.0			.93332	564.9	.00109	.000283			1.20
32.0	6.0			.93167	564.2	.00107	.000277			1.18
34.0	1.0			.94158	569.5	.00079	.000205	.00083	.000215	.88
34.0	2.0			.93993	568.2	.00079	.000205	.00076	.000197	.87
34.0	3.0			.93828	569.5	.00088	.000228	.00084	.000215	1.02
36.0	.0			.94820	573.2	.00079	.000205	.00080	.000207	
38.0	.0			.95426	575.9	.00063	.000163	.00063	.000163	.76
44.0	12.0			.95536	580.9	.00146	.000379			1.87
42.0	.0			.95867	579.2	.00065	.000169	.00062	.000161	.71
44.0	.0			.96693	583.9	.00057	.000148	.00059	.000153	.63
48.0	.0			.96969	585.5	.00056	.000145	.00057	.000148	.70
52.0	.0			.96583	582.9	.00059	.000153	.00059	.000153	.75
52.0	12.0			.95681	580.9	.00135	.000350			1.42
54.0	.0			.96638	583.2	.00058	.000150	.00058	.000150	.73
58.0	.0			.96859	584.9	.00058	.000150			.76
58.0	12.0			.95536	579.9	.00137	.000355			1.51
58.0	-12.0			.96087	585.2	.00139	.000360			1.83
46.0	-12.0			.96308	584.9	.00132	.000342			1.65
36.0	-8.0			.95261	575.9	.00087	.000226			1.14
36.0	-3.0			.95095	575.2	.00078	.000202			.99
34.0	-3.0			.94048	569.5	.00080	.000207	.00078	.000202	.89
32.0	-3.0			.93497	566.2	.00094	.000244	.00080	.000207	1.04
30.0	-3.0			.96583	587.9	.00122	.000316	.00108	.000280	1.53
34.0	-12.0			.95205	577.2	.00126	.000327	.00126	.000327	1.56
32.0	-12.0			.94765	575.5	.00134	.000347	.00132	.000342	1.47
19.0	-12.5			.94214	572.9	.00206	.000534			2.26
17.5	-11.0			.96969	589.2	.00175	.000454			2.22
15.5	-2.5			.96069	588.5	.00124	.000322			1.53
16.5	-2.5			.97575	592.5	.00157	.000407	.00147	.000381	1.65
17.5	-2.5			.98677	598.5	.00151	.000392	.00130	.000337	1.80
36.0	-16.0			.96142	580.2	.00053	.000137			.72
36.0	-12.0			.95571	579.2	.00125	.000324	.00126	.000327	1.69
32.0	-16.0			.96418	582.9	.00072	.000187	.00076	.000197	.78
32.0	-16.0			.96087	581.2	.00065	.000169	.00066	.000171	.71
32.0	-14.0			.95591	578.5	.00088	.000228	.00092	.000239	1.21
32.0	-12.0			.94048	569.2	.00106	.000275			1.31
28.0	-14.0			.95205	576.9	.00136	.000353			1.68
28.0	-12.0			.95922	578.9	.00055	.000143			.60
26.0	-12.5			.95426	579.9	.00121	.000314			1.51
22.5	-12.5			.94214	573.5	.00152	.000394			1.97
34.0	-3.0			.94599	571.9	.00071	.000184	.00078	.000202	.89
34.0	4.0			.93828	567.9	.00102	.000264	.00106	.000275	1.17
34.0	5.0			.93718	569.2	.00089	.000231	.00084	.000218	1.39
34.0	6.0			.93773	569.9	.00089	.000231	.00088	.000228	.98
36.0	6.0			.94654	574.5	.00087	.000226			.92
38.0	1.0			.95481	576.9	.00070	.000181			.86
38.0	2.0			.95316	575.9	.00072	.000187			.97
44.0	8.0			.96418	583.2	.00076	.000197	.00078	.000202	.84
44.0	6.0			.96087	581.2	.00075	.000194	.00074	.000192	.82
44.0	4.0			.96032	580.9	.00072	.000187	.00071	.000184	.95
44.0	2.0			.96197	582.9	.00083	.000215	.00080	.000207	1.02
44.0	1.0			.96528	582.9	.00062	.000161	.00064	.000166	.69
12.0	7.0	.66		.95536	586.5	.00463	.001200	.00465	.001206	
8.0	7.0	.66		.95426	589.2	.00485	.001258	.00488	.001265	
1.5	7.0	.66		.94930	588.2	.00586	.001519	.00578	.001499	
12.0	6.2	1.00		.94103	571.5	.00165	.000428	.00177	.000459	
8.0	6.2	1.00		.93773	569.2	.00160	.000415	.00163	.000423	
1.5	6.2	1.00		.93001	565.5	.00201	.000521	.00183	.000474	
12.0	3.6	1.00		.96252	582.5	.00086	.000223	.00095	.000246	
8.0	3.6	1.00		.96032	581.2	.00105	.000272	.00103	.000267	
1.5	3.6	1.00		.95922	580.9	.00102	.000264	.00100	.000259	
12.0	1.0	1.00		.97299	589.2	.00076	.000197			
8.0	1.0	1.00		.97410	590.2	.00087	.000226			
1.5	1.0	1.00		.97630	591.2	.00077	.000200			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

14. 30° Cableway - Concluded

(i) M = 4.44; R = 2.14 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97353	588.2	.00064	.000343			.85
28.0	12.0			.96471	582.2	.00038	.000204			.69
30.0	.0			.99393	600.5	.00070	.000375	.00072	.000386	1.35
31.0	12.0			.95699	578.9	.00067	.000359			1.31
34.0	.0			.95093	574.2	.00063	.000338	.00057	.000305	1.11
2.0	-12.0			.97463	588.9	.00055	.000295			.98
2.0	12.0			.97077	586.9	.00057	.000305			.89
12.0	-12.0			.97243	586.9	.00049	.000263			.82
12.0	12.0			.96581	584.2	.00054	.000289			.86
30.0	1.0			.99172	600.2	.00076	.000407			1.03
32.0	2.0			.95093	574.2	.00058	.000311	.00045	.000241	1.02
32.0	3.0			.94817	572.9	.00079	.000423			1.07
32.0	6.0			.94651	573.5	.00085	.000455			1.37
34.0	1.0			.95093	574.2	.00053	.000284	.00057	.000305	.87
34.0	2.0			.94872	572.9	.00056	.000300	.00053	.000284	.92
34.0	3.0			.94762	572.2	.00065	.000348	.00061	.000327	1.02
36.0	.0			.95699	577.2	.00052	.000279	.00052	.000279	
38.0	.0			.96140	580.2	.00050	.000268	.00051	.000273	.68
40.0	.0			.96526	582.2	.00044	.000236	.00045	.000241	
44.0	12.0			.96691	585.2	.00076	.000407			1.55
42.0	.0			.96636	582.9	.00051	.000273	.00048	.000257	.84
44.0	.0			.97408	587.9	.00041	.000220	.00043	.000230	.82
48.0	.0			.97684	589.2	.00049	.000263	.00050	.000268	.98
52.0	.0			.97353	587.2	.00048	.000257	.00047	.000252	.96
52.0	12.0			.96581	584.2	.00069	.000370			1.38
55.0	.0			.97408	587.5	.00048	.000257	.00047	.000252	.98
58.0	.0			.97794	589.9	.00045	.000241			.92
58.0	12.0			.96636	586.2	.00084	.000450			1.38
58.0	-12.0			.97133	587.2	.00075	.000402			1.53
44.0	-12.0			.97408	588.5	.00071	.000380			1.45
36.0	-8.0			.96030	579.2	.00051	.000273			1.04
36.0	-3.0			.95864	578.5	.00050	.000268			.94
34.0	-3.0			.95037	573.5	.00050	.000268	.00047	.000252	.82
32.0	-3.0			.94927	573.2	.00059	.000316			1.13
30.0	-3.0			.99062	599.9	.00081	.000434	.00083	.000445	1.23
34.0	-12.0			.96250	582.2	.00087	.000466	.00087	.000466	1.78
32.0	-12.0			.96030	581.5	.00083	.000445	.00082	.000439	1.38
30.0	-12.0			.96581	582.2	.00032	.000171	.00033	.000177	.63
19.0	-12.5			.95093	577.5	.00122	.000654			2.30
17.5	-11.0			.97739	591.5	.00110	.000589			2.04
15.5	-2.5			.97960	592.5	.00098	.000525			1.40
16.5	-2.5			.98125	594.9	.00122	.000654	.00106	.000568	2.35
17.5	-2.5			.99007	601.5	.00114	.000611	.00095	.000509	1.56
36.0	-12.0			.96636	583.5	.00062	.000332	.00055	.000295	1.27
32.0	-18.0			.97243	587.2	.00043	.000230	.00047	.000252	.78
32.0	-16.0			.97077	585.2	.00045	.000241	.00046	.000246	.82
32.0	-14.0			.96581	582.9	.00049	.000263	.00053	.000284	.84
32.0	-10.0			.95148	574.5	.00078	.000418			1.59
28.0	-14.0			.96085	580.5	.00078	.000418			1.59
26.0	-12.5			.96085	582.9	.00079	.000423			1.61
22.0	-12.5			.94817	575.5	.00086	.000461			1.59
34.0	-1.0			.95423	575.9	.00056	.000300	.00062	.000332	1.14
34.0	4.0			.94817	572.5	.00054	.000289	.00058	.000311	.87
34.0	5.0			.94651	571.5	.00061	.000327	.00056	.000300	.82
34.0	6.0			.94762	572.2	.00055	.000295	.00052	.000279	.74
36.0	8.0			.95478	576.5	.00049	.000263			.66
38.0	1.0			.96250	580.9	.00049	.000263			.86
38.0	2.0			.96085	579.9	.00050	.000268			.98
44.0	8.0			.97243	586.9	.00043	.000230	.00044	.000236	.57
44.0	6.0			.96857	584.9	.00048	.000257	.00047	.000252	.94
44.0	4.0			.96857	584.5	.00048	.000257	.00048	.000257	.87
44.0	2.0			.96912	584.9	.00051	.000273	.00048	.000257	.98
44.0	1.0			.97243	586.5	.00048	.000257	.00050	.000268	.84
12.0	7.0	.66		.95699	589.2	.00324	.001736	.00322	.001725	
8.0	7.0	.66		.95644	589.5	.00327	.001752	.00338	.001811	
1.5	7.0	.66		.95148	584.9	.00375	.002009	.00357	.001913	
12.0	6.2	1.00		.94817	575.5	.00108	.000579	.00120	.000643	
8.0	6.2	1.00		.94486	572.2	.00109	.000584	.00113	.000605	
1.5	6.2	1.00		.93769	568.2	.00137	.000734	.00118	.000632	
12.0	3.6	1.00		.96802	585.2	.00077	.000413	.00082	.000439	
8.0	3.6	1.00		.96581	584.2	.00065	.000348	.00064	.000343	
1.5	3.6	1.00		.96471	583.2	.00064	.000343	.00059	.000316	
12.0	1.0	1.00		.97849	591.5	.00052	.000279			
8.0	1.0	1.00		.98015	592.5	.00076	.000407			
1.5	1.0	1.00		.98125	592.9	.00047	.000252			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

15. 26° Fairing

(a) M = 2.65; R = 2.60 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_i}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94830	575.2	.00320	.000693			1.02
12.0	.0			.94493	572.2	.00299	.000648			.99
20.5	.0			.94493	572.2	.00294	.000637			1.01
28.0	12.0			.94212	571.5	.00308	.000667			.98
28.0	4.0			.94437	572.2	.00290	.000628			.96
28.0	.0			.94437	572.2	.00295	.000639			.99
20.5	-5.0			.94493	572.2	.00292	.000633			.97
24.5	-5.0			.94493	571.9	.00296	.000641			1.01
30.0	.0			.94605	572.5	.00296	.000641	.00296	.000641	1.06
31.0	12.0			.94325	571.5	.00304	.000659			.99
2.0	-12.0			.94886	574.9	.00306	.000663			1.00
2.0	12.0			.94662	574.2	.00314	.000680			.96
12.0	-12.0			.94830	574.5	.00308	.000667			1.02
12.0	12.0			.94381	572.9	.00336	.000728			1.06
30.0	1.0			.94437	572.2	.00287	.000622			.97
31.0	2.0			.94549	572.5	.00302	.000654			1.03
32.0	2.0			.94774	573.5	.00291	.000630	.00290	.000628	1.05
32.0	3.0			.94437	572.5	.00303	.000656			1.02
32.0	6.0			.94268	571.5	.00304	.000659			.98
34.0	1.0			.96010	589.5	.00271	.000587			.93
34.0	2.0			.94999	576.9	.00331	.000717	.00322	.000697	1.09
34.0	3.0			.94718	575.2	.00320	.000693	.00319	.000691	1.05
44.0	12.0			.94493	572.9	.00295	.000639			.97
42.0	.0			.94493	565.2	.00132	.000286	.00112	.000243	.45
44.0	.0			.94999	575.2	.00303	.000656	.00307	.000665	1.08
48.0	.0			.93763	570.5	.00377	.000817	.00376	.000814	1.28
52.0	.0			.94044	572.2	.00376	.000814	.00376	.000814	1.24
52.0	12.0			.94605	573.5	.00298	.000646			1.00
55.0	.0			.94325	573.9	.00374	.000810	.00374	.000810	1.24
58.0	.0			.94605	575.5	.00373	.000808			1.23
58.0	12.0			.94549	573.5	.00316	.000684			1.01
58.0	-12.0			.94718	574.2	.00303	.000656			1.00
44.0	-12.0			.94830	573.5	.00281	.000609			1.03
36.0	-8.0			.94718	572.9	.00283	.000613			.99
36.0	-3.0			.95336	577.9	.00310	.000671			1.11
34.0	-3.0			.94943	575.9	.00308	.000667	.00308	.000667	1.08
32.0	-3.0			.94662	573.2	.00285	.000617	.00284	.000615	1.01
30.0	-3.0			.94549	572.5	.00291	.000630	.00291	.000630	.98
28.0	-3.0			.94605	572.9	.00280	.000607			1.03
34.0	-12.0			.94662	572.5	.00293	.000635	.00289	.000626	1.02
32.0	-12.0			.94718	573.2	.00284	.000615	.00289	.000626	1.01
30.0	-12.0			.94718	573.5	.00300	.000650	.00296	.000641	1.02
19.0	-12.5			.94718	573.2	.00298	.000646			1.02
17.5	-11.0			.94718	573.5	.00296	.000641			.99
15.5	-2.5			.94662	573.9	.00303	.000656			1.00
16.5	-2.5			.94381	571.5	.00295	.000639	.00292	.000633	.99
17.5	-2.5			.94212	571.2	.00306	.000663	.00300	.000650	1.01
18.5	-2.5			.94718	573.5	.00297	.000643	.00307	.000665	1.00
19.5	-2.5			.94325	571.5	.00307	.000665	.00304	.000659	1.02
20.5	-2.5			.94156	570.9	.00304	.000659	.00299	.000648	.99
21.5	-2.5			.94437	572.2	.00301	.000652	.00306	.000663	1.00
22.5	-2.5			.94325	571.2	.00292	.000633	.00291	.000630	.97
23.5	-2.5			.94325	571.2	.00288	.000624	.00287	.000622	.96
24.5	-2.5			.94381	571.5	.00289	.000626			.99
.8	.0	.37		.92021	573.9	.00750	.001625			
1.7	.0	.73		.92302	580.9	.00929	.002012	.00931	.002017	
3.5	.0	1.69		.92920	609.2	.01156	.002504			
5.3	.0	2.56		.93650	610.2	.01208	.002617	.01242	.002690	
6.4	.0	2.57		.92246	563.2	.00480	.001040	.00454	.000983	
8.4	.0	2.57		.93594	570.9	.00412	.000892			
3.5	.2	.73		.92864	580.9	.00850	.001841			
5.3	.4	.73		.93201	579.5	.00734	.001590			
8.4	1.1	.73		.93819	571.5	.00392	.000849			
5.3	.2	1.69		.93032	586.2	.00966	.002092			
6.4	.6	1.69		.92414	563.5	.00442	.000957	.00439	.000951	
8.4	.6	1.69		.93426	571.2	.00465	.001007	.00462	.001001	
34.0	-1.0			.96123	583.2	.00294	.000637	.00302	.000654	1.10
34.0	4.0			.94605	573.5	.00304	.000659	.00304	.000659	1.00
34.0	5.0			.94381	572.2	.00304	.000659	.00300	.000650	1.19
34.0	6.0			.94493	572.9	.00299	.000648	.00299	.000648	.99
36.0	6.0			.94549	573.2	.00304	.000659			.99
38.0	1.0			.97864	581.2	.00056	.000121	.00045	.000097	.19
38.0	2.0			.95392	580.5	.00345	.000747			1.20
44.0	8.0			.94830	575.2	.00315	.000682	.00316	.000684	1.05
44.0	6.0			.94662	573.5	.00294	.000637	.00295	.000639	.98
44.0	4.0			.94268	569.5	.00258	.000559	.00258	.000559	.87
44.0	2.0			.93819	564.9	.00203	.000440	.00193	.000418	.68
44.0	1.0			.94437	569.9	.00229	.000496	.00228	.000494	.83
10.6		2.32	0	.96628	576.2	.00084	.000182			
10.6		2.32	90	.96291	572.9	.00069	.000149			
10.6		2.32	180	.95729	569.9	.00072	.000156			
13.6		2.32	0	.92639	565.9	.00431	.000934			
13.6		2.32	90	.91740	558.2	.00376	.000814			
13.6		2.32	180	.93538	566.9	.00314	.000680			
16.6		2.32	0	.92920	569.5	.00503	.001090	.00502	.001087	
16.6		2.32	90	.92807	567.9	.00486	.001053	.00486	.001053	
16.6		2.32	180	.93538	569.5	.00405	.000877	.00403	.000873	
19.6		2.32	0	.93706	575.2	.00521	.001129			
22.6		2.32	0	.94156	577.5	.00506	.001096			
25.6		2.32	0	.94493	578.2	.00465	.001007			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

15. 26° Fairing - Continued

(b) M = 2.65; R = 1.30 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$
2.0	.0			.95882	575.5	.00199	.000865			1.24
12.0	.0			.95430	572.5	.00200	.000870			1.33
20.5	.0			.95487	575.2	.00174	.000757			1.14
28.0	12.0			.95148	572.5	.00184	.000800			1.18
28.0	4.0			.95430	574.9	.00165	.000717			1.13
28.0	.0			.95374	571.9	.00173	.000752			1.16
20.5	-5.0			.95543	574.2	.00181	.000787			1.21
24.5	-5.0			.95487	574.9	.00165	.000717			1.22
30.0	.0			.95600	575.5	.00155	.000674	.00156	.000678	1.05
31.0	12.0			.95318	573.2	.00183	.000796			1.29
34.0	.0			.98194	579.9	.00020	.000087			.15
2.0	-12.0			.96051	575.9	.00198	.000861			1.27
2.0	12.0			.95769	575.2	.00185	.000804			1.01
12.0	-12.0			.95882	577.5	.00173	.000752			1.23
12.0	12.0			.95374	572.5	.00184	.000800			1.16
30.0	1.0			.95430	573.9	.00182	.000791			1.38
31.0	2.0			.95600	575.5	.00165	.000717			1.11
32.0	2.0			.95825	576.9	.00164	.000713	.00165	.000717	1.26
32.0	3.0			.95487	572.9	.00171	.000743			1.12
32.0	6.0			.95261	573.5	.00184	.000800			1.30
34.0	1.0			.96728	583.5	.00155	.000674	.00169	.000735	1.16
34.0	2.0			.95882	576.2	.00219	.000952	.00213	.000926	1.54
34.0	3.0			.95656	574.9	.00201	.000874	.00200	.000870	1.41
40.0	.0			.98364	581.5	.00021	.000091			
44.0	12.0			.95487	574.5	.00183	.000796			1.36
42.0	.0			.95430	569.9	.00085	.000370	.00086	.000374	.63
44.0	.0			.95543	574.2	.00219	.000952	.00221	.000961	1.61
48.0	.0			.94923	572.2	.00262	.001139	.00262	.001139	1.81
52.0	.0			.95092	573.2	.00229	.000996	.00229	.000996	1.56
52.0	12.0			.95543	575.9	.00166	.000722			1.13
55.0	.0			.95543	574.9	.00238	.001035	.00238	.001035	1.71
58.0	.0			.95938	580.2	.00204	.000887			1.46
58.0	12.0			.95487	572.9	.00172	.000748			1.12
58.0	-12.0			.95769	576.9	.00173	.000752			1.12
44.0	-12.0			.95938	577.2	.00154	.000670			1.05
36.0	-8.0			.95712	575.9	.00154	.000670			1.05
36.0	-3.0			.96220	580.2	.00182	.000791			1.24
34.0	-3.0			.95938	578.9	.00184	.000800	.00185	.000804	1.39
32.0	-3.0			.95712	573.5	.00170	.000739	.00169	.000735	1.15
30.0	-3.0			.95543	575.5	.00165	.000717	.00164	.000713	1.11
28.0	-3.0			.95656	575.9	.00164	.000713			1.12
34.0	-12.0			.95656	573.2	.00163	.000709	.00165	.000717	1.23
32.0	-12.0			.95712	574.9	.00169	.000735	.00185	.000804	1.24
30.0	-12.0			.95769	573.9	.00167	.000726	.00169	.000735	1.14
19.0	-12.5			.95656	575.2	.00182	.000791			1.33
17.5	-11.0			.95712	573.9	.00170	.000739			1.23
15.5	-2.5			.95600	573.5	.00177	.000770			1.21
16.5	-2.5			.95374	571.9	.00170	.000739	.00165	.000730	1.16
17.5	-2.5			.95148	570.9	.00201	.000874	.00194	.000843	1.37
18.5	-2.5			.95600	573.5	.00169	.000735	.00179	.000778	1.22
19.5	-2.5			.95261	571.5	.00171	.000743	.00168	.000730	1.16
20.5	-2.5			.95148	573.5	.00175	.000761	.00168	.000730	1.25
21.5	-2.5			.95430	572.2	.00170	.000739	.00176	.000765	1.15
22.5	-2.5			.95261	571.2	.00170	.000739	.00168	.000730	1.23
23.5	-2.5			.95261	571.2	.00200	.000870	.00199	.000865	1.35
24.5	-2.5			.95374	571.5	.00160	.000783			1.22
.8	.0	.37		.92497	574.5	.00442	.001922			
1.7	.0	.73		.92328	569.5	.00543	.002361	.00542	.002357	
3.5	.0	1.69		.93061	589.2	.00689	.002996			
5.3	.0	2.56		.93625	586.9	.00781	.003396	.00801	.003483	
6.4	.0	2.57		.92328	558.5	.00317	.001378	.00293	.001274	
8.4	.0	2.57		.93118	556.2	.00146	.000635			
3.5	.2	.73		.93174	571.9	.00484	.002104			
5.3	.4	.73		.93794	574.5	.00471	.002048			
8.4	1.1	.73		.94810	570.5	.00212	.000922			
5.3	.2	1.69		.93343	577.5	.00572	.002487			
6.4	.6	1.69		.92779	560.2	.00287	.001248	.00283	.001230	
8.4	.6	1.69		.93907	563.9	.00192	.000835	.00188	.000817	
34.0	-1.0			.96953	583.9	.00145	.000630	.00152	.000661	1.13
34.0	4.0			.95712	577.2	.00175	.000761	.00177	.000770	1.18
34.0	5.0			.95430	572.5	.00181	.000787	.00179	.000778	1.24
34.0	6.0			.95487	572.5	.00174	.000757	.00174	.000757	1.23
36.0	6.0			.95600	573.5	.00171	.000743			1.15
38.0	2.0			.95882	577.2	.00183	.000796			1.33
44.0	8.0			.95825	574.9	.00199	.000865	.00200	.000870	1.41
44.0	6.0			.95656	574.9	.00170	.000739	.00171	.000743	1.10
44.0	4.0			.95261	572.5	.00146	.000635	.00146	.000635	1.04
44.0	2.0			.94866	568.2	.00117	.000509	.00119	.000517	.84
44.0	1.0			.95205	569.5	.00161	.000700	.00158	.000687	1.19
10.6		2.32	0	.98194	583.2	.00067	.000291			
10.6		2.32	90	.97630	578.5	.00058	.000252			
10.6		2.32	180	.96953	574.9	.00068	.000296			
13.6		2.32	0	.92384	560.2	.00308	.001339			
13.6		2.32	90	.92215	556.5	.00264	.001148			
13.6		2.32	180	.94076	565.2	.00211	.000917			
16.6		2.32	0	.92892	562.9	.00313	.001361	.00312	.001357	
16.6		2.32	90	.93174	568.5	.00298	.001296	.00299	.001300	
16.6		2.32	180	.93851	566.5	.00269	.001170	.00268	.001165	
19.6		2.32	0	.93738	568.5	.00320	.001391			
22.6		2.32	0	.94189	570.5	.00301	.001309			
25.6		2.32	0	.94528	570.9	.00275	.001196			

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

15. 26° Fairing - Continued

(c) M = 3.51; R = 2.87×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94897	583.5	.00201	.000553			1.08
12.0	.0			.94349	579.5	.00188	.000517			1.11
20.5	.0			.94458	579.9	.00174	.000478			1.04
28.0	12.0			.94129	576.5	.00189	.000520			1.03
28.0	4.0			.94458	578.2	.00167	.000459			.95
28.0	.0			.94404	578.2	.00192	.000528			1.14
20.5	-5.0			.94568	578.5	.00172	.000473			.95
24.5	-5.0			.94568	581.5	.00171	.000470			1.04
30.0	.0			.94623	580.9	.00173	.000476	.00174	.000478	1.04
31.0	12.0			.94239	581.5	.00174	.000478			.97
2.0	-12.0			.95007	581.9	.00191	.000525			1.09
2.0	12.0			.94733	582.2	.00188	.000517			1.04
12.0	-12.0			.94733	581.9	.00188	.000517			1.14
12.0	12.0			.94184	577.2	.00185	.000509			1.02
30.0	1.0			.94513	578.5	.00165	.000454			.91
31.0	2.0			.94568	578.9	.00172	.000473			.98
32.0	2.0			.94788	583.2	.00171	.000470	.00170	.000467	1.05
32.0	3.0			.94458	578.5	.00180	.000495			1.00
32.0	6.0			.94239	577.5	.00184	.000506			1.02
34.0	1.0			.95775	588.5	.00222	.000610	.00225	.000618	1.26
34.0	2.0			.94897	582.9	.00224	.000616	.00209	.000575	1.24
34.0	3.0			.94623	582.2	.00202	.000555	.00190	.000522	1.12
44.0	12.0			.94294	577.5	.00183	.000503			1.07
42.0	.0			.95446	580.9	.00073	.000201	.00069	.000190	.44
44.0	.0			.93306	573.2	.00227	.000624	.00223	.000613	1.40
48.0	.0			.93635	578.2	.00324	.000891	.00323	.000888	1.81
52.0	.0			.95226	587.2	.00319	.000877	.00320	.000880	1.96
52.0	12.0			.94404	578.2	.00175	.000481			1.06
55.0	.0			.95611	588.5	.00284	.000781	.00284	.000781	1.74
58.0	.0			.95830	591.2	.00256	.000704			1.57
58.0	12.0			.94513	579.2	.00183	.000503			1.04
58.0	-12.0			.94842	580.9	.00177	.000487			.98
44.0	-12.0			.94788	580.2	.00172	.000473			1.05
36.0	-8.0			.94733	581.2	.00172	.000473			1.08
36.0	-3.0			.95226	587.2	.00203	.000558			1.13
34.0	-3.0			.94897	581.5	.00183	.000503	.00183	.000503	1.15
32.0	-3.0			.94678	581.2	.00187	.000514	.00186	.000511	1.13
30.0	-3.0			.94513	578.9	.00168	.000462	.00167	.000459	.93
28.0	-3.0			.94623	579.2	.00167	.000459			1.03
34.0	-12.0			.94568	580.9	.00188	.000517	.00194	.000533	1.16
32.0	-12.0			.94623	581.2	.00188	.000517	.00204	.000561	1.04
30.0	-12.0			.94678	579.9	.00167	.000459	.00171	.000470	.93
19.0	-12.5			.94678	579.9	.00168	.000462			1.06
17.5	-11.0			.94678	579.5	.00166	.000456			1.03
15.5	-2.5			.94568	579.2	.00194	.000533			1.11
16.5	-2.5			.94404	577.9	.00175	.000481	.00173	.000476	1.07
17.5	-2.5			.94184	578.5	.00189	.000520	.00181	.000498	1.12
18.5	-2.5			.94678	581.2	.00173	.000476	.00184	.000506	1.06
19.5	-2.5			.94349	579.5	.00188	.000517	.00186	.000511	1.15
20.5	-2.5			.94184	576.9	.00177	.000487	.00169	.000465	1.00
21.5	-2.5			.94458	578.5	.00191	.000525	.00197	.000542	1.17
22.5	-2.5			.94349	577.5	.00175	.000481	.00172	.000473	1.05
23.5	-2.5			.94294	579.2	.00188	.000517	.00187	.000514	1.12
24.5	-2.5			.94404	577.9	.00167	.000459			1.04
.8	.0	.37		.90069	564.2	.00594	.001633			
1.7	.0	.73		.90015	568.9	.00801	.002202	.00800	.002199	
3.5	.0	1.69		.90728	582.2	.01226	.003370			
5.3	.0	2.56		.91990	590.2	.01210	.003326	.01234	.003392	
6.4	.0	2.57		.90728	559.9	.00352	.000968	.00321	.000882	
8.4	.0	2.57		.91715	561.2	.00135	.000371			
3.5	.2	.73		.90783	569.9	.00674	.001853			
5.3	.4	.73		.91441	571.9	.00585	.001608			
8.4	1.1	.73		.93197	574.9	.00249	.000684			
5.3	.2	1.69		.91222	577.2	.00865	.002378			
6.4	.6	1.69		.90838	562.2	.00316	.000869	.00309	.000849	
8.4	.6	1.69		.92374	568.9	.00222	.000610	.00218	.000599	
34.0	-1.0			.95940	588.9	.00199	.000547	.00198	.000544	1.28
34.0	4.0			.94568	583.5	.00173	.000476	.00175	.000481	1.04
34.0	5.0			.94294	577.5	.00173	.000476	.00168	.000462	1.19
34.0	6.0			.94404	578.2	.00193	.000531	.00193	.000531	1.12
36.0	6.0			.94404	578.5	.00178	.000489			1.03
38.0	2.0			.94678	582.2	.00245	.000673			1.35
44.0	8.0			.94678	580.5	.00185	.000509	.00186	.000511	1.12
44.0	6.0			.94733	580.2	.00167	.000459	.00167	.000459	.94
44.0	4.0			.94623	579.5	.00171	.000470	.00174	.000478	1.01
44.0	2.0			.93910	573.9	.00156	.000429	.00151	.000415	.95
44.0	1.0			.94184	575.9	.00118	.000324	.00124	.000341	.74
10.6		2.32	0	.99122	602.2	.00041	.000113			
10.6		2.32	90	.98847	600.2	.00043	.000118			
13.6		2.32	0	.90673	558.9	.00306	.000841			
13.6		2.32	90	.90289	554.9	.00256	.000704			
13.6		2.32	180	.91496	562.5	.00194	.000533			
16.6		2.32	0	.91496	563.9	.00218	.000874	.00318	.000874	
16.6		2.32	90	.91496	563.5	.00285	.000783	.00285	.000783	
16.6		2.32	180	.91441	562.2	.00267	.000734	.00265	.000728	
19.6		2.32	0	.92374	569.9	.00324	.000891			
22.6		2.32	0	.92922	572.9	.00311	.000855			
25.6		2.32	0	.93416	575.5	.00290	.000797			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

15. 26° Fairing - Concluded

(d) M = 3.51; R = 1.65 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_c}$
2.0	.0			.95245	578.9	.00098	.000470			.94
12.0	.0			.94471	575.9	.00111	.000532			1.11
20.5	.0			.94637	578.5	.00109	.000523			.89
28.0	12.0			.94194	572.5	.00119	.000571			1.16
28.0	4.0			.94637	576.5	.00100	.000480			.94
28.0	.0			.94581	576.5	.00100	.000480			.95
20.5	-5.0			.94747	577.2	.00100	.000480			.96
24.5	-5.0			.94692	577.9	.00105	.000504			1.21
30.0	.0			.94858	578.9	.00105	.000504	.00106	.000508	1.21
31.0	12.0			.94360	575.2	.00111	.000532			1.11
2.0	-12.0			.95411	580.5	.00105	.000504			1.13
2.0	12.0			.95079	579.2	.00110	.000528			1.10
12.0	-12.0			.94968	576.9	.00106	.000508			1.15
12.0	12.0			.94360	573.2	.00119	.000571			1.18
30.0	1.0			.94747	579.2	.00109	.000523			1.12
31.0	2.0			.94858	577.9	.00100	.000480			1.03
32.0	2.0			.95024	578.9	.00099	.000475	.00099	.000475	1.03
32.0	3.0			.94692	576.5	.00106	.000508			1.06
32.0	6.0			.94416	577.2	.00109	.000523			1.10
34.0	1.0			.95687	582.9	.00119	.000571	.00123	.000590	1.29
34.0	2.0			.95024	578.5	.00126	.000604	.00121	.000580	1.02
34.0	3.0			.94858	578.2	.00120	.000576	.00118	.000566	1.20
44.0	12.0			.94416	576.2	.00105	.000504			1.04
42.0	.0			.95411	576.5	.00029	.000139			.24
44.0	.0			.93973	572.5	.00142	.000681	.00141	.000676	1.54
48.0	.0			.93420	570.9	.00184	.000882	.00182	.000873	1.92
52.0	.0			.95024	580.2	.00175	.000839	.00176	.000844	1.72
52.0	12.0			.94526	575.9	.00110	.000528			1.06
55.0	.0			1.16714	583.5	.00058	.000278	.00058	.000278	.63
58.0	.0			1.17186	585.5	.00058	.000278			.60
58.0	12.0			1.15501	575.5	.00040	.000192			.43
58.0	-12.0			1.15973	578.2	.00038	.000182			.41
44.0	-12.0			1.15838	577.2	.00042	.000201			.46
36.0	-8.0			1.15636	576.2	.00037	.000177			.41
36.0	-3.0			1.16242	579.9	.00049	.000235			.51
34.0	-3.0			1.16040	578.2	.00042	.000201			.43
32.0	-3.0			1.15636	575.9	.00033	.000158			.36
30.0	-3.0			.94803	577.5	.00100	.000480	.00100	.000480	.95
28.0	-3.0			.94858	577.9	.00100	.000480			1.01
34.0	-12.0			.94858	577.9	.00099	.000475	.00107	.000513	1.08
32.0	-12.0			.94913	579.2	.00105	.000504			1.19
30.0	-12.0			.94968	580.5	.00109	.000523	.00114	.000547	1.18
19.0	-12.5			.94858	578.2	.00100	.000480			1.09
17.5	-11.0			.94913	578.2	.00100	.000480			1.09
15.5	-2.5			.94747	575.9	.00117	.000561			1.16
16.5	-2.5			.94526	575.9	.00100	.000480	.00098	.000470	1.18
17.5	-2.5			.94305	575.9	.00106	.000508	.00097	.000465	1.06
18.5	-2.5			.94803	578.5	.00105	.000504	.00115	.000552	1.14
19.5	-2.5			.94526	577.9	.00109	.000523	.00103	.000494	1.18
20.5	-2.5			.94360	574.2	.00107	.000513	.00099	.000475	1.16
21.5	-2.5			.94692	576.9	.00100	.000480	.00105	.000504	1.09
22.5	-2.5			.94526	575.9	.00100	.000480	.00098	.000470	1.01
23.5	-2.5			.94471	576.9	.00105	.000504	.00104	.000499	1.06
24.5	-2.5			.94581	577.2	.00105	.000504			1.14
.8	.0	.37		.90158	558.9	.00380	.001822			
1.7	.0	.73		.89771	561.5	.00456	.002187	.00476	.002283	
3.5	.0	1.69		.90490	570.9	.00690	.003309			
5.3	.0	2.56		.91541	578.5	.00723	.003467	.00750	.003597	
6.4	.0	2.57		.90269	556.2	.00243	.001165	.00207	.000993	
8.4	.0	2.57		.90711	549.5	.00073	.000350			
3.5	.2	.73		.90601	560.9	.00406	.001947			
5.3	.4	.73		.91485	564.9	.00363	.001741			
8.4	1.1	.73		.93144	565.9	.00101	.000484			
5.3	.2	1.69		.90988	567.5	.00513	.002460			
6.4	.6	1.69		.90601	555.2	.00201	.000964	.00193	.000926	
8.4	.6	1.69		.91762	557.9	.00095	.000456	.00081	.000388	
34.0	-1.0			.95964	583.9	.00118	.000566	.00108	.000518	1.48
34.0	4.0			.94858	579.9	.00109	.000523	.00111	.000532	1.10
34.0	5.0			.94471	576.9	.00106	.000508	.00102	.000489	1.22
34.0	6.0			.94581	575.5	.00106	.000508	.00106	.000508	1.13
36.0	6.0			.94637	574.9	.00099	.000475			.80
38.0	2.0			.94747	577.9	.00134	.000643			1.44
44.0	8.0			.94858	576.5	.00118	.000566	.00119	.000571	1.19
44.0	6.0			.94913	579.9	.00108	.000518	.00108	.000518	.88
44.0	4.0			.94803	576.9	.00106	.000508	.00108	.000518	1.07
44.0	2.0			.94139	571.2	.00074	.000355	.00071	.000341	.76
13.6		2.32	0	.91209	558.2	.00213	.001022			
13.6		2.32	90	.91154	555.9	.00168	.000806			
13.6		2.32	180	.92204	563.5	.00146	.000700			
16.6		2.32	0	.91098	558.2	.00200	.000959	.00197	.000945	
16.6		2.32	90	.91264	557.5	.00194	.000930	.00191	.000916	
16.6		2.32	180	.91319	557.5	.00172	.000825	.00167	.000801	
19.6		2.32	0	.92149	562.9	.00201	.000964			
22.6		2.32	0	.92757	568.5	.00196	.000940			
25.6		2.32	0	.93255	569.2	.00165	.000791			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45^{0} Fairing

(a) M = 2.65; R = 4.01×10^{6}

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, ^{o}R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94511	583.9	.00457	.000643			.96
12.0	.0			.94345	581.9	.00436	.000613			.98
20.5	.0			.94455	582.2	.00434	.000610			.97
28.0	12.0			.94067	581.2	.00452	.000636			.98
28.0	4.0			.94234	581.5	.00447	.000629			.94
28.0	.0			.94234	581.2	.00437	.000615			.98
20.5	-5.0			.94400	581.9	.00436	.000613			.96
24.5	-5.0			.94234	580.5	.00429	.000603			1.00
30.0	.0			.94511	591.5	.00674	.000948	.00682	.000959	1.49
31.0	12.0			.94178	581.2	.00448	.000630			.98
2.0	-12.0			.94677	583.9	.00448	.000630			.98
2.0	12.0			.94622	584.5	.00457	.000643			.96
12.0	-12.0			.95010	585.9	.00446	.000627			.95
12.0	12.0			.94345	582.9	.00457	.000643			.95
30.0	1.0			.94123	587.2	.00625	.000879			1.43
31.0	2.0			.94012	586.5	.00636	.000895			1.44
32.0	2.0			.93513	584.5	.00720	.001013	.00721	.001014	1.66
32.0	3.0			.93624	580.9	.00536	.000754			1.17
32.0	6.0			.94234	582.2	.00448	.000630			.98
34.0	1.0			.95065	577.9	.00134	.000188			.30
34.0	2.0			.92460	579.2	.00740	.001041	.00722	.001016	1.62
34.0	3.0			.92737	576.5	.00582	.000819	.00563	.000792	1.28
38.0	.0			.93901	569.5	.00150	.000211	.00146	.000205	.35
40.0	.0			.92515	567.9	.00366	.000515	.00359	.000505	
44.0	12.0			.94511	583.5	.00440	.000619			.98
42.0	.0			.92404	577.9	.00711	.001000	.00715	.001006	1.67
44.0	.0			.92903	580.5	.00666	.000937	.00666	.000937	1.53
48.0	.0			.94067	586.2	.00654	.000920	.00656	.000923	1.51
52.0	.0			.93957	573.2	.00327	.000460	.00322	.000453	.73
52.0	12.0			.94677	584.9	.00448	.000630			1.01
55.0	.0			.94954	589.5	.00548	.000771	.00552	.000776	1.22
58.0	.0			.95564	592.9	.00548	.000771			1.12
58.0	12.0			.94345	583.2	.00455	.000640			.92
58.0	-12.0			.94455	582.9	.00444	.000625			.98
44.0	-12.0			.94788	583.5	.00405	.000570			.94
36.0	-8.0			.94511	582.2	.00433	.000609			1.03
36.0	-3.0			.93180	578.9	.00567	.000798			1.35
34.0	-3.0			.93014	577.2	.00541	.000761	.00538	.000757	1.29
32.0	-3.0			.93846	581.9	.00526	.000740	.00527	.000741	1.20
30.0	-3.0			.94566	583.5	.00446	.000627	.00447	.000629	1.01
28.0	-3.0			.94733	583.5	.00414	.000582			.95
34.0	-12.0			.94400	581.5	.00422	.000594	.00400	.000563	.96
32.0	-12.0			.94455	581.9	.00427	.000601	.00433	.000609	.98
30.0	-12.0			.94566	582.9	.00423	.000595	.00417	.000587	.95
19.0	-12.5			.94899	584.9	.00434	.000610			.92
17.5	-11.0			.94733	584.2	.00445	.000626			1.00
15.5	-2.5			.94899	585.9	.00445	.000626			.94
16.5	-2.5			.94511	582.9	.00433	.000609	.00427	.000601	.98
17.5	-2.5			.94400	582.5	.00449	.000632	.00442	.000622	.98
18.5	-2.5			.94844	584.9	.00437	.000615	.00448	.000630	.99
19.5	-2.5			.94345	582.2	.00446	.000627	.00441	.000620	.98
20.5	-2.5			.94289	581.9	.00443	.000623	.00438	.000616	.98
21.5	-2.5			.94566	583.2	.00435	.000612	.00443	.000623	.96
22.5	-2.5			.94289	581.2	.00433	.000609	.00427	.000601	.98
23.5	-2.5			.94345	581.5	.00437	.000615	.00436	.000613	.98
24.5	-2.5			.94511	582.5	.00429	.000603			.99
.6	.0	.65		.95620	627.2	.01887	.002654			
1.4	.0	1.35		.93957	618.5	.02062	.002900	.02172	.003055	
2.6	.0	2.13		.91850	590.5	.01357	.001909	.01504	.002115	
3.9	.0	2.48		.90796	561.9	.00528	.000743			
.6	.6	.65		.93846	613.9	.01759	.002474			
1.3	1.3	.65		.89965	570.2	.00991	.001394			
2.3	1.3	.65		.88080	542.9	.00527	.000741	.00334	.000470	
2.3	1.3	1.35		.91406	592.5	.01592	.002239			
3.3	1.3	.65		.88745	551.9	.00613	.000862	.00617	.000868	
3.3	1.3	1.35		.89022	550.5	.00541	.000761	.00462	.000650	
5.3	1.3	.65		.90242	563.9	.00691	.000972			
5.3	1.3	1.35		.89854	558.5	.00599	.000843			
34.0	-1.0			.95841	579.2	.00108	.000152	.00096	.000135	.28
34.0	4.0			.94123	581.5	.00461	.000648	.00468	.000658	1.03
34.0	5.0			.94345	583.5	.00463	.000651	.00466	.000655	1.32
34.0	6.0			.94400	583.9	.00457	.000643	.00458	.000644	1.00
36.0	6.0			.94622	584.5	.00450	.000633			.98
38.0	1.0			.92903	563.9	.00198	.000278	.00167	.000235	.46
38.0	2.0			.92127	572.2	.00540	.000760			1.23
44.0	8.0			.94511	583.9	.00449	.000632	.00450	.000633	.99
44.0	6.0			.94178	580.2	.00407	.000572	.00409	.000575	.90
44.0	4.0			.92792	572.2	.00421	.000592	.00417	.000587	.97
44.0	2.0			.92571	570.2	.00421	.000592	.00403	.000567	.95
44.0	1.0			.92571	580.2	.00722	.001016	.00743	.001045	1.77
8.0		1.84	0	.92681	569.9	.00389	.000547	.00455	.000640	
8.0		1.84	90	.90686	553.2	.00256	.000360	.00221	.000311	
8.0		1.84	180	.91406	554.9	.00182	.000256	.00187	.000263	
11.0		1.84	0	.91517	572.5	.00694	.000976	.00771	.001084	
11.0		1.84	90	.89521	555.5	.00582	.000819	.00521	.000733	
11.0		1.84	180	.91961	576.9	.00774	.001089			
15.0		1.84	0	.92404	579.9	.00765	.001076	.00836	.001176	
15.0		1.84	90	.90353	564.2	.00703	.000989	.00650	.000914	
15.0		1.84	180	.91295	572.2	.00764	.001075	.00802	.001128	
21.0		1.84	0	.92848	590.9	.00693	.000975			
24.0		1.84	0	.92404	576.5	.00678	.000954			
27.0		1.84	0	.93402	582.5	.00653	.000918			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^{o}R$.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(b) M = 2.65; R = 2.66 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95811	583.9	.00337	.000711			1.07
12.0	.0			.95365	580.2	.00313	.000660			1.04
20.5	.0			.95532	581.2	.00318	.000671			1.09
28.0	12.0			.95030	579.2	.00326	.000688			1.04
28.0	4.0			.95309	580.2	.00320	.000675			1.06
28.0	.0			.95309	579.9	.00312	.000658			1.05
20.5	-5.0			.95476	580.9	.00313	.000660			1.04
24.5	-5.0			.95309	582.2	.00317	.000669			1.08
30.0	.0			.95365	594.9	.00510	.001076	.00516	.001088	1.83
31.0	12.0			.95141	579.2	.00316	.000666			1.03
2.0	-12.0			.96035	584.5	.00320	.000675			1.04
2.0	12.0			.95923	584.5	.00340	.000717			1.04
12.0	-12.0			.96146	585.2	.00316	.000666			1.05
12.0	12.0			.95309	580.9	.00327	.000690			1.03
30.0	1.0			.94974	591.5	.00488	.001029			1.65
31.0	2.0			.94862	586.5	.00491	.001036			1.67
32.0	2.0			.94304	580.5	.00504	.001063	.00503	.001061	1.82
32.0	3.0			.94527	578.2	.00396	.000835			1.34
32.0	6.0			.95365	583.5	.00332	.000700			1.07
34.0	1.0			.97431	583.2	.00083	.000175	.00071	.000150	.29
34.0	2.0			.93633	580.9	.00522	.001101	.00513	.001082	1.72
34.0	3.0			.93745	574.2	.00419	.000884	.00423	.000892	1.38
38.0	.0			.96202	577.9	.00098	.000207	.00094	.000198	.33
40.0	.0			.93801	569.2	.00274	.000578	.00266	.000561	
44.0	12.0			.95588	582.2	.00315	.000664			1.04
42.0	.0			.93298	575.2	.00555	.001171	.00555	.001171	1.89
44.0	.0			.94024	582.9	.00517	.001090	.00517	.001090	1.84
48.0	.0			.95197	585.2	.00503	.001061	.00505	.001065	1.71
52.0	.0			.95141	574.2	.00230	.000485	.00226	.000477	.76
52.0	12.0			.95644	582.9	.00321	.000677			1.07
55.0	.0			.95923	587.2	.00417	.000880	.00419	.000884	1.38
58.0	.0			.96593	590.5	.00391	.000825			1.29
58.0	12.0			.95365	581.2	.00322	.000679			1.03
58.0	-12.0			.95532	581.5	.00314	.000662			1.04
44.0	-12.0			.95979	583.5	.00300	.000633			1.10
36.0	-8.0			.95755	582.2	.00306	.000645			1.07
36.0	-3.0			.94359	577.5	.00400	.000844			1.43
34.0	-3.0			.94080	575.5	.00396	.000835	.00394	.000831	1.38
30.0	-3.0			.95755	582.5	.00315	.000664	.00317	.000669	1.06
28.0	-3.0			.95867	583.2	.00303	.000639			1.11
34.0	-12.0			.95588	580.9	.00293	.000618	.00277	.000584	1.02
32.0	-12.0			.95588	581.5	.00302	.000637	.00302	.000637	1.07
30.0	-12.0			.95755	582.2	.00306	.000645	.00306	.000645	1.04
19.0	-12.5			.95979	583.9	.00309	.000652			1.05
17.5	-11.0			.95811	583.2	.00309	.000652			1.03
15.5	-2.5			.95979	584.5	.00322	.000679			1.06
16.5	-2.5			.95644	581.9	.00310	.000654	.00305	.000643	1.04
17.5	-2.5			.95532	581.5	.00320	.000675	.00314	.000662	1.06
18.5	-2.5			.95979	583.9	.00309	.000652	.00320	.000675	1.04
19.5	-2.5			.95476	581.2	.00314	.000662	.00309	.000652	1.05
20.5	-2.5			.95420	585.9	.00316	.000666	.00311	.000656	1.03
21.5	-2.5			.95700	582.5	.00310	.000654	.00318	.000671	1.03
22.5	-2.5			.95420	580.5	.00308	.000650	.00304	.000641	1.03
23.5	-2.5			.95420	580.9	.00309	.000652	.00308	.000650	1.03
24.5	-2.5			.95644	581.9	.00305	.000643			1.04
.6	.0	.65		.95923	626.2	.01475	.003111			
1.4	.0	1.35		.94248	617.5	.01609	.003394	.01740	.003670	
2.6	.0	2.13		.91735	577.9	.00966	.002037	.01115	.002352	
3.9	.0	2.48		.90730	551.9	.00337	.000711			
.6	.6	.65		.94192	612.5	.01357	.002862			
1.3	1.3	.65		.90674	565.2	.00755	.001601			
2.3	1.3	.65		.89110	541.9	.00380	.000801			
2.3	1.3	1.35		.91623	582.9	.01221	.002575			
3.3	1.3	.65		.89836	550.2	.00426	.000898	.00429	.000905	
3.3	1.3	1.35		.89613	544.9	.00354	.000747			
5.3	1.3	.65		.91400	562.5	.00504	.001063			
5.3	1.3	1.35		.90953	560.5	.00451	.000951			
34.0	-1.0			.98268	587.5	.00071	.000150	.00069	.000146	.27
34.0	4.0			.95085	579.5	.00328	.000692	.00335	.000707	1.08
34.0	5.0			.95309	581.2	.00334	.000704	.00336	.000709	1.31
34.0	6.0			.95420	582.2	.00346	.000730	.00346	.000730	1.15
36.0	6.0			.95644	582.9	.00321	.000677			1.05
38.0	1.0			.94918	570.9	.00147	.000310	.00130	.000274	.50
38.0	2.0			.93410	575.2	.00401	.000846			1.39
44.0	8.0			.95588	581.9	.00313	.000660	.00314	.000662	1.04
44.0	6.0			.95309	581.5	.00291	.000614	.00294	.000620	.97
44.0	4.0			.94024	574.2	.00310	.000654	.00307	.000647	1.04
44.0	2.0			.93633	569.9	.00321	.000677	.00309	.000652	1.08
44.0	1.0			.93578	577.5	.00557	.001175	.00567	.001196	2.03
8.0		1.84	0	.94359	572.9	.00309	.000652	.00341	.000719	
8.0		1.84	90	.92963	560.9	.00202	.000426	.00182	.000384	
8.0		1.84	180	.93522	561.9	.00127	.000268	.00130	.000274	
11.0		1.84	0	.91902	569.9	.00529	.001116	.00578	.001219	
11.0		1.84	90	.90450	553.5	.00419	.000884	.00359	.000757	
11.0		1.84	180	.92628	572.5	.00598	.001261	.00674	.001422	
15.0		1.84	0	.92907	573.9	.00586	.001236	.00635	.001339	
15.0		1.84	90	.91288	561.2	.00517	.001090	.00477	.001006	
15.0		1.84	180	.92182	569.2	.00582	.001228	.00614	.001295	
21.0		1.84	0	.93801	580.5	.00622	.001312			
24.0		1.84	0	.92852	570.5	.00500	.001055			
27.0		1.84	0	.93969	577.5	.00487	.001027			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(c) M = 2.65; R = 1.30×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_c}$
2.0	.0			.97482	588.5	.00169	.000731			1.06
12.0	.0			.96811	584.2	.00156	.000675			1.04
20.5	.0			.97035	585.2	.00147	.000636			.97
28.5	12.0			.96587	582.9	.00168	.000727			1.08
28.0	4.0			.96979	584.5	.00166	.000718			1.14
28.0	.0			.96867	583.9	.00147	.000636			.99
20.5	-5.0			.97147	585.5	.00145	.000628			.97
24.5	-5.0			.96979	584.2	.00145	.000628			1.07
30.0	.0			.96531	587.9	.00294	.001272	.00296	.001281	1.99
31.0	12.0			.96755	583.5	.00153	.000662			1.08
2.0	-12.0			.97818	591.2	.00159	.000688			1.02
2.0	12.0			.97650	589.5	.00169	.000731			.92
12.0	-12.0			.97706	588.9	.00165	.000714			1.17
12.0	12.0			.96811	584.2	.00167	.000723			1.05
30.0	1.0			.96252	585.5	.00252	.001091			1.91
31.0	2.0			.96028	583.2	.00248	.001073			1.68
32.0	2.0			.95357	579.9	.00261	.001130	.00257	.001112	2.01
32.0	3.0			.95804	580.2	.00197	.000853			1.29
32.0	6.0			.97035	585.5	.00167	.000723			1.18
34.0	1.0			.98769	589.5	.00056	.000242	.00056	.000242	.42
34.0	2.0			.94965	577.9	.00258	.001117	.00236	.001021	1.82
34.0	3.0			.95077	575.5	.00207	.000896	.00194	.000840	1.45
38.0	.0			.98154	586.5	.00049	.000212	.00047	.000203	.37
40.0	.0			.95469	575.5	.00146	.000632	.00139	.000602	
44.0	12.0			.97203	586.5	.00167	.000723			1.24
42.0	.0			.94518	576.2	.00302	.001307	.00299	.001294	2.22
44.0	.0			.95469	581.9	.00294	.001272	.00295	.001277	2.16
48.0	.0			.96811	588.9	.00290	.001255	.00292	.001264	2.00
52.0	.0			.96699	579.9	.00112	.000485	.00108	.000467	.76
52.0	12.0			.97147	585.9	.00149	.000645			1.01
55.0	.0			.97370	589.9	.00211	.000913	.00213	.000922	1.52
58.0	.0			.98154	593.5	.00186	.000805			1.33
58.0	12.0			.96923	584.5	.00148	.000641			.97
58.0	-12.0			.97203	586.9	.00148	.000641			.96
44.0	-12.0			.97650	588.5	.00165	.000714			1.12
36.0	-8.0			.97482	587.2	.00145	.000628			.99
35.0	-3.0			.95860	579.9	.00189	.000818			1.29
34.0	-3.0			.95413	578.5	.00192	.000831	.00190	.000822	1.45
30.0	-3.0			.97315	586.5	.00153	.000662	.00156	.000675	1.03
28.0	-3.0			.97538	587.5	.00144	.000623			.98
34.0	-12.0			.97203	585.5	.00144	.000623	.00137	.000593	1.09
32.0	-12.0			.97259	585.9	.00140	.000606	.00144	.000623	1.03
30.0	-12.0			.97370	587.9	.00147	.000636	.00154	.000667	1.01
19.0	-12.5			.97538	587.9	.00142	.000615			1.04
17.5	-11.0			.97426	587.2	.00145	.000628			1.05
15.5	-2.5			.97482	587.9	.00150	.000649			1.03
16.5	-2.5			.97203	585.9	.00166	.000718	.00163	.000705	1.13
17.5	-2.5			.97091	585.2	.00148	.000641	.00141	.000610	1.01
18.5	-2.5			.97538	587.9	.00165	.000714	.00175	.000757	1.20
19.5	-2.5			.97091	585.2	.00147	.000636	.00142	.000615	1.00
20.5	-2.5			.97035	584.9	.00166	.000718	.00162	.000701	1.19
21.5	-2.5			.97315	586.5	.00147	.000636	.00155	.000671	.99
22.5	-2.5			.97035	584.5	.00146	.000632	.00142	.000615	1.06
23.5	-2.5			.97091	584.9	.00144	.000623	.00143	.000619	.97
24.5	-2.5			.97259	585.9	.00144	.000623			.97
.6	.0	.65		.96028	608.2	.00880	.003809			
1.4	.0	1.35		.94294	599.2	.00966	.004181	.01058	.004579	
2.6	.0	2.13		.91365	565.9	.00541	.002342	.00645	.002792	
3.9	.0	2.48		.90770	546.9	.00164	.000710			
.6	.6	.65		.94518	596.2	.00818	.003540			
1.3	1.3	.65		.91553	563.5	.00464	.002008			
2.3	1.3	.65		.90434	546.2	.00221	.000957	.00111	.000480	
2.3	1.3	1.35		.91777	574.5	.00661	.002861			
3.3	1.3	.65		.90994	551.2	.00226	.000978	.00226	.000978	
3.3	1.3	1.35		.90378	547.9	.00180	.000779	.00122	.000528	
5.3	1.3	.65		.92448	561.9	.00251	.001086			
5.3	1.3	1.35		.91945	556.9	.00214	.000926			
34.0	-1.0			.99608	593.9	.00041	.000177			.32
34.0	4.0			.96476	582.2	.00168	.000727	.00174	.000753	1.14
34.0	5.0			.96811	584.2	.00167	.000723	.00168	.000727	1.14
34.0	6.0			.96979	585.9	.00159	.000688	.00159	.000688	1.13
36.0	6.0			.97203	586.2	.00166	.000718			1.11
38.0	1.0			.96979	580.2	.00074	.000320	.00067	.000290	.50
38.0	2.0			.95245	577.2	.00193	.000835			1.40
44.0	8.0			.97203	586.2	.00166	.000718	.00167	.000723	1.18
44.0	6.0			.97035	583.9	.00133	.000576	.00135	.000584	.86
44.0	4.0			.95972	577.9	.00138	.000597	.00137	.000593	.98
44.0	2.0			.94965	574.2	.00182	.000788	.00173	.000749	1.30
44.0	1.0			.94741	578.2	.00303	.001311	.00293	.001268	2.24
8.0		1.84	0	.96196	579.2	.00146	.000632	.00166	.000718	
8.0		1.84	90	.95636	574.5	.00098	.000424	.00086	.000372	
8.0		1.84	180	.96084	575.2	.00072	.000312	.00077	.000333	
11.0		1.84	0	.92168	561.5	.00282	.001221	.00305	.001320	
11.0		1.84	90	.91665	555.5	.00235	.001017	.00190	.000822	
11.0		1.84	180	.93231	569.9	.00340	.001472	.00397	.001718	
15.0		1.84	0	.93287	568.5	.00300	.001298	.00326	.001411	
15.0		1.84	90	.92448	561.9	.00277	.001199	.00250	.001082	
15.0		1.84	180	.93343	569.5	.00329	.001424	.00360	.001558	
21.0		1.84	0	.94965	579.5	.00302	.001307			
24.0		1.84	0	.93287	566.2	.00240	.001039			
27.0		1.84	0	.94518	573.9	.00250	.001082			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(d) M = 3.51; R = 4.07 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95054	578.5	.00272	.000526			1.05
12.0	.0			.94332	573.5	.00250	.000483			1.06
20.5	.0			.94554	574.9	.00249	.000482			1.00
28.0	12.0			.94110	572.2	.00259	.000501			.99
28.0	4.0			.94388	573.9	.00253	.000489			1.02
28.0	.0			.94388	574.2	.00275	.000532			1.10
20.5	-5.0			.94665	575.2	.00250	.000483			1.07
24.5	-5.0			.94554	574.5	.00244	.000472			1.01
30.0	.0			.94276	587.2	.00457	.000884	.00463	.000895	2.00
31.0	12.0			.94276	572.9	.00252	.000487			1.00
2.0	-12.0			.95388	579.5	.00252	.000487			1.02
2.0	12.0			.95165	578.2	.00247	.000478			.98
12.0	-12.0			.95165	578.5	.00256	.000495			1.04
12.0	12.0			.94276	575.5	.00259	.000501			1.00
30.0	1.0			.93888	577.2	.00407	.000787			1.67
31.0	2.0			.93554	574.5	.00410	.000793			1.74
32.0	2.0			.92721	570.2	.00441	.000853	.00436	.000843	1.85
32.0	3.0			.93221	570.2	.00350	.000677			1.37
32.0	6.0			.94388	574.2	.00255	.000493			1.00
34.0	1.0			.96832	581.2	.00081	.000157	.00076	.000147	.33
34.0	2.0			.91943	573.5	.00463	.000895	.00473	.000915	1.84
34.0	3.0			.92221	564.5	.00353	.000683	.00336	.000650	1.37
38.0	.0			.96332	577.5	.00045	.000087	.00043	.000083	.18
40.0	.0			.93054	564.2	.00209	.000404	.00203	.000393	
44.0	12.0			.94443	573.9	.00254	.000491			1.12
42.0	.0			.91609	562.5	.00414	.000801	.00410	.000793	1.66
44.0	.0			.92387	569.2	.00480	.000928	.00481	.000930	2.05
48.0	.0			.94054	576.5	.00403	.000779	.00405	.000783	1.72
52.0	.0			.94332	570.2	.00193	.000373	.00190	.000367	.78
52.0	12.0			.94610	574.9	.00253	.000489			1.09
55.0	.0			.95332	580.9	.00286	.000551	.00287	.000555	1.15
58.0	.0			.95888	584.5	.00309	.000598			1.25
58.0	12.0			.94610	575.2	.00259	.000501			1.04
58.0	-12.0			.94888	576.9	.00266	.000514			1.10
44.0	-12.0			.94999	576.9	.00243	.000470			1.08
36.0	-8.0			.94777	575.5	.00245	.000474			1.05
36.0	-3.0			.92832	567.9	.00353	.000683			1.47
34.0	-3.0			.92554	565.5	.00348	.000673	.00345	.000667	1.50
32.0	-3.0			.92943	575.2	.00322	.000623	.00322	.000623	1.38
30.0	-3.0			.94610	575.2	.00257	.000497	.00259	.000501	1.04
28.0	-3.0			.94943	576.5	.00251	.000485			1.03
34.0	-12.0			.94665	575.2	.00250	.000483	.00227	.000439	1.07
32.0	-12.0			.94721	575.5	.00250	.000483	.00250	.000483	1.03
30.0	-12.0			.94832	576.5	.00272	.000526	.00276	.000534	1.12
19.0	-12.5			.95110	577.5	.00246	.000476			1.07
17.5	-11.0			.94943	576.9	.00248	.000480			1.02
15.5	-2.5			.94888	576.9	.00255	.000493			1.05
16.5	-2.5			.94610	574.9	.00248	.000480	.00245	.000474	1.06
17.5	-2.5			.94499	574.5	.00273	.000528	.00268	.000518	1.10
18.5	-2.5			.94943	576.9	.00247	.000478	.00257	.000497	1.02
19.5	-2.5			.94554	574.5	.00253	.000489	.00249	.000482	1.03
20.5	-2.5			.94443	574.2	.00274	.000530	.00270	.000522	1.15
21.5	-2.5			.94777	575.5	.00264	.000491	.00262	.000507	1.05
22.5	-2.5			.94443	573.9	.00251	.000485	.00246	.000476	.98
23.5	-2.5			.94499	574.5	.00251	.000489	.00252	.000487	1.02
24.5	-2.5			.94721	575.2	.00247	.000478			1.06
.6	.0	.65		.93868	613.2	.01881	.003637			
1.4	.0	1.35		.91387	601.9	.02219	.004291	.02332	.004510	
2.6	.0	2.12		.89665	570.5	.01133	.002191	.01319	.002551	
3.9	.0	2.48		.88665	541.2	.00328	.000634			
.6	.6	.65		.91887	597.5	.01725	.003336			
1.3	1.3	.65		.87998	562.2	.00866	.001675			
2.3	1.3	.65		.86998	533.2	.00351	.000679			
2.3	1.3	1.35		.88831	573.5	.01569	.003034			
3.3	1.3	.65		.88109	538.5	.00355	.000686	.00358	.000692	
3.3	1.3	1.35		.87553	535.2	.00368	.000712			
5.3	1.3	.65		.89943	550.2	.00378	.000731			
5.3	1.3	1.35		.89554	548.5	.00388	.000750			
34.0	-1.0			.97777	586.2	.00062	.000120	.00060	.000116	.28
34.0	4.0			.93387	569.2	.00289	.000559	.00288	.000557	1.16
34.0	5.0			.94221	574.5	.00288	.000557	.00299	.000578	1.57
34.0	6.0			.94388	574.5	.00268	.000518	.00267	.000516	1.07
36.0	6.0			.94554	576.2	.00281	.000544			1.12
38.0	6.0			.94499	576.2	.00106	.000205	.00093	.000180	.43
38.0	1.0			.92110	564.9	.00366	.000708			1.53
38.0	2.0			.94610	575.5	.00255	.000493	.00256	.000495	1.02
44.0	8.0			.94332	573.5	.00249	.000482	.00252	.000487	1.02
44.0	6.0			.92999	566.5	.00299	.000578	.00297	.000574	1.20
44.0	4.0			.92721	563.2	.00240	.000464	.00237	.000458	.97
44.0	2.0			.91665	563.2	.00435	.000841	.00422	.000816	1.83
44.0	1.0			.93721	567.5	.00211	.000408	.00226	.000437	
8.0		1.84	0	.92999	566.5	.00196	.000379	.00187	.000362	
8.0		1.84	90	.93832	564.2	.00087	.000168	.00089	.000172	
8.0		1.84	180	.89554	550.9	.00441	.000853	.00478	.000924	
11.0		1.84	0	.88887	541.5	.00306	.000592	.00262	.000507	
11.0		1.84	90	.90165	554.5	.00474	.000917	.00528	.001021	
11.0		1.84	180	.91887	565.2	.00453	.000876	.00510	.000986	
15.0		1.84	0	.89887	550.5	.00398	.000770	.00357	.000690	
15.0		1.84	90	.90165	556.9	.00517	.001003	.00543	.001050	
15.0		1.84	180	.93387	578.2	.00380	.000736			
21.0		1.84	0	.91498	559.9	.00367	.000710			
24.0		1.84	0	.92443	565.2	.00342	.000661			
27.0										

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(e) M = 3.51; R = 2.88 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95339	572.9	.00202	.000555			1.09
12.0	.0			.94496	567.2	.00181	.000497			1.07
20.5	.0			.94721	568.9	.00198	.000544			1.18
28.0	12.0			.94272	566.2	.00198	.000544			1.08
28.0	4.0			.94552	568.2	.00188	.000517			1.07
28.0	.0			.94552	568.2	.00199	.000547			1.18
20.5	-6.0			.94889	569.9	.00197	.000541			1.09
24.5	-6.0			.94721	568.9	.00174	.000478			1.05
30.0	.0			.94440	573.2	.00344	.000945	.00348	.000956	2.07
31.0	12.0			.94496	567.2	.00194	.000533			1.08
2.0	-12.0			.95732	575.2	.00196	.000539			1.12
2.0	12.0			.95395	572.9	.00188	.000517			1.04
12.0	-12.0			.95451	573.2	.00196	.000539			1.19
12.0	12.0			.94440	567.2	.00195	.000536			1.07
30.0	1.0			.94159	570.9	.00340	.000934			1.88
31.0	2.0			.93766	567.9	.00339	.000931			1.94
32.0	2.0			.92924	562.9	.00342	.000940	.00337	.000926	2.10
32.0	3.0			.93429	564.2	.00260	.000714			1.44
32.0	6.0			.94552	568.5	.00195	.000536			1.08
34.0	1.0			.96349	572.9	.00055	.000151	.00053	.000146	.31
34.0	2.0			.92194	560.5	.00390	.001072	.00365	.001003	2.15
34.0	3.0			.92475	558.5	.00269	.000739	.00253	.000695	1.49
38.0	.0			.95732	569.2	.00030	.000082			.18
40.0	.0			.93373	562.2	.00155	.000426	.00151	.000415	
44.0	12.0			.94552	567.9	.00197	.000541			1.15
42.0	.0			.92025	557.5	.00324	.000890	.00320	.000879	1.95
44.0	.0			.92699	562.9	.00385	.001058	.00385	.001058	2.38
48.0	.0			.94384	570.9	.00314	.000863	.00316	.000868	1.75
52.0	.0			.94440	564.9	.00144	.000396	.00141	.000387	.88
52.0	12.0			.94721	568.9	.00198	.000544			1.20
55.0	.0			.95675	575.5	.00211	.000580	.00212	.000582	1.29
58.0	.0			.96069	578.5	.00230	.000632			1.41
58.0	12.0			.94777	569.2	.00196	.000539			1.11
58.0	-12.0			.95114	571.5	.00198	.000544			1.09
44.0	-12.0			.95170	571.9	.00180	.000495			1.10
36.0	-8.0			.94945	569.9	.00197	.000541			1.24
36.0	-9.0			.93148	564.2	.00264	.000725			1.47
34.0	-3.0			.92755	559.2	.00316	.000868	.00312	.000857	1.99
32.0	-3.0			.93542	564.2	.00248	.000681	.00248	.000681	1.50
30.0	-3.0			.94833	569.9	.00194	.000533	.00196	.000539	1.07
28.0	-3.0			.95170	571.2	.00196	.000539			1.21
34.0	-12.0			.95002	570.5	.00197	.000541	.00191	.000525	1.22
32.0	-12.0			.95002	570.9	.00181	.000497	.00188	.000517	1.00
30.0	-12.0			.95170	571.5	.00177	.000486	.00182	.000500	.98
19.0	-12.5			.95339	572.5	.00197	.000541			1.24
17.5	-11.0			.95170	571.9	.00197	.000541			1.22
15.5	-2.5			.95002	571.2	.00200	.000550			1.14
16.5	-2.5			.94721	568.9	.00198	.000544	.00195	.000536	1.21
17.5	-2.5			.94609	568.5	.00199	.000547	.00194	.000533	1.18
18.5	-2.5			.95002	572.2	.00192	.000528	.00201	.000552	1.18
19.5	-2.5			.94665	568.9	.00199	.000547	.00196	.000539	1.21
20.5	-2.5			.94609	568.5	.00186	.000511	.00181	.000497	1.05
21.5	-2.5			.94945	570.2	.00197	.000541	.00200	.000550	1.21
22.5	-2.5			.94609	568.2	.00198	.000544	.00194	.000533	1.19
23.5	-2.5			.94721	571.9	.00182	.000500	.00181	.000497	1.08
24.5	-2.5			.94889	569.5	.00177	.000486			1.11
.6	.0	.65		.93822	600.2	.01484	.004077			
1.4	.0	1.35		.91351	596.5	.01689	.004641	.01828	.005022	
2.6	.0	2.13		.89161	556.2	.00871	.002393	.01019	.002800	
3.9	.0	2.48		.88263	530.9	.00232	.000639			
.6	.6	.65		.91913	591.5	.01282	.003522			
1.3	1.3	.65		.88263	544.5	.00680	.001868			
2.3	1.3	.65		.87364	527.5	.00249	.000684			
2.3	1.3	1.35		.88768	561.2	.01223	.003360			
3.3	1.3	.65		.88319	532.5	.00250	.000687	.00252	.000692	
3.3	1.3	1.35		.87477	527.2	.00257	.000706			
5.3	1.3	.65		.87948	542.9	.00286	.000786			
5.3	1.3	1.45		.87611	541.5	.00285	.000783			
34.0	-1.0			.97248	577.9	.00048	.000132	.00049	.000135	.31
34.0	4.0			.93542	562.9	.00215	.000591	.00213	.000585	1.29
34.0	5.0			.94384	568.2	.00214	.000588	.00225	.000618	1.48
34.0	6.0			.94496	568.2	.00201	.000552	.00200	.000550	1.17
36.0	6.0			.94721	569.9	.00204	.000560			1.19
38.0	1.0			.94384	562.2	.00079	.000217	.00070	.000192	.44
38.0	2.0			.92531	559.5	.00304	.000835			1.68
44.0	8.0			.94665	568.9	.00197	.000541	.00198	.000544	1.19
44.0	6.0			.94552	567.5	.00176	.000484	.00178	.000489	.99
44.0	4.0			.93373	561.5	.00206	.000566	.00204	.000560	1.22
44.0	2.0			.93036	558.2	.00182	.000500	.00182	.000500	1.11
44.0	1.0			.92025	559.9	.00311	.000854	.00297	.000816	1.96
8.0		1.84	0	.93542	559.9	.00144	.000396	.00151	.000415	
8.0		1.84	90	.93205	557.9	.00138	.000379	.00132	.000363	
8.0		1.84	180	.93935	559.5	.00078	.000214	.00083	.000228	
11.0		1.84	0	.89105	540.2	.00331	.000909	.00353	.000970	
11.0		1.84	90	.88824	534.5	.00234	.000643	.00202	.000555	
11.0		1.84	180	.90004	546.2	.00364	.001000	.00409	.001124	
15.0		1.84	0	.91632	555.5	.00337	.000926	.00378	.001039	
15.0		1.84	90	.90116	544.5	.00302	.000830	.00269	.000739	
15.0		1.84	180	.90621	551.2	.00401	.001102	.00427	.001173	
21.0		1.84	0	.93036	562.5	.00301	.000827			
24.0		1.84	0	.91295	551.2	.00279	.000767			
27.0		1.84	0	.92250	556.5	.00261	.000717			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(f) M = 3.51; R = 1.65×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96593	582.2	.00134	.000643			1.29
12.0	.0			.95700	576.2	.00122	.000585			1.22
20.5	.0			.96035	577.9	.00109	.000523			.89
28.0	12.0			.95476	574.9	.00122	.000585			1.18
28.0	4.0			.95867	576.2	.00128	.000614			1.21
28.0	.0			.95867	576.2	.00109	.000523			1.04
20.5	-5.0			.96035	577.2	.00108	.000518			1.04
24.5	-5.0			.95979	576.9	.00107	.000513			1.23
30.0	.0			.95253	577.9	.00249	.001195	.00251	.001204	2.86
31.0	12.0			.95644	574.5	.00128	.000614			1.28
2.0	-12.0			.96872	583.9	.00121	.000580			1.30
2.0	12.0			.96537	579.9	.00113	.000542			1.13
12.0	-12.0			.96593	582.5	.00110	.000528			1.20
12.0	12.0			.95532	573.9	.00110	.000528			1.09
30.0	1.0			.95030	575.9	.00211	.001012			2.18
31.0	2.0			.94471	572.2	.00216	.001036			2.23
32.0	2.0			.93522	566.5	.00204	.000979	.00198	.000950	2.13
32.0	3.0			.94192	570.5	.00179	.000859			1.79
32.0	6.0			.95755	576.2	.00109	.000523			1.10
34.0	2.0			.92852	565.5	.00226	.001084	.00194	.000931	1.84
34.0	3.0			.93243	562.5	.00152	.000729	.00138	.000662	1.52
40.0	.0			.95085	570.9	.00083	.000398	.00081	.000389	
44.0	12.0			.95811	575.9	.00109	.000523			1.08
42.0	.0			.93243	564.9	.00216	.001036	.00212	.001017	1.76
44.0	.0			.93466	567.2	.00234	.001123	.00233	.001118	2.54
48.0	.0			.95085	574.9	.00192	.000921	.00193	.000926	2.00
52.0	.0			.95420	571.9	.00083	.000398	.00080	.000384	.81
52.0	12.0			.95867	576.2	.00109	.000523			1.05
56.0	.0			.96872	583.5	.00137	.000657	.00139	.000667	1.49
58.0	.0			.97375	587.9	.00146	.000700			1.52
58.0	12.0			.96035	577.9	.00109	.000523			1.17
58.0	-12.0			.96370	579.5	.00107	.000513			1.16
44.0	-12.0			.96481	579.9	.00104	.000499			1.14
36.0	-9.0			.96258	579.5	.00097	.000465			1.07
36.0	-3.0			.94024	567.5	.00154	.000739			1.59
34.0	-3.0			.93522	563.9	.00151	.000724	.00146	.000700	1.54
32.0	-3.0			.94415	569.9	.00158	.000758	.00157	.000753	1.72
30.0	-3.0			.96035	578.5	.00122	.000585	.00125	.000600	1.16
28.0	-3.0			.96426	579.5	.00106	.000509			1.07
34.0	-12.0			.96202	578.2	.00107	.000513	.00104	.000499	1.16
32.0	-12.0			.96202	579.2	.00109	.000523	.00127	.000609	1.24
30.0	-12.0			.96370	579.2	.00106	.000509	.00118	.000566	1.15
19.0	-12.5			.96481	579.9	.00103	.000494			1.12
17.5	-11.0			.96314	579.2	.00107	.000513			1.16
15.5	-2.5			.96258	579.9	.00121	.000580			1.20
16.5	-2.5			.95979	576.9	.00108	.000518	.00104	.000499	1.27
17.5	-2.5			.95923	577.9	.00122	.000585	.00117	.000561	1.22
18.5	-2.5			.96370	579.2	.00106	.000509	.00116	.000557	1.15
19.5	-2.5			.95979	576.9	.00108	.000518	.00104	.000499	1.17
20.5	-2.5			.95923	576.5	.00109	.000523	.00104	.000499	1.18
21.5	-2.5			.96258	578.5	.00127	.000609	.00134	.000643	1.38
22.5	-2.5			.95923	576.5	.00108	.000518	.00102	.000489	1.09
23.5	-2.5			.96035	577.2	.00127	.000609	.00127	.000609	1.28
24.5	-2.5			.96202	578.9	.00109	.000523			1.18
.6	.0	.65		.93410	592.5	.01015	.004869			
1.4	.0	1.35		.91009	582.2	.01238	.005939	.01310	.006285	
2.6	.0	2.13		.88384	547.5	.00574	.002754			
3.9	.0	2.48		.88105	530.9	.00141	.000676			
.6	.6	.65		.91679	583.5	.00886	.004155			
1.3	1.3	.65		.88608	544.9	.00466	.002236			
2.3	1.3	.65		.88105	530.5	.00159	.000763			
2.3	1.3	1.35		.88496	555.5	.00823	.003948			
3.3	1.3	.65		.89166	537.5	.00161	.000772	.00164	.000787	
3.3	1.3	1.35		.87882	529.5	.00164	.000787			
5.3	1.3	.65		.90730	547.5	.00181	.000868			
5.3	1.3	1.35		.90283	544.5	.00155	.000744			
34.0	4.0			.94471	568.9	.00140	.000672	.00139	.000667	1.41
34.0	5.0			.95420	574.9	.00140	.000672	.00150	.000720	1.61
34.0	6.0			.95755	577.2	.00135	.000648	.00135	.000648	1.44
36.0	6.0			.95867	576.9	.00121	.000580			.98
38.0	1.0			.95867	573.2	.00053	.000254	.00052	.000249	.55
38.0	2.0			.93745	568.2	.00181	.000868			1.95
44.0	8.0			.96035	578.9	.00110	.000528	.00111	.000533	1.11
44.0	6.0			.95867	575.9	.00104	.000499	.00106	.000509	.85
44.0	4.0			.94750	569.9	.00110	.000528	.00109	.000523	1.11
44.0	2.0			.94192	565.9	.00110	.000528	.00111	.000533	1.13
44.0	1.0			.92963	566.2	.00209	.001003	.00193	.000926	2.15
8.0		1.84	0	.95644	573.9	.00084	.000403	.00085	.000408	
8.0		1.84	90	.95588	572.9	.00070	.000336	.00064	.000307	
8.0		1.84	180	.96426	576.2	.00041	.000197	.00052	.000249	
11.0		1.84	0	.89591	542.5	.00229	.001099	.00240	.001151	
11.0		1.84	90	.89613	539.9	.00158	.000758	.00136	.000652	
11.0		1.84	180	.90562	549.2	.00240	.001151	.00276	.001324	
15.0		1.84	0	.91456	553.5	.00202	.000969	.00218	.001046	
15.0		1.84	90	.90841	548.9	.00192	.000921	.00174	.000835	
15.0		1.84	180	.91121	553.9	.00271	.001300	.00291	.001396	
21.0		1.84	0	.94806	572.2	.00149	.000715			
24.0		1.84	0	.92070	556.9	.00174	.000834			
27.0		1.84	0	.94131	561.5	.00157	.000753			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(g) M = 4.44; R = 4.55 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94382	575.2	.00129	.000325			1.54
12.0	.0			.93611	569.2	.00096	.000242			1.14
20.5	.0			.93831	571.2	.00101	.000254			1.10
28.0	12.0			.93336	568.5	.00137	.000345			1.09
28.0	4.0			.93666	569.5	.00115	.000290			1.37
28.0	.0			.93611	569.2	.00115	.000290			1.20
20.5	-6.0			.93941	570.5	.00145	.000365			1.75
24.5	-5.0			.93721	569.5	.00114	.000287			1.54
30.0	.0			.93446	572.2	.00244	.000615	.00249	.000627	2.65
31.0	12.0			.92501	570.2	.00131	.000330			1.05
2.0	-12.0			.94602	577.9	.00126	.000317			1.14
2.0	12.0			.94382	574.9	.00136	.000343			
12.0	-12.0			.94327	574.9	.00129	.000325			1.36
12.0	12.0			.93446	569.5	.00138	.000348			1.10
31.0	1.0			.93170	572.9	.00206	.000519			2.45
31.0	2.0			.92454	564.5	.00228	.000574			2.71
32.0	2.0			.91243	559.5	.00218	.000549	.00206	.000519	2.60
32.0	3.0			.92014	561.9	.00182	.000458			1.64
32.0	6.0			.93666	570.9	.00130	.000327			1.13
34.0	1.0			.94492	571.9	.00033	.000083	.00046	.000116	.39
34.0	2.0			.90362	553.2	.00246	.000620			2.93
34.0	3.0			.90802	553.9	.00176	.000443	.00141	.000355	1.57
40.0	.0			.93115	565.2	.00077	.000194	.00076	.000191	
44.0	12.0			.93776	571.5	.00130	.000327			1.09
42.0	.0			.91463	557.2	.00172	.000433	.00166	.000418	2.02
44.0	.0			.91022	556.6	.00205	.000516	.00201	.000506	2.47
48.0	.0			.92599	565.2	.00181	.000456	.00183	.000461	2.06
52.0	.0			.93225	565.5	.00079	.000199	.00077	.000194	.86
52.0	12.0			.93886	572.5	.00116	.000292			.96
55.0	.0			.94712	576.2	.00100	.000252	.00102	.000257	1.32
58.0	.0			.95483	581.9	.00127	.000320			1.51
58.0	12.0			.94162	572.2	.00116	.000292			.98
58.0	-12.0			.94437	573.5	.00112	.000282			1.05
44.0	-12.0			.94327	573.2	.00114	.000287			1.30
36.0	-8.0			.93996	572.2	.00114	.000287			1.30
36.0	-3.0			.91683	559.5	.00182	.000458			2.30
34.0	-3.0			.91188	556.2	.00142	.000358	.00134	.000337	1.71
32.0	-3.0			.92234	561.9	.00171	.000431	.00169	.000426	2.31
30.0	-3.0			.93831	571.5	.00129	.000325	.00135	.000340	1.74
28.0	-3.0			.94162	573.2	.00114	.000287			1.37
34.0	-12.0			.94052	571.2	.00115	.000290	.00118	.000297	1.05
32.0	-12.0			.93996	572.5	.00129	.000325			1.54
31.0	-12.0			.94162	573.5	.00128	.000322	.00151	.000380	1.16
19.0	-12.5			.94217	573.2	.00135	.000340			1.61
17.5	-11.5			.94107	572.5	.00135	.000340			1.61
15.5	-2.5			.94107	575.5	.00125	.000315			1.51
16.5	-2.5			.93831	570.5	.00115	.000290	.00110	.000277	1.37
17.5	-2.5			.93776	571.2	.00129	.000325	.00120	.000302	1.74
18.5	-2.5			.94162	572.5	.00114	.000287	.00129	.000325	1.46
19.5	-2.5			.93776	570.2	.00115	.000290	.00109	.000275	1.37
20.5	-2.5			.93721	569.9	.00115	.000290	.00107	.000269	1.25
21.5	-2.5			.93996	572.5	.00115	.000290	.00128	.000322	1.55
22.5	-2.5			.93721	570.5	.00115	.000290	.00106	.000267	1.37
23.5	-2.5			.93776	570.2	.00115	.000290	.00113	.000285	1.55
24.5	-2.5			.93996	571.2	.00114	.000287			1.36
.6	.0	.65		.92069	583.5	.01146	.002886			
1.4	.0	1.35		.89315	570.9	.01460	.003677	.01510	.003803	
2.6	.0	2.13		.88709	551.9	.00716	.001803	.00884	.002226	
3.9	.0	2.48		.87553	534.2	.00148	.000373			
.6	.6	.65		.89976	568.5	.01053	.002652			
1.3	1.3	.65		.86341	533.9	.00560	.001410			
2.3	1.3	.65		.86011	523.9	.00163	.000411			
2.3	1.3	1.35		.86947	548.9	.01017	.002561			
3.3	1.3	.65		.87277	532.2	.00148	.000373	.00153	.000385	
3.3	1.3	1.35		.86396	529.5	.00211	.000531			
5.3	1.3	.65		.89040	542.2	.00176	.000443			
5.3	1.3	1.35		.88764	541.2	.00188	.000473			
34.0	4.0			.92234	567.9	.00148	.000373	.00152	.000383	1.33
34.0	5.0			.93281	569.2	.00146	.000368	.00161	.000405	1.90
34.0	6.0			.93611	569.9	.00136	.000343	.00135	.000340	1.16
36.0	6.0			.93776	570.9	.00136	.000343			1.23
38.0	1.0			.93556	566.2	.00047	.000118	.00050	.000126	.56
38.0	2.0			.91243	557.5	.00204	.000514			2.43
44.0	8.0			.93886	570.5	.00117	.000295	.00119	.000300	1.04
44.0	6.0			.93556	568.2	.00116	.000292	.00119	.000300	1.05
44.0	4.0			.92399	562.9	.00139	.000350	.00137	.000345	1.25
44.0	2.0			.92069	559.5	.00098	.000247	.00104	.000262	1.17
44.0	1.0			.91133	555.2	.00174	.000438	.00160	.000404	1.98
8.0		1.84	0	.93886	569.5	.00070	.000176	.00071	.000179	
8.0		1.84	90	.93886	568.5	.00059	.000149	.00052	.000131	
8.0		1.84	180	.94492	571.2	.00028	.000071	.00041	.000103	
11.0		1.84	0	.87828	538.2	.00208	.000524	.00235	.000592	
11.0		1.84	90	.87498	535.5	.00135	.000340			
11.0		1.84	180	.88159	538.5	.00190	.000479	.00225	.000567	
15.0		1.84	0	.90582	551.9	.00180	.000453	.00222	.000559	
15.0		1.84	90	.89370	544.5	.00178	.000448			
15.0		1.84	180	.89370	546.5	.00264	.000665	.00276	.000695	
21.0		1.84	0	.93666	569.2	.00100	.000252			
24.0		1.84	0	.91133	555.5	.00134	.000337			
27.0		1.84	0	.92014	559.5	.00117	.000295			

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

L-2024

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Continued

(h) M = 4.44; R = 3.26 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94753	574.2	.00113	.000402			1.05
12.0	.0			.93980	569.5	.00097	.000345			1.11
20.5	.0			.94256	571.5	.00101	.000359			1.16
28.0	12.0			.93814	568.5	.00113	.000402			1.22
28.0	4.0			.94090	569.5	.00110	.000391			1.34
28.0	.0			.94035	570.2	.00101	.000359			1.11
26.5	-5.0			.94422	571.9	.00085	.000302			.94
24.5	-5.0			.94146	569.2	.00077	.000274			.96
30.0	.0			.93704	569.9	.00198	.000704	.00231	.000715	2.41
31.0	12.0			.93980	569.2	.00118	.000420			1.28
2.0	-12.0			.95029	576.9	.00102	.000363			1.07
2.0	12.0			.94753	574.9	.00116	.000413			1.10
12.0	-12.0			.94753	573.9	.00095	.000338			1.01
12.0	12.0			.93869	568.9	.00115	.000409			1.07
30.0	1.0			.93483	568.2	.00183	.000651			2.18
31.0	2.0			.92710	563.5	.00185	.000658			2.06
32.0	2.0			.91440	555.9	.00200	.000711	.00187	.000665	2.22
32.0	3.0			.92323	561.2	.00161	.000573			1.77
32.0	6.0			.94090	569.5	.00087	.000309			.96
34.0	2.0			.90611	551.9	.00236	.000839			2.59
34.0	3.0			.91108	554.5	.00151	.000537			1.76
38.0	.0			.95140	577.9	.00018	.000064	.00019	.000068	.22
40.0	.0			.93759	566.9	.00077	.000274	.00095	.000306	
44.0	12.0			.94201	571.9	.00102	.000363			1.31
42.0	.0			.92157	560.9	.00150	.000534	.00146	.000519	1.65
44.0	.0			.91605	556.5	.00192	.000683	.00188	.000669	2.13
46.0	.0			.92986	564.5	.00151	.000537	.00152	.000541	1.89
52.0	.0			.93483	564.5	.00070	.000249	.00065	.000235	.89
52.0	12.0			.94311	572.2	.00101	.000359			1.06
55.0	.0			.95084	575.9	.00095	.000338	.00087	.000309	1.20
58.0	.0			.95913	580.9	.00094	.000334			1.24
58.0	12.0			.94587	573.9	.00101	.000359			1.11
58.0	-12.0			.94919	574.9	.00084	.000299			1.11
44.0	-12.0			.94864	573.9	.00095	.000338			1.19
36.0	-8.0			.94532	571.5	.00078	.000277			1.03
36.0	-3.0			.91937	557.5	.00122	.000434			1.54
34.0	-3.0			.91440	556.9	.00145	.000516	.00136	.000484	1.61
32.0	-3.0			.92489	561.2	.00150	.000534	.00148	.000526	1.67
30.0	-3.0			.94256	570.9	.00096	.000341	.00102	.000363	1.20
28.0	-3.0			.94643	572.2	.00086	.000306			.95
34.0	-12.0			.94532	572.2	.00095	.000338	.00105	.000374	1.17
32.0	-12.0			.94532	572.5	.00085	.000302			.93
30.0	-12.0			.94643	572.5	.00086	.000306			1.08
19.0	-12.5			.94643	573.5	.00085	.000302			.93
17.5	-11.0			.94532	571.9	.00086	.000306			1.09
15.5	-2.5			.94532	572.5	.00096	.000341			1.19
16.5	-2.5			.94256	570.2	.00086	.000306	.00071	.000253	.91
17.5	-2.5			.94256	570.5	.00095	.000338	.00087	.000309	1.13
18.5	-2.5			.94587	572.9	.00096	.000341	.00111	.000395	1.19
19.5	-2.5			.94256	570.5	.00095	.000338	.00088	.000313	1.17
20.5	-2.5			.94201	570.2	.00096	.000341	.00088	.000313	1.14
21.5	-2.5			.94477	572.5	.00100	.000356	.00112	.000398	1.05
22.5	-2.5			.94146	569.5	.00086	.000306	.00084	.000299	.95
23.5	-2.5			.94256	570.2	.00086	.000306	.00085	.000302	1.05
24.5	-2.5			.94422	571.2	.00084	.000299			.92
.6	.0	.65		.91826	573.5	.00984	.003500			
1.4	.0	1.35		.89120	560.9	.01261	.004486	.01442	.004774	
2.6	.0	2.13		.87960	546.2	.00595	.002117			
3.9	.0	2.48		.87132	529.5	.00149	.000530			
.6	.6	.65		.89783	559.5	.00905	.003219			
1.3	1.3	.65		.86524	531.2	.00483	.001647			
2.3	1.3	.65		.86248	524.2	.00151	.000537			
2.3	1.3	1.35		.86690	539.5	.00866	.003078			
3.3	1.3	.65		.87518	532.5	.00142	.000505	.00148	.000526	
3.3	1.3	1.35		.86414	524.5	.00162	.000576			
5.3	1.3	.65		.89230	563.5	.00148	.000526			
5.3	1.3	1.35		.88899	539.9	.00146	.000519			
34.0	4.0			.92544	560.9	.00120	.000427	.00125	.000445	1.28
34.0	5.0			.93593	567.2	.00119	.000423	.00133	.000473	1.86
34.0	6.0			.94035	569.5	.00112	.000398	.00111	.000395	1.22
36.0	6.0			.94090	570.9	.00137	.000487			1.44
38.0	1.0			.93869	566.2	.00048	.000171	.00054	.000192	.59
38.0	2.0			.91716	557.9	.00182	.000580			2.20
44.0	8.0			.94311	570.9	.00110	.000393	.00111	.000395	1.21
44.0	6.0			.94035	569.2	.00096	.000341	.00099	.000352	1.05
44.0	4.0			.92931	563.2	.00120	.000427	.00117	.000416	1.58
44.0	2.0			.92654	561.2	.00098	.000349	.00104	.000370	1.21
44.0	1.0			.91826	558.5	.00155	.000554	.00138	.000491	1.67
8.0		1.84	0	.94256	568.9	.00060	.000214	.00061	.000217	
8.0		1.84	90	.94201	568.5	.00045	.000160	.00036	.000128	
8.0		1.84	180	.94919	571.5	.00038	.000135	.00052	.000185	
11.0		1.84	0	.87905	534.2	.00195	.000694	.00210	.000747	
11.0		1.84	90	.87860	532.2	.00103	.000366			
11.0		1.84	180	.88623	537.5	.00178	.000633	.00212	.000754	
15.0		1.84	0	.90169	548.5	.00138	.000490	.00160	.000569	
15.0		1.84	90	.89562	545.9	.00148	.000526	.00129	.000459	
15.0		1.84	180	.89728	547.9	.00221	.000786	.00233	.000829	
21.0		1.84	0	.93925	567.9	.00084	.000299			
24.0		1.84	0	.91384	553.5	.00126	.000448			
27.0		1.84	0	.92378	559.2	.00097	.000345			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

16. 45° Fairing - Concluded

(i) M = 4.44; R = 2.15 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94963	579.5	.00072	.000386			.96
12.0	.0			.94252	574.9	.00067	.000359			1.16
20.0	.0			.94471	576.2	.00067	.000359			1.18
28.0	12.0			.94033	573.9	.00068	.000365			1.24
28.0	4.0			.94306	575.2	.00070	.000375			1.21
28.0	.0			.94252	575.2	.00064	.000343			.86
20.0	-5.0			.94580	576.5	.00065	.000349			1.05
24.0	-5.0			.94361	575.5	.00061	.000327			.82
30.0	.0			.93923	576.2	.00149	.000799	.00152	.000815	2.87
31.0	12.0			.94197	574.9	.00061	.000327			1.20
2.0	-12.0			.95127	580.5	.00074	.000397			1.32
2.0	12.0			.94799	578.9	.00065	.000349			1.02
12.0	-12.0			.94983	579.2	.00060	.000322			1.00
12.0	12.0			.94033	573.9	.00071	.000381			1.13
30.0	1.0			.93704	573.5	.00137	.000735			1.85
31.0	2.0			.92883	570.5	.00160	.000858			2.16
32.0	2.0			.91624	562.9	.00162	.000869	.00142	.000762	2.84
32.0	3.0			.92445	565.5	.00127	.000681			1.72
32.0	6.0			.94306	576.2	.00076	.000408			1.23
34.0	1.0			.93649	570.2	.00033	.000177	.00048	.000257	.54
34.0	2.0			.90639	557.5	.00166	.000890			2.72
34.0	3.0			.91131	558.2	.00113	.000606			1.77
40.0	.0			.93978	572.9	.00050	.000268	.00052	.000279	
44.0	12.0			.94416	576.5	.00061	.000327			1.24
42.0	.0			.92774	567.2	.00122	.000654	.00119	.000638	2.00
44.0	.0			.92281	565.2	.00150	.000804	.00147	.000788	3.00
48.0	.0			.93266	570.5	.00127	.000681	.00129	.000692	2.54
52.0	.0			.93485	569.5	.00047	.000252	.00043	.000231	.94
52.0	12.0			.94471	576.5	.00061	.000327			1.22
55.0	.0			.95182	580.5	.00067	.000359	.00068	.000365	1.37
58.0	.0			.96003	585.9	.00076	.000408			1.55
58.0	12.0			.94744	578.2	.00061	.000327			1.00
58.0	-12.0			.95073	579.9	.00060	.000322			1.22
44.0	-12.0			.95073	579.5	.00060	.000322			1.22
36.0	-8.0			.94799	577.9	.00060	.000322			1.22
36.0	-3.0			.91898	562.9	.00095	.000509			1.79
34.0	-3.0			.91460	559.9	.00095	.000509	.00081	.000434	1.56
32.0	-3.0			.92664	566.5	.00095	.000509	.00093	.000499	1.83
30.0	-3.0			.94416	576.2	.00064	.000343	.00070	.000375	.97
28.0	-3.0			.94799	578.2	.00063	.000338			1.05
34.0	-12.0			.94744	577.5	.00060	.000322	.00074	.000397	1.22
32.0	-12.0			.94690	577.5	.00061	.000327			1.02
30.0	-12.0			.94854	578.5	.00060	.000322			1.18
19.0	-12.5			.94854	578.5	.00060	.000322			1.13
17.5	-11.0			.94744	577.9	.00060	.000322			1.11
15.5	-2.5			.94744	577.9	.00090	.000483			1.29
16.5	-2.5			.94471	575.9	.00067	.000359	.00060	.000322	1.29
17.5	-2.5			.94416	575.9	.00067	.000359	.00060	.000322	.92
18.5	-2.5			.94799	578.2	.00065	.000349	.00081	.000434	.94
19.5	-2.5			.94416	575.9	.00077	.000413	.00069	.000370	1.35
20.5	-2.5			.94361	575.5	.00067	.000359	.00060	.000322	.94
21.5	-2.5			.94690	577.2	.00070	.000375	.00082	.000440	1.30
22.5	-2.5			.94361	575.5	.00062	.000333	.00054	.000290	1.17
23.5	-2.5			.94471	576.2	.00063	.000338	.00062	.000333	.89
24.5	-2.5			.94635	577.2	.00091	.000488			1.30
.6	.0	.65		.91460	573.2	.00808	.004333			
1.4	.0	1.35		.88832	560.2	.01047	.005615	.01147	.006151	
2.6	.0	2.13		.87245	540.5	.00466	.002499	.00532	.002853	
3.9	.0	2.48		.86697	530.5	.00112	.000601			
.6	.6	.65		.89653	560.2	.00714	.003829			
1.3	1.3	.65		.86588	535.2	.00379	.002033			
2.3	1.3	.65		.86369	528.2	.00141	.000756			
2.3	1.3	1.35		.86623	539.9	.00696	.003733			
3.3	1.3	.65		.87683	536.2	.00111	.000595	.00117	.000627	
3.3	1.3	1.35		.86204	527.5	.00138	.000740			
5.3	1.3	.65		.89270	546.2	.00109	.000585			
5.3	1.3	1.35		.88832	543.5	.00098	.000526			
34.0	4.0			.92883	569.2	.00093	.000499			1.50
34.0	5.0			.93704	573.2	.00092	.000493	.00108	.000579	1.24
34.0	6.0			.94306	574.9	.00067	.000359	.00066	.000354	.91
36.0	6.0			.94252	576.2	.00091	.000488			1.23
38.0	1.0			.93595	569.9	.00037	.000198	.00045	.000241	.65
38.0	2.0			.91843	561.9	.00122	.000654			2.39
44.0	8.0			.94580	576.2	.00069	.000370	.00070	.000375	.92
44.0	6.0			.94197	574.5	.00061	.000327	.00064	.000343	1.20
44.0	4.0			.93321	569.2	.00074	.000397	.00071	.000381	1.35
44.0	2.0			.93157	568.2	.00082	.000440	.00086	.000461	1.58
44.0	1.0			.92500	566.5	.00111	.000595	.00105	.000563	1.95
11.0		1.84	0	.88558	542.2	.00149	.000799	.00168	.000901	
11.0		1.84	90	.88558	541.5	.00097	.000520	.00067	.000359	
11.0		1.84	180	.89489	546.5	.00135	.000724	.00164	.000880	
15.0		1.84	0	.89872	549.9	.00096	.000515	.00101	.000542	
15.0		1.84	90	.89708	548.5	.00108	.000579	.00097	.000520	
15.0		1.84	180	.89927	553.2	.00172	.000922	.00191	.001024	
21.0		1.84	0	.93868	570.9	.00041	.000220			
24.0		1.84	0	.91843	560.5	.00088	.000472			
27.		1.84	0	.92774	565.5	.00081	.000434			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; $\bar{s}$ = 1.50 INCHES - Continued

17. Lox line

(a) M = 2.65; R = 3.96×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$
2.0	.0			.94589	594.9	.00460	.000650			.97
12.0	.0			.94370	589.5	.00439	.000621			.99
20.5	.0			.94480	589.9	.00437	.000618			.98
28.0	12.0			.94152	589.2	.00455	.000643			.98
28.0	4.0			.94480	590.5	.00452	.000639			.95
28.0	.0			.95135	601.2	.00690	.000975			1.54
20.5	-5.0			.94480	590.2	.00441	.000623			.97
24.5	-5.0			.94425	589.5	.00422	.000596			.99
30.0	.0			.96447	620.5	.01111	.001570	.01131	.001599	2.45
31.0	12.0			.94206	588.9	.00436	.000616			.95
34.0	.0			.93605	585.2	.00461	.000652	.00487	.000688	1.11
2.0	-12.0			.94808	592.2	.00453	.000640			1.00
2.0	12.0			.94644	591.9	.00459	.000649			.96
12.0	-12.0			.94808	592.2	.00466	.000659			1.00
12.0	12.0			.94316	590.2	.00493	.000697			1.03
30.0	1.0			.95354	610.2	.00993	.001404			2.27
31.0	2.0			.94316	602.2	.00964	.001363			2.19
32.0	2.0			.93714	599.9	.00968	.001368	.00975	.001378	2.23
32.0	3.0			.93168	590.2	.00709	.001002			1.54
32.0	6.0			.94425	590.9	.00480	.000678			1.05
34.0	1.0			.91911	578.2	.00582	.000823	.00573	.000810	1.30
34.0	2.0			.91966	586.9	.00895	.001265	.00904	.001278	1.95
34.0	3.0			.92785	588.9	.00792	.001119	.00771	.001090	1.74
36.0	.0			.95026	593.2	.00468	.000661	.00466	.000659	
38.0	.0			.95846	617.9	.00627	.000886	.00651	.000920	1.45
40.0	.0			.95299	592.9	.00374	.000529	.00369	.000516	
44.0	12.0			.94753	592.5	.00453	.000640			1.01
42.0	.0			.95190	595.9	.00463	.000654	.00462	.000653	1.06
44.0	.0			.96338	600.5	.00399	.000564	.00402	.000568	.92
48.0	.0			.95846	597.5	.00407	.000575	.00406	.000574	.94
52.0	.0			.96119	601.5	.00472	.000667	.00475	.000671	1.06
52.0	12.0			.94644	591.2	.00437	.000618			.98
55.0	.0			.95135	592.9	.00405	.000572	.00402	.000568	.90
58.0	.0			.95463	596.9	.00451	.000637			.92
58.0	12.0			.94316	592.2	.00429	.000606			.86
58.0	-12.0			.94370	589.2	.00426	.000602			.94
44.0	-12.0			.95026	592.5	.00441	.000623			1.03
36.0	-8.0			.94917	591.9	.00414	.000585			.98
36.0	-3.0			.92840	585.9	.00631	.000892			1.51
34.0	-3.0			.92785	587.9	.00739	.001045	.00738	.001043	1.76
32.0	-3.0			.93387	595.2	.00697	.000985	.00694	.000981	1.59
30.0	-3.0			.94534	598.9	.00726	.001026	.00733	.001036	1.65
28.0	-3.0			.94971	593.2	.00450	.000636			1.04
34.0	-12.0			.94589	590.2	.00445	.000629	.00443	.000626	1.02
32.0	-12.0			.94644	590.5	.00444	.000628	.00443	.000626	1.02
30.0	-12.0			.94644	590.9	.00446	.000630	.00447	.000632	1.01
19.0	-12.5			.94862	591.9	.00433	.000612			.92
17.5	-11.0			.94862	592.5	.00441	.000623			.99
15.5	-2.5			.94753	592.5	.00449	.000635			.95
16.5	-2.5			.94534	593.5	.00428	.000605	.00423	.000598	.97
17.5	-2.5			.94480	590.5	.00440	.000622	.00436	.000616	.96
18.5	-2.5			.94862	592.5	.00446	.000630	.00441	.000623	1.01
19.5	-2.5			.94480	590.2	.00439	.000621	.00434	.000613	.97
20.5	-2.5			.94370	589.9	.00441	.000623	.00436	.000616	.97
21.5	-2.5			.94698	591.5	.00437	.000618	.00445	.000629	.97
22.5	-2.5			.94425	589.9	.00449	.000635	.00444	.000628	1.01
23.5	-2.5			.94534	590.5	.00448	.000633	.00448	.000633	1.00
24.5	-2.5			.94698	591.2	.00416	.000588			.96
36.0	-16.0			.94480	588.9	.00404	.000571			.98
36.0	-12.0			.94480	589.2	.00416	.000588	.00416	.000588	.97
32.0	-18.0			.94698	589.9	.00409	.000578			.98
32.0	-16.0			.94589	590.2	.00420	.000594	.00420	.000594	.97
32.0	-14.0			.94534	589.2	.00408	.000577	.00407	.000575	.98
32.0	-10.0			.94589	590.2	.00445	.000629			1.02
28.0	-14.0			.94589	590.2	.00445	.000629			1.01
28.0	-12.0			.94589	590.2	.00419	.000592			.99
26.0	-12.5			.94644	590.5	.00445	.000629			1.02
24.5	-11.0			.94534	589.5	.00411	.000581			.91
22.0	-12.5			.94698	591.2	.00426	.000602	.00426	.000602	.95
23.5	-11.0			.94644	590.9	.00422	.000596	.00427	.000596	.97
34.0	-1.0			.92676	581.2	.00550	.000777	.00540	.000763	1.42
34.0	4.0			.93094	586.2	.00630	.000890	.00626	.000885	1.41
34.0	5.0			.93332	585.9	.00518	.000732	.00508	.000715	1.48
34.0	6.0			.94316	590.9	.00469	.000663	.00470	.000664	1.02
36.0	6.0			.93933	588.5	.00485	.000686			1.06
38.0	1.0			.93933	592.9	.00620	.000876	.00617	.000872	1.45
38.0	2.0			.92512	582.2	.00563	.000796			1.28
44.0	8.0			.94261	588.5	.00414	.000585	.00417	.000589	.91
44.0	6.0			.92512	578.2	.00432	.000611	.00423	.000598	.96
44.0	4.0			.93059	582.5	.00465	.000657	.00469	.000657	1.08
44.0	2.0			.93387	585.9	.00497	.000702	.00491	.000694	1.12
44.0	1.0			.94589	591.2	.00440	.000622	.00443	.000626	1.08
6.0	.0			.94644	590.5	.00369	.000804			.99
6.0	12.0			.94644	590.2	.00377	.000816			.94
12.0	.0			.94698	594.5	.00494	.000766			1.03
12.0	5.0			.94480	593.9	.00548	.000775			.98
12.0	10.0			.94425	594.2	.00542	.000766			.97
18.0	.0			.94534	592.9	.00501	.000708			.97
30.0	.0			.94425	592.5	.00501	.000708			.97
42.0	.0			.94425	591.2	.00494	.000698			1.04

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(b) M = 2.65; R = 2.59×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_c}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95886	587.2	.00308	.000668			.98
12.0	.0			.95496	584.2	.00317	.000688			1.05
20.5	.0			.95608	584.9	.00298	.000646			1.02
28.0	12.0			.95218	583.2	.00320	.000694			1.02
28.0	4.0			.95663	585.5	.00300	.000651			.99
28.0	.0			.95997	594.2	.00481	.001043			1.62
20.5	-6.0			.95663	585.2	.00317	.000688			1.05
24.5	-6.0			.95608	584.9	.00292	.000633			1.00
30.0	.0			.96942	610.5	.00799	.001733	.00815	.001768	2.67
31.0	12.0			.95330	583.2	.00298	.000646			.97
34.0	.0			.94829	580.9	.00316	.000685	.00338	.000733	1.13
2.0	-12.0			.96219	588.9	.00316	.000685			1.03
2.0	12.0			.95941	593.2	.00318	.000690			.98
12.0	-12.0			.96052	592.9	.00306	.000664			1.02
12.0	12.0			.95385	584.5	.00320	.000694			1.01
30.0	1.0			.95886	613.5	.00647	.001403			2.19
31.0	2.0			.94885	592.9	.00665	.001442			2.26
32.0	2.0			.94329	595.5	.00645	.001399	.00619	.001343	2.33
32.0	3.0			.94107	583.5	.00480	.001041			1.62
32.0	6.0			.95441	585.2	.00319	.000692			1.03
34.0	1.0			.93161	573.2	.00390	.000846	.00359	.000779	1.34
34.0	2.0			.92883	587.9	.00576	.001249	.00579	.001256	1.89
34.0	3.0			.93773	582.5	.00522	.001132	.00532	.001154	1.72
36.0	.0			.96108	588.2	.00330	.000715	.00328	.000711	
38.0	.0			.96886	598.9	.00473	.001026	.00463	.001004	1.60
40.0	.0			.96386	587.9	.00259	.000562	.00251	.000544	
44.0	12.0			.95830	586.9	.00304	.000659			1.00
42.0	.0			.96386	591.2	.00334	.000724	.00334	.000724	1.14
44.0	.0			.97665	596.2	.00269	.000583	.00271	.000588	.96
48.0	.0			.97109	593.5	.00285	.000618	.00284	.000616	.97
52.0	.0			.97387	596.5	.00325	.000705	.00327	.000709	1.07
52.0	12.0			.95774	585.5	.00288	.000625			.96
55.0	.0			.96219	587.2	.00275	.000596	.00271	.000588	.91
58.0	.0			.96831	592.9	.00313	.000679			1.03
58.0	12.0			.95441	585.9	.00291	.000631			.93
58.0	-12.0			.95608	584.5	.00288	.000625			.95
44.0	-12.0			.96275	587.9	.00286	.000616			1.04
36.0	-8.0			.96108	587.2	.00275	.000596			.96
36.0	-3.0			.93995	580.2	.00441	.000957			1.58
34.0	-3.0			.93829	581.9	.00486	.001054	.00486	.001054	1.70
32.0	-3.0			.94273	584.2	.00483	.001048	.00480	.001041	1.72
30.0	-3.0			.95441	591.9	.00481	.001043	.00488	.001059	1.62
28.0	-3.0			.96163	588.5	.00305	.000662			1.12
34.0	-12.0			.95886	585.9	.00282	.000612	.00283	.000614	.99
32.0	-12.0			.95830	585.9	.00287	.000623	.00287	.000623	1.02
30.0	-12.0			.95886	586.2	.00287	.000623	.00287	.000623	.98
19.0	-12.5			.95997	587.2	.00288	.000625			.98
17.5	-11.0			.96108	587.9	.00290	.000629			.97
15.5	-2.5			.95941	587.2	.00317	.000688			1.05
16.5	-2.5			.95719	585.5	.00289	.000627	.00285	.000618	.97
17.5	-2.5			.95663	585.5	.00318	.000690	.00314	.000681	1.05
18.5	-2.5			.96052	587.9	.00293	.000636	.00302	.000655	.98
19.5	-2.5			.95663	585.5	.00296	.000642	.00292	.000633	.99
20.5	-2.5			.95552	584.9	.00318	.000690	.00314	.000681	1.04
21.5	-2.5			.95886	586.9	.00296	.000642	.00304	.000659	.99
22.5	-2.5			.95663	585.2	.00295	.000640	.00291	.000631	.98
23.5	-2.5			.95719	585.5	.00298	.000646	.00297	.000644	.99
24.5	-2.5			.95941	586.5	.00285	.000618			.97
36.0	-16.0			.95774	587.2	.00281	.000610			1.03
36.0	-12.0			.95774	584.9	.00282	.000612	.00282	.000612	.97
32.0	-18.0			.96052	588.9	.00280	.000607			.98
32.0	-16.0			.95886	585.9	.00283	.000614	.00283	.000614	.98
32.0	-14.0			.95830	587.5	.00281	.000610	.00280	.000607	.97
32.0	-10.0			.95830	585.9	.00282	.000614			.96
28.0	-14.0			.95830	585.9	.00279	.000605			.96
28.0	-12.0			.95830	585.5	.00274	.000594			.98
26.0	-12.5			.95886	586.2	.00283	.000614			.98
24.5	-11.0			.95830	585.2	.00270	.000586			.93
22.0	-12.5			.95941	586.9	.00292	.000633	.00292	.000633	.99
20.5	-11.0			.95886	586.5	.00295	.000640	.00295	.000640	1.01
34.0	-1.0			.94051	577.2	.00349	.000757	.00341	.000740	1.31
34.0	4.0			.94218	581.2	.00411	.000892	.00411	.000891	1.36
34.0	5.0			.94440	580.5	.00394	.000854	.00340	.000742	1.38
34.0	6.0			.95330	584.5	.00321	.000696	.00320	.000696	1.06
36.0	6.0			.95107	582.9	.00322	.000698			1.05
38.0	1.0			.95330	589.2	.00480	.001041	.00483	.001048	1.62
38.0	2.0			.93773	577.9	.00402	.000872			1.40
44.0	8.0			.95441	583.5	.00284	.000616	.00285	.000618	.94
44.0	6.0			.93884	574.5	.00297	.000644	.00290	.000629	.99
44.0	4.0			.94273	580.5	.00328	.000711	.00328	.000711	1.10
44.0	2.0			.94607	581.5	.00364	.000790	.00358	.000777	1.23
44.0	1.0			.95941	587.9	.00304	.000659	.00299	.000649	1.11
6.0	.0			.95608	589.9	.00411	.000891			1.00
6.0	10.0			.95608	590.5	.00441	.000957			1.01
12.0	.0			.95663	588.5	.00368	.000798			.99
12.0	6.0			.95496	588.2	.00381	.000826			.99
12.0	10.0			.95330	587.9	.00397	.000861			.98
18.0	.0			.95552	586.9	.00358	.000777			1.01
30.0	.0			.95441	586.2	.00359	.000779			1.03
42.0	.0			.95496	585.2	.00320	.000694			1.02

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(c) M = 2.65; R = 2.41×10^6

x, in.	y, in.	z, in. [a]	ϕ, deg [a]	$\frac{T_e}{T_t}$	T_w, °R	h [b]	N_{St}	h_c [b]	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.97445	592.5	.00177	.000432			1.11
12.0	.0			.96834	588.2	.00168	.000410			1.12
20.5	.0			.97001	589.2	.00166	.000405			1.09
28.0	12.0			.96612	587.2	.00189	.000461			1.21
28.0	4.0			.97167	590.2	.00166	.000405			1.14
28.0	.0			.97056	597.5	.00285	.000696			1.91
20.5	-5.0			.97167	591.5	.00170	.000415			1.14
24.5	-5.0			.97112	589.5	.00161	.000393			1.19
30.0	.0			.97389	604.9	.00508	.001240	.00491	.001198	3.43
31.0	12.0			.96668	587.5	.00165	.000403			1.16
34.0	.0			.96112	584.2	.00190	.000464	.00207	.000505	1.45
2.0	-12.0			.97889	594.5	.00168	.000410			1.08
2.0	12.0			.97501	592.9	.00188	.000459			1.03
12.0	-12.0			.97445	591.9	.00168	.000410			1.19
12.0	12.0			.96668	588.2	.00177	.000432			1.11
30.0	1.0			.96445	595.5	.00408	.000996			3.09
31.0	2.0			.95501	589.2	.00384	.000937			2.59
32.0	2.0			.94946	587.2	.00417	.001018	.00420	.001025	3.21
32.0	3.0			.94946	582.2	.00288	.000703			1.88
32.0	6.0			.96723	588.5	.00185	.000451			1.30
34.0	1.0			.94668	576.9	.00218	.000532	.00199	.000486	1.63
34.0	2.0			.93891	578.9	.00346	.000844	.00339	.000827	2.44
34.0	3.0			.94835	584.9	.00319	.000779	.00324	.000791	2.23
36.0	.0			.97501	592.5	.00203	.000495	.00203	.000495	
38.0	.0			.98334	602.9	.00293	.000715	.00304	.000742	2.19
40.0	.0			.97778	593.2	.00160	.000390	.00153	.000373	
44.0	12.0			.97278	591.2	.00187	.000456			1.39
42.0	.0			.98056	597.2	.00201	.000491	.00201	.000491	1.48
44.0	.0			.99222	601.9	.00159	.000388	.00160	.000390	1.17
48.0	.0			.98500	597.5	.00163	.000398	.00162	.000395	1.12
52.0	.0			.98556	598.9	.00185	.000451	.00187	.000456	1.26
52.0	12.0			.97112	589.5	.00160	.000390			1.09
55.0	.0			.97389	590.2	.00151	.000369	.00147	.000359	1.09
58.0	.0			.98222	596.5	.00165	.000403			1.18
58.0	12.0			.96890	588.2	.00162	.000395			1.06
58.0	-12.0			.97223	589.5	.00148	.000361			.96
44.0	-12.0			.97778	593.5	.00156	.000381			1.06
36.0	-8.0			.97556	591.9	.00156	.000381			1.06
36.0	-3.0			.95279	582.5	.00251	.000613			1.71
34.0	-3.0			.94835	581.9	.00289	.000705	.00288	.000703	2.19
32.0	-3.0			.95057	584.9	.00291	.000710	.00287	.000700	1.97
30.0	-3.0			.96445	593.9	.00288	.000703	.00292	.000713	1.95
28.0	-3.0			.97612	592.9	.00186	.000454			1.27
34.0	-12.0			.97389	590.9	.00160	.000390	.00160	.000390	1.21
32.0	-12.0			.97334	590.9	.00159	.000388	.00159	.000388	1.17
30.0	-12.0			.97389	591.2	.00159	.000388	.00160	.000390	1.09
19.0	-12.5			.97445	591.2	.00161	.000393			1.18
17.5	-11.0			.97556	592.2	.00163	.000398			1.18
15.5	-2.5			.97223	590.9	.00188	.000459			1.29
16.5	-2.5			.97112	589.5	.00164	.000400	.00161	.000393	1.12
17.5	-2.5			.97056	589.5	.00166	.000405	.00161	.000393	1.13
18.5	-2.5			.97445	591.9	.00161	.000393	.00170	.000415	1.17
19.5	-2.5			.97056	590.9	.00170	.000415	.00166	.000405	1.16
20.5	-2.5			.96945	590.5	.00171	.000417	.00167	.000408	1.22
21.5	-2.5			.97278	590.9	.00164	.000400	.00170	.000415	1.11
22.5	-2.5			.97056	589.5	.00160	.000390	.00157	.000383	1.16
23.5	-2.5			.97112	589.5	.00165	.000403	.00163	.000398	1.11
24.5	-2.5			.97278	590.5	.00156	.000381			1.05
36.0	-16.0			.97223	591.2	.00158	.000386			1.22
36.0	-12.0			.97278	591.9	.00158	.000386	.00158	.000386	1.07
32.0	-18.0			.97501	591.5	.00157	.000383			1.07
32.0	-16.0			.97334	590.5	.00158	.000386	.00158	.000386	1.22
32.0	-14.0			.97223	592.5	.00152	.000371	.00151	.000369	1.18
32.0	-10.0			.97389	590.9	.00153	.000373			1.13
28.0	-14.0			.97278	590.5	.00157	.000383			1.06
28.0	-12.0			.97334	590.5	.00158	.000386			1.21
26.0	-12.5			.97334	590.9	.00156	.000381			1.17
24.5	-11.0			.97278	591.5	.00180	.000439			1.38
22.0	-12.5			.97389	591.2	.00163	.000398	.00163	.000398	1.10
20.5	-11.0			.97389	591.2	.00161	.000393	.00161	.000393	1.09
34.0	-1.0			.95390	580.2	.00200	.000488	.00193	.000471	1.56
34.0	4.0			.95557	583.5	.00239	.000583	.00240	.000586	1.61
34.0	5.0			.95890	585.9	.00210	.000513	.00205	.000500	1.44
34.0	6.0			.96612	587.2	.00170	.000415	.00169	.000412	1.21
34.0	6.0			.96556	587.2	.00172	.000420			1.15
36.0	6.0			.97223	595.2	.00299	.000730	.00306	.000747	2.02
38.0	1.0			.95557	583.9	.00240	.000586			1.74
38.0	2.0			.97001	591.5	.00153	.000373	.00157	.000383	1.09
44.0	8.0			.95835	581.9	.00166	.000405	.00162	.000395	1.08
44.0	6.0			.95946	583.5	.00191	.000466	.00190	.000464	1.35
44.0	4.0			.96334	587.9	.00228	.000556	.00222	.000542	1.63
44.0	2.0			.97723	594.5	.00188	.000459	.00187	.000456	1.39
44.0	1.0			.96334	586.9	.00192	.000469			1.41
6.0	.0			.96279	583.5	.00102	.000249			1.20
6.0	10.0			.96612	590.9	.00265	.000647			1.17
12.0	.0			.96390	590.5	.00269	.000656			1.15
12.0	5.0			.96223	589.5	.00268	.000654			1.17
12.0	10.0			.96556	589.2	.00229	.000559			1.15
18.0	.0			.96612	588.9	.00225	.000549			1.20
30.0	.0			.96723	588.5	.00191	.000466			1.14
42.0	.0									

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(d) M = 3.51; R = 4.36 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.93749	579.5	.00268	.000505			1.03
12.0	.0			.93529	577.5	.00244	.000460			1.03
20.5	.0			.93529	577.2	.00226	.000426			.91
28.0	12.0			.93091	574.5	.00268	.000505			1.03
28.0	4.0			.93694	578.9	.00250	.000471			1.00
28.0	.0			.94297	593.2	.00441	.000831			1.77
20.5	-5.0			.93584	577.5	.00229	.000431			.98
24.5	-5.0			.93639	577.5	.00245	.000462			1.02
30.0	.0			.95229	609.9	.00710	.001337	.00708	.001334	3.10
31.0	12.0			.93145	574.9	.00250	.000471			.99
34.0	.0			.92104	567.5	.00227	.000428	.00252	.000475	.95
2.0	-12.0			.93858	580.2	.00251	.000473			1.02
2.0	12.0			.93694	578.2	.00246	.000463			.97
12.0	-12.0			.93913	580.2	.00241	.000454			.98
12.0	12.0			.93255	575.9	.00253	.000477			.98
30.0	1.0			.93858	592.9	.00591	.001113			2.43
31.0	2.0			.92597	583.9	.00601	.001132			2.56
32.0	2.0			.91884	582.9	.00652	.001228	.00661	.001245	2.74
32.0	3.0			.91501	572.5	.00445	.000838			1.74
32.0	6.0			.93145	577.2	.00311	.000586			1.22
34.0	1.0			.90349	559.9	.00307	.000578	.00259	.000488	1.24
34.0	2.0			.90130	572.9	.00567	.001068	.00571	.001076	2.26
34.0	3.0			.90952	570.9	.00474	.000893	.00476	.000897	1.84
36.0	.0			.93365	575.9	.00262	.000494	.00257	.000484	
38.0	.0			.95174	593.5	.00388	.000731	.00405	.000763	1.56
40.0	.0			.94626	582.5	.00198	.000373	.00191	.000360	
44.0	12.0			.93694	578.5	.00254	.000478			1.12
42.0	.0			.94681	584.9	.00250	.000471	.00248	.000467	1.00
44.0	.0			.95997	590.5	.00201	.000379	.00204	.000384	.86
48.0	.0			.95503	587.9	.00205	.000386	.00204	.000384	.88
52.0	.0			.95723	589.9	.00231	.000435	.00233	.000439	.94
52.0	12.0			.94023	579.9	.00244	.000460			1.05
55.0	.0			.94681	582.9	.00199	.000375	.00196	.000369	.81
58.0	.0			.95394	587.9	.00212	.000399			.85
58.0	12.0			.93803	578.5	.00245	.000462			.99
58.0	-12.0			.93913	579.9	.00246	.000463			1.02
44.0	-12.0			.94132	581.2	.00246	.000463			1.09
36.0	-8.0			.93858	579.5	.00240	.000452			1.03
36.0	-3.0			.91062	569.2	.00422	.000795			1.76
34.0	-3.0			.90952	572.5	.00445	.000838	.00443	.000835	1.92
32.0	-3.0			.91720	576.5	.00437	.000823	.00433	.000816	1.88
30.0	-3.0			.93365	584.9	.00462	.000833	.00450	.000848	1.79
28.0	-3.0			.94078	581.9	.00272	.000512			1.12
34.0	-12.0			.93584	577.9	.00243	.000458	.00243	.000458	1.04
32.0	-12.0			.93639	578.5	.00246	.000463	.00247	.000465	1.01
30.0	-12.0			.93639	578.5	.00247	.000465	.00247	.000465	1.02
19.0	-12.5			.93858	579.5	.00226	.000426			.99
17.5	-11.0			.93968	580.2	.00239	.000450			.99
15.5	-2.5			.93913	579.9	.00244	.000460			1.00
16.5	-2.5			.93639	577.9	.00246	.000463	.00243	.000458	1.05
17.5	-2.5			.93529	577.2	.00243	.000458	.00237	.000446	.98
18.5	-2.5			.93968	579.5	.00227	.000428	.00237	.000446	.94
19.5	-2.5			.93529	577.2	.00240	.000452	.00236	.000445	.98
20.5	-2.5			.93420	576.5	.00244	.000460	.00238	.000448	1.02
21.5	-2.5			.93694	578.2	.00228	.000430	.00236	.000445	.94
22.5	-2.5			.93474	576.5	.00224	.000422	.00219	.000413	.88
23.5	-2.5			.93529	577.2	.00226	.000426	.00226	.000426	.91
24.5	-2.5			.93694	578.2	.00230	.000433			.99
36.0	-16.0			.93420	576.5	.00247	.000465			1.09
36.0	-12.0			.93474	577.2	.00228	.000430	.00228	.000430	1.00
32.0	-18.0			.93529	579.2	.00232	.000437			1.02
32.0	-16.0			.93529	581.2	.00236	.000445	.00236	.000445	.98
32.0	-14.0			.93584	576.9	.00227	.000428	.00226	.000426	.95
32.0	-10.0			.93639	580.2	.00232	.000437			.95
28.0	-14.0			.93584	577.9	.00237	.000446			.98
28.0	-12.0			.93584	577.9	.00247	.000465			1.08
26.0	-12.5			.93639	581.9	.00236	.000445			1.02
24.5	-11.0			.93420	577.9	.00251	.000473			1.14
22.0	-12.5			.93749	578.9	.00239	.000450	.00239	.000450	1.00
23.6	-11.0			.93749	578.9	.00239	.000450	.00239	.000450	1.04
34.0	-1.6			.91172	563.5	.00276	.000520	.00264	.000497	1.24
34.0	4.0			.91720	571.5	.00363	.000684	.00364	.000686	1.46
34.0	5.0			.92049	571.9	.00324	.000610	.00318	.000599	1.76
34.0	6.0			.92871	576.5	.00288	.000543	.00288	.000543	1.15
36.0	6.0			.92597	573.5	.00279	.000526			1.11
38.0	1.0			.93584	582.9	.00368	.000693	.00374	.000705	1.49
38.0	2.0			.91610	569.9	.00348	.000656			1.46
44.0	8.0			.93200	575.5	.00237	.000446	.00239	.000450	.95
44.0	6.0			.91610	568.2	.00294	.000554	.00287	.000541	1.20
44.0	4.0			.92268	572.2	.00316	.000595	.00318	.000599	1.27
44.0	2.0			.92487	574.9	.00279	.000526	.00265	.000499	1.13
44.0	1.0			.94132	585.9	.00256	.000482	.00258	.000486	1.08
6.0	.0			.93694	583.2	.00354	.000667			.99
6.0	10.0			.93639	582.9	.00371	.000699			.97
12.0	.0			.93749	581.9	.00313	.000590			.98
12.0	5.0			.93529	581.2	.00312	.000588			.95
12.0	10.0			.93310	579.5	.00331	.000624			.97
18.0	.0			.93529	579.9	.00296	.000558			.98
30.0	.0			.93474	579.2	.00286	.000539			.97
42.0	.0			.93529	578.5	.00255	.000480			.92

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(e) M = 3.51; R = 3.03 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94566	575.9	.00192	.000517			1.03
12.0	.0			.94178	572.9	.00175	.000471			1.04
20.5	.0			.94234	573.2	.00175	.000471			1.04
28.0	12.0			.93735	570.2	.00181	.000487			.98
28.0	4.0			.94345	574.2	.00179	.000482			1.02
28.0	.0			.94677	585.5	.00344	.000926			2.05
20.5	-5.0			.94400	573.9	.00175	.000471			.97
24.5	-5.0			.94345	573.5	.00172	.000463			1.04
30.0	.0			.95287	594.9	.00600	.001616	.00578	.001555	3.61
31.0	12.0			.93846	570.9	.00184	.000495			1.03
34.0	.0			.92737	563.2	.00172	.000463	.00192	.000517	1.06
2.0	-12.0			.94899	577.5	.00178	.000479			1.02
2.0	12.0			.94566	575.5	.00185	.000498			1.02
12.0	-12.0			.94733	576.2	.00196	.000528			1.14
12.0	12.0			.93957	571.5	.00181	.000487			.99
30.0	1.0			.94067	583.2	.00467	.001257			2.58
31.0	2.0			.92848	575.2	.00447	.001204			2.55
32.0	2.0			.92182	574.2	.00334	.001438	.00541	.001457	3.28
32.0	3.0			.91961	565.9	.00330	.000889			1.83
32.0	6.0			.93735	573.9	.00221	.000595			1.22
32.0	9.0			.91129	556.2	.00229	.000617	.00199	.000536	1.30
34.0	1.0			.90686	565.5	.00444	.001196	.00448	.001206	2.45
34.0	2.0			.91573	564.5	.00361	.000972	.00362	.000975	1.99
34.0	3.0			.93901	570.9	.00200	.000539	.00196	.000528	
36.0	.0			.95731	587.5	.00330	.000889	.00341	.000918	1.99
38.0	.0			.95287	578.5	.00152	.000409	.00145	.000390	
40.0	.0			.94345	574.2	.00185	.000498			1.08
44.0	12.0			.95539	581.5	.00197	.000530	.00196	.000528	1.19
42.0	.0			.96729	586.9	.00153	.000412	.00155	.000417	.94
44.0	.0			.96285	584.2	.00153	.000412	.00155	.000417	.85
48.0	.0			.96396	585.5	.00168	.000452	.00169	.000455	1.03
52.0	.0			.94677	575.5	.00168	.000452			1.02
52.0	12.0			.95343	578.5	.00149	.000401	.00146	.000393	.91
56.0	.0			.96119	583.5	.00160	.000431			.98
58.0	.0			.94511	574.5	.00168	.000452			.95
58.0	12.0			.94733	575.9	.00164	.000442			.91
58.0	-12.0			.94899	577.2	.00176	.000474			1.07
44.0	-12.0			.94566	574.9	.00195	.000525			1.23
36.0	-8.0			.91794	564.2	.00347	.000934			1.94
36.0	-3.0			.91517	568.5	.00342	.000921	.00340	.000916	2.15
34.0	-3.0			.92127	566.2	.00326	.000878	.00321	.000864	1.98
32.0	-3.0			.93790	577.5	.00330	.000889	.00337	.000907	1.82
30.0	-3.0			.94733	577.2	.00209	.000563			1.29
28.0	-3.0			.94400	574.2	.00172	.000463	.00172	.000463	1.06
34.0	-12.0			.94455	575.9	.00180	.000485	.00181	.000487	.99
32.0	-12.0			.94455	574.5	.00172	.000463	.00172	.000463	.96
30.0	-12.0			.94677	577.2	.00179	.000482			1.13
19.0	-12.5			.94788	576.2	.00172	.000463			1.07
17.5	-11.0			.94622	575.5	.00176	.000474			1.01
15.5	-2.5			.94345	573.5	.00176	.000474	.00173	.000466	1.08
16.5	-2.5			.94178	576.2	.00183	.000493	.00186	.000501	1.08
17.5	-2.5			.94622	575.5	.00196	.000528	.00205	.000552	1.20
18.5	-2.5			.94234	573.2	.00179	.000482	.00175	.000471	1.09
19.5	-2.5			.94123	572.5	.00175	.000471	.00170	.000458	.99
20.5	-2.5			.94400	574.2	.00175	.000471	.00182	.000490	1.07
21.5	-2.5			.94123	572.5	.00174	.000469	.00169	.000455	1.05
22.5	-2.5			.94234	573.2	.00197	.000530	.00197	.000530	1.17
23.5	-2.5			.94400	573.9	.00174	.000469			1.09
24.5	-2.5			.94178	572.5	.00171	.000460			1.08
36.0	-16.0			.94234	574.5	.00180	.000485	.00180	.000485	1.13
36.0	-12.0			.94345	573.5	.00171	.000460			1.10
32.0	-18.0			.94289	573.5	.00172	.000463	.00172	.000463	1.06
32.0	-16.0			.94289	572.9	.00170	.000458	.00169	.000455	1.04
32.0	-14.0			.94400	574.2	.00173	.000466			1.07
32.0	-10.0			.94345	573.2	.00180	.000485			1.13
28.0	-14.0			.94400	573.9	.00172	.000463			1.08
28.0	-12.0			.94400	574.2	.00172	.000463			1.04
26.0	-12.5			.94455	573.9	.00177	.000477			1.12
24.5	-11.0			.94568	575.2	.00175	.000471	.00175	.000471	1.10
22.0	-12.5			.94511	574.9	.00172	.000463	.00172	.000463	1.04
20.5	-11.0			.92072	560.2	.00206	.000555	.00200	.000539	1.32
34.0	-1.0			.92404	566.5	.00279	.000751	.00281	.000757	1.67
34.0	4.0			.92792	567.2	.00238	.000645	.00237	.000638	1.63
34.0	5.0			.93458	572.2	.00207	.000557	.00206	.000555	1.40
34.0	6.0			.93367	569.2	.00205	.000552			1.19
36.0	6.0			.94400	579.5	.00293	.000789	.00303	.000816	1.62
38.0	1.0			.92571	566.5	.00265	.000714			1.46
38.0	2.0			.93961	571.2	.00179	.000482	.00181	.000487	1.08
44.0	8.0			.92519	564.9	.00214	.000576	.00209	.000563	1.21
44.0	6.0			.93069	568.5	.00240	.000646	.00241	.000649	1.42
44.0	4.0			.93462	570.2	.00208	.000560	.00196	.000528	1.27
44.0	2.0			.95065	579.2	.00214	.000576	.00216	.000582	1.32
44.0	1.0			.94163	577.2	.00297	.000800			1.10
54.0	.0			.94067	576.9	.00291	.000784			1.00
6.0	10.0			.94234	576.2	.00246	.000662			1.03
12.0	.0			.94012	575.5	.00251	.000676			1.01
12.0	5.0			.93790	573.9	.00255	.000687			.98
12.0	10.0			.94012	574.2	.00232	.000625			1.09
18.0	.0			.94012	573.9	.00235	.000579			1.02
30.0	.0			.94123	573.5	.00194	.000522			1.03
42.0	.0									

