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SINGLE STAGE EXPERIMENTAL EVALUATION OF HIGH MACH NUMBER COMPRESSOR ROTOR BLADING PART 3 - PERFORMANCE OF ROTOR 2E

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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 1.76 and a rotor adiabatic efficiency of 0.837 at a flow of 215.49 lbs/sec, was tested with an undistorted inlet. For conditions at design speed, judged to have adequate stall margin for engine operation, a total-pressure ratio of 1.711 and an adiabatic efficiency of 0.869 were achieved at a flow of 225.9 lbs/sec. The peak adiabatic efficiency of 0.884 at design speed occurred close to the stall line.

SUMMARY

A 1400 foot per second tip speed rotor, designed to have a diffusion factor of 0.45 at the tip, was tested with an undistorted inlet flow. 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. The tip element was designed to have a camber ratio (ratio of supersonic camber to total camber) of 0.35; this value is intermediate between the extreme cases of a double-circular-arc blade section and a blade section having the minimum supersonic camber which is 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 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 1.76 and a rotor adiabatic efficiency of 0.837 at a flow of 215.49 lbs/sec. For conditions on the 100% speed line judged to have adequate stall margin for engine operation a total-pressure ratio of 1.711 and an adiabatic efficiency of 0.869 were achieved at a flow of 225.9 lbs/sec. The peak adiabatic efficiency of 0.884 at design speed occurred close to the stall line.

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.

INTRODUCTION

In the previous report (ref. 1) the feasibility of efficiently operating a conventionally loaded medium-aspect-ratio rotor at a tip speed of 1400 feet per second was demonstrated. However, for the potential benefits of transonic compressors to be fully realized, it is desirable for the level of total-pressure-rise obtained in one stage to be even higher than that previously obtained. For this reason it was desired to obtain performance data at a higher loading level corresponding to a design tip diffusion factor of 0.45, which can be compared with the previously used value of 0.35. While the use of a diffusion factor is a great help in the definition of rotor loading, considerations of shock losses in transonic passages clearly have at least as important a contribution to make in assessing blade loading capabilities. The design objective of the three more highly loaded rotors was therefore to determine the performance potential of such rotors and if possible to optimize the rotor blade proportions in such a way that the rotor could be more highly loaded without significant sacrifice in efficiency.

Rotor 2E, the second of a series of four medium-aspect-ratio rotors, is designed for a tip diffusion factor of 0.45. 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. Similarly the suction and pressure surfaces are also each composed of two circular arcs which are mutually tangent at their junction point. The suction surface junction 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 sections. The Rotor 2E blade was designed to have a camber ratio of 0.35; this value is intermediate between the two extreme cases of a double-circular-arc blade section and a blade section having the minimum supersonic camber which is consistent with flow choking limitations, as used in Rotors 2D and 2B respectively. All rotors have double-circular-arc elements from the hub outboard to approximately the 60% span location.

Details of the design of Rotor 2E and the other rotors to be evaluated in this test series are given in reference 2. This report presents results of tests, on Rotor 2E, with a uniform inlet flow.

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

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 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

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$\kappa°$	angle between cylindrical projection of $\vec{i}_\kappa$ and axial direction, deg
ρ	static or stream density, lb-sec^2/ft^4
$\phi°$	camber angle, difference between angles, in cascade projection, of tangents to camber line at extremes of camber line arc, deg
σ	solidity, ratio of chord to spacing
ψ	stream function; $\psi_h = 0$, $\psi_c = 1$
$\bar{\omega}$	total-pressure-loss coefficient

Subscripts:

a	point on camber line were maximum camber line rise occurs
ad	adiabatic
an	annulus value
c	tip or casing at any plane
d	downstream
e	equivalent two-dimensional cascade
h	hub at any plane
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 2 in which it is identified as Rotor 2E. 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 0.45, 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 1.76. 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. Blade design data appear in Table 1. An overall view of the assembled Rotor 2E appears in figure 1(a) and a close-up view of the tip section is shown in figure 1(b).

In order to assess the quality of the blading after manufacture, the blading was inspected by means of contour layouts from six of the twelve manufacturing sections for seven 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 the seven blades was obtained and was compared with the design intent. The results of the comparisons of the average blade sections with design intent appear in figures 3(a) through 3(f). These figures show the blade

*As described in reference 2, 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 5.

as measured in its cold (zero speed) condition. At first sight the agreement between measured and design sections does not appear to be good, the error being equivalent to a stagger change in which the measured sections are more closed than design intent. However, a small manufacturing discrepancy was also present in the part-span shrouds which enabled the blade to open up more than design intent as the rotor was accelerated to design speed. These errors partially compensated each other and the maximum errors remaining at design speed were such that the blade was about 0.2° more open than design intent at sections outboard of the shroud and about 0.3° more closed than design intent at sections between the shroud and the hub.

The average running tip clearance at 100% speed was 0.043 inches.

Test Facility and Instrumentation

Performance tests of this rotor were made in General Electric's House Compressor Test Facility, at Lynn, Massachusetts. A diagram of the test set up is given in figure 4 and the facility is described in reference 1. Instrumentation was also identical with that used for the testing of Rotor 1B, with the exception of the rotor exit total temperature and total pressure rakes, which had elements at the five new radial positions corresponding to the 10%, 30%, 50%, 70% and 90% immersions. The meridional and circumferential locations of instrumentation are shown in figures 5 and 6 respectively. The general construction features of the fixed rakes and traverse probes are illustrated in figures 7 and 8.

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 at each speed over the remaining portion of stall-free operation up to the maximum facility flow capacity. Green readings and hot-wire data were then obtained in the stall region with the throttle valve closed to the setting where stall-free operation terminated. All data points are listed in table 2.

Because of the small pressure rise at the 50% and 70% speeds, accurate performance measurements were not obtained from absolute pressure readings. Therefore these two speed lines were re-run with the instrumentation hook-up revised to provide measurements of pressure rise across the rotor rather than absolute pressures. The readings for which the results are presented

on this basis are identified in table 2.

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. 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

Upon closing the throttle valve, rotating stalls were encountered, 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 three different 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.

RESULTS AND DISCUSSION

For the testing of this rotor two banks of air filters were in place in the inlet of the facility (fig. 4). No deterioration in performance due to dirt accumulation occurred during this testing.

Overall Performance

The compressor map obtained during testing of the rotor is shown in figure 9. The inlet total-temperature level was establised 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 efficiencies.

All points plotted on the map at 50% and 70% speeds were obtained, as described previously, from direct measurements of pressure difference across the rotor. For Rotor 1B (ref. 1), nozzle flows had been somewhat erratic at 50% design speed. The scatter in weight flow was eliminated for that rotor by establishing a correlation between nozzle flow and integrated flow and reading off the nozzle flow equivalent to the known integrated flow. Although the nozzle flows obtained in the testing of Rotor 2E at 50% design speed were not erratic, the procedure previously adopted was retained for consistency. At higher speeds the corrected weight flow was obtained directly from the calibrated venturi flow nozzles.

The maximum rotor adiabatic efficiency for Rotor 2E, of 0.931, was achieved at 70% corrected speed. At design speed the peak efficiency, of 0.884, occurred quite close to stall. A line of constant throttle position through

the Rotors 2 design point intersects the 100% speed line at a place where, for any reasonable application of this rotor, the rotor would operate much too close to the stall line. For conditions at design speed, judged to have adequate stall margin, a total-pressure ratio of 1.711 and an adiabatic efficiency of 0.869 were achieved at a flow of 225.9 lbs/sec. Rotor 2E was designed to deliver a total-pressure ratio of 1.76 and a rotor adiabatic efficiency of 0.837 at a flow of 215.49 lbs/sec.

A complete listing of the overall performance data (green readings) appears in table 2. A number of readings were repeated in order to obtain a history of the performance over the period of testing time. On the basis of these measurements it was determined that repeatability was within acceptable limits. Only one typical reading, for each throttle valve setting, has been plotted.

Stall Performance

The throttle position representing the limit of stall-free performance of the rotor, upon closing the throttle valve, 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 9. The overall performance measurements, recorded while the rotor was operating with stall present, appear as solid symbols in figure 9. 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 10. These are copies of Visicorder traces from the three anemometers. In figure 10(a) the anemometers are at immersions of 20%, 50% and 70%. A study of such traces gives an indication of the radial extent of stall cells. In figure 10(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 6. 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 agreement. These data and other stalling performance information are presented in figure 10(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 11. 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 blade 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 12.

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 12.

For most of the readings the part-span shroud wake impinged upon the center element. In the testing of Rotor 2E no substantial radial movement of the wake, upon closing the throttle valve, was observed. This is substantiated by figure 13 which illustrates the effect of throttle valve setting, upon two rotor exit angle traverses, at 90% speed.

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Table 1. - Cascade Projection Data for Rotor 2E Blade Setting.

ψ	$\frac{r_1}{r_t}$	β_1'	i	κ_1'	$\kappa_{s1}'-\kappa_1'$	$\frac{t_{e1}}{c_t}$
1.0	.9963	64.67	3.29	61.38	2.49	.0060
.9	.9600	62.87	3.68	59.19	2.96	.0063
.8	.9229	61.79	4.10	57.69	3.48	.0066
.7	.8840	60.74	4.52	56.22	4.10	.0069
.6	.8433	59.66	4.94	54.72	4.84	.0072
.5	.8005	58.55	5.35	53.20	5.45	.0076
.4	.7540	57.27	5.82	51.45	5.91	.0079
.3	.7046	56.20	6.10	50.10	6.36	.0083
.2	.6492	55.53	6.09	49.44	6.80	.0088
.1	.5850	56.18	5.90	50.28	7.23	.0093
0	.4995	61.18	5.70	55.48	7.56	.0100

ψ	$\frac{r_2}{r_t}$	β_2'	$\delta°$	κ_2'	β_{2e}'	$\frac{t_{e2}}{c_t}$
1.0	.9801	54.58	4.96	49.62	53.33	.0060
.9	.9489	54.41	4.79	49.62	50.47	.0063
.8	.9159	53.00	4.61	48.39	48.09	.0066
.7	.8815	50.84	4.69	46.15	45.17	.0070
.6	.8454	47.78	4.76	43.02	41.66	.0074
.5	.8070	44.05	5.05	39.00	37.76	.0078
.4	.7675	39.12	5.73	33.39	32.78	.0082
.3	.7257	33.36	6.71	26.65	27.15	.0086
.2	.6824	26.32	8.21	18.11	19.68	.0091
.1	.6378	18.34	10.70	7.64	8.52	.0095
0	.5912	10.18	16.82	-6.64	-19.05	.0100

ψ	$\frac{t_m}{c_t}$	$\gamma°$	$\frac{a}{c_t}$	σ	ϕ_t
1.0	.0350	57.40	.660	1.3058	11.76
.9	.0387	55.58	.621	1.3520	9.57
.8	.0426	53.85	.585	1.4036	9.30
.7	.0467	51.83	.562	1.4618	10.07
.6	.0510	49.30	.534	1.5283	11.70
.5	.0556	46.10	.500	1.6055	14.20
.4	.0604	42.42	.500	1.6963	18.06
.3	.0655	38.37	.500	1.8044	23.45
.2	.0708	33.77	.500	1.9382	31.33
.1	.0770	28.96	.500	2.1106	42.64
0	.0850	24.42	.500	2.3663	62.12

Table 2. - Overall Performance based on Fixed Instrumentation

*Rdg.	Total press. ratio	Rotor adiab. eff.	Corrected weight flow lb/sec	Rotor speed, percent design	Throttle valve setting	Operating mode	**Pressure measurement system
1	1.153	.9462	121.90	49.96	10.0	Stall free	Abs.
2	1.331	.9467	167.71	70.04	10.0	Stall free	Abs.
3	1.652	.9056	203.58	89.96	10.0	Stall free	Abs.
4	1.857	.8848	220.08	99.96	10.0	Stall free	Abs.
5	1.173	.8948	101.28	49.96	4.2	Stall free	Abs.
6T	1.353	.8806	143.33	69.93	5.8	Stall free	Abs.
7T	1.672	.9026	198.52	90.03	9.0	Stall free	Abs.
8T	1.863	.8825	220.04	100.11	9.9	Stall free	Abs.
9T	1.979	.8316	233.40	110.13	10.9	Stall free	Abs.
11T	1.568	.8340	227.72	100.05	15.0	Stall free	Abs.
12T	1.617	.8481	226.51	100.08	14.0	Stall free	Abs.
13T	1.679	.8677	226.28	99.96	13.0	Stall free	Abs.
14T	1.728	.8747	225.74	100.04	12.3	Stall free	Abs.
15T	1.770	.8811	225.50	100.04	11.7	Stall free	Abs.
16T	1.815	.8870	223.67	100.06	11.0	Stall free	Abs.
17T	1.320	.8238	214.92	90.02	50.0	Stall free	Abs.
18T	1.501	.8927	215.33	90.09	14.0	Stall free	Abs.
19T	1.542	.9117	214.31	90.01	13.0	Stall free	Abs.
20T	1.592	.9194	213.11	90.05	12.0	Stall free	Abs.
21T	1.629	.9246	209.41	89.95	11.0	Stall free	Abs.
22T	1.663	.9167	204.67	90.06	10.0	Stall free	Abs.
23	1.606	.9132	211.72	90.02	11.7	Stall free	Abs.
24	1.777	.8785	225.38	100.11	11.7	Stall free	Abs.
25	1.814	.8775	223.09	100.07	11.0	Stall free	Abs.
26	1.689	.8651	226.78	100.08	13.0	Stall free	Abs.
27	1.921	.8253	234.43	110.00	11.7	Stall free	Abs.
28	1.371	.9538	184.14	75.03	11.7	Stall free	Abs.
29	1.314	.9555	171.94	70.04	11.7	Stall free	Abs.
30	1.219	.9448	146.00	60.03	11.7	Stall free	Abs.
31	1.148	.9444	122.28	50.07	11.7	Stall free	Abs.
32T	1.438	.7455	234.99	110.09	50.0	Stall free	Abs.
33T	1.373	.7856	225.73	99.99	50.0	Stall free	Abs.
34T	1.756	.8157	234.55	110.07	14.0	Stall free	Abs.
35T	1.824	.8220	234.86	109.94	13.0	Stall free	Abs.
36T	1.875	.8245	234.75	109.97	12.3	Stall free	Abs.
37T	1.921	.8285	233.35	109.95	11.7	Stall free	Abs.
38T	1.946	.8266	233.84	110.02	11.3	Stall free	Abs.
39T	1.218	.9254	185.64	70.02	50.0	Stall free	Abs.
40T	1.291	.9634	178.53	70.05	15.0	Stall free	Abs.
41T	1.311	.9646	172.54	70.02	12.3	Stall free	Abs.
42T	1.319	.9635	169.39	69.95	11.0	Stall free	Abs.
43T	1.341	.9461	161.84	69.94	9.0	Stall free	Abs.
44T	1.350	.9061	153.93	70.05	7.5	Stall free	Abs.
45T	1.116	.9624	142.8	49.98	50.0	Stall free	Abs.
46T	1.127	.9905	136.4	50.03	25.0	Stall free	Abs.

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

**Abs. - Instrumentation arranged to record absolute pressure at rotor inlet and exit.
Diff. - Instrumentation arranged to record difference between rotor inlet and exit pressures.

Table 2. - Overall Performance based on Fixed Instrumentation. (cont'd)

*Rdg.	Total press. ratio	Rotor adiab. eff.	Corrected weight flow lb/sec	Rotor speed, percent design	Throttle valve setting	Operating mode	**Pressure measurement system
47T	1.137	.9810	131.69	50.04	18.0	Stall free	Abs.
48T	1.141	.9952	127.96	49.90	15.0	Stall free	Abs.
49T	1.151	.9630	122.9	50.06	11.0	Stall free	Abs.
50T	1.164	.9419	113.0	49.93	7.0	Stall free	Abs.
51T	1.172	.8883	102.5	50.02	4.2	Stall free	Abs.
52	1.137	.7414	90.19	50.04	3.3	Stalled	Abs.
53	1.300	.7552	129.36	70.08	4.9	Stalled	Abs.
54	1.575	.7927	182.12	90.15	8.0	Stalled	Abs.
55	1.745	.7960	202.53	100.02	9.3	Stalled	Abs.
56	1.898	.7727	217.72	110.27	10.1	Stalled	Abs.
57	1.117	.9628	142.8	50.03	50.0	Stall free	Abs.
58	1.128	.9245	136.4	50.05	25.0	Stall free	Abs.
59	1.137	.9646	131.69	50.05	18.0	Stall free	Abs.
60	1.142	.9460	127.96	50.04	15.0	Stall free	Abs.
61	1.151	.9485	122.9	50.01	11.0	Stall free	Abs.
62	1.164	.9115	113.0	50.02	7.0	Stall free	Abs.
63	1.172	.8827	102.5	49.98	4.2	Stall free	Abs.
64	1.217	.8996	185.18	70.02	50.0	Stall free	Abs.
65	1.291	.9482	178.42	70.02	15.0	Stall free	Abs.
66	1.311	.9447	172.51	69.98	12.3	Stall free	Abs.
67	1.322	.9487	169.85	70.04	11.0	Stall free	Abs.
68	1.346	.9370	161.01	70.03	9.0	Stall free	Abs.
69	1.351	.9047	152.06	69.98	7.5	Stall free	Abs.
70	1.353	.8697	142.96	70.02	5.8	Stall free	Abs.
71	1.811	.8729	223.83	100.12	11.0	Stall free	Abs.
72	1.777	.8782	225.61	100.11	11.7	Stall free	Abs.
73	1.729	.8659	226.03	99.96	12.3	Stall free	Abs.
74	1.687	.8625	226.47	100.24	13.0	Stall free	Abs.
75	1.127	.9525	136.4	50.01	25.0	Stall free	Abs.
76	1.113	.8752	142.8	50.02	50.0	Stall free	Diff.
77	1.123	.8800	136.4	50.07	25.0	Stall free	Diff.
78	1.132	.9078	131.69	50.04	18.0	Stall free	Diff.
79	1.138	.9393	127.96	50.01	15.0	Stall free	Diff.
80	1.147	.9235	122.9	50.02	11.0	Stall free	Diff.
81	1.159	.8855	113.0	50.03	7.0	Stall free	Diff.
82	1.167	.8526	102.5	50.00	4.2	Stall free	Diff.
83	1.213	.8801	186.45	70.03	50.0	Stall free	Diff.
84	1.284	.9262	177.45	69.99	15.0	Stall free	Diff.
85	1.303	.9016	171.43	70.11	12.3	Stall free	Diff.
86	1.316	.9344	169.29	70.03	11.0	Stall free	Diff.
87	1.338	.9159	160.27	70.10	9.0	Stall free	Diff.
88	1.345	.8821	151.44	70.03	7.5	Stall free	Diff.
89	1.347	.8569	143.58	70.08	5.8	Stall free	Diff.
90	1.122	.8945	136.4	50.03	25.0	Stall free	Diff.

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

**Abs. - Instrumentation arranged to record absolute pressure at rotor inlet and exit.
Diff. - Instrumentation arranged to record differences between rotor inlet and exit pressures.

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	1.3108 1.1849 1.0814 1.0567 1.0967			1.0320 .9483 .8661 .7831 .7001	1.0067 .9206 .8285 .7593 .7043
+ r_j	18.323 17.473 15.733 14.023 12.191 10.023 8.550	18.182 17.392 15.759 14.180 12.456 10.494 9.116	17.887 17.201 15.768 14.354 12.921 11.516 10.789	17.838 17.148 15.770 14.391 13.012 11.634 10.944	17.836 17.166 15.817 14.501 13.198 11.864 11.169
ε°_j	-1.57 1.85 6.10 11.76 20.40	-4.50 1.00 5.70 12.25 22.20	-4.00 -0.50 3.00 7.00 13.40	-.68 .28 2.51 5.68 9.72	-.07 .32 .42 .33 .13
$\kappa'^\circ_j(\kappa'^\circ_{sj})$		58.90 (61.96) 55.46 (59.90) 52.25 (57.96) 49.71 (56.28) 50.60 (57.88)	49.44 44.73 36.17 23.45 5.78		

$\frac{\left(\frac{w}{w^*}\right)_1}{\left(\frac{w}{w^*}\right)_u}$	1.0906 1.0762 1.0709 1.0802 1.0582
$\frac{\left(\frac{w}{w^*}\right)_2}{\left(\frac{w}{w^*}\right)_d}$	.9827 .9720 .9696 .9745 .9794
$\bar{r}_j$ (Used for Diffusion Factor)	17.283 15.768 14.272 12.738 11.023
σ_j (Used for Diffusion Factor)	1.363 1.494 1.650 1.849 2.136

+ 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	62.625	3.725	0.665	1.4012	1503.455	1334.214	693.000	0.646	690.864
2	61.159	4.699	0.259	1.2991	1393.785	1208.940	693.614	0.646	693.508
3	57.957	5.707	-0.003	1.1964	1285.123	1087.808	684.262	0.637	680.879
4	55.725	6.015	-0.555	1.0823	1164.969	955.553	666.387	0.619	651.214
5	52.874	6.274	-1.006	0.9055	984.885	805.039	567.370	0.522	525.312

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	54.224	4.764	8.401	0.8332	985.726	1319.562	777.226	0.657	575.793
2	49.376	4.646	10.784	0.7335	864.366	1209.630	789.432	0.670	562.776
3	41.761	5.591	16.196	0.6467	757.839	1101.156	822.263	0.702	564.862
4	38.561	7.111	25.165	0.5993	695.226	991.225	876.914	0.756	595.334
5	1[illegible].164	11.384	39.710	0.6221	709.745	883.441	960.912	0.842	661.221

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	0.471	0.33999	0.4556	0.	520.502	1334.214	799.060	0.833
2	0.513	0.41649	0.4987	0.	553.591	1208.940	656.040	0.811
3	0.552	0.47039	0.5299	0.	596.801	1087.808	504.356	0.830
4	0.554	0.51484	0.5276	0.	639.696	955.553	351.529	0.914
5	0.448	0.47302	0.3837	0.	679.209	805.039	204.233	1.259

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7951	0.8116	1.760	1.220	0.	42.113
2	0.8177	0.8316	1.760	1.215	0.	44.529
3	0.8321	0.8449	1.760	1.211	0.	46.575
4	0.8628	0.8733	1.760	1.203	0.	47.057
5	0.9106	0.9174	1.760	1.193	0.	45.769

TRAVERSE PRESSURE RATIO = 1.7600
TRAVERSE ADIABATIC EFF. = 0.8376
TRAVERSE POLYTROPIC EFF. = 0.8500
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950

FIXED INSTRUMENTATION PRESSURE RATIO = 1.7600
ADIABATIC EFF. = 0.8370
POLYTROPIC EFF. = 0.8500
NOZZLE WEIGHT FLOW = 215.49
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00324
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00408

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 (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 6 READING NUMBER 6 DATE 4/13/1967

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	67.359	8.459	5.399	0.9139	1011.350	932.980	390.357	0.353	389.154
2	64.821	9.361	4.921	0.8467	934.163	845.379	397.486	0.360	397.426
3	62.836	10.586	4.876	0.7764	855.862	760.674	392.268	0.356	390.329
4	60.377	10.667	4.097	0.7012	773.074	668.192	388.798	0.353	379.945
5	60.869	10.269	2.989	0.5941	657.052	562.942	338.842	0.306	313.724

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	53.766	4.326	13.593	0.5559	644.688	922.734	555.176	0.479	380.744
2	49.646	4.916	15.175	0.5270	605.255	845.861	549.121	0.478	391.899
3	44.847	8.677	17.989	0.4296	492.582	770.009	548.593	0.478	348.997
4	31.882	8.432	28.495	0.4406	501.494	693.136	605.580	0.532	423.543
5	16.819	11.039	44.051	0.4289	485.072	617.766	669.224	0.592	452.701

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	0.508	0.36155	0.4262	0.	403.169	932.980	519.565	0.978
2	0.490	0.43327	0.4738	0.	384.626	845.379	461.235	0.986
3	0.575	0.48689	0.5028	0.	422.872	760.674	347.137	0.894
4	0.504	0.56331	0.5349	0.	429.690	668.192	263.446	1.115
5	0.441	0.58900	0.4594	0.	480.927	562.942	136.839	1.443

