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SINGLE STAGE EXPERIMENTAL EVALUATION OF HIGH MACH NUMBER COMPRESSOR ROTOR BLADING PART 2 - PERFORMANCE OF ROTOR 1B

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SINGLE STAGE EXPERIMENTAL EVALUATION OF HIGH MACH NUMBER COMPRESSOR ROTOR BLADING

PART 2 - PERFORMANCE OF ROTOR 1B

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ABSTRACT

A 1400 foot per second tip speed rotor with a 0.5 hub-tip radius ratio, designed to deliver a total pressure ratio of 1.60 and a rotor adiabatic efficiency of 0.858 at a flow of 215.49 lbs/sec, was tested with and without inlet distortion. A rotor total-pressure ratio of 1.638 and an adiabatic efficiency of 0.895 at a flow of 219.2 lbs/sec were actually achieved.

SUMMARY

A 1400 foot per second tip speed rotor, designed to have a diffusion factor of 0.35 at the tip, was tested both with an undistorted inlet flow and with circumferential and radial distortions. The tip element was composed of two circular-arc sections; the curvature of the forward section was the minimum consistent with flow choking limitations. This type of tip shape was smoothly blended into a double-circular-arc shape at approximately the 60% span location. The hub-tip radius ratio at rotor inlet is 0.50. Neither inlet guide vanes nor a stator vane row were employed.

The rotor was designed to deliver a total-pressure ratio of 1.60 and a rotor adiabatic efficiency of 0.858 at a flow of 215.49 lbs/sec. A rotor total-pressure ratio of 1.638 and an adiabatic efficiency of 0.895 at a flow of 219.2 lbs/sec were actually achieved.

During running with an undistorted inlet, blade element data were obtained from measurements over a range of speeds from 50% to 110% design speed. Results of these blade element measurements were used to show the variation of deviation angle, diffusion factor and loss coefficient as a function of incidence angle. The rotor was also stalled at these speeds and overall performance data were obtained while in stall up to 100% speed. The stall type was rotating stall at all speeds.

The rotor was tested at three speeds with circumferential and with radial distortion screens installed. The screens were found to give a 20% distortion at 100% speed. Both distortions had a substantial effect on rotor performance. The points on the performance map at which the rotor stalled were also determined during distortion running.

INTRODUCTION

In the last fifteen years, the direction taken in the development of axial-flow compressors for use in aircraft propulsion engines has been toward increased blade speeds and increased stage loadings. The objective has been to advance in these areas without making a significant sacrifice in efficiency, and at the same time to increase ruggedness, reliability, and resistance to inlet flow distortion. The development of workable titanium alloys has made the use of tip speeds of 1400 feet per second and beyond mechanically practical and at such speeds blade relative Mach numbers are high enough so that the potential for high losses due to shocks exists. It is the purpose of the current experimental program to determine the total-pressure-ratio potential of such rotors and to obtain data that will aid in the selection of optimum blade proportions.

A new type of blade shape has been employed in which the camberline consists of two circular arcs that are mutually tangent at the point where they join. This point is directly across the flow passage from the leading edge of the adjacent blade that forms the other side of the flow passage. The front arc is identified as the supersonic arc, and the rear arc is identified as the subsonic arc. The term, camber ratio, refers to the ratio of the camber of the supersonic arc to the total camber. Blade elements developed in this way are called multiple-circular-arc elements.

Rotor 1B, the first of a series of four medium-aspect-ratio rotors, is designed for a tip diffusion factor of 0.35. The other three blade rows were designed for a tip diffusion factor of 0.45 and tip camber ratios varying between 0 and 0.65- the latter being the value corresponding to a double-circular-arc blade. All rotors have double-circular-arc elements from the hub outboard to approximately the 60%-span location.

This report presents results of tests on Rotor 1B, with uniform inlet flow and with radial and circumferential distortion of inlet flow. Details of the design of Rotor 1B and the other rotors to be evaluated in this test series are given in reference 1.

SYMBOLS

The following symbols are used in this report:

A flow area, in^2

A_j area represented by each discharge rake element. This is the area of an annulus bounded either by radii midway between those of two adjacent elements or by the hub or casing, in^2

a distance along chord line to position where maximum perpendicular displacement between camberline and chord line occurs, in

C_h enthalpy-equivalent static-pressure-rise coefficient,

$$C_h = \frac{2gJc_p t_1 \left[\left(\frac{p_2}{p_1} \right)^{\frac{\gamma-1}{\gamma}} - 1 \right] - (U_2^2 - U_1^2)}{V_1'^2}$$

C_p static-pressure-rise coefficient, $C_p = \frac{p_2 - p_1}{P_1' - p_1}$

c blade chord length, in

c_p specific heat at constant pressure, Btu/lb-°R

D diffusion factor,

$$D = 1 - \frac{V_2'}{V_1'} + \frac{r_2 V_{\theta 2} - r_1 V_{\theta 1}}{2\bar{r}\,\sigma V_1'}$$

g acceleration due to gravity, 32.174 ft/sec^2

i incidence angle, difference between air angle and camber line angle at leading edge in cascade projection, deg

$\vec{i}_\kappa$ unit vector in direction of intersection of axisymmetric stream surface and blade mean surface

J mechanical equivalent of heat, 778.161 ft-lb/Btu

M Mach number

P total or stagnation pressure, psia

P_{in} compressor inlet average total pressure, psia

P_j arithmetic average total pressure at j immersion, psia

P_{max} average total pressure in undistorted region, psia

P_{min} average total pressure in distorted region, psia

p static or stream pressure, psia

r radius, in

$\bar{r}$ mean radius, average of streamline leading-edge and trailing-edge radii, in

T	total or stagnation temperature, °R
T_j	arithmetic average total temperature at j immersion, °R
t	static or stream temperature, °R
t	blade thickness, in
t_e	blade edge thickness, in
t_m	blade maximum thickness, in
U	rotor speed, ft/sec
V	air velocity, ft/sec
V_{zj}	average axial velocity at j immersion, ft/sec
w	weight flow, lb/sec
Z	displacement along compressor axis, in
β	air angle, angle whose tangent is the ratio of tangential to axial velocity, deg
γ	ratio of specific heats
$\gamma°$	blade-chord angle, angle in cascade projection between blade chord and axial direction, deg
δ	ratio:- $\frac{\text{total pressure}}{\text{standard pressure}}, \frac{\text{psia}}{14.696 \text{ psia}}$
$\delta°$	deviation angle, difference between air angle and camber line angle at trailing edge in cascade projection, deg
$\varepsilon°$	meridional angle, angle between tangent to streamline projected on meridional plane and axial direction, deg
θ	ratio: - $\frac{\text{total temperature}}{\text{standard temperature}}, \frac{°R}{518.688°R}$
$\theta°$	angular displacement about compressor axis, deg
η	efficiency
$\kappa°$	angle between cylindrical projection of $\vec{i}_\kappa$ and axial direction, deg
ρ	static or stream density, lb-sec^2/ft^4

ϕ°	camber angle, difference between angles, in cascade projection, of tangents to camberline at extremes of camberline arc, deg
σ	solidity, ratio of chord to spacing
ψ	stream function; $\psi_h = 0$, $\psi_c = 1$
ω	total-pressure-loss coefficient

Subscripts:

a	point on camber line where maximum camber line rise occurs
ad	adiabatic
an	annulus value
avg	arithmetic average at any plane
c	tip or casing at any plane
d	downstream
e	equivalent two-dimensional cascade
h	hub at any plane
j	immersion number
m	meridional direction
p	polytropic
s	suction surface
t	tip at rotor leading edge plane
t	total when referring to blade element
u	upstream
z	with respect to axial displacement
θ	with respect to meridional displacement
1	leading edge
2	trailing edge

0.05, 0.86, 0.95, 1.51, 1.57, 2.0 instrumentation plane designations (fig. 5)

Superscripts:

* critical flow condition

' relative to rotor

APPARATUS AND PROCEDURE

Test Rotor

The design of the rotor used in this test investigation is presented in reference 1 in which it is identified as Rotor 1B. The rotor was designed for a corrected weight flow per unit frontal area of 29.66 lbs/sec per square foot. With the selected rotor tip diameter of 36.5 inches and the hub-tip radius ratio of 0.50, the design corrected weight flow is 215.49 lbs/sec. The selection of a rotor tip solidity of 1.3, a diffusion factor of 0.35, zero inlet swirl, a rotor tip speed of 1400 ft/sec, and an axial velocity ratio of 0.91 permitted the calculation of the change in angular momentum across the rotor at the rotor tip. This change in angular momentum, with a suitable rotor total-pressure-loss coefficient derived from the NASA method of references 3 and 4, resulted in a design rotor total-pressure ratio of 1.60. The design total-pressure ratio was held constant radially. Because the loss correlation resulted in radially varying losses, a radial variation of the change in angular momentum was used in the design vector diagram calculations.

Double-circular-arc blade sections were used in the cascade projection* along the radial height of the blade between the hub and a point approximately 60 per cent of the span away from the hub. Multiple-circular-arc sections were used in the remaining portion of the blade. As described in reference 1, a multiple-circular-arc blade element has its camber line, pressure surface, and suction surface each made up of two circular arcs mutually tangent at their junction point. The tip blade element for Rotor 1B was selected to have the minimum amount of camber in the supersonic or uncovered portion of the blade which was consistent with flow choking limitations.

Tabulations of the blade design data appear in table 1. A view of a portion of the assembled rotor appears in figure 1. This photograph was taken before the assembly was tip ground to the final contour; therefore the picture of the multiple-circular-arc tip blade element is not quite precise.

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*As described in reference 1, the cascade projection is obtained by viewing the intersection of a blade and an axisymmetric stream surface in the radial direction. The justification for the use of this projection is given in reference 2.

After manufacture, the blading was inspected by means of contour layouts at several sections. For this rotor blade five of the twelve manufacturing sections along the blade height were inspected for ten blades selected at random from the batch. A meridional view of the rotor appears in figure 2 and the inspected sections are identified by asterisks. At each manufacturing section the average of these ten blades was obtained and was compared with the design intent. The results of the comparisons appear in figures 3(a) through 3(e). It is judged that the blading was adequate to achieve design intent.

The average running tip clearance at 100% speed was 0.037 inches.

Test Facility

Performance tests of this rotor were made in General Electric's House Compressor Test Facility, at Lynn, Massachusetts. The general aspects of the test set-up are shown in figure 4. The test rotor draws air from the atmosphere through two banks of filters. The first filter bank is intended to remove 22% of the particles larger than 3-5 microns (dust spot test). The second and final filter bank is intended to remove 90-95% of the remaining particles down to the same size. The air then passes through a coarse wire inlet screen and into the bell-mouth. The flow straightener described in reference 1 appears just downstream of the bell-mouth. An area contraction of 2.24 occurs between the flow straightener exit and the inlet face of the test rotor. Downstream of the test rotor, outlet guide vanes are used to remove most of the swirl. In the exit assembly the air is split into two streams. The inner air stream is passed into an exit pipe containing a flow straightener and a venturi flow meter and then exhausted to atmosphere. The outer air stream passes through a slide cylindrical throttle valve and into a collector, then into pipes, each of which contains a flow straightener and a venturi flow meter, and is finally discharged to atmosphere.

Power to drive the test rotor is provided by a high-pressure non-condensing steam turbine rated at 15,000 horsepower.

Instrumentation

Inlet conditions were measured by 24 thermocouples distributed on the inlet screen and by 6 pitot-static rakes each of 7 elements (placed radially at centers of equal annulus area) located at plane 0.05 (14" downstream of the flow straightener). Traverse probes used for recording blade element data at plane 1.51 (the rotor exit station, figure 5) were immersed to the five standard radial positions corresponding to 10%, 30%, 50%, 70% and 90% of the annulus height at that location. Immersions at each other instrumentation plane upstream and downstream of the rotor were established to correspond to the radial locations at which design streamlines passing through the selected immersions at the rotor exit plane intersected the instrumentation plane. A generous number of static pressure taps were located on the casing and hub throughout the flow path. At measuring

planes where the traverse probes or rakes were located, static pressures at the hub and casing were measured at more than one circumferential location (fig. 6); otherwise static pressures on the walls were measured at one circumferential location. A multi-pronged boundary layer rake was located at plane 0.86. The general construction features of the fixed rakes and traverse probes are shown in figures 7 and 8. The thermocouple rakes, cobra probes, and static pressure wedge probes were calibrated for Mach number effects and these calibrations were used in the data reduction calculations. Pressures and temperatures measured by these probes were sufficiently insensitive to small pitch and yaw angle variations to justify the omission of corrections for these angles.

General Test Procedure

The following test sequence was followed in general during the testing of this rotor. With the throttle valve set to deliver approximately the design total-pressure ratio at 100% corrected speed, data were recorded from fixed instrumentation at 50%, 70%, 90%, 100% and 110% corrected speeds. (When only fixed-instrumentation measurements are taken, the data readings are termed green readings). The test rotor was returned to 50% corrected speed and the throttle valve closed until the limit of stall-free operation was achieved. With the throttle re-set so that the vehicle operated as close to stall as feasible, blade element data and a green reading were obtained. Additional blade element and green readings were taken at each speed over the remaining portion of stall-free operation up to the maximum facility flow capacity. The radial distortion screens described in reference 1 were then installed and green readings were recorded at 50%, 70% and 100% corrected speeds. Circumferential distortion screens were next installed and green readings were obtained at the same three corrected speeds as were used in radial distortion testing. Finally, with the distortion screens removed, green readings and hot-wire data were obtained in the stall region with the throttle valve closed to the setting where stall-free operation terminated.

Testing in the Unstalled Region

For all speeds the throttle positions at which data were recorded in the stall free region of operation were generally selected to give the closest spacing of the points on the map at those places where curvature of the speed line was greatest. At low speeds this led to a relatively even spacing whereas at higher speeds the throttle positions were concentrated in the higher pressure ratio region where incidence variations occur.

At the rotor inlet traverse location, the static pressure wedge was set to zero flow direction and the cobra probe was allowed to seek its nulled position. At the rotor exit traverse location the static pressure wedge was manually rotated to the angle orientation established by the nulled position of the cobra probe; since stationary vane rows and struts were relatively far removed from this plane, circumferential variations of angle

were presumed to be sufficiently small not to affect the pressure read by the wedge static probe. Probe immersion indicators and the probe aerodynamic parameters were connected to conventional X-Y plotting equipment. In general, continuous traverses were only recorded for the rotor exit flow angle; these were used to give an indication of the radial extent of the part span shroud wake. Recording of data from the traversing probes at the standard immersions was achieved by means of a digitized read-out on punched paper tape, as was also the case for the recording of data from fixed instrumentation.

Stall Testing Without Inlet Distortion

Rotating stalls were encountered, on closing the throttle valve, at all speeds. The rotor was stalled twice at each speed, the limit of stall free operation being established by closing the throttle valve slowly until performance and stress changes were noted. For the first stall at each speed the three traverse hot-wire anemometer probes were immersed at the 10%, 50% and 70% immersions. In this way a knowledge of the radial extent of the rotating stall cells was gained. For the second stall the hot wire anemometer probes were all set at the 10% immersion so that information was obtained from which the speed and number of rotating stall cells could be deduced.

Inlet Distortion Testing

The distortion screens were installed at the axial location shown in figure 5. The radial screen covered the outer 40% of the annulus and the circumferential screen covered a 90° arc. Both screens had a 0.016" wire diameter on a 20 mesh. The distortion screens were supported by a coarse screen consisting of wires of 0.092" diameter, spaced three quarters of an inch apart. The circumferential distortion screen and its support are shown in figure 9.

The total pressure at the rotor inlet was measured with four distortion rakes at plane 0.86. Blade element data were not obtained during the distortion tests, and hot wire data were limited to that amount necessary to obtain a qualitative indication of the stall type. The point of stall initiation was accurately determined, however.

RESULTS AND DISCUSSION

For the early portion of the testing of this rotor only the outer "coarse" filters were in place in the inlet of the facility (fig. 4). After some testing time had been invested, deterioration of rotor performance was observed. Examination of the blading showed an accumulation of dirt in the leading edge region of the blade suction surface. As a result of this discovery the blades were cleaned and an additional set of filters was installed. Subsequent testing revealed that the dirt problem had been solved and the following discussion will refer mainly to testing done with both sets of filters installed.

Overall Performance

The compressor map for operation of the test rotor with uniform inlet flow (that is without inlet distortion screens) is shown in figure 10. The inlet total-temperature level was established as the arithmetic average of 24 inlet temperatures measured in the low velocity region at the facility inlet screen (fig. 4). The rotor exit total-temperature and total-pressure ratio were established on the basis of fixed probe readings by a mass weighting routine, as follows : At each immersion, measurements from all circumferential locations were arithmetically averaged. The static pressure was assumed to vary linearly from hub to casing based on the measured average hub and casing values. With static pressure, total pressure, and total temperature known, static density and absolute velocity were computed at each immersion. The tangential velocity was obtained from the total-temperature rise and the Euler turbomachinery equation, and this, together with the absolute velocity and the design meridional streamline angle, gave the axial velocity. The discharge total-temperature and total-pressure ratio were then obtained from the following equations:

$$T = \frac{\sum_{j=1}^{5} T_j \rho_j V_{zj} A_j}{\sum_{j=1}^{5} \rho_j V_{zj} A_j} , \tag{1}$$

$$\frac{P}{P_{in}} = \left\{ \frac{\sum_{j=1}^{5} \left[\left(\frac{P_j}{P_{in}} \right)^{\frac{\gamma-1}{\gamma}} - 1 \right] \rho_j V_{zj} A_j}{\sum_{j=1}^{5} \rho_j V_{zj} A_j} + 1 \right\}^{\frac{\gamma}{\gamma-1}} . \tag{2}$$

These quantities were used with the real gas properties of dry air to compute the rotor adiabatic and polytropic efficiencies.

The corrected weight flow was obtained from the calibrated venturi flow nozzles. At 50% corrected speed, and especially with the throttle valve closed so that a large portion of the facility exit flow passed through the center pipe (fig. 4), the measurements of flow obtained from the venturi flow nozzles proved to be unreliable. This occurred because the venturi pressure drop was so small for such cases (especially for the two nozzles in the stream that was throttled) that pressures were below the range of high accuracy for the measuring transducer. The bell mouth flow measurement was also found to be unreliable, primarily because of the small difference between the static and total pressures

in the pitot-static rakes. The integrated flow from the rotor inlet traverse probe gave the only reasonable indication of the flow at this speed. An accurate flow was obtained by plotting nozzle flows against integrated flows, drawing the best line through the points, and reading off the nozzle flow equivalent to the given integrated flow. Accordingly, the flow data presented at 50% speed in figure 10 are consistent with nozzle flows at other speeds.

The performance at 100% corrected speed, shown in figure 10, may be compared with design performance at the point of intersection of a line of constant throttle position passing through the design point and the 100% corrected speed line. A comparison made in this way reflects the fact that the rotor would operate in an engine system along an operating line that is approximated by a line of constant throttle position. The rotor was designed to deliver a total-pressure ratio of 1.60 and a rotor adiabatic efficiency of 0.858 at a flow of 215.49 lbs/sec. A total pressure ratio of 1.638 and a rotor adiabatic efficiency of 0.895 at 219.2 lbs/sec were actually achieved. These conditions occurred close to the maximum rotor efficiency point at 100% corrected speed. The maximum rotor adiabatic efficiency of 0.920 was achieved at 70% corrected speed.

A complete listing of the overall performance data (green readings) appears in table 2. For reading number 52 and the data thereafter both sets of filters were installed in the House Compressor Test Facility. A number of readings, especially at 100% corrected speed, were repeated in order to obtain a history of the performance over the period of testing time. On the basis of these measurements it appears that the performance deterioration, which was associated with the accumulation of dirt during earlier testing, was no longer present after the second set of filters was installed. Readings taken when dirt may have been present on the blading have not been included in figure 10. Of the several readings listed at 100% at the throttle setting near design point, only the three showing the greatest scatter in efficiency are plotted.

Stall Performance

The throttle position representing the limit of stall-free performance of the rotor as the throttle is closed was recorded. With this information and performance data at throttle positions close to the stall throttle position it is possible to extrapolate each speed line on the compressor map to the limit of stall free operation. The stall line determined in this manner is shown in figure 10. The overall performance measurements, recorded while the rotor was operating with stall present, appear as solid symbols in figure 10. Since the flow was quite unsteady for these readings their accuracy is open to question.

Samples of the hot-wire anemometer data appear in figure 11. These are copies of Visicorder traces from the three anemometers. In figure 11(a) the anemometers are at immersions of 10%, 50% and 70%. A study of such traces gives an indication of the radial extent of the stall cells. In figure 11(b) the anemometers are each at 10% immersion.

In order to establish the number and speed of the rotating stall cells, the phase difference between any two hot wires gives certain options and the use of a third anemometer eliminates all integral numbers except one. A knowledge of the paper speed of the trace and the number of cells permits deduction of the stall speed/rotor speed ratio. This method generally follows the method given in reference 5. Another method is available to check the number and speed of the rotating stall cells by utilizing the traces from a rotor strain gauge and a hot wire. The number of stall cells can be calculated by adding the number of pulses per unit time of the strain gauge and the hot wire and dividing the total by the number of rotor revolutions for the same unit of time. The ratio of stall speed to rotor speed is calculated by dividing the number of pulses per unit time on the hot-wire trace by the product of the rotor revolutions per unit time and the number of stall cells. The number and speed of the rotating stall cells determined by both methods were in good agreement. These data and other stalling performance information are presented in figure 11(c).

Blade Element Performance

For presentation of the data from traverse probes located upstream and downstream of the rotor, a method of adjusting the data to obtain conditions at the blade edges was used. Knowing the measured total pressure, total temperature, static pressure and flow angle at each immersion and using the design meridional streamline angle, the meridional Mach number and all velocity components at each measurement plane may be calculated. Application of the condition of constant angular momentum along design streamlines yields the tangential velocity at each blade edge. It is assumed that the shape of each meridional stream tube, between a measurement plane and its adjacent blade edge, remains fixed at the design shape for all data conditions. The meridional Mach number at a measurement plane may then be used to determine the meridional Mach number at the blade edge by use of the relationship shown in figure 12. This method is not strictly correct at the trailing edge where there may be an appreciable swirl velocity together with a change in radius between the edge and the measurement plane. Nevertheless, since the radius changes are not large, the method should be a very good approximation. With the tangential velocities and the meridional Mach numbers at the edges thus obtained, and with measured stagnation conditions assumed to be constant along the design streamlines, the velocities, Mach numbers, and all of their components may be determined at the blade edges. The constant physical quantities used in these computations, at the measurement planes and at the edges, are given in table 3.

In order to check out this procedure and to determine small differences due to calculation technique, design values of total pressure, total temperature, static pressure and flow angle were used in a sample calculation. Treating this information as though it were test data, the calculation routine was used to give design point blade element performance, yielding the data

listed in table 4. Table 5 is included to give a more complete description of the abbreviations used. Some indication of the small differences which can occur is given in table 4 by the comparison of the integrated flows, at the upstream and downstream measurement planes, with the nozzle flow. In this case the nozzle flow was set equal to the design flow.

Complete listings of blade element data are given in table 6 and graphs of some blade element data, plotted as a function of incidence angle, are presented in figure 13.

Measurements of discharge stagnation temperature taken from the fixed instrumentation were judged to be more reliable than those from the cobra traversing probes. Efficiency, loss coefficient and loss parameter were therefore processed by separate computation, using fixed instrumentation stagnation temperatures and pressures in conjunction with the inlet relative Mach number obtained from the traverse probe data. The results of this computation are given as an addition in table 6 and loss coefficients obtained in this way are shown in figure 13.

Figure 14 illustrates the effect of throttle valve setting upon two rotor exit angle traverses at 90% speed. It is clearly seen that, as the rotor is throttled toward stall, the part-span shroud wake moves radially outward. In general, the reading at the center immersion is affected most by the part-span shroud wake when the throttle is open.

The radial variations of total pressure, total temperature, flow angle and adiabatic efficiency, obtained from a continuous cobra traverse taken at approximately the peak efficiency point of the 100% speed line during reading 60, are presented in figure 15.

Inlet Distortion Performance

Measurements which yielded the overall performance, with radial and circumferential distortion screens in place, are presented in the form of compressor maps in figure 16. It is evident that both distortions had a substantial influence on rotor performance.

In order to compute the total pressure ratio, with distortion screens present in the vehicle, the inlet pressure was taken as the arithmetic average of the twenty pressures from the inlet distortion rakes at plane 0.86 (figs. 5 and 6) and the discharge pressure was obtained from equation (2) as with undistorted inlet testing. Likewise, temperatures were obtained as with undistorted inlet testing, using equation (1) at discharge. Although the mass-weighting of discharge quantities, using equations (1) and (2), cannot really be justified for a circumferential distortion, the method was judged to be as good as any other that could be easily applied with the available data; the method was therefore retained for consistency.

Data are presented in figure 17(a) to indicate the radial profile and

circumferential variations of inlet total pressure, exit total pressure and exit total temperature for 100% corrected speed with radial distortion. Similar data are presented in figure 17(b) for 100% corrected speed with circumferential distortion.

Initial calculations, using the maximum and minimum pressures from the inlet distortion rakes, yielded values of distortion parameter considerably in excess of those expected on the basis of design calculations (ref. 1). Examination of the inlet distortion rake data from 100% corrected speed, such as in figure 17, shows that the minimum and maximum values of pressure are not typical of the average values in the distorted and undistorted regions of the flow at rotor inlet. In figure 18 data are presented from the boundary layer rake for a typical clean inlet reading and a typical distortion screen reading at 100% corrected speed. Evidence of pressure variations, corresponding to the pitch of the inlet distortion support screen, appears for the inlet distortion data readings. Pressure losses of this magnitude seem at first to be unreasonably large. Reference 6 was re-examined and the screen loss data showed that, for the solidity of the support screen and at the appropriate Mach number for 100% corrected speed, it is likely that the support screen was choked. This examination is offered in support of the strong observed pressure variations associated with the pitch of the support screen. Accordingly it is unreasonable to use the maximum and minimum pressures from the inlet distortion probes to calculate distortion parameters. When the average pressures in the distorted and undistorted region of the rotor inlet are used, at 100% speed, a value of about 0.20 is calculated for the distortion parameter, $\frac{P_{max} - P_{min}}{P_{max}}$.

Rotating stall was encountered upon closing the throttle valve and traces were obtained with hot wires at 10%, 50% and 70% immersions. With radial distortion the stall cells appeared to be qualitatively similar to those encountered during undistorted inlet running. Distinct stall cells were not maintained during running with circumferential distortion at 100% speed. At the lower speeds a stall cell pattern appeared, primarily at the 50% immersion.

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6. Cornell, W.G.: ASME Paper No. 57-F-19, ASME Transactions, Vol. 80, #4, pp. 791-799.

Table 1. - Cascade Projection Data for Rotor 1B Blade Setting

ψ	$\frac{r_1}{r_t}$	β_1'	i	κ_1'	$\kappa_{s1}'-\kappa_1'$	$\frac{t_{e1}}{c_t}$
1.0	.9955	65.13	3.25	61.88	2.46	.0060
.9	.9586	63.74	3.68	60.06	2.91	.0063
.8	.9202	62.57	4.10	58.47	3.41	.0066
.7	.8807	61.48	4.54	56.94	4.03	.0069
.6	.8388	60.36	4.99	55.37	4.75	.0072
.5	.7947	59.29	5.48	53.81	5.47	.0076
.4	.7473	57.88	5.88	52.00	5.98	.0080
.3	.6963	56.50	6.02	50.48	6.51	.0084
.2	.6404	55.12	6.06	49.06	7.02	.0089
.1	.5768	53.74	6.22	47.52	7.54	.0094
0	.5000	52.39	7.08	45.31	8.02	.0100

ψ	$\frac{r_2}{r_t}$	β_2'	$\delta°$	κ_2'	β_{2e}'	$\frac{t_{e2}}{c_t}$
1.0	.9804	58.63	3.70	54.93	56.77	.0058
.9	.9484	58.19	3.47	54.72	54.62	.0062
.8	.9135	57.08	3.55	53.53	52.36	.0065
.7	.8768	55.38	3.47	51.91	50.03	.0069
.6	.8385	53.10	3.41	49.69	47.29	.0072
.5	.7980	50.12	3.36	46.76	44.07	.0076
.4	.7547	46.21	3.95	42.26	39.96	.0080
.3	.7092	41.12	4.92	36.20	34.93	.0085
.2	.6607	34.57	6.22	28.35	28.32	.0090
.1	.6096	25.46	7.97	17.49	18.62	.0094
0	.5557	13.60	10.74	2.86	.37	.0100

ψ	$\frac{t_m}{c_t}$	$\gamma°$	$\frac{a}{c_t}$	σ	ϕ_t
1.0	.0350	60.77	.731	1.3062	6.95
.9	.0387	58.89	.696	1.3534	5.34
.8	.0425	57.07	.658	1.4075	4.94
.7	.0467	55.17	.616	1.4685	5.03
.6	.0509	52.94	.562	1.5387	5.68
.5	.0554	50.29	.500	1.6204	7.05
.4	.0604	47.13	.500	1.7183	9.74
.3	.0658	43.34	.500	1.8363	14.28
.2	.0714	38.71	.500	1.9836	20.71
.1	.0778	32.51	.500	2.1754	30.03
0	.0850	24.09	.500	2.4447	42.45

Table 2 - Overall Performance based on Fixed Instrumentation

Rdg.*	Total press. ratio	Rotor adia. eff.	Corrected weight flow lb/sec	Rotor speed, percent design	Throttle valve setting	Inlet dist.	Operating mode
3	1.429	.8510	207.54	91.98	13.0	None	Stall free
4	1.522	.8429	220.76	100.09	13.0	None	Stall free
5	1.612	.8047	230.59	109.93	13.0	None	Stall free
9	1.470	.8381	166.42	85.04	6.0	None	Stall free
10	1.574	.8755	191.17	91.91	8.0	None	Stall free
11	1.578	.8695	191.29	91.96	8.0	None	Stall free
13	1.834	.8460	228.66	110.02	10.0	None	Stall free
14	1.715	.8784	209.63	100.02	9.0	None	Stall free
15	1.546	.8975	199.42	92.15	9.5	None	Stall free
16	1.541	.8858	199.05	92.11	9.5	None	Stall free
17	1.123	.8291	106.86	50.00	14.0	Radial	Stall free
18	1.257	.8645	154.96	70.09	16.0	Radial	Stall free
19	1.567	.8216	212.30	100.06	17.5	Radial	Stall free
20	1.108	.8337	118.59	50.03	30.0	Radial	Stall free
21	1.119	.8360	110.28	50.06	17.0	Radial	Stall free
22	1.103	.8244	120.88	50.10	50.0	Radial	Stall free
23	1.114	.8761	115.50	49.91	22.0	Radial	Stall free
24	1.215	.8702	168.04	70.04	50.0	Radial	Stall free
25	1.226	.8693	165.11	70.08	30.0	Radial	Stall free
26	1.240	.8731	162.05	70.11	23.0	Radial	Stall free
27	1.251	.8641	158.32	70.14	19.0	Radial	Stall free
28	1.405	.7719	216.34	100.13	50.0	Radial	Stall free
29	1.479	.8048	215.87	100.16	25.0	Radial	Stall free
30	1.502	.8109	215.31	99.97	22.0	Radial	Stall free
31	1.540	.8153	213.46	100.03	19.0	Radial	Stall free
32	1.135	.8028	94.64	50.00	7.0	Circum.	Stall free
33	1.102	.8587	119.13	50.05	50.0	Circum.	Stall free
34	1.119	.8799	110.82	50.02	17.0	Circum.	Stall free
35	1.125	.8350	104.71	50.03	12.0	Circum.	Stall free
36	1.131	.8159	99.75	50.01	9.0	Circum.	Stall free
37	1.277	.8348	137.60	70.02	8.5	Circum.	Stall free
38	1.206	.8761	163.76	70.00	50.0	Circum.	Stall free
39	1.204	.8918	155.94	69.95	19.0	Circum.	Stall free
40	1.251	.8422	149.99	70.03	14.0	Circum.	Stall free
41	1.264	.8428	143.73	70.01	11.0	Circum.	Stall free
42	1.541	.8152	211.36	100.04	20.0	Circum.	Stall free
43	1.558	.8146	209.94	100.08	18.0	Circum.	Stall free
44	1.471	.8217	214.06	100.05	50.0	Circum.	Stall free
45	1.512	.8284	212.80	100.02	25.0	Circum.	Stall free
46	1.527	.8160	212.02	100.06	22.0	Circum.	Stall free
47	1.526	.8545	221.28	100.05	13.0	None	Stall free
48	1.615	.8726	216.98	100.02	11.0	None	Stall free
49	1.661	.8668	213.09	100.04	10.0	None	Stall free
50	1.678	.8635	210.90	100.07	9.5	None	Stall free
52T	1.636	.8915	219.38	100.08	11.0	None	Stall free
53	1.633	.8891	218.41	100.05	11.0	None	Stall free
54T	1.474	.8463	221.21	100.05	15.0	None	Stall free
55T	1.558	.8745	220.68	100.05	12.5	None	Stall free
56T	1.687	.8972	216.31	100.05	10.0	None	Stall free
57T	1.723	.8816	211.02	100.12	9.0	None	Stall free
58	1.634	.8901	218.52	100.09	11.0	None	Stall free
60	1.645	.8925	218.30	100.10	11.0	None	Stall free
61	1.474	.9018	201.24	90.07	11.0	None	Stall free

*The letter "T" following the reading number indicates Blade Element Performance data were recorded.