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(f) M = 3.51; R = 1.66×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95811	576.9	.00113	.000540			1.09
12.0	.0			.95197	572.2	.00113	.000540			1.13
20.5	.0			.95420	573.2	.00112	.000536			.92
28.0	12.0			.94918	571.5	.00126	.000602			1.22
28.0	4.0			.95476	573.5	.00112	.000536			1.06
28.0	.0			.95420	580.2	.00224	.001071			2.13
20.5	-5.0			.95588	574.2	.00112	.000536			1.08
24.5	-5.0			.95532	573.9	.00112	.000536			1.29
30.0	.0			.95532	587.9	.00405	.001937	.00421	.002013	4.66
31.0	12.0			.95030	570.9	.00112	.000536			1.12
34.0	.0			.93578	561.9	.00111	.000531			1.22
2.0	-12.0			.96146	577.9	.00112	.000536			1.20
2.0	12.0			.95700	575.2	.00112	.000536			1.12
12.0	-12.0			.95811	575.9	.00112	.000536			1.22
12.0	12.0			.95030	570.9	.00113	.000540			1.12
30.0	1.0			.94471	577.9	.00328	.001568			3.38
31.0	2.0			.93243	567.9	.00305	.001458			3.14
32.0	2.0			.92572	568.2	.00329	.001573	.00334	.001597	3.43
32.0	3.0			.92405	561.2	.00216	.001033			2.16
32.0	6.0			.94639	571.2	.00141	.000674			1.42
34.0	1.0			.92237	556.2	.00144	.000689			1.57
34.0	2.0			.91344	558.2	.00297	.001420	.00287	.001372	2.41
34.0	3.0			.92126	558.5	.00244	.001167	.00240	.001148	2.44
36.0	.0			.94583	570.5	.00134	.000641	.00125	.000598	
38.0	.0			.96370	582.9	.00211	.001009	.00220	.001052	2.37
40.0	.0			.96146	576.9	.00093	.000445	.00088	.000421	
44.0	12.0			.95476	573.9	.00112	.000536			1.11
42.0	.0			.96537	581.5	.00124	.000593	.00123	.000588	1.01
44.0	.0			.97766	586.2	.00080	.000383	.00083	.000397	.87
48.0	.0			.97096	582.2	.00085	.000406	.00084	.000402	.89
52.0	.0			.97040	582.9	.00098	.000469	.00099	.000473	.96
52.0	12.0			.95532	574.5	.00100	.000478			.96
55.0	.0			.95755	574.5	.00089	.000426	.00086	.000411	.97
58.0	.0			.96761	580.5	.00092	.000440			.96
58.0	12.0			.95365	572.5	.00094	.000449			1.01
58.0	-12.0			.95644	574.2	.00105	.000502			1.14
44.0	-12.0			.96035	576.9	.00106	.000507			1.16
36.0	-8.0			.95588	574.2	.00109	.000521			1.20
36.0	-3.0			.92684	560.9	.00221	.001057			2.28
34.0	-3.0			.92070	557.9	.00217	.001038	.00215	.001028	2.21
32.0	-3.0			.92517	559.9	.00216	.001033	.00216	.001033	2.35
30.0	-3.0			.94415	572.2	.00238	.001138	.00242	.001157	2.27
28.0	-3.0			.95867	578.5	.00133	.000636			1.34
34.0	-12.0			.95644	574.5	.00109	.000521	.00109	.000521	1.18
32.0	-12.0			.95644	574.9	.00107	.000512	.00108	.000516	1.22
30.0	-12.0			.95755	575.9	.00112	.000536	.00112	.000536	1.22
19.0	-12.5			.95811	575.5	.00106	.000507			1.15
17.5	-11.0			.95867	575.9	.00107	.000512			1.16
15.5	-2.5			.95644	574.5	.00111	.000531			1.10
16.5	-2.5			.95420	573.2	.00109	.000521	.00106	.000507	1.28
17.5	-2.5			.95420	573.2	.00109	.000521	.00104	.000497	1.09
18.5	-2.5			.95811	575.5	.00108	.000516	.00118	.000564	1.17
19.5	-2.5			.95420	573.2	.00109	.000521	.00104	.000497	1.18
20.5	-2.5			.95365	572.9	.00109	.000521	.00105	.000502	1.18
21.5	-2.5			.95644	574.5	.00108	.000516	.00115	.000550	1.17
22.5	-2.5			.95365	572.9	.00109	.000521	.00105	.000502	1.10
23.5	-2.5			.95476	573.5	.00109	.000521	.00109	.000521	1.10
24.5	-2.5			.95644	575.2	.00112	.000536			1.22
36.0	-16.0			.95476	573.5	.00103	.000493			1.17
36.0	-12.0			.95588	574.2	.00103	.000493	.00103	.000493	1.18
32.0	-18.0			.95588	574.2	.00109	.000521			1.24
32.0	-16.0			.95588	574.2	.00106	.000507	.00106	.000507	1.09
32.0	-14.0			.95588	573.9	.00111	.000531	.00110	.000526	1.28
32.0	-10.0			.95700	574.9	.00106	.000507			1.15
28.0	-14.0			.95700	574.5	.00108	.000516			1.17
28.0	-12.0			.95700	574.5	.00107	.000512			1.16
26.0	-12.5			.95700	574.9	.00108	.000516			1.24
24.5	-11.0			.95700	575.2	.00100	.000478			1.14
22.0	-12.5			.95755	575.2	.00112	.000536	.00112	.000536	1.11
20.5	-11.0			.95755	575.2	.00106	.000507	.00106	.000507	1.15
34.0	-1.0			.93075	560.5	.00129	.000617	.00124	.000593	1.61
34.0	4.0			.93187	562.5	.00177	.000846	.00182	.000870	1.79
34.0	5.0			.93689	564.5	.00150	.000717	.00147	.000703	1.72
34.0	6.0			.94359	570.2	.00136	.000650	.00135	.000646	1.45
36.0	6.0			.94415	568.9	.00127	.000607			1.03
38.0	1.0			.95476	577.5	.00193	.000923	.00207	.000990	2.01
38.0	2.0			.93857	566.2	.00175	.000837			1.88
44.0	8.0			.95141	571.5	.00103	.000493	.00105	.000502	1.04
44.0	6.0			.94024	566.9	.00141	.000674	.00131	.000626	1.15
44.0	4.0			.94359	568.2	.00137	.000655	.00137	.000655	1.38
44.0	2.0			.94918	573.9	.00135	.000646	.00126	.000602	1.39
44.0	1.0			.96314	579.2	.00131	.000626	.00133	.000636	1.35
6.0	.0			.94471	571.9	.00212	.001014			1.07
6.0	10.0			.94471	571.5	.00201	.000961			.93
12.0	.0			.94918	574.5	.00182	.000870			1.17
12.0	5.0			.94694	571.9	.00176	.000842			1.07
12.0	10.0			.94471	570.5	.00178	.000851			.97
18.0	.0			.94918	572.2	.00173	.000827			1.25
30.0	.0			.95030	572.5	.00143	.000684			1.21
42.0	.0			.95197	573.5	.00126	.000602			1.02

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(g) M = 4.44; R = 4.61×10^6

x, in.	y, in.	z, in. [a]	∅, deg [a]	$\frac{T_e}{T_t}$	T_w, °R	h [b]	N_{St}	h_c [b]	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.93485	572.5	.00128	.000322			1.52
12.0	.0			.92993	567.5	.00097	.000244			1.15
20.5	.0			.93047	568.2	.00097	.000244			1.05
28.0	12.0			.92664	567.2	.00155	.000390			1.23
28.0	4.0			.93266	569.9	.00138	.000347			1.64
28.0	.0			.93814	576.5	.00224	.000564			2.33
28.5	-5.0			.93157	568.9	.00108	.000272			1.30
24.5	-5.0			.93047	568.5	.00108	.000272			1.46
30.0	.0			.94033	579.2	.00349	.000878	.00371	.000933	3.79
31.0	12.0			.92774	567.2	.00132	.000332			1.06
34.0	.0			.90748	554.5	.00097	.000244	.00126	.000317	1.31
2.0	-12.0			.93704	572.2	.00141	.000355			1.27
2.0	12.0			.93540	572.5	.00154	.000387			
12.0	-12.0			.93376	570.5	.00164	.000413			1.73
12.0	12.0			.92828	568.5	.00155	.000392			1.24
30.0	1.0			.92774	570.2	.00278	.000699			3.31
31.0	2.0			.91350	561.5	.00317	.000797			3.77
32.0	2.0			.90639	558.5	.00380	.000956	.00387	.000974	4.52
32.0	3.0			.90201	552.9	.00224	.000564			2.02
32.0	4.0			.92390	565.9	.00156	.000392			1.36
32.0	6.0			.89544	547.2	.00143	.000360			1.70
34.0	1.0			.88996	547.2	.00321	.000808	.00299	.000752	3.82
34.0	2.0			.89708	551.5	.00235	.000591	.00268	.000674	2.10
34.0	3.0			.91460	558.2	.00099	.000249	.00091	.000229	
36.0	.0			.93595	572.9	.00166	.000418	.00180	.000453	2.24
38.0	.0			.93595	572.2	.00094	.000236	.00088	.000221	
40.0	.0			.93321	570.2	.00136	.000342			1.14
44.0	12.0			.93868	573.9	.00108	.000272	.00103	.000259	1.27
42.0	.0			.95127	580.2	.00079	.000199	.00084	.000211	.95
44.0	.0			.94908	578.5	.00078	.000196	.00078	.000196	.89
48.0	.0			.94799	577.9	.00084	.000211	.00085	.000214	.91
52.0	.0			.93266	569.9	.00108	.000272			.89
52.0	12.0			.93649	572.5	.00094	.000236	.00081	.000204	1.24
55.0	.0			.94744	578.5	.00085	.000214			1.01
58.0	.0			.93211	569.2	.00122	.000307			1.03
58.0	12.0			.93376	569.9	.00107	.000269			1.00
58.0	-12.0			.93649	572.5	.00129	.000325			1.47
44.0	-12.0			.92828	566.5	.00126	.000317			1.43
36.0	-8.0			.89982	555.2	.00233	.000586			2.95
36.0	-3.0			.89653	550.9	.00234	.000589	.00228	.000574	2.62
34.0	-3.0			.90310	553.2	.00174	.000438	.00164	.000413	2.35
32.0	-3.0			.92664	568.2	.00204	.000513	.00213	.000536	2.76
30.0	-3.0			.93649	575.2	.00154	.000387			1.86
28.0	-3.0			.93211	570.9	.00144	.000362	.00145	.000365	1.31
34.0	-12.0			.93211	569.2	.00138	.000347	.00145	.000365	1.64
32.0	-12.0			.93266	571.2	.00144	.000362	.00145	.000365	1.31
30.0	-12.0			.93321	570.2	.00164	.000413			1.95
19.0	-12.5			.93376	570.2	.00135	.000340			1.61
17.5	-11.0			.93321	569.5	.00096	.000242			1.16
15.5	-2.5			.93047	568.5	.00108	.000272	.00104	.000262	1.29
16.5	-2.5			.92938	568.2	.00109	.000274	.00098	.000247	1.47
17.5	-2.5			.93376	570.5	.00108	.000272	.00126	.000317	1.38
18.5	-2.5			.92993	568.2	.00108	.000272	.00101	.000254	1.29
19.5	-2.5			.92938	567.9	.00108	.000272	.00099	.000249	1.17
20.5	-2.5			.93211	569.5	.00108	.000272	.00120	.000302	1.46
21.5	-2.5			.92938	567.9	.00109	.000274	.00100	.000252	1.30
22.5	-2.5			.93047	568.5	.00108	.000272	.00107	.000269	1.46
23.5	-2.5			.93211	569.5	.00108	.000272			1.29
24.5	-2.5			.93047	569.9	.00144	.000362			1.30
36.0	-16.0			.93157	570.2	.00143	.000360	.00144	.000362	1.38
36.0	-12.0			.93102	569.2	.00140	.000352			1.17
32.0	-18.0			.93102	570.5	.00145	.000365	.00146	.000367	1.31
32.0	-16.0			.93047	568.2	.00164	.000413	.00163	.000410	1.78
32.0	-14.0			.93211	569.2	.00128	.000322			1.21
32.0	-10.0			.93157	570.5	.00144	.000362			1.30
28.0	-14.0			.93211	569.2	.00128	.000322			1.52
28.0	-12.0			.93211	569.2	.00133	.000335			1.24
26.0	-12.5			.93157	568.9	.00128	.000322			1.54
24.5	-11.0			.93266	571.2	.00144	.000362	.00144	.000362	1.50
22.0	-12.5			.93266	569.5	.00128	.000322	.00128	.000322	1.16
20.5	-11.0			.90474	552.5	.00089	.000224	.00089	.000224	1.09
34.0	-1.0			.90748	555.5	.00172	.000433	.00179	.000450	1.55
34.0	4.0			.91350	559.9	.00181	.000455	.00141	.000455	2.35
34.0	5.0			.91952	564.9	.00157	.000395	.00155	.000390	1.34
34.0	6.0			.91843	563.9	.00156	.000392			1.41
36.0	6.0			.92828	567.9	.00167	.000420	.00181	.000455	1.99
38.0	1.0			.91350	560.5	.00166	.000418			1.98
38.0	2.0			.92500	565.2	.00109	.000274	.00109	.000274	.96
44.0	8.0			.91788	563.2	.00165	.000415	.00161	.000405	1.49
44.0	6.0			.92007	563.9	.00158	.000397	.00159	.000400	1.42
44.0	4.0			.92226	565.2	.00147	.000370	.00126	.000317	1.75
44.0	2.0			.93759	572.9	.00107	.000269	.00097	.000244	1.22
44.0	1.0			.92828	568.2	.00168	.000423			1.06
6.0	.0			.92828	570.2	.00226	.000569			1.06
6.0	10.0			.92993	569.5	.00156	.000392			1.18
12.0	.0			.92883	569.9	.00180	.000453			1.22
12.0	5.0			.92719	568.2	.00199	.000501			1.05
12.0	10.0			.92883	568.5	.00155	.000390			1.17
18.0	.0			.92774	568.9	.00146	.000367			1.11
30.0	.0			.92938	567.9	.00135	.000340			1.22
42.0	.0									

[a] Thermocouple locations for which z and/or ∅ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Continued

17. Lox line - Continued

(h) M = 4.44; R = 3.26×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$
2.0	.0			.94541	573.9	.00094	.000335			.87
12.0	.0			.93935	569.2	.00089	.000317			1.02
20.5	.0			.94100	569.9	.00079	.000282			.91
28.0	12.0			.93604	569.9	.00102	.000364			1.10
28.0	4.0			.94210	571.9	.00094	.000335			1.15
28.0	.0			.94431	577.5	.00204	.000728			2.24
20.5	-5.0			.94210	570.5	.00082	.000292			.91
24.5	-5.0			.94155	569.9	.00076	.000271			.95
30.0	.0			.94376	579.5	.00306	.001091	.00327	.001166	3.73
31.0	12.0			.93714	569.9	.00100	.000357			1.09
34.0	.0			.91674	554.9	.00067	.000239			.74
2.0	-12.0			.94817	575.9	.00098	.000349			1.03
2.0	12.0			.94486	573.5	.00110	.000392			1.05
12.0	-12.0			.94431	572.9	.00094	.000335			1.00
12.0	12.0			.93769	569.5	.00095	.000339			.89
30.0	1.0			.93218	570.5	.00241	.000859			2.87
31.0	2.0			.91840	560.5	.00261	.000931			2.90
32.0	2.0			.91123	557.5	.00284	.001013	.00288	.001027	3.16
32.0	3.0			.90737	552.2	.00152	.000542			1.67
32.0	6.0			.93163	565.5	.00122	.000435			1.34
34.0	1.0			.90516	550.5	.00117	.000417	.00104	.000364	1.30
34.0	2.0			.89634	547.2	.00221	.000788	.00194	.000692	2.43
34.0	3.0			.90351	550.2	.00198	.000706	.00188	.000670	2.30
36.0	.0			.92226	559.2	.00077	.000275	.00074	.000264	
38.0	.0			.94321	573.9	.00134	.000478	.00147	.000524	1.61
40.0	.0			.94431	571.5	.00071	.000253	.00067	.000239	
44.0	12.0			.94321	571.9	.00086	.000307			1.10
42.0	.0			.94872	574.5	.00077	.000275	.00074	.000264	.85
44.0	.0			.96140	581.5	.00056	.000200	.00060	.000214	.62
48.0	.0			.95864	579.9	.00060	.000214	.00060	.000214	.75
52.0	12.0			.94210	570.9	.00076	.000271			.80
55.0	.0			.94596	572.5	.00067	.000239	.00062	.000221	.85
58.0	.0			.95920	580.5	.00064	.000228			.84
58.0	12.0			.94321	572.2	.00083	.000296			.91
58.0	-12.0			.94541	571.9	.00068	.000243			.89
44.0	-12.0			.94762	573.9	.00081	.000289			1.01
36.0	-8.0			.93824	568.9	.00083	.000296			1.09
36.0	-3.0			.90847	552.5	.00151	.000539			1.91
34.0	-3.0			.90296	550.5	.00182	.000649	.00177	.000631	2.02
32.0	-3.0			.90847	552.5	.00151	.000539	.00142	.000506	1.68
30.0	-3.0			.93218	567.5	.00189	.000674	.00197	.000703	2.36
28.0	-3.0			.94651	573.9	.00084	.000300			.92
34.0	-12.0			.94376	572.5	.00083	.000296	.00083	.000296	1.02
32.0	-12.0			.94376	572.2	.00093	.000332	.00094	.000335	1.02
30.0	-12.0			.94376	571.9	.00084	.000300	.00085	.000303	1.05
19.0	-12.5			.94431	572.5	.00093	.000332			1.02
17.5	-11.0			.94431	572.2	.00084	.000300			1.06
15.5	-2.5			.94321	571.9	.00093	.000332			1.15
16.5	-2.5			.94100	569.5	.00078	.000278	.00074	.000264	.82
17.5	-2.5			.93990	569.2	.00079	.000282	.00070	.000250	.94
18.5	-2.5			.94431	571.9	.00083	.000296	.00097	.000346	1.02
19.5	-2.5			.94045	569.2	.00081	.000289	.00073	.000260	1.00
20.5	-2.5			.93990	570.2	.00083	.000296	.00076	.000271	.99
21.5	-2.5			.94266	571.9	.00083	.000296			.87
22.5	-2.5			.93990	569.2	.00076	.000271	.00070	.000250	.84
23.5	-2.5			.94100	569.9	.00088	.000314	.00087	.000310	1.07
24.5	-2.5			.94266	571.9	.00083	.000296			.91
36.0	-16.0			.94155	570.5	.00083	.000296			1.12
36.0	-12.0			.94266	571.2	.00080	.000285	.00081	.000289	1.08
32.0	-18.0			.94266	571.5	.00087	.000310			.95
32.0	-16.0			.94210	572.2	.00099	.000353	.00099	.000353	1.08
32.0	-14.0			.94155	571.9	.00089	.000317	.00087	.000310	1.22
32.0	-10.0			.94321	571.5	.00083	.000296			1.02
28.0	-14.0			.94266	571.2	.00083	.000296			1.02
28.0	-12.0			.94321	571.9	.00093	.000332			1.02
26.0	-12.5			.94321	571.5	.00083	.000296			1.04
24.5	-11.0			.94266	571.5	.00093	.000332			1.26
22.0	-12.5			.94376	572.9	.00098	.000349	.00098	.000349	1.27
20.5	-11.0			.94321	571.5	.00086	.000307	.00086	.000307	.95
34.0	-1.0			.91399	556.9	.00086	.000307	.00088	.000314	1.08
34.0	4.0			.91454	557.9	.00148	.000528	.00155	.000553	1.70
34.0	5.0			.92170	562.2	.00139	.000496	.00140	.000499	2.17
34.0	6.0			.92722	562.9	.00123	.000439	.00121	.000432	1.35
36.0	6.0			.92832	562.9	.00086	.000307			.91
38.0	1.0			.93714	569.2	.00145	.000517	.00158	.000563	1.79
38.0	2.0			.92391	563.5	.00139	.000496			1.88
44.0	8.0			.93549	567.9	.00084	.000300	.00084	.000300	.92
44.0	6.0			.92887	564.9	.00136	.000485	.00133	.000474	1.49
44.0	4.0			.93053	565.9	.00136	.000485	.00136	.000485	1.79
44.0	2.0			.93439	566.5	.00085	.000303	.00079	.000282	1.05
44.0	1.0			.94817	574.2	.00077	.000275	.00079	.000282	.86
6.0	.0			.93549	570.5	.00159	.000567			.94
6.0	10.0			.93439	570.5	.00198	.000706			1.12
12.0	.0			.93824	572.2	.00136	.000485			.99
12.0	5.0			.93659	570.2	.00155	.000553			1.03
12.0	10.0			.93383	569.2	.00157	.000560			1.02
18.0	.0			.93714	569.5	.00114	.000407			.83
30.0	.0			.93714	568.5	.00119	.000424			.97
42.0	.0			.93880	569.2	.00085	.000303			.92

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

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TABLE IV. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 1.50 INCHES - Concluded

17. Lox line - Concluded

(i) M = 4.44; R = 2.17×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^0R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95376	577.9	.00072	.000385			.96
12.0	.0			.94880	574.6	.00063	.000337			1.09
20.0	.0			.95045	575.6	.00060	.000321			1.05
28.0	12.0			.94605	573.2	.00067	.000358			1.22
28.0	4.0			.95101	575.9	.00064	.000342			1.10
28.0	.0			.95046	581.6	.00149	.000797			2.01
20.0	-6.0			.95101	575.9	.00061	.000326			.98
30.0	.0			.94605	578.2	.00158	.001360	.00079	.001492	4.96
32.0	12.0			.94660	574.9	.00059	.000315			1.16
24.0	-12.0			.95541	579.2	.00089	.000476			1.59
24.0	12.0			.95211	577.5	.00090	.000481			1.41
12.0	-12.0			.95321	577.5	.00061	.000326			1.02
12.0	12.0			.94605	573.5	.00063	.000337			1.00
36.0	1.0			.93516	570.5	.00207	.001107			2.80
31.0	2.0			.92183	569.2	.00193	.001032			2.61
32.0	2.0			.91413	558.2	.00243	.001300	.00246	.001316	4.26
32.0	4.0			.91138	554.5	.00126	.000674			1.70
32.0	6.0			.93835	568.9	.00077	.000412			1.24
32.0	8.0			.91303	553.2	.00074	.000396	.00068	.000364	1.21
34.0	1.0			.90037	549.9	.00196	.001048	.00158	.000845	3.21
34.0	4.0			.90642	551.2	.00144	.000770	.00130	.000695	2.25
34.0	7.0			.94936	576.2	.00118	.000631	.00131	.000701	1.59
38.0	.0			.95101	575.9	.00057	.000305	.00054	.000289	
40.0	.0			.95266	577.2	.00088	.000471			1.80
44.0	12.0			.95705	579.2	.00057	.000305	.00054	.000289	.93
42.0	.0			.97027	586.9	.00039	.000209	.00043	.000230	.78
44.0	.0			.96697	584.9	.00042	.000225	.00042	.000225	.84
46.0	.0			.95211	576.2	.00057	.000305			1.14
46.0	12.0			.95486	577.9	.00041	.000219	.00036	.000193	.84
48.0	.0			.96697	585.2	.00044	.000235			.90
50.0	.0			.95211	576.6	.00058	.000310			.95
50.0	12.0			.95706	579.5	.00068	.000364			1.39
44.0	-12.0			.94715	573.2	.00062	.000332			1.27
36.0	-8.0			.91303	554.9	.00137	.000733			2.58
38.0	-8.0			.90587	550.9	.00130	.000695	.00124	.000663	2.13
34.0	-8.0			.91248	555.2	.00125	.000669	.00115	.000615	2.40
32.0	-8.0			.93614	569.2	.00138	.000738	.00143	.000765	2.09
30.0	-8.0			.95486	578.2	.00073	.000391			1.22
20.0	-8.0			.95321	577.2	.00088	.000471	.00088	.000471	1.80
34.0	-12.0			.95321	577.2	.00058	.000310	.00059	.000316	.97
32.0	-12.0			.95321	577.5	.00070	.000374	.00071	.000380	1.37
30.0	-12.0			.95321	577.2	.00063	.000337			1.19
28.0	-12.0			.95321	577.5	.00089	.000471			1.63
26.0	-12.0			.95211	576.6	.00057	.000358			.96
16.0	-2.0			.95046	575.2	.00063	.000321	.00056	.000300	1.15
16.0	-2.0			.94991	575.2	.00061	.000321	.00052	.000278	.82
17.0	-2.0			.95431	577.5	.00062	.000332	.00077	.000412	.90
18.0	-2.0			.94991	575.2	.00060	.000321	.00053	.000284	1.05
19.0	-2.0			.94936	574.9	.00062	.000332	.00055	.000294	.87
20.0	-2.0			.95211	576.6	.00061	.000326	.00071	.000380	1.13
21.0	-2.0			.94991	574.9	.00062	.000332	.00055	.000294	1.17
22.0	-2.0			.95101	575.6	.00062	.000332	.00061	.000326	.87
23.0	-2.0			.95211	576.6	.00058	.000310			.83
24.0	-2.0			.95046	575.6	.00060	.000321			1.09
38.0	-26.0			.95266	576.9	.00058	.000310	.00059	.000316	1.18
36.0	-10.0			.95101	576.2	.00061	.000326	.00061	.000326	1.11
32.0	-24.0			.95156	576.2	.00058	.000310	.00057	.000305	1.00
32.0	-12.0			.95321	577.2	.00058	.000310			1.18
28.0	-14.0			.95211	576.9	.00070	.000374			1.43
28.0	-12.0			.95266	576.9	.00058	.000310			
26.0	-12.0			.95266	576.9	.00058	.000310			1.18
24.0	-11.0			.95211	576.6	.00058	.000310			1.18
22.0	-10.0			.95321	577.2	.00058	.000310	.00058	.000310	1.07
20.0	-11.0			.95266	576.9	.00060	.000321	.00060	.000321	1.20
34.0	4.0			.91852	558.2	.00103	.000551	.00109	.000583	1.66
34.0	9.0			.92679	562.5	.00082	.000439	.00084	.000449	1.11
36.0	6.0			.93394	566.2	.00079	.000421	.00073	.000391	1.01
35.0	6.0			.93504	566.5	.00065	.000348			.88
38.0	1.0			.94440	574.2	.00088	.000471			1.54
38.0	2.0			.93229	565.2	.00079	.000423			1.55
40.0	8.0			.94550	572.9	.00054	.000289	.00054	.000289	.72
44.0	6.0			.94965	575.9	.00074	.000396	.00071	.000380	1.45
42.0	4.0			.94000	571.2	.00089	.000476	.00087	.000465	1.62
46.0	0.0			.94605	573.2	.00063	.000337	.00052	.000278	1.21
46.0	.0			.94055	571.2	.00092	.000492			.75
50.0	.0			.93890	571.6	.00178	.000945			1.11
50.0	10.0			.94550	574.5	.00088	.000471			.85
12.0	.0			.94275	572.9	.00121	.000649			.98
12.0	6.0			.94000	571.2	.00118	.000631			1.16
12.0	10.0			.94495	573.9	.00082	.000439			1.03
14.0	.0			.94660	574.9	.00076	.000407			1.03
42.0	.0			.94826	574.9	.00070	.000374			.93

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^{0}R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES

1. Flat Plate Alone

(a) M = 2.65; R = 3.93 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.94660	585.5	.00289	.000407		
12.0	.0			.94605	582.9	.00311	.000438		
20.5	.0			.94440	587.9	.00285	.000401		
28.0	12.0			.94440	582.5	.00333	.000468		
28.0	4.0			.94385	581.5	.00291	.000409		
28.0	.0			.94660	588.2	.00302	.000425		
20.5	-5.0			.94495	587.2	.00302	.000425		
24.5	-5.0			.94385	586.2	.00301	.000423		
30.0	.0			.94330	581.2	.00313	.000440	.00313	.000440
31.0	12.0			.94495	582.5	.00301	.000423		
34.0	.0			.94440	581.5	.00311	.000438	.00320	.000450
2.0	-12.0			.94715	588.5	.00301	.000423		
2.0	12.0			.94495	582.2	.00312	.000439		
12.0	-12.0			.94275	586.2	.00314	.000442		
12.0	12.0			.94440	582.2	.00293	.000412		
30.0	1.0			.94220	580.9	.00294	.000414		
31.0	2.0			.94110	579.9	.00285	.000401		
32.0	2.0			.94220	581.9	.00275	.000387	.00275	.000387
32.0	3.0			.94165	580.5	.00315	.000443		
32.0	6.0			.94275	581.2	.00290	.000408		
34.0	1.0			.94110	580.2	.00296	.000416	.00293	.000412
34.0	2.0			.94055	579.9	.00294	.000414	.00291	.000409
34.0	3.0			.94220	580.9	.00294	.000414	.00285	.000401
36.0	.0			.94495	582.5	.00295	.000415	.00296	.000416
38.0	.0			.94165	582.9	.00305	.000429	.00355	.000499
44.0	12.0			.94110	580.9	.00310	.000436		
42.0	.0			.94275	581.2	.00313	.000440	.00345	.000485
44.0	.0			.96036	592.2	.00290	.000408	.00297	.000418
48.0	.0			.94110	582.2	.00304	.000428	.00302	.000425
52.0	.0			.94330	581.5	.00295	.000415	.00295	.000415
52.0	12.0			.94110	584.9	.00304	.000428		
55.0	.0			.94220	580.5	.00294	.000414	.00293	.000412
58.0	.0			.94660	583.5	.00294	.000414		
58.0	12.0			.94770	586.9	.00316	.000445		
44.0	-12.0			.94110	580.5	.00317	.000446		
36.0	-8.0			.94385	582.2	.00318	.000447		
34.0	-3.0			.94385	583.9	.00303	.000426	.00316	.000445
32.0	-3.0			.94385	581.9	.00313	.000440	.00313	.000440
30.0	-3.0			.94385	586.5	.00303	.000426	.00305	.000429
28.0	-3.0			.93835	578.5	.00300	.000422		
34.0	-12.0			.94440	582.5	.00321	.000452	.00323	.000454
32.0	-12.0			.94275	581.5	.00321	.000452	.00320	.000450
30.0	-12.0			.94055	580.5	.00321	.000452	.00321	.000452
19.0	-12.5			.94660	586.2	.00316	.000445		
17.5	-11.0			.94495	587.2	.00302	.000425		
15.5	-2.5			.94495	584.5	.00302	.000425		
16.5	-2.5			.94440	581.5	.00291	.000409	.00286	.000402
17.5	-2.5			.94495	586.9	.00301	.000423	.00305	.000429
18.5	-2.5			.94440	581.5	.00311	.000438	.00309	.000435
19.5	-2.5			.94495	586.5	.00300	.000422	.00294	.000414
20.5	+2.5			.94880	584.9	.00311	.000438	.00324	.000456
21.5	-2.5			.94330	585.9	.00301	.000423	.00290	.000408
22.5	-2.5			.94550	584.9	.00302	.000425	.00304	.000428
23.5	-2.5			.94605	582.9	.00311	.000438	.00316	.000445
24.5	-2.5			.94275	580.9	.00294	.000414		
36.0	-16.0			.94330	583.9	.00316	.000445		
36.0	-12.0			.94110	580.5	.00318	.000447	.00318	.000447
32.0	-18.0			.93890	579.2	.00301	.000423		
32.0	-16.0			.94110	583.2	.00319	.000449	.00319	.000449
32.0	-14.0			.94385	586.2	.00301	.000423	.00302	.000425
32.0	-10.0			.94550	585.9	.00317	.000446		
28.0	-14.0			.94220	581.2	.00306	.000430		
28.0	-12.0			.93890	583.5	.00304	.000428		
26.0	-12.5			.94055	580.2	.00302	.000425		
24.5	-11.0			.94275	581.2	.00299	.000421		
22.0	-12.5			.94055	580.5	.00308	.000433	.00307	.000432
20.5	-11.0			.94330	586.5	.00303	.000426	.00303	.000426
34.0	-1.0			.94000	578.5	.00281	.000395	.00287	.000404
34.0	4.0			.95046	585.9	.00311	.000438	.00331	.000466
34.0	5.0			.94275	581.2	.00314	.000442	.00305	.000429
34.0	6.0			.94275	581.2	.00314	.000442	.00315	.000443
36.0	6.0			.94165	580.5	.00291	.000409		
38.0	1.0			.94330	583.5	.00303	.000426	.00304	.000428
38.0	2.0			.94330	581.5	.00313	.000440		
44.0	8.0			.94385	581.9	.00314	.000440	.00314	.000442
44.0	6.0			.94165	580.5	.00314	.000442	.00313	.000440
44.0	4.0			.94275	580.9	.00313	.000440	.00313	.000440
44.0	2.0			.94165	580.5	.00314	.000442	.00312	.000439
44.0	1.0			.94385	581.5	.00282	.000397	.00274	.000385

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(b) M = 2.65; R = 2.54 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95433	582.5	.00195	.000426		
12.0	.0			.95266	578.2	.00201	.000439		
20.5	.0			.94988	576.9	.00204	.000446		
28.0	12.0			.95043	577.5	.00220	.000481		
28.0	4.0			.94988	576.9	.00202	.000441		
28.0	.0			.95266	578.5	.00202	.000441		
20.5	-5.0			.95099	577.5	.00208	.000455		
24.5	-5.0			.94932	576.5	.00220	.000481		
30.0	.0			.94932	576.2	.00201	.000439	.00201	.000439
31.0	12.0			.95099	577.9	.00206	.000450		
34.0	.0			.94988	576.5	.00201	.000439	.00205	.000448
2.0	-12.0			.95433	579.9	.00205	.000448		
2.0	12.0			.95266	578.5	.00201	.000439		
12.0	-12.0			.94876	578.5	.00223	.000487		
12.0	12.0			.95155	577.9	.00201	.000439		
30.0	1.0			.94821	575.9	.00220	.000481		
31.0	2.0			.94709	575.2	.00203	.000444		
32.0	2.0			.94821	575.2	.00187	.000409	.00187	.000409
32.0	3.0			.94821	575.9	.00199	.000435		
32.0	6.0			.94876	576.2	.00202	.000441		
34.0	1.0			.94709	575.2	.00206	.000450	.00204	.000446
34.0	2.0			.94654	574.9	.00207	.000452	.00203	.000444
34.0	3.0			.94821	575.9	.00206	.000450	.00198	.000433
36.0	.0			.95043	577.2	.00200	.000437	.00202	.000441
38.0	.0			.94765	575.5	.00206	.000450	.00247	.000540
44.0	12.0			.94709	575.9	.00209	.000457		
42.0	.0			.94821	576.2	.00207	.000452	.00244	.000533
44.0	.0			.96547	586.2	.00216	.000472	.00221	.000483
48.0	.0			.94654	574.9	.00207	.000452	.00205	.000448
52.0	.0			.94932	576.5	.00207	.000452	.00207	.000452
52.0	12.0			.94765	575.9	.00206	.000450		
55.0	.0			.94821	575.9	.00203	.000444	.00202	.000441
58.0	.0			.95377	579.2	.00208	.000455		
58.0	12.0			.95433	579.9	.00206	.000450		
44.0	-12.0			.94709	575.5	.00209	.000457		
36.0	-8.0			.94932	576.9	.00211	.000461		
34.0	-3.0			.94876	576.5	.00206	.000450	.00215	.000470
32.0	-3.0			.94932	576.5	.00220	.000481	.00220	.000481
30.0	-3.0			.94932	576.9	.00208	.000455	.00210	.000459
28.0	-3.0			.94431	573.5	.00208	.000455		
34.0	-12.0			.94988	579.2	.00223	.000487	.00225	.000492
32.0	-12.0			.94821	578.2	.00223	.000487	.00222	.000485
30.0	-12.0			.94654	575.2	.00215	.000470	.00215	.000470
19.0	-12.5			.95155	578.2	.00206	.000450		
17.5	-11.0			.95099	577.9	.00208	.000455		
15.5	-2.5			.94988	577.2	.00207	.000452		
16.5	-2.5			.94932	576.5	.00205	.000448	.00202	.000441
17.5	-2.5			.95043	577.2	.00201	.000439	.00204	.000446
18.5	-2.5			.94988	576.9	.00205	.000448	.00203	.000444
19.5	-2.5			.94988	577.2	.00206	.000450	.00201	.000439
20.5	+2.5			.95433	579.9	.00206	.000450	.00219	.000479
21.5	-2.5			.94876	576.5	.00205	.000448	.00196	.000428
22.5	-2.5			.95099	577.5	.00205	.000448	.00207	.000452
23.5	-2.5			.95099	577.9	.00206	.000450	.00211	.000461
24.5	-2.5			.94821	575.9	.00206	.000450		
36.0	-16.0			.94876	576.5	.00208	.000455		
36.0	-12.0			.94709	575.5	.00210	.000459	.00210	.000459
32.0	-18.0			.94542	574.2	.00208	.000455		
32.0	-16.0			.94709	575.5	.00210	.000459	.00210	.000459
32.0	-14.0			.94932	576.5	.00208	.000455	.00209	.000457
32.0	-10.0			.95099	577.9	.00212	.000463		
28.0	-14.0			.94765	575.9	.00221	.000483		
28.0	-12.0			.94486	573.9	.00212	.000463		
26.0	-12.5			.94654	575.2	.00207	.000452		
24.5	-11.0			.94821	575.9	.00208	.000455		
22.0	-12.5			.94654	577.2	.00224	.000489	.00224	.000489
20.5	-11.0			.94932	576.9	.00215	.000470	.00215	.000470
34.0	-1.0			.94486	573.2	.00182	.000398	.00175	.000382
34.0	4.0			.95656	580.9	.00202	.000441	.00222	.000485
34.0	5.0			.94876	576.5	.00203	.000444	.00187	.000409
34.0	6.0			.94876	576.2	.00201	.000439	.00202	.000441
36.0	6.0			.94765	575.5	.00202	.000441		
38.0	1.0			.94876	576.2	.00205	.000448	.00206	.000450
38.0	2.0			.94932	576.5	.00204	.000446		
44.0	8.0			.94988	577.2	.00204	.000446	.00205	.000448
44.0	6.0			.94765	575.5	.00201	.000439	.00200	.000437
44.0	4.0			.94876	576.2	.00192	.000420	.00192	.000420
44.0	2.0			.94765	575.5	.00206	.000450	.00204	.000446
44.0	1.0			.94988	576.5	.00201	.000439	.00185	.000404

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(c) M = 2.65; R = 1.27 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.96072	583.9	.00102	.000444		
12.0	.0			.96238	583.9	.00093	.000404		
20.5	.0			.96072	583.2	.00098	.000426		
28.0	12.0			.96127	583.9	.00101	.000439		
28.0	4.0			.96127	583.2	.00099	.000430		
28.0	.0			.96404	585.2	.00098	.000426		
20.5	-5.0			.96238	584.2	.00104	.000452		
24.5	-5.0			.96238	583.9	.00095	.000413		
30.0	.0			.96072	582.5	.00093	.000404	.00093	.000404
31.0	12.0			.96127	583.5	.00107	.000465		
34.0	.0			.96293	584.5	.00095	.000413	.00108	.000470
2.0	-12.0			.96017	584.5	.00108	.000470		
2.0	12.0			.95851	582.2	.00102	.000444		
12.0	-12.0			.96017	582.9	.00105	.000457		
12.0	12.0			.96072	583.5	.00099	.000430		
30.0	1.0			.95961	584.5	.00094	.000409		
31.0	2.0			.95851	581.2	.00093	.000404		
32.0	2.0			.95961	584.2	.00094	.000409	.00095	.000413
32.0	3.0			.95961	583.2	.00096	.000417		
32.0	6.0			.96017	582.5	.00098	.000426		
34.0	1.0			.95906	581.9	.00088	.000383	.00086	.000374
34.0	2.0			.95795	581.2	.00102	.000444	.00099	.000430
34.0	3.0			.95961	582.2	.00100	.000435	.00093	.000404
36.0	.0			.96238	583.9	.00098	.000426	.00099	.000430
38.0	.0			.95961	584.9	.00094	.000409		
44.0	12.0			.95906	582.2	.00103	.000448		
42.0	.0			.96072	582.9	.00102	.000444		
44.0	.0			.97731	593.5	.00094	.000409	.00098	.000426
48.0	.0			.95906	584.2	.00094	.000409	.00092	.000400
52.0	.0			.96293	586.5	.00094	.000409	.00098	.000426
52.0	12.0			.96017	582.5	.00101	.000439		
55.0	.0			.96127	583.2	.00098	.000426	.00097	.000422
58.0	.0			.96736	586.9	.00100	.000435		
58.0	12.0			.96625	586.5	.00102	.000444		
44.0	-12.0			.96183	583.5	.00101	.000439		
36.0	-8.0			.96459	585.2	.00101	.000439		
34.0	-3.0			.96183	583.5	.00099	.000430	.00108	.000470
32.0	-3.0			.96238	583.9	.00088	.000383	.00089	.000387
30.0	-3.0			.96127	583.2	.00096	.000417	.00097	.000422
28.0	-3.0			.95629	582.9	.00095	.000413		
34.0	-12.0			.96293	584.2	.00096	.000417	.00097	.000422
32.0	-12.0			.96127	583.5	.00099	.000430	.00098	.000426
30.0	-12.0			.95851	581.9	.00104	.000452	.00104	.000452
19.0	-12.5			.96293	584.2	.00099	.000430		
17.5	-11.0			.96293	584.5	.00102	.000444		
15.5	-2.5			.96183	583.5	.00106	.000461		
16.5	-2.5			.96127	583.2	.00093	.000404	.00091	.000396
17.5	-2.5			.96293	584.2	.00095	.000413	.00098	.000426
18.5	-2.5			.96293	584.2	.00093	.000404	.00093	.000404
19.5	-2.5			.96238	584.2	.00099	.000430	.00093	.000404
20.5	-2.5			.96680	586.9	.00100	.000435	.00112	.000487
21.5	-2.5			.96072	583.2	.00102	.000444		
22.5	-2.5			.96349	584.5	.00098	.000426	.00100	.000435
23.5	-2.5			.96349	584.9	.00101	.000439	.00106	.000461
24.5	-2.5			.96017	582.9	.00098	.000426		
36.0	-16.0			.96238	586.2	.00094	.000409		
36.0	-12.0			.96127	583.5	.00099	.000430	.00099	.000430
32.0	-18.0			.95685	580.5	.00102	.000444		
32.0	-16.0			.95961	583.2	.00107	.000465	.00107	.000465
32.0	-14.0			.96349	584.2	.00087	.000378	.00088	.000383
32.0	-10.0			.96404	585.2	.00099	.000430		
28.0	-14.0			.96072	582.9	.00090	.000391		
28.0	-12.0			.95685	580.5	.00107	.000465		
26.0	-12.5			.95906	581.9	.00102	.000444		
24.5	-11.0			.96127	583.2	.00099	.000430		
22.0	-12.5			.95851	581.9	.00102	.000444	.00102	.000444
20.5	-11.0			.96238	584.2	.00100	.000435	.00100	.000435
34.0	-1.0			.95629	582.5	.00094	.000409	.00089	.000387
34.0	4.0			.96736	589.5	.00093	.000404		
34.0	5.0			.96017	582.9	.00101	.000439		
34.0	6.0			.96072	582.9	.00093	.000404	.00094	.000409
36.0	6.0			.95906	582.9	.00096	.000417		
38.0	1.0			.96017	582.5	.00093	.000404	.00093	.000404
38.0	2.0			.96072	582.9	.00098	.000426		
44.0	8.0			.96238	583.9	.00100	.000435	.00101	.000439
44.0	6.0			.95961	582.2	.00100	.000435	.00099	.000430
44.0	4.0			.96017	582.5	.00100	.000435	.00101	.000439
44.0	2.0			.95906	581.9	.00099	.000430	.00096	.000417
44.0	1.0			.96183	584.9	.00089	.000387		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(d) M = 3.51; R = 3.77 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95348	578.9	.00157	.000321		
12.0	.0			.95403	577.5	.00155	.000317		
20.5	.0			.95237	576.5	.00155	.000317		
28.0	12.0			.95126	578.9	.00178	.000364		
28.0	4.0			.95182	576.5	.00166	.000339		
28.0	.0			.95514	576.5	.00158	.000323		
20.5	-5.0			.95292	577.2	.00155	.000317		
24.5	-5.0			.95292	579.2	.00148	.000302		
30.0	.0			.95237	576.2	.00155	.000317	.00156	.000319
31.0	12.0			.95126	577.5	.00190	.000388		
34.0	.0			.95409	576.9	.00154	.000315	.00161	.000329
2.0	-12.0			.95182	576.2	.00163	.000333		
2.0	12.0			.95126	576.9	.00187	.000382		
12.0	-12.0			.95126	575.9	.00166	.000339		
12.0	12.0			.95126	575.9	.00186	.000380		
30.0	1.0			.95071	575.5	.00155	.000317		
31.0	2.0			.94960	573.2	.00158	.000323		
32.0	2.0			.95126	573.9	.00140	.000286	.00141	.000288
32.0	3.0			.95126	574.9	.00160	.000327		
32.0	6.0			.95015	574.5	.00169	.000345		
34.0	1.0			.95015	575.2	.00155	.000317	.00153	.000313
34.0	2.0			.94905	573.2	.00160	.000327	.00157	.000321
34.0	3.0			.95015	573.9	.00162	.000331	.00155	.000317
36.0	.0			.95292	576.5	.00155	.000317	.00155	.000317
38.0	.0			.95071	573.9	.00156	.000319	.00192	.000392
44.0	12.0			.94905	573.9	.00173	.000354		
42.0	.0			.95182	575.9	.00155	.000317	.00187	.000382
44.0	.0			.96677	584.5	.00152	.000311	.00155	.000317
48.0	.0			.95071	574.9	.00154	.000315	.00153	.000313
52.0	.0			.95403	575.5	.00157	.000321	.00157	.000321
52.0	12.0			.94960	575.5	.00178	.000364		
55.0	.0			.95237	574.5	.00149	.000305	.00148	.000302
58.0	.0			.96012	579.5	.00156	.000319		
58.0	12.0			.95514	580.9	.00177	.000362		
44.0	-12.0			.95237	574.2	.00165	.000337		
36.0	-8.0			.95514	575.9	.00157	.000321		
34.0	-3.0			.95292	574.9	.00149	.000305	.00159	.000325
32.0	-3.0			.95348	576.9	.00154	.000315	.00155	.000317
30.0	-3.0			.95182	576.2	.00155	.000317	.00156	.000319
28.0	-3.0			.94739	571.9	.00150	.000307		
34.0	-12.0			.95348	575.5	.00156	.000319	.00157	.000321
32.0	-12.0			.95237	576.2	.00165	.000337	.00165	.000337
30.0	-12.0			.94960	573.2	.00160	.000327	.00160	.000327
19.0	-12.5			.95182	574.5	.00158	.000323		
17.5	-11.0			.95348	575.5	.00166	.000339		
15.5	-2.5			.95237	578.2	.00159	.000325		
16.5	-2.5			.95237	574.9	.00143	.000292	.00140	.000286
17.5	-2.5			.95348	577.2	.00155	.000317	.00142	.000290
18.5	-2.5			.96234	580.9	.00143	.000292	.00163	.000333
19.5	-2.5			.95348	578.5	.00158	.000323	.00151	.000309
20.5	-2.5			.95735	581.2	.00158	.000323	.00169	.000345
21.5	-2.5			.95182	577.5	.00158	.000323	.00158	.000323
22.5	-2.5			.95348	576.9	.00154	.000315	.00154	.000315
23.5	-2.5			.95458	577.9	.00165	.000337	.00162	.000331
24.5	-2.5			.95126	574.2	.00142	.000290		
36.0	-16.0			.95292	574.9	.00182	.000372		
36.0	-12.0			.95237	574.5	.00165	.000337	.00165	.000337
32.0	-18.0			.94794	572.5	.00184	.000376		
32.0	-16.0			.94960	573.5	.00162	.000331	.00162	.000331
32.0	-14.0			.95348	574.9	.00165	.000337	.00166	.000339
32.0	-10.0			.95403	578.9	.00158	.000323		
28.0	-14.0			.95126	574.2	.00183	.000374		
28.0	-12.0			.94794	573.5	.00155	.000317		
26.0	-12.5			.95015	573.2	.00166	.000339		
24.5	-11.0			.95237	574.2	.00148	.000302		
22.0	-12.5			.94960	573.2	.00160	.000327	.00160	.000327
20.5	-11.0			.95458	576.2	.00158	.000323	.00158	.000323
34.0	-1.0			.94794	571.9	.00150	.000307	.00144	.000294
34.0	4.0			.95735	578.5	.00159	.000325	.00175	.000358
34.0	5.0			.95071	574.5	.00163	.000333	.00155	.000317
34.0	6.0			.95126	574.9	.00184	.000376	.00185	.000378
36.0	6.0			.94960	573.9	.00184	.000376		
38.0	1.0			.95126	574.2	.00157	.000321	.00157	.000321
38.0	2.0			.95182	576.2	.00155	.000317		
44.0	8.0			.95237	575.9	.00169	.000345	.00170	.000347
44.0	6.0			.95015	574.2	.00184	.000376	.00183	.000374
44.0	4.0			.95126	574.5	.00160	.000327	.00160	.000327
44.0	2.0			.95015	573.9	.00159	.000325	.00157	.000321
44.0	1.0			.95292	575.2	.00149	.000305	.00138	.000282

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(e) M = 3.51; R = 2.82 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95489	570.9	.00123	.000341		
12.0	.0			.94982	566.5	.00111	.000308		
20.5	.0			.94700	564.9	.00121	.000336		
28.0	12.0			.94700	565.9	.00153	.000424		
28.0	4.0			.94700	565.2	.00127	.000352		
28.0	.0			.94869	566.2	.00129	.000358		
27.5	-5.0			.94869	565.5	.00120	.000333		
24.5	-5.0			.94700	565.9	.00124	.000344		
30.0	.0			.94644	565.5	.00124	.000344	.00124	.000344
31.0	12.0			.94813	566.5	.00139	.000386		
34.0	.0			.94644	565.9	.00124	.000344	.00131	.000363
2.0	-12.0			.95377	568.5	.00127	.000352		
2.0	12.0			.95377	569.5	.00132	.000366		
12.0	-12.0			.94644	564.5	.00129	.000358		
12.0	12.0			.94926	566.9	.00133	.000369		
30.0	1.0			.94531	564.2	.00123	.000341		
31.0	2.0			.94362	563.2	.00127	.000352		
32.0	2.0			.94531	563.9	.00123	.000341	.00124	.000344
32.0	3.0			.94644	565.2	.00129	.000358		
32.0	6.0			.94531	564.5	.00133	.000369		
34.0	1.0			.94418	563.2	.00121	.000336	.00122	.000338
34.0	2.0			.94305	562.9	.00125	.000347	.00122	.000338
34.0	3.0			.94474	563.9	.00135	.000374	.00129	.000358
36.0	.0			.94700	564.9	.00124	.000344	.00125	.000347
38.0	.0			.94418	563.2	.00121	.000336		
44.0	12.0			.94362	563.9	.00153	.000424		
42.0	.0			.94531	563.9	.00121	.000336		
44.0	.0			.95884	572.2	.00125	.000347	.00129	.000358
48.0	.0			.94362	562.9	.00121	.000336	.00119	.000330
52.0	.0			.94700	564.9	.00128	.000355	.00128	.000355
52.0	12.0			.94474	564.2	.00153	.000424		
56.0	.0			.94644	564.5	.00129	.000358	.00128	.000355
58.0	.0			.95489	569.5	.00126	.000349		
58.0	12.0			.95095	568.2	.00152	.000422		
44.0	-12.0			.94474	565.5	.00119	.000330		
36.0	-8.0			.94700	564.9	.00123	.000341		
34.0	-3.0			.94587	564.2	.00119	.000330	.00127	.000352
32.0	-3.0			.94644	566.9	.00119	.000330	.00119	.000330
30.0	-3.0			.94587	564.2	.00121	.000336	.00122	.000338
28.0	-3.0			.94136	561.5	.00121	.000336		
34.0	-12.0			.94756	565.2	.00127	.000352	.00128	.000355
32.0	-12.0			.94644	564.2	.00120	.000333	.00120	.000333
30.0	-12.0			.95038	562.9	.00123	.000341	.00123	.000341
19.0	-12.5			.94531	563.9	.00126	.000349		
17.5	-11.0			.94813	565.2	.00120	.000333		
15.5	-2.5			.94644	564.9	.00123	.000341		
16.5	-2.5			.94644	564.5	.00123	.000341	.00117	.000325
17.5	-2.5			.94700	567.2	.00119	.000330	.00104	.000288
18.5	-2.5			.95997	573.9	.00122	.000338		
19.5	-2.5			.94700	564.9	.00121	.000336	.00100	.000277
20.5	-2.5			.95151	567.5	.00120	.000333	.00132	.000366
21.5	-2.5			.94531	564.2	.00124	.000344	.00111	.000308
22.5	-2.5			.94700	564.9	.00123	.000341	.00123	.000341
23.5	-2.5			.94756	565.5	.00125	.000347	.00130	.000361
24.5	-2.5			.94474	563.5	.00121	.000336		
36.0	-16.0			.94531	563.9	.00131	.000363		
36.0	-12.0			.94531	566.2	.00119	.000330	.00119	.000330
32.0	-18.0			.94136	561.9	.00130	.000361		
32.0	-16.0			.94305	562.9	.00152	.000422	.00152	.000422
32.0	-14.0			.94531	563.9	.00126	.000349	.00126	.000349
32.0	-10.0			.94756	565.2	.00125	.000347		
28.0	-14.0			.94418	563.2	.00123	.000341		
28.0	-12.0			.94193	561.9	.00124	.000344		
26.0	-12.5			.94362	562.9	.00126	.000349		
24.5	-11.0			.94531	564.9	.00124	.000344		
22.0	-12.5			.94362	562.9	.00121	.000336	.00121	.000336
20.5	-11.0			.94926	568.5	.00119	.000330	.00125	.000347
34.0	-1.0			.94305	563.2	.00112	.000311	.00108	.000300
34.0	4.0			.95207	568.5	.00127	.000352	.00143	.000397
34.0	5.0			.94531	564.5	.00132	.000366	.00124	.000344
34.0	6.0			.94531	565.9	.00136	.000377	.00137	.000380
36.0	6.0			.94418	563.9	.00133	.000369		
38.0	1.0			.94474	563.9	.00121	.000336	.00121	.000336
38.0	2.0			.94587	564.5	.00129	.000358		
44.0	8.0			.94644	565.5	.00153	.000424	.00154	.000427
44.0	6.0			.94418	565.2	.00137	.000380	.00136	.000377
44.0	4.0			.94587	564.5	.00135	.000374	.00136	.000377
44.0	2.0			.94418	563.9	.00127	.000352	.00125	.000347
44.0	1.0			.94700	566.2	.00124	.000344	.00108	.000300

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(f) M = 3.51; R = 1.62×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.95994	570.5	.00068	.000328		
12.0	.0			.95712	568.5	.00065	.000314		
20.5	.0			.95543	567.2	.00068	.000328		
28.0	12.0			.95543	569.5	.00085	.000410		
28.0	4.0			.95600	567.9	.00084	.000405		
28.0	.0			.95712	568.5	.00066	.000318		
20.5	-5.0			.95600	567.9	.00066	.000318		
24.5	-5.0			.95543	567.2	.00066	.000318		
30.0	.0			.95487	567.5	.00067	.000323	.00068	.000328
31.0	12.0			.95600	569.9	.00085	.000410		
34.0	.0			.95600	567.5	.00065	.000314	.00073	.000352
2.0	-12.0			.95769	569.2	.00085	.000410		
2.0	12.0			.95882	571.9	.00085	.000410		
12.0	-12.0			.95374	566.5	.00067	.000323		
12.0	12.0			.95600	568.5	.00077	.000371		
30.0	1.0			.95430	566.5	.00067	.000323		
31.0	2.0			.95261	565.9	.00074	.000357		
32.0	2.0			.95430	566.5	.00067	.000323	.00069	.000333
32.0	3.0			.95600	567.9	.00068	.000328		
32.0	6.0			.95430	567.2	.00085	.000410		
34.0	1.0			.95318	566.2	.00068	.000328	.00066	.000318
34.0	2.0			.95261	565.9	.00068	.000328	.00065	.000314
34.0	3.0			.95430	566.9	.00076	.000367	.00069	.000333
36.0	.0			.95543	567.5	.00085	.000410	.00086	.000415
38.0	.0			.95318	566.2	.00085	.000410		
44.0	12.0			.95261	566.2	.00077	.000371		
42.0	.0			.95430	566.9	.00068	.000328		
44.0	.0			.96897	574.9	.00078	.000376	.00086	.000415
48.0	.0			.95318	566.2	.00085	.000410	.00084	.000405
52.0	.0			.95712	568.5	.00071	.000342	.00071	.000342
52.0	12.0			.95374	566.9	.00085	.000410		
55.0	.0			.95656	567.9	.00067	.000323	.00066	.000318
58.0	.0			.96502	572.9	.00067	.000323		
58.0	12.0			.95994	570.5	.00084	.000405		
44.0	-12.0			.95430	566.5	.00065	.000314		
36.0	-8.0			.95656	567.9	.00066	.000318		
34.0	-3.0			.95487	566.9	.00067	.000323	.00071	.000342
32.0	-3.0			.95543	567.2	.00067	.000323	.00067	.000323
30.0	-3.0			.95430	566.9	.00072	.000347	.00073	.000352
28.0	-3.0			.94979	563.9	.00068	.000328		
34.0	-12.0			.95600	567.9	.00084	.000405	.00085	.000410
32.0	-12.0			.95487	566.9	.00067	.000323	.00067	.000323
30.0	-12.0			.95148	565.2	.00068	.000328	.00068	.000328
19.0	-12.5			.95318	565.9	.00067	.000323		
17.5	-11.0			.95543	567.5	.00085	.000410		
15.5	-2.5			.95430	566.9	.00074	.000357		
16.5	-2.5			.95430	566.9	.00085	.000410	.00085	.000410
17.5	-2.5			.95543	567.2	.00067	.000323		
18.5	-2.5			.97235	577.2	.00066	.000318		
19.5	-2.5			.95545	567.5	.00084	.000405		
20.5	-2.5			.95994	570.2	.00084	.000405	.00095	.000458
21.5	-2.5			.95374	566.5	.00085	.000410	.00072	.000347
22.5	-2.5			.95487	567.2	.00071	.000342	.00070	.000338
23.5	-2.5			.95656	567.9	.00066	.000318	.00071	.000342
24.5	-2.5			.95318	566.2	.00085	.000410		
36.0	-16.0			.95430	566.9	.00074	.000357		
36.0	-12.0			.95487	566.9	.00084	.000405	.00084	.000405
32.0	-18.0			.94979	564.2	.00085	.000410		
32.0	-16.0			.95092	565.5	.00075	.000362	.00075	.000362
32.0	-14.0			.95487	566.5	.00066	.000318	.00066	.000318
32.0	-10.0			.95600	567.5	.00067	.000323		
28.0	-14.0			.95261	565.9	.00085	.000410		
28.0	-12.0			.95035	564.2	.00066	.000318		
26.0	-12.5			.95205	565.2	.00067	.000323		
24.5	-11.0			.95374	566.2	.00066	.000318		
22.0	-12.5			.95148	565.2	.00068	.000328	.00068	.000328
20.5	-11.0			.95769	568.9	.00065	.000314	.00066	.000318
34.0	-1.0			.95092	564.5	.00067	.000323	.00062	.000299
34.0	4.0			.96107	571.2	.00075	.000362		
34.0	5.0			.95487	567.2	.00072	.000347	.00065	.000314
34.0	6.0			.95487	567.5	.00085	.000410	.00086	.000415
36.0	6.0			.95374	566.5	.00073	.000352		
38.0	1.0			.95430	566.5	.00069	.000333	.00069	.000333
38.0	2.0			.95487	567.2	.00070	.000338		
44.0	8.0			.95600	568.2	.00085	.000410	.00086	.000415
44.0	6.0			.95374	566.9	.00085	.000410	.00084	.000405
44.0	4.0			.95543	568.2	.00079	.000381	.00080	.000386
44.0	2.0			.95374	566.5	.00068	.000328	.00066	.000318
44.0	1.0			.95656	567.9	.00066	.000318	.00056	.000270

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(g) M = 4.44; R = 4.38 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.93660	573.5	.00085	.000217		
12.0	.0			.93824	573.5	.00072	.000184		
20.5	.0			.93714	572.9	.00070	.000179		
28.0	12.0			.93496	572.5	.00103	.000263		
28.0	4.0			.93878	573.9	.00083	.000212		
28.0	.0			.93933	574.2	.00080	.000204		
20.5	-5.0			.93824	573.5	.00067	.000171		
24.5	-5.0			.93824	573.2	.00067	.000171		
30.0	.0			.93714	572.9	.00068	.000174	.00069	.000176
31.0	12.0			.93496	572.9	.00102	.000261		
34.0	.0			.93878	573.5	.00067	.000171	.00079	.000202
2.0	-12.0			.93441	571.9	.00068	.000174		
2.0	12.0			.93387	572.9	.00100	.000256		
12.0	-12.0			.93605	571.9	.00056	.000143		
12.0	12.0			.93441	572.5	.00099	.000253		
30.0	1.0			.93660	572.2	.00065	.000166		
31.0	2.0			.93496	571.5	.00073	.000187		
32.0	2.0			.93714	572.5	.00080	.000204	.00082	.000210
32.0	3.0			.93878	574.2	.00083	.000212		
32.0	6.0			.93714	573.2	.00086	.000220		
34.0	1.0			.93605	572.2	.00070	.000179	.00066	.000169
34.0	2.0			.93551	572.2	.00073	.000187	.00071	.000181
34.0	3.0			.93660	572.9	.00071	.000181	.00061	.000156
36.0	.0			.93824	573.2	.00071	.000181	.00072	.000184
38.0	.0			.93605	572.2	.00070	.000179		
44.0	12.0			.93168	570.5	.00103	.000263		
42.0	.0			.93714	572.9	.00070	.000179		
44.0	.0			.94917	580.2	.00069	.000176	.00074	.000189
48.0	.0			.93605	571.9	.00080	.000204	.00078	.000199
52.0	.0			.93988	574.2	.00069	.000176	.00070	.000179
52.0	12.0			.93277	570.9	.00099	.000253		
55.0	.0			.93878	573.5	.00072	.000184	.00071	.000181
58.0	.0			.94534	577.9	.00053	.000135		
58.0	12.0			.93824	574.5	.00103	.000263		
44.0	-12.0			.93769	572.2	.00058	.000148		
36.0	-8.0			.93988	573.9	.00058	.000148		
34.0	-3.0			.93769	572.9	.00070	.000179	.00076	.000194
32.0	-3.0			.93824	573.5	.00067	.000171	.00068	.000174
30.0	-3.0			.93660	572.2	.00062	.000158	.00063	.000161
28.0	-3.0			.93277	569.9	.00070	.000179		
34.0	-12.0			.93933	573.5	.00055	.000141	.00056	.000143
32.0	-12.0			.93878	573.2	.00064	.000164	.00065	.000166
30.0	-12.0			.93496	571.2	.00064	.000164	.00063	.000161
19.0	-12.5			.93496	570.9	.00059	.000151		
17.5	-11.0			.93824	572.9	.00058	.000148		
15.5	-2.5			.93551	571.9	.00064	.000164		
16.5	-2.5			.93605	572.2	.00068	.000174	.00067	.000171
17.5	-2.5			.93714	572.9	.00067	.000171		
18.5	-2.5			.93955	586.5	.00061	.000156		
20.5	-2.5			.94206	575.5	.00063	.000161		
21.5	-2.5			.93605	571.9	.00064	.000164	.00052	.000133
22.5	-2.5			.93660	572.5	.00079	.000202	.00078	.000199
23.5	-2.5			.93824	573.5	.00080	.000204	.00087	.000222
24.5	-2.5			.93551	571.9	.00072	.000184		
36.0	-16.0			.93824	572.9	.00054	.000138		
36.0	-12.0			.93769	572.5	.00058	.000148	.00058	.000148
32.0	-18.0			.93387	570.2	.00058	.000148		
32.0	-16.0			.93223	571.5	.00073	.000187	.00073	.000187
32.0	-14.0			.93824	572.5	.00058	.000148	.00058	.000148
32.0	-10.0			.93878	573.5	.00064	.000164		
28.0	-14.0			.93605	571.5	.00058	.000148		
28.0	-12.0			.93332	570.2	.00064	.000164		
26.0	-12.5			.93551	571.2	.00058	.000148		
24.5	-11.0			.93714	572.2	.00053	.000135		
22.0	-12.5			.93496	571.2	.00064	.000164	.00064	.000164
20.5	-11.0			.94152	574.9	.00059	.000151	.00060	.000153
34.0	-1.0			.93332	570.2	.00061	.000156	.00053	.000135
34.0	4.0			.94370	577.2	.00073	.000187		
34.0	5.0			.93769	573.5	.00085	.000217	.00074	.000189
34.0	6.0			.93824	573.9	.00085	.000217	.00087	.000222
36.0	6.0			.93660	573.2	.00090	.000230		
38.0	1.0			.93660	572.5	.00073	.000187	.00072	.000184
38.0	2.0			.93769	573.5	.00070	.000179		
44.0	8.0			.93878	574.5	.00094	.000240	.00096	.000245
44.0	6.0			.93714	573.2	.00079	.000202	.00078	.000199
44.0	4.0			.93824	573.9	.00070	.000179	.00071	.000181
44.0	2.0			.93660	572.5	.00083	.000212	.00080	.000204
44.0	1.0			.93878	573.9	.00068	.000174	.00054	.000138

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Continued

(h) M = 4.44; R = 3.09 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	T_e/T_t	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.93978	573.9	.00059	.000213		
12.0	.0			.94252	574.5	.00074	.000268		
20.5	.0			.94142	573.9	.00053	.000192		
28.0	12.0			.93923	574.5	.00089	.000322		
28.0	4.0			.94306	574.9	.00058	.000210		
28.0	.0			.94416	575.5	.00063	.000228		
20.5	-5.0			.94252	574.2	.00053	.000192		
24.5	-5.0			.94252	573.9	.00054	.000195		
30.0	.0			.94197	573.9	.00055	.000199	.00055	.000199
31.0	12.0			.94033	573.9	.00072	.000260		
34.0	.0			.94306	574.5	.00057	.000206		
2.0	-12.0			.93704	571.5	.00054	.000195		
2.0	12.0			.93704	572.9	.00075	.000271		
12.0	-12.0			.93978	572.5	.00049	.000177		
12.0	12.0			.93868	573.2	.00075	.000271		
30.0	1.0			.94087	573.9	.00067	.000242		
31.0	2.0			.93978	572.5	.00057	.000206		
32.0	2.0			.94142	573.9	.00061	.000221	.00063	.000228
32.0	3.0			.94361	575.5	.00063	.000228		
32.0	6.0			.94197	574.5	.00065	.000235		
34.0	1.0			.94087	573.9	.00067	.000242	.00065	.000235
34.0	2.0			.94033	573.2	.00063	.000228	.00059	.000213
34.0	3.0			.94142	573.9	.00055	.000199		
36.0	.0			.94252	574.5	.00061	.000221	.00062	.000224
38.0	.0			.94087	573.2	.00057	.000206		
44.0	12.0			.93704	572.9	.00088	.000318		
42.0	.0			.94197	574.2	.00063	.000228		
48.0	.0			.94087	573.2	.00057	.000206	.00055	.000199
52.0	.0			.94471	575.5	.00055	.000199	.00055	.000199
52.0	12.0			.93759	572.5	.00084	.000304		
55.0	.0			.94416	574.9	.00058	.000210	.00056	.000203
58.0	.0			.95018	579.2	.00064	.000231		
58.0	12.0			.94252	575.9	.00084	.000304		
44.0	-12.0			.94197	573.2	.00049	.000177		
36.0	-8.0			.94416	574.9	.00049	.000177		
34.0	-3.0			.94197	573.9	.00055	.000199	.00061	.000221
32.0	-3.0			.94306	574.5	.00051	.000184	.00052	.000188
30.0	-3.0			.94087	573.2	.00055	.000199	.00056	.000203
28.0	-3.0			.93704	570.9	.00053	.000192		
34.0	-12.0			.94361	574.2	.00050	.000181	.00051	.000184
32.0	-12.0			.94252	573.9	.00049	.000177	.00051	.000184
30.0	-12.0			.93868	571.5	.00049	.000177		
19.0	-12.5			.93868	571.5	.00049	.000177		
17.5	-11.0			.94197	573.5	.00049	.000177		
15.5	-2.5			.94033	572.9	.00053	.000192		
16.5	-2.5			.94087	573.2	.00051	.000184	.00051	.000184
17.5	-2.5			.94142	573.9	.00061	.000221		
18.5	-2.5			.96605	588.5	.00050	.000181		
19.5	-2.5			.94197	573.9	.00055	.000199		
20.5	-2.5			.94635	576.9	.00061	.000221		
21.5	-2.5			.94033	573.2	.00061	.000221		
22.5	-2.5			.94142	573.5	.00051	.000184	.00050	.000181
23.5	-2.5			.94306	574.5	.00055	.000199	.00062	.000224
24.5	-2.5			.94033	572.9	.00053	.000192		
36.0	-16.0			.94252	573.5	.00049	.000177		
32.0	-18.0			.93759	570.9	.00046	.000166		
32.0	-14.0			.94252	573.5	.00041	.000148	.00042	.000152
32.0	-10.0			.94306	574.2	.00049	.000177		
28.0	-14.0			.94033	572.2	.00049	.000177		
28.0	-12.0			.93759	570.9	.00045	.000163		
26.0	-12.5			.93923	571.9	.00049	.000177		
24.5	-11.0			.94087	572.9	.00046	.000166		
22.0	-12.5			.93868	571.5	.00049	.000177	.00049	.000177
34.0	-1.0			.93814	571.5	.00052	.000188		
34.0	4.0			.94854	578.2	.00074	.000268		
34.0	5.0			.94254	574.9	.00063	.000228		
34.0	6.0			.94306	575.2	.00065	.000235	.00068	.000246
36.0	6.0			.94142	574.2	.00065	.000235		
38.0	1.0			.94142	573.9	.00063	.000228	.00062	.000224
38.0	2.0			.94306	574.5	.00055	.000199		
44.0	8.0			.94361	576.5	.00074	.000268	.00075	.000271
44.0	6.0			.94197	574.5	.00065	.000235	.00064	.000231
44.0	4.0			.94361	574.9	.00057	.000206	.00058	.000210
44.0	2.0			.94197	573.9	.00055	.000199	.00052	.000188

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

1. Flat Plate Alone - Concluded

(i) M = 4.44; R = 2.08×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h_o (b)	N_{St}	$h_{o,c}$ (b)	$N_{St,c}$
2.0	.0			.93694	571.2	.00053	.000288		
12.0	.0			.93749	570.9	.00050	.000271		
20.5	.0			.93639	570.2	.00051	.000277		
28.0	12.0			.93365	569.2	.00063	.000342		
28.0	4.0			.93803	571.2	.00051	.000277		
20.5	-5.0			.93694	570.2	.00040	.000217		
24.5	-5.0			.93639	569.9	.00050	.000271		
30.0	.0			.93639	569.9	.00040	.000217	.00041	.000223
31.0	12.0			.93474	569.9	.00079	.000429		
34.0	.0			.93749	570.5	.00051	.000277	.00063	.000342
2.0	-12.0			.93365	568.5	.00053	.000288		
2.0	12.0			.93420	570.2	.00080	.000434		
12.0	-12.0			.93474	568.5	.00046	.000250		
12.0	12.0			.93420	569.5	.00079	.000429		
30.0	1.0			.93584	569.5	.00040	.000217		
31.0	2.0			.93474	568.9	.00052	.000282		
32.0	2.0			.93639	569.9	.00040	.000217	.00043	.000233
32.0	3.0			.93858	571.9	.00047	.000255		
32.0	6.0			.93694	570.5	.00053	.000288		
34.0	1.0			.93584	569.5	.00052	.000282	.00050	.000271
34.0	2.0			.93474	569.2	.00053	.000288	.00048	.000261
34.0	3.0			.93639	570.2	.00051	.000277		
36.0	.0			.93694	570.5	.00044	.000239	.00045	.000244
38.0	.0			.93529	569.2	.00052	.000282		
44.0	12.0			.93091	567.5	.00067	.000364		
42.0	.0			.93694	570.2	.00048	.000261		
44.0	.0			.94845	577.2	.00049	.000266	.00055	.000299
48.0	.0			.93584	569.5	.00048	.000261	.00046	.000250
52.0	.0			.93913	571.5	.00040	.000217	.00041	.000223
52.0	12.0			.93145	567.9	.00079	.000429		
58.0	.0			.94516	575.5	.00052	.000282		
58.0	12.0			.93749	571.5	.00079	.000429		
44.0	-12.0			.93529	568.5	.00039	.000212		
36.0	-8.0			.93803	570.5	.00044	.000239		
34.0	-3.0			.93694	570.2	.00044	.000239	.00049	.000266
32.0	-3.0			.93749	570.5	.00050	.000271	.00051	.000277
30.0	-3.0			.93529	569.5	.00044	.000239	.00045	.000244
34.0	-12.0			.93749	570.2	.00048	.000261	.00049	.000266
30.0	-12.0			.93310	567.2	.00039	.000212	.00038	.000206
17.5	-11.0			.93639	569.2	.00039	.000212		
15.5	-2.5			.93474	568.9	.00040	.000217		
16.5	-2.5			.93529	569.2	.00052	.000282	.00052	.000282
18.5	-2.5			.96161	585.2	.00047	.000255		
19.5	-2.5			.93639	569.9	.00052	.000282		
20.5	-2.5			.94078	572.5	.00052	.000282		
22.5	-2.5			.93584	569.2	.00040	.000217	.00038	.000206
23.5	-2.5			.93749	570.5	.00046	.000250	.00054	.000293
24.5	-2.5			.93474	568.9	.00046	.000250		
36.0	-16.0			.93639	569.2	.00046	.000250		
36.0	-12.0			.93584	569.2	.00044	.000239	.00044	.000239
32.0	-16.0			.93365	567.5	.00035	.000190	.00035	.000190
32.0	-14.0			.93584	568.9	.00046	.000250	.00046	.000250
32.0	-10.0			.93694	569.9	.00046	.000250		
28.0	-14.0			.93365	567.9	.00046	.000250		
28.0	-12.0			.93145	566.5	.00046	.000250		
24.5	-11.0			.93420	568.2	.00038	.000206		
20.5	-11.0			.93968	571.5	.00048	.000261	.00049	.000266
34.0	-1.0			.93255	567.5	.00050	.000271		
34.0	5.0			.93749	570.9	.00051	.000277		
34.0	6.0			.93749	570.9	.00054	.000293	.00058	.000315
36.0	6.0			.93584	570.2	.00053	.000288		
38.0	1.0			.93584	569.9	.00051	.000277	.00051	.000277
38.0	2.0			.93749	570.5	.00040	.000217		
44.0	8.0			.93803	571.2	.00054	.000293	.00055	.000299
44.0	6.0			.93639	570.5	.00053	.000288	.00052	.000282
44.0	4.0			.93803	571.2	.00046	.000250	.00047	.000255
44.0	2.0			.93639	570.2	.00050	.000271	.00047	.000255
44.0	1.0			.93858	571.2	.00050	.000271		

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener

(a) M = 2.65; R = 3.08 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95441	589.2	.00268	.000379			.93
12.0	.0			.97363	604.9	.00375	.000531			1.21
20.5	.0			.99231	620.5	.00510	.000722			1.79
28.0	12.0			.91267	559.2	.00187	.000265			.56
28.0	4.0			.96430	585.5	.00058	.000082			.20
28.0	.0			.98791	599.5	.00043	.000061			.14
20.5	-5.0			.99121	621.2	.00515	.000729			1.71
24.5	-5.0			1.02141	651.9	.00811	.001148			2.69
30.0	.0			.96759	588.2	.00079	.000112	.00082	.000116	.25
31.0	12.0			.91377	562.2	.00246	.000348			.82
34.0	.0			.95880	588.9	.00230	.000326	.00230	.000326	.74
2.0	-12.0			.95111	590.5	.00303	.000429			1.01
2.0	12.0			.95386	588.5	.00276	.000391			.88
12.0	-12.0			.96155	597.9	.00378	.000535			1.20
12.0	12.0			.96430	598.5	.00375	.000531			1.28
30.0	1.0			.96375	586.2	.00084	.000119			.29
31.0	2.0			.95606	582.9	.00131	.000185			.46
32.0	2.0			.95770	584.9	.00156	.000221	.00156	.000221	.57
32.0	3.0			.95606	585.2	.00172	.000243			.55
32.0	6.0			.93903	575.5	.00199	.000282			.69
34.0	1.0			.95880	591.9	.00256	.000362	.00261	.000369	.86
34.0	2.0			.95496	588.2	.00264	.000374	.00265	.000375	.90
34.0	3.0			.95166	586.5	.00275	.000389			.94
36.0	.0			.94727	584.9	.00305	.000432	.00306	.000433	1.03
38.0	.0			.93683	579.5	.00342	.000484	.00373	.000528	1.12
44.0	12.0			.91981	576.5	.00326	.000461			1.09
42.0	.0			.92915	575.2	.00346	.000490	.00376	.000532	1.11
44.0	.0			.93793	583.2	.00322	.000456	.00325	.000460	1.11
48.0	.0			.92750	573.9	.00345	.000488	.00344	.000487	1.13
52.0	.0			.93134	581.5	.00336	.000476	.00336	.000476	1.14
52.0	12.0			.92805	575.9	.00309	.000437			1.02
55.0	.0			.93134	576.5	.00345	.000488	.00344	.000487	1.17
58.0	.0			.94013	581.9	.00338	.000478			1.15
58.0	12.0			.93464	579.9	.00307	.000435			.97
44.0	-12.0			.91981	571.2	.00393	.000556			1.24
36.0	-8.0			.92640	572.9	.00323	.000457			1.02
36.0	-3.0			.92750	567.9	.00164	.000232			
34.0	-3.0			.95606	588.2	.00271	.000384	.00269	.000381	.89
32.0	-3.0			.96045	587.2	.00169	.000239	.00171	.000242	.54
30.0	-3.0			.95935	583.5	.00098	.000139	.00093	.000132	.32
28.0	-3.0			.97528	592.2	.00062	.000088			.21
34.0	-12.0			.91322	565.9	.00353	.000500	.00355	.000502	1.10
32.0	-12.0			.91102	562.5	.00291	.000412	.00291	.000412	.91
30.0	-12.0			.89949	552.9	.00225	.000318	.00219	.000310	.76
19.0	-12.5			.96869	606.2	.00505	.000715			1.60
17.5	-11.0			.97638	609.2	.00456	.000645			1.51
15.5	-2.5			.98077	611.2	.00451	.000638			1.49
16.5	-2.5			.98297	612.2	.00414	.000586	.00410	.000580	1.42
17.5	-2.5			.98517	614.9	.00472	.000668	.00443	.000627	1.57
18.5	-2.5			1.01427	632.9	.00431	.000610	.00500	.000708	1.39
19.5	-2.5			.98846	618.5	.00514	.000728	.00475	.000672	1.71
20.5	-2.5			.99505	623.5	.00535	.000757	.00501	.000709	1.72
21.5	-2.5			.99450	623.9	.00556	.000787	.00549	.000777	1.85
22.5	-2.5			1.00000	632.2	.00553	.000783	.00543	.000769	1.83
23.5	-2.5			1.00933	636.9	.00645	.000913	.00636	.000900	2.07
24.5	-2.5			1.01977	650.2	.00767	.001086			2.61
36.0	-16.0			.92969	575.2	.00344	.000487			1.09
36.0	-12.0			.91212	566.2	.00362	.000512	.00360	.000510	1.14
32.0	-18.0			.92750	575.2	.00351	.000497			1.17
32.0	-16.0			.92475	576.9	.00346	.000490	.00346	.000490	1.08
32.0	-14.0			.92860	573.9	.00310	.000439	.00316	.000447	1.03
32.0	-10.0			.90937	557.9	.00208	.000294			.66
28.0	-14.0			.93464	580.2	.00386	.000546			1.26
28.0	-12.0			.90498	553.9	.00173	.000245			.57
26.0	-12.5			.94617	582.9	.00278	.000393			.92
24.5	-11.0			1.01098	654.2	.00875	.001238			2.93
22.0	-12.5			.97308	618.2	.00519	.000735	.00534	.000756	1.69
20.5	-11.0			.98297	616.5	.00501	.000709	.00497	.000703	1.65
2.0	14.0	2.00		.98517	599.2	.00056	.000079			
2.0	12.0	2.00		.99011	602.2	.00055	.000078			
2.0	12.0	1.00		.99231	603.9	.00059	.000084			
2.0	5.5	2.00		.97912	595.2	.00045	.000064			
2.0	3.0	2.00		.97858	594.9	.00050	.000071	.00049	.000069	
2.0	1.5	3.00		.97967	594.5	.00029	.000041			
2.0	1.5	2.00		.98187	596.2	.00031	.000044			
2.0	1.5	1.00		.98077	595.5	.00035	.000050			
1.0	12.0	4.00		.94288	589.5	.00460	.000651			
1.0	3.5	4.00		.94068	588.2	.00479	.000678			
1.0	1.5	4.00		.94013	595.2	.00456	.000645			
.0	14.0	2.00		1.00054	631.2	.00575	.000814			
.0	12.0	3.00		1.00274	639.9	.00785	.001111			
.0	12.0	2.00		1.00604	634.9	.00609	.000862	.00624	.000883	
.0	12.0	1.00		1.00164	630.9	.00568	.000804			
.0	5.5	2.00		.99615	631.2	.00673	.000953			
.0	3.5	2.00		1.00000	642.2	.00618	.000875			
.0	1.5	3.00		1.00054	643.9	.00941	.001332			
.0	1.5	2.00		.99340	638.9	.00638	.000903	.00660	.000934	
.0	1.5	1.00		.99340	626.9	.00617	.000873			
1.0	.0	3.00		.92695	567.2	.00134	.000190			
1.0	.0	2.00		.94178	574.9	.00088	.000125	.00077	.000109	
1.0	.0	1.00		.94727	576.2	.00075	.000106			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(b) M = 2.65; R = 2.54×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95955	585.9	.00203	.000443			1.04
12.0	.0			.97395	598.5	.00274	.000598			1.36
20.5	.0			.99279	613.9	.00356	.000776			1.75
28.0	12.0			.91577	556.5	.00146	.000318			.66
28.0	4.0			.96564	582.2	.00042	.000092			.21
28.0	.0			.98171	591.9	.00039	.000085			.19
20.5	-5.0			.99279	614.5	.00381	.000831			1.83
24.5	-5.0			1.02216	642.9	.00573	.001250			2.60
30.0	.0			.95844	579.2	.00069	.000150	.00072	.000157	.34
31.0	12.0			.91466	558.2	.00187	.000408			.91
34.0	.0			.95345	581.2	.00178	.000388	.00176	.000384	.89
2.0	-12.0			.95678	584.5	.00222	.000484			1.08
2.0	12.0			.95899	585.5	.00203	.000443			1.01
12.0	-12.0			.96287	591.5	.00277	.000604			1.24
12.0	12.0			.96620	595.2	.00267	.000582			1.33
30.0	1.0			.95567	577.5	.00071	.000155			.32
31.0	2.0			.94846	574.5	.00101	.000220			.50
32.0	2.0			.95013	577.9	.00121	.000264	.00121	.000264	.65
32.0	3.0			.95013	577.2	.00141	.000307			.71
32.0	6.0			.93572	569.2	.00166	.000362			.82
34.0	1.0			.95401	582.5	.00204	.000445	.00203	.000443	.99
34.0	2.0			.95068	580.9	.00196	.000427	.00196	.000427	.95
34.0	3.0			.94736	578.9	.00205	.000447			1.00
36.0	.0			.94534	578.9	.00228	.000497	.00230	.000502	1.14
38.0	.0			.93572	573.9	.00246	.000536	.00287	.000626	1.19
44.0	12.0			.92021	564.2	.00254	.000554			1.22
42.0	.0			.92963	569.9	.00248	.000541	.00287	.000626	1.20
44.0	.0			.93738	574.5	.00248	.000541	.00251	.000547	1.15
48.0	.0			.92685	568.2	.00245	.000534	.00244	.000532	1.18
52.0	.0			.93018	570.2	.00248	.000541	.00248	.000541	1.20
52.0	12.0			.92852	569.9	.00233	.000508			1.13
55.0	.0			.93073	570.9	.00256	.000558	.00255	.000556	1.26
58.0	.0			.93960	575.9	.00246	.000536			1.18
58.0	12.0			.93517	572.2	.00221	.000482			1.07
44.0	-12.0			.92021	565.2	.00287	.000626			1.37
36.0	-8.0			.92519	567.2	.00256	.000558			1.21
36.0	-3.0			.92963	563.9	.00097	.000212			
34.0	-3.0			.95123	580.9	.00192	.000419	.00202	.000440	.93
32.0	-3.0			.95290	578.5	.00132	.000288	.00133	.000290	.60
30.0	-3.0			.95179	575.2	.00077	.000168	.00069	.000150	.37
28.0	-3.0			.97395	587.5	.00046	.000100			.22
34.0	-12.0			.91577	561.9	.00260	.000567	.00262	.000571	1.17
32.0	-12.0			.91245	558.2	.00217	.000473	.00218	.000475	.97
30.0	-12.0			.90026	548.9	.00182	.000397	.00176	.000384	.85
19.0	-12.5			.97007	599.2	.00339	.000739			1.65
17.5	-11.0			.97617	602.2	.00326	.000711			1.57
15.5	-2.5			.97949	603.9	.00310	.000676			1.50
16.5	-2.5			.98171	604.9	.00311	.000678	.00308	.000672	1.52
17.5	-2.5			.98448	607.5	.00324	.000707	.00287	.000626	1.61
18.5	-2.5			1.01385	625.5	.00329	.000717			1.06
19.5	-2.5			.98891	611.2	.00353	.000770	.00322	.000702	1.71
20.5	-2.5			.99556	616.2	.00362	.000789	.00372	.000811	1.76
21.5	-2.5			.99501	616.2	.00383	.000835	.00375	.000818	1.87
22.5	-2.5			1.00000	619.5	.00401	.000874	.00392	.000855	1.96
23.5	-2.5			1.00941	628.2	.00451	.000983	.00455	.000992	2.19
24.5	-2.5			1.02050	641.2	.00550	.001199			2.67
36.0	-16.0			.93073	569.9	.00250	.000545			1.20
36.0	-12.0			.91411	563.5	.00282	.000615	.00280	.000611	1.34
32.0	-18.0			.92907	569.9	.00259	.000565			1.25
32.0	-16.0			.92907	569.5	.00248	.000541	.00249	.000543	1.18
32.0	-14.0			.92907	568.5	.00225	.000491	.00230	.000502	1.08
32.0	-10.0			.90968	553.5	.00158	.000345			.75
28.0	-14.0			.93350	573.2	.00278	.000606			1.26
28.0	-12.0			.90524	550.9	.00127	.000277			.60
26.0	-12.5			.94459	576.2	.00203	.000443			.98
24.5	-11.0			1.00997	646.2	.00620	.001352			2.98
22.0	-12.5			.97451	603.5	.00390	.000850	.00388	.000846	1.74
20.5	-11.0			.98503	609.5	.00366	.000798	.00363	.000792	1.70
2.0	14.0	2.00		.99944	602.9	.00041	.000089			
2.0	12.0	2.00		1.00221	604.2	.00039	.000085			
2.0	12.0	1.00		1.00443	605.9	.00039	.000085			
2.0	5.5	2.00		.99279	598.5	.00034	.000074			
2.0	3.0	2.00		.99390	598.9	.00032	.000070			
2.0	1.5	3.00		.99168	596.9	.00021	.000046			
2.0	1.5	2.00		.99722	600.2	.00020	.000044			
2.0	1.5	1.00		.99501	599.2	.00026	.000057			
1.0	12.0	4.00		.95068	587.2	.00335	.000731			
1.0	3.5	4.00		.94791	585.2	.00335	.000731			
1.0	1.5	4.00		.94791	586.2	.00359	.000783			
.0	14.0	2.00		1.00609	633.5	.00362	.000789			
.0	12.0	3.00		1.00554	632.5	.00562	.001226			
.0	12.0	2.00		1.00941	628.5	.00429	.000936	.00439	.000957	
.0	12.0	1.00		1.00775	625.9	.00404	.000881			
.0	5.5	2.00		1.00110	624.5	.00457	.000997			
.0	3.5	2.00		1.00443	627.2	.00477	.001040			
.0	1.5	3.00		1.00277	634.5	.00693	.001511			
.0	1.5	2.00		.99612	626.2	.00481	.001049	.00493	.001075	
.0	1.5	1.00		.99722	620.2	.00431	.000940			
1.0	.0	3.00		.96237	571.5	.00097	.000212			
1.0	.0	2.00		.95622	577.5	.00053	.000116			
1.0	.0	1.00		.96176	580.9	.00064	.000140			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(c) M = 2.65; R = 1.26×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96570	586.9	.00104	.000456			1.02
12.0	.0			.97953	597.5	.00150	.000657			1.61
20.5	.0			.99778	611.2	.00200	.000876			2.04
28.0	12.0			.93140	564.2	.00081	.000355			.80
28.0	.0			.99336	598.2	.00019	.000083			.19
20.5	-5.0			.99778	611.9	.00212	.000929			2.04
24.5	-5.0			1.02323	638.5	.00317	.001389			3.34
30.0	.0			.97344	587.2	.00033	.000145			.35
31.0	12.0			.92698	565.5	.00096	.000421			.90
34.0	.0			.96625	585.9	.00094	.000412	.00094	.000412	.99
2.0	-12.0			.96238	585.2	.00108	.000473			1.00
2.0	12.0			.96404	585.5	.00109	.000477			1.07
12.0	-12.0			.96957	592.5	.00149	.000653			1.42
12.0	12.0			.97234	592.9	.00143	.000626			1.44
30.0	1.0			.97068	585.5	.00033	.000145			.35
31.0	2.0			.96293	581.5	.00043	.000188			.46
32.0	2.0			.96349	582.5	.00055	.000241	.00055	.000241	.59
32.0	3.0			.96293	583.2	.00074	.000324			.77
32.0	6.0			.94910	575.2	.00091	.000399			.93
34.0	1.0			.96625	587.5	.00097	.000425	.00103	.000451	1.10
34.0	2.0			.96238	584.5	.00107	.000469	.00107	.000469	1.05
34.0	3.0			.95851	584.2	.00112	.000491			1.12
36.0	.0			.95685	583.2	.00124	.000543	.00124	.000543	1.27
38.0	.0			.94855	577.5	.00135	.000591			1.44
44.0	12.0			.93251	568.5	.00127	.000556			1.23
42.0	.0			.94246	574.2	.00136	.000596			1.33
44.0	.0			.95076	580.9	.00164	.000718	.00167	.000732	1.74
48.0	.0			.94081	572.9	.00139	.000609	.00138	.000605	1.48
52.0	.0			.94468	574.9	.00135	.000591	.00135	.000591	1.44
52.0	12.0			.94136	571.9	.00110	.000482			1.09
55.0	.0			.94468	575.2	.00137	.000600	.00136	.000596	1.40
58.0	.0			.95298	580.2	.00136	.000596			1.36
58.0	12.0			.94744	575.9	.00111	.000486			1.09
44.0	-12.0			.93417	569.5	.00172	.000753			1.70
36.0	-8.0			.94081	574.2	.00140	.000613			1.39
36.0	-3.0			.93583	566.5	.00060	.000263			
34.0	-3.0			.96293	584.5	.00098	.000429	.00107	.000469	.99
32.0	-3.0			.96680	584.9	.00070	.000307	.00071	.000311	.80
30.0	-3.0			.96736	583.9	.00035	.000153			.36
28.0	-3.0			.98783	595.5	.00027	.000118			.28
34.0	-12.0			.93030	567.2	.00145	.000635	.00147	.000644	1.51
32.0	-12.0			.92808	564.5	.00114	.000499	.00114	.000499	1.15
30.0	-12.0			.91591	557.2	.00096	.000421	.00090	.000394	.92
19.0	-12.5			.97621	598.2	.00191	.000837			1.93
17.5	-11.0			.98174	600.9	.00178	.000780			1.75
15.5	-2.5			.98561	602.5	.00178	.000780			1.68
16.5	-2.5			.98783	603.9	.00178	.000780	.00175	.000767	1.91
17.5	-2.5			.99114	607.9	.00185	.000810			1.95
18.5	-2.5			1.02046	625.9	.00180	.000788			1.94
19.5	-2.5			.99502	609.9	.00207	.000907			2.09
20.5	+2.5			1.00110	613.5	.00205	.000898	.00214	.000937	2.05
21.5	+2.5			.99944	613.2	.00210	.000920	.00204	.000894	2.06
22.5	-2.5			1.00276	615.5	.00240	.001051	.00230	.001008	2.45
23.5	-2.5			1.01106	623.2	.00272	.001191	.00265	.001161	2.69
24.5	-2.5			1.02157	636.5	.00315	.001380			3.21
36.0	-16.0			.94578	575.2	.00131	.000574			1.39
36.0	-12.0			.92864	567.5	.00155	.000679	.00153	.000670	1.57
32.0	-18.0			.94246	574.2	.00142	.000622			1.39
32.0	-16.0			.94357	574.5	.00113	.000495	.00113	.000495	1.06
32.0	-14.0			.94302	574.5	.00125	.000548	.00130	.000569	1.44
32.0	-10.0			.92808	562.5	.00093	.000407			.94
28.0	-14.0			.94136	573.9	.00147	.000644			1.63
28.0	-12.0			.92089	557.2	.00070	.000307			.65
26.0	-12.5			.95298	577.9	.00092	.000403			.90
24.5	-11.0			1.01106	630.2	.00372	.001630			3.76
22.0	-12.5			.97897	600.5	.00208	.000911	.00212	.000929	2.04
20.5	-11.0			.99059	607.5	.00211	.000924	.00209	.000916	2.11
2.0	12.0	2.00		1.01438	612.2	.00025	.000110			
2.0	12.0	1.00		1.01659	613.2	.00023	.000101			
2.0	5.5	2.00		1.00663	607.2	.00025	.000110			
1.0	12.0	4.00		.96515	592.5	.00179	.000784			
1.0	3.5	4.00		.96404	590.2	.00189	.000828			
1.0	1.5	4.00		.96404	590.9	.00180	.000788			
.0	14.0	2.00		1.01106	624.5	.00239	.001047			
.0	12.0	3.00		1.00885	626.9	.00335	.001467			
.0	12.0	2.00		1.01493	625.2	.00242	.001060	.00239	.001047	
.0	12.0	1.00		1.01438	626.9	.00208	.000911			
.0	5.5	2.00		1.00663	621.2	.00267	.001170			
.0	3.5	2.00		1.00995	623.5	.00266	.001165			
.0	1.5	3.00		1.00608	630.2	.00384	.001682			
.0	1.5	2.00		1.00221	619.2	.00264	.001156	.00264	.001156	
.0	1.5	1.00		1.00663	620.9	.00226	.000990			
1.0	.0	3.00		.97068	586.9	.00048	.000210			
1.0	.0	2.00		.98395	593.5	.00025	.000110			
1.0	.0	1.00		.98727	595.5	.00030	.000131			

[a]Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(d) M = 3.51; R = 4.00×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95617	573.5	.00159	.000309			1.01
12.0	.0			.98201	592.5	.00275	.000535			1.77
20.5	.0			1.00000	605.9	.00343	.000667			2.21
28.0	12.0			.92077	550.5	.00138	.000268			.78
28.0	4.0			.97583	579.5	.00044	.000086			.27
28.0	.0			.98763	586.2	.00029	.000056			.18
20.5	-5.0			.99719	604.2	.00344	.000669			2.22
24.5	-5.0			1.02416	630.2	.00560	.001089			3.78
30.0	.0			.95898	570.5	.00060	.000117	.00063	.000123	.39
31.0	12.0			.90785	543.9	.00152	.000296			.80
34.0	.0			.93931	563.2	.00168	.000327	.00165	.000321	1.09
2.0	-12.0			.95336	571.2	.00165	.000321			1.01
2.0	12.0			.95392	572.5	.00190	.000370			1.02
12.0	-12.0			.96628	582.2	.00237	.000461			1.43
12.0	12.0			.96797	588.5	.00257	.000500			1.38
30.0	1.0			.95617	568.9	.00060	.000117			.39
31.0	2.0			.94774	565.2	.00097	.000189			.61
32.0	2.0			.94605	566.5	.00126	.000245	.00127	.000247	.90
32.0	3.0			.94774	567.9	.00137	.000266			.86
32.0	6.0			.93257	558.2	.00157	.000305			.93
34.0	1.0			.94212	565.2	.00173	.000336	.00178	.000346	1.12
34.0	2.0			.94044	567.9	.00187	.000364	.00188	.000366	1.17
34.0	3.0			.93875	563.5	.00194	.000377			1.20
36.0	.0			.92976	558.5	.00214	.000416	.00214	.000416	1.38
38.0	.0			.92133	554.2	.00208	.000405	.00236	.000459	1.33
44.0	12.0			.90897	546.9	.00238	.000463			1.38
42.0	.0			.91852	552.2	.00209	.000406	.00236	.000459	1.35
44.0	.0			.92695	557.2	.00204	.000397	.00206	.000401	1.34
48.0	.0			.91740	551.2	.00199	.000387	.00198	.000385	1.29
52.0	.0			.92021	554.5	.00204	.000397	.00204	.000397	1.30
52.0	12.0			.91965	554.5	.00205	.000399			1.15
55.0	.0			.92189	555.5	.00204	.000397	.00203	.000395	1.37
58.0	.0			.93088	561.2	.00202	.000393			1.29
58.0	12.0			.92807	557.2	.00196	.000381			1.11
44.0	-12.0			.91403	549.9	.00236	.000459			1.43
26.0	-8.0			.91796	551.5	.00208	.000405			1.32
36.0	-3.0			.93369	557.9	.00092	.000179			
34.0	-3.0			.93987	563.9	.00193	.000375	.00195	.000379	1.30
32.0	-3.0			.94718	565.9	.00114	.000222	.00114	.000222	.74
30.0	-3.0			.95336	567.2	.00065	.000126	.00058	.000113	.42
28.0	-3.0			.98145	582.9	.00032	.000062			.21
34.0	-12.0			.91009	546.9	.00205	.000399	.00207	.000403	1.31
32.0	-12.0			.90560	543.2	.00175	.000340	.00172	.000335	1.06
30.0	-12.0			.89324	536.2	.00128	.000249	.00120	.000233	.80
19.0	-12.5			.97359	588.5	.00296	.000576			1.87
17.5	-11.0			.97864	593.5	.00279	.000543			1.68
15.5	-2.5			.98651	595.9	.00291	.000566			1.83
16.5	-2.5			.98820	596.5	.00266	.000517	.00263	.000511	1.86
17.5	-2.5			.99044	598.9	.00292	.000568	.00265	.000515	1.88
18.5	-2.5			1.02022	616.9	.00283	.000550			1.98
19.5	-2.5			.99438	602.2	.00328	.000638			2.08
20.5	-2.5			1.00000	606.2	.00344	.000669	.00351	.000683	2.18
21.5	-2.5			.99943	606.2	.00327	.000636	.00322	.000626	2.07
22.5	-2.5			1.00224	608.2	.00363	.000706	.00338	.000657	2.36
23.5	-2.5			1.01067	619.2	.00412	.000801	.00401	.000780	2.50
24.5	-2.5			1.02303	628.9	.00541	.001052			3.81
36.0	-16.0			.92751	556.9	.00196	.000381			1.08
36.0	-12.0			.90672	545.5	.00238	.000463	.00236	.000459	1.44
32.0	-18.0			.92751	559.2	.00215	.000418			1.17
32.0	-16.0			.92927	563.2	.00193	.000375	.00194	.000377	1.19
32.0	-14.0			.92583	555.5	.00178	.000346	.00183	.000356	1.08
32.0	-10.0			.90729	542.9	.00137	.000266			.87
28.0	-14.0			.93032	559.2	.00206	.000401			1.13
28.0	-12.0			.90335	538.5	.00085	.000165			.55
26.0	-12.5			.94774	567.9	.00137	.000266			.83
24.5	-11.0			1.01292	628.5	.00588	.001144			3.97
22.0	-12.5			.97752	591.9	.00333	.000648	.00337	.000655	2.08
20.5	-11.0			.98876	598.5	.00329	.000640	.00327	.000636	2.08
2.0	14.0	2.00		1.01179	600.5	.00027	.000053			
2.0	12.0	2.00		1.01348	601.5	.00027	.000053			
2.0	12.0	1.00		1.01573	602.9	.00027	.000053			
2.0	5.5	2.00		.99775	592.2	.00026	.000051			
2.0	3.0	2.00		.99831	592.2	.00025	.000049			
2.0	1.5	3.00		.99494	589.5	.00018	.000035			
2.0	1.5	2.00		1.00168	593.9	.00020	.000039			
2.0	1.5	1.00		.99831	592.2	.00023	.000045			
1.0	12.0	4.00		.94437	571.9	.00308	.000599			
1.0	3.5	4.00		.94437	571.2	.00306	.000595			
1.0	1.5	4.00		.94044	571.9	.00318	.000618			
.0	14.0	2.00		1.00561	613.5	.00424	.000825			
.0	12.0	3.00		1.00224	618.2	.00581	.001130			
.0	12.0	2.00		1.00786	614.9	.00423	.000823	.00425	.000827	
.0	12.0	1.00		1.00899	614.2	.00400	.000778			
.0	5.5	2.00		1.00000	610.5	.00446	.000867			
.0	3.5	2.00		1.00337	618.9	.00403	.000784			
.0	1.5	3.00		1.00112	624.2	.00661	.001286			
.0	1.5	2.00		.99494	611.5	.00450	.000875	.00457	.000889	
.0	1.5	1.00		.99719	611.9	.00351	.000683			
1.0	.0	3.00		.93875	558.5	.00067	.000130			
1.0	.0	2.00		.95785	568.9	.00050	.000097			
1.0	.0	1.00		.96909	575.5	.00040	.000078			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(e) M = 3.51; R = 2.79×10^6

x, in.	y, in.	z, in. [a]	ø, deg [a]	$\frac{T_e}{T_t}$	T_w, °R	h [b]	N_{St}	h_c [b]	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95744	576.2	.00114	.000317			.93
12.0	.0			.98096	592.9	.00186	.000517			1.68
20.5	.0			.99944	606.5	.00234	.000651			1.93
28.0	12.0			.92496	554.5	.00102	.000284			.67
28.0	4.0			.97984	583.5	.00026	.000072			.20
28.0	.0			.98768	587.9	.00024	.000067			.19
20.5	-5.0			.99664	606.9	.00243	.000676			2.03
24.5	-5.0			1.02127	634.2	.00365	.001015			2.94
30.0	.0			.96136	573.2	.00049	.000136	.00052	.000145	.40
31.0	12.0			.91040	546.5	.00125	.000348			.90
34.0	.0			.94120	565.5	.00127	.000353	.00124	.000345	1.02
2.0	-12.0			.95352	573.9	.00126	.000351			.99
2.0	12.0			.95464	574.2	.00137	.000381			1.04
12.0	-12.0			.96472	582.2	.00168	.000467			1.30
12.0	12.0			.96752	584.9	.00186	.000517			1.40
30.0	1.0			.95800	571.5	.00043	.000120			.35
31.0	2.0			.95016	567.9	.00066	.000184			.52
32.0	2.0			.94736	569.9	.00090	.000250	.00090	.000250	.73
32.0	3.0			.94904	568.9	.00097	.000270			.75
32.0	6.0			.93616	561.5	.00121	.000337			.91
34.0	1.0			.94344	567.2	.00138	.000384	.00143	.000398	1.14
34.0	2.0			.94176	566.5	.00133	.000370	.00134	.000373	1.06
34.0	3.0			.93952	566.5	.00141	.000392			1.04
36.0	.0			.93112	560.5	.00142	.000395	.00142	.000395	1.15
38.0	.0			.92328	556.2	.00160	.000445	.00186	.000517	1.32
44.0	12.0			.91208	549.9	.00150	.000417			.98
42.0	.0			.92160	554.9	.00143	.000398	.00171	.000476	1.18
44.0	.0			.93000	559.9	.00141	.000392	.00144	.000401	1.13
48.0	.0			.92104	554.5	.00137	.000381	.00136	.000378	1.13
52.0	.0			.92440	555.9	.00138	.000384	.00138	.000384	1.08
52.0	12.0			.92272	555.2	.00139	.000387			.91
55.0	.0			.92552	556.9	.00139	.000387	.00138	.000384	1.08
58.0	.0			.93504	562.9	.00144	.000401			1.14
58.0	12.0			.93056	562.2	.00135	.000376			.89
44.0	-12.0			.91656	552.9	.00168	.000467			1.41
36.0	-8.0			.92104	554.5	.00160	.000445			1.30
36.0	-3.0			.93336	558.9	.00067	.000186			
34.0	-3.0			.94176	565.9	.00125	.000348	.00127	.000353	1.05
32.0	-3.0			.94904	570.5	.00090	.000250	.00090	.000250	.76
30.0	-3.0			.95576	570.2	.00045	.000125			.37
28.0	-3.0			.98432	586.2	.00028	.000078			.23
34.0	-12.0			.91376	550.5	.00149	.000415	.00152	.000423	1.17
32.0	-12.0			.90984	546.9	.00131	.000364	.00129	.000359	1.09
30.0	-12.0			.89752	537.9	.00085	.000236	.00078	.000217	.69
19.0	-12.5			.97256	589.5	.00208	.000579			1.65
17.5	-11.0			.97872	593.2	.00207	.000576			1.73
15.5	-2.5			.98656	596.2	.00199	.000554			1.62
16.5	-2.5			.98824	597.2	.00195	.000542	.00192	.000534	1.59
17.5	-2.5			.99104	599.5	.00220	.000612	.00193	.000537	1.85
18.5	-2.5			1.02127	617.5	.00201	.000559			1.65
19.5	-2.5			.99552	602.9	.00225	.000626			1.86
20.5	-2.5			1.00111	608.9	.00240	.000668	.00248	.000690	2.00
21.5	-2.5			1.00000	606.5	.00255	.000709	.00252	.000701	2.06
22.5	-2.5			1.00167	607.9	.00247	.000687	.00245	.000682	2.01
23.5	-2.5			1.00895	615.2	.00296	.000823	.00286	.000796	2.37
24.5	-2.5			1.02071	632.9	.00362	.001007			2.99
36.0	-16.0			.93168	559.9	.00137	.000381			1.05
36.0	-12.0			.91096	548.9	.00154	.000428	.00152	.000423	1.29
32.0	-18.0			.93056	560.2	.00148	.000412			1.14
32.0	-16.0			.93000	560.9	.00142	.000395	.00143	.000398	.93
32.0	-14.0			.92776	557.9	.00132	.000367	.00137	.000381	1.05
32.0	-10.0			.91264	546.9	.00101	.000281			.81
28.0	-14.0			.93000	560.2	.00147	.000409			1.20
28.0	-12.0			.90704	541.9	.00068	.000189			.55
26.0	-12.5			.94680	567.2	.00101	.000281			.80
24.5	-11.0			1.00895	628.9	.00414	.001152			3.34
22.0	-12.5			.97592	591.9	.00244	.000679	.00247	.000687	2.02
20.5	-11.0			.98824	599.2	.00241	.000670	.00239	.000665	2.03
2.0	14.0	2.00		1.01343	603.2	.00023	.000064			
2.0	12.0	2.00		1.01511	603.9	.00019	.000053			
2.0	12.0	1.00		1.01735	605.2	.00019	.000053			
2.0	5.0	2.00		1.00111	595.5	.00019	.000053			
2.0	1.5	2.00		1.00503	597.2	.00015	.000042			
1.0	12.0	4.00		.94960	577.2	.00205	.000570			
1.0	3.5	4.00		.95128	577.9	.00203	.000565			
1.0	1.5	4.00		.94568	573.2	.00232	.000645			
.0	14.0	2.00		1.00503	616.2	.00285	.000793			
.0	12.0	3.00		1.00055	623.2	.00397	.001104			
.0	12.0	2.00		1.00727	619.5	.00280	.000779	.00281	.000782	
.0	12.0	1.00		1.00951	618.9	.00249	.000693			
.0	5.5	2.00		.99944	610.5	.00318	.000885			
.0	3.5	2.00		1.00279	612.9	.00318	.000885			
.0	1.5	3.00		.99888	618.5	.00492	.001369			
.0	1.5	2.00		.99384	612.9	.00306	.000851	.00310	.000862	
.0	1.5	1.00		.99720	607.2	.00278	.000773			
1.0	.0	3.00		.95016	566.9	.00039	.000108			
1.0	.0	2.00		.96808	576.5	.00031	.000086			
1.0	.0	1.00		.97760	582.2	.00029	.000081			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(f) M = 3.51; R = 1.60×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96291	574.5	.00067	.000325			.99
12.0	.0			.98339	592.5	.00114	.000578			1.83
20.5	.0			1.00393	602.9	.00148	.000718			2.18
28.0	12.0			.93650	557.9	.00067	.000325			.79
28.0	.0			.99044	587.5	.00017	.000083			.26
20.5	-5.0			1.00000	600.5	.00155	.000752			2.35
24.5	-5.0			1.02303	620.9	.00288	.001398			4.36
30.0	.0			.96684	574.5	.00029	.000141			.47
31.0	12.0			.91908	548.2	.00068	.000330			.80
34.0	.0			.94718	565.5	.00077	.000374	.00074	.000359	1.18
2.0	-12.0			.95954	572.5	.00079	.000383			.93
2.0	12.0			.96235	574.2	.00086	.000417			1.01
12.0	-12.0			.97022	580.5	.00118	.000573			1.76
12.0	12.0			.97246	582.5	.00123	.000597			1.60
30.0	1.0			.96516	573.2	.00031	.000150			.46
31.0	2.0			.95673	569.2	.00052	.000252			.70
32.0	2.0			.95504	569.2	.00061	.000296	.00062	.000301	.91
32.0	3.0			.95729	570.5	.00065	.000316			.96
32.0	6.0			.94718	564.9	.00068	.000330			.80
34.0	1.0			.94999	568.9	.00086	.000417	.00091	.000442	1.26
34.0	2.0			.94830	569.2	.00091	.000442	.00092	.000447	1.34
34.0	3.0			.94662	568.2	.00091	.000442			1.20
36.0	.0			.93819	560.9	.00099	.000481	.00099	.000481	1.16
38.0	.0			.93088	556.9	.00097	.000471			1.14
44.0	12.0			.92470	552.5	.00096	.000466			1.25
42.0	.0			.93088	556.2	.00099	.000481			1.46
44.0	.0			.94044	561.9	.00094	.000456	.00097	.000471	1.21
48.0	.0			.93257	559.2	.00092	.000447	.00091	.000442	1.08
52.0	.0			.93594	560.5	.00087	.000422	.00087	.000422	1.23
52.0	12.0			.93313	558.5	.00087	.000422			1.02
55.0	.0			.93706	561.2	.00087	.000422	.00086	.000417	1.30
58.0	.0			.94718	565.5	.00081	.000393			1.21
58.0	12.0			.94156	562.2	.00077	.000374			.92
44.0	-12.0			.92751	554.5	.00100	.000485			1.54
36.0	-8.0			.93088	556.2	.00100	.000485			1.52
36.0	-3.0			.93931	559.2	.00050	.000243			
34.0	-3.0			.94830	567.5	.00086	.000417	.00088	.000427	1.28
32.0	-3.0			.95561	569.2	.00060	.000291	.00060	.000291	.90
31.0	-3.0			.96291	571.9	.00033	.000160			.46
34.0	-12.0			.92470	552.9	.00098	.000476	.00102	.000495	1.17
32.0	-12.0			.92077	550.5	.00094	.000456	.00095	.000461	1.40
30.0	-12.0			.90953	541.9	.00065	.000316	.00060	.000291	.76
17.5	-11.0			1.00224	599.9	.00125	.000607			1.47
15.5	-2.5			1.00505	602.9	.00120	.000582			1.62
16.5	-2.5			1.00337	600.9	.00122	.000592	.00120	.000582	1.44
17.5	-2.5			1.00337	601.5	.00129	.000626			1.93
18.5	-2.5			1.03146	617.5	.00126	.000612			1.91
19.5	-2.5			1.00393	599.5	.00131	.000636			1.56
20.5	-2.5			1.00730	604.2	.00138	.000670	.00145	.000704	1.64
21.5	-2.5			1.00280	601.2	.00152	.000738	.00148	.000718	1.79
22.5	-2.5			1.00224	601.9	.00154	.000748	.00135	.000655	2.17
23.5	-2.5			1.00842	606.2	.00193	.000937	.00185	.000898	2.92
24.5	-2.5			1.01910	616.2	.00267	.001296			3.14
36.0	-16.0			.93931	558.5	.00076	.000369			1.03
36.0	-12.0			.91852	547.5	.00104	.000505	.00102	.000495	1.24
32.0	-18.0			.93594	557.5	.00083	.000403			.98
32.0	-16.0			.93706	558.2	.00101	.000490	.00102	.000495	1.35
32.0	-14.0			.93313	555.2	.00081	.000393	.00082	.000398	1.23
32.0	-10.0			.92077	546.5	.00052	.000252			.78
28.0	-14.0			.93201	559.5	.00087	.000422			1.02
28.0	-12.0			.91515	543.5	.00039	.000189			.59
26.0	-12.5			.94999	565.5	.00062	.000301			.93
24.5	-11.0			1.00730	612.9	.00314	.001524			4.76
22.0	-12.5			.97640	585.5	.00151	.000733	.00166	.000806	2.22
20.5	-11.0			.98876	592.9	.00139	.000675	.00135	.000655	2.14
2.0	14.0	2.00		1.01573	601.5	.00014	.000068			
2.0	12.0	2.00		1.01741	604.5	.00015	.000073			
1.0	12.0	4.00		.96066	578.2	.00139	.000676			
1.0	3.5	4.00		.96684	579.2	.00136	.000660			
1.0	1.5	4.00		.95842	575.2	.00131	.000636			
.0	14.0	2.00		1.00955	609.2	.00185	.000898			
.0	12.0	3.00		1.00337	612.5	.00273	.001325			
.0	12.0	2.00		1.01067	614.5	.00174	.000845	.00170	.000825	
.0	12.0	1.00		1.01404	612.5	.00168	.000815			
.0	5.5	2.00		1.00449	609.5	.00191	.000927			
.0	3.5	2.00		1.00786	610.5	.00205	.000995			
.0	1.5	3.00		1.00224	613.9	.00314	.001524			
.0	1.5	2.00		.99943	605.9	.00208	.001010	.00205	.000995	
.0	1.5	1.00		1.00449	604.9	.00157	.000762			
1.0	.0	3.00		.96909	575.9	.00042	.000204			
1.0	.0	2.00		.98426	583.9	.00020	.000097			
1.0	.0	1.00		.99157	588.2	.00019	.000092			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(g) M = 4.44; R = 4.60 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ$R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96450	574.2	.00086	.000217			1.01
12.0	.0			1.01428	605.5	.00149	.000377			2.07
20.0	.0			1.02366	612.8	.00192	.000485			2.74
28.0	12.0			.94027	558.9	.00087	.000220			.84
20.0	-5.0			1.01746	610.2	.00190	.000480			2.84
24.5	-5.0			1.03606	628.9	.00297	.000751			4.43
32.0	.0			.97971	579.2	.00035	.000088			.51
31.0	12.0			.91820	547.5	.00095	.000240			.93
34.0	.0			.95041	564.9	.00101	.000255	.00100	.000253	1.51
2.0	-12.0			.96281	571.9	.00071	.000179			1.04
2.0	12.0			.96168	574.2	.00117	.000296			1.17
12.0	-12.0			.99436	592.2	.00134	.000339			2.39
12.0	12.0			.90436	537.5	.00184	.000465			1.86
30.0	1.0			.97771	576.2	.00035	.000088			.54
31.0	2.0			.97182	575.5	.00057	.000144			.78
32.0	2.0			.96106	572.5	.00068	.000172	.00068	.000172	.85
32.0	3.0			.96506	572.9	.00069	.000174			.83
32.0	5.0			.95661	569.2	.00090	.000227			1.05
34.0	1.0			.94985	566.9	.00093	.000235	.00092	.000233	1.33
34.0	2.0			.95041	565.5	.00106	.000268	.00106	.000268	1.45
34.0	3.0			.95097	565.9	.00107	.000270			1.51
36.0	.0			.93914	559.2	.00107	.000270	.00105	.000265	1.51
38.0	.0			.93407	556.2	.00134	.000339			1.91
44.0	12.0			.92449	551.5	.00128	.000324			1.24
42.0	.0			.93407	557.2	.00119	.000301			1.70
44.0	.0			.93520	556.2	.00105	.000265	.00105	.000265	1.52
48.0	.0			.93801	557.9	.00082	.000207	.00082	.000207	1.03
52.0	.0			.94027	558.5	.00085	.000215	.00085	.000215	1.23
52.0	12.0			.93463	558.9	.00127	.000321			1.28
55.0	.0			.94196	559.9	.00101	.000255	.00101	.000255	1.40
58.0	.0			.94478	562.2	.00088	.000222			1.66
58.0	12.0			.94083	562.9	.00127	.000321			1.23
44.0	-12.0			.93294	554.9	.00108	.000273			1.86
36.0	-8.0			.93407	555.5	.00107	.000270			1.84
36.0	-3.0			.94252	559.2	.00055	.000139			
34.0	-3.0			.95097	565.2	.00103	.000260	.00103	.000260	1.47
32.0	-3.0			.96224	570.5	.00062	.000157	.00062	.000157	.93
30.0	-3.0			.97408	576.2	.00033	.000083			.53
34.0	-12.0			.92280	548.9	.00107	.000270	.00110	.000278	1.95
32.0	-12.0			.91773	545.5	.00090	.000227	.00078	.000197	1.41
30.0	-12.0			.91097	539.9	.00052	.000131			.81
19.0	-12.5			.99605	596.2	.00156	.000394			2.64
17.5	-11.0			.99887	596.5	.00159	.000402			2.74
15.5	-2.5			1.01690	607.2	.00158	.000399			2.47
16.5	-2.5			1.01803	607.9	.00176	.000445	.00174	.000440	2.59
17.5	-2.5			1.01972	611.5	.00177	.000447	.00181	.000457	2.64
18.5	-2.5			1.01972	611.9	.00177	.000447	.00174	.000440	2.90
19.5	-2.5			1.02084	610.5	.00188	.000475	.00189	.000478	
20.5	-2.5			1.02141	611.2	.00194	.000490	.00196	.000495	3.08
21.5	-2.5			1.02084	611.2	.00202	.000511	.00201	.000508	3.16
22.5	-2.5			1.01972	611.2	.00207	.000523	.00191	.000483	2.62
23.5	-2.5			1.02479	620.2	.00266	.000672	.00243	.000614	3.33
24.5	-2.5			1.03887	631.2	.00316	.000799			4.39
36.0	-16.0			.94478	561.9	.00087	.000220			1.61
36.0	-12.0			.92111	548.9	.00108	.000273	.00104	.000263	1.86
32.0	-18.0			.95041	564.9	.00077	.000195			1.33
32.0	-16.0			.94759	564.9	.00104	.000263	.00106	.000268	1.42
32.0	-14.0			.94083	558.9	.00080	.000202	.00086	.000217	1.38
32.0	-10.0			.92844	550.5	.00062	.000157			.97
28.0	-14.0			.94252	560.5	.00102	.000258			1.76
26.0	-12.5			.96562	572.2	.00056	.000142			.97
24.5	-11.0			1.02479	618.9	.00309	.000781			5.83
22.0	-12.0			.99436	593.9	.00166	.000420	.00170	.000430	2.59
20.5	-11.0			1.00225	599.2	.00166	.000420	.00162	.000409	2.81
2.0	14.0	2.00		1.03493	611.5	.00017	.000043			
2.0	12.0	2.00		1.03268	610.2	.00018	.000045			
1.0	12.0	4.00		.96168	575.2	.00171	.000432			
1.0	3.5	4.00		.95830	573.5	.00162	.000409			
1.0	1.5	4.00		.95774	572.2	.00158	.000399			
.0	14.0	2.00		1.01859	613.2	.00257	.000650			
.0	12.0	2.00		1.01362	618.2	.00376	.000950			
.0	12.0	2.00		1.01634	614.9	.00243	.000614	.00210	.000536	
.0	12.0	1.00		1.02648	616.5	.00218	.000551			
.0	3.5	2.00		1.01295	610.5	.00237	.000599			
.0	3.5	2.00		1.01126	607.5	.00221	.000559			
.0	1.5	4.00		1.01295	617.2	.00340	.000859			
.0	1.5	2.00		1.00801	605.5	.00219	.000554	.00211	.000533	
.0	1.5	1.00		1.01408	606.9	.00188	.000475			
1.0	.0	3.00		.96731	571.9	.00030	.000076			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Continued

(h) M = 4.44; R = 3.27×10^6

x, in.	y, in.	z, in. [a]	ϕ, deg [a]	$\frac{T_e}{T_t}$	T_w, °R	h [b]	N_{St}	h_c [b]	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96436	571.2	.00079	.000281			1.34
12.0	.0			1.00791	598.5	.00137	.000487			1.85
20.5	.0			1.01923	607.9	.00182	.000648			3.43
28.0	12.0			.94003	555.2	.00070	.000249			.79
20.5	-5.0			1.01301	601.9	.00158	.000562			2.98
24.5	-5.0			1.02941	616.5	.00305	.001085			5.65
31.0	12.0			.91797	543.5	.00082	.000292			1.14
34.0	.0			.94739	560.5	.00089	.000317	.00088	.000313	1.56
2.0	-12.0			.96209	568.2	.00079	.000281			1.46
2.0	12.0			.96096	568.9	.00108	.000384			1.44
12.0	-12.0			.98981	586.9	.00121	.000431			2.47
12.0	12.0			.98925	587.5	.00161	.000573			2.15
30.0	1.0			.97567	574.9	.00033	.000117			.49
31.0	2.0			.96888	571.5	.00051	.000181			.89
32.0	2.0			.96266	568.2	.00078	.000278	.00079	.000281	1.28
32.0	3.0			.96266	568.5	.00079	.000281			1.25
32.0	6.0			.95531	565.2	.00079	.000281			1.22
34.0	1.0			.94739	561.5	.00094	.000334	.00093	.000331	1.40
34.0	2.0			.94795	561.5	.00089	.000317	.00090	.000320	1.41
34.0	3.0			.94852	561.2	.00106	.000377			1.93
36.0	.0			.93720	554.5	.00106	.000377	.00104	.000370	1.74
38.0	.0			.93155	551.9	.00091	.000324			1.60
44.0	12.0			.92532	547.9	.00112	.000399			1.27
42.0	.0			.93211	552.5	.00096	.000342			1.52
44.0	.0			.93324	553.2	.00096	.000342	.00096	.000342	
48.0	.0			.93777	554.9	.00090	.000320	.00090	.000320	1.58
52.0	.0			.93947	556.2	.00080	.000285	.00080	.000285	1.45
52.0	12.0			.93437	553.2	.00107	.000381			1.27
55.0	.0			.94173	557.5	.00080	.000285	.00080	.000285	1.38
58.0	.0			.94512	558.5	.00071	.000253			1.11
58.0	12.0			.94060	556.9	.00111	.000395			1.32
44.0	-12.0			.93155	552.2	.00096	.000342			1.96
36.0	-8.0			.93211	551.9	.00090	.000320			1.84
36.0	-3.0			.94286	556.9	.00052	.000185			
34.0	-3.0			.94795	560.5	.00078	.000278	.00077	.000274	1.42
32.0	-3.0			.95870	565.9	.00062	.000221	.00062	.000221	1.22
34.0	-12.0			.92250	545.9	.00091	.000324	.00099	.000352	1.82
32.0	-12.0			.91740	542.2	.00075	.000267	.00062	.000221	1.53
30.0	-12.0			.91231	537.9	.00054	.000192	.00046	.000164	1.10
19.0	-12.5			.99434	588.5	.00130	.000463			2.65
17.5	-11.0			.99490	590.9	.00139	.000495			2.84
15.5	-2.5			1.01187	601.2	.00137	.000487			2.58
16.5	-2.5			1.01301	600.9	.00155	.000552	.00153	.000544	3.04
17.5	-2.5			1.01527	602.2	.00130	.000463	.00139	.000495	2.13
18.5	-2.5			1.01583	602.9	.00148	.000527	.00135	.000480	2.96
19.5	-2.5			1.01640	604.9	.00171	.000608	.00173	.000616	3.11
20.5	-2.5			1.01697	604.2	.00160	.000569	.00163	.000580	2.62
21.5	-2.5			1.01583	603.5	.00166	.000591	.00165	.000587	2.72
22.5	-2.5			1.01470	603.2	.00185	.000658	.00171	.000608	3.63
23.5	-2.5			1.01979	611.2	.00241	.000858	.00213	.000758	4.38
24.5	-2.5			1.03224	620.5	.00310	.001103			5.85
36.0	-16.0			.94343	557.5	.00074	.000263			1.51
36.0	-12.0			.92080	545.9	.00097	.000345	.00093	.000331	
32.0	-18.0			.94852	561.9	.00080	.000285			1.74
32.0	-16.0			.94456	559.5	.00107	.000381	.00109	.000388	
32.0	-14.0			.93777	554.9	.00080	.000285	.00092	.000327	1.95
32.0	-10.0			.92759	547.5	.00081	.000288			1.65
28.0	-14.0			.93947	556.2	.00080	.000285			1.63
26.0	-12.5			.96153	567.5	.00052	.000185			1.06
24.5	-11.0			1.01866	612.5	.00275	.000979			5.98
22.0	-12.5			.98925	589.5	.00138	.000491	.00142	.000505	2.82
20.5	-11.0			.99830	592.5	.00150	.000534	.00136	.000484	
2.0	5.5	2.00		1.00961	594.2	.00022	.000078			
1.0	12.0	4.00		.96209	571.5	.00159	.000566			
1.0	3.5	4.00		.95870	569.2	.00126	.000448			
1.0	1.5	4.00		.95813	568.2	.00137	.000487			
.0	14.0	2.00		1.01470	605.2	.00243	.000865			
.0	12.0	3.00		1.00905	606.5	.00376	.001338			
.0	12.0	2.00		1.01187	603.9	.00245	.000872	.00218	.000776	
.0	12.0	1.00		1.02206	608.5	.00187	.000665			
.0	5.5	2.00		1.00791	600.5	.00217	.000772			
.0	3.5	2.00		1.00622	599.5	.00217	.000772			
.0	1.5	3.00		1.00678	603.2	.00339	.001206			
.0	1.5	2.00		1.00339	597.2	.00189	.000673	.00176	.000626	
.0	1.5	1.00		1.00961	599.5	.00157	.000559			
1.0	.0	2.00		.98416	579.2	.00022	.000078			

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

2. 2-inch by 4-inch rectangular stiffener - Concluded

(i) M = 4.44; R = 2.15×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
12.0	.0			1.00055	599.5	.00080	.000428			1.60
20.5	.0			1.01062	606.9	.00108	.000578			2.12
28.0	12.0			.93850	560.9	.00044	.000236			.70
20.5	-5.0			1.00614	603.5	.00108	.000578			2.70
24.5	-5.0			1.01844	617.2	.00201	.001076			4.02
31.0	12.0			.91781	548.5	.00054	.000289			.68
34.0	.0			.94633	565.9	.00052	.000278	.00052	.000278	1.02
2.0	-12.0			.95471	570.5	.00048	.000257			.91
2.0	12.0			.95471	571.5	.00056	.000300			.70
12.0	-12.0			.98434	588.9	.00061	.000327			1.33
12.0	12.0			.98099	588.9	.00107	.000573			1.35
31.0	2.0			.96757	577.2	.00034	.000182			.65
32.0	2.0			.96142	574.2	.00043	.000230	.00044	.000236	1.08
32.0	6.0			.95527	570.9	.00052	.000278			.98
34.0	1.0			.94633	565.9	.00059	.000316	.00058	.000311	1.13
34.0	2.0			.94689	566.5	.00069	.000369	.00069	.000369	1.30
34.0	3.0			.94744	566.9	.00067	.000359			1.31
36.0	.0			.93515	559.5	.00080	.000428	.00078	.000418	1.82
38.0	.0			.92900	555.9	.00064	.000343			1.23
44.0	12.0			.92732	554.9	.00060	.000321			.90
42.0	.0			.93011	556.2	.00059	.000316			1.23
44.0	.0			.93738	557.2	.00060	.000321	.00060	.000321	1.22
52.0	.0			.94018	561.5	.00052	.000278	.00052	.000278	1.30
52.0	12.0			.93682	560.2	.00069	.000369			.87
55.0	.0			.94241	562.9	.00054	.000289	.00054	.000289	
58.0	12.0			.94185	563.5	.00067	.000359			.85
44.0	-12.0			.93123	556.9	.00067	.000359			1.72
36.0	-8.0			.93123	556.9	.00059	.000316			1.34
34.0	-3.0			.94639	565.9	.00058	.000311	.00059	.000316	1.32
32.0	-3.0			.95751	571.9	.00046	.000246	.00046	.000246	.92
34.0	-12.0			.92173	551.2	.00069	.000369	.00071	.000380	1.44
32.0	-12.0			.91781	548.5	.00053	.000284			
30.0	-12.0			.91446	545.9	.00041	.000220			1.05
19.0	-12.5			.98602	592.2	.00104	.000557			
17.5	-11.0			.98937	592.5	.00081	.000434			2.08
15.5	-2.5			1.00614	602.9	.00088	.000471			2.20
16.5	-2.5			1.00782	603.9	.00097	.000519	.00095	.000509	1.87
17.5	-2.5			1.01006	606.9	.00101	.000541	.00105	.000562	
18.5	-2.5			1.01006	605.5	.00082	.000439	.00080	.000428	1.74
19.5	-2.5			1.01062	606.2	.00101	.000541	.00104	.000557	1.94
20.5	-2.5			1.01006	606.2	.00102	.000546	.00105	.000562	1.96
21.5	-2.5			1.00782	605.2	.00106	.000568	.00105	.000562	
22.5	-2.5			1.00670	604.5	.00109	.000584	.00094	.000503	2.73
23.5	-2.5			1.01118	609.2	.00161	.000862	.00149	.000798	3.50
24.5	-2.5			1.02124	618.2	.00211	.001130			4.59
36.0	-12.0			.92061	550.5	.00060	.000321	.00056	.000300	1.36
32.0	-18.0			.94633	565.5	.00054	.000289			
28.0	-14.0			.93626	559.5	.00053	.000284			1.15
28.0	-12.0			.92732	552.5	.00027	.000145			.59
24.5	-11.0			1.00782	608.9	.00192	.001028			5.05
22.0	-17.5			.98099	588.2	.00100	.000535	.00103	.000552	
20.5	-11.0			.99049	593.9	.00084	.000450	.00081	.000434	1.75
1.0	12.0	4.00		.96254	577.9	.00106	.000568			
1.0	3.5	4.00		.95918	575.5	.00089	.000477			
1.0	1.5	4.00		.95918	575.9	.00094	.000503			
.0	14.0	2.00		1.00782	608.2	.00160	.000857			
.0	12.0	3.00		1.00223	607.9	.00243	.001301			
.0	12.0	2.00		1.00559	605.9	.00149	.000798	.00115	.000616	
.0	12.0	1.00		1.01453	611.2	.00140	.000750			
.0	5.5	2.00		1.00055	602.5	.00148	.000792			
.0	3.5	2.00		.99944	601.2	.00142	.000760			
.0	1.5	3.00		.99832	605.2	.00205	.001098			
.0	1.5	2.00		.99608	601.2	.00132	.000707	.00116	.000621	
.0	1.5	1.00		1.00279	601.9	.00105	.000562			