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7425	0.7532	1.352	1.121	0.	46.639
2	0.8441	0.8506	1.346	1.105	0.	44.463
3	0.8099	0.8174	1.327	1.104	0.	50.467
4	0.9179	0.9214	1.357	1.099	0.	45.413
5	0.9652	0.9667	1.376	1.099	0.	46.732

TRAVERSE PRESSURE RATIO = 1.3516
TRAVERSE ADIABATIC EFF. = 0.8463
TRAVERSE POLYTROPIC EFF. = 0.8527
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.3530
ADIABATIC EFF. = 0.8806
POLYTROPIC EFF. = 0.8856
NOZZLE WEIGHT FLOW = 143.33
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98309
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95937

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0466	0.7482	0.2147	1.347	1.119
2	0.0249	0.8667	0.1150	1.350	1.103
3	0.0253	0.8765	0.1176	1.338	1.099
4	0.0100	0.9604	0.0435	1.357	1.095
5	0.0027	0.9919	0.0120	1.374	1.096

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

NASA - TASK I (ROTOR 2F)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 7 READING NUMBER 7 DATE 4/13/1967

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	63.414	4.514	1.454	1.2346	1344.133	1201.265	603.040	0.554	601.181
2	60.272	4.812	0.372	1.1579	1253.481	1088.474	621.643	0.574	621.549
3	58.208	5.958	0.248	1.0661	1153.888	979.412	610.090	0.564	607.073
4	56.324	6.614	0.044	0.9600	1041.293	860.336	586.611	0.541	573.255
5	57.292	6.692	-0.588	0.8068	882.101	724.820	502.731	0.460	465.464

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	52.138	2.698	11.276	0.7028	834.706	1188.072	737.440	0.621	511.834
2	47.866	3.136	12.406	0.6612	775.097	1089.095	731.376	0.624	519.977
3	42.041	5.871	16.167	0.5875	685.315	991.430	737.077	0.632	508.574
4	32.395	8.945	23.929	0.5591	645.352	892.453	774.023	0.671	542.014
5	18.909	13.129	38.384	0.5201	595.658	795.410	829.412	0.724	549.725

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	0.523	0.41485	0.5140	0.	529.681	1201.265	658.392	0.851
2	0.519	0.49379	0.5654	0.	514.310	1088.474	574.785	0.837
3	0.547	0.55933	0.6020	0.	532.847	979.412	458.584	0.838
4	0.525	0.61770	0.6132	0.	548.547	860.336	343.906	0.946
5	0.493	0.63362	0.5298	0.	607.104	724.820	188.306	1.181

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8061	0.8204	1.725	1.209	0.	45.982
2	0.8820	0.4906	1.705	1.187	0.	44.686
3	0.8783	0.8868	1.673	1.181	0.	46.335
4	0.9358	0.9402	1.661	1.167	0.	45.343
5	0.9304	0.9351	1.642	1.164	0.	47.840

TRAVERSE PRESSURE RATIO = 1.6849
TRAVERSE ADIABATIC EFF. = 0.8770
TRAVERSE POLYTROPIC EFF. = 0.8857
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.6720
ADIABATIC EFF. = 0.9026
POLYTROPIC EFF. = 0.9094
NOZZLE WEIGHT FLOW = 198.52
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99928
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98865

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0424	0.7964	0.1383	1.695	1.204
2	0.0153	0.9017	0.0681	1.704	1.182
3	0.0193	0.9143	0.0857	1.669	1.172
4	0.0043	0.9828	0.0187	1.654	1.157
5	0.0090	0.9711	0.0405	1.625	1.153

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 8 READING NUMBER 8 DATE 4/13/1967

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	62.657	3.757	0.697	1.3977	1504.684	1335.697	692.811	0.644	690.675
2	59.630	4.170	-0.270	1.3095	1402.826	1210.284	709.320	0.662	709.212
3	57.335	5.085	-0.625	1.2090	1295.492	1089.017	701.670	0.655	698.200
4	55.263	5.553	-1.017	1.0932	1172.961	956.615	678.769	0.633	663.314
5	56.317	5.717	-1.563	0.9160	993.033	805.934	580.159	0.535	537.152

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	51.594	2.154	11.063	0.7386	891.760	1321.028	834.139	0.691	553.461
2	47.446	2.716	12.184	0.7108	842.843	1210.975	820.459	0.692	569.993
3	42.911	6.741	14.423	0.5951	704.546	1102.380	809.183	0.683	515.635
4	31.295	7.845	23.967	0.5972	695.769	992.327	869.159	0.746	591.290
5	20.064	14.284	36.253	0.5494	634.179	884.423	899.354	0.779	581.314

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	0.558	0.39624	0.5139	0.	622.874	1335.697	698.155	0.801
2	0.540	0.48628	0.5746	0.	590.115	1210.284	620.860	0.804
3	0.603	0.56151	0.6184	0.	623.031	1089.017	479.349	0.739
4	0.555	0.62528	0.6331	0.	632.884	956.615	359.443	0.891
5	0.527	0.63938	0.5472	0.	672.110	805.934	212.313	1.082

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7577	0.7790	1.937	1.275	0.	48.377
2	0.8753	0.8863	1.928	1.236	0.	45.994
3	0.8424	0.8555	1.862	1.231	0.	50.388
4	0.9203	0.9270	1.877	1.215	0.	46.946
5	0.8935	0.9020	1.795	1.204	0.	49.143

TRAVERSE PRESSURE RATIO = 1.8865
TRAVERSE ADIABATIC EFF. = 0.8470
TRAVERSE POLYTROPIC EFF. = 0.8600
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.8630
ADIABATIC EFF. = 0.8825
POLYTROPIC EFF. = 0.8923
NOZZLE WEIGHT FLOW = 220.04
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99069
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98582

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0491	0.7783	0.2155	1.896	1.258
2	0.0235	0.8947	0.1039	1.915	1.228
3	0.0285	0.8774	0.1282	1.849	1.219
4	0.0090	0.9660	0.0388	1.859	1.201
5	0.0161	0.9472	0.0734	1.768	1.187

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

NASA = TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 9 READING NUMBER 9 DATE 4/13/1967

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	62.422	3.522	0.462	1.5572	1658.807	1469.363	769.813	0.723	767.440
2	59.744	4.284	-0.156	1.4524	1541.417	1331.399	776.752	0.732	776.633
3	57.605	5.355	-0.355	1.3373	1420.825	1197.997	763.903	0.719	760.126
4	55.408	5.698	-0.872	1.2100	1288.015	1052.345	742.666	0.698	725.756
5	56.410	5.810	-1.470	1.0121	1091.096	886.586	635.969	0.590	588.825

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	50.116	0.676	12.306	0.8316	1012.321	1453.226	938.727	0.771	648.488
2	46.173	1.443	13.571	0.8059	960.843	1332.159	922.518	0.774	665.357
3	45.108	8.938	12.497	0.6178	740.317	1212.698	864.597	0.721	522.138
4	26.045	2.595	29.363	0.6526	764.426	1091.631	1023.536	0.874	682.656
5	19.421	13.641	36.989	0.6505	751.562	972.929	1018.329	0.881	691.559

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	0.539	0.31764	0.4504	0.	677.211	1469.363	776.016	0.845
2	0.515	0.40447	0.5107	0.	638.989	1331.399	693.171	0.857
3	0.627	0.47666	0.5517	0.	688.587	1197.997	524.111	0.687
4	0.568	0.51592	0.5423	0.	758.011	1052.345	333.620	0.941
5	0.475	0.54668	0.4676	0.	729.108	886.586	243.821	1.174

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.6942	0.7229	2.040	1.325	0.	46.241
2	0.8261	0.8428	2.062	1.278	0.	43.842
3	0.7446	0.7667	1.917	1.275	0.	52.828
4	0.8523	0.8666	2.080	1.273	0.	47.994
5	0.8832	0.8938	1.969	1.242	0.	46.514

TRAVERSE PRESSURE RATIO = 2.0199
TRAVERSE ADIABATIC EFF. = 0.7895
TRAVERSE POLYTROPIC EFF. = 0.8092
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.9790
ADIABATIC EFF. = 0.8316
POLYTROPIC EFF. = 0.8469
NOZZLE WEIGHT FLOW = 233.40
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98462
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.03121

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0590	0.7405	0.2509	1.995	1.295
2	0.0336	0.8540	0.1451	2.037	1.264
3	0.0446	0.7996	0.2087	1.909	1.254
4	0.0397	0.8603	0.1634	1.955	1.245
5	0.0179	0.9440	0.0813	1.982	1.229

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

NASA = TASK I (ROTOR 2F)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 11 READING NUMBER 11 DATE 4/13/1967

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	61.137	2.237	-0.823	1.4269	1526.822	1336.195	738.762	0.690	736.485
2	58.514	3.054	-1.386	1.3309	1419.836	1210.734	741.657	0.695	741.544
3	56.808	4.558	-1.152	1.2191	1303.775	1089.423	716.232	0.670	712.691
4	54.590	4.880	-1.690	1.1045	1193.422	956.971	696.199	0.650	680.347
5	55.600	5.000	-2.280	0.9242	1002.755	806.234	596.242	0.550	552.043

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	54.728	5.288	6.409	1.0165	1175.955	1321.520	770.608	0.666	678.511
2	50.749	6.019	7.764	0.9222	1062.747	1211.426	776.575	0.674	672.406
3	48.488	12.318	8.319	0.7133	830.070	1102.791	731.475	0.629	549.815
4	30.281	6.831	24.308	0.7908	896.230	992.696	946.802	0.835	769.634
5	17.168	11.388	38.432	0.7815	875.012	884.753	1050.148	0.938	815.175

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	0.316	0.24114	0.3473	0.	362.228	1336.195	959.293	0.921
2	0.343	0.30773	0.3942	0.	388.464	1210.734	822.962	0.907
3	0.476	0.33668	0.3962	0.	481.591	1089.423	621.200	0.771
4	0.369	0.33574	0.3501	0.	543.294	956.971	449.402	1.131
5	0.282	0.19545	0.0973	0.	632.918	806.234	251.835	1.477

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7872	0.7995	1.524	1.163	0.	28.096
2	0.8303	0.8405	1.553	1.162	0.	30.016
3	0.6476	0.6656	1.450	1.173	0.	41.216
4	0.8688	0.8777	1.648	1.177	0.	35.219
5	0.8388	0.8497	1.643	1.182	0.	37.826

TRAVERSE PRESSURE RATIO = 1.5628
TRAVERSE ADIABATIC EFF. = 0.8002
TRAVERSE POLYTROPIC EFF = 0.8124
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5680
ADIABATIC EFF. = 0.8340
POLYTROPIC EFF. = 0.8442
NOZZLE WEIGHT FLOW = 227.72
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97827
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99942

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0320	0.7749	0.1510	1.523	1.165
2	0.0288	0.8152	0.1359	1.557	1.165
3	0.0385	0.7543	0.1915	1.486	1.159
4	0.0153	0.9312	0.0655	1.652	1.166
5	0.0296	0.8945	0.1323	1.639	1.170

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 12 READING NUMBER 12 DATE 4/13/1967

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	61.260	2.360	-0.700	1.4243	1524.052	1335.349	734.558	0.686	732.294
2	58.629	3.169	-1.271	1.3284	1417.184	1209.968	737.827	0.692	737.714
3	56.512	4.262	-1.448	1.2241	1307.412	1088.733	723.868	0.678	720.289
4	54.328	4.618	-1.952	1.1092	1186.648	956.366	702.494	0.657	686.499
5	55.582	4.982	-2.298	0.9251	1002.355	805.724	596.259	0.550	552.058

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	54.346	4.906	6.914	0.9740	1134.972	1320.684	773.608	0.664	661.021
2	50.209	5.479	8.421	0.8929	1033.777	1210.659	781.721	0.675	661.601
3	47.115	10.945	9.397	0.6938	810.500	1102.093	750.565	0.643	551.217
4	32.157	8.707	22.172	0.7426	849.279	992.068	901.898	0.789	715.144
5	17.331	11.551	38.251	0.7490	841.849	884.193	1028.627	0.915	783.621

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	0.351	0.26976	0.3803	0.	399.230	1335.349	921.454	0.903
2	0.369	0.34031	0.4292	0.	416.339	1209.968	794.320	0.897
3	0.499	0.37530	0.4376	0.	508.599	1088.733	593.494	0.765
4	0.410	0.42097	0.4394	0.	542.475	956.366	449.593	1.042
5	0.316	0.26045	0.1691	0.	639.657	805.724	244.536	1.419

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7836	0.7972	1.587	1.180	0.	31.130
2	0.8478	0.8578	1.617	1.174	0.	32.182
3	0.6785	0.6968	1.518	1.187	0.	42.697
4	0.8701	0.8792	1.679	1.184	0.	37.182
5	0.8493	0.8598	1.669	1.186	0.	39.224

TRAVERSE PRESSURE RATIO = 1.6139
TRAVERSE ADIABATIC EFF. = 0.8084
TRAVERSE POLYTROPIC EFF. = 0.8209
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.6170
ADIABATIC EFF. = 0.8481
POLYTROPIC EFF. = 0.8581
NOZZLE WEIGHT FLOW = 226.51
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98567
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.00744

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0352	0.7721	0.1647	1.578	1.180
2	0.0264	0.8413	0.1231	1.617	1.175
3	0.0368	0.7834	0.1786	1.548	1.170
4	0.0130	0.9416	0.0569	1.687	1.171
5	0.0241	0.9151	0.1080	1.668	1.172

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 13 READING NUMBER 13 DATE 4/13/1967

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	61.196	2.296	-0.764	1.4239	1523.175	1333.759	735.629	0.688	733.362
2	58.549	3.089	-1.351	1.3277	1416.710	1208.527	739.275	0.693	739.163
3	56.735	4.485	-1.225	1.2182	1302.494	1087.437	716.919	0.671	713.374
4	54.797	5.087	-1.483	1.0997	1178.149	955.227	689.621	0.644	673.919
5	55.615	5.015	-2.265	0.9230	1000.722	804.765	594.809	0.549	550.716

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	53.733	4.293	7.463	0.9340	1097.548	1319.112	782.333	0.666	648.697
2	49.484	4.754	9.065	0.8511	990.713	1209.218	788.846	0.678	643.621
3	45.251	9.081	11.484	0.6646	779.672	1100.781	775.493	0.661	548.520
4	30.775	7.325	24.022	0.7113	816.563	990.887	908.404	0.791	697.706
5	17.754	11.974	37.861	0.6944	787.131	883.140	993.008	0.876	731.061

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	0.384	0.30259	0.4172	0.	434.947	1333.759	884.164	0.885
2	0.408	0.38033	0.4712	0.	456.069	1208.527	753.149	0.871
3	0.529	0.42138	0.4841	0.	547.438	1087.437	553.342	0.769
4	0.441	0.45801	0.4749	0.	575.383	955.227	415.504	1.035
5	0.372	0.35944	0.2741	0.	649.063	804.765	234.077	1.327

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7766	0.7920	1.662	1.201	0.	33.842
2	0.8697	0.8790	1.692	1.187	0.	35.321
3	0.7235	0.7414	1.612	1.202	0.	44.943
4	0.8833	0.8920	1.738	1.194	0.	39.542
5	0.8589	0.8691	1.698	1.190	0.	41.600

TRAVERSE PRESSURE RATIO = 1.6806
TRAVERSE ADIABATIC EFF. = 0.8216
TRAVERSE POLYTROPIC EFF. = 0.8342
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.6790
ADIABATIC EFF. = 0.8677
POLYTROPIC EFF. = 0.8770
NOZZLE WEIGHT FLOW = 226.28
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98298
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01149

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0366	0.7810	0.1687	1.642	1.195
2	0.0224	0.8743	0.1030	1.691	1.185
3	0.0328	0.8275	0.1537	1.641	1.184
4	0.0113	0.9527	0.0485	1.736	1.179
5	0.0223	0.9232	0.1000	1.693	1.176

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 14 READING NUMBER 14 DATE 4/13/1967

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	61.451	2.551	-0.509	1.4188	1520.661	1334.823	728.463	0.680	726.217
2	58.623	3.163	-1.277	1.3266	1416.718	1209.492	737.712	0.691	737.600
3	56.575	4.325	-1.385	1.2226	1305.944	1088.304	721.860	0.676	718.291
4	54.385	4.675	-1.895	1.1075	1185.321	955.989	700.765	0.655	684.809
5	55.172	4.572	-2.708	0.9310	1007.461	805.407	605.226	0.559	560.361

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	52.817	3.377	8.634	0.8974	1061.239	1320.164	799.152	0.676	640.794
2	48.791	4.061	9.832	0.8211	961.098	1210.182	798.898	0.683	633.164
3	44.461	8.291	12.114	0.6449	759.222	1101.659	786.908	0.668	541.503
4	31.212	7.762	23.172	0.6848	790.567	991.677	894.609	0.775	672.438
5	20.516	14.736	34.656	0.6372	728.940	883.844	933.696	0.816	666.323

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	0.416	0.32483	0.4410	0.	475.414	1334.823	844.750	0.882
2	0.437	0.40849	0.4999	0.	487.146	1209.492	723.036	0.858
3	0.552	0.46737	0.5304	0.	570.257	1088.304	531.402	0.754
4	0.468	0.52573	0.5424	0.	584.239	955.989	407.438	0.982
5	0.430	0.49212	0.4110	0.	634.510	805.407	249.335	1.189

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7811	0.7973	1.731	1.218	0.	36.572
2	0.8715	0.8813	1.753	1.200	0.	37.574
3	0.7571	0.7744	1.689	1.214	0.	46.482
4	0.9023	0.9100	1.793	1.201	0.	40.985
5	0.8641	0.8740	1.715	1.193	0.	43.599

TRAVERSE PRESSURE RATIO = 1.7378
TRAVERSE ADIABATIC EFF. = 0.8319
TRAVERSE POLYTROPIC EFF. = 0.8445
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.7280
ADIABATIC EFF. = 0.8747
POLYTROPIC EFF. = 0.8840
NOZZLE WEIGHT FLOW = 225.74
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98799
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01330

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0394	0.7831	0.1776	1.701	1.209
2	0.0216	0.8860	0.0978	1.749	1.195
3	0.0301	0.8507	0.1393	1.707	1.194
4	0.0097	0.9602	0.0418	1.775	1.186
5	0.0232	0.9188	0.1060	1.703	1.179

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

NASA = TASK I (ROTOR 2F)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 15 READING NUMBER 15 DATE 4/13/1967

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	61.448	2.548	-0.512	1.4178	1520.678	1334.793	728.554	0.679	726.308
2	58.682	3.222	-1.218	1.3243	1415.806	1209.464	736.005	0.688	735.893
3	56.895	4.645	-1.065	1.2149	1301.109	1088.280	713.114	0.666	709.588
4	54.820	5.110	-1.460	1.0985	1178.711	955.967	689.555	0.643	673.855
5	55.751	5.151	-2.129	0.9214	999.713	805.389	592.263	0.546	548.359

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	52.230	2.790	9.217	0.8574	1021.274	1320.134	810.078	0.680	624.945
2	48.126	3.396	10.556	0.7958	935.438	1210.155	808.525	0.688	624.393
3	43.537	7.367	13.358	0.6379	752.556	1101.634	799.149	0.677	545.158
4	30.427	6.977	24.393	0.6669	771.974	991.655	899.019	0.777	661.953
5	20.021	14.241	35.730	0.6068	696.545	883.824	924.644	0.805	638.648

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	0.452	0.34807	0.4658	0.	513.576	1334.793	806.558	0.860
2	0.461	0.43413	0.5254	0.	513.630	1209.464	696.525	0.848
3	0.558	0.49242	0.5538	0.	583.631	1088.280	518.003	0.768
4	0.485	0.54321	0.5576	0.	602.866	955.967	388.789	0.982
5	0.463	0.52342	0.4388	0.	651.112	805.389	232.712	1.165

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7699	0.7879	1.789	1.235	0.	39.413
2	0.8803	0.8899	1.808	1.210	0.	39.441
3	0.7895	0.8053	1.743	1.218	0.	46.952
4	0.9095	0.9168	1.822	1.206	0.	42.325
5	0.8731	0.8825	1.731	1.195	0.	45.554

TRAVERSE PRESSURE RATIO = 1.7822
TRAVERSE ADIABATIC EFF. = 0.8387
TRAVERSE POLYTROPIC EFF. = 0.8513
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.7700
ADIABATIC EFF. = 0.8811
POLYTROPIC EFF. = 0.8903
NOZZLE WEIGHT FLOW = 225.50
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98178
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01143

PARAMETERS DETERMINED FROM FIXED INSTRUMENATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0419	0.7834	0.1866	1.758	1.223
2	0.0206	0.8966	0.0923	1.801	1.204
3	0.0286	0.8658	0.1303	1.756	1.201
4	0.0087	0.9654	0.0375	1.804	1.190
5	0.0218	0.9257	0.0993	1.718	1.181

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

NASA = TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 16 READING NUMBER 16 DATE 4/13/1967

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	61.877	2.977	-0.083	1.4115	1514.756	1335.004	715.718	0.667	713.512
2	59.047	3.587	-0.853	1.3193	1410.586	1209.655	725.594	0.679	725.483
3	56.738	4.488	-1.222	1.2192	1303.654	1088.452	717.487	0.671	713.939
4	54.694	4.984	-1.586	1.1019	1180.791	956.118	692.897	0.647	677.120
5	55.535	4.935	-2.345	0.9257	1002.721	805.516	597.155	0.551	552.888

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	51.105	1.665	10.772	0.8079	967.778	1320.343	832.341	0.695	607.076
2	47.630	2.900	11.417	0.7645	901.838	1210.346	815.726	0.692	607.754
3	43.577	7.407	13.161	0.6270	740.991	1101.808	798.928	0.676	536.425
4	31.318	7.868	23.376	0.6343	736.693	991.811	878.047	0.756	625.917
5	21.670	15.890	33.866	0.5845	673.410	883.964	897.584	0.779	611.024

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	0.498	0.36929	0.4875	0.	567.846	1335.004	752.497	0.851
2	0.490	0.46039	0.5507	0.	544.074	1209.655	666.272	0.838
3	0.570	0.53107	0.5912	0.	591.392	1088.452	510.416	0.751
4	0.518	0.58968	0.6018	0.	610.973	956.118	380.839	0.924
5	0.485	0.59943	0.5131	0.	641.184	805.516	242.780	1.105

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7644	0.7842	1.870	1.256	0.	43.088
2	0.8818	0.8918	1.870	1.222	0.	41.836
3	0.8140	0.8286	1.797	1.224	0.	47.790
4	0.9156	0.9226	1.844	1.209	0.	44.308
5	0.8837	0.8925	1.753	1.197	0.	46.380

TRAVERSE PRESSURE RATIO = 1.8333
TRAVERSE ADIABATIC EFF. = 0.8429
TRAVERSE POLYTROPIC EFF. = 0.8557
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION PRESSURE RATIO = 1.8150
ADIABATIC EFF. = 0.8870
POLYTROPIC EFF. = 0.8960
NOZZLE WEIGHT FLOW = 223.67
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98948
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01073

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0451	0.7844	0.1959	1.821	1.238
2	0.0201	0.9043	0.0892	1.857	1.214
3	0.0264	0.8797	0.1201	1.803	1.209
4	0.0080	0.9686	0.0346	1.832	1.195
5	0.0187	0.9360	0.0861	1.740	1.183

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

NASA = TASK 1 (ROTOR 2F)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 17 READING NUMBER 17 DATE 4/13/1967

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	60.594	1.694	-1.366	1.2815	1381.118	1202.279	679.715	0.631	677.620
2	57.922	2.462	-1.978	1.1959	1285.738	1089.392	682.896	0.635	682.792
3	55.981	3.731	-1.979	1.1010	1184.488	980.239	664.938	0.618	661.651
4	54.076	4.366	-2.204	0.9935	1071.904	861.062	638.397	0.592	623.861
5	54.655	4.055	-3.225	0.8391	913.804	725.432	555.686	0.510	514.493