Table 2. - Overall Performance Based on Fixed Instrumentation (continued).

Rdg.*	Total press. ratio	Rotor adia. eff.	Corrected weight flow, lb/sec	Rotor speed, percent design	Throttle valve setting	Inlet dist.	Operating mode
62	1.294	.9126	169.95	75.02	11.0	None	Stall free
63	1.562	.9051	209.69	95.06	11.0	None	Stall free
64T	1.750	.8728	204.79	100.01	8.0	None	Stall free
65T	1.297	.7712	221.81	100.16	50.0	None	Stall free
66	1.644	.8971	219.29	100.00	11.0	None	Stall free
67T	1.478	.9233	201.40	89.83	11.0	None	Stall free
68T	1.297	.8262	207.14	90.07	25.0	None	Stall free
69T	1.247	.8038	207.45	89.97	50.0	None	Stall free
70T	1.383	.8772	206.46	90.03	15.0	None	Stall free
71T	1.434	.9041	204.04	90.03	12.5	None	Stall free
72T	1.551	.8970	187.27	90.02	8.0	None	Stall free
73T	1.562	.8643	177.55	90.06	6.5	None	Stall free
74	1.647	.8991	218.80	100.19	11.0	None	Stall free
75	1.692	.8947	214.95	100.05	10.0	None	Stall free
76T	1.252	.9200	157.16	70.10	11.0	None	Stall free
77T	1.161	.8845	174.67	69.95	50.0	None	Stall free
78T	1.225	.9167	163.30	69.95	15.0	None	Stall free
79T	1.274	.8912	147.50	70.03	8.0	None	Stall free
80T	1.289	.8652	137.29	69.99	6.0	None	Stall free
81T	1.293	.8284	126.99	69.95	4.5	None	Stall free
82	1.639	.9082	219.28	100.12	11.0	None	Stall free
83	1.687	.8946	215.48	100.06	10.0	None	Stall free
84T	1.118	.9242	113.2	49.97	11.0	None	Stall free
85T	1.084	.8770	129.9	49.94	50.0	None	Stall free
86T	1.096	.9008	124.8	49.94	25.0	None	Stall free
87T	1.103	.8847	120.4	49.98	18.0	None	Stall free
88T	1.110	.8954	117.5	49.97	15.0	None	Stall free
89T	1.130	.8849	105.1	49.95	7.0	None	Stall free
90T	1.142	.8605	92.5	49.96	3.3	None	Stall free
91	1.203	.9106	169.15	70.03	20.0	None	Stall free
92T	1.295	.8312	124.50	69.94	3.8	None	Stall free
93T	1.142	.8248	90.60	49.97	2.5	None	Stall free
94T	1.517	.9084	196.41	90.09	9.5	None	Stall free
95T	1.768	.8485	231.25	110.07	11.0	None	Stall free
96T	1.334	.7478	231.87	109.99	50.0	None	Stall free
97T	1.667	.8373	231.86	110.01	12.5	None	Stall free
98T	1.730	.8476	231.98	109.99	11.7	None	Stall free
99T	1.829	.8648	231.30	110.01	10.3	None	Stall free
100	1.638	.8992	219.16	100.05	11.0	None	Stall free
101T	1.886	.8635	229.08	109.92	9.6	None	Stall free
102T	1.939	.8592	225.31	110.09	8.7	None	Stall free
103T	1.204	.9180	168.78	70.06	20.0	None	Stall free
104	1.296	.8295	129.89	70.06	3.8	None	Stall free
105	1.109	.9233	117.50	50.02	15.0	None	Stall free
106	1.140	.8415	92.50	50.02	3.3	None	Stall free
107	1.140	.8146	90.60	50.06	2.5	None	Stall free
114	1.104	.6970	73.75	49.96	2.0	None	Stalled
115	1.231	.6964	117.26	70.00	3.3	None	Stalled
116	1.379	.6979	157.14	89.97	5.9	None	Stalled
117	1.728	.8830	209.43	100.03	8.5	None	Stall free
118	1.539	.7196	181.15	99.98	7.4	None	Stalled
119	1.637	.9026	219.78	99.94	11.0	None	Stall free

*The letter "T" following the reading number indicates Blade Element Performance data were recorded.

Table 3. - Constants Used in Data Analysis Methods

Columns list data in order of increasing immersion number

Parameter	Plane 0.95	Edge 1	Edge 2	Plane 1.51	Plane 1.57
A_j	1.3765 1.2334 1.0931 1.0107 .9463			1.1282 1.0276 .9277 .8282 .7285	1.1214 1.0001 .8953 .8127 .7357
+ r_j	18.323 17.420 15.604 13.797 11.972 9.910 8.737	18.164 17.310 15.622 13.916 12.182 10.257 9.125	17.885 17.137 15.595 14.034 12.456 10.895 10.129	17.838 17.081 15.568 14.056 12.543 11.030 10.273	17.838 17.082 15.586 14.144 12.684 11.206 10.439
ε°_j	-1.88 1.07 4.74 9.49 15.78	-4.80 0.40 4.35 9.55 16.30	-4.60 -1.50 1.30 4.75 10.10	-.99 -.56 .98 3.68 7.82	-.02 .46 .64 .45 .06
$\kappa'^\circ_j(\kappa'^\circ_{sj})$		59.61(62.64) 56.01(60.47) 52.56(58.40) 49.71(56.50) 47.11(54.77)	54.42 50.68 43.79 32.15 14.29		

$\frac{\left(\frac{w}{w^*}\right)_1}{\left(\frac{w}{w^*}\right)_u}$	1.0837 1.0707 1.0586 1.0565 1.0388
$\frac{\left(\frac{w}{w^*}\right)_2}{\left(\frac{w}{w^*}\right)_d}$	.9932 .9768 .9762 .9729 .9747
$\bar{r}_j$ (Used for Diffusion Factor)	17.201 15.613 13.989 12.355 10.622
σ_j (Used for Diffusion Factor)	1.369 1.508 1.684 1.906 2.217

+ first and last values are casing and hub radii, respectively.

Radii are in inches
Areas are in square feet.

Frontal Area = 7.2660
Annulus Area = 5.4495

Table 4. - Listing of Check Case for Blade Element Results Using Design Data.

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.358	3.748	0.718	1.3816	1486.719	1327.924	668.546	0.621	666.201
2	60.806	4.796	0.336	1.2759	1372.824	1198.430	669.634	0.622	669.618
3	58.406	5.846	0.006	1.1643	1254.316	1067.556	658.509	0.611	656.612
4	55.659	5.949	-0.841	1.0540	1136.904	934.533	647.456	0.600	638.483
5	53.393	6.283	-1.377	0.9186	995.005	786.858	609.007	0.562	584.528

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.896	3.476	5.462	0.9085	1061.785	1314.652	702.138	0.601	563.776
2	54.077	3.397	6.729	0.7949	927.204	1196.359	703.289	0.603	543.928
3	47.497	3.707	10.909	0.6911	802.597	1076.608	727.541	0.626	542.191
4	37.542	5.392	18.117	0.6042	697.152	955.553	767.471	0.665	551.581
5	22.770	8.480	30.623	0.5716	651.945	835.802	841.066	0.737	593.189

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.388	0.29809	0.4062	0.	416.049	1327.924	898.603	0.846
2	0.432	0.37155	0.4595	0.	445.595	1198.430	750.764	0.812
3	0.475	0.44125	0.5029	0.	484.967	1067.556	591.641	0.826
4	0.510	0.50776	0.5383	0.	531.667	934.533	423.886	0.864
5	0.481	0.52543	0.4929	0.	586.817	786.858	248.985	1.015

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8213	0.8328	1.600	1.175	0.	36.426
2	0.8418	0.8519	1.600	1.171	0.	39.325
3	0.8609	0.8699	1.600	1.167	0.	41.811
4	0.8843	0.8917	1.600	1.163	0.	43.947
5	0.9164	0.9218	1.600	1.157	0.	44.691

TRAVERSE PRESSURE RATIO = 1.6000
TRAVERSE ADIABATIC EFF. = 0.8588
TRAVERSE POLYTROPIC EFF. = 0.8678
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.6000
ADIABATIC EFF. = 0.8580
POLYTROPIC EFF. = 0.8675
NOZZLE WEIGHT FLOW = 215.49
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00238
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00401

Table 5. - Simulated Listing for Symbolic Identification of Column Headings.

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1									
2									
3	β_1'	i	$\beta_1' - \kappa_{s1}'$	M_1'	V_1'	U_1	V_1	M_1	V_{z1}
4									
5									

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1									
2									
3	β_2'	$\delta°$	$\Delta\beta'$	M_2'	V_2'	U_2	V_2	M_2	V_{z2}
4									
5									

RADIAL POSITION		DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1									
2									
3		D	C_p	C_h	$V_{\theta 1}$	$V_{\theta 2}$	$V_{\theta 1}'$	$V_{\theta 2}'$	$\frac{V_{z2}}{V_{z1}}$
4									
5									

RADIAL POSITION		ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO		ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1								
2								
3		η_{ad}	η_p	$\frac{P_{1.51}}{P_{0.95}}$	$\frac{T_{1.51}}{T_{0.95}}$		β_1	β_2
4								
5								

TRAVERSE PRESSURE RATIO =
TRAVERSE ADIABATIC EFF. =
TRAVERSE POLYTROPIC EFF. =
FLOW COEFFICIENT L.E. =
FLOW COEFFICIENT T.E. =

FIXED INSTRUMENTATION PRESSURE RATIO =
ADIABATIC EFF. =
POLYTROPIC EFF. =
NOZZLE WEIGHT FLOW =
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW =
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW =

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1					
2					
3	$\frac{\bar{\omega}'\cos\beta_2'}{2\sigma}$	η_{ad}	$\bar{\omega}'$	$\frac{P_{1.57}}{P_{0.05}}$	$\frac{T_{1.57}}{T_{0.05}}$
4					
5					

Table 6. - Listing of Blade Element Performance.

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 2 READING NUMBER 52 DATE 3/16/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.239	3.629	0.599	1.3793	1489.385	1328.913	672.500	0.623	670.142
2	60.447	4.437	-0.023	1.2822	1378.699	1199.323	680.025	0.632	680.009
3	57.719	5.159	-0.681	1.1767	1264.713	1068.351	676.848	0.630	674.899
4	55.137	5.427	-1.363	1.0644	1145.056	935.230	660.680	0.614	651.524
5	53.068	5.958	-1.702	0.9255	1000.195	787.445	616.702	0.571	591.914

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.158	4.738	4.081	0.8908	1055.328	1315.632	680.050	0.574	540.574
2	54.843	4.163	5.604	0.7926	929.092	1197.251	691.346	0.590	534.932
3	50.050	6.260	7.669	0.6753	789.950	1077.410	692.861	0.592	507.188
4	40.628	8.478	14.509	0.6165	713.284	956.265	732.603	0.633	540.279
5	28.754	14.464	24.314	0.5312	610.318	836.425	766.049	0.667	528.652

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.392	0.34425	0.4562	0.	410.312	1328.913	905.320	0.807
2	0.431	0.42564	0.5155	0.	437.735	1199.323	759.516	0.787
3	0.487	0.49860	0.5608	0.	471.894	1068.351	605.516	0.752
4	0.491	0.56753	0.5970	0.	492.737	935.230	463.528	0.829
5	0.516	0.62819	0.5925	0.	546.343	787.445	290.082	0.893

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8109	0.8238	1.656	1.192	0.	37.200
2	0.8897	0.8974	1.668	1.177	0.	39.293
3	0.8521	0.8619	1.626	1.175	0.	42.936
4	0.9097	0.9156	1.618	1.162	0.	42.365
5	0.8995	0.9059	1.582	1.156	0.	45.943

TRAVERSE PRESSURE RATIO = 1.6348
TRAVERSE ADIABATIC EFF. = 0.8652
TRAVERSE POLYTROPIC EFF. = 0.8743
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.6360
ADIABATIC EFF. = 0.8915
POLYTROPIC EFF. = 0.8988
NOZZLE WEIGHT FLOW = 219.38
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99431
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97221

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0255	0.8261	0.1362	1.662	1.189
2	0.0175	0.8891	0.0916	1.680	1.180
3	0.0185	0.8877	0.0971	1.626	1.168
4	0.0084	0.9543	0.0421	1.612	1.153
5	0.0121	0.9436	0.0610	1.571	1.146

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 3 READING NUMBER 54 DATE 3/16/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.866	3.256	0.226	1.3850	1494.048	1328.639	683.300	0.633	680.904
2	60.059	4.049	-0.411	1.2868	1383.766	1199.075	690.671	0.642	690.654
3	57.413	4.853	-0.987	1.1811	1268.764	1068.130	684.734	0.637	682.762
4	54.673	4.963	-1.827	1.0714	1151.474	935.036	672.012	0.625	662.698
5	52.932	5.822	-1.838	0.9276	1001.882	787.282	619.640	0.574	594.734

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.916	5.496	2.949	1.0128	1172.549	1315.360	661.881	0.572	587.282
2	57.218	6.538	2.841	0.8846	1022.315	1197.003	648.471	0.561	553.475
3	50.936	7.146	6.477	0.7255	842.262	1077.188	678.966	0.585	530.733
4	40.981	8.831	13.692	0.7051	806.960	956.067	745.188	0.651	607.999
5	27.898	13.608	25.033	0.6271	713.048	836.252	810.265	0.713	622.510

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.289	0.24556	0.3467	0.	301.585	1328.639	1013.775	0.863
2	0.342	0.31771	0.4034	0.	337.594	1199.075	859.409	0.801
3	0.436	0.37780	0.4404	0.	423.288	1068.130	653.899	0.777
4	0.397	0.44740	0.4814	0.	427.891	935.036	528.176	0.917
5	0.405	0.47614	0.4462	0.	506.671	787.282	329.581	1.047

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8204	0.8295	1.448	1.136	0.	27.182
2	0.8376	0.8460	1.452	1.135	0.	31.381
3	0.7317	0.7455	1.454	1.155	0.	38.574
4	0.8819	0.8886	1.507	1.141	0.	35.137
5	0.8737	0.8810	1.520	1.146	0.	39.143

TRAVERSE PRESSURE RATIO = 1.4729
TRAVERSE ADIABATIC EFF. = 0.8274
TRAVERSE POLYTROPIC EFF. = 0.8366
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.4740
ADIABATIC EFF. = 0.8463
POLYTROPIC EFF. = 0.8546
NOZZLE WEIGHT FLOW = 221.21
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99351
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96901

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0201	0.8181	0.1100	1.460	1.140
2	0.0205	0.8254	0.1142	1.461	1.139
3	0.0342	0.7562	0.1828	1.443	1.146
4	0.0098	0.9389	0.0494	1.511	1.133
5	0.0195	0.9039	0.0976	1.505	1.137

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 4 READING NUMBER 55 DATE 3/16/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.980	3.370	0.340	1.3847	1494.082	1330.035	680.654	0.631	678.267
2	59.963	3.953	-0.507	1.2902	1386.550	1200.335	694.058	0.646	694.041
3	57.491	4.931	-0.909	1.1812	1268.988	1069.252	683.395	0.636	681.427
4	54.857	5.147	-1.643	1.0695	1150.026	936.019	668.154	0.621	658.894
5	53.019	5.909	-1.751	0.9267	1001.720	788.109	618.327	0.572	593.473

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.974	5.554	3.006	0.9479	1111.100	1316.742	661.079	0.564	555.539
2	55.970	5.290	3.993	0.8367	974.791	1198.260	670.982	0.576	545.461
3	49.709	5.919	7.782	0.6985	815.490	1078.319	697.451	0.597	527.293
4	40.509	8.359	14.349	0.6609	761.092	957.072	742.175	0.644	577.514
5	29.139	14.849	23.880	0.5742	657.307	837.130	776.755	0.679	567.296

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.343	0.29703	0.4053	0.	355.533	1330.035	961.209	0.819
2	0.390	0.37638	0.4662	0.	390.495	1200.335	807.766	0.786
3	0.464	0.44064	0.5044	0.	456.351	1069.252	621.968	0.774
4	0.445	0.51289	0.5455	0.	463.680	936.019	493.392	0.876
5	0.464	0.55532	0.5234	0.	520.877	788.109	316.254	0.956

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8130	0.8241	1.546	1.163	0.	32.618
2	0.8691	0.8771	1.564	1.157	0.	35.599
3	0.7867	0.7995	1.554	1.171	0.	40.875
4	0.9006	0.9067	1.572	1.154	0.	38.761
5	0.8771	0.8844	1.540	1.150	0.	42.557

TRAVERSE PRESSURE RATIO = 1.5551
TRAVERSE ADIABATIC EFF. = 0.8452
TRAVERSE POLYTROPIC EFF. = 0.8545
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.5580
ADIABATIC EFF. = 0.8745
POLYTROPIC EFF. = 0.8822
NOZZLE WEIGHT FLOW = 220.68
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99451
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96990

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0223	0.8237	0.1221	1.557	1.164
2	0.0180	0.8691	0.0970	1.576	1.160
3	0.0260	0.8344	0.1356	1.549	1.160
4	0.0078	0.9552	0.0389	1.570	1.144
5	0.0174	0.9158	0.0882	1.531	1.141

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 5 READING NUMBER 56 DATE 3/16/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.675	4.065	1.035	1.3744	1484.975	1330.048	660.396	0.611	658.080
2	60.561	4.551	0.091	1.2813	1378.319	1200.348	677.444	0.630	677.427
3	58.192	5.632	-0.208	1.1709	1259.242	1069.264	665.106	0.618	663.190
4	55.769	6.059	-0.731	1.0572	1137.198	936.028	645.810	0.600	636.860
5	54.077	6.967	-0.693	0.9122	987.438	788.117	594.900	0.550	570.988

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.748	3.328	5.927	0.8427	1004.602	1316.756	712.527	0.598	535.606
2	54.500	3.820	6.062	0.7549	889.823	1198.273	701.250	0.595	516.669
3	49.659	5.869	8.533	0.6437	754.510	1078.330	701.383	0.598	488.368
4	41.573	9.423	14.196	0.5827	676.245	957.082	718.337	0.619	504.931
5	29.080	14.790	24.997	0.5048	582.007	837.139	756.016	0.656	502.586

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.438	0.36809	0.4808	0.	467.935	1330.048	848.820	0.814
2	0.468	0.45521	0.5448	0.	473.942	1200.348	724.331	0.763
3	0.520	0.52675	0.5871	0.	503.301	1069.264	575.029	0.736
4	0.524	0.60449	0.6305	0.	509.208	936.028	447.874	0.793
5	0.541	0.67377	0.6318	0.	557.631	788.117	279.508	0.880

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8040	0.8187	1.744	1.215	0.	41.142
2	0.8821	0.8908	1.726	1.192	0.	42.530
3	0.8703	0.8794	1.677	1.183	0.	45.863
4	0.9032	0.9098	1.645	1.170	0.	45.242
5	0.9019	0.9083	1.611	1.162	0.	47.972

TRAVERSE PRESSURE RATIO = 1.6891
TRAVERSE ADIABATIC EFF. = 0.8621
TRAVERSE POLYTROPIC EFF. = 0.8719
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.6870
ADIABATIC EFF. = 0.8972
POLYTROPIC EFF. = 0.9045
NOZZLE WEIGHT FLOW = 216.31
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99724
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96954

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0274	0.8324	0.1407	1.736	1.205
2	0.0174	0.8960	0.0901	1.734	1.190
3	0.0181	0.8971	0.0940	1.677	1.177
4	0.0080	0.9575	0.0409	1.645	1.160
5	0.0102	0.9545	0.0517	1.599	1.150

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 6 READING NUMBER 57 DATE 3/16/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.290	4.680	1.650	1.3651	1479.746	1332.366	643.778	0.594	641.521
2	61.207	5.197	0.737	1.2708	1372.076	1202.439	660.858	0.612	660.842
3	58.863	6.303	0.463	1.1605	1252.384	1071.127	648.962	0.601	647.093
4	56.616	6.906	0.116	1.0436	1127.739	937.659	626.570	0.580	617.886
5	54.943	7.833	0.173	0.9006	977.971	789.490	577.176	0.531	553.977

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.332	2.912	6.958	0.8041	965.801	1319.050	727.905	0.606	520.818
2	54.538	3.858	6.670	0.7267	861.064	1200.361	706.245	0.596	499.503
3	49.277	5.487	9.585	0.6176	727.442	1080.209	710.698	0.603	474.530
4	41.445	9.295	15.172	0.5610	653.469	958.749	720.033	0.618	488.888
5	29.173	14.883	25.770	0.4815	557.565	838.598	750.799	0.648	481.053

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.472	0.38916	0.5017	0.	506.792	1332.366	812.258	0.812
2	0.493	0.47168	0.5598	0.	499.107	1202.439	701.254	0.756
3	0.545	0.54954	0.6074	0.	528.959	1071.127	551.251	0.733
4	0.544	0.62566	0.6483	0.	527.055	937.659	431.695	0.791
5	0.565	0.69910	0.6524	0.	570.039	789.490	268.558	0.868

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7949	0.8113	1.808	1.232	0.	44.218
2	0.8771	0.8865	1.763	1.201	0.	44.977
3	0.8732	0.8825	1.720	1.192	0.	48.105
4	0.9190	0.9247	1.671	1.172	0.	47.151
5	0.8905	0.8977	1.625	1.167	0.	49.839

TRAVERSE PRESSURE RATIO = 1.7288
TRAVERSE ADIABATIC EFF. = 0.8586
TRAVERSE POLYTROPIC EFF. = 0.8691
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.7230
ADIABATIC EFF. = 0.8816
POLYTROPIC EFF. = 0.8904
NOZZLE WEIGHT FLOW = 211.02
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00205
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97227

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0331	0.8125	0.1679	1.787	1.222
2	0.0205	0.8827	0.1067	1.768	1.200
3	0.0220	0.8830	0.1133	1.716	1.189
4	0.0109	0.9453	0.0556	1.672	1.167
5	0.0131	0.9442	0.0665	1.618	1.156

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 6 READING NUMBER 64 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN,CMBR,LN	INCID ANG SUCT,SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	65,560	5,950	2,920	1,3398	1459,679	1328,083	605,688	0,556	603,564
2	62,228	6,218	1,758	1,2508	1354,625	1198,574	631,214	0,583	631,199
3	59,878	7,318	1,478	1,1406	1235,271	1067,683	621,245	0,574	619,455
4	57,753	8,043	1,253	1,0243	1109,544	934,645	597,936	0,552	589,649
5	55,851	8,741	1,081	0,8853	963,638	786,952	556,152	0,511	533,798

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57,334	2,914	8,226	0,7413	895,010	1314,810	741,861	0,614	482,621
2	54,336	3,656	7,891	0,6923	823,091	1196,502	713,459	0,600	479,826
3	48,742	4,952	11,136	0,5891	695,629	1076,737	719,204	0,609	458,681
4	40,816	8,666	16,937	0,5323	620,947	955,667	724,326	0,621	469,013
5	28,556	14,266	27,295	0,4556	527,795	835,902	748,723	0,646	458,019

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0,527	0,39478	0,5048	0.	562,073	1328,083	752,736	0,800
2	0,521	0,48050	0,5662	0.	527,856	1198,574	668,646	0,760
3	0,570	0,55997	0,6149	0.	553,857	1067,683	522,880	0,740
4	0,572	0,63206	0,6517	0.	550,596	934,645	405,072	0,795
5	0,593	0,71516	0,6642	0.	586,642	786,952	249,260	0,858

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0,7774	0,7956	1,841	1,246	0.	49,349
2	0,8591	0,8702	1,790	1,211	0.	47,729
3	0,8683	0,8782	1,746	1,199	0.	50,370
4	0,9055	0,9122	1,686	1,178	0.	49,575
5	0,9044	0,9108	1,635	1,167	0.	52,019

TRAVERSE PRESSURE RATIO = 1.7518
TRAVERSE ADIABATIC EFF. = 0.8482
TRAVERSE POLYTROPIC EFF. = 0.8597
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.7500
ADIABATIC EFF. = 0.8728
POLYTROPIC EFF. = 0.8825
NOZZLE WEIGHT FLOW = 204.79
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99770
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95554

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0419	0.7781	0.2128	1.819	1.240
2	0.0237	0.8720	0.1224	1.798	1.209
3	0.0217	0.8905	0.1109	1.748	1.194
4	0.0115	0.9455	0.0579	1.692	1.171
5	0.0083	0.9663	0.0417	1.644	1.158

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 7 READING NUMBER 65 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.714	3.104	0.074	1.3886	1496.308	1328.827	687.864	0.638	685.451
2	59.739	3.729	-0.731	1.2930	1388.448	1199.246	699.713	0.652	699.696
3	57.373	4.813	-1.027	1.1819	1269.510	1068.282	685.878	0.639	683.902
4	54.959	5.249	-1.541	1.0671	1147.514	935.169	665.017	0.618	655.801
5	52.820	5.710	-1.950	0.9290	1003.581	787.394	622.242	0.576	597.231

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.546	5.126	3.168	1.1611	1301.789	1315.547	689.342	0.615	659.264
2	58.149	7.469	1.590	1.0211	1150.924	1197.173	645.998	0.573	607.302
3	53.137	9.347	4.236	0.8659	985.725	1077.340	658.159	0.578	591.280
4	41.007	8.857	13.953	0.8008	900.886	956.203	773.099	0.687	678.504
5	23.834	9.544	28.986	0.7573	843.556	836.371	921.053	0.827	761.576

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.177	0.12069	0.1909	0.	194.292	1328.827	1121.255	0.962
2	0.223	0.17834	0.2432	0.	219.646	1199.246	977.527	0.868
3	0.291	0.22293	0.2709	0.	288.758	1068.282	788.582	0.865
4	0.299	0.27722	0.3024	0.	366.245	935.169	589.958	1.035
5	0.275	0.25230	0.2136	0.	499.938	787.394	336.432	1.275

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8050	0.8107	1.234	1.077	0.	16.421
2	0.7462	0.7536	1.232	1.082	0.	19.884
3	0.5970	0.6093	1.244	1.108	0.	26.029
4	0.8319	0.8392	1.368	1.113	0.	28.359
5	0.8951	0.9008	1.486	1.134	0.	33.283

TRAVERSE PRESSURE RATIO = 1.3047
TRAVERSE ADIABATIC EFF. = 0.7847
TRAVERSE POLYTROPIC EFF. = 0.7926
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2970
ADIABATIC EFF. = 0.7712
POLYTROPIC EFF. = 0.7795
NOZZLE WEIGHT FLOW = 221.81
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99258
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97747

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0182	0.7432	0.0984	1.236	1.084
2	0.0230	0.6955	0.1312	1.231	1.088
3	0.0353	0.6256	0.1983	1.235	1.099
4	0.0189	0.8554	0.0956	1.358	1.107
5	0.0230	0.8832	0.1114	1.456	1.128

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 9 READING NUMBER 67 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.286	3.676	0.646	1.2308	1336.392	1192.895	602.449	0.555	600.336
2	60.238	4.228	-0.232	1.1458	1240.162	1076.568	615.631	0.569	615.616
3	58.012	5.452	-0.388	1.0466	1131.605	959.002	600.704	0.556	598.974
4	55.681	5.971	-0.819	0.9427	1021.027	839.506	581.143	0.537	573.089
5	53.868	6.758	-0.902	0.8169	888.098	706.847	537.666	0.495	516.055

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.554	4.134	4.731	0.8324	969.316	1180.973	618.673	0.531	505.235
2	54.754	4.074	5.484	0.7408	856.434	1074.708	620.703	0.537	494.181
3	48.698	4.908	9.314	0.6521	750.145	967.134	638.871	0.555	495.064
4	40.568	8.418	15.113	0.5805	663.553	858.388	661.621	0.579	503.057
5	26.306	12.016	27.561	0.5098	579.438	750.814	720.201	0.634	512.931

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.371	0.33166	0.4253	0.	354.741	1192.895	826.232	0.842
2	0.410	0.40811	0.4824	0.	375.353	1076.568	699.355	0.803
3	0.443	0.47725	0.5262	0.	403.660	959.002	563.474	0.827
4	0.461	0.53671	0.5556	0.	427.703	839.506	430.685	0.878
5	0.477	0.57476	0.5308	0.	497.236	706.847	253.578	0.994

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8184	0.8282	1.481	1.145	0.	35.074
2	0.8876	0.8937	1.480	1.134	0.	37.218
3	0.8920	0.8978	1.477	1.133	0.	39.193
4	0.9211	0.9252	1.460	1.124	0.	40.371
5	0.9046	0.9096	1.460	1.126	0.	44.110

TRAVERSE PRESSURE RATIO = 1.4730
TRAVERSE ADIABATIC EFF. = 0.8783
TRAVERSE POLYTROPIC EFF. = 0.8848
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.4780
ADIABATIC EFF. = 0.9233
POLYTROPIC EFF. = 0.9275
NOZZLE WEIGHT FLOW = 201.40
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00300
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95872

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0193	0.8530	0.1015	1.487	1.141
2	0.0113	0.9183	0.0589	1.493	1.132
3	0.0087	0.9434	0.0443	1.482	1.126
4	0.0047	0.9722	0.0238	1.462	1.118
5	0.0079	0.9636	0.0390	1.458	1.118

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 10 READING NUMBER 68 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLOT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.633	3.023	-0.007	1.2419	1347.879	1196.134	621.321	0.572	619.142
2	59.590	3.580	-0.880	1.1570	1251.707	1079.492	633.615	0.586	633.599
3	57.172	4.612	-1.228	1.0579	1145.336	961.606	622.180	0.575	620.388
4	54.587	4.877	-1.913	0.9580	1037.772	841.785	606.934	0.560	598.523
5	52.507	5.397	-2.263	0.8349	907.340	708.766	566.494	0.521	543.724