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing

(a) M = 2.65; R = 4.02×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94618	578.2	.00280	.000381			.97
12.0	.0			.95963	586.5	.00437	.000611			1.41
20.5	.0			.98934	613.5	.00630	.000880			2.21
28.0	12.0			.89516	538.9	.00196	.000274			.59
28.0	4.0			.93104	556.2	.00071	.000099			.24
28.0	.0			.94393	563.9	.00067	.000094			.22
20.5	-5.0			.99215	623.5	.00580	.000810			1.92
30.0	.0			.93216	557.5	.00085	.000119	.00089	.000124	.27
31.0	12.0			.89404	539.2	.00215	.000300			.71
34.0	.0			.93552	564.9	.00222	.000310	.00222	.000310	.71
2.0	-12.0			.94562	579.5	.00313	.000437			1.04
2.0	12.0			.95010	576.2	.00290	.000405			.93
12.0	-12.0			.95290	588.2	.00395	.000552			1.26
12.0	12.0			.94954	579.5	.00363	.000507			1.24
30.0	1.0			.92880	557.2	.00093	.000130			.32
31.0	2.0			.91983	551.2	.00132	.000184			.46
32.0	2.0			.92543	555.2	.00142	.000198	.00140	.000196	.52
32.0	3.0			.91927	552.2	.00147	.000205			.47
32.0	6.0			.89796	539.5	.00152	.000212			.52
34.0	1.0			.93721	566.5	.00250	.000349	.00246	.000344	.84
34.0	2.0			.93552	565.5	.00247	.000345	.00253	.000354	.84
34.0	3.0			.92824	561.5	.00249	.000348			.85
36.0	.0			.93552	568.9	.00327	.000457	.00330	.000461	1.11
38.0	.0			.93104	568.2	.00375	.000524	.00418	.000584	1.29
44.0	12.0			.90245	550.9	.00379	.000530			1.22
42.0	.0			.92039	562.2	.00413	.000577	.00437	.000611	1.32
44.0	.0			.92543	564.2	.00372	.000520	.00372	.000520	1.28
48.0	.0			.92992	567.2	.00363	.000507	.00364	.000509	1.19
52.0	.0			.92375	563.2	.00356	.000497	.00355	.000496	1.21
52.0	12.0			.90805	553.2	.00342	.000478			1.13
55.0	.0			.92431	563.2	.00360	.000503	.00365	.000510	1.22
58.0	.0			.93552	575.2	.00353	.000493			1.20
58.0	12.0			.92375	562.9	.00339	.000474			1.07
44.0	-12.0			.89852	551.2	.00445	.000622			1.40
36.0	-8.0			.89011	542.2	.00351	.000490			1.10
36.0	-3.0			.91814	551.9	.00143	.000200			
34.0	-3.0			.92992	562.2	.00252	.000352	.00263	.000367	.83
32.0	-3.0			.92039	552.9	.00148	.000207	.00145	.000203	.47
30.0	-3.0			.92039	550.9	.00106	.000148	.00099	.000138	.35
28.0	-3.0			.94113	561.9	.00065	.000091			.22
34.0	-12.0			.88955	545.2	.00322	.000450	.00321	.000449	1.00
32.0	-12.0			.88731	537.2	.00251	.000351	.00248	.000347	.78
30.0	-12.0			.82564	533.9	.00387	.000541	.00381	.000532	1.21
19.0	-12.5			.96524	593.9	.00486	.000679			1.54
17.5	-11.0			.96580	592.9	.00452	.000632			1.50
15.5	-2.5			.98149	600.9	.00432	.000604			1.43
16.5	-2.5			.96412	590.5	.00442	.000618	.00415	.000580	1.52
17.5	-2.5			.96692	593.5	.00484	.000676	.00463	.000647	1.61
18.5	-2.5			.98654	613.2	.00469	.000655	.00507	.000708	1.51
19.5	-2.5			.97757	607.2	.00550	.000769	.00509	.000711	1.83
20.5	-2.5			.98710	613.5	.00641	.000896			2.06
21.5	-2.5			.99607	598.9	.00179	.000250			.59
36.0	-16.0			.90861	553.9	.00346	.000483			1.09
36.0	-12.0			.89572	551.5	.00371	.000518	.00371	.000518	1.17
32.0	-18.0			.92039	561.5	.00367	.000513			1.22
32.0	-16.0			.90693	553.5	.00373	.000521	.00372	.000520	1.17
32.0	-14.0			.89796	546.9	.00347	.000485	.00349	.000488	1.15
32.0	-10.0			.88283	532.2	.00196	.000274			.62
28.0	-14.0			.90077	554.5	.00423	.000591			1.38
28.0	-12.0			.88899	535.5	.00198	.000277			.65
26.0	-12.5			.91590	563.5	.00342	.000478			1.13
22.0	-12.5			.92824	566.5	.00379	.000530	.00374	.000523	1.23
20.5	-11.0			.97589	617.5	.00685	.000957			2.26
1.0	12.0	4.00		.94898	579.9	.00383	.000535			
2.0	12.0	3.00		.95515	570.5	.00067	.000094			
2.0	1.5	2.00		.95122	566.9	.00032	.000045			
2.0	3.5	2.00		.95851	571.9	.00043	.000060	.00048	.000067	
2.0	5.5	2.00		.94954	566.9	.00047	.000066	.00043	.000060	
2.0	8.0	2.00		.95459	570.2	.00069	.000096	.00069	.000096	
2.0	12.0	2.00		.95963	573.2	.00070	.000098	.00071	.000099	
2.0	1.5	1.00		.94954	565.9	.00029	.000041			
2.0	12.0	1.00		.96243	575.5	.00071	.000099			
-2.0	.0	2.00		.91086	548.5	.00175	.000245			
1.0	.0	2.00		.90413	545.5	.00189	.000264			
-3.9	1.5	1.00		.97701	615.2	.00711	.000994			
-3.9	8.0	1.00		.98430	611.2	.00618	.000864			
-3.9	12.0	1.00		.98654	613.2	.00621	.000868			
-2.8	1.5	2.83		.97028	612.5	.00915	.001279	.00989	.001382	
-2.8	8.0	2.83		.97309	611.2	.00790	.001104	.00853	.001192	
-2.8	12.0	2.83		.97645	611.5	.00729	.001019	.00786	.001098	
-1.0	1.5	3.87		.93440	576.5	.00541	.000756			
-1.0	8.0	3.87		.93833	578.2	.00512	.000715	.00473	.000661	
-1.0	12.0	3.87		.94113	582.5	.00476	.000665	.00421	.000588	
1.0	1.5	4.00		.92768	565.9	.00368	.000514			
1.0	3.5	4.00		.92992	573.2	.00351	.000490	.00352	.000492	
1.0	8.0	4.00		.93272	570.5	.00412	.000576	.00411	.000574	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(b) M = 2.65; R = 2.57×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95030	570.2	.00306	.000449			1.06
12.0	.0			.96159	580.5	.00278	.000606			1.38
20.5	.0			.99096	612.2	.00414	.000902			2.03
28.0	12.0			.90286	538.2	.00140	.000305			.64
28.0	4.0			.93900	555.9	.00042	.000092			.21
28.0	.0			.94860	561.9	.00052	.000113			.26
20.5	-5.0			.99378	611.9	.00448	.000977			2.15
30.0	.0			.93562	554.9	.00069	.000150	.00072	.000157	.34
31.0	12.0			.89891	536.5	.00146	.000318			.71
34.0	.0			.93731	560.2	.00154	.000336	.00154	.000336	.77
2.0	-12.0			.94973	570.5	.00227	.000495			1.11
2.0	12.0			.95425	572.2	.00205	.000447			1.02
12.0	-12.0			.95538	576.9	.00278	.000606			1.25
12.0	12.0			.95256	576.9	.00272	.000593			1.35
30.0	1.0			.93279	553.2	.00068	.000148			.31
31.0	2.0			.92319	548.9	.00086	.000187			.42
32.0	2.0			.92827	551.9	.00102	.000222	.00100	.000218	.55
32.0	3.0			.92263	548.9	.00106	.000231			.53
32.0	6.0			.90286	537.5	.00110	.000240			.54
34.0	1.0			.93957	561.9	.00168	.000366	.00174	.000379	.82
34.0	2.0			.93674	560.9	.00175	.000381	.00181	.000395	.85
34.0	3.0			.92997	556.5	.00174	.000379			.84
36.0	.0			.93787	564.2	.00226	.000493	.00228	.000497	1.13
38.0	.0			.93505	564.2	.00261	.000569	.00301	.000656	1.27
44.0	12.0			.90681	546.9	.00282	.000615			1.35
42.0	.0			.92489	560.5	.00281	.000613	.00318	.000693	1.36
44.0	.0			.92884	560.2	.00267	.000582	.00267	.000582	1.24
48.0	.0			.93505	562.9	.00251	.000547	.00252	.000549	1.21
52.0	.0			.92771	559.2	.00259	.000565	.00258	.000562	1.25
52.0	12.0			.91246	549.5	.00239	.000521			1.16
55.0	.0			.92884	559.2	.00248	.000541	.00246	.000536	1.22
58.0	.0			.93957	565.9	.00253	.000552			1.22
58.0	12.0			.92827	558.5	.00252	.000549			1.22
44.0	-12.0			.90343	546.9	.00309	.000674			1.48
36.0	-8.0			.89778	540.2	.00235	.000512			1.11
36.0	-3.0			.92489	553.5	.00094	.000205			
34.0	-3.0			.93166	557.5	.00177	.000386	.00185	.000403	.86
32.0	-3.0			.92319	549.2	.00110	.000240	.00106	.000231	.50
30.0	-3.0			.92489	548.5	.00073	.000159	.00066	.000144	.35
28.0	-3.0			.94747	561.2	.00053	.000116			.25
34.0	-12.0			.89552	538.2	.00225	.000490	.00224	.000488	1.01
32.0	-12.0			.89270	534.5	.00183	.000399	.00180	.000392	.82
30.0	-12.0			.89834	537.2	.00134	.000292	.00131	.000286	.62
19.0	-12.5			.96668	586.9	.00341	.000743			1.66
17.5	-11.0			.96781	586.5	.00327	.000713			1.57
15.5	-2.5			.98305	594.5	.00320	.000698			1.55
16.5	-2.5			.96611	587.2	.00312	.000680	.00285	.000621	1.52
17.5	-2.5			.96893	587.2	.00318	.000693	.00290	.000632	1.58
18.5	-2.5			.98870	604.9	.00333	.000726	.00376	.000820	1.62
19.5	-2.5			.97910	596.5	.00391	.000852	.00362	.000789	1.90
20.5	-2.5			.98870	605.9	.00464	.001011			2.25
21.5	-2.5			.99774	592.2	.00108	.000235			.53
22.5	-2.5			.99209	584.9	.00013	.000028			.06
36.0	-16.0			.91359	549.9	.00257	.000560			1.24
36.0	-12.0			.90117	543.2	.00255	.000556	.00262	.000571	1.21
32.0	-18.0			.92545	557.2	.00251	.000547			1.21
32.0	-16.0			.91133	549.5	.00260	.000567	.00259	.000565	1.24
32.0	-14.0			.90230	542.9	.00234	.000510	.00235	.000512	1.13
32.0	-10.0			.89100	532.9	.00130	.000283			.61
28.0	-14.0			.90568	547.5	.00290	.000632			1.31
28.0	-12.0			.89665	534.9	.00145	.000316			.68
26.0	-12.5			.92150	557.2	.00240	.000523			1.16
22.0	-12.5			.93223	561.2	.00248	.000541	.00244	.000532	1.11
20.5	-11.0			.97628	604.5	.00514	.001120			2.39
1.0	12.0	4.00		.95595	576.2	.00248	.000541			
2.0	1.5	3.00		.85147	512.5	.00042	.000092			
2.0	12.0	3.00		.96442	571.2	.00042	.000092			
2.0	3.5	2.00		.97006	573.9	.00030	.000065			
2.0	5.5	2.00		.96103	568.5	.00035	.000076			
2.0	8.0	2.00		.96555	571.9	.00042	.000092	.00042	.000092	
2.0	12.0	2.00		.96893	574.2	.00051	.000111	.00053	.000116	
2.0	1.5	1.00		.96046	567.5	.00021	.000046			
2.0	12.0	1.00		.97232	576.2	.00055	.000120			
-2.0	.0	2.00		.92601	554.2	.00098	.000214			
1.0	.0	2.00		.91698	548.9	.00140	.000305			
-3.9	1.5	1.00		.97854	608.9	.00471	.001027			
-3.9	8.0	1.00		.98644	609.5	.00407	.000887			
-3.9	12.0	1.00		.98927	611.9	.00408	.000889			
-2.8	1.5	2.83		.97232	603.5	.00623	.001358	.00646	.001408	
-2.8	8.0	2.83		.97515	603.2	.00564	.001229	.00583	.001271	
-2.8	12.0	2.83		.97854	610.2	.00489	.001066	.00552	.001203	
-1.0	1.5	3.87		.93731	569.5	.00345	.000752			
-1.0	8.0	3.87		.94239	574.5	.00325	.000708	.00284	.000619	
-1.0	12.0	3.87		.94465	575.9	.00324	.000706	.00272	.000593	
1.0	1.5	4.00		.93449	565.2	.00207	.000451			
1.0	3.5	4.00		.93731	564.9	.00223	.000486	.00224	.000488	
1.0	8.0	4.00		.93957	566.0	.00253	.000552	.00252	.000549	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(c) M = 2.65; R = 1.28×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96101	572.9	.00102	.000447			1.00
12.0	.0			.97061	581.2	.00160	.000700			1.72
20.5	.0			.99717	604.5	.00239	.001046			2.44
28.0	12.0			.92371	547.9	.00077	.000337			.76
28.0	4.0			.96214	567.5	.00021	.000092			.21
20.5	-5.0			.99830	605.9	.00234	.001024			2.25
10.0	.0			.96157	567.2	.00027	.000118			.29
31.0	12.0			.91693	543.5	.00069	.000302			.64
34.0	.0			.95649	567.5	.00086	.000377	.00087	.000381	.91
2.0	-12.0			.96044	572.9	.00124	.000543			1.15
2.0	12.0			.96383	574.5	.00104	.000455			1.02
12.0	-12.0			.96609	578.2	.00160	.000700			1.52
12.0	12.0			.96327	576.5	.00161	.000705			1.63
30.0	1.0			.95875	565.2	.00024	.000105			.26
31.0	2.0			.94801	559.5	.00034	.000149			.37
32.0	2.0			.95084	561.9	.00049	.000215	.00049	.000215	.52
32.0	3.0			.94462	558.5	.00052	.000228			.54
32.0	6.0			.92654	548.2	.00058	.000254			.59
34.0	1.0			.95762	570.2	.00087	.000381	.00093	.000407	.99
34.0	2.0			.95366	568.5	.00088	.000385	.00094	.000412	.86
34.0	3.0			.94632	562.5	.00084	.000368			.84
36.0	.0			.95310	569.9	.00119	.000521	.00120	.000525	1.21
38.0	.0			.95084	568.5	.00139	.000609			1.48
44.0	12.0			.92089	550.5	.00136	.000595			1.32
42.0	.0			.94066	562.9	.00142	.000622			1.39
44.0	.0			.94632	566.2	.00145	.000635	.00145	.000635	1.54
48.0	.0			.95027	568.9	.00132	.000578	.00133	.000582	1.40
52.0	.0			.94462	564.2	.00133	.000582	.00133	.000582	1.41
52.0	12.0			.92710	554.5	.00123	.000539			1.22
55.0	.0			.94462	563.9	.00133	.000582	.00131	.000574	1.36
58.0	.0			.95592	574.5	.00115	.000503			1.15
58.0	12.0			.94292	565.2	.00128	.000560			1.25
44.0	-12.0			.91919	550.9	.00158	.000692			1.56
36.0	-8.0			.92032	550.5	.00124	.000543			1.23
36.0	-3.0			.93388	553.9	.00052	.000228			
34.0	-3.0			.94858	565.2	.00088	.000385	.00097	.000425	.89
32.0	-3.0			.94688	559.5	.00054	.000236	.00051	.000223	.61
30.0	-3.0			.95084	561.2	.00030	.000131			.31
34.0	-12.0			.91411	544.5	.00111	.000486	.00110	.000482	1.16
32.0	-12.0			.91241	541.5	.00079	.000346	.00074	.000324	.80
30.0	-12.0			.91128	540.2	.00066	.000289	.00063	.000276	.63
19.0	-12.5			.97400	585.5	.00195	.000854			1.97
17.5	-11.0			.97683	586.5	.00171	.000749			1.68
15.5	-2.5			.99208	595.2	.00165	.000722			1.56
16.5	-2.5			.97626	585.5	.00164	.000718	.00139	.000609	1.76
17.5	-2.5			.97231	587.9	.00185	.000810	.00165	.000722	1.95
18.5	-2.5			.99773	599.5	.00189	.000827	.00220	.000963	2.03
19.5	-2.5			.98700	597.2	.00220	.000963	.00187	.000819	2.22
20.5	-2.5			.99491	603.9	.00242	.001059			2.42
21.5	-2.5			1.00169	591.9	.00049	.000215			.48
36.0	-16.0			.93049	554.9	.00115	.000503			1.22
36.0	-12.0			.91919	549.2	.00138	.000604	.00137	.000600	1.39
32.0	-18.0			.94236	562.5	.00127	.000556			1.25
32.0	-16.0			.92767	554.2	.00138	.000604	.00137	.000600	1.29
32.0	-14.0			.91919	549.2	.00123	.000539	.00123	.000539	1.41
32.0	-10.0			.91637	542.6	.00060	.000263			.61
28.0	-14.0			.92032	551.5	.00153	.000670			1.70
28.0	-12.0			.91863	544.5	.00072	.000315			.67
26.0	-12.5			.93727	561.2	.00122	.000534			1.20
22.0	-12.5			.94632	564.5	.00128	.000560	.00123	.000539	1.25
20.5	-11.0			.98248	598.2	.00288	.001261			2.88
1.0	12.0	4.00		.97287	581.2	.00105	.000460			
2.0	1.5	3.00		.85534	513.5	.00038	.000166			
2.0	12.0	3.00		.98361	580.5	.00021	.000092			
2.0	1.5	2.00		.98191	579.2	.00014	.000061			
2.0	8.0	2.00		.98304	580.9	.00026	.000114			
2.0	12.0	2.00		.98813	583.9	.00026	.000114			
2.0	12.0	1.00		.99039	585.2	.00031	.000136			
-2.0	.0	2.00		.95253	564.5	.00051	.000223			
1.0	.0	2.00		.94236	559.5	.00065	.000285			
-3.9	1.5	1.00		.98756	604.9	.00254	.001112			
-3.9	8.0	1.00		.99434	602.9	.00241	.001055			
-3.9	12.0	1.00		.99660	604.9	.00236	.001033			
-2.8	1.5	2.83		.98078	602.9	.00322	.001410	.00371	.001624	
-2.8	8.0	2.83		.98304	602.9	.00292	.001278	.00334	.001462	
-2.8	12.0	2.83		.98643	603.9	.00287	.001257	.00326	.001427	
-1.0	1.5	3.87		.95140	573.2	.00174	.000762			
-1.0	8.0	3.87		.95479	573.9	.00157	.000687			
-1.0	12.0	3.87		.95705	574.9	.00165	.000722			
1.0	1.5	4.00		.95366	569.2	.00088	.000385			
1.0	3.5	4.00		.95592	569.9	.00097	.000425	.00097	.000425	
1.0	8.0	4.00		.95762	572.2	.00107	.000468	.00106	.000464	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(d) M = 3.51; R = 4.03×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95035	569.2	.00161	.000312			1.03
12.0	.0			.96615	582.5	.00238	.000461			1.54
20.5	.0			.99661	612.9	.00407	.000788			2.63
28.0	12.0			.90579	542.2	.00126	.000244			.71
28.0	4.0			.96728	571.5	.00031	.000060			.19
20.5	-5.0			.99774	613.5	.00406	.000786			2.62
30.0	.0			.95487	564.5	.00045	.000087	.00047	.000091	.29
31.0	12.0			.89846	536.9	.00119	.000230			.63
34.0	.0			.92948	555.9	.00160	.000310	.00160	.000310	1.04
2.0	-12.0			.94923	569.5	.00173	.000335			1.06
2.0	12.0			.95374	571.9	.00190	.000368			1.02
12.0	-12.0			.95656	575.5	.00231	.000447			1.39
12.0	12.0			.95261	574.5	.00235	.000455			1.26
30.0	1.0			.95318	563.5	.00045	.000087			.29
31.0	2.0			.94020	556.9	.00058	.000112			.37
32.0	2.0			.93907	557.5	.00079	.000153	.00080	.000155	.56
32.0	3.0			.93512	555.5	.00081	.000157			.51
32.0	6.0			.92159	550.2	.00091	.000176			.54
34.0	1.0			.93230	557.9	.00161	.000312	.00166	.000321	1.04
34.0	2.0			.93287	558.2	.00163	.000316	.00168	.000325	1.02
34.0	3.0			.92892	555.9	.00169	.000327			1.04
36.0	.0			.91989	555.2	.00220	.000426	.00219	.000424	1.42
38.0	.0			.91707	552.5	.00238	.000461	.00268	.000519	1.53
44.0	12.0			.90184	542.9	.00241	.000467			1.39
42.0	.0			.91369	550.5	.00239	.000463	.00268	.000519	1.54
44.0	.0			.92159	553.5	.00233	.000451	.00234	.000453	1.53
48.0	.0			.92723	557.2	.00208	.000403	.00209	.000405	1.35
52.0	.0			.92159	553.5	.00204	.000395	.00203	.000393	1.30
52.0	12.0			.90579	544.5	.00210	.000407			1.18
54.0	.0			.92215	553.5	.00198	.000383	.00196	.000380	1.33
58.0	.0			.93400	560.9	.00199	.000385			1.28
58.0	12.0			.92215	553.9	.00202	.000391			1.14
44.0	-12.0			.89338	540.9	.00267	.000517			1.62
36.0	-8.0			.89338	536.5	.00210	.000407			1.34
36.0	-3.0			.92441	552.9	.00092	.000178			
34.0	-3.0			.93061	556.9	.00164	.000318	.00168	.000325	1.10
32.0	-3.0			.93512	555.2	.00083	.000161	.00080	.000155	.54
30.0	-3.0			.94528	559.2	.00043	.000083			.28
28.0	-3.0			.96841	572.5	.00032	.000062			.21
34.0	-12.0			.88774	533.2	.00186	.000360	.00186	.000360	1.19
32.0	-12.0			.88774	530.5	.00133	.000258	.00123	.000238	.81
30.0	-12.0			.88830	528.2	.00097	.000188	.00090	.000174	.61
19.0	-12.5			.96841	585.5	.00287	.000556			1.82
17.5	-11.0			.97123	586.5	.00266	.000515			1.60
15.5	-2.5			.98758	596.5	.00258	.000500			1.62
16.5	-2.5			.97292	587.5	.00280	.000542	.00259	.000502	1.96
17.5	-2.5			.97630	593.2	.00284	.000550	.00269	.000521	1.83
18.5	-2.5			.99379	601.9	.00290	.000562	.00319	.000618	2.03
19.5	-2.5			.98364	597.9	.00337	.000653	.00322	.000624	2.13
20.5	-2.5			.99435	611.5	.00397	.000769			2.51
21.5	-2.5			1.01523	602.2	.00073	.000141			.46
36.0	-16.0			.90523	542.9	.00199	.000385			1.09
36.0	-12.0			.89000	536.2	.00225	.000436	.00224	.000434	1.36
32.0	-18.0			.91989	551.9	.00195	.000378			1.06
32.0	-16.0			.90410	542.9	.00207	.000401	.00206	.000399	1.28
32.0	-14.0			.89677	537.5	.00202	.000391	.00203	.000393	1.22
32.0	-10.0			.82056	529.9	.00102	.000198			.65
28.0	-14.0			.90071	542.2	.00238	.000461			1.30
28.0	-12.0			.89733	533.2	.00096	.000186			.62
26.0	-12.5			.91764	549.9	.00197	.000382			1.19
22.0	-12.5			.93343	559.2	.00189	.000366	.00185	.000358	1.18
20.5	-11.0			.97743	601.5	.00441	.000854			2.79
1.0	12.0	4.00		.94979	572.2	.00230	.000445			
2.0	1.5	3.00		.85277	512.9	.00039	.000076			
2.0	12.0	3.00		.98758	583.9	.00024	.000046			
2.0	3.5	2.00		.98928	584.9	.00023	.000045			
2.0	5.5	2.00		.97969	579.5	.00029	.000056			
2.0	8.0	2.00		.98476	582.9	.00031	.000060			
2.0	1.5	1.00		.98194	579.5	.00016	.000031			
2.0	12.0	1.00		.99774	589.9	.00030	.000058			
-2.0	.0	2.00		.94133	558.9	.00083	.000161			
1.0	.0	2.00		.92666	553.9	.00091	.000176			
-3.9	1.5	1.00		.97912	606.5	.00428	.000829			
-3.9	8.0	1.00		.98815	604.5	.00423	.000819			
-3.9	12.0	1.00		.99153	611.5	.00417	.000808			
-2.8	1.5	2.83		.96615	605.9	.00560	.001085	.00631	.001222	
-2.8	8.0	2.83		.97123	605.9	.00561	.001087	.00621	.001203	
-2.8	12.0	2.83		.97517	608.2	.00533	.001032	.00592	.001147	
-1.0	1.5	3.87		.92835	566.2	.00330	.000639			
-1.0	8.0	3.87		.93456	567.9	.00338	.000655	.00301	.000583	
-1.0	12.0	3.87		.93685	572.5	.00331	.000641			
1.0	1.5	4.00		.92948	557.9	.00196	.000380			
1.0	3.5	4.00		.93118	560.2	.00203	.000393	.00204	.000395	
1.0	8.0	4.00		.93343	562.5	.00253	.000490	.00252	.000488	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(e) M = 3.51; R = 2.83×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95492	571.2	.00115	.000318			.93
12.0	.0			.97070	583.9	.00174	.000481			1.57
20.5	.0			.99943	607.9	.00303	.000837			2.50
28.0	12.0			.91604	544.9	.00082	.000226			.54
28.0	4.0			.97182	574.9	.00024	.000066			.19
20.5	-5.0			1.00000	612.5	.00278	.000768			2.32
30.0	.0			.96224	568.9	.00026	.000072			.21
31.0	12.0			.90815	540.5	.00083	.000229			.60
34.0	.0			.93914	559.5	.00104	.000287	.00100	.000276	.84
2.0	-12.0			.95323	569.2	.00120	.000331			.94
2.0	12.0			.95774	572.5	.00128	.000354			.97
12.0	-12.0			.96112	576.2	.00162	.000447			1.26
12.0	12.0			.95830	575.2	.00174	.000481			1.31
30.0	1.0			.96055	567.5	.00024	.000066			.20
31.0	2.0			.94872	561.2	.00046	.000127			.36
32.0	2.0			.94816	561.9	.00061	.000168	.00062	.000171	.50
32.0	3.0			.94365	559.9	.00060	.000166			.47
32.0	6.0			.93125	552.5	.00062	.000171			.47
34.0	1.0			.94196	563.5	.00105	.000290	.00110	.000304	.87
34.0	2.0			.94083	562.5	.00128	.000354	.00130	.000359	1.02
34.0	3.0			.93689	559.9	.00116	.000320			.86
36.0	.0			.92844	556.2	.00148	.000409	.00147	.000406	1.19
38.0	.0			.92505	554.9	.00168	.000464	.00198	.000547	1.39
44.0	12.0			.91097	545.5	.00163	.000450			1.07
42.0	.0			.92280	553.2	.00166	.000458	.00194	.000536	1.37
44.0	.0			.92900	556.5	.00150	.000414	.00150	.000414	1.20
48.0	.0			.93745	560.5	.00135	.000373	.00136	.000376	1.12
52.0	.0			.93182	556.9	.00138	.000381	.00137	.000378	1.08
52.0	12.0			.91548	547.5	.00136	.000376			.89
55.0	.0			.93238	557.2	.00133	.000367	.00132	.000365	1.03
58.0	.0			.94421	564.2	.00131	.000362			1.04
58.0	12.0			.93125	556.5	.00136	.000376			.89
44.0	-12.0			.90364	542.2	.00176	.000486			1.48
36.0	-8.0			.90533	541.5	.00163	.000450			1.33
36.0	-3.0			.92844	552.9	.00087	.000240			
34.0	-3.0			.93914	561.2	.00116	.000320	.00124	.000342	.97
32.0	-3.0			.94421	559.5	.00065	.000180	.00062	.000171	.55
30.0	-3.0			.95323	563.5	.00031	.000086			.26
28.0	-3.0			.97351	575.5	.00023	.000064			.19
34.0	-12.0			.89801	536.9	.00121	.000334	.00121	.000334	.95
32.0	-12.0			.90009	535.5	.00089	.000246	.00084	.000232	.74
30.0	-12.0			.90122	533.5	.00065	.000180	.00062	.000171	.53
19.0	-12.5			.97239	585.2	.00199	.000550			1.58
17.5	-11.0			.97577	586.9	.00193	.000533			1.61
15.5	-2.5			.99267	599.5	.00182	.000503			1.48
16.5	-2.5			.97802	587.5	.00184	.000508	.00168	.000464	1.50
17.5	-2.5			.98140	590.5	.00207	.000572	.00194	.000536	1.74
18.5	-2.5			.99774	601.2	.00214	.000591	.00243	.000671	1.75
19.5	-2.5			.98704	596.9	.00254	.000702	.00231	.000638	2.10
20.5	-2.5			.99661	606.9	.00324	.000895			2.70
21.5	-2.5			1.01352	600.5	.00058	.000160			.47
36.0	-16.0			.91435	546.5	.00136	.000376			1.04
36.0	-12.0			.90122	539.5	.00146	.000403	.00145	.000400	1.23
32.0	-18.0			.92900	555.2	.00135	.000373			1.04
32.0	-16.0			.91322	545.9	.00142	.000392	.00140	.000387	.93
32.0	-14.0			.90590	540.9	.00132	.000365	.00133	.000367	1.05
32.0	-10.0			.90308	535.9	.00067	.000185			.54
28.0	-14.0			.90871	544.5	.00165	.000456			1.34
28.0	-12.0			.90815	538.9	.00064	.000177			.52
26.0	-12.5			.92562	553.9	.00118	.000326			.94
22.0	-12.5			.94140	561.9	.00125	.000345	.00122	.000337	1.03
20.5	-11.0			.98084	601.5	.00293	.000809			2.46
1.0	12.0	4.00		.95830	574.5	.00134	.000370			
2.0	1.5	3.00		.85180	513.5	.00030	.000083			
2.0	8.0	2.00		.98816	585.2	.00025	.000069			
2.0	12.0	2.00		.99718	589.9	.00021	.000058			
-2.0	.0	2.00		.95266	565.2	.00050	.000138			
1.0	.0	2.00		.93801	557.5	.00063	.000174			
-3.9	1.5	1.00		.98309	603.9	.00306	.000845			
-3.9	8.0	1.00		.99154	603.2	.00288	.000795			
-3.9	12.0	1.00		.99492	606.5	.00327	.000903			
-2.8	1.5	2.83		.97013	597.2	.00432	.001193	.00455	.001257	
-2.8	8.0	2.83		.97464	599.9	.00430	.001188	.00435	.001201	
-2.8	12.0	2.83		.97802	601.9	.00410	.001132	.00453	.001251	
-1.0	1.5	3.87		.93576	568.2	.00208	.000575			
-1.0	8.0	3.87		.94140	570.5	.00223	.000616			
-1.0	12.0	3.87		.94309	571.9	.00224	.000619			
1.0	1.5	4.00		.93970	562.5	.00129	.000356			
1.0	3.5	4.00		.94140	563.5	.00130	.000359	.00130	.000359	
1.0	8.0	4.00		.94309	566.5	.00143	.000395	.00142	.000392	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(f) M = 3.51; R = 1.62×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95592	568.5	.00068	.000329			1.00
12.0	.0			.96948	579.9	.00105	.000508			1.62
20.5	.0			.99660	602.5	.00170	.000822			2.50
28.0	12.0			.92315	547.5	.00060	.000290			.71
28.0	4.0			.97287	574.2	.00016	.000077			.19
28.0	.0			.97457	574.9	.00016	.000077			.24
20.5	-5.0			.99717	605.5	.00167	.000808			2.53
31.0	12.0			.91241	541.2	.00047	.000227			.55
34.0	.0			.93953	558.9	.00069	.000334	.00066	.000319	1.06
2.0	-12.0			.95479	567.9	.00066	.000319			.78
2.0	12.0			.95931	570.9	.00070	.000339			.82
12.0	-12.0			.96044	573.2	.00100	.000484			1.49
12.0	12.0			.95875	573.2	.00105	.000508			1.36
31.0	2.0			.94801	560.2	.00028	.000135			.38
32.0	2.0			.94801	561.2	.00047	.000227	.00049	.000237	.70
32.0	3.0			.94518	559.5	.00042	.000203			.62
32.0	6.0			.93614	554.2	.00040	.000193			.47
34.0	1.0			.94292	560.9	.00071	.000343	.00075	.000363	1.04
34.0	2.0			.94179	560.9	.00078	.000377	.00082	.000397	1.15
34.0	3.0			.93840	558.5	.00073	.000353			.96
36.0	.0			.93049	555.5	.00100	.000484	.00099	.000479	1.18
38.0	.0			.92710	553.9	.00107	.000518			1.26
44.0	12.0			.91580	546.2	.00096	.000464			1.25
42.0	.0			.92541	552.5	.00104	.000503	.00132	.000639	1.53
44.0	.0			.93332	555.9	.00094	.000455	.00094	.000455	1.21
48.0	.0			.94123	560.9	.00105	.000508	.00106	.000513	1.24
52.0	.0			.93614	557.6	.00080	.000387	.00079	.000382	1.13
52.0	12.0			.91976	547.9	.00082	.000397			.96
55.0	.0			.93671	557.9	.00080	.000387	.00078	.000377	1.19
58.0	.0			.94858	564.9	.00079	.000382			1.18
58.0	12.0			.93558	557.2	.00080	.000387			.95
44.0	-12.0			.90959	543.5	.00105	.000508			1.62
36.0	-8.0			.91241	544.2	.00100	.000484			1.52
36.0	-3.0			.93219	552.9	.00046	.000223			
34.0	-3.0			.94123	559.5	.00071	.000343	.00075	.000363	1.06
32.0	-3.0			.94462	559.2	.00042	.000203			.63
30.0	-3.0			.95366	562.9	.00023	.000111			.32
34.0	-12.0			.90337	537.2	.00072	.000348	.00071	.000343	.86
32.0	-12.0			.90337	535.5	.00046	.000223			.69
30.0	-12.0			.90507	535.9	.00036	.000174			.53
19.0	-12.5			.97005	585.2	.00129	.000624			1.93
17.5	-11.0			.97400	583.9	.00117	.000566			1.38
15.5	-2.5			.99039	592.2	.00119	.000576			1.61
16.5	-2.5			.97570	584.5	.00116	.000561			1.36
17.5	-2.5			.97965	586.2	.00125	.000605	.00108	.000522	1.87
18.5	-2.5			.99547	596.5	.00137	.000663	.00167	.000808	2.08
19.5	-2.5			.98530	592.5	.00156	.000755	.00129	.000624	1.86
20.5	-2.5			.99434	603.9	.00167	.000808			1.99
21.5	-2.5			1.00678	594.9	.00039	.000189			.46
36.0	-16.0			.91863	547.5	.00085	.000411			1.15
36.0	-12.0			.90620	541.5	.00093	.000450	.00091	.000440	1.11
32.0	-18.0			.93275	556.9	.00090	.000435			1.06
32.0	-16.0			.91693	547.9	.00092	.000445	.00090	.000435	1.23
32.0	-14.0			.90902	540.9	.00074	.000358	.00074	.000358	1.12
32.0	-10.0			.90902	538.2	.00036	.000174			.54
28.0	-14.0			.91241	544.5	.00105	.000508			1.24
28.0	-12.0			.91411	541.5	.00050	.000242			.76
26.0	-12.5			.92993	553.2	.00070	.000339			1.04
22.0	-12.5			.94575	562.5	.00086	.000416	.00084	.000406	1.26
20.5	-11.0			.97965	592.5	.00201	.000972			3.09
1.0	12.0	4.00		.96440	574.9	.00086	.000416			
2.0	3.5	2.00		.99491	587.2	.00014	.000068			
2.0	12.0	1.00		.99887	590.5	.00018	.000087			
-2.0	.0	2.00		.96383	570.2	.00027	.000131			
1.0	.0	2.00		.94914	562.5	.00046	.000223			
-3.9	1.5	1.00		.98304	596.9	.00199	.000963			
-3.9	8.0	1.00		.99095	599.2	.00170	.000822			
-3.9	12.0	1.00		.99434	603.5	.00184	.000890			
-2.8	1.5	2.83		.97174	594.5	.00237	.001146	.00281	.001359	
-2.8	8.0	2.83		.97570	597.2	.00236	.001142	.00276	.001335	
-2.8	12.0	2.83		.97909	597.2	.00220	.001064	.00264	.001277	
-1.0	1.5	3.87		.94123	564.5	.00128	.000619			
-1.0	8.0	3.87		.94632	569.2	.00135	.000653			
-1.0	12.0	3.87		.94745	571.2	.00131	.000634			
1.0	1.5	4.00		.94575	562.5	.00062	.000300			
1.0	3.5	4.00		.94745	564.2	.00068	.000329	.00068	.000329	
1.0	8.0	4.00		.94858	565.5	.00076	.000368	.00075	.000363	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(g) M = 4.44; R = 4.53 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95061	567.2	.00075	.000189			.88
12.0	.0			.98316	589.2	.00131	.000331			1.82
20.5	.0			1.00673	608.2	.00237	.000598			3.39
28.0	12.0			.91581	544.9	.00062	.000157			.60
20.5	-5.0			1.00392	605.9	.00206	.000520			3.07
31.0	12.0			.90627	538.9	.00066	.000167			.65
34.0	.0			.92872	553.5	.00100	.000252	.00093	.000235	1.49
2.0	-12.0			.94948	565.0	.00068	.000172			1.00
2.0	12.0			.95061	568.2	.00102	.000258			1.02
12.0	-12.0			.96800	579.5	.00109	.000275			1.95
12.0	12.0			.96239	577.2	.00153	.000386			1.55
32.0	2.0			.94724	562.5	.00047	.000119	.00053	.000134	.59
32.0	3.0			.94612	561.9	.00048	.000121			.58
32.0	6.0			.94387	560.2	.00047	.000119			.55
34.0	1.0			.93152	555.5	.00100	.000252	.00108	.000273	1.43
34.0	2.0			.92984	554.5	.00104	.000263	.00103	.000260	1.42
34.0	3.0			.92872	553.9	.00106	.000268			1.49
36.0	.0			.91525	547.2	.00136	.000343	.00126	.000318	1.92
38.0	.0			.91412	548.5	.00130	.000328			1.86
44.0	12.0			.90683	542.5	.00146	.000369			1.42
42.0	.0			.91749	551.5	.00129	.000326			1.84
44.0	.0			.92535	554.2	.00115	.000290	.00116	.000293	1.67
48.0	.0			.93601	559.9	.00112	.000283	.00114	.000288	1.40
52.0	.0			.93152	555.5	.00100	.000252	.00099	.000250	1.45
52.0	12.0			.91132	544.5	.00136	.000343			1.37
55.0	.0			.93321	556.2	.00099	.000250	.00097	.000245	1.38
58.0	.0			.94555	563.5	.00096	.000242			1.81
58.0	12.0			.92703	557.5	.00128	.000323			1.24
44.0	-12.0			.90795	543.5	.00116	.000293			2.00
36.0	-8.0			.90795	542.5	.00122	.000308			2.10
36.0	-3.0			.92423	550.9	.00061	.000154			
34.0	-3.0			.93377	556.9	.00100	.000252	.00101	.000255	1.43
32.0	-3.0			.94555	561.5	.00047	.000119			.70
34.0	-12.0			.89560	533.5	.00097	.000245	.00096	.000242	1.76
32.0	-12.0			.89897	533.9	.00051	.000129	.00045	.000114	.80
30.0	-12.0			.90065	534.2	.00037	.000093			.58
19.0	-12.5			.97642	584.5	.00144	.000364			2.44
17.5	-11.0			.98428	588.9	.00136	.000343			2.34
15.5	-2.5			1.00448	601.2	.00121	.000305			1.89
16.5	-2.5			.98989	592.9	.00143	.000361			2.10
17.5	-2.5			.99326	595.5	.00149	.000376	.00133	.000336	2.22
18.5	-2.5			1.00729	604.2	.00147	.000371	.00184	.000465	2.41
19.5	-2.5			.99438	597.9	.00227	.000573			3.48
20.5	-2.5			1.00224	605.5	.00219	.000553			.69
21.5	-2.5			1.01459	603.2	.00044	.000111			1.46
36.0	-16.0			.91244	543.9	.00079	.000199			1.79
36.0	-12.0			.89616	534.5	.00104	.000263	.00101	.000255	1.34
32.0	-18.0			.92647	552.2	.00078	.000197			1.34
32.0	-16.0			.91132	543.2	.00098	.000247	.00095	.000240	1.48
32.0	-14.0			.90458	539.2	.00086	.000217	.00090	.000227	.81
32.0	-10.0			.90458	537.2	.00052	.000131			2.12
28.0	-14.0			.90683	542.2	.00123	.000311			.59
28.0	-12.0			.90795	538.9	.00038	.000096			1.45
26.0	-12.5			.92254	549.9	.00084	.000212			1.16
22.0	-12.5			.94387	561.9	.00074	.000187	.00070	.000177	3.51
20.5	-11.0			.98260	592.2	.00207	.000523			
1.0	12.0	4.00		.95117	570.2	.00120	.000303			
2.0	1.5	3.00		.84790	514.5	.00050	.000126			
-2.0	.0	2.00		.96015	569.9	.00030	.000076			
1.0	.0	2.00		.94387	560.9	.00044	.000111			
-3.9	1.5	1.00		.98316	592.9	.00214	.000540			
-3.9	8.0	1.00		.99382	599.9	.00215	.000543			
-3.9	12.0	1.00		.99831	604.5	.00257	.000649			
-2.8	1.5	2.83		.96857	588.2	.00316	.000798	.00380	.000959	
-2.8	8.0	2.83		.97418	593.2	.00325	.000820	.00387	.000977	
-2.8	12.0	2.83		.97755	596.2	.00345	.000871			
-1.0	1.5	3.87		.93096	558.9	.00163	.000411			
-1.0	8.0	3.87		.93601	562.9	.00190	.000480			
-1.0	12.0	3.87		.93601	563.9	.00192	.000485			
1.0	1.5	4.00		.93545	557.9	.00088	.000222			
1.0	3.5	4.00		.93657	559.5	.00101	.000255	.00101	.000255	
1.0	8.0	4.00		.93770	561.5	.00120	.000303	.00119	.000300	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Continued

(h) M = 4.44; R = 3.17×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95375	571.2	.00058	.000208			.98
12.0	.0			.99052	593.2	.00091	.000327			1.23
22.5	.0			1.00947	610.9	.00196	.000704			3.70
28.0	12.0			.92700	553.9	.00047	.000169			.53
20.5	-5.0			1.00557	607.9	.00184	.000661			3.47
30.0	.0			.97325	580.2	.00020	.000072			.36
31.0	12.0			.92032	548.9	.00040	.000144			.56
34.0	.0			.94261	563.2	.00064	.000230	.00059	.000212	1.12
2.0	-12.0			.95152	569.2	.00054	.000194			1.00
2.0	12.0			.95375	571.9	.00085	.000305			1.13
12.0	-12.0			.97604	583.5	.00078	.000280			1.59
12.0	12.0			.97046	583.5	.00127	.000456			1.69
32.0	3.0			.95876	571.9	.00040	.000144			.63
32.0	6.0			.95598	570.2	.00036	.000129			.55
34.0	1.0			.94539	564.9	.00069	.000248	.00076	.000273	1.03
34.0	2.0			.94316	563.9	.00067	.000241	.00066	.000237	1.06
34.0	3.0			.94205	563.2	.00067	.000241			1.22
36.0	.0			.92756	555.2	.00097	.000348	.00092	.000330	1.59
38.0	.0			.92589	554.2	.00097	.000348			1.70
44.0	12.0			.92088	551.2	.00092	.000330			1.05
42.0	.0			.92979	555.9	.00084	.000302			1.33
44.0	.0			.93815	561.5	.00079	.000284	.00080	.000287	
48.0	.0			.94985	567.5	.00065	.000233	.00067	.000241	1.14
52.0	.0			.94706	565.5	.00061	.000219	.00061	.000219	1.11
52.0	12.0			.92700	554.2	.00076	.000273			.90
55.0	.0			.94762	565.5	.00069	.000248	.00067	.000241	1.19
58.0	.0			.95821	572.2	.00055	.000197			.86
58.0	12.0			.94149	563.2	.00076	.000273			.90
44.0	-12.0			.92255	551.2	.00083	.000298			1.69
36.0	-8.0			.92199	551.2	.00083	.000298			1.69
36.0	-3.0			.92700	554.9	.00040	.000144			
34.0	-3.0			.94651	565.2	.00061	.000219	.00064	.000230	1.11
32.0	-3.0			.95876	571.2	.00034	.000122			.67
34.0	-12.0			.90862	542.5	.00063	.000226	.00061	.000219	1.26
30.0	-12.0			.91586	544.2	.00029	.000104			.59
19.0	-12.5			.98328	589.2	.00116	.000416			2.37
17.5	-11.0			.99219	593.9	.00093	.000334			1.90
15.5	-2.5			1.01337	610.2	.00103	.000370			1.94
16.5	-2.5			.99832	601.5	.00105	.000377			2.06
17.5	-2.5			1.00167	602.5	.00113	.000406	.00098	.000352	1.85
18.5	-2.5			1.01448	608.9	.00114	.000409			2.28
19.5	-2.5			.99944	601.5	.00151	.000542			2.75
20.5	-2.5			1.00445	607.9	.00194	.000697			3.18
21.5	-2.5			1.01114	603.5	.00029	.000104			.48
36.0	-16.0			.92533	552.2	.00058	.000208			1.18
36.0	-12.0			.91029	543.9	.00072	.000259	.00069	.000248	
32.0	-18.0			.93815	560.2	.00062	.000223			1.35
32.0	-16.0			.92310	551.2	.00066	.000237	.00063	.000226	
32.0	-14.0			.91642	546.9	.00054	.000194	.00053	.000190	1.32
32.0	-10.0			.91920	547.9	.00034	.000122			.69
28.0	-16.0			.91698	548.5	.00069	.000248			1.41
28.0	-12.0			.91920	547.9	.00032	.000115			.71
26.0	-12.5			.93146	556.5	.00058	.000208			1.18
22.0	-12.5			.95263	568.5	.00051	.000183	.00048	.000172	1.04
26.5	-11.0			.98662	597.5	.00169	.000607			
1.0	12.0	4.00		.96211	576.9	.00092	.000330			
2.0	1.5	3.00		.84008	514.5	.00051	.000183			
1.0	.0	2.00		.95263	569.2	.00037	.000133			
-3.9	1.5	1.00		.98885	596.5	.00170	.000610			
-3.9	8.0	1.00		.99888	603.5	.00171	.000614			
-3.9	12.0	1.00		1.00278	607.9	.00226	.000811			
-2.8	1.5	2.83		.97325	591.2	.00280	.001005	.00331	.001188	
-2.8	8.0	2.83		.97882	596.2	.00280	.001005	.00332	.001192	
-2.8	12.0	2.83		.98161	599.5	.00309	.001109			
-1.0	1.5	3.87		.94038	566.2	.00132	.000474			
-1.0	8.0	3.87		.94483	568.9	.00148	.000531			
-1.0	12.0	3.87		.94428	570.5	.00168	.000603			
1.0	1.5	4.00		.94651	565.9	.00056	.000201			
1.0	3.5	4.00		.94762	567.2	.00066	.000237	.00066	.000237	
1.0	8.0	4.00		.94873	568.5	.00091	.000327	.00090	.000323	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

3. 2-inch by 4-inch stiffener with 1/4 round fairing - Concluded

(l) M = 4.44; R = 2.08×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94492	572.5	.00045	.000244			.85
12.0	.0			.98017	593.5	.00060	.000325			1.20
20.5	.0			.99614	608.5	.00150	.000812			2.94
28.0	12.0			.92289	557.9	.00047	.000254			.75
20.5	-5.0			.99228	605.9	.00141	.000763			3.53
31.0	12.0			.91628	553.2	.00032	.000173			.41
34.0	.0			.93996	568.2	.00047	.000254			.92
2.0	12.0			.94547	572.9	.00055	.000298			.69
12.0	-12.0			.96640	584.5	.00065	.000352			1.41
12.0	12.0			.96199	583.5	.00090	.000487			1.14
32.0	3.0			.95596	576.9	.00031	.000168			.66
34.0	1.0			.94272	569.9	.00050	.000271	.00055	.000298	.96
34.0	2.0			.94162	569.5	.00052	.000282	.00055	.000298	.98
34.0	3.0			.93996	568.2	.00050	.000271			.98
36.0	.0			.92399	559.5	.00065	.000352	.00061	.000330	1.48
38.0	.0			.92069	557.2	.00059	.000319			1.13
44.0	12.0			.91849	555.5	.00058	.000314			.87
42.0	.0			.92399	558.9	.00071	.000384			1.48
44.0	.0			.93281	563.9	.00051	.000276	.00051	.000276	1.04
48.0	.0			.94492	570.9	.00046	.000249			.96
52.0	.0			.94272	569.5	.00045	.000244			1.13
52.0	12.0			.92565	559.5	.00058	.000314			.73
55.0	.0			.94217	569.2	.00039	.000211			
58.0	.0			.95208	575.5	.00046	.000249			.88
58.0	12.0			.93886	567.9	.00070	.000379			.89
44.0	-12.0			.92014	556.2	.00061	.000330			1.56
36.0	-8.0			.91959	556.2	.00058	.000314			1.32
34.0	-5.0			.94272	569.9	.00048	.000260	.00052	.000282	1.09
32.0	-3.0			.95428	575.9	.00029	.000157			.58
30.0	-3.0			.96034	579.5	.00019	.000103			.43
32.0	-12.0			.90857	547.9	.00029	.000157			
19.0	-12.5			.97301	589.2	.00074	.000401			
17.5	-11.0			.98127	593.9	.00073	.000395			1.87
15.5	-2.5			1.00385	607.5	.00072	.000390			1.80
16.5	-2.5			.98843	598.2	.00076	.000411	.00047	.000254	1.46
17.5	-2.5			.99118	600.5	.00086	.000466	.00071	.000384	
18.5	-2.5			1.00385	608.2	.00073	.000395			1.55
19.5	-2.5			.98843	602.5	.00116	.000628			2.23
20.5	-2.5			.99063	605.2	.00170	.000920			3.27
21.5	-2.5			.99559	601.2	.00027	.000146			
36.0	-16.0			.92069	555.9	.00036	.000195			.78
36.0	-12.0			.90802	548.9	.00048	.000260			1.09
32.0	-18.0			.93225	563.2	.00046	.000249			
32.0	-16.0			.91794	554.5	.00048	.000260			1.37
32.0	-14.0			.91133	550.5	.00046	.000249			1.00
28.0	-14.0			.91133	551.5	.00060	.000325			1.30
26.0	-12.5			.92565	559.5	.00033	.000179			
20.5	-11.0			.97521	595.9	.00120	.000650			2.50
1.0	12.0	4.00		.95979	581.2	.00054	.000292			
2.0	5.5	2.00		.97521	589.9	.00018	.000097			
-3.9	1.5	1.00		.97962	596.9	.00120	.000650			
-3.9	8.0	1.00		.98953	606.2	.00134	.000726			
-3.9	12.0	1.00		.99284	607.2	.00161	.000872			
-2.8	1.5	2.83		.96585	591.9	.00201	.001088			
-2.8	8.0	2.83		.97136	596.2	.00212	.001148			
-2.8	12.0	2.83		.97411	600.9	.00242	.001310	.00281	.001521	
-1.0	1.5	3.87		.93721	569.2	.00097	.000525			
-1.0	8.0	3.87		.94162	572.5	.00102	.000552			
-1.0	12.0	3.87		.94107	574.5	.00123	.000666			
1.0	1.5	4.00		.94272	570.5	.00042	.000227			
1.0	3.5	4.00		.94437	571.5	.00047	.000254			
1.0	8.0	4.00		.94602	572.9	.00058	.000314	.00057	.000309	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^\circ R$.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge

(a) M = 2.65; R = 3.95×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95298	580.9	.00273	.000384			.94
12.0	.0			.95914	587.9	.00380	.000534			1.22
28.0	12.0			.89925	543.9	.00202	.000284			.61
28.0	4.0			.94067	562.5	.00068	.000096			.23
28.0	.0			.95242	568.9	.00057	.000080			.19
30.0	.0			.95018	570.5	.00087	.000122	.00092	.000129	.28
31.0	12.0			.90261	545.9	.00202	.000284			.67
34.0	.0			.94627	574.5	.00244	.000343	.00246	.000346	.78
2.0	-12.0			.94962	584.2	.00293	.000412			.97
2.0	12.0			.95466	583.5	.00276	.000388			.88
12.0	-12.0			.95354	582.5	.00313	.000440			1.00
12.0	12.0			.95074	579.5	.00298	.000419			1.02
30.0	1.0			.94683	566.9	.00084	.000118			.29
31.0	2.0			.93675	562.9	.00129	.000181			.45
32.0	2.0			.94235	567.5	.00144	.000203	.00145	.000204	.52
32.0	3.0			.93787	565.5	.00167	.000235			.53
32.0	6.0			.91325	551.5	.00174	.000245			.60
34.0	1.0			.94627	575.2	.00254	.000357	.00258	.000363	.86
34.0	2.0			.94403	574.5	.00262	.000368	.00266	.000374	.89
34.0	3.0			.93955	571.9	.00273	.000384			.93
36.0	.0			.93675	573.2	.00348	.000489	.00350	.000492	1.18
38.0	.0			.92612	570.9	.00378	.000532	.00415	.000584	1.24
44.0	12.0			.90933	558.9	.00376	.000529			1.21
42.0	.0			.92276	566.5	.00373	.000525	.00414	.000582	1.19
44.0	.0			.92780	568.2	.00390	.000548	.00390	.000548	1.34
48.0	.0			.93171	570.5	.00348	.000489	.00360	.000506	1.14
52.0	12.0			.96865	595.2	.00401	.000564			1.32
55.0	.0			.96138	589.2	.00360	.000506	.00380	.000534	1.22
58.0	.0			.96865	592.2	.00330	.000464			1.12
58.0	12.0			.95298	586.9	.00393	.000553			1.24
44.0	-12.0			.90149	558.2	.00471	.000662			1.49
36.0	-8.0			.88974	546.2	.00393	.000553			1.24
36.0	-3.0			.92444	559.2	.00166	.000233			
34.0	-3.0			.93451	570.2	.00270	.000380	.00280	.000394	.89
32.0	-3.0			.93171	564.2	.00165	.000232	.00164	.000231	.53
30.0	-3.0			.93004	559.9	.00108	.000152	.00104	.000146	.36
28.0	-3.0			.94011	563.9	.00066	.000093			.22
34.0	-12.0			.88190	538.9	.00292	.000411	.00289	.000406	.91
32.0	-12.0			.87687	532.9	.00220	.000309	.00204	.000287	.69
30.0	-12.0			.87463	530.5	.00209	.000294	.00197	.000277	.65
19.0	-12.5			.93619	581.9	.00466	.000655			1.47
17.5	-11.0			.95410	588.9	.00438	.000616			1.45
15.5	-2.5			.96865	596.2	.00424	.000596			1.40
16.5	-2.5			.95298	587.5	.00435	.000612	.00407	.000572	1.49
17.5	-2.5			.95858	592.5	.00401	.000564			1.33
18.5	-2.5			.97425	581.9	.00028	.000039			.09
36.0	-16.0			.91436	560.5	.00360	.000506			1.14
36.0	-12.0			.89757	549.5	.00364	.000512	.00363	.000510	1.14
32.0	-18.0			.93115	570.2	.00358	.000503			1.19
32.0	-16.0			.91492	562.9	.00390	.000548	.00392	.000551	1.22
32.0	-14.0			.90317	553.5	.00347	.000488	.00353	.000496	1.18
32.0	-10.0			.88638	536.9	.00208	.000293			.66
28.0	-14.0			.90485	560.2	.00465	.000654			1.52
28.0	-12.0			.89254	539.2	.00198	.000278			.65
26.0	-12.5			.91716	564.2	.00406	.000571			1.34
22.0	-12.5			.92332	571.2	.00401	.000564	.00399	.000561	1.30
1.0	12.0	4.00		.94123	581.2	.00302	.000425			
2.0	1.5	3.00		.86064	516.5	.00025	.000035			
2.0	12.0	3.00		.95242	569.5	.00064	.000090			
2.0	1.5	2.00		.94011	560.5	.00034	.000048			
2.0	3.5	2.00		.94739	565.5	.00036	.000051			
2.0	5.5	2.00		.94123	562.9	.00063	.000089	.00061	.000086	
2.0	8.0	2.00		.94739	566.5	.00060	.000084	.00060	.000084	
2.0	12.0	2.00		.95634	571.9	.00060	.000084	.00077	.000108	
2.0	12.0	1.00		.95242	569.2	.00046	.000065			
-2.0	.0	2.00		.92108	557.2	.00175	.000246			
1.0	.0	2.00		.84776	509.5	.00032	.000045			
-6.2	1.5	.54		.96138	574.9	.00045	.000063			
-6.2	8.0	.54		.97369	601.9	.00434	.000610	.00437	.000615	
-6.2	12.0	.54		.97761	603.5	.00429	.000603			
-3.7	1.5	1.98		.96250	594.9	.00439	.000617	.00442	.000622	
-3.7	8.0	1.98		.97201	604.9	.00533	.000750	.00536	.000754	
-3.7	12.0	1.98		.97593	607.9	.00534	.000751	.00536	.000754	
-1.2	1.5	3.42		.95354	602.9	.00613	.000862			
-1.2	8.0	3.42		.96306	598.9	.00516	.000726	.00515	.000724	
-1.2	12.0	3.42		.96306	604.9	.00617	.000868			
1.0	1.5	4.00		.91436	559.9	.00319	.000449			
1.0	3.5	4.00		.91716	562.2	.00339	.000477	.00339	.000477	
1.0	8.0	4.00		.92388	571.5	.00321	.000451	.00337	.000474	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(b) M = 2.65; R = 2.56 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95724	577.2	.00203	.000443			1.04
12.0	.0			.96174	584.9	.00268	.000584			1.33
28.0	12.0			.90549	542.5	.00150	.000327			.68
28.0	4.0			.94318	561.2	.00048	.000105			.24
28.0	.0			.95387	566.9	.00041	.000089			.20
30.0	.0			.94543	563.2	.00062	.000135	.00067	.000146	.31
31.0	12.0			.90437	542.2	.00133	.000290			.65
34.0	.0			.94487	568.9	.00183	.000399	.00185	.000403	.91
2.0	-12.0			.95443	576.2	.00223	.000486			1.09
2.0	12.0			.95893	577.9	.00202	.000440			1.00
12.0	-12.0			.95724	578.5	.00241	.000525			1.08
12.0	12.0			.95443	575.5	.00199	.000434			.99
30.0	1.0			.94206	561.2	.00070	.000153			.32
31.0	2.0			.93306	559.5	.00096	.000209			.47
32.0	2.0			.93924	561.9	.00109	.000238	.00111	.000242	.58
32.0	3.0			.93531	560.9	.00122	.000266			.61
32.0	6.0			.91337	547.2	.00137	.000299			.68
34.0	1.0			.94543	569.9	.00188	.000410	.00191	.000416	.91
34.0	2.0			.94318	568.5	.00203	.000443	.00206	.000449	.98
34.0	3.0			.93924	566.2	.00207	.000451			1.00
36.0	.0			.93868	568.2	.00245	.000534	.00247	.000539	1.23
38.0	.0			.92912	563.5	.00263	.000573	.00299	.000652	1.28
44.0	12.0			.91281	553.9	.00279	.000608			1.33
42.0	.0			.92631	562.2	.00265	.000578	.00302	.000658	1.28
44.0	.0			.92968	563.2	.00259	.000565	.00259	.000565	1.20
48.0	.0			.93474	566.2	.00251	.000547	.00261	.000569	1.21
52.0	12.0			.97299	590.2	.00240	.000523			1.17
55.0	.0			.96624	584.9	.00241	.000525	.00254	.000554	1.19
58.0	.0			.97299	587.9	.00230	.000501			1.11
58.0	12.0			.96174	582.2	.00262	.000571			1.27
44.0	-12.0			.91787	553.5	.00281	.000613			1.34
36.0	-8.0			.90324	542.9	.00267	.000582			1.27
36.0	-3.0			.93474	559.5	.00109	.000238			
34.0	-3.0			.94093	564.5	.00182	.000397	.00189	.000412	.88
32.0	-3.0			.93643	562.5	.00122	.000266	.00124	.000270	.55
30.0	-3.0			.93531	534.5	.00072	.000157	.00067	.000146	.35
28.0	-3.0			.95049	562.2	.00054	.000118			.26
34.0	-12.0			.89424	536.5	.00204	.000445	.00209	.000456	.91
32.0	-12.0			.88749	529.9	.00146	.000318	.00130	.000283	.65
30.0	-12.0			.88468	527.9	.00132	.000288	.00122	.000266	.61
19.0	-12.5			.94599	578.5	.00308	.000672			1.50
17.5	-11.0			.96062	585.5	.00309	.000674			1.49
15.5	-2.5			.97468	590.2	.00276	.000602			1.33
16.5	-2.5			.95724	581.2	.00304	.000663	.00277	.000604	1.48
17.5	-2.5			.96512	588.5	.00272	.000593			1.35
18.5	-2.5			.98593	583.2	.00029	.000063			.14
36.0	-16.0			.92012	556.5	.00242	.000528			1.16
36.0	-12.0			.90324	546.5	.00251	.000547	.00250	.000545	1.20
32.0	-18.0			.93362	565.2	.00254	.000554			1.22
32.0	-16.0			.91787	557.5	.00288	.000628	.00289	.000630	1.37
32.0	-14.0			.90606	548.9	.00248	.000541	.00254	.000554	1.19
32.0	-10.0			.89199	535.9	.00151	.000329			.71
28.0	-14.0			.90887	554.5	.00333	.000726			1.51
28.0	-12.0			.89818	538.2	.00149	.000325			.70
26.0	-12.5			.92293	562.9	.00284	.000619			1.37
22.0	-12.5			.92968	567.5	.00284	.000619	.00282	.000615	1.27
1.0	12.0	4.00		.94937	574.5	.00210	.000458			
2.0	1.5	3.00		.85037	512.2	.00032	.000070			
2.0	12.0	3.00		.96399	573.2	.00040	.000087			
2.0	1.5	2.00		.95331	565.9	.00022	.000048			
2.0	3.5	2.00		.96062	570.9	.00033	.000072			
2.0	5.5	2.00		.95387	567.5	.00035	.000076			
2.0	8.0	2.00		.96062	571.2	.00035	.000076			
2.0	12.0	2.00		.96737	575.2	.00038	.000083	.00052	.000113	
2.0	1.5	1.00		.95162	564.9	.00025	.000055			
2.0	12.0	1.00		.96287	572.5	.00047	.000102			
-2.0	.0	2.00		.93362	561.2	.00124	.000270			
1.0	.0	2.00		.84080	506.2	.00042	.000092			
-6.2	1.5	.54		.97806	581.9	.00030	.000065			
-6.2	8.0	.54		.97693	599.2	.00317	.000691	.00319	.000695	
-6.2	12.0	.54		.98199	600.9	.00298	.000650			
-3.7	1.5	1.98		.96849	595.5	.00294	.000641	.00297	.000648	
-3.7	8.0	1.98		.97637	606.5	.00338	.000737	.00341	.000743	
-3.7	12.0	1.98		.98031	602.2	.00397	.000866	.00399	.000870	
-1.2	1.5	3.42		.95724	595.2	.00438	.000955			
-1.2	8.0	3.42		.96681	593.9	.00402	.000876	.00402	.000876	
-1.2	12.0	3.42		.96681	600.9	.00433	.000944			
1.0	1.5	4.00		.92181	557.9	.00197	.000429			
1.0	3.5	4.00		.92406	562.9	.00212	.000462	.00212	.000462	
1.0	8.0	4.00		.93081	564.2	.00214	.000467	.00213	.000464	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(c) M = 2.65; R = 1.28×10^6

x, in.	y, in.	z, in. (a)	∅, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96215	581.9	.00099	.000430			.97
12.0	.0			.96660	586.9	.00147	.000638			1.58
28.0	12.0			.92041	554.5	.00083	.000360			.82
28.0	4.0			.95825	573.9	.00029	.000126			.29
30.0	.0			.96048	574.9	.00026	.000113			.28
31.0	12.0			.91651	550.9	.00055	.000239			.51
34.0	.0			.95547	576.5	.00101	.000438	.00102	.000443	1.06
2.0	-12.0			.95881	580.2	.00108	.000469			1.00
2.0	12.0			.96326	582.5	.00102	.000443			1.00
12.0	-12.0			.96438	586.5	.00129	.000560			1.23
12.0	12.0			.96271	581.9	.00107	.000464			1.08
30.0	1.0			.95658	572.9	.00029	.000126			.31
31.0	2.0			.94657	567.5	.00043	.000187			.46
32.0	2.0			.95046	570.9	.00062	.000269	.00064	.000278	.66
32.0	3.0			.94545	568.2	.00055	.000239			.57
32.0	6.0			.92542	556.5	.00071	.000308			.72
34.0	1.0			.95491	576.5	.00103	.000447	.00107	.000464	1.17
34.0	2.0			.95157	574.9	.00108	.000469	.00111	.000482	1.06
34.0	3.0			.94657	571.9	.00109	.000473			1.09
36.0	.0			.94823	574.2	.00134	.000582	.00135	.000586	1.37
38.0	.0			.93933	569.9	.00147	.000638			1.56
44.0	12.0			.92319	560.2	.00150	.000651			1.46
42.0	.0			.93710	569.9	.00152	.000660			1.49
44.0	.0			.94044	570.5	.00150	.000651	.00150	.000651	1.60
48.0	.0			.94601	573.2	.00141	.000612	.00142	.000616	1.50
52.0	.0			.93655	567.5	.00139	.000603	.00138	.000599	1.48
52.0	12.0			.92987	563.9	.00142	.000616			1.41
55.0	.0			.93710	569.9	.00132	.000573	.00130	.000564	1.35
58.0	.0			.95324	577.2	.00132	.000573			1.32
58.0	12.0			.94879	574.9	.00137	.000595			1.34
44.0	-12.0			.92041	559.5	.00159	.000690			1.57
36.0	-8.0			.91484	554.9	.00144	.000625			1.43
36.0	-3.0			.93376	562.5	.00065	.000282			
34.0	-3.0			.95213	574.9	.00102	.000443	.00110	.000477	1.03
32.0	-3.0			.95213	571.9	.00059	.000256	.00058	.000252	.67
30.0	-3.0			.95436	571.5	.00035	.000152			.36
34.0	-12.0			.91428	552.2	.00107	.000464	.00107	.000464	1.11
32.0	-12.0			.90928	546.9	.00070	.000304	.00061	.000265	.71
30.0	-12.0			.90705	545.2	.00058	.000252	.00054	.000234	.56
19.0	-12.5			.96104	587.2	.00190	.000825			1.92
17.5	-11.0			.97328	594.5	.00175	.000759			1.72
15.5	-2.5			.98664	599.5	.00162	.000703			1.53
16.5	-2.5			.96938	589.5	.00156	.000677	.00125	.000542	1.68
17.5	-2.5			.97606	595.5	.00149	.000647			1.57
36.0	-16.0			.93376	566.5	.00125	.000542			1.33
36.0	-12.0			.91985	557.9	.00143	.000621	.00143	.000621	1.44
32.0	-18.0			.94434	574.9	.00132	.000573			1.29
32.0	-16.0			.92931	563.9	.00149	.000647	.00149	.000647	1.39
32.0	-14.0			.91874	557.2	.00127	.000551	.00128	.000555	1.46
32.0	-10.0			.91261	549.5	.00074	.000321			.75
28.0	-14.0			.91707	559.2	.00184	.000799			2.04
28.0	-12.0			.91484	550.9	.00075	.000325			.70
26.0	-12.5			.93432	567.9	.00145	.000629			1.42
22.0	-12.5			.94044	571.5	.00150	.000651	.00147	.000638	1.47
1.0	12.0	4.00		.96159	582.5	.00103	.000447			
2.0	1.5	3.00		.84360	515.2	.00033	.000143			
2.0	12.0	3.00		.97773	586.2	.00023	.000100			
2.0	5.5	2.00		.97050	581.9	.00026	.000113			
2.0	12.0	2.00		.98163	588.5	.00027	.000117			
2.0	12.0	1.00		.97718	585.5	.00021	.000091			
-2.0	.0	2.00		.95102	573.2	.00068	.000295			
1.0	.0	2.00		.83470	510.2	.00032	.000139			
-6.2	1.5	.54		.98664	591.9	.00021	.000091			
-6.2	8.0	.54		.98330	600.5	.00186	.000807	.00187	.000812	
-6.2	12.0	.54		.98775	605.2	.00159	.000690			
-3.7	1.5	1.98		.97662	597.5	.00176	.000764	.00178	.000772	
-3.7	8.0	1.98		.98274	602.9	.00229	.000994	.00231	.001002	
-3.7	12.0	1.98		.98552	606.9	.00219	.000950	.00221	.000959	
-1.2	1.5	3.42		.96493	594.2	.00258	.001120			
-1.2	8.0	3.42		.97439	597.5	.00212	.000920	.00212	.000920	
-1.2	12.0	3.42		.97272	599.9	.00258	.001120			
1.0	1.5	4.00		.93710	566.9	.00105	.000456			
1.0	3.5	4.00		.93933	568.5	.00103	.000447	.00103	.000447	
1.0	8.0	4.00		.94434	572.2	.00107	.000464	.00106	.000460	

[a]Thermocouple locations for which z and/or ∅ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(d) M = 3.51; R = 4.04 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95617	573.2	.00162	.000310			1.03
12.0	.0			.95954	581.2	.00216	.000414			1.39
28.0	12.0			.91066	544.9	.00157	.000301			.88
28.0	4.0			.96909	575.5	.00032	.000061			.19
30.0	.0			.95673	568.5	.00052	.000100	.00054	.000103	.34
31.0	12.0			.90897	543.5	.00132	.000253			.69
34.0	.0			.92920	558.2	.00196	.000375	.00193	.000370	1.27
2.0	-12.0			.95224	571.2	.00187	.000358			1.15
2.0	12.0			.95673	574.2	.00203	.000389			1.09
12.0	-12.0			.95280	571.5	.00186	.000356			1.12
12.0	12.0			.94774	569.2	.00193	.000370			1.04
30.0	1.0			.95336	566.9	.00052	.000100			.34
31.0	2.0			.94100	560.5	.00077	.000147			.49
32.0	2.0			.94044	561.5	.00108	.000207	.00111	.000213	.77
32.0	3.0			.93931	563.5	.00119	.000228			.74
32.0	6.0			.92527	552.9	.00128	.000245			.76
34.0	1.0			.92976	558.9	.00198	.000379	.00198	.000379	1.28
34.0	2.0			.93032	559.2	.00203	.000389	.00205	.000393	1.27
34.0	3.0			.92920	558.9	.00198	.000379			1.22
36.0	.0			.91852	553.2	.00239	.000458	.00239	.000458	1.54
38.0	.0			.91122	548.9	.00253	.000485	.00275	.000527	1.62
44.0	12.0			.91459	550.9	.00235	.000450			1.36
42.0	.0			.91403	550.5	.00238	.000456	.00265	.000508	1.54
44.0	.0			.92414	553.5	.00225	.000431	.00225	.000431	1.48
48.0	.0			.92807	557.9	.00227	.000435	.00228	.000437	1.47
52.0	.0			.91908	552.2	.00207	.000396	.00206	.000395	1.32
52.0	12.0			.91234	548.9	.00232	.000444			1.30
55.0	.0			.91965	552.5	.00201	.000385	.00199	.000381	1.35
58.0	.0			.93650	562.5	.00208	.000398			1.33
58.0	12.0			.93145	559.9	.00205	.000393			1.16
44.0	-12.0			.89605	542.2	.00259	.000496			1.57
36.0	-8.0			.89773	540.9	.00247	.000473			1.57
36.0	-3.0			.93032	555.9	.00120	.000230			
34.0	-3.0			.93538	561.9	.00202	.000387	.00204	.000391	1.36
32.0	-3.0			.94325	565.9	.00118	.000226	.00117	.000224	.77
30.0	-3.0			.95167	566.2	.00064	.000123	.00060	.000115	.41
28.0	-3.0			.97471	578.9	.00037	.000071			.25
34.0	-12.0			.89324	535.9	.00178	.000341	.00179	.000343	1.14
32.0	-12.0			.88987	532.2	.00118	.000226	.00110	.000211	.72
30.0	-12.0			.88706	530.2	.00095	.000182	.00091	.000174	.59
19.0	-12.5			.95448	580.2	.00307	.000588			1.94
17.5	-11.0			.97022	586.2	.00291	.000557			1.75
15.5	-2.5			.98482	593.9	.00250	.000479			1.57
16.5	-2.5			.96797	583.9	.00273	.000523	.00246	.000471	1.91
17.5	-2.5			.97640	589.9	.00289	.000554			1.86
36.0	-16.0			.91234	548.9	.00232	.000444			1.27
36.0	-12.0			.89492	542.5	.00232	.000444	.00230	.000441	1.41
32.0	-18.0			.92583	556.9	.00229	.000439			1.24
32.0	-16.0			.91066	548.9	.00271	.000519	.00271	.000519	1.67
32.0	-14.0			.89942	541.2	.00218	.000418	.00219	.000419	1.32
32.0	-10.0			.89268	535.2	.00143	.000274			.91
28.0	-14.0			.90054	544.9	.00315	.000603			1.72
28.0	-12.0			.89605	534.9	.00106	.000203			.68
26.0	-12.5			.91740	552.5	.00251	.000481			1.51
22.0	-12.5			.93088	562.2	.00235	.000450	.00233	.000446	1.47
1.0	12.0	4.00		.94718	573.5	.00246	.000471			
2.0	1.5	3.00		.85166	511.9	.00039	.000075			
2.0	1.5	2.00		.97921	580.9	.00019	.000036			
2.0	3.5	2.00		.98595	585.2	.00025	.000048			
2.0	5.5	2.00		.97864	581.5	.00030	.000057			
2.0	8.0	2.00		.98595	585.9	.00041	.000079	.00041	.000079	
2.0	12.0	2.00		.99775	592.2	.00022	.000042			
2.0	1.5	1.00		.97527	578.5	.00018	.000034			
-2.0	.0	2.00		.94830	565.9	.00096	.000184			
1.0	.0	2.00		.84155	506.2	.00042	.000080			
-6.2	1.5	.54		1.00168	596.9	.00093	.000178			
-6.2	8.0	.54		.98258	598.9	.00337	.000645	.00337	.000645	
-6.2	12.0	.54		.98820	602.2	.00334	.000640			
-3.7	1.5	1.98		.97190	592.5	.00340	.000651	.00339	.000649	
-3.7	8.0	1.98		.97921	597.5	.00462	.000885	.00464	.000889	
-3.7	12.0	1.98		.98258	600.9	.00483	.000925	.00485	.000929	
-1.2	1.5	3.42		.95224	589.2	.00539	.001032			
-1.2	8.0	3.42		.96572	590.2	.00489	.000937	.00489	.000937	
-1.2	12.0	3.42		.96291	598.2	.00582	.001115			
1.0	1.5	4.00		.91908	553.5	.00232	.000444			
1.0	3.5	4.00		.92189	555.5	.00251	.000481	.00251	.000481	
1.0	8.0	4.00		.92864	562.5	.00252	.000483	.00251	.000481	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(e) M = 3.51; R = 2.80 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96155	572.5	.00121	.000336			.98
12.0	.0			.96381	577.5	.00167	.000464			1.50
28.0	12.0			.92028	546.5	.00118	.000328			.77
28.0	4.0			.97681	575.9	.00027	.000075			.21
30.0	.0			.96438	568.9	.00032	.000089			.26
31.0	12.0			.91575	545.9	.00090	.000250			.65
34.0	.0			.93498	557.5	.00152	.000422	.00150	.000417	1.23
2.0	-12.0			.95759	569.9	.00125	.000347			.98
2.0	12.0			.96268	573.5	.00129	.000358			.98
12.0	-12.0			.95703	570.2	.00148	.000411			1.15
12.0	12.0			.95307	568.2	.00131	.000364			.98
30.0	1.0			.96098	567.2	.00032	.000089			.26
31.0	2.0			.94798	560.5	.00061	.000169			.48
32.0	2.0			.94628	560.9	.00083	.000230	.00085	.000236	.67
32.0	3.0			.94515	560.5	.00086	.000239			.67
32.0	6.0			.93159	552.5	.00086	.000239			.65
34.0	1.0			.93498	557.9	.00152	.000422	.00152	.000422	1.26
34.0	2.0			.93554	558.5	.00156	.000433	.00158	.000439	1.25
34.0	3.0			.93441	557.5	.00152	.000422			1.13
36.0	.0			.92367	552.5	.00174	.000483	.00174	.000483	1.40
38.0	.0			.91632	548.2	.00193	.000536	.00212	.000589	1.60
44.0	12.0			.92084	551.9	.00175	.000486			1.14
42.0	.0			.91971	550.2	.00175	.000486	.00201	.000558	1.45
44.0	.0			.92650	555.2	.00174	.000483	.00175	.000486	1.39
48.0	.0			.93554	558.2	.00157	.000436	.00158	.000439	1.30
52.0	.0			.92593	552.5	.00145	.000403	.00144	.000400	1.13
52.0	12.0			.91802	548.2	.00148	.000411			.97
55.0	.0			.92650	552.5	.00153	.000425	.00151	.000419	1.19
58.0	.0			.94346	564.2	.00147	.000408			1.17
58.0	12.0			.93780	559.5	.00152	.000422			1.00
44.0	-12.0			.90388	540.2	.00176	.000489			1.48
36.0	-8.0			.90501	541.2	.00194	.000539			1.58
36.0	-3.0			.93667	555.5	.00079	.000219			
34.0	-3.0			.94007	560.9	.00144	.000400	.00146	.000405	1.21
32.0	-3.0			.94855	562.5	.00097	.000269	.00096	.000267	.82
30.0	-3.0			.95872	566.2	.00046	.000128	.00042	.000117	.38
28.0	-3.0			.98134	578.9	.00027	.000075			.22
34.0	-12.0			.90162	536.9	.00132	.000367	.00133	.000369	1.04
32.0	-12.0			.89879	532.5	.00085	.000236	.00079	.000219	.71
30.0	-12.0			.89710	531.2	.00085	.000236	.00077	.000214	.69
19.0	-12.5			.95929	577.9	.00207	.000575			1.64
17.5	-11.0			.97399	583.9	.00188	.000522			1.57
15.5	-2.5			.98756	591.2	.00183	.000508			1.49
16.5	-2.5			.97116	581.5	.00187	.000519	.00160	.000444	1.52
17.5	-2.5			.97851	589.9	.00186	.000516			1.56
36.0	-16.0			.91858	547.9	.00155	.000430			1.18
36.0	-12.0			.90275	539.2	.00176	.000489	.00175	.000486	1.48
32.0	-18.0			.92989	555.2	.00159	.000442			1.22
32.0	-16.0			.91575	547.5	.00192	.000533	.00192	.000533	1.26
32.0	-14.0			.90558	540.2	.00157	.000436	.00155	.000430	1.25
32.0	-10.0			.90275	536.2	.00121	.000336			.97
28.0	-14.0			.90558	546.9	.00220	.000611			1.79
28.0	-12.0			.90614	536.9	.00079	.000219			.64
26.0	-12.5			.92480	552.5	.00161	.000447			1.28
22.0	-12.5			.93780	559.9	.00158	.000439	.00156	.000433	1.31
1.0	12.0	4.00		.95477	571.2	.00156	.000433			
2.0	1.5	3.00		.85243	512.2	.00036	.000100			
2.0	12.0	3.00		.99830	589.2	.00023	.000064			
2.0	5.5	2.00		.98473	580.9	.00021	.000058			
2.0	8.0	2.00		.99038	584.5	.00027	.000075			
2.0	12.0	2.00		1.00169	590.5	.00019	.000053			
2.0	12.0	1.00		.99491	586.5	.00017	.000047			
-2.0	.0	2.00		.95646	566.9	.00075	.000208			
1.0	.0	2.00		.84395	507.5	.00054	.000150			
-6.2	1.5	.54		1.00339	593.2	.00041	.000114			
-6.2	8.0	.54		.98530	597.2	.00224	.000622	.00224	.000622	
-6.2	12.0	.54		.99151	602.2	.00208	.000578			
-3.7	1.5	1.98		.97625	589.2	.00239	.000664	.00239	.000664	
-3.7	8.0	1.98		.98247	597.5	.00305	.000847	.00307	.000852	
-3.7	12.0	1.98		.98643	598.5	.00330	.000916	.00332	.000922	
-1.2	1.5	3.42		.95646	585.2	.00371	.001030			
-1.2	8.0	3.42		.96946	594.5	.00289	.000803	.00289	.000803	
-1.2	12.0	3.42		.96720	591.5	.00424	.001177			
1.0	1.5	4.00		.92706	553.5	.00154	.000428			
1.0	3.5	4.00		.92932	555.2	.00154	.000428	.00154	.000428	
1.0	8.0	4.00		.93611	561.5	.00173	.000480	.00172	.000478	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(f) M = 3.51; R = 1.62×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.96476	569.9	.00067	.000323			.99
12.0	.0			.96533	573.5	.00112	.000540			1.72
28.0	12.0			.92953	548.5	.00066	.000318			.78
30.0	.0			.96533	566.9	.00026	.000125			.39
31.0	12.0			.92214	543.2	.00049	.000236			.58
34.0	.0			.93862	555.5	.00098	.000473	.00096	.000463	1.51
2.0	-12.0			.96022	567.5	.00075	.000362			.88
2.0	12.0			.96647	571.2	.00084	.000405			.99
12.0	-12.0			.95965	567.5	.00095	.000458			1.42
12.0	12.0			.95681	565.5	.00085	.000410			1.10
31.0	2.0			.94942	558.5	.00033	.000159			.45
32.0	2.0			.94828	558.9	.00054	.000261	.00056	.000270	.81
32.0	3.0			.94771	558.5	.00051	.000246			.75
32.0	6.0			.93635	552.2	.00064	.000309			.75
34.0	1.0			.93862	555.9	.00095	.000458	.00095	.000458	1.40
34.0	2.0			.93919	556.2	.00099	.000478	.00101	.000487	1.46
34.0	3.0			.93749	555.2	.00096	.000463			1.26
36.0	.0			.92839	551.5	.00116	.000560	.00111	.000536	1.36
38.0	.0			.92157	546.5	.00123	.000594	.00143	.000690	1.45
44.0	12.0			.92726	549.5	.00103	.000497			1.34
42.0	.0			.92555	548.5	.00105	.000507			1.54
44.0	.0			.93294	552.9	.00100	.000483	.00100	.000483	1.28
48.0	.0			.94260	557.9	.00102	.000492	.00103	.000497	1.20
52.0	.0			.93951	552.2	.00091	.000439	.00090	.000434	1.28
52.0	12.0			.92385	546.9	.00098	.000473			1.15
55.0	.0			.93408	554.2	.00086	.000415	.00084	.000405	1.28
58.0	.0			.95112	562.5	.00083	.000401			1.24
58.0	12.0			.94487	558.9	.00083	.000401			.99
44.0	-12.0			.91305	541.2	.00124	.000598			1.91
36.0	-8.0			.91362	542.9	.00130	.000627			1.97
36.0	-3.0			.94146	554.9	.00044	.000212			
34.0	-3.0			.94374	558.5	.00098	.000473	.00099	.000478	1.46
32.0	-3.0			.95056	560.2	.00070	.000338	.00069	.000333	1.04
30.0	-3.0			.96078	564.5	.00030	.000145			.42
28.0	-3.0			.98238	576.9	.00023	.000111			.34
34.0	-12.0			.90964	539.2	.00088	.000425	.00088	.000425	1.05
32.0	-12.0			.90794	534.9	.00045	.000217			.67
30.0	-12.0			.90737	534.2	.00043	.000207			.63
19.5	-12.5			.96192	573.5	.00126	.000608			1.88
17.5	-11.0			.97499	578.9	.00117	.000565			1.38
16.5	-2.5			.98749	586.9	.00121	.000584			1.64
16.5	-2.5			.96988	575.9	.00123	.000594			1.45
17.5	-2.5			.97613	581.2	.00124	.000598			1.85
36.0	-16.0			.92328	546.9	.00096	.000463			1.30
36.0	-12.0			.91135	540.2	.00124	.000598	.00123	.000594	1.48
32.0	-18.0			.93351	552.5	.00100	.000483			1.18
32.0	-16.0			.91987	545.5	.00110	.000531	.00110	.000531	1.47
32.0	-14.0			.91078	539.2	.00100	.000483	.00099	.000478	1.52
32.0	-10.0			.91362	539.2	.00064	.000309			.96
28.0	-14.0			.90964	540.9	.00138	.000666			1.62
28.0	-12.0			.91532	539.2	.00049	.000236			.74
26.0	-12.5			.93237	552.2	.00097	.000468			1.45
22.0	-12.5			.94374	558.9	.00102	.000492	.00101	.000487	1.50
1.0	12.0	4.00		.96363	570.9	.00088	.000425			
2.0	1.5	3.00		.85452	511.5	.00040	.000193			
2.0	12.0	3.00		.99772	585.5	.00015	.000072			
2.0	1.5	2.00		.98749	579.2	.00012	.000058			
2.0	5.5	2.00		.98692	579.5	.00019	.000092			
2.0	8.0	2.00		.99147	582.2	.00016	.000077			
2.0	12.0	2.00		1.00056	587.2	.00015	.000072			
2.0	12.0	1.00		.99431	583.5	.00015	.000072			
-2.0	.0	2.00		.96619	567.9	.00040	.000193			
1.0	.0	2.00		.84656	506.9	.00041	.000198			
-6.2	1.5	.54		1.00170	588.5	.00026	.000125			
-6.2	8.0	.54		.98579	589.9	.00145	.000700	.00145	.000700	
-6.2	12.0	.54		.99204	591.2	.00150	.000724			
-3.7	1.5	1.98		.97840	582.9	.00152	.000733	.00152	.000733	
-3.7	8.0	1.98		.98465	592.5	.00184	.000888	.00187	.000902	
-3.7	12.0	1.98		.98863	595.9	.00185	.000893	.00187	.000902	
-1.2	1.5	3.42		.96078	577.5	.00233	.001124			
-1.2	8.0	3.42		.97272	585.9	.00188	.000907	.00188	.000907	
-1.2	12.0	3.42		.97101	589.2	.00241	.001163			
1.0	1.5	4.00		.93692	554.2	.00085	.000410			
1.0	3.5	4.00		.93862	556.2	.00092	.000444	.00092	.000444	
1.0	8.0	4.00		.94487	559.5	.00102	.000492	.00101	.000487	

[a] *Thermocouple locations for which* z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES: δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(g) M = 4.44; R = 4.59×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.94747	568.9	.00101	.000254			1.19
12.0	.0			.95250	571.9	.00097	.000244			1.35
28.0	12.0			.91451	548.5	.00085	.000213			.83
30.0	.0			.95362	569.2	.00042	.000105	.00045	.000113	.62
31.0	12.0			.91060	546.2	.00077	.000193			.75
34.0	.0			.90892	548.5	.00134	.000337	.00129	.000324	2.00
2.0	-12.0			.94468	566.8	.00085	.000213			1.25
2.0	12.0			.94636	569.9	.00121	.000304			1.21
12.0	-12.0			.94636	567.2	.00072	.000181			1.29
12.0	12.0			.93630	565.5	.00124	.000311			1.25
31.0	2.0			.93630	559.5	.00053	.000133			.73
32.0	2.0			.92959	557.9	.00076	.000191	.00081	.000203	.95
32.0	3.0			.93071	557.5	.00076	.000191			.92
32.0	6.0			.93351	558.5	.00065	.000163			.76
34.0	1.0			.90836	548.5	.00135	.000339	.00133	.000334	1.93
34.0	2.0			.90948	548.9	.00134	.000337	.00137	.000344	1.84
34.0	3.0			.90836	550.2	.00134	.000337			1.89
36.0	.0			.89830	541.2	.00157	.000394	.00154	.000387	2.21
38.0	.0			.89495	539.2	.00154	.000387			2.20
44.0	12.0			.91171	552.2	.00134	.000337			1.30
42.0	.0			.90222	543.9	.00146	.000367	.00178	.000447	2.09
44.0	.0			.91171	550.2	.00134	.000337	.00135	.000339	1.94
48.0	.0			.92345	557.5	.00126	.000316	.00128	.000321	1.58
52.0	.0			.91618	551.2	.00124	.000311	.00123	.000309	1.80
52.0	12.0			.90557	546.9	.00135	.000339			1.36
56.0	.0			.91786	551.2	.00111	.000279	.00108	.000271	1.54
58.0	.0			.93351	560.5	.00105	.000264			1.98
58.0	12.0			.92457	558.2	.00132	.000331			1.28
44.0	-12.0			.89439	540.2	.00130	.000326			2.24
36.0	-8.0			.89998	542.9	.00147	.000369			2.53
36.0	-4.0			.92065	551.9	.00069	.000173			
34.0	-3.0			.91730	552.9	.00144	.000362	.00140	.000352	2.06
32.0	-3.0			.93183	558.9	.00085	.000213	.00083	.000208	1.27
30.0	-3.0			.94971	566.9	.00042	.000105			.68
34.0	-12.0			.89383	536.9	.00114	.000286	.00115	.000289	2.07
32.0	-12.0			.89719	536.5	.00057	.000143	.00055	.000138	.89
30.0	-12.0			.89439	534.2	.00051	.000128			.80
19.0	-12.5			.94971	572.5	.00139	.000349			2.36
17.5	-11.0			.96926	582.9	.00139	.000349			2.40
15.5	-2.5			.98603	593.2	.00140	.000352			2.19
16.5	-2.5			.96815	582.5	.00149	.000374			2.19
17.5	-2.5			.97206	585.5	.00148	.000372			2.21
36.0	-16.0			.90892	545.2	.00113	.000284			2.09
36.0	-12.0			.89104	537.2	.00136	.000342	.00133	.000334	2.34
32.0	-18.0			.92010	552.5	.00106	.000266			1.83
32.0	-16.0			.90669	546.5	.00133	.000334	.00132	.000331	1.82
32.0	-14.0			.89719	538.5	.00116	.000291	.00113	.000284	2.00
32.0	-10.0			.90222	540.2	.00074	.000186			1.16
28.0	-14.0			.89663	541.2	.00148	.000372			2.55
28.0	-12.0			.89942	537.5	.00055	.000138			.86
26.0	-12.5			.91563	550.2	.00112	.000281			1.93
22.0	-12.5			.92736	556.9	.00110	.000276	.00107	.000269	1.72
1.0	12.0	4.00		.93686	565.9	.00143	.000359			
2.0	12.0	3.00		.98603	588.2	.00023	.000058			
2.0	3.5	2.00		.97876	583.5	.00019	.000048	.00024	.000060	
2.0	12.0	2.00		.98826	589.5	.00022	.000055			
-2.0	.0	2.00		.94915	567.5	.00048	.000121			
-6.2	1.5	.54		.98826	590.2	.00031	.000078			
-6.2	8.0	.54		.97765	592.9	.00193	.000485	.00192	.000482	
-6.2	12.0	.54		.98435	596.5	.00213	.000535			
-3.7	1.5	1.98		.96312	584.5	.00185	.000465	.00185	.000465	
-3.7	8.0	1.98		.97206	592.5	.00257	.000645	.00261	.000655	
-3.7	12.0	1.98		.97429	593.9	.00307	.000771	.00310	.000779	
-1.2	1.5	3.42		.94245	574.5	.00318	.000799			
-1.2	8.0	3.42		.95474	581.9	.00298	.000748	.00299	.000751	
-1.2	12.0	3.42		.95027	583.5	.00379	.000952			
1.0	1.5	4.00		.91171	551.2	.00128	.000321			
1.0	3.5	4.00		.91339	551.9	.00135	.000339	.00135	.000339	
1.0	8.0	4.00		.91898	554.2	.00158	.000397	.00157	.000394	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Continued

(h) M = 4.44; R = 3.24×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95085	569.2	.00062	.000221			1.05
12.0	.0			.95811	574.6	.00077	.000274			1.04
28.0	12.0			.92237	552.9	.00080	.000285			.90
31.0	12.0			.91846	548.5	.00055	.000196			.76
34.0	.0			.91623	549.5	.00092	.000328	.00087	.000310	1.61
2.0	-12.0			.94694	566.5	.00054	.000192			1.00
2.0	12.0			.94974	569.5	.00102	.000363			1.36
12.0	-12.0			.95141	568.9	.00065	.000232			1.33
12.0	12.0			.94192	564.9	.00089	.000317			1.19
30.0	1.0			.95755	570.5	.00028	.000100			.42
31.0	2.0			.94359	563.2	.00042	.000150			.74
32.0	2.0			.93745	560.2	.00052	.000185	.00056	.000199	.85
32.0	3.0			.93857	560.9	.00079	.000281			1.25
32.0	6.0			.94080	561.5	.00061	.000182			.78
34.0	1.0			.91567	549.5	.00110	.000392	.00107	.000381	1.64
34.0	2.0			.91735	550.2	.00092	.000328	.00096	.000342	1.46
34.0	3.0			.91623	549.2	.00109	.000388			1.98
36.0	.0			.90450	542.5	.00111	.000395	.00108	.000385	1.82
38.0	.0			.90171	540.5	.00111	.000395			1.95
44.0	12.0			.92070	551.9	.00109	.000388			1.24
42.0	.0			.90953	545.2	.00106	.000378			1.68
44.0	.0			.92070	551.2	.00085	.000303	.00086	.000306	
48.0	.0			.93243	558.9	.00090	.000321	.00092	.000328	1.58
52.0	.0			.92684	554.2	.00074	.000264	.00073	.000260	1.35
52.0	12.0			.91344	547.5	.00109	.000388			1.30
55.0	.0			.92796	555.9	.00079	.000281	.00076	.000271	1.36
58.0	.0			.94248	564.2	.00071	.000253			1.11
58.0	12.0			.93298	559.2	.00105	.000374			1.25
44.0	-12.0			.90562	541.9	.00084	.000299			1.71
36.0	-8.0			.90897	544.5	.00112	.000399			2.29
36.0	-3.0			.92349	552.2	.00053	.000189			
34.0	-3.0			.92405	553.9	.00104	.000370	.00100	.000356	1.89
32.0	-3.0			.93857	560.9	.00061	.000217	.00059	.000210	1.20
30.0	-3.0			.95700	570.2	.00031	.000110	.00029	.000103	.56
34.0	-12.0			.90283	540.5	.00092	.000328	.00092	.000328	1.84
32.0	-12.0			.90730	540.9	.00041	.000146	.00040	.000142	.84
30.0	-12.0			.90506	539.2	.00037	.000132	.00034	.000121	.76
19.0	-12.5			.95197	571.5	.00112	.000399			2.29
17.5	-11.0			.96984	582.2	.00087	.000310			1.78
15.5	-2.5			.98771	592.2	.00102	.000363			1.92
16.5	-2.5			.96872	581.2	.00105	.000374			2.06
17.5	-2.5			.97263	583.9	.00104	.000370			1.70
36.0	-16.0			.91511	548.2	.00080	.000285			1.63
36.0	-12.0			.90004	538.9	.00106	.000378	.00103	.000367	
32.0	-18.0			.92517	554.2	.00079	.000281			1.72
32.0	-16.0			.91176	546.5	.00092	.000328	.00090	.000321	
32.0	-14.0			.90395	541.5	.00081	.000289	.00076	.000271	1.98
32.0	-10.0			.91232	544.9	.00059	.000210			1.20
28.0	-14.0			.90115	540.5	.00118	.000420			2.41
28.0	-12.0			.90730	541.2	.00040	.000142			.89
26.0	-12.5			.92237	552.2	.00075	.000267			1.53
22.0	-12.5			.93243	558.2	.00076	.000271	.00073	.000260	1.55
1.0	12.0	4.00		.94471	566.9	.00107	.000381			
2.0	5.5	2.00		.97487	581.5	.00020	.000071			
-2.0	.0	2.00		.95476	570.2	.00039	.000139			
-6.2	8.0	.54		.97877	589.2	.00136	.000484	.00135	.000481	
-6.2	12.0	.54		.98603	596.9	.00157	.000559			
-3.7	1.5	1.98		.96537	580.9	.00157	.000559	.00157	.000559	
-2.7	8.0	1.98		.97487	588.9	.00197	.000702	.00200	.000712	
-3.7	12.0	1.98		.97766	591.9	.00255	.000908	.00258	.000919	
-1.2	1.5	3.42		.94583	572.9	.00242	.000862			
-1.2	8.0	3.42		.95923	581.5	.00246	.000876	.00247	.000880	
-1.2	12.0	3.42		.95476	582.9	.00322	.001147			
1.0	1.5	4.00		.91958	551.5	.00092	.000328			
1.0	3.5	4.00		.92070	552.2	.00107	.000381	.00107	.000381	
1.0	8.0	4.00		.92684	556.2	.00139	.000495	.00138	.000492	

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in $Btu/ft^2\text{-}sec\text{-}^oR$.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

4. 2-inch by 4-inch stiffener with 30° wedge - Concluded

(i) M = 4.44; R = 1.75×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95141	568.9	.00053	.000352			1.00
12.0	.0			.95867	573.9	.00066	.000438			1.32
28.0	12.0			.92628	553.5	.00055	.000365			.87
31.0	12.0			.92237	550.5	.00043	.000285			.54
34.0	.0			.92126	551.2	.00070	.000465	.00066	.000438	1.37
2.0	12.0			.95085	569.2	.00082	.000544			1.03
12.0	-12.0			.95253	568.9	.00049	.000325			1.07
12.0	12.0			.94415	564.5	.00056	.000372			.71
31.0	2.0			.94639	564.5	.00030	.000199			.58
32.0	2.0			.94136	562.2	.00047	.000312	.00053	.000352	1.18
32.0	3.0			.94248	562.9	.00045	.000299			.96
32.0	6.0			.94471	563.5	.00042	.000279			.79
34.0	1.0			.92070	551.2	.00073	.000485	.00071	.000471	1.40
34.0	2.0			.92182	552.2	.00075	.000498	.00088	.000584	1.42
34.0	3.0			.92126	551.2	.00067	.000445			1.31
36.0	.0			.90841	543.9	.00071	.000471	.00067	.000445	1.61
38.0	.0			.90506	541.9	.00086	.000571			1.65
44.0	12.0			.92628	554.2	.00072	.000478			1.07
42.0	.0			.91288	545.9	.00063	.000418			1.31
44.0	.0			.92405	552.9	.00055	.000366	.00057	.000378	1.12
48.0	.0			.93745	559.9	.00045	.000299	.00047	.000312	.94
52.0	.0			.93131	556.2	.00054	.000359	.00053	.000352	1.35
52.0	12.0			.91846	549.5	.00071	.000471			.90
55.0	.0			.93298	557.2	.00054	.000359	.00051	.000339	
58.0	.0			.94694	565.5	.00053	.000352			1.02
58.0	12.0			.93801	561.2	.00082	.000544			1.04
44.0	-12.0			.91288	545.5	.00056	.000372			1.44
36.0	-8.0			.91400	547.9	.00084	.000558			1.91
36.0	-3.0			.92461	552.5	.00038	.000252			
34.0	-3.0			.92852	555.5	.00071	.000471	.00069	.000458	1.61
32.0	-3.0			.94192	562.2	.00041	.000272	.00039	.000259	.82
30.0	-3.0			.95867	571.2	.00026	.000173	.00025	.000166	.59
34.0	-12.0			.90674	541.9	.00056	.000372	.00056	.000372	1.17
32.0	-12.0			.91121	542.9	.00034	.000226	.00033	.000219	
19.0	-12.5			.95309	570.9	.00062	.000412			
17.5	-11.0			.96816	579.5	.00080	.000531			2.05
15.5	-2.5			.98603	589.9	.00060	.000398			1.50
16.5	-2.5			.96649	578.9	.00072	.000478			1.38
17.5	-2.5			.96928	580.5	.00064	.000425			
36.0	-16.0			.91791	548.2	.00048	.000319			1.04
36.0	-12.0			.90556	541.2	.00059	.000392	.00056	.000372	1.34
32.0	-18.0			.92572	552.9	.00054	.000359			
32.0	-16.0			.91400	546.2	.00056	.000372	.00055	.000365	1.60
32.0	-14.0			.90674	541.5	.00055	.000365	.00051	.000339	1.20
32.0	-10.0			.91791	547.9	.00046	.000305			1.00
28.0	-14.0			.90227	540.5	.00077	.000511			1.67
26.0	-12.5			.92572	553.2	.00055	.000365			
22.0	-12.5			.93522	558.9	.00055	.000365	.00053	.000352	
1.0	12.0	4.00		.95030	569.2	.00065	.000432			
2.0	12.0	3.00		.98213	585.9	.00020	.000133			
2.0	5.5	2.00		.97375	580.9	.00020	.000133	.00018	.000120	
2.0	12.0	1.00		.98045	584.5	.00019	.000126			
-6.2	1.5	.54		.98380	586.5	.00021	.000139			
-6.2	8.0	.54		.97598	586.2	.00082	.000544	.00084	.000558	
-6.2	12.0	.54		.98324	590.9	.00109	.000724			
-3.7	1.5	1.98		.96537	579.9	.00092	.000611	.00092	.000611	
-3.7	8.0	1.98		.97431	587.5	.00131	.000870	.00135	.000896	
-3.7	12.0	1.98		.97766	589.9	.00159	.001056	.00163	.001082	
-1.2	1.5	3.42		.94862	577.5	.00136	.000903			
-1.2	8.0	3.42		.96091	586.9	.00142	.000943	.00143	.000949	
-1.2	12.0	3.42		.95700	580.9	.00200	.001328			
1.0	3.5	4.00		.92740	554.9	.00064	.000425	.00064	.000425	
1.0	8.0	4.00		.93298	558.9	.00070	.000465	.00069	.000458	

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

5. 1-inch by 2-inch rectangular stiffener

(a) M = 2.65; R = 2.56×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95186	569.5	.00195	.000425			1.00
12.0	.0			.95129	568.9	.00208	.000453			1.03
20.5	.0			.97281	586.5	.00316	.000688			1.55
28.0	12.0			.91731	547.5	.00196	.000427			.89
28.0	4.0			.95922	567.2	.00077	.000168			.38
28.0	.0			.96715	571.2	.00072	.000157			.36
20.5	-5.0			.97678	589.9	.00315	.000686			1.51
24.5	-5.0			.99546	606.5	.00423	.000922			1.92
30.0	.0			.94166	563.2	.00198	.000431	.00200	.000436	.99
31.0	12.0			.92184	554.9	.00294	.000641			1.43
34.0	.0			.92354	554.2	.00254	.000553	.00250	.000545	1.26
2.0	-12.0			.95072	569.9	.00227	.000495			1.11
2.0	12.0			.95695	572.2	.00206	.000449			1.02
12.0	-12.0			.95299	570.9	.00226	.000492			1.01
12.0	12.0			.94959	569.9	.00211	.000460			1.05
30.0	1.0			.93883	561.9	.00203	.000442			.92
31.0	2.0			.92920	557.9	.00239	.000521			1.18
32.0	2.0			.92694	556.2	.00236	.000514	.00233	.000508	1.26
32.0	3.0			.92581	558.5	.00258	.000562			1.30
32.0	6.0			.93034	559.5	.00265	.000577			1.31
34.0	1.0			.92694	559.2	.00258	.000562	.00263	.000573	1.25
34.0	2.0			.92807	557.5	.00248	.000540	.00255	.000556	1.20
34.0	3.0			.92354	558.9	.00252	.000549			1.22
36.0	.0			.92297	553.9	.00240	.000523	.00239	.000521	1.20
38.0	.0			.92524	554.9	.00229	.000499	.00257	.000560	1.11
40.0	.0			.84878	503.2	.00134	.000292			
44.0	12.0			.93770	562.9	.00239	.000521			1.14
42.0	.0			.92127	552.2	.00226	.000492	.00249	.000542	1.09
44.0	.0			.92920	556.5	.00231	.000503	.00232	.000505	1.07
48.0	.0			.93657	560.9	.00209	.000455	.00210	.000458	1.01
52.0	.0			.92920	556.5	.00226	.000492	.00226	.000492	1.09
52.0	12.0			.93090	558.2	.00235	.000512			1.14
55.0	.0			.92581	554.5	.00224	.000488	.00222	.000484	1.10
58.0	.0			.94053	563.2	.00207	.000451			1.00
58.0	12.0			.94563	566.5	.00224	.000488			1.09
58.0	-12.0			.94846	570.9	.00286	.000623			
44.0	-12.0			.94223	566.9	.00287	.000625			1.37
36.0	-8.0			.92581	556.5	.00291	.000634			1.38
36.0	-3.0			.91901	542.5	.00040	.000087			
34.0	-3.0			.92411	557.5	.00259	.000564	.00263	.000573	1.26
32.0	-3.0			.92807	558.2	.00262	.000571	.00262	.000571	1.19
30.0	-3.0			.93600	560.9	.00226	.000492	.00223	.000486	1.09
28.0	-3.0			.96262	569.2	.00085	.000185			.41
34.0	-12.0			.92297	557.2	.00307	.000669	.00304	.000662	1.38
32.0	-12.0			.92014	555.5	.00307	.000669	.00305	.000665	1.38
30.0	-12.0			.92241	555.2	.00268	.000584	.00273	.000595	1.25
19.0	-12.5			.96602	581.9	.00282	.000614			1.37
17.5	-11.0			.96318	579.5	.00257	.000560			1.24
15.5	-2.5			.97224	582.5	.00214	.000466			1.03
16.5	-2.5			.95356	573.2	.00265	.000577	.00238	.000519	1.29
17.5	-2.5			.96148	583.2	.00272	.000593	.00256	.000558	1.35
18.5	-2.5			.98244	591.5	.00293	.000638	.00319	.000695	1.43
19.5	-2.5			.96828	584.2	.00297	.000647	.00273	.000595	1.44
20.5	-2.5			.96998	585.5	.00319	.000695	.00312	.000680	1.55
21.5	-2.5			.97678	590.2	.00321	.000699	.00330	.000719	1.57
22.5	-2.5			.97564	590.2	.00355	.000773	.00343	.000747	1.73
23.5	-2.5			.98470	596.9	.00355	.000773	.00343	.000747	1.72
24.5	-2.5			1.00226	609.2	.00425	.000926			2.06
36.0	-16.0			.93090	557.9	.00223	.000486			1.07
36.0	-12.0			.93600	564.5	.00292	.000636	.00294	.000641	1.39
32.0	-18.0			.94336	564.9	.00222	.000484			1.07
32.0	-16.0			.93204	558.9	.00228	.000497	.00226	.000492	1.09
32.0	-14.0			.92920	557.2	.00235	.000512	.00235	.000512	1.13
32.0	-10.0			.92581	557.5	.00293	.000638			1.38
28.0	-14.0			.93260	561.2	.00272	.000593			1.23
28.0	-12.0			.91505	546.2	.00173	.000377			.82
26.0	-12.5			.95695	575.9	.00283	.000617			1.37
24.5	-11.0			.98131	597.5	.00426	.000928			2.05
22.0	-12.5			.96885	588.9	.00340	.000741	.00342	.000745	1.52
20.5	-11.0			.96318	581.5	.00304	.000662	.00303	.000660	1.41
.0	13.7	1.00		1.02775	628.5	.00465	.001013			
1.0	11.7	1.00		1.00283	589.5	.00028	.000061			
.0	7.7	1.00		.99886	612.9	.00505	.001100			
1.0	7.7	1.00		.99830	587.5	.00042	.000092			
.0	3.2	1.00		.99263	611.2	.00557	.001214			
1.0	3.2	1.00		.98017	578.9	.00068	.000148			
.0	1.2	1.00		.99320	614.9	.00521	.001135	.00542	.001181	
1.0	1.2	1.00		.97734	576.2	.00056	.000122			
.5	11.7	2.00		.95412	577.5	.00330	.000719	.00331	.000721	
.5	3.2	2.00		.94846	576.2	.00393	.000856	.00391	.000852	
.5	1.2	2.00		.94789	587.2	.00347	.000756			
34.0	-1.0			.92354	553.9	.00253	.000551			1.39
34.0	4.0			.92581	556.9	.00253	.000551			1.25
34.0	5.0			.90315	545.5	.00278	.000606			1.37
34.0	6.0			.93543	562.2	.00259	.000564			1.29
36.0	6.0			.92694	559.2	.00258	.000562			1.28
38.0	1.0			.82783	486.2	.00121	.000264			.59
38.0	2.0			.92524	554.9	.00232	.000505			1.14
44.0	8.0			.93090	557.9	.00226	.000492			1.11
44.0	6.0			.92807	556.5	.00232	.000505			1.15

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

5. 1-inch by 2-inch rectangular stiffener - Continued

(b) M = 2.65; R = 1.31×10^6

x, in.	y, in.	z, in. (a)	∅, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95746	575.9	.00105	.000445			1.03
12.0	.0			.95914	575.9	.00104	.000441			1.12
20.5	.0			.97705	590.9	.00168	.000712			1.71
28.0	12.0			.92724	556.9	.00103	.000437			1.02
28.0	4.0			.96763	576.5	.00037	.000157			.37
28.0	.0			.97547	580.5	.00033	.000140			.34
20.5	-5.0			.98153	593.9	.00172	.000729			1.65
24.5	-5.0			.99832	608.2	.00267	.001132			2.81
30.0	.0			.94906	571.5	.00117	.000496	.00119	.000504	1.26
31.0	12.0			.93227	563.2	.00165	.000699			1.54
34.0	.0			.93227	561.5	.00140	.000593	.00136	.000577	1.47
2.0	-12.0			.95578	575.2	.00110	.000466			1.02
2.0	12.0			.96194	580.2	.00105	.000445			1.03
12.0	-12.0			.96138	578.9	.00116	.000492			1.10
12.0	12.0			.95690	576.2	.00105	.000445			1.06
30.0	1.0			.94571	569.9	.00118	.000500			1.26
31.0	2.0			.93619	564.5	.00140	.000593			1.51
32.0	2.0			.93395	562.9	.00142	.000602	.00139	.000589	1.51
32.0	3.0			.93283	563.2	.00164	.000695			1.71
32.0	6.0			.93731	565.9	.00163	.000691			1.66
34.0	1.0			.93563	564.2	.00141	.000598	.00147	.000623	1.60
34.0	2.0			.93507	563.9	.00144	.000610	.00149	.000632	1.41
34.0	3.0			.92948	564.2	.00149	.000632			1.49
36.0	.0			.93171	561.5	.00136	.000577	.00135	.000572	1.39
38.0	.0			.93507	564.2	.00132	.000560			1.40
40.0	.0			.85392	509.9	.00074	.000314			
44.0	12.0			.94739	571.5	.00131	.000555			1.27
42.0	.0			.93283	561.2	.00130	.000551			1.27
44.0	.0			.94011	566.2	.00118	.000500	.00119	.000504	1.26
48.0	.0			.94795	570.9	.00117	.000496	.00118	.000500	1.24
52.0	.0			.94011	566.5	.00131	.000555	.00131	.000555	1.39
52.0	12.0			.94123	567.5	.00119	.000504			1.18
55.0	.0			.93731	564.5	.00119	.000504	.00117	.000496	1.21
58.0	.0			.95186	572.2	.00111	.000471			1.11
58.0	12.0			.95522	574.9	.00128	.000543			1.25
58.0	-12.0			.95858	577.9	.00142	.000602			
44.0	-12.0			.95354	574.5	.00141	.000598			1.40
36.0	-8.0			.93619	564.5	.00162	.000687			1.60
36.0	-3.0			.91604	546.9	.00026	.000110			
34.0	-3.0			.93283	562.2	.00146	.000615	.00151	.000640	1.46
32.0	-3.0			.93619	564.9	.00163	.000691	.00163	.000691	1.85
30.0	-3.0			.94403	567.9	.00128	.000543	.00121	.000513	1.33
28.0	-3.0			.97425	580.2	.00038	.000161			.40
34.0	-12.0			.93451	564.9	.00169	.000716	.00166	.000704	1.76
32.0	-12.0			.93171	563.5	.00177	.000750	.00174	.000738	1.79
30.0	-12.0			.93339	563.5	.00153	.000649	.00157	.000666	1.47
19.0	-12.5			.97313	587.2	.00149	.000632			1.51
17.5	-11.0			.97145	586.2	.00157	.000666			1.54
15.5	-2.5			.98153	590.9	.00124	.000526			1.17
16.5	-2.5			.96138	580.2	.00159	.000674			1.71
17.5	-2.5			.96865	584.5	.00157	.000666	.00143	.000606	1.65
18.5	-2.5			.98824	596.5	.00154	.000653			1.66
19.5	-2.5			.97481	588.9	.00160	.000678	.00162	.000602	1.62
20.5	-2.5			.97637	589.9	.00174	.000738	.00164	.000695	1.74
21.5	-2.5			.98265	594.9	.00180	.000763	.00190	.000805	1.76
22.5	-2.5			.98097	594.5	.00186	.000788	.00173	.000733	1.90
23.5	-2.5			.98936	600.5	.00206	.000873	.00196	.000831	2.04
24.5	-2.5			1.00447	611.9	.00244	.001034			2.49
36.0	-16.0			.94459	567.5	.00108	.000458			1.15
36.0	-12.0			.94739	572.2	.00158	.000670	.00171	.000725	1.60
32.0	-18.0			.95522	573.9	.00109	.000462			1.07
32.0	-16.0			.94459	570.5	.00126	.000534	.00124	.000526	1.18
32.0	-14.0			.94123	567.5	.00131	.000555	.00131	.000555	1.51
32.0	-10.0			.93619	565.5	.00165	.000699			1.67
28.0	-14.0			.94011	566.5	.00143	.000606			1.59
28.0	-12.0			.92724	556.2	.00101	.000428			.94
26.0	-12.5			.96306	581.2	.00158	.000670			1.55
24.5	-11.0			.98320	604.9	.00247	.001047			2.49
22.0	-12.5			.97313	589.2	.00195	.000827	.00196	.000831	1.91
20.5	-11.0			.96865	585.5	.00171	.000725	.00169	.000716	1.71
.0	13.7	1.00		1.03693	633.2	.00261	.001106			
.0	11.7	1.00		.83993	510.2	.00032	.000136			
.0	7.7	1.00		1.00615	616.2	.00272	.001153			
.0	3.2	1.00		1.00000	615.9	.00312	.001323			
1.0	3.2	1.00		.99776	593.9	.00031	.000131			
.0	1.2	1.00		1.00111	613.5	.00287	.001217	.00302	.001280	
1.0	1.2	1.00		.99832	593.5	.00027	.000114			
.5	11.7	2.00		.97145	588.9	.00181	.000767	.00181	.000767	
.5	3.2	2.00		.96362	585.2	.00205	.000869	.00200	.000848	
.5	1.2	2.00		.96641	587.2	.00214	.000907			
34.0	-1.0			.93115	560.9	.00139	.000589			1.48
34.0	4.0			.93395	563.5	.00153	.000649			1.7
34.0	5.0			.91157	550.2	.00149	.000632			1.48
34.0	6.0			.94291	568.9	.00143	.000606			1.54
36.0	6.0			.93563	565.5	.00146	.000619			1.52
38.0	1.0			.83657	490.9	.00067	.000284			.72
38.0	2.0			.93451	565.2	.00128	.000543			1.31
44.0	8.0			.94235	567.2	.00129	.000547			1.29
44.0	6.0			.93955	566.2	.00119	.000504			1.19

[a] Thermocouple locations for which z and/or ∅ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

5. 1-inch by 2-inch rectangular stiffener - Continued

(c) M = 3.51; R = 2.77×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95341	571.9	.00117	.000326			.95
12.0	.0			.95341	572.5	.00102	.000285			.92
20.5	.0			.98035	592.5	.00179	.000499			1.48
28.0	12.0			.92254	552.2	.00099	.000276			.65
28.0	4.0			.97362	577.5	.00049	.000137			.39
28.0	.0			.97530	578.5	.00038	.000106			.29
20.5	-5.0			.98428	594.5	.00183	.000511			1.53
24.5	-5.0			1.00168	609.9	.00251	.000700			2.02
30.0	.0			.94443	566.9	.00122	.000340	.00124	.000346	.98
32.0	12.0			.92030	555.5	.00166	.000463			1.19
34.0	.0			.92591	556.2	.00133	.000371	.00130	.000363	1.07
2.0	-12.0			.95117	570.5	.00117	.000326			.92
2.0	12.0			.95622	574.5	.00123	.000343			.93
12.0	-12.0			.95566	573.5	.00111	.000310			.86
12.0	12.0			.95004	571.5	.00125	.000349			.94
30.0	1.0			.94219	565.9	.00125	.000349			1.02
31.0	2.0			.92984	559.5	.00141	.000393			1.11
32.0	2.0			.92703	557.5	.00156	.000435	.00154	.000430	1.27
32.0	3.0			.92535	557.5	.00145	.000405			1.12
32.0	6.0			.92591	558.5	.00162	.000452			1.22
34.0	1.0			.92816	559.2	.00140	.000391	.00146	.000407	1.16
34.0	2.0			.92591	557.2	.00139	.000388	.00142	.000396	1.11
34.0	3.0			.92254	557.9	.00153	.000427			1.13
36.0	.0			.92535	555.9	.00131	.000365	.00130	.000363	1.06
38.0	.0			.92928	557.5	.00129	.000360			1.07
40.0	.0			.85463	508.9	.00090	.000248			
44.0	12.0			.93714	563.9	.00138	.000385			.90
42.0	.0			.92703	556.9	.00131	.000321			.95
44.0	.0			.93882	559.5	.00101	.000282	.00101	.000282	.81
48.0	.0			.94275	565.5	.00124	.000346	.00125	.000349	1.02
52.0	.0			.93377	559.2	.00118	.000329	.00118	.000329	.92
52.0	12.0			.93096	558.5	.00126	.000349			.82
55.0	.0			.93152	557.9	.00119	.000332	.00117	.000326	.92
58.0	.0			.94668	567.9	.00112	.000312			.89
58.0	12.0			.94443	566.5	.00121	.000338			.80
58.0	-12.0			.95004	570.2	.00126	.000352			
44.0	-12.0			.94499	566.5	.00124	.000346			
36.0	-8.0			.92984	558.5	.00130	.000363			1.04
34.0	-3.0			.92647	556.9	.00131	.000365	.00134	.000374	1.06
32.0	-3.0			.92928	559.2	.00156	.000435	.00155	.000432	1.10
30.0	-3.0			.93826	563.9	.00134	.000374	.00130	.000363	1.31
28.0	-3.0			.97081	576.9	.00056	.000156			1.11
34.0	-12.0			.92647	558.2	.00150	.000418	.00147	.000410	.46
32.0	-12.0			.92310	556.5	.00162	.000452	.00158	.000441	1.18
30.0	-12.0			.92647	557.5	.00140	.000391	.00144	.000402	1.35
19.0	-12.5			.96800	584.2	.00144	.000402			1.14
17.5	-11.0			.96632	581.9	.00150	.000419			1.14
15.5	-2.5			.97586	585.5	.00118	.000329			1.25
16.5	-2.5			.95909	577.2	.00151	.000421			.96
17.5	-2.5			.96800	583.2	.00152	.000424	.00145	.000405	1.23
18.5	-2.5			.98989	596.5	.00154	.000430			1.28
19.5	-2.5			.97811	590.2	.00163	.000455	.00148	.000413	1.26
20.5	-2.5			.97867	591.5	.00180	.000502	.00178	.000497	1.35
21.5	-2.5			.98596	596.5	.00187	.000522	.00195	.000544	1.50
22.5	-2.5			.98596	596.9	.00202	.000564	.00192	.000536	1.51
23.5	-2.5			.99438	603.2	.00215	.000600	.00212	.000591	1.64
24.5	-2.5			1.00785	613.9	.00240	.000670			1.72
36.0	-16.0			.93714	561.2	.00118	.000329			1.98
36.0	-12.0			.93826	564.9	.00155	.000432	.00156	.000435	.90
32.0	-18.0			.94892	568.5	.00117	.000326			1.30
32.0	-16.0			.93826	563.9	.00114	.000318	.00113	.000315	.90
32.0	-14.0			.93208	560.5	.00127	.000354	.00127	.000354	.75
32.0	-10.0			.92928	559.5	.00143	.000399			1.01
28.0	-14.0			.93714	563.5	.00136	.000379			1.14
28.0	-12.0			.92254	550.9	.00087	.000243			1.11
26.0	-12.5			.96295	579.2	.00139	.000388			.70
24.5	-11.0			.98147	598.9	.00240	.000670			1.10
22.0	-12.5			.97362	588.5	.00169	.000471	.00172	.000480	1.94
20.5	-11.0			.96913	584.9	.00164	.000458	.00162	.000452	1.40
.0	13.7	1.00		1.03311	634.2	.00311	.000868			1.38
.0	7.7	1.00		1.00224	614.5	.00300	.000837			
.0	3.2	1.00		.99663	614.5	.00306	.000854			
1.0	3.2	1.00		.99494	589.5	.00028	.000078			
.0	1.2	1.00		.99663	615.9	.00288	.000803	.00306	.000854	
1.0	1.2	1.00		.99270	587.5	.00027	.000075			
.5	11.7	2.00		.96183	583.2	.00193	.000538	.00193	.000538	
.5	3.2	2.00		.95510	579.2	.00197	.000550	.00193	.000538	
.5	1.2	2.00		.95510	579.9	.00208	.000580			
34.0	-1.0			.92479	555.5	.00138	.000385			
34.0	4.0			.92427	556.9	.00157	.000438			1.23
34.0	5.0			.90122	543.2	.00162	.000452			1.24
34.0	6.0			.93208	564.2	.00152	.000424			1.23
36.0	6.0			.92647	557.5	.00156	.000435			1.12
38.0	1.0			.88382	530.9	.00139	.000388			1.17
38.0	2.0			.92816	557.5	.00131	.000365			1.15
44.0	8.0			.93657	562.2	.00128	.000357			1.02
44.0	6.0			.93208	560.5	.00128	.000357			.84
										.93

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

5. 1-inch by 2-inch rectangular stiffener - Concluded

(d) M = 3.51; R = 1.59×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$
2.0	.0			.95060	574.7	.00066	.000320			.97
12.0	.0			.95393	575.7	.00062	.000301			.95
20.5	.0			.97835	594.7	.00115	.000558			1.69
28.0	12.0			.97562	557.9	.00057	.000277			.67
28.0	.0			.97502	584.2	.00023	.000112			.35
20.5	-5.0			.98168	594.9	.00102	.000495			1.55
24.5	-5.0			.99555	608.9	.00176	.000854			2.67
30.0	.0			.94616	571.5	.00079	.000384	.00081	.000393	1.18
31.0	12.0			.92340	559.5	.00105	.000510			1.24
34.0	.0			.92729	560.5	.00081	.000393	.00078	.000379	1.25
2.0	-12.0			.94727	572.2	.00070	.000340			.82
2.0	12.0			.95282	575.9	.00077	.000374			.91
12.0	-12.0			.95615	576.5	.00065	.000316			.97
12.0	12.0			.95171	574.2	.00070	.000340			.91
30.0	1.0			.94283	569.9	.00079	.000384			1.18
31.0	2.0			.93062	562.9	.00094	.000456			1.27
32.0	2.0			.92840	563.9	.00095	.000461	.00093	.000451	1.42
32.0	3.0			.92729	561.2	.00103	.000500			1.51
32.0	6.0			.92784	561.9	.00107	.000519			1.26
34.0	1.0			.92951	563.5	.00090	.000437	.00096	.000466	1.32
34.0	2.0			.92784	563.5	.00095	.000461	.00100	.000485	1.40
34.0	3.0			.92451	561.2	.00081	.000393			1.07
36.0	.0			.92729	560.2	.00080	.000388	.00079	.000384	.94
38.0	.0			.93228	562.5	.00088	.000427	.00110	.000534	1.04
40.0	.0			.85458	513.2	.00046	.000223			
44.0	12.0			.94283	568.9	.00072	.000350			.94
42.0	.0			.93228	562.2	.00069	.000335			1.01
44.0	.0			.93894	566.2	.00068	.000330	.00069	.000335	.87
48.0	.0			.94782	571.2	.00059	.000286	.00060	.000291	.69
52.0	.0			.93950	566.2	.00065	.000316	.00064	.000311	.92
52.0	12.0			.93617	564.5	.00070	.000340			.82
56.0	.0			.93783	564.9	.00056	.000272	.00054	.000262	.84
58.0	.0			.95171	573.5	.00069	.000335			1.03
58.0	12.0			.94949	572.9	.00069	.000335			.82
58.0	-12.0			.95337	576.2	.00081	.000393			
44.0	-12.0			.94893	572.5	.00075	.000364			1.15
36.0	-8.0			.93228	563.2	.00080	.000388			1.21
36.0	-3.0			.91730	551.2	.00017	.000083			
34.0	-3.0			.92784	560.9	.00081	.000393	.00084	.000408	1.21
32.0	-3.0			.93062	565.5	.00095	.000461	.00093	.000451	1.42
30.0	-3.0			.94061	570.2	.00089	.000432	.00084	.000408	1.24
28.0	-3.0			.97391	584.2	.00030	.000146			.44
34.0	-12.0			.92895	562.5	.00103	.000500	.00101	.000490	1.23
32.0	-12.0			.92729	560.5	.00106	.000515	.00101	.000490	1.58
30.0	-12.0			.92951	563.5	.00090	.000437	.00093	.000451	1.32
19.0	-12.5			.96836	586.2	.00098	.000476			1.46
17.5	-11.0			.96669	584.9	.00097	.000471			1.14
15.5	-2.5			.97613	589.2	.00073	.000354			.99
16.5	-2.5			.95837	580.2	.00100	.000485			1.18
17.5	-2.5			.96780	585.5	.00098	.000476	.00085	.000413	1.46
18.5	-2.5			.98834	597.9	.00095	.000461			1.44
19.5	-2.5			.97613	591.2	.00101	.000490	.00087	.000422	1.20
20.5	-2.5			.97668	591.8	.00104	.000505	.00094	.000456	1.24
21.5	-2.5			.98445	597.8	.00114	.000553	.00126	.000612	1.34
22.5	-2.5			.98390	597.2	.00126	.000612	.00112	.000544	1.77
23.5	-2.5			.99000	601.8	.00134	.000651	.00125	.000607	2.03
24.5	-2.5			1.00277	611.5	.00167	.000811			1.96
26.0	-16.0			.94172	567.5	.00066	.000320			.89
36.0	-12.0			.94005	569.5	.00107	.000519	.00108	.000524	1.27
32.0	-18.0			.95226	573.9	.00066	.000320			.78
32.0	-16.0			.94172	567.5	.00071	.000345	.00070	.000340	.95
32.0	-14.0			.93506	564.5	.00079	.000384	.00079	.000384	1.20
32.0	-10.0			.93173	563.9	.00098	.000476			1.46
28.0	-14.0			.93672	567.5	.00089	.000432			1.05
28.0	-12.0			.92784	558.5	.00047	.000228			.71
26.0	-12.5			.96281	582.2	.00096	.000466			1.43
24.5	-11.0			.97946	598.5	.00237	.001151			3.59
22.0	-12.5			.97224	590.5	.00116	.000563	.00122	.000592	1.71
20.5	-11.0			.96780	586.2	.00097	.000471	.00096	.000466	1.49
.0	13.7	1.00		1.03219	632.9	.00207	.001005			
.0	11.7	1.00		.83238	509.2	.00035	.000170			
1.0	11.7	1.00		1.01831	609.5	.00011	.000053			
.0	7.7	1.00		.99888	615.0	.00201	.000976			
1.0	7.7	1.00		1.01276	606.5	.00013	.000063			
.0	3.2	1.00		.99444	611.9	.00218	.001058			
1.0	3.2	1.00		.99666	597.2	.00019	.000092			
.0	1.2	1.00		.99500	609.9	.00214	.001039	.00224	.001087	
1.0	1.2	1.00		.99444	595.5	.00017	.000083			
.5	11.7	2.00		.96891	590.2	.00130	.000631	.00129	.000626	
.5	3.2	2.00		.96170	584.5	.00142	.000689	.00139	.000675	
.5	1.2	2.00		.96225	586.5	.00143	.000694			
34.0	-1.0			.92618	561.2	.00090	.000437			1.34
34.0	4.0			.92618	560.5	.00095	.000461			1.27
34.0	5.0			.90398	547.2	.00092	.000447			1.28
34.0	6.0			.93450	565.5	.00099	.000481			1.16
36.0	6.0			.92951	562.2	.00096	.000466			1.32
38.0	1.0			.88788	536.2	.00080	.000388			1.16
38.0	2.0			.93173	562.5	.00072	.000350			1.03
44.0	8.0			.94283	569.2	.00072	.000384			.93
44.0	6.0			.91783	555.9	.00071	.000345			.84

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder

(a) M = 2.65; R = 3.89 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95610	592.9	.00257	.000364				
12.0	.0			.95554	586.2	.00270	.000382			.89	
20.5	.0			.95389	589.5	.00280	.000396			.87	
28.0	12.0			.95443	586.5	.00279	.000395			.98	
28.0	4.0			.96555	611.2	.00502	.000710			.84	
28.0	.0			.98444	627.2	.00576	.000815			1.73	
20.5	-5.0			.95721	590.5	.00295	.000417			1.91	
24.5	-5.0			.95554	589.5	.00296	.000419			.98	
30.0	.0			1.02111	666.2	.00912	.001290	.00957	.001354	.98	
31.0	12.0			.95999	590.9	.00296	.000419			2.91	
34.0	.0			.94888	581.5	.00260	.000368	.00254	.000359	.98	
2.0	-12.0			.95610	587.5	.00308	.000436			.84	
2.0	12.0			.96221	592.5	.00267	.000378			1.02	
12.0	-12.0			.95499	589.5	.00297	.000420			.86	
12.0	12.0			.95332	585.5	.00291	.000412			.95	
30.0	1.0			1.00833	654.9	.00787	.001113			.99	
31.0	2.0			.99555	640.2	.00936	.001324			2.68	
32.0	2.0			.98444	630.5	.00815	.001153	.00821	.001161	3.28	
32.0	3.0			.97888	630.5	.00683	.000966			2.96	
32.0	6.0			.94943	591.2	.00470	.000665			2.17	
34.0	1.0			.95110	585.5	.00324	.000458	.00291	.000412	1.62	
34.0	2.0			.96110	615.2	.00547	.000774	.00607	.000859	1.09	
34.0	3.0			.96332	619.9	.00600	.000849	.00602	.000852	1.86	
36.0	.0			.92165	588.5	.00580	.000820	.00585	.000827	2.04	
38.0	.0			.91498	581.5	.00543	.000768	.00600	.000849	1.97	
40.0	.0			.82608	495.5	.00014	.000020			1.78	
44.0	12.0			.93888	578.9	.00323	.000457			1.04	
42.0	.0			.91832	573.9	.00489	.000692	.00535	.000757	1.56	
44.0	.0			.92610	577.9	.00471	.000666	.00472	.000668	1.62	
48.0	.0			.93276	579.9	.00432	.000611	.00433	.000612	1.42	
52.0	.0			.92999	576.9	.00402	.000569	.00402	.000569	1.36	
52.0	12.0			.92165	569.2	.00308	.000436			1.01	
55.0	.0			.93054	576.5	.00392	.000554	.00391	.000553	1.33	
58.0	.0			.94110	583.2	.00392	.000554			1.33	
58.0	12.0			.93165	571.2	.00267	.000378			.84	
58.0	-12.0			.92665	570.2	.00307	.000434				
44.0	-12.0			.93054	577.5	.00365	.000516			1.15	
36.0	-8.0			.93943	591.5	.00399	.000564			1.25	
36.0	-3.0			.93332	571.9	.00196	.000277				
34.0	-3.0			.96110	613.5	.00587	.000830	.00600	.000849	1.94	
32.0	-3.0			.97999	627.2	.00711	.001006	.00728	.001030	2.27	
30.0	-3.0			.97499	616.2	.00563	.000796	.00557	.000788	1.86	
28.0	-3.0			.97499	611.5	.00576	.000815			1.92	
34.0	-12.0			.95388	588.2	.00333	.000471			1.04	
32.0	-12.0			.95388	587.5	.00332	.000470	.00331	.000468	1.03	
30.0	-12.0			.95499	588.5	.00315	.000446			.98	
19.0	-12.5			.96166	595.5	.00290	.000410			.92	
17.5	-11.0			.95554	587.2	.00293	.000414			.97	
15.5	-2.5			.96666	593.9	.00279	.000395			.92	
16.5	-2.5			.95110	583.9	.00291	.000412	.00271	.000383	1.00	
17.5	+2.5			.95332	587.9	.00296	.000419	.00282	.000399	.98	
18.5	-2.5			.96610	597.9	.00279	.000395	.00316	.000447	.90	
19.5	-2.5			.95332	588.2	.00297	.000420	.00281	.000397	.99	
20.5	-2.5			.95277	585.5	.00279	.000395	.00279	.000395	.90	
21.5	-2.5			.95277	589.9	.00283	.000400	.00288	.000407	.94	
22.5	-2.5			.94999	583.2	.00275	.000389	.00264	.000373	.91	
23.5	-2.5			.95388	586.2	.00283	.000400	.00271	.000383	.91	
24.5	-2.5			.96221	600.9	.00312	.000441			1.06	
		10.55	90	.94832	577.2	.00246	.000348				
		6.55	90	.95666	583.5	.00276	.000390				.62
		4.55	90	.94943	585.2	.00378	.000535				.71
		2.55	90	.94665	576.5	.00248	.000351				.96
		10.55	180	1.00833	602.2	.00048	.000068				.63
		8.55	180	1.00444	609.9	.00180	.000255	.00177	.000250		
		6.55	180	1.02111	612.5	.00077	.000109	.00082	.000116		
		4.55	180	1.00111	603.5	.00117	.000165	.00113	.000160		
		3.55	180	1.00055	602.2	.00110	.000156	.00105	.000149		
		2.55	180	.98722	592.5	.00076	.000107				
		1.55	180	.97499	588.5	.00115	.000163				
		1.05	180	.97444	586.9	.00092	.000130				
34.0	-1.0			.95721	587.5	.00300	.000424	.00300	.000424	1.07	
34.0	4.0			.97055	612.5	.00642	.000908	.00595	.000842	2.06	
34.0	5.0			.95499	603.9	.00564	.000798	.00556	.000786	1.80	
34.0	6.0			.94665	594.2	.00477	.000675	.00474	.000670	1.52	
36.0	6.0			.95110	594.9	.00522	.000738			1.79	
38.0	1.0			.92165	573.9	.00483	.000683	.00466	.000659	1.59	
38.0	2.0			.94054	581.5	.00364	.000515			1.16	
44.0	8.0			.93332	579.2	.00431	.000610			1.38	
44.0	6.0			.93332	576.9	.00383	.000542	.00383	.000542	1.22	
44.0	4.0			.94332	579.9	.00304	.000430	.00311	.000440	.97	
44.0	2.0			.93721	579.2	.00357	.000505	.00362	.000512	1.14	
44.0	1.0			.92832	582.5	.00415	.000587	.00443	.000627	1.47	
		10.55	0	1.00333	653.5	.00982	.001389				.59
		8.55	0	1.00222	662.2	.01044	.001477	.01045	.001478		.63
		6.55	0	1.00555	660.5	.01119	.001583	.01224	.001731		.67
		3.55	0	1.00722	685.5	.01547	.002188				.93
		2.55	0	1.00222	664.2	.01442	.002040	.01450	.002051		.87
		1.55	0	.99166	660.2	.00951	.001345	.00996	.001409		.57
		1.05	0	.98444	645.2	.00882	.001248				.53
		10.55	45	.98055	623.5	.00758	.001072	.00816	.001154		.59
		6.55	45	.98555	632.9	.00806	.001140	.00835	.001181		.63
		4.55	45	.97999	657.5	.01147	.001622				.90
		2.55	45	.98333	640.5	.00955	.001351	.01006	.001423		.75