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	55.085	5.645	5.509	1.0996	1224.395	1189.075	726.143	0.652	700.240
2	52.606	7.876	5.316	0.9690	1086.041	1090.014	697.585	0.622	659.529
3	48.707	12.537	7.274	0.8305	937.638	992.267	683.017	0.605	618.387
4	32.603	9.153	21.472	0.8311	925.831	893.206	876.667	0.787	775.800
5	14.782	9.002	39.873	0.8532	932.830	796.081	1065.197	0.974	878.940

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	0.163	0.12144	0.1844	0.	185.876	1202.279	1003.199	1.033
2	0.214	0.18039	0.2333	0.	227.185	1089.392	862.829	0.966
3	0.283	0.20733	0.2404	0.	288.199	980.239	704.068	0.935
4	0.238	0.21704	0.2099	0.	396.996	861.062	496.210	1.244
5	0.130	-0.01922	-0.1517	0.	564.150	725.432	231.931	1.708

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8294	0.8344	1.228	1.073	0.	14.866
2	0.7630	0.7702	1.242	1.084	0.	19.007
3	0.6040	0.6152	1.223	1.098	0.	24.988
4	0.8676	0.8740	1.414	1.120	0.	27.100
5	0.9067	0.9121	1.521	1.141	0.	32.694

TRAVERSE PRESSURE RATIO = 1.3183
TRAVERSE ADIABATIC EFF. = 0.8097
TRAVERSE POLYTROPIC EFF. = 0.8170
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.3200
ADIABATIC EFF. = 0.8238
POLYTROPIC EFF. = 0.8306
NOZZLE WEIGHT FLOW = 214.92
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98814
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99693

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS. RATIO	TOT. TEMP RATIO
1	0.0166	0.7950	0.0790	1.232	1.077
2	0.0254	0.7380	0.1252	1.251	1.089
3	0.0360	0.6707	0.1798	1.236	1.093
4	0.0171	0.9032	0.0753	1.409	1.114
5	0.0181	0.9315	0.0798	1.505	1.133

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

NASA = TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 18 READING NUMBER 18 DATE 4/13/1967

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	60.875	1.975	-1.085	1.2763	1377.009	1202.024	671.782	0.623	669.711
2	58.050	2.590	-1.850	1.1938	1283.673	1089.161	679.370	0.632	679.266
3	55.799	3.549	-2.161	1.1036	1186.811	980.031	669.372	0.622	666.063
4	53.524	3.814	-2.756	1.0025	1079.486	860.879	651.289	0.605	636.460
5	54.358	3.758	-3.522	0.8436	917.342	725.278	561.683	0.517	520.046

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	54.330	4.890	6.546	0.9108	1050.146	1188.823	699.550	0.607	611.856
2	50.835	6.105	7.215	0.8253	947.068	1089.783	695.812	0.606	598.117
3	44.754	8.584	11.045	0.6888	794.271	992.057	711.518	0.617	563.650
4	33.192	9.742	20.332	0.6873	781.781	893.017	805.150	0.708	650.798
5	18.862	13.082	35.496	0.6754	760.533	795.912	911.087	0.809	702.072

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	0.327	0.28258	0.3775	0.	336.410	1202.024	852.413	0.914
2	0.355	0.33653	0.4309	0.	355.504	1089.161	734.279	0.881
3	0.442	0.40616	0.4563	0.	433.225	980.031	558.831	0.846
4	0.395	0.43684	0.4653	0.	467.272	860.879	425.745	1.023
5	0.319	0.36909	0.2812	0.	556.057	725.278	239.856	1.350

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8213	0.8305	1.457	1.139	0.	28.803
2	0.8789	0.8853	1.471	1.133	0.	30.726
3	0.7653	0.7774	1.459	1.149	0.	37.546
4	0.9074	0.9129	1.539	1.145	0.	35.678
5	0.8944	0.9027	1.563	1.152	0.	38.380

TRAVERSE PRESSURE RATIO = 1.4941
TRAVERSE ADIABATIC EFF. = 0.8530
TRAVERSE POLYTROPIC EFF. = 0.8611
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5010
ADIABATIC EFF. = 0.8927
POLYTROPIC EFF. = 0.8987
NOZZLE WEIGHT FLOW = 215.33
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98796
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98295

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0258	0.8164	0.1205	1.460	1.140
2	0.0179	0.8798	0.0846	1.484	1.136
3	0.0250	0.8515	0.1164	1.473	1.137
4	0.0068	0.9669	0.0302	1.545	1.137
5	0.0109	0.9600	0.0490	1.562	1.142

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 19 READING NUMBER 19 DATE 4/13/1967

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	60.683	1.783	-1.277	1.2797	1379.769	1202.167	677.169	0.628	675.082
2	58.025	2.565	-1.875	1.1936	1284.173	1089.291	680.107	0.632	680.004
3	56.026	3.776	-1.934	1.0999	1183.751	980.148	663.759	0.617	660.478
4	54.251	4.541	-2.029	0.9910	1049.365	860.982	634.234	0.588	619.793
5	54.882	4.282	-2.998	0.8370	910.899	725.364	550.985	0.506	510.140

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	53.931	4.491	6.752	0.8741	1013.650	1188.965	703.160	0.606	596.290
2	49.630	4.900	8.395	0.7966	917.775	1089.913	711.363	0.617	594.450
3	43.132	6.962	12.894	0.6734	778.242	992.175	731.461	0.633	567.533
4	31.624	8.174	22.627	0.6660	758.720	893.123	816.428	0.717	642.553
5	18.899	13.119	35.983	0.6441	727.784	796.007	892.857	0.790	671.699

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	0.31737	0.4162	0.	370.316	1202.167	818.648	0.883
2	0.387	0.39099	0.4667	0.	390.690	1089.291	699.223	0.874
3	0.461	0.43769	0.4877	0.	460.496	980.148	531.679	0.859
4	0.418	0.47176	0.4780	0.	497.450	860.982	395.673	1.037
5	0.353	0.41237	0.3232	0.	566.045	725.364	229.962	1.317

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8280	0.8378	1.512	1.152	0.	31.842
2	0.9038	0.9094	1.531	1.144	0.	33.314
3	0.8014	0.8127	1.517	1.158	0.	39.056
4	0.9215	0.9263	1.574	1.150	0.	37.746
5	0.8955	0.9020	1.572	1.154	0.	40.121

TRAVERSE PRESSURE RATIO = 1.5388
TRAVERSE ADIABATIC EFF. = 0.8681
TRAVERSE POLYTROPIC EFF. = 0.8759
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5420
ADIABATIC EFF. = 0.9117
POLYTROPIC EFF. = 0.9169
NOZZLE WEIGHT FLOW = 214.31
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98721
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99178

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0255	0.8307	0.1181	1.510	1.151
2	0.0143	0.9110	0.0661	1.539	1.144
3	0.0210	0.8859	0.0950	1.530	1.146
4	0.0031	0.9859	0.0133	1.575	1.141
5	0.0104	0.9622	0.0470	1.567	1.142

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

NASA = TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 20 READING NUMBER 20 DATE 4/13/1967

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	61.167	2.267	-0.793	1.2711	1372.550	1201.531	663.488	0.614	661.443
2	58.313	2.853	-1.587	1.1893	1279.501	1088.715	672.177	0.625	672.074
3	56.010	3.760	-1.950	1.0997	1183.351	979.629	663.811	0.617	660.529
4	53.809	4.099	-2.471	0.9978	1074.989	860.526	644.280	0.598	629.610
5	54.777	4.177	-3.103	0.8379	911.720	724.981	552.844	0.508	511.862

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	53.040	3.600	8.127	0.8357	975.581	1188.336	716.112	0.613	586.057
2	49.157	4.427	9.156	0.7579	877.690	1089.337	714.451	0.617	573.995
3	42.530	6.360	13.480	0.6504	753.839	991.650	736.039	0.635	555.109
4	32.393	8.943	21.415	0.6288	720.274	892.651	793.974	0.693	604.949
5	19.813	14.033	34.964	0.5949	676.190	795.586	856.934	0.754	620.763

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	0.398	0.35536	0.4561	0.	409.480	1201.531	778.856	0.886
2	0.425	0.43318	0.5091	0.	425.375	1088.715	663.961	0.854
3	0.487	0.49371	0.5432	0.	482.454	979.629	509.196	0.840
4	0.460	0.54684	0.5526	0.	508.836	860.526	383.815	0.961
5	0.412	0.51153	0.4229	0.	571.944	724.981	223.642	1.213

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8384	0.8486	1.590	1.169	0.	34.942
2	0.9058	0.9118	1.593	1.157	0.	36.541
3	0.8468	0.8565	1.583	1.166	0.	40.994
4	0.9282	0.9329	1.609	1.157	0.	40.068
5	0.9042	0.9102	1.587	1.156	0.	42.656

TRAVERSE PRESSURE RATIO = 1.5925
TRAVERSE ADIABATIC EFF. = 0.8908
TRAVERSE POLYTROPIC EFF. = 0.8884
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.5920
ADIABATIC EFF. = 0.9194
POLYTROPIC EFF. = 0.9245
NOZZLE WEIGHT FLOW = 213.11
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99102
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98908

PARAMETERS DETERMINED FROM FIXED INSTRUMENATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0269	0.8411	0.1218	1.583	1.167
2	0.0132	0.9245	0.0605	1.602	1.156
3	0.0173	0.9122	0.0774	1.590	1.155
4	0.0035	0.9845	0.0152	1.605	1.147
5	0.0116	0.9584	0.0527	1.580	1.146

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

NASA = TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 21 READING NUMBER 21 DATE 4/13/1967

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	61.390	2.490	-0.570	1.2647	1368.057	1200.169	656.638	0.607	654.614
2	58.607	3.147	-1.293	1.1820	1274.020	1087.481	663.711	0.616	663.610
3	56.605	4.355	-1.355	1.0890	1173.796	978.519	648.305	0.601	645.099
4	55.006	5.296	-1.274	0.9782	1057.341	859.551	615.745	0.570	601.725
5	55.816	5.216	-2.064	0.8239	898.114	724.159	531.228	0.487	491.848

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	51.929	2.489	9.462	0.7846	922.729	1186.989	733.133	0.623	568.465
2	48.294	3.564	10.313	0.7199	837.720	1088.102	724.383	0.623	557.332
3	41.693	5.523	14.912	0.6290	730.597	990.526	743.619	0.640	545.138
4	31.526	8.070	23.487	0.6064	695.968	891.639	796.292	0.694	590.063
5	19.002	13.222	36.814	0.5665	645.732	794.684	849.995	0.746	595.620

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	0.449	0.38736	0.4888	0.	461.250	1200.169	725.739	0.868
2	0.464	0.46469	0.5396	0.	462.696	1087.481	625.406	0.840
3	0.509	0.52432	0.5715	0.	504.954	978.519	485.572	0.845
4	0.479	0.56097	0.5627	0.	529.771	859.551	361.868	0.981
5	0.442	0.55242	0.4581	0.	589.571	724.159	205.113	1.211

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8300	0.8417	1.658	1.188	0.	39.056
2	0.9099	0.9160	1.645	1.168	0.	39.699
3	0.8700	0.8786	1.631	1.173	0.	42.809
4	0.9331	0.9375	1.632	1.161	0.	41.918
5	0.9085	0.9145	1.611	1.161	0.	44.708

TRAVERSE PRESSURE RATIO = 1.6375
TRAVERSE ADIABATIC EFF. = 0.8847
TRAVERSE POLYTROPIC EFF. = 0.8925
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.6290
ADIABATIC EFF. = 0.9246
POLYTROPIC EFF. = 0.9296
NOZZLE WEIGHT FLOW = 209.41
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99131
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99505

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0294	0.8419	0.1300	1.640	1.180
2	0.0128	0.9319	0.0577	1.648	1.165
3	0.0152	0.9273	0.0672	1.628	1.161
4	0.0024	0.9899	0.0104	1.626	1.151
5	0.0105	0.9639	0.0474	1.592	1.147

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 1 READING NUMBER 22 DATE 4/14/1967

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	62.434	3.534	0.474	1.2487	1356.452	1201.668	629.252	0.579	627.312
2	59.361	3.901	-0.539	1.1720	1265.555	1088.839	645.027	0.597	644.929
3	57.267	5.017	-0.693	1.0800	1166.395	979.741	632.919	0.586	629.789
4	55.335	5.625	-0.945	0.9750	1054.312	860.624	609.016	0.563	595.149
5	56.501	5.901	-1.379	0.8174	891.267	725.063	518.305	0.475	479.884

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	51.428	1.988	11.006	0.7203	850.633	1188.471	746.168	0.632	529.866
2	47.870	3.140	11.491	0.6622	773.374	1089.460	731.660	0.626	518.782
3	41.838	5.668	15.429	0.5822	677.954	991.763	739.541	0.635	504.714
4	32.379	8.929	22.955	0.5595	644.013	892.752	774.114	0.673	540.982
5	19.184	13.404	37.318	0.5170	590.098	795.676	824.786	0.723	543.736

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	0.40709	0.5075	0.	524.057	1201.668	664.414	0.845
2	0.525	0.48526	0.5587	0.	515.917	1088.839	573.543	0.804
3	0.560	0.55347	0.5981	0.	539.893	979.741	451.870	0.801
4	0.532	0.60759	0.6062	0.	549.708	860.624	343.045	0.909
5	0.504	0.61414	0.5148	0.	606.501	725.063	189.175	1.133

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8452	0.8565	1.715	1.197	0.	44.684
2	0.9039	0.9107	1.688	1.179	0.	44.841
3	0.8859	0.8938	1.663	1.177	0.	46.929
4	0.9438	0.9476	1.649	1.163	0.	45.458
5	0.9371	0.9412	1.624	1.159	0.	48.123

TRAVERSE PRESSURE RATIO = 1.6721
TRAVERSE ADIABATIC EFF. = 0.8953
TRAVERSE POLYTROPIC EFF. = 0.9026
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 90

FIXED INSTRUMENTATION PRESSURE RATIO = 1.6630
ADIABATIC EFF. = 0.9167
POLYTROPIC EFF. = 0.9225
NOZZLE WEIGHT FLOW = 204.67
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99596
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96020

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0363	0.8205	0.1588	1.682	1.195
2	0.0181	0.9108	0.0808	1.689	1.177
3	0.0165	0.9246	0.0729	1.660	1.169
4	0.0010	0.9957	0.0045	1.650	1.155
5	0.0046	0.9846	0.0208	1.616	1.149

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 11 READING NUMBER 32 DATE 4/14/1967

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	61.601	2.701	-0.359	1.5749	1671.055	1468.933	796.655	0.751	794.200
2	59.243	3.783	-0.657	1.4632	1548.928	1331.009	792.207	0.748	792.087
3	57.325	5.075	-0.635	1.3433	1424.874	1197.647	771.952	0.728	768.135
4	55.378	5.668	-0.902	1.2187	1288.107	1052.037	743.261	0.699	726.337
5	56.263	5.663	-1.617	1.0146	1092.844	886.326	639.324	0.594	591.931

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	54.155	4.715	7.446	1.2991	1443.254	1452.801	892.843	0.804	844.452
2	52.544	7.814	6.699	1.1339	1274.523	1331.770	838.589	0.746	775.088
3	51.612	15.442	5.713	0.9095	1040.031	1212.343	758.870	0.664	645.503
4	24.823	1.373	30.556	0.8476	932.856	1091.311	1100.758	1.000	841.461
5	16.170	10.390	40.093	0.8698	956.334	972.645	1164.289	1.059	895.361

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	0.198	0.08533	0.1565	0.	283.872	1468.933	1168.929	1.063
2	0.246	0.14738	0.2166	0.	320.038	1331.009	1011.732	0.979
3	0.355	0.18709	0.2389	0.	397.575	1197.647	814.768	0.840
4	0.425	0.13173	0.1250	0.	702.095	1052.037	389.216	1.158
5	0.284	0.07794	-0.0367	0.	713.021	886.326	259.624	1.513

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7539	0.7637	1.331	1.113	0.	18.581
2	0.7272	0.7389	1.363	1.127	0.	22.436
3	0.5209	0.5377	1.288	1.144	0.	31.630
4	0.8762	0.8845	1.629	1.171	0.	39.841
5	0.8655	0.8753	1.715	1.193	0.	38.532

TRAVERSE PRESSURE RATIO = 1.4445
TRAVERSE ADIABATIC EFF. = 0.7604
TRAVERSE POLYTROPIC EFF. = 0.7725
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.4380
ADIABATIC EFF. = 0.7455
POLYTROPIC EFF. = 0.7582
NOZZLE WEIGHT FLOW = 234.99
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98708
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95801

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0262	0.7209	0.1221	1.309	1.111
2	0.0347	0.6908	0.1705	1.361	1.133
3	0.0492	0.5645	0.2613	1.293	1.135
4	0.0339	0.8419	0.1380	1.605	1.172
5	0.0467	0.8308	0.2075	1.680	1.192

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 12 READING NUMBER 33 DATE 4/14/1967

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	61.070	2.170	-0.890	1.4270	1525.459	1334.134	739.669	0.692	737.389
2	58.474	3.014	-1.426	1.3300	1418.251	1208.867	741.670	0.696	741.557
3	56.589	4.339	-1.371	1.2214	1305.060	1087.743	721.108	0.675	717.543
4	54.717	5.007	-1.563	1.1021	1179.671	955.495	691.847	0.646	676.095
5	55.562	4.962	-2.318	0.9253	1001.712	804.991	596.167	0.551	551.974

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	54.919	5.479	6.151	1.1923	1326.037	1319.483	798.776	0.718	761.502
2	53.126	8.396	5.348	1.0428	1171.507	1209.558	753.922	0.671	702.959
3	48.573	12.403	8.016	0.8733	990.344	1101.090	747.604	0.659	654.882
4	29.780	6.330	24.938	0.8924	988.993	991.165	996.134	0.899	853.556
5	14.821	9.041	40.741	0.8756	955.159	883.388	1127.846	1.034	899.824

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	0.187	0.10801	0.1778	0.	235.207	1334.134	1084.276	1.033
2	0.238	0.16853	0.2311	0.	272.413	1208.867	937.144	0.948
3	0.325	0.20357	0.2470	0.	358.976	1087.743	742.114	0.913
4	0.279	0.16218	0.1546	0.	502.733	955.495	488.432	1.262
5	0.204	-0.00429	-0.1372	0.	645.290	804.991	238.098	1.630

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8100	0.8165	1.279	1.090	0.	17.164
2	0.7306	0.7402	1.290	1.104	0.	21.183
3	0.6104	0.6240	1.287	1.123	0.	28.730
4	0.8361	0.8454	1.511	1.150	0.	30.498
5	0.8808	0.8884	1.598	1.163	0.	35.645

TRAVERSE PRESSURE RATIO = 1.3821
TRAVERSE ADIABATIC EFF. = 0.7857
TRAVERSE POLYTROPIC EFF. = 0.7953
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 100

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.3730
ADIABATIC EFF. = 0.7856
POLYTROPIC EFF. = 0.7950
NOZZLE WEIGHT FLOW = 225.73
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98972
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99911

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0194	0.7713	0.0920	1.269	1.091
2	0.0310	0.6966	0.1546	1.294	1.110
3	0.0406	0.6476	0.2024	1.280	1.113
4	0.0229	0.8811	0.0975	1.504	1.140
5	0.0355	0.8655	0.1567	1.562	1.157

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 13 READING NUMBER 34 DATE 4/14/1967

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	61.630	2.730	-0.330	1.5738	1670.224	1468.606	795.517	0.750	793.065
2	59.314	3.854	-0.586	1.4601	1547.446	1330.713	789.807	0.745	789.686
3	57.270	5.020	-0.690	1.3443	1425.437	1197.380	773.403	0.729	769.579
4	55.225	5.515	-1.055	1.2128	1290.291	1051.803	747.370	0.702	730.353
5	56.161	5.561	-1.719	1.0150	1094.041	886.128	641.640	0.595	594.075

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	52.911	3.471	8.720	1.0104	1187.223	1452.477	877.789	0.747	715.330
2	48.649	3.919	10.664	0.9232	1077.386	1331.473	883.117	0.757	711.779
3	48.526	12.356	8.745	0.7153	842.191	1212.072	806.015	0.685	557.436
4	23.382	-0.068	31.843	0.7789	886.536	1091.068	1101.572	0.968	808.614
5	10.650	4.870	45.511	0.8344	928.731	972.428	1217.840	1.094	888.700

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	0.400	0.23628	0.3590	0.	506.274	1468.606	946.203	0.902
2	0.417	0.30435	0.4059	0.	522.712	1330.713	808.760	0.901
3	0.533	0.34126	0.4155	0.	581.440	1197.380	630.633	0.724
4	0.471	0.28801	0.3093	0.	741.450	1051.803	349.618	1.107
5	0.331	0.15198	0.0521	0.	805.309	886.128	167.119	1.496

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7455	0.7643	1.725	1.226	0.	35.289
2	0.8146	0.8289	1.769	1.218	0.	36.293
3	0.6512	0.6733	1.598	1.220	0.	46.207
4	0.8198	0.8348	1.865	1.238	0.	42.519
5	0.8570	0.8693	1.902	1.236	0.	42.182

TRAVERSE PRESSURE RATIO = 1.7715
TRAVERSE ADIABATIC EFF. = 0.7814
TRAVERSE POLYTROPIC EFF. = 0.7982
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.7560
ADIABATIC EFF. = 0.8157
POLYTROPIC EFF. = 0.8297
NOZZLE WEIGHT FLOW = 234.55
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98888
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.03015

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0456	0.7338	0.2060	1.693	1.221
2	0.0367	0.8024	0.1658	1.753	1.217
3	0.0440	0.7431	0.2194	1.629	1.201
4	0.0315	0.8788	0.1270	1.826	1.214
5	0.0222	0.9296	0.0967	1.896	1.216

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 14 READING NUMBER 35 DATE 4/14/1967

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	61.644	2.744	-0.316	1.5730	1669.652	1468.290	794.899	0.749	792.449
2	59.265	3.805	-0.635	1.4604	1547.898	1330.426	791.172	0.746	791.051
3	57.610	5.360	-0.350	1.3363	1419.712	1197.122	763.205	0.718	759.432
4	55.765	6.055	-0.515	1.2022	1281.408	1051.576	732.253	0.687	715.581
5	56.591	5.991	-1.289	1.0082	1087.774	885.938	631.163	0.585	584.375

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	52.622	3.182	9.022	0.9564	1137.112	1452.165	883.062	0.743	689.684
2	47.849	3.119	11.416	0.8828	1036.494	1331.186	894.741	0.762	695.570
3	45.762	9.592	11.847	0.6747	798.764	1211.812	848.795	0.717	556.874
4	22.254	-1.196	33.511	0.7242	830.605	1090.833	1094.503	0.954	763.820
5	12.483	6.703	44.108	0.7643	863.316	972.218	1156.340	1.024	820.992

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	0.439	0.26963	0.3982	0.	549.372	1468.290	902.793	0.870
2	0.452	0.33617	0.4406	0.	562.769	1330.426	768.418	0.879
3	0.575	0.37437	0.4493	0.	639.917	1197.122	571.895	0.733
4	0.518	0.33529	0.3588	0.	778.280	1051.576	312.553	1.067
5	0.384	0.28304	0.1977	0.	790.468	885.938	181.750	1.405

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG
1	0.7347	0.7560	1.820	1.254	0.	38.539
2	0.8283	0.8426	1.856	1.234	0.	38.975
3	0.6853	0.7081	1.713	1.243	0.	48.969
4	0.8261	0.8414	1.938	1.252	0.	45.537
5	0.8619	0.8742	1.941	1.242	0.	43.915

TRAVERSE PRESSURE RATIO = 1.8537
TRAVERSE ADIABATIC EFF. = 0.7870
TRAVERSE POLYTROPIC EFF. = 0.8046
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.8240
ADIABATIC EFF. = 0.8220
POLYTROPIC EFF. = 0.8364
NOZZLE WEIGHT FLOW = 234.86
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98305
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.03099

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0493	0.7336	0.2213	1.775	1.243
2	0.0348	0.8255	0.1547	1.843	1.231
3	0.0449	0.7715	0.2124	1.735	1.220
4	0.0374	0.8639	0.1494	1.859	1.224
5	0.0194	0.9395	0.0848	1.920	1.218

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 15 READING NUMBER 36 DATE 4/14/1967