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.730	5.310	2.903	0.9950	1127.963	1184.180	607.689	0.536	568.117
2	57.074	6.394	2.516	0.8763	994.546	1077.626	592.779	0.522	540.536
3	50.196	6.406	6.975	0.7098	810.703	969.760	624.367	0.547	518.923
4	39.225	7.075	15.362	0.7087	799.811	860.719	715.319	0.634	618.312
5	25.356	11.066	27.151	0.6410	718.775	752.853	791.105	0.706	641.277

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.220	0.17692	0.2498	0.	210.807	1196.134	973.372	0.918
2	0.270	0.24194	0.3048	0.	242.915	1079.492	834.711	0.853
3	0.382	0.28908	0.3327	0.	347.008	961.606	622.752	0.836
4	0.320	0.35533	0.3754	0.	355.994	841.785	504.725	1.033
5	0.322	0.36537	0.3260	0.	448.957	708.766	303.896	1.179

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7741	0.7810	1.243	1.083	0.	20.358
2	0.7758	0.7829	1.254	1.086	0.	24.199
3	0.6645	0.6757	1.271	1.107	0.	33.771
4	0.8916	0.8963	1.362	1.104	0.	29.931
5	0.9223	0.9260	1.404	1.111	0.	34.996

TRAVERSE PRESSURE RATIO = 1.3011
TRAVERSE ADIABATIC EFF. = 0.8090
TRAVERSE POLYTROPIC EFF. = 0.8161
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2970
ADIABATIC EFF. = 0.8262
POLYTROPIC EFF. = 0.8325
NOZZLE WEIGHT FLOW = 207.14
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99759
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95504

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0193	0.7561	0.1046	1.241	1.084
2	0.0198	0.7744	0.1098	1.258	1.087
3	0.0338	0.7050	0.1776	1.264	1.098
4	0.0077	0.9457	0.0381	1.360	1.097
5	0.0130	0.9313	0.0640	1.387	1.105

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 11 READING NUMBER 69 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.676	3.066	0.036	1.2420	1345.859	1194.807	619.495	0.572	617.322
2	59.621	3.611	-0.849	1.1566	1249.912	1078.294	632.109	0.585	632.094
3	57.126	4.566	-1.274	1.0592	1144.660	960.539	622.584	0.576	620.791
4	54.479	4.769	-2.021	0.9601	1038.030	840.851	608.666	0.563	600.231
5	52.351	5.241	-2.419	0.8367	908.322	707.980	569.047	0.524	546.174

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.450	5.030	3.226	1.0450	1172.171	1182.866	622.128	0.555	595.303
2	57.519	6.839	2.102	0.9221	1037.151	1076.431	592.468	0.527	556.919
3	52.007	8.217	5.118	0.7491	850.593	968.684	602.728	0.531	523.540
4	39.768	7.618	14.711	0.7386	828.720	859.764	718.523	0.640	635.693
5	24.414	10.124	27.937	0.6828	761.259	752.017	823.349	0.738	684.246

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.176	0.12629	0.1868	0.	174.251	1194.807	1008.615	0.964
2	0.224	0.18819	0.2425	0.	201.610	1078.294	874.821	0.881
3	0.335	0.23253	0.2702	0.	298.405	960.539	670.279	0.843
4	0.286	0.30034	0.3175	0.	330.727	840.851	529.037	1.059
5	0.274	0.30052	0.2586	0.	441.424	707.980	310.593	1.253

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7246	0.7311	1.182	1.068	0.	16.315
2	0.7316	0.7383	1.192	1.070	0.	19.901
3	0.5689	0.5799	1.200	1.094	0.	29.682
4	0.8602	0.8656	1.321	1.096	0.	27.486
5	0.9243	0.9278	1.400	1.109	0.	32.827

TRAVERSE PRESSURE RATIO = 1.2527
TRAVERSE ADIABATIC EFF. = 0.7744
TRAVERSE POLYTROPIC EFF. = 0.7815
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2470
ADIABATIC EFF. = 0.8038
POLYTROPIC EFF. = 0.8098
NOZZLE WEIGHT FLOW = 207.45
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99886
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95738

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0159	0.7482	0.0858	1.182	1.065
2	0.0188	0.7387	0.1055	1.197	1.071
3	0.0357	0.6273	0.1952	1.199	1.085
4	0.0124	0.9026	0.0614	1.303	1.087
5	0.0101	0.9453	0.0493	1.379	1.102

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 12 READING NUMBER 70 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.886	3.276	0.246	1.2385	1344.084	1195.500	614.282	0.566	612.127
2	59.824	3.814	-0.646	1.1553	1248.056	1078.920	627.357	0.581	627.342
3	57.409	4.849	-0.991	1.0566	1141.678	961.096	616.217	0.570	614.442
4	54.868	5.158	-1.632	0.9554	1033.560	841.339	600.328	0.555	592.008
5	52.919	5.809	-1.851	0.8297	901.642	708.391	557.801	0.513	535.380

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.624	5.204	3.263	0.9120	1047.735	1183.552	600.562	0.523	529.378
2	56.063	5.383	3.761	0.8051	921.978	1077.055	602.116	0.526	514.668
3	47.224	3.434	10.184	0.6735	772.654	969.246	661.181	0.576	524.669
4	39.017	6.867	15.850	0.6452	732.167	860.263	696.209	0.614	567.679
5	25.962	11.672	26.957	0.5735	647.972	752.454	751.357	0.665	575.252

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.296	0.25234	0.3383	0.	280.394	1195.500	903.158	0.865
2	0.344	0.32542	0.3969	0.	312.216	1078.920	764.839	0.820
3	0.428	0.38438	0.4336	0.	402.170	961.096	567.076	0.854
4	0.394	0.44370	0.4656	0.	400.279	841.339	459.983	0.959
5	0.403	0.46762	0.4286	0.	472.359	708.391	280.095	1.074

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8058	0.8139	1.349	1.111	0.	27.909
2	0.8358	0.8428	1.364	1.111	0.	31.243
3	0.7843	0.7944	1.400	1.129	0.	37.471
4	0.9126	0.9168	1.417	1.115	0.	35.188
5	0.9011	0.9060	1.424	1.118	0.	39.391

TRAVERSE PRESSURE RATIO = 1.3873
TRAVERSE ADIABATIC EFF. = 0.8441
TRAVERSE POLYTROPIC EFF. = 0.8512
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.3830
ADIABATIC EFF. = 0.8772
POLYTROPIC EFF. = 0.8828
NOZZLE WEIGHT FLOW = 206.46
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99537
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95368

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0184	0.8184	0.0996	1.350	1.110
2	0.0161	0.8553	0.0870	1.368	1.109
3	0.0251	0.8270	0.1243	1.385	1.118
4	0.0054	0.9653	0.0267	1.410	1.107
5	0.0124	0.9380	0.0612	1.414	1.111

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 13 READING NUMBER 71 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.088	3.478	0.448	1.2376	1343.008	1196.696	609.581	0.562	607.443
2	60.053	4.043	-0.417	1.1522	1246.417	1079.999	622.220	0.575	622.205
3	57.586	5.026	-0.814	1.0556	1140.566	962.058	612.647	0.567	610.882
4	55.162	5.452	-1.338	0.9530	1030.808	842.181	594.388	0.550	586.150
5	53.213	6.103	-1.557	0.8271	898.887	709.099	552.427	0.508	530.222

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.886	5.466	3.202	0.8743	1010.432	1184.736	596.001	0.516	506.546
2	55.811	5.131	4.242	0.7738	891.413	1078.132	605.976	0.526	500.857
3	47.980	4.190	9.605	0.6679	768.490	970.215	651.295	0.566	514.356
4	39.794	7.644	15.368	0.6134	699.479	861.123	679.220	0.596	536.351
5	26.309	12.019	26.904	0.5426	615.941	753.206	735.261	0.648	545.233

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.332	0.29344	0.3844	0.	311.396	1196.696	873.340	0.834
2	0.375	0.37047	0.4442	0.	340.848	1079.999	737.284	0.805
3	0.431	0.43607	0.4862	0.	399.358	962.058	570.857	0.842
4	0.428	0.50257	0.5236	0.	414.344	842.181	446.779	0.915
5	0.439	0.53566	0.4950	0.	483.629	709.099	269.578	1.028

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8287	0.8368	1.408	1.124	0.	31.581
2	0.8628	0.8695	1.423	1.123	0.	34.236
3	0.8280	0.8367	1.445	1.134	0.	37.827
4	0.9093	0.9140	1.448	1.123	0.	37.687
5	0.8956	0.9009	1.449	1.125	0.	41.573

TRAVERSE PRESSURE RATIO = 1.4326
TRAVERSE ADIABATIC EFF. = 0.8620
TRAVERSE POLYTROPIC EFF. = 0.8688
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.4340
ADIABATIC EFF. = 0.9041
POLYTROPIC EFF. = 0.9089
NOZZLE WEIGHT FLOW = 204.04
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00234
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95614

PARAMETERS DETERMINED FROM FIXED INSTRUMENTION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0185	0.8381	0.1008	1.421	1.126
2	0.0136	0.8906	0.0730	1.435	1.122
3	0.0151	0.8988	0.0758	1.440	1.122
4	0.0046	0.9718	0.0228	1.437	1.112
5	0.0110	0.9472	0.0542	1.437	1.115

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 14 READING NUMBER 72 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.951	5.341	2.311	1.2105	1324.529	1199.196	562.411	0.514	560.439
2	62.021	6.011	1.551	1.1252	1225.493	1082.256	574.941	0.528	574.927
3	60.163	7.603	1.763	1.0203	1112.189	964.068	554.561	0.509	552.964
4	58.029	8.319	1.529	0.9148	998.778	843.940	534.156	0.489	526.753
5	56.402	9.292	1.632	0.7886	864.192	710.581	491.836	0.449	472.067

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.360	2.940	7.591	0.7366	870.436	1187.211	654.501	0.554	469.032
2	54.603	3.923	7.418	0.6714	785.338	1080.385	633.145	0.541	454.843
3	48.347	4.557	11.815	0.5817	675.956	972.243	648.224	0.558	449.200
4	40.318	8.168	17.711	0.5119	591.564	862.922	659.790	0.571	450.145
5	25.431	11.141	30.971	0.4472	513.754	754.780	710.510	0.618	458.082

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.468	0.38986	0.4846	0.	454.924	1199.196	732.287	0.837
2	0.478	0.46519	0.5375	0.	440.282	1082.256	640.103	0.791
3	0.517	0.52890	0.5734	0.	467.236	964.068	505.007	0.812
4	0.535	0.59455	0.6069	0.	480.929	843.940	381.993	0.855
5	0.549	0.66335	0.6079	0.	536.960	710.581	217.820	0.970

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8310	0.8420	1.614	1.177	0.	44.125
2	0.8824	0.8898	1.575	1.157	0.	44.068
3	0.8991	0.9052	1.550	1.149	0.	46.127
4	0.8999	0.9056	1.512	1.140	0.	46.894
5	0.9039	0.9094	1.507	1.138	0.	49.532

TRAVERSE PRESSURE RATIO = 1.5580
TRAVERSE ADIABATIC EFF. = 0.8761
TRAVERSE POLYTROPIC EFF. = 0.8836
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5510
ADIABATIC EFF. = 0.8970
POLYTROPIC EFF. = 0.9032
NOZZLE WEIGHT FLOW = 187.27
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01432
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96753

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0300	0.8178	0.1523	1.595	1.174
2	0.0159	0.9013	0.0828	1.575	1.154
3	0.0136	0.9239	0.0690	1.549	1.144
4	0.0133	0.9323	0.0663	1.499	1.132
5	0.0084	0.9660	0.0415	1.506	1.129

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 15 READING NUMBER 73 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	66.222	6.612	3.582	1.1891	1306.650	1195.053	528.376	0.481	526.523
2	63.256	7.246	2.786	1.1057	1207.717	1078.517	543.491	0.498	543.478
3	61.602	9.042	3.202	1.0005	1092.880	960.737	520.933	0.477	519.432
4	59.644	9.934	3.144	0.8949	978.164	841.025	499.483	0.457	492.561
5	57.990	10.880	3.220	0.7704	845.070	708.126	461.194	0.420	442.657

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.250	2.830	8.973	0.6866	815.775	1183.110	665.822	0.560	440.900
2	54.273	3.593	8.983	0.6422	753.174	1076.653	640.317	0.546	439.746
3	49.399	5.609	12.203	0.5559	647.222	968.884	636.786	0.547	421.157
4	41.552	9.402	18.092	0.4689	542.523	859.941	645.068	0.558	405.216
5	24.517	10.227	33.473	0.4252	488.896	752.173	709.592	0.617	439.087

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.514	0.39623	0.4891	0.	497.662	1195.053	685.448	0.837
2	0.504	0.47153	0.5417	0.	465.292	1078.517	611.361	0.809
3	0.538	0.54118	0.5830	0.	477.527	960.737	491.357	0.811
4	0.581	0.60942	0.6182	0.	500.778	841.025	359.163	0.823
5	0.573	0.67949	0.6186	0.	551.912	708.126	200.261	0.992

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8053	0.8184	1.639	1.189	0.	48.461
2	0.8679	0.8764	1.595	1.165	0.	46.617
3	0.8875	0.8943	1.557	1.152	0.	48.589
4	0.8841	0.8907	1.516	1.143	0.	51.021
5	0.8931	0.8993	1.519	1.143	0.	51.495

TRAVERSE PRESSURE RATIO = 1.5728
TRAVERSE ADIABATIC EFF. = 0.8583
TRAVERSE POLYTROPIC EFF. = 0.8671
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5620
ADIABATIC EFF. = 0.8643
POLYTROPIC EFF. = 0.8726
NOZZLE WEIGHT FLOW = 177.55
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.02109
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96615

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0416	0.7673	0.2105	1.610	1.190
2	0.0217	0.8748	0.1120	1.594	1.163
3	0.0201	0.8917	0.1040	1.554	1.151
4	0.0192	0.9059	0.0980	1.506	1.137
5	0.0129	0.9513	0.0631	1.515	1.133

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 18 READING NUMBER 76 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	66.449	6.839	3.809	0.9821	1083.558	992.747	434.226	0.394	432.703
2	63.701	7.691	3.231	0.9069	999.387	895.939	442.796	0.402	442.785
3	61.379	8.819	2.979	0.8259	909.796	798.098	436.771	0.397	435.513
4	58.843	9.133	2.343	0.7440	819.501	698.651	428.333	0.389	422.397
5	56.864	9.754	2.094	0.6457	711.407	588.250	400.078	0.363	383.997

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG, T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	60.382	5.962	6.067	0.7447	850.607	982.825	486.916	0.426	420.046
2	57.085	6.405	6.616	0.6657	757.564	894.390	486.173	0.427	411.615
3	51.673	7.883	9.707	0.5761	654.774	804.865	499.770	0.440	406.021
4	42.140	9.990	16.703	0.5082	575.083	714.365	539.267	0.477	425.622
5	28.260	13.970	28.605	0.4461	502.671	624.840	590.995	0.525	437.407

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.297	0.26080	0.3232	0.	243.940	992.747	738.885	0.971
2	0.328	0.32847	0.3751	0.	258.497	895.939	635.893	0.930
3	0.376	0.38545	0.4110	0.	291.259	798.098	513.606	0.932
4	0.405	0.44594	0.4455	0.	329.248	698.651	385.117	1.008
5	0.420	0.46817	0.4054	0.	389.717	588.250	235.123	1.139

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8354	0.8404	1.245	1.078	0.	30.146
2	0.9258	0.9282	1.249	1.071	0.	32.129
3	0.9052	0.9081	1.248	1.072	0.	35.654
4	0.9649	0.9660	1.261	1.071	0.	37.724
5	0.9351	0.9372	1.268	1.075	0.	41.700

TRAVERSE PRESSURE RATIO = 1.2533
TRAVERSE ADIABATIC EFF. = 0.9079
TRAVERSE POLYTROPIC EFF. = 0.9109
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2520
ADIABATIC EFF. = 0.9200
POLYTROPIC EFF. = 0.9226
NOZZLE WEIGHT FLOW = 157.16
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99923
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96730

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0152	0.8419	0.0841	1.248	1.078
2	0.0075	0.9256	0.0418	1.252	1.072
3	0.0078	0.9337	0.0421	1.247	1.070
4	0.0060	0.9588	0.0310	1.253	1.069
5	0.0077	0.9615	0.0385	1.265	1.072

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 19 READING NUMBER 77 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	62.693	3.083	0.053	0.9512	1043.651	926.657	480.118	0.438	478.434
2	59.685	3.675	-0.785	0.8843	968.768	836.293	489.004	0.446	488.992
3	56.725	4.165	-1.675	0.8150	891.833	744.966	490.298	0.448	488.886
4	53.607	3.897	-2.893	0.7446	814.173	652.140	487.433	0.446	480.678
5	51.239	4.129	-3.531	0.6543	715.879	549.089	459.331	0.420	440.869

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.308	4.888	3.384	0.8208	919.183	917.396	487.299	0.435	468.773
2	55.707	5.027	3.978	0.7378	825.900	834.848	489.816	0.438	465.283
3	47.428	3.638	9.297	0.6285	705.631	751.283	530.689	0.473	477.315
4	38.631	6.481	14.976	0.5942	663.131	666.808	577.434	0.517	516.941
5	24.147	9.857	27.092	0.5484	609.546	583.243	651.632	0.586	549.007

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.164	0.14971	0.1950	0.	127.631	926.657	789.764	0.980
2	0.200	0.21355	0.2491	0.	152.591	836.293	682.257	0.952
3	0.286	0.26473	0.2849	0.	231.698	744.966	519.585	0.976
4	0.268	0.31224	0.3123	0.	253.686	652.140	413.121	1.075
5	0.257	0.29086	0.2373	0.	337.124	549.089	246.119	1.245

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7787	0.7821	1.117	1.041	0.	15.231
2	0.8723	0.8746	1.136	1.043	0.	18.157
3	0.7671	0.7721	1.163	1.058	0.	25.893
4	0.9302	0.9320	1.193	1.056	0.	26.139
5	0.9177	0.9201	1.226	1.066	0.	31.552

TRAVERSE PRESSURE RATIO = 1.1631
TRAVERSE ADIABATIC EFF. = 0.8579
TRAVERSE POLYTROPIC EFF. = 0.8610
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1610
ADIABATIC EFF. = 0.8845
POLYTROPIC EFF. = 0.8869
NOZZLE WEIGHT FLOW = 174.67
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99228
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95599

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0109	0.8086	0.0583	1.120	1.041
2	0.0076	0.8860	0.0407	1.139	1.043
3	0.0185	0.8099	0.0920	1.155	1.052
4	0.0059	0.9508	0.0289	1.192	1.054
5	0.0100	0.9409	0.0484	1.216	1.061

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 20 READING NUMBER 78 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.214	4.604	1.574	0.9380	1032.551	929.112	450.457	0.409	448.877
2	61.320	5.310	0.850	0.8700	955.778	838.509	458.710	0.418	458.699
3	58.699	6.139	0.299	0.7971	874.856	746.940	455.473	0.415	454.160
4	55.908	6.198	-0.592	0.7231	793.069	653.867	448.794	0.409	442.574
5	53.742	6.632	-1.028	0.6310	692.886	550.543	420.706	0.383	403.795

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.931	3.511	6.283	0.7305	829.335	919.826	492.113	0.433	439.929
2	54.518	3.838	6.802	0.6580	744.617	837.060	490.062	0.433	432.166
3	48.950	5.160	9.750	0.5766	651.601	753.273	501.776	0.444	427.873
4	39.174	7.024	16.734	0.5134	578.176	668.574	542.162	0.481	447.296
5	23.477	9.187	30.265	0.4612	517.574	584.788	609.801	0.543	468.516

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.274	0.25613	0.3136	0.	217.682	929.112	702.145	0.980
2	0.301	0.32613	0.3691	0.	230.793	838.509	606.266	0.942
3	0.344	0.38818	0.4120	0.	261.934	746.940	491.339	0.942
4	0.372	0.44709	0.4471	0.	304.112	653.867	364.462	1.011
5	0.380	0.45258	0.3954	0.	381.293	550.543	203.494	1.160

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8299	0.8345	1.212	1.068	0.	26.327
2	0.9142	0.9166	1.219	1.064	0.	28.104
3	0.9065	0.9092	1.223	1.065	0.	31.474
4	0.9364	0.9384	1.239	1.068	0.	34.211
5	0.9078	0.9108	1.259	1.075	0.	39.140

TRAVERSE PRESSURE RATIO = 1.2283
TRAVERSE ADIABATIC EFF. = 0.8963
TRAVERSE POLYTROPIC EFF. = 0.8993
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2250
ADIABATIC EFF. = 0.9167
POLYTROPIC EFF. = 0.9191
NOZZLE WEIGHT FLOW = 163.30
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99951
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96704

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0127	0.8652	0.0654	1.211	1.065
2	0.0079	0.9222	0.0412	1.219	1.063
3	0.0096	0.9193	0.0494	1.220	1.064
4	0.0083	0.9445	0.0408	1.233	1.065
5	0.0141	0.9311	0.0682	1.248	1.070

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 21 READING NUMBER 79 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	66.511	6.901	3.871	0.9194	1015.573	930.899	405.977	0.368	404.553
2	63.827	7.817	3.357	0.8487	936.108	840.121	412.909	0.374	412.899
3	61.682	9.122	3.282	0.7718	850.667	748.376	404.435	0.367	403.270
4	59.212	9.502	2.712	0.6935	765.424	655.125	395.835	0.359	390.349
5	57.167	10.057	2.397	0.6016	664.666	551.602	370.832	0.336	355.927

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.738	3.318	8.773	0.6444	740.667	921.595	494.534	0.430	394.999
2	55.090	4.410	8.737	0.5815	664.594	838.669	480.627	0.421	380.298
3	49.346	5.556	12.335	0.5034	573.528	754.722	491.764	0.432	373.604
4	38.978	6.828	20.234	0.4428	503.126	669.860	527.959	0.465	390.311
5	23.279	8.989	33.888	0.3964	448.443	585.912	582.611	0.515	406.529

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.377	0.33435	0.3963	0.	295.853	930.899	625.742	0.976
2	0.394	0.40371	0.4477	0.	293.729	840.121	544.940	0.921
3	0.438	0.46148	0.4833	0.	319.656	748.376	435.066	0.926
4	0.465	0.52517	0.5202	0.	354.042	655.125	315.818	1.000
5	0.468	0.56874	0.5016	0.	411.007	551.602	174.906	1.142

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8006	0.8076	1.286	1.093	0.	36.833
2	0.8819	0.8860	1.275	1.082	0.	37.681
3	0.8803	0.8843	1.267	1.080	0.	40.550
4	0.9132	0.9161	1.272	1.078	0.	42.210
5	0.9273	0.9298	1.283	1.080	0.	45.314

TRAVERSE PRESSURE RATIO = 1.2770
TRAVERSE ADIABATIC EFF. = 0.8716
TRAVERSE POLYTROPIC EFF. = 0.8760
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2740
ADIABATIC EFF. = 0.8912
POLYTROPIC EFF. = 0.8949
NOZZLE WEIGHT FLOW = 147.50
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00139
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96872

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0247	0.8120	0.1267	1.283	1.091
2	0.0145	0.8885	0.0763	1.273	1.080
3	0.0171	0.8857	0.0884	1.263	1.078
4	0.0106	0.9415	0.0518	1.267	1.074
5	0.0068	0.9715	0.0328	1.280	1.075

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 22 READING NUMBER 80 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	68.031	8.421	5.391	0.9058	1002.815	929.537	376.297	0.340	374.978
2	65.550	9.540	5.080	0.8340	921.535	838.892	381.428	0.345	381.419
3	63.586	11.026	5.186	0.7556	834.865	747.281	372.251	0.337	371.179
4	61.066	11.356	4.566	0.6788	749.941	654.166	366.712	0.332	361.630
5	59.019	11.909	4.249	0.5869	649.682	550.795	344.546	0.311	330.698

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.386	2.966	10.645	0.6049	698.270	920.247	502.927	0.436	376.000
2	55.344	4.664	10.206	0.5476	628.081	837.442	480.168	0.419	357.113
3	50.046	6.256	13.540	0.4609	527.420	753.617	486.619	0.425	338.656
4	39.777	7.627	21.288	0.4104	467.482	668.880	516.363	0.453	358.546
5	23.474	9.184	35.546	0.3748	424.358	585.055	571.987	0.505	384.146

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.424	0.34819	0.4100	0.	332.632	929.537	587.614	1.003
2	0.434	0.41587	0.4588	0.	320.849	838.892	516.593	0.936
3	0.493	0.47928	0.4993	0.	349.359	747.281	404.259	0.912
4	0.507	0.55076	0.5431	0.	370.389	654.166	298.491	0.991
5	0.496	0.60168	0.5291	0.	418.233	550.795	166.822	1.162

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7753	0.7838	1.309	1.103	0.	41.498
2	0.8410	0.8467	1.289	1.090	0.	41.938
3	0.8331	0.8388	1.278	1.087	0.	45.891
4	0.8787	0.8829	1.279	1.083	0.	45.931
5	0.9516	0.9534	1.289	1.079	0.	47.433

TRAVERSE PRESSURE RATIO = 1.2902
TRAVERSE ADIABATIC EFF. = 0.8426
TRAVERSE POLYTROPIC EFF. = 0.8482
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2890
ADIABATIC EFF. = 0.8652
POLYTROPIC EFF. = 0.8700
NOZZLE WEIGHT FLOW = 137.29
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00449
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97673

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0323	0.7824	0.1640	1.305	1.101
2	0.0188	0.8679	0.0998	1.291	1.087
3	0.0245	0.8505	0.1283	1.275	1.085
4	0.0155	0.9204	0.0769	1.278	1.079
5	0.0109	0.9577	0.0528	1.290	1.079

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 23 READING NUMBER 81 DATE 3/20/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SLCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	69.538	9.928	6.898	0.8939	991.856	928.872	347.815	0.313	346.595
2	67.127	11.117	6.657	0.8214	909.834	838.292	353.644	0.319	353.635
3	65.156	12.596	6.756	0.7431	823.321	746.747	346.738	0.313	345.739
4	62.633	12.923	6.133	0.6670	738.281	653.699	343.129	0.310	338.374
5	60.417	13.306	5.647	0.5774	639.470	550.401	325.547	0.294	312.462

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.869	3.449	11.669	0.5689	659.597	919.589	504.327	0.435	350.493
2	55.038	4.358	12.089	0.5198	597.768	836.844	487.651	0.424	342.502
3	49.437	5.647	15.719	0.4275	490.751	753.079	496.489	0.433	319.094
4	39.252	7.102	23.380	0.3917	446.742	668.402	518.889	0.455	345.229
5	22.945	8.655	37.471	0.3633	412.197	584.637	571.217	0.503	374.578

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.468	0.35141	0.4126	0.	361.532	928.872	558.057	1.011
2	0.469	0.41611	0.4580	0.	347.009	838.292	489.835	0.969
3	0.542	0.47230	0.4909	0.	380.300	746.747	372.778	0.923
4	0.533	0.54658	0.5370	0.	386.315	653.699	282.086	1.020
5	0.510	0.60613	0.5301	0.	426.061	550.401	158.576	1.199

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7357	0.7458	1.318	1.112	0.	45.888
2	0.8193	0.8259	1.299	1.095	0.	45.374
3	0.8069	0.8136	1.285	1.092	0.	50.001
4	0.8695	0.8741	1.283	1.085	0.	48.215
5	0.9030	0.9064	1.292	1.084	0.	48.679

TRAVERSE PRESSURE RATIO = 1.2972
TRAVERSE ADIABATIC EFF. = 0.8137
TRAVERSE POLYTROPIC EFF. = 0.8205
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2930
ADIABATIC EFF. = 0.8284
POLYTROPIC EFF. = 0.8345
NOZZLE WEIGHT FLOW = 126.99
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01798
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00420

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0427	0.7308	0.2200	1.309	1.109
2	0.0268	0.8285	0.1409	1.299	1.094
3	0.0331	0.8156	0.1713	1.282	1.090
4	0.0231	0.8900	0.1135	1.281	1.082
5	0.0170	0.9378	0.0817	1.292	1.081

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 3 READING NUMBER 84 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	66.841	7.231	4.201	0.6481	722.203	663.641	284.880	0.256	283.881
2	63.808	7.798	3.338	0.5999	667.461	598.926	294.605	0.265	294.598
3	61.288	8.728	2.888	0.5473	608.721	533.520	293.084	0.263	292.239
4	58.642	8.932	2.142	0.4939	549.023	467.041	288.616	0.260	284.616
5	56.429	9.319	1.659	0.4302	478.092	393.239	271.910	0.245	260.981

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.247	3.827	8.593	0.5077	574.583	657.009	346.949	0.307	302.106
2	54.898	4.218	8.910	0.4566	515.368	597.891	344.886	0.306	296.319
3	49.147	5.357	12.141	0.3981	449.121	538.044	354.516	0.314	293.746
4	39.698	7.548	18.943	0.3537	398.183	477.546	379.709	0.337	305.745
5	23.614	9.324	32.815	0.3205	359.589	417.699	430.132	0.383	325.175

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.289	0.28755	0.3257	0.	168.863	663.641	488.146	1.064
2	0.315	0.35933	0.3825	0.	176.299	598.926	421.591	1.006
3	0.359	0.42209	0.4269	0.	198.370	533.520	339.674	1.005
4	0.383	0.47921	0.4612	0.	223.726	467.041	253.819	1.074
5	0.381	0.48930	0.4139	0.	275.536	393.239	142.163	1.246

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8477	0.8501	1.116	1.038	0.	29.203
2	0.9426	0.9435	1.117	1.034	0.	30.751
3	0.9288	0.9300	1.118	1.035	0.	34.032
4	0.9537	0.9545	1.122	1.035	0.	36.194
5	0.9863	0.9866	1.132	1.037	0.	40.276

TRAVERSE PRESSURE RATIO = 1.1203
TRAVERSE ADIABATIC EFF. = 0.9269
TRAVERSE POLYTROPIC EFF. = 0.9281
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1180
ADIABATIC EFF. = 0.9242
POLYTROPIC EFF. = 0.9255
NOZZLE WEIGHT FLOW = 112.02
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97363
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95280

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0196	0.8047	0.1019	1.113	1.039
2	0.0080	0.9218	0.0421	1.116	1.035
3	0.0090	0.9260	0.0462	1.115	1.034
4	-0.0001	1.0006	-0.0005	1.121	1.033
5	-0.0010	1.0048	-0.0049	1.129	1.035

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 4 READING NUMBER 85 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.572	3.962	0.932	0.6667	741.128	663.213	330.786	0.298	329.625
2	60.323	4.313	-0.147	0.6205	688.907	598.540	341.092	0.307	341.084
3	57.283	4.723	-1.117	0.5721	634.253	533.176	343.512	0.310	342.522
4	54.075	4.365	-2.425	0.5236	579.174	466.740	342.923	0.310	338.171
5	51.741	4.631	-3.029	0.4593	508.616	392.986	322.881	0.292	309.903

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.878	4.458	4.694	0.5903	662.386	656.585	354.786	0.316	342.069
2	55.097	4.417	5.226	0.5311	595.735	597.505	357.950	0.319	340.838
3	49.168	5.378	8.115	0.4736	530.296	537.697	372.681	0.333	346.693
4	38.619	6.469	15.456	0.4313	481.529	477.238	416.377	0.373	375.435
5	23.883	9.593	27.858	0.3980	443.297	417.430	472.089	0.424	400.067

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.150	0.16326	0.1946	0.	90.028	663.213	566.557	1.038
2	0.188	0.22662	0.2461	0.	108.987	598.540	488.518	0.999
3	0.228	0.27954	0.2839	0.	136.504	533.176	401.193	1.012
4	0.250	0.32304	0.3084	0.	177.328	466.740	299.910	1.110
5	0.238	0.28553	0.2197	0.	240.284	392.986	177.146	1.291