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(b) M = 2.65; R = 2.53 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96254	582.8	.00211	.000462			1.08	
12.0	.0			.96030	581.2	.00191	.000419			.95	
20.5	.0			.95863	580.2	.00197	.000432			.97	
28.0	12.0			.95974	581.2	.00211	.000462			.96	
28.0	4.0			.97092	599.6	.00392	.000859			1.94	
28.0	.0			.98881	613.5	.00445	.000975			2.20	
20.5	-5.0			.96198	582.9	.00204	.000447			.98	
24.5	-5.0			.96142	582.9	.00229	.000502			1.04	
30.0	.0			1.02180	652.2	.00764	.001674	.00801	.001755	3.80	
31.0	12.0			.96533	585.6	.00229	.000502			1.11	
34.0	.0			.95248	579.9	.00190	.000416	.00175	.000383	.95	
2.0	-12.0			.96198	585.2	.00214	.000469			1.04	
2.0	12.0			.96869	589.5	.00187	.000410			.93	
12.0	-12.0			.96030	583.9	.00214	.000469			.96	
12.0	12.0			.95863	580.9	.00196	.000430			.98	
30.0	1.0			1.00950	632.9	.00702	.001538			3.19	
31.0	2.0			.99608	630.5	.00694	.001521			3.42	
32.0	2.0			.98490	616.2	.00633	.001387	.00636	.001394	3.39	
32.0	3.0			.98155	614.2	.00550	.001205			2.76	
32.0	6.0			.95639	587.9	.00338	.000741			1.67	
34.0	1.0			.95359	578.6	.00230	.000504	.00210	.000460	1.12	
34.0	2.0			.96310	596.5	.00427	.000936	.00444	.000973	2.06	
34.0	3.0			.96701	601.6	.00474	.001039	.00473	.001037	2.30	
36.0	.0			.92788	574.2	.00487	.001067	.00485	.001072	2.44	
38.0	.0			.91893	566.2	.00440	.000964	.00454	.000997	2.14	
44.0	12.0			.94409	573.2	.00231	.000506			1.11	
42.0	.0			.92173	565.8	.00361	.000791	.00401	.000879	1.74	
44.0	.0			.92955	569.5	.00365	.000800	.00366	.000802	1.69	
48.0	.0			.93736	572.9	.00315	.000690	.00316	.000692	1.52	
52.0	.0			.93515	574.9	.00288	.000631	.00288	.000631	1.39	
52.0	12.0			.92788	564.2	.00222	.000486			1.08	
55.0	.0			.93570	570.6	.00283	.000620	.00282	.000618	1.39	
56.0	.0			.94689	576.9	.00272	.000596			1.31	
58.0	12.0			.93850	567.9	.00180	.000394			.87	
58.0	-12.0			.93403	568.6	.00221	.000484				
44.0	-12.0			.93682	571.9	.00261	.000572			1.25	
36.0	-8.0			.94465	576.9	.00335	.000734			1.59	
36.0	-3.0			.94018	567.6	.00159	.000348				
34.0	-3.0			.96422	598.9	.00459	.001006	.00466	.001021	2.23	
32.0	-3.0			.98155	610.4	.00572	.001253	.00583	.001278	2.60	
30.0	-3.0			.97819	606.9	.00420	.000920	.00415	.000909	2.02	
28.0	-3.0			.98043	609.6	.00397	.000870			1.91	
34.0	-12.0			.95807	581.9	.00237	.000519			1.06	
32.0	-12.0			.95807	581.9	.00234	.000513	.00233	.000511	1.05	
30.0	-12.0			.95974	583.2	.00235	.000515			1.09	
19.0	-12.5			.96589	585.6	.00205	.000449			1.00	
17.5	-11.0			.96086	582.5	.00205	.000449			.99	
15.5	-2.5			.97148	590.7	.00211	.000462			1.02	
16.5	-2.5			.95639	579.2	.00198	.000434	.00179	.000392	.97	
17.5	-2.5			.95807	582.2	.00214	.000469	.00202	.000443	1.06	
18.5	-2.5			.97092	587.9	.00199	.000436	.00229	.000502	.97	
19.5	-2.5			.95807	580.5	.00204	.000447	.00188	.000412	.99	
20.5	-2.5			.95807	582.2	.00214	.000469	.00214	.000469	1.04	
21.5	-2.5			.95807	580.5	.00199	.000436	.00203	.000445	.97	
22.5	-2.5			.95527	578.5	.00200	.000438	.00189	.000414	.98	
23.5	-2.5			.96030	581.9	.00201	.000440	.00193	.000423	.98	
24.5	-2.5			.96757	588.9	.00245	.000537			1.19	
		10.55	90	.94744	571.6	.00190	.000416				.59
		6.55	90	.95527	576.9	.00211	.000462				.66
		4.55	90	.94800	575.5	.00266	.000583				.83
		2.55	90	.94409	568.9	.00178	.000390				.55
		10.55	180	1.00167	595.9	.00028	.000061				
		8.55	180	.99832	598.2	.00092	.000202	.00091	.000199		
		6.55	180	1.01174	603.9	.00063	.000138	.00066	.000145		
		4.55	180	1.00559	601.5	.00082	.000180	.00081	.000177		
		3.55	180	1.00726	601.2	.00060	.000131				
		2.55	180	.99273	592.2	.00043	.000094				
		1.55	180	.97931	586.2	.00064	.000140				
		1.05	180	.97987	585.9	.00061	.000134				
34.0	-1.0			.96086	581.5	.00208	.000456	.00208	.000456	1.14	
34.0	4.0			.97540	606.2	.00468	.001026	.00483	.001102	2.32	
34.0	5.0			.96030	594.9	.00416	.000912	.00409	.000896	2.05	
34.0	6.0			.95303	586.9	.00356	.000780	.00354	.000776	1.77	
36.0	6.0			.95583	589.9	.00372	.000815			1.84	
38.0	1.0			.92676	567.2	.00328	.000719	.00313	.000679	1.60	
38.0	2.0			.94633	576.2	.00270	.000592			1.32	
44.0	8.0			.93906	572.5	.00276	.000605			1.35	
44.0	6.0			.93850	572.9	.00260	.000570	.00261	.000572	1.29	
44.0	4.0			.94912	575.2	.00209	.000458	.00217	.000476	1.09	
44.0	2.0			.94185	575.2	.00240	.000530	.00266	.000583	1.26	
44.0	1.0			.93291	569.6	.00319	.000699	.00321	.000703	1.59	
		10.55	0	1.00167	639.9	.00834	.001828				.62
		8.55	0	1.00055	647.2	.00871	.001909	.00870	.001906		.64
		6.55	0	1.00503	640.9	.00995	.002158	.01024	.002244		.73
		3.55	0	1.00503	656.9	.01454	.003186				1.07
		2.55	0	.99944	644.9	.01152	.002546	.01167	.002557		.86
		1.55	0	.98993	630.6	.00910	.001994	.00934	.002047		.67
		1.05	0	.98327	619.6	.00745	.001633				.55
		10.55	45	.97931	611.6	.00620	.001359	.00665	.001457		.60
		6.55	45	.98378	619.6	.00657	.001440	.00689	.001510		.62
		4.55	45	.97931	625.9	.01029	.002255				.99
		2.55	45	.97931	616.2	.00760	.001665	.00797	.001747		.73

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(c) M = 2.65; R = 1.26×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0				.96449	584.5	.00107	.000468			1.06	
12.0	.0			.96560	584.2	.00103	.000451			1.11	
20.5	.0			.96449	583.5	.00101	.000442			1.03	
28.0	12.0			.96616	584.9	.00105	.000459			1.04	
28.0	4.0			.97302	598.5	.00226	.000989			2.28	
28.0	.0			.98613	605.5	.00238	.001041			2.43	
20.5	-5.0			.96893	586.5	.00103	.000451			.99	
24.5	-5.0			.96893	588.5	.00119	.000521			1.25	
30.0	.0			1.01719	644.2	.00476	.002083	.00510	.002232	5.12	
31.0	12.0			.96949	590.5	.00126	.000551			1.18	
34.0	.0			.95784	579.9	.00095	.000416	.00083	.000363	1.00	
2.0	-12.0			.96449	585.9	.00119	.000521			1.10	
2.0	12.0			.96949	587.5	.00105	.000459			1.03	
12.0	-12.0			.96671	585.2	.00105	.000459			1.00	
12.0	12.0			.96338	583.2	.00105	.000459			1.06	
30.0	1.0			1.00499	630.2	.00409	.001790			4.35	
31.0	2.0			.99112	619.2	.00451	.001974			4.85	
32.0	2.0			.98058	610.2	.00365	.001597	.00367	.001606	3.88	
32.0	3.0			.97725	609.2	.00312	.001365			3.25	
32.0	6.0			.96117	588.2	.00187	.000818			1.91	
34.0	1.0			.95673	579.9	.00130	.000569	.00111	.000486	1.48	
34.0	2.0			.96117	589.2	.00228	.000998	.00232	.001015	2.24	
34.0	3.0			.98560	596.2	.00273	.001195	.00269	.001177	2.73	
36.0	.0			.93398	575.9	.00283	.001238	.00285	.001247	2.89	
38.0	.0			.92511	567.9	.00232	.001015	.00269	.001177	2.47	
44.0	12.0			.95118	577.9	.00121	.000530			1.27	
42.0	.0			.92677	566.5	.00213	.000932	.00241	.001055	2.09	
44.0	.0			.93620	574.2	.00174	.000761	.00175	.000766	1.85	
48.0	.0			.94508	575.5	.00171	.000748	.00172	.000753	1.82	
52.0	.0			.94508	574.2	.00147	.000643	.00147	.000643	1.56	
52.0	12.0			.93731	568.2	.00110	.000481			1.09	
55.0	.0			.94508	575.9	.00149	.000652	.00148	.000648	1.52	
58.0	.0			.95617	580.9	.00142	.000621			1.42	
58.0	12.0			.94952	575.5	.00090	.000394			.88	
58.0	-12.0			.94730	573.9	.00108	.000473				
44.0	-12.0			.94619	574.5	.00137	.000600			1.36	
36.0	-8.0			.95229	580.2	.00172	.000753			1.70	
36.0	-3.0			.94009	569.2	.00091	.000398				
34.0	-3.0			.96227	591.5	.00248	.001085	.00253	.001107	2.51	
32.0	-3.0			.97781	606.9	.00316	.001383	.00326	.001427	3.59	
30.0	-3.0			.97503	598.5	.00239	.001046	.00234	.001024	2.49	
28.0	-3.0			.98169	603.9	.00226	.000989			2.38	
34.0	-12.0			.96338	586.2	.00126	.000551			1.31	
32.0	-12.0			.96449	585.9	.00131	.000573	.00125	.000547	1.32	
30.0	-12.0			.96671	588.5	.00124	.000543			1.21	
19.0	-12.5			.97337	598.9	.00101	.000441			1.04	
17.5	-11.0			.96838	586.2	.00105	.000459			1.03	
15.5	-2.5			.97781	594.2	.00082	.000359			.77	
16.5	-2.5			.96338	582.9	.00100	.000438			1.08	
17.5	-2.5			.96560	584.2	.00103	.000451	.00091	.000398	1.08	
18.5	-2.5			.97781	591.9	.00097	.000424			1.04	
19.5	-2.5			.96560	584.5	.00101	.000442	.00087	.000381	1.02	
20.5	-2.5			.96505	584.2	.00104	.000455	.00103	.000451	1.04	
21.5	-2.5			.96560	584.5	.00102	.000446	.00105	.000459	1.00	
22.5	-2.5			.96338	583.9	.00106	.000464	.00097	.000424	1.08	
23.5	-2.5			.96782	587.2	.00107	.000468	.00103	.000451	1.06	
24.5	-2.5			.97281	591.5	.00140	.000613			1.43	
		11.55	90	.97115	590.2	.00096	.000420				.42
		6.55	90	.97392	588.9	.00137	.000600				.60
		4.55	90	.96616	586.2	.00169	.000740				.74
		2.55	90	.95784	577.9	.00104	.000455				.46
		8.55	180	1.02274	613.5	.00044	.000193	.00042	.000184		
		6.55	180	1.03272	618.2	.00030	.000131				
		4.55	180	1.03217	618.9	.00026	.000114				
		3.55	180	1.03383	618.9	.00019	.000083				
		2.55	180	1.01553	607.9	.00018	.000079				
		1.55	180	.98835	593.5	.00029	.000127				
		1.05	180	.99445	596.5	.00025	.000109				
34.0	-1.0			.96338	583.2	.00111	.000486	.00113	.000494	1.18	
34.0	4.0			.97550	604.2	.00253	.001107	.00297	.001300	2.72	
34.0	5.0			.96283	591.5	.00249	.001090	.00243	.001063	2.47	
34.0	6.0			.95728	585.5	.00207	.000906	.00205	.000897	2.23	
36.0	6.0			.95950	587.5	.00204	.000893			2.13	
38.0	1.0			.93288	569.5	.00191	.000836	.00178	.000779	2.05	
38.0	2.0			.95174	578.2	.00139	.000608			1.42	
44.0	8.0			.94452	574.5	.00145	.000635			1.45	
44.0	6.0			.94508	574.5	.00135	.000591	.00136	.000595	1.35	
44.0	4.0			.95673	579.2	.00106	.000464	.00114	.000499	1.06	
44.0	2.0			.95007	577.2	.00139	.000608	.00144	.000630	1.40	
44.0	1.0			.93953	572.2	.00168	.000735	.00176	.000770	1.89	
		10.55	0	1.00776	636.2	.00546	.002389				.57
		8.55	0	1.00610	637.2	.00598	.002617	.00596	.002608		.62
		6.55	0	1.00776	640.2	.00695	.003041	.00761	.003330		.72
		3.55	0	1.00110	647.5	.00914	.004000				.95
		2.55	0	.99556	638.9	.00660	.002888	.00665	.002910		.69
		1.55	0	.98391	620.9	.00552	.002416	.00565	.002472		.58
		1.05	0	.97836	614.2	.00409	.001790				.43
		10.55	45	.98835	615.2	.00408	.001785	.00430	.001882		.55
		6.55	45	.99001	617.5	.00447	.001956	.00460	.002013		.61
		4.55	45	.98335	627.5	.00638	.002792				.87

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(d) M = 3.51; R = 3.96×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94888	566.5	.00159	.000310			1.01	
12.0	.0			.94718	563.2	.00153	.000299			.99	
20.5	.0			.94320	561.2	.00174	.000340			1.12	
28.0	12.0			.94547	563.9	.00182	.000355			1.02	
28.0	4.0			.96365	583.7	.00365	.000713			2.20	
28.0	.0			.97841	593.9	.00368	.000719			2.33	
20.5	-5.0			.94831	564.2	.00173	.000338			1.12	
24.5	-5.0			.94774	564.2	.00172	.000336			1.16	
30.0	.0			1.01590	637.9	.00783	.001529	.00817	.001595	5.05	
31.0	12.0			.95058	568.9	.00192	.000375			1.01	
34.0	.0			.94604	561.5	.00131	.000256	.00124	.000242	.85	
2.0	-12.0			.94718	563.9	.00174	.000340			1.07	
2.0	12.0			.95342	568.2	.00177	.000346			.95	
12.0	-12.0			.94490	562.2	.00175	.000342			1.05	
12.0	12.0			.94490	563.5	.00179	.000350			.96	
30.0	1.0			1.00170	628.9	.00583	.001138			3.76	
31.0	2.0			.98636	613.5	.00705	.001377			4.46	
32.0	2.0			.97614	614.2	.00571	.001115	.00579	.001131	4.08	
32.0	3.0			.96933	594.2	.00524	.001023			3.28	
32.0	6.0			.94207	572.5	.00290	.000566			1.72	
32.0	1.0			.94434	562.5	.00190	.000371	.00168	.000318	1.23	
34.0	2.0			.95342	588.2	.00406	.000793	.00439	.000857	2.54	
34.0	3.0			.95456	587.9	.00467	.000912	.00466	.000910	2.88	
34.0	.0			.91878	557.5	.00388	.000758	.00389	.000760	2.50	
36.0	.0			.90628	552.2	.00360	.000703	.00376	.000734	2.31	
38.0	.0			.93184	556.9	.00210	.000410			1.21	
44.0	12.0			.91253	551.5	.00319	.000623	.00346	.000676	2.06	
42.0	.0			.92276	561.5	.00298	.000582	.00299	.000584	1.96	
44.0	.0			.93014	558.9	.00300	.000586	.00301	.000588	1.95	
48.0	.0			.92559	554.9	.00249	.000486	.00249	.000486	1.59	
52.0	.0			.91253	546.5	.00224	.000437			1.26	
52.0	12.0			.92616	554.2	.00221	.000432	.00219	.000428	1.48	
56.0	.0			.93923	561.5	.00214	.000418			1.37	
58.0	.0			.91821	549.5	.00216	.000422			1.22	
58.5	12.0			.92787	555.2	.00215	.000420			1.30	
44.0	-12.0			.93071	558.5	.00252	.000492			1.61	
36.0	-8.0			.93695	559.9	.00137	.000268				
36.0	-3.0			.94945	579.2	.00455	.000886	.00458	.000894	3.05	
34.0	-3.0			.96762	593.9	.00529	.001033	.00492	.000961	3.44	
32.0	-3.0			.96308	586.2	.00349	.000681	.00342	.000668	2.25	
30.0	-3.0			.96933	589.5	.00345	.000674			2.30	
28.0	-3.0			.94490	564.2	.00208	.000406			1.33	
34.0	-12.0			.94490	565.2	.00192	.000375	.00191	.000373	1.16	
32.0	-12.0			.94661	564.5	.00206	.000402			1.29	
30.0	-12.0			.95115	565.9	.00162	.000316			1.03	
19.0	-12.5			.95115	565.9	.00172	.000336			1.04	
17.5	-11.5			.95683	569.2	.00171	.000334			1.08	
15.0	-2.5			.94207	561.9	.00159	.000310	.00142	.000277	1.11	
16.5	-2.5			.94263	561.2	.00159	.000310	.00144	.000281	1.03	
17.5	-2.5			.95797	570.2	.00156	.000305	.00186	.000363	1.09	
18.5	-2.5			.94320	561.5	.00174	.000340	.00160	.000312	1.10	
19.5	-2.5			.94320	561.5	.00175	.000342	.00174	.000340	1.11	
20.5	-2.5			.94434	561.9	.00174	.000340	.00177	.000346	1.10	
21.5	-2.5			.94150	561.5	.00159	.000310	.00150	.000293	1.03	
22.5	-2.5			.94604	563.2	.00174	.000340	.00147	.000326	1.05	
23.5	-2.5			.95456	571.2	.00211	.000412			1.49	
24.5	-2.5			.94490	561.2	.00201	.000392				.57
		10.56	90	.95456	567.5	.00217	.000424				.62
		6.56	90	.94377	566.5	.00293	.000572				.84
		4.56	90	.93752	557.2	.00194	.000379				.55
		2.56	90	1.00454	585.2	.00031	.000061				
		10.56	180	1.00738	592.2	.00087	.000170	.00087	.000170		
		8.56	180	1.02328	597.5	.00042	.000082	.00045	.000088		
		6.56	180	1.01930	595.5	.00039	.000076	.00038	.000074		
		4.56	180	1.01760	594.2	.00044	.000086				
		3.56	180	.99943	585.2	.00045	.000088				
		2.56	180	.98239	577.5	.00054	.000105				
		1.56	180	.98796	577.2	.00051	.000100				
34.0	-1.0			.95513	567.2	.00153	.000299	.00155	.000303	1.02	
34.0	4.0			.96251	590.5	.00421	.000822	.00458	.000894	2.65	
34.0	5.0			.94320	574.5	.00357	.000697	.00340	.000664	2.19	
34.0	6.0			.93752	564.5	.00277	.000541	.00274	.000535	1.51	
36.0	6.0			.93979	568.2	.00317	.000619			1.72	
38.0	1.0			.91935	553.2	.00288	.000562	.00284	.000555	1.83	
38.0	2.0			.93468	560.2	.00229	.000447			1.48	
44.0	8.0			.92616	558.9	.00291	.000568			1.72	
44.0	6.0			.92803	558.9	.00272	.000531	.00273	.000533	1.48	
44.0	4.0			.93525	558.9	.00198	.000387	.00203	.000396	1.24	
44.0	2.0			.93468	561.9	.00232	.000453	.00242	.000473	1.46	
44.0	1.0			.92219	558.5	.00258	.000504	.00269	.000525	1.73	
		10.56	0	1.00000	639.9	.01020	.001992				.69
		8.56	0	1.00000	643.9	.01093	.002134	.01093	.002134		.74
		6.56	0	1.00340	647.2	.01105	.002158	.01172	.002289		.75
		3.56	0	1.00511	665.8	.01759	.003433				1.19
		2.56	0	.99772	647.2	.01356	.002646	.01359	.002654		.92
		1.56	0	.98523	625.9	.00973	.001900	.01002	.001957		.66
		1.06	0	.97101	609.9	.00758	.001480				.51
		10.56	45	.97728	607.2	.00776	.001515	.00786	.001535		.69
		6.56	45	.98182	610.9	.00761	.001486	.00754	.001472		.67
		4.56	45	.97387	620.9	.01105	.002158	.00855	.001670		.98
		2.56	45	.97614	614.9	.00886	.001730				.78

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(e) M = 3.51; R = 2.76 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95477	568.5	.00119	.000333			.97	
12.0	.0			.95363	566.9	.00112	.000313			1.01	
20.5	.0			.95024	564.9	.00124	.000347			1.02	
28.0	12.0			.95250	567.2	.00140	.000391			.92	
28.0	4.0			.96890	587.2	.00263	.000735			2.07	
28.0	.0			.98021	593.2	.00277	.000774			2.15	
20.5	-5.0			.95590	568.2	.00123	.000344			1.03	
24.5	-5.0			.95533	568.9	.00140	.000391			1.13	
30.0	.0			1.01639	639.5	.00597	.001669	.00634	.001772	4.81	
31.0	12.0			.95759	570.5	.00140	.000391			1.01	
34.0	.0			.95250	565.2	.00108	.000302	.00100	.000280	.87	
2.0	-12.0			.95194	566.9	.00114	.000319			.90	
2.0	12.0			.95816	570.9	.00125	.000349			.95	
12.0	-12.0			.95081	565.5	.00120	.000335			.93	
12.0	12.0			.95137	566.9	.00129	.000361			.97	
30.0	1.0			1.00169	626.2	.00486	.001359			3.95	
31.0	2.0			.98643	610.9	.00559	.001563			4.40	
32.0	2.0			.97681	607.5	.00482	.001347	.00489	.001367	3.92	
32.0	3.0			.97003	592.5	.00411	.001149			3.19	
32.0	6.0			.94911	572.5	.00241	.000646			1.74	
34.0	1.0			.94911	565.5	.00150	.000419			1.24	
34.0	2.0			.95533	585.5	.00315	.000881	.00345	.000964	2.52	
34.0	3.0			.95703	586.2	.00360	.001006	.00357	.000998	2.67	
36.0	.0			.92537	562.9	.00292	.000816	.00294	.000822	2.35	
38.0	.0			.91349	554.5	.00281	.000786	.00301	.000841	2.32	
44.0	12.0			.93837	559.9	.00152	.000425			.99	
42.0	.0			.91802	555.2	.00241	.000674	.00267	.000746	1.99	
44.0	.0			.92819	557.9	.00213	.000595	.00214	.000598	1.78	
48.0	.0			.93611	560.9	.00190	.000531	.00191	.000534	1.57	
52.0	.0			.93272	557.5	.00174	.000486	.00174	.000486	1.36	
52.0	12.0			.91971	549.9	.00181	.000506			1.18	
55.0	.0			.93385	558.9	.00162	.000453	.00160	.000447	1.26	
58.0	.0			.94742	565.2	.00153	.000428			1.21	
58.0	12.0			.92593	553.2	.00157	.000439			1.03	
44.0	-12.0			.93554	558.9	.00156	.000436			1.31	
36.0	-8.0			.93780	561.9	.00187	.000523			1.52	
36.0	-3.0			.93780	559.5	.00106	.000296				
34.0	-3.0			.95137	578.2	.00316	.000883	.00319	.000892	2.66	
32.0	-3.0			.96833	591.9	.00376	.001051	.00387	.001082	3.16	
30.0	-3.0			.96494	582.9	.00264	.000738	.00259	.000724	2.18	
28.0	-3.0			.97286	589.5	.00262	.000732			2.17	
34.0	-12.0			.95081	566.9	.00148	.000414			1.17	
32.0	-12.0			.95081	566.5	.00139	.000389	.00140	.000391	1.16	
30.0	-12.0			.95307	569.5	.00147	.000411			1.20	
19.0	-12.5			.95759	569.5	.00118	.000330			.94	
17.5	-11.0			.95816	569.5	.00112	.000313			.93	
15.5	-2.5			.96381	573.2	.00114	.000319			.93	
16.5	-2.5			.94968	564.5	.00118	.000330	.00101	.000282	.96	
17.5	-2.5			.95081	565.2	.00124	.000347	.00111	.000310	1.04	
18.5	-2.5			.96607	574.2	.00113	.000316			.93	
10.5	+2.5			.95081	565.5	.00112	.000313			.93	
20.5	-2.5			.95137	565.9	.00115	.000321	.00115	.000321	.96	
21.5	-2.5			.95194	566.2	.00117	.000327	.00121	.000338	.94	
22.5	-2.5			.94968	564.5	.00116	.000324	.00106	.000296	.94	
23.5	-2.5			.95420	568.9	.00125	.000349	.00119	.000333	1.00	
24.5	-2.5			.96098	574.5	.00156	.000436			1.29	
		10.55	90	.95703	568.2	.00162	.000453				.55
		6.55	90	.96494	573.5	.00162	.000453				.55
		4.55	90	.95137	569.9	.00236	.000660				.81
		2.55	90	.94515	561.5	.00150	.000419				.51
		8.55	180	1.02261	600.9	.00054	.000151	.00054	.000151		
		6.55	180	1.03505	605.9	.00022	.000061				
		4.55	180	1.03392	605.2	.00021	.000059				
		3.55	180	1.03392	606.5	.00036	.000101				
		2.55	180	1.01583	595.5	.00021	.000059				
		1.55	180	.99208	583.9	.00033	.000092				
		1.05	180	.99547	585.2	.00029	.000081				
34.0	-1.0			.96042	570.2	.00114	.000319	.00116	.000324	1.02	
34.0	4.0			.96664	587.5	.00336	.000939	.00359	.001004	2.65	
34.0	5.0			.94855	575.9	.00271	.000758	.00255	.000713	2.05	
34.0	6.0			.94459	567.5	.00216	.000604	.00213	.000595	1.59	
36.0	6.0			.94572	570.5	.00248	.000693			1.86	
38.0	1.0			.92593	555.9	.00211	.000590	.00212	.000593	1.74	
38.0	2.0			.94007	563.5	.00169	.000472			1.31	
44.0	8.0			.93215	560.9	.00219	.000612			1.43	
44.0	6.0			.93102	558.5	.00213	.000595	.00214	.000598	1.55	
44.0	4.0			.94176	561.9	.00159	.000444	.00165	.000461	1.18	
44.0	2.0			.94176	563.5	.00166	.000464	.00177	.000495	1.31	
44.0	1.0			.92819	556.5	.00189	.000528	.00199	.000556	1.52	
		10.55	0	1.00113	632.5	.00854	.002387				.69
		8.55	0	1.00113	635.2	.00916	.002561	.00916	.002561		.74
		6.55	0	1.00395	637.9	.00923	.002580	.00967	.002703		.75
		3.55	0	1.00395	666.8	.01312	.003668				1.07
		2.55	0	.99604	645.5	.00987	.002759	.00982	.002745		.80
		1.55	0	.98416	624.9	.00717	.002004	.00744	.002080		.58
		1.05	0	.97512	610.2	.00572	.001599				.46
		10.55	45	.97964	612.2	.00611	.001708	.00636	.001778		.65
		6.55	45	.98416	610.2	.00590	.001649	.00610	.001705		.62
		4.55	45	.97342	622.2	.00849	.002373				.90
		2.55	45	.97512	609.2	.00688	.001923	.00717	.002004		.73

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

I-2024

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; $\bar{s}$ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(f) M = 3.51; R = 1.60×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	0			.95799	566.9	.00072	.000206			1.06	
12.0	0			.95572	564.9	.00076	.000218			1.17	
20.5	0			.95232	562.9	.00076	.000218			1.12	
28.0	12.0			.95459	565.2	.00076	.000218			.89	
28.0	4.0			.96934	579.5	.00182	.000521			2.17	
28.0	0			.97729	584.5	.00179	.000512			2.71	
28.0	-6.0			.95799	566.2	.00071	.000203			1.08	
20.5	-6.0			.95742	566.9	.00086	.000246			1.30	
24.5	-6.0			1.01362	627.5	.00423	.001211	.00456	.001306	6.31	
28.0	0			.96083	568.9	.00091	.000261			1.07	
31.0	12.0			.94891	560.2	.00052	.000149			.80	
34.0	0			.95515	564.9	.00079	.000226			.93	
2.0	-12.0			.96083	568.9	.00075	.000215			.88	
2.0	12.0			.95232	563.2	.00084	.000240			1.25	
12.0	-12.0			.95402	564.9	.00086	.000246			1.12	
12.0	12.0			1.00000	609.2	.00368	.001054			5.49	
30.0	1.0			.98353	605.9	.00344	.000985			4.65	
31.0	2.0			.97502	596.5	.00316	.000905	.00122	.000922	4.72	
32.0	2.0			.96764	583.5	.00275	.000787			4.04	
32.0	3.0			.95232	568.9	.00132	.000378			1.58	
32.0	6.0			.96834	581.5	.00098	.000281			1.44	
34.0	1.0			.98402	602.5	.00198	.000567	.00211	.000604	2.91	
34.0	2.0			.95572	578.9	.00229	.000656	.00221	.000633	3.01	
34.0	3.0			.93035	560.9	.00186	.000533	.00189	.000541	2.19	
36.0	0			.91996	550.9	.00178	.000510	.00202	.000578	2.09	
38.0	0			.94210	558.5	.00094	.000269			1.22	
44.0	12.0			.92280	550.5	.00156	.000447	.00181	.000518	2.29	
42.0	0			.93188	555.2	.00152	.000436	.00153	.000438	1.95	
44.0	0			.94040	558.5	.00119	.000341	.00120	.000344	1.40	
48.0	0			.93642	556.5	.00110	.000315	.00110	.000315	1.55	
52.0	0			.92564	549.2	.00117	.000335			1.38	
52.0	12.0			.93756	555.9	.00098	.000281	.00096	.000275	1.46	
55.0	0			.95175	564.2	.00114	.000326			1.70	
58.0	0			.93302	553.2	.00093	.000266			1.11	
58.0	12.0			.94040	557.5	.00098	.000281			1.51	
44.0	-12.0			.94153	559.5	.00126	.000361			1.91	
36.0	-8.0			.94040	556.5	.00078	.000223				
36.0	-3.0			.94948	569.9	.00204	.000584	.00204	.000584	3.04	
34.0	-3.0			.96537	582.5	.00258	.000739	.00258	.000767	3.85	
32.0	-3.0			.96253	575.2	.00180	.000524	.00178	.000510	2.64	
30.0	-3.0			.97275	580.9	.00161	.000461			2.37	
28.0	-3.0			.95176	563.5	.00096	.000275			1.14	
34.0	-12.0			.94232	563.9	.00089	.000255	.00088	.000252	1.33	
32.0	-12.0			.95515	566.5	.00091	.000261			1.34	
30.0	-12.0			.96083	567.2	.00070	.000200			1.04	
26.0	-12.0			.96140	567.2	.00077	.000220			.91	
19.0	-12.0			.96651	570.5	.00079	.000226			1.07	
17.5	-11.0			.96232	567.2	.00071	.000203			.84	
16.5	-2.5			.95345	562.9	.00076	.000218	.00062	.000178	1.13	
17.5	-2.5			.96878	571.5	.00066	.000189			1.00	
18.5	-2.5			.95345	563.2	.00071	.000203			.85	
19.5	-2.5			.95345	563.2	.00071	.000203	.00070	.000200	.85	
20.5	-2.5			.95459	563.9	.00076	.000218	.00083	.000229	.89	
21.5	-2.5			.95232	562.5	.00071	.000203	.00062	.000178	1.00	
22.5	-2.5			.95742	565.5	.00079	.000226	.00074	.000212	1.20	
23.5	-2.5			.96367	572.9	.00107	.000306			1.26	
24.5	-2.5			.95232	564.5	.00118	.000338				.53
		10.55	90	.95969	568.2	.00127	.000364				.57
		6.55	90	.94721	563.5	.00163	.000467				.73
		4.55	90	.94096	556.2	.00113	.000324				.51
		2.55	90	1.00170	584.5	.00014	.000040				
		10.55	180	1.00340	587.9	.00034	.000097				
		8.55	180	1.00853	589.2	.00018	.000052				
		6.55	180	.99829	584.2	.00016	.000046				
		2.55	180	.98240	576.5	.00020	.000057				
		1.55	180	.95969	567.2	.00076	.000218	.00081	.000232	1.13	
34.0	-3.0			.96821	581.5	.00202	.000578			2.69	
34.0	4.0			.95175	569.2	.00185	.000530	.00172	.000492	2.57	
34.0	5.0			.94834	564.9	.00135	.000387	.00132	.000378	1.59	
34.0	6.0			.95004	567.5	.00156	.000447			2.14	
36.0	4.0			.92961	553.2	.00131	.000375	.00124	.000355	1.90	
38.0	1.0			.94210	560.2	.00110	.000315			1.57	
38.0	2.0			.93585	557.9	.00152	.000435			1.79	
44.0	8.0			.93472	555.9	.00124	.000355	.00124	.000355	1.46	
44.0	6.0			.94550	562.2	.00094	.000269	.00099	.000283	1.19	
44.0	4.0			.94644	563.5	.00121	.000346	.00129	.000369	1.78	
44.0	2.0			.93245	554.5	.00125	.000358	.00133	.000381	1.89	
44.0	1.0			.99829	630.5	.00598	.001712				.64
		10.55	0	.99886	629.2	.00640	.001832	.00640	.001832		.68
		8.55	0	1.00227	627.9	.00693	.001984	.00735	.002104		.74
		6.55	0	1.00000	620.9	.01002	.002869				1.07
		3.55	0	.99091	631.2	.00654	.001872	.00641	.001835		.70
		2.55	0	.97899	605.5	.00524	.001500	.00538	.001540		.56
		1.55	0	.97161	593.9	.00403	.001154				.43
		10.55	0	.97672	598.9	.00443	.001268	.00471	.001349		.62
		6.55	45	.98126	601.9	.00440	.001260	.00457	.001308		.61
		4.55	45	.96991	604.5	.00653	.001870				.91
		2.55	45	.96934	598.9	.00448	.001283	.00462	.001323		.62

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(g) M = 4.44; R = 4.43 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{F_o}$	$\frac{h}{h_L}$
2.0	.0			.94197	575.2	.00081	.000206			.95	
12.0	.0			.94416	575.5	.00084	.000214			1.17	
20.5	.0			.94306	574.9	.00084	.000214			1.20	
28.0	12.0			.93923	572.9	.00110	.000280			1.07	
28.5	4.0			.96770	595.5	.00214	.000545			2.58	
28.0	.0			.97372	599.9	.00228	.000581			2.85	
2.5	-5.0			.94744	576.5	.00067	.000171			1.00	
24.5	-5.0			.94963	579.5	.00106	.000270			1.58	
30.0	.0			1.01697	641.2	.00491	.001250	.00671	.001454	7.22	
31.0	12.0			.94341	577.9	.00127	.000323			1.25	
34.0	.0			.94182	577.9	.00060	.000153	.00058	.000148	.90	
2.0	-12.0			.94252	574.9	.00072	.000183			1.06	
2.0	12.0			.94361	577.2	.00109	.000278			1.09	
12.0	-12.0			.94580	575.2	.00065	.000166			1.16	
12.0	12.0			.93769	572.2	.00130	.000331			1.31	
30.0	1.0			1.00109	626.2	.00422	.001074			6.49	
31.0	2.0			.98467	617.1	.00448	.001141			6.14	
32.0	2.0			.97098	610.9	.00458	.001166	.00463	.001179	5.73	
32.0	3.0			.96168	597.2	.00341	.000868			4.11	
32.0	6.0			.94471	578.9	.00165	.000420			1.92	
34.0	1.0			.94580	577.2	.00118	.000300			1.69	
34.0	2.0			.94471	585.5	.00293	.000746	.00305	.000777	4.01	
34.0	3.0			.94799	588.5	.00320	.000815	.00427	.000833	4.51	
36.0	.0			.92555	568.5	.00204	.000519	.00202	.000514	2.87	
38.0	.0			.91241	561.2	.00200	.000509			2.86	
44.0	12.0			.93102	570.2	.00128	.000326			1.24	
42.0	.0			.91405	561.2	.00185	.000471			2.64	
44.0	.0			.92281	566.9	.00181	.000461	.00182	.000463	2.62	
48.0	.0			.93157	569.5	.00133	.000339	.00134	.000341	1.66	
52.0	.0			.92993	569.5	.00128	.000326	.00128	.000326	1.86	
52.0	12.0			.91186	559.2	.00167	.000425			1.69	
56.0	.0			.93047	567.2	.00114	.000290	.00112	.000285	1.58	
58.0	.0			.94142	574.9	.00119	.000303			2.25	
58.0	12.0			.91788	563.2	.00178	.000453			1.73	
58.0	-12.0			.93540	572.9	.00140	.000356				
44.0	-12.0			.93211	568.5	.00114	.000290			1.97	
36.0	-8.0			.92883	569.5	.00130	.000331			2.24	
36.0	-3.0			.92500	566.2	.00108	.000275				
34.0	-3.0			.94416	584.9	.00300	.000764	.00305	.000777	4.29	
32.0	-3.0			.96058	596.9	.00344	.000876	.00362	.000922	5.13	
30.0	-3.0			.95620	587.9	.00209	.000532	.00198	.000504	3.37	
28.0	-3.0			.96715	595.9	.00194	.000494			2.77	
34.0	-12.0			.93978	573.2	.00113	.000288			2.05	
32.0	-12.0			.94306	576.2	.00100	.000255	.00101	.000257	1.66	
30.0	-12.0			.94580	575.2	.00098	.000250			1.63	
19.0	-11.5			.95182	578.5	.00062	.000158			1.05	
17.5	-11.0			.94854	576.5	.00064	.000163			1.10	
17.5	-2.5			.95565	582.2	.00082	.000209			1.28	
16.5	-2.5			.94197	573.2	.00071	.000181			1.04	
17.5	-2.5			.94361	574.9	.00084	.000214	.00070	.000178	1.25	
18.5	-2.5			.95565	581.9	.00082	.000209			1.34	
19.5	-2.5			.94416	575.2	.00083	.000211				
20.5	-2.5			.94361	574.9	.00084	.000214	.00080	.000204	1.33	
21.5	-2.5			.94525	576.2	.00074	.000188	.00080	.000204	1.16	
22.5	-2.5			.94361	575.2	.00074	.000188	.00063	.000160	.64	
23.5	-2.5			.95018	581.5	.00099	.000252	.00094	.000239	1.24	
24.5	-2.5			.95784	585.9	.00150	.000382			2.08	
		10.55	90	.95620	581.2	.00141	.000359				.46
		6.55	90	.96168	585.5	.00153	.000390				.50
		4.55	90	.94709	580.5	.00185	.000471				.61
		2.55	90	.93978	573.2	.00129	.000328				.42
		4.55	180	1.01806	614.9	.00031	.000079				
		2.55	180	1.02682	620.9	.00019	.000048				
34.0	-1.0			.95292	579.9	.00098	.000250	.00098	.000250	1.61	
34.0	4.0			.95292	589.5	.00276	.000703	.00318	.000810	3.78	
34.0	5.0			.93814	577.2	.00215	.000547	.00191	.000487	2.53	
34.0	6.0			.93540	573.2	.00167	.000425	.00167	.000415	1.96	
36.0	6.0			.93376	573.9	.00194	.000494			2.16	
36.0	1.0			.92390	567.2	.00161	.000410	.00160	.000407	2.21	
38.0	2.0			.93321	571.2	.00158	.000402			2.26	
44.0	8.0			.92281	567.6	.00207	.000527			2.70	
44.0	6.0			.92117	565.9	.00196	.000499	.00195	.000497	2.48	
44.0	4.0			.93102	570.6	.00129	.000328	.00136	.000346	1.84	
44.0	2.0			.93211	570.2	.00133	.000339	.00140	.000356	1.60	
44.0	1.0			.92609	567.9	.00160	.000407	.00180	.000458	2.35	
		10.55	0	1.00492	640.9	.00797	.002025				.62
		8.55	0	1.00273	646.2	.01001	.002549	.01004	.002556		.78
		6.55	0	1.00547	648.9	.01062	.002704	.01194	.003040		.83
		3.55	0	1.00437	651.9	.01148	.002923				.90
		2.55	0	.99726	648.5	.01066	.002714	.01124	.002862		.84
		1.55	0	.97974	626.5	.00700	.001782	.00737	.001864		.55
		1.05	0	.96879	609.2	.00496	.001264				.39
		10.55	45	.98084	614.5	.00569	.001449	.00606	.001543		.58
		6.55	45	.98412	618.9	.00636	.001619	.00644	.001596		.65
		4.55	45	.97317	617.9	.00765	.001949				.78
		2.55	45	.97098	622.5	.00711	.001810	.00771	.001963		.72

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Continued

(h) $M = 4.44$; $R = 3.13 \times 10^6$

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_f}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.94568	575.5	.00058	.000209			.98	
12.0	.0			.94952	576.5	.00060	.000217			.81	
20.5	.0			.94897	575.9	.00057	.000206			1.08	
28.0	12.0			.94568	574.9	.00074	.000267			.83	
28.0	4.0			.97147	594.9	.00161	.000581			2.78	
28.0	.0			.97531	597.9	.00186	.000671			2.95	
20.5	-5.0			.95281	578.2	.00049	.000177			.92	
24.5	-5.0			.95501	581.5	.00084	.000303			1.56	
30.0	.0			1.01645	645.2	.00418	.001508	.00489	.001764	7.60	
31.0	12.0			.95007	578.2	.00079	.000285			1.10	
34.0	.0			.95605	578.9	.00048	.000173			.84	
2.0	-12.0			.94513	574.9	.00052	.000188			.96	
2.0	12.0			.94788	578.1	.00086	.000310			1.15	
12.0	-12.0			.95062	576.5	.00049	.000177			1.00	
12.0	12.0			.94349	573.0	.00069	.000249			.92	
30.0	1.0			1.00109	624.2	.00352	.001270			5.25	
31.0	2.0			.98463	615.2	.00403	.001454			7.07	
32.0	2.0			.97202	606.2	.00341	.001230	.00345	.001245	5.59	
32.0	3.0			.96269	595.2	.00256	.000924			4.06	
32.0	6.0			.95007	582.9	.00122	.000440			1.88	
32.0	9.0			.95062	577.5	.00075	.000271			1.12	
34.0	1.0			.94733	585.7	.00246	.000888	.00241	.000870	3.90	
34.0	2.0			.95007	587.2	.00252	.000909	.00259	.000920	4.58	
34.0	3.0			.93361	571.2	.00155	.000559	.00155	.000559	2.54	
36.0	.0			.92209	564.5	.00161	.000581	.00208	.000751	2.82	
38.0	.0			.93965	572.6	.00088	.000318			1.00	
44.0	12.0			.92264	563.9	.00158	.000570	.00206	.000743	2.51	
42.0	.0			.93087	570.5	.00124	.000447	.00126	.000451		
44.0	.0			.93965	572.2	.00104	.000375	.00105	.000379	1.82	
48.0	.0			.93910	570.9	.00100	.000361	.00100	.000361	1.82	
52.0	.0			.92044	564.2	.00126	.000455			1.50	
52.0	12.0			.93910	570.5	.00077	.000278	.00075	.000271	1.33	
55.0	.0			.94952	577.5	.00084	.000303			1.31	
58.0	.0			.92438	567.2	.00133	.000480			1.58	
58.0	12.0			.94294	574.2	.00102	.000368				
44.0	-12.0			.93965	571.2	.00075	.000271			1.53	
36.0	-8.0			.93635	569.5	.00102	.000368			2.08	
36.0	-3.0			.92813	566.9	.00088	.000318				
34.0	-3.0			.94568	583.2	.00238	.000859	.00242	.000873	4.33	
32.0	-3.0			.96104	597.9	.00271	.000978	.00288	.001039	5.41	
30.0	-3.0			.95775	586.2	.00157	.000567	.00146	.000527	2.86	
28.0	-3.0			.96982	594.5	.00159	.000559			2.92	
34.0	-12.0			.94513	575.2	.00084	.000303			1.68	
32.0	-12.0			.94788	575.9	.00067	.000242	.00067	.000242	1.37	
30.0	-12.0			.94788	576.5	.00068	.000245			1.39	
16.0	-12.0			.95611	579.9	.00048	.000173			.98	
15.5	-2.5			.96049	582.2	.00049	.000177			.92	
16.5	-2.5			.94578	574.5	.00054	.000195			1.06	
17.5	-2.5			.94897	575.9	.00057	.000206			.93	
18.5	-2.5			.95995	582.9	.00060	.000217			1.20	
19.5	-2.5			.94897	575.2	.00053	.000191			.96	
20.5	-2.5			.94897	576.2	.00060	.000217	.00057	.000206	.98	
21.5	-2.5			.95062	577.2	.00060	.000217	.00066	.000238	.98	
18.5	-2.5			.94952	576.2	.00060	.000217			1.18	
23.5	-2.5			.95556	580.9	.00066	.000238	.00063	.000227	1.20	
24.5	-2.5			.96159	586.5	.00101	.000364			1.91	
		10.55	90	.96214	583.2	.00106	.000382				.42
		8.55	90	.96653	588.9	.00121	.000437				.48
		4.55	90	.95226	581.5	.00160	.000577				.63
		2.55	90	.94349	575.5	.00113	.000408				.44
		8.55	180	1.01536	613.5	.00029	.000105				
		1.55	180	.98024	593.9	.00023	.000083				
36.0	-1.0			.95775	581.2	.00065	.000235	.00074	.000267	1.25	
34.0	6.0			.95611	589.2	.00217	.000783	.00258	.000931	2.93	
34.0	5.0			.94294	578.2	.00160	.000577	.00142	.000512	2.54	
34.0	6.0			.94184	575.5	.00123	.000444	.00119	.000429	1.89	
36.0	6.0			.94020	575.5	.00155	.000555			2.38	
38.0	1.0			.93087	570.2	.00124	.000447	.00119	.000429	1.97	
38.0	2.0			.93965	572.5	.00108	.000390			1.96	
44.0	8.0			.92977	569.2	.00138	.000498			1.86	
44.0	6.0			.92867	569.5	.00132	.000476	.00130	.000469	2.03	
44.0	4.0			.93910	571.5	.00099	.000357	.00106	.000382	1.74	
44.0	2.0			.94074	574.2	.00121	.000437	.00130	.000469	2.20	
44.0	1.0			.93416	570.2	.00122	.000440	.00158	.000570		
		10.55	0	1.00713	634.5	.00682	.002461				.64
		8.55	0	1.00493	638.9	.00825	.002977	.00826	.002980		.77
		4.55	0	1.00658	642.2	.00862	.003110	.00979	.003533		.80
		2.55	0	1.00938	653.9	.01098	.003962				1.03
		0.55	0	.99615	641.5	.00910	.003284	.00954	.003442		.85
		1.55	0	.97805	619.5	.00609	.002194	.00597	.002154		.57
		4.55	0	.96817	612.5	.00410	.001479				.38
		10.55	45	.98463	612.5	.00473	.001700	.00491	.001772		.57
		8.55	45	.98628	617.5	.00493	.001779	.00517	.001866		.60
		4.55	45	.97476	617.2	.00620	.002274				.77
		2.55	45	.97092	612.5	.00533	.001923	.00611	.002205		.65

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

6. 2.8-Inch-Diameter Instrumented Cylinder - Concluded

(i) M = 4.44; R = 2.08×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
12.0	.0			.95021	577.9	.00038	.000206			.76	
20.5	.0			.95021	577.9	.00045	.000244			.88	
28.0	12.0			.94857	577.2	.00052	.000281			.83	
28.0	4.0			.96936	593.2	.00113	.000612			2.22	
28.0	.0			.97209	596.9	.00121	.000655				
20.5	-5.0			.95349	579.5	.00037	.000200			.93	
24.5	-5.0			.95623	582.2	.00052	.000281			1.04	
30.0	.0			1.01148	634.2	.00373	.002019	.00425	.002300	9.33	
31.0	12.0			.95349	580.2	.00060	.000325			.76	
34.0	.0			.95568	579.2	.00032	.000173			.63	
2.0	-12.0			.94364	574.9	.00049	.000265			.92	
2.0	12.0			.94747	578.2	.00054	.000292			.68	
12.0	-12.0			.95021	577.5	.00036	.000195			.78	
30.0	1.0			.99726	625.2	.00279	.001510			6.98	
31.0	2.0			.98085	611.5	.00327	.001770			6.29	
32.0	2.0			.96936	605.9	.00266	.001440	.00270	.001461	6.65	
32.0	3.0			.95951	592.2	.00213	.001153			4.53	
32.0	6.0			.95075	581.2	.00080	.000433			1.51	
34.0	1.0			.95075	578.2	.00058	.000314			1.12	
34.0	2.0			.94692	582.9	.00173	.000936	.00175	.000947	3.26	
34.0	3.0			.94747	586.5	.00191	.001034	.00187	.001012	3.75	
36.0	.0			.93782	575.2	.00109	.000590	.00109	.000590	2.48	
34.0	.0			.927778	567.5	.00112	.000606			2.15	
44.0	12.0			.94364	574.5	.00065	.000352			.97	
42.0	.0			.92832	567.2	.00108	.000585			2.25	
44.0	.0			.93653	572.9	.00085	.000460	.00086	.000465	1.73	
48.0	.0			.94528	575.9	.00068	.000368	.00069	.000373	1.42	
52.0	.0			.94528	574.9	.00056	.000303	.00056	.000303	1.40	
52.0	12.0			.92559	564.9	.00075	.000406			.95	
55.0	.0			.94474	574.5	.00052	.000281	.00050	.000271		
58.0	.0			.95404	580.5	.00080	.000433			1.54	
58.0	12.0			.92996	568.5	.00094	.000509			1.19	
58.0	-12.0			.94747	577.5	.00072	.000390				
44.0	-12.0			.94309	573.9	.00065	.000352			1.67	
36.0	-8.0			.93872	571.9	.00069	.000373			1.57	
36.0	-3.0			.92668	565.9	.00055	.000298				
34.0	-3.0			.94364	580.5	.00173	.000936	.00177	.000958	3.93	
32.0	-3.0			.95732	591.2	.00215	.001164	.00228	.001234	4.30	
30.0	-3.0			.95513	584.2	.00112	.000606	.00101	.000547	2.55	
28.0	-3.0			.96771	591.5	.00110	.000595				
34.0	-12.0			.94692	576.2	.00052	.000281			1.08	
32.0	-12.0			.94911	576.9	.00052	.000281	.00052	.000281		
30.0	-12.0			.96224	577.9	.00046	.000249			1.18	
19.0	-12.5			.95677	581.2	.00041	.000222				
17.5	-2.5			.95021	577.5	.00036	.000195				
18.5	-2.5			.96115	584.2	.00035	.000189			.74	
19.5	-2.5			.95075	577.9	.00042	.000227			.81	
21.5	-2.5			.95021	577.5	.00037	.000200	.00034	.000184	.71	
23.5	-2.5			.95732	581.9	.00039	.000211	.00037	.000200	.85	
24.5	-2.5			.96224	586.9	.00071	.000384			1.54	
		10.55	90	.96936	587.9	.00073	.000395				.35
		6.55	90	.97154	590.9	.00102	.000552				.49
		4.55	90	.95623	584.2	.00139	.000752				.67
		2.55	90	.94583	576.5	.00090	.000487				.43
		8.55	180	1.01203	613.5	.00027	.000146	.00029	.000157		
36.0	-1.0			.95841	581.9	.00051	.000276	.00055	.000298	1.02	
34.0	4.0			.95513	587.2	.00169	.000915				
34.0	5.0			.94415	577.9	.00114	.000617			2.24	
34.0	6.0			.94364	576.2	.00091	.000493	.00087	.000471	1.69	
36.0	6.0			.94307	576.5	.00109	.000590			2.05	
38.0	1.0			.93379	569.9	.00092	.000498	.00084	.000455	1.80	
38.0	2.0			.94200	574.2	.00073	.000395			1.83	
44.0	8.0			.93379	571.5	.00094	.000509			1.74	
44.0	6.0			.93325	570.5	.00093	.000503	.00088	.000476	1.75	
44.0	4.0			.94364	574.2	.00058	.000314	.00064	.000346	1.26	
44.0	2.0			.94638	577.9	.00079	.000428	.00087	.000471	1.58	
44.0	1.0			.93981	573.9	.00080	.000433			1.60	
		10.55	0	1.00820	632.5	.00498	.002695				.57
		8.55	0	1.00601	635.9	.00619	.003350	.00620	.003356		.71
		6.55	0	1.00656	639.2	.00669	.003621				.77
		3.55	0	1.00218	648.5	.01093	.005916				1.25
		2.55	0	.99124	638.5	.00847	.004585	.00896	.004850		.97
		1.55	0	.97209	613.2	.00526	.002847	.00527	.002852		.60
		1.55	0	.96389	601.9	.00372	.002014				.43
		10.55	45	.98686	612.5	.00360	.001949	.00377	.002041		.54
		6.55	45	.98741	616.9	.00401	.002170	.00417	.002257		.60
		4.55	45	.97428	614.5	.00538	.002912				.80
		2.55	45	.96826	608.5	.00504	.002728	.00522	.002825		.75

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream

(a) M = 2.65; R = 3.93×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.95300	590.9	.00274	.000387			.95	
12.0	.0			.95300	584.5	.00279	.000394			.90	
20.5	.0			1.00387	630.5	.00762	.001077			2.67	
28.0	12.0			.95632	588.9	.00371	.000524			1.11	
28.0	4.0			.95190	593.2	.00583	.000824			2.00	
28.0	.0			.93973	586.2	.00615	.000869			2.04	
20.5	-5.0			.95964	597.2	.00554	.000783			1.83	
24.5	-5.0			.95245	601.9	.00565	.000798			1.88	
30.0	.0			.97125	612.2	.00807	.001140	.00629	.001172	2.58	
31.0	12.0			.94968	584.9	.00358	.000506			1.19	
34.0	.0			.92591	562.9	.00172	.000243	.00145	.000205	.55	
2.0	-12.0			.95300	587.9	.00313	.000442			1.04	
2.0	12.0			.95742	587.2	.00305	.000431			.98	
12.0	-12.0			.95079	584.2	.00319	.000451			1.02	
12.0	12.0			.95134	583.9	.00289	.000408			.99	
30.0	1.0			.95024	601.2	.00867	.001225			2.95	
31.0	2.0			.93918	592.6	.00842	.001190			2.95	
32.0	3.0			.92923	580.2	.00626	.000885			1.99	
32.0	6.0			.94250	584.2	.00490	.000692			1.69	
34.0	1.0			.93365	570.2	.00222	.000314	.00229	.000324	.75	
34.0	2.0			.92867	573.9	.00406	.000574	.00409	.000578	1.38	
34.0	3.0			.92536	574.5	.00493	.000697	.00480	.000678	1.68	
36.0	.0			.91541	568.5	.00491	.000694	.00493	.000697	1.66	
38.0	.0			.91485	570.5	.00610	.000862	.00651	.000920	2.00	
42.0	.0			.82142	495.2	.00015	.000021				
44.0	12.0			.92702	570.9	.00340	.000480			1.10	
42.0	.0			.92093	571.5	.00491	.000694	.00537	.000759	1.57	
44.0	.0			.92978	575.5	.00444	.000627	.00445	.000629	1.53	
48.0	.0			.93973	579.9	.00405	.000572	.00406	.000574	1.33	
52.0	.0			.93697	578.5	.00406	.000574	.00406	.000574	1.38	
52.0	12.0			.91541	561.9	.00292	.000413			.96	
55.0	.0			.93420	576.5	.00385	.000544	.00382	.000540	1.31	
58.0	.0			.94637	583.9	.00378	.000534			1.29	
58.0	12.0			.92978	569.5	.00259	.000366			.82	
58.0	-12.0			.93255	575.2	.00320	.000452				
44.0	-12.0			.93420	576.2	.00402	.000568			1.27	
36.0	-8.0			.94029	582.5	.00448	.000633			1.41	
36.0	-3.0			.93199	566.9	.00113	.000160				
34.0	-3.0			.92370	572.5	.00481	.000680	.00480	.000678	1.59	
32.0	-3.0			.92867	580.2	.00629	.000889	.00630	.000890	2.01	
30.0	-3.0			.93973	585.9	.00550	.000777	.00548	.000774	1.82	
28.0	-3.0			.95190	593.9	.00608	.000859			2.03	
34.0	-12.0			.93144	574.5	.00375	.000530			1.17	
32.0	-12.0			.93476	576.2	.00367	.000519	.00364	.000514	1.14	
30.0	-12.0			.94360	582.2	.00373	.000527			1.16	
19.0	-12.5			.95687	587.9	.00312	.000441			.99	
17.5	-11.0			.95411	585.5	.00299	.000423			.99	
15.5	-2.5			.97069	600.5	.00351	.000496			1.16	
16.5	-2.5			.95577	590.5	.00436	.000616	.00411	.000581	1.50	
17.5	-2.5			.95853	595.5	.00530	.000749	.00499	.000705	1.76	
18.5	-2.5			.98673	615.2	.00604	.000854	.00626	.000885	1.94	
19.5	-2.5			.97069	605.9	.00618	.000873	.00586	.000828	2.06	
20.5	-2.5			.97567	609.2	.00616	.000871	.00611	.000863	1.98	
21.5	-2.5			.98009	615.2	.00737	.001041	.00740	.001046	2.45	
22.5	-2.5			.97899	619.9	.00910	.001286	.00932	.001317	3.01	
23.5	-2.5			.96903	614.5	.00906	.001280	.00896	.001266	2.91	
24.5	-2.5			.97125	613.2	.00836	.001181			2.84	
		10.55	90	.92757	580.2	.00630	.000890	.00596	.000842		1.61
		6.55	90	.93033	578.5	.00563	.000796	.00503	.000711		1.43
		4.55	90	.92425	572.9	.00520	.000735				1.32
		2.55	90	.91762	566.9	.00413	.000584				1.05
		10.55	180	.91319	558.9	.00286	.000404				
		8.55	180	.93973	574.9	.00229	.000324	.00236	.000334		
		6.55	180	.94747	574.5	.00164	.000232	.00170	.000240		
		4.55	180	.90877	558.5	.00202	.000285	.00195	.000276		
		3.55	180	.90656	556.2	.00211	.000298	.00180	.000254		
		2.55	180	.90380	550.2	.00183	.000259				
		1.55	180	.93476	568.9	.00188	.000266				
		1.05	180	.92425	561.9	.00170	.000240				
34.0	-1.0			.93420	569.2	.00182	.000257	.00187	.000264	.65	
34.0	4.0			.94581	586.2	.00449	.000635	.00474	.000670	1.44	
34.0	5.0			.94747	587.2	.00447	.000632	.00453	.000640	1.42	
34.0	6.0			.94526	585.9	.00488	.000690	.00488	.000690	1.55	
36.0	6.0			.94803	586.5	.00444	.000627			1.53	
38.0	1.0			.91541	565.2	.00395	.000558	.00375	.000530	1.30	
38.0	2.0			.92702	567.9	.00271	.000383			.87	
44.0	8.0			.93863	580.9	.00363	.000513			1.16	
44.0	6.0			.93807	575.9	.00313	.000442	.00313	.000442	1.00	
44.0	4.0			.94692	579.5	.00253	.000358	.00262	.000370	.81	
44.0	2.0			.92923	573.2	.00377	.000533	.00368	.000520	1.20	
44.0	1.0			.93199	583.9	.00443	.000626	.00493	.000697	1.57	
		10.55	0	.99225	627.9	.00894	.001263				.54
		8.55	0	.98507	626.9	.00971	.001372	.00963	.001361		.56
		6.55	0	.99668	637.9	.01166	.001648	.01135	.001660		.71
		4.55	0	1.00718	632.2	.00717	.001013	.00720	.001019		.43
		3.55	0	1.00055	626.9	.00674	.000952	.00669	.000945		.41
		2.55	0	.99668	623.9	.00633	.000895	.00634	.000468		.38
		1.55	0	1.00110	630.9	.00782	.001105	.00750	.001060		.47
		1.05	0	1.00608	639.9	.00940	.001328				.57
		10.55	45	.98230	630.5	.01190	.001682	.01277	.001805		.73
		6.55	45	.98617	642.5	.01574	.002224	.01680	.002374		.95
		4.55	45	.98230	624.9	.00982	.001388	.01034	.001461		.77
		2.55	45	.97677	617.9	.00577	.000815				.45

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(b) M = 2.65; R = 2.56×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95309	578.2	.00208	.000454			1.07	
12.0	.0			.95197	577.5	.00192	.000419			.96	
20.5	.0			.99888	620.5	.00552	.001204			2.71	
28.0	12.0			.95420	581.2	.00249	.000543			1.13	
28.0	4.0			.95197	585.5	.00377	.000822			1.87	
28.0	.0			.94192	580.5	.00416	.000907			2.06	
20.5	-5.0			.95979	590.2	.00374	.000816			1.80	
24.5	-5.0			.95309	587.5	.00408	.000890			1.85	
36.0	.0			.96705	605.9	.00569	.001241	.00589	.001284	2.83	
31.0	12.0			.94806	577.2	.00249	.000543			1.21	
34.0	.0			.92461	556.2	.00112	.000244			.56	
2.0	12.0			.95923	581.9	.00191	.000416			.95	
12.0	-12.0			.95040	577.2	.00216	.000471			.97	
12.0	12.0			.95085	577.2	.00197	.000430			.98	
30.0	1.0			.95085	597.9	.00593	.001293			2.70	
31.0	2.0			.93969	589.2	.00573	.001249			2.82	
32.0	2.0			.93913	585.5	.00498	.001086	.00507	.001106	2.66	
32.0	3.0			.93075	573.9	.00422	.000920			2.12	
32.0	6.0			.94192	576.5	.00321	.000700			1.59	
34.0	1.0			.93019	561.2	.00150	.000327	.00152	.000331	.73	
34.0	2.0			.92628	567.2	.00283	.000617	.00281	.000613	1.37	
34.0	3.0			.92517	567.2	.00346	.000754	.00325	.000709	1.68	
36.0	.0			.91567	562.2	.00355	.000774	.00357	.000778	1.78	
38.0	.0			.91400	563.2	.00426	.000929	.00450	.000981	2.07	
44.0	12.0			.92461	562.5	.00256	.000558			1.22	
42.0	.0			.92237	565.9	.00350	.000763	.00390	.000850	1.69	
44.0	.0			.92852	570.9	.00329	.000717	.00329	.000717	1.52	
48.0	.0			.93913	573.5	.00295	.000643	.00296	.000645	1.43	
52.0	.0			.93578	571.2	.00280	.000611	.00280	.000611	1.35	
52.0	12.0			.92299	559.9	.00214	.000467			1.04	
55.0	.0			.93354	569.2	.00285	.000621	.00294	.000641	1.40	
58.0	.0			.94750	577.9	.00266	.000580			1.28	
58.0	12.0			.93075	563.5	.00181	.000395			.88	
58.0	-12.0			.93354	566.9	.00215	.000469				
44.0	-12.0			.93187	567.9	.00276	.000602			1.32	
36.0	-8.0			.93913	574.9	.00322	.000702			1.53	
36.0	-3.0			.93243	560.5	.00092	.000201				
34.0	-3.0			.92182	564.5	.00329	.000717	.00328	.000715	1.60	
32.0	-3.0			.93019	573.9	.00426	.000929	.00429	.000935	1.94	
30.0	-3.0			.93913	578.2	.00413	.000901	.00411	.000896	1.99	
28.0	-3.0			.95141	585.9	.00406	.000885			1.95	
34.0	-12.0			.93187	567.9	.00264	.000576			1.18	
32.0	-12.0			.93410	568.9	.00255	.000556	.00253	.000552	1.14	
30.0	-12.0			.94248	574.5	.00261	.000569			1.21	
19.0	-12.5			.95644	580.9	.00213	.000464			1.03	
17.5	-11.0			.95339	578.9	.00210	.000458			1.01	
15.5	-2.5			.96761	589.9	.00251	.000547			1.21	
16.5	-2.5			.95644	584.5	.00312	.000680	.00289	.000630	1.52	
17.5	-2.5			.96146	591.2	.00362	.000789	.00350	.000763	1.80	
18.5	-2.5			.98045	604.9	.00440	.000959	.00458	.000999	2.15	
19.5	-2.5			.97040	601.5	.00424	.000925	.00402	.000877	2.06	
20.5	-2.5			.97152	599.5	.00418	.000911	.00405	.000883	2.03	
21.5	-2.5			.97766	606.2	.00495	.001079	.00503	.001097	2.41	
22.5	-2.5			.97431	616.9	.00587	.001280	.00611	.001332	2.86	
23.5	-2.5			.96537	603.9	.00639	.001393	.00627	.001367	3.10	
24.5	-2.5			.96872	603.5	.00579	.001263			2.81	
		10.55	90	.92572	572.9	.00479	.001044	.00423	.000922		1.49
		6.55	90	.92517	569.9	.00425	.000927				1.32
		4.55	90	.92293	566.2	.00369	.000805	.00316	.000689		1.15
		2.55	90	.91623	560.2	.00326	.000711	.00281	.000613		1.01
		10.55	180	.91176	553.2	.00215	.000469				
		8.55	180	.93466	567.5	.00163	.000355	.00174	.000379		
		6.55	180	.93857	565.5	.00122	.000266	.00131	.000286		
		4.55	180	.90730	547.9	.00150	.000327	.00141	.000307		
		3.55	180	.90395	546.2	.00149	.000325				
		2.55	180	.90395	546.2	.00129	.000281				
		1.55	180	.93466	563.5	.00131	.000286				
		1.05	180	.92237	555.2	.00110	.000240				
34.0	-1.0			.93187	563.5	.00132	.000288	.00135	.000294	.73	
34.0	4.0			.94471	578.5	.00324	.000706	.00349	.000761	1.60	
34.0	5.0			.94527	578.9	.00312	.000680	.00314	.000685	1.54	
34.0	6.0			.94471	580.9	.00323	.000704	.00324	.000706	1.61	
36.0	6.0			.94750	579.2	.00296	.000645			1.47	
38.0	1.0			.91735	559.9	.00293	.000639	.00291	.000635	1.43	
38.0	2.0			.92796	562.2	.00190	.000414			.93	
44.0	8.0			.93745	570.5	.00253	.000552			1.24	
44.0	6.0			.93857	569.5	.00213	.000464	.00218	.000475	1.06	
44.0	4.0			.94582	572.5	.00181	.000395	.00187	.000408	.94	
44.0	2.0			.92969	566.9	.00263	.000573	.00256	.000558	1.28	
44.0	1.0			.93076	572.2	.00327	.000713	.00350	.000763	1.63	
		10.55	0	.98659	616.9	.00624	.001361				.46
		8.55	0	.98157	616.9	.00700	.001526	.00693	.001511		.52
		6.55	0	.99106	625.9	.00789	.001720	.00800	.001744		.58
		4.55	0	1.00055	620.5	.00505	.001101	.00508	.001108		.37
		3.55	0	.99553	619.5	.00464	.001012	.00464	.001012		.34
		2.55	0	.98938	614.9	.00437	.000953	.00413	.000901		.32
		1.55	0	.99218	621.5	.00541	.001180	.00483	.001054		.40
		1.05	0	1.00055	628.9	.00682	.001487				.50
		10.55	45	.97766	619.5	.00810	.001766	.00863	.002078		.78
		6.55	45	.97877	634.2	.01051	.002295				1.01
		4.55	45	.97710	613.9	.00696	.001518	.00762	.001662		.67
		2.55	45	.97152	600.2	.00449	.000979	.00498	.001086		.43

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(c) M = 2.65; R = 1.27×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96260	581.5	.00100	.000439			.98	
12.0	.0			.96204	580.9	.00103	.000452			1.11	
20.5	.0			1.00111	618.5	.00317	.001391			3.23	
28.0	12.0			.96316	582.9	.00116	.000509			1.15	
28.0	4.0			.96037	586.2	.00190	.000834			1.92	
28.0	.0			.95423	584.5	.00229	.001005			2.34	
20.5	-5.0			.96986	592.2	.00211	.000926			2.03	
24.5	-5.0			.96204	589.2	.00220	.000965			2.32	
30.0	.0			.97376	601.9	.00304	.001334	.00317	.001391	3.27	
31.0	12.0			.95758	580.9	.00123	.000540			1.15	
34.0	.0			.94028	563.2	.00048	.000211			.51	
2.0	-12.0			.96204	581.5	.00104	.000456			.96	
2.0	12.0			.96818	584.9	.00100	.000439			.98	
12.0	-12.0			.96093	580.5	.00104	.000456			.99	
12.0	12.0			.96093	580.2	.00104	.000456			1.05	
30.0	1.0			.96260	601.5	.00324	.001422			3.45	
31.0	2.0			.94976	587.9	.00318	.001395			3.42	
32.0	3.0			.94195	577.2	.00231	.001014			2.41	
32.0	6.0			.95256	578.9	.00152	.000667			1.55	
34.0	1.0			.94028	565.2	.00090	.000395	.00091	.000399	1.02	
34.0	2.0			.93525	566.9	.00141	.000619	.00136	.000597	1.38	
34.0	3.0			.93525	569.2	.00177	.000777	.00157	.000689	1.77	
36.0	.0			.92632	565.2	.00180	.000790	.00163	.000715	1.84	
38.0	.0			.92465	565.9	.00224	.000983	.00257	.001128	2.38	
44.0	12.0			.93749	567.2	.00132	.000579			1.28	
42.0	.0			.93079	567.5	.00190	.000834			1.86	
44.0	.0			.93749	570.5	.00164	.000720	.00164	.000720	1.74	
48.0	.0			.94921	576.5	.00157	.000689	.00158	.000693	1.67	
52.0	.0			.94697	574.5	.00148	.000649	.00148	.000649	1.57	
52.0	12.0			.93581	564.5	.00104	.000456			1.03	
55.0	.0			.94474	573.2	.00145	.000636	.00143	.000627	1.48	
58.0	.0			.95981	581.9	.00144	.000632			1.44	
58.0	12.0			.94642	570.5	.00082	.000360			.80	
58.0	-12.0			.95032	573.9	.00109	.000478				
44.0	-12.0			.94586	575.2	.00132	.000579			1.31	
36.0	-8.0			.95200	578.2	.00153	.000671			1.51	
36.0	-3.0			.93916	563.2	.00036	.000158				
34.0	-3.0			.93358	567.2	.00155	.000680	.00151	.000663	1.57	
32.0	-3.0			.94307	577.9	.00233	.001022	.00238	.001044	2.65	
30.0	-3.0			.94976	580.5	.00220	.000965	.00218	.000956	2.29	
28.0	-3.0			.95925	586.2	.00202	.000886			2.13	
34.0	-12.0			.94474	572.5	.00140	.000614			1.46	
32.0	-12.0			.94642	575.5	.00132	.000579	.00123	.000540	1.33	
30.0	-12.0			.95311	579.5	.00131	.000575			1.26	
19.0	-12.5			.96930	584.9	.00103	.000452			1.04	
17.5	-11.0			.96595	582.5	.00103	.000452			1.01	
15.5	-2.5			.97990	593.9	.00136	.000597			1.28	
16.5	-2.5			.96707	587.2	.00167	.000733	.00146	.000641	1.80	
17.5	-2.5			.96986	591.5	.00209	.000917	.00188	.000825	2.20	
18.5	-2.5			.99162	606.5	.00211	.000926			2.27	
19.5	-2.5			.97767	597.5	.00214	.000939	.00193	.000847	2.16	
20.5	-2.5			.97544	596.9	.00224	.000983	.00210	.000921	2.24	
21.5	-2.5			.97990	602.9	.00285	.001250	.00295	.001294	2.79	
22.5	-2.5			.97600	604.5	.00317	.001391	.00334	.001465	3.23	
23.5	-2.5			.96762	604.9	.00299	.001312	.00282	.001237	2.96	
24.5	-2.5			.97209	599.2	.00283	.001242			2.89	
		10.55	90	.94697	580.2	.00253	.001110				1.11
		6.55	90	.94586	579.9	.00238	.001044				1.04
		4.55	90	.94530	576.5	.00193	.000847				.85
		2.55	90	.93414	567.2	.00174	.000763				.76
		10.55	180	.95144	573.2	.00089	.000390				
		8.55	180	.97376	583.5	.00063	.000276	.00068	.000298		
		6.55	180	.97823	584.5	.00044	.000193	.00052	.000228		
		4.55	180	.94753	568.2	.00068	.000298	.00060	.000263		
		3.55	180	.94307	565.9	.00063	.000276				
		2.55	180	.93972	562.9	.00055	.000241				
		1.55	180	.95646	573.9	.00045	.000197				
		1.05	180	.94855	568.2	.00052	.000228				
34.0	-1.0			.94697	567.9	.00053	.000233	.00058	.000254	.56	
34.0	4.0			.95479	580.9	.00175	.000768	.00198	.000869	1.88	
34.0	5.0			.95479	581.2	.00159	.000698	.00161	.000706	1.57	
34.0	6.0			.95479	580.5	.00152	.000667	.00153	.000671	1.63	
36.0	6.0			.95646	580.5	.00147	.000645			1.53	
38.0	1.0			.92800	564.5	.00156	.000684	.00144	.000632	1.68	
38.0	2.0			.94028	569.2	.00096	.000421			.98	
44.0	8.0			.94865	573.9	.00131	.000575			1.31	
44.0	6.0			.94865	573.5	.00098	.000430	.00098	.000430	.98	
44.0	4.0			.95814	578.9	.00090	.000395	.00097	.000426	.90	
44.0	2.0			.94307	573.5	.00133	.000584	.00128	.000562	1.34	
44.0	1.0			.93916	571.2	.00174	.000763	.00183	.000803	1.96	
		10.55	0	.99553	615.9	.00332	.001457				.35
		8.55	0	.98995	615.5	.00397	.001742	.00394	.001729		.41
		6.55	0	.99665	620.2	.00414	.001816	.00417	.001830		.43
		4.55	0	1.01004	619.9	.00253	.001110	.00263	.001154		.26
		3.55	0	1.00055	612.9	.00245	.001075	.00242	.001062		.26
		2.55	0	.99218	607.5	.00220	.000965	.00194	.000851		.23
		1.55	0	.99386	613.9	.00296	.001299				.23
		1.05	0	1.00111	628.2	.00342	.001501				.31
		10.55	45	.98493	616.5	.00438	.001922				.60
		6.55	45	.98325	622.2	.00520	.002282				.71
		4.55	45	.98660	611.9	.00318	.001395				.43
		2.55	45	.97711	598.2	.00220	.000965				.30

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(d) M = 3.51; R = 3.98 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95464	574.9	.00170	.000332			1.08	
12.0	.0			.95184	573.2	.00161	.000314			1.04	
20.5	.0			1.00111	616.5	.00499	.000974			3.22	
28.0	12.0			.95352	576.9	.00226	.000441			1.27	
28.0	4.0			.94792	580.5	.00407	.000794			2.45	
28.0	.0			.94680	582.2	.00385	.000751			2.44	
20.5	-5.0			.95856	589.2	.00312	.000609			2.01	
24.5	-5.0			.94736	578.9	.00385	.000751			2.60	
30.0	.0			.97032	602.5	.00497	.000970	.00515	.001005	3.21	
31.0	12.0			.94792	573.5	.00225	.000439			1.18	
34.0	.0			.93728	563.2	.00089	.000174	.00080	.000156	.58	
2.0	-12.0			.95352	575.9	.00172	.000336			1.06	
2.0	12.0			.95744	577.2	.00188	.000367			1.01	
12.0	-12.0			.94960	571.9	.00165	.000322			.99	
12.0	12.0			.94960	572.9	.00190	.000371			1.02	
30.0	1.0			.95296	590.5	.00585	.001142			3.77	
31.0	2.0			.93952	581.5	.00571	.001114			3.61	
32.0	3.0			.93056	574.2	.00425	.000830			2.66	
32.0	6.0			.93840	575.2	.00334	.000652			1.98	
34.0	1.0			.93616	561.9	.00129	.000252	.00131	.000256	.83	
34.0	2.0			.92720	561.5	.00238	.000465	.00228	.000445	1.49	
34.0	3.0			.92552	563.9	.00316	.000617	.00296	.000578	1.95	
36.0	.0			.92048	565.9	.00261	.000509	.00263	.000513	1.68	
38.0	.0			.91040	555.5	.00359	.000701	.00365	.000712	2.30	
44.0	12.0			.92328	559.9	.00272	.000531			1.57	
42.0	.0			.91320	555.2	.00297	.000580	.00321	.000627	1.92	
44.0	.0			.92104	559.2	.00272	.000531	.00272	.000531	1.79	
48.0	.0			.93336	565.2	.00250	.000488	.00251	.000490	1.62	
52.0	.0			.92944	562.5	.00228	.000445	.00228	.000445	1.45	
52.0	12.0			.91824	556.2	.00240	.000468			1.35	
55.0	.0			.92776	561.5	.00217	.000424	.00215	.000420	1.46	
58.0	.0			.94288	570.2	.00228	.000445			1.46	
58.0	12.0			.92888	563.2	.00215	.000420			1.21	
58.0	-12.0			.94232	569.2	.00197	.000385				
44.0	-12.0			.94008	572.5	.00264	.000515			1.60	
36.0	-8.0			.93952	574.5	.00318	.000621			2.03	
36.0	-3.0			.93952	562.5	.00084	.000164				
34.0	-3.0			.92496	565.5	.00311	.000607	.00306	.000597	2.09	
32.0	-3.0			.93112	572.2	.00459	.000896	.00463	.000904	2.98	
30.0	-3.0			.93168	576.2	.00443	.000865	.00440	.000859	2.86	
28.0	-3.0			.94512	583.2	.00419	.000818			2.79	
34.0	-12.0			.93448	565.5	.00230	.000449			1.47	
32.0	-12.0			.93392	564.5	.00207	.000404	.00206	.000402	1.25	
30.0	-12.0			.93840	566.5	.00227	.000443			1.42	
19.0	-12.5			.95632	577.2	.00171	.000334			1.08	
17.5	-11.0			.95296	573.5	.00164	.000320			.99	
15.5	-2.5			.97144	587.5	.00224	.000437			1.41	
16.5	-2.5			.95800	581.5	.00263	.000513	.00239	.000466	1.84	
17.5	-2.5			.96024	590.9	.00323	.000630	.00296	.000578	2.08	
18.5	-2.5			.98656	605.2	.00355	.000693			2.48	
19.5	±2.5			.96920	591.9	.00375	.000732	.00334	.000652	2.37	
20.5	±2.5			.96864	592.2	.00361	.000705	.00353	.000689	2.28	
21.5	-2.5			.97368	597.9	.00436	.000851	.00436	.000851	2.76	
22.5	-2.5			.97144	603.5	.00639	.001247	.00659	.001286	4.15	
23.5	-2.5			.96248	605.9	.00567	.001107	.00618	.001206	3.44	
24.5	-2.5			.96360	601.9	.00569	.001111			4.01	
		10.55	90	.93112	577.9	.00433	.000845	.00383	.000748		1.24
		6.55	90	.92776	567.9	.00415	.000810				1.19
		4.55	90	.92496	563.9	.00351	.000685				1.00
		2.55	90	.93280	570.5	.00276	.000539				.79
		10.55	180	.94736	569.9	.00127	.000248				
		8.55	180	.97144	580.9	.00114	.000223	.00120	.000234		
		6.55	180	.97536	580.9	.00063	.000123	.00070	.000137		
		4.55	180	.94512	564.5	.00087	.000170	.00079	.000154		
		3.55	180	.93896	564.2	.00102	.000199				
		2.55	180	.93112	557.9	.00120	.000234				
		1.55	180	.95576	572.5	.00095	.000185				
		1.05	180	.94512	566.5	.00090	.000176				
34.0	-1.0			.94232	563.9	.00084	.000164	.00087	.000170	.56	
34.0	4.0			.94400	580.5	.00318	.000621	.00347	.000677	2.00	
34.0	5.0			.94400	576.2	.00365	.000712	.00371	.000724	2.24	
34.0	6.0			.94064	573.5	.00314	.000613	.00313	.000611	1.71	
36.0	6.0			.94512	575.9	.00326	.000636			1.77	
38.0	1.0			.91656	554.2	.00215	.000420	.00202	.000394	1.37	
38.0	2.0			.92944	559.2	.00161	.000314			1.04	
44.0	8.0			.93840	569.5	.00269	.000525			1.59	
44.0	6.0			.93896	567.5	.00228	.000445	.00234	.000457	1.24	
44.0	4.0			.94624	569.5	.00160	.000312	.00168	.000328	1.00	
44.0	2.0			.93056	561.5	.00194	.000379	.00194	.000379	1.22	
44.0	1.0			.92440	560.5	.00247	.000482	.00259	.000506	1.66	
		10.55	0	.99104	615.9	.00525	.001025				.36
		8.55	0	.98152	617.9	.00701	.001368	.00698	.001362		.48
		6.55	0	.98544	618.2	.00771	.001505	.00773	.001509		.52
		4.55	0	.99944	621.9	.00682	.001331	.00678	.001323		.46
		3.55	0	1.01623	629.9	.00482	.000941	.00489	.000954		.33
		2.55	0	1.02071	627.2	.00454	.000886	.00464	.000906		.30
		1.55	0	1.01119	626.5	.00449	.000876	.00401	.000783		.31
		1.05	0	1.01455	637.2	.00524	.001023				.36
		10.55	45	.98096	625.2	.00862	.001682				.76
		6.55	45	.97704	636.2	.01232	.002405				1.09

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(e) M = 3.51; R = 2.77×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96055	575.5	.00116	.000325			.94	
12.0	.0			.95774	572.5	.00110	.000308			.99	
20.5	.0			1.00338	611.2	.00387	.001083			3.20	
28.0	12.0			.95830	574.2	.00161	.000451			1.05	
28.0	4.0			.95492	580.2	.00283	.000792			2.23	
28.0	.0			.95492	577.5	.00282	.000789			2.19	
20.5	-6.0			.96506	581.9	.00241	.000675			2.01	
24.5	-6.0			.95379	576.5	.00281	.000786			2.27	
30.0	.0			.97577	597.9	.00360	.001008	.00174	.001047	2.90	
31.0	12.0			.95323	571.5	.00187	.000523			1.36	
34.0	.0			.94365	559.9	.00064	.000179	.00057	.000160	.52	
2.0	-12.0			.95999	574.2	.00121	.000339			.95	
2.0	12.0			.96450	576.5	.00127	.000355			.96	
12.0	-12.0			.95548	572.5	.00117	.000327			.91	
12.0	12.0			.95548	570.9	.00130	.000364			.98	
30.0	1.0			.96112	591.9	.00413	.001156			3.36	
31.0	2.0			.94703	579.5	.00432	.001209			3.40	
32.0	3.0			.93858	576.5	.00294	.000823			2.28	
32.0	6.0			.94590	570.5	.00238	.000666			1.79	
34.0	1.0			.94140	560.5	.00088	.000246	.00088	.000246	.73	
34.0	2.0			.93294	559.5	.00167	.000467	.00158	.000442	1.34	
34.0	3.0			.93238	561.9	.00226	.000633	.00213	.000596	1.67	
36.0	.0			.92787	560.5	.00214	.000599	.00216	.000605	1.73	
38.0	.0			.91829	554.2	.00255	.000714	.00280	.000784	2.11	
44.0	12.0			.93013	558.5	.00181	.000507			1.18	
42.0	.0			.91998	553.5	.00209	.000585	.00237	.000663	1.73	
44.0	.0			.92731	557.2	.00193	.000540	.00193	.000540	1.54	
48.0	.0			.93970	564.9	.00172	.000481	.00173	.000484	1.42	
52.0	.0			.93632	560.9	.00171	.000479	.00171	.000479	1.34	
52.0	12.0			.92562	555.2	.00169	.000473			1.10	
56.0	.0			.93463	559.9	.00172	.000481	.00170	.000476	1.33	
58.0	.0			.94985	568.9	.00169	.000473			1.34	
58.0	12.0			.93632	560.5	.00154	.000431			1.01	
58.0	-12.0			.95041	568.5	.00151	.000423				
44.0	-12.0			.94703	568.5	.00189	.000529			1.59	
40.0	-8.0			.94647	569.9	.00226	.000633			1.84	
36.0	-3.0			.94534	561.5	.00057	.000160				
34.0	-3.0			.93182	560.9	.00229	.000641	.00224	.000627	1.92	
32.0	-3.0			.93914	570.2	.00308	.000862	.00313	.000876	2.59	
30.0	-3.0			.93914	573.5	.00331	.000926	.00328	.000918	2.74	
28.0	-3.0			.95097	576.9	.00323	.000904			2.67	
34.0	-12.0			.94252	564.9	.00162	.000453			1.28	
32.0	-12.0			.94196	565.5	.00159	.000445	.00158	.000442	1.33	
30.0	-12.0			.94478	565.5	.00153	.000428			1.24	
19.0	-12.5			.96281	575.5	.00120	.000336			.95	
17.5	-11.0			.95886	574.2	.00116	.000325			.97	
15.5	-2.5			.97633	585.5	.00183	.000512			1.49	
16.5	-2.5			.96337	579.2	.00197	.000551	.00186	.000521	1.60	
17.5	-2.5			.96562	585.2	.00254	.000711	.00230	.000644	2.13	
18.5	-2.5			.99098	598.9	.00270	.000756			2.21	
19.5	-2.5			.97351	588.2	.00275	.000770	.00253	.000708	2.27	
20.5	-2.5			.97126	587.5	.00263	.000736	.00250	.000700	2.19	
21.5	-2.5			.97577	592.9	.00351	.000982	.00353	.000988	2.83	
22.5	-2.5			.97295	597.5	.00466	.001304	.00455	.001273	3.79	
23.5	-2.5			.96393	592.2	.00471	.001318	.00462	.001293	3.77	
24.5	-2.5			.96562	591.9	.00445	.001245			3.68	
		10.55	90	.93463	567.2	.00364	.001019				1.25
		6.55	90	.93238	564.9	.00322	.000901				1.10
		4.55	90	.93125	561.9	.00263	.000736				.90
		2.55	90	.93914	564.5	.00226	.000633				.77
		10.55	180	.95097	564.2	.00088	.000246				
		8.55	180	.97182	575.5	.00068	.000190	.00072	.000202		
		6.55	180	.97746	576.9	.00050	.000140	.00056	.000157		
		4.55	180	.95210	563.5	.00061	.000171	.00055	.000154		
		3.55	180	.94703	561.9	.00077	.000216	.00036	.000101		
		2.55	180	.93970	557.9	.00080	.000224				
		1.55	180	.96168	571.5	.00069	.000193				
		1.05	180	.95210	565.2	.00074	.000207				
34.0	-1.0			.95041	563.9	.00064	.000179	.00069	.000193	.57	
34.0	4.0			.95041	573.2	.00245	.000686	.00265	.000742	1.93	
34.0	5.0			.95041	573.5	.00236	.000661	.00240	.000672	1.79	
34.0	6.0			.94759	571.5	.00231	.000647	.00230	.000644	1.70	
36.0	6.0			.95154	573.5	.00225	.000630			1.69	
38.0	1.0			.92393	553.9	.00163	.000456	.00153	.000428	1.35	
38.0	2.0			.93632	559.5	.00112	.000313			.87	
44.0	8.0			.94478	567.2	.00190	.000532			1.24	
44.0	6.0			.94478	565.5	.00155	.000434	.00161	.000451	1.13	
44.0	4.0			.95323	568.5	.00108	.000302	.00119	.000333	.80	
44.0	2.0			.93914	561.5	.00153	.000428	.00155	.000434	1.20	
44.0	1.0			.93013	558.5	.00193	.000540	.00201	.000563	1.56	
		10.55	0	.99098	604.5	.00399	.001117				.32
		8.55	0	.98309	605.2	.00523	.001464	.00520	.001455		.42
		6.55	0	.98760	611.5	.00629	.001760	.00630	.001763		.51
		4.55	0	1.00281	615.5	.00465	.001301	.00462	.001293		.38
		3.55	0	1.01972	623.5	.00352	.000985	.00363	.001016		.29
		2.55	0	1.02141	622.9	.00314	.000879	.00321	.000898		.26
		1.55	0	1.01126	615.9	.00361	.001010	.00322	.000901		.29
		1.05	0	1.01464	622.2	.00444	.001243				.36
		10.55	45	.98140	612.2	.00722	.002021	.00796	.002228		.76
		6.55	45	.97858	627.5	.00948	.002653				1.00
		4.55	45	.98027	617.2	.00703	.001968				.74

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(f) M = 3.51; R = 1.60 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96349	575.5	.00072	.000351			1.06	
12.0	.0			.96237	574.2	.00069	.000336			1.06	
20.5	.0			.99943	607.2	.00277	.001350			4.07	
28.0	12.0			.96181	575.5	.00098	.000477			1.15	
28.0	4.0			.95732	577.2	.00178	.000867			2.12	
28.0	.0			.95732	578.9	.00187	.000911			2.83	
20.5	-5.0			.96630	582.2	.00146	.000711			2.21	
24.5	-5.0			.95507	575.9	.00173	.000843			2.62	
30.0	.0			.97809	593.5	.00245	.001194	.00251	.001223	3.66	
31.0	12.0			.95844	573.5	.00102	.000497			1.20	
34.0	.0			.95339	565.9	.00033	.000161			.51	
2.0	-12.0			.96293	574.9	.00088	.000429			1.04	
2.0	12.0			.96799	578.5	.00088	.000429			1.04	
12.0	-12.0			.96069	573.2	.00088	.000429			1.31	
12.0	12.0			.95956	573.9	.00083	.000404			1.08	
30.0	1.0			.96686	590.5	.00273	.001330			4.07	
31.0	2.0			.95395	582.5	.00277	.001350			3.74	
32.0	2.0			.95058	574.9	.00210	.001023	.00211	.001028	3.13	
32.0	3.0			.94552	572.9	.00204	.000994			3.00	
32.0	6.0			.95114	571.9	.00166	.000809			1.95	
34.0	1.0			.94889	564.5	.00048	.000234	.00048	.000234	.71	
34.0	2.0			.93991	563.5	.00110	.000536	.00099	.000482	1.62	
34.0	3.0			.93878	564.2	.00144	.000702	.00132	.000643	1.89	
36.0	.0			.93654	563.2	.00137	.000668	.00137	.000668	1.61	
38.0	.0			.92587	557.9	.00172	.000838	.00195	.000950	2.02	
44.0	12.0			.93654	561.2	.00108	.000526			1.40	
42.0	.0			.92643	558.5	.00133	.000648			1.96	
44.0	.0			.93373	559.9	.00131	.000638	.00131	.000638	1.68	
48.0	.0			.94609	566.5	.00128	.000624	.00129	.000629	1.51	
52.0	.0			.94384	564.9	.00102	.000497	.00102	.000497	1.44	
52.0	12.0			.93317	558.5	.00110	.000536			1.29	
55.0	.0			.94215	563.9	.00102	.000497	.00100	.000487	1.52	
58.0	.0			.95788	573.2	.00099	.000482			1.48	
58.0	12.0			.94496	566.2	.00090	.000439			1.07	
58.0	-12.0			.95900	572.9	.00080	.000390				
44.0	-12.0			.95339	570.9	.00107	.000521			1.65	
36.0	-8.0			.95170	572.2	.00135	.000658			2.05	
36.0	-3.0			.94440	562.2	.00031	.000151				
34.0	-3.0			.93766	564.9	.00131	.000638	.00127	.000619	1.96	
32.0	-3.0			.94496	571.2	.00191	.000931	.00196	.000955	2.85	
30.0	-3.0			.94384	570.5	.00211	.001028	.00209	.001018	2.93	
28.0	-3.0			.95226	574.9	.00186	.000906			2.74	
34.0	-12.0			.94889	567.9	.00103	.000502			1.23	
32.0	-12.0			.94889	569.9	.00094	.000458	.00093	.000453	1.40	
30.0	-12.0			.95002	571.5	.00095	.000463			1.40	
19.0	-12.5			.97023	577.9	.00066	.000322			.99	
17.5	-11.0			.96630	575.2	.00067	.000326			.79	
15.5	-2.5			.98090	586.5	.00103	.000502			1.39	
16.5	-2.5			.96742	582.5	.00115	.000560	.00097	.000473	1.35	
17.5	-2.5			.96855	582.2	.00163	.000794	.00142	.000692	2.43	
18.5	-2.5			.99157	596.5	.00164	.000799			2.48	
19.5	-2.5			.97248	586.2	.00169	.000823			2.01	
20.5	-2.5			.96855	582.9	.00166	.000809	.00151	.000736	1.98	
21.5	-2.5			.97360	588.9	.00222	.001082	.00228	.001111	2.61	
22.5	-2.5			.97079	591.5	.00288	.001403	.00307	.001496	4.06	
23.5	-2.5			.96181	586.2	.00314	.001530	.00304	.001481	4.76	
24.5	-2.5			.96349	587.9	.00273	.001330			3.21	
		10.55	90	.94496	569.9	.00219	.001067				.98
		6.55	90	.94384	568.9	.00226	.001101				1.01
		4.55	90	.94665	568.9	.00172	.000838				.77
		2.55	90	.95002	569.5	.00136	.000663				.61
		10.55	180	.97248	575.9	.00041	.000200				
		8.55	180	.98876	585.2	.00027	.000132				
		6.55	180	.99719	589.2	.00020	.000097				
		4.55	180	.97697	578.5	.00031	.000151				
		3.55	180	.96967	575.2	.00035	.000171				
		2.55	180	.95900	569.5	.00037	.000180				
		1.55	180	.97023	576.9	.00045	.000219				
		1.05	180	.96349	572.2	.00034	.000166				
34.0	-1.0			.96069	570.5	.00034	.000166			.51	
34.0	4.0			.95563	574.9	.00166	.000809	.00187	.000911	2.21	
34.0	5.0			.95507	575.5	.00148	.000721	.00150	.000731	2.06	
34.0	6.0			.95282	573.9	.00148	.000721	.00148	.000721	1.74	
36.0	6.0			.95563	574.2	.00137	.000668			1.88	
38.0	1.0			.93148	559.9	.00096	.000468	.00082	.000400	1.39	
38.0	2.0			.94328	562.2	.00064	.000312			.91	
44.0	8.0			.94945	568.9	.00107	.000521			1.26	
44.0	6.0			.95002	569.5	.00090	.000439	.00096	.000468	1.06	
44.0	4.0			.95900	571.5	.00056	.000273	.00064	.000312	.71	
44.0	2.0			.94665	565.5	.00085	.000414	.00087	.000424	1.25	
44.0	1.0			.93654	561.2	.00130	.000633	.00137	.000668	1.97	
		10.55	0	.99157	600.9	.00259	.001262				.28
		8.55	0	.98259	600.2	.00360	.001754	.00357	.001739		.38
		6.55	0	.98708	605.2	.00399	.001944	.00398	.001939		.43
		4.55	0	1.00505	611.5	.00315	.001539	.00313	.001525		.34
		3.55	0	1.01853	616.2	.00231	.001126	.00236	.001150		.25
		2.55	0	1.01684	615.9	.00201	.000979	.00205	.000999		.21
		1.55	0	1.00617	609.9	.00236	.001150				.25
		1.05	0	1.00898	617.2	.00277	.001350				.30
		10.55	45	.98034	614.2	.00428	.002085				.59
		6.55	45	.97753	616.2	.00621	.003026				.86
		4.55	45	.98315	612.5	.00414	.002017				.58
		2.55	45	.99550	604.2	.00220	.001072				.31

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(g) M = 4.44; R = 4.65 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94583	569.9	.00084	.000210			.99	
12.0	.0			.94304	568.2	.00084	.000210			1.17	
20.5	.0			.99720	610.2	.00375	.000938			5.36	
28.0	12.0			.94080	567.9	.00158	.000395			1.53	
28.0	4.0			.93913	573.2	.00270	.000676			3.25	
28.0	.0			.95532	581.9	.00246	.000616			3.08	
20.5	-5.0			.95420	577.9	.00199	.000498			2.97	
24.5	-5.0			.93857	570.9	.00217	.000543			3.24	
30.0	.0			.97877	597.5	.00312	.000781	.00242	.000856	4.59	
31.0	12.0			.93578	565.5	.00147	.000368			1.44	
34.0	.0			.93857	562.2	.00068	.000170	.00060	.000150	1.01	
2.0	-12.0			.94639	568.9	.00084	.000210			1.24	
2.0	12.0			.94639	569.9	.00135	.000338			1.35	
12.0	-12.0			.94192	565.2	.00072	.000180			1.29	
12.0	12.0			.93633	564.2	.00137	.000343			1.38	
30.0	1.0			.96426	590.2	.00366	.000916			5.63	
31.0	2.0			.94918	582.9	.00349	.000873			4.78	
32.0	3.0			.93578	570.9	.00304	.000761			3.66	
32.0	6.0			.92852	564.5	.00254	.000636			2.95	
34.0	1.0			.93633	561.5	.00076	.000190	.00076	.000190	1.09	
34.0	2.0			.93019	561.9	.00147	.000368	.00129	.000373	2.01	
34.0	3.0			.92963	564.2	.00250	.000626	.00231	.000578	3.52	
36.0	.0			.92293	558.5	.00185	.000463	.00190	.000475	2.61	
38.0	.0			.90562	548.9	.00211	.000528	.00250	.000626	3.01	
44.0	12.0			.92070	557.9	.00207	.000518			2.01	
42.0	.0			.90283	545.9	.00167	.000418	.00210	.000526	2.39	
44.0	.0			.91121	551.2	.00152	.000380	.00153	.000383	2.20	
48.0	.0			.92517	558.5	.00147	.000368	.00149	.000373	1.84	
52.0	.0			.92126	555.2	.00140	.000350	.00140	.000350	2.03	
52.0	12.0			.91400	553.9	.00209	.000523			2.11	
55.0	.0			.92014	554.5	.00140	.000350	.00136	.000340	1.94	
58.0	.0			.93522	563.9	.00116	.000290			2.19	
58.0	12.0			.92907	562.9	.00182	.000455			1.77	
58.0	-12.0			.93633	564.2	.00137	.000343				
44.0	-12.0			.93689	566.2	.00160	.000400			2.76	
36.0	-8.0			.93075	564.2	.00206	.000516			3.55	
36.0	-3.0			.93689	561.2	.00049	.000123				
34.0	-3.0			.92405	559.9	.00206	.000516	.00196	.000491	2.94	
32.0	-3.0			.93243	570.9	.00260	.000651	.00268	.000671	3.88	
30.0	-3.0			.93243	569.5	.00329	.000823	.00325	.000813	5.31	
28.0	-3.0			.94192	574.5	.00302	.000756			4.31	
34.0	-12.0			.93075	560.9	.00138	.000345			2.51	
32.0	-12.0			.92852	559.9	.00117	.000293	.00115	.000288	1.83	
30.0	-12.0			.93075	560.5	.00137	.000343			2.14	
19.0	-12.5			.95030	570.9	.00083	.000208			1.41	
17.5	-11.0			.94694	568.9	.00083	.000208			1.43	
15.5	-2.5			.96705	584.9	.00143	.000358			2.23	
16.5	-2.5			.95644	579.5	.00177	.000443	.00146	.000365	2.60	
17.5	-2.5			.95923	582.9	.00211	.000528			3.15	
18.5	-2.5			.98380	597.9	.00205	.000513			3.36	
19.5	-2.5			.96091	583.5	.00243	.000608				
20.5	-2.5			.96035	583.9	.00211	.000528	.00188	.000470	3.35	
21.5	-2.5			.96537	588.9	.00314	.000786	.00318	.000796	4.91	
22.5	-2.5			.96481	595.2	.00393	.000984	.00402	.001006	4.97	
23.5	-2.5			.95420	589.2	.00386	.000966	.00365	.000913	4.83	
24.5	-2.5			.95532	587.2	.00410	.001026			5.69	
		10.55	90	.92293	559.5	.00273	.000683	.00164	.000410		.70
		6.55	90	.91623	557.2	.00312	.000781				1.02
		4.55	90	.91456	556.5	.00293	.000733				.96
		2.55	90	.94080	567.2	.00168	.000420				.55
		10.55	180	.93633	558.9	.00062	.000155				
		8.55	180	.95476	569.5	.00040	.000100	.00046	.000115		
		6.55	180	.95923	571.2	.00029	.000073	.00037	.000093		
		4.55	180	.94304	562.5	.00043	.000108				
		3.55	180	.94248	562.5	.00050	.000125				
		2.55	180	.93298	558.2	.00055	.000138				
		1.55	180	.95644	572.9	.00084	.000210				
		1.05	180	.94694	566.9	.00059	.000148				
34.0	-1.0			.94471	565.5	.00056	.000140	.00065	.000163	.92	
34.0	4.0			.94192	572.2	.00249	.000623	.00277	.000693	3.41	
34.0	5.0			.93466	567.9	.00251	.000628	.00225	.000563	2.95	
34.0	6.0			.93131	565.9	.00252	.000631	.00251	.000628	2.96	
36.0	6.0			.93522	567.9	.00249	.000623			2.77	
38.0	1.0			.91400	552.2	.00150	.000375	.00130	.000325	2.05	
38.0	2.0			.93019	560.2	.00116	.000290			1.66	
44.0	8.0			.93243	564.5	.00203	.000508			2.16	
44.0	6.0			.92963	561.9	.00148	.000370	.00163	.000408	1.87	
44.0	4.0			.93857	564.2	.00111	.000278	.00126	.000315	1.59	
44.0	2.0			.92405	556.9	.00139	.000348	.00146	.000365	1.67	
44.0	1.0			.91567	551.9	.00155	.000388	.00160	.000400	2.28	
		10.55	0	.98101	597.5	.00362	.000906				.28
		8.55	0	.97766	600.9	.00489	.001224	.00492	.001231		.38
		6.55	0	.97542	605.9	.00534	.001336	.00526	.001316		.42
		4.55	0	.98659	614.2	.00581	.001454	.00594	.001487		.46
		3.55	0	.99497	611.9	.00436	.001091	.00482	.000956		.34
		2.55	0	1.02457	628.5	.00277	.000693				.22
		1.55	0	1.01954	622.5	.00301	.000753	.00294	.000736		.23
		1.05	0	1.01507	621.9	.00352	.000881				.27
		10.55	45	.97096	607.2	.00528	.001321				.54
		6.55	45	.96593	608.2	.00707	.001769				.72
		4.55	45	.96872	608.9	.00712	.001782				.72
		2.55	45	.99888	609.5	.00306	.000763				.31

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Continued

(h) M = 4.44; R = 3.14×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94100	571.5	.00070	.000253			1.19	
12.0	.0			.94155	571.2	.00063	.000228			.85	
20.5	.0			.99117	611.2	.00253	.000914			4.77	
28.0	12.0			.93990	572.9	.00094	.000340			1.06	
28.0	4.0			.93824	575.9	.00181	.000654			3.12	
28.0	.0			.95423	584.5	.00180	.000651			2.86	
20.5	-6.0			.95093	581.6	.00134	.000484			2.53	
24.5	-6.0			.93659	573.2	.00148	.000535			2.74	
30.0	.0			.97739	601.9	.00196	.000708			3.56	
31.0	12.0			.93604	570.6	.00094	.000340			1.31	
2.0	-12.0			.94045	570.9	.00055	.000199			1.02	
2.0	12.0			.94210	574.2	.00082	.000296			1.09	
12.0	-12.0			.93935	569.5	.00053	.000192			1.08	
12.0	12.0			.93549	568.9	.00077	.000278			1.03	
30.0	1.0			.96361	593.5	.00214	.000773			3.19	
31.0	2.0			.94982	585.9	.00251	.000907			4.40	
32.0	3.0			.93714	575.5	.00196	.000708			3.11	
32.0	6.0			.92887	568.9	.00151	.000546			2.32	
34.0	1.0			.93935	568.5	.00054	.000195	.00052	.000188	.81	
34.0	2.0			.93218	567.9	.00094	.000340			1.49	
34.0	3.0			.93053	569.9	.00138	.000499	.00132	.000477	2.51	
36.0	.0			.92777	565.9	.00121	.000437	.00124	.000448	1.98	
38.0	.0			.91123	558.5	.00147	.000531			2.58	
44.0	12.0			.92170	565.5	.00139	.000502			1.58	
42.0	.0			.90627	552.5	.00119	.000430			1.89	
44.0	.0			.91674	557.9	.00095	.000343	.00096	.000347		
48.0	.0			.92722	564.5	.00094	.000340	.00096	.000347	1.65	
52.0	.0			.92556	562.9	.00093	.000336	.00093	.000336	1.69	
52.0	12.0			.91399	562.5	.00141	.000510			1.68	
55.0	.0			.92446	562.5	.00083	.000300	.00080	.000289	1.43	
58.0	.0			.93880	570.9	.00092	.000333			1.44	
58.0	12.0			.92997	567.2	.00123	.000445			1.46	
58.0	-12.0			.93714	569.9	.00081	.000293				
44.0	-12.0			.93769	571.2	.00116	.000419			2.37	
36.0	-8.0			.93108	571.5	.00138	.000499			2.82	
36.0	-3.0			.92997	563.2	.00037	.000134				
34.0	-3.0			.92556	567.9	.00139	.000502	.00134	.000484	2.53	
32.0	-3.0			.93328	575.5	.00212	.000766	.00219	.000792	4.16	
30.0	-3.0			.93273	573.5	.00218	.000788	.00215	.000777	3.96	
28.0	-3.0			.93935	577.2	.00198	.000716			3.74	
34.0	-12.0			.93108	566.5	.00081	.000293			1.62	
32.0	-12.0			.92997	565.2	.00074	.000267	.00072	.000260	1.51	
30.0	-12.0			.93218	567.2	.00093	.000336			1.90	
19.0	-12.5			.94872	574.9	.00055	.000199			1.12	
17.5	-11.0			.94541	572.9	.00057	.000206			1.16	
15.5	-2.5			.96416	587.5	.00083	.000300			1.57	
16.5	-2.5			.95203	581.2	.00121	.000437			2.37	
17.5	-2.5			.95478	584.5	.00163	.000589			2.67	
18.5	-2.5			.98015	600.2	.00131	.000473			2.62	
19.5	-2.5			.95589	585.5	.00135	.000488			2.45	
20.5	-2.5			.95478	583.9	.00145	.000524	.00132	.000477	2.38	
21.5	-2.5			.95975	589.9	.00211	.000763	.00216	.000781	3.46	
22.5	-2.5			.95920	594.2	.00286	.001034	.00324	.001171	5.61	
23.5	-2.5			.94927	588.2	.00262	.000947	.00252	.000911	4.76	
24.5	-2.5			.95037	587.9	.00257	.000929			4.85	
		10.55	90	.92942	569.2	.00226	.000817				.89
		6.55	90	.92336	566.2	.00214	.000773				.86
		4.55	90	.92391	565.9	.00177	.000640				.70
		2.55	90	.94486	575.5	.00113	.000408				.44
		10.55	180	.95037	572.5	.00032	.000116				
		8.55	180	.96471	581.2	.00030	.000108	.00035	.000127		
		1.55	180	.95754	579.5	.00039	.000141				
34.0	-1.0			.94927	574.2	.00044	.000159	.00053	.000192	.85	
34.0	4.0			.94210	576.5	.00147	.000531			1.99	
34.0	5.0			.93494	572.5	.00149	.000539	.00143	.000517	2.37	
34.0	6.0			.93163	570.5	.00168	.000607	.00168	.000607	2.58	
36.0	6.0			.93494	571.9	.00159	.000575			2.45	
38.0	1.0			.91784	558.9	.00114	.000412	.00097	.000351	1.81	
38.0	2.0			.93273	566.5	.00074	.000267			1.35	
44.0	8.0			.93273	569.2	.00123	.000445			1.66	
44.0	6.0			.93053	566.5	.00085	.000307	.00095	.000343	1.31	
44.0	4.0			.94045	571.9	.00081	.000293	.00097	.000351	1.42	
44.0	2.0			.92832	564.9	.00093	.000336	.00101	.000365	1.69	
44.0	1.0			.91895	559.9	.00095	.000343	.00105	.000380		
		10.55	0	.98235	607.2	.00290	.001048				.27
		8.55	0	.97794	606.2	.00395	.001428	.00397	.001435		.37
		6.55	0	.97574	605.9	.00408	.001475	.00400	.001446		.38
		4.55	0	.98731	614.2	.00391	.001413	.00398	.001439		.37
		3.55	0	.99558	614.5	.00270	.000976	.00242	.000875		.25
		2.55	0	1.02039	627.2	.00199	.000719				.19
		1.55	0	1.01323	623.2	.00201	.000726	.00198	.000716		.19
		1.05	0	1.00771	621.5	.00236	.000853				.22
		10.55	45	.97022	604.2	.00470	.001699				.57
		6.55	45	.96526	607.2	.00570	.002060				.69
		4.55	45	.96912	610.9	.00516	.001865				.63
		2.55	45	.99669	611.9	.00201	.000726				.24

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

7. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream - Concluded

(i) M = 4.44; R = 2.13 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94891	571.2	.00050	.000269			.94	
12.0	.0			.95168	572.8	.00046	.000247			.92	
20.5	.0			.99278	605.9	.00230	.001235			4.51	
28.0	12.0			.94835	571.9	.00085	.000457			1.35	
28.0	4.0			.94391	572.9	.00161	.000865			3.16	
28.0	.0			.95835	580.9	.00148	.000795				
20.5	-5.0			.95501	577.2	.00104	.000559			2.60	
24.5	-5.0			.94058	570.5	.00144	.000773			2.88	
30.0	.0			.98222	597.2	.00171	.000919	.00201	.001080	4.28	
31.0	12.0			.94613	570.2	.00074	.000397			.94	
2.0	-12.0			.94835	570.2	.00039	.000209			.74	
2.0	12.0			.95057	572.9	.00077	.000414			.96	
12.0	-12.0			.94835	569.9	.00042	.000226			.91	
12.0	12.0			.94446	568.5	.00059	.000317			.75	
30.0	1.0			.96800	592.2	.00191	.001026			4.78	
31.0	2.0			.95724	583.2	.00200	.001101			3.94	
32.0	2.0			.95335	581.9	.00161	.000865	.00153	.000876	4.03	
32.0	3.0			.94557	574.2	.00170	.000913			3.62	
32.0	6.0			.93780	570.5	.00128	.000688			2.42	
34.0	1.0			.95113	570.5	.00034	.000183	.00035	.000188	.65	
34.0	2.0			.94335	568.9	.00086	.000462	.00081	.000435	1.62	
34.0	3.0			.94002	571.2	.00127	.000682	.00106	.000569	2.49	
36.0	.0			.94113	567.9	.00102	.000548	.00104	.000559	2.32	
38.0	.0			.92558	560.2	.00126	.000677			2.47	
40.0	.0			.82507	495.2	.00021	.000113				
44.0	12.0			.93113	562.5	.00106	.000566			1.58	
42.0	.0			.91947	554.5	.00102	.000548			2.13	
44.0	.0			.92836	559.9	.00087	.000467	.00088	.000473	1.78	
48.0	.0			.94002	565.9	.00071	.000381	.00073	.000392	1.48	
52.0	.0			.93891	564.5	.00061	.000329	.00061	.000328	1.53	
52.0	12.0			.92280	557.2	.00109	.000585			1.38	
56.0	.0			.93724	563.9	.00066	.000355	.00063	.000338		
58.0	.0			.95113	572.2	.00058	.000312			1.12	
58.0	12.0			.93946	567.5	.00087	.000467			1.10	
58.0	-12.0			.94835	571.2	.00068	.000365				
44.0	-12.0			.94724	572.2	.00090	.000483			2.31	
36.0	-8.0			.94002	569.5	.00118	.000634			2.68	
34.0	-3.0			.93558	565.2	.00134	.000720	.00131	.000704	3.05	
32.0	-3.0			.94113	571.2	.00165	.000886	.00170	.000913	3.30	
30.0	-3.0			.93891	570.9	.00176	.000945	.00174	.000935	4.00	
28.0	-3.0			.94391	574.5	.00183	.000983				
34.0	-12.0			.94113	566.9	.00066	.000355			1.38	
32.0	-12.0			.94058	565.9	.00060	.000322	.00058	.000312		
30.0	-12.0			.94224	567.2	.00061	.000328			1.56	
19.0	-12.5			.95835	575.5	.00045	.000242				
17.5	-11.0			.95501	573.2	.00038	.000204			.97	
15.5	-2.5			.97112	586.5	.00084	.000451			2.10	
16.5	-2.5			.95612	577.9	.00103	.000553			1.98	
17.5	-2.5			.95779	580.9	.00141	.000757				
18.5	-2.5			.98278	595.9	.00137	.000736			2.91	
19.5	-2.5			.95779	581.2	.00130	.000698			2.50	
20.5	-2.5			.95668	580.5	.00130	.000698	.00115	.000618	2.50	
21.5	-2.5			.96112	584.9	.00182	.000978	.00190	.001021		
22.5	-2.5			.96001	587.9	.00262	.001407	.00296	.001590	6.55	
23.5	-2.5			.95002	582.2	.00252	.001354	.00233	.001252	5.48	
24.5	-2.5			.95224	581.9	.00231	.001241			5.02	
		10.55	90	.93835	568.2	.00160	.000859				.77
		6.55	90	.93336	565.9	.00172	.000924				.83
		4.55	90	.93613	566.2	.00153	.000822				.74
		2.55	90	.95501	575.5	.00101	.000543				.49
		10.55	180	.96668	576.9	.00225	.001134				
		8.55	180	.97723	582.5	.00020	.000107	.00023	.000124		
		4.55	180	.97167	580.5	.00022	.000118				
		3.55	180	.97223	581.5	.00023	.000124				
		2.55	180	.95946	574.5	.00030	.000161				
		1.55	180	.96834	581.2	.00036	.000193				
		1.05	180	.96390	577.9	.00030	.000161				
34.0	4.0			.95057	577.2	.00132	.000709				
34.0	5.0			.94391	573.9	.00127	.000682	.00120	.000645	2.49	
34.0	6.0			.94058	570.2	.00126	.000677	.00126	.000677	2.33	
36.0	6.0			.94280	572.2	.00119	.000639			2.25	
38.0	1.0			.93002	560.9	.00087	.000467	.00075	.000403	1.71	
38.0	2.0			.94391	566.9	.00058	.000312			1.45	
44.0	8.0			.94169	568.5	.00102	.000548			1.89	
44.0	6.0			.94002	566.5	.00075	.000403	.00081	.000435	1.42	
44.0	4.0			.95057	571.5	.00051	.000274	.00064	.000344	1.11	
44.0	2.0			.94113	566.5	.00066	.000355	.00072	.000387	1.32	
44.0	1.0			.93169	562.2	.00077	.000414	.00094	.000505	1.64	
		10.55	0	.98500	598.9	.00214	.001134				.24
		8.55	0	.97945	600.5	.00328	.001762	.00330	.001773		.38
		6.55	0	.97778	599.5	.00322	.001730	.00314	.001687		.37
		4.55	0	.99055	607.9	.00335	.001799	.00342	.001837		.38
		3.55	0	.99888	609.2	.00253	.001359	.00221	.001187		.29
		2.55	0	1.02054	621.2	.00187	.001004				.21
		1.55	0	1.01443	616.9	.00171	.000919	.00173	.000929		.20
		1.05	0	1.00832	614.9	.00206	.001107				.24
		10.55	45	.97223	598.2	.00339	.001821				.51
		6.55	45	.96668	600.2	.00526	.002836				.79
		4.55	45	.97278	602.5	.00475	.002552				.71
		2.55	45	.99944	606.5	.00182	.000978				.27

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream

(a) M = 2.65; R = 3.89×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95426	589.9	.00248	.000351			.86	
12.0	.0			1.02424	670.2	.00822	.001164			2.64	
20.5	.0			.91348	576.2	.00491	.000695			1.72	
28.0	12.0			.93167	578.2	.00309	.000437			.93	
28.0	4.0			.95481	601.2	.00476	.000674			1.64	
28.0	.0			.96748	630.2	.00705	.000998			2.33	
20.5	-5.0			.94710	594.5	.00461	.000653			1.53	
24.5	-5.0			.93718	582.5	.00331	.000469			1.10	
30.0	.0			1.00771	660.2	.00841	.001191	.00891	.001261	2.69	
31.0	12.0			.93001	576.9	.00307	.000435			1.02	
34.0	.0			.94654	578.2	.00180	.000255			.58	
2.0	-12.0			.95205	591.5	.00275	.000389			.91	
2.0	12.0			.95591	590.2	.00266	.000377			.85	
12.0	-12.0			.95812	593.9	.00288	.000408			.92	
12.0	12.0			.95481	589.9	.00267	.000378			.91	
30.0	1.0			.99063	639.2	.00844	.001195			2.87	
31.0	2.0			.98457	635.2	.00826	.001169			2.90	
32.0	2.0			.97520	627.2	.00649	.000919	.00648	.000917	2.36	
32.0	3.0			.96969	630.5	.00621	.000879			1.97	
32.0	6.0			.94489	593.5	.00455	.000644			1.57	
34.0	1.0			.94765	583.5	.00242	.000343	.00214	.000303	.82	
34.0	2.0			.95646	601.2	.00500	.000708	.00516	.000731	1.70	
34.0	3.0			.95922	608.5	.00562	.000796	.00556	.000787	1.91	
36.0	.0			.91458	576.9	.00431	.000610	.00427	.000605	1.46	
38.0	.0			.91734	576.5	.00479	.000678	.00509	.000721	1.57	
44.0	12.0			.94214	586.9	.00321	.000454			1.04	
42.0	.0			.92340	578.9	.00431	.000610	.00480	.000680	1.38	
44.0	.0			.93552	584.5	.00368	.000521	.00369	.000522	1.27	
48.0	.0			.94985	593.2	.00405	.000573	.00409	.000579	1.33	
52.0	12.0			.92560	571.2	.00259	.000367			.85	
55.0	.0			.93883	585.5	.00378	.000535	.00400	.000566	1.29	
58.0	.0			.95481	593.9	.00347	.000491			1.18	
58.0	12.0			.94489	581.5	.00226	.000320			.72	
58.0	-12.0			.93442	576.9	.00260	.000368				
44.0	-12.0			.93332	579.2	.00322	.000456			1.02	
36.0	-8.0			.93607	586.2	.00419	.000593			1.32	
36.0	-3.0			.92560	567.9	.00126	.000178				
34.0	-3.0			.95922	607.2	.00547	.000774	.00563	.000797	1.81	
32.0	-3.0			.97134	630.5	.00682	.000966	.00705	.000998	2.18	
30.0	-3.0			.95812	608.9	.00596	.000844	.00619	.000876	1.97	
28.0	-3.0			.96142	613.2	.00559	.000791			1.86	
34.0	-12.0			.92340	575.5	.00354	.000501			1.10	
32.0	-12.0			.92395	575.9	.00346	.000490	.00347	.000491	1.08	
30.0	-12.0			.92175	573.9	.00339	.000480			1.06	
19.0	-12.5			.97079	602.2	.00308	.000436			.97	
17.5	-11.0			.96252	597.9	.00320	.000453			1.06	
15.5	-2.5			.98732	631.5	.00600	.000849			1.99	
16.5	-2.5			.95316	601.2	.00505	.000715	.00454	.000643	1.74	
17.5	-2.5			.94765	594.9	.00452	.000640	.00418	.000592	1.50	
18.5	-2.5			.96914	604.9	.00390	.000552			1.25	
19.5	-2.5			.94048	585.9	.00375	.000531	.00348	.000493	1.25	
20.5	-2.5			.93552	582.2	.00361	.000511	.00355	.000503	1.16	
21.5	-2.5			.93552	581.2	.00341	.000483	.00344	.000487	1.13	
22.5	-2.5			.93222	578.9	.00326	.000462	.00321	.000454	1.08	
23.5	-2.5			.93167	578.5	.00330	.000467	.00318	.000450	1.06	
24.5	-2.5			.94048	583.9	.00322	.000456			1.10	
		10.55	90	.95536	583.2	.00226	.000320				.57
		6.55	90	.97520	598.2	.00264	.000374				.67
		4.55	90	.95481	591.5	.00367	.000505				.91
		2.55	90	.94324	580.2	.00278	.000394				.71
		10.55	180	.99173	600.5	.00148	.000210				
		8.55	180	1.00165	607.9	.00132	.000187	.00136	.000193		
		6.55	180	.99283	604.9	.00159	.000225	.00156	.000221		
		4.55	180	1.00495	605.5	.00071	.000101	.00067	.000095		
		3.55	180	1.00991	608.9	.00076	.000108				
		2.55	180	.98016	593.9	.00098	.000139				
		1.55	180	.97079	589.9	.00102	.000144				
		1.05	180	.96583	590.2	.00133	.000188				
34.0	-1.0			.96969	594.2	.00205	.000290	.00217	.000307	.73	
34.0	4.0			.97299	618.2	.00617	.000874	.00636	.000900	1.98	
34.0	5.0			.95261	606.9	.00546	.000773	.00534	.000756	1.74	
34.0	6.0			.94434	593.5	.00447	.000633	.00445	.000630	1.42	
36.0	6.0			.94875	597.5	.00461	.000653			1.58	
38.0	1.0			.92836	577.5	.00348	.000493	.00334	.000473	1.15	
38.0	2.0			.94544	584.2	.00286	.000405			.91	
44.0	8.0			.91899	571.9	.00332	.000470			1.06	
44.0	6.0			.92836	578.5	.00326	.000462	.00365	.000517	1.04	
44.0	4.0			.94710	583.9	.00254	.000360	.00256	.000362	.81	
44.0	2.0			.94103	584.9	.00334	.000473			1.06	
44.0	1.0			.93442	582.5	.00358	.000507	.00381	.000539	1.27	
		10.55	0	.99944	672.2	.01309	.001853				.79
		8.55	0	1.01046	674.2	.01208	.001710	.01213	.001717		.73
		6.55	0	1.01212	670.2	.01107	.001567	.01106	.001566		.67
		4.55	0	1.00606	662.5	.01186	.001679	.01196	.001693		.71
		3.55	0	1.00110	655.5	.01027	.001454	.00981	.001389		.62
		2.55	0	1.01377	669.5	.00962	.001362	.00968	.001370		.58
		1.55	0	1.01873	673.5	.01092	.001546	.01187	.001681		.66
		1.05	0	1.01157	665.8	.01023	.001448				.62
		10.55	45	.97134	633.2	.00980	.001387	.01035	.001465		.77
		6.55	45	.99393	638.5	.00812	.001150	.00806	.001141		.64
		4.55	45	.98401	638.5	.00939	.001329	.00955	.001352		.74
		2.55	45	.99063	640.2	.00810	.001147	.00850	.001203		.64

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(b) M = 2.65; R = 2.51 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, ^oR	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96174	589.5	.00173	.000379			.89	
12.0	.0			1.02550	661.2	.00649	.001422			3.23	
20.5	.0			.91683	572.9	.00366	.000802			1.79	
28.0	12.0			.93679	576.5	.00216	.000473			.98	
28.0	4.0			.95841	597.9	.00344	.000754			1.70	
28.0	.0			.97061	617.9	.00526	.001153			2.60	
20.5	-5.0			.95232	591.5	.00311	.000681			1.50	
24.5	-5.0			.94234	580.5	.00240	.000526			1.09	
30.0	.0			1.00776	650.2	.00686	.001503	.00725	.001589	3.41	
31.0	12.0			.93624	575.9	.00219	.000480			1.06	
34.0	.0			.94566	574.9	.00125	.000274			.62	
2.0	-12.0			.95897	588.9	.00200	.000438			.98	
2.0	12.0			.96285	591.2	.00181	.000397			.90	
12.0	-12.0			.96285	592.5	.00209	.000458			.94	
12.0	12.0			.96119	589.5	.00185	.000405			.92	
30.0	1.0			.99057	642.9	.00554	.001214			2.52	
31.0	2.0			.98336	627.9	.00603	.001321			2.97	
32.0	2.0			.97394	621.5	.00454	.000995	.00450	.000986	2.43	
32.0	3.0			.97061	613.9	.00469	.001028			2.36	
32.0	6.0			.95010	591.2	.00327	.000717			1.62	
34.0	1.0			.94677	578.9	.00169	.000370	.00141	.000309	.82	
34.0	2.0			.95731	594.9	.00313	.000686	.00326	.000714	1.51	
34.0	3.0			.96174	603.5	.00407	.000892	.00401	.000879	1.98	
36.0	.0			.91850	572.2	.00310	.000679	.00307	.000673	1.55	
38.0	.0			.92072	573.5	.00334	.000732			1.62	
44.0	12.0			.94511	581.5	.00214	.000469			1.02	
42.0	.0			.92681	575.5	.00318	.000697	.00362	.000793	1.54	
44.0	.0			.93846	581.2	.00283	.000620	.00283	.000620	1.31	
48.0	.0			.95343	590.9	.00289	.000633	.00291	.000638	1.40	
52.0	.0			.93790	581.2	.00276	.000605	.00274	.000600	1.33	
52.0	12.0			.92959	569.5	.00182	.000399			.88	
55.0	.0			.94234	582.9	.00272	.000596	.00270	.000592	1.34	
58.0	.0			.95786	591.5	.00252	.000552			1.21	
58.0	12.0			.95010	580.5	.00163	.000357			.79	
58.0	-12.0			.94012	576.5	.00202	.000443				
44.0	-12.0			.93679	576.9	.00244	.000535			1.17	
36.0	-8.0			.94012	583.5	.00301	.000660			1.43	
36.0	-3.0			.93402	567.5	.00082	.000180				
34.0	-3.0			.96119	601.5	.00401	.000879	.00398	.000872	1.95	
32.0	-3.0			.97227	616.5	.00503	.001102	.00520	.001139	2.29	
30.0	-3.0			.96063	604.2	.00433	.000949	.00424	.000929	2.08	
28.0	-3.0			.96507	605.9	.00413	.000905			1.99	
34.0	-12.0			.92959	574.2	.00257	.000563			1.15	
32.0	-12.0			.93069	574.9	.00254	.000557	.00256	.000561	1.14	
30.0	-12.0			.92903	572.9	.00250	.000548			1.16	
19.0	-12.5			.97283	598.9	.00216	.000473			1.05	
17.5	-11.0			.96562	595.5	.00241	.000528			1.16	
15.5	-2.5			.98569	624.2	.00429	.000940			2.07	
16.5	-2.5			.95453	596.5	.00365	.000800	.00324	.000710	1.78	
17.5	-2.5			.94954	593.2	.00334	.000732	.00296	.000649	1.66	
18.5	-2.5			.97227	601.9	.00276	.000605			1.35	
19.5	-2.5			.94345	583.5	.00276	.000605	.00259	.000568	1.34	
20.5	-2.5			.93901	579.9	.00257	.000563	.00251	.000550	1.25	
21.5	-2.5			.93846	578.9	.00248	.000543	.00251	.000550	1.21	
22.5	-2.5			.93513	576.9	.00244	.000535	.00241	.000528	1.19	
23.5	-2.5			.93402	575.9	.00249	.000546	.00234	.000513	1.21	
24.5	-2.5			.94400	582.2	.00246	.000539			1.19	
		10.55	90	.95343	578.9	.00140	.000307				.43
		6.55	90	.96673	591.9	.00210	.000460				.65
		4.55	90	.94844	585.2	.00279	.000611				.87
		2.55	90	.93901	575.5	.00207	.000454				.64
		10.55	180	.99390	603.9	.00110	.000241				
		8.55	180	1.00110	605.2	.00089	.000195	.00093	.000204		
		6.55	180	.98835	600.5	.00111	.000243	.00113	.000248		
		4.55	180	.99889	600.5	.00042	.000092				
		3.55	180	1.00338	603.9	.00041	.000090				
		2.55	180	.97449	589.2	.00080	.000175				
		1.55	180	.96950	586.5	.00080	.000175				
		1.05	180	.96340	584.5	.00093	.000204				
34.0	-1.0			.96895	589.9	.00137	.000300	.00148	.000324	.75	
34.0	4.0			.97671	614.2	.00408	.000894			2.02	
34.0	5.0			.95731	600.2	.00408	.000894	.00398	.000872	2.01	
34.0	6.0			.94899	591.2	.00357	.000782	.00355	.000778	1.78	
36.0	6.0			.95287	594.5	.00339	.000743			1.68	
38.0	1.0			.93180	575.9	.00258	.000565	.00249	.000546	1.26	
38.0	2.0			.94844	582.2	.00201	.000440			.99	
44.0	8.0			.92349	569.9	.00234	.000513			1.15	
44.0	6.0			.93180	575.5	.00231	.000506	.00223	.000489	1.15	
44.0	4.0			.95065	582.5	.00184	.000403	.00186	.000408	.96	
44.0	2.0			.94455	582.5	.00239	.000524	.00240	.000526	1.16	
44.0	1.0			.93679	579.5	.00260	.000570	.00279	.000611	1.29	
		10.55	0	.99556	662.5	.00917	.002009				.68
		8.55	0	1.00609	665.8	.00849	.002080	.00958	.002099		.70
		6.55	0	1.00776	657.9	.00905	.001983	.00906	.001985		.67
		4.55	0	1.00110	657.2	.00860	.001885	.00865	.001895		.63
		3.55	0	.99833	647.5	.00769	.001685	.00727	.001593		.57
		2.55	0	1.01219	662.8	.00739	.001619	.00751	.001646		.54
		1.55	0	1.01774	670.5	.00781	.001711	.00848	.001858		.58
		1.05	0	1.01053	658.5	.00770	.001687				.57
		10.55	45	.96895	614.5	.00553	.001212	.00544	.001192		.53
		6.55	45	.98724	630.2	.00606	.001328	.00640	.001402		.58
		4.55	45	.97893	629.5	.00729	.001597	.00742	.001626		.70
		2.55	45	.98780	632.5	.00573	.001255	.00656	.001437		.55

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-^oR.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(c) M = 2.65; R = 1.26×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, $^\circ R$	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96566	586.5	.00101	.000440			.99	
12.0	.0			1.02159	650.9	.00481	.002095			5.17	
20.5	.0			.92690	569.5	.00219	.000954			2.23	
28.0	12.0			.94794	576.2	.00119	.000518			1.18	
28.0	4.0			.96511	592.5	.00211	.000919			2.13	
28.0	.0			.97120	606.5	.00339	.001477			3.46	
20.5	-5.0			.96068	586.9	.00167	.000727			1.61	
24.5	-5.0			.95514	581.9	.00125	.000545			1.32	
30.0	.0			1.00553	642.9	.00449	.001956	.00473	.002060	4.83	
31.0	12.0			.94794	575.2	.00112	.000488			1.05	
34.0	.0			.96123	576.9	.00054	.000235			.57	
2.0	-12.0			.96400	585.5	.00105	.000457			.97	
2.0	12.0			.96621	586.5	.00103	.000449			1.01	
12.0	-12.0			.97175	592.2	.00123	.000536			1.17	
12.0	12.0			.96898	587.9	.00122	.000531			1.23	
30.0	1.0			.98892	620.5	.00434	.001891			4.62	
31.0	2.0			.98006	613.5	.00369	.001607			3.97	
32.0	2.0			.97120	602.9	.00287	.001250	.00276	.001202	3.05	
32.0	3.0			.96843	600.9	.00315	.001372			3.28	
32.0	6.0			.95901	586.9	.00198	.000863			2.02	
34.0	1.0			.95791	579.2	.00086	.000375	.00072	.000314	.98	
34.0	2.0			.96068	596.9	.00175	.000762	.00176	.000767	1.72	
34.0	3.0			.96400	593.2	.00239	.001041	.00230	.001002	2.39	
36.0	.0			.93188	571.2	.00183	.000797	.00180	.000784	1.87	
38.0	.0			.93243	571.5	.00204	.000889			2.17	
44.0	12.0			.95625	580.9	.00118	.000514			1.15	
42.0	.0			.93852	573.2	.00179	.000780			1.75	
44.0	.0			.95182	579.9	.00152	.000662	.00152	.000662	1.62	
48.0	.0			.96788	590.2	.00165	.000719	.00168	.000732	1.76	
52.0	.0			.95237	579.9	.00152	.000662	.00150	.000653	1.62	
52.0	12.0			.94517	571.2	.00086	.000375			.85	
55.0	.0			.95680	581.9	.00143	.000623	.00141	.000614	1.46	
58.0	.0			.97175	590.9	.00136	.000592			1.36	
58.0	12.0			.96621	583.5	.00076	.000331			.75	
58.0	-12.0			.95901	580.9	.00093	.000405				
44.0	-12.0			.95348	578.9	.00117	.000510			1.16	
36.0	-8.0			.95292	581.5	.00175	.000762			1.73	
36.0	-3.0			.94019	568.2	.00047	.000205				
34.0	-3.0			.96400	591.9	.00216	.000941	.00222	.000967	2.18	
32.0	-3.0			.97175	608.2	.00303	.001320	.00326	.001420	3.44	
30.0	-3.0			.96068	595.5	.00274	.001194	.00265	.001154	2.85	
28.0	-3.0			.97009	598.5	.00267	.001163			2.81	
34.0	-12.0			.94240	573.5	.00140	.000610			1.46	
32.0	-12.0			.94462	574.9	.00136	.000592	.00137	.000597	1.37	
30.0	-12.0			.94074	572.2	.00131	.000571			1.26	
19.0	-12.5			.98061	597.5	.00122	.000531			1.23	
17.5	-11.0			.97397	592.2	.00131	.000571			1.28	
15.5	-2.5			.98449	607.9	.00264	.001150			2.49	
16.5	-2.5			.95625	586.9	.00211	.000919			2.27	
17.5	-2.5			.95237	582.2	.00180	.000784			1.89	
18.5	-2.5			.98061	597.2	.00149	.000649			1.60	
19.5	-2.5			.95348	579.9	.00141	.000614			1.42	
20.5	-2.5			.94960	577.2	.00138	.000601	.00133	.000579	1.38	
21.5	-2.5			.94960	576.9	.00143	.000623	.00146	.000636	1.40	
22.5	-2.5			.94794	575.5	.00138	.000601	.00136	.000592	1.41	
23.5	-2.5			.94517	574.9	.00145	.000632	.00131	.000571	1.44	
24.5	-2.5			.95791	582.2	.00138	.000601			1.41	
		10.55	90	.98172	590.2	.00082	.000357				.36
		6.55	90	.98781	596.9	.00124	.000540				.54
		4.55	90	.96400	588.5	.00179	.000780				.79
		2.55	90	.95348	577.9	.00135	.000588				.59
		8.55	180	1.02713	617.2	.00056	.000244	.00061	.000266		
		6.55	180	1.01772	611.2	.00053	.000231	.00051	.000222		
		4.55	180	1.01938	609.9	.00020	.000087				
		3.55	180	1.02049	610.5	.00021	.000091				
		2.55	180	.98947	594.5	.00040	.000174				
		1.55	180	.97950	588.9	.00033	.000144				
		1.05	180	.97563	587.2	.00049	.000213				
34.0	-1.0			.97950	589.2	.00066	.000288	.00076	.000331	.70	
34.0	4.0			.97895	604.2	.00247	.001076			2.66	
34.0	5.0			.96400	593.5	.00246	.001072	.00238	.001037	2.44	
34.0	6.0			.95846	586.9	.00197	.000858	.00196	.000854	2.12	
36.0	6.0			.96178	589.9	.00207	.000902			2.16	
38.0	1.0			.94406	574.2	.00143	.000623	.00135	.000588	1.54	
38.0	2.0			.96123	580.9	.00103	.000449			1.05	
44.0	8.0			.93686	571.5	.00128	.000558			1.28	
44.0	6.0			.94572	572.9	.00110	.000479	.00103	.000449	1.10	
44.0	4.0			.96566	583.2	.00098	.000427	.00100	.000436	.98	
44.0	2.0			.95901	582.2	.00132	.000575	.00134	.000584	1.33	
44.0	1.0			.94960	577.5	.00140	.000610	.00148	.000645	1.57	
		10.55	0	1.00498	647.2	.00636	.002770				.66
		8.55	0	1.01273	648.2	.00601	.002618	.00604	.002631		.63
		6.55	0	1.01329	648.5	.00625	.002723	.00633	.002757		.65
		4.55	0	1.00443	644.9	.00539	.002348	.00536	.002335		.56
		3.55	0	1.00166	640.9	.00494	.002152	.00474	.002065		.52
		2.55	0	1.01439	650.5	.00553	.002409	.00574	.002500		.58
		1.55	0	1.01495	655.2	.00600	.002614				.63
		1.05	0	1.00609	648.9	.00516	.002248				.54
		10.55	45	.98560	613.5	.00365	.001590	.00352	.001533		.50
		6.55	45	.99667	623.9	.00413	.001799	.00422	.001838		.56
		4.55	45	.98449	621.9	.00453	.001973	.00471	.002052		.62
		2.55	45	.99113	628.5	.00407	.001773				.55