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	61.854	2.954	-0.106	1.5676	1665.178	1467.258	787.382	0.741	784.955
2	59.412	3.952	-0.488	1.4578	1544.465	1329.492	786.016	0.742	785.897
3	57.389	5.139	-0.571	1.3398	1422.232	1196.281	769.190	0.725	765.387
4	55.341	5.631	-0.939	1.2098	1287.230	1050.838	743.439	0.699	726.512
5	56.301	5.701	-1.579	1.0123	1091.070	885.316	637.690	0.592	590.419

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	51.716	2.276	10.138	0.9195	1099.497	1451.145	901.240	0.754	680.562
2	48.121	3.391	11.290	0.8451	998.841	1330.251	888.075	0.751	666.771
3	45.209	9.039	12.179	0.6378	758.249	1210.961	859.638	0.723	533.838
4	23.898	0.448	31.443	0.6757	783.798	1090.067	1055.775	0.910	712.129
5	14.723	8.943	41.577	0.6993	798.560	971.536	1094.210	0.958	752.620

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	0.469	0.28658	0.4170	0.	588.901	1467.258	862.244	0.867
2	0.480	0.36442	0.4702	0.	586.566	1329.492	743.685	0.848
3	0.611	0.41597	0.4924	0.	673.210	1196.281	537.751	0.697
4	0.556	0.42891	0.4572	0.	774.524	1050.838	315.543	0.980
5	0.442	0.40953	0.3324	0.	773.764	885.316	197.772	1.275

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7341	0.7568	1.896	1.273	0.	40.870
2	0.8160	0.8319	1.911	1.249	0.	41.338
3	0.7150	0.7374	1.798	1.256	0.	51.587
4	0.8339	0.8493	2.004	1.264	0.	47.403
5	0.8732	0.8846	1.960	1.243	0.	45.794

TRAVERSE PRESSURE RATIO = 1.9144
TRAVERSE ADIABATIC EFF. = 0.7909
TRAVERSE POLYTROPIC EFF. = 0.8091
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.8750
ADIABATIC EFF. = 0.8245
POLYTROPIC EFF. = 0.8393
NOZZLE WEIGHT FLOW = 234.75
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98556
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.02151

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0518	0.7398	0.2278	1.847	1.259
2	0.0338	0.8364	0.1512	1.909	1.243
3	0.0453	0.7813	0.2121	1.797	1.233
4	0.0406	0.8526	0.1640	1.878	1.231
5	0.0189	0.9411	0.0833	1.943	1.222

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 16 READING NUMBER 37 DATE 4/14/1967

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	61.836	2.936	-0.124	1.5679	1665.224	1467.043	787.880	0.742	785.452
2	59.458	3.998	-0.442	1.4557	1543.494	1329.297	784.438	0.740	784.319
3	57.663	5.413	-0.297	1.3346	1417.659	1196.106	760.978	0.716	757.215
4	56.295	6.585	0.015	1.1921	1272.119	1050.684	717.183	0.672	700.854
5	56.696	6.096	-1.184	1.0063	1085.386	885.186	628.100	0.582	581.539

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	50.962	1.522	10.873	0.8766	1056.135	1450.932	917.844	0.762	664.545
2	47.081	2.351	12.377	0.8136	966.294	1330.056	905.766	0.763	657.996
3	44.767	8.597	12.896	0.6186	737.892	1210.783	867.756	0.728	523.523
4	22.283	-1.167	34.011	0.6585	764.398	1089.907	1069.775	0.922	702.791
5	16.206	10.426	40.490	0.6648	763.534	971.393	1059.724	0.923	714.731

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	0.504	0.30430	0.4369	0.	631.394	1467.043	819.538	0.846
2	0.509	0.37990	0.4860	0.	622.431	1329.297	707.625	0.839
3	0.628	0.43989	0.5155	0.	691.499	1196.106	519.284	0.691
4	0.572	0.43273	0.4579	0.	801.909	1050.684	287.998	1.003
5	0.469	0.47128	0.3925	0.	763.664	885.186	207.729	1.229

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7199	0.7450	1.965	1.296	0.	43.535
2	0.8101	0.8273	1.970	1.264	0.	43.409
3	0.7266	0.7492	1.857	1.266	0.	52.871
4	0.8421	0.8572	2.054	1.271	0.	48.769
5	0.8742	0.8855	1.967	1.244	0.	46.896

TRAVERSE PRESSURE RATIO = 1.9651
TRAVERSE ADIABATIC EFF. = 0.7881
TRAVERSE POLYTROPIC EFF. = 0.8071
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.9210
ADIABATIC EFF. = 0.8285
POLYTROPIC EFF. = 0.8435
NOZZLE WEIGHT FLOW = 233.35
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98546
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.02040

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0532	0.7483	0.2302	1.920	1.274
2	0.0340	0.8440	0.1491	1.966	1.253
3	0.0451	0.7909	0.2096	1.845	1.242
4	0.0424	0.8529	0.1696	1.904	1.237
5	0.0193	0.9403	0.0859	1.957	1.225

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 17 READING NUMBER 38 DATE 4/14/1967

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	62.203	3.303	0.243	1.5604	1860.592	1467.976	776.280	0.729	773.887
2	59.543	4.083	-0.357	1.4542	1543.124	1330.143	782.275	0.737	782.155
3	57.512	5.262	-0.448	1.3374	1420.956	1196.867	765.915	0.721	762.128
4	55.376	5.666	-0.904	1.2094	1287.312	1051.352	742.854	0.698	725.940
5	56.309	5.709	-1.571	1.0123	1091.491	885.749	637.809	0.592	590.529

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	50.478	1.038	11.725	0.8612	1040.374	1451.855	928.587	0.769	661.415
2	47.013	2.283	12.530	0.7996	951.679	1330.902	907.733	0.763	648.873
3	45.151	8.981	12.362	0.6091	728.544	1211.553	864.828	0.723	513.451
4	24.319	0.869	31.057	0.6430	751.214	1090.600	1040.739	0.891	680.311
5	18.040	12.260	38.269	0.6423	741.638	972.011	1029.264	0.891	687.756

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	0.516	0.30839	0.4406	0.	650.126	1467.976	801.729	0.855
2	0.521	0.39285	0.4991	0.	634.753	1330.143	696.150	0.830
3	0.636	0.45840	0.5341	0.	695.393	1196.867	516.160	0.674
4	0.583	0.48905	0.5165	0.	783.158	1051.352	307.442	0.937
5	0.488	0.53309	0.4549	0.	748.018	885.749	223.993	1.165

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7190	0.7448	2.000	1.305	0.	44.507
2	0.8193	0.8360	2.005	1.268	0.	44.370
3	0.7347	0.7571	1.882	1.270	0.	53.559
4	0.8443	0.8593	2.069	1.274	0.	49.020
5	0.8788	0.8898	1.971	1.244	0.	47.403

TRAVERSE PRESSURE RATIO = 1.9895
TRAVERSE ADIABATIC EFF. = 0.7916
TRAVERSE POLYTROPIC EFF. = 0.8107
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 110

FIXED INSTRUMENTATION PRESSURE RATIO = 1.9460
ADIABATIC EFF. = 0.8266
POLYTROPIC EFF. = 0.8420
NOZZLE WEIGHT FLOW = 233.84
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98630
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 1.01387

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0557	0.7460	0.2385	1.955	1.283
2	0.0348	0.8435	0.1526	1.997	1.259
3	0.0459	0.7896	0.2146	1.870	1.248
4	0.0422	0.8512	0.1713	1.924	1.242
5	0.0194	0.9394	0.0872	1.968	1.227

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 18 READING NUMBER 39 DATE 4/14/1967

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	60.192	1.292	-1.768	0.9874	1077.536	934.255	536.890	0.492	535.235
2	57.413	1.953	-2.487	0.9224	1004.743	846.535	541.190	0.497	541.108
3	54.766	2.516	-3.194	0.8580	934.097	761.715	540.674	0.497	538.001
4	52.027	2.317	-4.253	0.7866	856.335	669.106	534.422	0.491	522.254
5	52.556	1.956	-5.324	0.6681	731.542	563.712	466.244	0.426	431.681

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	53.919	4.479	6.273	0.8630	949.068	923.995	581.593	0.523	558.463
2	50.682	5.952	6.731	0.7696	858.134	847.018	573.757	0.515	543.724
3	43.732	7.562	11.034	0.6311	710.136	771.062	585.087	0.520	512.760
4	29.801	6.351	22.226	0.6470	719.900	694.084	711.440	0.639	621.185
5	15.361	9.581	37.194	0.6411	708.626	618.611	811.465	0.734	665.963

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	0.173	0.13682	0.1830	0.	157.624	934.255	766.371	1.043
2	0.207	0.20118	0.2348	0.	183.138	846.535	663.880	1.005
3	0.331	0.24474	0.2622	0.	280.502	761.715	490.559	0.953
4	0.268	0.28485	0.2695	0.	338.319	669.106	355.765	1.189
5	0.177	0.14857	0.0416	0.	435.656	563.712	182.955	1.543

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	MOMEN RISE/ MEAS T.RISE	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8416	0.8446	1.142	1.046	1.0167	0.	15.762
2	0.8495	0.8527	1.161	1.052	0.9697	0.	18.615
3	0.6252	0.6334	1.170	1.073	0.9512	0.	28.681
4	0.9224	0.9251	1.277	1.079	0.9641	0.	28.574
5	0.9424	0.9447	1.329	1.090	0.9674	0.	33.192

TRAVERSE PRESSURE RATIO = 1.2110
TRAVERSE ADIABATIC EFF. = 0.8458
TRAVERSE POLYTROPIC EFF. = 0.8500
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.2180
ADIABATIC EFF. = 0.9254
POLYTROPIC EFF. = 0.9275
NOZZLE WEIGHT FLOW = 185.64
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.99082
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96290

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0102	0.8582	0.0470	1.148	1.047
2	0.0089	0.8948	0.0421	1.170	1.051
3	0.0247	0.7918	0.1126	1.187	1.063
4	0.0002	0.9989	0.0008	1.281	1.073
5	-0.0038	1.0158	-0.0168	1.326	1.083

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 19 READING NUMBER 40 DATE 4/14/1967

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	61.160	2.260	-0.800	0.9750	1068.741	935.509	516.750	0.471	515.157
2	58.420	2.960	-1.480	0.9103	995.067	847.671	521.165	0.477	521.086
3	56.236	3.986	-1.724	0.8403	918.898	762.737	512.451	0.469	509.917
4	54.153	4.443	-2.127	0.7612	833.224	670.003	495.336	0.453	484.057
5	54.799	4.199	-3.081	0.6450	709.646	564.468	430.086	0.391	398.204

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	52.928	3.488	8.232	0.7463	846.952	925.235	569.221	0.502	510.104
2	49.077	4.347	9.343	0.6732	760.841	848.155	568.403	0.503	498.378
3	41.998	5.828	14.238	0.5921	669.870	772.096	594.353	0.525	497.449
4	30.103	6.653	24.050	0.5566	626.307	695.016	664.155	0.590	538.803
5	15.727	9.947	39.072	0.5378	601.812	619.441	740.879	0.662	564.626

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	0.293	0.27806	0.3415	0.	250.069	935.509	675.166	0.990
2	0.327	0.34412	0.3882	0.	273.281	847.671	574.874	0.956
3	0.379	0.39476	0.4180	0.	324.222	762.737	447.874	0.976
4	0.374	0.42009	0.4047	0.	382.644	670.003	312.372	1.113
5	0.311	0.34233	0.2361	0.	460.440	564.468	159.001	1.418

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8683	0.8726	1.258	1.078	0.	26.116
2	0.9399	0.9419	1.266	1.074	0.	28.738
3	0.8894	0.8932	1.280	1.082	0.	33.095
4	0.9473	0.9493	1.316	1.086	0.	35.381
5	0.9524	0.9543	1.341	1.092	0.	39.196

TRAVERSE PRESSURE RATIO = 1.2889
TRAVERSE ADIABATIC EFF. = 0.9186
TRAVERSE POLYTROPIC EFF. = 0.9215
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.2910
ADIABATIC EFF. = 0.9634
POLYTROPIC EFF. = 0.9647
NOZZLE WEIGHT FLOW = 178.53
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98294
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96265

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0106	0.9092	0.0479	1.262	1.076
2	0.0049	0.9613	0.0224	1.272	1.074
3	0.0087	0.9436	0.0384	1.281	1.078
4	0.0008	0.9960	0.0033	1.314	1.081
5	-0.0003	1.0013	-0.0016	1.339	1.087

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 20 READING NUMBER 41 DATE 4/14/1967

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	62.051	3.151	0.091	0.9640	1058.292	934.225	497.198	0.453	495.665
2	59.370	3.910	-0.530	0.8980	983.806	846.507	501.299	0.458	501.222
3	57.101	4.851	-0.859	0.8295	908.510	761.690	495.196	0.452	492.746
4	54.787	5.077	-1.493	0.7529	825.335	669.084	483.224	0.441	472.221
5	55.516	4.916	-2.364	0.6358	701.877	563.693	418.188	0.379	387.188

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	53.011	3.571	9.040	0.7115	811.066	923.965	561.632	0.493	487.553
2	49.013	4.283	10.357	0.6422	729.257	846.990	562.772	0.496	478.304
3	42.740	6.570	14.361	0.5630	639.741	771.036	578.562	0.509	469.505
4	31.113	7.663	23.673	0.5207	588.848	694.061	639.065	0.565	501.378
5	16.815	11.035	38.700	0.5049	568.387	618.591	712.308	0.633	530.465

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	0.329	0.31208	0.3773	0.	276.695	934.225	647.270	0.984
2	0.360	0.38079	0.4251	0.	296.514	846.507	550.476	0.954
3	0.409	0.43577	0.4584	0.	337.184	761.690	433.852	0.953
4	0.417	0.48066	0.4641	0.	391.451	669.084	302.610	1.062
5	0.350	0.42850	0.3207	0.	458.279	563.693	160.312	1.370

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG
1	0.8674	0.8720	1.287	1.086	0.	29.576
2	0.9289	0.9315	1.293	1.082	0.	31.796
3	0.8740	0.8786	1.295	1.088	0.	35.685
4	0.9294	0.9322	1.325	1.090	0.	37.981
5	0.9611	0.9627	1.345	1.092	0.	40.824

TRAVERSE PRESSURE RATIO = 1.3068
TRAVERSE ADIABATIC EFF. = 0.9096
TRAVERSE POLYTROPIC EFF. = 0.9130
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.3110
ADIABATIC EFF. = 0.9646
POLYTROPIC EFF. = 0.9660
NOZZLE WEIGHT FLOW = 172.54
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98906
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95864

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0118	0.9095	0.0532	1.292	1.084
2	0.0058	0.9590	0.0263	1.299	1.081
3	0.0078	0.9519	0.0352	1.301	1.082
4	-0.0001	1.0006	-0.0005	1.326	1.084
5	-0.0011	1.0039	-0.0048	1.344	1.088

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 21 READING NUMBER 42 DATE 4/14/1967

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	62.488	3.588	0.528	0.9590	1053.059	933.357	487.626	0.444	486.123
2	59.898	4.438	-0.002	0.8915	977.593	845.720	490.352	0.447	490.277
3	57.894	5.644	-0.066	0.8199	899.640	760.982	479.853	0.437	477.481
4	55.872	6.162	-0.408	0.7407	813.502	668.462	463.620	0.422	453.064
5	56.568	5.968	-1.312	0.6265	691.672	563.170	401.560	0.364	371.793

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	52.938	3.498	9.551	0.6929	791.352	923.106	559.953	0.490	476.514
2	48.737	4.007	11.162	0.6194	705.257	846.203	562.371	0.494	465.122
3	42.346	6.176	15.547	0.5424	617.123	770.320	578.161	0.508	455.766
4	30.999	7.549	24.873	0.5088	575.778	693.417	635.103	0.561	490.832
5	15.803	10.023	40.765	0.4880	549.411	618.016	709.598	0.630	515.280

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	0.350	0.33186	0.3980	0.	292.184	933.357	630.922	0.980
2	0.387	0.39922	0.4435	0.	316.079	845.720	530.124	0.949
3	0.434	0.44845	0.4700	0.	354.932	760.982	415.388	0.955
4	0.427	0.48313	0.4642	0.	398.506	668.462	294.910	1.083
5	0.373	0.43363	0.3216	0.	472.173	563.170	145.843	1.396

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8668	0.8717	1.305	1.091	0.	31.515
2	0.9114	0.9147	1.308	1.088	0.	34.199
3	0.8867	0.8910	1.306	1.090	0.	37.910
4	0.9390	0.9415	1.329	1.090	0.	39.073
5	0.9498	0.9519	1.349	1.094	0.	42.500

TRAVERSE PRESSURE RATIO = 1.3177
TRAVERSE ADIABATIC EFF. = 0.9079
TRAVERSE POLYTROPIC EFF. = 0.9114
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.3190
ADIABATIC EFF. = 0.9635
POLYTROPIC EFF. = 0.9649
NOZZLE WEIGHT FLOW = 169.39
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98380
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95848

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0140	0.8983	0.0632	1.306	1.088
2	0.0052	0.9645	0.0237	1.312	1.084
3	0.0073	0.9571	0.0324	1.309	1.084
4	-0.0006	1.0026	-0.0024	1.331	1.085
5	-0.0000	1.0001	-0.0000	1.346	1.089

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 22 READING NUMBER 43 DATE 4/14/1967

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	63.949	5.049	1.989	0.9443	1039.322	933.174	457.577	0.416	456.167
2	61.342	5.882	1.442	0.8781	963.628	845.555	462.185	0.421	462.115
3	59.225	6.975	1.265	0.8087	886.683	760.833	455.346	0.415	453.094
4	56.988	7.278	0.708	0.7318	802.557	668.331	444.333	0.405	434.216
5	57.966	7.366	0.086	0.6169	679.577	563.059	380.511	0.345	352.304

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	52.545	3.105	11.405	0.6474	742.418	922.926	562.232	0.490	451.090
2	48.955	4.225	12.387	0.5829	665.326	846.038	556.233	0.487	436.880
3	43.900	7.730	15.326	0.5036	574.428	770.169	556.810	0.488	413.613
4	31.883	8.433	25.105	0.4740	536.895	693.281	614.662	0.543	453.434
5	15.987	10.207	41.979	0.4587	516.597	617.895	690.852	0.613	484.085

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	0.403	0.36270	0.4293	0.	334.107	933.174	588.819	0.989
2	0.429	0.43119	0.4747	0.	344.262	845.555	501.776	0.945
3	0.480	0.48517	0.5052	0.	372.146	760.833	398.023	0.913
4	0.472	0.53731	0.5155	0.	411.227	668.331	282.054	1.044
5	0.412	0.50684	0.5894	0.	479.206	563.059	138.689	1.374

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8734	0.8786	1.341	1.100	0.	36.526
2	0.9049	0.9088	1.334	1.095	0.	38.238
3	0.8529	0.8586	1.318	1.097	0.	41.979
4	0.9330	0.9357	1.342	1.094	0.	42.205
5	0.9452	0.9476	1.363	1.098	0.	44.710

TRAVERSE PRESSURE RATIO = 1.3393
TRAVERSE ADIABATIC EFF. = 0.8990
TRAVERSE POLYTROPIC EFF. = 0.9032
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.3410
ADIABATIC EFF. = 0.9461
POLYTROPIC EFF. = 0.9483
NOZZLE WEIGHT FLOW = 161.84
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.98697
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95356

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0197	0.8746	0.0885	1.338	1.099
2	0.0097	0.9404	0.0441	1.337	1.092
3	0.0111	0.9381	0.0510	1.327	1.090
4	0.0008	0.9966	0.0033	1.348	1.089
5	0.0000	0.9999	0.0001	1.359	1.092

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 23 READING NUMBER 44 DATE 4/14/1967

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	65.311	6.411	3.351	0.9324	1030.238	935.554	431.427	0.390	430.097
2	62.829	7.369	2.929	0.8655	952.895	847.711	435.194	0.395	435.128
3	60.985	8.735	3.025	0.7933	873.264	762.773	425.167	0.386	423.065
4	58.988	9.278	2.708	0.7141	786.664	670.036	412.180	0.374	402.795
5	59.597	8.997	1.717	0.6048	668.313	564.495	357.753	0.324	331.233

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	52.677	3.237	12.634	0.6098	704.016	925.280	562.736	0.487	426.471
2	49.235	4.505	13.593	0.5523	633.652	848.195	553.913	0.483	413.738
3	44.219	8.049	16.767	0.4557	522.174	772.133	553.973	0.483	373.969
4	31.109	7.659	27.878	0.4498	511.968	695.049	616.043	0.541	435.935
5	15.412	9.632	44.184	0.4413	498.377	619.471	687.159	0.608	468.263

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	0.446	0.37363	0.4399	0.	365.930	935.554	559.349	0.992
2	0.464	0.43752	0.4799	0.	368.277	847.711	479.919	0.951
3	0.545	0.48685	0.5049	0.	408.226	762.773	363.907	0.884
4	0.500	0.54324	0.5178	0.	431.978	670.036	263.071	1.082
5	0.434	0.53350	0.4096	0.	490.380	564.495	129.091	1.414

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8267	0.8340	1.357	1.111	0.	40.631
2	0.8594	0.8652	1.344	1.103	0.	41.673
3	0.8192	0.8263	1.324	1.102	0.	47.508
4	0.9014	0.9055	1.352	1.100	0.	44.739
5	0.9575	0.9593	1.373	1.099	0.	46.322

TRAVERSE PRESSURE RATIO = 1.3501
TRAVERSE ADIABATIC EFF. = 0.8678
TRAVERSE POLYTROPIC EFF. = 0.8733
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 70

FIXED INSTRUMENTATION PRESSURE RATIO = 1.3500
ADIABATIC EFF. = 0.9061
POLYTROPIC EFF. = 0.9100
NOZZLE WEIGHT FLOW = 153.93
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97904
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.94721

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0319	0.8165	0.1436	1.352	1.110
2	0.0175	0.9000	0.0801	1.346	1.098
3	0.0196	0.8992	0.0901	1.335	1.096
4	0.0081	0.9666	0.0350	1.354	1.094
5	0.0069	0.9786	0.0306	1.367	1.095

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 24 READING NUMBER 45 DATE 4/14/1967

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	60.661	1.761	-1.299	0.6936	765.504	666.819	375.964	0.341	374.805
2	57.465	2.005	-2.435	0.6507	716.711	604.209	385.495	0.350	385.436
3	54.682	2.432	-3.278	0.6067	667.409	543.669	387.115	0.352	385.201
4	51.876	2.166	-4.404	0.5568	612.499	477.570	383.513	0.349	374.781
5	52.503	1.903	-5.377	0.4737	522.538	402.346	333.413	0.302	308.697

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	53.415	3.975	7.245	0.6090	678.647	659.496	421.133	0.378	404.131
2	49.021	4.291	8.444	0.5538	616.870	604.554	427.707	0.384	404.525
3	42.295	6.125	12.387	0.4932	549.737	550.341	445.197	0.399	406.330
4	29.120	5.670	22.756	0.4729	525.718	495.399	519.389	0.467	456.649
5	13.970	8.190	38.533	0.4703	520.330	441.530	598.011	0.541	491.964

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	0.168	0.15714	0.1899	0.	115.032	666.819	544.464	1.078
2	0.204	0.22041	0.2378	0.	138.855	604.209	465.699	1.050
3	0.259	0.26924	0.2709	0.	180.673	543.669	369.667	1.055
4	0.250	0.28414	0.2536	0.	241.023	477.570	254.376	1.218
5	0.154	0.10705	-0.0086	0.	319.142	402.346	122.388	1.594

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8881	0.8893	1.079	1.025	0.	15.888
2	0.9041	0.9054	1.091	1.028	0.	18.945
3	0.8314	0.8338	1.103	1.034	0.	23.972
4	0.9343	0.9356	1.139	1.041	0.	27.825
5	0.9736	0.9742	1.165	1.046	0.	32.972

TRAVERSE PRESSURE RATIO = 1.1133
TRAVERSE ADIABATIC EFF. = 0.9145
TRAVERSE POLYTROPIC EFF. = 0.9158
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.1160
ADIABATIC EFF. = 0.9624
POLYTROPIC EFF. = 0.9630
NOZZLE WEIGHT FLOW = 142.08
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.97749
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96037