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG
1	0.8635	0.8648	1.065	1.021	0.	14.745
2	0.9078	0.9087	1.073	1.022	0.	17.732
3	0.9693	0.9697	1.080	1.023	0.	21.491
4	1.0017	1.0017	1.098	1.027	0.	25.283
5	1.0179	1.0176	1.114	1.031	0.	30.989

TRAVERSE PRESSURE RATIO = 1.0846
TRAVERSE ADIABATIC EFF. = 0.9614
TRAVERSE POLYTROPIC EFF. = 0.9619
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.0840
ADIABATIC EFF. = 0.8770
POLYTROPIC EFF. = 0.8785
NOZZLE WEIGHT FLOW = 128.76
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98144
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95035

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0153	0.7463	0.0811	1.065	1.024
2	0.0124	0.8232	0.0653	1.074	1.025
3	0.0113	0.8688	0.0581	1.081	1.026
4	0.0057	0.9509	0.0278	1.097	1.028

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 5 READING NUMBER 86 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.505	4.895	1.865	0.6614	735.184	663.162	317.350	0.286	316.237
2	61.347	5.337	0.877	0.6145	682.014	598.493	327.030	0.295	327.022
3	58.490	5.930	0.090	0.5644	625.835	533.135	327.775	0.296	326.830
4	55.531	5.821	-0.969	0.5134	568.649	466.704	324.884	0.293	320.381
5	53.155	6.045	-1.615	0.4491	498.524	392.955	306.777	0.276	294.446

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.211	3.791	6.294	0.5614	630.799	656.534	354.315	0.315	332.000
2	54.602	3.922	6.746	0.5054	566.877	597.459	355.265	0.317	328.328
3	48.739	4.949	9.751	0.4469	501.839	537.656	367.848	0.328	330.921
4	38.551	6.401	16.980	0.3999	448.155	477.201	403.192	0.360	349.743
5	23.363	9.073	29.793	0.3679	411.070	417.398	457.060	0.409	372.422

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.202	0.20270	0.2367	0.	120.839	663.162	535.696	1.050
2	0.235	0.26907	0.2902	0.	135.425	598.493	462.034	1.004
3	0.274	0.32192	0.3268	0.	160.459	533.135	377.197	1.013
4	0.304	0.37415	0.3587	0.	198.493	466.704	278.708	1.092
5	0.294	0.35232	0.2840	0.	256.525	392.955	160.872	1.265

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.9037	0.9048	1.083	1.025	0.	20.000
2	1.0121	1.0120	1.088	1.024	0.	22.415
3	0.8609	0.8626	1.093	1.030	0.	25.868
4	0.8954	0.8969	1.106	1.033	0.	29.577
5	1.0401	1.0395	1.120	1.032	0.	34.559

TRAVERSE PRESSURE RATIO	= 1.0965	FIXED INSTRUMENTATION	PRESSURE RATIO	=	1.0960
TRAVERSE ADIABATIC EFF.	= 0.9408		ADIABATIC EFF.	=	0.9008
TRAVERSE POLYTROPIC EFF.	= 0.9416		POLYTROPIC EFF.	=	0.9021
FLOW COEFFICIENT L.E.	= 0.980		NOZZLE WEIGHT FLOW	=	124.49
FLOW COEFFICIENT T.E.	= 0.950	L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW		=	0.97351
PERCENT DESIGN SPEED	= 50	T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW		=	0.94513

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0167	0.7743	0.0870	1.081	1.029
2	0.0121	0.8530	0.0630	1.088	1.029
3	0.0101	0.8976	0.0514	1.093	1.029
4	0.0021	0.9836	0.0102	1.106	1.030
5	-0.0015	1.0085	-0.0072	1.117	1.032

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 6 READING NUMBER 87 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	65.419	5.809	2.779	0.6568	730.268	663.685	304.655	0.274	303.587
2	62.272	6.262	1.802	0.6093	676.673	598.965	314.845	0.283	314.838
3	59.553	6.993	1.153	0.5585	619.364	533.555	314.533	0.284	313.627
4	56.690	6.980	0.190	0.5062	561.272	467.071	311.240	0.281	306.926
5	54.337	7.227	-0.433	0.4426	491.023	393.265	294.017	0.265	282.200

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.080	3.660	7.340	0.5418	609.826	657.052	352.174	0.313	322.149
2	54.300	3.620	7.972	0.4855	546.377	597.930	354.263	0.315	318.796
3	48.537	4.747	11.016	0.4285	481.681	538.079	364.881	0.325	318.905
4	37.814	5.664	18.876	0.3819	431.880	477.577	402.783	0.356	340.456
5	23.209	8.919	31.128	0.3511	392.823	417.726	448.520	0.401	356.290

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.235	0.23214	0.2678	0.	139.910	663.685	517.142	1.061
2	0.268	0.30079	0.3228	0.	154.278	598.965	443.652	1.013
3	0.307	0.35745	0.3625	0.	177.159	533.555	360.920	1.017
4	0.331	0.40437	0.3880	0.	213.362	467.071	264.215	1.109
5	0.325	0.39201	0.3213	0.	264.953	393.265	152.773	1.263

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8930	0.8945	1.095	1.030	0.	23.475
2	0.9005	0.9019	1.100	1.031	0.	25.824
3	0.8785	0.8803	1.103	1.032	0.	29.053
4	0.6228	0.6286	1.114	1.050	0.	32.075
5	0.9608	0.9615	1.124	1.035	0.	36.636

TRAVERSE PRESSURE RATIO = 1.1060
TRAVERSE ADIABATIC EFF. = 0.8341
TRAVERSE POLYTROPIC EFF. = 0.8365
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1030
ADIABATIC EFF. = 0.8847
POLYTROPIC EFF. = 0.8863
NOZZLE WEIGHT FLOW = 121.62
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95882
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93836

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0189	0.7746	0.0980	1.092	1.033
2	0.0130	0.8591	0.0669	1.097	1.031
3	0.0121	0.8891	0.0614	1.101	1.031
4	0.0065	0.9531	0.0315	1.110	1.032
5	0.0059	0.9687	0.0286	1.119	1.034

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 7 READING NUMBER 88 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	66.025	6.415	3.385	0.6530	726.698	663.612	296.156	0.266	295.117
2	62.901	6.891	2.431	0.6051	672.760	598.900	306.472	0.276	306.465
3	60.198	7.638	1.798	0.5535	615.244	533.497	306.442	0.276	305.559
4	57.402	7.692	0.902	0.5014	556.621	467.021	302.851	0.273	298.654
5	55.141	8.031	0.371	0.4373	485.855	393.222	285.363	0.257	273.893

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.271	3.851	7.754	0.5295	597.860	656.980	348.568	0.309	314.136
2	54.481	3.801	8.419	0.4744	534.375	597.865	350.693	0.311	310.418
3	48.807	5.017	11.391	0.4174	469.861	538.021	360.309	0.320	309.413
4	38.905	6.755	18.496	0.3697	415.371	477.525	389.797	0.347	322.563
5	23.566	9.276	31.575	0.3379	378.680	417.681	439.357	0.392	342.562

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.252	0.25245	0.2891	0.	148.928	663.612	508.052	1.064
2	0.286	0.32272	0.3452	0.	162.972	598.900	434.892	1.013
3	0.326	0.38281	0.3878	0.	184.491	533.497	353.530	1.013
4	0.357	0.43618	0.4193	0.	217.202	467.021	260.323	1.080
5	0.348	0.43633	0.3639	0.	268.259	393.222	149.422	1.251

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8161	0.8187	1.102	1.035	0.	25.365
2	0.9541	0.9548	1.107	1.031	0.	27.700
3	0.9692	0.9697	1.109	1.031	0.	30.806
4	0.9437	0.9447	1.116	1.034	0.	33.955
5	0.9861	0.9863	1.127	1.035	0.	38.064

TRAVERSE PRESSURE RATIO = 1.1112
TRAVERSE ADIABATIC EFF. = 0.9278
TRAVERSE POLYTROPIC EFF. = 0.9289
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1100
ADIABATIC EFF. = 0.8954
POLYTROPIC EFF. = 0.8970
NOZZLE WEIGHT FLOW = 118.80
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95644
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93604

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0198	0.7853	0.1031	1.102	1.036
2	0.0132	0.8676	0.0683	1.106	1.034
3	0.0119	0.8975	0.0610	1.108	1.033
4	0.0056	0.9615	0.0272	1.115	1.033
5	0.0016	0.9920	0.0076	1.125	1.035

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 8 READING NUMBER 89 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	68.693	9.083	6.053	0.6399	712.363	663.364	259.635	0.233	258.724
2	65.814	9.804	5.344	0.5903	656.288	598.675	268.889	0.242	268.883
3	63.406	10.846	5.006	0.5374	596.739	533.297	267.754	0.241	266.983
4	60.834	11.124	4.334	0.4831	536.427	466.846	264.214	0.238	260.552
5	58.821	11.711	4.051	0.4184	464.673	393.075	247.817	0.223	237.856

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.835	3.415	10.858	0.4667	529.688	656.734	351.370	0.310	281.725
2	55.233	4.553	10.580	0.4262	481.430	597.640	341.006	0.302	274.498
3	49.356	5.566	14.050	0.3650	412.037	537.819	350.385	0.310	268.353
4	39.091	6.941	21.742	0.3231	363.611	477.346	376.347	0.334	281.629
5	22.642	8.352	36.179	0.2947	330.814	417.524	422.879	0.377	301.273

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.363	0.32021	0.3594	0.	208.754	663.364	447.980	1.089
2	0.368	0.39030	0.4135	0.	202.199	598.675	395.441	1.021
3	0.422	0.44804	0.4519	0.	225.210	533.297	312.609	1.005
4	0.445	0.50601	0.4858	0.	248.544	466.846	228.802	1.081
5	0.433	0.53283	0.4517	0.	291.857	393.075	125.667	1.267

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7622	0.7665	1.134	1.048	0.	36.538
2	0.9013	0.9030	1.129	1.039	0.	36.376
3	0.8348	0.8376	1.127	1.042	0.	40.004
4	0.9240	0.9254	1.130	1.039	0.	41.429
5	0.9333	0.9345	1.138	1.040	0.	44.090

TRAVERSE PRESSURE RATIO = 1.1314
TRAVERSE ADIABATIC EFF. = 0.8596
TRAVERSE POLYTROPIC EFF. = 0.8620
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1300
ADIABATIC EFF. = 0.8849
POLYTROPIC EFF. = 0.8869
NOZZLE WEIGHT FLOW = 107.16
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93792
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.92887

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0298	0.7599	0.1535	1.130	1.047
2	0.0153	0.8738	0.0811	1.129	1.040
3	0.0163	0.8850	0.0845	1.126	1.039
4	0.0070	0.9595	0.0343	1.130	1.037
5	-0.0022	1.0093	-0.0104	1.138	1.037

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 9 READING NUMBER 90 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	71.548	11.938	8.908	0.6266	699.720	663.514	222.164	0.199	221.385
2	68.751	12.741	8.281	0.5763	642.492	598.811	232.856	0.209	232.851
3	66.573	14.013	8.173	0.5224	581.603	533.418	231.793	0.208	231.125
4	63.922	14.212	7.422	0.4682	521.296	466.951	231.745	0.208	228.534
5	61.754	14.644	6.984	0.4049	450.563	393.164	220.066	0.198	211.220

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.387	4.967	12.161	0.3987	455.519	656.883	352.681	0.309	231.769
2	55.390	4.710	13.361	0.3856	437.808	597.776	343.892	0.303	248.640
3	50.195	6.405	16.378	0.3131	354.798	537.941	349.347	0.308	227.108
4	39.741	7.591	24.181	0.2860	322.823	477.454	368.100	0.326	247.727
5	22.894	8.604	38.860	0.2687	302.392	417.619	410.958	0.365	274.895

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.487	0.34450	0.3642	0.	265.178	663.514	391.705	1.047
2	0.441	0.41796	0.4407	0.	237.482	598.811	360.294	1.068
3	0.526	0.47581	0.4781	0.	265.402	533.418	272.539	0.983
4	0.518	0.54326	0.5200	0.	271.487	466.951	205.967	1.084
5	0.484	0.59315	0.5051	0.	301.532	393.164	116.087	1.301

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.6859	0.6920	1.148	1.059	0.	48.846
2	0.8299	0.8332	1.143	1.047	0.	43.685
3	0.8097	0.8132	1.137	1.046	0.	49.446
4	0.9186	0.9201	1.137	1.041	0.	47.620
5	0.9278	0.9292	1.143	1.042	0.	47.646

TRAVERSE PRESSURE RATIO = 1.1418
TRAVERSE ADIABATIC EFF. = 0.8160
TRAVERSE POLYTROPIC EFF. = 0.8195
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1420
ADIABATIC EFF. = 0.8605
POLYTROPIC EFF. = 0.8632
NOZZLE WEIGHT FLOW = 102.16
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.85894
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.85087

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0420	0.7110	0.2257	1.147	1.056
2	0.0201	0.8594	0.1069	1.146	1.046
3	0.0234	0.8564	0.1231	1.137	1.044
4	0.0111	0.9426	0.0548	1.137	1.040
5	-0.0030	1.0115	-0.0143	1.145	1.039

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 11 READING NUMBER 92 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	70.244	10.634	7.604	0.8895	987.281	928.798	334.749	0.302	333.575
2	67.754	11.744	7.284	0.8178	905.641	838.226	342.875	0.310	342.867
3	65.740	13.180	7.340	0.7403	819.416	746.687	337.491	0.305	336.519
4	63.106	13.396	6.606	0.6646	735.033	653.646	336.184	0.304	331.525
5	60.839	13.729	6.069	0.5750	636.601	550.357	319.949	0.289	307.089

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	58.367	3.947	11.877	0.5447	632.967	919.516	505.904	0.435	331.680
2	55.105	4.425	12.648	0.5116	588.282	836.777	488.726	0.425	336.501
3	50.068	6.278	15.672	0.4106	471.421	753.019	494.890	0.431	302.562
4	39.925	7.775	23.181	0.3850	439.131	668.348	513.392	0.450	336.082
5	22.855	8.565	37.984	0.3605	408.676	584.590	570.637	0.503	371.618

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.499	0.34776	0.4085	0.	381.071	928.798	538.445	0.994
2	0.480	0.41852	0.4602	0.	354.320	838.226	482.457	0.981
3	0.567	0.47486	0.4931	0.	391.568	746.687	361.451	0.899
4	0.542	0.55553	0.5453	0.	387.092	653.646	281.256	1.014
5	0.514	0.62022	0.5429	0.	427.955	550.357	156.635	1.210

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7006	0.7122	1.320	1.118	0.	48.964
2	0.8171	0.8239	1.304	1.097	0.	46.478
3	0.7822	0.7899	1.288	1.096	0.	52.307
4	0.8559	0.8610	1.285	1.087	0.	49.035
5	0.9185	0.9215	1.297	1.084	0.	49.030

TRAVERSE PRESSURE RATIO = 1.3001
TRAVERSE ADIABATIC EFF. = 0.7990
TRAVERSE POLYTROPIC EFF. = 0.8063
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2950
ADIABATIC EFF. = 0.8312
POLYTROPIC EFF. = 0.8373
NOZZLE WEIGHT FLOW = 129.52
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97428
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95369

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0452	0.7187	0.2357	1.311	1.112
2	0.0278	0.8254	0.1464	1.303	1.095
3	0.0308	0.8260	0.1617	1.283	1.089
4	0.0208	0.8993	0.1036	1.281	1.082
5	0.0112	0.9588	0.0537	1.293	1.080

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 12 READING NUMBER 93 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	72.287	12.677	9.647	0.6246	696.837	663.564	212.692	0.191	211.947
2	69.349	13.339	8.879	0.5752	639.997	598.874	225.712	0.203	225.706
3	67.148	14.588	8.748	0.5219	579.166	533.474	225.474	0.203	224.825
4	64.587	14.877	8.087	0.4682	518.375	467.001	224.995	0.203	221.877
5	62.334	15.224	7.564	0.4048	448.038	393.205	214.774	0.194	206.141

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	60.192	5.772	12.095	0.3754	429.268	656.952	356.164	0.312	213.216
2	54.828	4.148	14.521	0.3777	428.109	597.839	349.730	0.309	246.576
3	49.613	5.823	17.534	0.3049	344.413	537.998	354.712	0.314	223.136
4	39.357	7.207	25.230	0.2807	315.558	477.505	369.962	0.329	243.489
5	22.083	7.793	40.251	0.2672	299.229	417.663	413.841	0.370	273.576

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.533	0.34956	0.3894	0.	284.775	663.584	372.177	1.006
2	0.459	0.41901	0.4417	0.	247.930	598.874	349.909	1.092
3	0.547	0.47533	0.4774	0.	275.691	533.474	262.307	0.992
4	0.533	0.54754	0.5238	0.	277.804	467.001	199.700	1.097
5	0.490	0.59718	0.5080	0.	306.669	393.205	110.994	1.327

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.6560	0.6629	1.153	1.063	0.	53.177
2	0.8159	0.8195	1.148	1.049	0.	45.157
3	0.8050	0.8087	1.141	1.048	0.	51.014
4	0.8587	0.8614	1.140	1.045	0.	48.766
5	0.9080	0.9098	1.147	1.044	0.	48.264

TRAVERSE PRESSURE RATIO = 1.1460
TRAVERSE ADIABATIC EFF. = 0.7965
TRAVERSE POLYTROPIC EFF. = 0.8004
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1420
ADIABATIC EFF. = 0.8248
POLYTROPIC EFF. = 0.8281
NOZZLE WEIGHT FLOW = 91.31
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93886
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93277

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0475	0.6831	0.2614	1.149	1.059
2	0.0276	0.8205	0.1422	1.145	1.048
3	0.0303	0.8226	0.1574	1.136	1.045
4	0.0195	0.9027	0.0960	1.135	1.041
5	0.0078	0.9706	0.0375	1.143	1.040

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A,S.A, COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 13 READING NUMBER 94 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.071	4.461	1.431	1.2217	1331.168	1196.359	583.723	0.536	581.676
2	61.085	5.075	0.615	1.1363	1233.473	1079.695	596.419	0.549	596.404
3	58.932	6.372	0.532	1.0348	1123.718	961.787	581.126	0.535	579.452
4	56.680	6.970	0.180	0.9317	1011.869	841.944	561.257	0.517	553.478
5	54.968	7.858	0.198	0.8042	877.854	708.900	517.773	0.474	496.962

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.840	3.420	6.230	0.7839	919.320	1184.402	637.248	0.543	488.889
2	54.693	4.013	6.392	0.7075	822.169	1077.829	625.717	0.538	475.129
3	48.660	4.870	10.272	0.6147	711.418	969.942	640.979	0.554	469.854
4	40.524	8.374	16.155	0.5478	629.646	860.881	659.207	0.573	477.661
5	26.234	11.944	28.735	0.4741	541.632	752.994	710.153	0.622	479.757

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.421	0.36654	0.4614	0.	406.849	1196.359	777.554	0.840
2	0.443	0.44454	0.5181	0.	406.964	1079.695	670.865	0.797
3	0.482	0.51451	0.5612	0.	435.864	961.787	534.078	0.811
4	0.496	0.58171	0.5971	0.	452.568	841.944	408.312	0.863
5	0.519	0.63088	0.5813	0.	516.573	708.900	236.421	0.965

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8389	0.8486	1.557	1.161	0.	39.767
2	0.9086	0.9140	1.537	1.144	0.	40.581
3	0.9043	0.9098	1.521	1.141	0.	42.851
4	0.9149	0.9197	1.497	1.134	0.	43.455
5	0.9227	0.9269	1.485	1.130	0.	47.116

TRAVERSE PRESSURE RATIO = 1.5235
TRAVERSE ADIABATIC EFF. = 0.8910
TRAVERSE POLYTROPIC EFF. = 0.8974
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5170
ADIABATIC EFF. = 0.9084
POLYTROPIC EFF. = 0.9137
NOZZLE WEIGHT FLOW = 196.41
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00225
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95943

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0239	0.8396	0.1228	1.547	1.158
2	0.0137	0.9084	0.0717	1.536	1.144
3	0.0122	0.9266	0.0622	1.515	1.136
4	0.0082	0.9464	0.0493	1.482	1.126
5	0.0079	0.9657	0.0391	1.482	1.123

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 14 READING NUMBER 95 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.481	3.871	0.841	1.5218	1629.947	1457.430	729.811	0.681	727.252
2	60.618	4.608	0.148	1.4142	1509.483	1315.308	740.610	0.694	740.592
3	58.121	5.561	-0.279	1.2939	1380.907	1171.670	730.817	0.685	728.712
4	55.635	5.925	-0.865	1.1666	1248.140	1025.674	711.229	0.665	701.372
5	53.790	6.680	-0.980	1.0087	1086.174	863.597	658.767	0.612	632.288

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.170	4.750	4.311	0.9244	1113.679	1442.864	751.560	0.624	570.269
2	55.044	4.364	5.574	0.8421	998.159	1313.034	756.488	0.638	571.825
3	49.631	5.841	8.490	0.6905	818.924	1181.605	769.751	0.649	530.369
4	39.704	7.554	15.931	0.6431	751.057	1048.744	812.178	0.695	576.648
5	28.166	13.876	25.625	0.5582	645.987	917.314	840.311	0.726	562.600

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.426	0.31672	0.4436	0.	487.371	1457.430	955.494	0.784
2	0.447	0.40466	0.5098	0.	495.041	1315.308	817.993	0.772
3	0.527	0.47897	0.5544	0.	557.746	1171.670	623.859	0.728
4	0.519	0.54758	0.5878	0.	569.925	1025.674	478.819	0.822
5	0.536	0.60368	0.5751	0.	616.086	863.597	301.228	0.890

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7297	0.7509	1.794	1.249	0.	40.518
2	0.8589	0.8702	1.820	1.218	0.	40.883
3	0.7978	0.8135	1.782	1.225	0.	46.441
4	0.8807	0.8899	1.771	1.202	0.	44.664
5	0.8796	0.8884	1.711	1.189	0.	47.598

TRAVERSE PRESSURE RATIO = 1.7810
TRAVERSE ADIABATIC EFF. = 0.8174
TRAVERSE POLYTROPIC EFF. = 0.8316
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.7680
ADIABATIC EFF. = 0.8485
POLYTROPIC EFF. = 0.8601
NOZZLE WEIGHT FLOW = 231.25
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98674
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99334

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0384	0.7564	0.2049	1.777	1.236
2	0.0237	0.8568	0.1246	1.815	1.217
3	0.0288	0.8388	0.1497	1.760	1.209
4	0.0138	0.9312	0.0684	1.774	1.191
5	0.0194	0.9140	0.0974	1.684	1.176

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 15 READING NUMBER 96 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.209	3.599	0.569	1.5309	1637.438	1460.623	740.124	0.692	737.528
2	60.524	4.514	0.054	1.4195	1514.193	1318.189	745.089	0.698	745.071
3	58.001	5.441	-0.399	1.2992	1385.748	1174.237	735.843	0.690	733.724
4	55.353	5.643	-1.147	1.1763	1255.191	1027.921	720.336	0.675	710.353
5	53.669	6.559	-1.101	1.0144	1090.328	865.489	663.133	0.617	636.478

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.638	5.218	3.571	1.2740	1433.541	1446.026	756.114	0.672	723.994
2	59.024	8.344	1.500	1.1189	1265.465	1315.911	691.226	0.611	651.253
3	54.325	10.535	3.675	0.9506	1085.110	1184.193	701.623	0.615	632.761
4	42.795	10.645	12.558	0.8814	996.099	1051.041	822.800	0.728	729.571
5	23.142	8.852	30.527	0.8543	945.308	919.324	1031.823	0.933	857.812

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.171	0.10513	0.1811	0.	210.113	1460.623	1235.912	0.982
2	0.215	0.16004	0.2324	0.	231.024	1318.189	1084.887	0.874
3	0.282	0.20779	0.2647	0.	302.790	1174.237	881.403	0.862
4	0.286	0.26578	0.3006	0.	375.568	1027.921	675.474	1.027
5	0.250	0.14419	0.0962	0.	552.693	865.489	366.630	1.348

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7112	0.7211	1.276	1.102	0.	16.183
2	0.6937	0.7038	1.267	1.101	0.	19.531
3	0.5908	0.6050	1.284	1.125	0.	25.572
4	0.7765	0.7874	1.425	1.138	0.	27.238
5	0.8338	0.8436	1.537	1.157	0.	32.794

TRAVERSE PRESSURE RATIO = 1.3485
TRAVERSE ADIABATIC EFF. = 0.7298
TRAVERSE POLYTROPIC EFF. = 0.7410
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.3340
ADIABATIC EFF. = 0.7478
POLYTROPIC EFF. = 0.7579
NOZZLE WEIGHT FLOW = 231.87
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99059
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99797

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0207	0.7182	0.1121	1.265	1.097
2	0.0247	0.6855	0.1449	1.276	1.105
3	0.0337	0.6275	0.1948	1.262	1.110
4	0.0217	0.8351	0.1126	1.420	1.126
5	0.0333	0.8282	0.1604	1.482	1.144

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 16 READING NUMBER 97 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.225	3.615	0.585	1.5315	1637.566	1460.943	739.774	0.692	737.179
2	60.505	4.495	0.035	1.4192	1514.809	1318.478	745.829	0.699	745.811
3	58.082	5.522	-0.318	1.2983	1384.814	1174.494	733.672	0.688	731.558
4	55.579	5.869	-0.921	1.1706	1251.998	1028.146	714.433	0.668	704.531
5	53.705	6.595	-1.065	1.0133	1090.036	865.679	662.404	0.616	635.779

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.448	5.028	3.777	0.9982	1185.211	1446.342	739.353	0.623	601.970
2	56.307	5.627	4.198	0.8995	1057.345	1316.200	731.298	0.622	586.496
3	49.776	5.986	8.306	0.7251	853.765	1184.453	766.668	0.651	551.280
4	40.646	8.496	14.933	0.6831	793.334	1051.272	806.339	0.694	600.748
5	27.592	13.302	26.113	0.6222	715.144	919.525	869.049	0.756	626.054

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.371	0.27094	0.3936	0.	426.532	1460.943	1019.810	0.817
2	0.397	0.35015	0.4540	0.	436.559	1318.478	879.640	0.786
3	0.498	0.40779	0.4845	0.	532.649	1174.494	651.804	0.754
4	0.479	0.47415	0.5178	0.	535.530	1028.146	515.742	0.853
5	0.470	0.50967	0.4860	0.	592.340	865.679	327.186	0.985

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7388	0.7569	1.670	1.214	0.	35.320
2	0.8375	0.8490	1.682	1.192	0.	36.662
3	0.7533	0.7703	1.666	1.209	0.	44.015
4	0.8426	0.8536	1.671	1.188	0.	41.715
5	0.8533	0.8635	1.663	1.184	0.	43.415

TRAVERSE PRESSURE RATIO = 1.6708
TRAVERSE ADIABATIC EFF. = 0.7979
TRAVERSE POLYTROPIC EFF. = 0.8119
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.6670
ADIABATIC EFF. = 0.8373
POLYTROPIC EFF. = 0.8486
NOZZLE WEIGHT FLOW = 231.86
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98829
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99436

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0315	0.7733	0.1699	1.669	1 204
2	0.0246	0.8295	0.1340	1.682	1.193
3	0.0322	0.8017	0.1682	1.640	1.189
4	0.0158	0.9146	0.0795	1.694	1.178
5	0.0203	0.9062	0.1016	1.644	1.168

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 17 READING NUMBER 98 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.436	3.826	0.796	1.5256	1634.153	1460.609	732.856	0.684	730.286
2	60.672	4.662	0.202	1.4151	1511.972	1318.176	740.589	0.693	740.571
3	58.085	5.525	-0.315	1.2969	1384.456	1174.225	733.426	0.687	731.314
4	55.473	5.763	-1.027	1.1722	1253.342	1027.911	717.124	0.671	707.185
5	53.662	6.552	-1.108	1.0138	1090.432	865.480	663.315	0.617	636.653

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	59.347	4.927	4.088	0.9604	1148.846	1446.011	744.945	0.623	585.224
2	55.623	4.943	5.049	0.8706	1028.678	1315.898	745.387	0.631	580.771
3	49.768	5.978	8.317	0.7003	828.275	1184.182	768.686	0.650	534.907
4	40.666	8.516	14.806	0.6638	774.219	1051.031	803.519	0.689	586.095
5	27.895	13.605	25.767	0.5836	674.313	919.314	852.553	0.738	588.712

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.399	0.29544	0.4207	0.	458.518	1460.609	987.494	0.801
2	0.422	0.37967	0.4844	0.	466.986	1318.176	848.912	0.784
3	0.520	0.44885	0.5254	0.	551.910	1174.225	632.271	0.731
4	0.498	0.52515	0.5673	0.	547.507	1027.911	503.524	0.829
5	0.511	0.55797	0.5327	0.	607.674	865.480	311.640	0.925

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7436	0.7627	1.738	1.230	0.	38.078
2	0.8521	0.8634	1.759	1.206	0.	38.802
3	0.7837	0.7997	1.734	1.218	0.	45.896
4	0.8653	0.8753	1.731	1.196	0.	43.050
5	0.8459	0.8568	1.684	1.190	0.	45.908

TRAVERSE PRESSURE RATIO = 1.7322
TRAVERSE ADIABATIC EFF. = 0.8107
TRAVERSE POLYTROPIC EFF. = 0.8247
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.7300
ADIABATIC EFF. = 0.8476
POLYTROPIC EFF. = 0.8589
NOZZLE WEIGHT FLOW = 231.98
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98583
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99214

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0346	0.7689	0.1857	1.736	1.222
2	0.0240	0.8470	0.1280	1.760	1.207
3	0.0296	0.8282	0.1546	1.718	1.202
4	0.0127	0.9338	0.0639	1.748	1.185
5	0.0203	0.9081	0.1020	1.667	1.173

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 18 READING NUMBER 99 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.655	4.045	1.015	1.5212	1631.297	1460.856	725.968	0.677	723.422
2	60.722	4.712	0.252	1.4155	1511.482	1318.399	739.189	0.692	739.172
3	58.239	5.679	-0.161	1.2947	1382.375	1174.424	729.171	0.683	727.070
4	55.702	5.992	-0.798	1.1689	1250.057	1028.085	711.114	0.665	701.259
5	53.921	6.811	-0.849	1.0091	1086.814	865.627	657.157	0.610	630.743

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.641	3.221	6.014	0.8686	1055.252	1446.256	793.256	0.653	564.267
2	53.589	2.909	7.134	0.8146	969.549	1316.121	786.503	0.661	575.434
3	49.226	5.436	9.013	0.6802	807.806	1184.382	778.719	0.656	527.507
4	39.372	7.222	16.330	0.6235	731.031	1051.209	816.395	0.696	563.959
5	27.573	13.283	26.348	0.5431	629.840	919.470	844.138	0.728	551.474

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.477	0.33237	0.4608	0.	555.695	1460.856	890.561	0.780
2	0.476	0.42532	0.5307	0.	535.944	1318.399	780.176	0.778
3	0.539	0.50465	0.5791	0.	572.709	1174.424	611.673	0.726
4	0.540	0.58062	0.6188	0.	588.434	1028.085	462.775	0.804
5	0.555	0.62667	0.5963	0.	631.503	865.627	287.967	0.874

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7158	0.7398	1.886	1.278	0.	44.562
2	0.8649	0.8766	1.906	1.234	0.	42.965
3	0.8284	0.8424	1.840	1.230	0.	47.353
4	0.8799	0.8896	1.821	1.213	0.	46.217
5	0.8824	0.8912	1.740	1.195	0.	48.870