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-$^\circ$R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, ℓ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(d) M = 3.51; R = 3.93×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95994	583.9	.00133	.000261			.85	
12.0	.0			1.02836	661.5	.00586	.001149			3.78	
20.5	.0			.91155	565.2	.00300	.000588			1.94	
28.0	12.0			.93436	571.2	.00180	.000353			1.01	
28.0	4.0			.96328	600.5	.00290	.000569			1.75	
28.0	.0			.97608	616.5	.00478	.000937			3.03	
20.5	-5.0			.94437	583.9	.00273	.000535			1.76	
24.5	-5.0			.93603	573.5	.00218	.000427			1.47	
30.0	.0			1.00611	649.5	.00514	.001008	.00558	.001094	3.32	
31.0	12.0			.92935	569.2	.00191	.000374			1.01	
34.0	.0			.95716	575.5	.00076	.000149			.49	
2.0	-12.0			.95716	581.9	.00135	.000265			.83	
2.0	12.0			.95994	585.2	.00155	.000304			.83	
12.0	-12.0			.95994	584.5	.00160	.000314			.96	
12.0	12.0			.95494	581.5	.00155	.000304			.83	
30.0	1.0			.98998	625.9	.00514	.001008			3.32	
31.0	2.0			.97941	620.9	.00507	.000994			3.21	
32.0	2.0			.97218	618.2	.00436	.000855	.00445	.000872	3.11	
32.0	3.0			.96439	604.9	.00402	.000788			2.51	
32.0	6.0			.94771	586.5	.00303	.000594			1.79	
34.0	1.0			.95216	576.5	.00132	.000259			.85	
34.0	2.0			.95828	593.2	.00300	.000588	.00312	.000612	1.88	
34.0	3.0			.95828	599.2	.00396	.000776	.00398	.000780	2.44	
36.0	.0			.92212	570.5	.00247	.000484	.00242	.000474	1.59	
38.0	.0			.92546	570.5	.00266	.000522	.00301	.000590	1.71	
44.0	12.0			.94103	577.5	.00213	.000418			1.23	
42.0	.0			.93213	573.5	.00239	.000469	.00279	.000547	1.54	
44.0	.0			.94381	578.9	.00240	.000471	.00240	.000471	1.58	
48.0	.0			.95994	586.9	.00204	.000400	.00206	.000404	1.32	
52.0	.0			.94214	578.9	.00220	.000431	.00218	.000427	1.40	
52.0	12.0			.92657	566.9	.00201	.000394			1.13	
55.0	.0			.94604	578.9	.00214	.000420	.00213	.000418	1.44	
58.0	.0			.96161	587.9	.00197	.000386			1.26	
58.0	12.0			.94493	575.5	.00164	.000322			.93	
58.0	-12.0			.92657	562.9	.00156	.000306				
44.0	-12.0			.93714	572.9	.00199	.000390			1.21	
36.0	-8.0			.93046	572.5	.00249	.000488			1.59	
36.0	-3.0			.93992	568.2	.00074	.000145				
34.0	-3.0			.95160	591.9	.00322	.000631	.00327	.000641	2.16	
32.0	-3.0			.96328	606.2	.00451	.000884	.00461	.000904	2.93	
30.0	-3.0			.96106	600.5	.00369	.000723	.00364	.000714	2.38	
28.0	-3.0			.96606	602.5	.00350	.000686			2.33	
34.0	-12.0			.92935	571.2	.00234	.000459			1.50	
32.0	-12.0			.93213	571.9	.00215	.000422	.00216	.000424	1.30	
30.0	-12.0			.92991	570.5	.00215	.000422			1.34	
19.0	-12.5			.96551	589.2	.00168	.000329			1.06	
17.5	-11.0			.95716	584.9	.00179	.000351			1.08	
15.5	-2.5			.97941	619.5	.00374	.000733			2.35	
16.5	-2.5			.94771	589.5	.00322	.000631	.00296	.000580	2.25	
17.5	-2.5			.94103	582.5	.00305	.000598	.00268	.000525	1.97	
18.5	-2.5			.96606	594.5	.00245	.000480			1.71	
19.5	-2.5			.93714	575.9	.00241	.000473			1.53	
20.5	-2.5			.93213	571.9	.00218	.000427	.00211	.000414	1.38	
21.5	-2.5			.93158	572.9	.00224	.000439	.00227	.000445	1.42	
22.5	-2.5			.92879	569.2	.00214	.000420	.00211	.000414	1.39	
23.5	-2.5			.92713	568.5	.00212	.000416	.00196	.000384	1.28	
24.5	-2.5			.93769	575.5	.00218	.000427			1.54	
		10.55	90	.97051	584.9	.00113	.000222				.32
		6.55	90	.98553	596.2	.00162	.000318				.46
		4.55	90	.96106	586.9	.00227	.000445				.65
		2.55	90	.94604	575.5	.00182	.000357				.52
		10.55	180	1.02169	607.9	.00040	.000078				
		8.55	180	1.03838	620.9	.00070	.000137	.00076	.000149		
		6.55	180	1.04060	619.5	.00035	.000069				
		4.55	180	1.04005	618.2	.00023	.000045				
		3.55	180	1.03893	617.9	.00024	.000047				
		2.55	180	1.00333	599.9	.00041	.000080				
		1.55	180	.99109	593.2	.00046	.000090				
		1.05	180	.98609	591.2	.00057	.000112				
34.0	-1.0			.97274	585.9	.00098	.000192	.00106	.000208	.65	
34.0	4.0			.96718	603.9	.00370	.000725	.00392	.000769	2.33	
34.0	5.0			.94938	588.5	.00292	.000573	.00270	.000529	1.79	
34.0	6.0			.94548	583.2	.00255	.000500	.00253	.000496	1.39	
36.0	6.0			.94659	584.9	.00268	.000525			1.46	
38.0	1.0			.93992	573.9	.00191	.000374	.00192	.000376	1.22	
38.0	2.0			.95271	579.9	.00166	.000325			1.07	
44.0	8.0			.91489	559.2	.00202	.000396			1.20	
44.0	6.0			.91934	562.5	.00191	.000374	.00174	.000341	1.04	
44.0	4.0			.94493	573.9	.00152	.000298	.00153	.000300	.95	
44.0	2.0			.95160	579.2	.00166	.000325	.00167	.000327	1.04	
44.0	1.0			.93992	574.2	.00191	.000374	.00197	.000386	1.28	
		10.55	0	1.00222	660.5	.00772	.001514				.52
		8.55	0	1.00834	652.2	.00736	.001443	.00737	.001445		.50
		6.55	0	1.01001	650.5	.00660	.001294	.00654	.001282		.45
		4.55	0	1.01168	665.5	.00727	.001425	.00755	.001480		.49
		3.55	0	1.00333	652.5	.00679	.001331	.00632	.001239		.46
		2.55	0	1.01279	655.9	.00675	.001323	.00661	.001296		.46
		1.55	0	1.02169	671.8	.00675	.001323	.00775	.001520		.46
		1.05	0	1.01223	658.2	.00699	.001371				.47
		10.55	45	.97719	613.5	.00478	.000937	.00461	.000904		.42
		6.55	45	.99610	627.2	.00463	.000908	.00483	.000947		.43
		4.55	45	.98831	636.2	.00602	.001180	.00650	.001274		.53
		2.55	45	.98831	628.5	.00537	.001053	.00573	.001123		.48

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(e) M = 3.51; R = 2.76×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
4.0	.0			.96338	585.2	.00096	.000268			.78	
12.0	.0			1.02718	656.9	.00440	.001227			3.96	
20.5	.0			.91901	566.9	.00221	.000616			1.83	
28.0	12.0			.94175	573.2	.00128	.000357			.84	
28.0	4.0			.96838	597.9	.00222	.000619			1.75	
28.0	.0			.97725	613.2	.00333	.000929			2.58	
28.5	-5.0			.94952	583.9	.00199	.000555			1.66	
24.5	-5.0			.94341	575.5	.00160	.000446			1.29	
30.0	.0			1.00554	639.2	.00429	.001196	.00447	.001246	3.46	
31.0	12.0			.93620	570.9	.00142	.000396			1.02	
34.0	.0			.96560	579.5	.00042	.000117			.34	
2.0	-12.0			.96006	583.2	.00099	.000276			.78	
2.0	12.0			.96338	586.2	.00103	.000287			.78	
12.0	-12.0			.96505	586.2	.00120	.000335			.93	
12.0	12.0			.96117	583.5	.00103	.000287			.77	
30.0	1.0			.98890	624.9	.00387	.001079			3.15	
31.0	2.0			.97836	623.2	.00354	.000987			2.79	
32.0	2.0			.97170	612.9	.00322	.000898	.00329	.000917	2.62	
32.0	3.0			.96449	600.9	.00290	.000809			2.25	
32.0	6.0			.95395	587.2	.00210	.000586			1.58	
34.0	1.0			.95784	578.5	.00087	.000243			.72	
34.0	2.0			.96006	590.9	.00203	.000566	.00213	.000594	1.62	
34.0	3.0			.96061	596.2	.00270	.000753	.00268	.000747	2.00	
36.0	.0			.93177	572.2	.00172	.000480	.00169	.000471	1.39	
38.0	.0			.93343	574.2	.00189	.000527			1.56	
44.0	12.0			.94674	578.5	.00161	.000449			1.05	
42.0	.0			.93953	574.9	.00171	.000477			1.41	
44.0	.0			.95174	580.9	.00159	.000443	.00160	.000446	1.27	
48.0	.0			.96782	589.5	.00138	.000385	.00140	.000390	1.14	
52.0	.0			.95063	579.5	.00159	.000443	.00157	.000438	1.24	
52.0	12.0			.93398	568.5	.00132	.000368			.86	
55.0	.0			.95395	581.2	.00157	.000438	.00156	.000435	1.22	
58.0	.0			.97004	591.5	.00127	.000354			1.01	
58.0	12.0			.95284	578.5	.00105	.000293			.69	
58.0	-12.0			.93676	568.5	.00105	.000293				
44.0	-12.0			.94508	574.9	.00135	.000376			1.13	
36.0	-8.0			.93787	574.2	.00174	.000485			1.41	
36.0	-3.0			.94175	568.9	.00055	.000153				
34.0	-3.0			.95451	589.9	.00241	.000672	.00246	.000686	2.03	
32.0	-3.0			.96394	602.5	.00309	.000862	.00319	.000889	2.60	
30.0	-3.0			.96227	597.2	.00266	.000742	.00261	.000728	2.20	
28.0	-3.0			.96893	601.2	.00257	.000717			2.12	
34.0	-12.0			.93620	572.9	.00163	.000455			1.28	
32.0	-12.0			.93898	573.9	.00153	.000427	.00154	.000429	1.28	
30.0	-12.0			.93731	572.2	.00145	.000404			1.18	
19.0	-12.5			.97060	590.2	.00123	.000343			.98	
17.5	-11.0			.96338	586.2	.00124	.000346			1.03	
15.5	-2.5			.97947	610.5	.00285	.000795			2.32	
16.5	-2.5			.94952	587.2	.00244	.000680	.00215	.000600	1.98	
17.5	-2.5			.94452	581.2	.00208	.000580			1.75	
18.5	-2.5			.97170	595.2	.00172	.000480			1.41	
19.5	-2.5			.94397	576.9	.00166	.000463			1.37	
20.5	-2.5			.93898	573.5	.00160	.000446	.00157	.000438	1.33	
21.5	-2.5			.93898	572.9	.00159	.000443	.00161	.000449	1.28	
22.5	-2.5			.93620	571.5	.00162	.000452	.00162	.000452	1.32	
23.5	-2.5			.93343	570.2	.00127	.000354	.00110	.000307	1.02	
24.5	-2.5			.94508	577.5	.00160	.000446			1.32	
		10.55	90	.98169	590.5	.00091	.000254				.31
		6.55	90	.99445	601.9	.00122	.000340				.42
		4.55	90	.96782	590.2	.00169	.000471				.58
		2.55	90	.95174	578.9	.00156	.000435				.53
		10.55	180	1.03217	617.2	.00028	.000078				
		8.55	180	1.04548	627.5	.00048	.000134	.00053	.000148		
		6.55	180	1.04604	625.5	.00020	.000056				
		4.55	180	1.04271	623.2	.00015	.000042				
		3.55	180	1.04104	622.5	.00017	.000047				
		2.55	180	1.00887	605.2	.00029	.000081				
		1.55	180	.99500	596.9	.00023	.000064				
		1.05	180	.99112	595.5	.00032	.000089				
34.0	-1.0			.97892	588.9	.00067	.000187	.00075	.000209	.60	
34.0	4.0			.97115	602.5	.00245	.000683			1.93	
34.0	5.0			.95506	589.2	.00215	.000600	.00196	.000547	1.63	
34.0	6.0			.95229	584.2	.00183	.000510	.00181	.000505	1.35	
36.0	6.0			.95284	585.5	.00197	.000549			1.48	
38.0	1.0			.94674	576.2	.00133	.000371	.00128	.000357	1.10	
38.0	2.0			.96006	581.9	.00109	.000304			.84	
44.0	8.0			.92345	561.9	.00130	.000362			.85	
44.0	6.0			.92622	565.5	.00134	.000374			.98	
44.0	4.0			.95340	576.9	.00089	.000248	.00086	.000240	.66	
44.0	2.0			.96061	585.2	.00122	.000340	.00124	.000346	.96	
44.0	1.0			.94896	577.2	.00132	.000368	.00141	.000393	1.06	
		10.55	0	1.00499	655.2	.00636	.001773				.52
		8.55	0	1.01164	654.9	.00594	.001656	.00595	.001659		.48
		6.55	0	1.01275	649.2	.00535	.001492	.00531	.001481		.43
		4.55	0	1.01275	653.5	.00617	.001720	.00606	.001690		.50
		3.55	0	1.00443	644.2	.00495	.001380	.00448	.001249		.40
		2.55	0	1.01331	657.5	.00494	.001377	.00483	.001347		.40
		1.55	0	1.01996	668.5	.00527	.001469	.00660	.001840		.43
		1.05	0	1.01053	659.2	.00449	.001252				.36
		10.55	45	.98335	615.2	.00373	.001040	.00348	.000970		.39
		6.55	45	1.00055	627.2	.00364	.001015	.00374	.001043		.39
		4.55	45	.99001	632.5	.00461	.001285	.00603	.001681		.49
		2.55	45	.99001	628.9	.00416	.001160	.00463	.001291		.44

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(f) M = 3.51; R = 1.60×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96119	581.5	.00061	.000296			.90	
12.0	.0			1.01995	645.5	.00372	.001803			5.72	
20.5	.0			.92127	563.5	.00153	.000742			2.25	
28.0	12.0			.94067	571.9	.00092	.000446			1.08	
28.0	4.0			.96285	588.5	.00165	.000800			1.96	
28.0	.0			.96950	601.2	.00259	.001255			3.92	
20.5	-5.0			.94844	578.5	.00133	.000645			2.02	
24.5	-5.0			.94178	571.5	.00097	.000470			1.47	
30.0	.0			.99944	627.2	.00372	.001803	.00403	.001953	5.55	
31.0	12.0			.93679	568.5	.00098	.000475			1.15	
34.0	.0			.95453	573.9	.00029	.000141			.45	
2.0	-12.0			.95731	579.5	.00067	.000325			.79	
2.0	12.0			.96174	582.5	.00071	.000344			.84	
12.0	-12.0			.96008	581.5	.00080	.000388			1.19	
12.0	12.0			.95841	579.9	.00069	.000334			.90	
30.0	1.0			.98281	611.2	.00290	.001406			4.33	
31.0	2.0			.97172	606.5	.00287	.001391			3.88	
32.0	2.0			.96451	600.9	.00259	.001255	.00264	.001280	3.87	
32.0	3.0			.95675	589.5	.00217	.001052			3.19	
32.0	6.0			.94954	581.5	.00151	.000732			1.78	
34.0	1.0			.94954	573.5	.00087	.000422			1.28	
34.0	2.0			.95176	581.5	.00147	.000712	.00151	.000732	2.16	
34.0	3.0			.95343	585.5	.00187	.000906	.00178	.000863	2.46	
34.0	.0			.93069	568.9	.00127	.000616	.00124	.000601	1.49	
36.0	.0			.93125	568.5	.00142	.000688	.00182	.000882	1.67	
38.0	.0			.94400	573.5	.00104	.000504			1.35	
44.0	12.0			.93568	569.5	.00130	.000630			1.91	
47.0	.0			.94788	575.5	.00108	.000523	.00108	.000523	1.28	
44.0	.0			.96507	585.2	.00078	.000378	.00080	.000388	.92	
48.0	.0			.94733	575.2	.00104	.000504	.00102	.000494	1.46	
52.0	.0			.93069	565.9	.00093	.000451			1.09	
52.0	12.0			.95121	577.2	.00100	.000485	.00098	.000475	1.49	
55.0	.0			.96673	586.2	.00097	.000470			1.45	
58.0	.0			.95176	575.9	.00071	.000344			.85	
58.0	12.0			.93957	567.9	.00069	.000334				
58.0	-12.0			.94234	571.2	.00085	.000412			1.31	
44.0	-12.0			.93458	569.9	.00124	.000601			1.88	
36.0	-8.0			.93957	566.9	.00036	.000174				
36.0	-3.0			.94733	580.2	.00162	.000784	.00163	.000790	2.42	
34.0	-3.0			.95675	590.9	.00230	.001115	.00238	.001154	3.43	
32.0	-3.0			.95509	586.9	.00202	.000978	.00205	.000994	2.81	
30.0	-3.0			.96396	592.2	.00187	.000906			2.75	
28.0	-3.0			.93679	570.2	.00111	.000538			1.32	
34.0	-12.0			.93901	570.5	.00102	.000494	.00103	.000499	1.52	
32.0	-12.0			.93679	569.9	.00098	.000475			1.44	
30.0	-12.0			.96673	585.5	.00079	.000383			1.18	
19.0	-12.5			.96008	583.5	.00090	.000436			1.06	
17.5	-11.0			.97172	598.5	.00210	.001018			2.84	
15.5	-2.5			.94234	577.2	.00177	.000858			2.38	
16.5	-2.5			.93735	572.2	.00147	.000712			2.19	
17.5	-2.5			.96618	587.9	.00109	.000528			1.65	
18.5	+2.5			.93901	570.9	.00110	.000533			1.31	
19.5	-2.5			.93513	568.2	.00107	.000519	.00101	.000490	1.27	
20.5	-2.5			.93568	568.2	.00106	.000514	.00108	.000523	1.25	
21.5	-2.5			.93402	567.2	.00102	.000494	.00101	.000490	1.44	
22.5	-2.5			.93180	568.9	.00113	.000548	.00096	.000465	1.71	
23.5	-2.5			.94455	574.2	.00127	.000616			1.49	
24.5	-2.5			.96451	580.5	.00069	.000334				.31
		10.55	90	.98503	594.5	.00097	.000470				.43
		6.55	90	.95952	583.5	.00132	.000640				.59
		4.55	90	.94733	574.2	.00104	.000504				.47
		2.55	90	1.02772	613.9	.00014	.000068				
		6.55	180	.99667	597.2	.00024	.000116				
		2.55	180	.98115	588.9	.00022	.000107				
		1.05	180	.97117	584.5	.00051	.000247	.00063	.000305	.76	
34.0	-1.0			.96618	593.5	.00183	.000887			2.44	
34.0	4.0			.95176	582.2	.00167	.000809	.00154	.000746	2.32	
34.0	5.0			.94844	577.9	.00132	.000640	.00130	.000630	1.55	
34.0	6.0			.95065	581.2	.00137	.000664			1.88	
36.0	6.0			.94012	569.9	.00097	.000470	.00081	.000393	1.41	
38.0	1.0			.95232	575.5	.00071	.000344			1.01	
38.0	2.0			.92460	561.9	.00093	.000451			1.09	
44.0	8.0			.92515	560.9	.00099	.000480	.00084	.000407	1.16	
44.0	6.0			.94844	572.6	.00061	.000296	.00059	.000286	.77	
44.0	4.0			.95509	579.9	.00090	.000436	.00094	.000456	1.32	
44.0	2.0			.94455	572.6	.00098	.000475	.00108	.000523	1.48	
44.0	1.0			.99279	635.9	.00524	.002540				.56
		10.55	0	1.00609	638.5	.00508	.002462	.00613	.002486		.54
		8.55	0	1.00544	638.5	.00456	.002210	.00470	.002278		.49
		6.55	0	1.00332	636.5	.00474	.002297	.00490	.002375		.51
		4.55	0	.98556	632.9	.00404	.001958	.00355	.001721		.43
		3.55	0	1.00720	639.9	.00429	.002079	.00425	.002060		.46
		2.55	0	1.01330	650.9	.00513	.002486				.55
		1.55	0	1.00332	639.5	.00428	.002074				.46
		1.05	0	.97061	607.2	.00299	.001449	.00278	.001352		.42
		10.55	45	.99112	615.2	.00296	.001435	.00298	.001449		.41
		6.55	45	.98115	614.9	.00371	.001798	.00399	.001934		.52
		4.55	45	.98392	618.9	.00318	.001541				.44
		2.55	45								

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(g) M = 4.44; R = 4.42×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_U}$	$\frac{h}{h_L}$
2.0	.0			.94033	580.9	.00100	.000255			1.18	
12.0	.0			1.02115	652.5	.00547	.001395			3.60	
20.5	.0			.90888	565.2	.00242	.000617			3.46	
28.0	12.0			.92406	571.2	.00136	.000347			1.42	
28.0	4.0			.96281	592.5	.00223	.000569			2.69	
28.0	.0			.97179	610.9	.00393	.001002			4.91	
28.0	-6.0			.92894	580.2	.00225	.000574			2.36	
28.5	-8.0			.92134	570.9	.00180	.000459			2.69	
30.0	.0			.99403	631.9	.00498	.001270	.00551	.001406	3.42	
31.0	12.0			.91864	568.9	.00164	.000418			1.61	
34.0	.0			.94630	579.9	.00043	.000110			.64	
2.0	-12.0			.93762	578.2	.00079	.000201			1.16	
2.0	12.0			.93871	581.2	.00143	.000365			1.63	
12.0	-12.0			.94142	580.9	.00098	.000250			1.75	
12.0	12.0			.93599	579.5	.00133	.000339			1.94	
30.0	1.0			.97884	619.9	.00413	.001053			6.36	
31.0	2.0			.96583	610.2	.00430	.001097			5.89	
32.0	2.0			.95877	604.9	.00418	.001066	.00443	.001102	5.23	
32.0	3.0			.94738	595.5	.00338	.000862			4.07	
32.0	6.0			.93871	588.9	.00235	.000599			2.73	
34.0	1.0			.94142	590.5	.00096	.000245			1.37	
34.0	2.0			.94359	587.2	.00220	.000561	.00245	.000626	3.01	
34.0	3.0			.94033	588.9	.00325	.000829	.00299	.000764	4.18	
36.0	.0			.91701	569.9	.00193	.000492	.00192	.000490	2.72	
38.0	.0			.91755	570.2	.00212	.000541	.00287	.000732	3.04	
44.0	12.0			.92569	575.2	.00209	.000533			3.04	
42.0	.0			.92623	573.9	.00188	.000479			2.69	
44.0	.0			.93925	581.9	.00163	.000416	.00174	.000444	2.36	
48.0	.0			.95389	592.2	.00152	.000388	.00155	.000398	1.90	
52.0	.0			.93925	580.9	.00141	.000360	.00138	.000352	2.04	
52.0	12.0			.91109	564.9	.00186	.000474			2.68	
56.0	.0			.94196	581.9	.00135	.000344	.00132	.000337	1.98	
58.0	.0			.95715	590.9	.00128	.000326			2.62	
58.0	12.0			.93166	576.2	.00159	.000405			1.64	
58.0	-12.0			.91267	563.2	.00102	.000260				
44.0	-12.0			.92027	571.2	.00145	.000370			2.50	
36.0	-8.0			.91810	568.9	.00188	.000479			3.24	
36.0	-3.0			.92027	567.2	.00093	.000237				
34.0	-3.0			.93220	583.2	.00291	.000742	.00294	.000750	4.15	
32.0	-3.0			.94576	594.2	.00368	.000938	.00376	.000959	5.49	
30.0	-3.0			.95335	598.5	.00294	.000750	.00294	.000750	4.74	
28.0	-3.0			.95986	600.5	.00305	.000778			4.36	
34.0	-12.0			.92081	570.5	.00178	.000454			3.24	
32.0	-12.0			.92352	571.5	.00162	.000413	.00164	.000418	2.93	
30.0	-12.0			.92189	571.9	.00152	.000388			2.69	
19.0	-12.5			.94522	583.2	.00121	.000308			2.05	
17.5	-11.0			.94033	581.2	.00140	.000357			2.41	
14.5	-2.5			.96311	597.5	.00339	.000865			5.30	
16.5	-2.5			.93328	584.2	.00293	.000747			4.31	
17.5	-2.5			.92786	577.5	.00273	.000696			4.07	
18.5	-2.5			.95552	593.9	.00205	.000523			4.36	
19.5	-2.5			.92677	575.2	.00189	.000482				
20.5	-2.5			.92134	571.5	.00189	.000482	.00178	.000454	3.00	
21.5	-2.5			.92081	570.9	.00168	.000428	.00169	.000431	2.84	
22.5	-2.5			.91972	569.9	.00167	.000426	.00164	.000418	2.81	
23.5	-2.5			.91647	570.5	.00190	.000485			3.39	
24.5	-2.5			.92949	575.5	.00162	.000413			2.78	
		11.55	90	.96366	591.2	.00091	.000232				.30
		6.55	90	.98318	603.5	.00111	.000283				.36
		4.55	90	.96040	591.5	.00148	.000377				.46
		2.55	90	.93762	580.9	.00140	.000357				.46
		8.55	180	1.02440	626.2	.00030	.000077	.00048	.000097		
		2.55	180	.99349	607.9	.00031	.000079				
34.0	-1.0			.95823	588.9	.00071	.000181			1.16	
34.0	4.0			.94630	591.9	.00318	.000811			4.46	
34.0	5.0			.93003	580.2	.00241	.000615			3.84	
34.0	6.0			.93003	578.5	.00213	.000543	.00207	.000535	3.51	
36.0	6.0			.92949	580.2	.00223	.000569			3.64	
38.0	1.0			.92732	577.5	.00143	.000365	.00133	.000434	2.26	
38.0	2.0			.94033	579.2	.00117	.000298			1.87	
44.0	8.0			.90562	559.9	.00163	.000416			1.74	
44.0	6.0			.90996	562.9	.00163	.000416	.00134	.000342	2.26	
44.0	4.0			.93545	577.2	.00101	.000258	.00099	.000252	1.44	
44.0	2.0			.94196	580.9	.00118	.000301	.00116	.000296	1.43	
44.0	1.0			.93274	575.9	.00128	.000326	.00147	.000375	1.88	
		10.55	0	.99620	635.2	.00970	.002474				.76
		8.55	0	1.00488	637.2	.00678	.001729	.00679	.001732		.53
		6.55	0	1.00650	638.2	.00655	.001670	.00646	.001647		.51
		4.55	0	1.01030	653.5	.00804	.002050	.00897	.002288		.63
		3.55	0	.99891	641.2	.00690	.001760	.00636	.001622		.54
		2.55	0	1.00325	644.2	.00608	.001551	.00594	.001520		.47
		1.55	0	1.01138	648.9	.00739	.001885				.58
		1.05	0	1.00108	643.2	.00653	.001665				.51
		10.55	45	.97505	614.5	.00519	.001324	.00412	.001306		.53
		6.55	45	.99294	627.2	.00403	.001028	.00408	.001041		.33
		4.55	45	.98264	622.2	.00548	.001398	.00431	.001099		.56
		2.55	45	.97615	616.9	.00448	.001142	.00492	.001280		.45

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Continued

(h) $M = 4.44$; $R = 3.10 \times 10^6$

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94416	581.5	.00064	.000231			1.08	
12.0	.0			1.02005	647.2	.00502	.001814			6.78	
20.5	.0			.91814	568.9	.00178	.000643			3.36	
28.0	12.0			.93278	574.9	.00111	.000401			1.25	
28.0	4.0			.96771	593.5	.00172	.000622			2.97	
28.0	.0			.97181	608.2	.00298	.001077			4.73	
28.0	-4.0			.93603	579.9	.00176	.000636			3.32	
24.5	-6.0			.93061	574.2	.00142	.000513			2.63	
30.0	.0			.99457	627.9	.00442	.001597	.00489	.001767	8.04	
31.0	12.0			.92681	572.2	.00116	.000419			1.61	
2.0	-12.0			.94037	578.9	.00056	.000202			1.04	
2.0	12.0			.94253	582.5	.00085	.000307			1.13	
12.0	-12.0			.94687	582.5	.00081	.000293			1.65	
12.0	12.0			.94308	580.9	.00078	.000282			1.04	
31.0	.0			.97994	614.2	.00353	.001276			5.27	
31.0	2.0			.96639	606.2	.00358	.001294			6.28	
32.0	2.0			.95988	602.5	.00354	.001279	.00363	.001312	5.80	
32.0	3.0			.94904	591.5	.00258	.000932			4.10	
32.0	6.0			.94416	584.9	.00174	.000629			2.68	
34.0	1.0			.94741	581.5	.00059	.000213			.88	
34.0	2.0			.94687	586.9	.00174	.000629	.00183	.000661	2.76	
34.0	3.0			.94308	587.5	.00247	.000893	.00235	.000849	4.49	
36.0	.0			.92736	574.9	.00148	.000535	.00148	.000535	2.43	
38.0	.0			.92627	573.5	.00173	.000625			3.04	
44.0	12.0			.93278	577.2	.00161	.000582			1.83	
42.0	.0			.93386	577.9	.00130	.000470			2.08	
44.0	.0			.94741	583.9	.00118	.000426	.00119	.000430		
48.0	.0			.96313	593.9	.00091	.000329	.00095	.000343	1.60	
52.0	.0			.94958	585.5	.00097	.000351	.00094	.000340	1.76	
52.0	12.0			.91923	567.5	.00144	.000520			1.71	
55.0	.0			.95175	586.2	.00106	.000383	.00104	.000376	1.83	
58.0	.0			.96530	594.2	.00106	.000383			1.66	
58.0	12.0			.93982	579.5	.00110	.000398			1.31	
58.0	-12.0			.92356	568.2	.00077	.000278				
44.0	-12.0			.92898	572.2	.00112	.000405			2.29	
36.0	-8.0			.92519	571.9	.00136	.000492			2.78	
36.0	-3.0			.92248	567.9	.00047	.000170				
34.0	-3.0			.93549	584.9	.00209	.000755	.00221	.000799	3.80	
32.0	-3.0			.94741	591.2	.00276	.000998	.00280	.001012	5.41	
30.0	-3.0			.95500	594.2	.00234	.000846	.00233	.000842	4.25	
28.0	-3.0			.96313	598.9	.00231	.000835			4.36	
34.0	-12.0			.92898	574.2	.00135	.000488			2.70	
32.0	-12.0			.93169	574.5	.00119	.000430	.00121	.000437	2.43	
30.0	-12.0			.92952	574.2	.00114	.000412			2.33	
19.0	-12.5			.95229	587.2	.00083	.000300			1.69	
17.5	-11.0			.94850	584.5	.00092	.000333			1.88	
15.5	-2.5			.96422	602.2	.00286	.001034			5.40	
16.5	-2.5			.93549	583.2	.00226	.000817			4.43	
17.5	-2.5			.93169	577.5	.00182	.000658			2.98	
18.5	-2.5			.96097	594.2	.00157	.000567			3.14	
19.5	-2.5			.93332	577.2	.00135	.000488			2.45	
20.5	-2.5			.92952	573.5	.00142	.000513	.00135	.000488	2.33	
21.5	-2.5			.92952	573.2	.00114	.000412	.00115	.000416	1.87	
22.5	-2.5			.92844	572.5	.00114	.000412	.00114	.000412	2.24	
23.5	-2.5			.92790	572.2	.00142	.000513			2.58	
24.5	-2.5			.93874	579.5	.00141	.000510			2.66	
		10.55	90	.96584	591.5	.00076	.000275				.30
		6.55	90	.98915	606.9	.00074	.000267				.29
		4.55	90	.96584	594.2	.00107	.000387				.42
		2.55	90	.94362	581.2	.00111	.000401				.44
		10.55	180	.99674	610.5	.00026	.000094				
		2.55	180	.98861	606.2	.00024	.000087				
		1.55	180	.97506	598.2	.00023	.000083				
34.0	-1.0			.96530	591.9	.00050	.000181			.96	
34.0	4.0			.95067	591.9	.00239	.000864			3.23	
34.0	5.0			.93657	580.5	.00178	.000643			2.83	
34.0	6.0			.93657	580.9	.00147	.000531	.00141	.000510	2.26	
36.0	6.0			.93657	579.9	.00174	.000629			2.68	
38.0	1.0			.93495	575.5	.00087	.000314	.00073	.000264	1.38	
38.0	2.0			.94741	581.9	.00073	.000264			1.33	
44.0	8.0			.91651	564.5	.00112	.000405			1.51	
44.0	6.0			.91868	566.9	.00096	.000347			1.48	
44.0	4.0			.94416	579.9	.00070	.000253	.00069	.000249	1.23	
44.0	2.0			.95121	584.9	.00075	.000271	.00072	.000260	1.36	
44.0	1.0			.94145	579.9	.00092	.000333				
		10.55	0	.99078	630.2	.00710	.002566				.66
		8.55	0	1.00921	638.9	.00537	.001941	.00545	.001970		.50
		6.55	0	1.01029	638.9	.00555	.002006	.00549	.001984		.52
		4.55	0	1.01246	646.5	.00724	.002617	.00746	.002696		.68
		3.55	0	1.00000	635.5	.00574	.002075	.00523	.001890		.54
		2.55	0	1.00433	636.9	.00537	.001941	.00504	.001822		.50
		1.55	0	1.01084	646.5	.00660	.002385				.62
		1.05	0	1.00000	637.9	.00595	.002150				.56
		10.55	45	.97398	611.9	.00419	.001514	.00413	.001493		.51
		6.55	45	.99783	624.2	.00317	.001146	.00321	.001160		.39
		4.55	45	.98590	620.9	.00437	.001579	.00446	.001612		.53
		2.55	45	.97885	613.9	.00356	.001287	.00393	.001420		.43

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

8. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 6.4 Diameters Upstream - Concluded

(i) M = 4.44; R = 2.08 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.94588	582.9	.00054	.000293			1.02	
12.0	.0			1.01840	644.5	.00444	.002406			8.88	
2.0	.0			.92693	573.2	.00127	.000688			2.49	
28.0	12.0			.93992	578.5	.00062	.000336			.98	
28.0	4.0			.96103	594.5	.00156	.000835			3.02	
28.0	.0			.97131	609.5	.00229	.001241				
28.0	-5.0			.94155	582.2	.00121	.000656			3.03	
24.5	-8.0			.93884	579.2	.00088	.000477			1.76	
30.0	.0			.99621	627.2	.00391	.002119	.00398	.002157	9.78	
31.0	12.0			.93451	576.9	.00089	.000482			1.13	
2.0	-12.0			.94100	579.5	.00042	.000228			.79	
2.0	12.0			.94479	582.9	.00072	.000390			.90	
12.0	-12.0			.95020	584.9	.00056	.000303			1.22	
12.0	12.0			.94804	583.5	.00057	.000309			.72	
30.0	1.0			.98159	617.2	.00298	.001615			7.45	
31.0	2.0			.96806	606.2	.00309	.001674			5.94	
32.0	2.0			.96103	601.9	.00312	.001691	.00319	.001729	7.80	
32.0	3.0			.95020	591.2	.00191	.001035			4.06	
32.0	6.0			.94750	585.9	.00120	.000650			2.26	
34.0	1.0			.95237	584.5	.00052	.000282			1.00	
34.0	2.0			.94966	588.9	.00136	.000737	.00140	.000759	2.57	
34.0	3.0			.94474	587.9	.00195	.001057	.00176	.000954	3.82	
36.0	.0			.93613	578.5	.00103	.000558	.00096	.000520	2.34	
38.0	.0			.93397	577.9	.00121	.000656			2.33	
44.0	12.0			.93938	580.2	.00102	.000553			1.52	
42.0	.0			.93938	579.9	.00101	.000547			2.10	
44.0	.0			.95237	587.2	.00099	.000536	.00101	.000547	2.02	
48.0	.0			.96015	596.5	.00072	.000390	.00074	.000401	1.50	
52.0	.0			.95616	588.2	.00063	.000341	.00060	.000325	1.58	
52.0	12.0			.92685	571.5	.00089	.000482			1.13	
56.0	.0			.95886	590.2	.00071	.000385	.00069	.000374		
58.0	.0			.97023	597.2	.00067	.000363			1.29	
58.0	12.0			.94588	582.5	.00068	.000368			.86	
58.0	-12.0			.93397	574.9	.00056	.000303				
44.0	-12.0			.93722	576.9	.00072	.000390			1.85	
36.0	-6.0			.93072	574.9	.00089	.000482			2.02	
36.0	-3.0			.92260	568.2	.00039	.000211				
34.0	-3.0			.93830	582.2	.00149	.000807	.00152	.000824	3.39	
32.0	-3.0			.94966	591.9	.00217	.001176	.00223	.001208	4.34	
30.0	-3.0			.95670	596.5	.00171	.000927	.00169	.000916	3.69	
28.0	-3.0			.96590	600.9	.00168	.000910				
34.0	-12.0			.93613	576.9	.00072	.000390			1.50	
32.0	-12.0			.93830	578.2	.00065	.000352	.00067	.000363		
30.0	-12.0			.93613	576.9	.00090	.000488			2.31	
19.0	-12.5			.95778	589.2	.00057	.000309				
17.5	-11.0			.95399	587.2	.00057	.000309			1.46	
19.5	-2.5			.96482	603.2	.00208	.001127			5.20	
16.5	-2.5			.93722	582.2	.00172	.000932			3.31	
17.5	-2.5			.93397	577.9	.00123	.000667				
18.5	-2.5			.96482	595.2	.00109	.000591			2.32	
19.5	-2.5			.93830	578.9	.00101	.000547			1.94	
20.5	-2.5			.93505	576.2	.00077	.000417	.00069	.000374	1.48	
21.5	-2.5			.93559	577.2	.00088	.000477	.00089	.000482		
22.5	-2.5			.93559	576.5	.00080	.000434	.00090	.000488	2.00	
23.5	-2.5			.93397	576.2	.00060	.000325			1.30	
24.5	-2.5			.94696	583.9	.00081	.000439			1.76	
		10.55	90	.97077	595.2	.00051	.000276				.25
		8.55	90	.99567	611.2	.00082	.000444				.40
		4.55	90	.97185	598.5	.00096	.000520				.46
		2.55	90	.95020	585.2	.00072	.000390				.35
		3.05	180	.96969	596.2	.00027	.000146				
34.0	4.0			.95345	592.9	.00170	.000921				
34.0	5.0			.94100	581.9	.00131	.000710			2.57	
34.0	6.0			.94100	581.9	.00105	.000569	.00099	.000536	1.94	
36.0	6.0			.94209	582.2	.00114	.000618			2.15	
38.0	1.0			.93992	578.2	.00089	.000482	.00074	.000401	1.75	
44.0	8.0			.92693	570.2	.00068	.000368			1.26	
44.0	6.0			.92531	569.9	.00069	.000374			1.30	
44.0	4.0			.94804	582.2	.00041	.000222	.00039	.000211	.89	
44.0	2.0			.95562	587.5	.00056	.000303	.00050	.000271	1.12	
44.0	1.0			.94642	582.2	.00058	.000314			1.16	
		10.55	0	.99134	628.5	.00575	.003116				.66
		8.55	0	1.01352	638.5	.00448	.002428	.00457	.002476		.51
		6.55	0	1.01461	638.9	.00451	.002444	.00445	.002411		.52
		4.55	0	1.01515	646.5	.00673	.003647				.77
		3.55	0	1.00216	634.2	.00523	.002834	.00470	.002547		.60
		2.55	0	1.00649	636.2	.00476	.002579	.00449	.002433		.55
		1.55	0	1.01082	647.5	.00615	.003333				.71
		1.05	0	1.00000	642.2	.00472	.002558				.54
		10.55	45	.97672	610.2	.00332	.001799	.00321	.001739		.50
		6.55	45	1.00270	624.5	.00258	.001398	.00259	.001404		.39
		4.55	45	.98971	621.5	.00381	.002065	.00378	.002048		.57
		2.55	45	.98322	615.2	.00279	.001512	.00311	.001685		.42

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5°

(a) M = 2.65; R = 3.94 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96656	590.9	.00282	.000397			.98	
12.0	.0			.96378	589.2	.00275	.000387			.88	
20.5	.0			.96601	604.2	.00510	.000718			1.79	
28.0	12.0			.95096	594.5	.00430	.000606			1.29	
28.0	4.0			.94539	600.2	.00615	.000866			2.11	
28.0	.0			.97715	621.9	.00854	.001203			2.83	
20.5	-5.0			.97269	596.9	.00343	.000483			1.14	
24.5	-5.0			.96155	593.5	.00397	.000559			1.32	
30.0	.0			1.02228	656.9	.01000	.001408	.01036	.001459	3.19	
34.0	.0			.95821	576.9	.00100	.000141			.32	
2.0	-12.0			.96712	594.9	.00298	.000420			.99	
2.0	12.0			.97269	596.2	.00266	.000375			.85	
12.0	-12.0			.96545	591.6	.00293	.000413			.93	
12.0	12.0			.96378	589.6	.00279	.000393			.95	
30.0	1.0			1.00835	641.2	.00889	.001252			3.02	
31.0	2.0			.99944	641.5	.00832	.001172			2.92	
32.0	2.0			.98774	621.5	.00672	.000946	.00672	.000946	2.44	
32.0	3.0			.98161	622.9	.00687	.000967			2.18	
32.0	6.0			.94428	595.5	.00737	.001038			2.54	
34.0	1.0			.96044	579.5	.00118	.000166			.40	
34.0	2.0			.96712	589.9	.00263	.000370	.00257	.000362	.89	
34.0	3.0			.97158	599.5	.00411	.000579	.00399	.000562	1.40	
36.0	.0			.93592	572.2	.00269	.000379	.00265	.000373	.91	
38.0	.0			.94316	575.2	.00255	.000359			.84	
44.0	12.0			.96044	590.9	.00358	.000504			1.15	
42.0	.0			.94651	581.9	.00350	.000493	.00396	.000558	1.12	
44.0	.0			.94985	592.2	.00454	.000639	.00455	.000641	1.57	
48.0	.0			.96322	596.5	.00465	.000655	.00466	.000656	1.53	
52.0	.0			.95988	595.2	.00459	.000646	.00459	.000646	1.56	
52.0	12.0			.94149	575.5	.00283	.000399			.93	
55.0	.0			.95988	594.2	.00440	.000620	.00437	.000615	1.50	
58.0	.0			.97604	602.9	.00408	.000575			1.39	
58.0	12.0			.95821	585.2	.00270	.000380			.85	
58.0	-12.0			.94205	578.9	.00335	.000472				
44.0	-12.0			.95152	588.2	.00445	.000627			1.40	
36.0	-8.0			.96211	601.9	.00512	.000721			1.61	
36.0	-3.0			.95431	580.9	.00206	.000290				
34.0	-3.0			.97882	613.5	.00584	.000822	.00594	.000836	1.93	
32.0	-3.0			.99498	630.2	.00788	.001110	.00806	.001135	2.52	
30.0	-3.0			.97882	615.2	.00672	.000946	.00669	.000942	2.22	
28.0	-3.0			.97269	605.9	.00538	.000758			1.79	
34.0	-12.0			.95765	590.5	.00377	.000531			1.17	
32.0	-12.0			.96378	593.5	.00361	.000508	.00361	.000508	1.12	
30.0	-12.0			.96935	595.9	.00351	.000494			1.09	
19.0	-12.5			.97436	601.2	.00293	.000413			.93	
17.5	-11.0			.96935	593.2	.00292	.000411			.97	
15.5	-2.5			.98161	602.9	.00302	.000425			1.00	
16.5	-2.5			.96211	588.2	.00287	.000404	.00250	.000352	.99	
17.5	-2.5			.96155	590.5	.00323	.000455	.00294	.000414	1.07	
18.5	-2.5			.99164	608.5	.00314	.000442	.00392	.000552	1.01	
19.5	-2.5			.96879	596.5	.00371	.000522	.00349	.000491	1.24	
20.5	-2.5			.96322	595.5	.00441	.000621	.00444	.000625	1.42	
21.5	-2.5			.95821	592.9	.00445	.000627	.00450	.000634	1.48	
22.5	-2.5			.94985	587.5	.00448	.000631	.00440	.000620	1.48	
23.5	-2.5			.94818	593.9	.00385	.000542	.00361	.000508	1.24	
24.5	-2.5			.96211	594.5	.00440	.000620			1.50	
		10.55	90	.94428	570.5	.00179	.000252				.45
		6.55	90	.96099	579.9	.00166	.000234				.42
		4.55	90	.95319	575.9	.00182	.000256				.46
		2.55	90	.94985	574.2	.00154	.000217				.39
		10.55	180	.98049	584.9	.00045	.000063				
		8.55	180	.98272	589.2	.00078	.000110	.00074	.000104		
		6.55	180	1.00724	601.5	.00039	.000055				
		4.55	180	1.02563	611.5	.00028	.000039				
		3.55	180	1.03565	617.2	.00023	.000032				
		1.55	180	1.00390	600.5	.00037	.000052				
		1.05	180	1.00501	600.5	.00043	.000061				
34.0	-1.0			.97548	596.5	.00194	.000273	.00221	.000311	.69	
34.0	4.0			.97994	614.2	.00619	.000872	.00647	.000911	1.99	
34.0	5.0			.95988	604.9	.00722	.001017	.00685	.000965	2.30	
34.0	6.0			.94818	595.9	.00692	.000974	.00693	.000976	2.20	
36.0	6.0			.95208	594.5	.00579	.000815			1.99	
38.0	1.0			.92478	571.9	.00303	.000427			1.00	
38.0	2.0			.94873	580.2	.00279	.000393			.89	
44.0	8.0			.94818	584.2	.00333	.000469			1.06	
44.0	6.0			.93090	568.9	.00290	.000408	.00270	.000380	.92	
44.0	4.0			.95152	583.5	.00327	.000460	.00324	.000456	1.04	
44.0	2.0			.95876	594.9	.00475	.000669	.00477	.000672	1.51	
44.0	1.0			.94873	590.2	.00489	.000689	.00530	.000746	1.73	
		10.55	0	1.00278	639.2	.00868	.001222				.52
		8.55	0	1.00390	644.2	.00983	.001384	.00987	.001390		.59
		6.55	0	1.00612	643.5	.00937	.001319	.00929	.001308		.56
		4.55	0	1.00891	664.2	.01120	.001577	.01125	.001584		.67
		3.55	0	1.00891	657.8	.01366	.001924	.01374	.001935		.82
		2.55	0	1.00557	657.5	.01278	.001800	.01244	.001752		.77
		1.55	0	1.01671	675.2	.01048	.001476	.01239	.001745		.63
		1.05	0	1.00947	656.2	.01154	.001625				.69
		10.55	45	.97604	610.5	.00600	.000845	.00631	.000889		.47
		6.55	45	.97994	611.5	.00580	.000817	.00580	.000817		.45
		4.55	45	.97381	613.2	.00697	.000982	.00685	.000965		.56
		2.55	45	.98105	619.9	.00762	.001073	.00779	.001097		.61

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(b) M = 2.65; R = 2.54 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97978	591.9	.00179	.000391			.92	
12.0	.0			.97585	589.2	.00191	.000417			.95	
20.5	.0			.97866	602.5	.00355	.000775			1.74	
28.0	12.0			.96293	587.9	.00305	.000666			1.39	
28.0	4.0			.95619	591.2	.00440	.000960			2.18	
28.0	.0			.98596	617.9	.00611	.001333			3.02	
20.5	-5.0			.98371	596.2	.00230	.000502			1.11	
24.5	-5.0			.97304	592.2	.00272	.000594			1.24	
30.0	.0			1.02863	651.9	.00742	.001619	.00774	.001689	3.69	
34.0	.0			.96967	577.5	.00063	.000137			.31	
2.0	-12.0			.98090	593.2	.00195	.000426			.95	
2.0	12.0			.98652	595.5	.00189	.000412			.94	
12.0	-12.0			.97753	591.2	.00198	.000432			.89	
12.0	12.0			.97641	589.9	.00192	.000419			.96	
30.0	1.0			1.01460	636.2	.00656	.001432			2.98	
31.0	2.0			1.00336	636.2	.00569	.001242			2.80	
32.0	2.0			.99101	612.9	.00463	.001010	.00460	.001004	2.48	
32.0	3.0			.98708	611.5	.00455	.000993			2.29	
32.0	6.0			.95339	592.2	.00488	.001065			2.42	
34.0	1.0			.97136	578.5	.00071	.000155	.00060	.000131	.34	
34.0	2.0			.97304	585.2	.00158	.000345	.00148	.000323	.76	
34.0	3.0			.97809	594.9	.00269	.000587	.00256	.000559	1.31	
36.0	.0			.94721	572.5	.00179	.000391	.00174	.000380	.90	
38.0	.0			.95451	575.2	.00173	.000378			.84	
44.0	12.0			.97192	589.9	.00239	.000522			1.14	
42.0	.0			.95619	582.5	.00258	.000563			1.25	
44.0	.0			.95956	591.5	.00311	.000679	.00312	.000681	1.44	
48.0	.0			.97304	593.9	.00302	.000659	.00303	.000661	1.46	
52.0	.0			.96911	592.2	.00334	.000729	.00334	.000729	1.61	
52.0	12.0			.95451	576.2	.00198	.000432			.96	
55.0	.0			.96855	591.2	.00295	.000644	.00293	.000639	1.45	
58.0	.0			.98539	600.2	.00280	.000611			1.35	
58.0	12.0			.97192	586.2	.00191	.000417			.93	
58.0	-12.0			.95619	579.2	.00230	.000502				
44.0	-12.0			.96349	586.9	.00280	.000611			1.34	
36.0	-8.0			.97304	595.9	.00342	.000746			1.62	
36.0	-3.0			.96742	581.9	.00135	.000295				
34.0	-3.0			.98764	608.5	.00396	.000864	.00403	.000879	1.92	
32.0	-3.0			1.00168	623.5	.00504	.001100	.00520	.001135	2.29	
30.0	-3.0			.98708	610.9	.00442	.000965	.00439	.000958	2.13	
28.0	-3.0			.98315	603.5	.00393	.000858			1.89	
34.0	-12.0			.96742	588.2	.00263	.000574			1.18	
32.0	-12.0			.97416	591.5	.00239	.000522	.00239	.000522	1.07	
30.0	-12.0			.97866	593.9	.00236	.000515			1.10	
19.0	-12.5			.98596	597.9	.00210	.000458			1.02	
17.5	-11.0			.98034	594.5	.00211	.000460			1.01	
15.5	-2.5			.99438	600.5	.00205	.000447			.99	
16.5	-2.5			.97416	588.9	.00199	.000434	.00174	.000380	.97	
17.5	-2.5			.97304	590.2	.00232	.000506			1.15	
18.5	-2.5			1.00168	607.5	.00222	.000484			1.08	
19.5	-2.5			.97866	601.5	.00255	.000556	.00229	.000500	1.24	
20.5	-2.5			.97304	593.9	.00284	.000620	.00285	.000622	1.38	
21.5	-2.5			.96967	591.9	.00287	.000626	.00294	.000642	1.40	
22.5	-2.5			.96237	586.9	.00286	.000624	.00276	.000602	1.40	
23.5	-2.5			.96237	586.2	.00291	.000635	.00273	.000596	1.41	
24.5	-2.5			.97416	594.2	.00299	.000652			1.45	
		10.55	90	.96237	576.5	.00135	.000295				.42
		6.55	90	.97809	585.2	.00121	.000264				.38
		4.55	90	.96967	579.2	.00116	.000253				.36
		2.55	90	.96293	574.9	.00123	.000268				.38
		8.55	180	1.01010	599.2	.00050	.000109	.00046	.000100		
		6.55	180	1.02695	607.5	.00029	.000063				
		1.55	180	1.01347	600.9	.00027	.000059				
		1.05	180	1.01460	600.5	.00019	.000041				
34.0	-1.0			.98539	591.5	.00122	.000266	.00122	.000266	.67	
34.0	4.0			.98876	609.9	.00412	.000899			2.04	
34.0	5.0			.96742	600.5	.00460	.001004	.00459	.001002	2.27	
34.0	6.0			.95675	594.5	.00437	.000954	.00437	.000954	2.17	
36.0	6.0			.96012	590.5	.00390	.000851			1.93	
38.0	1.0			.93654	567.5	.00221	.000482	.00179	.000391	1.08	
38.0	2.0			.96125	580.5	.00194	.000423			.95	
44.0	8.0			.95956	581.2	.00211	.000460			1.03	
44.0	6.0			.94440	569.9	.00193	.000421	.00180	.000393	.96	
44.0	4.0			.96181	582.2	.00218	.000476	.00215	.000469	1.14	
44.0	2.0			.96630	590.5	.00311	.000679	.00309	.000674	1.51	
44.0	1.0			.95619	585.9	.00362	.000790	.00378	.000825	1.80	
		10.55	0	1.00842	634.2	.00660	.001440				.49
		8.55	0	1.00842	638.0	.00735	.001604	.00738	.001610		.54
		6.55	0	1.01010	638.7	.00778	.001698	.00772	.001685		.57
		4.55	0	1.01347	654.9	.00935	.002040	.00943	.002058		.69
		3.55	0	1.01347	660.9	.00931	.002032	.00904	.001973		.69
		2.55	0	1.01066	650.5	.00950	.002073	.00920	.002008		.70
		1.55	0	1.02133	669.2	.00835	.001822				.62
		1.05	0	1.01403	656.5	.00745	.001626				.55
		10.55	45	.98371	607.5	.00469	.001023	.00482	.001052		.45
		6.55	45	.98820	608.9	.00435	.000949	.00426	.000930		.42
		4.55	45	.98146	609.9	.00532	.001161	.00510	.001113		.51
		2.55	45	.98539	612.9	.00542	.001183	.00541	.001181		.52

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(c) M = 2.65; R = 1.27 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.98209	591.5	.00099	.000432			.97	
12.0	.0			.97929	589.2	.00100	.000436			1.08	
20.5	.0			.98153	597.2	.00207	.000903			2.11	
28.0	12.0			.96753	587.2	.00177	.000772			1.75	
28.0	4.0			.96082	589.9	.00285	.001243			2.88	
28.0	.0			.98712	611.6	.00365	.001592			3.72	
20.5	-5.0			.98712	595.5	.00127	.000554			1.22	
24.5	-5.0			.97705	593.9	.00154	.000672			1.62	
30.0	.0			1.02630	643.9	.00486	.002120	.00516	.002251	5.23	
34.0	.0			.97705	581.5	.00024	.000105			.25	
2.0	-12.0			.98320	592.5	.00104	.000454			.96	
2.0	12.0			.98824	594.9	.00101	.000441			.99	
12.0	-12.0			.98209	591.2	.00104	.000454			.99	
12.0	12.0			.97929	589.5	.00102	.000445			1.03	
30.0	1.0			1.01175	629.2	.00404	.001763			4.30	
31.0	2.0			.99720	618.5	.00364	.001588			3.91	
32.0	2.0			.98544	606.2	.00270	.001178	.00264	.001152	2.87	
32.0	3.0			.98097	601.5	.00263	.001147			2.74	
32.0	6.0			.95746	588.9	.00296	.001291			3.02	
34.0	1.0			.97929	583.5	.00033	.000144			.38	
34.0	2.0			.97369	584.2	.00080	.000349			.78	
34.0	3.0			.97425	588.2	.00159	.000694	.00140	.000611	1.59	
36.0	.0			.95690	575.5	.00088	.000384	.00082	.000358	.90	
38.0	.0			.96026	576.9	.00095	.000414	.00137	.000598	1.01	
44.0	12.0			.97593	590.2	.00131	.000572			1.27	
42.0	.0			.96306	582.5	.00144	.000628			1.41	
44.0	.0			.96530	585.9	.00175	.000763	.00175	.000763	1.86	
48.0	.0			.97705	591.9	.00162	.000707	.00163	.000711	1.72	
52.0	.0			.97313	590.5	.00180	.000785	.00180	.000785	1.91	
52.0	12.0			.96194	578.5	.00101	.000441			1.00	
55.0	.0			.97145	588.9	.00170	.000742	.00167	.000729	1.73	
58.0	.0			.98880	598.5	.00162	.000707			1.62	
58.0	12.0			.98041	589.2	.00099	.000432			.97	
58.0	-12.0			.96697	584.2	.00119	.000519				
44.0	-12.0			.97089	587.9	.00153	.000668			1.51	
36.0	-8.0			.97649	593.9	.00189	.000825			1.87	
36.0	-3.0			.96921	583.5	.00094	.000410				
34.0	-3.0			.98488	600.2	.00213	.000929	.00216	.000942	2.15	
32.0	-3.0			.99496	612.2	.00294	.001283	.00306	.001335	3.34	
30.0	-3.0			.98376	603.2	.00277	.001208	.00274	.001195	2.89	
28.0	-3.0			.98600	600.9	.00216	.000942			2.27	
34.0	-12.0			.97145	588.2	.00144	.000628			1.50	
32.0	-12.0			.97649	589.5	.00130	.000567	.00130	.000567	1.31	
30.0	-12.0			.98153	591.9	.00127	.000554			1.22	
19.0	-12.5			.99048	596.2	.00103	.000449			1.04	
17.5	-11.0			.98488	593.2	.00122	.000532			1.20	
15.5	-2.5			.99944	601.2	.00085	.000371			.80	
16.5	-2.5			.97817	591.9	.00116	.000506	.00103	.000449	1.25	
17.5	-2.5			.97649	589.9	.00135	.000589			1.42	
18.5	-2.5			1.00559	609.2	.00139	.000606			1.49	
19.5	-2.5			.98153	594.2	.00163	.000711			1.65	
20.5	-2.5			.97705	592.5	.00172	.000750	.00172	.000750	1.72	
21.5	-2.5			.97313	590.5	.00167	.000729	.00171	.000746	1.64	
22.5	-2.5			.96753	586.9	.00171	.000746	.00166	.000724	1.74	
23.5	-2.5			.96697	585.2	.00200	.000873	.00181	.000790	1.98	
24.5	-2.5			.97929	595.5	.00171	.000746			1.74	
		10.55	90	.98041	585.9	.00072	.000314				.32
		6.55	90	.99272	592.9	.00081	.000353				.36
		4.55	90	.98376	587.9	.00069	.000301				.30
		2.55	90	.97313	581.2	.00061	.000266				.27
		8.55	180	1.02910	611.2	.00018	.000079				
		6.55	180	1.03469	613.9	.00017	.000074				
		1.05	180	1.01119	600.9	.00019	.000083				
34.0	-1.0			.98880	591.9	.00069	.000301	.00076	.000332	.73	
34.0	4.0			.98712	602.9	.00224	.000977			2.41	
34.0	5.0			.96809	594.5	.00251	.001095	.00249	.001086	2.49	
34.0	6.0			.95858	586.9	.00266	.001160	.00265	.001156	2.86	
36.0	6.0			.96250	586.5	.00214	.000934			2.23	
38.0	1.0			.94795	576.5	.00125	.000545	.00119	.000519	1.34	
38.0	2.0			.96697	582.2	.00124	.000541			1.27	
44.0	3.0			.96641	583.5	.00131	.000572			1.31	
44.0	6.0			.95690	574.5	.00094	.000410	.00080	.000349	.94	
44.0	4.0			.96921	584.2	.00106	.000462	.00105	.000458	1.06	
44.0	2.0			.97033	588.5	.00182	.000794	.00180	.000785	1.84	
44.0	1.0			.96026	584.9	.00188	.000820	.00193	.000842	2.11	
		10.55	0	1.01063	631.9	.00455	.001985				.47
		8.55	0	1.01063	634.9	.00517	.002256	.00519	.002264		.54
		6.55	0	1.01175	634.2	.00500	.002181	.00493	.002151		.52
		4.55	0	1.01511	644.5	.00611	.002666	.00626	.002731		.64
		3.55	0	1.01231	641.5	.00617	.002692	.00611	.002666		.64
		2.55	0	1.01063	641.2	.00625	.002727	.00600	.002618		.63
		1.55	0	1.01902	651.5	.00639	.002788				.67
		1.05	0	1.01063	639.2	.00544	.002373				.57
		10.55	45	.99048	608.2	.00303	.001322	.00301	.001313		.41
		6.55	45	.99384	608.2	.00300	.001309	.00282	.001230		.41
		4.55	45	.98712	609.2	.00349	.001523	.00320	.001396		.47
		2.55	45	.98768	608.2	.00323	.001409	.00310	.001352		.44

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(d) M = 3.51; R = 4.00 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.97345	584.2	.00133	.000259			.85	
12.0	.0			.96837	580.5	.00137	.000266			.88	
27.5	.0			.96950	596.2	.00285	.000554			1.84	
28.0	12.0			.95256	579.2	.00244	.000474			1.57	
28.0	4.0			.95651	591.5	.00401	.000780			2.42	
28.0	.0			.98870	626.5	.00539	.001048			3.41	
28.5	-5.0			.97515	587.5	.00187	.000364			1.21	
24.5	-5.0			.96046	582.2	.00222	.000432			1.50	
30.0	.0			1.02993	660.2	.00554	.001077	.00602	.001170	3.57	
31.0	12.0			.94973	579.9	.00276	.000537			1.65	
34.0	.0			.98983	584.9	.00048	.000093			.31	
2.0	-12.0			.97402	584.9	.00141	.000274			.87	
2.0	12.0			.97010	588.5	.00152	.000296			.81	
12.0	-12.0			.96950	581.9	.00143	.000278			.86	
12.0	12.0			.96668	581.5	.00162	.000315			.87	
30.0	1.0			1.01411	635.5	.00588	.001143			3.79	
31.0	2.0			1.00508	632.5	.00571	.001110			3.61	
32.0	2.0			.99661	620.2	.00437	.000850	.00441	.000857	3.12	
32.0	3.0			.98870	616.5	.00485	.000943			3.03	
32.0	6.0			.95086	591.5	.00440	.000855			2.60	
34.0	1.0			.98814	584.9	.00062	.000121	.00053	.000103	.40	
34.0	2.0			.98249	589.5	.00157	.000305	.00140	.000272	.98	
34.0	3.0			.98136	597.9	.00276	.000537	.00267	.000519	1.70	
36.0	.0			.96385	576.9	.00132	.000257	.00128	.000249	.85	
38.0	.0			.95708	576.9	.00185	.000360			1.19	
44.0	12.0			.95990	581.5	.00247	.000480			1.63	
42.0	.0			.95312	582.2	.00279	.000542			1.80	
44.0	.0			.96329	587.9	.00278	.000540	.00279	.000542	1.83	
48.0	.0			.97966	594.5	.00235	.000457	.00236	.000459	1.53	
52.0	.0			.97289	588.5	.00214	.000416	.00213	.000414	1.36	
52.0	12.0			.94465	570.2	.00192	.000373			1.08	
55.0	.0			.96950	588.2	.00248	.000482	.00246	.000478	1.66	
58.0	.0			.98531	596.5	.00209	.000406			1.34	
58.0	12.0			.96498	579.9	.00160	.000311			.90	
58.0	-12.0			.95369	578.5	.00231	.000449				
44.0	-12.0			.95933	585.5	.00259	.000504			1.67	
36.0	-8.0			.96724	591.2	.00287	.000558			1.83	
36.0	-3.0			.97458	585.5	.00151	.000294				
34.0	-3.0			.98927	609.2	.00350	.000680	.00353	.000686	2.35	
32.0	-3.0			1.00338	627.2	.00507	.000986	.00526	.001023	3.29	
30.0	-3.0			.98362	607.5	.00387	.000752	.00382	.000743	2.50	
28.0	-3.0			.96950	596.2	.00339	.000659			2.26	
34.0	-12.0			.96159	582.9	.00229	.000445			1.47	
32.0	-12.0			.96498	584.5	.00222	.000432	.00222	.000432	1.35	
30.0	-12.0			.97005	586.2	.00208	.000404			1.30	
19.0	-12.5			.97910	586.5	.00145	.000282			.92	
17.5	-11.0			.97402	583.5	.00141	.000274			.85	
15.5	-2.5			.98757	594.5	.00134	.000261			.84	
16.5	-2.5			.96781	580.5	.00155	.000301			1.08	
17.5	-2.5			.96668	585.5	.00176	.000342			1.14	
18.5	-2.5			.99491	599.9	.00189	.000367			1.32	
19.5	-2.5			.97176	588.5	.00224	.000435	.00210	.000408	1.42	
20.5	-2.5			.96555	586.5	.00242	.000470	.00242	.000470	1.53	
21.5	-2.5			.96103	585.9	.00257	.000500	.00262	.000509	1.63	
22.5	-2.5			.95312	578.2	.00239	.000465	.00231	.000449	1.55	
23.5	-2.5			.95086	582.2	.00227	.000441	.00207	.000402	1.38	
24.5	-2.5			.96272	583.5	.00234	.000455			1.65	
		10.55	90	.96837	572.5	.00075	.000146				.21
		6.55	90	.98531	586.2	.00096	.000187				.27
		4.55	90	.97458	579.5	.00106	.000206				.30
		2.55	90	.96611	574.2	.00115	.000224				.33
		8.55	180	1.03049	605.9	.00027	.000052				
		6.55	180	1.04574	613.9	.00022	.000043				
		4.55	180	1.06155	622.9	.00014	.000027				
		1.05	180	1.03049	606.2	.00027	.000052				
34.0	-1.0			.99774	592.9	.00077	.000150	.00080	.000156	.51	
34.0	4.0			.98644	610.5	.00408	.000793	.00450	.000875	2.57	
34.0	5.0			.96442	599.9	.00423	.000822	.00421	.000818	2.60	
34.0	6.0			.95312	590.5	.00415	.000807	.00416	.000809	2.56	
36.0	6.0			.95651	588.5	.00345	.000671			1.88	
38.0	1.0			.94522	573.2	.00222	.000432	.00181	.000352	1.41	
38.0	2.0			.97289	587.9	.00195	.000379			1.26	
44.0	8.0			.95256	574.9	.00189	.000367			1.12	
44.0	6.0			.94352	567.5	.00168	.000327	.00146	.000284	.91	
44.0	4.0			.96724	583.2	.00181	.000352	.00182	.000354	1.13	
44.0	2.0			.97119	589.5	.00243	.000472	.00246	.000478	1.53	
44.0	1.0			.96385	586.2	.00252	.000490	.00282	.000548	1.69	
		10.55	0	1.00621	639.9	.00577	.001316				.46
		8.55	0	1.00734	646.9	.00808	.001571	.00811	.001577		.66
		6.55	0	1.01072	648.5	.00821	.001596	.00821	.001596		.66
		4.55	0	1.01016	650.5	.00847	.001647	.00849	.001651		.68
		3.55	0	.99243	657.9	.00872	.001695	.00859	.001670		.69
		2.55	0	1.00847	653.5	.00877	.001705	.00847	.001647		.69
		1.55	0	1.02315	667.2	.00819	.001592	.00862	.001676		.66
		1.05	0	1.02654	668.5	.00728	.001415				.49
		10.55	45	.97458	600.9	.00407	.000791	.00384	.000747		.36
		6.55	45	.98305	608.5	.00438	.000852	.00408	.000793		.45
		4.55	45	.97684	607.5	.00482	.000937	.00447	.000869		.43
		2.55	45	.98362	612.5	.00504	.000980	.00496	.000964		.45

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(e) M = 3.51; R = 2.80 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_c}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.97002	583.9	.00107	.000297			.87	
12.0	.0			.97449	585.3	.00097	.000260			.87	
20.0	.0			.97762	586.3	.00219	.000608			1.81	
28.0	12.0			.95974	577.7	.00192	.000533			1.26	
28.0	4.0			.96144	587.2	.00331	.000919			2.61	
28.0	.0			.99162	619.6	.00444	.001232			3.44	
28.0	-6.0			.98852	584.9	.00136	.000377			1.13	
24.0	-6.0			.96768	580.6	.00184	.000511			1.48	
20.0	.0			1.03288	647.2	.00541	.001501	.00076	.001598	4.36	
12.0	12.0			.95690	577.6	.00226	.000627			1.84	
4.0	.0			.98603	585.2	.00077	.000075			.22	
2.0	-12.0			.97702	584.2	.00107	.000767			.84	
2.0	-12.0			.98621	587.2	.00118	.000327			.89	
12.0	-12.0			.97505	583.2	.00105	.000791			.81	
12.0	.0			.97355	579.0	.00117	.000325			.88	
20.0	.0			1.01750	635.2	.00432	.001199			3.51	
28.0	2.0			1.01966	627.2	.00435	.001207			3.43	
32.0	2.0			.99773	614.2	.00333	.000924	.00116	.000877	2.71	
32.0	3.2			.98939	608.2	.00346	.000960			2.68	
32.0	6.0			.95534	586.9	.00347	.000963			2.61	
36.0	.0			.99439	584.9	.00037	.000103			.31	
44.0	2.0			.98582	587.2	.00106	.000295			.85	
56.0	6.0			.98412	591.9	.00198	.000549	.00184	.000511	1.47	
56.0	.0			.97101	577.5	.00093	.000258	.00090	.000250	.74	
56.0	.0			.96654	577.2	.00147	.000408			1.21	
44.0	12.0			.96654	580.9	.00184	.000511			1.20	
62.0	.0			.96031	580.2	.00226	.000627	.00210	.000710	1.87	
44.0	.0			.96995	584.9	.00221	.000613	.00221	.000613	1.77	
68.0	.0			.98639	591.9	.00170	.000472	.00171	.000475	1.40	
62.0	.0			.98015	586.5	.00157	.000436	.00157	.000433	1.23	
62.0	12.0			.96237	568.9	.00149	.000413			.87	
51.0	.0			.97471	586.2	.00180	.000500	.00178	.000494	1.40	
68.0	.0			.96206	566.5	.00171	.000475			1.35	
44.0	12.0			.97301	579.9	.00120	.000333			.79	
56.0	-12.0			.96247	577.5	.00170	.000472				
44.0	-12.0			.96711	581.5	.00184	.000511			1.55	
56.0	-8.0			.97335	587.9	.00241	.000669			1.96	
56.0	-4.0			.97748	584.9	.00108	.000300				
56.0	-3.0			.99262	602.5	.00276	.000766	.00277	.000769	2.42	
32.0	-4.0			1.00519	618.5	.00366	.001016	.00384	.001066	3.08	
32.0	-3.0			.98525	600.9	.00301	.000835	.00299	.000829	2.46	
28.0	-3.0			.97562	592.9	.00268	.000744			2.21	
44.0	-12.0			.96881	580.9	.00165	.000458			1.30	
32.0	-12.0			.97051	581.5	.00161	.000447	.00161	.000447	1.34	
20.0	-12.0			.97391	583.2	.00157	.000436			1.28	
12.0	-12.0			.98299	587.9	.00104	.000289			.83	
17.5	-11.0			.97845	584.2	.00105	.000291			.88	
15.5	-2.5			.99376	595.9	.00097	.000269			.79	
16.5	-2.5			.97221	579.5	.00121	.000336			.98	
17.5	-2.5			.97051	580.5	.00139	.000386			1.17	
18.5	-2.5			.99829	597.2	.00148	.000411			1.21	
19.5	-2.5			.97562	585.9	.00176	.000488	.00157	.000436	1.45	
20.5	-2.5			.96938	583.5	.00203	.000563	.00203	.000563	1.65	
21.5	-2.5			.96731	581.9	.00192	.000533	.00199	.000552	1.56	
22.5	-2.5			.96937	583.2	.00172	.000477	.00164	.000455	1.40	
23.5	-2.5			.96747	582.2	.00162	.000450	.00158	.000438	1.46	
24.5	-2.5			.96938	583.2	.00186	.000516			1.54	
		12.56	90	.97406	593.5	.00059	.000164				.20
		8.56	90	.99169	603.2	.00069	.000193				.24
		4.56	90	.98072	597.2	.00092	.000255				.32
		2.56	90	.97278	592.2	.00088	.000244				.30
		1.56	180	1.00461	609.2	.00114	.000317				
		8.56	180	1.01231	614.2	.00022	.000061				
		4.56	180	1.00621	611.2	.00042	.000117				
36.0	-1.0			1.00340	609.2	.00058	.000161	.00062	.000172	.52	
34.0	4.0			.99092	603.2	.00304	.000844			2.17	
36.0	5.0			.98996	602.9	.00343	.000953	.00342	.000949	2.60	
34.0	6.0			.98747	601.9	.00307	.000907	.00327	.000907	2.49	
36.0	6.0			.98275	599.2	.00270	.000749			2.03	
38.0	1.0			.97674	595.9	.00169	.000469			1.40	
38.0	2.0			.98015	586.5	.00146	.000405			1.13	
44.0	8.0			.96087	573.9	.00137	.000380			.90	
44.0	6.0			.98294	587.2	.00121	.000336	.00096	.000275	.88	
44.0	4.0			.97505	582.9	.00146	.000405	.00148	.000411	1.08	
44.0	2.0			.97902	584.2	.00174	.000483	.00136	.000488	1.37	
44.0	0			.97061	581.5	.00194	.000538	.00139	.000608	1.56	
44.		12.56	0	1.00850	606.2	.00563	.001562				.46
		8.56	0	1.01020	607.2	.00686	.001904	.00684	.001912		.56
		6.56	0	1.01120	607.9	.00643	.001784	.00640	.001792		.52
		4.56	0	1.01247	608.9	.00698	.001937	.00702	.001948		.57
		3.56	0	1.00283	606.9	.00734	.002037	.00744	.002065		.61
		2.56	0	1.01133	608.9	.00716	.001987	.00686	.001904		.58
		1.56	0	1.02604	609.2	.00717	.001976	.00760	.002109		.58
		1.06	0	1.02814	610.2	.00652	.001809				.53
		12.56	45	.97902	597.2	.00335	.000930	.00308	.000855		.38
		6.56	45	.98809	604.2	.00345	.000957	.00248	.000616		.28
		4.56	45	.98072	600.2	.00302	.001048	.00378	.000980		.43
		2.56	45	.97602	601.2	.00366	.001066	.00381	.001035		.43

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(f) M = 3.51; R = 1.61×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97857	583.5	.00065	.000314			.96	
12.0	.0			.97688	581.2	.00057	.000276			.88	
22.5	.0			.97463	588.2	.00141	.000682			2.07	
28.0	12.0			.96279	580.6	.00125	.000605			1.47	
28.0	4.0			.96109	585.2	.00213	.001030			2.54	
28.0	.0			.98928	610.9	.00317	.001534			4.80	
20.5	-4.0			.98106	586.6	.00087	.000421			1.32	
24.5	-4.0			.97181	583.2	.00103	.000498			1.56	
30.0	.0			1.02875	644.6	.00348	.001684	.00375	.001814	5.19	
31.0	12.0			.95997	579.6	.00135	.000653			1.99	
2.0	-12.0			.97801	583.2	.00065	.000414			.76	
2.0	12.0			.98421	587.6	.00079	.000382			.93	
12.0	-12.0			.97744	581.9	.00064	.000310			.76	
12.0	12.0			.97463	581.2	.00080	.000387			1.04	
30.5	1.0			1.01296	627.5	.00314	.001519			4.69	
31.0	2.0			.98887	616.6	.00282	.001364			3.81	
32.0	2.0			.99097	605.2	.00223	.001079	.00221	.001069	3.33	
32.0	3.0			.98139	601.5	.00229	.001108			3.37	
32.0	6.0			.95771	585.6	.00230	.001113			2.71	
34.0	1.0			.99830	588.9	.00022	.000106			.32	
34.0	2.0			.98500	586.6	.00064	.000310	.00052	.000252	.94	
34.0	3.0			.97914	588.9	.00127	.000614			1.67	
36.0	.0			.98421	583.6	.00042	.000203			.49	
38.5	.0			.97576	581.9	.00075	.000363			.88	
44.5	12.0			.96955	582.6	.00115	.000556			1.69	
42.5	.0			.96617	582.2	.00139	.000672			2.04	
44.5	.0			.97463	585.9	.00134	.000648	.00134	.000648	1.72	
48.0	.0			.99007	593.2	.00099	.000479	.00101	.000489	1.16	
52.0	.0			.98524	588.9	.00096	.000464	.00095	.000460	1.35	
52.5	12.0			.95771	573.2	.00086	.000416			1.01	
54.0	.0			.98105	589.6	.00114	.000552	.00112	.000542	1.70	
56.0	.0			.99718	596.4	.00098	.000474			1.46	
58.5	12.0			.98083	584.2	.00069	.000334			.82	
58.0	-12.0			.96899	580.2	.00102	.000493				
44.0	-12.0			.97237	583.2	.00108	.000522			1.66	
36.0	-4.0			.97575	587.2	.00130	.000629			1.97	
36.0	-2.0			.97575	581.6	.00058	.000281				
34.0	-3.0			.98646	595.9	.00150	.000726	.00150	.000726	2.24	
32.0	-3.0			.99661	609.2	.00241	.001166	.00250	.001209	3.60	
30.0	-2.0			.97970	595.2	.00198	.000958	.00192	.000929	2.75	
28.0	-3.0			.97688	591.9	.00180	.000871			2.65	
34.0	-12.0			.97237	582.6	.00100	.000484			1.19	
32.0	-12.0			.97237	581.9	.00100	.000484	.00099	.000479	1.40	
30.0	-12.0			.98252	582.9	.00092	.000445			1.35	
10.5	-12.5			.98690	586.9	.00067	.000324			1.00	
17.5	-11.0			.98139	584.2	.00060	.000290			.71	
16.5	-2.5			.99605	593.2	.00064	.000310			.86	
14.5	-2.5			.97463	581.2	.00068	.000329			.80	
12.5	-2.5			.97181	583.2	.00086	.000416			1.28	
10.5	-2.5			.99943	597.9	.00097	.000469			1.47	
8.5	-2.5			.97688	586.9	.00126	.000610			1.50	
6.5	-2.5			.97068	584.2	.00129	.000624	.00127	.000614	1.54	
21.5	-2.5			.96862	582.2	.00140	.000677	.00147	.000711	1.65	
23.5	-2.5			.96166	577.2	.00122	.000590	.00117	.000566	1.72	
25.5	-2.5			.97181	582.9	.00105	.000508			1.24	
		11.55	90	.98534	582.5	.00054	.000261				.24
		6.55	90	1.00000	590.5	.00053	.000256				.24
		4.55	90	.98646	584.5	.00053	.000256				.24
		2.55	90	.97688	579.2	.00053	.000256				.24
36.0	4.0			.98750	601.9	.00184	.000890			2.45	
36.5	4.5			.96899	590.9	.00216	.001045	.00213	.001030	3.00	
36.0	5.0			.95771	582.9	.00212	.001026	.00211	.001021	2.49	
34.0	6.0			.96222	581.9	.00180	.000871			2.47	
33.5	5.0			.96673	581.2	.00104	.000508			1.50	
33.2	2.0			.98195	587.9	.00090	.000435			1.29	
44.5	8.0			.96730	577.6	.00079	.000382			.93	
44.5	6.0			.96222	572.6	.00066	.000319			.78	
44.5	4.0			.98139	586.2	.00074	.000358	.00077	.000373	.94	
44.5	2.0			.98365	590.5	.00113	.000547	.00114	.000552	1.68	
44.0	1.0			.97519	585.9	.00115	.000556			1.74	
		10.55	0	1.00733	630.9	.00423	.002046				.45
		8.55	0	1.00902	636.9	.00486	.002351	.00489	.002366		.52
		6.55	0	1.01240	636.9	.00461	.002230	.00461	.002230		.49
		4.55	0	1.00902	637.9	.00472	.002625	.00526	.002545		.56
		3.55	0	1.00056	641.5	.00504	.002438	.00494	.002390		.54
		2.55	0	1.00789	637.2	.00466	.002254	.00450	.002177		.50
		1.55	0	1.02085	653.3	.00463	.002240	.00489	.002366		.49
		1.05	0	1.02142	650.2	.00434	.002100				.46
		10.55	45	.98308	598.5	.00245	.001185				.34
		6.55	45	.99097	606.9	.00262	.001268				.36

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(g) M = 4.44; R = 4.57×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
7.0	.0			.95489	567.2	.00085	.000214			1.00	
12.0	.0			.95489	566.5	.00084	.000212			1.17	
20.5	.0			.95997	574.9	.00201	.000507			2.87	
28.0	12.0			.93967	560.9	.00176	.000444			1.71	
28.0	4.0			.96448	581.2	.00300	.000756			3.61	
28.0	.0			.99718	609.2	.00501	.001263			6.26	
20.5	-5.0			.96109	574.9	.00126	.000318			1.88	
24.5	-5.0			.95038	567.2	.00168	.000423			2.51	
30.0	.0			1.02988	631.5	.00531	.001338	.00087	.001480	7.81	
31.0	12.0			.93572	560.9	.00207	.000522			2.03	
34.0	.0			.99041	583.5	.00030	.000076			.45	
2.0	-12.0			.95264	565.2	.00076	.000192			1.12	
2.0	12.0			.95489	568.2	.00112	.000282			1.12	
12.0	-12.0			.95151	564.5	.00087	.000219			1.55	
12.0	12.0			.94531	562.7	.00115	.000290			1.18	
30.0	1.0			1.01409	616.5	.00438	.001104			6.74	
31.0	2.0			1.00338	612.5	.00467	.001177			6.40	
32.0	2.0			.99379	602.2	.00337	.000849	.00136	.000847	4.21	
32.0	3.0			.98500	598.2	.00286	.000973			4.65	
32.0	6.0			.95038	575.5	.00374	.000943			4.35	
34.0	1.0			.98703	581.9	.00037	.000093			.53	
34.0	2.0			.98026	582.2	.00107	.000270	.00089	.000224	1.47	
34.0	3.0			.97857	587.9	.00202	.000509	.00176	.000444	2.85	
36.0	.0			.96617	573.5	.00105	.000265	.00103	.000260	1.48	
38.0	.0			.94982	566.5	.00163	.000411			2.33	
44.0	12.0			.93967	563.5	.00236	.000595			2.20	
42.0	.0			.94926	568.2	.00213	.000537			3.04	
44.0	.0			.95489	571.2	.00170	.000428	.00170	.000428	2.46	
48.0	.0			.96730	576.5	.00164	.000413	.00166	.000418	2.05	
52.0	.0			.95828	570.2	.00136	.000343	.00135	.000340	1.97	
52.0	12.0			.92783	554.2	.00151	.000381			1.53	
56.0	.0			.95884	571.5	.00126	.000318	.00124	.000313	1.75	
58.0	.0			.97068	578.9	.00142	.000358			2.68	
58.0	12.0			.96038	564.0	.00112	.000282			1.09	
58.0	-12.0			.94136	562.2	.00184	.000464				
44.0	-12.0			.95038	567.5	.00173	.000436			2.98	
36.0	-8.0			.95680	571.0	.00225	.000567			3.88	
34.0	-3.0			.95884	570.5	.00089	.000224				
34.0	-3.0			.98139	590.5	.00261	.000658	.00266	.000670	3.73	
32.0	-3.0			.99379	603.5	.00398	.001003	.00425	.001071	5.94	
30.0	-3.0			.97293	585.9	.00288	.000726	.00280	.000706	4.65	
28.0	-3.0			.96222	578.5	.00276	.000696			3.94	
34.0	-12.0			.95433	569.7	.00170	.000428			3.09	
32.0	-12.0			.95320	570.9	.00163	.000411	.00163	.000411	2.55	
30.0	-12.0			.95207	568.5	.00146	.000368			2.28	
19.0	-12.5			.96109	569.9	.00086	.000217			1.46	
17.5	-11.0			.95602	566.5	.00074	.000187			1.28	
15.5	-2.5			.97237	577.5	.00086	.000217			1.34	
16.5	-2.5			.95095	565.5	.00119	.000300			1.75	
17.5	-2.5			.95038	567.0	.00134	.000338			2.00	
18.5	-2.5			.98421	587.5	.00141	.000355			2.31	
19.5	-2.5			.95940	572.0	.00176	.000444				
20.5	-2.5			.94377	570.2	.00177	.000446	.00180	.000454	2.81	
21.5	-2.5			.94869	566.5	.00175	.000441	.00181	.000456	2.73	
22.5	-2.5			.93967	560.9	.00170	.000428	.00159	.000401	2.15	
23.5	-2.5			.93572	558.5	.00173	.000436			2.16	
24.5	-2.5			.94587	564.5	.00169	.000426			2.35	
		10.66	90	.96270	564.0	.00047	.000118				.15
		6.66	90	.97576	573.9	.00065	.000164				.21
		4.66	90	.96786	569.5	.00064	.000161				.21
		2.66	90	.95377	562.0	.00072	.000181				.24
		1.66	180	1.00958	593.9	.00017	.000043				
34.0	-1.0			.99774	589.9	.00052	.000131	.00060	.000151	.85	
34.0	4.0			.98816	597.9	.00211	.000784			4.26	
34.0	5.0			.96842	585.9	.00359	.000905	.00359	.000905	4.22	
34.0	6.0			.95377	576.2	.00348	.000877	.00346	.000872	4.09	
36.0	4.0			.96335	579.5	.00282	.000711			3.13	
38.0	1.0			.94700	564.5	.00165	.000416			2.26	
38.0	2.0			.97914	584.2	.00141	.000355			2.01	
44.0	8.0			.94136	561.2	.00128	.000323			1.36	
44.0	6.0			.94587	564.2	.00126	.000318	.00108	.000272	1.59	
44.0	4.0			.97350	580.5	.00142	.000358	.00164	.000413	2.03	
44.0	2.0			.97124	579.9	.00168	.000423			2.02	
44.0	1.0			.95828	572.2	.00181	.000456			2.66	
		10.66	0	1.00563	624.2	.00719	.001810				.56
		8.66	0	1.00620	622.5	.00815	.002054	.00817	.002059		.64
		6.66	0	1.01014	625.2	.00811	.002044	.00814	.002052		.63
		4.66	0	1.01071	624.5	.00772	.001946	.00794	.002001		.60
		3.66	0	.99267	616.2	.00843	.002125	.00778	.001961		.66
		2.66	0	1.00281	622.5	.00842	.002122	.00839	.002115		.66
		1.66	0	1.01353	629.5	.00780	.001966	.00746	.001880		.61
		1.05	0	1.02029	635.9	.00823	.002074				.64
		10.66	45	.97124	584.5	.00359	.000905	.00315	.000794		.36
		8.66	45	.97801	590.9	.00391	.000986	.00338	.000852		.40
		6.66	45	.97350	588.9	.00410	.001033				.42
		2.66	45	.97350	588.5	.00410	.001033	.00390	.000983		.42

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Continued

(h) M = 4.44; R = 3.23×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95512	569.9	.00069	.000246			1.17	
12.0	.0			.95793	570.9	.00069	.000246			.93	
20.5	.0			.95961	577.2	.00182	.000650			3.43	
28.0	12.0			.94334	566.5	.00136	.000486			1.53	
28.0	4.0			.96353	581.9	.00268	.000957			4.62	
28.0	.0			.99495	608.5	.00474	.001693			7.52	
20.5	-5.0			.96297	575.2	.00105	.000375			1.98	
24.5	-5.0			.95512	571.2	.00136	.000486			2.52	
30.0	.0			1.02748	631.2	.00543	.001939	.00591	.002111	9.87	
31.0	12.0			.93885	565.2	.00188	.000671			2.61	
2.0	-12.0			.95232	567.5	.00062	.000221			1.15	
2.0	12.0			.95512	570.5	.00102	.000364			1.36	
12.0	-12.0			.95400	567.9	.00078	.000279			1.59	
12.0	12.0			.94839	566.2	.00088	.000314			1.17	
30.0	1.0			1.01177	616.5	.00421	.001503			6.28	
31.0	2.0			.99887	612.9	.00435	.001553			7.63	
32.0	2.0			.98934	600.5	.00328	.001171	.00324	.001157	5.38	
32.0	3.0			.98148	596.2	.00339	.001211			5.38	
32.0	6.0			.95175	577.5	.00338	.001207			5.20	
34.0	1.0			.98934	586.2	.00027	.000096	.00030	.000107	.40	
34.0	2.0			.97980	584.9	.00075	.000268	.00066	.000236	1.19	
34.0	3.0			.97587	584.9	.00155	.000554	.00134	.000479	2.82	
36.0	.0			.97251	579.2	.00068	.000243	.00066	.000236	1.11	
38.0	.0			.95736	573.2	.00125	.000446			2.19	
44.0	12.0			.94278	567.5	.00187	.000668			2.13	
42.0	.0			.95568	573.5	.00165	.000589			2.62	
44.0	.0			.96129	575.9	.00160	.000571	.00160	.000571		
48.0	.0			.97195	581.5	.00122	.000436	.00124	.000443	2.14	
52.0	.0			.96410	575.2	.00103	.000368	.00102	.000364	1.87	
52.0	12.0			.93324	557.9	.00138	.000493			1.64	
56.0	.0			.96522	575.9	.00107	.000382	.00105	.000375	1.84	
58.0	.0			.97644	583.9	.00121	.000432			1.89	
58.0	12.0			.95624	571.2	.00091	.000325			1.08	
58.0	-12.0			.94615	568.2	.00135	.000482				
44.0	-12.0			.95512	573.2	.00133	.000475			2.71	
36.0	-8.0			.95849	576.2	.00182	.000650			3.71	
36.0	-3.0			.95793	571.2	.00062	.000221				
34.0	-3.0			.97868	589.5	.00226	.000807	.00231	.000825	4.11	
32.0	-3.0			.98934	601.5	.00349	.001246	.00372	.001328	6.84	
30.0	-3.0			.96970	586.9	.00247	.000882	.00238	.000850	4.49	
28.0	-3.0			.96297	580.5	.00226	.000807			4.26	
34.0	-12.0			.95849	575.9	.00127	.000454			2.54	
32.0	-12.0			.95736	574.9	.00126	.000450	.00127	.000454	2.57	
30.0	-12.0			.95288	570.2	.00113	.000404			2.31	
19.0	-12.5			.96410	573.5	.00053	.000189			1.08	
17.5	-11.0			.95905	570.5	.00054	.000193			1.10	
15.5	-2.5			.97587	581.5	.00068	.000243			1.28	
16.5	-2.5			.95400	569.5	.00101	.000361			1.98	
17.5	-2.5			.95288	570.9	.00119	.000425			1.95	
18.5	-2.5			.98541	589.9	.00121	.000432			2.42	
19.5	+2.5			.96073	577.2	.00134	.000479			2.44	
20.5	-2.5			.95568	572.9	.00156	.000557	.00158	.000564	2.56	
21.5	-2.5			.95119	571.2	.00134	.000479	.00144	.000514	2.20	
22.5	-2.5			.94278	565.5	.00135	.000482	.00124	.000443	2.65	
23.5	-2.5			.93941	564.5	.00129	.000461			2.35	
24.5	-2.5			.95007	568.2	.00137	.000489			2.58	
		10.55	90	.96970	573.5	.00040	.000143				.16
		6.55	90	.98148	581.2	.00048	.000171				.19
		4.55	90	.97251	576.2	.00055	.000196				.22
		2.55	90	.95849	568.9	.00062	.000221				.24
		8.55	180	1.01234	598.2	.00019	.000068				
34.0	-1.0			.99887	593.2	.00040	.000143	.00050	.000179	.77	
34.0	4.0			.98643	595.9	.00256	.000941			3.46	
34.0	5.0			.96858	588.5	.00313	.001118	.00315	.001125	4.97	
34.0	6.0			.95400	577.2	.00291	.001039	.00288	.001029	4.48	
36.0	6.0			.96353	580.5	.00225	.000804			3.46	
38.0	1.0			.95512	573.5	.00126	.000450			2.00	
38.0	2.0			.98205	586.9	.00131	.000468			2.38	
44.0	8.0			.94671	565.2	.00106	.000379			1.43	
44.0	6.0			.95175	567.5	.00087	.000311	.00074	.000264	1.34	
44.0	4.0			.97756	583.2	.00104	.000371	.00124	.000443	1.82	
44.0	2.0			.97700	585.9	.00130	.000464	.00162	.000579	2.36	
44.0	1.0			.96353	577.5	.00142	.000507				
		10.55	0	1.00560	619.5	.00667	.002382				.62
		8.55	0	1.00560	623.5	.00786	.002807	.00788	.002814		.73
		6.55	0	1.00997	625.2	.00780	.002786	.00783	.002796		.73
		4.55	0	1.00785	623.9	.00738	.002636	.00757	.002703		.69
		3.55	0	.98990	615.2	.00820	.002928	.00763	.002725		.77
		2.55	0	1.00000	621.2	.00813	.002903	.00809	.002889		.76
		1.55	0	1.01065	628.6	.00780	.002786	.00759	.002711		.73
		1.05	0	1.01626	634.5	.00853	.003046				.80
		10.55	45	.97419	589.9	.00302	.001079				.37
		6.55	45	.97980	593.9	.00382	.001364				.46
		4.55	45	.97419	590.9	.00386	.001378				.47
		2.55	45	.97363	590.9	.00361	.001289	.00335	.001196		.44

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

9. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 26.5° - Concluded

(i) M = 4.44; R = 2.16 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95938	569.2	.00051	.000272			.96	
12.0	.0			.96720	569.9	.00050	.000267			1.00	
20.5	.0			.95882	573.2	.00127	.000677			2.49	
28.0	12.0			.94810	564.5	.00101	.000538			1.60	
28.0	4.0			.96333	579.2	.00216	.001152			4.24	
28.0	.0			.99372	604.5	.00325	.001733				
20.5	-6.0			.96559	574.5	.00076	.000406			1.90	
24.5	-5.0			.95882	571.6	.00092	.000490			1.84	
30.0	.0			1.02820	628.9	.00413	.002202	.00458	.002442	10.33	
31.0	12.0			.94359	566.2	.00131	.000698			1.66	
2.0	-12.0			.95656	569.9	.00051	.000272			.96	
2.0	12.0			.95938	569.9	.00057	.000304			.71	
12.0	-12.0			.95712	566.5	.00048	.000256			1.04	
12.0	12.0			.96148	569.9	.00067	.000357			.85	
30.0	1.5			1.01297	614.5	.00334	.001781			8.35	
31.0	2.0			.99717	612.9	.00317	.001690			6.10	
32.0	2.0			.98815	596.5	.00242	.001290	.00237	.001264	6.05	
32.0	3.0			.97856	592.2	.00253	.001349			5.38	
32.0	6.0			.95600	578.2	.00257	.001370			4.85	
34.0	1.0			.98758	582.9	.00035	.000187	.00039	.000208	.67	
34.0	2.0			.97912	580.9	.00067	.000357	.00061	.000325	1.26	
34.0	3.0			.97348	580.9	.00123	.000656			2.41	
36.0	.0			.97574	577.9	.00049	.000261	.00049	.000261	1.11	
38.0	.0			.96276	572.2	.00079	.000421			1.52	
44.0	12.0			.94753	568.2	.00130	.000693			1.94	
42.0	.0			.96164	574.9	.00144	.000768			3.00	
44.0	.0			.97066	575.9	.00109	.000581	.00109	.000581	2.22	
46.0	.0			.97630	580.2	.00081	.000432	.00083	.000443	1.69	
48.0	.0			.96784	575.5	.00076	.000405	.00074	.000395	1.90	
52.0	.0			.93794	558.2	.00089	.000474			1.13	
52.0	12.0			.97010	575.9	.00070	.000373	.00068	.000363		
56.0	.0			.98251	583.5	.00075	.000400			1.44	
58.0	.0			.96164	570.5	.00056	.000299			.71	
58.0	12.0			.94318	567.5	.00106	.000565				
58.0	-12.0			.96051	572.2	.00088	.000469			2.26	
44.0	-12.0			.96220	574.5	.00125	.000666			2.84	
36.0	-8.0			.96107	570.2	.00050	.000267				
36.0	-3.0			.97743	584.9	.00159	.000848	.00162	.000864	3.61	
44.0	-3.0			.98702	596.2	.00264	.001408	.00284	.001514	5.28	
32.0	-3.0			.96897	581.2	.00177	.000944	.00167	.000890	4.02	
30.0	-3.0			.96502	578.5	.00174	.000929			2.13	
28.0	-3.0			.96276	572.5	.00102	.000544				
34.0	-12.0			.96107	572.5	.00091	.000485	.00092	.000490	2.00	
32.0	-12.0			.95712	568.9	.00078	.000416			1.13	
30.0	-12.0			.96276	569.5	.00044	.000235			1.20	
17.5	-11.0			.98082	580.5	.00048	.000256			1.31	
15.5	-2.5			.95825	568.5	.00068	.000363				
16.5	-2.5			.95600	568.2	.00087	.000464			1.87	
17.5	-2.5			.98758	582.9	.00088	.000469			2.00	
18.5	-2.5			.96220	572.9	.00104	.000554			2.27	
19.5	-2.5			.96769	571.9	.00118	.000629	.00120	.000640		
20.5	-2.5			.95261	569.9	.00105	.000560	.00117	.000624	2.23	
21.5	-2.5			.94471	562.5	.00089	.000474	.00078	.000416	2.30	
22.5	-2.5			.94189	560.5	.00106	.000565	.00113	.000602	2.24	
23.5	-2.5			.95318	566.9	.00103	.000549				.15
24.5	-2.5			.96897	570.2	.00031	.000165				.23
		10.55	90	.97066	572.5	.00048	.000256				.24
		4.55	90	.95938	566.5	.00049	.000261				
		2.55	90	.98533	581.5	.00197	.001050				
34.0	4.0			.96897	583.5	.00227	.001210	.00229	.001221	4.45	
34.0	5.0			.95600	575.2	.00220	.001173	.00217	.001157	4.07	
34.0	6.0			.96446	578.9	.00184	.000981			3.47	
36.0	5.0			.98251	584.9	.00075	.000400			1.88	
38.0	2.0			.95235	564.5	.00072	.000384			1.33	
44.0	8.0			.95430	565.9	.00065	.000347			1.23	
44.0	6.0			.97800	581.9	.00075	.000400			1.63	
44.0	4.0			.98082	583.5	.00102	.000544			2.04	
44.0	2.0			.96897	576.9	.00104	.000554			2.08	
44.0	1.0			1.00338	615.2	.00465	.002479				.53
		10.55	0	1.00394	614.9	.00534	.002847	.00536	.002858		.61
		8.55	0	1.00676	620.9	.00561	.002991	.00564	.003007		.64
		6.55	0	1.00451	615.2	.00591	.003151	.00615	.003279		.68
		4.55	0	.98871	617.2	.00622	.003316	.00558	.002975		.71
		3.55	0	.99543	621.5	.00612	.003261	.00608	.003242		.70
		2.55	0	1.01015	634.5	.00554	.002954	.00534	.002847		.64
		1.55	0	1.01579	631.2	.00690	.003679				.79
		1.05	0	.97292	584.9	.00239	.001274				.36
		10.55	45	.97856	589.9	.00278	.001482				.42
		6.55	45	.97179	587.5	.00331	.001765				.49
		4.55	45	.97406	588.9	.00279	.001487	.00252	.001344		.42
		2.55	45								

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45°

(a) M = 2.65; R = 3.85 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96010	597.9	.00264	.000376			.91	
12.0	.0			.96283	598.9	.00247	.000351			.79	
20.5	.0			.96611	603.5	.00309	.000440			1.08	
28.0	12.0			.95135	600.2	.00448	.000637			1.35	
28.0	4.0			.96338	613.5	.00575	.000818			1.98	
28.0	.0			.98579	637.9	.00589	.000838			1.95	
20.5	-5.0			.96611	601.5	.00273	.000388			.90	
24.5	-5.0			.97048	607.9	.00328	.000467			1.09	
30.0	.0			1.03279	682.8	.01019	.001450	.01067	.001518	3.26	
31.0	12.0			.94862	593.2	.00320	.000455			1.06	
34.0	.0			.96010	600.9	.00318	.000452	.00304	.000433	1.02	
2.0	-12.0			.95627	596.9	.00287	.000408			.95	
2.0	12.0			.96283	603.2	.00251	.000357			.80	
12.0	-12.0			.95791	597.5	.00304	.000433			.97	
12.0	12.0			.95737	595.9	.00254	.000361			.87	
30.0	1.0			1.02131	667.5	.00946	.001346			3.22	
31.0	2.0			1.01147	659.9	.00915	.001302			3.21	
32.0	2.0			1.00163	653.5	.00882	.001255	.00896	.001275	3.21	
32.0	3.0			.98633	632.9	.00677	.000963			2.15	
32.0	6.0			.95081	600.2	.00451	.000642			1.56	
34.0	1.0			.96228	610.2	.00426	.000606	.00402	.000572	1.44	
34.0	2.0			.97485	623.9	.00631	.000898	.00651	.000926	2.15	
34.0	3.0			.96775	617.9	.00624	.000888	.00623	.000886	2.12	
36.0	.0			.92840	597.2	.00591	.000841	.00575	.000818	2.00	
38.0	.0			.91255	581.2	.00564	.000802	.00589	.000838	1.85	
44.0	12.0			.95245	602.5	.00496	.000706			1.60	
42.0	.0			.91474	577.2	.00425	.000605	.00474	.000674	1.36	
44.0	.0			.92785	583.2	.00378	.000538	.00379	.000539	1.30	
48.0	.0			.93168	582.5	.00324	.000461	.00325	.000462	1.07	
52.0	.0			.92020	574.9	.00311	.000442	.00309	.000440	1.05	
52.0	12.0			.94152	589.5	.00331	.000471			1.09	
55.0	.0			.92239	576.2	.00320	.000455	.00318	.000452	1.09	
58.0	.0			.93878	587.5	.00331	.000471			1.13	
58.0	12.0			.96392	600.9	.00280	.000398			.89	
58.0	-12.0			.93660	585.5	.00317	.000451				
44.0	-12.0			.93933	591.5	.00409	.000582			1.29	
36.0	-8.0			.93059	589.2	.00510	.000726			1.60	
36.0	-3.0			.92840	577.2	.00181	.000258				
34.0	-3.0			.95682	615.2	.00687	.000977	.00699	.000994	2.27	
32.0	-3.0			.97649	631.9	.00797	.001134	.00810	.001152	2.55	
30.0	-3.0			.97540	625.5	.00661	.000940	.00662	.000942	2.18	
28.0	-3.0			.97103	617.5	.00546	.000777			1.82	
34.0	-12.0			.93660	588.2	.00362	.000515			1.13	
32.0	-12.0			.95135	596.9	.00358	.000509	.00361	.000514	1.12	
30.0	-12.0			.95846	600.5	.00333	.000474			1.04	
19.0	-12.5			.97048	604.9	.00271	.000386			.86	
17.5	-11.0			.96502	601.5	.00274	.000390			.91	
15.5	-2.5			.97813	611.2	.00263	.000374			.87	
16.5	-2.5			.95354	593.5	.00265	.000377	.00234	.000333	.91	
17.5	-2.5			.95409	594.2	.00284	.000404	.00250	.000356	.94	
18.5	-2.5			.98524	612.2	.00255	.000363			.82	
19.5	-2.5			.96283	599.9	.00282	.000401	.00256	.000364	.94	
20.5	-2.5			.96065	600.2	.00289	.000411	.00286	.000407	.93	
21.5	-2.5			.96338	601.5	.00290	.000413	.00292	.000415	.96	
22.5	-2.5			.96338	601.9	.00306	.000435	.00300	.000427	1.01	
23.5	-2.5			.96720	605.5	.00327	.000465	.00319	.000454	1.05	
24.5	-2.5			.97759	616.2	.00367	.000522			1.25	
		10.55	90	.95026	588.2	.00277	.000394				.79
		6.55	90	.95682	594.9	.00319	.000454				.81
		4.55	90	.95190	590.9	.00301	.000428				.76
		2.55	90	.94862	588.5	.00279	.000397				.71
		10.55	180	1.02787	625.5	.00078	.000111				
		8.55	180	1.02076	626.5	.00109	.000155	.00119	.000169		
		6.55	180	1.00710	612.5	.00048	.000068	.00046	.000065		
		4.55	180	.99180	604.2	.00060	.000085	.00055	.000078		
		3.55	180	.98961	604.2	.00067	.000095				
		2.55	180	.96338	588.9	.00078	.000111				
		1.55	180	.96338	591.5	.00106	.000151				
		1.05	180	.95299	584.2	.00100	.000142				
34.0	-1.0			.97267	607.5	.00328	.000467	.00332	.000472	1.17	
34.0	4.0			.96447	611.9	.00520	.000740	.00543	.000773	1.67	
34.0	5.0			.94206	598.5	.00454	.000646	.00401	.000571	1.45	
34.0	6.0			.94698	604.2	.00479	.000681	.00484	.000689	1.53	
36.0	6.0			.93988	596.9	.00440	.000626			1.51	
38.0	1.0			.91966	579.2	.00411	.000585	.00387	.000551	1.36	
38.0	2.0			.93933	587.2	.00326	.000464			1.04	
44.0	8.0			.95026	595.2	.00353	.000502			1.13	
44.0	6.0			.92621	576.5	.00260	.000370	.00258	.000367	.83	
44.0	4.0			.92457	574.2	.00248	.000353	.00235	.000334	.79	
44.0	2.0			.92348	581.2	.00308	.000438	.00319	.000454	.98	
44.0	1.0			.91862	575.2	.00366	.000521	.00325	.000462	1.30	
		10.55	0	1.00437	662.5	.01142	.001625				.69
		8.55	0	1.00218	667.5	.01313	.001868	.01310	.001864		.79
		6.55	0	1.00000	676.2	.01663	.002366	.01668	.002373		1.00
		4.55	0	1.00874	684.2	.01472	.002094	.01492	.002123		.89
		3.55	0	.99672	672.2	.01554	.002211	.01574	.002239		.94
		2.55	0	.99016	664.5	.01194	.001699	.01234	.001756		.72
		1.55	0	.97485	644.5	.00841	.001197	.00779	.001108		.51
		1.05	0	.97267	631.5	.00845	.001202				.51
		10.55	45	.98087	637.9	.00869	.001236	.00945	.001344		.68
		6.55	45	.98087	651.5	.01092	.001554	.01148	.001633		.86
		4.55	45	.98360	649.2	.01192	.001696	.01215	.001729		.99
		2.55	45	.98305	650.9	.00975	.001387	.01084	.001542		.76

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(b) M = 2.65; R = 2.49 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96528	595.2	.00176	.000389			.90	
12.0	.0			.96473	594.5	.00180	.000398			.90	
20.5	.0			.96859	599.5	.00241	.000532			1.18	
28.0	12.0			.95426	595.2	.00296	.000654			1.35	
28.0	4.0			.96693	608.5	.00367	.000811			1.82	
28.0	.0			.98787	624.5	.00452	.000998			2.24	
20.5	-5.0			.96969	598.9	.00198	.000437			.95	
24.5	-5.0			.97134	602.5	.00241	.000532			1.10	
30.0	.0			1.03030	674.2	.00725	.001602	.00769	.001699	3.61	
31.0	12.0			.95205	591.2	.00230	.000508			1.12	
34.0	.0			.95867	594.5	.00237	.000524	.00223	.000493	1.18	
2.0	-12.0			.96252	594.2	.00203	.000448			.99	
2.0	12.0			.96914	597.2	.00174	.000384			.87	
12.0	-12.0			.96087	593.2	.00200	.000442			.90	
12.0	12.0			.96032	592.2	.00178	.000393			.89	
30.0	1.0			1.01928	659.5	.00705	.001557			3.20	
31.0	2.0			1.00881	651.5	.00679	.001500			3.34	
32.0	2.0			.99889	647.5	.00567	.001253	.00581	.001283	3.03	
32.0	3.0			.98567	625.5	.00462	.001021			2.32	
32.0	6.0			.95426	595.5	.00297	.000656			1.47	
34.0	1.0			.96087	599.5	.00312	.000689	.00291	.000643	1.51	
34.0	2.0			.97355	618.2	.00426	.000941	.00472	.001043	2.06	
34.0	3.0			.96803	611.2	.00413	.000912	.00412	.000910	2.00	
36.0	.0			.93222	592.2	.00432	.000954	.00431	.000952	2.16	
38.0	.0			.91569	576.2	.00390	.000862	.00432	.000954	1.89	
44.0	12.0			.95426	599.5	.00326	.000720			1.56	
42.0	.0			.91569	571.9	.00329	.000727	.00362	.000800	1.59	
44.0	.0			.92671	577.2	.00279	.000616	.00280	.000619	1.29	
48.0	.0			.93167	577.5	.00252	.000557	.00253	.000559	1.22	
52.0	.0			.92065	570.2	.00235	.000519	.00234	.000517	1.14	
52.0	12.0			.94324	585.2	.00242	.000535			1.17	
55.0	.0			.92395	571.9	.00220	.000486	.00218	.000482	1.08	
58.0	.0			.94048	583.9	.00250	.000552			1.20	
58.0	12.0			.96528	596.5	.00207	.000457			1.00	
58.0	-12.0			.93993	581.9	.00230	.000508				
44.0	-12.0			.94103	586.5	.00285	.000630			1.36	
36.0	-8.0			.93167	586.2	.00351	.000775			1.66	
36.0	-3.0			.93718	580.2	.00127	.000281				
34.0	-3.0			.95646	611.2	.00482	.001065	.00485	.001071	2.34	
32.0	-3.0			.97630	624.2	.00562	.001241	.00574	.001268	2.55	
30.0	-3.0			.97575	618.5	.00454	.001003	.00454	.001003	2.18	
28.0	-3.0			.97520	616.2	.00385	.000850			1.85	
34.0	-12.0			.93883	583.5	.00259	.000572			1.16	
32.0	-12.0			.95261	591.9	.00255	.000563	.00257	.000568	1.14	
30.0	-12.0			.95977	595.2	.00238	.000526			1.11	
19.0	-12.5			.97189	599.9	.00196	.000433			.95	
17.5	-11.0			.96803	597.2	.00196	.000433			.94	
15.5	-2.5			.98071	604.5	.00197	.000435			.95	
16.5	-2.5			.95591	589.2	.00202	.000446			.99	
17.5	-2.5			.95646	589.9	.00203	.000448			1.01	
18.5	-2.5			.98787	609.9	.00179	.000395			.87	
19.5	-2.5			.96528	596.5	.00207	.000457	.00185	.000409	1.00	
20.5	-2.5			.96252	595.9	.00215	.000475	.00210	.000464	1.04	
21.5	-2.5			.96638	599.5	.00225	.000497	.00230	.000508	1.10	
22.5	-2.5			.96473	599.2	.00228	.000504	.00224	.000495	1.11	
23.5	-2.5			.96638	599.9	.00263	.000581	.00248	.000548	1.28	
24.5	-2.5			.97850	610.2	.00267	.000590			1.30	
		10.55	90	.93663	577.2	.00236	.000521				.73
		6.55	90	.94434	582.9	.00244	.000539				.76
		4.55	90	.93883	579.2	.00251	.000554				.78
		2.55	90	.93552	576.2	.00221	.000488				.69
		8.55	180	.99944	607.2	.00067	.000148	.00072	.000159		
		6.55	180	.98953	598.2	.00033	.000073				
		4.55	180	.98126	593.5	.00036	.000080				
		3.55	180	.98236	595.5	.00046	.000102				
		2.55	180	.95812	581.9	.00065	.000144				
		1.55	180	.96252	586.5	.00077	.000170				
		1.05	180	.95150	579.2	.00069	.000152				
34.0	-1.0			.97299	601.9	.00246	.000543	.00251	.000554	1.35	
34.0	4.0			.96748	607.5	.00342	.000755	.00368	.000813	1.69	
34.0	5.0			.94765	592.5	.00321	.000709	.00283	.000625	1.58	
34.0	6.0			.95040	599.2	.00349	.000771	.00354	.000782	1.74	
36.0	6.0			.94379	591.9	.00313	.000691			1.55	
38.0	1.0			.92285	575.5	.00297	.000656	.00287	.000634	1.45	
38.0	2.0			.94168	583.2	.00230	.000508			1.13	
44.0	8.0			.94985	590.9	.00233	.000515			1.14	
44.0	6.0			.92836	573.9	.00192	.000424	.00192	.000424	.96	
44.0	4.0			.92781	571.5	.00181	.000400	.00170	.000376	.94	
44.0	2.0			.92505	572.5	.00219	.000484	.00222	.000490	1.06	
44.0	1.0			.91899	570.2	.00252	.000557	.00217	.000479	1.25	
		10.55	0	.99504	652.9	.00917	.002026				.68
		8.55	0	.99559	658.5	.00981	.002167	.00978	.002160		.72
		6.55	0	.99504	666.8	.01278	.002823	.01284	.002836		.94
		4.55	0	1.00165	668.8	.01187	.002622	.01209	.002671		.89
		3.55	0	.98897	659.5	.01097	.002423	.01113	.002459		.81
		2.55	0	.98181	649.5	.00841	.001858	.00869	.001920		.62
		1.55	0	.97024	623.5	.00610	.001348	.00555	.001226		.45
		1.05	0	.97024	624.5	.00548	.001211				.40
		10.55	45	.97189	628.2	.00722	.001595	.00801	.001769		.60
		6.55	45	.97189	634.5	.00871	.001924	.00893	.001973		.84
		4.55	45	.97465	637.5	.00884	.001953	.00940	.002076		.86
		2.55	45	.97299	634.9	.00695	.001535				.67

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(c) M = 2.65; R = 1.25 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96874	595.5	.00101	.000446			.99	
12.0	.0			.96984	595.5	.00100	.000442			1.08	
20.5	.0			.97203	601.5	.00131	.000578			1.34	
28.0	12.0			.95777	592.9	.00171	.000755			1.69	
28.0	4.0			.97093	605.5	.00217	.000958			2.19	
28.0	.0			.98684	617.5	.00257	.001135			2.62	
20.5	-4.0			.97697	604.5	.00118	.000521			1.13	
24.5	-8.0			.97313	600.9	.00139	.000614			1.46	
30.0	.0			1.02621	664.8	.00465	.002053	.00507	.002239	5.00	
31.0	12.0			.95777	590.5	.00124	.000548			1.16	
34.0	.0			.96161	594.9	.00132	.000583	.00110	.000486	1.39	
2.0	-12.0			.96600	594.2	.00106	.000468			.98	
2.0	12.0			.97148	596.9	.00097	.000428			.95	
12.0	-12.0			.96655	594.2	.00104	.000459			.99	
12.0	12.0			.96435	592.5	.00091	.000402			.92	
30.0	1.0			1.01590	651.9	.00433	.001912			4.61	
31.0	2.0			1.00493	645.5	.00396	.001749			4.26	
32.0	2.0			.99451	635.2	.00370	.001634	.00380	.001678	3.94	
32.0	3.0			.98190	616.2	.00291	.001285			3.03	
32.0	6.0			.95832	593.5	.00175	.000773			1.79	
34.0	1.0			.96161	595.9	.00178	.000786	.00158	.000698	2.02	
34.0	2.0			.96984	607.9	.00242	.001069	.00269	.001188	2.37	
34.0	3.0			.96655	603.0	.00234	.001033	.00228	.001007	2.34	
36.0	.0			.93968	589.9	.00252	.001113	.00257	.001135	2.57	
38.0	.0			.92268	575.2	.00224	.000989			2.38	
44.0	12.0			.95942	595.2	.00182	.000804			1.77	
42.0	.0			.92159	570.9	.00179	.000790			1.75	
44.0	.0			.93200	575.5	.00096	.000424	.00097	.000428	1.02	
48.0	.0			.94297	584.5	.00122	.000539	.00124	.000548	1.30	
52.0	.0			.93365	575.5	.00127	.000561	.00126	.000556	1.35	
52.0	12.0			.95065	588.2	.00133	.000587			1.32	
55.0	.0			.93694	576.2	.00117	.000517	.00115	.000508	1.19	
58.0	.0			.95394	588.2	.00144	.000636			1.44	
58.0	12.0			.97258	597.9	.00108	.000477			1.06	
58.0	-12.0			.95119	585.2	.00115	.000508				
44.0	-12.0			.94736	585.0	.00149	.000658			1.48	
36.0	-8.0			.93694	582.2	.00190	.000839			1.88	
36.0	-3.0			.93749	575.5	.00093	.000411				
34.0	-3.0			.95503	601.9	.00296	.001307	.00300	.001325	2.99	
32.0	-3.0			.97203	614.2	.00341	.001506	.00352	.001554	3.88	
30.0	-3.0			.97313	610.2	.00271	.001197	.00269	.001188	2.82	
28.0	-3.0			.97751	609.5	.00221	.000976			2.33	
34.0	-12.0			.94461	583.2	.00145	.000640			1.51	
32.0	-12.0			.95558	589.9	.00138	.000609	.00139	.000614	1.39	
30.0	-12.0			.96216	593.2	.00133	.000587			1.28	
19.0	-12.5			.97861	601.5	.00101	.000446			1.02	
17.5	-11.0			.97313	598.2	.00104	.000459			1.02	
15.5	-2.5			.98519	605.2	.00102	.000450			.96	
16.5	-2.5			.96161	590.5	.00097	.000428			1.04	
17.5	-2.5			.96381	592.2	.00101	.000446			1.06	
18.5	-2.5			.99561	611.2	.00095	.000420			1.02	
19.5	-2.5			.97093	599.5	.00123	.000543			1.24	
20.5	-2.5			.96819	597.9	.00136	.000601	.00123	.000543	1.36	
21.5	-2.5			.97039	600.2	.00130	.000574	.00135	.000596	1.27	
22.5	-2.5			.96874	598.2	.00123	.000543	.00121	.000534	1.26	
23.5	-2.5			.96874	599.5	.00161	.000711	.00144	.000636	1.59	
24.5	-2.5			.98026	605.9	.00147	.000649			1.50	
		10.55	90	.95394	586.2	.00145	.000640				.64
		6.55	90	.95942	589.9	.00148	.000654				.65
		4.55	90	.95284	585.9	.00150	.000662				.66
		2.55	90	.94407	579.9	.00130	.000574				.57
		8.55	180	1.01754	617.9	.00037	.000163	.00039	.000172		
		4.55	180	1.00767	610.5	.00015	.000066				
		3.55	180	1.00877	611.9	.00020	.000088				
		2.55	180	.98245	596.9	.00030	.000132				
		1.55	180	.97477	594.2	.00047	.000208				
		1.05	180	.96929	589.9	.00035	.000155				
34.0	-1.0			.97477	600.5	.00141	.000623	.00149	.000658	1.50	
34.0	4.0			.97093	604.2	.00199	.000879	.00224	.000989	2.14	
34.0	5.0			.95503	592.9	.00186	.000821			1.84	
34.0	6.0			.95777	596.2	.00217	.000958	.00214	.000945	2.33	
36.0	6.0			.95229	590.5	.00178	.000786			1.85	
38.0	1.0			.93200	576.9	.00176	.000777	.00165	.000729	1.89	
38.0	2.0			.94845	585.2	.00125	.000552			1.28	
44.0	8.0			.95503	589.2	.00124	.000548			1.24	
44.0	6.0			.93968	579.2	.00098	.000433	.00102	.000450	.98	
44.0	4.0			.94078	579.5	.00097	.000428	.00086	.000380	.97	
44.0	2.0			.93694	577.5	.00126	.000556	.00128	.000565	1.27	
44.0	1.0			.92816	571.9	.00137	.000605			1.54	
		10.55	0	.99835	647.9	.00627	.002769				.65
		8.55	0	.99725	651.5	.00705	.003113	.00703	.003104		.74
		6.55	0	.99725	657.9	.00831	.003670	.00837	.003696		.87
		4.55	0	.99945	657.5	.00762	.003365	.00789	.003484		.79
		3.55	0	.98464	644.9	.00746	.003294	.00750	.003312		.78
		2.55	0	.97751	636.5	.00515	.002274	.00538	.002376		.54
		1.55	0	.96710	611.9	.00349	.001541	.00294	.001298		.36
		1.05	0	.96929	610.9	.00309	.001365				.32
		10.55	45	.97697	624.9	.00486	.002146	.00529	.002336		.66
		6.55	45	.97532	627.2	.00557	.002460	.00578	.002552		.76
		4.55	45	.97477	628.5	.00562	.002482	.00612	.002703		.76
		2.55	45	.97093	618.9	.00450	.001987	.00505	.002230		.61

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(d) M = 3.51; R = 3.95 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95562	582.9	.00157	.000307			1.00	
12.0	.0			.95284	581.2	.00157	.000307			1.01	
20.5	.0			.95506	585.9	.00205	.000400			1.32	
28.0	12.0			.94064	584.5	.00323	.000631			1.81	
28.0	4.0			.94619	598.2	.00397	.000775			2.39	
28.0	.0			.97004	608.5	.00440	.000859			2.78	
20.5	-5.0			.95839	585.5	.00175	.000342			1.13	
24.5	-5.0			.95839	590.2	.00235	.000459			1.59	
30.0	.0			1.02385	673.8	.00676	.001320	.00737	.001439	4.36	
31.0	12.0			.93787	577.2	.00237	.000463			1.25	
34.0	.0			.94231	580.2	.00246	.000480			1.60	
2.0	-12.0			.95284	583.9	.00153	.000299			.94	
2.0	12.0			.95895	585.9	.00163	.000318			.87	
12.0	-12.0			.94896	578.9	.00151	.000295			.91	
12.0	12.0			.94674	578.9	.00168	.000328			.90	
30.0	1.0			1.01664	657.9	.00705	.001377			4.55	
31.0	2.0			1.00943	648.2	.00738	.001441			4.67	
32.0	2.0			1.00443	650.2	.00642	.001254	.00671	.001310	4.59	
32.0	3.0			.97725	620.5	.00512	.001000			3.20	
32.0	6.0			.93620	580.9	.00318	.000621			1.88	
34.0	1.0			.95673	599.2	.00402	.000785	.00414	.000808	2.59	
34.0	2.0			.96949	620.9	.00456	.000890			2.85	
34.0	3.0			.95506	603.9	.00468	.000914	.00451	.000881	2.89	
36.0	.0			.92511	577.2	.00366	.000715	.00374	.000730	2.36	
38.0	.0			.90126	559.9	.00329	.000642	.00357	.000697	2.11	
44.0	12.0			.94341	588.5	.00359	.000701			2.08	
42.0	.0			.88961	548.2	.00244	.000476	.00273	.000533	1.57	
44.0	.0			.89793	551.2	.00205	.000400	.00205	.000400	1.35	
48.0	.0			.90736	557.2	.00191	.000373	.00192	.000375	1.24	
52.0	.0			.90104	550.2	.00178	.000348	.00176	.000344	1.13	
52.0	12.0			.93232	573.9	.00237	.000463			1.33	
55.0	.0			.90459	553.9	.00184	.000359	.00182	.000355	1.23	
58.0	.0			.92178	564.5	.00199	.000389			1.28	
58.0	12.0			.95673	586.2	.00199	.000389			1.12	
58.0	-12.0			.92566	569.5	.00237	.000463				
44.0	-12.0			.91679	566.5	.00266	.000519			1.61	
36.0	-8.0			.89349	555.9	.00339	.000662			2.16	
36.0	-3.0			.93620	573.2	.00164	.000320				
34.0	-3.0			.93343	594.2	.00592	.001156	.00593	.001158	3.97	
32.0	-3.0			.95340	612.2	.00712	.001390	.00731	.001428	4.62	
30.0	-3.0			.94841	599.2	.00500	.000976	.00495	.000967	3.23	
28.0	-3.0			.95063	593.9	.00398	.000777			2.65	
34.0	-12.0			.90680	559.2	.00256	.000500			1.64	
32.0	-12.0			.92012	567.2	.00246	.000480	.00246	.000480	1.49	
30.0	-12.0			.93288	574.9	.00251	.000490			1.57	
19.0	-12.5			.96061	585.9	.00154	.000301			.97	
17.5	-11.0			.95506	582.5	.00157	.000307			.95	
15.5	-2.5			.96727	590.2	.00147	.000287			.92	
16.5	-2.5			.94286	575.2	.00146	.000285			1.02	
17.5	-2.5			.94341	575.5	.00159	.000310			1.03	
18.5	-2.5			.97448	593.9	.00140	.000273			.98	
19.5	-2.5			.95229	581.5	.00161	.000314			1.02	
20.5	-2.5			.95063	582.5	.00182	.000355	.00176	.000344	1.15	
21.5	-2.5			.95617	585.9	.00193	.000377	.00197	.000385	1.22	
22.5	-2.5			.95673	587.5	.00206	.000402	.00203	.000396	1.34	
23.5	-2.5			.95895	591.9	.00235	.000459	.00224	.000437	1.42	
24.5	-2.5			.96949	600.2	.00261	.000510			1.84	
		10.55	90	.91457	569.2	.00426	.000832				1.22
		6.55	90	.92622	576.5	.00391	.000764				1.12
		4.55	90	.92067	571.2	.00368	.000719				1.05
		2.55	90	.92123	569.9	.00368	.000719				1.05
		10.55	180	.94841	568.5	.00049	.000096				
		8.55	180	.94064	565.2	.00058	.000113	.00061	.000119		
		6.55	180	.92234	553.2	.00051	.000100	.00045	.000088		
		4.55	180	.92511	554.9	.00051	.000100	.00047	.000092		
		3.55	180	.92955	558.9	.00054	.000105				
		2.55	180	.91180	549.9	.00063	.000123				
		1.55	180	.93232	566.2	.00088	.000172				
		1.05	180	.91568	553.5	.00087	.000170				
34.0	-1.0			.94790	583.5	.00265	.000517	.00264	.000516	1.77	
34.0	4.0			.95617	596.2	.00354	.000691	.00353	.000689	2.23	
34.0	5.0			.94896	591.9	.00376	.000734	.00353	.000689	2.31	
34.0	6.0			.95063	599.2	.00464	.000906	.00475	.000928	2.52	
36.0	5.0			.95340	597.2	.00404	.000789			2.20	
38.0	1.0			.91512	564.2	.00258	.000504	.00261	.000510	1.64	
38.0	2.0			.92178	567.2	.00240	.000469			1.55	
44.0	8.0			.95229	589.2	.00281	.000549			1.66	
44.0	6.0			.93676	575.2	.00221	.000432	.00242	.000473	1.20	
44.0	4.0			.92178	561.9	.00162	.000316	.00160	.000312	1.01	
44.0	2.0			.91235	557.5	.00173	.000339	.00183	.000357	1.09	
44.0	1.0			.89848	549.5	.00188	.000367	.00140	.000273	1.06	
		10.55	0	.96671	666.5	.01444	.002820				.98
		8.55	0	.98890	684.8	.01415	.002763	.01404	.002742		.96
		6.55	0	.98779	679.8	.01645	.003212	.01652	.003226		1.12
		4.55	0	.99778	682.8	.01720	.003359	.01546	.003019		1.17
		3.55	0	.98113	666.5	.01278	.002496	.01311	.002562		.87
		2.55	0	.98838	640.5	.00835	.001631	.00831	.001624		.57
		1.55	0	.95395	609.5	.00761	.001486				.52
		1.05	0	.95506	607.9	.00503	.000982				.34
		10.55	45	.96283	662.9	.01464	.002859				1.00
		8.55	45	.96471	664.9	.01586	.002511	.01327	.002591		1.14
		6.55	45	.97737	669.1	.01351	.002638	.01497	.002923		1.03
		4.55	45	.97010	658.5	.00869	.001664				.76

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(e) M = 3.51; R = 2.78×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96328	583.9	.00099	.000275			.80	
12.0	.0			.96217	582.5	.00099	.000275			.89	
20.5	.0			.96328	586.9	.00146	.000406			1.21	
28.0	12.0			.94882	583.5	.00238	.000662			1.56	
28.0	4.0			.95494	598.5	.00288	.000801			2.27	
28.0	.0			.97663	606.2	.00303	.000843			2.35	
20.5	-5.0			.96829	587.9	.00131	.000364			1.09	
24.5	-5.0			.96551	589.5	.00175	.000487			1.41	
30.0	.0			1.02614	666.8	.00511	.001421	.00565	.001571	4.12	
31.0	12.0			.94659	577.5	.00166	.000462			1.19	
34.0	.0			.95049	580.2	.00174	.000484			1.40	
2.0	-12.0			.96050	581.9	.00119	.000331			.94	
2.0	12.0			.96718	587.9	.00126	.000350			.95	
12.0	-12.0			.95772	579.9	.00119	.000331			.92	
12.0	12.0			.95605	580.9	.00115	.000320			.86	
30.0	1.0			1.02002	657.5	.00481	.001338			3.91	
31.0	2.0			1.01168	645.9	.00521	.001449			4.10	
32.0	2.0			1.00667	640.2	.00493	.001371	.00514	.001429	4.01	
32.0	3.0			.98164	615.9	.00373	.001037			2.89	
32.0	6.0			.94437	580.9	.00236	.000656			1.77	
34.0	1.0			.96161	595.9	.00286	.000795	.00295	.000820	2.36	
34.0	2.0			.97274	607.2	.00345	.000959	.00388	.001079	2.76	
34.0	3.0			.96106	597.9	.00319	.000887	.00304	.000845	2.36	
36.0	.0			.93324	576.5	.00276	.000767	.00283	.000787	2.23	
38.0	.0			.91099	560.9	.00245	.000681	.00273	.000759	2.02	
44.0	12.0			.94993	586.2	.00264	.000734			1.73	
42.0	.0			.89987	549.9	.00188	.000523	.00216	.000601	1.55	
44.0	.0			.90988	553.9	.00164	.000456	.00164	.000456	1.31	
48.0	.0			.92045	559.2	.00133	.000370	.00134	.000373	1.10	
52.0	.0			.91266	554.9	.00121	.000336	.00120	.000334	.95	
52.0	12.0			.94103	574.2	.00167	.000464			1.09	
55.0	.0			.91823	558.5	.00133	.000370	.00131	.000364	1.03	
58.0	.0			.93547	569.5	.00131	.000364			1.04	
58.0	12.0			.96718	587.9	.00137	.000381			.90	
58.0	-12.0			.93547	570.5	.00169	.000470				
44.0	-12.0			.92490	566.2	.00199	.000553			1.67	
36.0	-8.0			.90098	555.2	.00249	.000692			2.02	
36.0	-3.0			.94048	572.5	.00125	.000348				
34.0	-3.0			.93714	590.2	.00422	.001173	.00423	.001176	3.55	
32.0	-3.0			.95661	606.9	.00481	.001338	.00499	.001388	4.04	
30.0	-3.0			.95160	595.2	.00371	.001032	.00366	.001018	3.07	
28.0	-3.0			.95828	592.9	.00277	.000770			2.29	
34.0	-12.0			.91433	559.2	.00183	.000509			1.46	
32.0	-12.0			.92768	567.2	.00180	.000501	.00180	.000501	1.50	
30.0	-12.0			.93936	574.2	.00177	.000492			1.44	
19.0	-12.5			.96996	587.2	.00102	.000284			.81	
17.5	-11.0			.96439	583.9	.00118	.000328			.98	
15.5	-2.5			.97663	591.2	.00100	.000278			.81	
16.5	-2.5			.95327	576.9	.00099	.000275			.80	
17.5	-2.5			.95383	577.5	.00101	.000281			.85	
18.5	†2.5			.98553	596.2	.00097	.000270			.80	
19.5	-2.5			.96273	585.2	.00127	.000353			1.05	
20.5	-2.5			.96050	584.2	.00131	.000364	.00126	.000350	1.09	
21.5	-2.5			.96551	587.2	.00154	.000428	.00158	.000439	1.24	
22.5	-2.5			.96495	587.9	.00147	.000409	.00145	.000403	1.20	
23.5	-2.5			.96662	591.5	.00152	.000423	.00138	.000384	1.22	
24.5	-2.5			.97663	597.2	.00177	.000492			1.46	
		10.55	90	.92657	569.5	.00296	.000823				1.01
		6.55	90	.93603	574.9	.00280	.000779				.96
		4.55	90	.93046	571.2	.00277	.000770				.95
		2.55	90	.93046	572.2	.00238	.000662				.82
		10.55	180	.97997	585.5	.00124	.000345				
		8.55	180	.97441	581.9	.00029	.000081				
		6.55	180	.95716	570.9	.00028	.000078				
		3.55	180	.96106	574.2	.00032	.000089				
		2.55	180	.93992	563.2	.00041	.000114				
		1.55	180	.95104	572.5	.00062	.000172				
		1.05	180	.93769	563.5	.00054	.000150				
34.0	-1.0			.95605	584.5	.00187	.000520	.00189	.000526	1.67	
34.0	4.0			.96384	595.2	.00259	.000720	.00262	.000729	2.04	
34.0	5.0			.95549	591.2	.00274	.000762	.00240	.000692	2.08	
34.0	6.0			.95716	597.9	.00323	.000898	.00335	.000932	2.38	
36.0	6.0			.95883	594.9	.00290	.000806			2.18	
38.0	1.0			.92434	565.2	.00180	.000501	.00183	.000509	1.49	
38.0	2.0			.93158	568.2	.00156	.000434			1.21	
44.0	8.0			.95883	587.9	.00205	.000570			1.34	
44.0	6.0			.94493	575.5	.00147	.000409	.00169	.000470	1.07	
44.0	4.0			.93491	565.5	.00101	.000281	.00100	.000278	.75	
44.0	2.0			.92601	562.2	.00118	.000328	.00132	.000367	.93	
44.0	1.0			.91099	553.2	.00133	.000370			1.07	
		10.55	0	.97163	663.5	.01138	.003165				.92
		8.55	0	.99332	664.2	.01075	.002989	.01065	.002962		.87
		6.55	0	.99109	673.2	.01269	.003529	.01275	.003546		1.03
		4.55	0	.99833	673.8	.01274	.003543	.01337	.003718		1.03
		3.55	0	.98219	652.2	.00992	.002759	.01010	.002809		.81
		2.55	0	.97051	624.9	.00653	.001816	.00643	.001788		.52
		1.55	0	.95883	601.5	.00386	.001073	.00318	.000884		.31
		1.05	0	.96217	601.5	.00344	.000957				.28
		10.55	45	.96662	638.9	.01095	.003045	.01213	.003373		1.16
		6.55	45	.96940	636.9	.00973	.002706	.00993	.002761		1.03
		4.55	45	.97385	643.5	.01003	.002789	.01111	.003089		1.06
		2.55	45	.97385	633.2	.00574	.001596				.61