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0058	0.9142	0.0265	1.082	1.025
2	0.0036	0.9565	0.0166	1.096	1.028
3	0.0085	0.9243	0.0380	1.110	1.033
4	0.0024	0.9852	0.0103	1.140	1.039
5	0.0009	0.9963	0.0039	1.163	1.044

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 25 READING NUMBER 46 DATE 4/14/1967

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	61.693	2.793	-0.267	0.6837	756.668	665.722	359.668	0.325	358.560
2	58.506	3.046	-1.394	0.6405	707.451	603.215	369.619	0.335	369.563
3	55.993	3.743	-1.967	0.5942	655.780	542.775	368.026	0.333	366.207
4	53.631	3.921	-2.649	0.5409	597.007	476.784	359.297	0.326	351.117
5	54.100	3.500	-3.780	0.4608	509.881	401.684	314.052	0.284	290.772

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	53.382	3.942	8.311	0.5813	651.414	658.411	412.255	0.368	388.220
2	48.852	4.122	9.654	0.5237	586.415	603.559	418.494	0.374	385.858
3	42.346	6.176	13.647	0.4657	521.345	549.435	433.667	0.387	385.034
4	29.318	5.868	24.313	0.4395	490.609	494.583	499.031	0.447	425.339
5	14.291	8.511	39.809	0.4362	484.803	440.803	571.436	0.514	457.760

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	0.205	0.20537	0.2415	0.	136.023	665.722	522.387	1.083
2	0.248	0.26898	0.2862	0.	161.987	603.215	441.572	1.044
3	0.297	0.31410	0.3160	0.	198.518	542.775	350.917	1.051
4	0.296	0.32715	0.2946	0.	255.717	476.784	238.866	1.211
5	0.205	0.18415	0.0654	0.	324.196	401.684	116.607	1.574

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	MOMEN RISE/ MEAS T.RISE	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8672	0.8690	1.098	1.031	0.9220	0.	19.309
2	0.8795	0.8812	1.106	1.033	0.9423	0.	22.773
3	0.8490	0.8513	1.114	1.037	0.9508	0.	27.275
4	0.9330	0.9343	1.143	1.042	0.9770	0.	31.015
5	0.9785	0.9790	1.165	1.046	1.0076	0.	35.307

TRAVERSE PRESSURE RATIO = 1.1233
TRAVERSE ADIABATIC EFF. = 0.9065
TRAVERSE POLYTROPIC EFF. = 0.9080
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.1270
ADIABATIC EFF. = 0.9905
POLYTROPIC EFF. = 0.9907
NOZZLE WEIGHT FLOW = 137.06
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96428
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.94968

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0052	0.9358	0.0239	1.101	1.030
2	0.0015	0.9840	0.0069	1.111	1.031
3	0.0059	0.9516	0.0265	1.120	1.035
4	-0.0042	1.0247	-0.0179	1.146	1.039
5	-0.0079	1.0325	-0.0349	1.164	1.043

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 26 READING NUMBER 47 DATE 4/14/1967

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	62.870	3.970	0.910	0.6772	750.624	667.608	343.127	0.310	342.069
2	59.774	4.314	-0.126	0.6327	700.136	604.924	352.501	0.319	352.447
3	57.185	4.935	-0.775	0.5861	648.607	544.313	352.725	0.319	350.981
4	54.764	5.054	-1.516	0.5330	589.964	478.135	345.607	0.312	337.738
5	55.234	4.634	-2.646	0.4535	503.459	402.822	302.003	0.272	279.615

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	53.131	3.691	9.740	0.5540	622.549	660.277	407.943	0.363	373.195
2	48.964	4.234	10.810	0.5032	564.919	605.270	411.902	0.367	370.883
3	42.656	6.486	14.530	0.4452	500.152	550.992	424.922	0.378	367.557
4	30.121	6.671	24.643	0.4195	469.754	495.985	483.873	0.432	404.049
5	15.101	9.321	40.133	0.4107	458.664	442.053	550.296	0.493	431.557

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	0.250	0.24154	0.2798	0.	162.671	667.608	497.606	1.091
2	0.279	0.30583	0.3260	0.	179.161	604.924	426.109	1.052
3	0.329	0.35491	0.3569	0.	212.343	544.313	338.649	1.047
4	0.325	0.37926	0.3458	0.	261.566	478.135	234.418	1.196
5	0.247	0.26499	0.1442	0.	325.599	402.822	116.454	1.543

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8877	0.8894	1.114	1.035	0.	23.552
2	0.9140	0.9155	1.120	1.036	0.	25.784
3	0.8805	0.8825	1.124	1.039	0.	30.016
4	0.9754	0.9759	1.149	1.042	0.	32.918
5	0.9781	0.9786	1.167	1.046	0.	37.034

TRAVERSE PRESSURE RATIO = 1.1331
TRAVERSE ADIABATIC EFF. = 0.9280
TRAVERSE POLYTROPIC EFF. = 0.9293
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.1370
ADIABATIC EFF. = 0.9806
POLYTROPIC EFF. = 0.9810
NOZZLE WEIGHT FLOW = 131.76
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.96173
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95094

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0065	0.9318	0.0296	1.116	1.034
2	0.0025	0.9767	0.0116	1.124	1.035
3	0.0062	0.9544	0.0277	1.131	1.037
4	-0.0015	1.0080	-0.0063	1.152	1.041
5	-0.0050	1.0195	-0.0222	1.167	1.044

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 27 READING NUMBER 48 DATE 4/14/1967

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	63.332	4.432	1.372	0.6723	745.490	665.768	335.422	0.302	334.388
2	60.425	4.965	0.525	0.6264	693.658	603.257	342.408	0.309	342.356
3	58.056	5.806	0.096	0.5790	640.575	542.812	340.133	0.307	338.451
4	55.803	6.093	-0.477	0.5250	580.766	476.817	331.563	0.300	324.014
5	56.253	5.653	-1.627	0.4469	495.378	401.712	289.873	0.262	268.385

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	53.250	3.810	10.082	0.5363	603.826	658.457	401.977	0.357	360.972
2	48.760	4.030	11.665	0.4864	546.605	603.601	408.577	0.364	360.327
3	42.858	6.688	15.198	0.4277	480.424	549.473	416.990	0.371	351.910
4	29.814	6.364	25.989	0.4024	450.569	494.618	476.761	0.426	388.734
5	14.907	9.127	41.346	0.3934	439.011	440.834	538.545	0.483	413.422

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	0.276	0.26630	0.3057	0.	175.065	665.768	483.392	1.079
2	0.305	0.33070	0.3512	0.	192.588	603.257	411.013	1.052
3	0.356	0.37803	0.3796	0.	222.935	542.812	326.538	1.040
4	0.353	0.40015	0.3651	0.	271.862	476.817	222.755	1.200
5	0.277	0.29708	0.1731	0.	330.777	401.712	110.058	1.540

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.8700	0.8721	1.122	1.038	0.	25.873
2	0.9410	0.9420	1.128	1.037	0.	28.124
3	0.8874	0.8893	1.129	1.040	0.	32.354
4	0.9660	0.9667	1.152	1.043	0.	34.967
5	0.9681	0.9688	1.167	1.047	0.	38.663

TRAVERSE PRESSURE RATIO	= 1.1384	FIXED INSTRUMENTATION	PRESSURE RATIO	=	1.1410
TRAVERSE ADIABATIC EFF.	= 0.9275		ADIABATIC EFF.	=	0.9952
TRAVERSE POLYTROPIC EFF.	= 0.9288		POLYTROPIC EFF.	-	0.9953
FLOW COEFFICIENT L.E.	= 0.980		NOZZLE WEIGHT FLOW	=	127.96
FLOW COEFFICIENT T.E.	= 0.950	L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW		=	0.96262
PERCENT DESIGN SPEED	= 50	T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW		=	0.95096

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0060	0.9407	0.0275	1.125	1.036
2	0.0004	0.9964	0.0019	1.131	1.036
3	0.0039	0.9725	0.0173	1.136	1.038
4	-0.0058	1.0302	-0.0243	1.155	1.041
5	-0.0062	1.0235	-0.0274	1.167	1.044

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 28 READING NUMBER 49 DATE 4/14/1967

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	64.872	5.972	2.912	0.6651	738.143	667.911	314.246	0.283	313.277
2	61.978	6.518	2.078	0.6189	685.592	605.198	322.137	0.291	322.088
3	59.480	7.230	1.520	0.5718	632.953	544.559	322.621	0.291	321.026
4	57.120	7.410	0.840	0.5180	573.542	478.352	316.433	0.286	309.228
5	57.589	6.989	-0.291	0.4407	488.654	403.005	276.350	0.249	255.865

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	53.529	4.089	11.343	0.5121	577.993	660.576	396.106	0.351	343.274
2	49.530	4.800	12.448	0.4627	520.799	605.544	397.611	0.353	338.019
3	43.727	7.557	15.753	0.4024	452.811	551.242	405.072	0.360	326.986
4	31.393	7.943	25.727	0.3770	422.954	496.210	455.695	0.406	359.074
5	16.127	10.347	41.462	0.3663	409.582	442.253	515.028	0.461	383.549

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	0.314	0.30543	0.3465	0.	196.181	667.911	464.395	1.096
2	0.343	0.37141	0.3924	0.	209.354	605.198	396.190	1.049
3	0.399	0.42494	0.4262	0.	238.474	544.559	312.768	1.019
4	0.395	0.46196	0.4253	0.	277.093	478.352	219.117	1.161
5	0.328	0.39701	0.2696	0.	331.354	403.005	110.899	1.499

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG
1	0.8768	0.8790	1.139	1.043	0.	29.748
2	0.9452	0.9463	1.141	1.041	0.	31.772
3	0.8971	0.8990	1.140	1.043	0.	36.104
4	0.9689	0.9695	1.157	1.044	0.	37.657
5	0.9683	0.9690	1.171	1.048	0.	40.824

TRAVERSE PRESSURE RATIO = 1.1483
TRAVERSE ADIABATIC EFF. = 0.9296
TRAVERSE POLYTROPIC EFF. = 0.9310
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1510
ADIABATIC EFF. = 0.9630
POLYTROPIC EFF. = 0.9638
NOZZLE WEIGHT FLOW = 122.49
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.95554
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93921

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0133	0.8891	0.0610	1.139	1.043
2	0.0052	0.9602	0.0237	1.144	1.041
3	0.0084	0.9455	0.0383	1.145	1.042
4	-0.0020	1.0098	-0.0085	1.161	1.043
5	-0.0025	1.0089	-0.0110	1.170	1.046

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 29 READING NUMBER 50 DATE 4/14/1967

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	67.072	8.172	5.112	0.6507	723.692	666.203	282.674	0.254	281.802
2	64.197	8.737	4.297	0.6036	670.521	603.650	291.899	0.263	291.854
3	62.028	9.778	4.068	0.5548	615.686	543.166	289.895	0.261	288.461
4	59.991	10.281	3.711	0.4994	554.229	477.128	281.991	0.254	275.570
5	60.407	9.807	2.527	0.4242	471.572	401.974	246.570	0.222	228.292

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	53.642	4.202	13.430	0.4576	519.680	658.886	391.364	0.345	307.817
2	49.959	5.229	14.238	0.4207	475.779	603.995	388.809	0.344	306.079
3	43.240	7.070	18.789	0.3522	398.034	549.832	401.392	0.355	289.755
4	31.394	7.944	28.597	0.3453	388.857	494.940	443.573	0.394	330.124
5	15.360	9.580	45.047	0.3340	374.905	441.122	499.754	0.445	352.337

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	0.403	0.34825	0.3903	0.	240.732	666.203	418.155	1.092
2	0.410	0.41630	0.4369	0.	239.751	603.650	364.244	1.049
3	0.491	0.46612	0.4655	0.	277.357	543.166	272.475	1.004
4	0.444	0.50948	0.4683	0.	293.483	477.128	201.457	1.198
5	0.384	0.47639	0.3390	0.	344.337	401.974	96.785	1.543

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.7823	0.7868	1.157	1.055	0.	38.028
2	0.9035	0.9055	1.155	1.047	0.	38.071
3	0.8439	0.8471	1.153	1.049	0.	43.748
4	0.9321	0.9336	1.165	1.048	0.	41.637
5	0.9624	0.9633	1.177	1.050	0.	44.342

TRAVERSE PRESSURE RATIO = 1.1609
TRAVERSE ADIABATIC EFF. = 0.8779
TRAVERSE POLYTROPIC EFF. = 0.8805
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION
PRESSURE RATIO = 1.1640
ADIABATIC EFF. = 0.9419
POLYTROPIC EFF. = 0.9431
NOZZLE WEIGHT FLOW = 112.41
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.94111
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93260

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0264	0.8219	0.1212	1.157	1.052
2	0.0086	0.9432	0.0397	1.160	1.046
3	0.0107	0.9400	0.0484	1.159	1.046
4	-0.0020	1.0089	-0.0086	1.170	1.045
5	-0.0053	1.0174	-0.0237	1.178	1.047

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

NASA - TASK I (ROTOR 2E)

N.A.S.A. COMPRESSOR OUTPUT DATA
BLADE ELEMENT PERFORMANCE RESULTS
POINT NUMBER 30 READING NUMBER 51 DATE 4/14/1967

RADIAL POSITION	REL.INLET FLOW ANG.	INCID ANG MN.CMBR.IN	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	69.637	10.737	7.677	0.6392	711.492	666.781	248.243	0.223	247.478
2	66.624	11.164	6.724	0.5923	658.213	604.174	261.186	0.235	261.146
3	64.464	12.214	6.504	0.5428	603.048	543.638	261.006	0.235	259.716
4	61.946	12.236	5.666	0.4897	543.937	477.543	260.424	0.234	254.494
5	61.998	11.398	4.118	0.4170	463.958	402.323	231.069	0.208	213.940

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	55.149	5.709	14.489	0.3853	439.729	659.458	390.748	0.342	251.082
2	49.422	4.692	17.203	0.3863	438.075	604.519	393.804	0.347	284.958
3	44.179	8.009	20.285	0.3042	344.796	550.309	396.792	0.350	247.102
4	31.171	7.721	30.775	0.3153	355.782	495.370	436.491	0.387	302.750
5	14.590	8.810	47.407	0.3118	350.585	441.505	491.780	0.437	330.607

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	0.535	0.35289	0.3950	0.	298.887	666.781	360.571	1.015
2	0.473	0.42476	0.4447	0.	271.799	604.174	332.720	1.091
3	0.585	0.47432	0.4721	0.	310.189	543.638	240.120	0.951
4	0.503	0.53497	0.4908	0.	312.227	477.543	153.143	1.190
5	0.432	0.51853	0.3756	0.	355.448	402.323	86.057	1.545

RADIAL POSITION	ADIABATIC EFFICIENCY	POLYTROPIC EFFICIENCY	TOT. PRESS RATIO	TOT. TEMP RATIO	ABS.INLET FLOW ANG.	ABS.EXIT FLOW ANG.
1	0.6770	0.6839	1.165	1.066	0.	49.968
2	0.8126	0.8167	1.165	1.055	0.	43.646
3	0.7814	0.7859	1.158	1.055	0.	51.459
4	0.8818	0.8845	1.169	1.052	0.	46.883
5	0.9438	0.9451	1.180	1.051	0.	47.074

TRAVERSE PRESSURE RATIO = 1.1673
TRAVERSE ADIABATIC EFF. = 0.8093
TRAVERSE POLYTROPIC EFF. = 0.8134
FLOW COEFFICIENT L.E. = 0.980
FLOW COEFFICIENT T.E. = 0.950
PERCENT DESIGN SPEED = 50

FIXED INSTRUMENTATION PRESSURE RATIO = 1.1720
ADIABATIC EFF. = 0.8883
POLYTROPIC EFF. = 0.8909
NOZZLE WEIGHT FLOW = 103.05
L.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.93559
T.E. CHECK WEIGHT FLOW/NOZ. WEIGHT FLOW = 0.90617

PARAMETERS DETERMINED FROM FIXED INSTRUMENTATION

RADIAL POSITION	TOT. PRESS LOSS PARAM	ADIABATIC EFFICIENCY	LOSS COEFFICIENT	TOT. PRESS RATIO	TOT. TEMP RATIO
1	0.0455	0.7369	0.2170	1.168	1.062
2	0.0210	0.8813	0.0965	1.170	1.052
3	0.0223	0.8887	0.1024	1.165	1.050
4	0.0088	0.9648	0.0379	1.173	1.048
5	-0.0013	1.0038	-0.0057	1.183	1.049

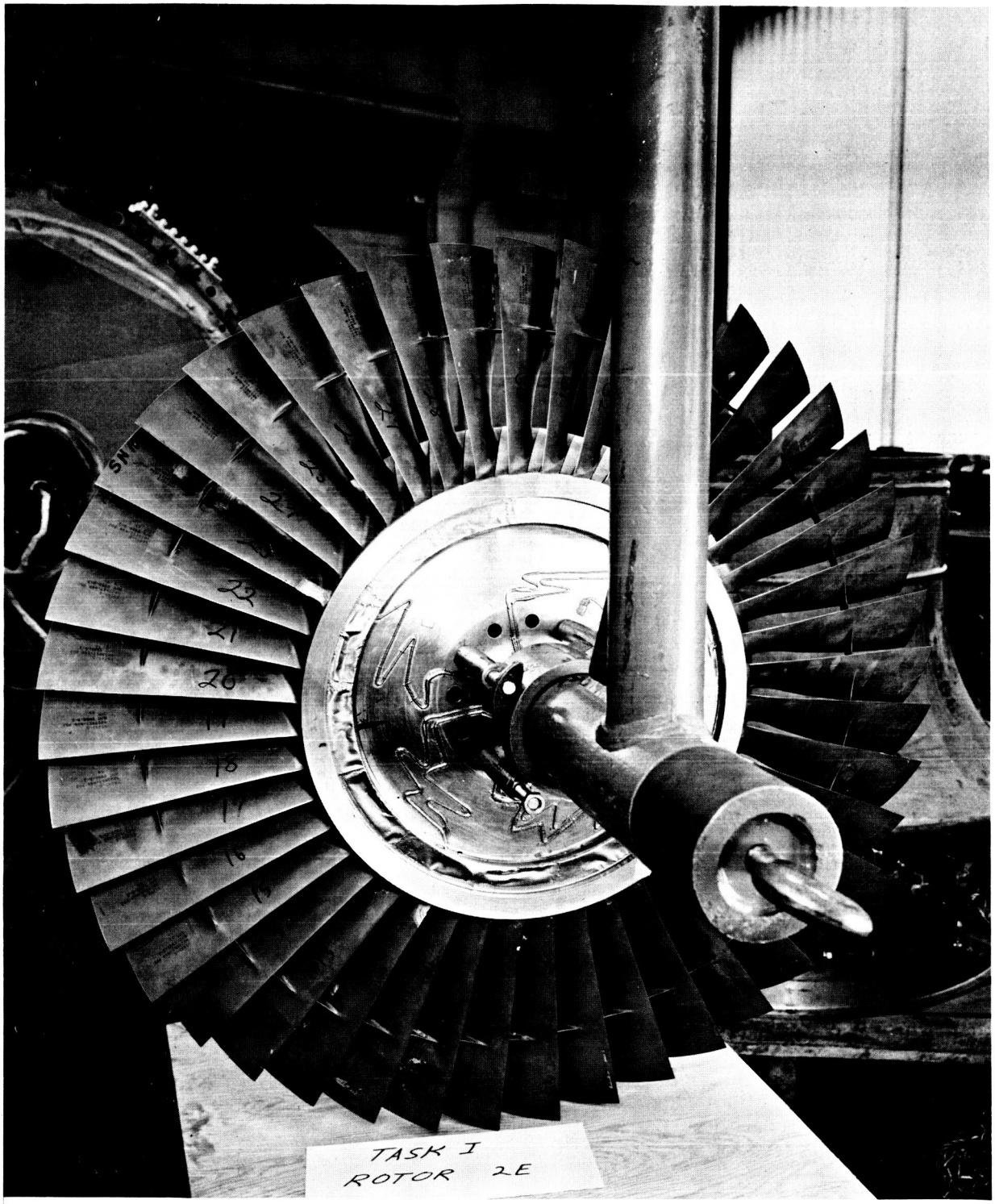


Figure 1(a). - Overall view of Rotor 2E.

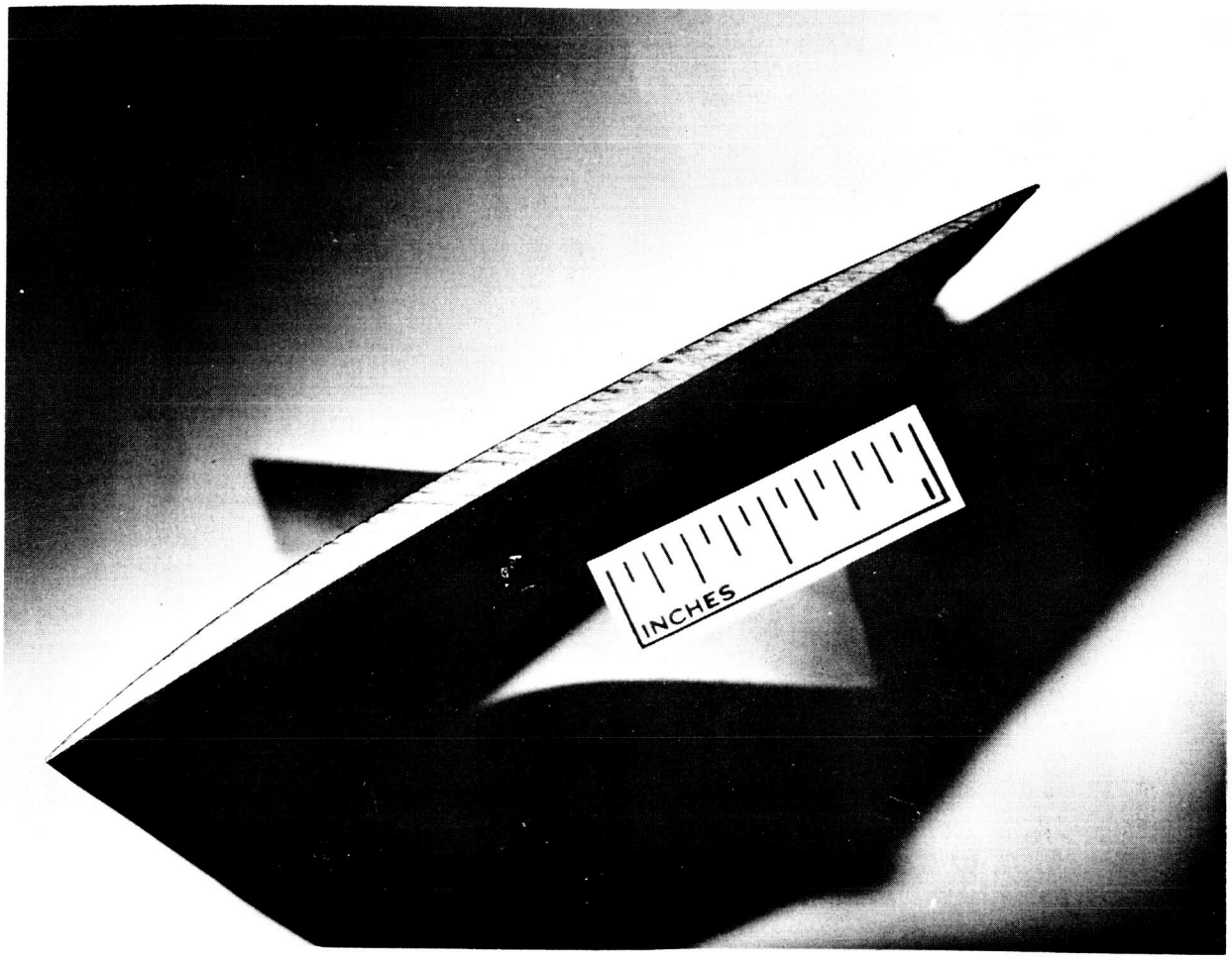


Figure 1(b). - Close-up view of tip section.