TRAVERSE PRESSURE RATIO = 1.8479
TRAVERSE ADIABATIC EFF. = 0.8196
TRAVERSE POLYTROPIC EFF. = 0.8345
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.8290
ADIABATIC EFF. = 0.8648
POLYTROPIC EFF. = 0.8757
NOZZLE WEIGHT FLOW = 231.30
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98471
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99992

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0410	0.7636	0.2099	1.854	1.253
2	0.0218	0.8783	0.1110	1.897	1.229
3	0.0250	0.8650	0.1288	1.816	1.215
4	0.0125	0.9398	0.0614	1.813	1.197
5	0.0129	0.9435	0.0647	1.717	1.177

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 20 READING NUMBER 101 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.039	4.429	1.399	1.5134	1624.676	1459.743	713.248	0.664	710.747
2	61.021	5.011	0.551	1.4086	1505.945	1317.395	729.618	0.682	729.600
3	58.422	5.862	0.022	1.2906	1378.585	1173.529	723.413	0.677	721.329
4	55.891	6.181	-0.609	1.1654	1246.246	1027.301	705.537	0.660	695.759
5	54.151	7.041	-0.619	1.0066	1082.658	864.967	651.137	0.605	624.965

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	55.885	1.465	8.154	0.8256	1007.276	1445.154	833.786	0.683	564.367
2	52.385	1.705	8.636	0.7785	931.566	1315.118	810.360	0.677	568.508
3	49.780	5.990	8.642	0.6550	778.646	1183.480	774.460	0.651	502.738
4	39.490	7.340	16.401	0.5840	686.657	1050.408	812.010	0.691	528.832
5	27.202	12.912	26.948	0.5125	595.354	918.769	839.432	0.723	522.984

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.517	0.35126	0.4801	0.	612.068	1459.743	833.086	0.794
2	0.508	0.44964	0.5538	0.	577.288	1317.395	737.830	0.779
3	0.562	0.53200	0.6043	0.	588.993	1173.529	594.486	0.697
4	0.579	0.60638	0.6420	0.	614.628	1027.301	435.780	0.760
5	0.589	0.66340	0.6294	0.	649.966	864.967	268.804	0.837

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7287	0.7536	1.996	1.300	0.	47.322
2	0.8601	0.8729	1.990	1.253	0.	45.439
3	0.8537	0.8661	1.882	1.232	0.	49.517
4	0.8768	0.8870	1.849	1.219	0.	49.291
5	0.8818	0.8909	1.771	1.202	0.	51.179

TRAVERSE PRESSURE RATIO = 1.9131
TRAVERSE ADIABATIC EFF. = 0.8233
TRAVERSE POLYTROPIC EFF. = 0.8387
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.8860
ADIABATIC EFF. = 0.8635
POLYTROPIC EFF. = 0.8752
NOZZLE WEIGHT FLOW = 229.08
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98857
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99769

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0451	0.7666	0.2201	1.942	1.272
2	0.0236	0.8789	0.1167	1.974	1.244
3	0.0250	0.8682	0.1304	1.862	1.224
4	0.0145	0.9318	0.0718	1.841	1.205
5	0.0129	0.9456	0.0643	1.748	1.183

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 21 READING NUMBER 102 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	64.540	4.930	1.900	1.5048	1619.395	1461.174	698.149	0.649	695.701
2	61.544	5.534	1.074	1.3995	1499.908	1318.686	714.697	0.667	714.679
3	59.014	6.454	0.614	1.2811	1371.269	1174.679	707.466	0.661	705.428
4	56.550	6.840	0.050	1.1545	1237.725	1028.308	688.873	0.643	679.326
5	54.926	7.816	0.156	0.9939	1072.755	865.815	633.378	0.587	607.920

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	56.089	1.669	8.451	0.7875	967.647	1446.570	841.369	0.685	539.317
2	52.685	2.005	8.859	0.7499	900.515	1316.407	811.469	0.676	545.817
3	49.182	5.392	9.832	0.6246	745.877	1184.639	788.965	0.661	487.498
4	39.217	7.067	17.333	0.5573	657.546	1051.437	815.750	0.691	508.388
5	26.591	12.301	28.335	0.4891	570.481	919.670	841.070	0.721	503.787

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.547	0.37200	0.5009	0.	644.327	1461.174	802.244	0.775
2	0.532	0.46737	0.5700	0.	600.301	1318.686	716.106	0.764
3	0.591	0.55037	0.6202	0.	620.232	1174.679	564.407	0.691
4	0.605	0.62543	0.6578	0.	636.558	1028.308	414.879	0.748
5	0.612	0.69068	0.6515	0.	667.491	865.815	252.178	0.829

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7254	0.7517	2.066	1.318	0.	50.070
2	0.8673	0.8798	2.035	1.260	0.	47.722
3	0.8450	0.8587	1.936	1.246	0.	51.833
4	0.8731	0.8839	1.882	1.227	0.	51.387
5	0.8836	0.8928	1.800	1.207	0.	52.956

TRAVERSE PRESSURE RATIO = 1.9614
TRAVERSE ADIABATIC EFF. = 0.8216
TRAVERSE POLYTROPIC EFF. = 0.8377
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.9390
ADIABATIC EFF. = 0.8592
POLYTROPIC EFF. = 0.8717
NOZZLE WEIGHT FLOW = 225.31
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99155
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98962

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0468	0.7690	0.2297	2.027	1.291
2	0.0264	0.8695	0.1311	2.023	1.256
3	0.0262	0.8697	0.1351	1.917	1.235
4	0.0183	0.9183	0.0898	1.871	1.214
5	0.0119	0.9520	0.0592	1.782	1.189

Table 6. - Listing of Blade Element Performance (continued).

NASA TASK I R1 TEST VEHICLE

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 22 READING NUMBER 103 DATE 3/24/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.LN	INCID ANG SUCT.SURF	INLET REL MACH NO.	INLET REL VELOCITY	ROTOR SPD AT INLET	INLET ABS VELOCITY	INLET ABS MACH NO.	INLET AX. VELOCITY
1	63.506	3.896	0.866	0.9440	1040.294	930.392	465.384	0.422	463.752
2	60.703	4.693	0.233	0.8767	962.822	839.664	471.160	0.429	471.148
3	57.863	5.303	-0.537	0.8058	884.034	747.968	471.232	0.430	469.875
4	54.870	5.160	-1.630	0.7334	804.343	654.768	467.168	0.426	460.694
5	52.603	5.493	-2.167	0.6410	704.803	551.301	439.105	0.399	421.456

RADIAL POSITION	REL. EXIT FLOW ANG.	REL. DEV. ANG. T.E.	REL. TURN ANGLE	EXIT REL. MACH NO.	EXIT REL. VELOCITY	ROTOR SPD AT EXIT	EXIT ABS VELOCITY	EXIT ABS MACH NO.	EXIT AX. VELOCITY
1	57.902	3.482	5.605	0.7666	866.427	921.093	498.207	0.441	459.977
2	54.392	3.712	6.310	0.6917	780.082	838.213	498.021	0.442	454.138
3	48.960	5.170	8.903	0.6050	682.247	754.311	508.152	0.451	447.905
4	39.327	7.177	15.543	0.5456	613.317	669.495	552.271	0.491	473.448
5	24.389	10.099	28.214	0.4995	559.408	585.593	623.543	0.557	502.912

RADIAL POSITION	DIFFUSION FACTOR	ST. PRESS RISE COEFF	CH1	INLET ABS TANG. VEL	EXIT ABS TANG.VEL	INLET REL TANG. VEL	EXIT REL TANG.VEL	AXIAL VEL.RATIO
1	0.233	0.21936	0.2735	0.	187.781	930.392	733.312	0.992
2	0.260	0.28621	0.3274	0.	204.064	839.664	634.149	0.964
3	0.309	0.34363	0.3670	0.	239.783	747.968	514.528	0.953
4	0.330	0.39727	0.3982	0.	281.607	654.768	387.888	1.028
5	0.324	0.38978	0.3351	0.	357.577	551.301	228.017	1.193

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8925	0.8950	1.183	1.055	0.	22.207
2	0.9179	0.9200	1.195	1.057	0.	24.196
3	0.8767	0.8799	1.198	1.061	0.	28.162
4	0.9285	0.9305	1.219	1.063	0.	30.744
5	0.9467	0.9484	1.243	1.068	0.	35.413

TRAVERSE PRESSURE RATIO = 1.2052
TRAVERSE ADIABATIC EFF. = 0.9129
TRAVERSE POLYTROPIC EFF. = 0.9152
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2040
ADIABATIC EFF. = 0.9180
POLYTROPIC EFF. = 0.9202
NOZZLE WEIGHT FLOW = 168.78
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99239
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96737

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0125	0.8503	0.0642	1.183	1.058
2	0.0070	0.9237	0.0360	1.195	1.057
3	0.0094	0.9138	0.0480	1.200	1.059
4	0.0058	0.9575	0.0286	1.219	1.061
5	0.0106	0.9433	0.0517	1.235	1.066

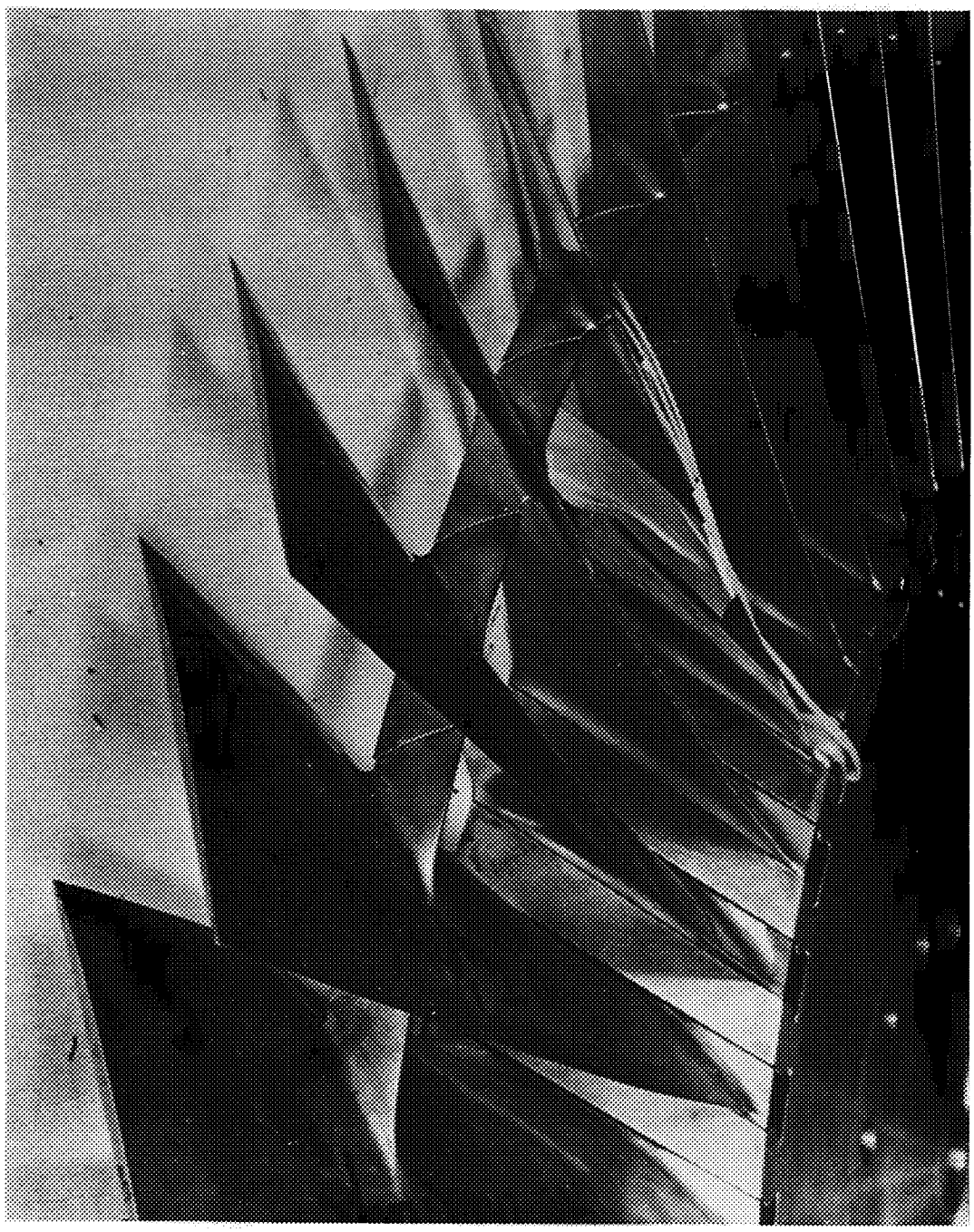


Figure 1. - Partial view of Rotor 1B.

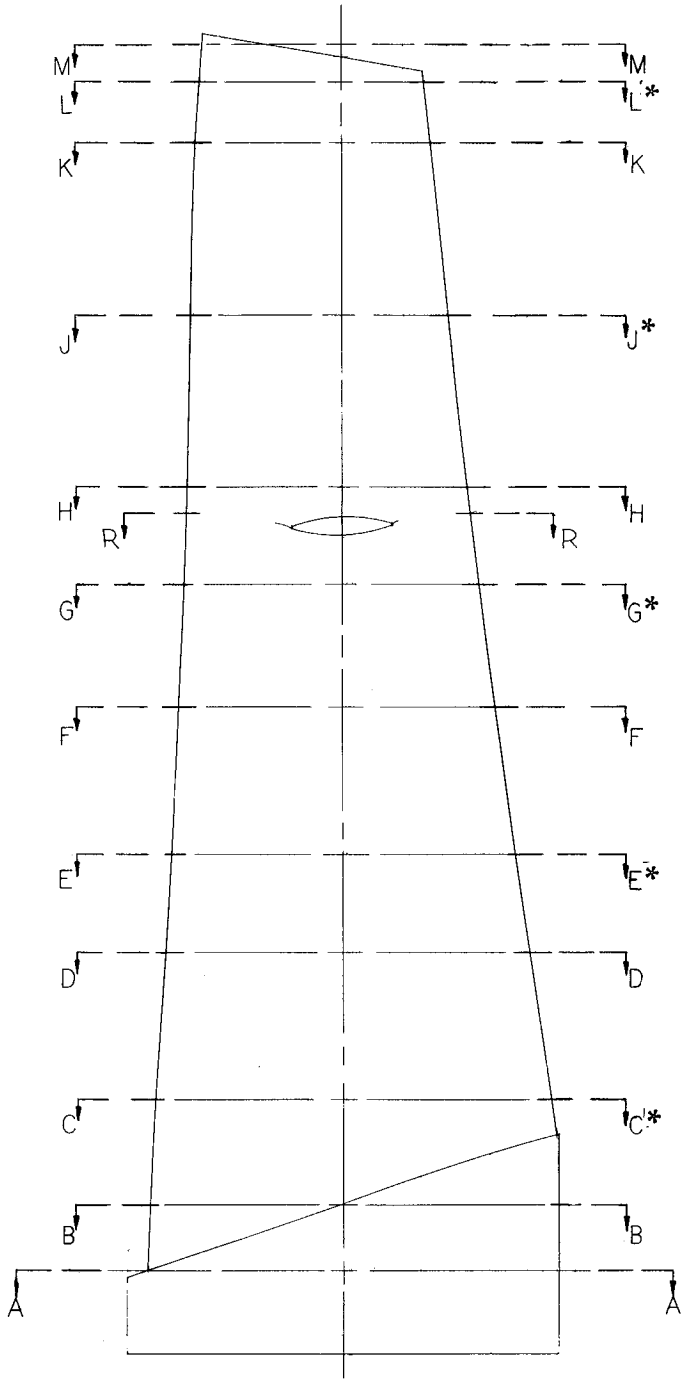


Figure 2. - Meridional view of rotor. Probograph inspection sections are indicated by asterisks.

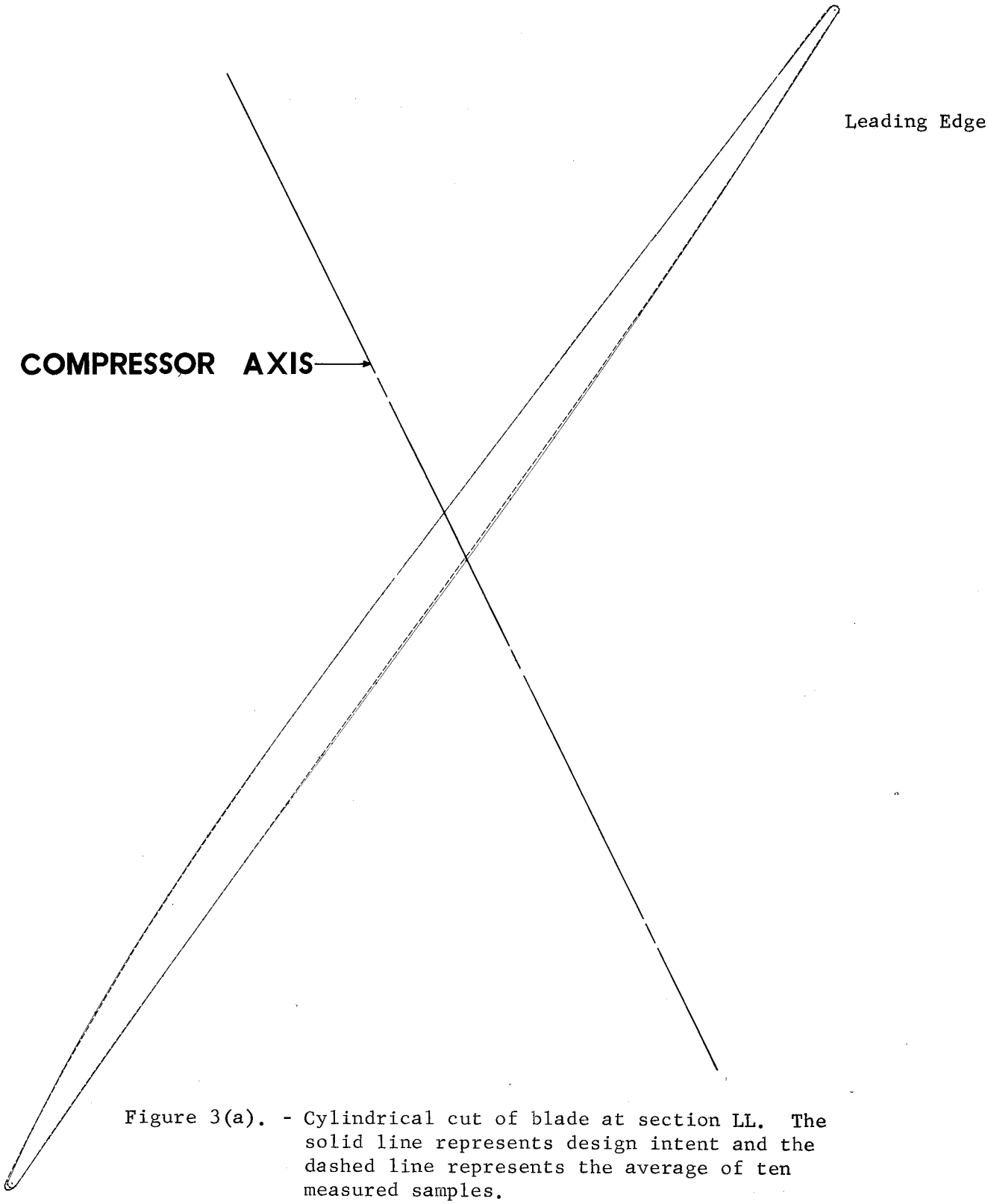


Figure 3(a). - Cylindrical cut of blade at section LL. The solid line represents design intent and the dashed line represents the average of ten measured samples.

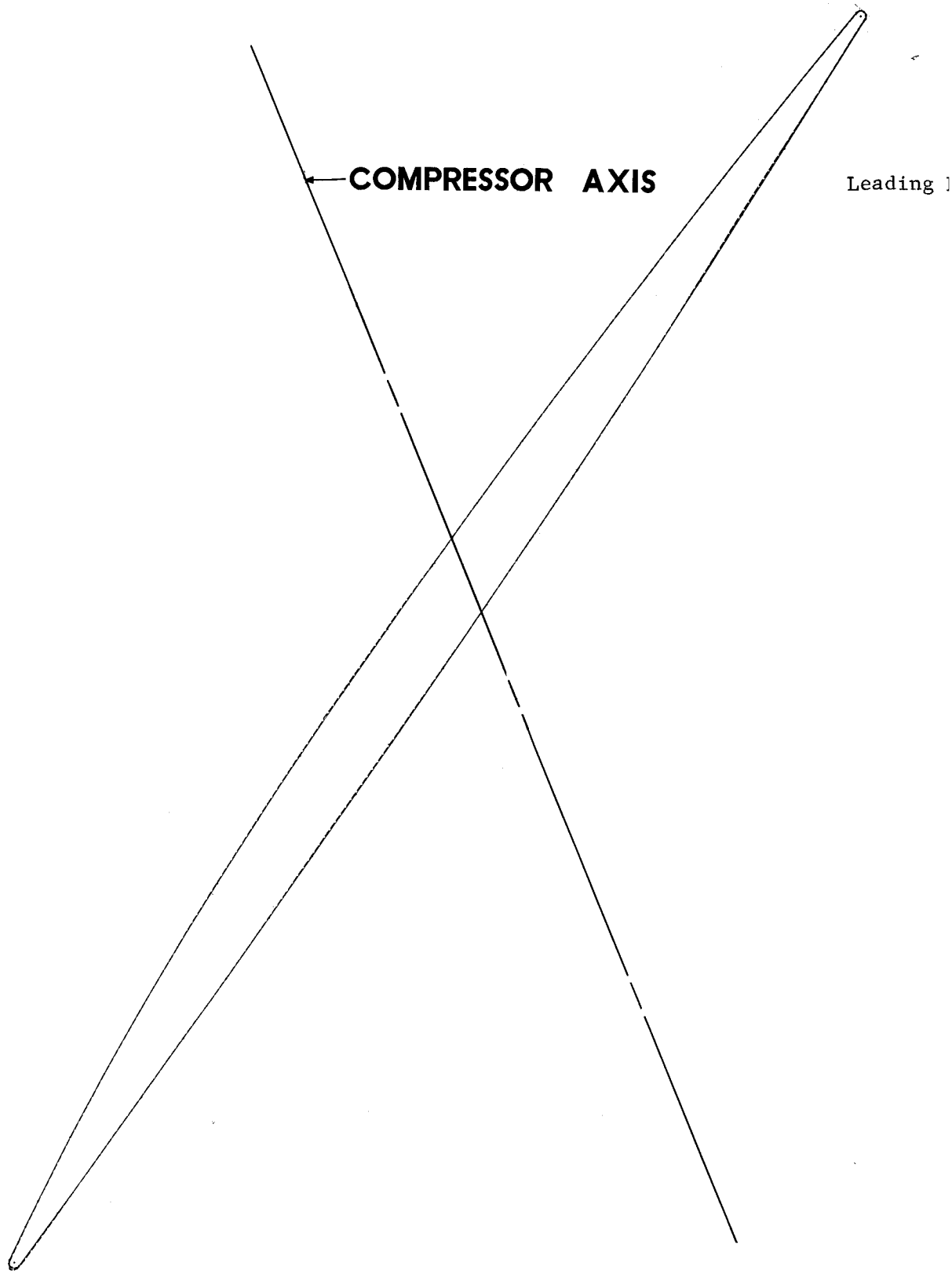


Figure 3(b). - Cylindrical cut of blade at section JJ. The solid line represents design intent and the dashed line represents the average of ten measured samples.

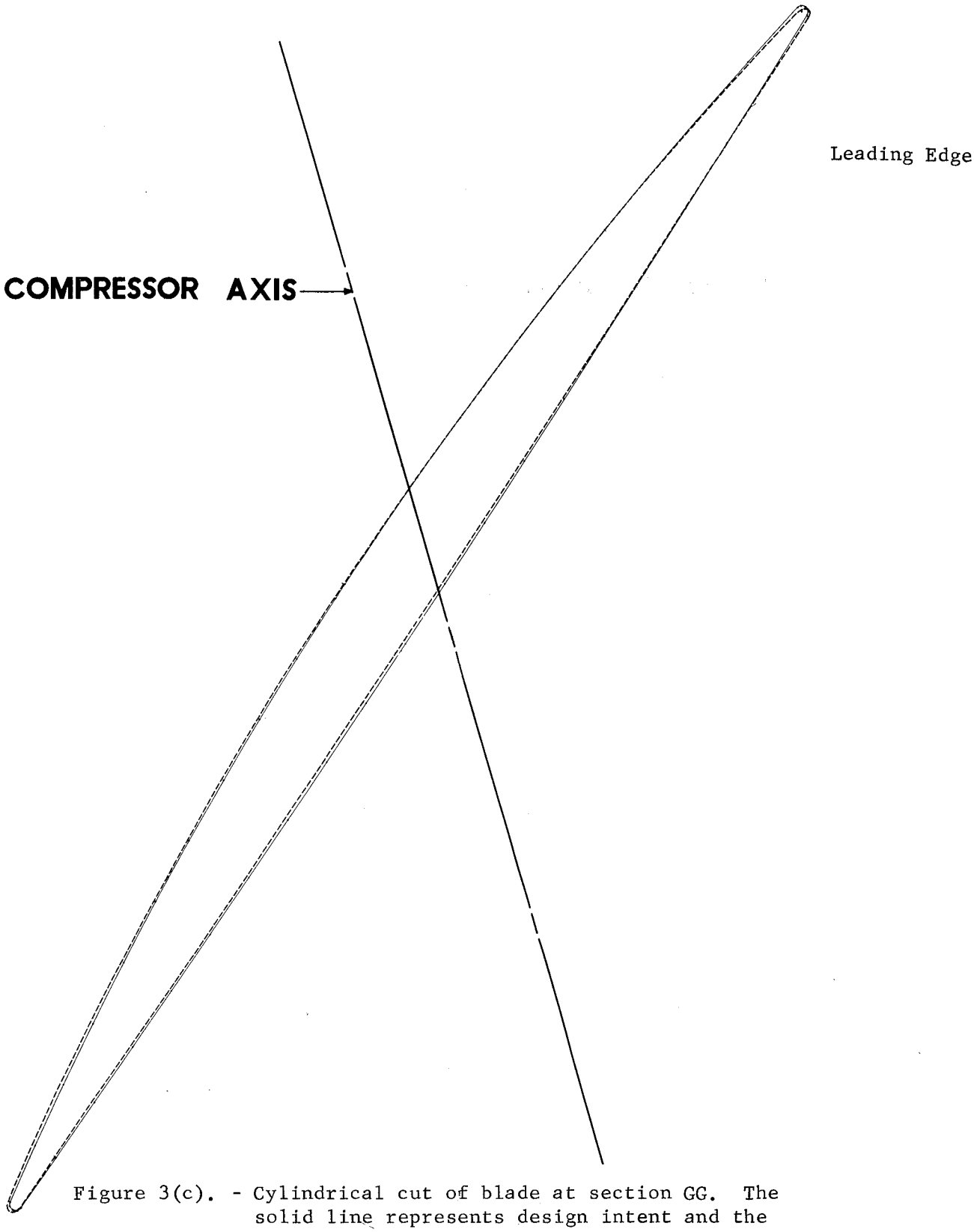


Figure 3(c). - Cylindrical cut of blade at section GG. The solid line represents design intent and the dashed line represents the average of ten measured samples.

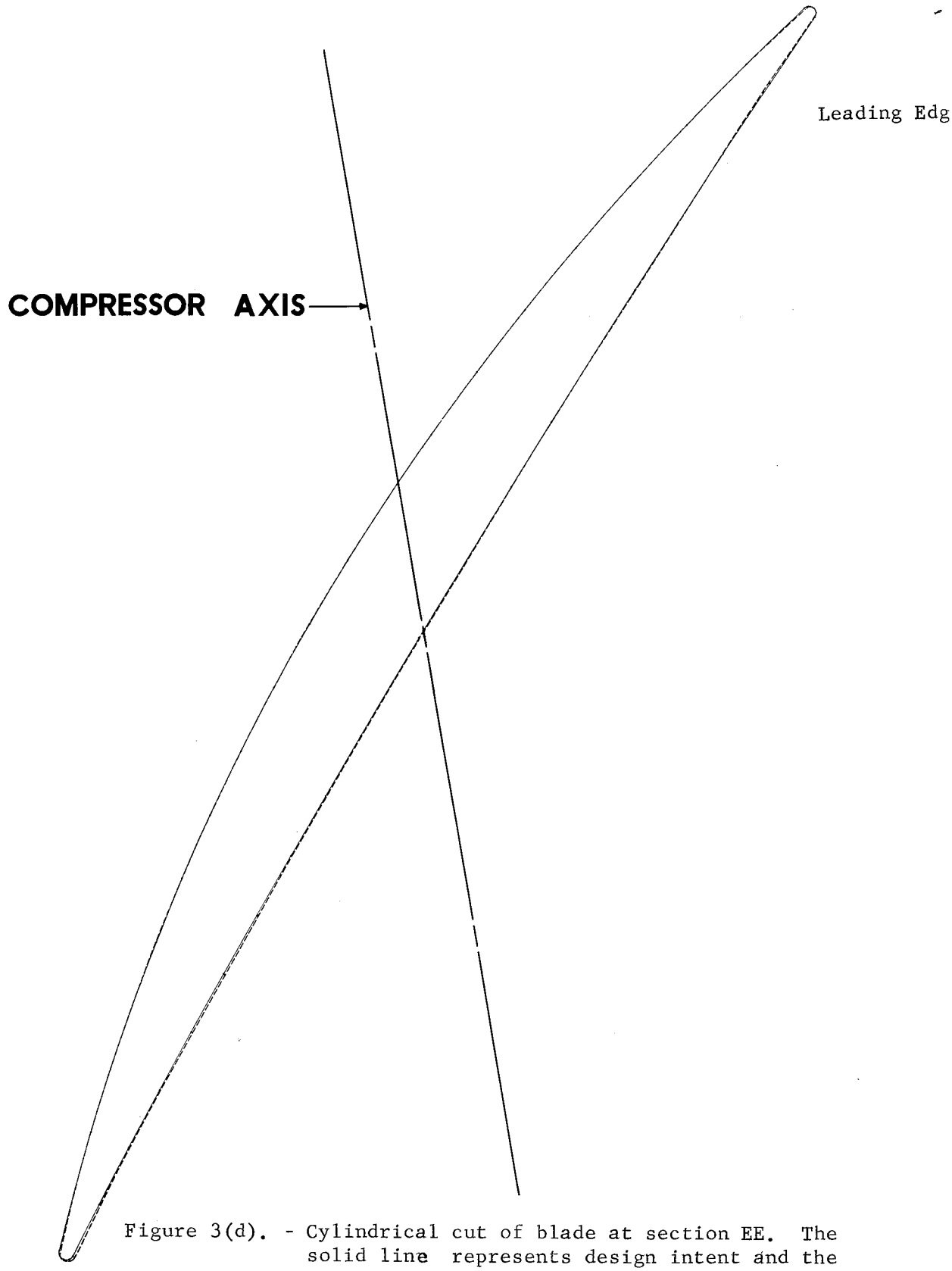


Figure 3(d). - Cylindrical cut of blade at section EE. The solid line represents design intent and the dashed line represents the average of ten measured samples.