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(f) M = 3.51; R = 1.59 x 10[6]

x, in.	y, in.	z, in. (a)	∅, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96277	580.9	.00069	.000336			1.01	
12.0	.0			.96221	579.2	.00068	.000331			1.05	
20.5	.0			.96443	583.2	.00104	.000506			1.53	
28.0	12.0			.94943	577.5	.00169	.000822			1.99	
28.0	4.0			.95888	586.2	.00215	.001046			2.56	
28.0	.0			.97666	597.2	.00214	.001041			3.24	
[illegible]	-4.0			.96888	585.5	.00099	.000482			1.50	
24.5	5.0			.96443	587.2	.00115	.000559			1.74	
[illegible]	[illegible]			1.02055	646.2	.00551	.002680	[illegible]	.002856	8.22	
31.0	12.0			.94888	574.2	.00108	.000525			1.27	
34.0	[illegible]			.95054	576.2	.00119	.000579			1.84	
2.0	-12.0			.95999	579.2	.00070	.000340			.82	
2.0	12.0			.96721	583.9	.00078	.000379			.92	
12.0	-12.0			.95777	577.2	.00070	.000340			1.04	
12.0	12.0			.95666	577.2	.00076	.000370			.99	
[illegible]	[illegible]			1.01500	635.2	.00459	.002233			6.85	
31.	[illegible]			1.00666	625.5	.00463	.002252			[illegible]	
32.0	[illegible]			.99944	621.1	.00428	.002082	[illegible]	.002164	[illegible]	
[illegible]	[illegible]			.97721	599.9	.00280	.001362			4.17	
[illegible]	[illegible]			.94932	577.2	.00173	.000842			[illegible]	
[illegible]	[illegible]			.95888	586.2	.00207	.001007	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.96666	593.5	.00283	.001376	[illegible]	.001449	4.16	
[illegible]	[illegible]			.95832	586.9	.00244	.001187	[illegible]	[illegible]	3.21	
[illegible]	[illegible]			.93554	570.5	.00193	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.91776	556.5	.00176	.000856	[illegible]	[illegible]	[illegible]	
[illegible]	12.0			[illegible]	[illegible]	.00186	.000905			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	.00133	.000647			1.96	
[illegible]	[illegible]			.91665	556.2	.00108	.000525	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.92887	[illegible]	.00088	.000426	[illegible]	.000438	[illegible]	
[illegible]	[illegible]			.92110	[illegible]	.00084	.000409	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.94388	[illegible]	.00129	[illegible]			[illegible]	
[illegible]	[illegible]			.92721	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	568.5	[illegible]	[illegible]				
[illegible]	[illegible]			.92665	561.9	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			.90387	550.5	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	.00091	[illegible]				
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	.001007			[illegible]	
[illegible]	[illegible]			.91832	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	.00121	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			.98722	604.9	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			.96277	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.96499	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.96277	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.97610	[illegible]	.00128	[illegible]			[illegible]	
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				.69
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				.84
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		[illegible]	[illegible]	.94221	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			.92721	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			.93443	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]

[a]Thermocouple locations for which z and/or ∅ stations are provided are for models, x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft[2]-sec-°R

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(g) M = 4.44; R = 4.58 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96149	578.2	.00087	.000219			1.02	
12.0	.0			.96093	576.2	.00079	.000199			1.10	
24.0	.0			.96651	582.5	.00145	.000365			2.07	
28.0	12.0			.94307	573.2	.00266	.000670			2.58	
28.0	6.0			.94442	577.5	.00316	.000796			3.81	
28.0	.0			.97823	596.2	.00297	.000748			3.71	
2.0	-6.0			.97163	584.2	.00125	.000315			1.87	
24.0	-6.0			.96986	585.2	.00149	.000375			2.22	
28.0	.0			1.03069	642.5	.00610	.001536	.00622	.001566	8.97	
28.0	12.0			.93860	569.5	.00188	.000473			1.84	
28.0	.0			.95429	576.2	.00165	.000390			2.31	
2.0	-12.0			.95981	575.5	.00075	.000189			1.10	
2.0	12.0			.96204	579.0	.00112	.000282			1.52	
12.0	-12.0			.95814	579.0	.00059	.000148			1.06	
12.0	12.0			.95032	577.0	.00114	.000287			1.15	
3.0	.0			1.02567	634.0	.00493	.001241			7.58	
12.0	.0			1.01053	630.2	.00496	.001249			6.39	
12.0	.0			1.01506	627.5	.00466	.001172	.00493	.001241	5.83	
32.0	.0			.98214	601.0	.00357	.000899			4.30	
32.0	6.0			.93581	566.9	.00211	.000531			2.45	
32.0	1.0			.96762	590.0	.00298	.000750	.00328	.000826	4.28	
36.0	2.0			.97544	598.2	.00361	.000909			4.95	
36.0	3.0			.96272	587.5	.00310	.000781			4.27	
36.0	.0			.94028	570.2	.00223	.000561			3.14	
38.0	.0			.92130	559.0	.00192	.000486			2.76	
44.0	12.0			.94530	575.5	.00227	.000607			2.69	
42.0	.0			.90288	544.5	.00151	.000380			2.16	
44.0	.0			.90958	549.2	.00120	.000302	.00120	.000302	1.74	
48.0	.0			.91907	554.2	.00115	.000290	.00117	.000295	1.44	
52.0	.0			.90735	546.9	.00119	.000300	.00112	.000282	1.32	
52.0	12.0			.94139	569.5	.00177	.000446			1.39	
56.0	.0			.91293	548.5	.00106	.000267	.00103	.000259	1.47	
58.0	.0			.93191	561.5	.00116	.000292			2.19	
58.0	12.0			.96595	582.5	.00125	.000315			1.21	
58.0	-12.0			.92967	561.5	.00143	.000360				
44.0	-12.0			.91572	552.2	.00153	.000385			2.64	
36.0	-8.0			.89786	542.5	.00176	.000443			3.03	
36.0	-3.0			.94251	567.9	.00131	.000330				
36.0	-3.0			.93860	576.5	.00345	.000869	.00338	.000851	4.93	
32.0	-3.0			.95702	585.2	.00428	.001078	.00445	.001120	4.39	
28.0	-3.0			.95535	584.9	.00360	.000906	.00356	.000896	5.81	
28.0	-3.0			.95758	585.9	.00232	.000584			3.91	
44.0	-12.0			.90958	549.2	.00145	.000366			2.64	
32.0	-12.0			.92409	557.2	.00152	.000383	.00153	.000385	2.78	
32.0	-12.0			.93581	564.2	.00154	.000388			3.41	
10.0	-12.0			.97321	580.9	.00056	.000141			.95	
17.0	-11.0			.96428	577.5	.00061	.000154			1.56	
16.0	-2.0			.97600	585.2	.00068	.000171			1.04	
16.0	-2.0			.95200	570.9	.00080	.000201			1.18	
17.0	-2.0			.95311	571.5	.00069	.000174			1.03	
18.0	-2.0			.98604	591.5	.00077	.000181			1.18	
19.0	-2.0			.96316	580.5	.00112	.000282				
20.0	-2.0			.96428	579.9	.00109	.000274	.00100	.000252	1.73	
21.0	-2.0			.97041	585.9	.00125	.000315	.00140	.000353	1.95	
22.0	-2.0			.96986	584.5	.00146	.000368	.00144	.000363	1.85	
23.0	-2.0			.97153	587.5	.00126	.000317			1.58	
24.0	-2.0			.98325	594.9	.00170	.000428			2.36	
		1.55	90	.95032	582.9	.00472	.001188				1.55
		6.55	90	.94307	575.5	.00379	.000954				1.24
		6.55	90	.91581	570.9	.00319	.000803				1.05
		2.55	90	.94136	570.9	.00235	.000592				.77
		10.55	180	.97376	581.9	.00077	.000194				
		8.55	180	.97220	583.5	.00044	.000111	.00055	.000138		
		6.55	180	.96883	582.5	.00031	.000078				
		4.55	180	.96707	575.9	.00037	.000093				
		2.55	180	.94418	563.2	.00042	.000106				
		1.55	180	.95088	568.9	.00050	.000126				
34.0	-1.0			.95535	576.9	.00163	.000410	.00167	.000420	2.67	
34.0	6.0			.97209	591.5	.00267	.000672			3.66	
34.0	5.0			.95646	582.5	.00272	.000685	.00264	.000665	3.20	
36.0	6.0			.94753	575.5	.00246	.000614	.00247	.000622	2.87	
40.0	6.0			.96707	592.2	.00347	.000874			3.86	
48.0	1.0			.91684	563.9	.00164	.000413	.00146	.000368	2.25	
38.0	2.0			.91963	565.9	.00170	.000428			2.43	
44.0	8.0			.96483	584.9	.00211	.000531			2.26	
44.0	6.0			.94865	572.2	.00151	.000380			1.91	
44.0	4.0			.93171	560.5	.00101	.000254	.00100	.000252	1.44	
44.0	2.0			.91963	552.2	.00100	.000362	.00114	.000287	1.25	
44.0	1.0			.91181	547.9	.00109	.000274			1.69	
		10.55	0	1.00781	632.5	.00264	.000377				
		8.55	0	.98325	631.5	.01171	.00 256	.01583	.003986		.74
		6.55	0	.96595	624.9	.01522	.00 832	.01456	.003663		1.23
		4.55	0	1.01506	661.8	.01183	.00 979	.01386	.003488		1.19
		3.55	0	.99330	639.2	.00891	.002243	.00891	.002244		.92
		2.55	0	.97711	606.2	.00541	.001362	.00511	.001287		.70
		1.55	0	.96483	590.2	.00335	.000844				.42
		1.05	0	.96651	590.5	.00306	.000770				.26
		10.55	45	.99832	625.2	.00809	.002264	.01021	.002571		.24
		6.55	45	.98883	651.2	.01800	.004542				.91
		4.55	45	.99107	645.5	.01116	.002810				1.83
		2.55	45	.99214	612.1	.00671	.001690				1.13
											.68

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Continued

(h) M = 4.44; R = 3.23 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96679	575.2	.00077	.000275			1.31	
12.0	.0			.96566	574.5	.00081	.000289			1.09	
20.5	.0			.97073	581.5	.00124	.000443			2.34	
28.0	12.0			.94765	570.5	.00245	.000874			2.75	
28.0	4.0			.95272	579.5	.00295	.001053			5.09	
28.0	.0			.98198	592.9	.00296	.001056			4.70	
20.5	-5.0			.97579	583.5	.00109	.000389			2.06	
24.5	-5.0			.97298	583.2	.00124	.000443			2.30	
30.0	.0			1.03039	643.5	.00635	.002266	.00687	.002452	11.55	
31.0	12.0			.94428	565.5	.00151	.000539			2.10	
34.0	.0			.95778	572.5	.00142	.000507			2.49	
2.0	-12.0			.96454	573.5	.00064	.000228			1.19	
2.0	12.0			.96679	576.2	.00094	.000335			1.25	
12.0	-12.0			.96229	571.9	.00062	.000221			1.27	
12.0	12.0			.95497	569.2	.00095	.000339			1.27	
30.0	1.0			1.02645	635.5	.00524	.001870			7.82	
31.0	2.0			1.01969	625.2	.00557	.001988			9.77	
32.0	2.0			1.01463	622.5	.00536	.001913	.00561	.002002	8.79	
32.0	3.0			.98424	597.5	.00334	.001192			5.30	
32.0	6.0			.94202	567.9	.00187	.000667			2.88	
34.0	1.0			.96904	586.2	.00305	.001088	.00324	.001156	4.55	
34.0	2.0			.97579	595.2	.00380	.001356	.00413	.001474	6.03	
34.0	3.0			.96623	585.9	.00311	.001110	.00272	.000971	5.65	
36.0	.0			.94428	567.9	.00207	.000739	.00212	.000757	3.39	
38.0	.0			.92852	557.9	.00179	.000639			3.14	
44.0	12.0			.94934	575.2	.00246	.000878			2.80	
42.0	.0			.91107	545.5	.00143	.000510			2.27	
44.0	.0			.91839	549.5	.00117	.000418	.00117	.000418		
48.0	.0			.92739	553.5	.00103	.000368	.00105	.000375	1.81	
52.0	.0			.91670	546.2	.00099	.000353	.00097	.000346	1.80	
52.0	12.0			.94596	565.9	.00147	.000525			1.75	
55.0	.0			.92233	549.5	.00099	.000353	.00096	.000343	1.71	
58.0	.0			.94146	561.5	.00101	.000360			1.58	
58.0	12.0			.97185	579.5	.00124	.000443			1.48	
58.0	-12.0			.93583	560.2	.00139	.000496				
44.0	-12.0			.92176	551.5	.00140	.000500			2.86	
36.0	-8.0			.90319	541.2	.00163	.000582			3.33	
36.0	-3.0			.94878	566.5	.00099	.000353				
34.0	-3.0			.94146	571.5	.00379	.001352	.00372	.001328	6.89	
32.0	-3.0			.95778	589.9	.00444	.001584	.00461	.001645	8.71	
30.0	-3.0			.95553	580.5	.00376	.001342	.00374	.001335	6.84	
28.0	-3.0			.96060	578.5	.00242	.000864			4.57	
34.0	-12.0			.91557	548.5	.00131	.000467			2.62	
32.0	-12.0			.92964	556.9	.00129	.000460	.00130	.000464	2.63	
30.0	-12.0			.94090	563.9	.00128	.000457			2.61	
19.0	-12.5			.97467	579.5	.00059	.000211			1.20	
17.5	-11.0			.96848	575.5	.00071	.000253			1.45	
15.5	-2.5			.98030	582.9	.00076	.000271			1.43	
16.5	-2.5			.95722	569.2	.00065	.000232			1.27	
17.5	-2.5			.95891	570.2	.00063	.000225			1.03	
18.5	+2.5			.99212	590.2	.00075	.000268			1.50	
19.5	+2.5			.96791	577.2	.00097	.000346			1.76	
20.5	-2.5			.96848	577.9	.00125	.000446	.00118	.000421	2.05	
21.5	-2.5			.97354	581.2	.00106	.000378	.00126	.000450	1.74	
22.5	-2.5			.97242	583.5	.00118	.000421	.00111	.000396	2.31	
23.5	-2.5			.97523	584.2	.00134	.000478	.00120	.000428	2.44	
24.5	-2.5			.98592	590.5	.00143	.000510			2.70	
		10.55	90	.94653	575.5	.00404	.001442				1.59
		6.55	90	.94034	566.5	.00316	.001128				1.24
		4.55	90	.93583	565.9	.00325	.001160				1.28
		2.55	90	.93414	561.9	.00245	.000874				.96
		6.55	180	.98255	579.9	.00028	.000100				
		4.55	180	.96960	572.9	.00034	.000121				
		2.55	180	.94878	561.9	.00038	.000136				
		1.55	180	.95835	568.5	.00048	.000171				
		1.05	180	.94709	561.5	.00044	.000157				
34.0	-1.0			.96341	576.5	.00147	.000525	.00155	.000553	2.83	
34.0	4.0			.97579	587.5	.00238	.000849	.00265	.000946	3.22	
34.0	5.0			.96003	578.5	.00244	.000871	.00234	.000835	3.87	
34.0	6.0			.95215	573.2	.00244	.000871	.00239	.000853	3.75	
36.0	6.0			.97017	591.5	.00296	.001056			4.55	
38.0	1.0			.92345	552.9	.00188	.000671	.00172	.000614	2.98	
38.0	2.0			.92626	554.9	.00157	.000560			2.85	
44.0	8.0			.96848	581.2	.00168	.000600			2.27	
44.0	6.0			.95328	569.9	.00119	.000425			1.83	
44.0	4.0			.93977	559.9	.00074	.000264	.00073	.000261	1.30	
44.0	2.0			.92964	553.9	.00075	.000268	.00088	.000314	1.36	
44.0	1.0			.92064	548.5	.00100	.000357				
		10.55	0	1.00562	624.5	.00867	.003094				.81
		8.55	0	.97804	623.5	.01738	.006202	.01744	.006224		1.62
		6.55	0	.97073	618.5	.01683	.006006	.01630	.005817		1.57
		4.55	0	1.01519	555.9	.02206	.007872	.02400	.008565		2.06
		3.55	0	.99155	626.5	.01285	.004586	.01267	.004521		1.20
		2.55	0	.97579	600.5	.00602	.002148	.00568	.002027		.56
		1.55	0	.96623	585.5	.00323	.001153	.00272	.000971		.30
		1.05	0	.96848	588.5	.00317	.001131				.30
		10.55	45	.99649	620.2	.00784	.002798				.95
		6.55	45	.98198	644.5	.02067	.007376				2.51
		4.55	45	.99099	641.9	.01505	.005371				1.83
		2.55	45	.98198	612.5	.00621	.002216				.76

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

10. 2.8-Inch-Diameter Instrumented Cylinder and Dummy Cylinder 3.2 Diameters Upstream, Offset 45° - Concluded

(i) M = 4.44; R = 2.16 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.95937	576.2	.00048	.000257			.91	
12.0	.0			.96104	576.5	.00048	.000257			.96	
20.5	.0			.96493	580.9	.00077	.000412			1.51	
28.0	12.0			.94211	571.9	.00147	.000786			2.33	
28.0	4.0			.94879	576.2	.00192	.001027			3.76	
28.0	.0			.97606	591.9	.00184	.000984				
20.5	-5.0			.97050	583.5	.00071	.000380			1.78	
24.5	-5.0			.96660	582.5	.00092	.000492			1.84	
31.0	.0			1.01836	630.9	.00400	.002139	.00444	.002374	10.00	
31.0	12.0			.94156	568.2	.00095	.000508			1.20	
34.0	.0			.95269	573.9	.00093	.000497			1.82	
2.0	-12.0			.95603	573.5	.00041	.000219			.77	
2.0	12.0			.95937	576.9	.00067	.000358			.84	
12.0	-12.0			.95658	573.2	.00040	.000214			.87	
12.0	12.0			.94990	570.9	.00061	.000326			.77	
30.0	1.0			1.01447	622.5	.00312	.001668			7.80	
31.0	2.0			1.00834	618.2	.00336	.001797			6.46	
32.0	2.0			1.00278	617.2	.00318	.001700	.00343	.001834	7.95	
32.0	3.0			.97551	593.9	.00212	.001134			4.51	
32.0	6.0			.93989	567.5	.00123	.000658			2.32	
34.0	1.0			.95937	582.5	.00192	.001027	.00205	.001096	3.69	
34.0	2.0			.96549	588.2	.00216	.001155	.00248	.001326	4.08	
34.0	3.0			.95825	581.2	.00192	.001027			3.76	
36.0	.0			.93933	569.9	.00140	.000749	.00143	.000765	3.18	
38.0	.0			.92542	558.2	.00087	.000465			1.67	
44.0	12.0			.94434	572.5	.00158	.000845			2.36	
42.0	.0			.91261	548.9	.00074	.000396			1.54	
44.0	.0			.92041	553.2	.00065	.000348	.00066	.000353	1.33	
48.0	.0			.93042	558.2	.00062	.000332	.00064	.000342	1.29	
52.0	12.0			.94323	567.5	.00076	.000406			.96	
55.0	.0			.92486	555.2	.00057	.000305	.00054	.000289		
58.0	.0			.94434	566.9	.00055	.000294			1.06	
58.0	12.0			.96938	582.5	.00058	.000310			.73	
58.0	-12.0			.93599	562.9	.00075	.000401				
44.0	-12.0			.92041	553.9	.00080	.000428			2.05	
36.0	-8.0			.90093	543.2	.00120	.000642			2.73	
36.0	-3.0			.93989	565.5	.00067	.000358				
34.0	-3.0			.93488	571.2	.00220	.001176	.00212	.001134	5.00	
32.0	-3.0			.94935	580.5	.00259	.001385	.00272	.001454	5.18	
30.0	-3.0			.94657	576.5	.00219	.001171	.00215	.001150	4.98	
28.0	-3.0			.95436	578.9	.00144	.000770				
34.0	-12.0			.91373	549.9	.00081	.000433			1.69	
32.0	-12.0			.92709	557.9	.00081	.000433	.00083	.000444		
30.0	-12.0			.93766	563.9	.00083	.000444			2.13	
19.0	-12.5			.97050	581.5	.00038	.000203				
17.5	-11.0			.96326	577.5	.00037	.000198			.95	
15.5	-2.5			.97951	584.9	.00040	.000214			1.00	
16.5	-2.5			.95380	571.9	.00048	.000257			.92	
17.5	-2.5			.95547	573.2	.00045	.000241				
18.5	-2.5			.98775	592.5	.00040	.000214			.85	
19.5	-2.5			.96326	579.2	.00071	.000380			1.37	
20.5	-2.5			.96326	579.2	.00071	.000380	.00062	.000332	1.37	
21.5	-2.5			.96771	581.9	.00063	.000337	.00073	.000390		
22.5	-2.5			.96604	581.5	.00076	.000406	.00068	.000364	1.90	
23.5	-2.5			.96883	583.5	.00082	.000438			1.78	
24.5	-2.5			.97996	590.5	.00105	.000561			2.28	
		10.55	90	.93877	573.9	.00356	.001904				1.72
		6.55	90	.93599	569.2	.00210	.001123				1.01
		4.55	90	.93209	568.5	.00206	.001101				.99
		2.55	90	.93154	567.9	.00148	.000791				.71
		1.05	180	.94601	566.2	.00033	.000176				
34.0	-1.0			.96215	579.9	.00092	.000492			1.84	
34.0	4.0			.96938	587.2	.00172	.000920				
34.0	5.0			.95436	579.2	.00158	.000845	.00145	.000775	3.10	
34.0	6.0			.94712	573.2	.00165	.000882	.00157	.000839	3.06	
36.0	6.0			.96493	588.9	.00225	.001203			4.25	
38.0	1.0			.92152	555.5	.00097	.000519			1.90	
38.0	2.0			.92542	558.2	.00097	.000519			2.43	
44.0	8.0			.96271	580.0	.00119	.000636			2.20	
44.0	6.0			.94879	571.9	.00083	.000444			1.57	
44.0	4.0			.93933	563.9	.00046	.000246	.00047	.000251	1.00	
44.0	2.0			.93154	558.5	.00055	.000294	.00069	.000369	1.10	
44.0	1.0			.92152	553.2	.00062	.000332			1.24	
		10.55	0	.99777	624.9	.00733	.003919				.84
		8.55	0	.96771	616.2	.01251	.006689	.01251	.006689		1.44
		6.55	0	.96716	610.9	.01050	.005614	.01005	.005374		1.21
		4.55	0	1.00445	639.2	.00972	.005197				1.12
		3.55	0	.98052	613.2	.00592	.003165	.00570	.003048		.68
		2.55	0	.96604	594.9	.00352	.001882	.00318	.001700		.40
		1.55	0	.95770	584.2	.00211	.001128				.24
		1.05	0	.96048	583.5	.00180	.000962				.21
		10.55	45	.98664	614.5	.00678	.003625				1.01
		6.55	45	.97050	619.2	.01199	.006411				1.79
		4.55	45	.98107	619.5	.00804	.004299				1.20
		2.55	45	.97328	600.2	.00410	.002192				.61

[a] *Thermocouple locations for which* z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES: δ = 6.00 INCHES - Continued

11. 2.8-inch-diameter cylinder swept forward 45°

(a) M = 2.65; R = 3.26 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.95603	584.9	.00286	.000484			.99	
12.0	.0			.95380	583.5	.00270	.000457			.87	
20.5	.0			.95714	588.9	.00340	.000575			1.19	
28.0	12.0			.95324	590.9	.00379	.000641			1.14	
28.0	4.0			.96604	606.9	.00669	.001132			2.30	
28.0	.0			.99554	644.5	.01135	.001920			3.76	
20.5	-5.0			.95992	594.5	.00318	.000538			1.05	
24.5	-5.0			.94935	589.9	.00505	.000854			1.68	
30.0	.0			1.02560	698.5	.01766	.002988	.01732	.002930	5.64	
31.0	12.0			.95102	588.2	.00409	.000692			1.36	
34.0	.0			.96938	583.2	.00121	.000205			.39	
2.0	-12.0			.95157	583.2	.00297	.000502			.99	
2.0	12.0			.95770	585.9	.00285	.000482			.91	
12.0	-12.0			.95213	583.9	.00301	.000509			.96	
12.0	12.0			.95157	582.9	.00275	.000465			.94	
38.0	1.0			.99721	667.5	.01574	.002663			5.35	
31.0	2.0			.97384	630.9	.01207	.002042			4.24	
32.0	2.0			.96660	608.2	.00656	.001110	.00676	.001144	2.39	
32.0	3.0			.96382	615.9	.00948	.001604			3.01	
32.0	6.0			.95825	609.2	.00707	.001196			2.44	
34.0	1.0			.96994	593.5	.00255	.000431	.00283	.000479	.86	
34.0	2.0			.95992	589.9	.00355	.000601	.00330	.000558	1.21	
34.0	3.0			.93877	595.5	.00640	.001083	.00620	.001049	2.18	
36.0	.0			.93042	574.2	.00377	.000638	.00368	.000623	1.28	
38.0	.0			.92764	580.2	.00543	.000919	.00571	.000966	1.78	
40.0	.0			.88145	540.5	.00295	.000499	.00258	.000436		
44.0	12.0			.94601	584.5	.00417	.000705			1.35	
42.0	.0			.91985	577.2	.00611	.001034	.00630	.001066	1.95	
44.0	.0			.93098	584.9	.00639	.001081	.00640	.001083	2.20	
48.0	.0			.94545	595.2	.00681	.001152	.00699	.001183	2.24	
52.0	12.0			.97105	599.2	.00273	.000462			.90	
55.0	.0			.96271	603.2	.00606	.001025	.00635	.001074	2.06	
58.0	.0			.97161	606.5	.00557	.000942			1.89	
58.0	12.0			.95603	586.5	.00263	.000445			.83	
58.0	-12.0			.95102	588.5	.00309	.000523				
44.0	-12.0			.94879	590.2	.00430	.000727			1.36	
36.0	-8.0			.94768	598.2	.00601	.001017			1.89	
36.0	-3.0			.92430	558.5	.00067	.000113				
34.0	-3.0			.94823	593.5	.00548	.000927	.00558	.000944	1.81	
32.0	-3.0			.95714	618.9	.00936	.001584	.00942	.001594	2.99	
30.0	-3.0			.96382	629.9	.01086	.001837	.01099	.001859	3.58	
28.0	-3.0			.96938	622.2	.00809	.001369			2.70	
34.0	-12.0			.93376	580.9	.00478	.000809	.00464	.000785	1.49	
32.0	-12.0			.93098	579.5	.00482	.000815	.00474	.000802	1.50	
30.0	-12.0			.93933	584.2	.00475	.000804	.00476	.000805	1.48	
19.0	-12.5			.95157	585.9	.00314	.000531			.99	
17.5	-11.0			.95157	584.2	.00309	.000523			1.02	
15.5	-2.5			.96048	589.2	.00294	.000497			.97	
16.5	-2.5			.93933	576.5	.00284	.000480	.00250	.000423	.98	
17.5	-2.5			.94545	583.9	.00302	.000511	.00292	.000494	1.00	
18.5	-2.5			.96159	593.5	.00296	.000501	.00336	.000568	.95	
19.5	-2.5			.94545	580.9	.00307	.000519	.00288	.000487	1.02	
20.5	-2.5			.94378	584.2	.00368	.000623	.00353	.000597	1.18	
21.5	-2.5			.95046	589.5	.00394	.000667	.00408	.000690	1.31	
22.5	-2.5			.94490	585.2	.00417	.000705	.00393	.000665	1.38	
23.5	-2.5			.94378	590.9	.00473	.000800	.00463	.000783	1.52	
24.5	-2.5			.95213	597.9	.00515	.000871			1.75	
		10.55	180	.91929	558.9	.00180	.000305				
		8.55	180	.92764	567.9	.00245	.000415				
		6.55	180	.93432	571.2	.00292	.000494				
		4.55	180	.94768	578.5	.00261	.000442				
		3.55	180	.95881	582.2	.00193	.000327	.00195	.000330		
		2.55	180	.95380	583.9	.00295	.000499	.00312	.000528		
		1.55	180	.94267	570.5	.00162	.000274				
		.55	180	.96938	585.9	.00156	.000264				
		10.55	135	.95431	569.5	.00035	.000059				
		6.55	135	.93765	570.9	.00166	.000281				
		4.55	135	.95269	577.9	.00186	.000315				
		2.55	135	.93209	567.5	.00227	.000384				
34.0	-1.5			.98719	602.9	.00233	.000394	.00264	.000447	.83	
34.0	4.5			.96771	608.9	.00659	.001115	.00706	.001194	2.12	
34.0	5.0			.95491	607.5	.00725	.001227	.00714	.001208	2.31	
34.0	6.0			.95380	609.2	.00656	.001110	.00654	.001106	2.09	
36.0	6.0			.95937	600.5	.00620	.001049			2.13	
38.0	1.0			.93265	574.2	.00354	.000599	.00320	.000541	1.17	
38.0	2.0			.94990	581.2	.00308	.000521			.98	
44.0	8.0			.94879	584.9	.00372	.000629	.00375	.000634	1.19	
44.0	6.0			.93989	581.9	.00324	.000548	.00331	.000560	1.03	
44.0	4.5			.94657	577.9	.00263	.000445	.00265	.000448	.84	
44.0	2.0			.93321	574.2	.00383	.000648	.00387	.000655	1.22	
44.0	1.0			.92096	571.2	.00478	.000809	.00437	.000739	1.70	
		10.55	90	.93822	574.2	.00346	.000585				1.29
		8.55	90	.93154	572.9	.00402	.000680				1.49
		6.55	90	.93488	580.9	.00540	.000914				2.03
		4.55	90	.93599	572.2	.00305	.000516				1.19
		2.55	90	.98052	662.2	.01582	.002676				3.64
		1.55	-	.97495	648.9	.01894	.003204				4.62
		.55	-	.97328	648.2	.01858	.003143				4.60
		8.55	-	.97328	648.2	.01858	.003143				4.52
		6.55	-	.97886	669.6	.01925	.003257				4.75
		4.55	-	.97661	667.5	.02027	.003429	.02056	.003478		5.04
		3.55	-	.96660	644.5	.01659	.002807	.01664	.002815		3.97
		2.55	-	.95658	620.5	.01715	.002956	.01127	.001907		1.99
		1.55	-	.99276	679.5	.02137	.003615				1.89
		.55	-								

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.6 inch diameter cylinder swept forward 45° - Continued

(b) M = 2.65; R = 2.52 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_u}$	$\frac{h}{h_L}$
2.0	.0			.96710	589.2	.00170	.000372			.87	
12.0	.0			.96376	586.9	.00193	.000423			.96	
20.5	.0			.96599	592.2	.00222	.000486			1.09	
28.0	12.0			.96209	590.2	.00242	.000530			1.10	
28.0	4.0			.97212	610.9	.00439	.000961			2.17	
28.0	.0			.99944	643.9	.00745	.001631			3.69	
20.5	-5.0			.96989	595.2	.00218	.000477			1.05	
24.5	-5.0			.95763	591.9	.00314	.000688			1.43	
30.0	.0			1.02675	693.2	.01020	.002233	.01142	.002500	5.07	
31.0	12.0			.95930	590.2	.00264	.000578			1.28	
34.0	.0			.98494	591.2	.00095	.000208			.47	
2.0	-12.0			.96264	587.5	.00181	.000396			.88	
2.0	12.0			.96878	589.9	.00170	.000372			.85	
12.0	-12.0			.96209	586.9	.00192	.000420			.86	
12.0	12.0			.96153	586.2	.00180	.000394			.90	
30.0	1.0			.99832	657.9	.01058	.002317			4.81	
31.0	2.0			.97491	623.9	.00674	.001476			3.32	
32.0	2.0			.96710	602.5	.00401	.000878	.00377	.000825	2.14	
32.0	3.0			.96933	613.9	.00562	.001231			2.82	
32.0	4.0			.96487	604.9	.00445	.000974			2.20	
34.0	1.0			.98216	599.5	.00192	.000420	.00217	.000475	.99	
34.0	2.0			.96766	591.2	.00237	.000519	.00208	.000455	1.14	
34.0	3.0			.95986	596.9	.00379	.000830	.00364	.000797	1.84	
36.0	.0			.94759	579.2	.00223	.000488	.00212	.000464	1.12	
38.0	.0			.93421	580.9	.00360	.000788	.00384	.000841	1.76	
40.0	.0			.88794	542.2	.00185	.000405			1.28	
44.0	12.0			.95428	586.5	.00267	.000585			1.28	
42.0	.0			.92418	577.2	.00421	.000922	.00438	.000959	2.03	
44.0	.0			.93477	587.5	.00442	.000968	.00443	.000970	2.05	
48.0	.0			.95094	596.2	.00467	.001023	.00485	.001062	2.26	
52.0	12.0			.97825	595.5	.00165	.000361			.80	
50.0	.0			.96933	603.5	.00399	.000874	.00427	.000935	1.97	
48.0	.0			.97714	607.5	.00391	.000856			1.88	
50.0	12.0			.96487	589.5	.00168	.000368			.82	
50.0	12.0			.96153	591.5	.00199	.000436				
44.0	-12.0			.95918	591.5	.00259	.000567			1.24	
32.0	0.0			.95540	595.2	.00420	.000920			1.99	
32.0	0.0			.93142	561.2	.00040	.000088				
34.0	0.0			.95651	594.5	.00359	.000786	.00369	.000808	1.76	
30.0	0.0			.96209	610.9	.00574	.001257	.00577	.001263	2.61	
41.0	0.0			.96933	622.5	.00684	.001498	.00696	.001524	3.26	
28.0	0.0			.97602	617.5	.00508	.001112			2.44	
36.0	-12.0			.94313	583.5	.00312	.000683	.00314	.000688	1.40	
32.0	-12.0			.94090	581.9	.00291	.000637	.00277	.000607	1.35	
21.0	12.0			.94871	585.9	.00287	.000628	.00284	.000622	1.33	
19.0	-12.0			.96209	588.9	.00204	.000447			.99	
17.0	12.0			.96264	587.9	.00198	.000434			.95	
17.0	-2.0			.97156	595.2	.00192	.000420			.93	
16.5	-2.5			.94871	579.5	.00197	.000431	.00165	.000361	.82	
17.0	-2.5			.95595	584.9	.00202	.000442	.00191	.000418	1.00	
18.0	-2.5			.97435	595.5	.00192	.000420			.94	
19.5	-2.5			.95707	585.2	.00206	.000451	.00184	.000403	1.00	
20.0	-2.5			.95372	585.2	.00258	.000565	.00248	.000543	1.26	
21.5	-2.5			.95818	588.5	.00265	.000580	.00275	.000602	1.29	
22.5	-2.5			.95149	586.5	.00282	.000617	.00274	.000600	1.38	
23.5	-2.5			.94982	588.5	.00324	.000709	.00311	.000681	1.57	
24.5	2.5			.96041	596.2	.00333	.000729			1.63	
		10.55	15	.93588	565.2	.00108	.000236				
		8.55	15	.95930	579.5	.00126	.000276				
		6.55	15	.95361	578.9	.00163	.000357				
		4.55	15	.96376	585.2	.00166	.000363				
		3.55	15	.97602	589.2	.00119	.000261	.00117	.000256		
		2.55	15	.97825	594.9	.00171	.000374	.00187	.000409		
		1.55	15	.96710	584.9	.00113	.000247				
		.55	15	.99052	595.9	.00098	.000215				
		6.55	30	.96487	580.2	.00089	.000195				
		4.55	30	.97491	587.9	.00119	.000261				
		2.55	30	.95707	579.5	.00124	.000272				
30.0	1.0			1.00167	610.5	.00187	.000409			1.04	
34.0	4.0			.97435	608.9	.00433	.000948	.00478	.001047	2.14	
36.0	5.0			.96153	602.5	.00459	.001005	.00447	.000979	2.26	
36.0	6.0			.96097	600.9	.00436	.000955	.00434	.000950	2.13	
38.0	6.0			.96599	600.5	.00384	.000841			1.88	
38.0	3.0			.94369	576.5	.00239	.000523	.00210	.000464	1.17	
38.0	2.0			.95874	584.9	.00213	.000466			1.04	
44.0	8.0			.95707	586.5	.00245	.000536	.00247	.000541	1.20	
46.0	4.0			.94871	579.2	.00212	.000464	.00207	.000453	1.03	
46.0	4.0			.95595	580.9	.00175	.000383	.00177	.000388	.91	
46.0	2.0			.94257	577.9	.00263	.000576	.00269	.000589	1.31	
46.0	1.0			.92752	572.5	.00317	.000694	.00277	.000607	1.59	
		11.55	90	.94648	574.9	.00201	.000440				.93
		6.55	90	.94146	575.2	.00267	.000583				1.21
		4.55	90	.94257	580.2	.00333	.000729				1.51
		2.55	90	.94703	574.9	.00184	.000403				.84
		10.55	0	.98271	648.2	.00914	.002001				.58
		8.55	0	.97658	645.9	.01206	.002641				.77
		6.55	0	.97435	644.9	.01219	.002669				.78
		4.55	0	.98160	659.9	.01435	.003142				.92
		3.55	0	.97602	654.9	.01289	.002822	.01302	.002851		.83
		2.55	0	.96766	633.5	.01069	.002341	.01069	.002341		.68
		1.55	0	.95930	616.9	.00921	.001798	.00767	.001679		.49
		.55	0	.99219	669.8	.01544	.003381				.99

(a) Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

(b) h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.8-inch-diameter cylinder swept forward 45° - Continued

(c) M = 2.65; R = 1.25 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96895	588.2	.00114	.000500			1.12	
12.0	.0			.96673	585.2	.00103	.000452			1.11	
20.5	.0			.96839	588.9	.00162	.000711			1.65	
28.0	12.0			.96396	585.9	.00158	.000694			1.56	
28.0	4.0			.97117	596.9	.00311	.001365			3.14	
28.0	.0			.99611	630.2	.00604	.002652			6.16	
20.5	-5.0			.97338	594.2	.00148	.000650			1.42	
24.5	-5.0			.96008	586.2	.00210	.000922			2.21	
30.0	.0			1.02217	673.8	.00929	.004078	.01010	.004434	9.99	
31.0	12.0			.96340	586.2	.00168	.000738			1.57	
34.0	.0			.99223	595.9	.00052	.000228			.55	
2.0	-12.0			.96507	586.2	.00127	.000558			1.18	
2.0	12.0			.97061	587.9	.00120	.000527			1.18	
12.0	-12.0			.96673	586.5	.00114	.000500			1.09	
12.0	12.0			.96507	585.2	.00114	.000500			1.15	
30.0	.0			.99445	639.9	.00842	.003697			8.96	
31.0	2.0			.96784	604.5	.00446	.001958			4.80	
32.0	2.0			.96119	587.2	.00216	.000948	.00197	.000865	2.30	
32.0	3.0			.96562	597.9	.00340	.001493			3.54	
32.0	6.0			.96729	594.5	.00301	.001321			3.07	
34.0	1.0			.98835	600.5	.00124	.000544			1.41	
34.0	2.0			.97006	588.9	.00119	.000522			1.17	
34.0	3.0			.95952	587.2	.00206	.000904	.00182	.000799	2.06	
36.0	.0			.96729	585.5	.00127	.000558	.00126	.000553	1.30	
38.0	.0			.94400	581.2	.00233	.001023	.00249	.001093	2.48	
40.0	.0			.89133	542.2	.00119	.000610	.00105	.000461		
44.0	12.0			.95952	583.2	.00163	.000716			1.58	
42.0	.0			.92626	568.9	.00271	.001190	.00282	.001238	2.66	
44.0	.0			.93735	575.2	.00301	.001321	.00301	.001321	3.20	
48.0	.0			.95398	586.5	.00307	.001348	.00320	.001405	3.27	
52.0	12.0			.94511	572.5	.00114	.000500			1.13	
56.0	.0			.94400	579.2	.00284	.001247	.00302	.001326	2.90	
58.0	.0			.96119	588.9	.00266	.001168			2.66	
58.0	12.0			.96119	581.5	.00121	.000531			1.19	
58.0	-12.0			.96839	587.2	.00114	.000500				
44.0	-12.0			.96729	587.9	.00159	.000698			1.57	
36.0	-8.0			.96562	590.2	.00227	.000997			2.25	
34.0	-3.0			.96618	587.9	.00173	.000760	.00182	.000799	1.75	
32.0	-3.0			.96729	595.2	.00334	.001466	.00332	.001458	3.80	
30.0	-3.0			.97726	611.2	.00459	.002015	.00460	.002019	4.78	
28.0	-3.0			.98503	611.5	.00363	.001594			3.82	
34.0	-12.0			.96119	584.9	.00172	.000755	.00166	.000729	1.79	
32.0	-12.0			.95952	585.2	.00177	.000777	.00165	.000724	1.79	
30.0	-12.0			.96230	585.9	.00171	.000751	.00165	.000724	1.64	
19.0	-12.5			.97782	591.9	.00106	.000465			1.07	
17.5	-11.0			.97726	592.5	.00113	.000496			1.11	
15.5	-2.5			.98447	596.2	.00108	.000474			1.02	
16.5	-2.5			.96174	581.9	.00103	.000452			1.11	
17.5	-2.5			.96895	586.5	.00120	.000527	.00106	.000465	1.26	
18.5	-2.5			.99002	599.2	.00106	.000465			1.14	
19.5	-2.5			.96895	587.5	.00129	.000566	.00108	.000474	1.30	
20.5	-2.5			.96230	585.2	.00159	.000698	.00149	.000654	1.55	
21.5	-2.5			.96396	586.5	.00169	.000742	.00177	.000777	1.66	
22.5	-2.5			.95731	583.2	.00196	.000860	.00190	.000834	2.00	
23.5	-2.5			.95453	584.9	.00219	.000961	.00205	.000900	2.17	
24.5	-2.5			.96562	590.2	.00214	.000939			2.18	
		10.55	180	.96839	582.5	.00065	.000285				
		8.55	180	.99279	596.9	.00057	.000250				
		6.55	180	.98225	592.2	.00075	.000329				
		4.55	180	.97449	587.2	.00084	.000369				
		3.55	180	.98558	592.2	.00051	.000224	.00052	.000228		
		2.55	180	.99002	596.2	.00071	.000312	.00079	.000347		
		1.55	180	.98170	591.5	.00083	.000364	.00071	.000312		
		.55	180	1.00055	601.2	.00054	.000237				
		6.55	135	.97616	587.5	.00057	.000250				
		4.55	135	.98059	590.5	.00063	.000277				
		2.55	135	.96895	584.2	.00071	.000312				
			135	1.00720	611.2	.00126	.000553			1.34	
34.0	-1.0			.97837	601.5	.00253	.001111			2.72	
34.0	4.0			.96673	593.5	.00293	.001286	.00284	.001247	2.90	
34.0	5.0			.96507	592.2	.00293	.001286	.00291	.001278	3.15	
34.0	6.0			.97006	593.5	.00236	.001036			2.46	
36.0	6.0			.95620	578.2	.00130	.000571	.00115	.000505	1.40	
38.0	1.0			.96618	588.2	.00117	.000514			1.19	
38.0	2.0			.96285	584.2	.00138	.000606	.00140	.000615	1.38	
44.0	8.0			.95731	581.9	.00122	.000536	.00123	.000540	1.22	
44.0	6.0			.96618	583.5	.00101	.000443	.00105	.000461	1.01	
44.0	4.0			.95287	578.5	.00159	.000698	.00169	.000742	1.61	
44.0	2.0			.93402	568.5	.00199	.000874			2.24	
		10.55	90	.95897	577.2	.00097	.000426				.63
		8.55	90	.95232	574.5	.00100	.000439				.65
		6.55	90	.94954	575.9	.00166	.000729				1.07
		4.55	90	.95398	576.2	.00091	.000400				.59
		2.55	90	.95398	576.2	.00091	.000400				.77
		10.55	0	.98392	612.2	.00501	.002199				.68
		8.55	0	.98004	608.2	.00445	.001954				.66
		6.55	0	.97671	612.5	.00433	.001901				2.13
		4.55	0	.98059	642.9	.01395	.006124				1.32
		3.55	0	.97506	626.0	.00862	.003784	.00852	.003740		.94
		2.55	0	.96618	607.5	.00614	.002696	.00608	.002669		.76
		1.55	0	.96063	598.2	.00494	.002169	.00425	.001866		1.94
		.55	0	.98724	640.5	.01273	.005589				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.8-inch-diameter cylinder swept forward 45° - Continued

(d) M = 3.51; R = 3.95 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96512	580.5	.00144	.000281			.92	
12.0	.0			.96006	577.2	.00144	.000281			.93	
20.5	.0			.96062	583.2	.00201	.000393			1.30	
28.0	12.0			.95556	580.9	.00237	.000463			1.33	
28.0	4.0			.95949	589.9	.00355	.000694			2.14	
28.0	.0			.99943	640.9	.00751	.001468			4.75	
20.5	-5.0			.96512	582.9	.00177	.000346			1.14	
24.5	-5.0			.94881	579.5	.00267	.000522			1.80	
30.0	.0			1.04500	709.5	.00973	.001902	.01128	.002205	6.28	
31.0	12.0			.95443	582.2	.00262	.000512			1.38	
34.0	.0			1.00112	592.2	.00032	.000063			.21	
2.0	-12.0			.96118	578.5	.00160	.000313			.98	
2.0	12.0			.96881	582.9	.00161	.000315			.86	
12.0	-12.0			.95893	576.9	.00160	.000313			.96	
12.0	12.0			.95668	576.9	.00158	.000309			.85	
30.0	1.0			1.00618	664.5	.01180	.002306			7.61	
31.0	2.0			.98199	641.5	.00735	.001436			4.65	
32.0	2.0			.97749	609.2	.00471	.000921	.00473	.000924	3.36	
32.0	3.0			.96568	609.5	.00633	.001237			3.96	
32.0	6.0			.95499	591.5	.00409	.000799			2.42	
34.0	1.0			.98931	591.9	.00092	.000180	.00088	.000172	.59	
34.0	2.0			.97299	592.2	.00263	.000514	.00261	.000510	1.64	
34.0	3.0			.95949	601.9	.00378	.000739	.00392	.000766	2.33	
36.0	.0			.98031	587.5	.00141	.000276	.00142	.000278	.91	
38.0	.0			.96287	581.5	.00192	.000375	.00212	.000414	1.23	
40.0	.0			.89031	533.9	.00125	.000244	.00079	.000154		
44.0	12.0			.94881	577.9	.00248	.000485			1.43	
42.0	.0			.92293	563.2	.00282	.000551	.00299	.000584	1.82	
44.0	.0			.91899	561.5	.00296	.000578	.00295	.000577	1.95	
48.0	.0			.92574	565.2	.00294	.000575	.00303	.000592	1.91	
52.0	12.0			.93362	567.2	.00222	.000434			1.25	
55.0	.0			.91899	562.2	.00309	.000604	.00322	.000629	2.07	
58.0	.0			.94262	576.9	.00293	.000573			1.88	
58.0	12.0			.94993	574.9	.00192	.000375			1.08	
58.0	-12.0			.95781	578.5	.00186	.000364				
44.0	-12.0			.95612	581.9	.00252	.000492			1.53	
34.0	-8.0			.94993	584.5	.00354	.000692			2.25	
36.0	-3.0			.95106	566.5	.00038	.000074				
34.0	-3.0			.96287	591.9	.00357	.000698	.00363	.000709	2.40	
32.0	-3.0			.96568	606.5	.00565	.001104	.00568	.001110	3.67	
30.0	-3.0			.97243	617.9	.00699	.001366	.00710	.001388	4.51	
28.0	-3.0			.97806	607.5	.00461	.000901			3.07	
34.0	-12.0			.94656	575.5	.00241	.000471	.00230	.000450	1.54	
32.0	-12.0			.94487	576.9	.00250	.000489	.00242	.000473	1.52	
30.0	-12.0			.95049	578.5	.00249	.000487	.00239	.000467	1.56	
19.0	-12.5			.96906	582.9	.00149	.000291			.94	
17.5	-11.0			.97131	583.5	.00144	.000281			.87	
15.5	-2.5			.97918	588.9	.00145	.000283			.91	
16.5	-2.5			.95387	573.2	.00136	.000266	.00109	.000213	.95	
17.5	-2.5			.95668	574.9	.00144	.000281	.00121	.000236	.93	
18.5	-2.5			.98368	590.9	.00141	.000276	.00193	.000377	.99	
19.5	-2.5			.96006	577.9	.00160	.000313	.00139	.000272	1.01	
20.5	-2.5			.95499	578.2	.00188	.000367	.00185	.000362	1.19	
21.5	-2.5			.95387	578.5	.00216	.000422	.00222	.000434	1.37	
22.5	-2.5			.94712	576.2	.00244	.000477	.00238	.000465	1.58	
23.5	-2.5			.94431	576.9	.00283	.000553	.00272	.000532	1.72	
24.5	-2.5			.95499	584.5	.00289	.000565			2.04	
		10.55	180	.96793	575.9	.00067	.000131				
		8.55	180	1.00956	597.5	.00033	.000064				
		6.55	180	1.00225	594.9	.00051	.000100				
		4.55	180	.97356	580.9	.00087	.000170				
		3.55	180	.98537	588.9	.00107	.000209	.00112	.000219		
		2.55	180	.98649	590.9	.00117	.000229	.00116	.000227		
		1.55	180	1.00112	594.2	.00055	.000107	.00050	.000098		
		.55	180	1.01406	602.9	.00072	.000141				
		6.55	135	.98931	585.9	.00035	.000068				
		4.55	135	.98312	584.2	.00060	.000117				
		2.55	135	.96287	573.2	.00081	.000158				
34.0	-1.0			1.00956	602.2	.00087	.000170	.00104	.000203	.58	
34.0	4.0			.96906	602.9	.00464	.000907	.00500	.000977	2.92	
34.0	5.0			.95556	596.5	.00473	.000924	.00467	.000913	2.90	
34.0	6.0			.95274	592.5	.00438	.000856	.00439	.000858	2.38	
36.0	6.0			.95724	592.9	.00399	.000780			2.17	
38.0	1.0			.96512	582.5	.00194	.000379	.00201	.000393	1.24	
38.0	2.0			.96062	579.5	.00177	.000346			1.14	
44.0	8.0			.95106	580.2	.00260	.000508	.00263	.000514	1.64	
44.0	6.0			.94374	572.9	.00226	.000442	.00223	.000436	1.23	
44.0	4.0			.94824	570.9	.00183	.000319	.00160	.000313	1.02	
44.0	2.0			.95106	573.5	.00183	.000358	.00197	.000385	1.15	
44.0	1.0			.92743	563.2	.00232	.000453	.00214	.000418	1.46	
		10.55	90	.94656	570.5	.00205	.000401				.90
		6.55	90	.94374	572.9	.00268	.000524				1.18
		4.55	90	.93193	572.9	.00384	.000750				1.68
		2.55	90	.93531	565.9	.00226	.000442				.99
		10.55	0	.98031	668.9	.01199	.002343				1.25
		8.55	0	.97243	662.5	.01303	.002547				1.36
		6.55	0	.96737	655.5	.01389	.002715				1.45
		4.55	0	.96681	654.5	.01400	.002736				1.46
		3.55	0	.97187	661.5	.01661	.003246	.01352	.003424		1.73
		2.55	0	.96456	638.5	.01305	.002550	.01307	.002554		1.36
		1.55	0	.95274	613.2	.00872	.001704	.00770	.001505		.52
		.55	0	.90043	571.0	.01339	.002617				1.39

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; ℓ = 6.00 INCHES - Continued

11. 2.0 inch diameter cylinder swept forward 45° - Continued

(e) M = 3.51; R = 2.77×10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	η_c (c)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_{1.}}$
[illegible]											

[a]Thermocouple locations for which z and/or ϕ stations are provided are for models, x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V.- HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.8-inch-diameter cylinder swept forward 45° - Continued

(f) M = 3.51; R = 1.64 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96697	579.6	.00064	.000301			.94	
12.5	.0			.96530	577.2	.00064	.000301			.98	
20.5	.0			.96418	581.5	.00101	.000475			1.49	
28.0	12.0			.96026	578.5	.00112	.000527			1.32	
28.0	4.0			.95802	581.2	.00186	.000876			2.21	
28.0	.0			.99328	625.5	.00463	.002179			7.02	
28.0	-4.0			.97033	582.9	.00094	.000442			1.42	
24.5	-4.0			.95186	574.5	.00135	.000635			2.35	
31.0	.0			1.03246	677.2	.00683	.003215			10.19	
31.0	12.0			.96138	579.9	.00127	.000598			1.49	
2.0	-12.0			.96362	577.2	.00066	.000311			.78	
2.0	12.0			.97033	581.9	.00073	.000344			.86	
12.5	-12.0			.96474	577.2	.00068	.000320			1.01	
12.5	12.0			.96250	576.5	.00066	.000311			.86	
30.0	1.0			.99832	643.2	.00684	.003220			10.21	
31.0	2.0			.97257	603.5	.00387	.001822			5.23	
32.0	2.0			.96753	590.5	.00212	.000998	.00195	.000918	3.26	
32.0	3.0			.96362	591.5	.00282	.001327			4.15	
32.0	6.0			.95802	583.5	.00204	.000960			2.40	
34.0	1.0			.99216	591.5	.00039	.000184	.00045	.000212	.67	
34.0	2.0			.97425	584.9	.00097	.000457	.00086	.000405	1.43	
34.0	3.0			.96474	585.6	.00172	.000810	.00150	.000706	2.26	
36.0	.0			.99720	595.5	.00067	.000315	.00070	.000329	.74	
38.0	.0			.99880	590.2	.00070	.000329	.00088	.000414	.82	
40.0	.0			.90821	541.9	.00058	.000273				
44.0	12.0			.95858	577.2	.00123	.000579			1.60	
42.0	.0			.94123	568.2	.00138	.000650	.00151	.000711	2.04	
44.0	.0			.93731	565.2	.00136	.000640	.00135	.000635	1.74	
48.0	.0			.94459	568.5	.00152	.000715	.00160	.000753	1.78	
52.0	12.0			.94403	567.2	.00118	.000555			1.39	
55.0	.0			.93787	565.9	.00155	.000730	.00164	.000772	2.01	
58.0	.0			.95970	579.2	.00152	.000715			2.27	
58.0	12.0			.96194	576.9	.00085	.000400			1.01	
58.0	-12.0			.97201	582.2	.00083	.000391				
44.0	-12.0			.96865	583.9	.00122	.000574			1.88	
36.0	-8.0			.95970	580.9	.00166	.000781			2.62	
36.0	-3.0			.95130	567.5	.00022	.000104				
34.0	-3.0			.96697	583.5	.00151	.000711	.00153	.000720	2.24	
32.0	-3.0			.96250	588.9	.00249	.001172	.00247	.001163	3.72	
30.0	-3.0			.96809	599.2	.00350	.001647	.00358	.001685	4.66	
28.0	-3.0			.97369	595.5	.00255	.001200			1.76	
34.0	-12.0			.95914	578.2	.00112	.000527	.00105	.000494	1.33	
32.0	-12.0			.95634	576.5	.00112	.000527	.00094	.000442	1.67	
30.0	-12.0			.95690	577.5	.00124	.000584	.00107	.000504	1.82	
19.0	-12.5			.97537	583.2	.00064	.000301			.96	
17.5	-11.0			.97593	583.5	.00060	.000282			.71	
15.5	-2.5			.98432	588.9	.00061	.000287			.92	
16.5	-2.5			.96026	574.2	.00061	.000287			.72	
17.5	-2.5			.96306	575.9	.00054	.000254			.81	
18.5	-2.5			.99272	593.5	.00058	.000273			.88	
19.5	-2.5			.96641	578.9	.00078	.000367			.93	
20.5	-2.5			.95970	577.2	.00098	.000461	.00097	.000457	1.17	
21.5	-2.5			.95578	576.2	.00112	.000527	.00119	.000560	1.32	
22.5	-2.5			.94906	571.5	.00122	.000574	.00117	.000551	1.72	
23.5	-2.5			.94515	570.9	.00137	.000645	.00122	.000574	2.08	
24.5	-2.5			.95578	577.9	.00145	.000683			1.71	
		10.55	180	.99272	591.5	.00046	.000217				
		6.55	180	1.00671	597.2	.00017	.000080				
		4.55	180	.99216	589.2	.00028	.000132				
		2.55	180	.99048	588.9	.00038	.000179				
		.55	180	1.01175	601.5	.00030	.000141				
		4.55	135	.98768	586.5	.00027	.000127				
		2.55	135	.97201	577.6	.00024	.000113				
34.0	1.0			1.01287	603.5	.00038	.000179			.57	
34.0	4.0			.97593	593.9	.00204	.000960			2.72	
34.0	5.0			.96194	587.2	.00230	.001083	.00222	.001045	3.19	
34.0	6.0			.95858	585.9	.00216	.001017	.00214	.001012	2.64	
36.0	1.0			.96530	586.5	.00191	.000899			2.62	
38.0	2.0			.98200	587.5	.00075	.000353	.00077	.000362	1.09	
38.0	8.0			.97593	583.5	.00081	.000381			1.16	
44.0	8.0			.96194	579.5	.00123	.000579	.00125	.000588	1.45	
44.0	6.0			.95690	574.5	.00116	.000546	.00113	.000532	1.36	
44.0	4.0			.96474	576.5	.00065	.000306	.00064	.000301	.87	
44.0	2.0			.96921	580.5	.00089	.000419	.00105	.000494	1.21	
44.0	1.0			.94683	568.5	.00117	.000551	.00103	.000485	1.73	
		10.55	90	.95858	570.9	.00070	.000329				.48
		8.55	90	.95356	569.9	.00084	.000395				.58
		4.55	90	.94067	572.2	.00224	.001054				1.54
		2.55	90	.94850	567.2	.00079	.000372				.54
		10.55	0	.97929	608.5	.00422	.001986				.69
		8.55	0	.97481	603.9	.00392	.001845				.64
		6.55	0	.96865	600.2	.00376	.001770				.61
		4.55	0	.96921	599.9	.00382	.001798				.62
		3.55	0	.97145	644.2	.00972	.004575	.01094	.005168		1.50
		2.55	0	.96082	604.5	.00546	.002570	.00526	.002471		.88
		1.55	0	.95522	590.9	.00384	.001808				.63
		.55	0	.98544	655.9	.00980	.004613				1.60

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.8-inch-diameter cylinder swept forward 45° - Continued

(g) M = 4.44; R = 4.51×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94259	572.9	.00103	.000760			1.21	
12.0	.0			.93818	569.9	.00100	.000252			1.39	
20.5	.0			.94094	574.7	.00163	.000411			2.33	
28.0	12.0			.94094	575.5	.00197	.000497			1.91	
28.0	4.0			.93652	574.9	.00251	.000633			3.02	
28.0	.0			.98675	629.9	.00785	.001980			9.81	
20.5	-5.0			.94535	576.9	.00143	.000361			2.13	
24.5	-5.0			.93100	570.5	.00221	.000557			3.30	
30.0	.0			1.03477	674.2	.01743	.004396	.01566	.003950	25.63	
31.0	12.0			.93983	575.5	.00221	.000557			2.17	
34.0	.0			.96522	582.5	.00026	.000066			.39	
2.0	-12.0			.94149	572.5	.00092	.000232			1.35	
2.0	12.0			.94370	575.2	.00125	.000315			1.25	
12.0	-12.0			.93873	569.5	.00078	.000197			1.39	
12.0	12.0			.93155	568.9	.00135	.000341			1.36	
30.0	1.0			.98896	640.2	.01302	.003284			20.03	
31.0	2.0			.95805	604.5	.00763	.001925			10.45	
32.0	2.0			.95308	591.5	.00440	.001110	.00426	.001075	5.50	
32.0	3.0			.93928	590.9	.00618	.001559			7.45	
32.0	6.0			.93045	573.2	.00329	.000830			3.83	
34.0	1.0			.95749	579.5	.00054	.000136	.00051	.000129	.77	
34.0	2.0			.94314	577.2	.00212	.000535	.00193	.000487	2.90	
34.0	3.0			.93210	578.5	.00432	.001090	.00394	.000994	6.08	
36.0	.0			.94977	576.9	.00113	.000285	.00113	.000280	1.59	
38.0	.0			.93486	570.2	.00163	.000411	.00217	.000547	2.33	
44.0	12.0			.92990	568.5	.00187	.000472			1.82	
42.0	.0			.90837	554.9	.00184	.000464			2.63	
44.0	.0			.90616	553.5	.00182	.000459	.00181	.000457	2.64	
48.0	.0			.90616	553.5	.00178	.000449	.00190	.000479	2.23	
52.0	12.0			.91665	561.9	.00209	.000527			2.11	
56.0	.0			.90009	549.5	.00202	.000510	.00235	.000542	2.61	
58.0	.0			.92217	562.2	.00167	.000421			3.15	
58.0	12.0			.93486	571.5	.00180	.000454			1.75	
58.0	-12.0			.94038	573.9	.00144	.000363				
44.0	-12.0			.93818	573.2	.00195	.000492			3.76	
36.0	-8.0			.92769	569.9	.00280	.000706			4.83	
34.0	-3.0			.93266	575.2	.00341	.000860	.00341	.000860	4.87	
32.0	-3.0			.93818	585.9	.00566	.001428	.00564	.001423	8.45	
30.0	-3.0			.95253	597.9	.00690	.001740	.00708	.001786	11.13	
28.0	-3.0			.96308	588.9	.00388	.000979			6.64	
34.0	-12.0			.92714	565.9	.00172	.000434	.00175	.000441	3.13	
32.0	-12.0			.92438	564.5	.00176	.000444			2.75	
30.0	-12.0			.93100	567.9	.00194	.000489	.00179	.000452	3.03	
19.0	-12.5			.94866	576.9	.00091	.000230			1.54	
17.5	-11.0			.94425	573.9	.00091	.000230			1.57	
15.5	-2.5			.95749	581.2	.00104	.000262			1.63	
16.5	-2.5			.93155	566.2	.00101	.000255			1.49	
17.5	-2.5			.93210	566.2	.00105	.000265			1.57	
18.5	-2.5			.96522	586.2	.00099	.000250			1.62	
19.5	-2.5			.94038	572.9	.00124	.000313				
20.5	-2.5			.93597	572.2	.00164	.000414	.00161	.000406	2.60	
21.5	-2.5			.93321	570.2	.00180	.000454	.00183	.000462	2.81	
22.5	-2.5			.92769	568.9	.00208	.000525	.00202	.000510	2.63	
23.5	-2.5			.92548	567.5	.00240	.000605	.00223	.000562	3.00	
24.5	-2.5			.93707	574.9	.00258	.000651			3.58	
		10.55	180	.93486	564.2	.00041	.000104				
		8.55	180	.93486	563.5	.00028	.000071				
		7.55	180	.96577	584.2	.00062	.000156	.00066	.000166		
		2.55	180	.96853	585.5	.00049	.000124				
		.55	180	.98012	592.5	.00049	.000124				
		6.55	135	.94756	571.5	.00029	.000073				
		4.55	135	.95087	574.5	.00042	.000106				
		2.55	135	.93266	563.9	.00052	.000131				
34.0	4.0			.94590	586.9	.00429	.001082			5.88	
34.0	5.0			.93321	579.2	.00436	.001100	.00429	.001082	5.13	
34.0	6.0			.92769	573.9	.00381	.000961	.00378	.000953	4.48	
36.0	6.0			.93431	577.5	.00397	.001001			4.41	
38.0	1.0			.93542	570.5	.00133	.000335	.00135	.000341	1.82	
38.0	2.0			.93100	567.9	.00145	.000366			2.07	
44.0	8.0			.92824	569.5	.00261	.000658	.00264	.000666	2.78	
44.0	6.0			.92107	564.5	.00208	.000525	.00202	.000510	2.63	
44.0	4.0			.92769	566.9	.00136	.000343	.00135	.000341	1.94	
44.0	2.0			.93266	569.5	.00135	.000341	.00162	.000409	1.63	
44.0	1.0			.91279	556.5	.00161	.000406	.00144	.000363	2.37	
		10.55	90	.91775	560.2	.00139	.000351				.70
		6.55	90	.92493	564.5	.00196	.000494				1.02
		4.55	90	.91941	563.2	.00238	.000600				1.23
		2.55	90	.91775	561.2	.00219	.000552				1.13
		10.55	0	.96888	615.5	.01165	.002939				1.43
		8.55	0	.95970	612.5	.01302	.003284				1.60
		6.55	0	.95473	610.9	.01309	.003302				1.61
		4.55	0	.95253	610.5	.01311	.003307				1.61
		3.55	0	.95860	619.9	.01504	.003794	.01356	.003925		1.85
		2.55	0	.94977	611.9	.01433	.003615	.01449	.003655		1.76
		1.55	0	.94866	597.9	.00800	.002018				.98
		.55	0	.97792	633.2	.01322	.003336				1.62

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.8-inch-diameter cylinder swept forward 45° - Continued

(h) M = 4.44; R = 3.19 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94677	571.0	.00070	.000232			1.19	
12.0	.0			.94345	569.5	.00064	.000212			.86	
20.5	.0			.94511	572.9	.00116	.000384			2.19	
28.0	12.0			.94511	576.5	.00143	.000474			1.61	
28.0	4.0			.93846	571.9	.00171	.000566			2.95	
28.0	.0			.98669	617.9	.00540	.001789			8.57	
20.5	-6.0			.95010	575.2	.00105	.000348			1.98	
24.5	-6.0			.93468	568.5	.00156	.000517			2.89	
30.0	.0			1.03215	667.2	.00878	.002908			15.96	
31.0	12.0			.94622	575.2	.00137	.000454			1.90	
34.0	.0			.97172	582.9	.00024	.000079			.42	
2.0	-12.0			.94511	570.2	.00060	.000199			1.11	
2.0	12.0			.94844	575.2	.00085	.000282			1.13	
12.0	-12.0			.94345	568.9	.00055	.000182			1.12	
12.0	12.0			.93679	567.9	.00086	.000285			1.15	
30.0	1.0			.99002	629.5	.00756	.002504			11.28	
31.0	2.0			.95861	598.2	.00483	.001600			8.47	
32.0	2.0			.95343	585.9	.00266	.000881	.00250	.000828	4.76	
32.0	3.0			.94234	587.2	.00381	.001262			6.05	
32.0	6.0			.93458	571.5	.00223	.000739			3.43	
34.0	2.0			.94844	578.2	.00142	.000470	.00129	.000427	2.25	
34.0	3.0			.93624	574.5	.00247	.000785			4.31	
36.0	.0			.96063	580.2	.00076	.000252	.00078	.000258	1.25	
38.0	.0			.94733	574.2	.00124	.000411			2.18	
44.0	12.0			.93735	569.5	.00127	.000421			1.44	
42.0	.0			.91810	556.9	.00121	.000401			1.92	
44.0	.0			.91628	556.5	.00130	.000431	.00125	.000427		
48.0	.0			.91739	556.2	.00165	.000547	.00176	.000583	2.89	
52.0	12.0			.92349	562.5	.00140	.000464			1.67	
55.0	.0			.91185	552.2	.00111	.000368	.00126	.000417	1.91	
58.0	.0			.93291	564.9	.00112	.000371			1.75	
58.0	12.0			.94234	571.5	.00114	.000378			1.36	
58.0	-12.0			.94788	573.2	.00085	.000282				
44.0	-12.0			.94622	574.5	.00126	.000417			2.57	
36.0	-8.0			.93402	569.2	.00172	.000570			3.51	
34.0	-3.0			.93735	574.2	.00213	.000705	.00214	.000709	3.87	
32.0	-3.0			.94067	580.9	.00340	.001126	.00337	.001116	6.67	
30.0	-3.0			.95287	591.9	.00412	.001365	.00430	.001424	7.49	
28.0	-3.0			.95398	585.2	.00251	.000831			4.74	
34.0	-12.0			.93568	567.9	.00127	.000421	.00128	.000424	2.54	
32.0	-12.0			.93201	566.5	.00128	.000424			2.61	
30.0	-12.0			.93624	568.9	.00128	.000424			2.61	
19.0	-12.5			.95308	575.2	.00051	.000169			1.04	
17.5	-11.0			.94954	572.5	.00051	.000169			1.04	
15.5	-2.5			.96285	580.9	.00075	.000248			1.42	
16.5	-2.5			.93624	565.9	.00057	.000189			1.12	
17.5	-2.5			.93790	565.9	.00061	.000202			1.00	
18.5	-2.5			.97117	585.5	.00058	.000192			1.16	
19.5	-2.5			.94566	571.9	.00077	.000255			1.40	
20.5	-2.5			.94012	569.9	.00112	.000371	.00108	.000358	1.84	
21.5	-2.5			.93679	568.9	.00127	.000421	.00130	.000431	2.08	
22.5	-2.5			.93125	567.2	.00139	.000460	.00131	.000434	2.73	
23.5	-2.5			.92848	564.9	.00140	.000464	.00125	.000414	2.56	
24.5	-2.5			.93957	572.2	.00167	.000553			3.15	
		4.55	180	.96562	579.5	.00029	.000096				
		3.55	180	.96895	582.5	.00039	.000129	.00041	.000136		
		2.55	180	.97172	583.9	.00033	.000109				
		1.55	180	.97837	587.2	.00024	.000079				
		6.55	135	.95232	570.9	.00020	.000066				
		2.55	135	.94123	565.5	.00039	.000129				
34.0	-1.5			.98447	591.0	.00037	.000123	.00070	.000232	.71	
34.0	4.0			.95121	585.9	.00279	.000924			3.77	
34.0	5.0			.93846	576.9	.00233	.000770	.00285	.000944	4.65	
34.0	6.0			.93291	571.9	.00241	.000798	.00234	.000776	3.71	
36.0	6.0			.94012	576.9	.00235	.000778			3.62	
38.0	1.0			.94511	570.9	.00077	.000255	.00078	.000258	1.22	
38.0	2.0			.93957	569.2	.00094	.000311			1.71	
44.0	8.0			.93513	569.2	.00144	.000543	.00168	.000557	2.22	
44.0	6.0			.92792	564.9	.00139	.000460	.00132	.000437	2.14	
44.0	4.0			.93624	567.2	.00094	.000311	.00094	.000311	1.65	
44.0	2.0			.94178	570.2	.00093	.000308	.00118	.000391	1.69	
44.0	1.0			.92293	558.5	.00108	.000358	.00084	.000278		
		10.55	90	.92238	555.9	.00087	.000288				.54
		8.55	90	.92460	559.2	.00116	.000384				.72
		4.55	90	.91951	560.5	.00189	.000626				1.17
		2.55	90	.92571	563.5	.00144	.000477				.89
		10.55	0	.96285	597.5	.00485	.001604				.71
		8.55	0	.95841	597.0	.00465	.001540				.68
		6.55	0	.95121	592.9	.00478	.001583				.70
		4.55	0	.94455	593.5	.00418	.001384				.61
		3.55	0	.94729	620.9	.01076	.003564	.00384	.003022		1.58
		2.55	0	.95287	604.2	.00928	.003074	.00021	.000351		1.36
		1.55	0	.95176	601.9	.00521	.001726				.77
		.55	0	.96015	624.5	.00862	.002855				1.27

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

11. 2.8 inch-diameter cylinder swept forward 45° - Concluded

(i) M = 4.44; R = 2.12 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_r}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
				.94846	572.2	.00048	.000259			.91	
				.94791	570.9	.00055	.000297			1.10	
				.94846	574.9	.00090	.000486			1.76	
				.94846	574.9	.00117	.000631			1.86	
				.93904	570.7	.00158	.000852			3.10	
				.9448	615.9	.00538	.002905				
				.94401	576.9	.00077	.000414			1.93	
				.93683	567.8	.00123	.000664			2.46	
				1.02770	659.9	.01012	.005460	.01188	.006388	75.30	
				.93234	578.7	.00139	.000750			1.76	
				.95013	574.5	.00077	.000415			.96	
				.96880	576.2	.00052	.000281			1.13	
				.94672	567.5	.00063	.000340			.80	
				.99836	624.2	.00894	.004824			22.35	
				.95678	592.6	.00493	.002660			9.48	
				.96123	582.5	.00238	.001268	.00274	.001465	5.88	
				.94237	574.5	.00355	.001915			7.55	
				.93738	570.5	.00183	.000987			4.46	
				.94398	579.2	.00044	.000238	.00047	.000250	.65	
				.96957	576.2	.00102	.000550	.00093	.000486	1.92	
				.93684	572.0	.00192	.001036			3.76	
				.96620	581.2	.00054	.000291	.00060	.000302	1.23	
				.95678	577.2	.00076	.000410			1.45	
				.94569	572.5	.00097	.000523			1.85	
				.92963	561.9	.00091	.000491			1.90	
				.92796	562.9	.00091	.000491	.00098	.000529	1.86	
				.92969	562.5	.00101	.000545	.00135	.000650	2.10	
				.93129	563.2	.00124	.000669			1.57	
				.92408	557.9	.00091	.000493	.00105	.000566		
				.94469	570.5	.00082	.000442			1.68	
				.94957	574.2	.00085	.000459			1.68	
				.95567	577.2	.00074	.000410				
				.95511	577.2	.00088	.000490			2.26	
				.94071	570.5	.00156	.000843			1.66	
				.95672	563.5	.00027	.000146				
				.93980	571.2	.00160	.000863	.00142	.000834	3.64	
				.96015	576.9	.00316	.001692	.00295	.001667	4.28	
				.96123	582.5	.00401	.002159	.00421	.002373	9.25	
				.95345	582.5	.00232	.001256				
				.94459	570.5	.00089	.000485	.00090	.000486	1.85	
				.96126	568.9	.00290	.001584				
				.96292	576.9	.00098	.000529			2.61	
				.95234	573.5	.00046	.000248			1.18	
				.96730	582.9	.00055	.000297			1.38	
				.96348	582.5	.00053	.000286			1.02	
				.94292	567.5	.00043	.000232				
				.95541	582.5	.00046	.000248			.98	
				.95068	574.5	.00063	.000469			1.67	
				.94403	570.9	.00056	.000486	.00065	.000459	1.73	
				.93924	569.2	.00102	.000558	.00119	.000566		
				.94295	566.2	.00103	.000556	.00138	.000637	2.58	
				.92963	565.5	.00139	.000728			2.82	
				.94016	572.2	.00136	.000723			2.91	
				.95174	581.2	.00061	.000342	.00068	.000362		
				.95617	582.2	.00095	.000535	.00097	.000503		
				.95559	581.5	.00060	.000342			.60	
				.95341	580.5	.00243	.001353				
				.94126	571.2	.00226	.001224	.00253	.001340	4.38	
				.94827	574.2	.00203	.001098	.00198	.001074	3.76	
				.94514	573.2	.00209	.001128			3.94	
				.95050	574.5	.00065	.000359	.00072	.000374	1.20	
				.94625	570.5	.00084	.000434			1.55	
				.94202	574.5	.00141	.000777	.00139	.000723	2.44	
				.93927	574.2	.00101	.000549	.00118	.000624	3.91	
				.94459	572.2	.00073	.000388	.00084	.000434	1.37	
				.95013	572.5	.00065	.000371			2.55	
				.93205	563.5	.00090	.000484			1.66	
		1.50	90	.93295	566.9	.00035	.000191				.57
		6.00	90	.92184	561.2	.00031	.000167				.44
		4.50	90	.92892	563.5	.00041	.000221				.59
		3.00	90	.92460	564.2	.00028	.000152				.75
		1.50	90	.93574	567.2	.00050	.000268				.90
		0	90	.94176	570.5	.00047	.000254				.77
		4.50	0	.94266	570.5	.00049	.000264				.81
		3.00	0	.95068	574.2	.00031	.000170				.58
		1.50	0	.94841	573.2	.00100	.000547	.00111	.000605		1.82
		0	0	.94068	569.2	.00161	.000861	.00161	.000844		1.47
				.94403	568.2	.00303	.001626				.72
				.95403	572.5	.00100	.000548				1.81

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu ft^2 sec^{-1} °R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 0.00 INCHES - Continued

12. 2.8-inch diameter cylinder swept back 45°

(a) M = 2.65; R = 3.88 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t'}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96101	588.5	.00282	.000401			.98	
12.0	.0			.95870	586.0	.00262	.000401			.91	
20.0	.0			.95712	586.9	.00271	.000386			.95	
28.0	12.0			.95879	587.9	.00275	.000391			.83	
28.0	6.0			.95767	586.5	.00270	.000384			.93	
28.0	.0			.95990	588.5	.00291	.000414			.96	
28.0	-6.0			.96326	590.5	.00280	.000399			.93	
28.0	-12.0			.95600	585.9	.00287	.000409			.95	
36.0	.0			.96047	587.2	.00201	.000286	.00190	.000270	.64	
36.0	12.0			.96101	588.9	.00274	.000390			.91	
36.0	.0			.93763	563.9	.00082	.000117			.26	
36.0	-12.0			.96101	589.5	.00279	.000397			.93	
44.0	12.0			.96937	593.2	.00262	.000373			.84	
44.0	-12.0			.95990	588.9	.00292	.000416			.93	
52.0	12.0			.95934	587.5	.00283	.000403			.97	
4.0	.0			.96324	598.2	.00399	.000568			1.36	
32.0	2.0			.95600	599.2	.00407	.000579			1.43	
32.0	2.0			.95433	598.5	.00401	.000571	.00405	.000576	1.46	
32.0	3.0			.95433	588.9	.00369	.000525			1.17	
32.0	6.0			.95823	591.9	.00276	.000393			.95	
34.0	1.0			.93540	569.2	.00199	.000283	.00177	.000252	.67	
34.0	2.0			.94876	592.2	.00371	.000528	.00407	.000579	1.26	
34.0	3.0			.95155	590.5	.00370	.000527	.00358	.000510	1.26	
36.0	.0			.91201	572.2	.00344	.000490	.00345	.000491	1.17	
38.0	.0			.91257	568.9	.00405	.000576	.00435	.000619	1.33	
44.0	12.0			.96603	592.9	.00292	.000416			.94	
42.0	.0			.92203	571.5	.00430	.000612	.00451	.000642	1.37	
44.0	.0			.93261	577.2	.00402	.000572	.00403	.000574	1.39	
48.0	.0			.94542	583.5	.00353	.000502	.00355	.000505	1.16	
52.0	.0			.93707	577.9	.00351	.000500	.00350	.000498	1.19	
52.0	12.0			.96154	583.9	.00282	.000401			.93	
56.0	.0			.93596	576.5	.00340	.000484	.00338	.000481	1.16	
58.0	.0			.95156	590.5	.00322	.000458			1.10	
58.0	12.0			.96881	594.2	.00284	.000404			.90	
58.0	-12.0			.96101	590.2	.00306	.000436				
46.0	-12.0			.96658	593.2	.00302	.000430			.95	
36.0	-8.0			.95823	588.0	.00322	.000458			1.01	
36.0	-3.0			.94264	575.2	.00189	.000269				
34.0	-3.0			.95099	587.9	.00392	.000558	.00352	.000501	1.29	
32.0	-3.0			.95433	594.2	.00355	.000505	.00356	.000507	1.13	
30.0	-3.0			.95655	588.5	.00312	.000444	.00310	.000441	1.03	
28.0	-3.0			.96658	594.5	.00285	.000406			.95	
34.0	-12.0			.95210	584.2	.00304	.000433	.00256	.000364	.95	
32.0	-12.0			.95377	585.2	.00296	.000421	.00279	.000397	.92	
31.0	-12.0			.95377	585.5	.00291	.000414	.00273	.000389	.91	
10.0	-12.0			.96881	594.5	.00295	.000420			.93	
17.5	-11.0			.96380	591.2	.00290	.000413			.96	
15.5	-2.5			.97605	600.5	.00295	.000420			.98	
15.5	-2.5			.95377	584.2	.00268	.000381	.00235	.000334	.92	
17.5	-2.5			.95433	587.2	.00290	.000413	.00256	.000364	.96	
18.5	-2.5			.98329	602.2	.00264	.000376			.85	
19.5	-2.5			.95823	587.5	.00279	.000397	.00252	.000359	.93	
20.5	-2.5			.95322	584.5	.00277	.000394	.00268	.000381	.89	
21.5	-2.5			.95433	584.9	.00285	.000406	.00292	.000416	.95	
22.5	-2.5			.94988	581.9	.00272	.000387	.00266	.000379	.90	
23.5	-2.5			.94876	581.5	.00280	.000399	.00273	.000389	.90	
24.5	-2.5			.96268	589.9	.00278	.000396			.95	
		11.55	0	.96937	652.2	.01541	.002193				
		8.55	0	.97828	658.2	.01331	.001895				
		6.55	0	.96268	636.9	.01454	.002070				
		4.55	0	.95210	624.5	.01251	.001781				
		3.55	0	.95099	623.9	.01039	.001479	.01040	.001480		
		2.55	0	.94876	612.5	.00980	.001395	.00976	.001389		
		1.55	0	.95433	617.2	.00707	.001006				
		.55	0	.97716	621.9	.00734	.001045				
		10.55	45	.97271	641.5	.01217	.001732				
		6.55	45	.94488	626.2	.00979	.001393				
		4.55	45	.94319	607.9	.01016	.001446				
		2.55	45	.94261	600.9	.00699	.000995				
54.0	-1.0			.95155	577.2	.00171	.000243	.00181	.000258	.61	
54.0	4.0			.96825	595.2	.00321	.000457	.00339	.000483	1.03	
54.0	5.0			.95879	590.9	.00303	.000431	.00289	.000411	.96	
54.0	6.0			.95934	588.5	.00285	.000406	.00285	.000406	.91	
16.0	6.0			.96380	590.9	.00283	.000403			.97	
38.0	1.0			.92426	567.5	.00276	.000393	.00261	.000372	.91	
48.0	2.0			.94061	575.5	.00287	.000409			.92	
44.0	8.0			.96213	589.9	.00285	.000406	.00287	.000409	.91	
44.0	6.0			.95043	581.9	.00263	.000374	.00261	.000372	.84	
44.0	4.0			.94542	577.2	.00238	.000339	.00234	.000333	.76	
44.0	2.0			.94654	580.9	.00265	.000377	.00271	.000386	.84	
44.0	1.0			.93373	573.2	.00297	.000423	.00276	.000392	1.05	
		12.55	90	.93707	576.2	.00187	.000551				
		6.55	90	.92148	565.2	.00328	.000467				
		4.55	90	.92811	566.2	.00292	.000416				
		2.55	90	.92700	562.9	.00261	.000372				
		12.55	180	.74119	564.9	.00088	.000125				
		8.55	180	.92983	558.5	.00097	.000138				
		6.55	180	.91050	550.2	.00128	.000182				
		4.55	180	.88973	537.5	.00143	.000204				
		2.55	180	.87915	532.2	.00110	.000157	.00105	.000149		
		1.55	180	.87804	531.5	.00122	.000174				
		.55	180	.91591	553.2	.00122	.000174				

(a) The thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

(b) h measured in Btu/ft^2-sec-°R.

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TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept forward 45° - Continued

(b) M = 2.65; R = 2.50 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.97094	590.9	.00186	.000410			.95	
12.0	.0			.96759	588.6	.00174	.000384			.87	
20.5	.0			.96535	587.2	.00183	.000404			.90	
28.0	12.0			.96703	588.5	.00187	.000412			.85	
28.0	4.0			.96647	587.9	.00181	.000399			.90	
28.0	.0			.96871	590.2	.00196	.000432			.97	
20.5	-5.0			.97150	593.5	.00205	.000452			.99	
24.5	-5.0			.96424	587.7	.00192	.000423			.87	
30.0	.0			.97541	588.9	.00156	.000348	.00150	.000331	.79	
31.0	12.0			.96926	589.9	.00192	.000423			.93	
34.0	.0			.94412	565.5	.00065	.000143			.32	
2.0	-12.0			.97094	591.5	.00191	.000421			.93	
2.0	12.0			.97932	595.2	.00183	.000404			.91	
12.0	-12.0			.96871	589.9	.00203	.000448			.91	
12.0	12.0			.96759	588.5	.00184	.000406			.92	
30.0	1.0			.96982	601.5	.00241	.000532			1.10	
31.0	2.0			.96200	596.9	.00279	.000615			1.37	
32.0	2.0			.95977	597.5	.00258	.000569	.00261	.000576	1.38	
32.0	3.0			.96144	588.9	.00263	.000580			1.32	
32.0	6.0			.96703	588.9	.00204	.000450			1.01	
34.0	1.0			.94245	569.9	.00133	.000293			.65	
34.0	2.0			.95474	585.2	.00249	.000549	.00272	.000600	1.20	
34.0	3.0			.95809	590.2	.00265	.000584	.00255	.000562	1.29	
36.0	.0			.92345	570.9	.00268	.000591	.00270	.000595	1.34	
38.0	.0			.92177	568.2	.00303	.000668	.00325	.000717	1.47	
44.0	12.0			.97373	593.2	.00196	.000432			.94	
42.0	.0			.92959	571.9	.00297	.000655	.00321	.000708	1.43	
44.0	.0			.94077	577.5	.00263	.000580	.00263	.000580	1.22	
48.0	.0			.95474	585.9	.00251	.000554	.00253	.000558	1.21	
52.0	.0			.94580	581.2	.00253	.000558	.00252	.000556	1.22	
52.0	12.0			.95921	584.2	.00197	.000434			.96	
55.0	.0			.94524	578.2	.00249	.000549	.00247	.000545	1.23	
58.0	.0			.96144	587.5	.00215	.000474			1.03	
58.0	12.0			.97765	594.9	.00201	.000443			.98	
58.0	-12.0			.96982	591.2	.00213	.000470				
44.0	-12.0			.97429	595.5	.00205	.000452			.98	
36.0	-8.0			.96535	588.9	.00207	.000457			.98	
36.0	-3.0			.94859	574.2	.00128	.000282				
34.0	-3.0			.95809	587.2	.00242	.000534	.00249	.000549	1.17	
32.0	-3.0			.96088	590.5	.00249	.000549	.00249	.000549	1.13	
30.0	-3.0			.96424	589.5	.00221	.000487	.00220	.000485	1.06	
28.0	-3.0			.97485	593.2	.00186	.000410			.89	
34.0	-12.0			.95921	584.5	.00206	.000454	.00181	.000399	.92	
32.0	-12.0			.96200	585.9	.00205	.000452	.00184	.000406	.92	
30.0	-12.0			.96256	587.9	.00207	.000457	.00191	.000421	.96	
19.0	-12.5			.97876	595.5	.00194	.000428			.94	
17.5	-11.0			.97373	592.5	.00194	.000428			.93	
15.5	-2.5			.98603	599.5	.00190	.000419			.92	
16.5	-2.5			.96256	585.5	.00178	.000393			.87	
17.5	-2.5			.96368	586.2	.00191	.000421			.95	
18.5	-2.5			.99329	603.5	.00187	.000412			.91	
19.5	-2.5			.96759	588.5	.00203	.000448	.00183	.000404	.99	
20.5	-2.5			.96312	585.5	.00203	.000448	.00183	.000404	.99	
21.5	-2.5			.96368	586.2	.00179	.000395	.00186	.000410	.87	
22.5	-2.5			.95865	583.2	.00191	.000421	.00185	.000408	.93	
23.5	-2.5			.95809	582.9	.00204	.000450	.00190	.000419	.99	
24.5	-2.5			.97262	591.2	.00189	.000417			.92	
		10.55	0	.97206	641.5	.01132	.002497				1.22
		8.55	0	.98044	658.2	.00870	.001919				.94
		6.55	0	.96591	632.2	.00997	.002199				1.28
		4.55	0	.95585	627.9	.00768	.001694				.83
		3.55	0	.95418	618.9	.00732	.001614	.00731	.001612		.73
		2.55	0	.95418	609.5	.00638	.001407	.00635	.001400		.64
		1.55	0	.95977	611.2	.00510	.001125	.00492	.001085		.56
		.55	0	.98267	620.2	.00470	.001037				.61
		10.55	45	.97429	642.5	.00808	.001782				1.14
		6.55	45	.94691	616.5	.00713	.001572				1.00
		4.55	45	.94524	601.9	.00648	.001429				.91
		2.55	45	.93742	589.2	.00465	.001026				.65
34.0	-1.0			.95865	578.2	.00115	.000254	.00125	.000276	.63	
34.0	4.0			.97653	595.9	.00206	.000454	.00234	.000516	1.02	
34.0	5.0			.96647	588.9	.00195	.000430	.00181	.000399	.96	
34.0	6.0			.96815	590.9	.00193	.000426	.00192	.000423	.96	
36.0	6.0			.97150	591.5	.00186	.000410			.92	
38.0	1.0			.93295	569.2	.00207	.000457	.00195	.000430	1.01	
38.0	2.0			.94747	576.2	.00187	.000412			.92	
44.0	8.0			.97038	590.2	.00202	.000445	.00204	.000450	.99	
44.0	6.0			.95809	582.5	.00187	.000412	.00185	.000408	.93	
44.0	4.0			.95585	581.2	.00159	.000351	.00157	.000346	.83	
44.0	2.0			.95474	581.9	.00172	.000379	.00180	.000397	.83	
44.0	1.0			.94300	574.9	.00201	.000443	.00184	.000406	1.00	
		10.55	90	.94133	573.9	.00265	.000584				1.20
		6.55	90	.92624	566.2	.00226	.000498				1.03
		4.55	90	.91339	554.5	.00201	.000443				.91
		2.55	90	.91395	553.5	.00171	.000377				.78
		10.55	180	.95585	571.2	.00060	.000132				
		8.55	180	.94245	563.9	.00072	.000159				
		6.55	180	.92457	554.9	.00086	.000190				
		4.55	180	.90557	544.5	.00077	.000170				
		3.55	180	.89775	542.5	.00091	.000201	.00088	.000194		
		2.55	180	.89607	538.5	.00077	.000170	.00075	.000165		
		1.55	180	.89551	540.5	.00088	.000194	.00073	.000161		
		.55	180	.92904	557.9	.00065	.000143				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(c) M = 2.65; R = 1.25 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.97446	591.5	.00099	.000435			.97	
12.0	.0			.97224	589.5	.00099	.000435			1.06	
20.5	.0			.97002	588.5	.00097	.000426			.99	
28.0	12.0			.97224	590.2	.00117	.000514			1.16	
28.0	4.0			.97169	589.5	.00096	.000422			.97	
28.0	.0			.97446	591.5	.00104	.000457			1.06	
20.5	-5.0			.97779	593.5	.00116	.000510			1.12	
24.5	-5.0			.97113	590.2	.00101	.000444			1.06	
30.0	.0			.97557	589.9	.00096	.000422	.00091	.000400	1.03	
31.0	12.0			.97446	591.5	.00116	.000510			1.08	
34.0	.0			.94671	569.5	.00025	.000110			.26	
2.0	-12.0			.97446	591.9	.00101	.000444			.94	
2.0	12.0			.98168	595.9	.00099	.000435			.97	
12.0	-12.0			.97391	591.2	.00117	.000514			1.11	
12.0	12.0			.97224	589.9	.00099	.000435			1.00	
30.0	1.0			.97113	597.5	.00151	.000664			1.41	
31.0	2.0			.96336	589.5	.00163	.000716			1.74	
32.0	2.0			.95948	587.5	.00175	.000769	.00176	.000774	1.85	
32.0	3.0			.96225	586.5	.00136	.000598			1.42	
32.0	6.0			.97224	590.5	.00117	.000514			1.19	
34.0	1.0			.94616	571.9	.00067	.000295	.00055	.000242	.76	
34.0	2.0			.95393	581.5	.00136	.000598	.00149	.000655	1.33	
34.0	3.0			.95726	584.5	.00139	.000611	.00124	.000545	1.39	
36.0	.0			.93062	572.5	.00173	.000760	.00170	.000747	1.77	
38.0	.0			.92895	569.5	.00182	.000800			1.94	
44.0	12.0			.97835	594.2	.00116	.000510			1.13	
42.0	.0			.93506	571.9	.00160	.000703			1.57	
44.0	.0			.94671	578.2	.00158	.000695	.00159	.000699	1.68	
48.0	.0			.96225	586.5	.00134	.000589	.00135	.000593	1.43	
52.0	.0			.95504	581.9	.00133	.000585	.00132	.000580	1.41	
52.0	12.0			.96503	585.5	.00100	.000440			.99	
55.0	.0			.95504	581.5	.00137	.000602	.00135	.000593	1.40	
58.0	.0			.97113	591.2	.00130	.000571			1.40	
58.0	12.0			.98390	596.9	.00098	.000431			.98	
58.0	-12.0			.97779	594.9	.00122	.000536				
44.0	-12.0			.98168	595.5	.00115	.000505			1.14	
36.0	-8.0			.97224	590.2	.00104	.000457			1.03	
36.0	-3.0			.94838	573.9	.00065	.000286				
34.0	-3.0			.95837	584.2	.00138	.000607	.00142	.000624	1.39	
32.0	-3.0			.96225	586.2	.00137	.000602	.00136	.000598	1.66	
30.0	-3.0			.96891	590.2	.00131	.000576	.00130	.000571	1.36	
28.0	-3.0			.98112	595.2	.00099	.000435			1.04	
34.0	-12.0			.96614	586.2	.00101	.000444			1.05	
32.0	-12.0			.96836	587.5	.00104	.000457	.00090	.000396	1.05	
30.0	-12.0			.96836	589.9	.00101	.000444	.00088	.000387	.97	
19.0	-12.5			.98445	597.2	.00098	.000431			.99	
17.5	-11.0			.97946	594.5	.00116	.000510			1.14	
15.5	-2.5			.99111	601.2	.00085	.000374			.80	
16.5	-2.5			.96780	587.2	.00117	.000514			1.26	
17.5	-2.5			.96836	587.9	.00117	.000514			1.23	
18.5	-2.5			.99777	605.5	.00093	.000409			1.00	
19.5	-2.5			.97280	592.0	.00109	.000479			1.10	
20.5	-2.5			.96780	589.5	.00110	.000484	.00101	.000444	1.10	
21.5	-2.5			.96836	587.9	.00117	.000514	.00123	.000541	1.15	
22.5	-2.5			.96392	586.5	.00101	.000444	.00095	.000418	1.04	
23.5	-2.5			.96281	584.5	.00101	.000444	.00085	.000374	1.00	
24.5	-2.5			.97668	592.9	.00098	.000431			1.00	
		10.55	0	.97335	628.9	.00725	.003187				1.11
		8.55	0	.98001	631.2	.00634	.002787				.97
		6.55	0	.96392	618.9	.00629	.002765				.96
		4.55	0	.95226	607.5	.00542	.002382				.83
		3.55	0	.95115	606.9	.00475	.002088	.00474	.002084		.73
		2.55	0	.95282	608.9	.00388	.001705	.00385	.001692		.59
		1.55	0	.95948	608.5	.00330	.001451	.00298	.001310		.50
		.55	0	.98057	613.2	.00328	.001442				.50
		10.55	45	.97668	618.5	.00489	.002149				.97
		6.55	45	.94504	596.2	.00567	.002404				1.09
		4.55	45	.94227	600.9	.00407	.001789				.81
		2.55	45	.93561	582.2	.00296	.001301				.59
34.0	-1.0			.96170	581.2	.00065	.000286	.00079	.000347	.69	
34.0	4.0			.97946	599.2	.00113	.000497			1.22	
34.0	5.0			.97002	590.2	.00101	.000444	.00088	.000387	1.00	
34.0	6.0			.97113	590.9	.00101	.000444	.00100	.000440	1.00	
36.0	6.0			.97502	591.9	.00116	.000510			1.21	
38.0	1.0			.93617	570.9	.00117	.000514	.00106	.000466	1.26	
38.0	2.0			.95004	577.9	.00102	.000448			1.04	
44.0	8.0			.97391	591.2	.00117	.000514	.00119	.000523	1.17	
44.0	6.0			.96336	583.9	.00095	.000418	.00091	.000400	.95	
44.0	4.0			.96336	583.2	.00074	.000325	.00074	.000325	.74	
44.0	2.0			.96114	583.2	.00096	.000422	.00104	.000457	.97	
44.0	1.0			.94949	578.2	.00127	.000558			1.43	
		10.55	90	.95226	578.9	.00125	.000549				.81
		6.55	90	.93173	569.2	.00127	.000558				.82
		4.55	90	.91730	559.9	.00121	.000532				.78
		2.55	90	.92007	558.2	.00093	.000409				.60
		10.55	180	.97946	587.2	.00025	.000110				
		6.55	180	.94116	565.5	.00033	.000145				
		4.55	180	.92007	554.5	.00049	.000215				
		3.55	180	.91341	550.2	.00053	.000233	.00049	.000215		
		2.55	180	.91452	550.9	.00047	.000207	.00045	.000198		
		1.55	180	.91563	552.9	.00058	.000255	.00046	.000202		
		.55	180	.94227	567.2	.00033	.000145				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES, δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(d) M = 3.51; R = 3.97 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.96412	582.2	.00147	.000286			.94	
12.0	.0			.95963	578.9	.00149	.000290			.96	
20.5	.0			.95683	577.2	.00146	.000284			.94	
28.0	12.0			.95683	578.5	.00164	.000319			.92	
28.0	6.0			.95765	578.2	.00147	.000286			.89	
28.0	.0			.95907	578.9	.00154	.000300			.97	
20.5	-6.0			.96412	581.5	.00145	.000282			.94	
24.5	-6.0			.95739	577.2	.00150	.000292			1.01	
30.0	.0			.96892	579.9	.00128	.000249	.00123	.000240	.83	
32.0	12.0			.95907	579.9	.00163	.000317			.86	
34.0	.0			.93889	567.5	.00032	.000062			.21	
2.0	-12.0			.96366	584.5	.00143	.000278			.88	
2.0	12.0			.97028	588.2	.00166	.000323			.89	
12.0	-12.0			.96019	579.5	.00152	.000296			.92	
12.0	12.0			.95683	578.2	.00152	.000315			.97	
30.0	12.0			.95907	588.9	.00198	.000386			1.28	
32.0	2.0			.94898	578.9	.00245	.000477			1.55	
32.0	2.0			.94562	579.9	.00240	.000467	.00241	.000469	1.71	
32.0	3.0			.94954	576.5	.00205	.000399			1.28	
32.0	6.0			.95571	577.2	.00165	.000321			.98	
34.0	1.0			.93329	560.2	.00116	.000226			.75	
34.0	2.0			.94225	576.2	.00226	.000440	.00247	.000481	1.41	
34.0	3.0			.94562	577.6	.00213	.000415	.00198	.000386	1.31	
36.0	.0			.91490	559.9	.00184	.000358	.00186	.000362	1.19	
48.0	.0			.90603	554.2	.00222	.000432	.00246	.000479	1.42	
44.0	12.0			.96299	582.2	.00151	.000414			.93	
42.0	.0			.91534	557.5	.00233	.000454	.00253	.000493	1.50	
44.0	.0			.92769	566.2	.00192	.000374	.00193	.000376	1.26	
48.0	.0			.94193	572.9	.00206	.000401	.00208	.000405	1.34	
52.0	.0			.93665	570.9	.00186	.000362	.00185	.000360	1.18	
52.0	12.0			.95066	577.2	.00182	.000354			1.02	
56.0	.0			.93721	567.5	.00188	.000366	.00186	.000362	1.26	
58.0	.0			.95402	577.2	.00157	.000305			1.07	
58.0	12.0			.96972	587.9	.00178	.000347			1.01	
58.0	-12.0			.96412	581.5	.00150	.000292				
44.0	-12.0			.96748	584.2	.00152	.000296			.92	
36.0	-6.0			.95851	580.2	.00167	.000325			1.06	
36.0	-3.0			.94506	568.2	.00115	.000224				
34.0	-3.0			.94505	574.5	.00201	.000391	.00204	.000397	1.35	
32.0	-3.0			.94898	576.2	.00193	.000376	.00192	.000374	1.28	
30.0	-3.0			.95571	578.2	.00163	.000317	.00162	.000315	1.09	
28.0	-3.0			.96693	582.9	.00146	.000284			.97	
26.0	-12.0			.95122	573.5	.00150	.000292			.96	
12.0	-12.0			.95432	575.5	.00150	.000292			.91	
8.0	-12.0			.95459	575.9	.00151	.000294	.00135	.000263	.94	
12.0	-12.0			.97084	585.9	.00151	.000294			.96	
17.5	-12.0			.96580	582.5	.00148	.000288			.89	
14.5	-2.5			.97925	590.5	.00138	.000269			.87	
16.5	-2.5			.95469	574.6	.00139	.000271			.97	
17.5	-2.5			.95515	576.2	.00152	.000296			.98	
18.5	-2.5			.98542	593.5	.00142	.000277			.99	
19.5	-2.5			.95963	578.9	.00141	.000275			.89	
20.5	-2.5			.95402	577.2	.00134	.000261	.00127	.000247	.85	
21.5	-2.5			.95515	577.6	.00156	.000304	.00155	.000302	.99	
22.5	-2.5			.95010	575.9	.00148	.000288	.00143	.000278	.96	
23.5	-2.5			.94956	575.5	.00150	.000292	.00135	.000263	.91	
24.5	-2.5			.96366	580.9	.00150	.000292			1.06	
		1.55	0	.96243	651.5	.01074	.002092				2.12
		3.55	0	.96155	644.5	.01149	.002238				2.20
		5.55	0	.94449	632.2	.00774	.001897				2.01
		4.55	0	.93496	617.2	.00790	.001539				.82
		3.55	0	.93965	612.9	.00678	.001320	.00678	.001320		.92
		2.55	0	.94051	605.2	.00623	.001213	.00623	.001213		.85
		1.55	0	.94051	598.9	.00542	.001062	.00505	.000983		.74
		.55	0	.95580	611.2	.00439	.000855				.60
		10.55	45	.95580	642.5	.00876	.001706				1.19
		8.55	45	.92499	606.5	.00835	.001626				1.13
		4.55	45	.92499	595.4	.00654	.001274				.89
		2.55	45	.92499	586.1	.00515	.001003				.70
34.0	-1.0			.95010	568.2	.00079	.000154	.00088	.000171	.63	
34.0	4.0			.96636	586.2	.00179	.000349	.00205	.000399	1.13	
34.0	5.0			.94749	579.2	.00161	.000313	.00156	.000304	1.02	
34.0	6.0			.94765	582.5	.00163	.000317	.00163	.000317	.89	
36.0	6.0			.96299	582.5	.00157	.000306			.85	
38.0	1.0			.92319	556.2	.00159	.000310	.00155	.000302	1.01	
38.0	2.0			.93721	564.9	.00149	.000290			.96	
44.0	8.0			.96187	582.2	.00177	.000345	.00180	.000351	1.05	
44.0	6.0			.95066	574.2	.00169	.000329	.00165	.000321	.90	
44.0	4.0			.94449	571.5	.00144	.000280	.00140	.000273	.90	
44.0	2.0			.94674	571.2	.00149	.000290	.00159	.000310	.94	
44.0	1.0			.93440	561.9	.00156	.000304	.00145	.000282	1.05	
		12.55	90	.93721	570.5	.00279	.000541				1.22
		8.55	90	.91422	555.5	.00244	.000479				1.08
		4.55	90	.90141	544.5	.00218	.000417				.96
		2.55	90	.89918	548.2	.00168	.000327				.74
		12.55	180	.96412	570.9	.00034	.000070				
		8.55	180	.95515	561.2	.00029	.000056				
		6.55	180	.93777	551.9	.00035	.000068				
		4.55	180	.91646	544.9	.00038	.000074				
		3.55	180	.90806	540.2	.00047	.000092	.00044	.000086		
		2.55	180	.90581	539.2	.00041	.000080				
		1.55	180	.90749	540.9	.00046	.000090				
		.55	180	.91422	550.2	.00039	.000076				

[a]Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(e) M = 3.51; R = 2.76 x 10^6

x, in.	y, in.	z, in. (a)	Ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.5	.0			.96804	583.9	.00107	.000298			.87	
12.0	.0			.96412	580.5	.00098	.000273			.88	
23.5	.0			.96131	578.5	.00119	.000332			.98	
28.0	12.0			.96187	578.5	.00124	.000346			.81	
28.0	4.0			.96299	579.5	.00119	.000332			.96	
28.0	.0			.96412	580.2	.00119	.000332			.92	
2[illegible]	-6.0			.96916	581.9	.00112	.000312			.93	
24.5	-6.0			.96187	578.5	.00108	.000301			.87	
1[illegible]	.0			.96804	580.2	.00105	.000293	.00101	.000282	.85	
31.0	12.0			.96412	579.9	.00124	.000346			.89	
34.0	.0			.94057	558.2	.00023	.000064			.19	
2.0	-12.0			.96692	585.2	.00106	.000296			.83	
2.0	12.0			.97421	586.2	.00118	.000357			.97	
12.0	-12.0			.96468	580.5	.00119	.000332			.92	
12.0	12.0			.96187	578.5	.00117	.000326			.88	
3[illegible]	1.0			.96187	586.2	.00156	.000435			1.27	
31.0	2.0			.95122	579.9	.00184	.000513			1.46	
32.0	2.0			.94674	576.5	.00186	.000519	.00186	.000519	1.51	
32.0	3.0			.95179	574.9	.00155	.000432			1.20	
32.0	6.0			.96131	577.0	.00118	.000329			.89	
34.0	1.0			.93665	560.2	.00083	.000232	.00066	.000184	.60	
34.0	2.0			.94337	571.2	.00163	.000456	.00180	.000502	1.20	
34.0	3.0			.94730	573.5	.00186	.000519	.00170	.000474	1.38	
36.0	.0			.92151	567.5	.00156	.000435	.00157	.000438	1.26	
38.0	.0			.91310	553.2	.00164	.000457	.00191	.000533	1.36	
44.0	12.0			.96860	582.5	.00121	.000338			.70	
42.0	.0			.91983	556.5	.00164	.000457	.00191	.000533	1.36	
44.0	.0			.93272	565.9	.00148	.000413	.00149	.000416	1.18	
48.0	.0			.94898	572.5	.00140	.000391	.00141	.000393	1.10	
52.0	.0			.94281	569.2	.00134	.000374	.00133	.000371	1.04	
52.0	12.0			.95627	575.5	.00125	.000349			.82	
56.0	.0			.94393	568.2	.00127	.000354	.00125	.000348	.98	
58.0	.0			.96131	578.5	.00125	.000349			.90	
58.0	12.0			.97533	588.5	.00130	.000363			.86	
58.0	-12.0			.96072	583.5	.00107	.000298				
44.0	-12.0			.97252	584.2	.00117	.000326			.94	
36.0	-8.0			.96355	579.9	.00108	.000301			.84	
36.0	-3.0			.94730	567.2	.00067	.000187				
36.0	-3.0			.94674	572.2	.00151	.000421	.00153	.000427	1.22	
32.0	-3.0			.95066	573.5	.00140	.000391	.00138	.000385	1.14	
3[illegible]	-1.0			.95963	577.0	.00127	.000354	.00127	.000354	1.05	
28.0	-1.0			.97196	583.2	.00111	.000310			.92	
24.0	-12.0			.95571	575.2	.00120	.000335			.94	
32.0	-12.0			.95851	576.9	.00120	.000335			1.00	
36.0	-12.0			.95907	576.9	.00108	.000301	.00096	.000268	.85	
10.0	-12.0			.97533	587.9	.00114	.000318			.95	
17.5	-11.0			.97028	584.0	.00118	.000329			.98	
15.5	-2.5			.98376	590.0	.00110	.000307			.85	
16.5	-2.5			.95907	576.0	.00108	.000301			.89	
17.5	-2.5			.95963	576.2	.00113	.000315			.95	
18.5	-2.5			.98990	594.9	.00115	.000321			.94	
19.5	-2.5			.96412	578.9	.00102	.000285			.84	
2[illegible].5	-2.5			.95907	578.2	.00116	.000324	.00107	.000298	.97	
21.5	-2.5			.95963	576.2	.00113	.000315	.00118	.000329	.91	
22.5	-2.5			.95515	573.2	.00113	.000315	.00108	.000301	.92	
23.5	-2.5			.95460	575.2	.00107	.000298	.00091	.000254	.86	
24.5	-2.5			.96804	581.2	.00112	.000312			.93	
		12.55	0	.98355	637.2	.01025	.002859				1.[illegible]
		8.55	0	.96524	634.9	.00921	.002569				1.[illegible]
		6.55	0	.94449	615.9	.00919	.002564				1.[illegible]
		4.55	0	.93384	608.9	.00692	.001930				.[illegible]
		3.55	0	.93833	601.9	.00619	.001724	.00619	.001727		.[illegible]
		2.55	0	.93889	594.2	.00567	.001582	.00567	.001582		.[illegible]
		1.55	0	.94001	592.5	.00451	.001258	.00430	.001199		.[illegible]
		.55	0	.96580	605.5	.00387	.001080				.[illegible]
		10.55	45	.96748	619.9	.00799	.002229				1.[illegible]
		8.55	45	.92655	595.2	.00690	.001925				1.[illegible]
		4.55	45	.92543	588.2	.00554	.001545				.90
		2.55	45	.92487	581.5	.00401	.001119				.65
34.0	-1.0			.95290	569.5	.00064	.000179	.00075	.000209	.57	
34.0	4.0			.97028	584.2	.00128	.000357			1.01	
34.0	5.0			.96131	580.2	.00132	.000368	.00121	.000338	1.00	
34.0	6.0			.96299	580.9	.00131	.000365	.00131	.000365	.96	
36.0	6.0			.96692	583.2	.00131	.000365			.98	
38.0	1.0			.92768	557.9	.00117	.000326	.00114	.000318	.97	
38.0	2.0			.94057	566.9	.00109	.000304			.84	
44.0	8.0			.96692	584.2	.00116	.000324	.00118	.000329	.76	
44.0	6.0			.95515	574.2	.00119	.000332	.00117	.000326	.87	
44.0	4.0			.95178	570.5	.00093	.000259	.00090	.000251	.69	
44.0	2.0			.95234	572.9	.00109	.000304	.00119	.000332	.86	
44.0	1.0			.94001	567.2	.00118	.000329	.00106	.000296	.95	
		10.55	90	.94113	568.9	.00210	.000586				1.[illegible]
		6.55	90	.91646	553.2	.00171	.000477				.[illegible]
		4.55	90	.90077	543.2	.00165	.000460				.[illegible]
		2.55	90	.91086	547.2	.00127	.000354				.[illegible]
		10.55	180	.96860	574.5	.00025	.000070				
		8.55	180	.95963	568.5	.00019	.000053				
		6.55	180	.94113	558.2	.00025	.000070				
		4.55	180	.91983	544.9	.00033	.000092				
		3.55	180	.91198	542.5	.00032	.000089				
		2.55	180	.91198	542.5	.00030	.000084				
		1.55	180	.91478	544.2	.00030	.000084				
		.55	180	.94057	559.5	.00024	.000068				

[a] Thermocouple locations for which z and/or Ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(f) M = 3.51; R = 1.59 x 10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
2.0	.0			.96598	581.9	.00065	.000316			.96	
12.0	.0			.96209	578.9	.00067	.000326			1.03	
20.5	.0			.95986	577.5	.00054	.000263			.79	
28.0	12.0			.96097	579.2	.00069	.000336			.81	
28.0	4.0			.96200	579.2	.00067	.000326			.80	
28.0	.0			.96320	579.5	.00067	.000326			1.02	
20.5	-5.0			.96766	582.2	.00066	.000321			1.00	
24.5	-6.0			.96041	577.0	.00061	.000297			.92	
30.0	.0			.96320	578.9	.00068	.000331	.00065	.000316	1.01	
31.0	12.0			.96376	580.5	.00069	.000336			.81	
2.0	-12.0			.96432	581.2	.00064	.000311			.75	
2.0	12.0			.97268	586.2	.00068	.000331			.80	
12.0	-12.0			.96264	579.2	.00067	.000326			1.00	
12.0	12.0			.96097	579.2	.00068	.000331			.88	
30.0	1.0			.95874	581.9	.00099	.000481			1.48	
31.0	2.0			.94982	575.5	.00124	.000603			1.68	
32.0	2.0			.94425	572.9	.00107	.000520	.00106	.000515	1.60	
32.0	3.0			.94926	573.9	.00097	.000472			1.43	
32.0	6.0			.96097	579.0	.00067	.000326			.79	
34.0	1.0			.93365	561.2	.00045	.000219			.66	
34.0	2.0			.93923	568.5	.00102	.000496	.00112	.000545	1.50	
34.0	3.0			.94369	570.9	.00124	.000603			1.63	
36.0	.0			.92250	559.9	.00092	.000447	.00093	.000452	1.08	
38.0	.0			.91637	555.5	.00106	.000515	.00136	.000661	1.25	
44.0	12.0			.96766	583.2	.00069	.000336			.90	
42.0	.0			.92083	557.2	.00101	.000491	.00130	.000632	1.49	
44.0	.0			.93254	563.5	.00096	.000467	.00097	.000472	1.23	
48.0	.0			.95038	572.5	.00081	.000394	.00083	.000404	.95	
52.0	.0			.94369	569.2	.00079	.000384	.00078	.000379	1.11	
52.0	12.0			.95540	576.9	.00081	.000394			.95	
56.0	.0			.94536	569.9	.00072	.000350	.00070	.000340	1.07	
58.0	.0			.96320	580.5	.00072	.000350			1.07	
58.0	12.0			.97491	587.9	.00081	.000394			.96	
58.0	-12.0			.96933	583.5	.00070	.000340				
44.0	-12.0			.97045	584.2	.00073	.000355			1.12	
36.0	-8.0			.96153	578.9	.00079	.000384			1.20	
36.0	-3.0			.94267	566.2	.00038	.000185				
34.0	-3.0			.94257	571.2	.00089	.000433	.00090	.000438	1.33	
32.0	-3.0			.94703	571.9	.00083	.000404	.00081	.000394	1.24	
30.0	-3.0			.95818	578.2	.00077	.000374	.00077	.000374	1.07	
28.0	-3.0			.96980	583.9	.00063	.000306			.93	
34.0	-12.0			.95484	574.5	.00065	.000316			.77	
32.0	-12.0			.95707	575.9	.00067	.000326	.00056	.000272	1.00	
30.0	-12.0			.95763	576.2	.00067	.000326	.00057	.000277	.99	
19.0	-12.5			.97435	586.2	.00064	.000311			.96	
17.5	-11.0			.96878	582.9	.00055	.000316			.76	
16.5	-2.5			.98104	590.9	.00064	.000311			.86	
16.5	-2.5			.95763	575.9	.00061	.000297			.72	
17.5	-2.5			.95818	576.5	.00064	.000311			.96	
18.5	-2.5			.98717	593.9	.00052	.000253			.79	
19.5	-2.5			.96264	579.2	.00073	.000353			.87	
20.5	-2.5			.95707	576.2	.00069	.000336	.00060	.000292	.82	
21.5	-2.5			.95818	576.5	.00067	.000326	.00073	.000355	.79	
22.5	-2.5			.95317	573.5	.00064	.000311	.00059	.000287	.90	
23.5	-2.5			.95317	573.5	.00063	.000306			.95	
24.5	-2.5			.96655	581.5	.00064	.000311			.75	
		10.55	0	.96376	628.2	.00639	.003107				1.04
		8.55	0	.96209	622.5	.00616	.002995				1.01
		6.55	0	.94313	604.9	.00608	.002957				.99
		4.55	0	.93254	597.5	.00465	.002261				.76
		3.55	0	.93533	594.2	.00389	.001892	.00390	.001896		.64
		2.55	0	.93533	588.2	.00339	.001648	.00338	.001644		.55
		1.55	0	.93811	587.2	.00278	.001352	.00293	.001425		.45
		.55	0	.96209	596.5	.00257	.001250				.42
		10.55	45	.96655	617.2	.00463	.002251				.75
		8.55	45	.93419	591.5	.00450	.002188				.96
		4.55	45	.92250	578.5	.00391	.001901				.75
		2.55	45	.92139	577.2	.00225	.001094				.44
34.0	-1.0			.96205	570.2	.00040	.000195			.60	
34.0	4.0			.96766	583.9	.00077	.000374			1.03	
34.0	5.0			.95986	579.2	.00085	.000413	.00074	.000364	1.18	
34.0	6.0			.96153	580.9	.00081	.000394	.00081	.000394	.95	
36.0	6.0			.96543	582.2	.00070	.000340			.76	
38.0	1.0			.92529	557.5	.00071	.000345	.00063	.000306	1.03	
38.0	2.0			.93644	563.9	.00067	.000277			.81	
44.0	8.0			.96543	581.2	.00070	.000340	.00072	.000350	.82	
44.0	6.0			.95372	574.5	.00069	.000336	.00066	.000321	.81	
44.0	4.0			.95205	573.5	.00048	.000233	.00047	.000229	.61	
44.0	2.0			.95149	572.9	.00056	.000271	.00075	.000365	.97	
44.0	1.0			.93979	566.2	.00086	.000418	.00074	.000365	1.30	
		10.55	90	.93867	568.5	.00130	.000632				.90
		8.55	90	.91358	551.9	.00108	.000525				.74
		4.55	90	.90020	543.5	.00105	.000511				.72
		2.55	90	.91024	548.7	.00065	.000316				.45
		10.55	180	.96822	574.9	.00014	.000078				
		8.55	180	.93423	554.9	.00016	.000078				
		4.55	180	.91749	544.5	.00025	.000122				
		2.55	180	.91131	545.2	.00026	.000126				
		1.55	180	.91414	544.9	.00026	.000126				

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(g) M = 4.44; R = 4.42 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.0	.0			.94541	576.5	.00088	.000225			1.04	
12.0	.0			.94210	572.9	.00093	.000237			1.29	
20.5	.0			.93990	571.5	.00096	.000245			1.37	
28.0	12.0			.93549	572.2	.00128	.000327			1.24	
28.0	4.0			.94155	572.9	.00096	.000245			1.16	
28.0	.0			.94210	572.9	.00097	.000248			1.21	
20.5	-5.0			.94762	575.9	.00074	.000189			1.10	
24.5	-5.0			.93990	572.2	.00087	.000222			1.30	
30.0	.0			.94486	573.5	.00077	.000197	.00077	.000197	1.13	
31.0	12.0			.93824	573.5	.00115	.000293			1.13	
2.0	-12.0			.94596	574.9	.00084	.000214			1.24	
2.0	12.0			.94817	578.9	.00119	.000304			1.19	
12.0	-12.0			.94431	573.5	.00072	.000184			1.29	
12.0	12.0			.93604	572.2	.00116	.000296			1.17	
30.0	1.0			.93880	575.5	.00141	.000360			2.17	
31.0	2.0			.92777	568.2	.00141	.000360			1.93	
32.0	2.0			.92170	564.2	.00156	.000398	.00152	.000388	1.95	
32.0	3.0			.92887	568.5	.00130	.000332			1.57	
32.0	6.0			.93935	571.5	.00074	.000189			.86	
34.0	1.0			.91068	563.5	.00076	.000194			1.09	
34.0	2.0			.91784	562.2	.00143	.000365			1.96	
34.0	3.0			.92446	567.5	.00123	.000314			1.73	
36.0	.0			.90406	552.9	.00120	.000306	.00124	.000316	1.69	
38.0	.0			.89248	546.9	.00137	.000350			1.96	
44.0	12.0			.94155	575.5	.00115	.000293			1.12	
42.0	.0			.89800	549.9	.00135	.000345			1.93	
44.0	.0			.91013	556.9	.00133	.000339	.00134	.000342	1.93	
48.0	.0			.92556	565.5	.00116	.000296	.00118	.000301	1.45	
52.0	.0			.92170	562.5	.00122	.000311	.00121	.000309	1.77	
52.0	12.0			.93053	568.5	.00138	.000352			1.39	
55.0	.0			.92391	562.5	.00103	.000263	.00101	.000258	1.43	
58.0	.0			.94100	574.2	.00113	.000288			2.13	
58.0	12.0			.94982	581.2	.00127	.000324			1.23	
58.0	-12.0			.94982	576.9	.00084	.000214				
44.0	-12.0			.95203	578.2	.00073	.000186			1.26	
36.0	-8.0			.94210	572.5	.00092	.000235			1.59	
36.0	-3.0			.92667	562.9	.00062	.000158				
34.0	-3.0			.92281	565.2	.00132	.000337	.00131	.000334	1.89	
32.0	-3.0			.92722	565.9	.00121	.000309	.00120	.000306	1.81	
30.0	-3.0			.93824	571.2	.00099	.000253	.00099	.000253	1.60	
28.0	-3.0			.95037	577.5	.00076	.000194			1.09	
34.0	-12.0			.93604	568.5	.00070	.000179			1.27	
32.0	-12.0			.93880	570.2	.00087	.000222			1.36	
30.0	-12.0			.93935	570.5	.00070	.000179			1.09	
19.0	-12.5			.95589	580.2	.00074	.000189			1.25	
17.5	-11.0			.95037	577.2	.00071	.000181			1.22	
15.5	-2.5			.96195	584.9	.00082	.000209			1.28	
16.5	-2.5			.93714	569.9	.00093	.000237			1.37	
17.5	-2.5			.93824	570.5	.00079	.000202			1.18	
18.5	-2.5			.96691	588.2	.00082	.000209			1.34	
19.5	-2.5			.94376	573.5	.00078	.000199				
20.5	-2.5			.93769	570.2	.00100	.000255			1.59	
21.5	-2.5			.93824	571.9	.00101	.000258	.00112	.000286	1.58	
22.5	-2.5			.93383	567.5	.00087	.000222	.00079	.000202	1.10	
23.5	-2.5			.93383	567.5	.00084	.000214			1.05	
24.5	-2.5			.94707	576.2	.00099	.000253			1.38	
		10.55	0	.95699	618.2	.01316	.003358				1.62
		8.55	0	.95589	615.9	.01151	.002937				1.41
		6.55	0	.93273	600.9	.01083	.002764				1.33
		4.55	0	.91619	587.2	.00883	.002253				1.08
		3.55	0	.91950	584.5	.00698	.001781	.00695	.001774		.86
		2.55	0	.92336	583.5	.00591	.001483	.00592	.001511		.71
		1.55	0	.91784	576.5	.00486	.001240	.00451	.001151		.60
		.55	0	.94100	591.5	.00381	.000972				.47
		10.55	45	.95809	608.9	.00838	.002139				1.34
		6.55	45	.91288	579.9	.00767	.001957				1.23
		4.55	45	.90737	572.9	.00664	.001695				1.06
		2.55	45	.90737	566.9	.00415	.001059				.66
34.0	-1.0			.93108	563.9	.00045	.000115			.74	
34.0	4.0			.94817	578.2	.00126	.000322			1.73	
34.0	5.0			.94210	573.5	.00105	.000268			1.24	
34.0	6.0			.94155	575.9	.00108	.000276	.00106	.000271	1.27	
36.0	6.0			.94707	577.9	.00118	.000301			1.31	
38.0	1.0			.90461	551.2	.00087	.000222	.00082	.000209	1.19	
38.0	2.0			.91729	568.9	.00102	.000260			1.46	
44.0	8.0			.94596	576.5	.00102	.000260	.00106	.000271	1.09	
44.0	6.0			.93383	568.5	.00103	.000263	.00101	.000258	1.30	
44.0	4.0			.92722	565.5	.00091	.000232	.00091	.000232	1.30	
44.0	2.0			.93328	567.2	.00080	.000204			.96	
44.0	1.0			.91895	558.9	.00076	.000194	.00074	.000189	1.12	
		10.55	90	.92281	564.5	.00204	.000521				1.06
		6.55	90	.89744	549.9	.00182	.000464				.53
		4.55	90	.88256	540.5	.00165	.000421				.85
		2.55	90	.89028	544.2	.00134	.000342				.69
		4.55	180	.89855	542.9	.00026	.000066				
		3.55	180	.89248	539.2	.00028	.000071				
		1.55	180	.89744	542.9	.00037	.000094				
		.55	180	.91950	555.9	.00032	.000082				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Continued

12. 2.8-inch-diameter cylinder swept back 45° - Continued

(b) M = 4.44; R = 3.27 x 10^6

x, in.	y, in.	z, in. (a)	ϕ, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_o}$	$\frac{h}{h_L}$
2.40	0			.94599	574.6	.00058	.000200			.98	
12.40	0			.94324	572.6	.00059	.000203			.80	
24.45	0			.94158	571.6	.00058	.000400			1.09	
28.60	12.00			.93718	570.5	.00080	.000276			.90	
28.60	6.00			.94324	574.2	.00075	.000259			1.29	
28.60	0			.94436	573.6	.00056	.000193			.80	
2.40	-6.00			.94875	576.2	.00053	.000183			1.00	
24.45	-6.00			.94158	571.6	.00056	.000193			1.02	
2.40	0			.94379	572.9	.00067	.000241	.000067	.000231	1.22	
12.40	12.00			.93993	570.2	.00080	.000276			1.11	
44.60	0			.91569	553.5	.00019	.000066			.33	
2.40	-12.00			.94544	574.2	.00052	.000179			.96	
2.40	12.00			.94875	577.5	.00076	.000262			1.02	
12.40	-12.00			.94434	573.2	.00052	.000179			1.06	
12.40	12.00			.93773	571.2	.00085	.000293			1.13	
4.40	1.00			.93938	573.2	.00113	.000390			1.60	
32.60	0.00			.92836	566.2	.00114	.000393			2.00	
12.40	0.00			.92175	562.5	.00112	.000386	.000108	.000372	1.84	
12.40	0.00			.92891	566.2	.00095	.000328			1.61	
44.60	4.00			.94158	573.2	.00075	.000259			1.15	
16.40	0.00			.93183	568.2	.00051	.000176			.78	
16.40	2.00			.93775	568.2	.00111	.000383	.000120	.000414	1.76	
16.40	1.00			.92945	563.2	.00101	.000362			1.91	
16.40	1.00			.92642	561.2	.00074	.000263	.000079	.000272	1.39	
16.40	0.00			.92986	563.2	.00108	.000372			1.89	
44.60	2.00			.94379	574.9	.00051	.000259			.97	
44.60	0.00			.90026	548.6	.00083	.000300			1.38	
44.60	1.00			.91248	556.8	.00054	.000421	.000034	.000324		
44.60	0.00			.92781	566.2	.00071	.000246	.000071	.000245	1.21	
16.40	1.00			.92005	560.5	.00063	.000231	.000066	.000229	1.21	
16.40	0.00			.92337	562.5	.00101	.000368			1.80	
16.40	1.00			.92726	565.2	.00067	.000241	.000067	.000231	1.16	
16.40	0.00			.91580	558.0	.00101	.000369			1.70	
16.40	-1.00			.95004	577.4	.00014	.000051				
16.40	-2.00			.95316	579.5	.00014	.000184			.25	
44.60	-2.00			.94436	573.6	.00018	.000200			.32	
44.60	-1.00			.92110	559.3	.00014	.000136				
16.40	-1.00			.92139	561.2	.00016	.000284	.000012	.000278	1.01	
16.40	-2.00			.92671	564.9	.00021	.000381	.000014	.000334	.56	
16.40	-3.00			.92484	563.8	.00021	.000381	.000014	.000334	1.36	
16.40	-4.00			.92251	562.2	.00021	.000381			1.34	
16.40	-5.00			.92004	560.2	.00053	.001369			1.04	
44.60	-3.00			.90123	547.0	.00049	.000329			1.00	
44.60	-4.00			.90123	547.0	.00049	.000329			1.00	
44.60	-5.00			.89684	544.0	.00041	.000329			.69	
44.60	-6.00			.89368	541.9	.00059	.000329			1.11	
44.60	-7.00			.89284	541.3	.00053	.000144			.83	
44.60	-8.00			.89416	542.2	.00012	.000176			1.00	
44.60	-9.00			.90489	549.6	.00018	.000200			1.51	
44.60	-10.00			.90498	549.6	.00021	.000144			.91	
44.60	-11.00			.89705	544.2	.00017	.000231	.000007	.000262	1.41	
44.60	-12.00			.89987	546.1	.00021	.000193	.000048	.000185	1.15	
44.60	-13.00			.89487	542.6	.00021	.000172			.91	
44.60	-14.00			.89826	545.0	.00021	.000286			1.07	
44.60	1.00	0	0	.90481	549.6	.00024	.000264				1.17
44.60	2.00	0	0	.90116	547.0	.00026	.000237				.95
44.60	3.00	0	0	.89801	544.8	.00021	.000461				1.05
44.60	4.00	0	0	.91403	556.0	.00012	.000170				.93
44.60	5.00	0	0	.91736	558.2	.00014	.000322	.000032	.000326		.76
44.60	6.00	0	0	.91956	559.8	.00026	.000341	.000034	.000340		.65
44.60	7.00	0	0	.91998	560.1	.00021	.000258	.000031	.000341		.54
44.60	8.00	0	0	.92212	561.6	.00021	.000327				.40
44.60	1.00	45	45	.96466	591.2	.00024	.000303				1.07
44.60	2.00	45	45	.96062	588.3	.00024	.000303				1.05
44.60	3.00	45	45	.96411	590.8	.00026	.000330				.71
44.60	4.00	45	45	.96411	590.8	.00039	.000330				.64
44.60	5.00			.93163	570.6	.00042	.000361			.81	
44.60	6.00			.94785	581.1	.00074	.000311			1.00	
44.60	7.00			.94103	576.8	.00031	.000362			1.01	
44.60	8.00			.94269	577.9	.00021	.000178	.000041	.000176	.64	
44.60	9.00			.94710	580.8	.00021	.000178			1.26	
44.60	10.00			.94068	576.8	.00021	.000241	.000041	.000217	1.11	
44.60	11.00			.93624	574.0	.00024	.000241			1.16	
44.60	12.00			.94710	580.8	.00044	.000260	.000044	.000234	.14	
44.60	13.00			.93442	572.9	.00026	.000262	.000034	.000265	.17	
44.60	14.00			.92098	564.9	.00021	.000213	.000031	.000195	1.07	
44.60	15.00			.93497	574.2	.00021	.000238			1.25	
44.60	1.00	90	90	.92330	566.0	.00141	.000488				.88
44.60	2.00	90	90	.89865	549.6	.00132	.000456				.84
44.60	3.00	90	90	.88870	543.0	.00021	.000145				.64
44.60	4.00	90	90	.89684	548.4	.00021	.000254				

[a] Thermocouple locations for which z and/or ϕ stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

TABLE V. - HEAT-TRANSFER MEASUREMENTS FOR VARIOUS PROTUBERANCE SHAPES; δ = 6.00 INCHES - Concluded

12. 2.8-inch-diameter cylinder swept back 45° - Concluded

(i) M = 4.44; R = 2.12×10^6

x, in.	y, in.	z, in. (a)	ø, deg (a)	$\frac{T_e}{T_t}$	T_w, °R	h (b)	N_{St}	h_c (b)	$N_{St,c}$	$\frac{h}{h_0}$	$\frac{h}{h_L}$
12.0	.0			.95137	573.2	.00041	.000221			.82	
20.5	.0			.94971	572.5	.00049	.000265			.96	
28.0	12.0			.94584	570.9	.00068	.000367			1.08	
28.0	4.0			.95192	573.9	.00051	.000275			1.00	
28.0	.0			.95303	574.2	.00042	.000227				
24.5	-5.0			.94971	572.2	.00047	.000254			.94	
30.0	.0			.94971	572.2	.00042	.000227	.00043	.000232	1.05	
31.0	12.0			.94916	572.5	.00058	.000313			.73	
2.0	-12.0			.94971	572.9	.00040	.000216			.75	
2.0	12.0			.95413	576.9	.00085	.000459			1.06	
12.0	-12.0			.95137	573.2	.00043	.000232			.93	
12.0	12.0			.94584	570.5	.00061	.000329			.77	
12.0	1.0			.94584	572.2	.00071	.000383			1.78	
31.0	2.0			.93535	565.9	.00079	.000427			1.52	
32.0	2.0			.92816	561.9	.00080	.000432	.00076	.000410	2.00	
32.0	3.0			.93535	565.2	.00063	.000340			1.34	
32.0	6.0			.94971	572.9	.00048	.000259			.91	
34.0	1.0			.92043	554.5	.00037	.000200			.71	
34.0	2.0			.92319	558.2	.00079	.000427	.00080	.000432	1.49	
34.0	3.0			.92871	560.9	.00086	.000465			1.69	
36.0	.0			.91545	552.9	.00058	.000313	.00060	.000324	1.32	
38.0	.0			.90606	547.5	.00069	.000373			1.33	
44.0	12.0			.95303	575.2	.00068	.000367			1.01	
42.0	.0			.90993	549.5	.00072	.000389			1.50	
44.0	.0			.92159	556.2	.00058	.000313	.00059	.000319	1.18	
48.0	.0			.93590	565.2	.00060	.000324	.00062	.000335	1.25	
52.0	.0			.93535	563.9	.00056	.000302	.00055	.000297	1.40	
52.0	12.0			.94142	568.2	.00062	.000335			.78	
56.0	.0			.93700	564.9	.00056	.000302	.00052	.000281		
58.0	12.0			.96021	579.9	.00069	.000373			.87	
44.0	-12.0			.96076	578.9	.00043	.000232			1.10	
36.0	-3.0			.92927	560.5	.00036	.000194				
34.0	-3.0			.92706	559.9	.00061	.000329	.00058	.000313	1.39	
32.0	-3.0			.93369	563.5	.00056	.000302	.00053	.000286	1.12	
30.0	-3.0			.94695	571.2	.00055	.000297	.00055	.000297	1.25	
28.0	-3.0			.96076	578.9	.00044	.000238				
30.0	-12.0			.94805	571.2	.00042	.000227	.00039	.000211	1.08	
16.5	-2.5			.94695	570.5	.00055	.000297			1.06	
18.5	-2.5			.97679	588.5	.00041	.000221			.87	
22.5	-2.5			.94308	568.2	.00040	.000216	.00032	.000173	1.00	
23.5	-2.5			.94308	568.2	.00037	.000200	.00028	.000151	.80	
24.5	-2.5			.95690	576.9	.00052	.000281			1.13	
		10.55	0	.95800	596.9	.00626	.003381				1.19
		8.55	0	.95413	601.9	.00582	.003144				1.05
		6.55	0	.92927	578.9	.00513	.002771				.93
		4.55	0	.91601	568.2	.00490	.002647				.89
		3.55	0	.91877	567.5	.00407	.002198	.00408	.002204		.74
		2.55	0	.91877	566.2	.00354	.001912	.00359	.001939		.64
		1.55	0	.91490	563.5	.00302	.001631	.00267	.001442		.55
		.55	0	.94032	576.9	.00262	.001415				.47
		10.55	45	.95966	590.9	.00402	.002171				.95
		6.55	45	.90993	560.9	.00356	.001923				.84
		4.55	45	.90716	557.5	.00347	.001874				.82
		2.55	45	.90385	553.5	.00262	.001415				.62
34.0	5.0			.94916	572.9	.00057	.000308	.00046	.000248	1.12	
34.0	6.0			.95026	574.2	.00055	.000297	.00053	.000286	1.02	
36.0	6.0			.95413	575.9	.00060	.000324			1.13	
38.0	7.0			.92208	556.2	.00050	.000270			1.25	
44.0	8.0			.95468	576.2	.00084	.000454	.00088	.000475	1.56	
44.0	6.0			.94253	568.5	.00052	.000281	.00048	.000259	.98	
44.0	4.0			.93977	565.9	.00041	.000221	.00038	.000205	.89	
44.0	2.0			.94142	567.2	.00048	.000259			.96	
44.0	1.0			.92816	559.9	.00050	.000270			1.00	
		10.55	90	.93203	561.9	.00081	.000438				.62
		6.55	90	.90164	544.5	.00089	.000481				.68
		4.55	90	.88838	536.5	.00080	.000432				.61
		2.55	90	.89722	542.2	.00074	.000400				.56

[a] Thermocouple locations for which z and/or ø stations are provided are for models; x and y stations for these models are measured from model origins.