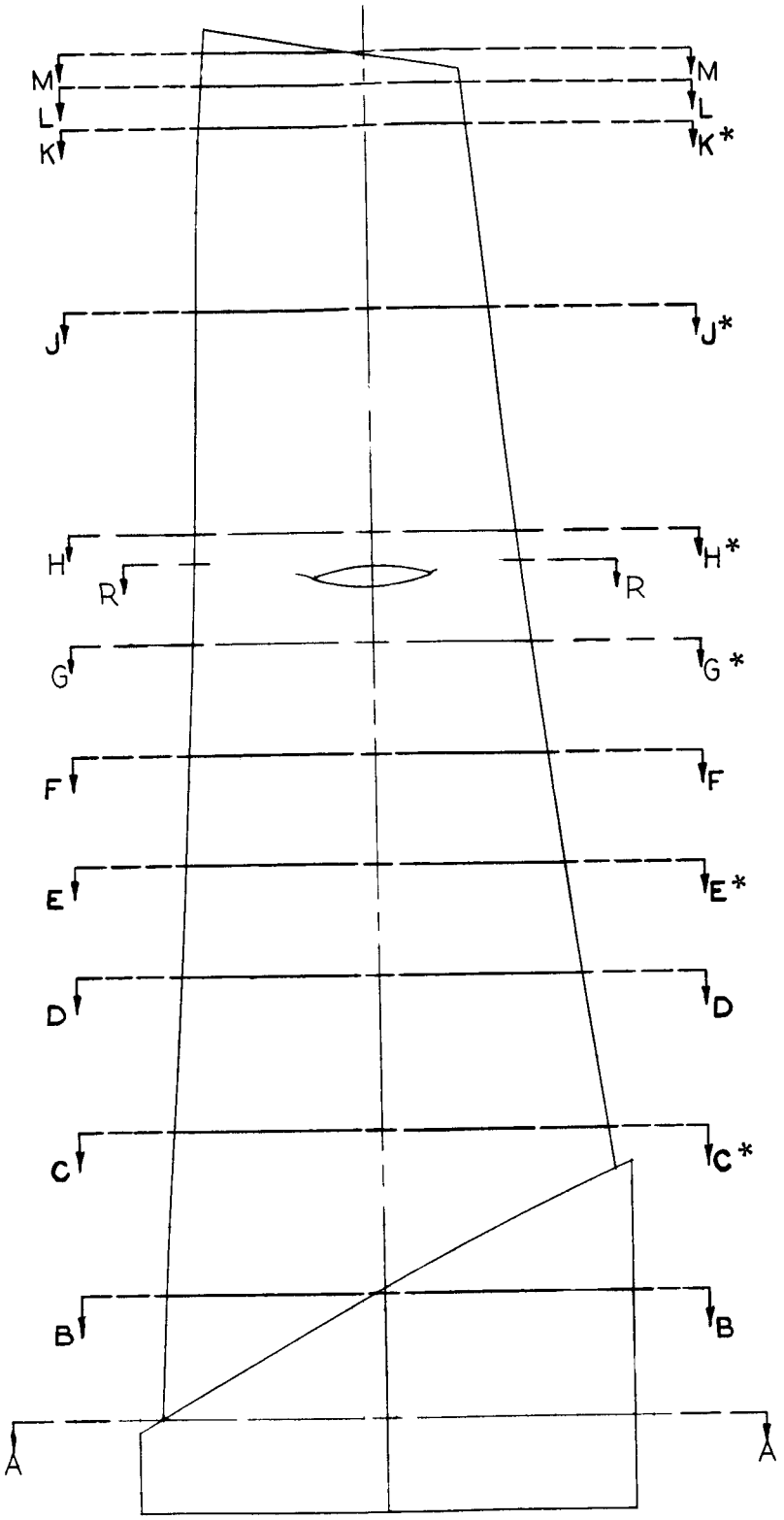


Figure 2. - Meridional view of rotor. Probograph inspection sections are indicated by asterisks.

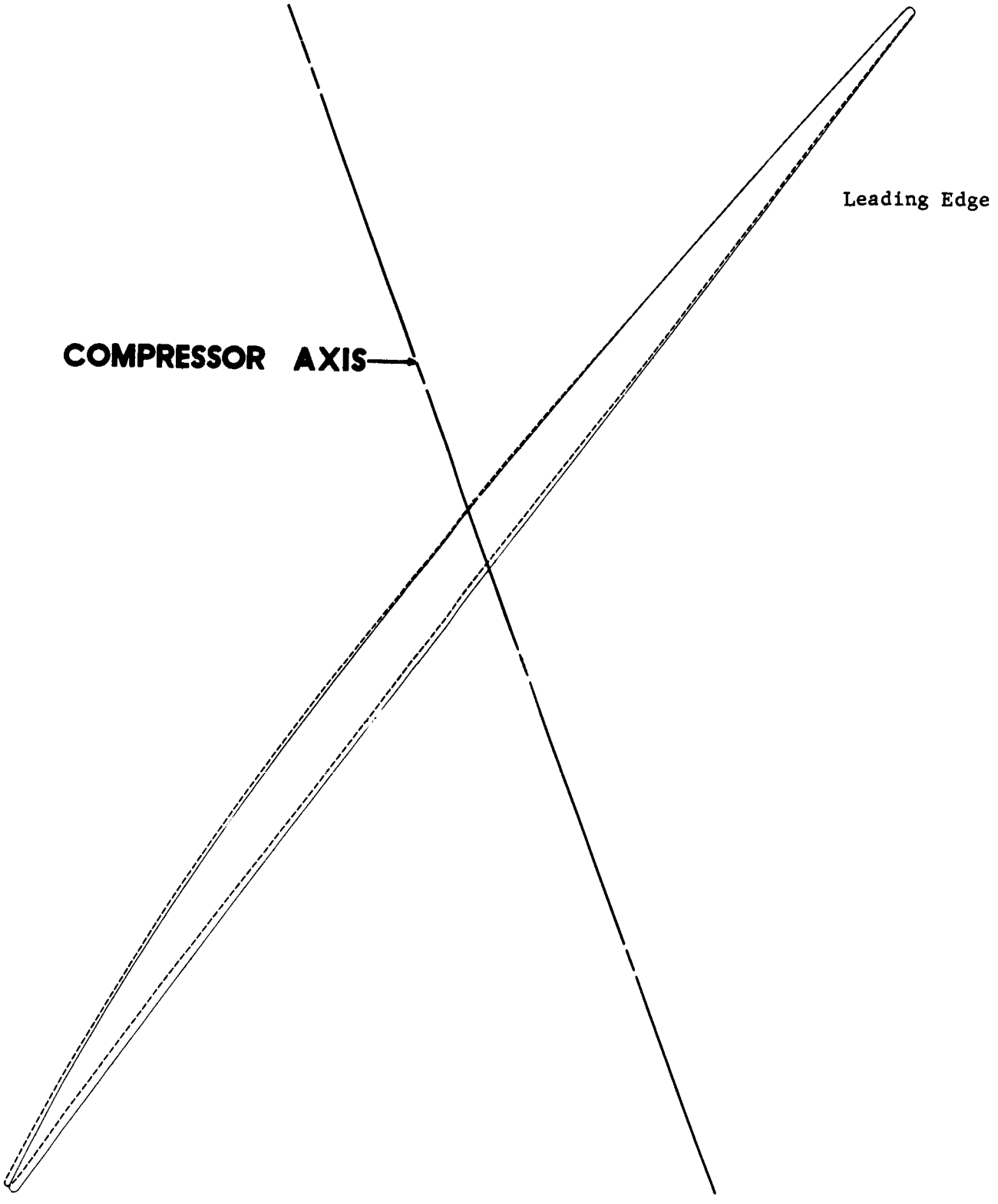


Figure 3(a). - Cylindrical cut of blade at section KK. The solid line represents design intent and the dashed line represents the average of seven measured samples.

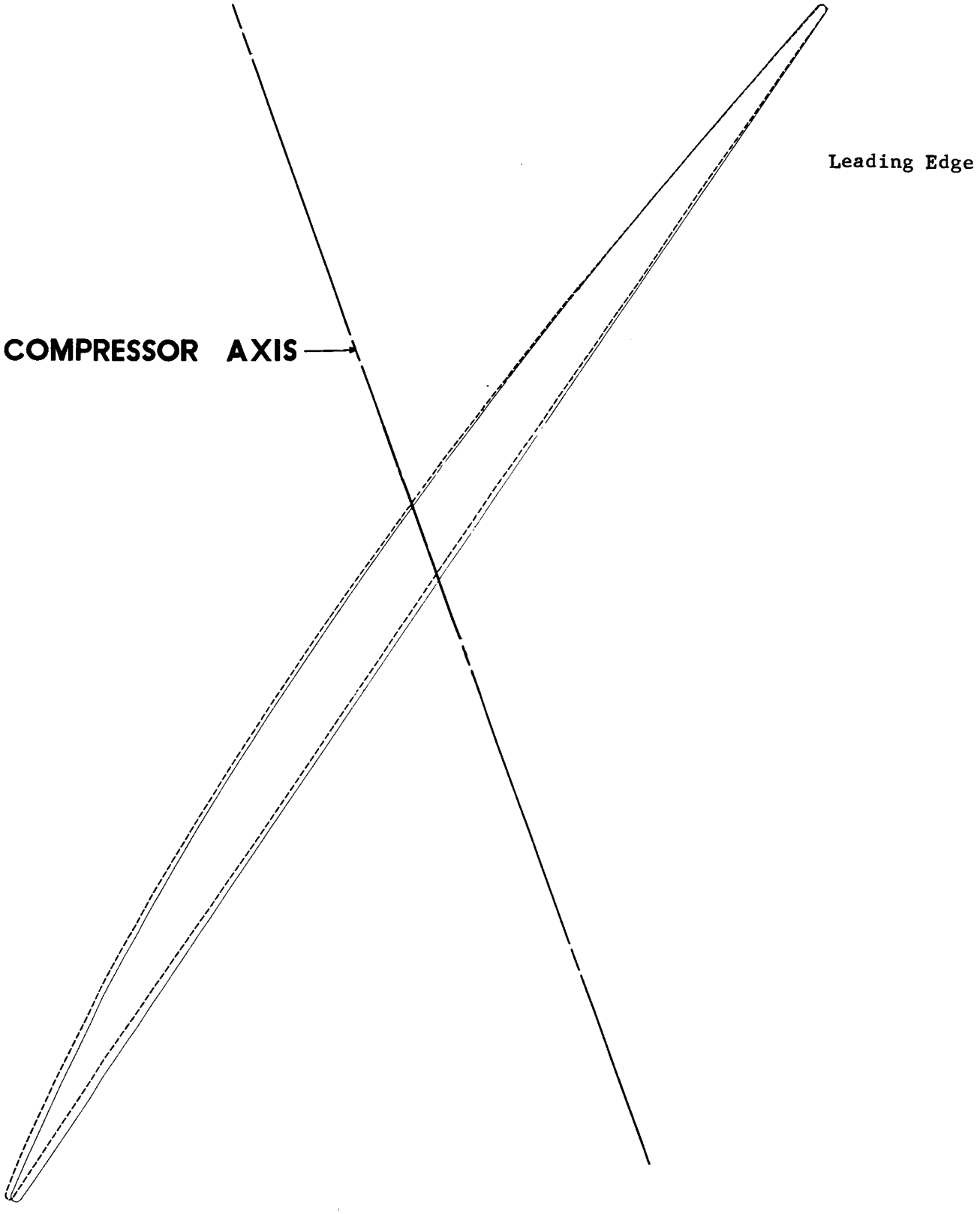


Figure 3(b). - Cylindrical cut of blade at section JJ. The solid line represents design intent and the dashed line represents the average of seven measured samples.

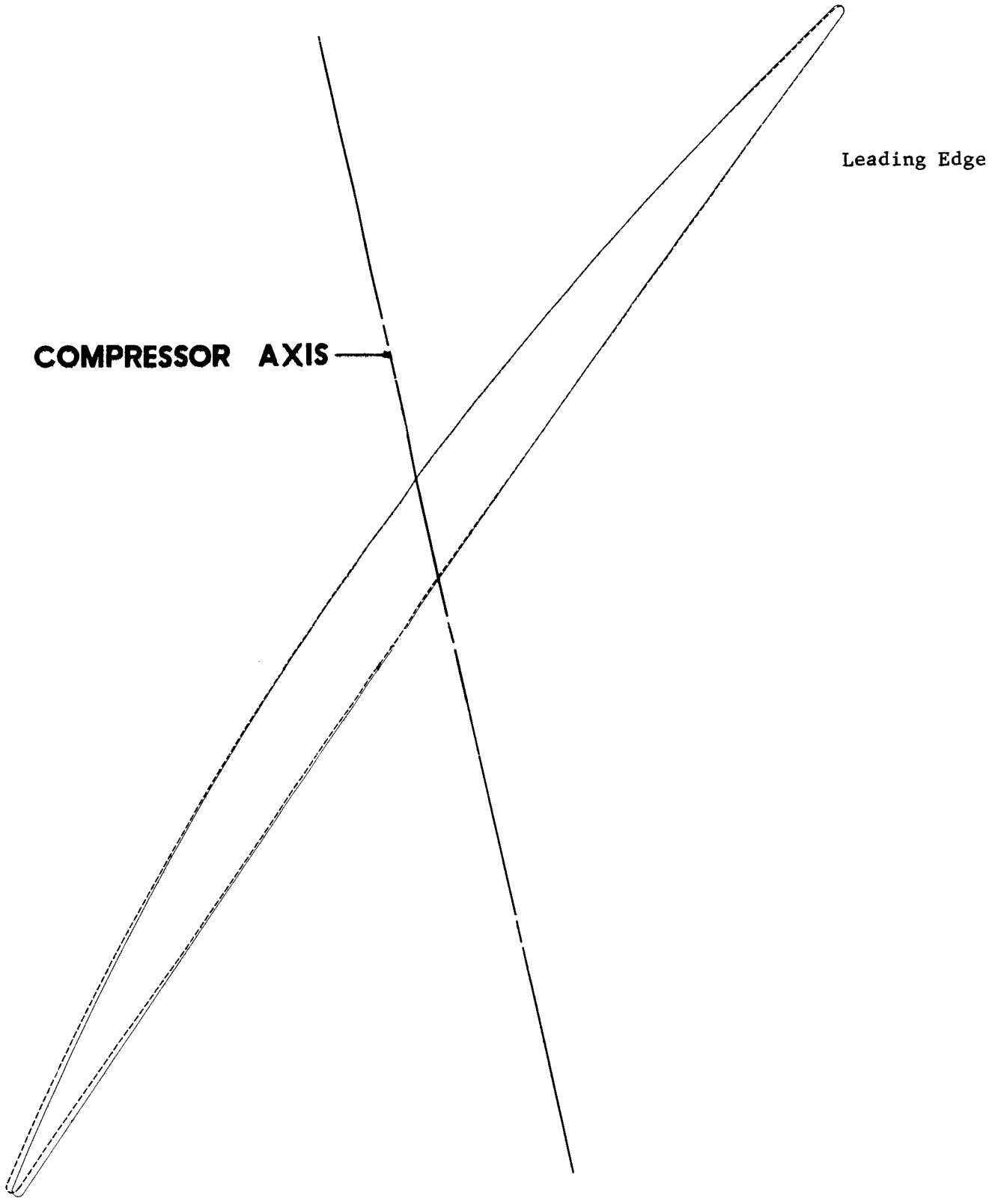


Figure 3(c). - Cylindrical cut of blade at section HH. The solid line represents design intent and the dashed line represents the average of seven measured samples.

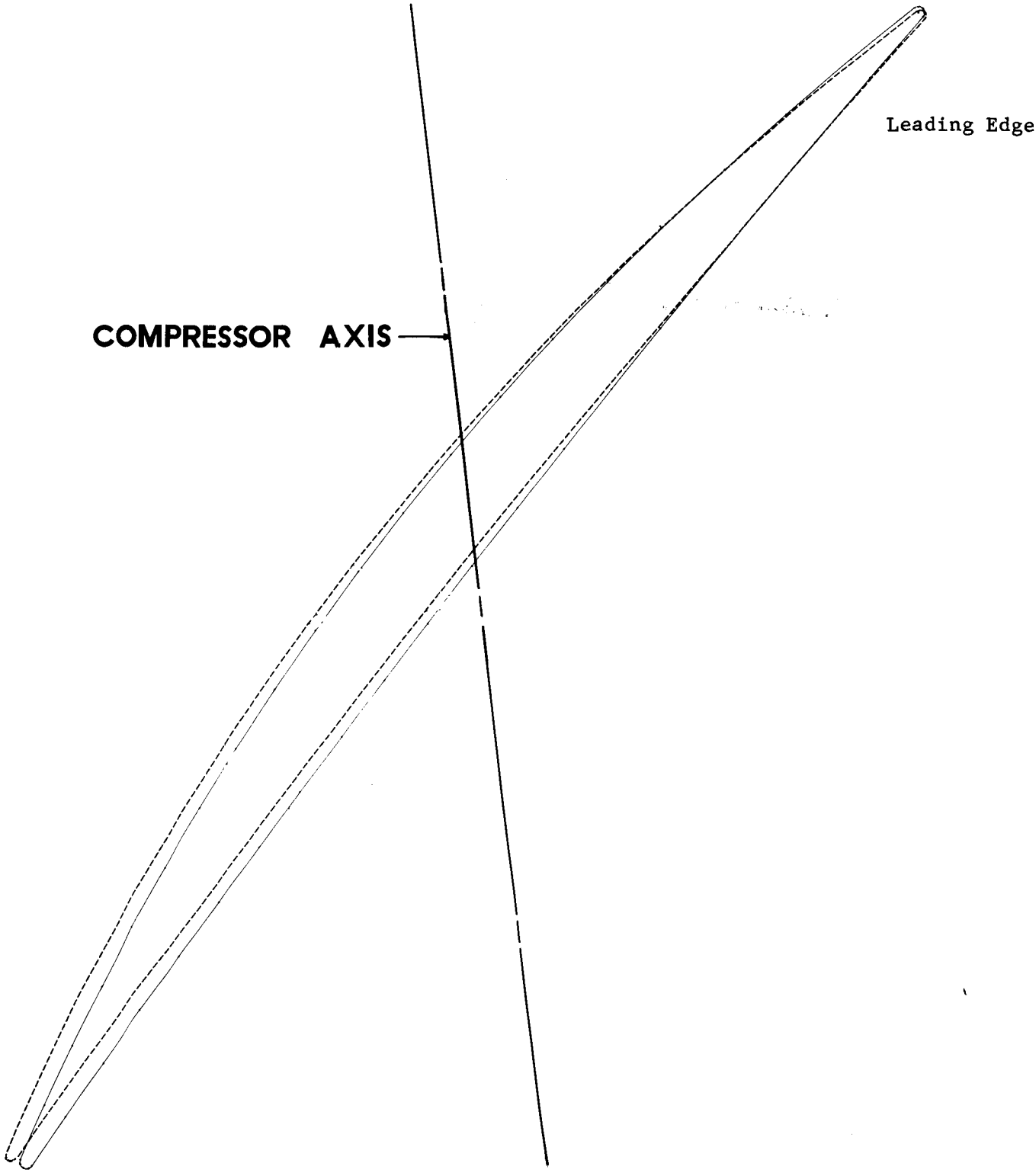


Figure 3(d). - Cylindrical cut of blade at section GG. The solid line represents design intent and the dashed line represents the average of seven measured samples.

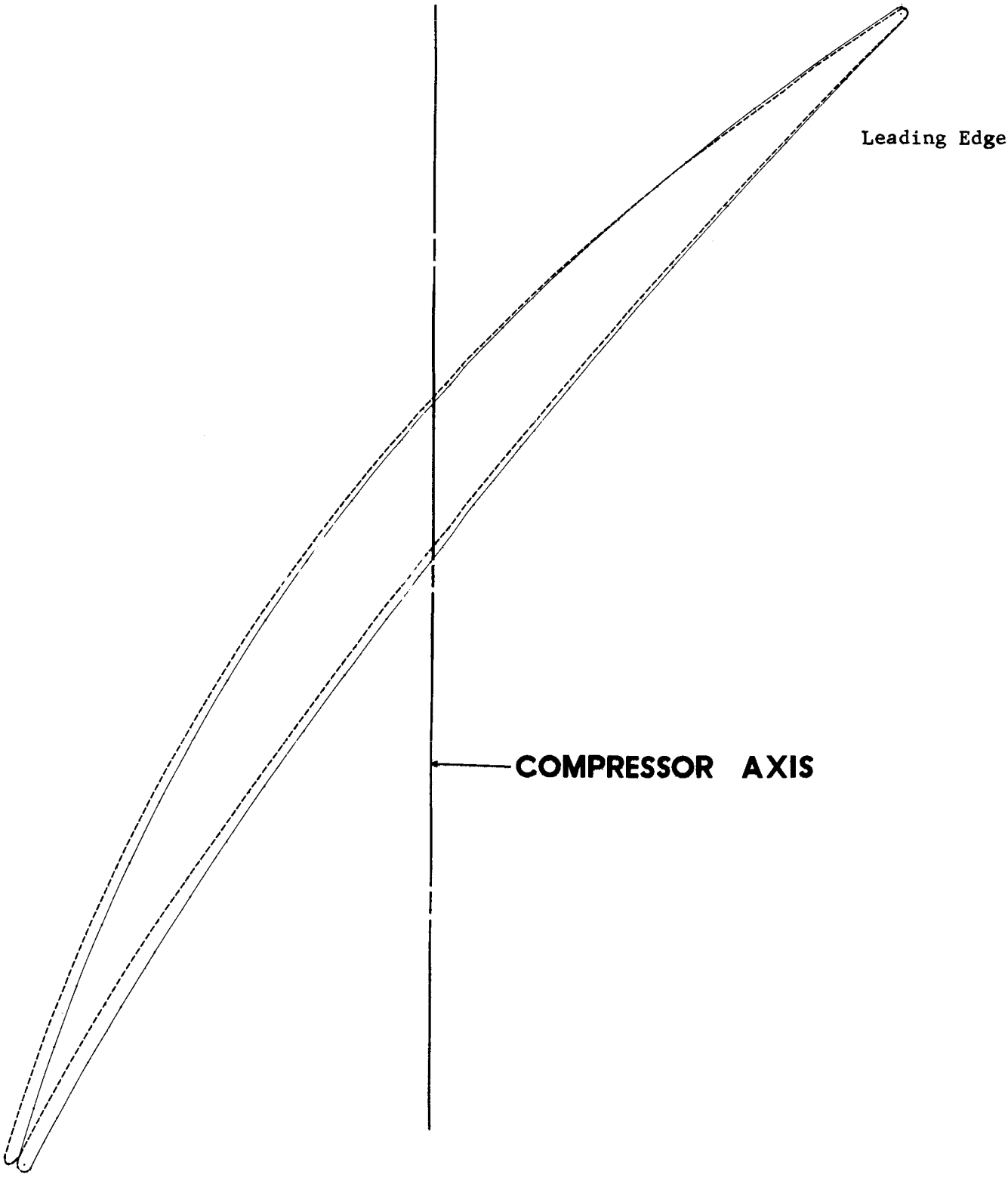


Figure 3(e). - Cylindrical cut of blade at section EE. The solid line represents design intent and the dashed line represents the average of seven measured samples.