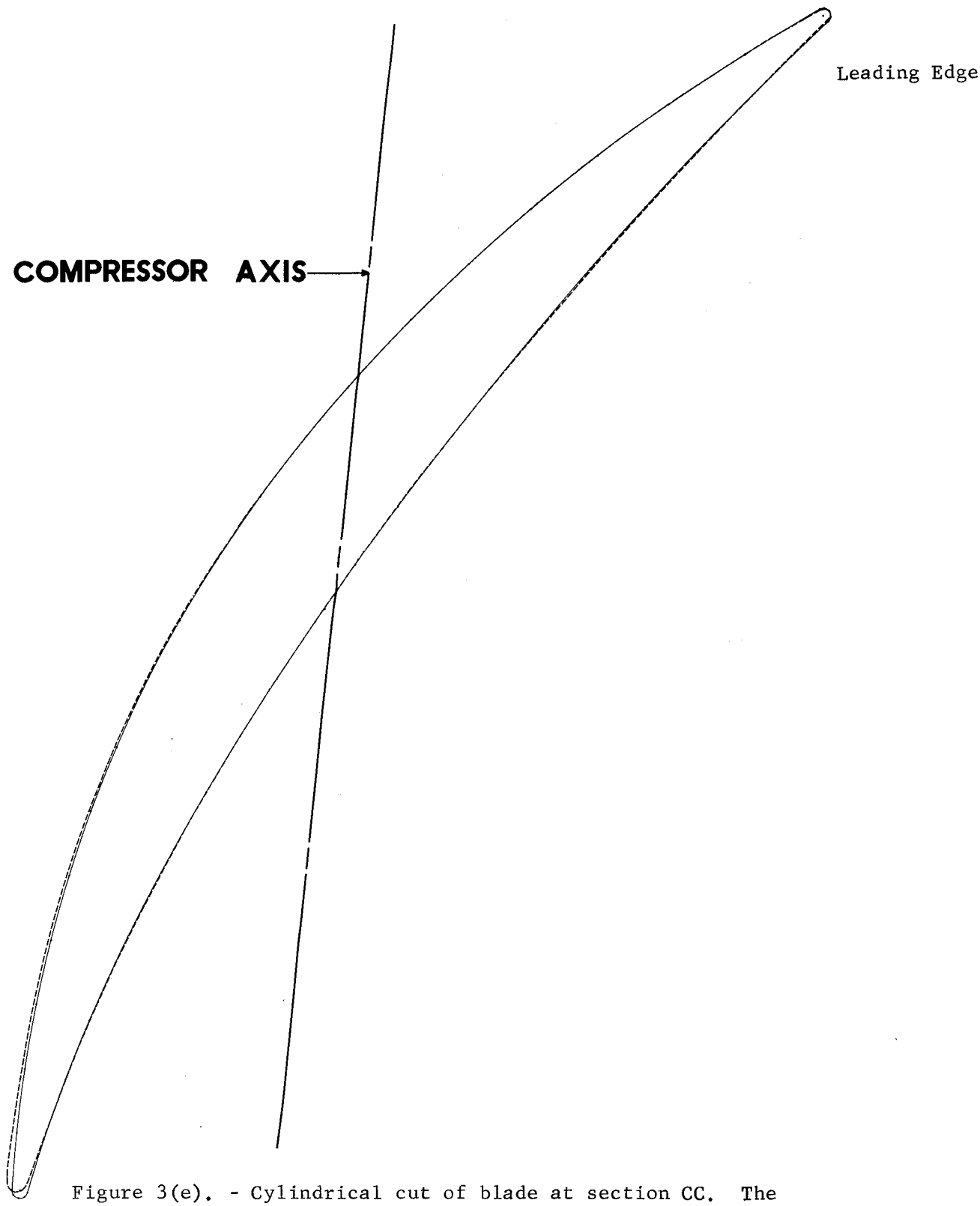


Figure 3(e). - Cylindrical cut of blade at section CC. The solid line represents design intent and the dashed line represents the average of ten measured samples.

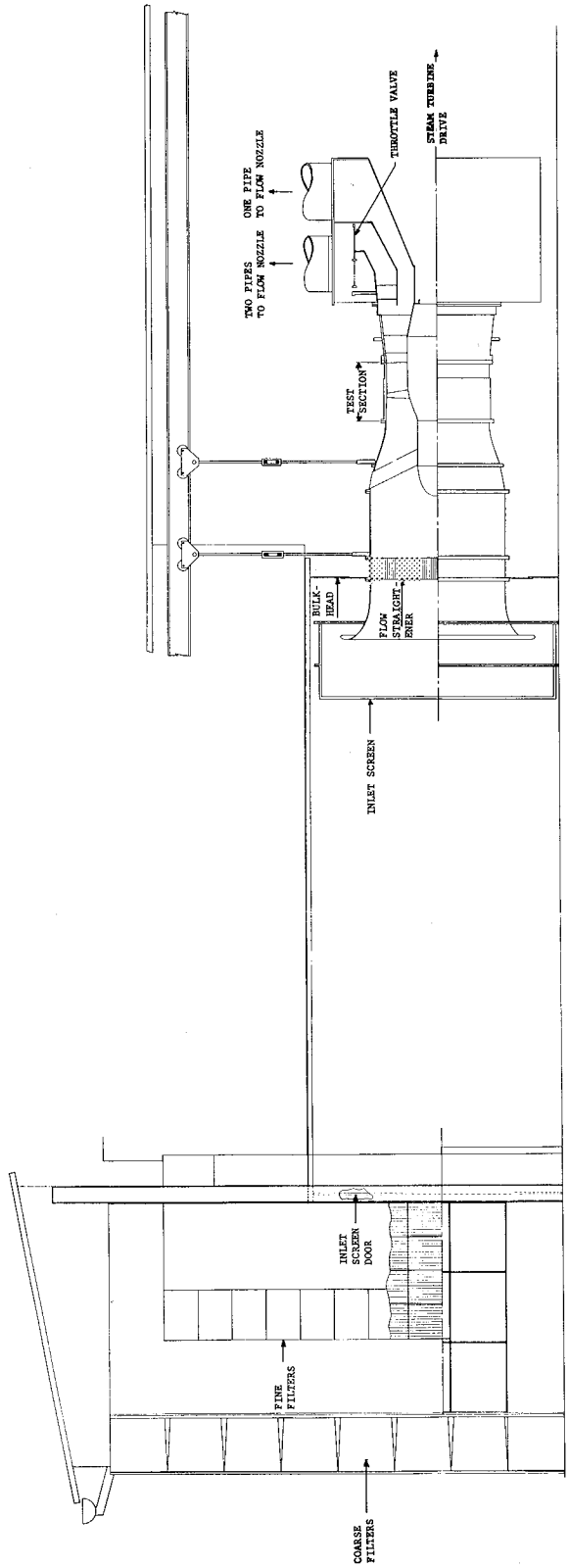
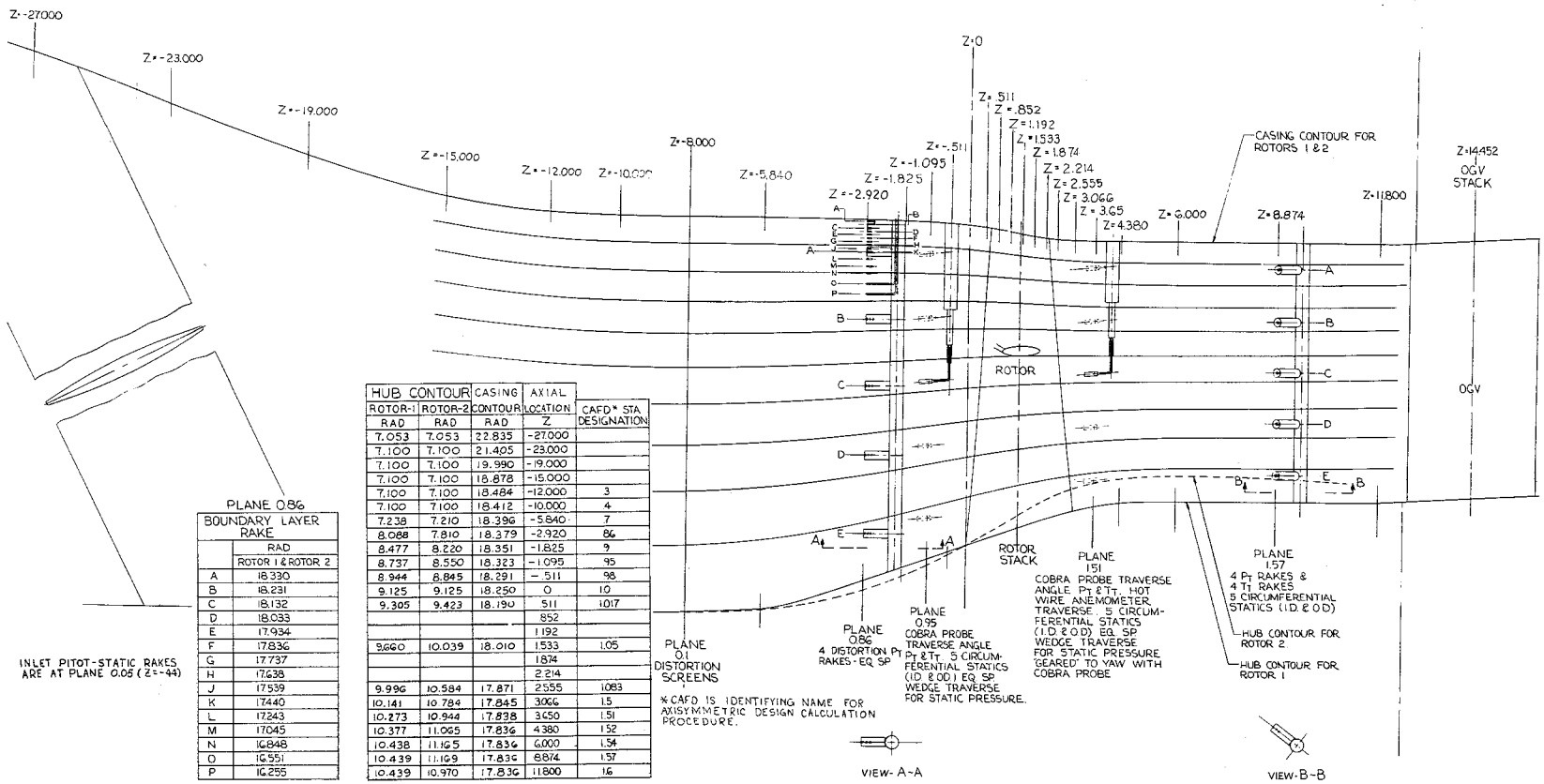


Figure 4. - House Compressor Test Facility.



PLANE 0.86

BOUNDARY LAYER RAKE	RAD
	ROTOR 1 & ROTOR 2
A	18.330
B	18.231
C	18.132
D	18.033
E	17.934
F	17.836
G	17.737
H	17.638
J	17.539
K	17.440
L	17.243
M	17.045
N	16.848
O	16.551
P	16.255

HUB CONTOUR ROTOR-1 RAD	HUB CONTOUR ROTOR-2 RAD	CASING CONTOUR RAD	AXIAL LOCATION Z	CAFD* STA DESIGNATION
7.053	7.053	22.835	-27.000	
7.100	7.100	21.405	-23.000	
7.100	7.100	19.990	-19.000	
7.100	7.100	18.878	-15.000	
7.100	7.100	18.484	-12.000	3
7.100	7.100	18.412	-10.000	4
7.238	7.210	18.396	-5.840	7
8.088	7.810	18.379	-2.920	86
8.477	8.220	18.351	-1.825	9
8.737	8.550	18.323	-1.095	95
8.944	8.845	18.291	-.511	98
9.125	9.125	18.250	0	10
9.305	9.423	18.190	.511	1.017
			.852	
			1.192	
9.660	10.039	18.010	1.533	1.05
			1.874	
			2.214	
9.996	10.584	17.871	2.555	1.083
10.141	10.784	17.845	3.066	1.5
10.273	10.944	17.838	3.650	1.51
10.377	11.065	17.836	4.380	1.52
10.438	11.165	17.836	6.000	1.54
10.439	11.169	17.836	8.874	1.57
10.439	10.970	17.836	11.800	1.6

Figure 5. - Meridional view showing location of instrumentation.

QTY USED	SYMBOL	DESCRIPTION	PLANE
84	○	STATIC PRESSURE TAPS	
3	□	STATIC PRESSURE PROBES	0.95 & 1.51
2	◇	COBRA PROBE TRAVERSE	0.95 & 1.51
4	△	OUTLET P_T RAKES	1.57
4	⊿	OUTLET T_T RAKES	1.57
4	⌀	INLET DISTORTION P_T RAKES	0.86
1	○	INLET BOUNDARY LAYER RAKE	0.86
6	⊙	INLET PITOT STATIC RAKES	0.05
3	⊙	HOT WIRE ANEMOMETER TRAVERSE	1.51
3	○	P_T WAKE RAKES	2.0

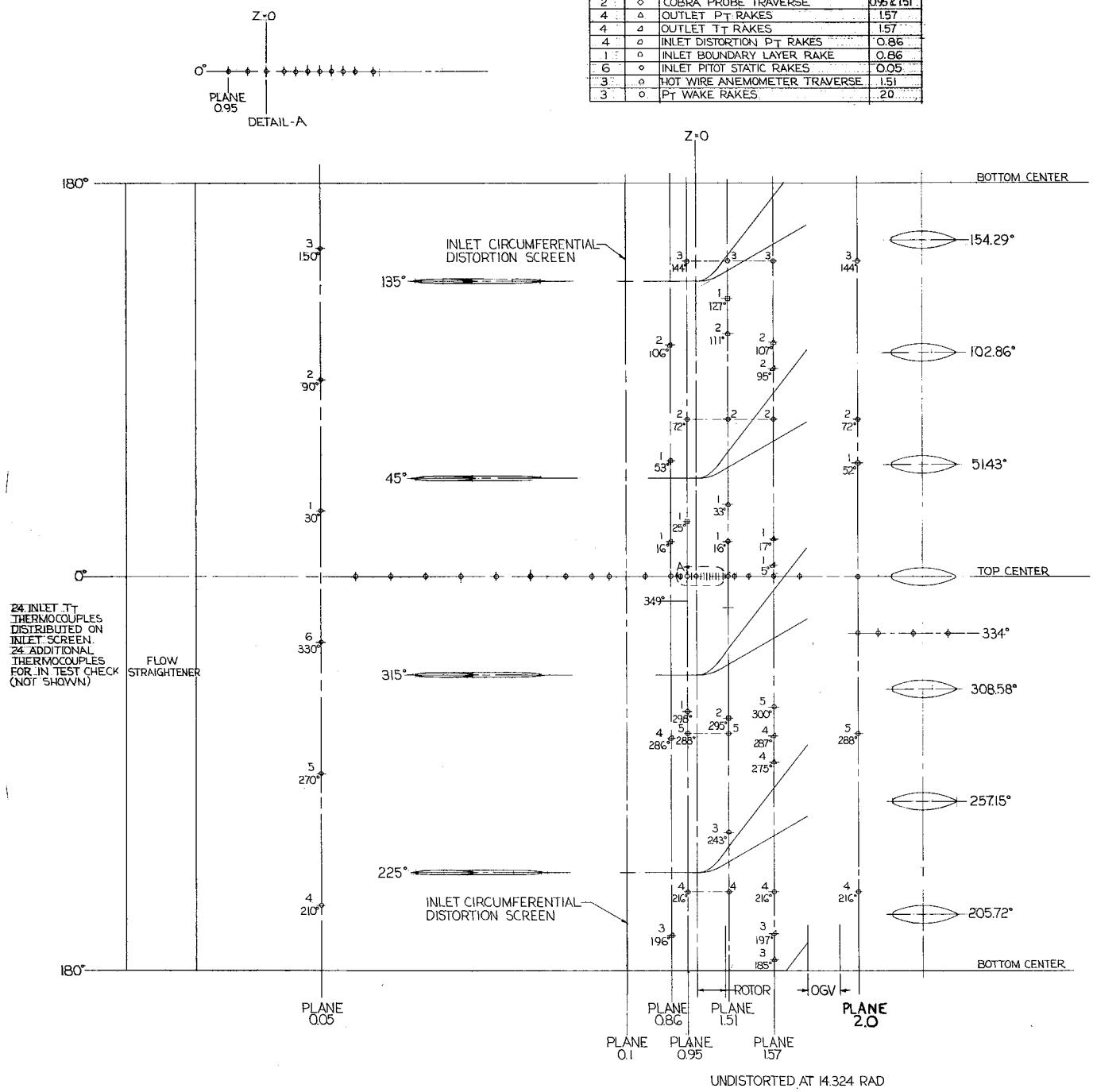
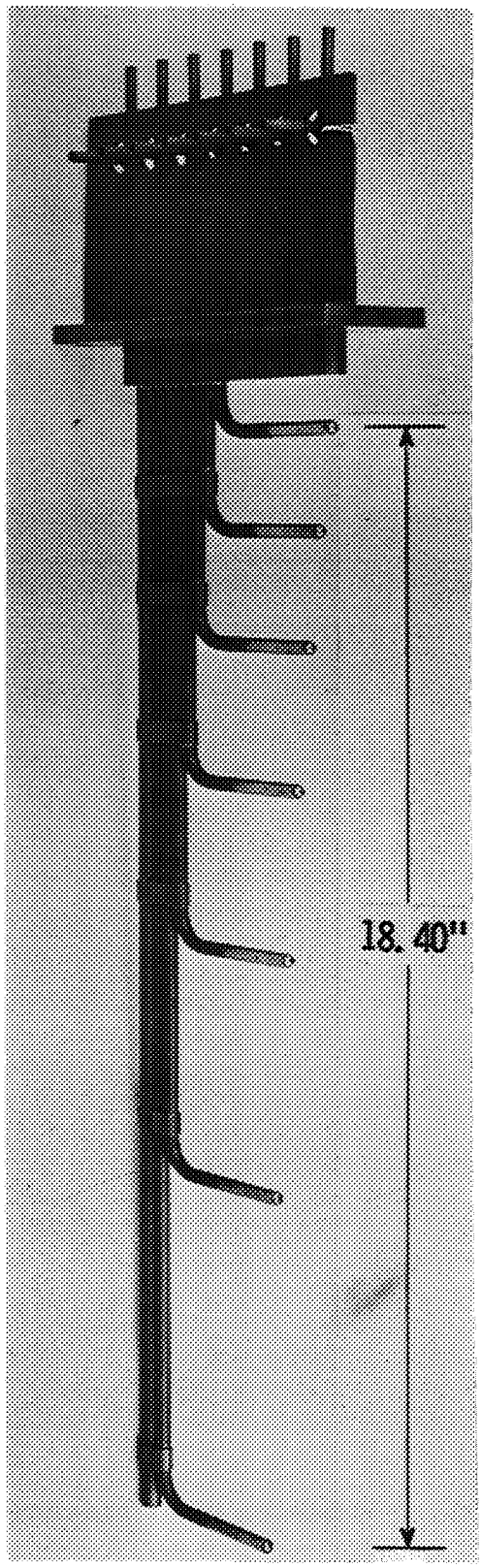
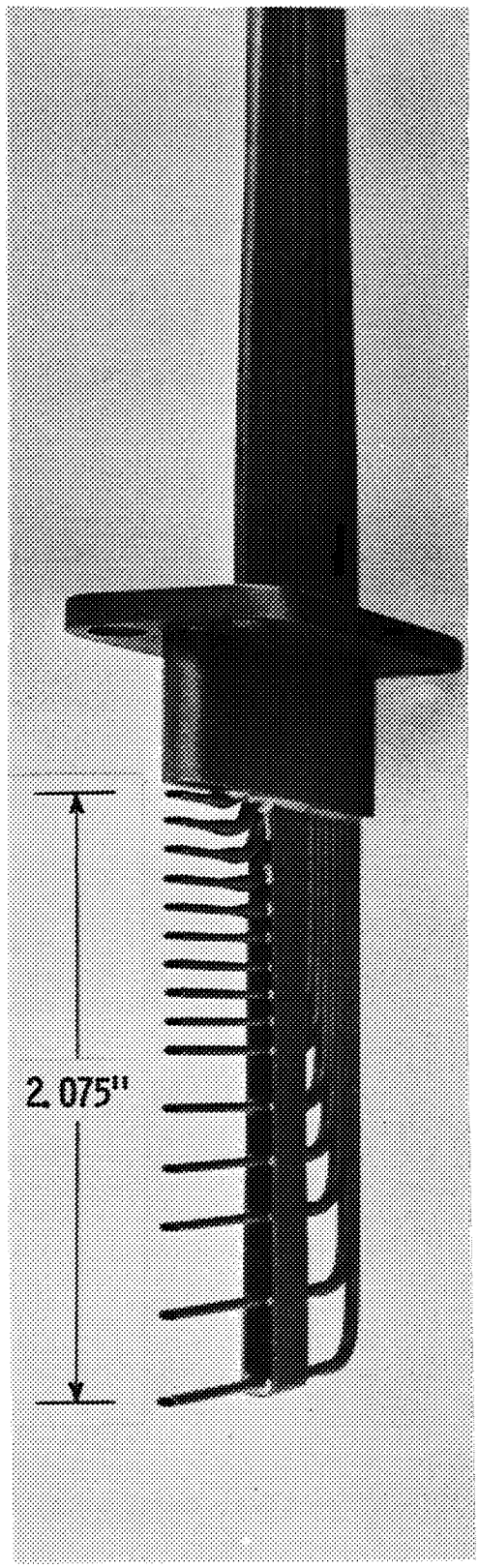


Figure 6. - Development showing circumferential location of instrumentation.

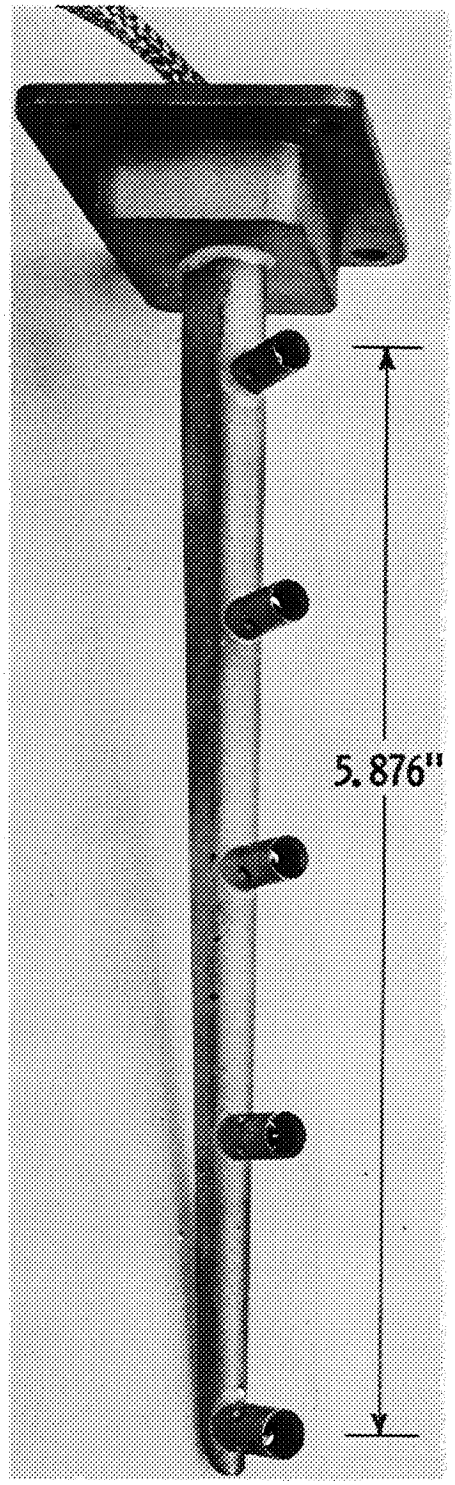


(a). - Inlet pitot-static rake.

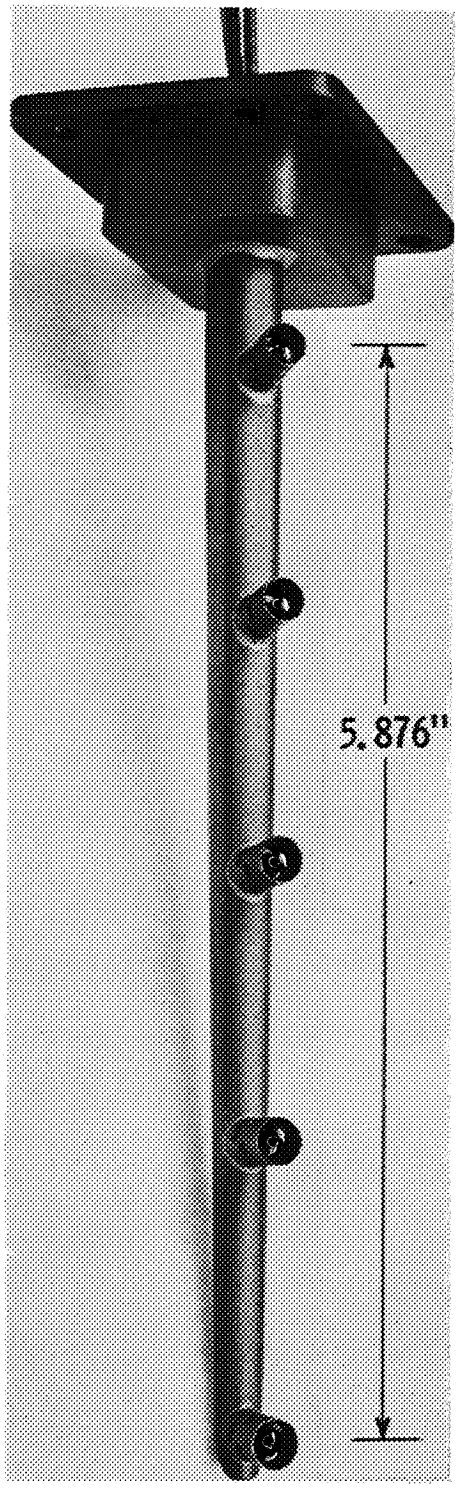


(b). - Casing boundary layer rake.

Figure 7. - Photographs of fixed instrumentation.

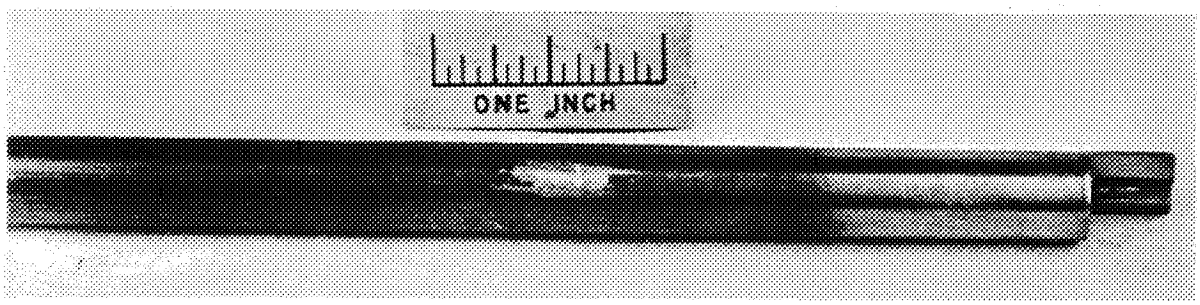


(c). - Discharge total temperature rake.

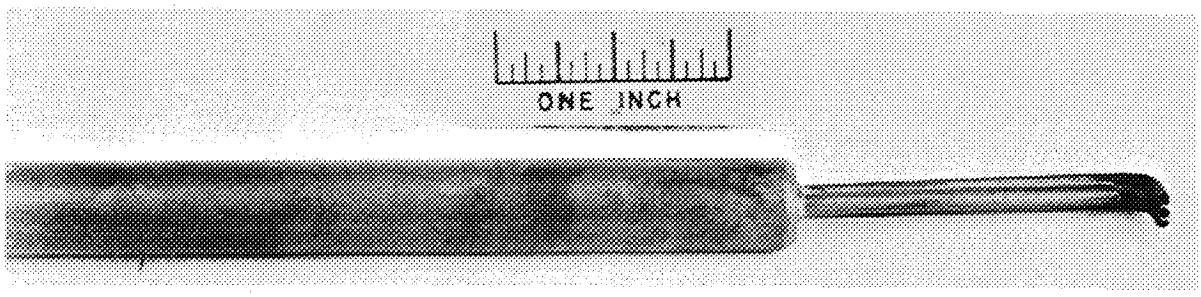


(d). - Discharge total pressure rake.

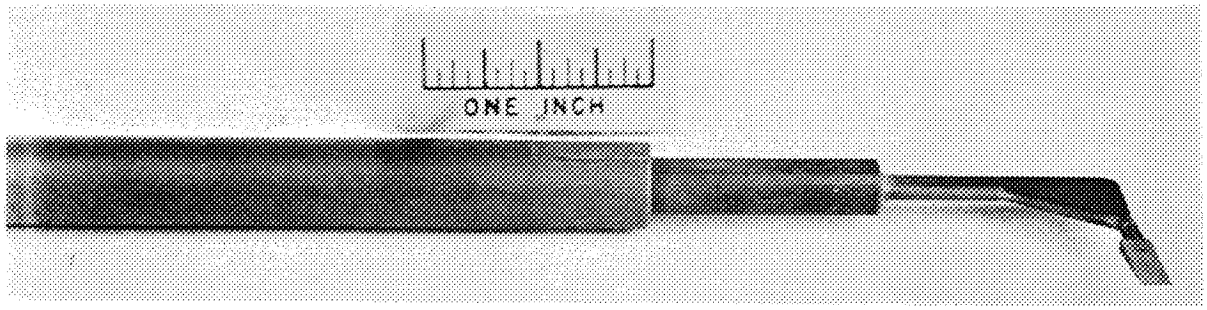
Figure 7. - Photographs of fixed instrumentation.



(a). - Shielded hot wire probe.



(b). - Cobra probe for sensing flow angle, total pressure and total temperature.



(c). - Wedge probe for sensing static pressure.

Figure 8. - Photographs of traverse instrumentation.

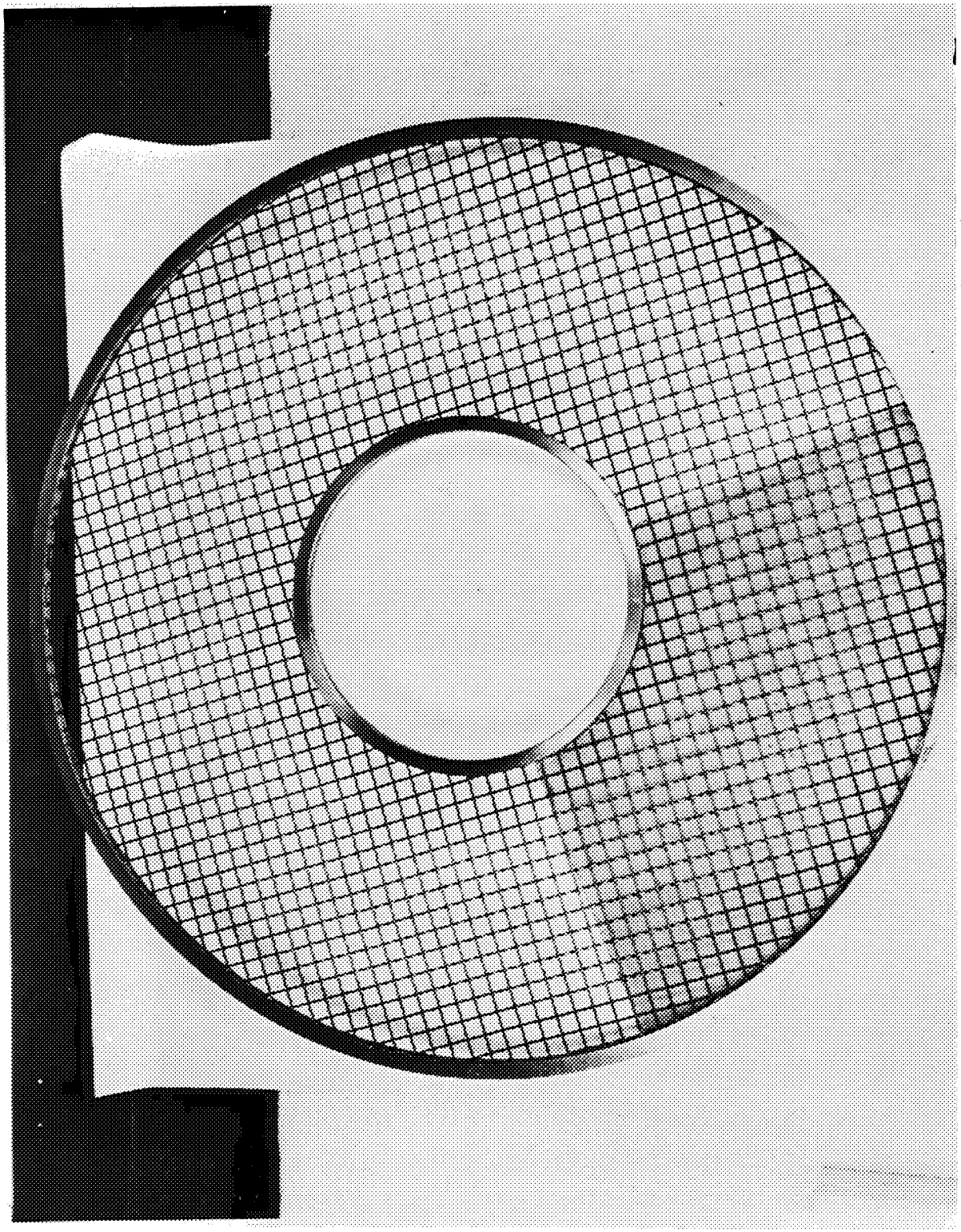


Figure 9. - Support screen with circumferential distortion screen attached.