[b] h measured in Btu/ft^2-sec-°R.

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TABLE VI.- THEORETICAL HEAT-TRANSFER COEFFICIENTS ON RIGHT CIRCULAR CYLINDERS OF INFINITE LENGTH

M	R	h_L		
		$\phi = 0^\circ$	$\phi = 45^\circ$	$\phi = 90^\circ$
1.4-inch-diameter cylinder				
2.65	3.95×10^6	0.02349		0.00558
2.65	2.65	.01912		.00454
2.65	1.60	.01352		.00321
3.51	3.95	.02003		.00476
3.51	2.75	.01678		.00398
3.51	1.60	.01278		.00304
4.44	4.50	.01705		.00405
4.44	3.20	.01407		.00339
4.44	2.15	.01156		.00275
2.8-inch-diameter cylinder				
2.65	3.95×10^6	0.01661	0.01275	0.00394
2.65	2.65	.01356	.01041	.00322
2.65	1.60	.00959	.00736	.00228
3.51	3.95	.01472	.01130	.00350
3.51	2.75	.01231	.00945	.00292
3.51	1.60	.00938	.00720	.00223
4.44	4.50	.01282	.00985	.00305
4.44	3.20	.01071	.00822	.00254
4.44	2.15	.00871	.00669	.00207
2.8-inch-diameter cylinder swept 45°				
2.65	3.95×10^6	0.01133	0.00870	0.00269
2.65	2.65	.00925	.00710	.00220
2.65	1.60	.00654	.00502	.00155
3.51	3.95	.00961	.00738	.00228
3.51	2.75	.00803	.00617	.00191
3.51	1.60	.00612	.00470	.00145
4.44	4.50	.00814	.00625	.00193
4.44	3.20	.00680	.00522	.00161
4.44	2.15	.00553	.00425	.00131

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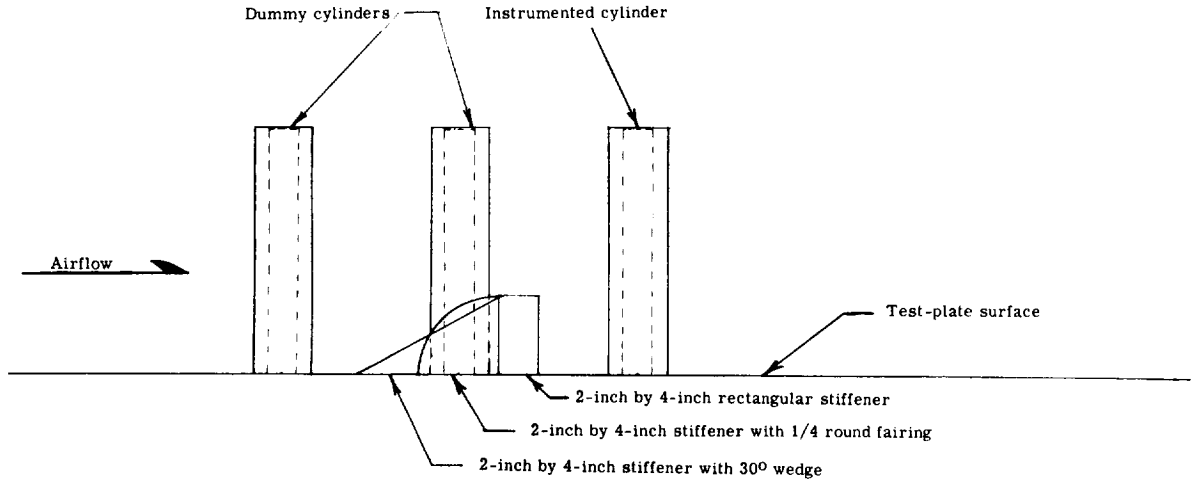

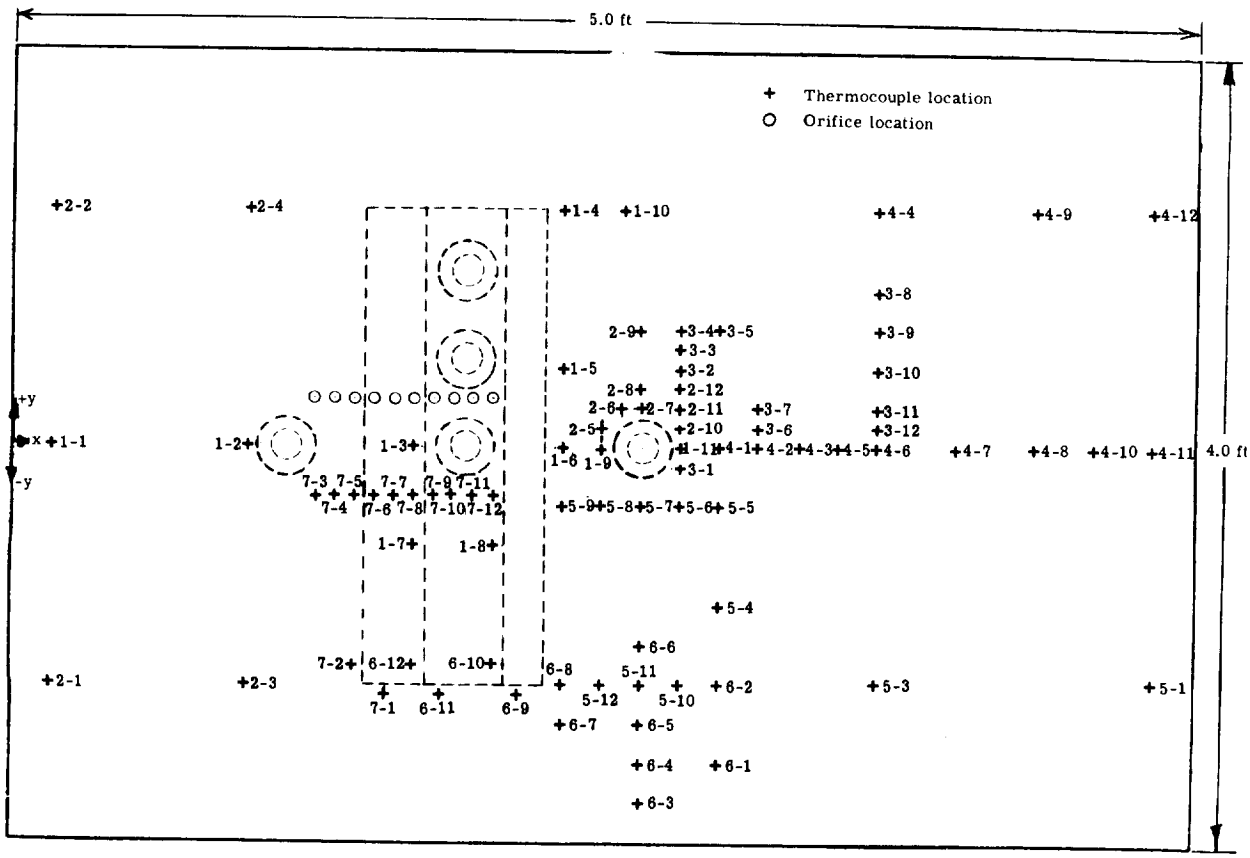

Figure 1.- Test plate showing typical models with thermocouple and orifice locations.

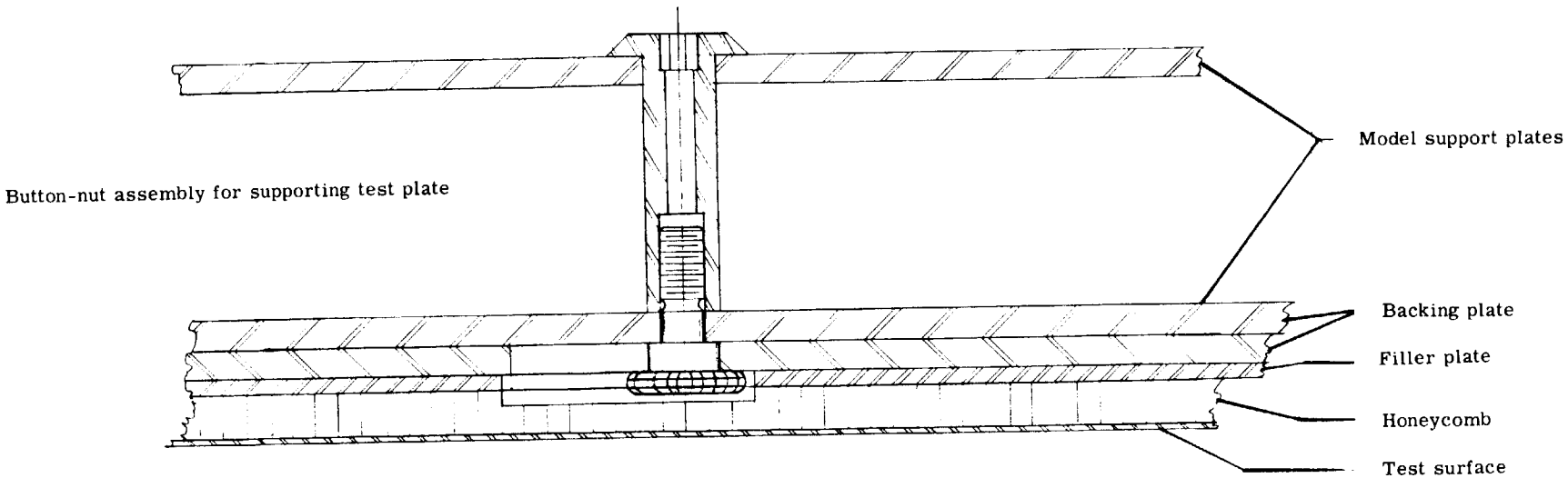

Figure 2.- Cross-sectional view of laminated flat plate and wing-type support backing structure.

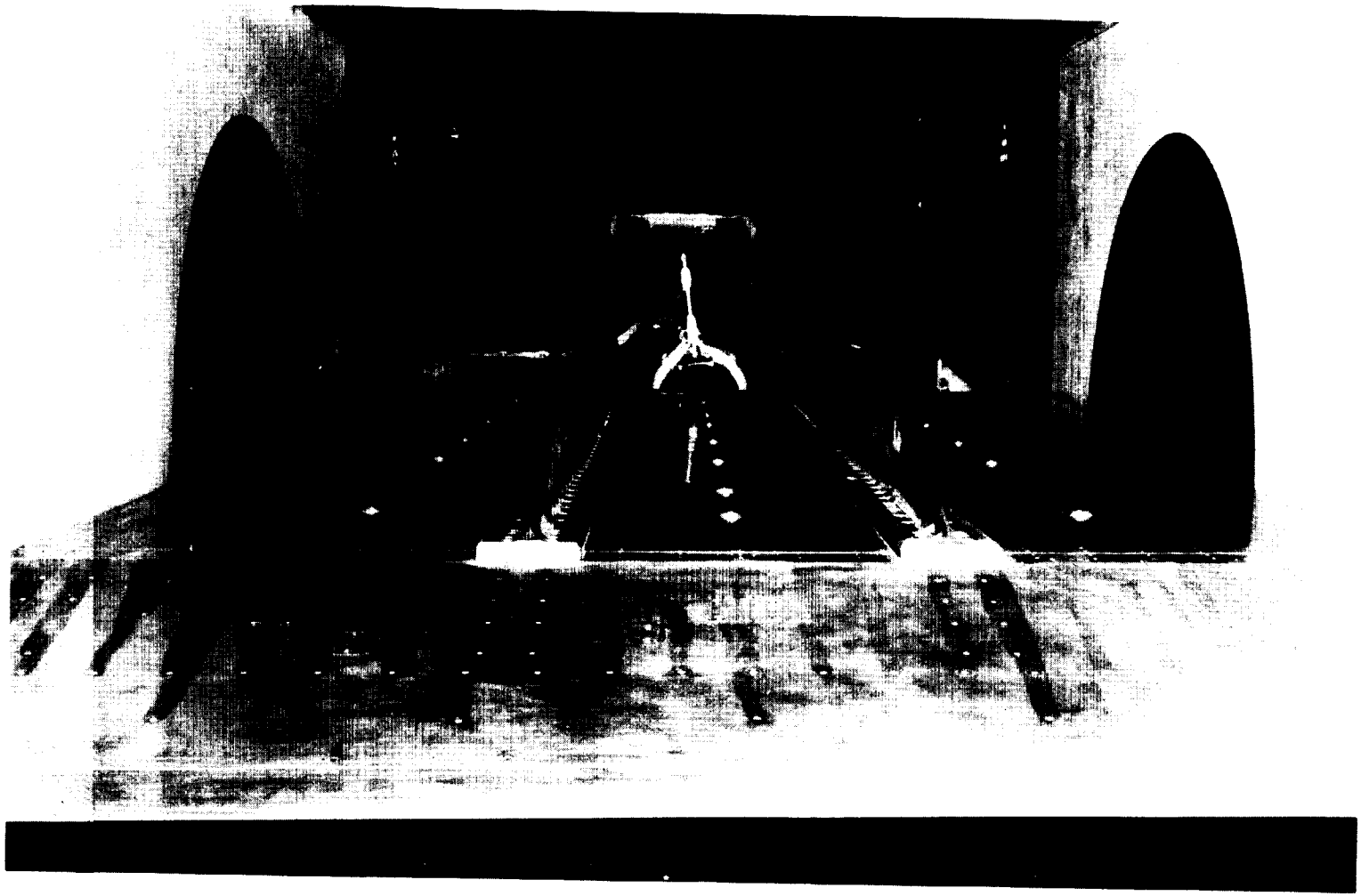

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Figure 3.- Upper surface of the wing-type support mounted along the horizontal center plane of the test section.

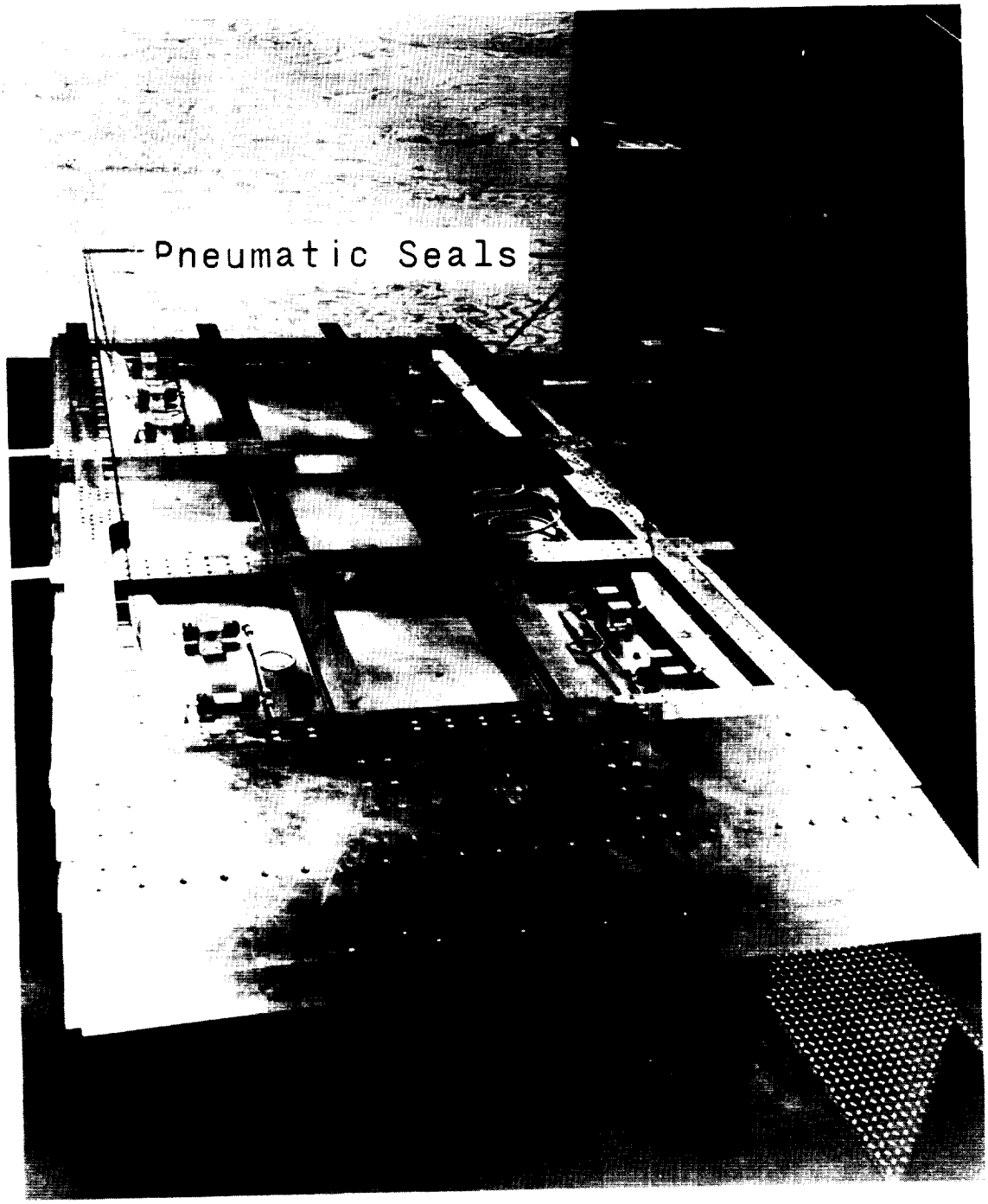

Figure 4.- Wing-type support interior showing pneumatic seals. L-62-2091

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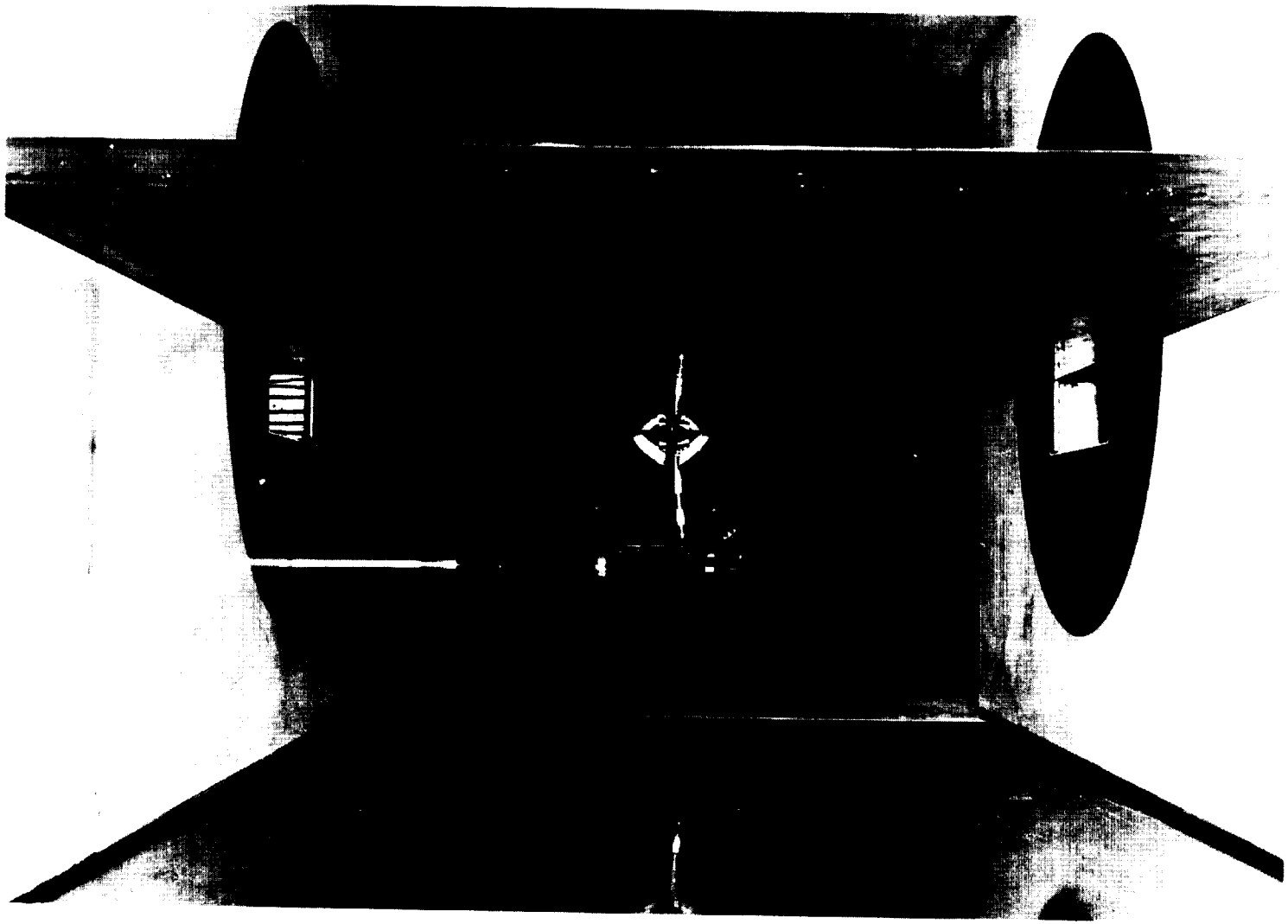

Figure 5.- Test surface mounted on support structure in test section. L-58-999

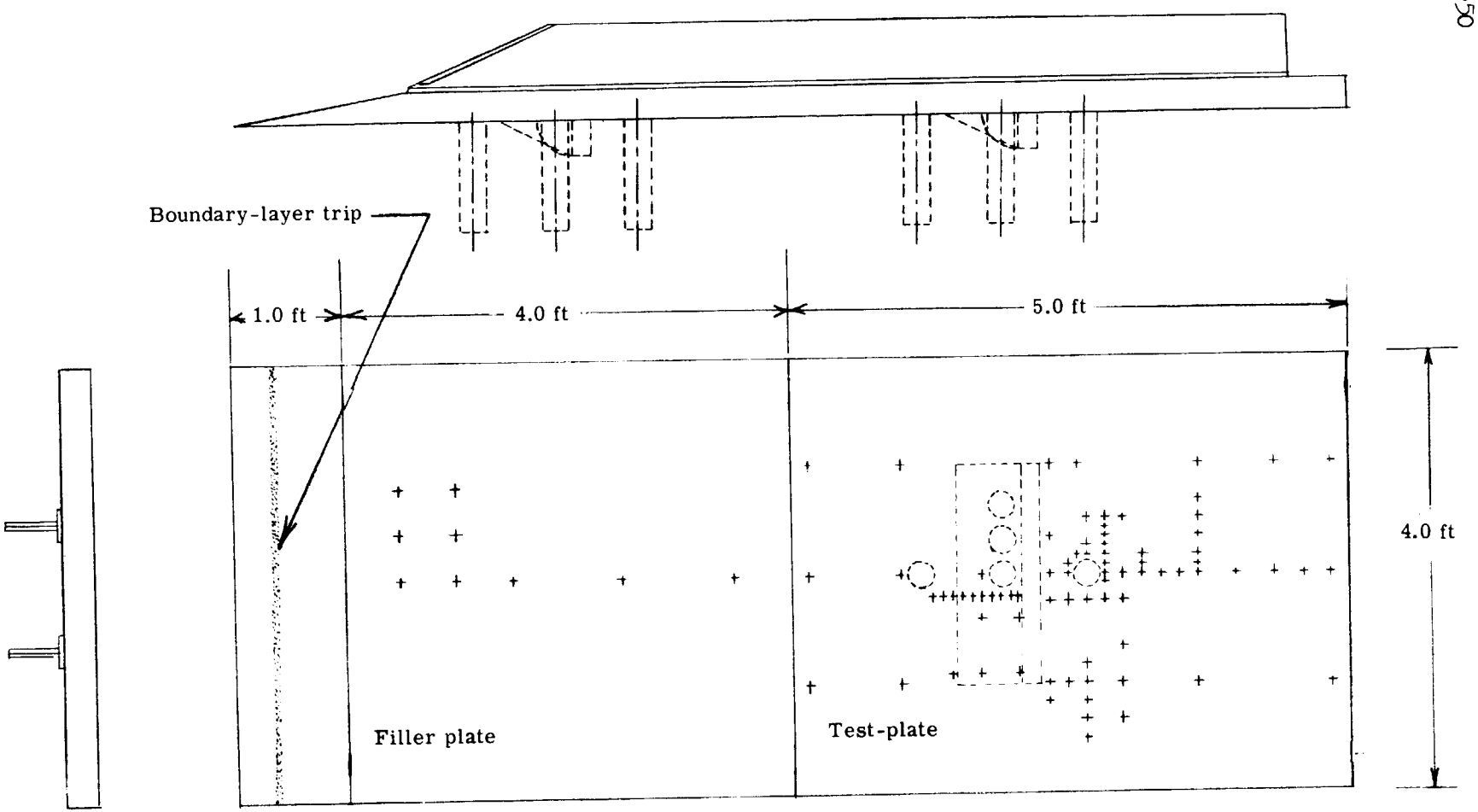

Figure 6.- Thermocouple and protuberance locations on interchangeable flat-plate panels with support structure.

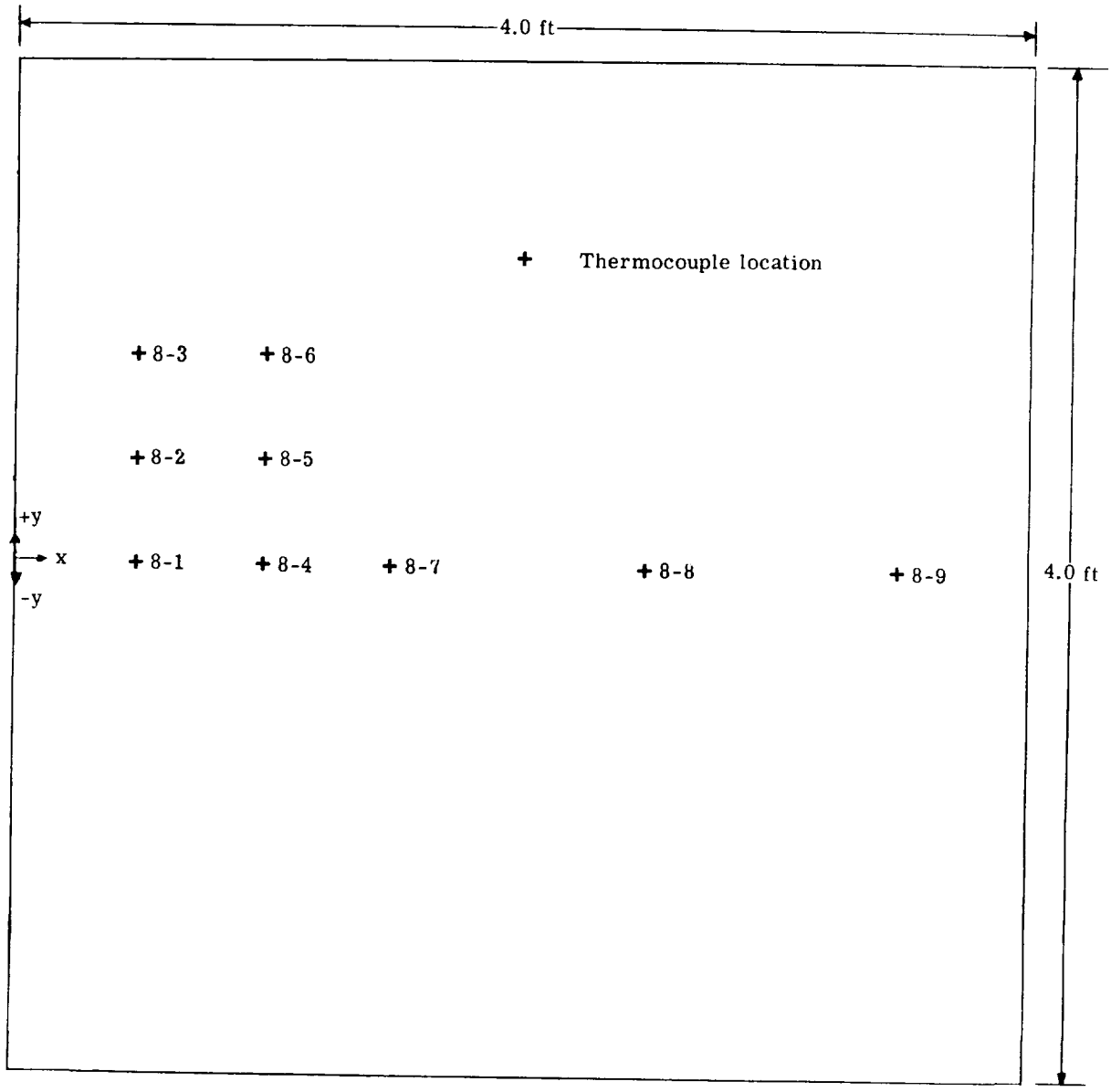

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Figure 7.- Filler plate showing thermocouple locations.

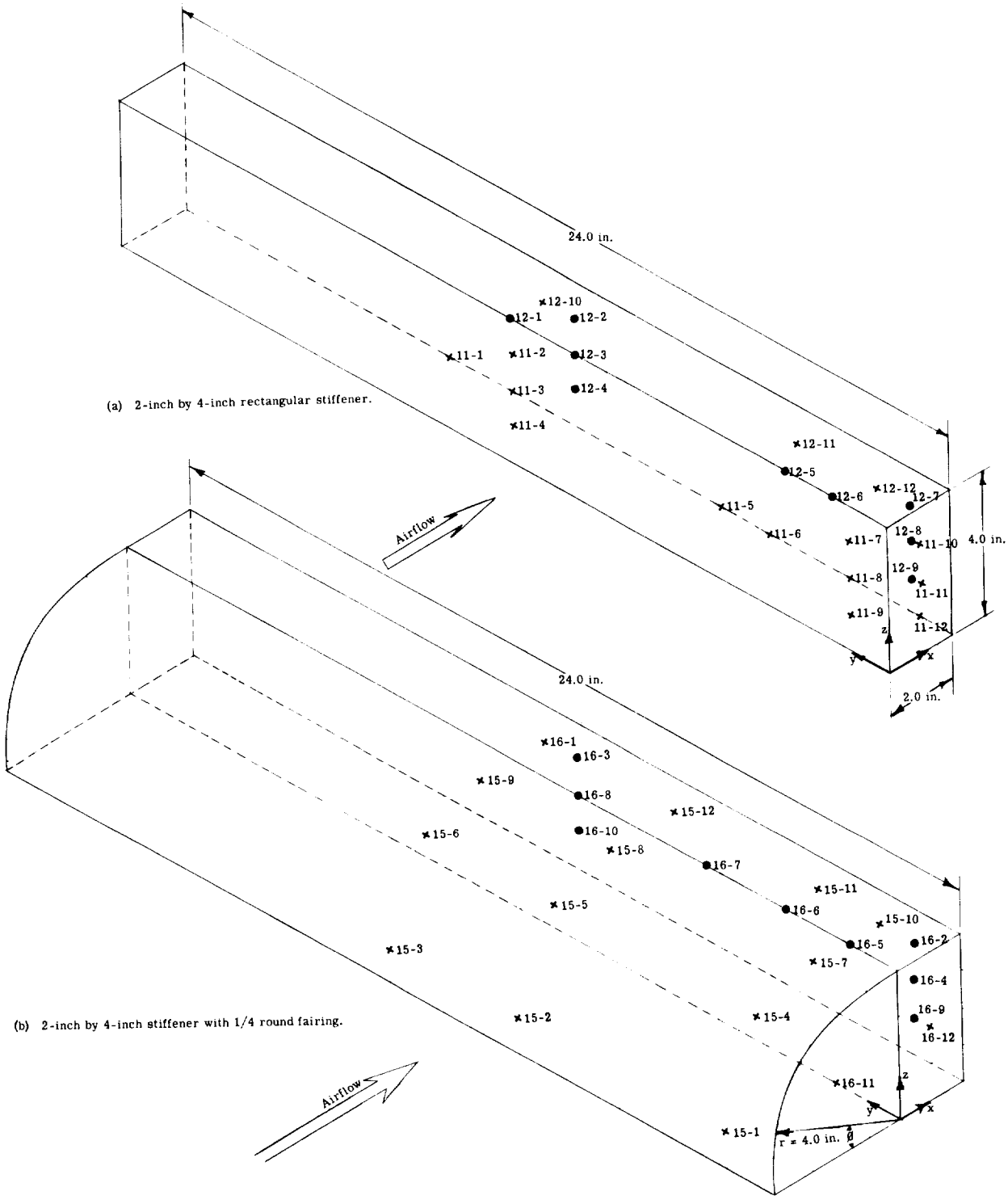
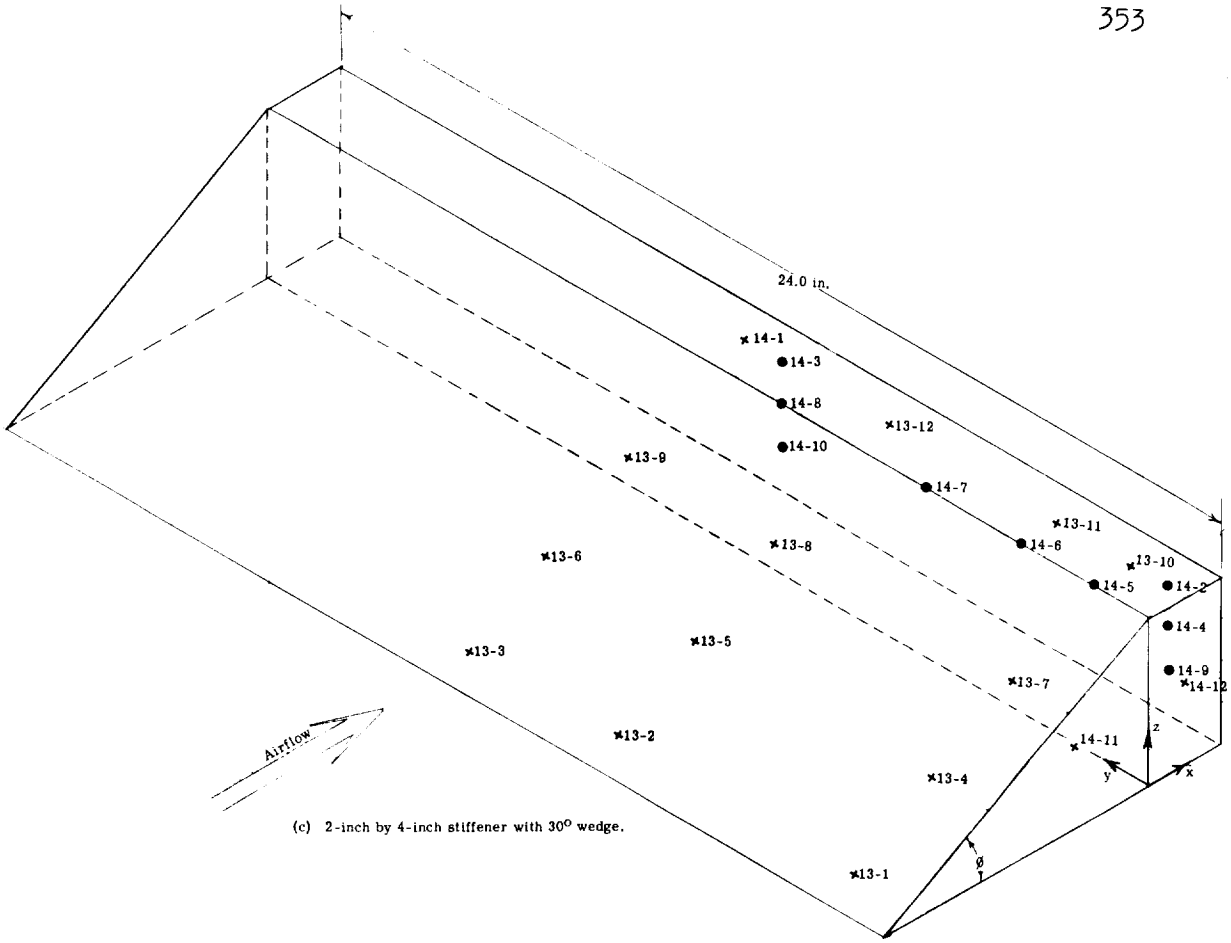
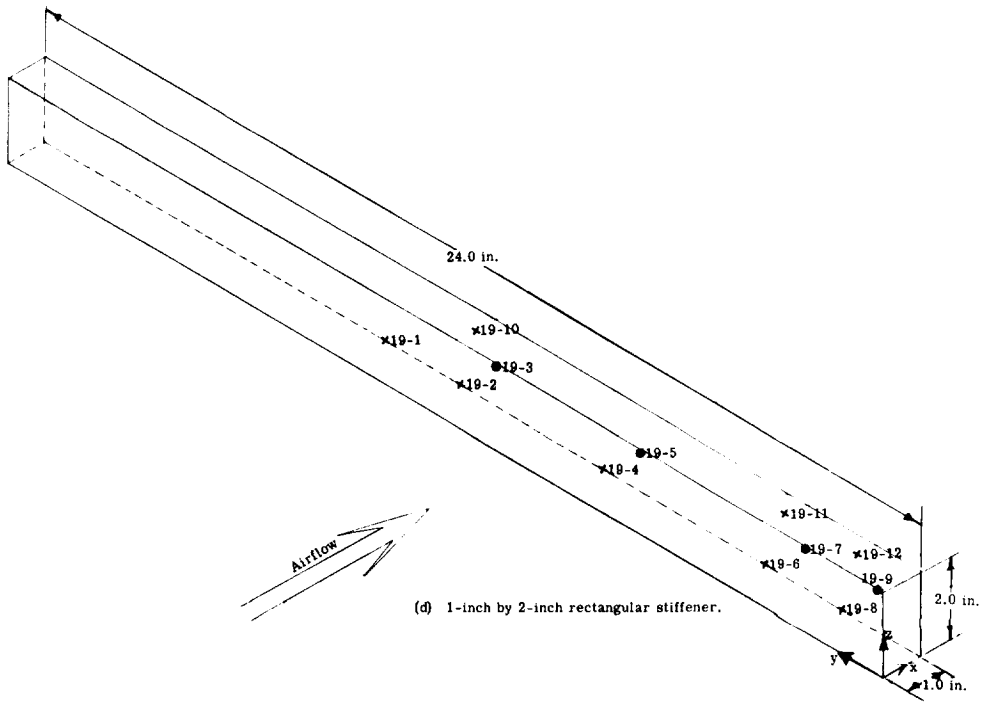


Figure 8.- Stiffener models showing thermocouple locations.



(c) 2-inch by 4-inch stiffener with 30° wedge.



(d) 1-inch by 2-inch rectangular stiffener.

Figure 8.- Concluded.

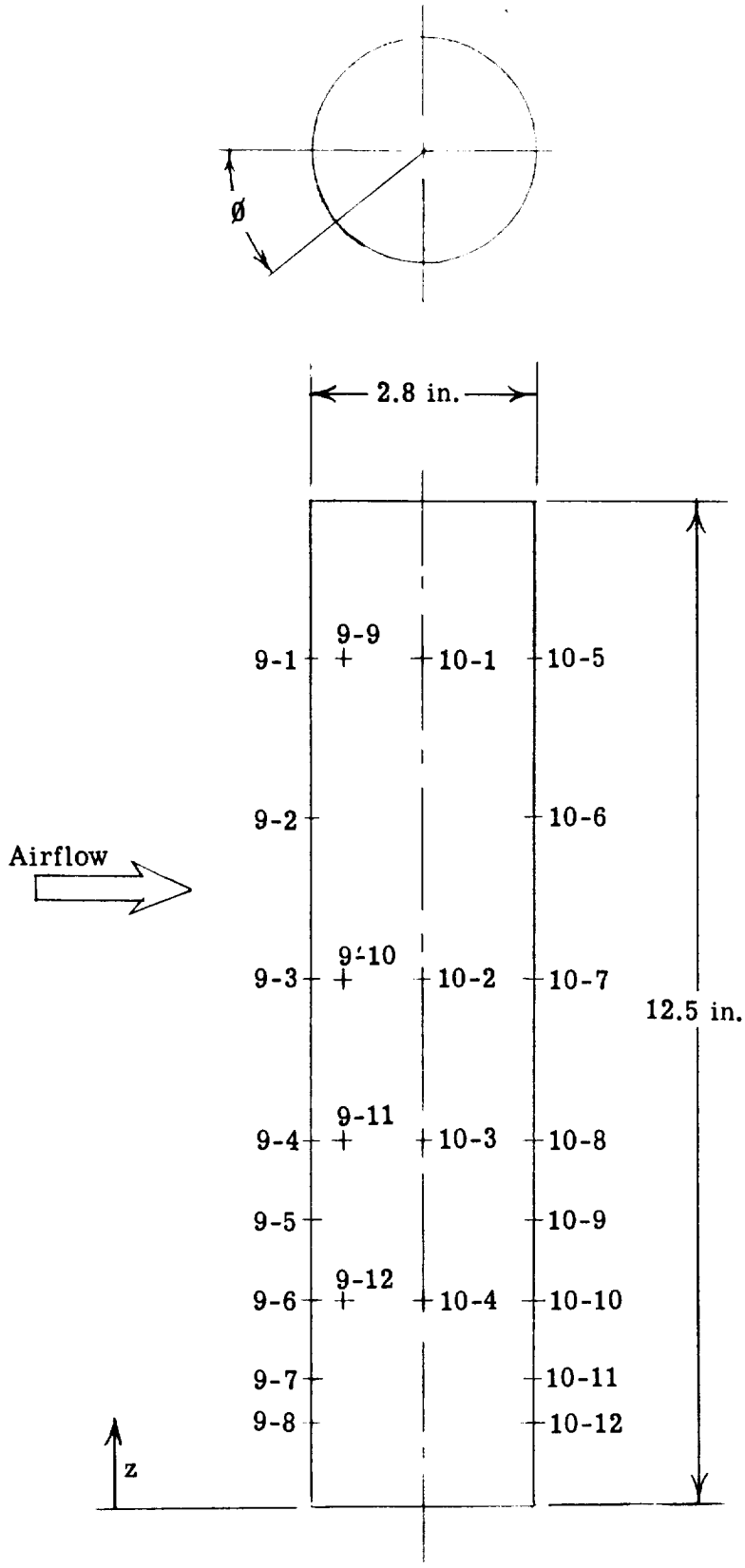


Figure 9.- The 2.8-inch-diameter right circular cylinder.

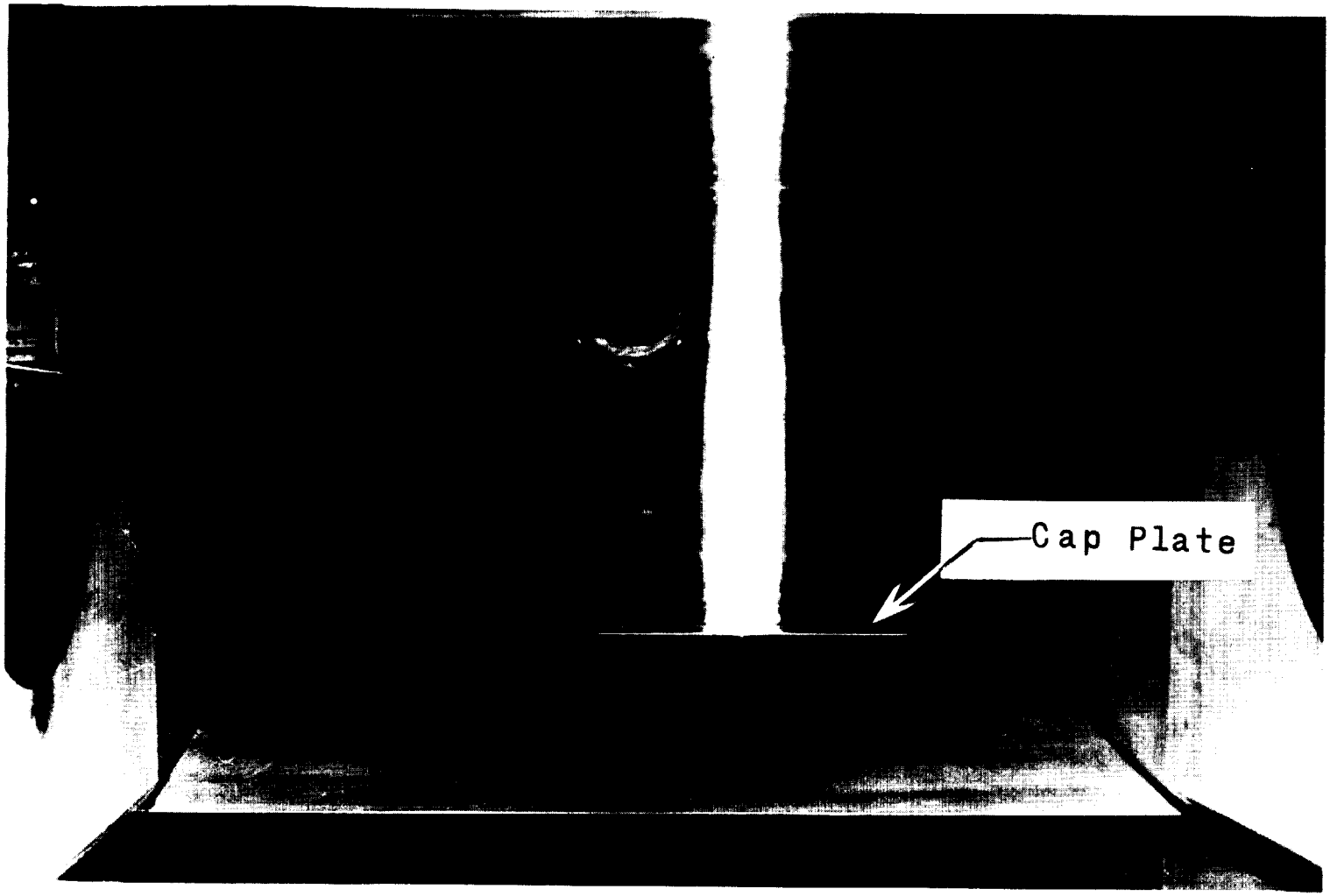


Figure 10.- The 2.8-inch-diameter cylinder with cap plate. L-57-3166.1

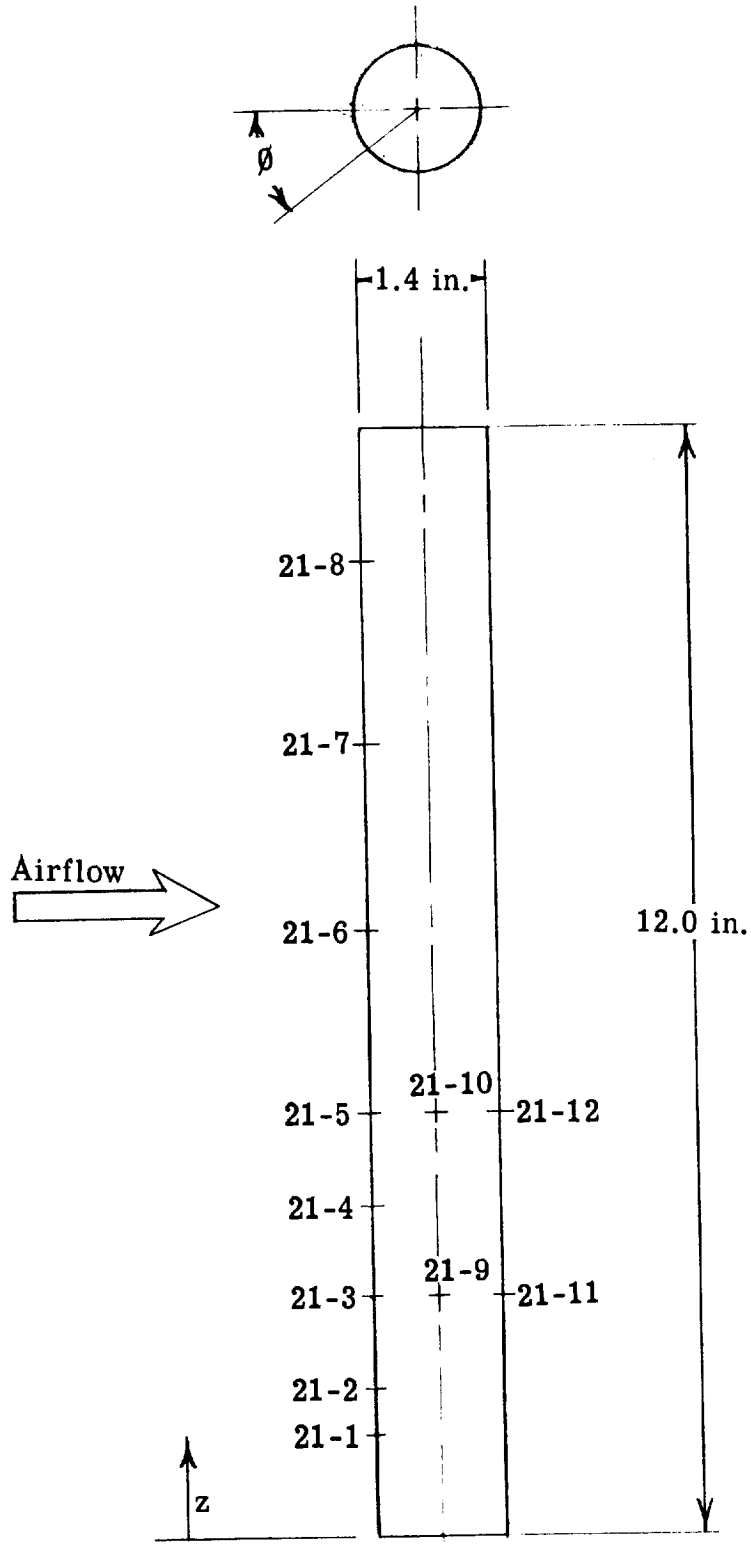


Figure 11.- The 1.4-inch-diameter right circular cylinder.

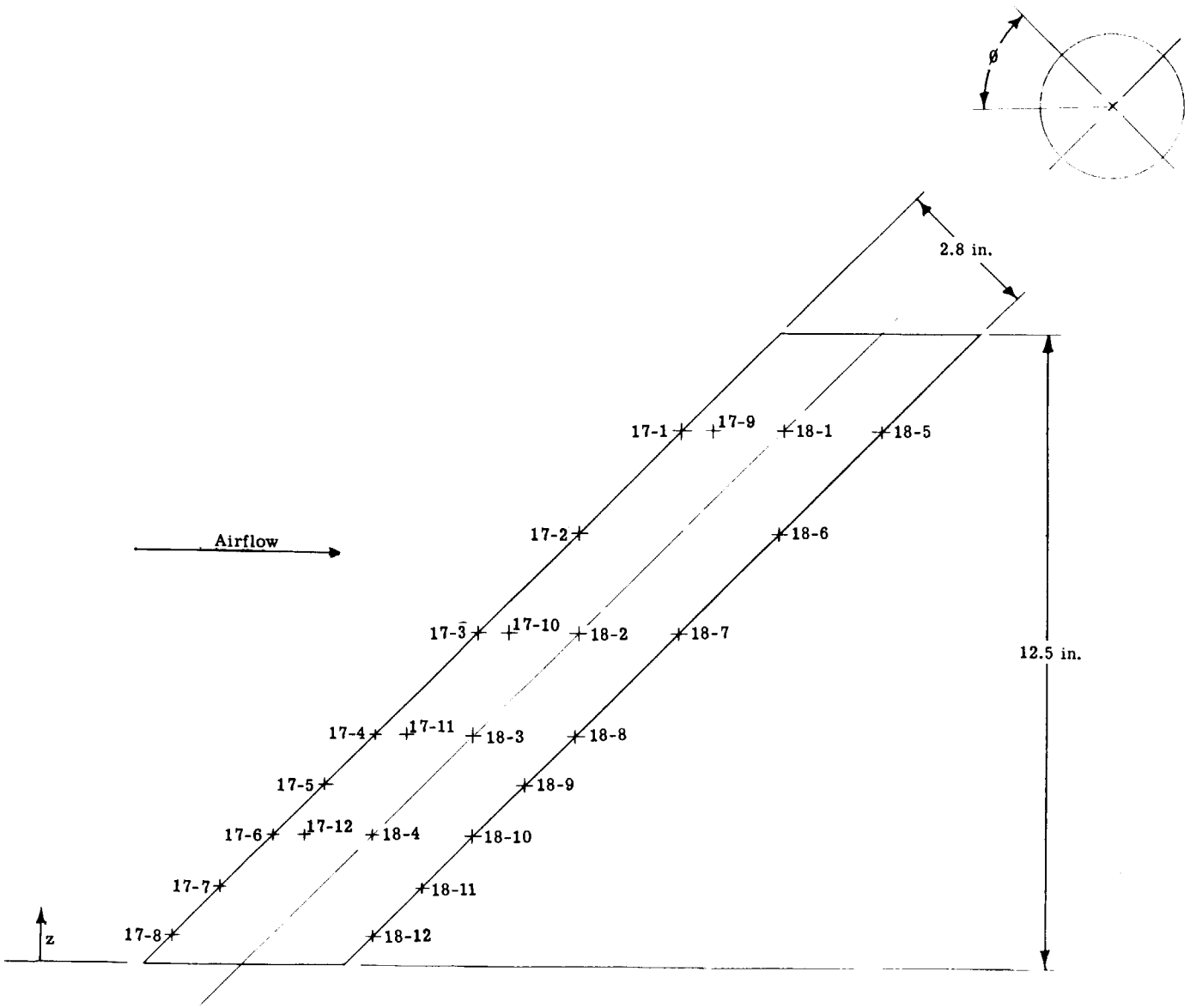
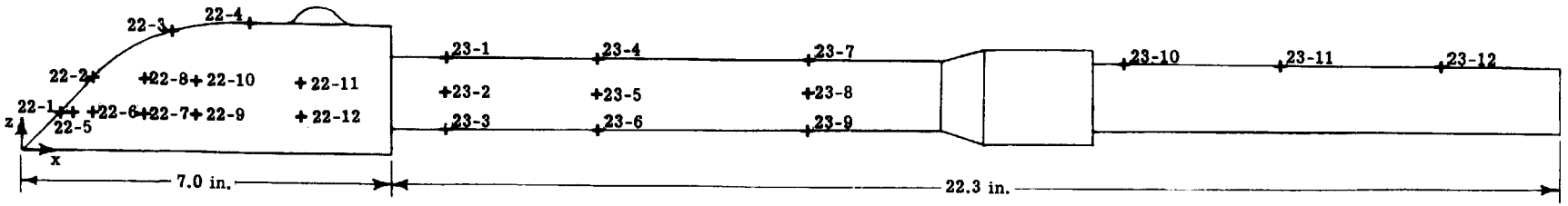
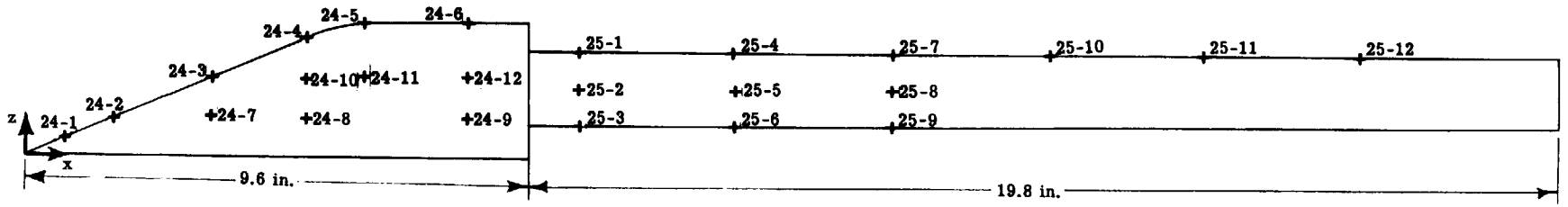


Figure 12.- The 2.8-inch-diameter circular cylinder swept 45°.

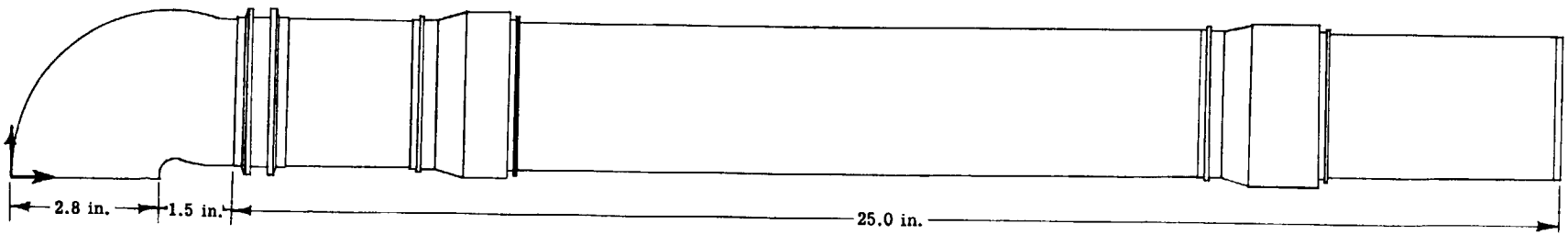
Figure 13.- The 30° cableway model.



(a) 45° fairing.



(b) 26° fairing.



(c) Lox line.

Figure 14.- Drawings of specific models with external piping.

Figure 15.- The 2-inch by 4-inch rectangular stiffener. L-57-3139

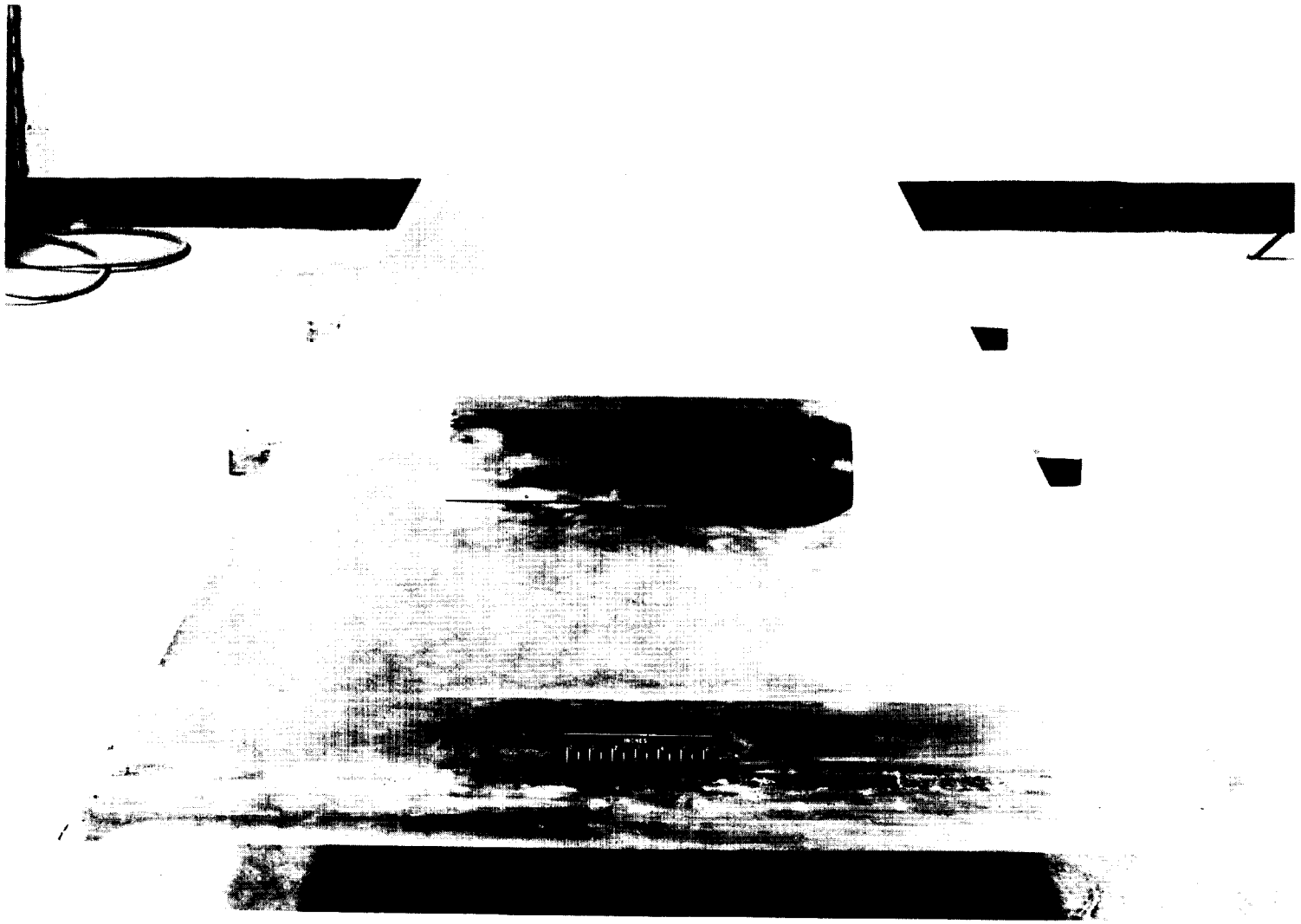


Figure 16.- The 2-inch by 4-inch stiffener with 1/4 round fairing. L-57-3140

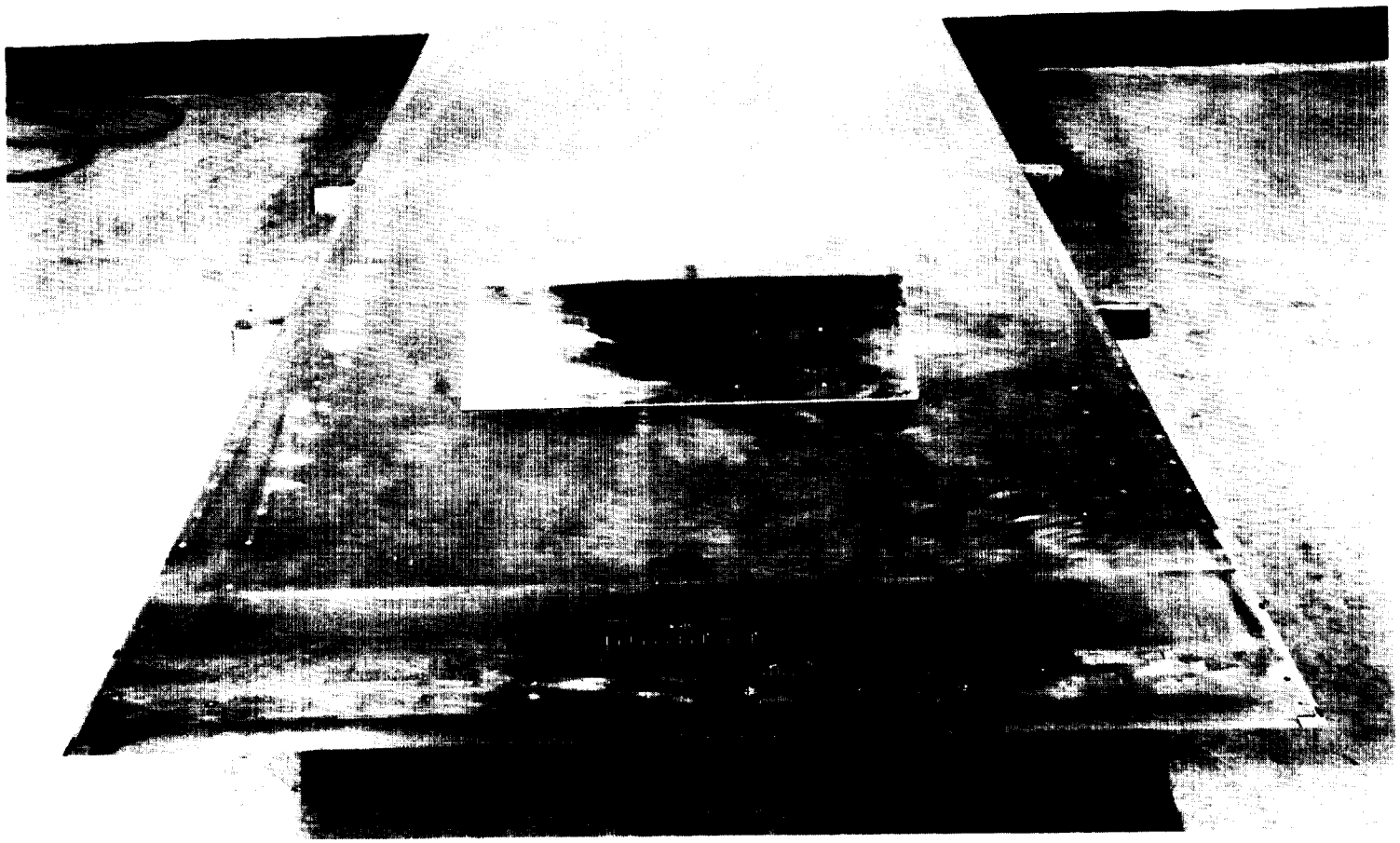


Figure 17.- The 2-inch by 4-inch stiffener with 30° wedge. L-57-3138

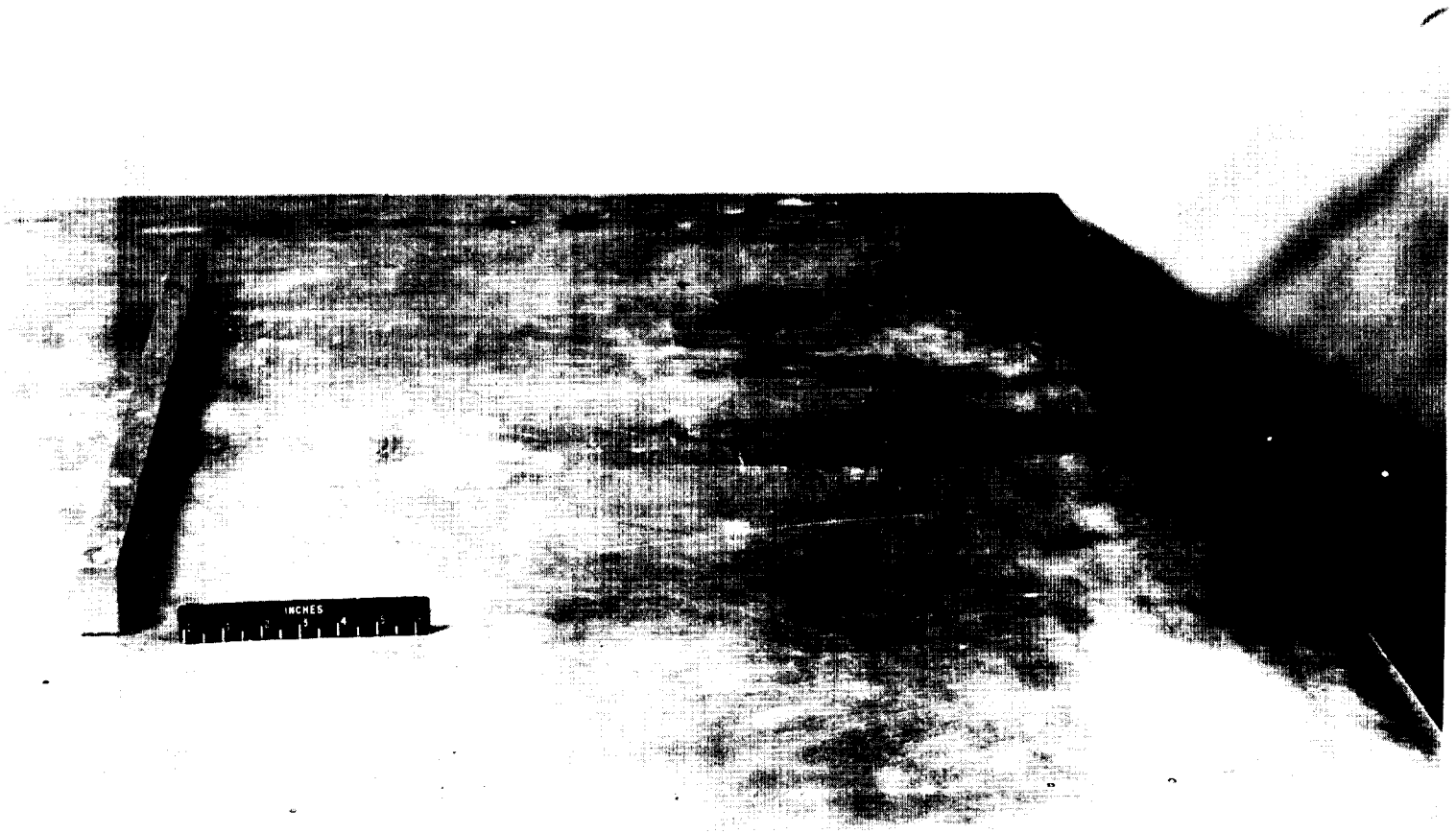


Figure 18.- The 1-inch by 2-inch rectangular stiffener. L-58-1789

Figure 19.- The 2.8-inch-diameter cylinder swept forward 45°. L-58-1782

Figure 20.- The 2.8-inch-diameter cylinder swept back 45°. L-58-1781

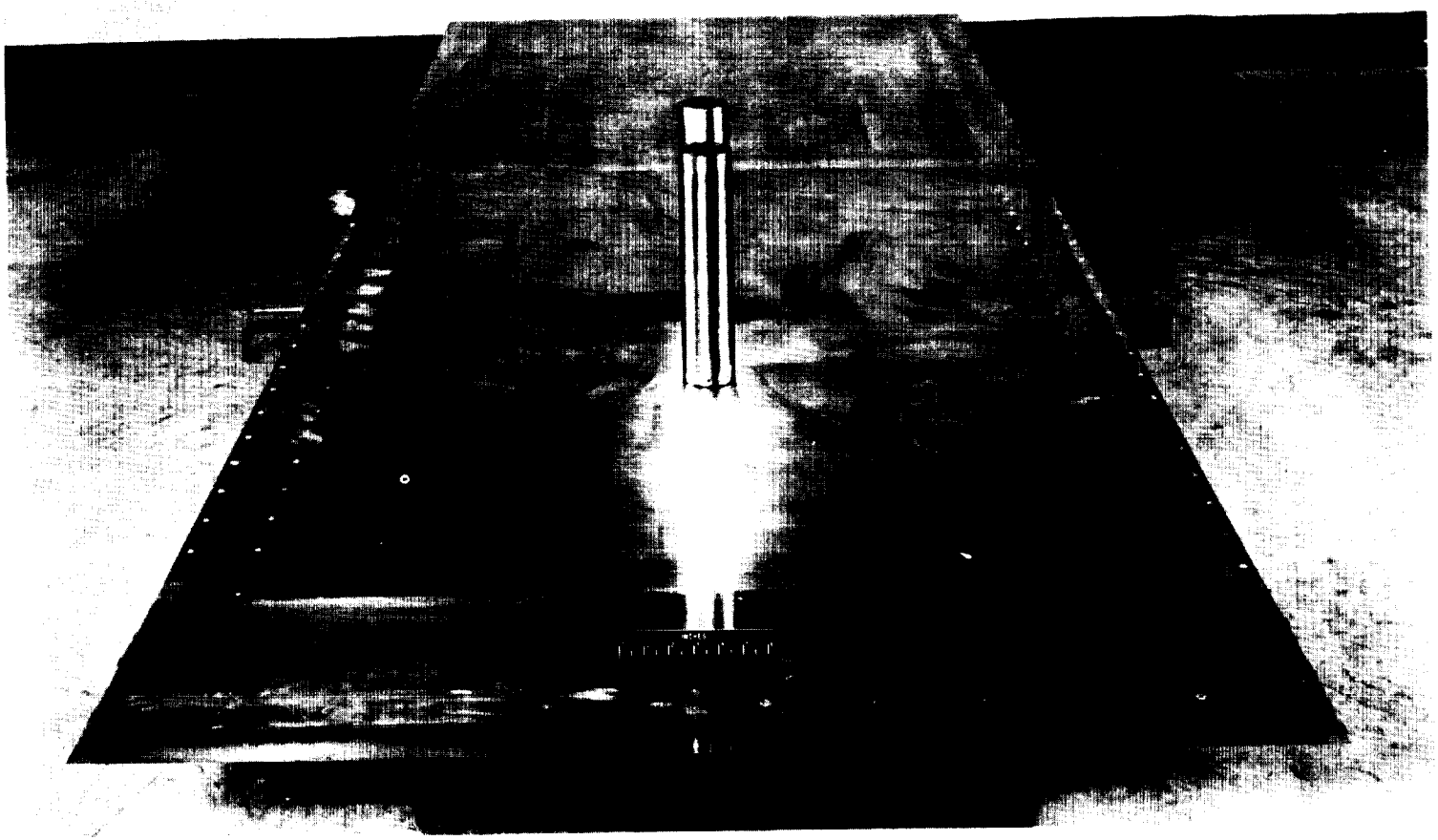


Figure 21.- The 2.8-inch-diameter tandem cylinders 3.2 diameters apart. L-57-3143

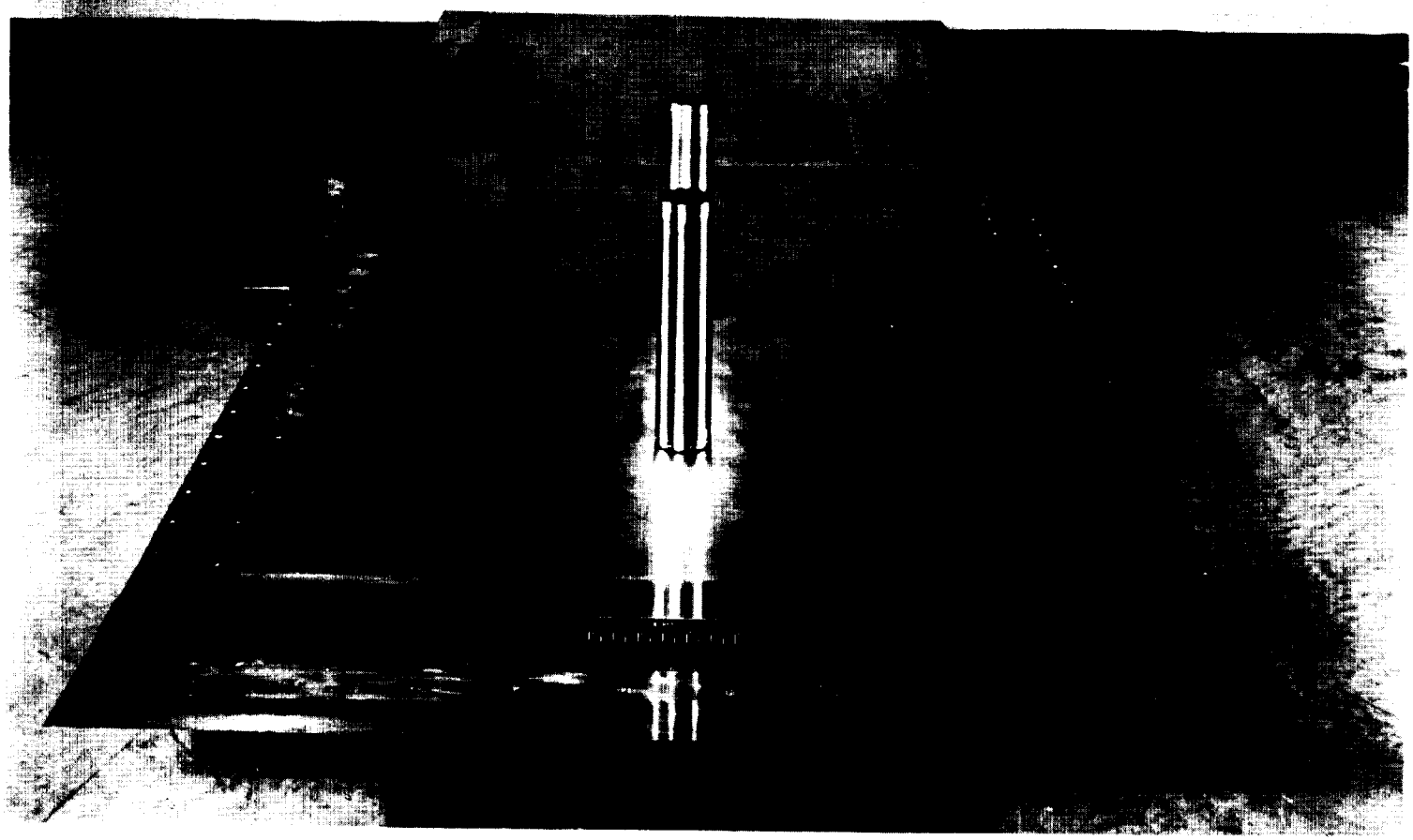
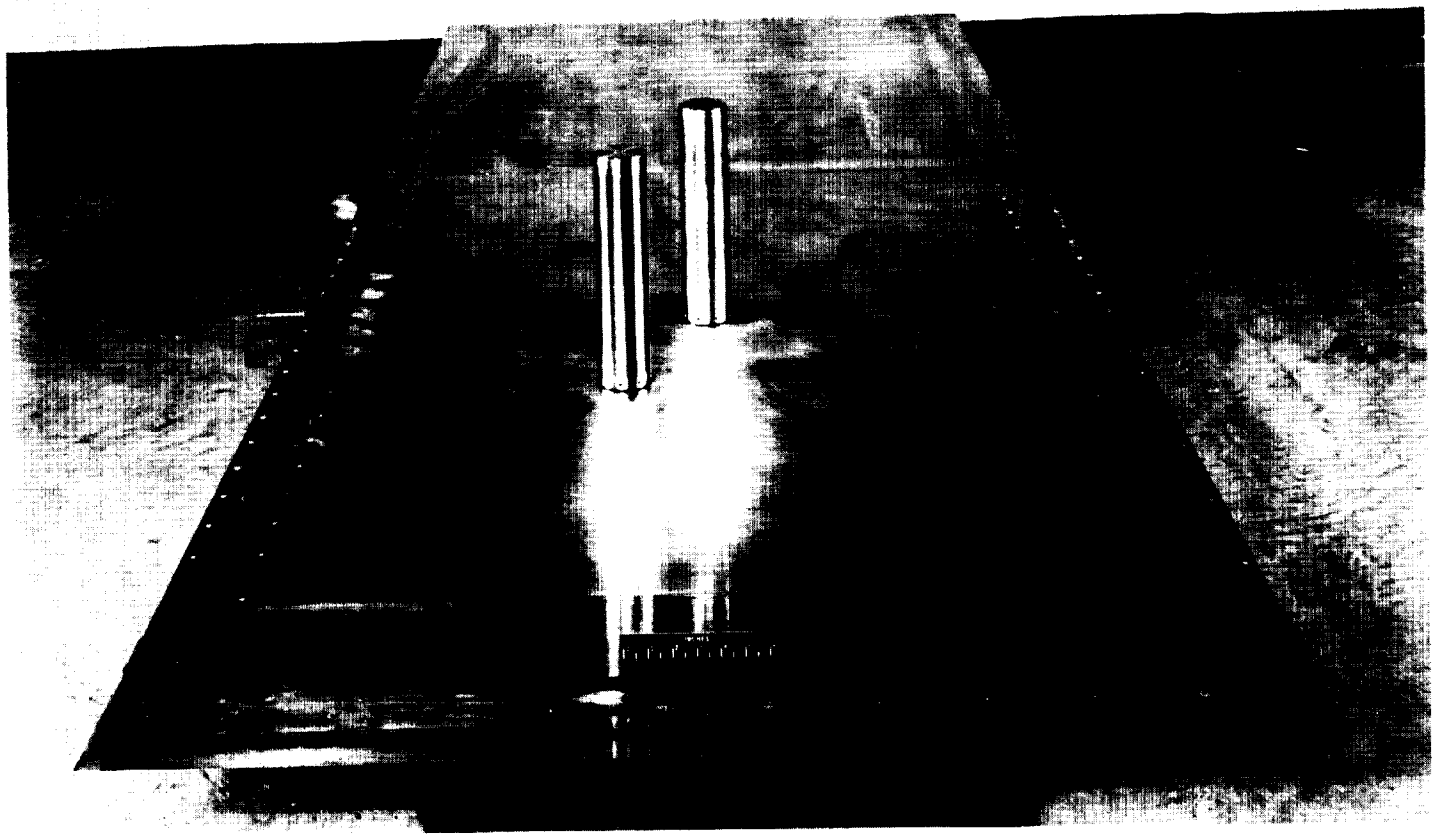
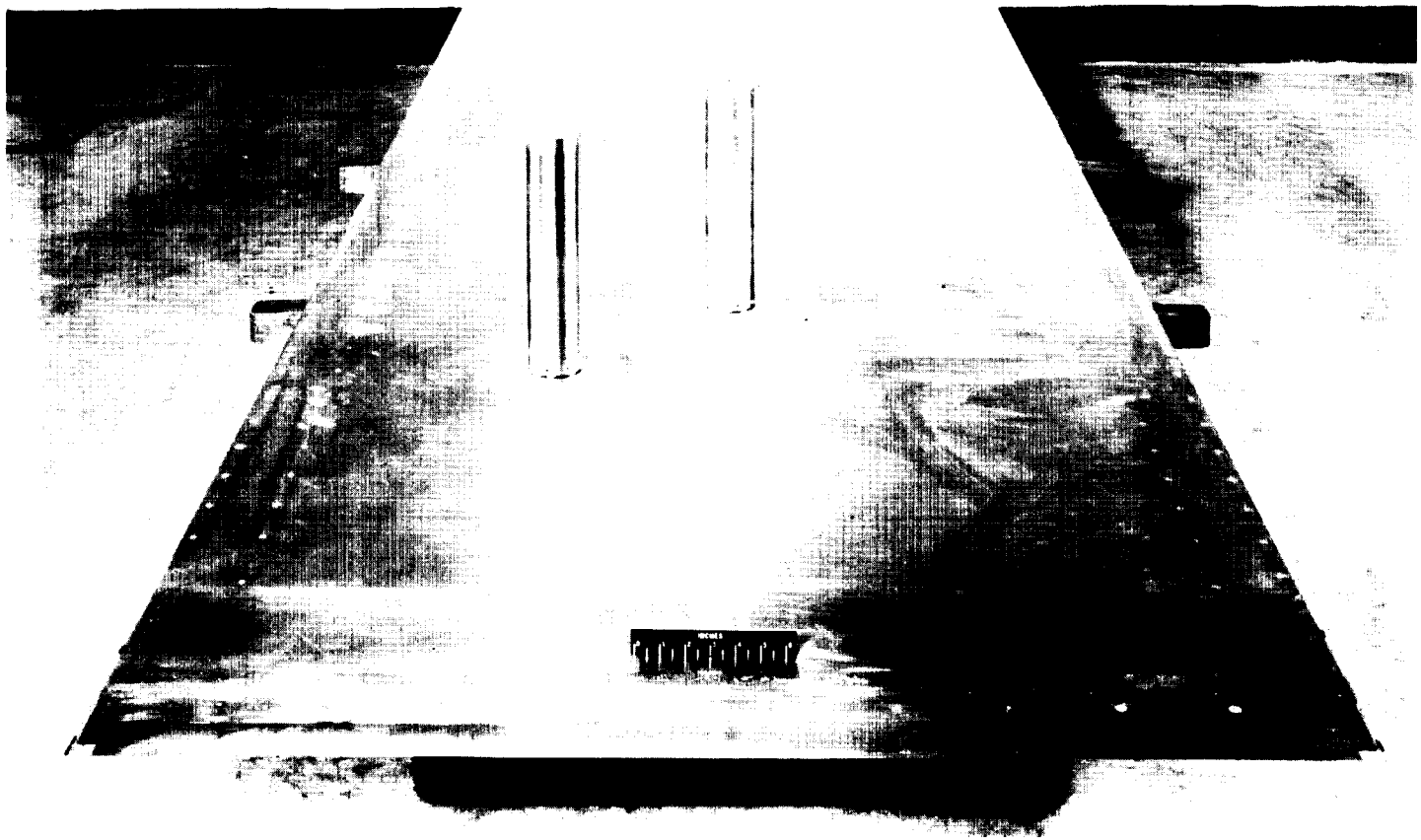


Figure 22.- The 2.8-inch-diameter tandem cylinders 6.4 diameters apart. L-57-3144



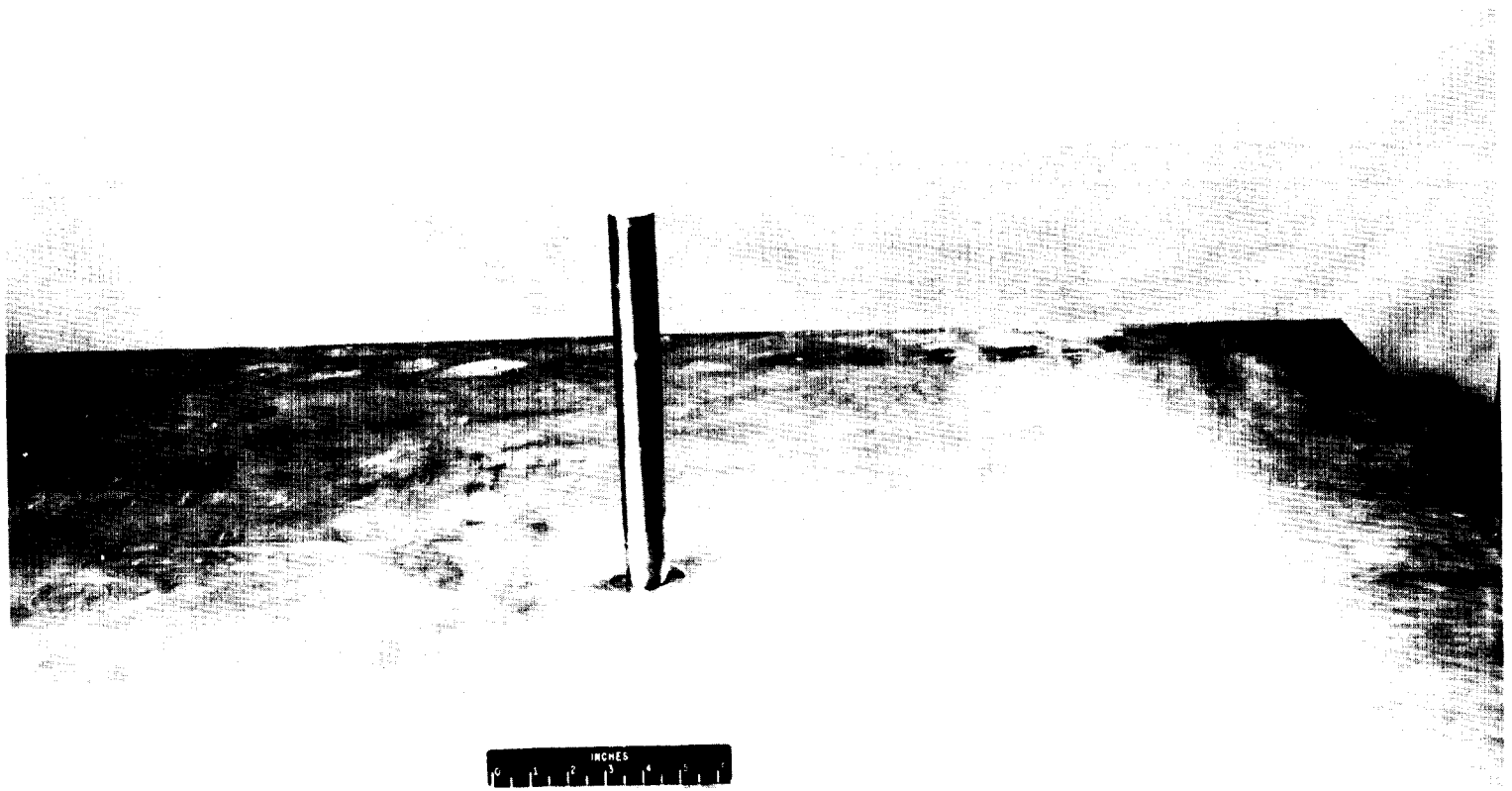
L-57-3142

Figure 23.- The 2.8-inch-diameter cylinders 3.2 diameters apart with 26.5° offset.



L-57-3141

Figure 24.- The 2.8-inch-diameter cylinders 3.2 diameters apart with 45° offset.



L-58-1785

Figure 25.- The 1.4-inch-diameter instrumented right circular cylinder.

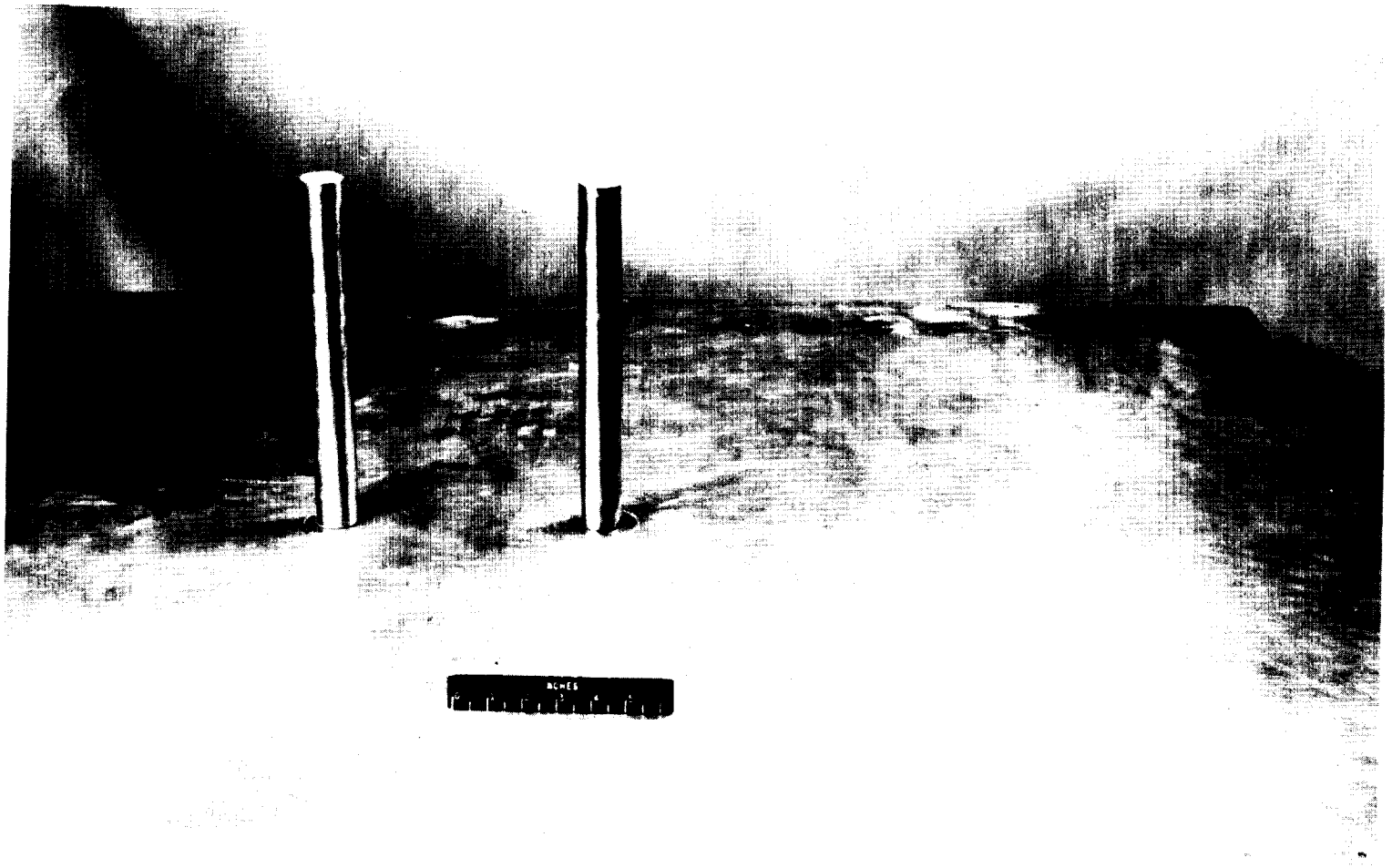
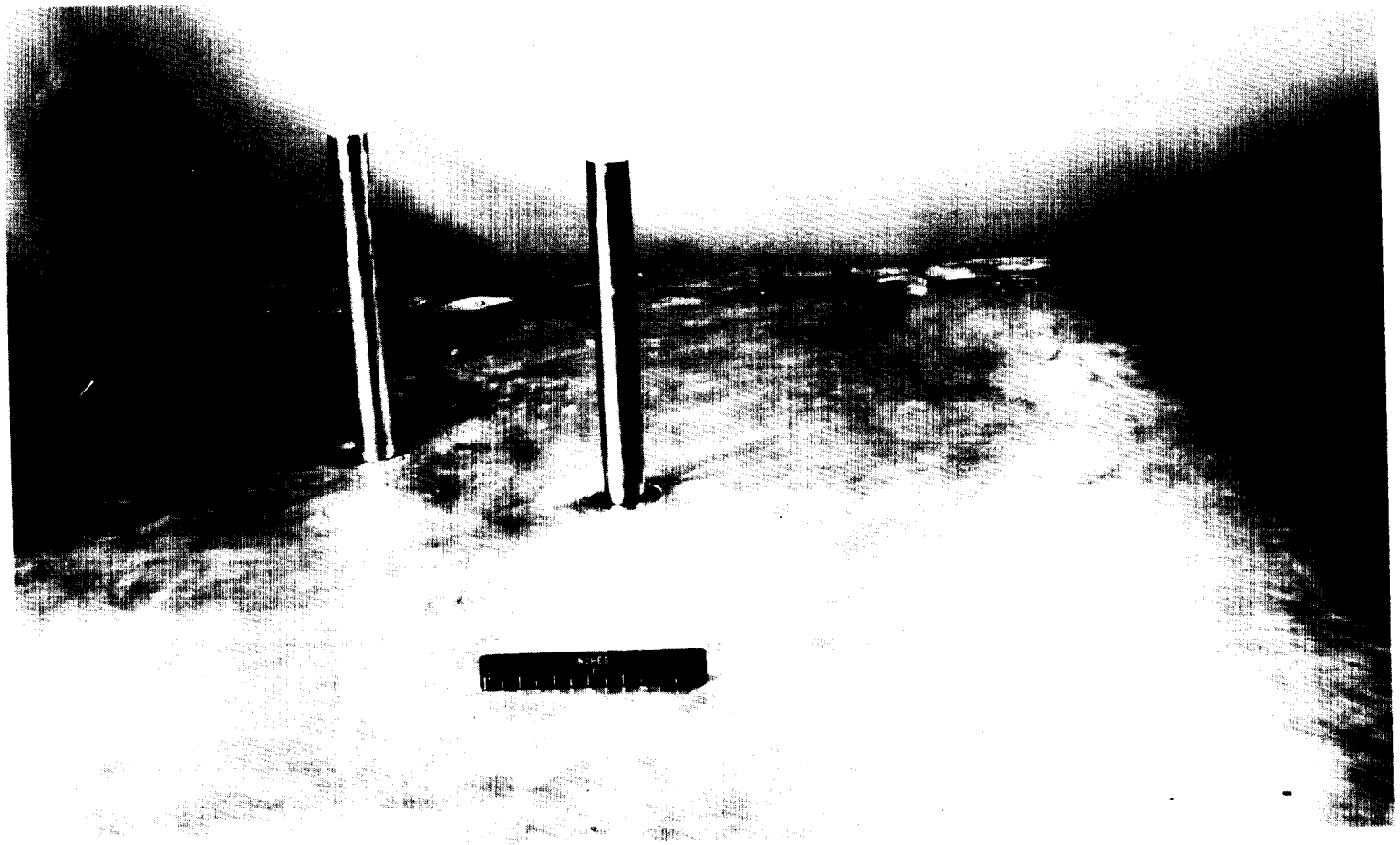


Figure 26.- The 1.4-inch-diameter tandem cylinders 6.4 diameters apart. L-58-1784



L-58-1783

Figure 27.- The 1.4-inch-diameter cylinders 6.4 diameters apart with 26.5° offset.

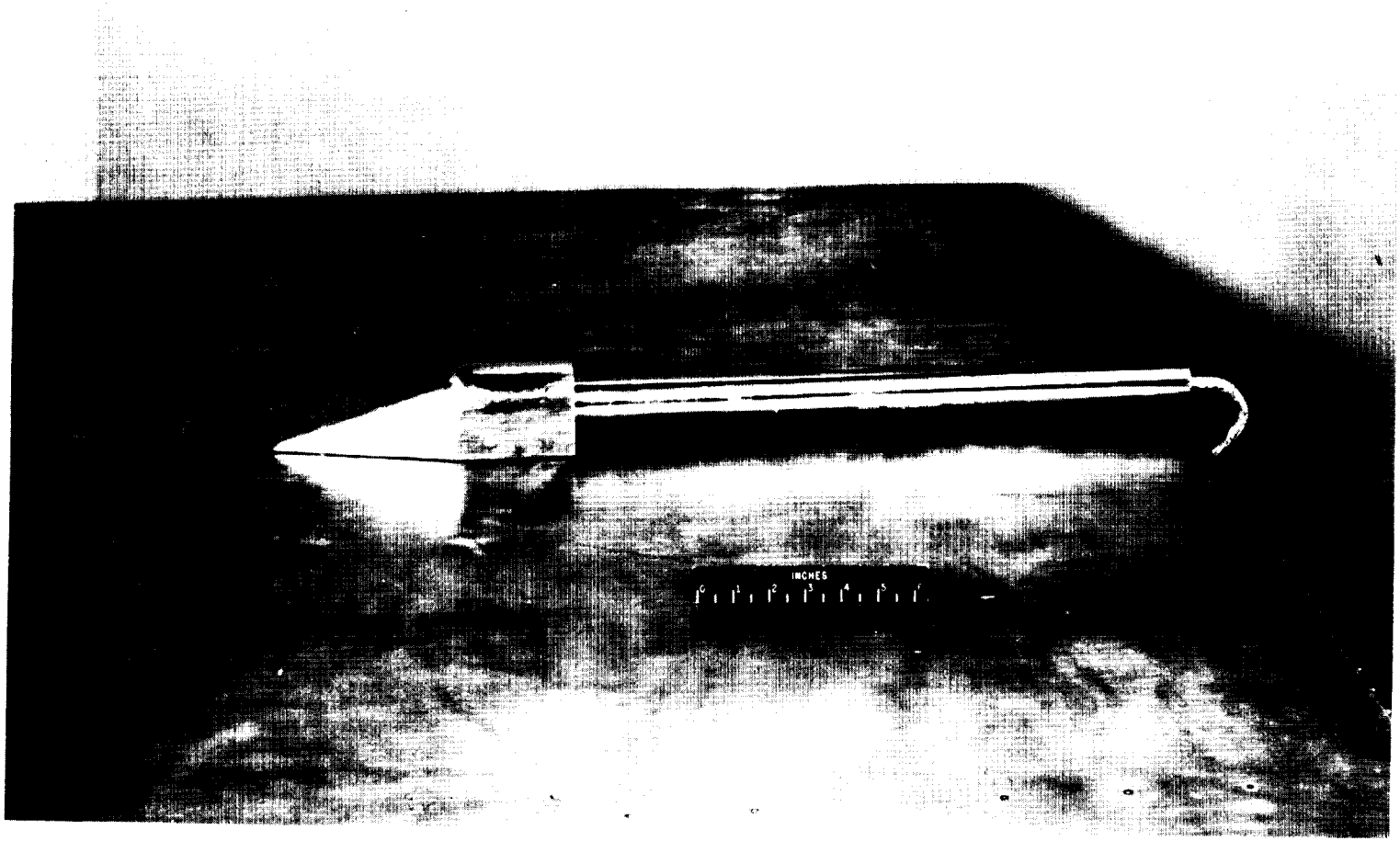


Figure 28.- Helium line with 26° fairing. L-58-1788

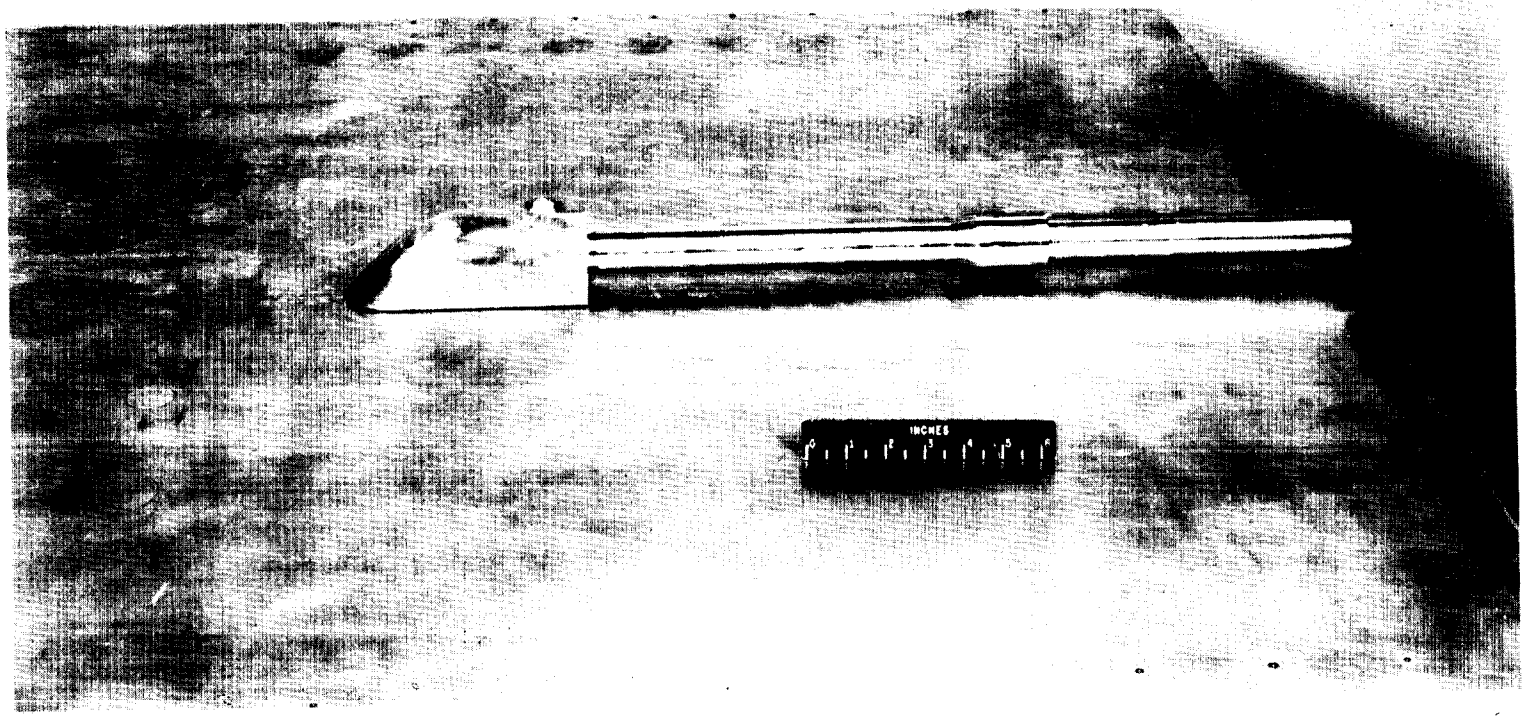


Figure 29.- Helium line with 45° fairing. L-58-1787

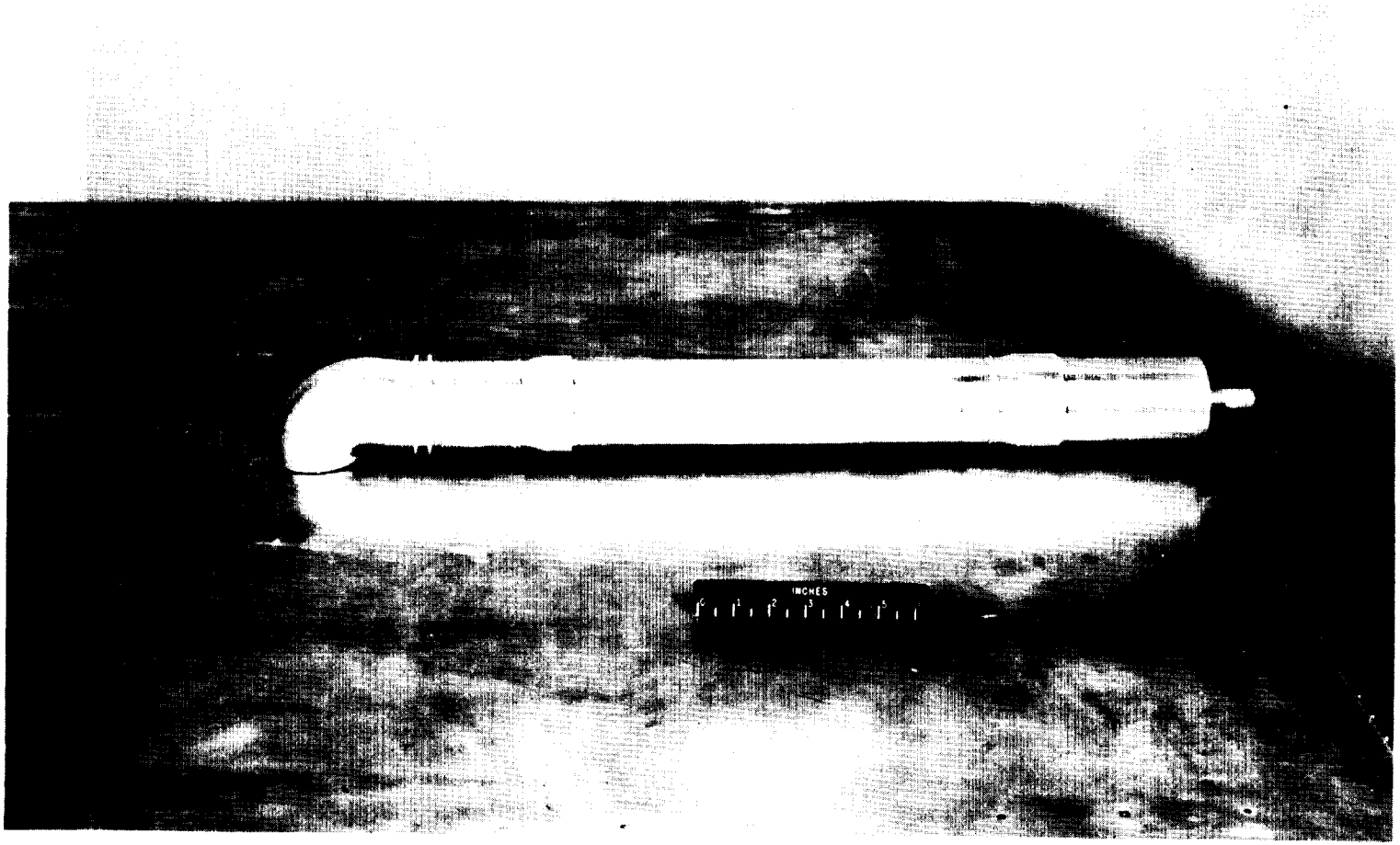
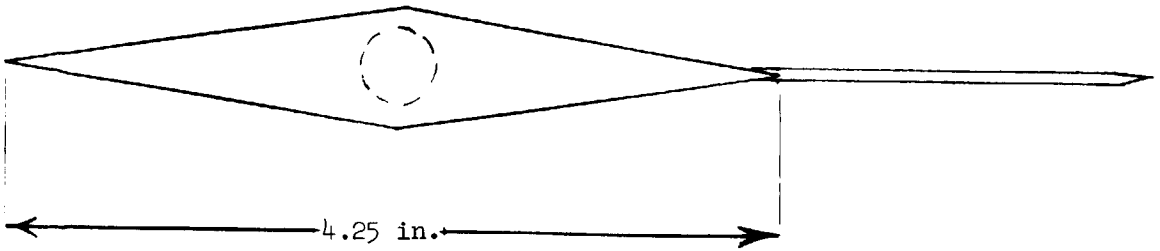
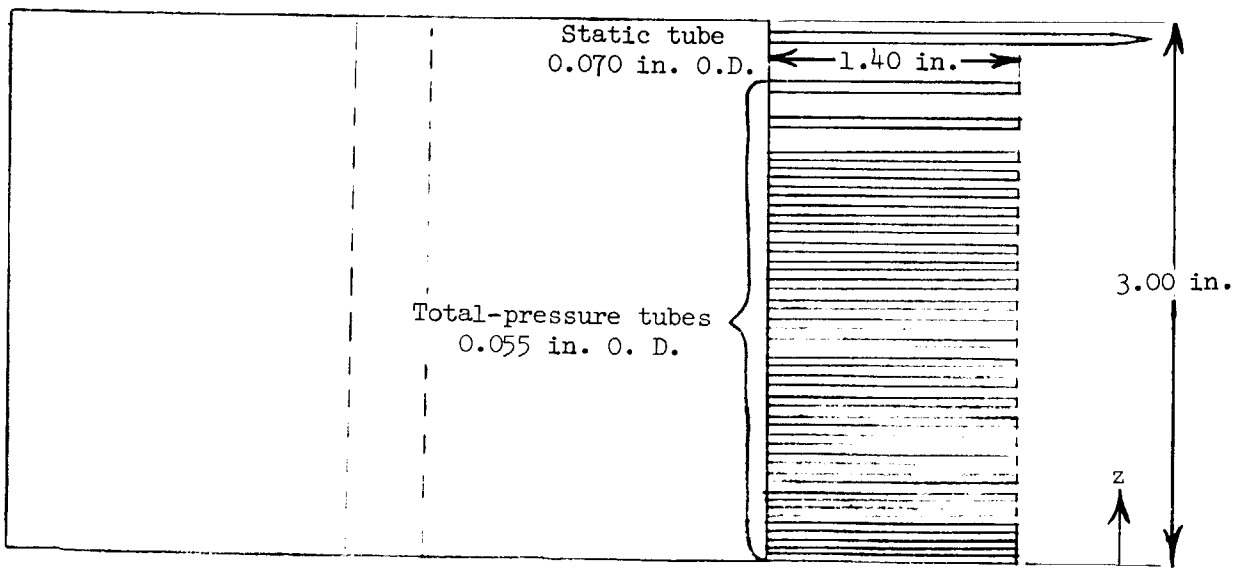


Figure 30.- Lox line representative of that used on a current ICBM. L-58-1786

Figure 31.- The 30° cableway model. L-58-1790





Tube no.	z, in.
1	.01
2	.09
3	.15
4	.21
5	.27
6	.36
7	.52
8	.60
9	.67
10	.77
11	.86
12	.93
13	1.01
14	1.11
15	1.19
16	1.28
17	1.37
18	1.47
19	1.56
20	1.67
21	1.76
22	1.85
23	1.93
24	2.02
25	2.11
26	2.19
27	2.28
28	2.40
29	2.60
30	2.90

Figure 32.- Small boundary-layer survey rake.

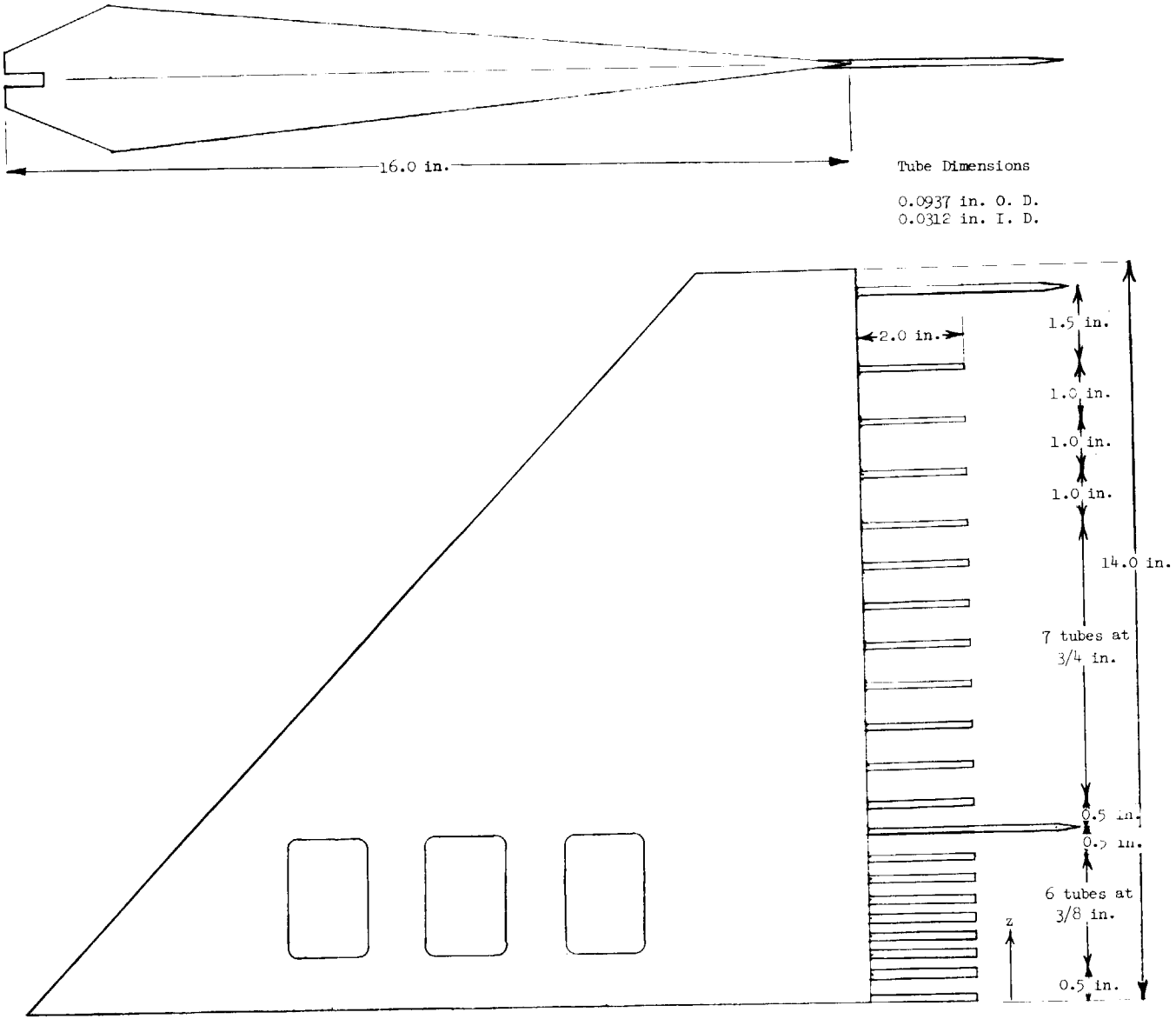
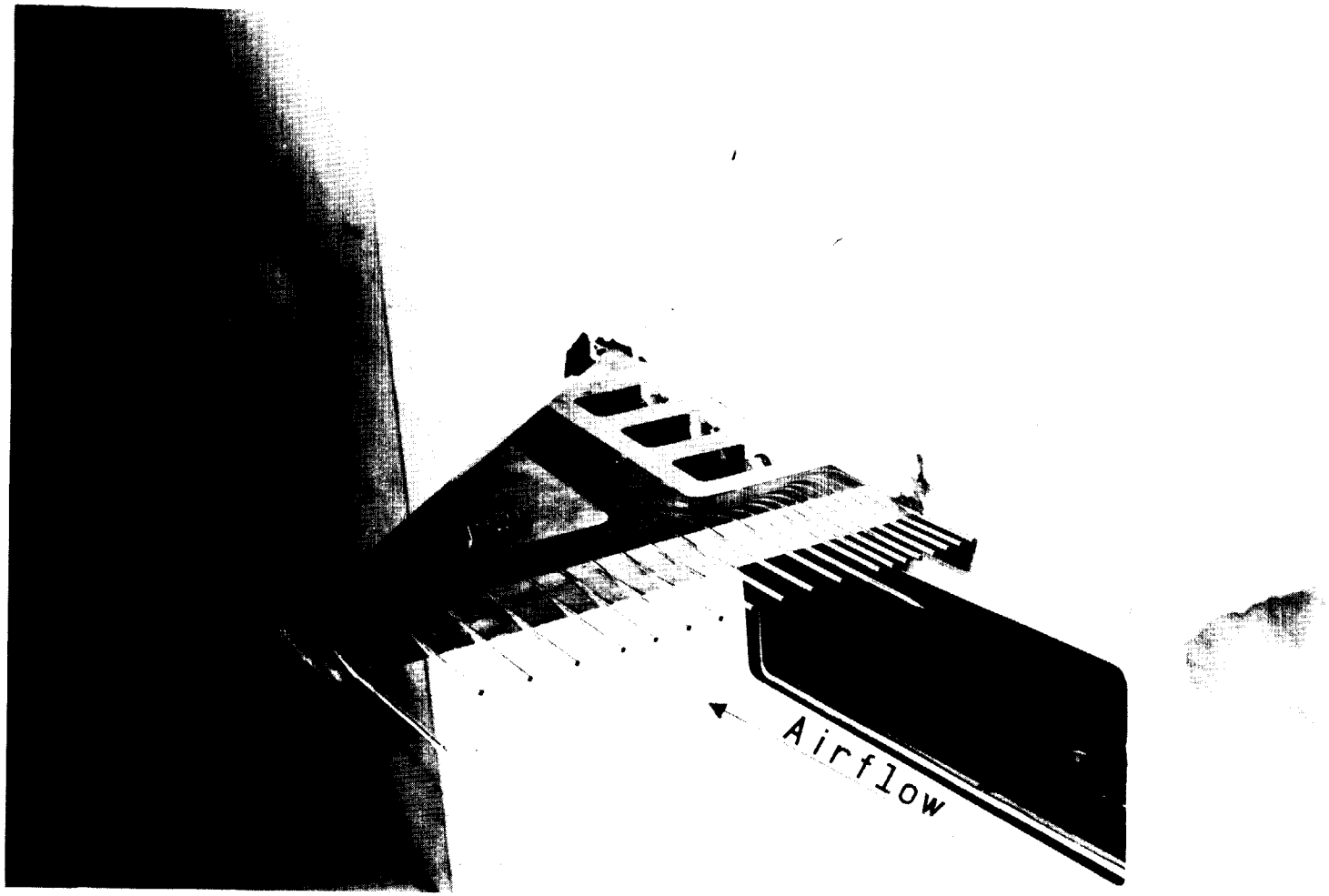
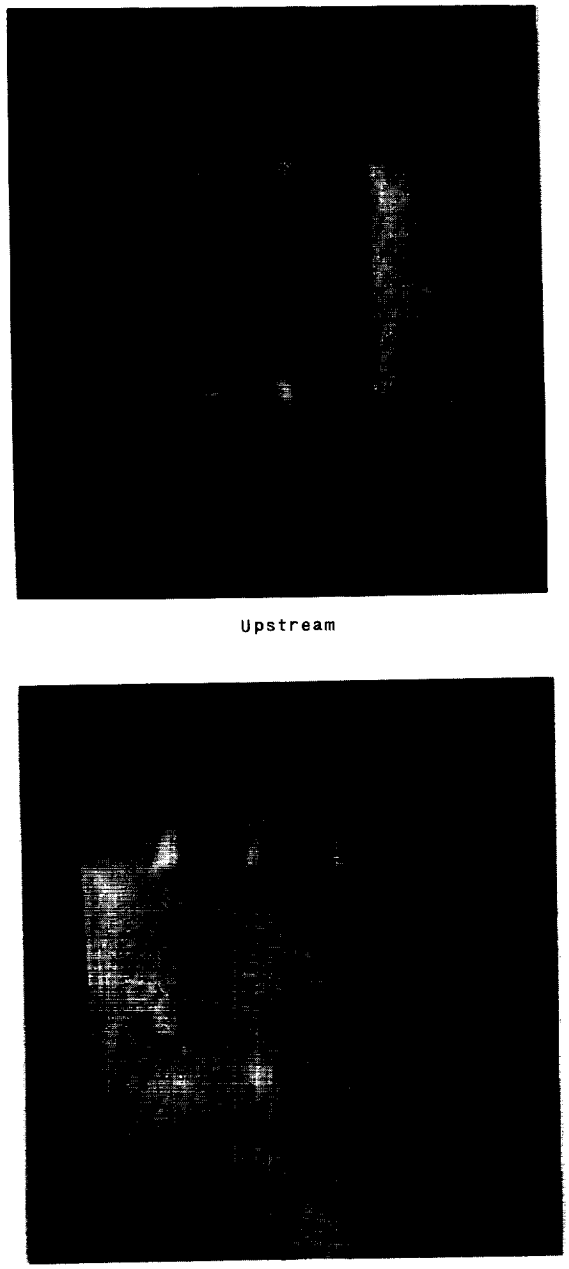


Figure 33.- Large boundary-layer survey rake.



L-59-5910

Figure 34.- Large boundary-layer survey rake mounted on wall of test section.

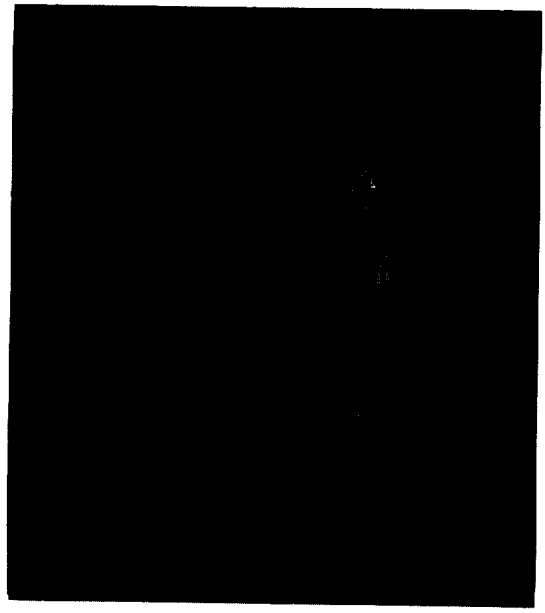


L-2024

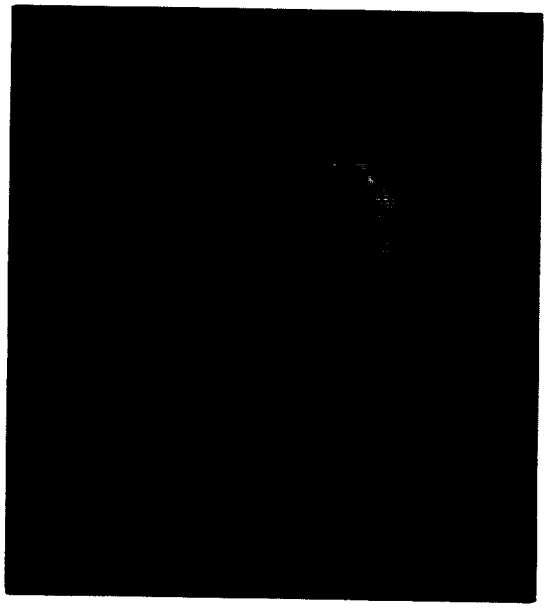
L-62-2092

(a) 2-inch by 4-inch rectangular stiffener; M = 3.51; R = 3.5×10^6.

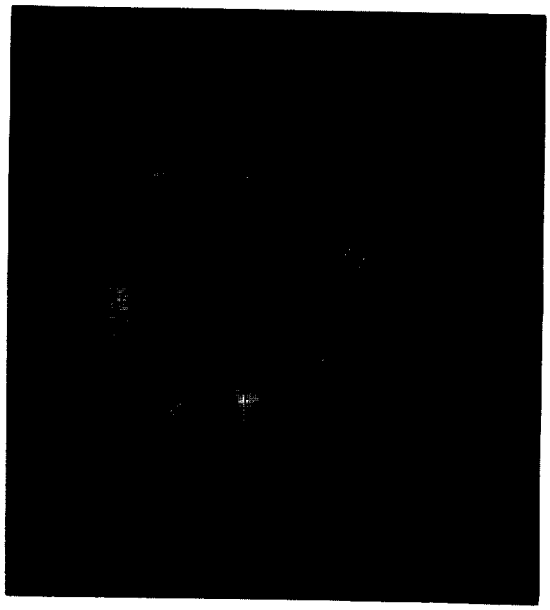
Figure 35.- Oil-flow patterns of stiffener models.



Upstream
$R = 2.0 \times 10^6$



upstream



Downstream

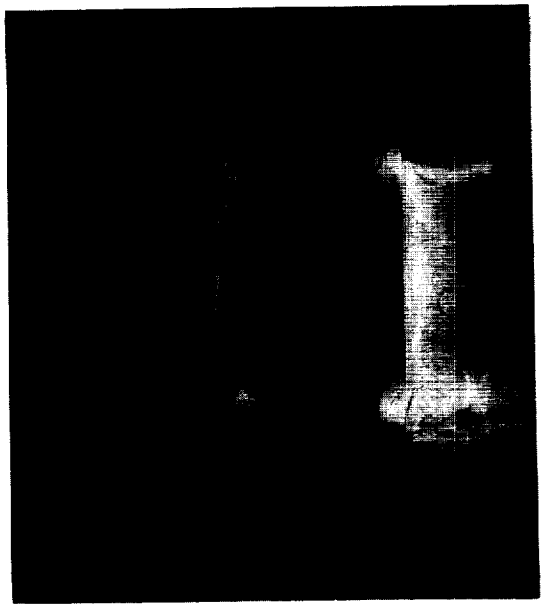
$R = 3.5 \times 10^6$

L-62-2093

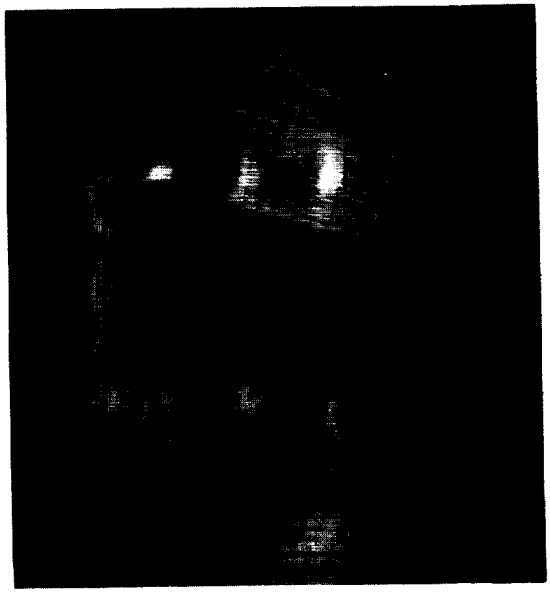
(b) 2-inch by 4-inch stiffener with 1/4 round fairing; M = 3.51.

Figure 35.- Continued.

L-2024



Upstream

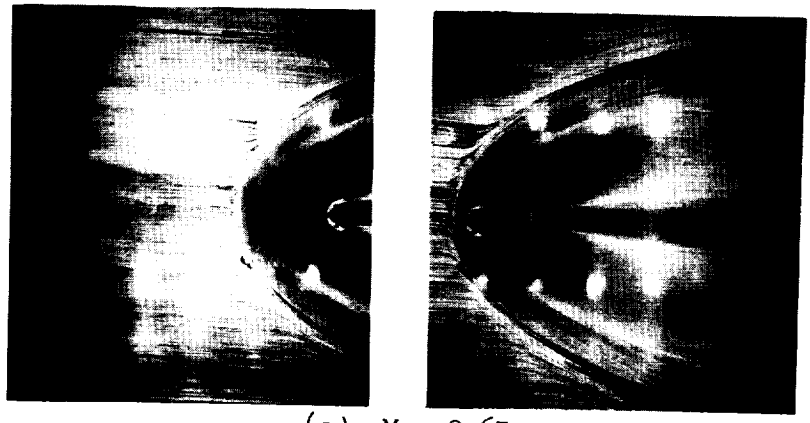


Downstream

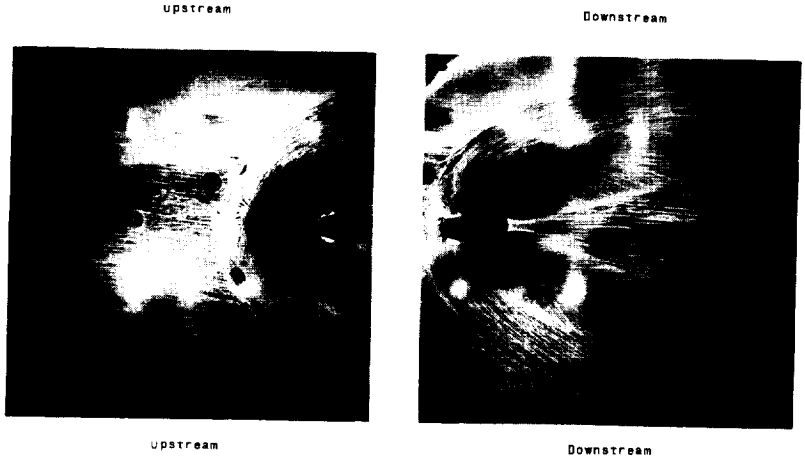
L-62-2094

(c) 2-inch by 4-inch stiffener with 30° wedge; M = 3.51; R = 3.5×10^{6}.

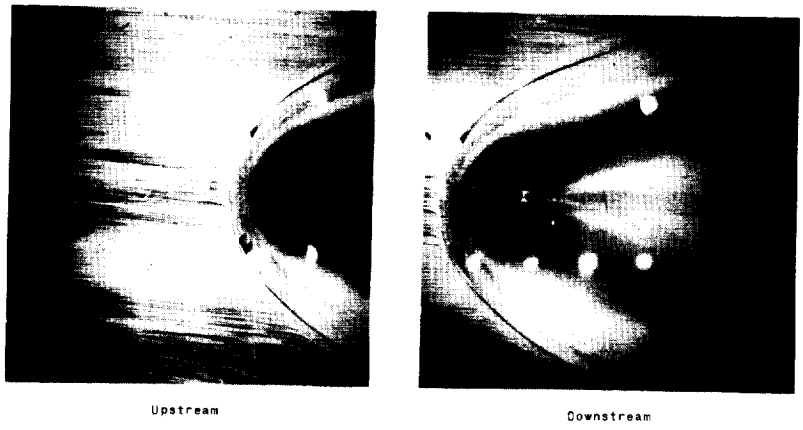
Figure 35.- Concluded.



(a) M = 2.65.



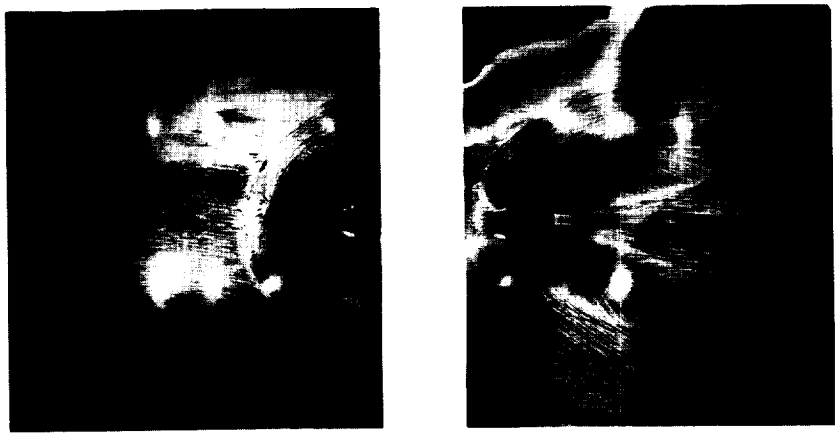
(b) M = 3.51.



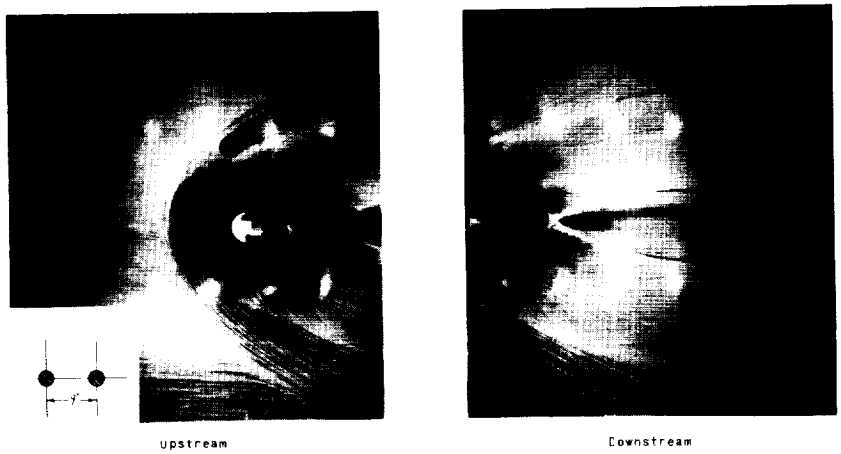
(c) M = 4.44.

L-62-2095

Figure 36.- Oil-flow patterns of a 2.8-inch-diameter right circular cylinder. $R \approx 3.5 \times 10^6$.



(a) 2.8-inch-diameter right circular cylinder.

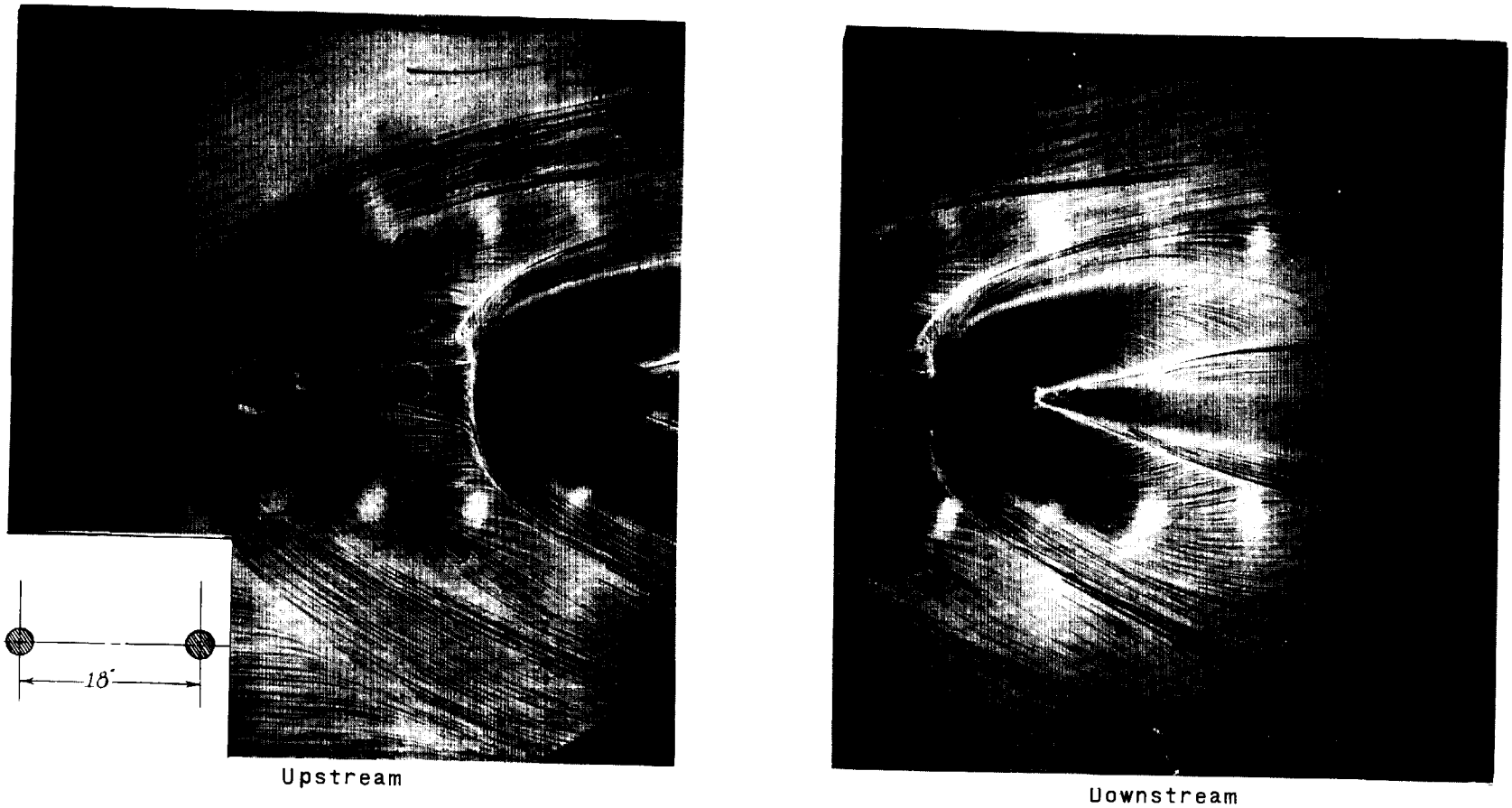


L-62-2096

(b) 2.8-inch-diameter tandem cylinders placed 3.2 diameters apart.