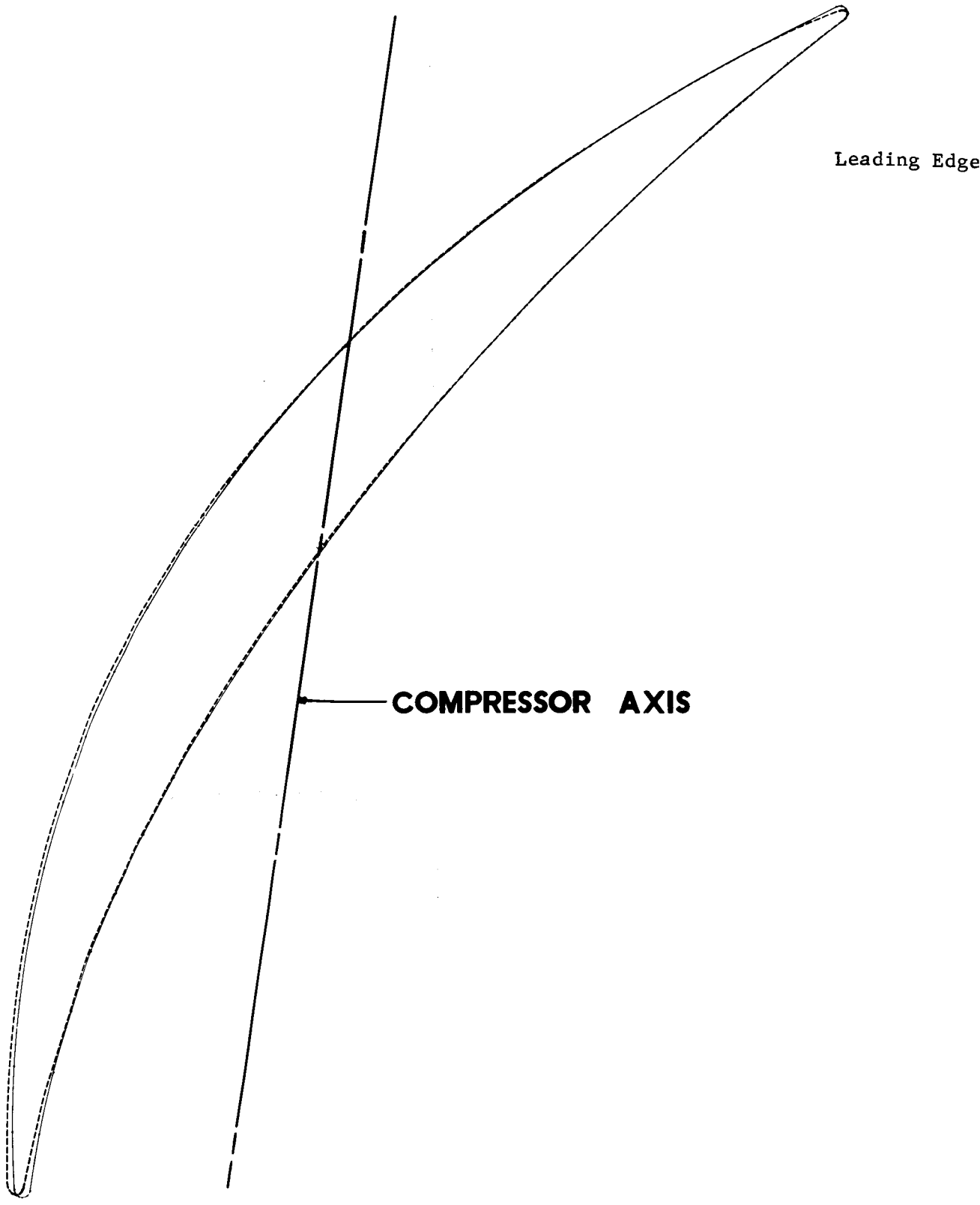


Figure 3(f). - Cylindrical cut of blade at section CC. The solid line represents design intent and the dashed line represents the average of seven measured samples.

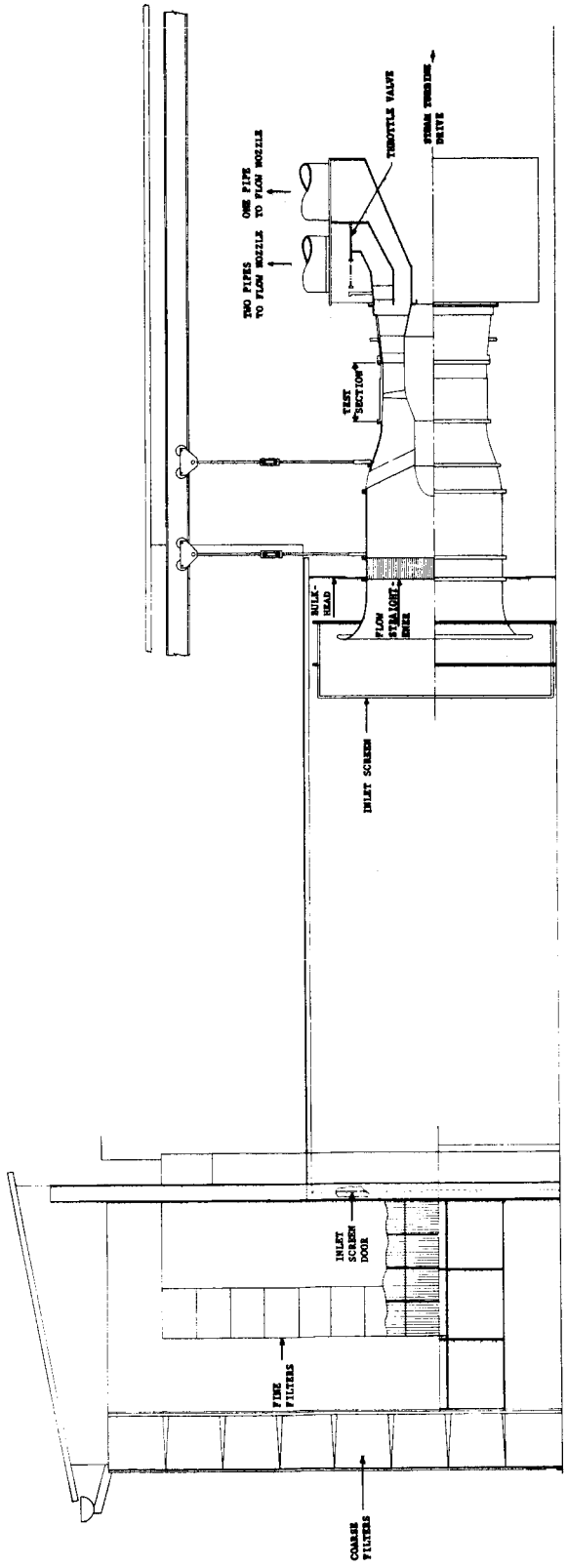
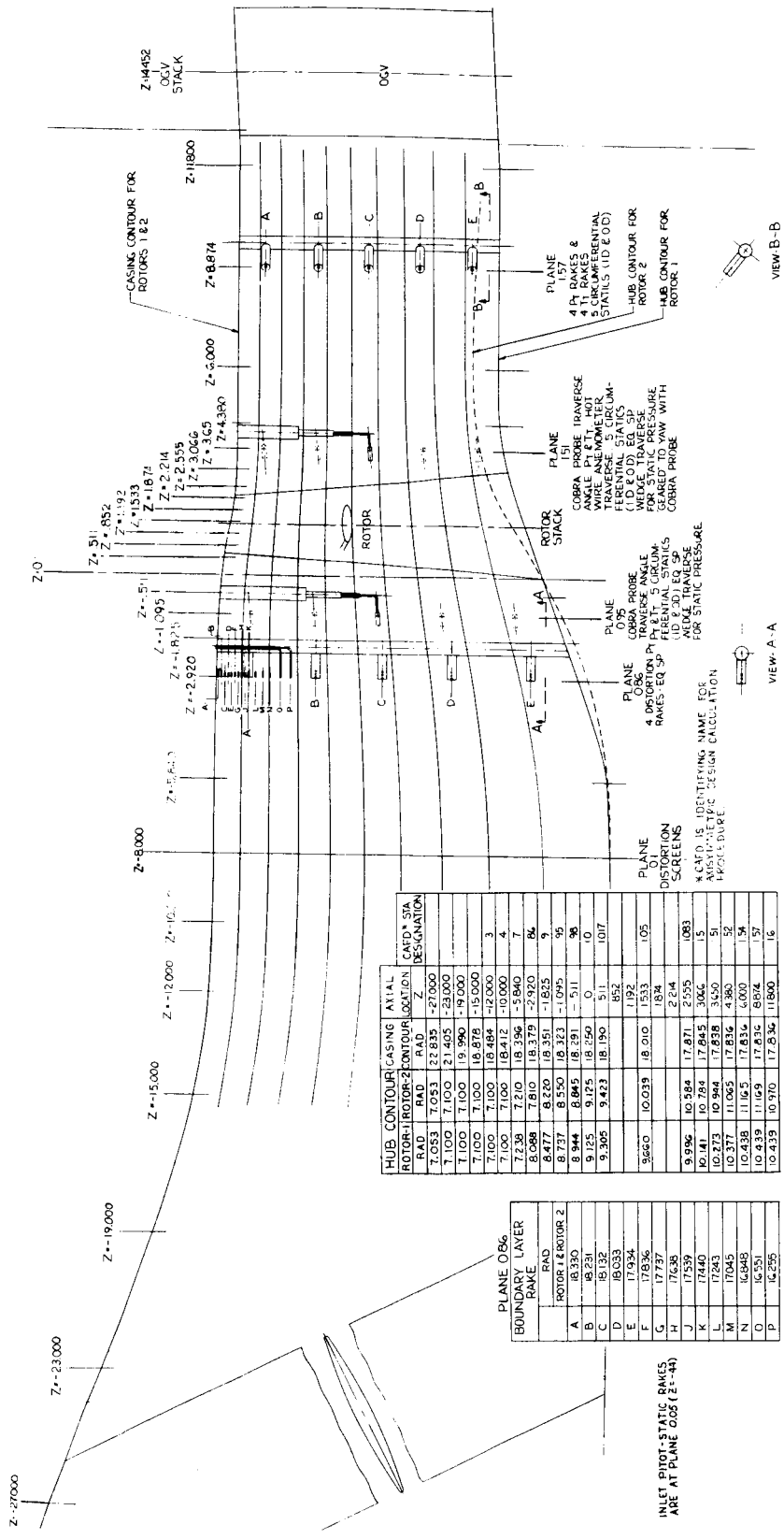


Figure 4. - House Compressor Test Facility.



	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	18.494	-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	8.260	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	1017
			.852	
			1.192	
9.660	10.039	18.010	1.533	105
			1.874	
			2.214	
9.996	10.584	17.871	2.559	1083
10.141	10.784	17.845	3.066	15
10.273	10.944	17.838	3.450	51
10.377	11.065	17.836	4.380	52
10.438	11.165	17.836	6.000	154
10.439	11.169	17.836	8.874	157
10.439	10.970	17.836	11.800	16

Figure 5. - Meridional view showing location of instrumentation.

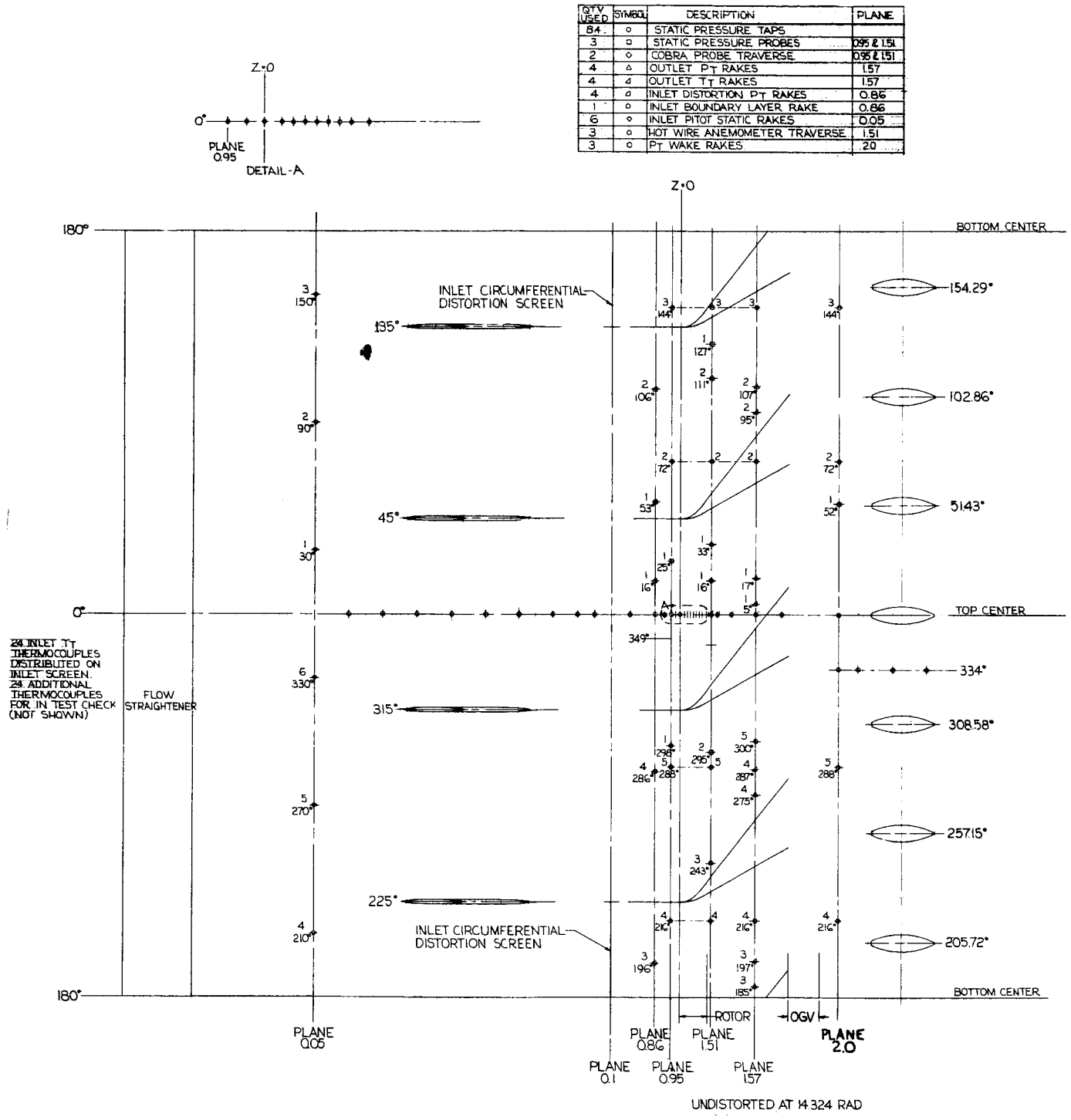
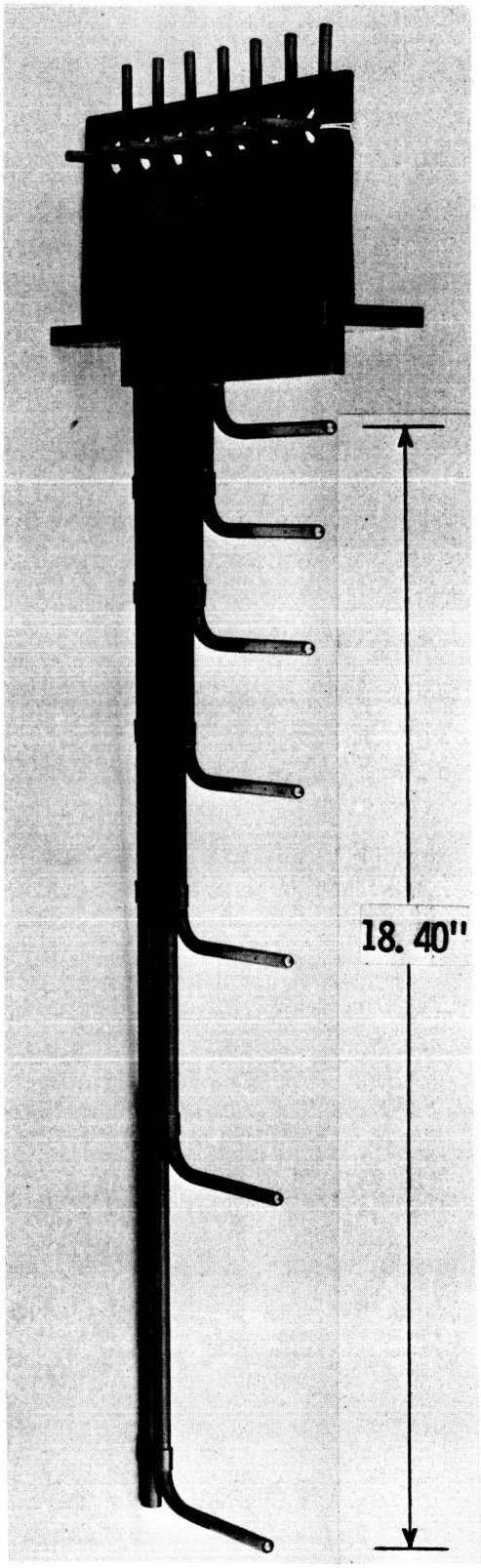
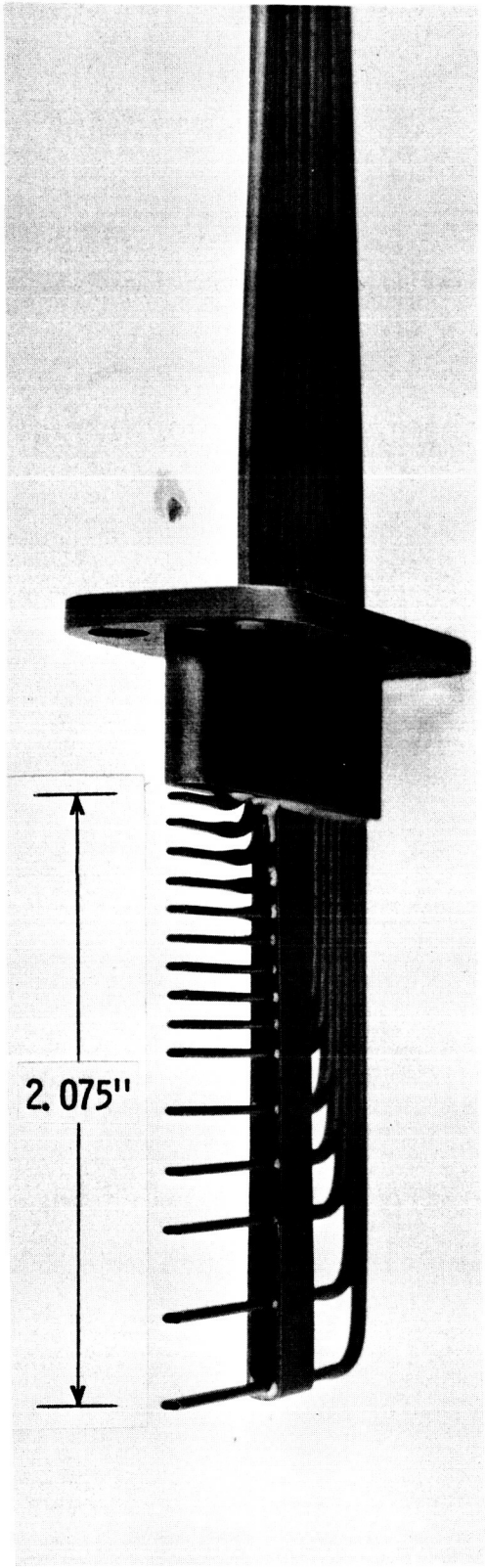


Figure 6. - Development showing circumferential location of instrumentation.

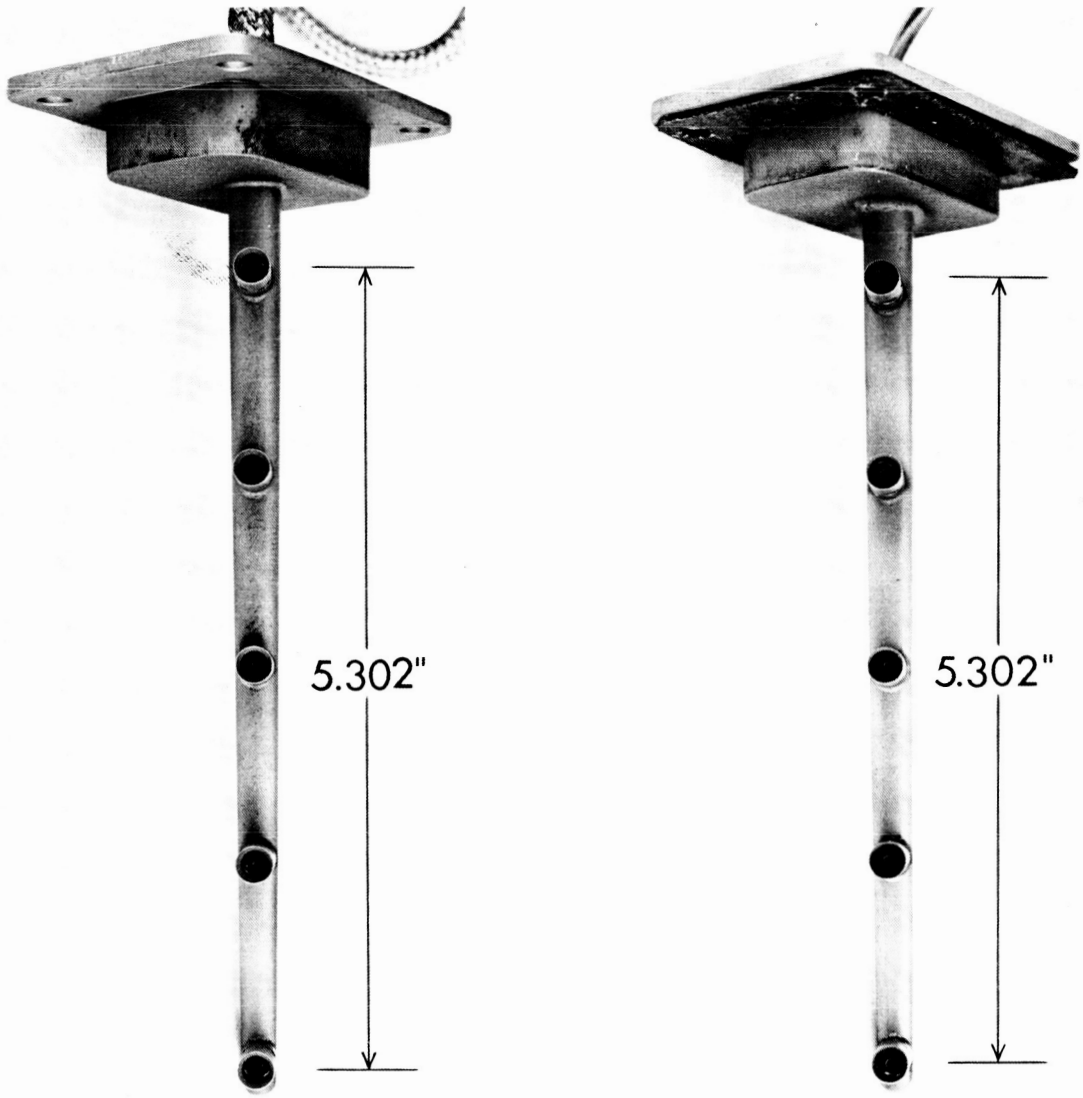


(a). - Inlet pitot-static rake.



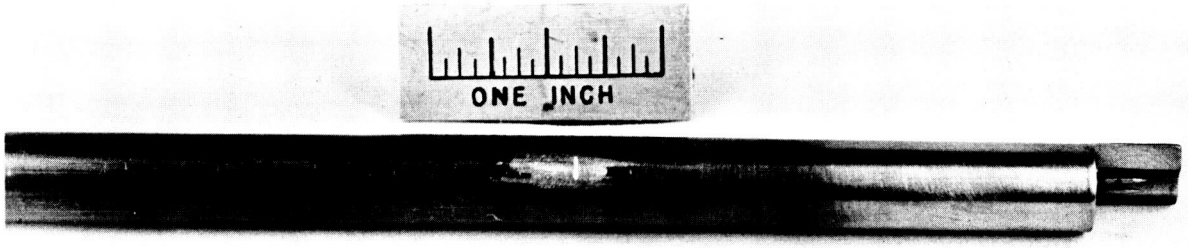
(b). - Casing boundary layer rake.

Figure 7. - Photographs of fixed instrumentation.