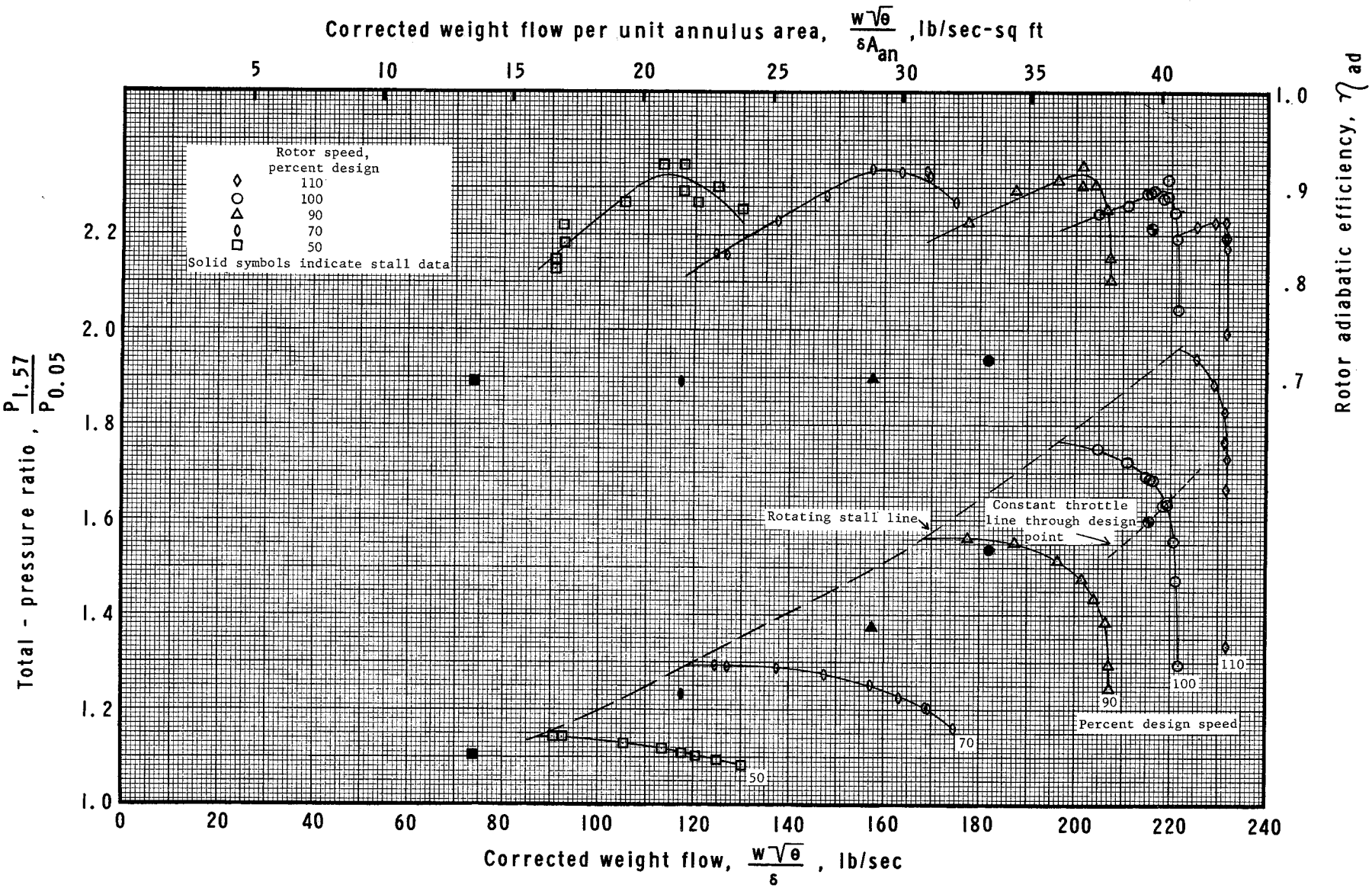
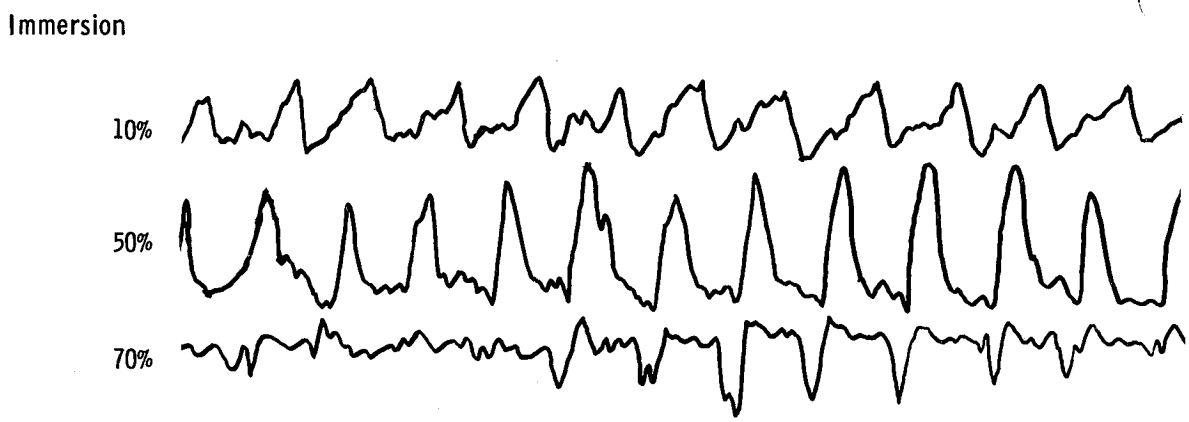
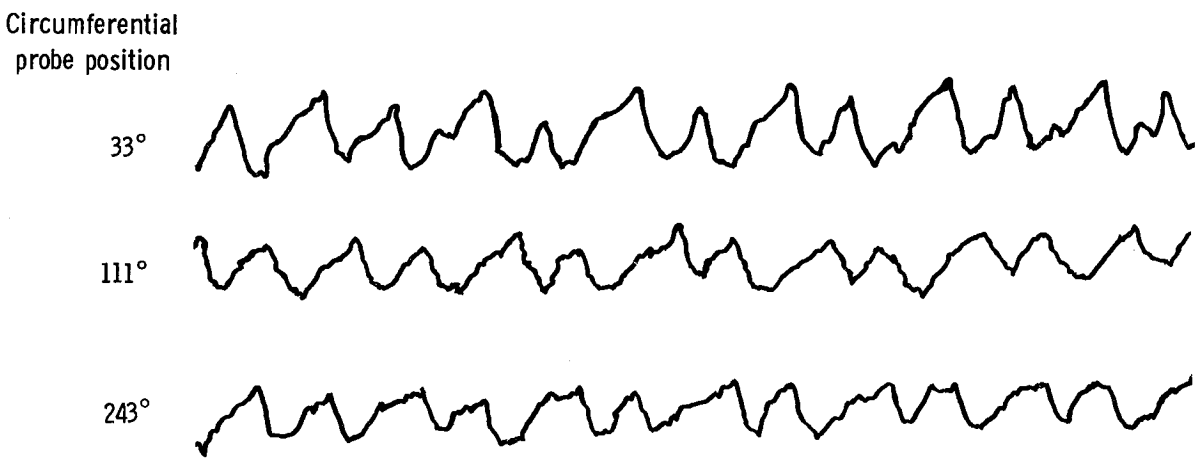


Figure 10. - Rotor performance map obtained with uniform inlet flow.



(a) Sample of hot wire anemometer traces at 70 percent design rotor speed.



(b) Sample of hot wire anemometer traces from 10 percent immersion at 70 percent design rotor speed.

Rotor speed, percent design	Number of stall cells	Stall cell speed / Rotor speed	Radial extent of stall cell	Throttle setting at stall
50	2	.60	Full span	1.97
70	2	.62	Full span	3.31
90	3	.62	Full span	5.90
100	2	.62	Full span	7.35
110	1	.58	Full span	8.30

(c) Tabulation of stall data

Figure 11. - Sample hot-wire traces and tabulation of stall data.

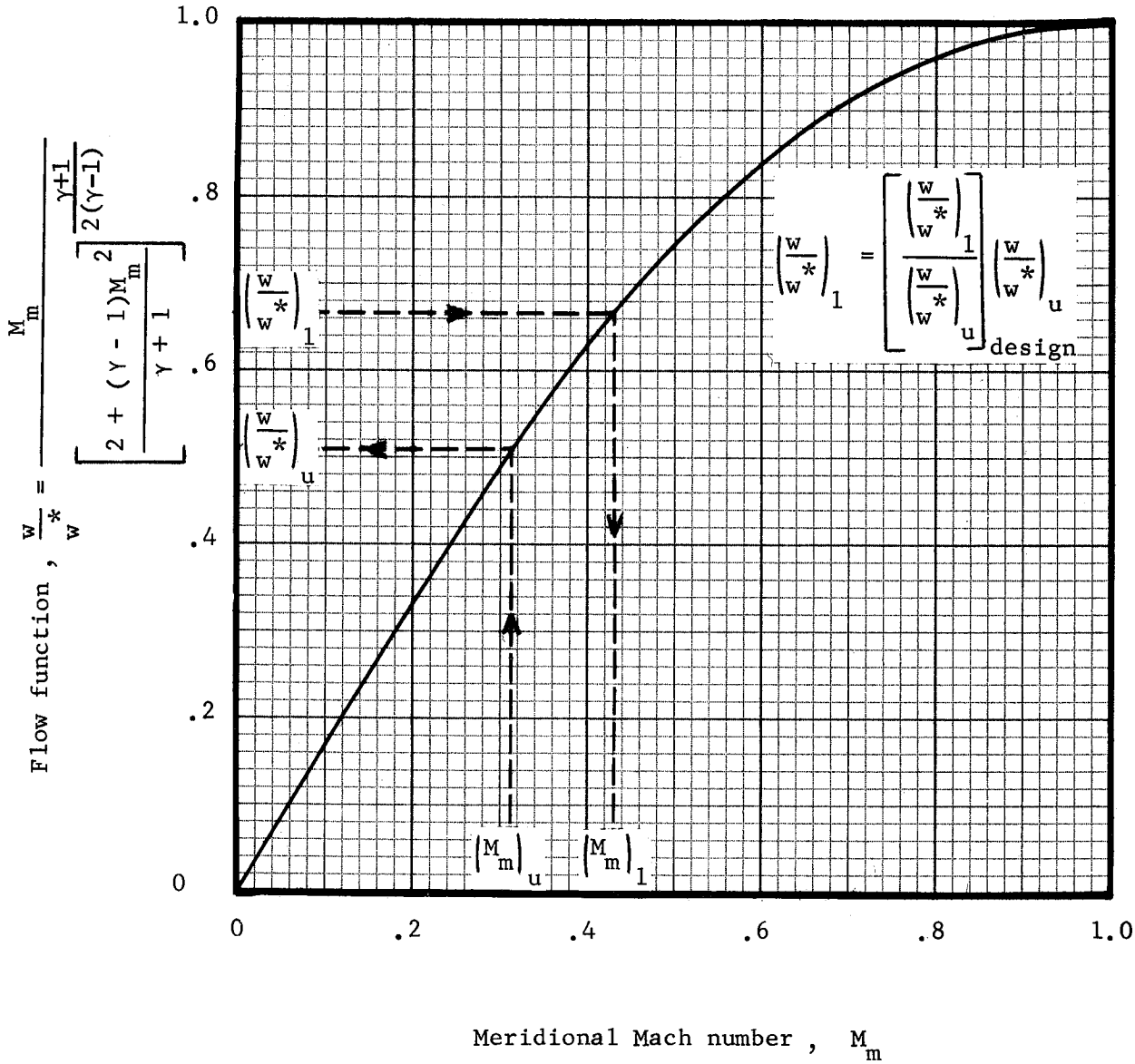


Figure 12. - Relationship between flow function and meridional Mach number - used for transferring traverse measurements to blade edges. Dashed lines with arrows and inset formulas indicate calculation sequence for sample case at leading edge.

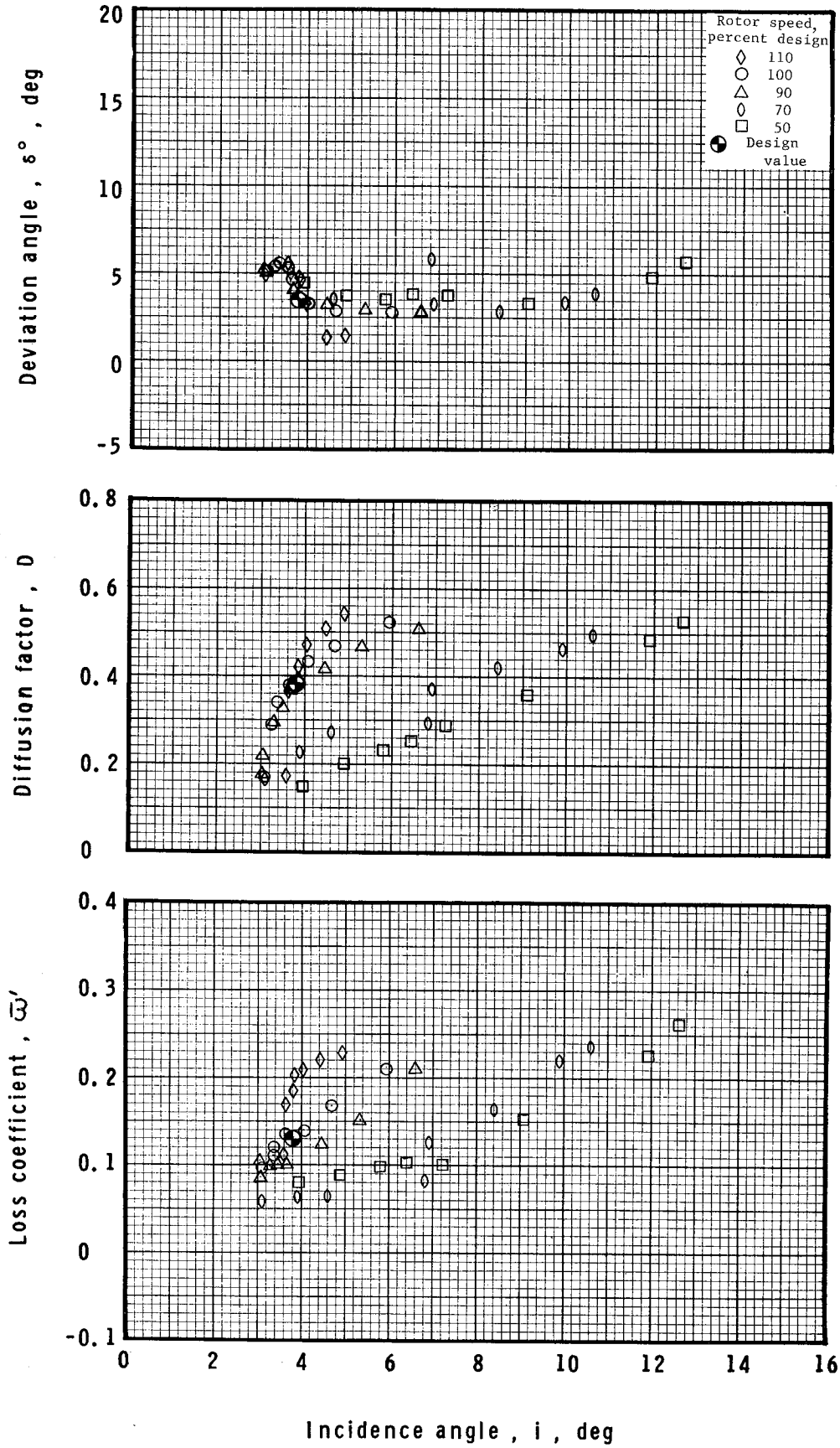


Figure 13(a). - Blade element data measured at 10% immersion from tip.

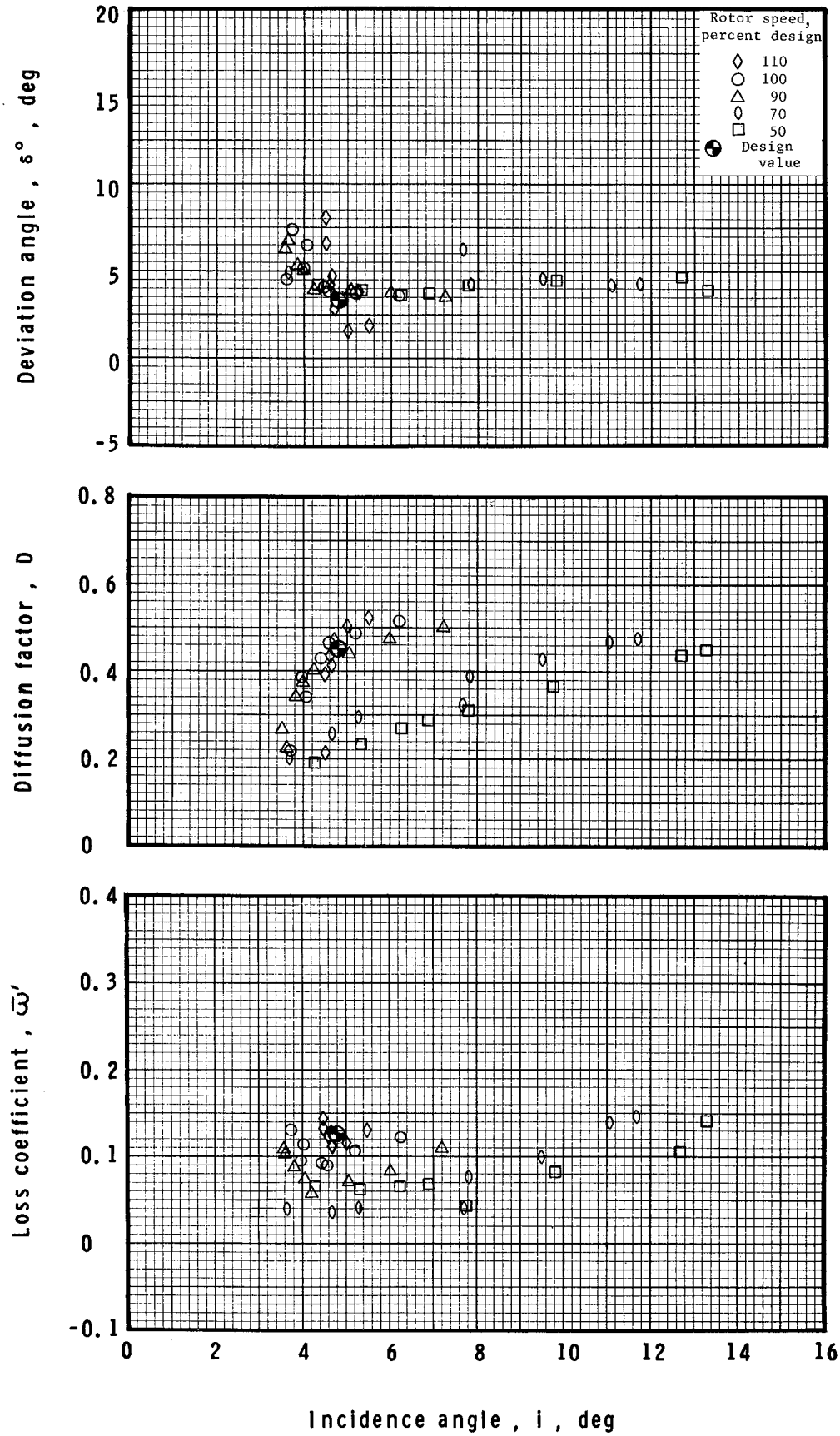


Figure 13(b). - Blade element data measured at 30% immersion from tip.

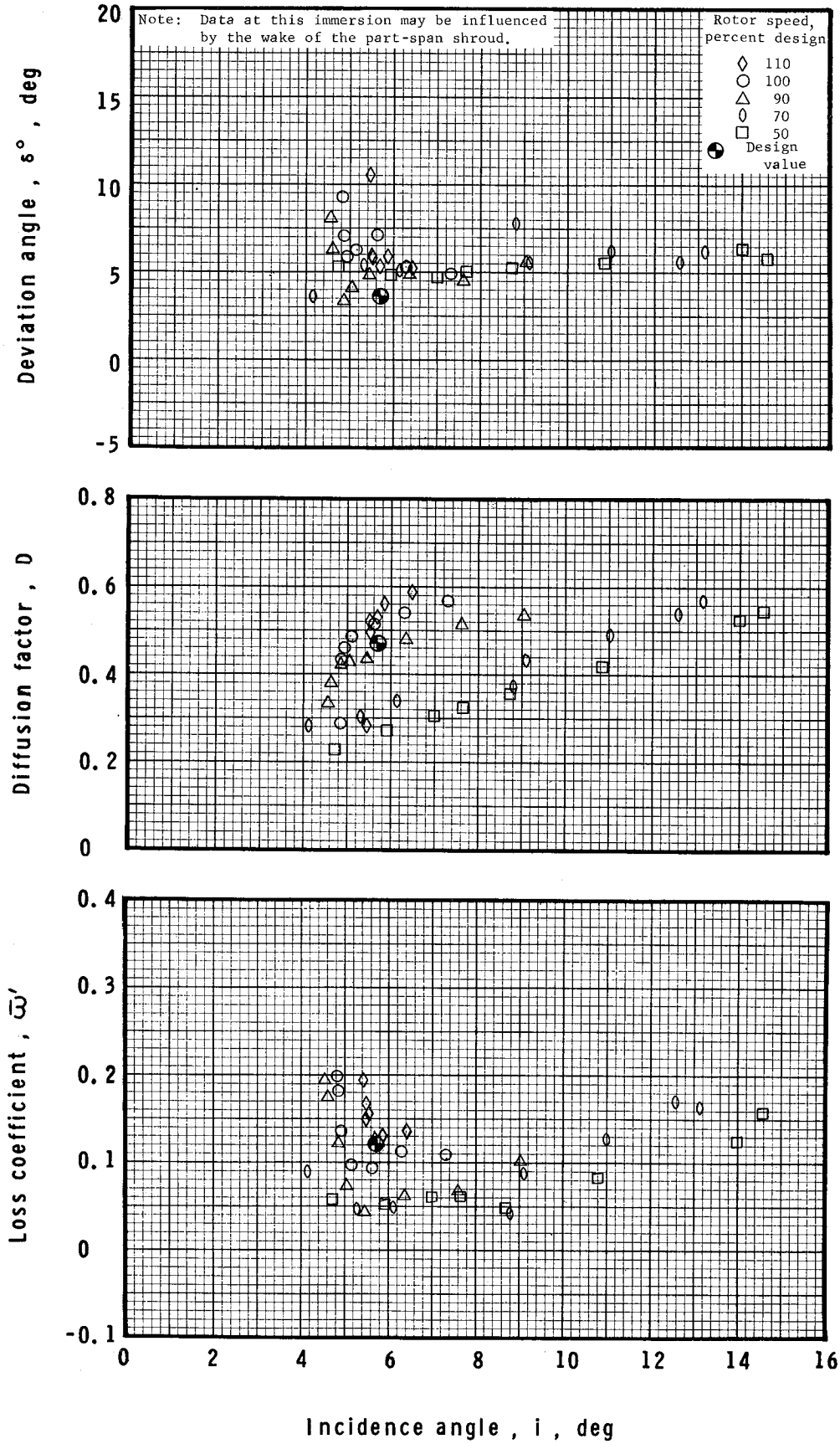


Figure 13(c). - Blade element data measured at 50% immersion from tip.

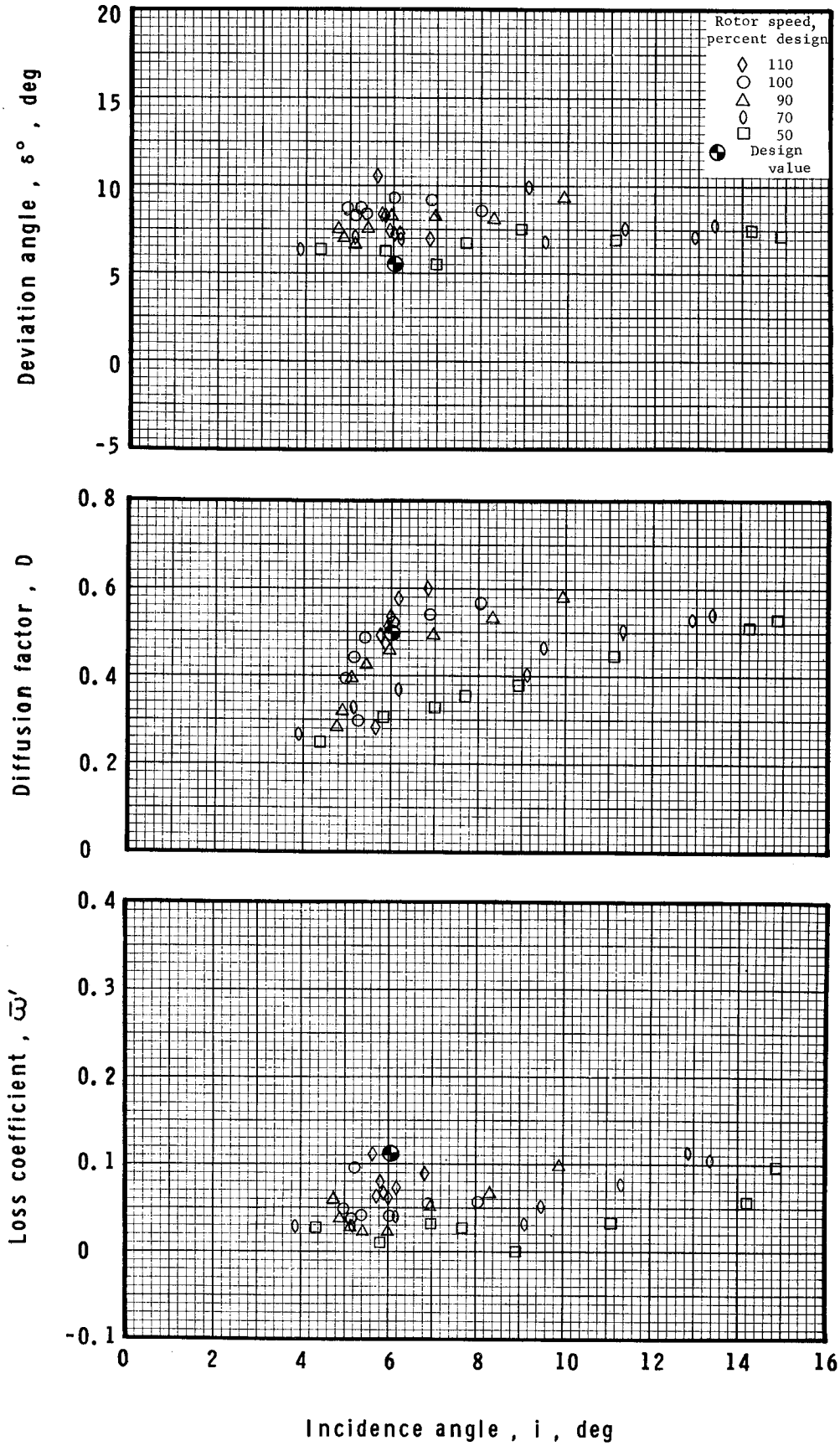


Figure 13(d). - Blade element data measured at 70% immersion from tip.

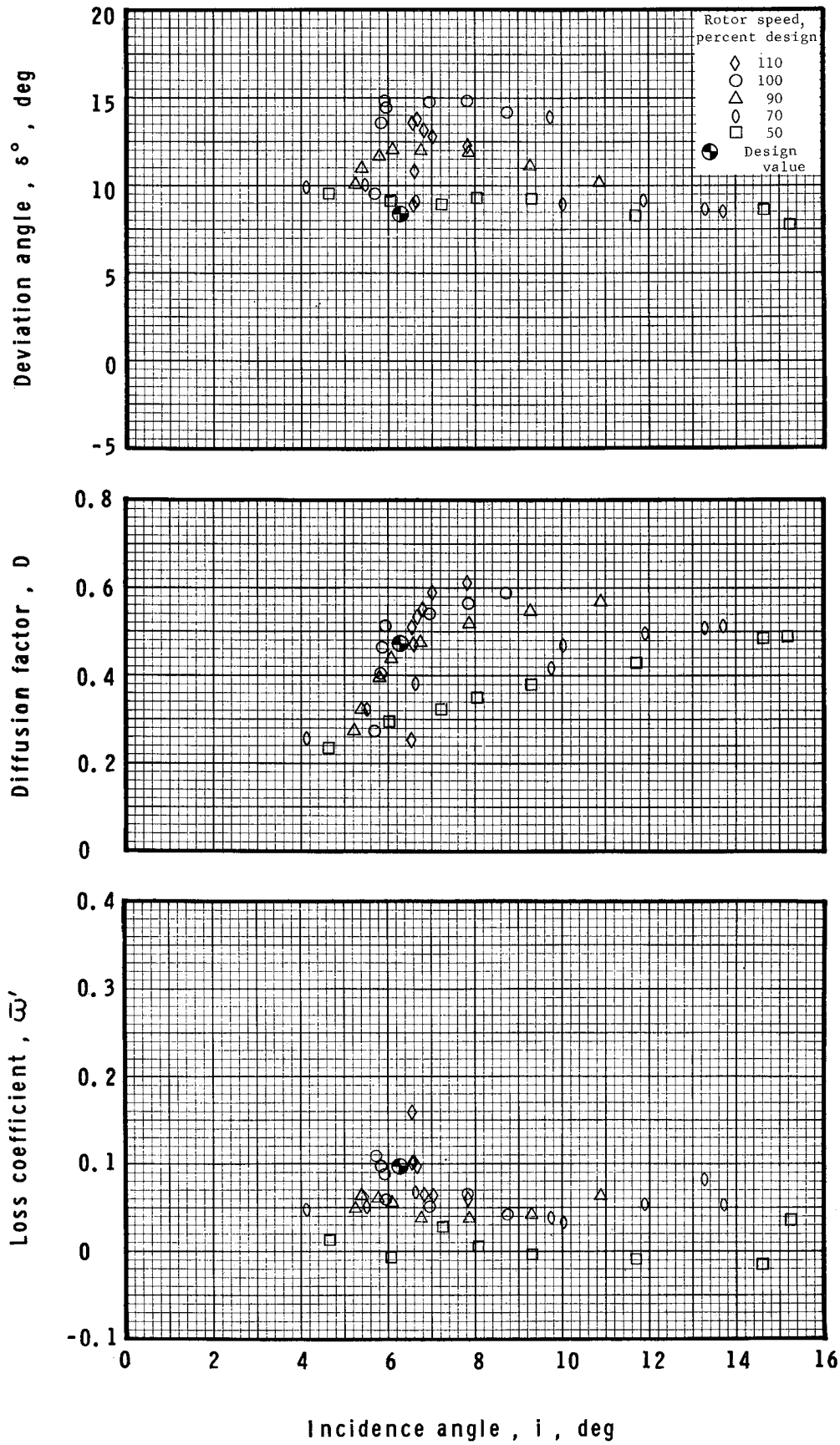


Figure 13(e). - Blade element data measured at 90% immersion from tip.