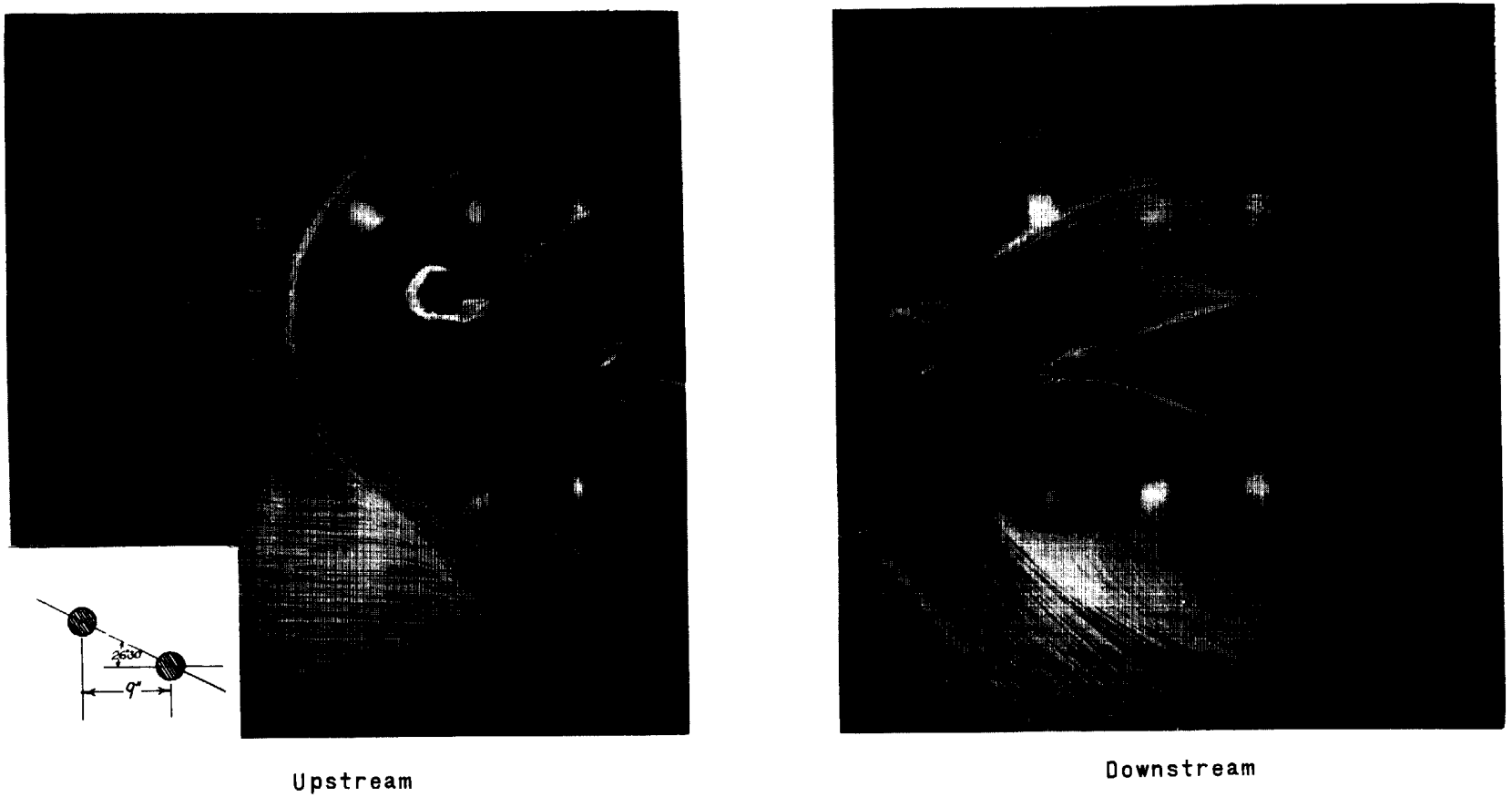
Figure 37.- Comparison of boundary-layer flow fields of single and tandem right circular cylinders. M = 3.51; R = 3.5×10^6.

L-2024



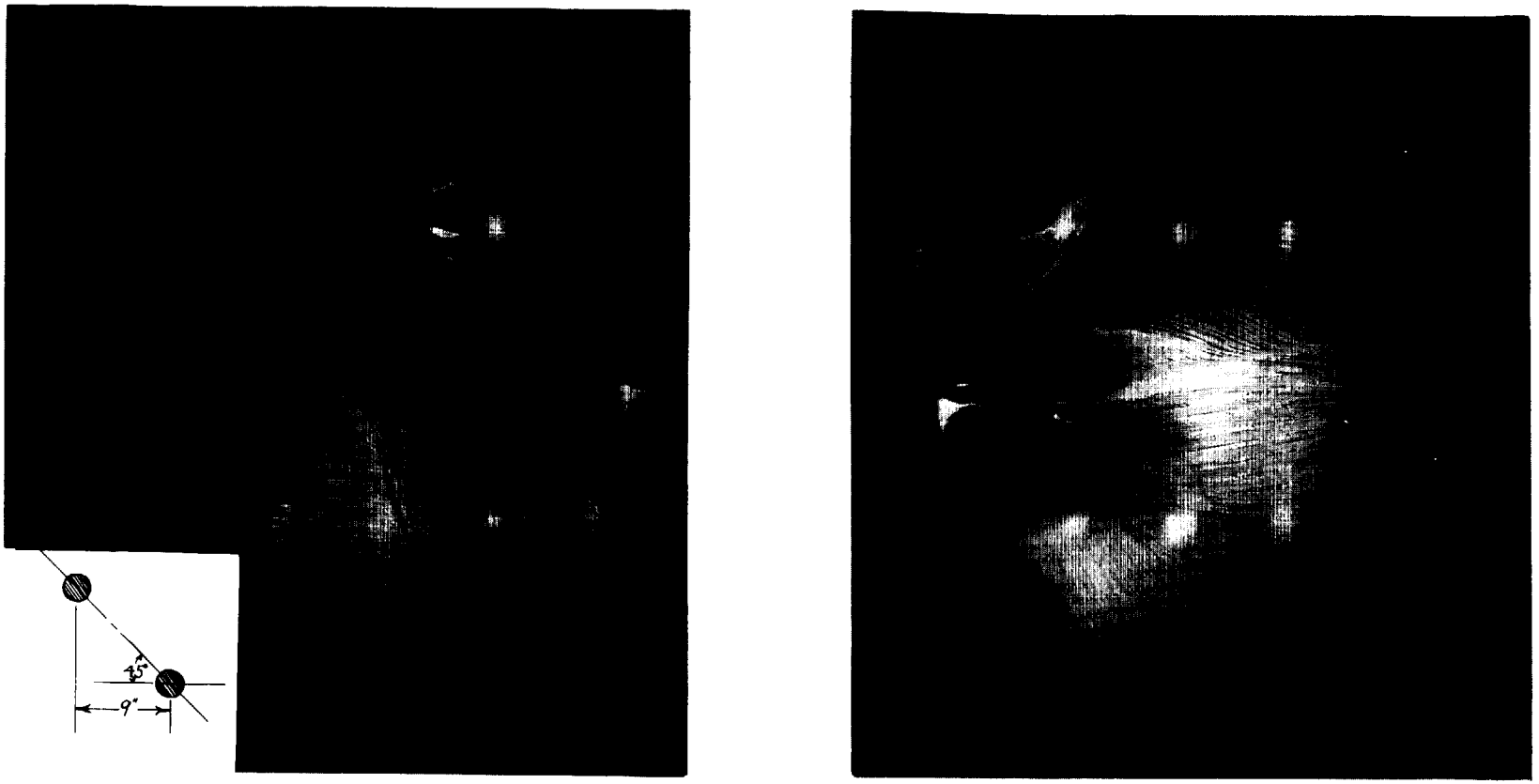
L-62-2097

Figure 38.- Oil-flow patterns for 2.8-inch-diameter tandem cylinders spaced 6.4 diameters apart. M = 3.51; R = 3.5×10^6.



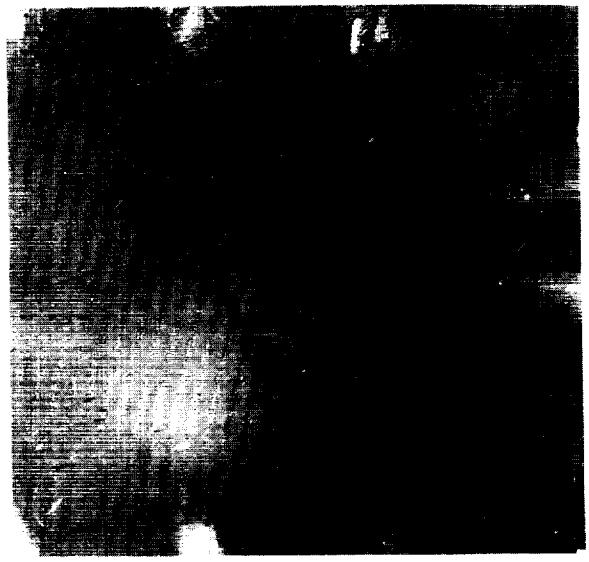
L-62-2098

Figure 39.- Oil-flow patterns for 2.8-inch-diameter right circular cylinders with 26.5° offset. M = 3.51; R = 3.5×10^6.



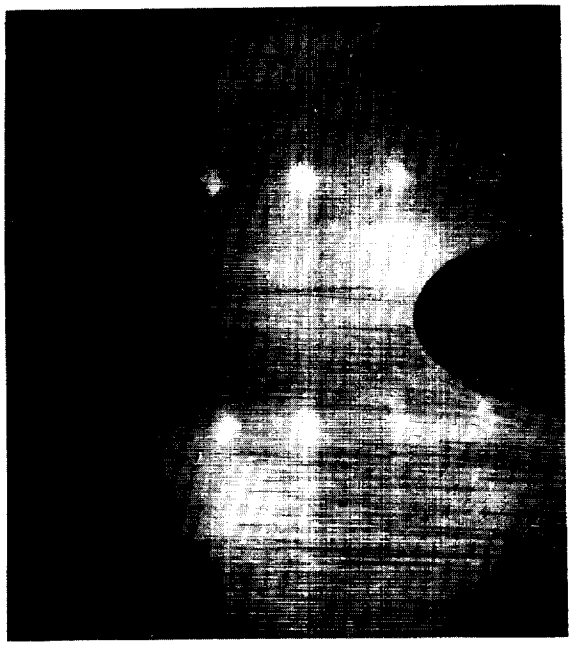
L-62-2099

Figure 40.- Oil-flow patterns for 2.8-inch-diameter right circular cylinders with 45° offset. M = 3.51; R = 3.5×10^6.

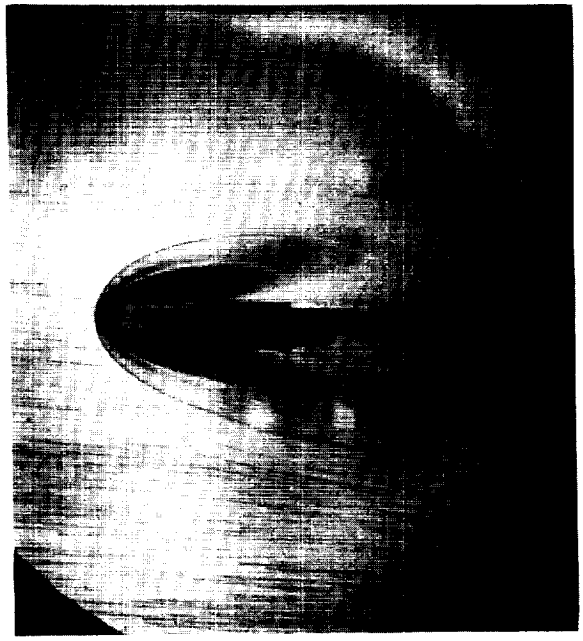


upstream

(a) R = 0.9 x 10^6.



upstream



Downstream

(b) R = 3.5 x 10^6

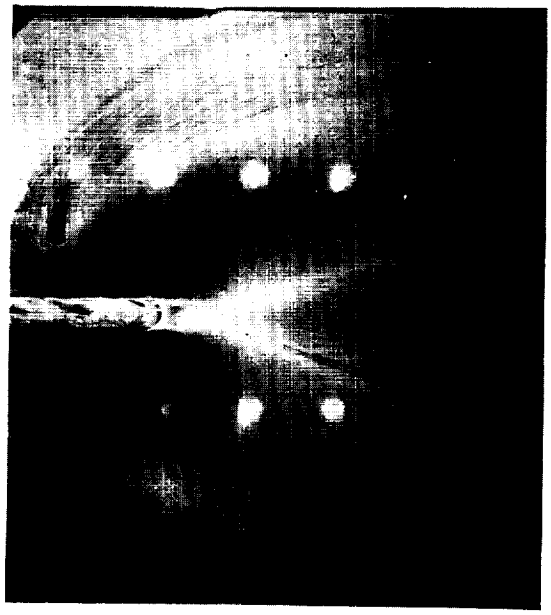
L-62-2100

Figure 41.- Oil-flow patterns of a 2.8-inch-diameter circular cylinder swept back 45°. M = 3.51.

L-2024

L-2024

Upstream



Downstream

L-62-2101

Figure 42.- Oil-flow patterns of a 2.8-inch-diameter circular cylinder swept forward 45°. M = 3.51; R = 3.0×10^6.

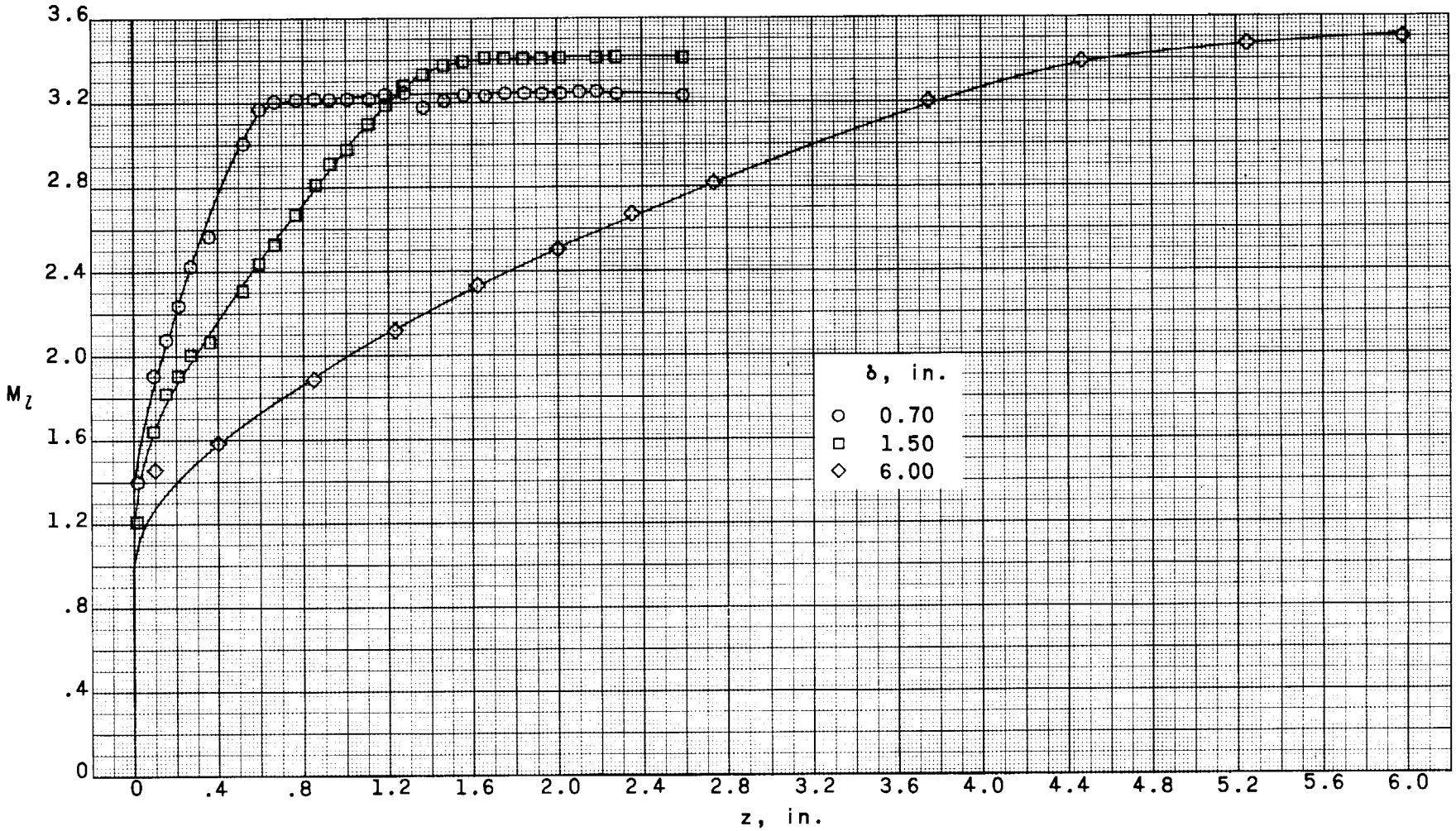
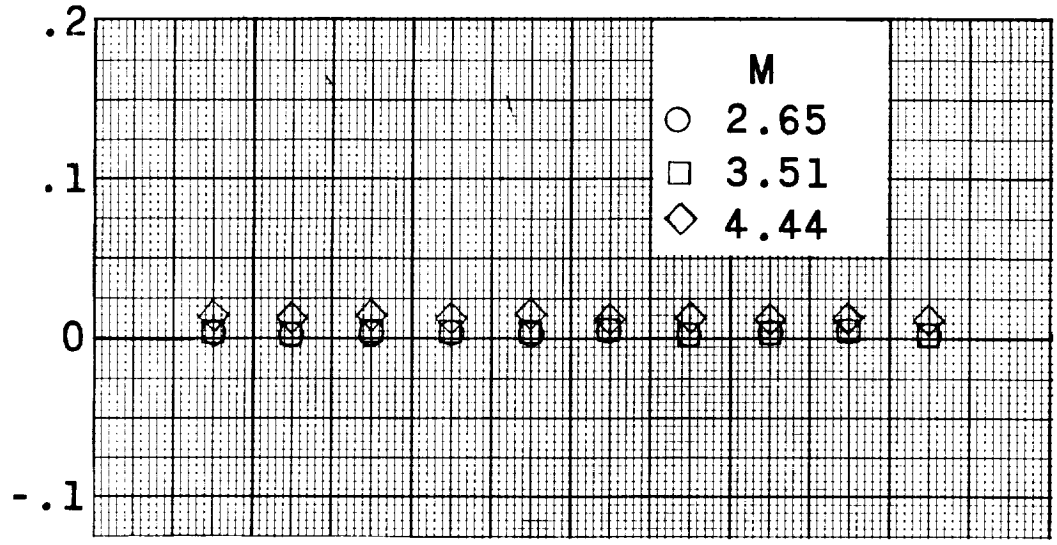
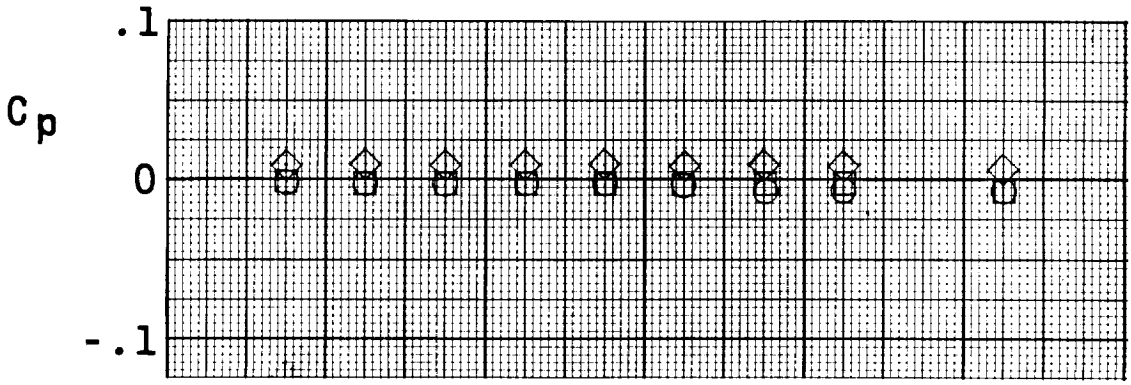


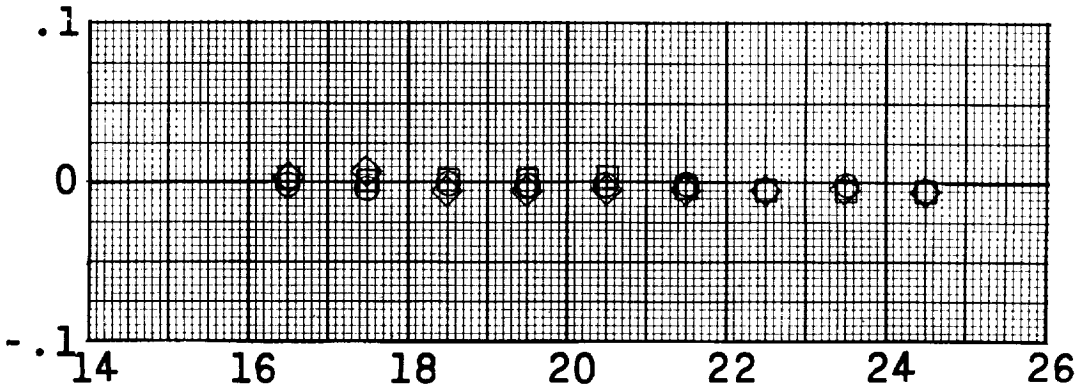
Figure 43.- Typical boundary-layer survey plot. M = 3.51; R ≈ 3.0×10^6.



(a) δ = 0.7 inch.

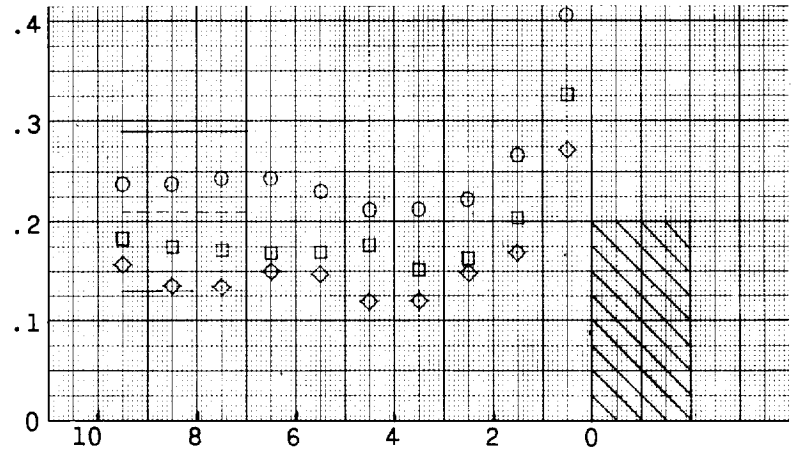


(b) δ = 1.5 inches.

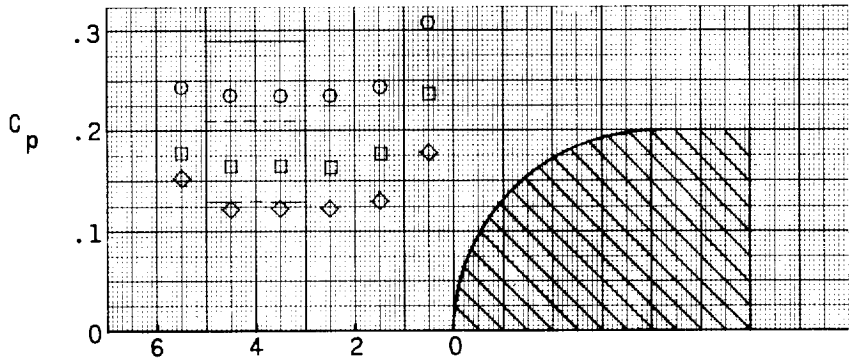


(c) δ = 6.0 inches.

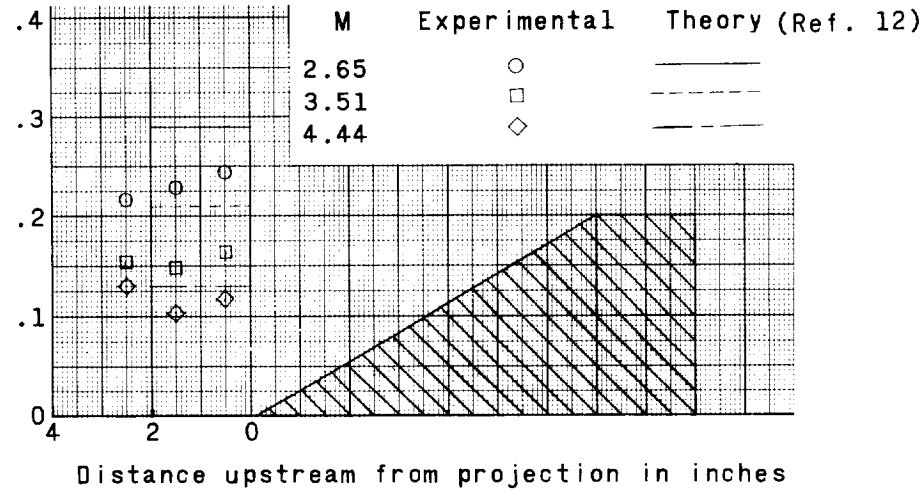
Figure 44.- Pressure distribution on a flat plate. $R \approx 4.0 \times 10^6$.



(a) 2-inch by 4-inch rectangular stiffener.



(b) 2-inch by 4-inch stiffener with 1/4 round fairing.



(c) 2-inch by 4-inch stiffener with 30° wedge.

Figure 45.- Pressure measurements upstream from stiffener models. δ = 6.0 inches; R = 2.85×10^6.

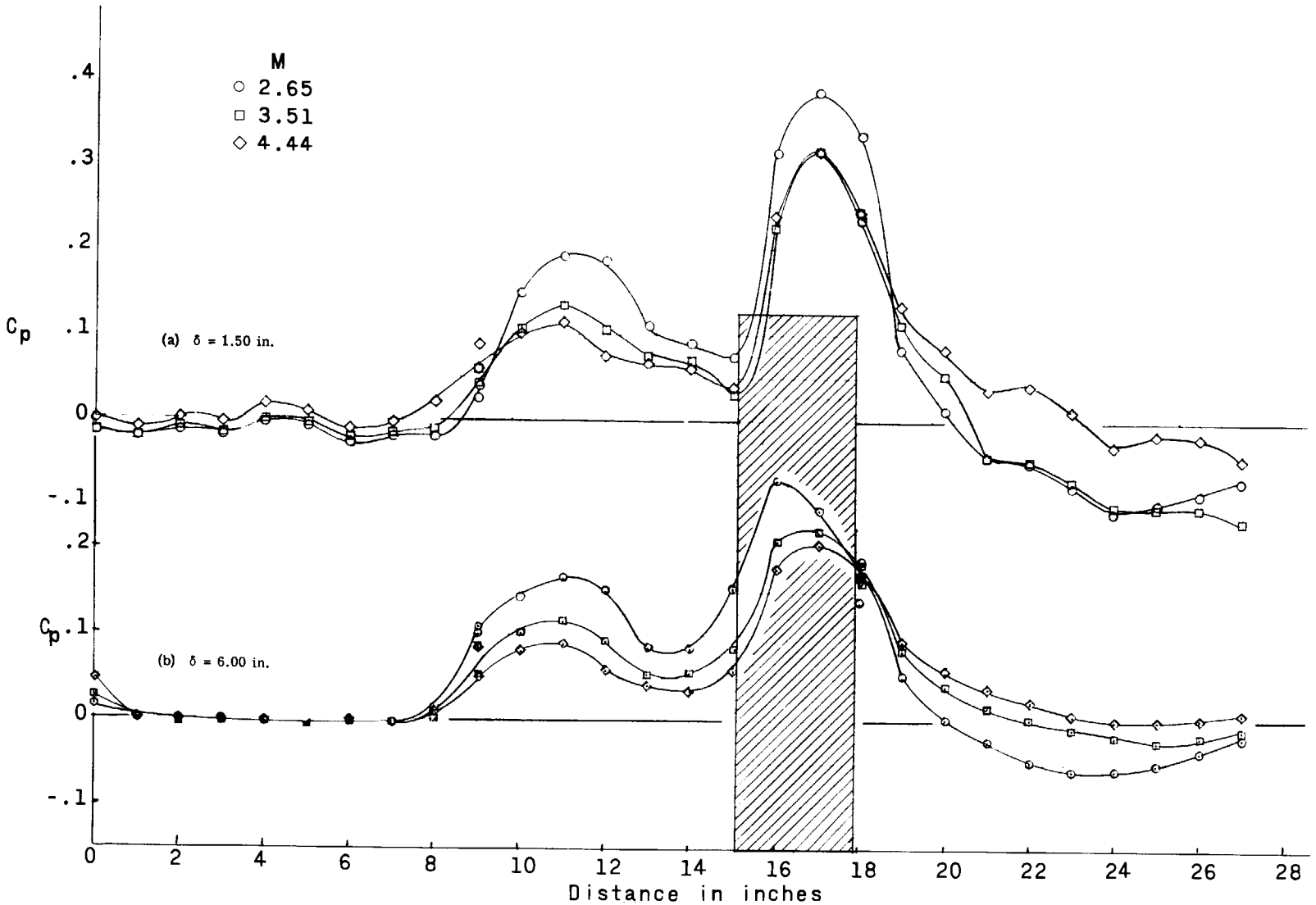


Figure 46.- Pressure distribution along a flat plate in the vicinity of a 2.8-inch-diameter right circular cylinder. $R = 2.8 \times 10^6$.

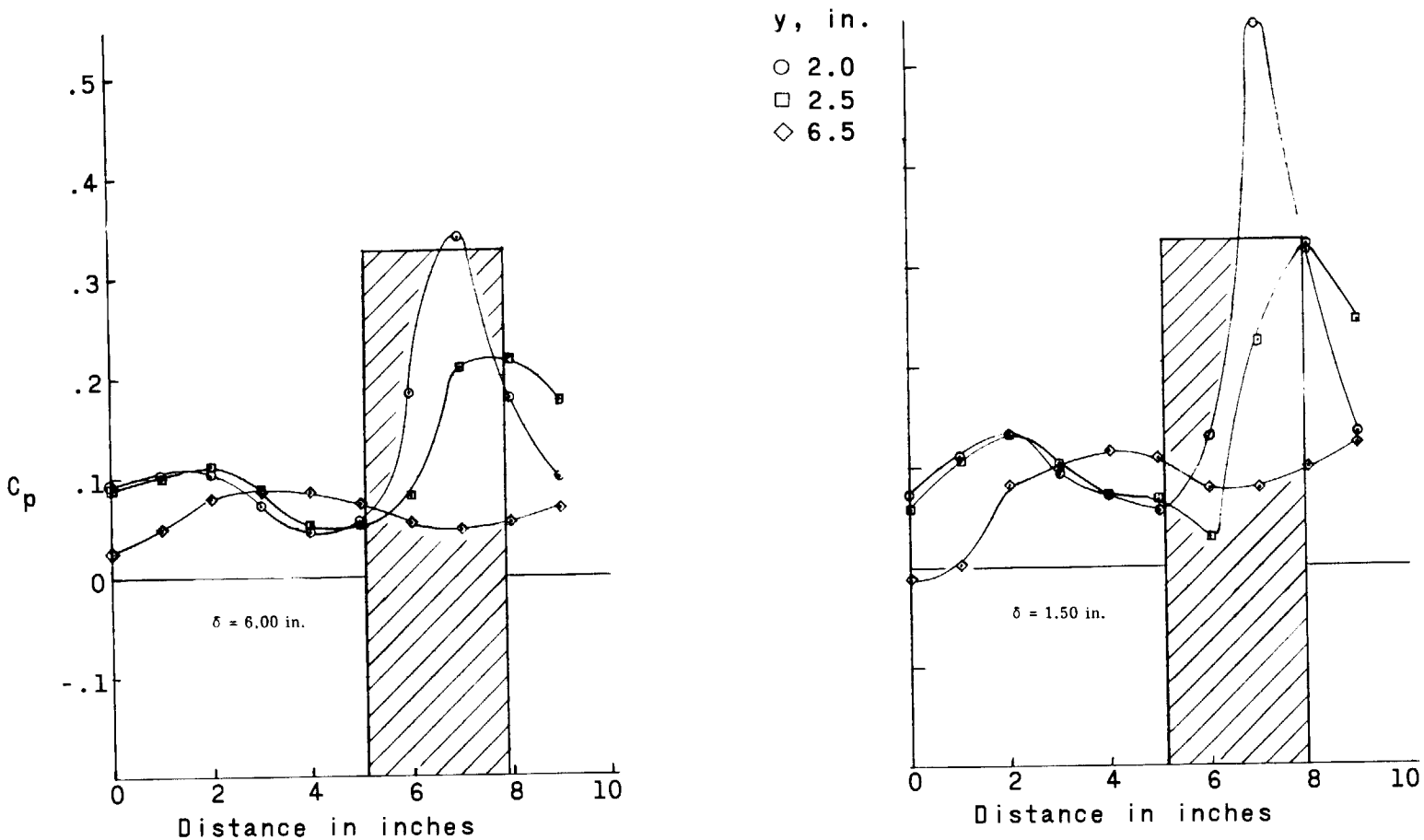
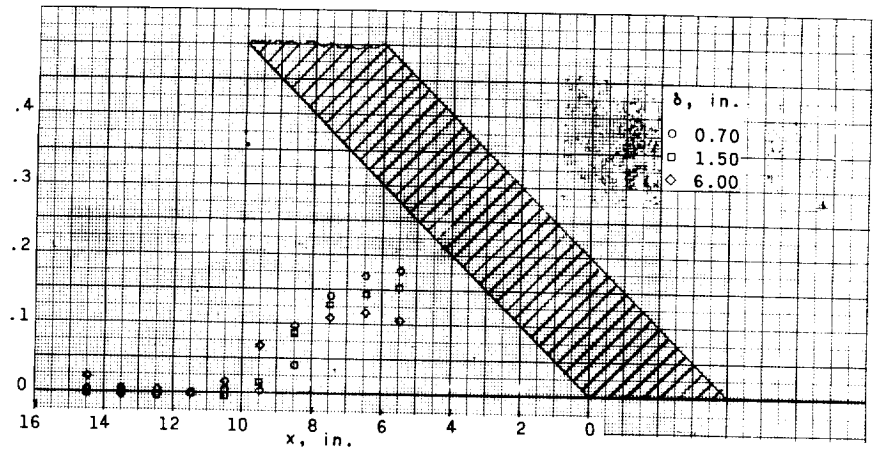
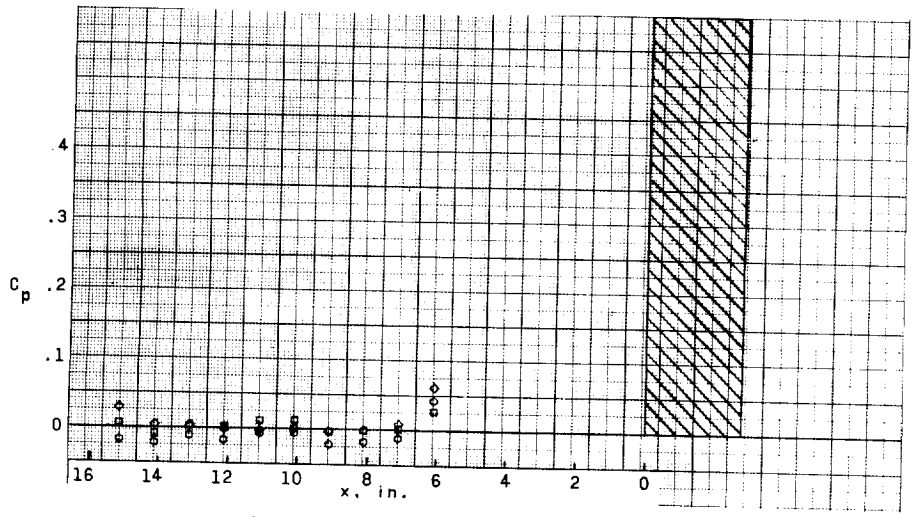


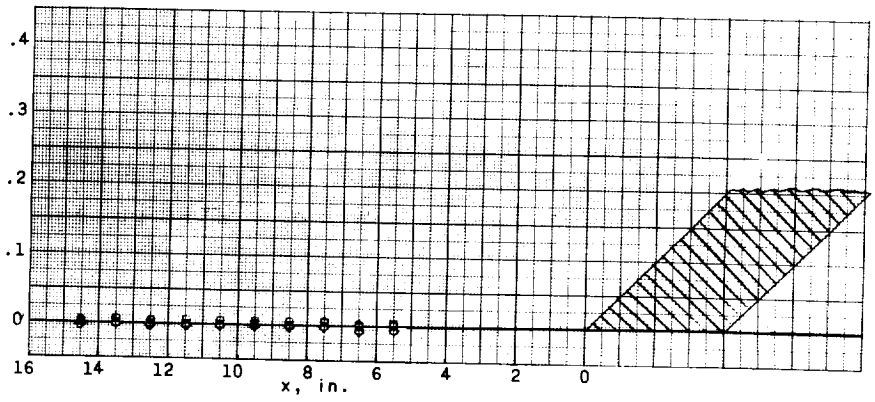
Figure 47.- Pressure distribution along flat plate at various lateral stations from the 2.8-inch-diameter-cylinder center line. M = 3.51; R = 2.86×10^6.



(a) 2.8-inch-diameter cylinder swept forward 45°.



(b) 2.8-inch-diameter cylinder.



(c) 2.8-inch-diameter cylinder swept back 45°.

Figure 48.- Effect of sweep on C_p in the vicinity of a cylindrical model. $M = 3.51$; $R \approx 2.85 \times 10^6$.

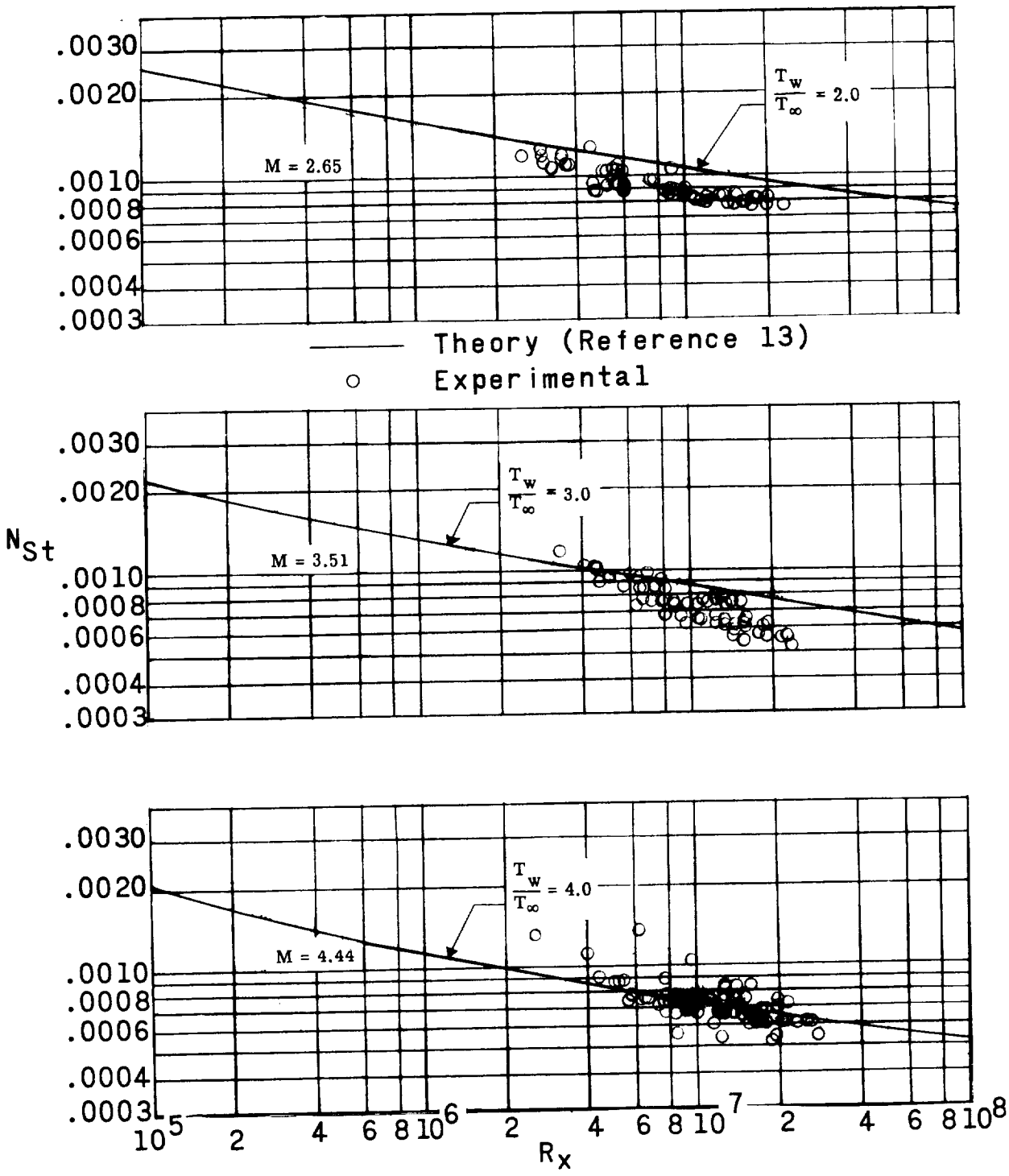


Figure 49.- Comparison of Van Driest theory for $N_{St} = 0.6c_f$ with experimental values on a flat plate. δ = 0.70 inch.

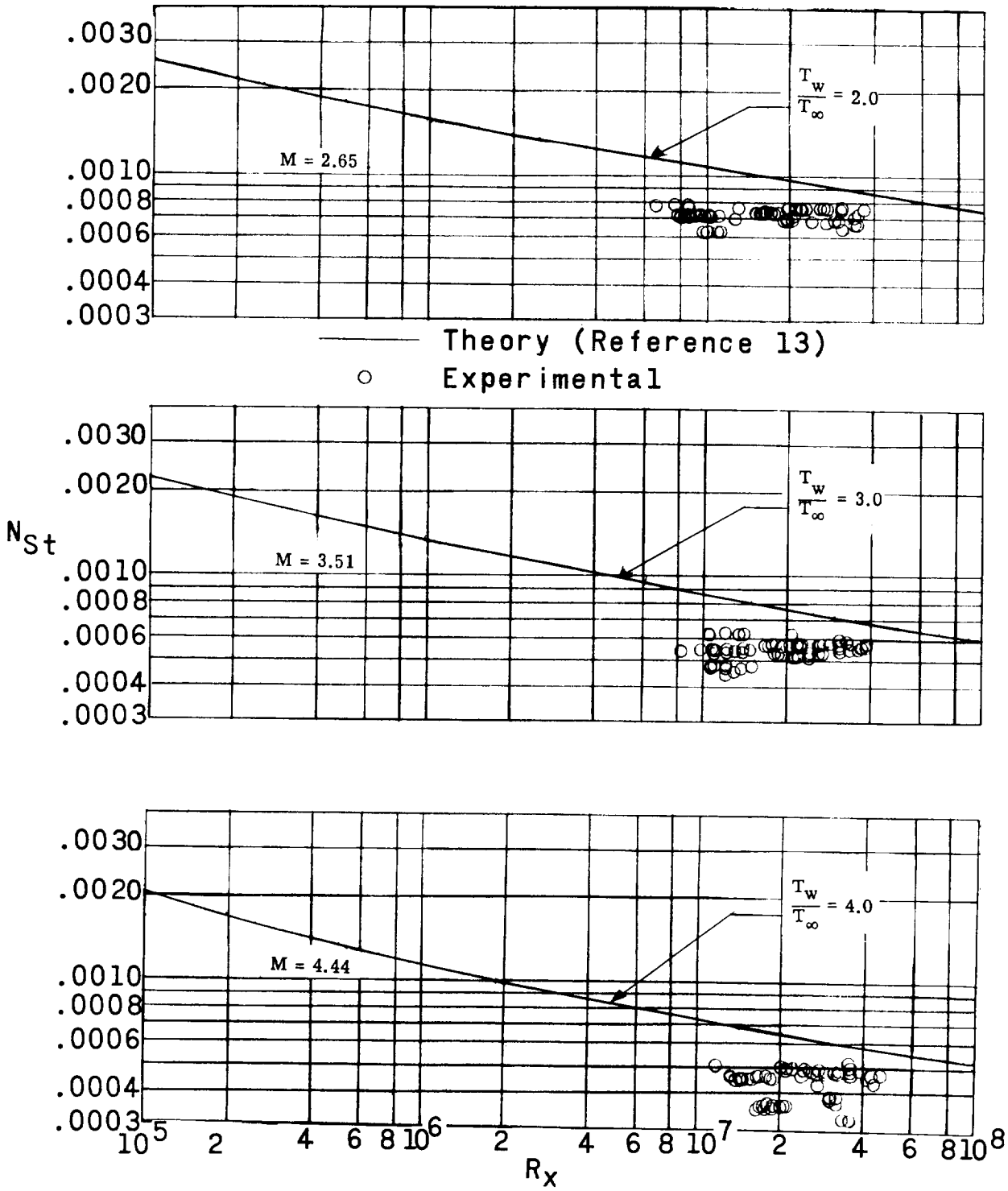
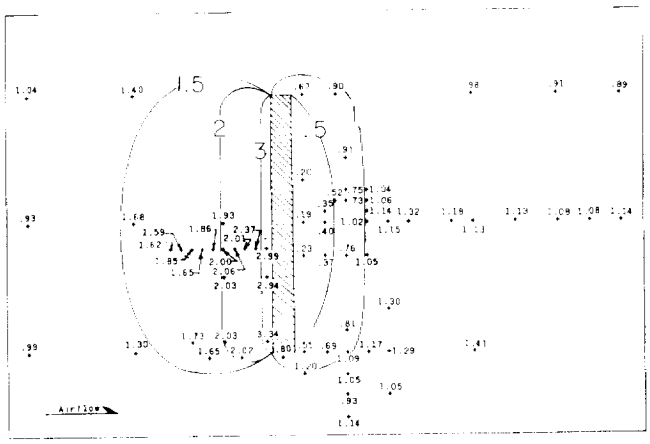
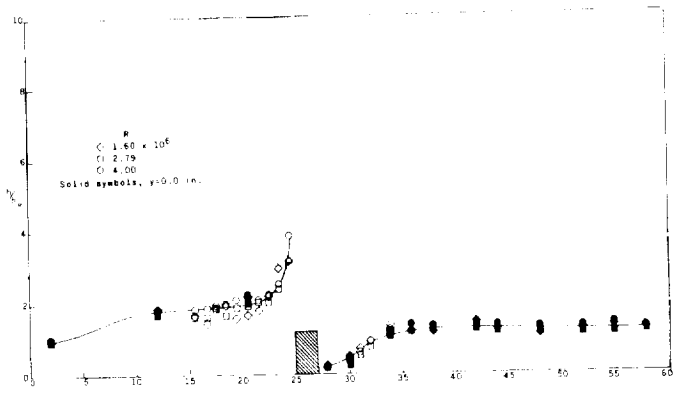


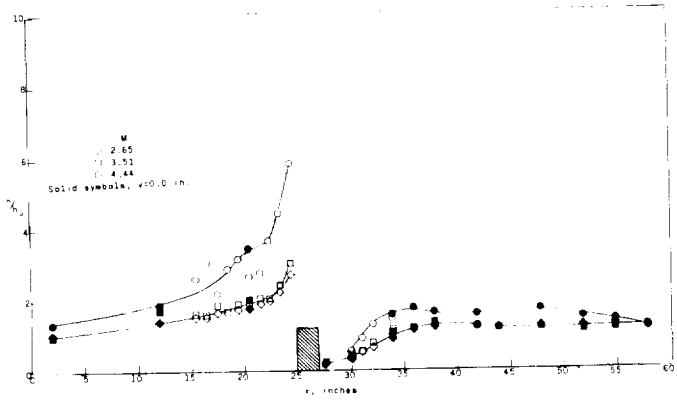
Figure 50.- Comparison of Van Driest theory for $N_{St} = 0.6c_f$ with experimental values on a flat plate. δ = 1.50 inches.



(a) Lines of constant h/h_o. M = 3.51; R = 2.79×10^6.

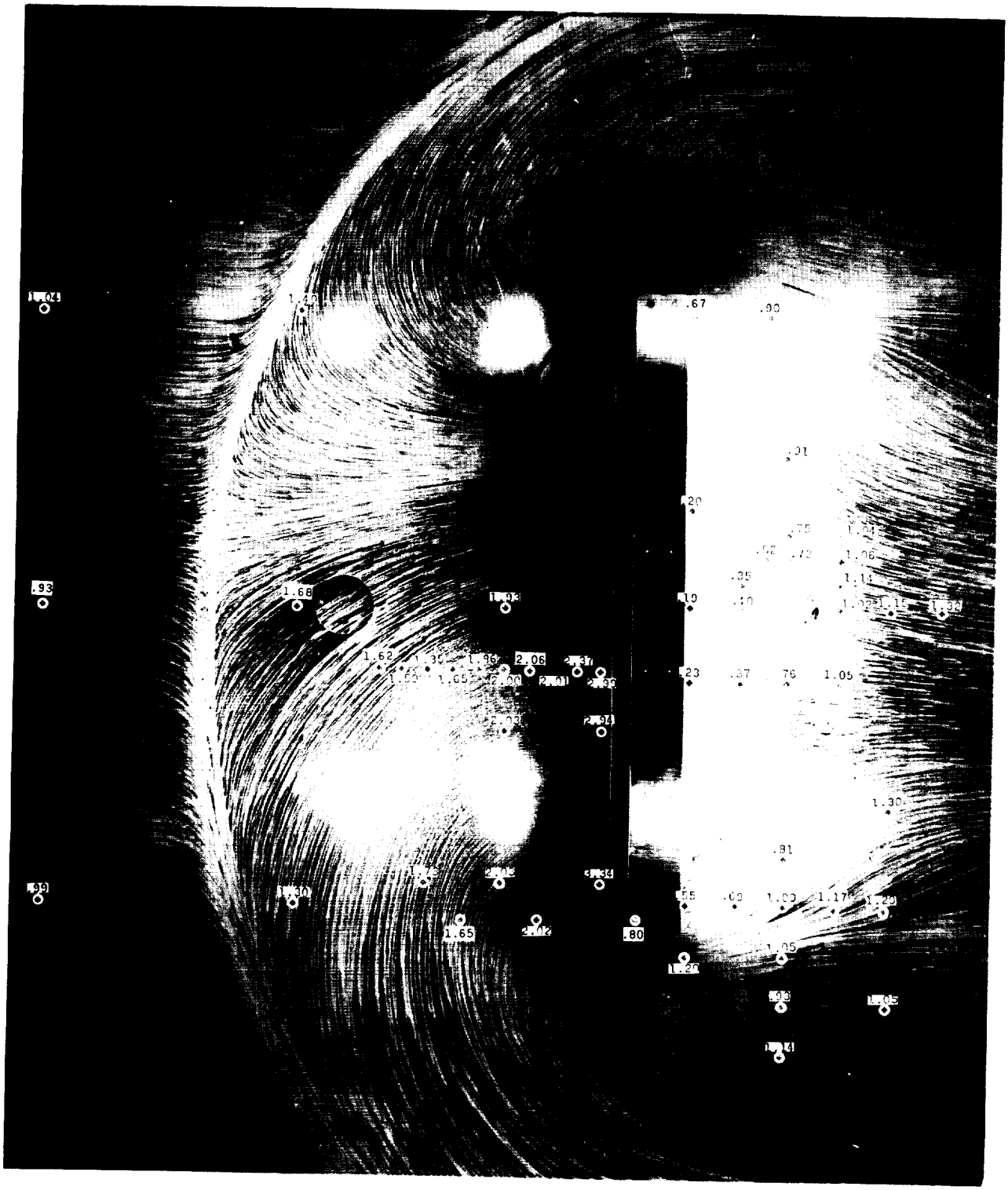


(b) Effect of Reynolds number along center line. M = 3.51.



(c) Effect of Mach number along center line. R ≈ 3.00×10^6.

Figure 51.- Flat-plate heat-transfer ratio for a 2-inch by 4-inch rectangular stiffener. δ = 6.00 inches.



(a) Upstream.

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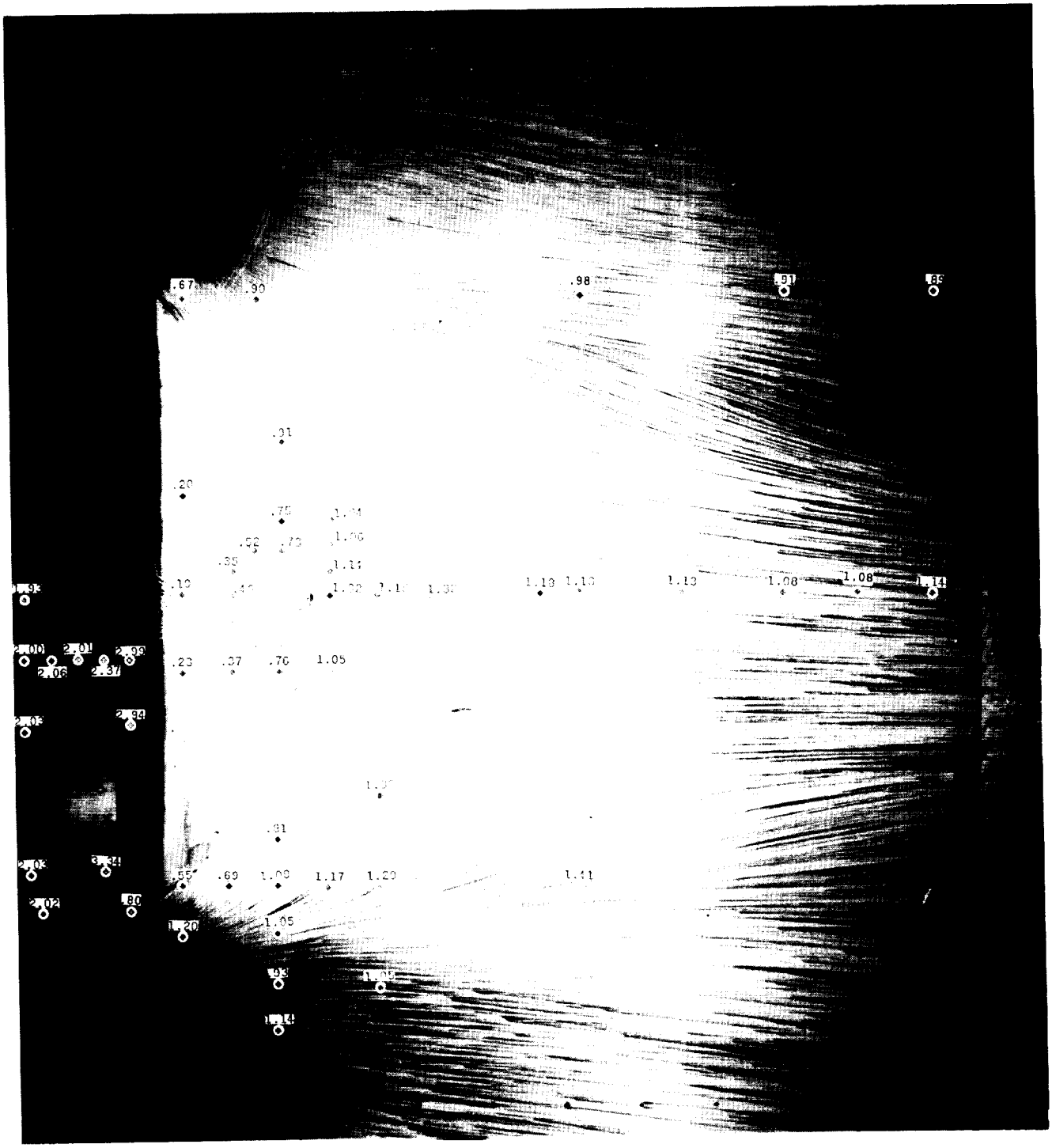
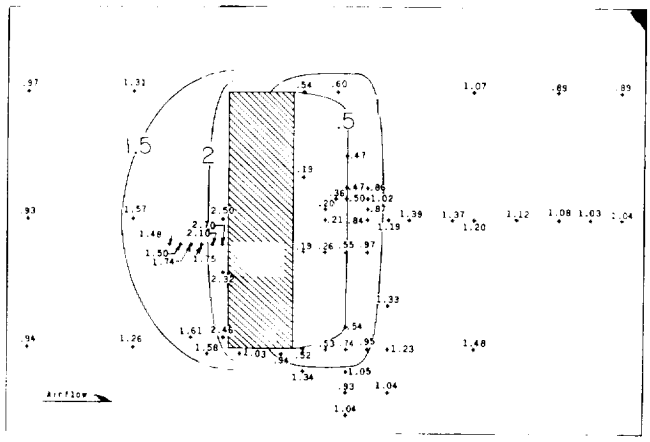
Figure 52.- Correlation of heat-transfer ratios and oil-flow patterns for a 2-inch by 4-inch rectangular stiffener. M = 3.51; R ≈ 3.00 × 10^6.

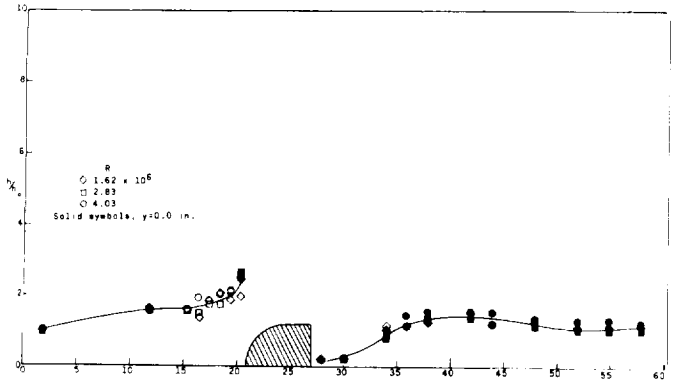


(b) Downstream. L-62-2103

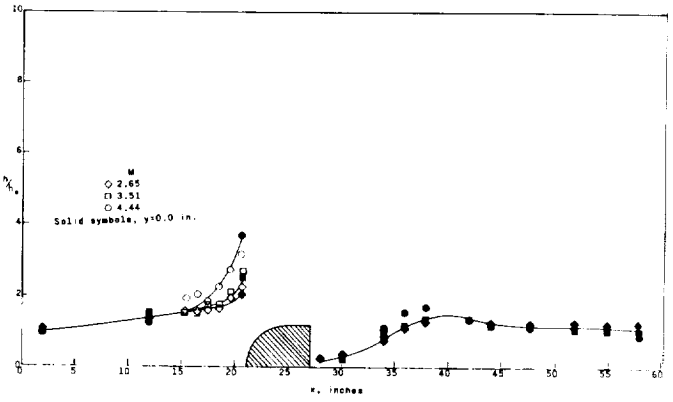
Figure 52.- Concluded.



(a) Lines of constant h/h_o. M = 3.51; R = 2.83×10^6.

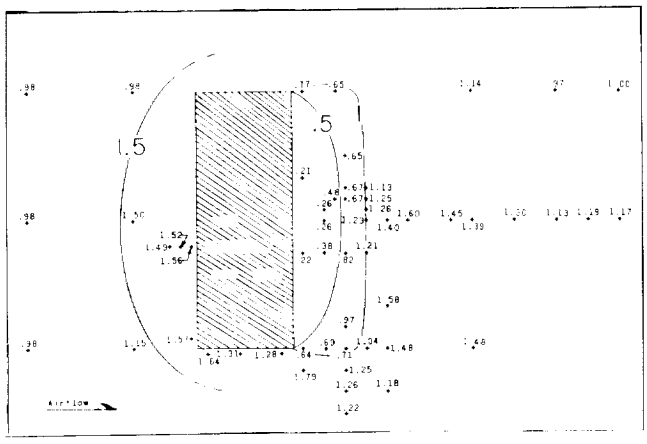


(b) Effect of Reynolds number along center line. M = 3.51.

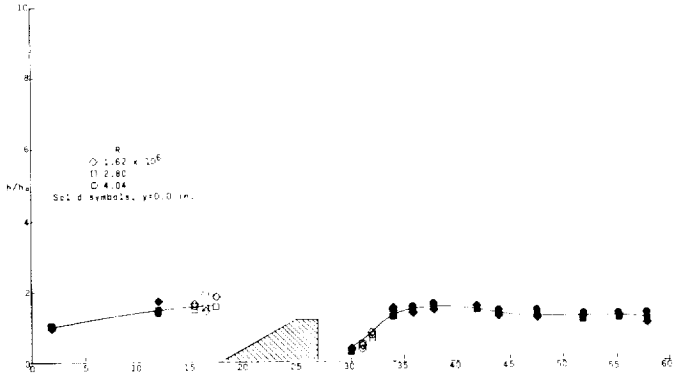


(c) Effect of Mach number along center line. R ≈ 3.00×10^6.

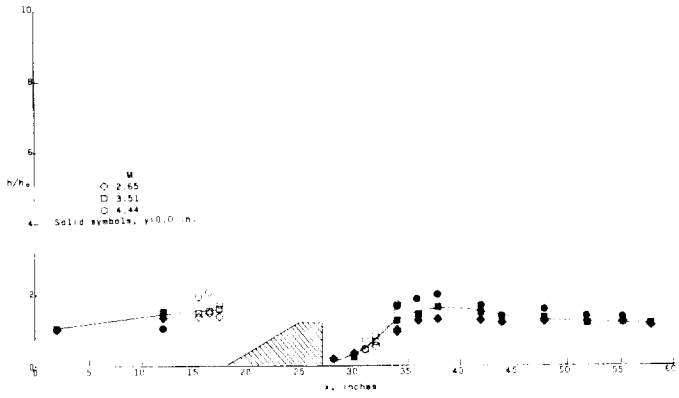
Figure 53.- Flat-plate heat-transfer ratio for a 2-inch by 4-inch stiffener with 1/4 round fairing. δ = 6.00 inches.



(a) Lines of constant h/h_o. $M = 3.51$; $R = 2.80 \times 10^6$.



(b) Effect of Reynolds number along center line. $M = 3.51$.



(c) Effect of Mach number along center line. $R \approx 3.00 \times 10^6$.

Figure 54.- Flat-plate heat-transfer ratio for a 2-inch by 4-inch stiffener with 30° wedge. $\delta = 6.00$ inches.

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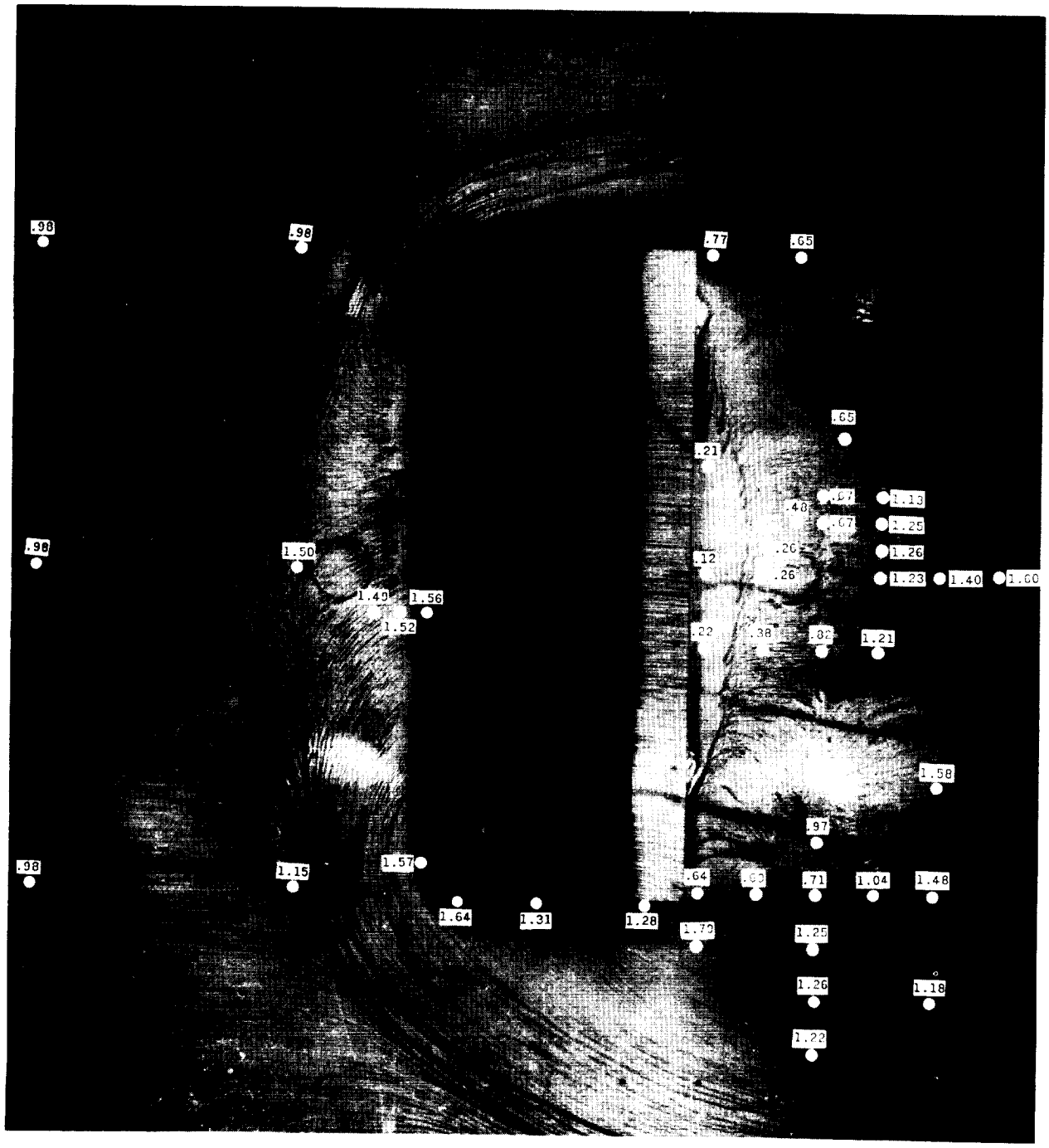

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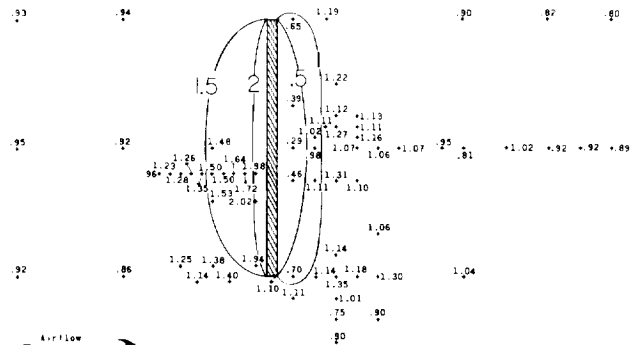
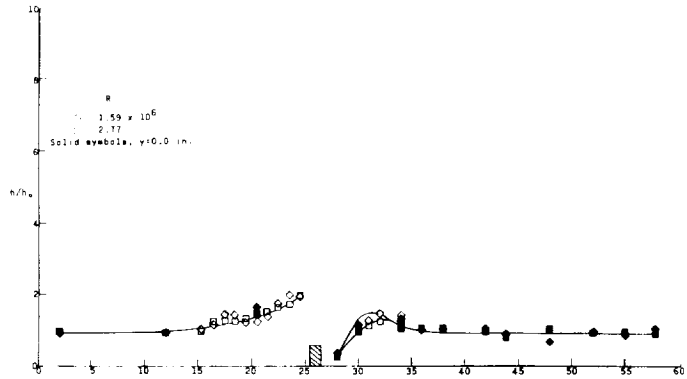
Figure 55.- Correlation of heat-transfer ratios and oil-flow patterns for a 2-inch by 4-inch stiffener with 30° wedge. $M \approx 3.51$; $R = 3.00 \times 10^6$.

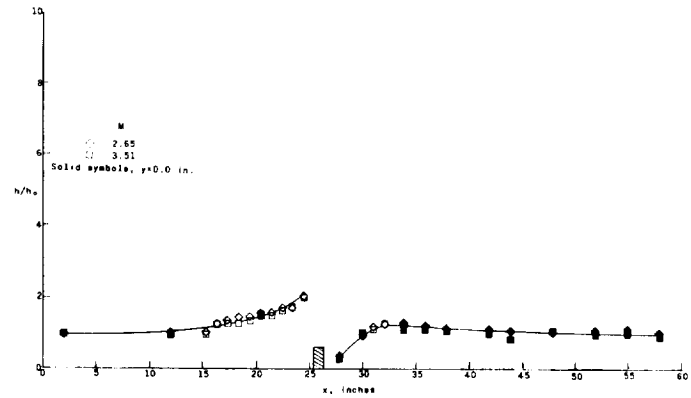
Figure 56.- Axial distribution of the ratio of model heat transfer to flat-plate heat transfer on stiffener models. $M = 3.51$; $R \approx 3.00 \times 10^6$; $\delta = 6.00$ inches.



(a) Lines of constant h/h_o. M = 3.51; R = 2.77 × 10^6.



(b) Effect of Reynolds number along center line. M = 3.51.



(c) Effect of Mach number along center line. R ≈ 3.00 × 10^6.

Figure 57.- Flat-plate heat-transfer ratio for a 1-inch by 2-inch rectangular stiffener. δ = 6.00 inches.

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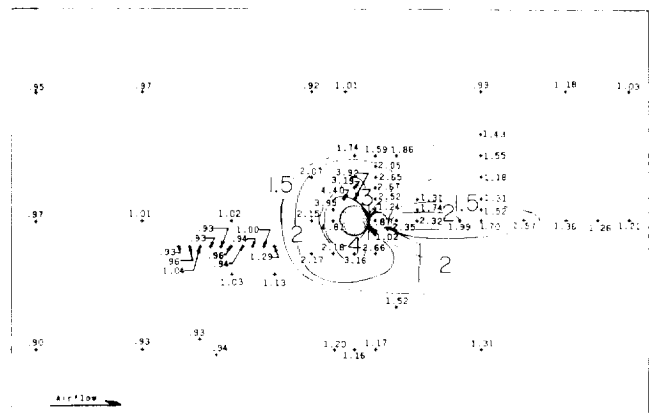
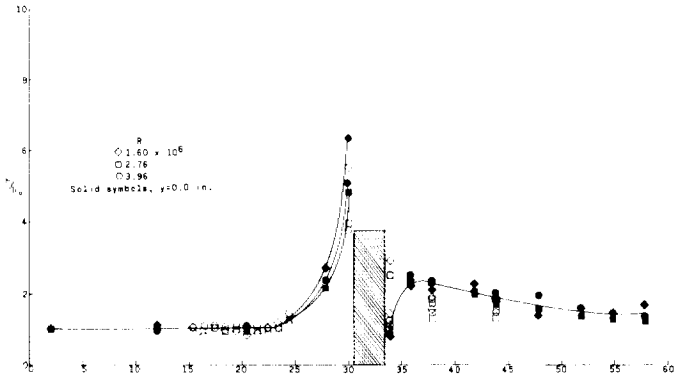
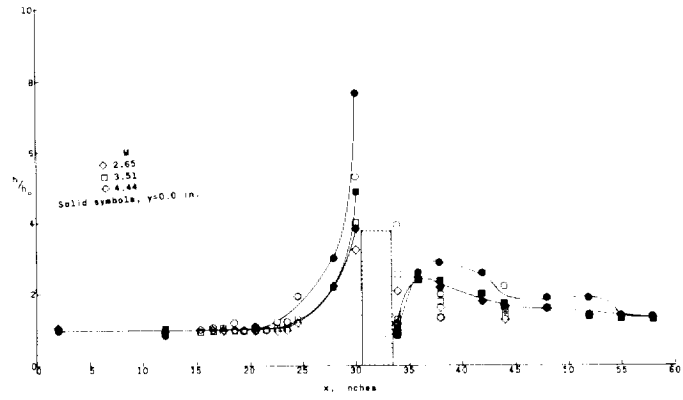


(a) Lines of constant h/h_o. M = 3.51; R = 2.76×10^6.



(b) Effect of Reynolds number along center line. M = 3.51.



(c) Effect of Mach number along center line. R ≈ 3.00×10^6.

Figure 58.- Flat-plate heat-transfer ratio for a single 2.8-inch-diameter right circular cylinder. δ = 6.00 inches.

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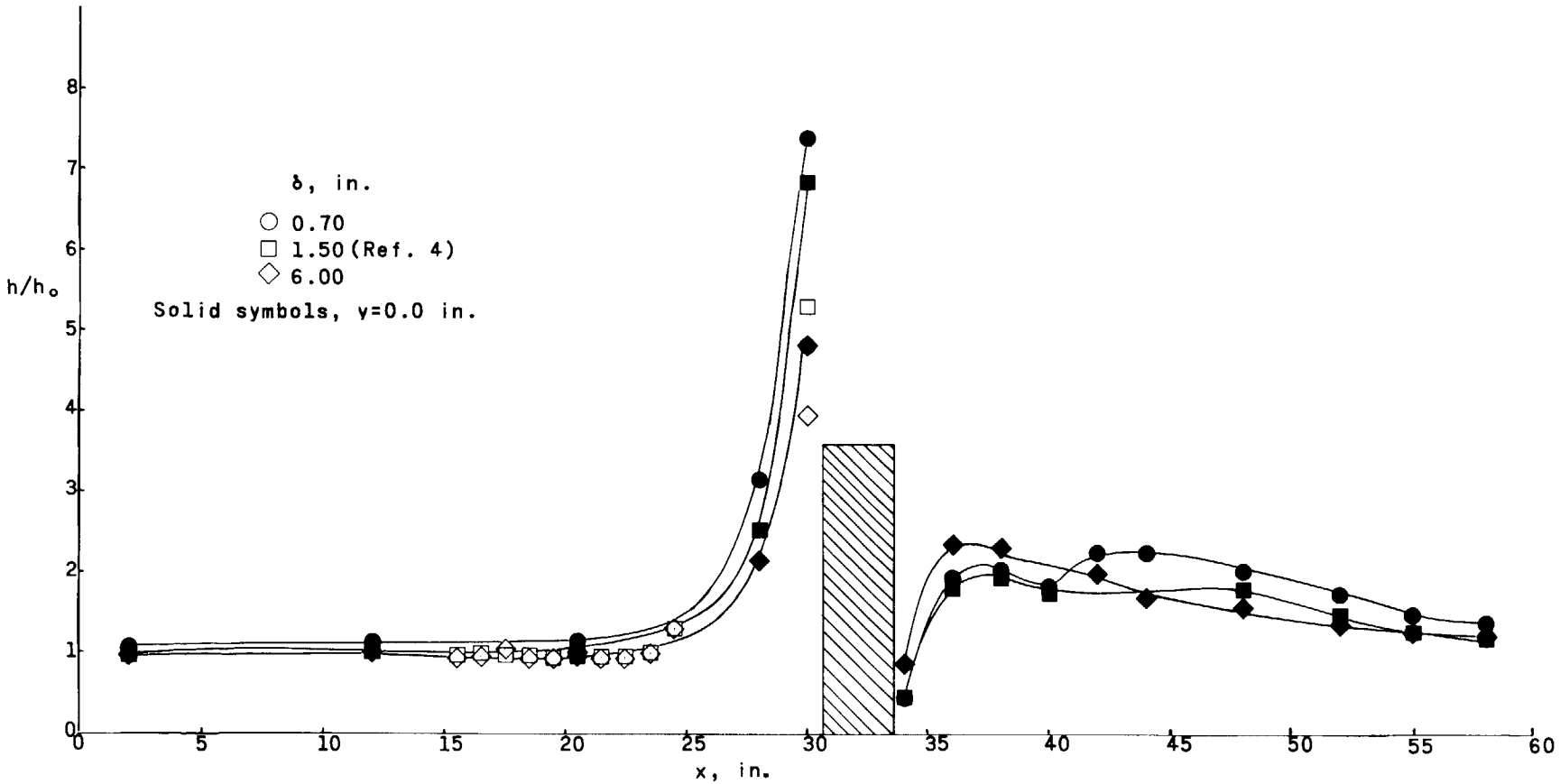
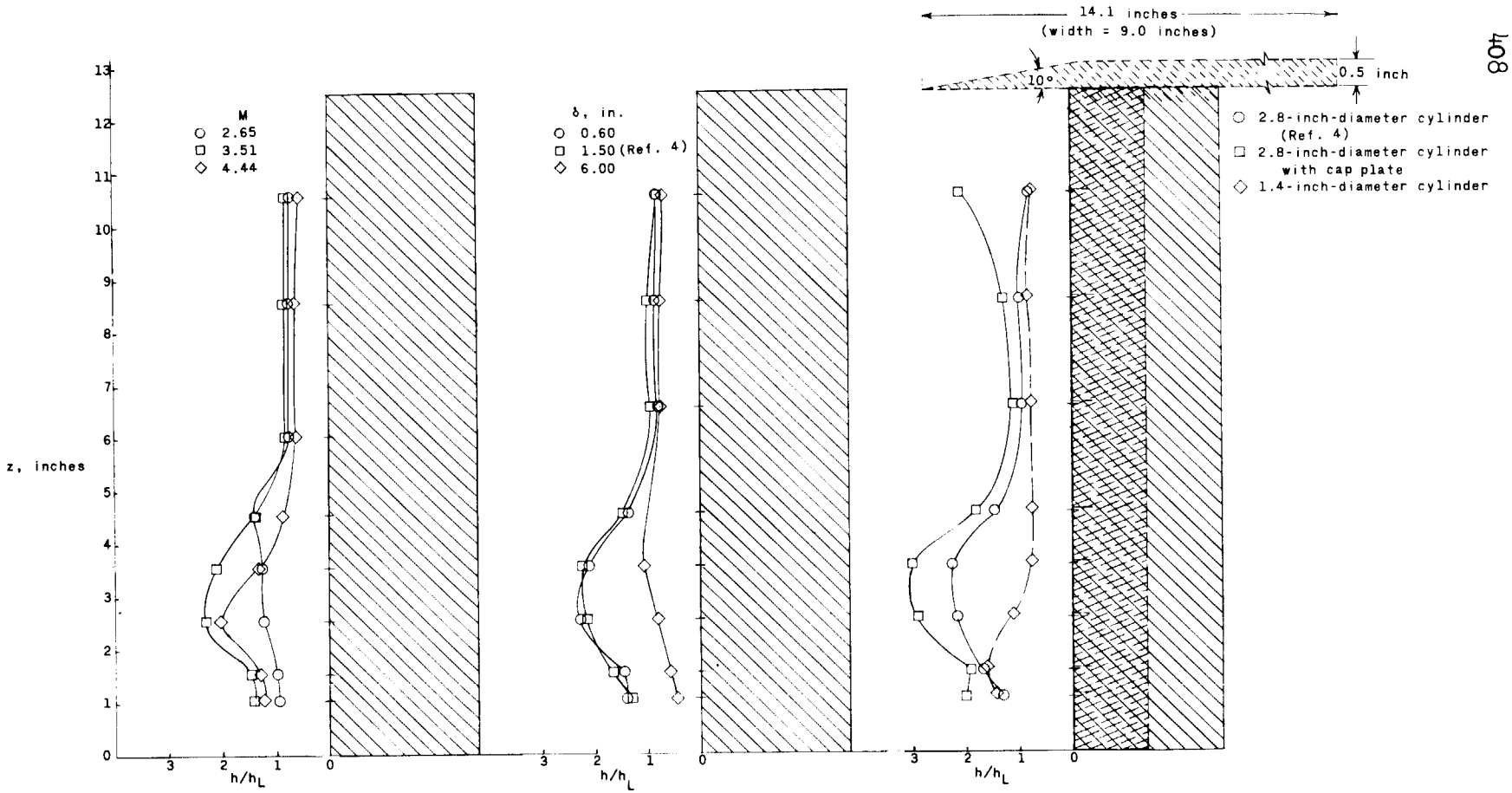


Figure 59.- Effect of boundary-layer thickness on the distribution of h/h_o within $2\frac{1}{2}$ inches of the flat-plate center line for a 2.8-inch-diameter right circular cylinder. M = 3.51; $R \approx 2.90 \times 10^6$.

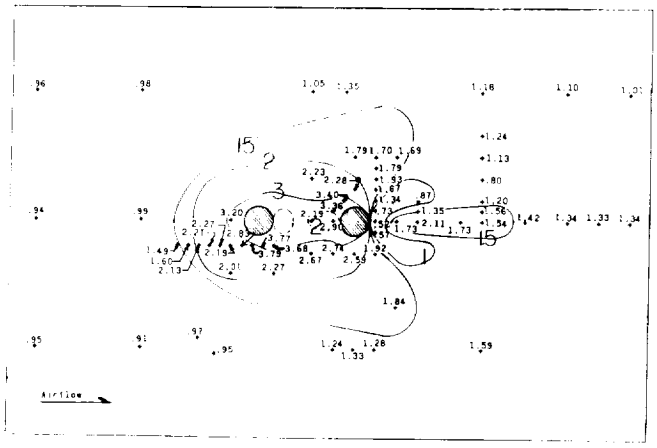


(a) Effect of Mach number. $\delta = 0.70$ inch; $R \approx 3.00 \times 10^6$.

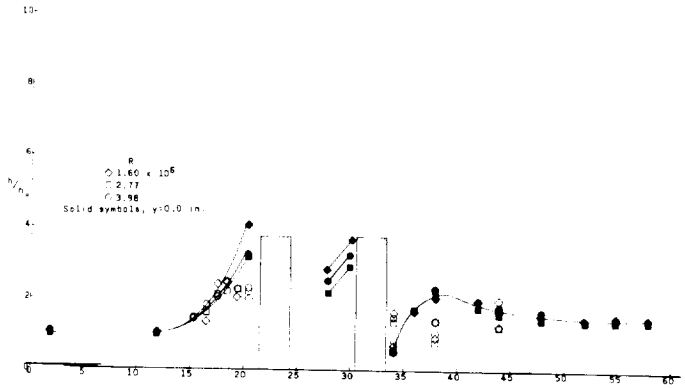
(b) Effect of boundary layer. $M = 3.51$; $R \approx 2.90 \times 10^6$.

(c) Effect of configuration. $M = 3.51$; $R \approx 2.90 \times 10^6$; $\delta = 1.50$ inches.

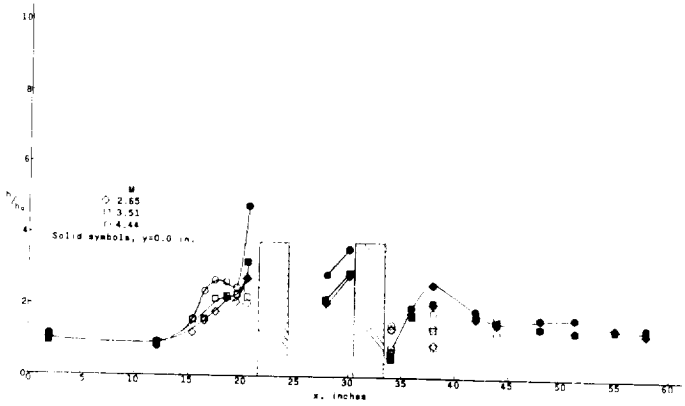
Figure 60.- Ratio of experimental to theoretical heat-transfer coefficients along the stagnation line on right circular cylindrical configurations.



(a) Lines of constant h/h_o. M = 3.51; R = 2.77×10^6.

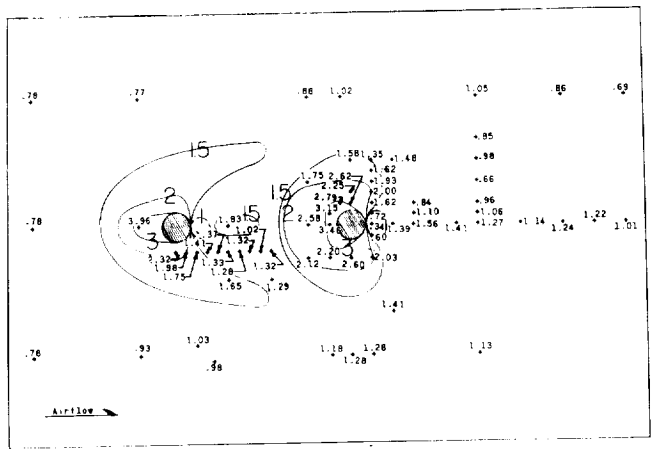


(b) Effect of Reynolds number along center line. M = 3.51.

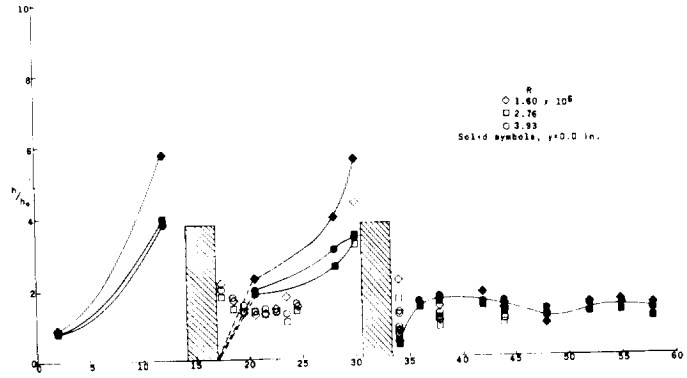


(c) Effect of Mach number along center line. R $\approx 3.00 \times 10^6$.

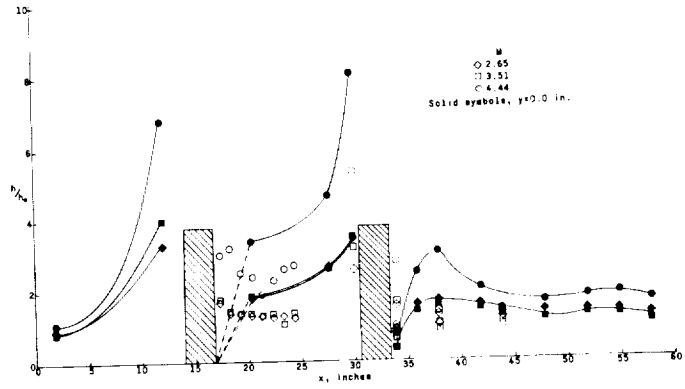
Figure 61.- Flat-plate heat-transfer ratios for tandem 2.8-inch-diameter right circular cylinders 3.2 diameters apart. δ = 6.00 inches.



(a) Lines of constant h/h_o. M = 3.51; R = 2.76×10^6.

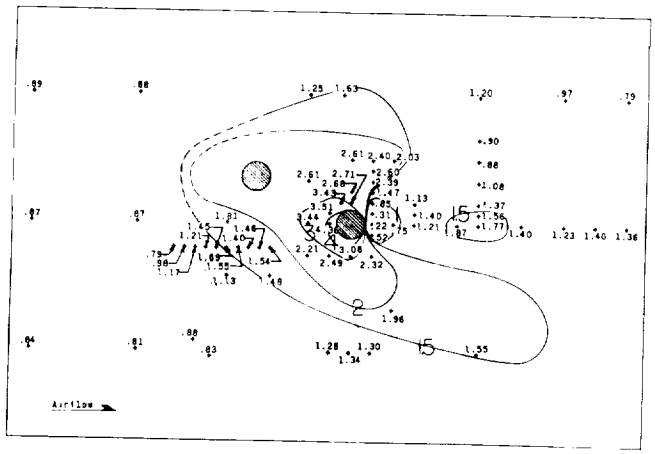


(b) Effect of Reynolds number along center line. M = 3.51.

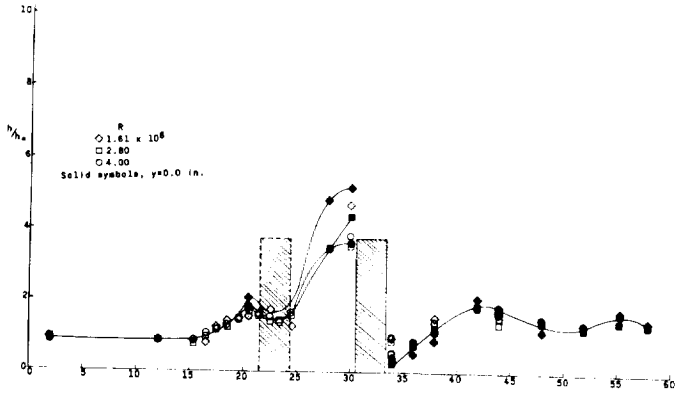


(c) Effect of Mach number along center line. R ≈ 3.00×10^6.

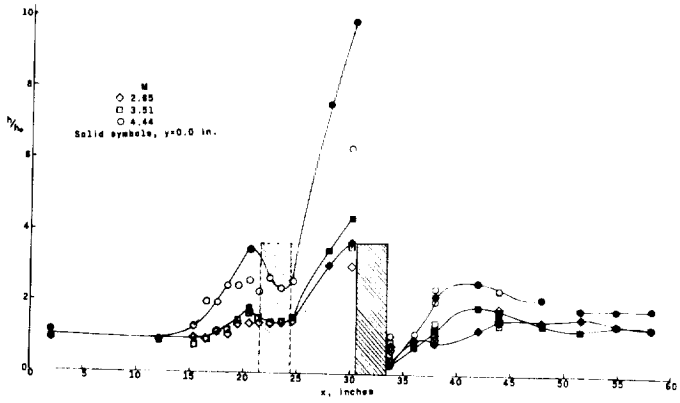
Figure 62.- Flat-plate heat-transfer ratios for tandem 2.8-inch-diameter right circular cylinders 6.4 diameters apart. δ = 6.00 inches.



(a) Lines of constant h/h_o. M = 3.51; R = 2.80×10^6.

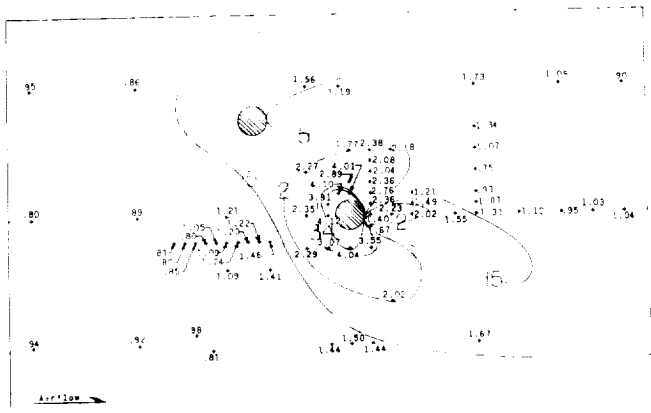


(b) Effect of Reynolds number along center line. M = 3.51.

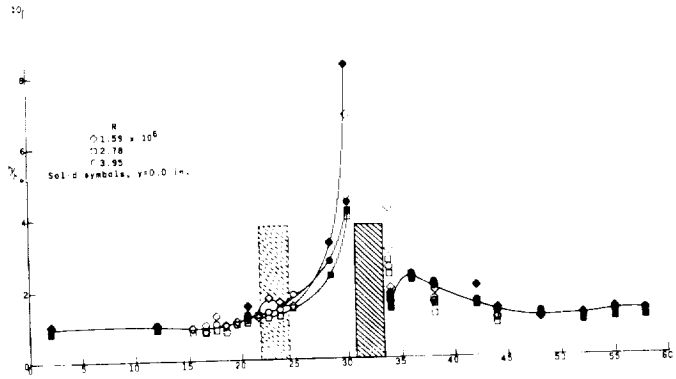


(c) Effect of Mach number along center line. R ≈ 3.00×10^6.

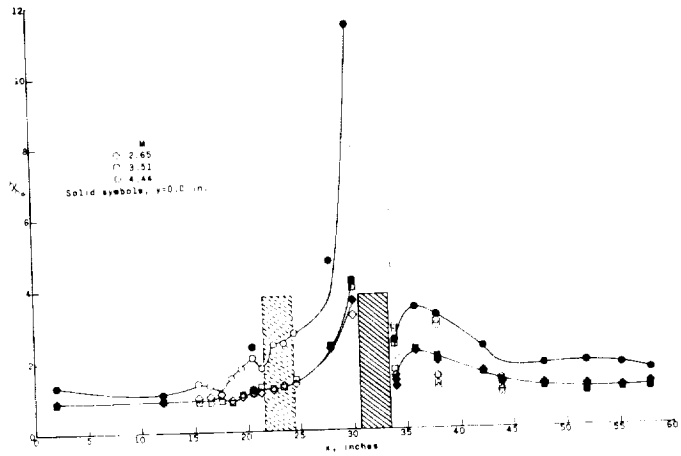
Figure 63.- Flat-plate heat-transfer ratios for 2.8-inch-diameter right circular cylinders with 26.5° offset. δ = 6.00 inches.



(a) Lines of constant h/h_o. M = 3.51; R = 2.78×10^6.



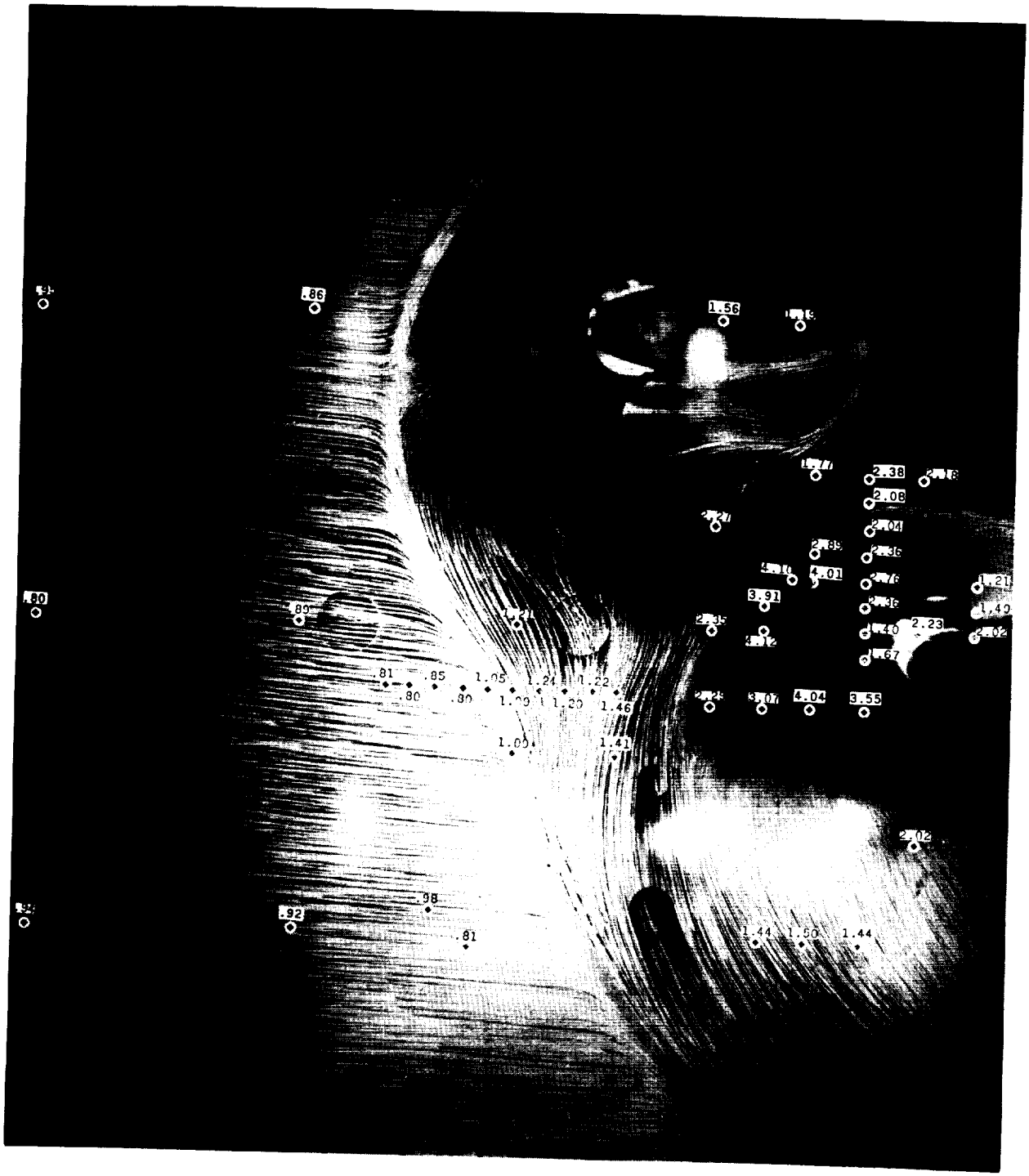
(b) Effect of Reynolds number along center line. M = 3.51.



(c) Effect of Mach number along center line. R $\approx 3.00 \times 10^6$.

Figure 64.- Flat-plate heat-transfer ratios for 2.8-inch-diameter right circular cylinders with 45° offset. δ = 6.00 inches.

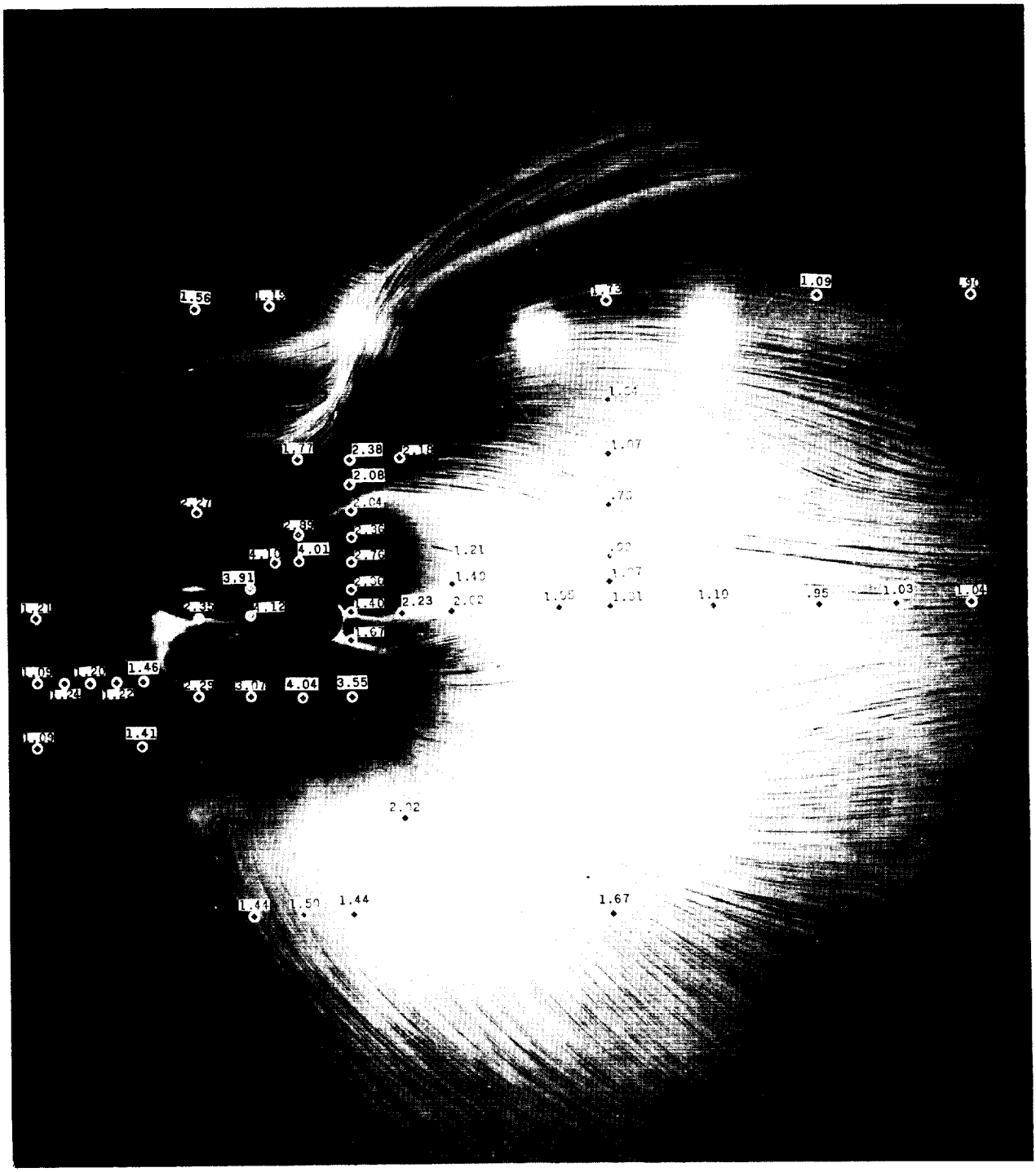
L-2024



(a) Upstream.

L-62-2105

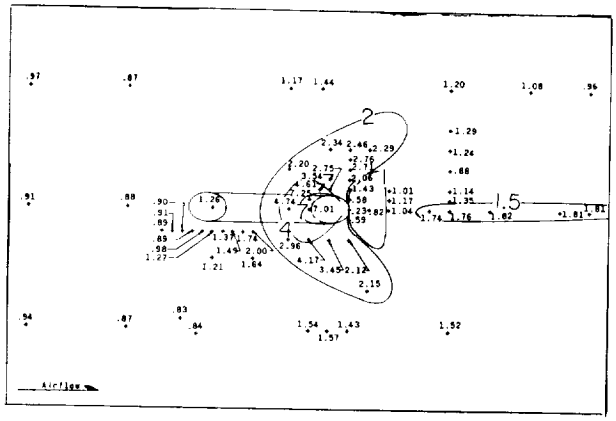
Figure 65.- Correlation of heat-transfer ratios and oil-flow patterns for 2.8-inch-diameter cylinders with 45° offset. M = 3.51; $R \approx 3.00 \times 10^6$.



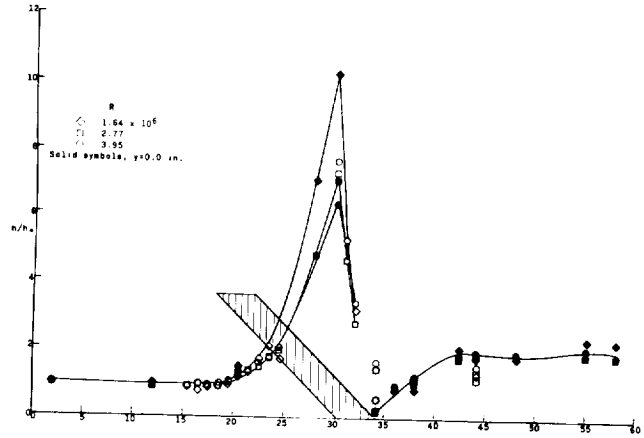
L-2024

(b) Downstream. L-62-2106

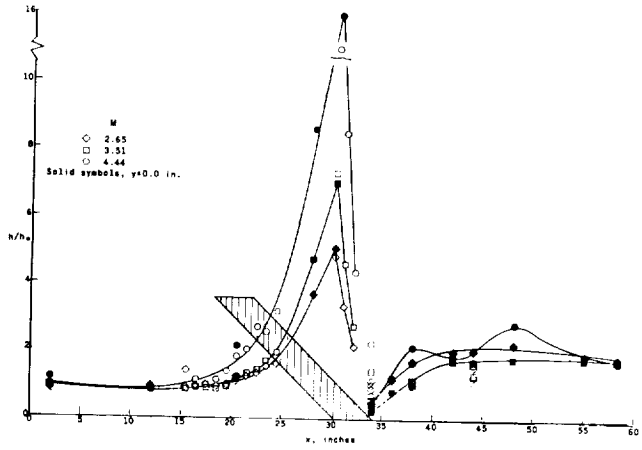
Figure 65.- Concluded.



(a) Lines of constant h/h_o. $M = 3.51$; $R = 2.77 \times 10^6$.

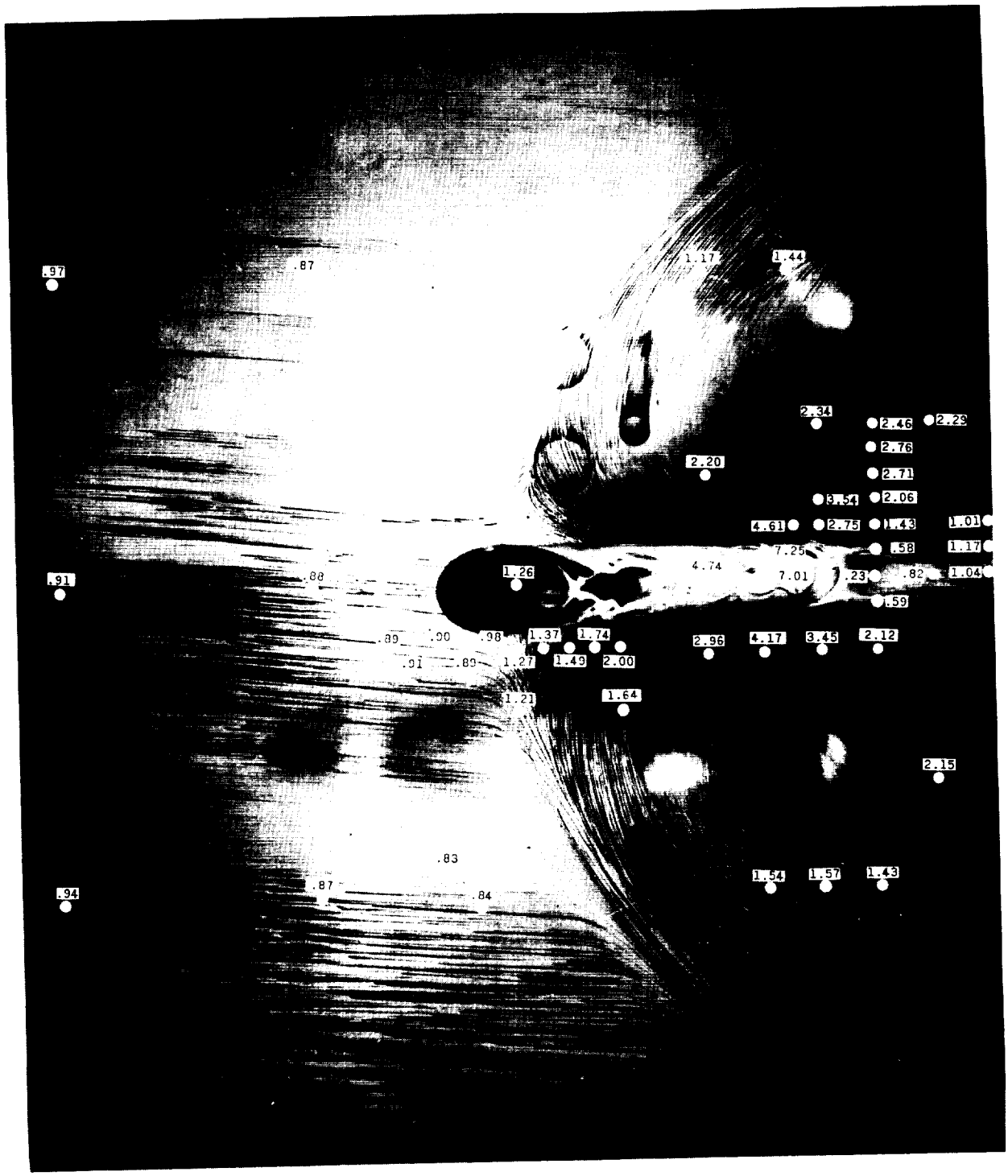


(b) Effect of Reynolds number along center line. $M = 3.51$.



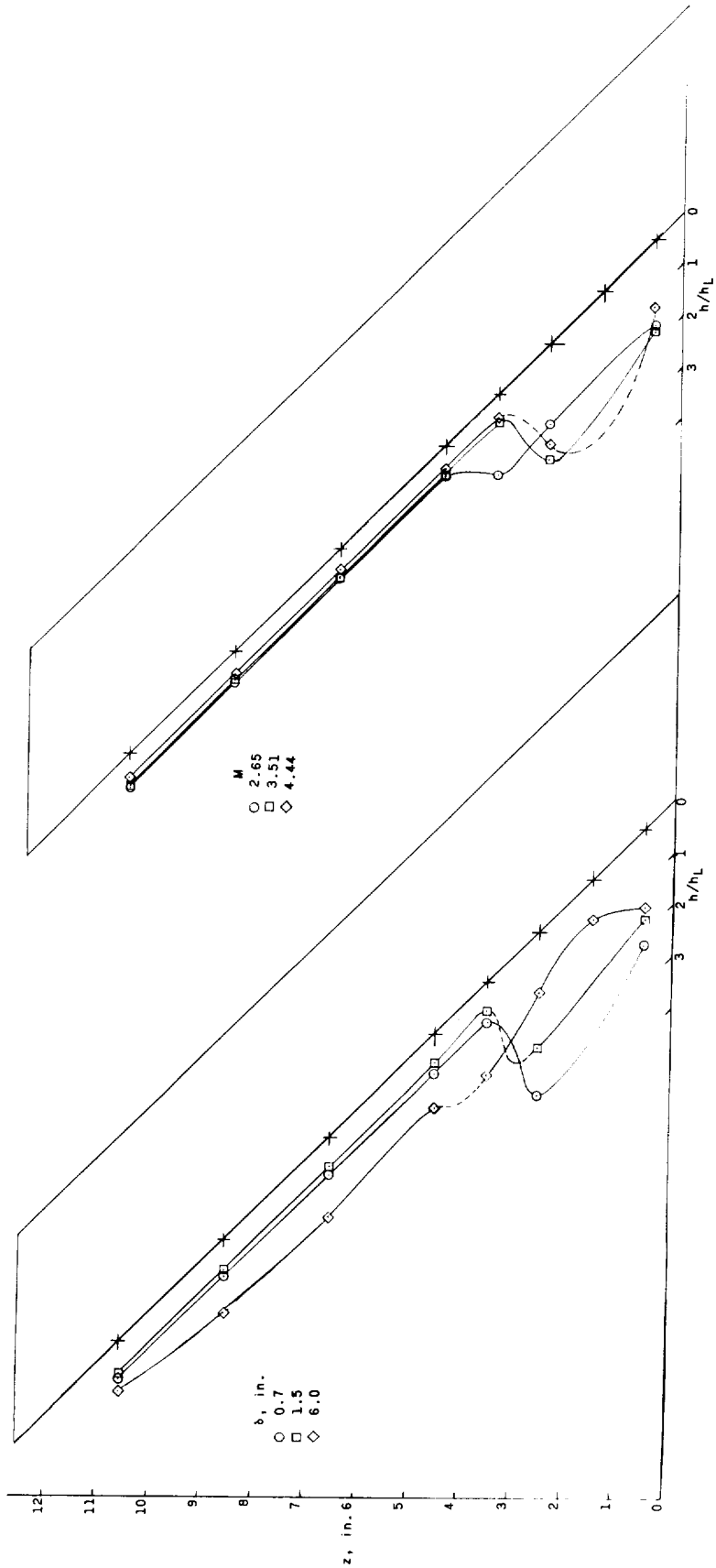
(c) Effect of Mach number along center line. $R \approx 3.00 \times 10^6$.

Figure 66.- Flat-plate heat-transfer ratio for a 2.8-inch-diameter cylinder swept forward 45°. $\delta = 6.00$ inches.



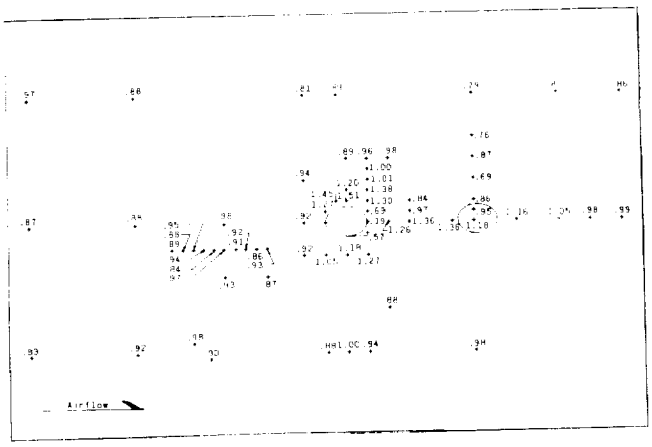
L-62-2107

Figure 67.- Correlation of heat-transfer ratios and oil-flow patterns for a 2.8-inch-diameter cylinder swept forward 45°. M = 3.51; R ≈ 3.00 × 10^6.

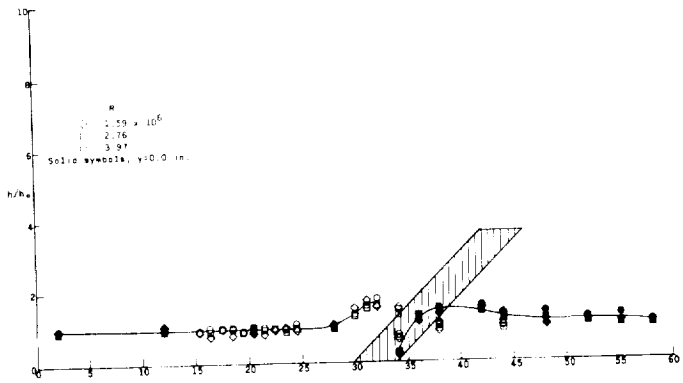


(a) Effect of boundary layer; M = 3.51. (b) Effect of Mach number; δ = 1.5.

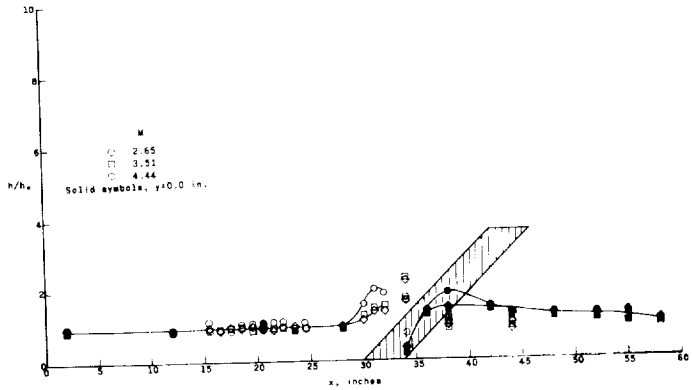
Figure 68.- Ratio of experimental to theoretical heat-transfer coefficients along the stagnation line of a 2.8-inch-diameter cylinder swept forward 45°. R ≈ 3.00 × 10⁶.



(a) Lines of constant h/h_o. M = 3.51; R = 2.76×10^6.

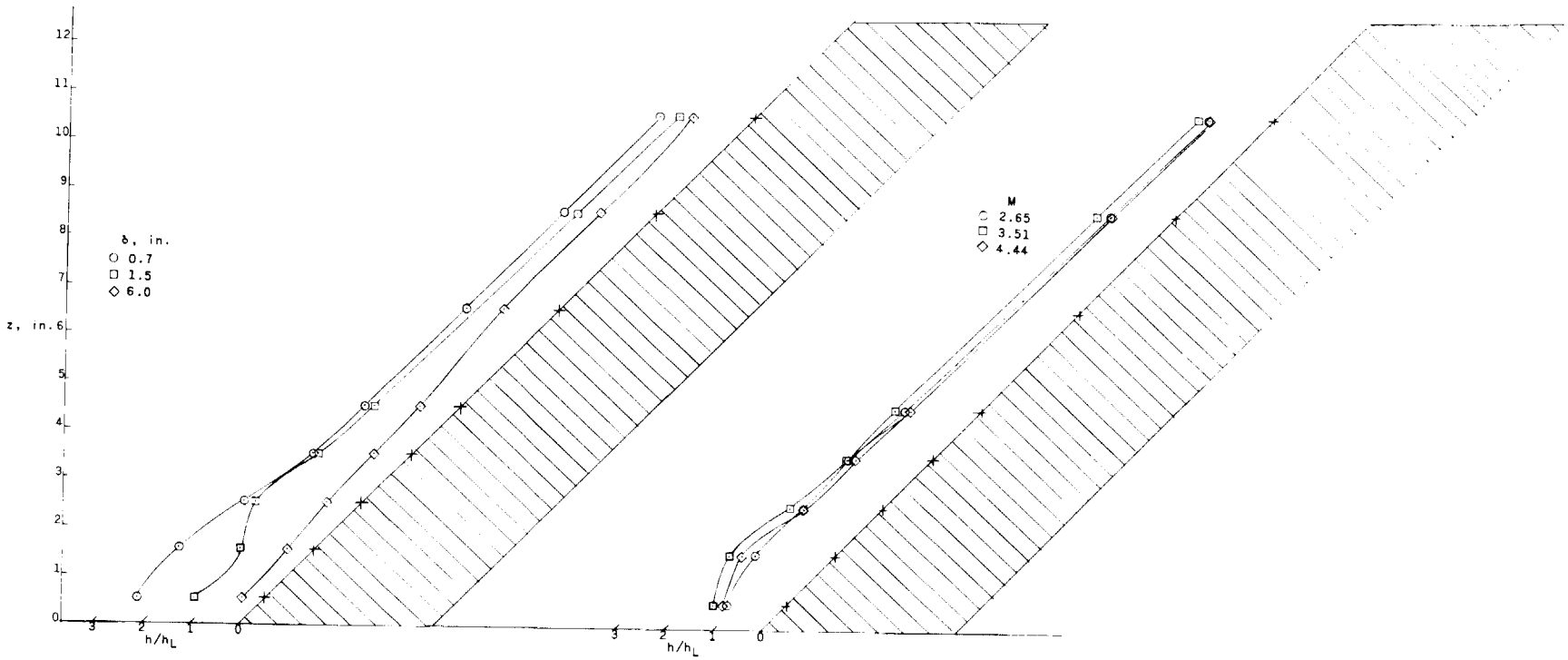


(b) Effect of Reynolds number along center line. M = 3.51.



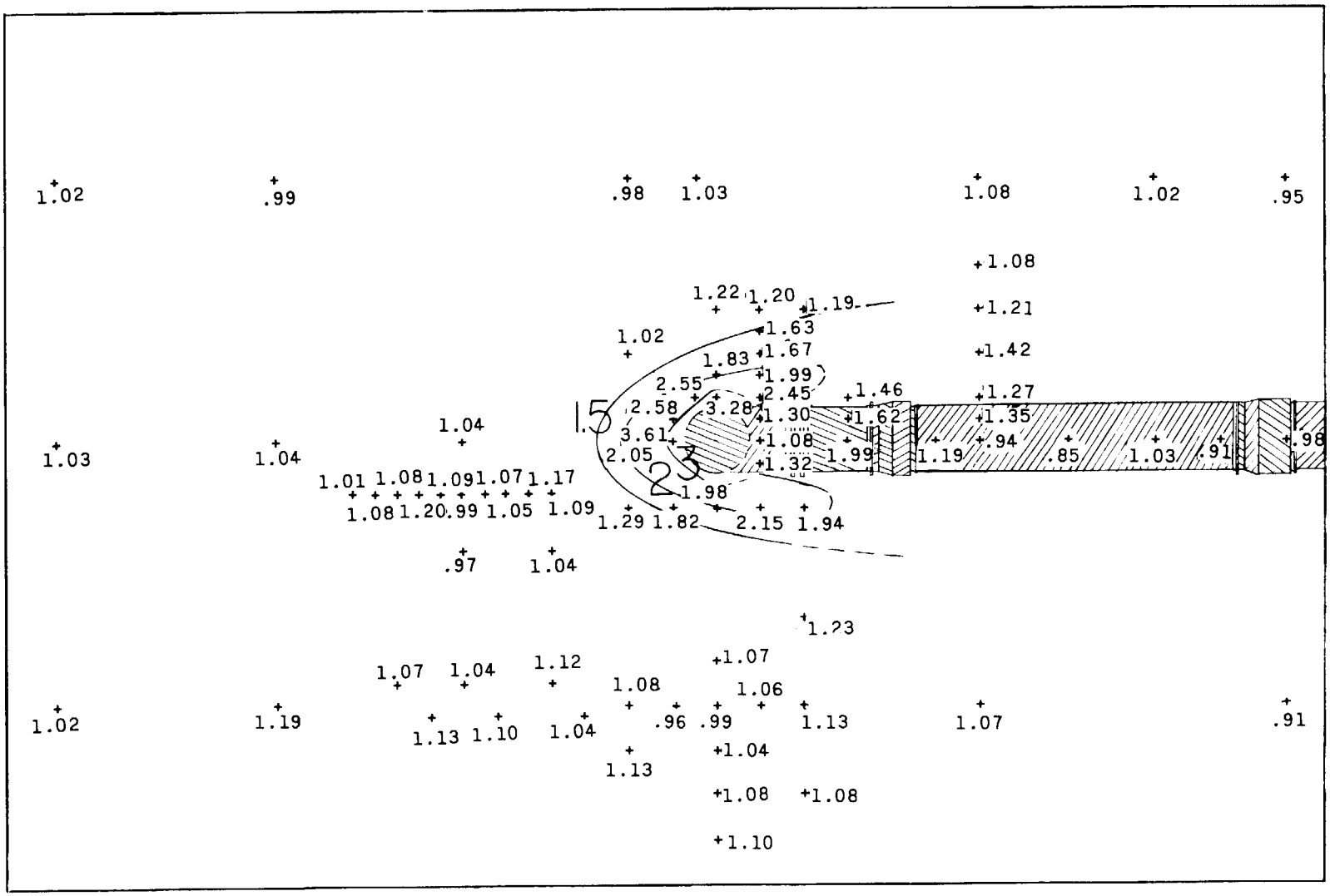
(c) Effect of Mach number along center line. R $\approx 3.00 \times 10^6$.

Figure 69.- Flat-plate heat-transfer ratio for a 2.8-inch-diameter cylinder swept back 45°. δ = 6.00 inches.



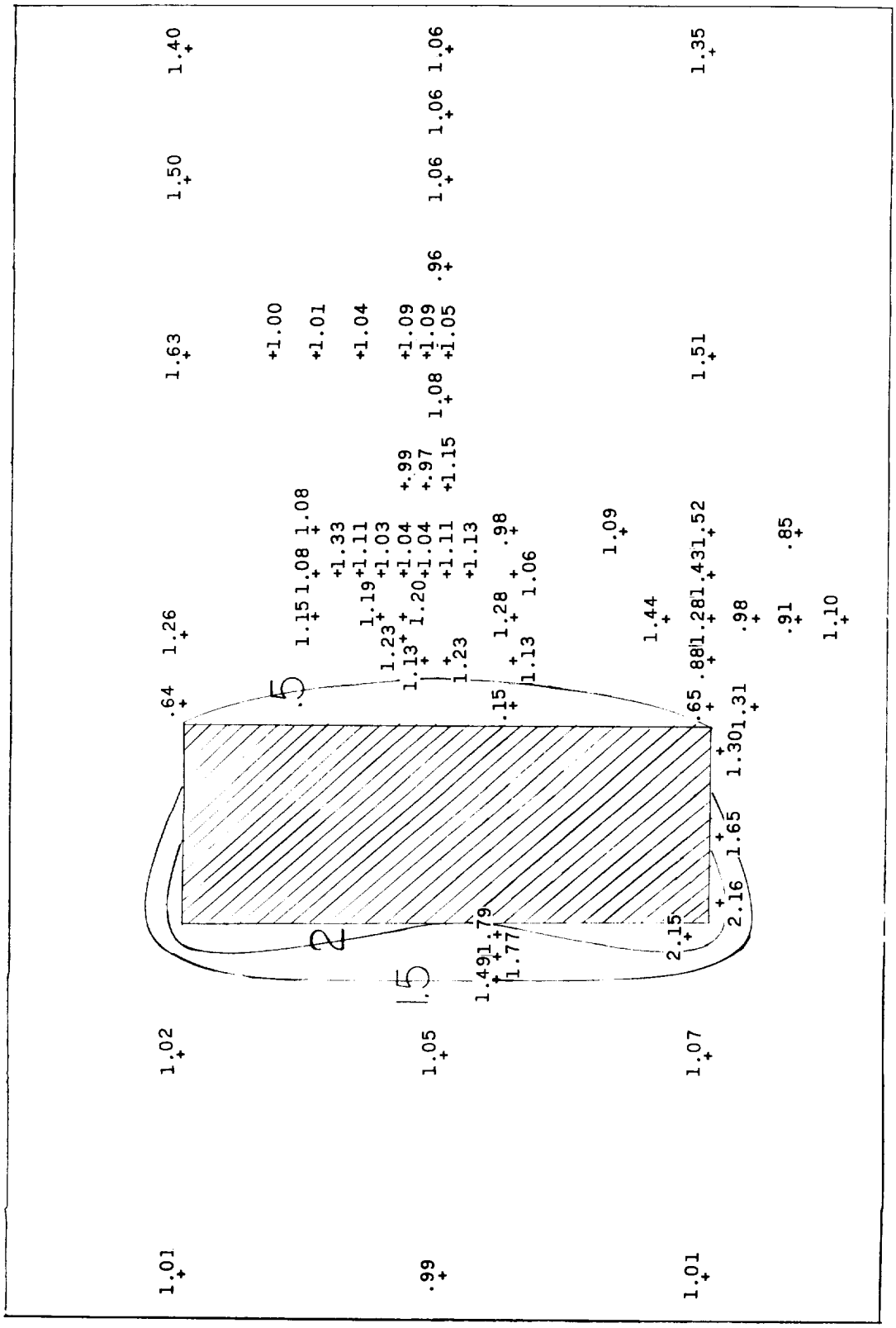
(a) Effect of boundary layer; M = 3.51. (b) Effect of Mach number; δ = 1.50 inches.

Figure 70.- Ratio of experimental to theoretical heat-transfer coefficients along the stagnation line of a 2.8-inch-diameter cylinder swept back 45°. $R \approx 3.00 \times 10^6$.



(c) Lox line.

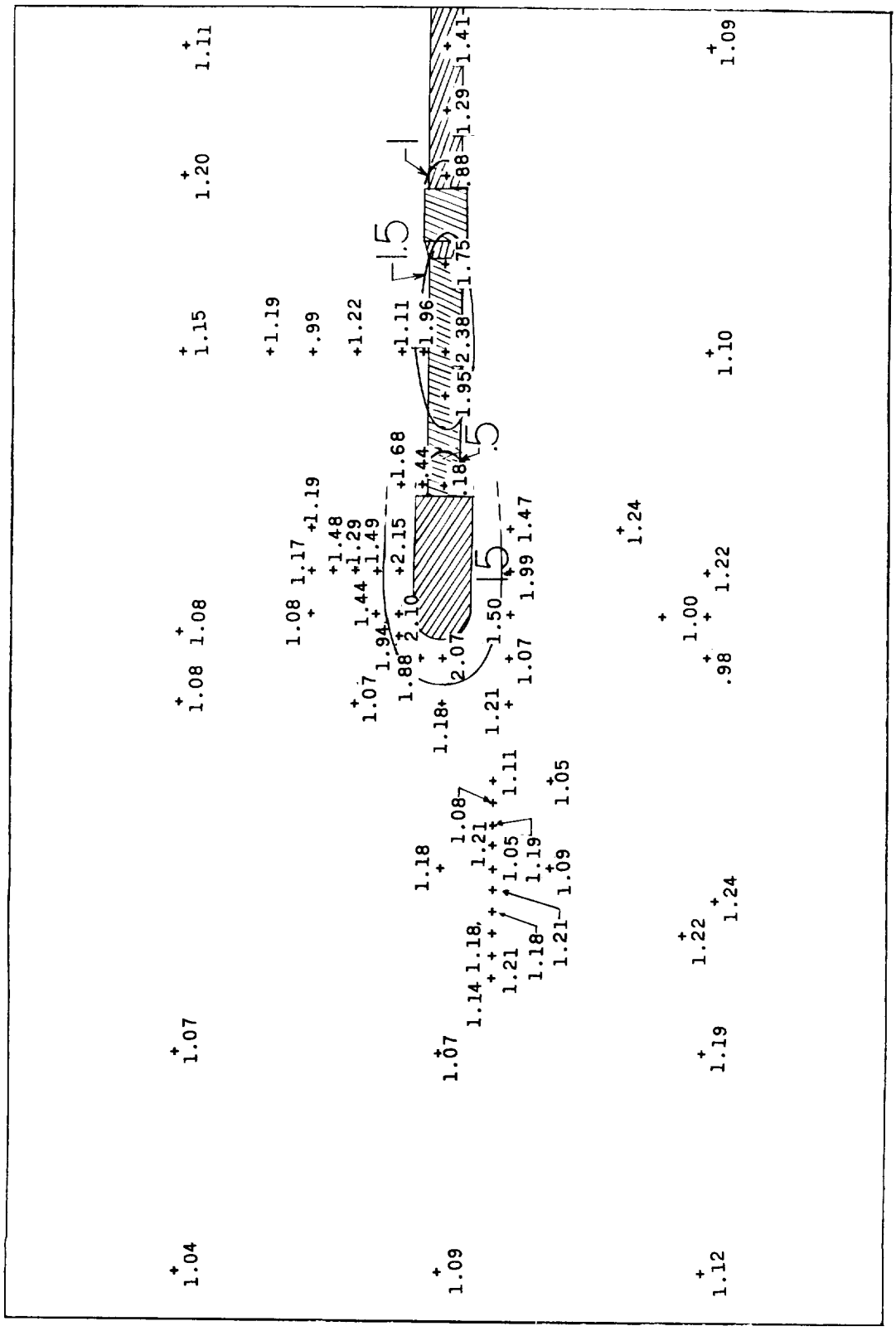
Figure 71.- Continued.



(d) Cableway.

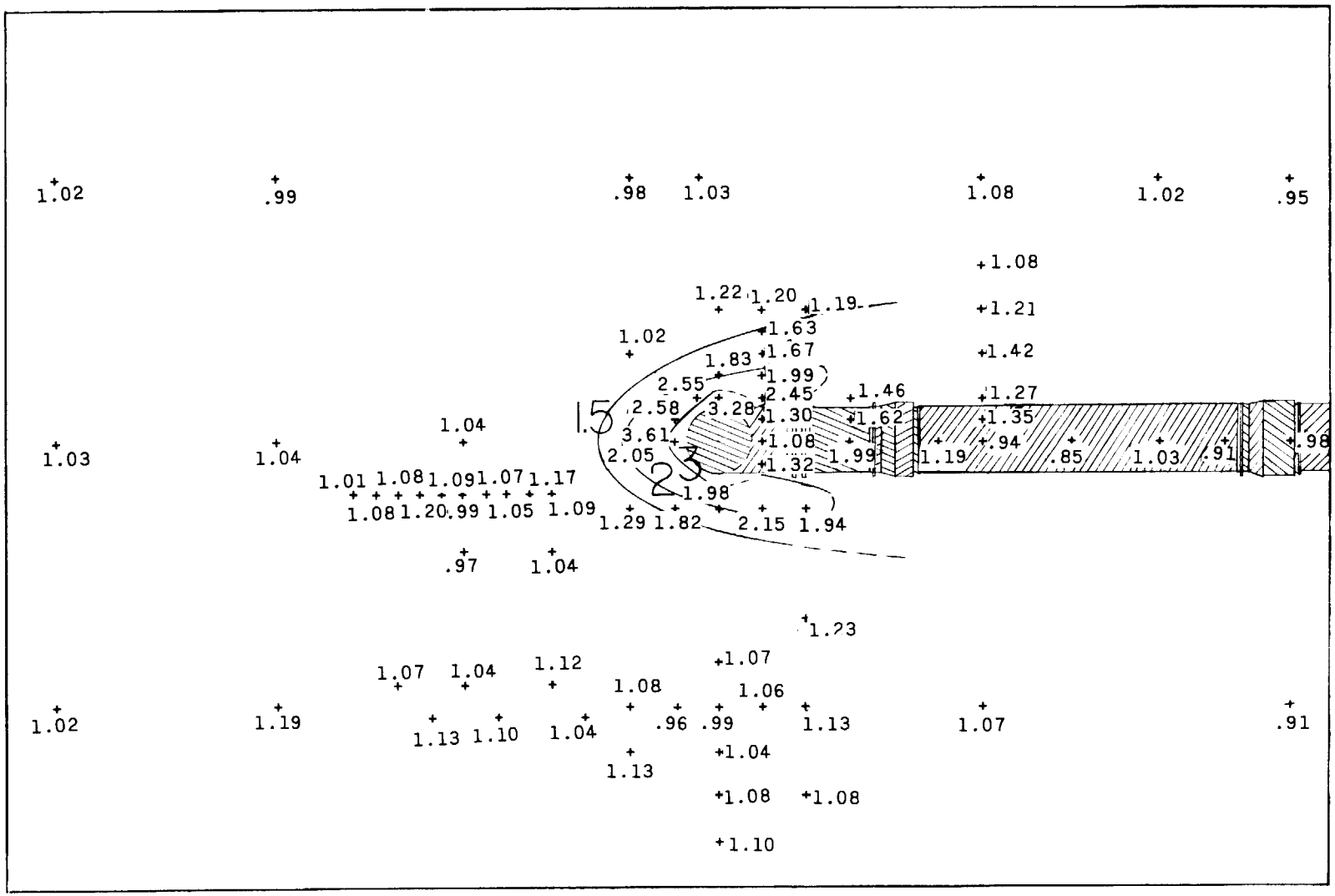
Figure 71.- Concluded.

L-2024



(b) 45° fairing.

Figure 71.- Continued.



(c) Lox line.

Figure 71.- Continued.