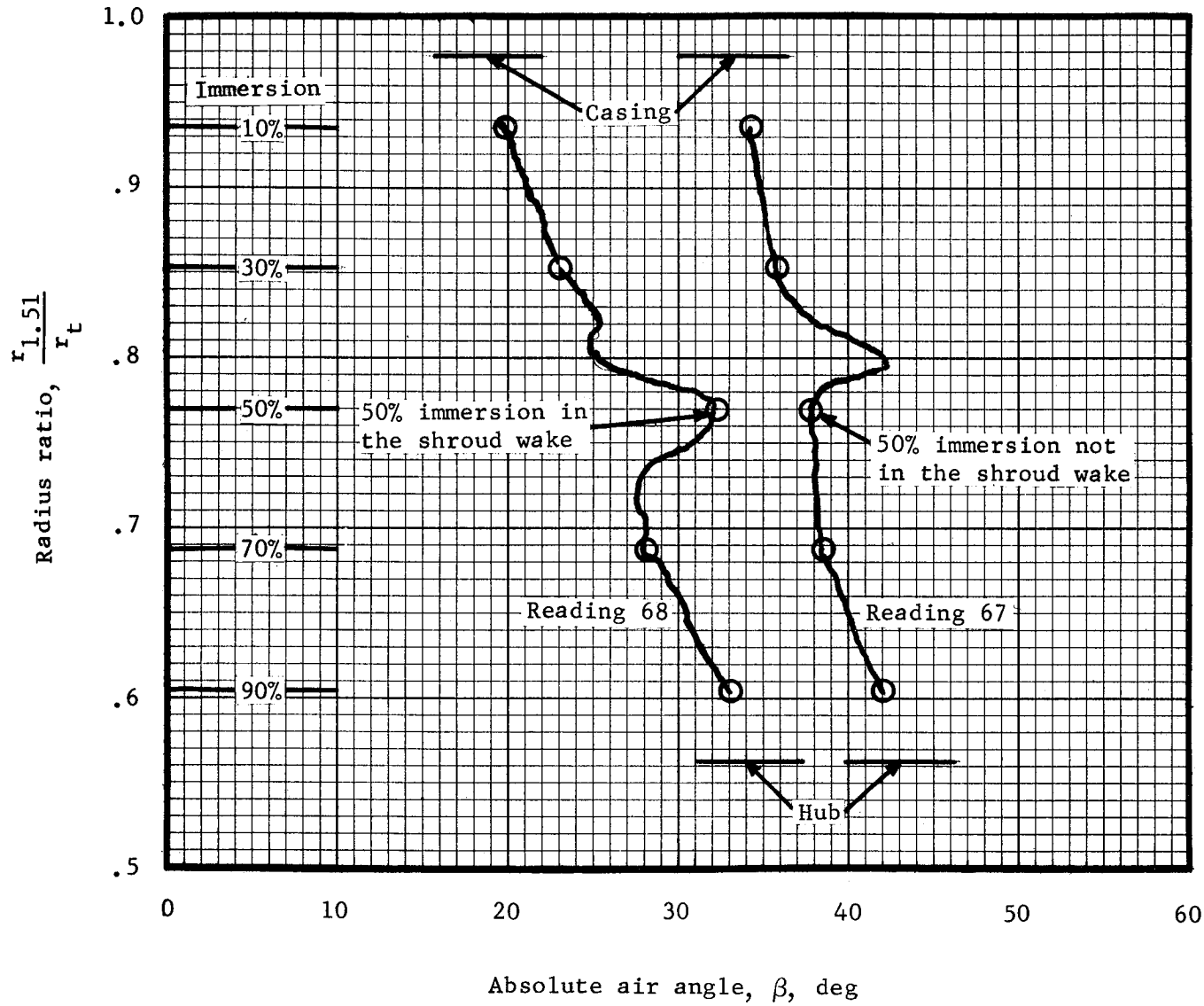


Figure 14. - Two rotor exit flow angle traverses at 90% speed. The part-span shroud wake moves radially outwards as the rotor is throttled.

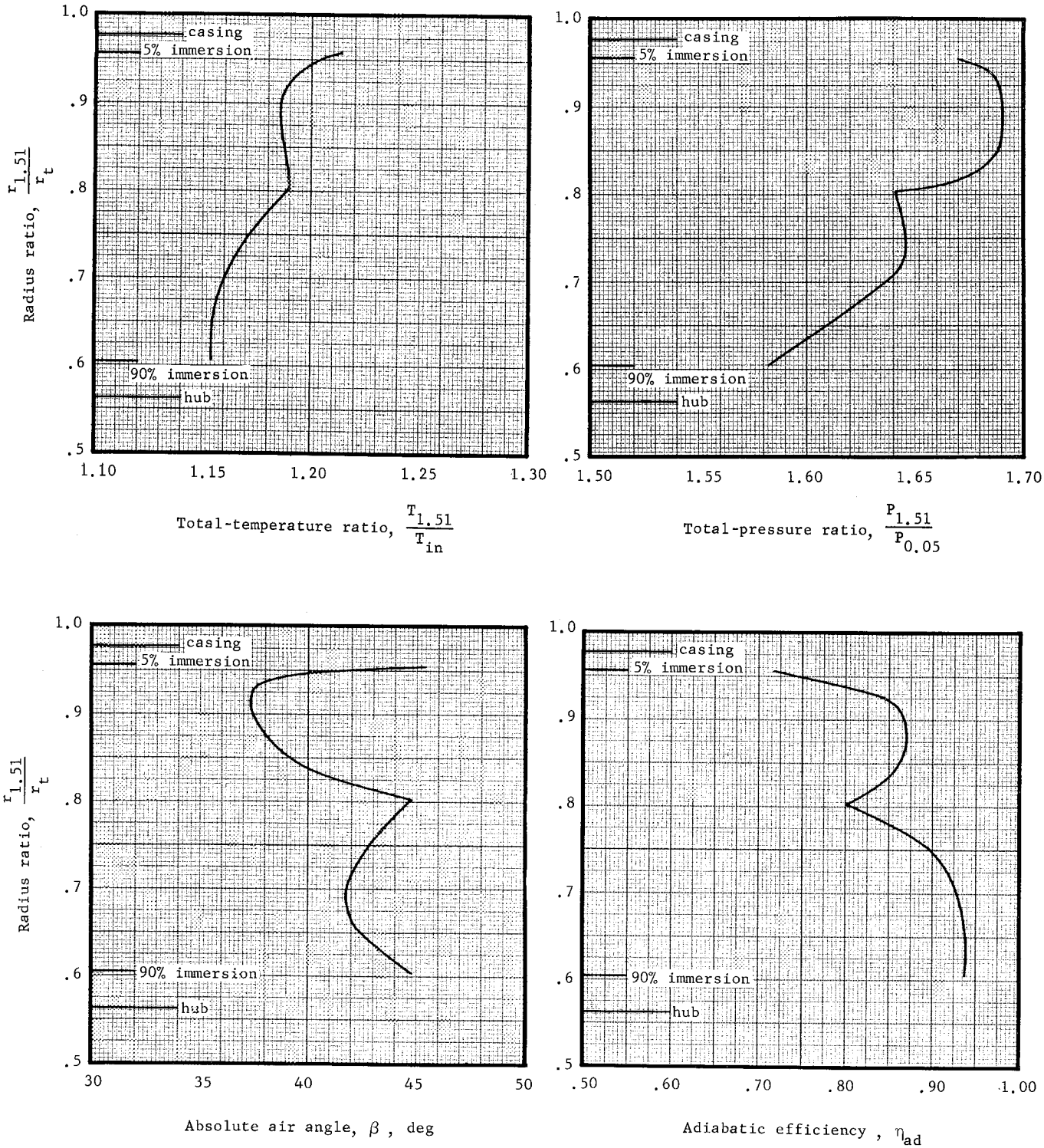


Figure 15. - Continuous traverse at rotor exit plane 1.51 for reading 60.

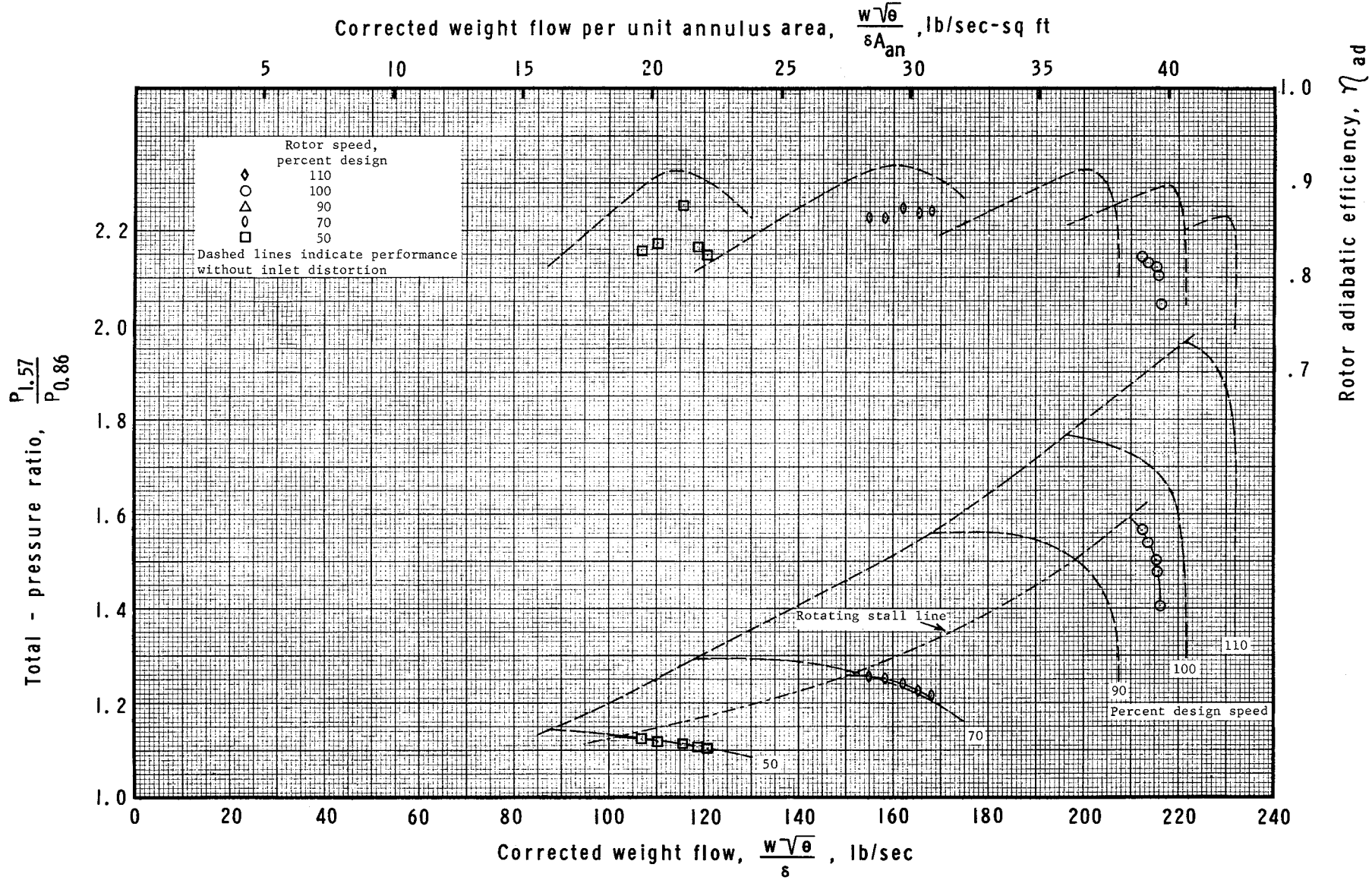


Figure 16(a). - Rotor performance map with radial distortion.

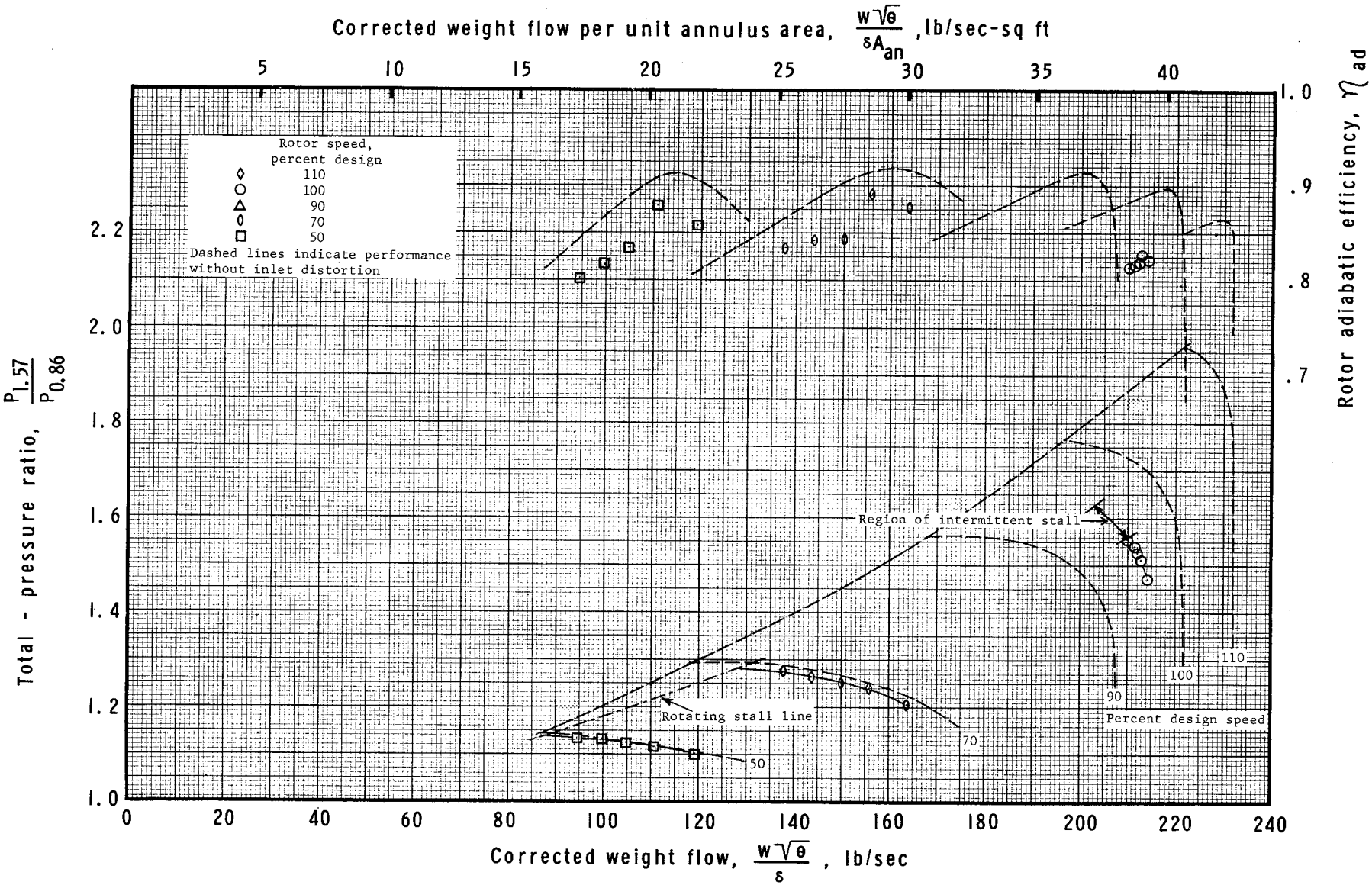


Figure 16(b). - Rotor performance map with circumferential distortion.

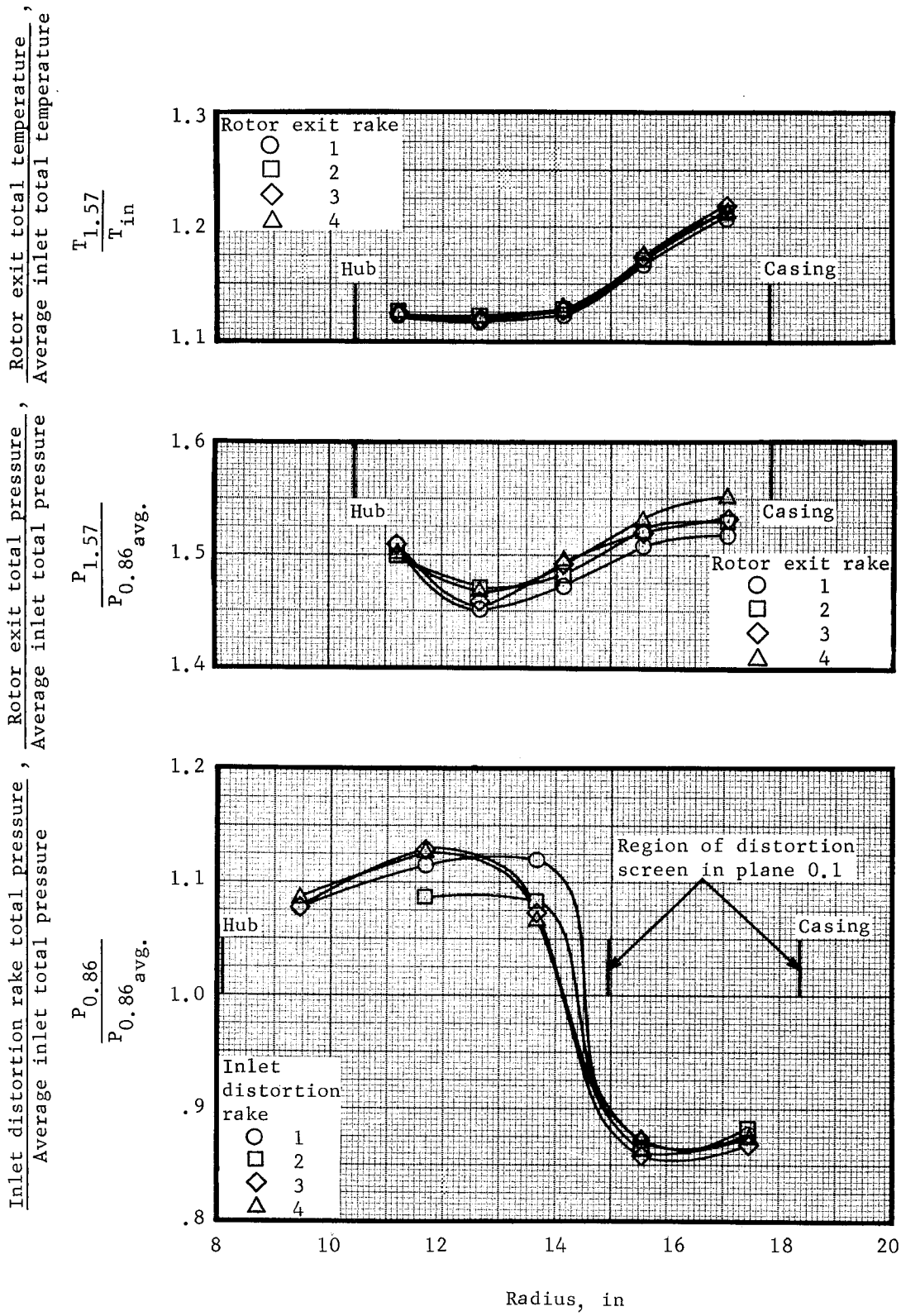


Figure 17(a). - Inlet total pressure, exit total pressure and exit total temperature profiles at 100% corrected speed, with radial distortion, for reading 30.

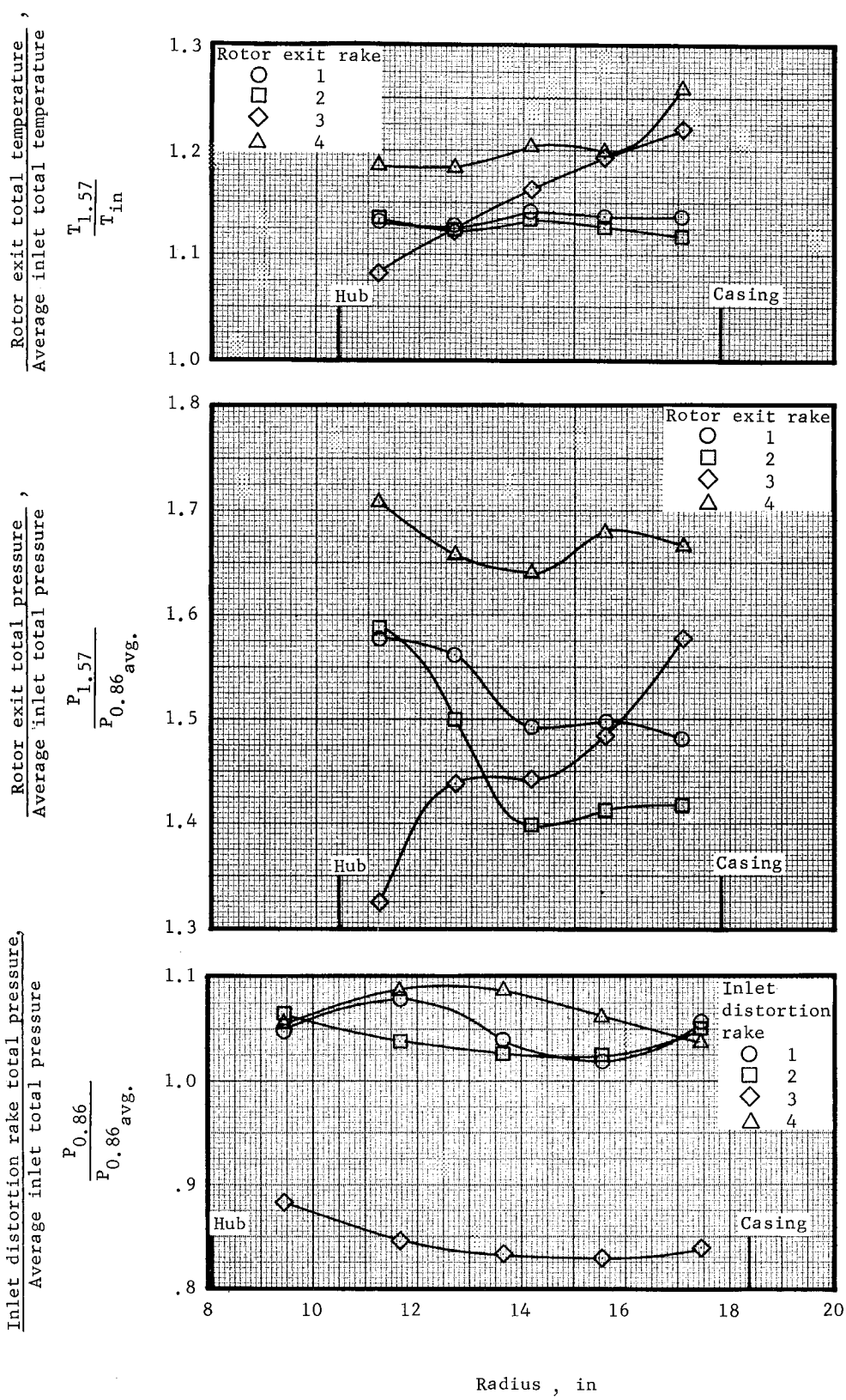


Figure 17(b). - Inlet total pressure, exit total pressure and exit total temperature profiles at 100% corrected speed, with circumferential distortion, for reading 46.

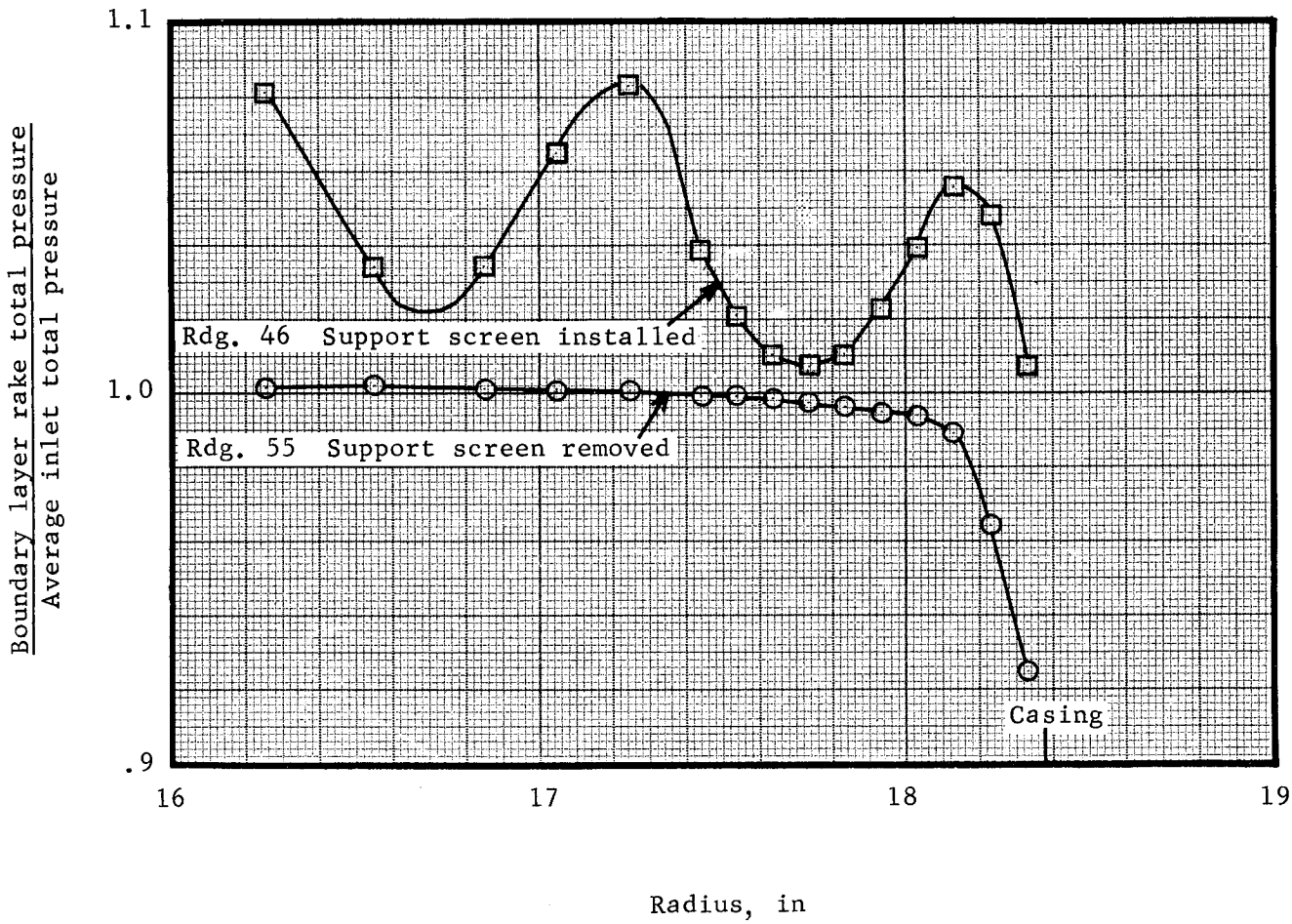


Figure 18. - Total pressures recorded by the boundary layer rake during undistorted inlet and circumferential distortion testing.

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HIGH MACH NUMBER COMPRESSOR ROTOR BLADING

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400 Main Street
East Hartford, Connecticut

Attention:	J.A. Fligg	1
	A.W. Stubner	1
	W.D. Harshbarger	1
	P. Tramm	1
	M.J. Keenan	1
	B.B. Smyth	1

12. Allison Division, GMC
Dept. 8894, Plant 8
P.O. Box 894
Indianapolis, Indiana 46206

Attention:	J.N. Barney	
	R.H. Carmody	1
	G.E. Holbrook	1
	B.A. Hopkins	1
	M.L. Miller	1
	Library	1

13. Northern Research & Engineering
219 Vassar Streat
Cambridge 39, Massachusetts

Attention:	R.A. Novak	1
	K. Ginwala	1

14. General Electric Company
Flight Propulsion Division
Cincinnati, Ohio 45215

Attention:	J.W. Blanton J-19	1
	W.G. Cornell K-49	1
	J.R. Erwin J-162	1
	E.E. Hood/J.C. Pirtle J-165	1
	J.F. Klapproth H-42	1
	J.W. McBride H-44	1

14. General Electric Company (Cont.)
Flight Propulsion Division
Cincinnati, Ohio 45215
Attention: L.H. Smith H-50 1
S.N. Suciu H-32 1
J.B. Taylor J-168 1
Technical Information Center N-32 1

15. General Electric Company
1000 Western Avenue
West Lynn, Massachusetts
Attention: D.P. Edkins Bldg. 2-40 1
F.F. Ehrich Bldg. 2-40 1
L.H. King Bldg. 2-40 1
R.E. Neitzel Bldg. 2-40 1
Dr. C.W. Smith Library Bldg. 2-40M 1

16. Curtiss-Wright Corporation
Wright Aeronautical
Woodridge, New Jersey
Attention: S. Lombardo 1
B. Provenzale 1
J. Wiggins 1

17. Air Research Manufacturing Company
402 South 36th Street
Phoenix, Arizona 85034
Attention: Robert O. Bullock 1
John H. Daman 1

18. Air Research Manufacturing Company
8951 Sepulveda Boulevard
Los Angeles, California 90009
Attention: L.C. Wright 1

19. Avco Corporation
Lycoming Division
550 South Main Street
Stratford, Connecticut
Attention: Clause W. Bolton 1

20. Continental Aviation & Engineering Corporation
12700 Kercheval
Detroit, Michigan 48215
Attention: Eli H. Benstein 1
Howard C. Wasch 1

21. Solar
San Diego, California 92112
Attention: P.A. Pitt 1
Mrs. L. Walper 1

22. Goodyear Atomic Corporation
Box 628
Piketon, Ohio
Attention: C.O. Langebrake 2

23. Iowa State University of Science and Technology
Department of Mechanical Engineering
Ames, Iowa 50010
Attention: Professor George K. Serovy 1

24. Pennsylvania State University
233 Hammond Building
University Park, Pennsylvania 16802
Attention: B. Lakshminarayana 1

25. The Boeing Company
Commercial Airplane Division
P.O. Box 3991
Seattle, Washington 98124
Attention: G.J. Schott, M.S. 80-66 1

26. Union Carbide Corporation
Nuclear Division
Oak Ridge Gaseous Diffusion Plant
P.O. Box "P"
Oak Ridge, Tennessee 37830
Attention: R.G. Jordan 1