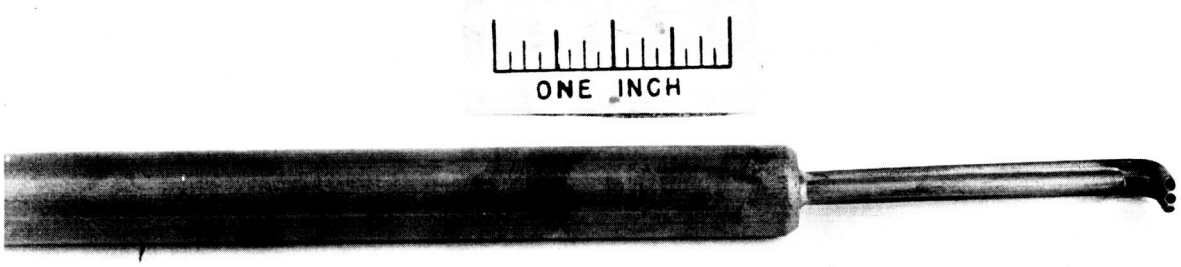


(c). Discharge total temperature rake. (d). Discharge total pressure rake.

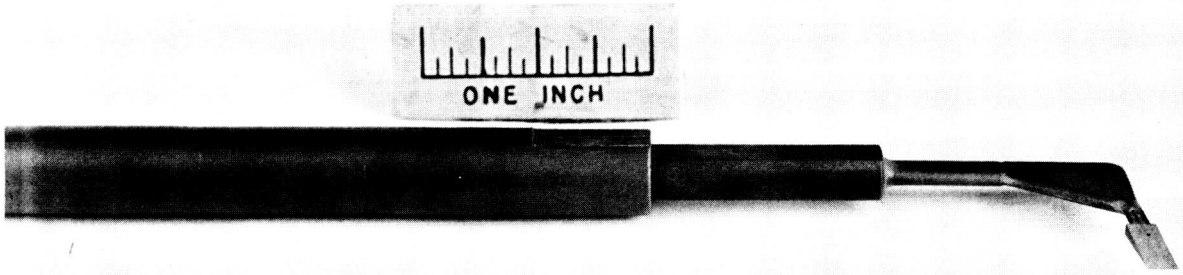
Figure 7. - Photographs of fixed instrumentation.



(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.

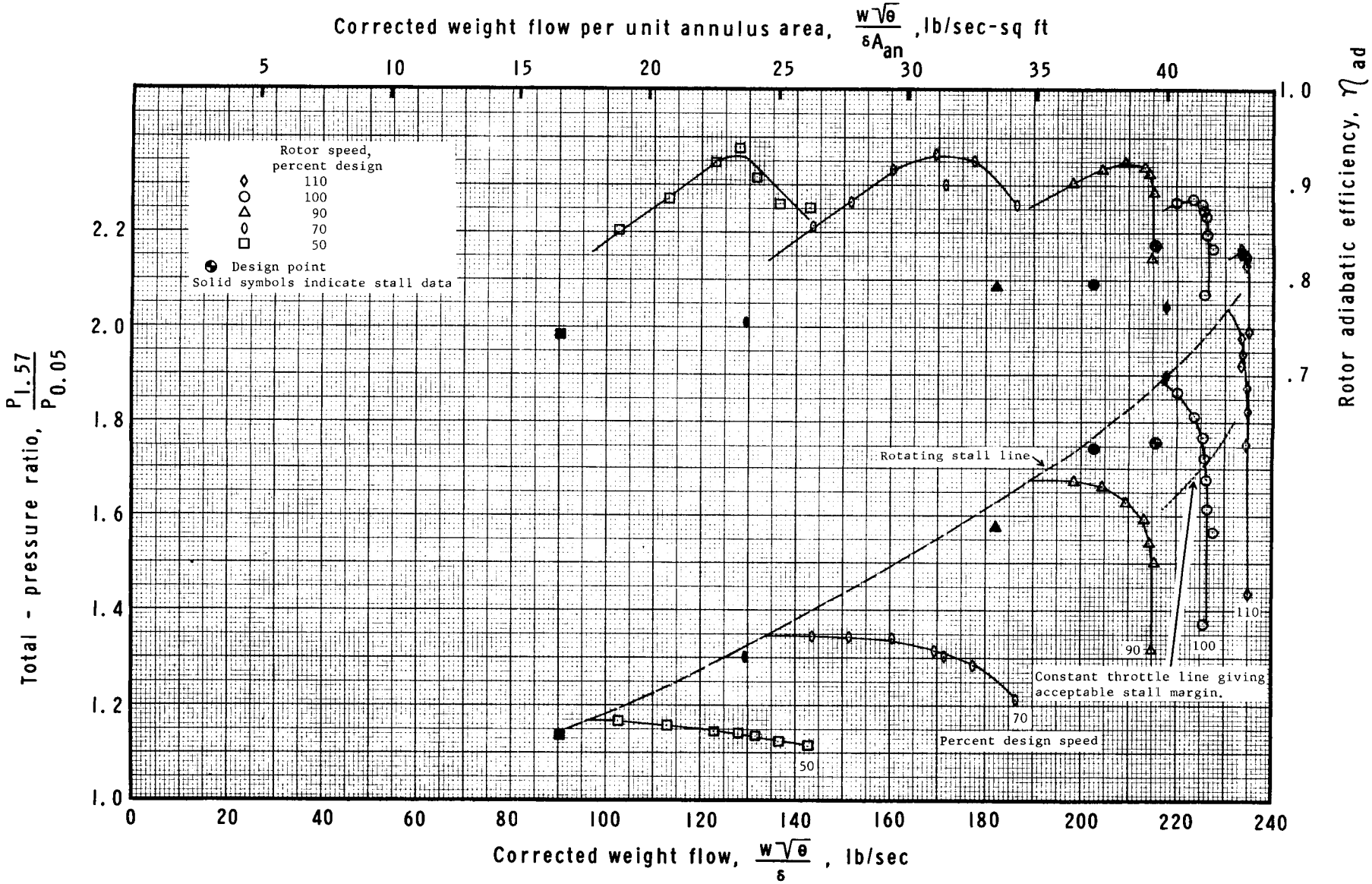
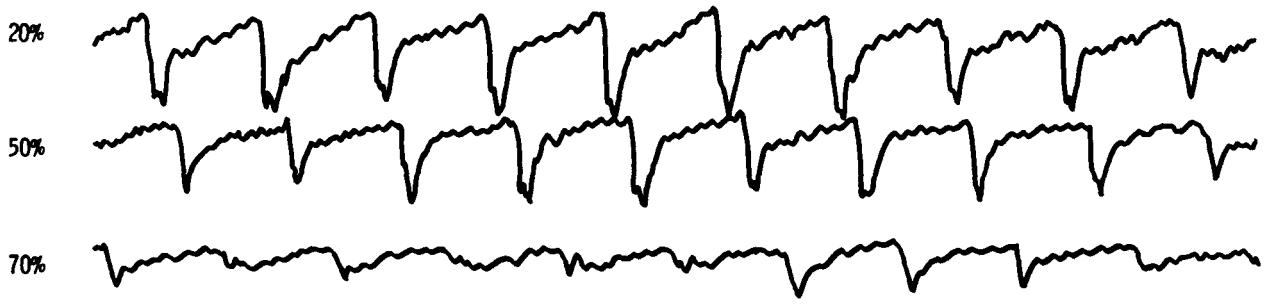


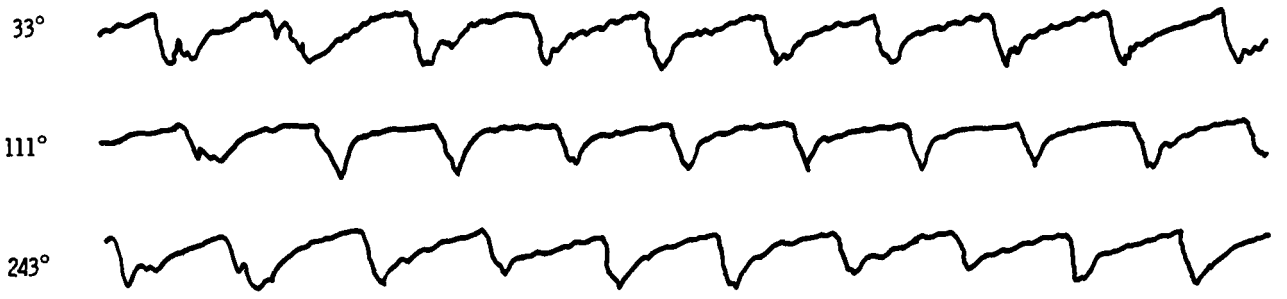
Figure 9. - Rotor performance map.

Immersion



(a) Sample of hot-wire anemometer traces at 90 percent design rotor speed.

Circumferential probe position



(b) Sample of hot-wire anemometer traces from 10 percent immersion at 90 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	3	.68	Full span	3.30
70	2	.64	Full span	4.90
90	1	.61	Full span	8.00
100	1	.66	Uncertain	9.25
110	1	.61	Uncertain	10.10

(c) Tabulation of stall data

Figure 10. - Sample hot-wire traces and tabulation of stall data.

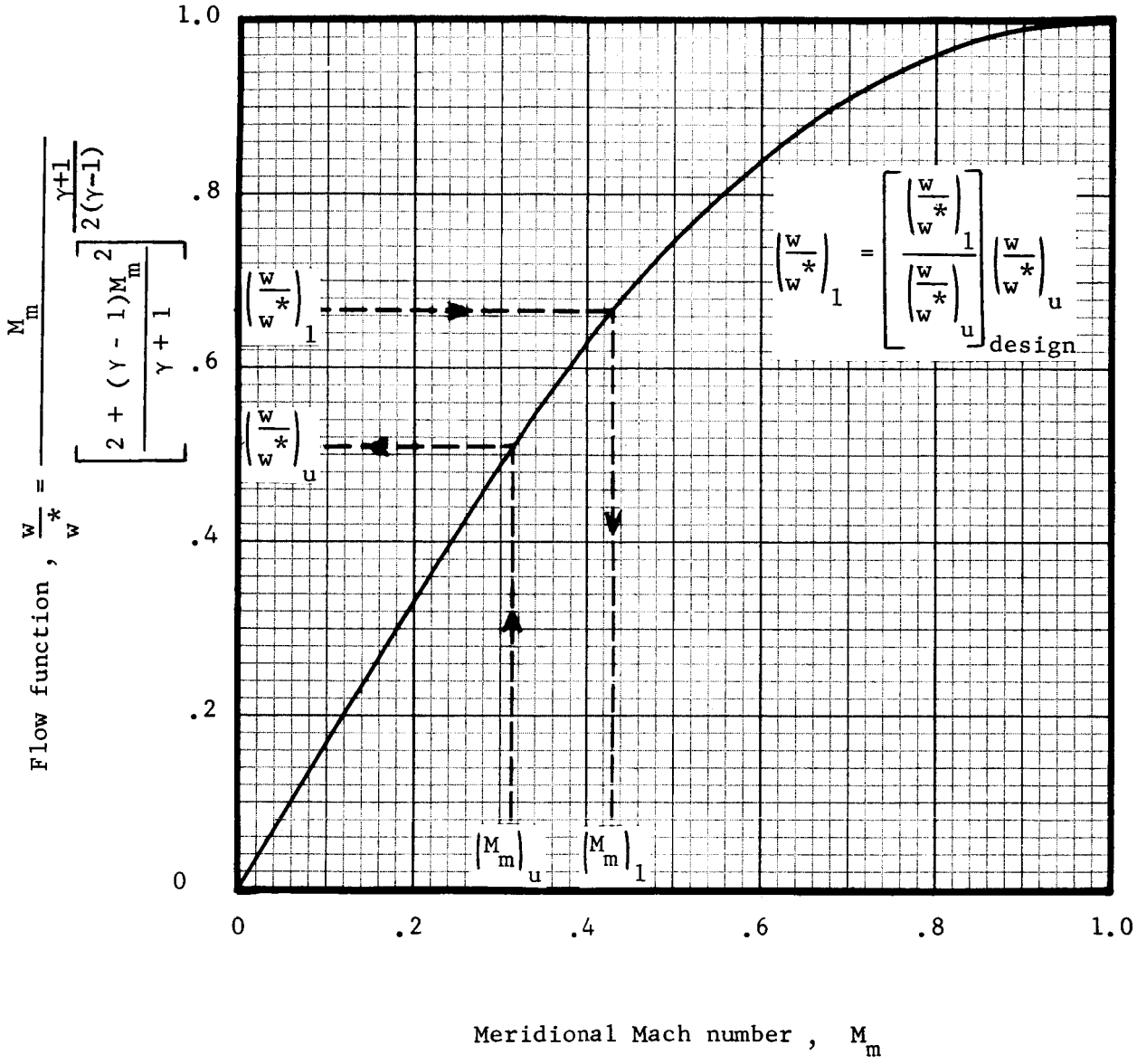


Figure 11. - Relationship between flow function and meridional Mach number - used for transferring traverse measurements to blade edges. Dashed lines with arrows and inset formulas indicate calculation sequence for sample case at leading edge.

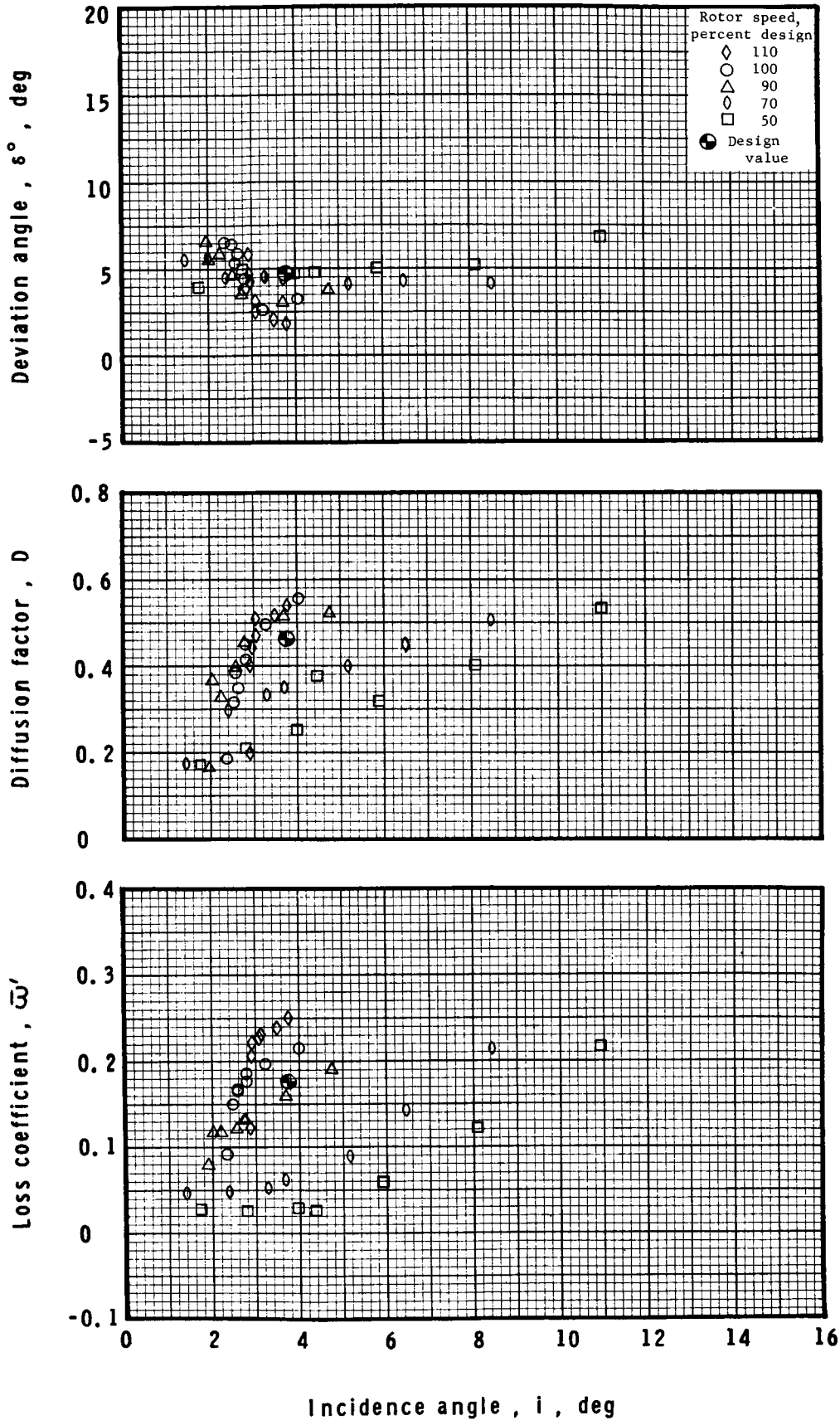


Figure 12(a). - Blade element data measured at 10% immersion from tip.

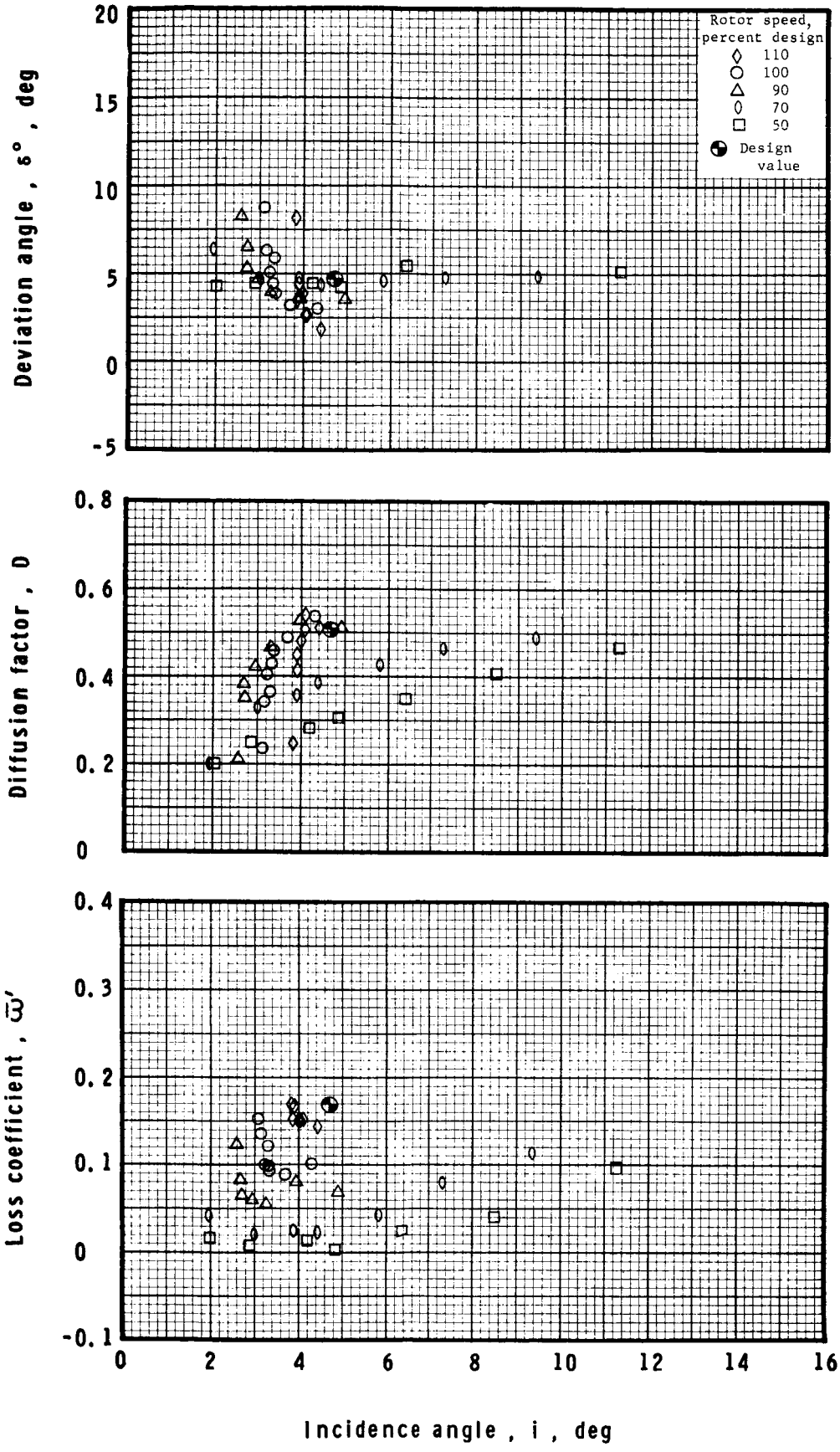


Figure 12(b). - Blade element data measured at 30% immersion from tip.

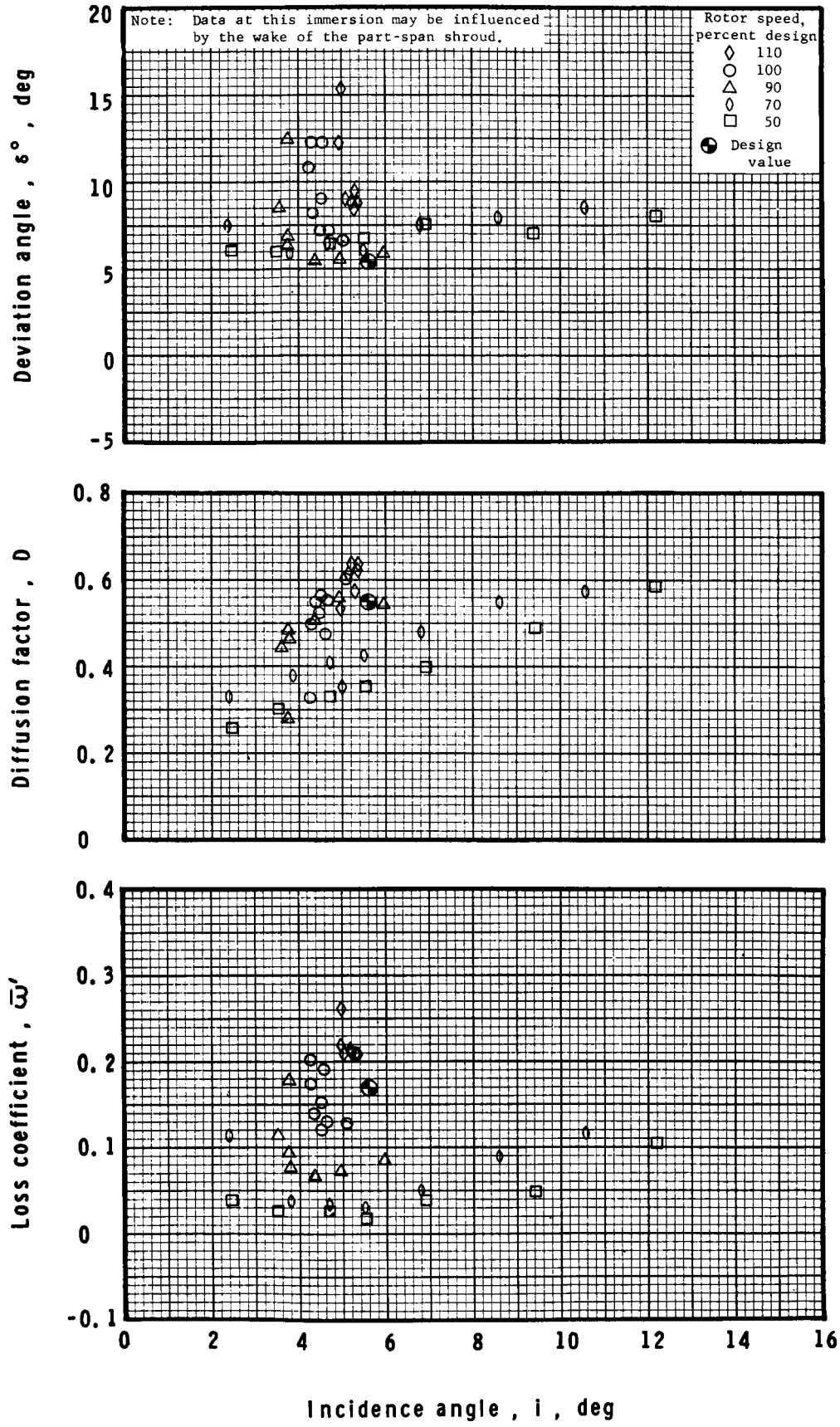


Figure 12(c). - Blade element data measured at 50% immersion from tip.

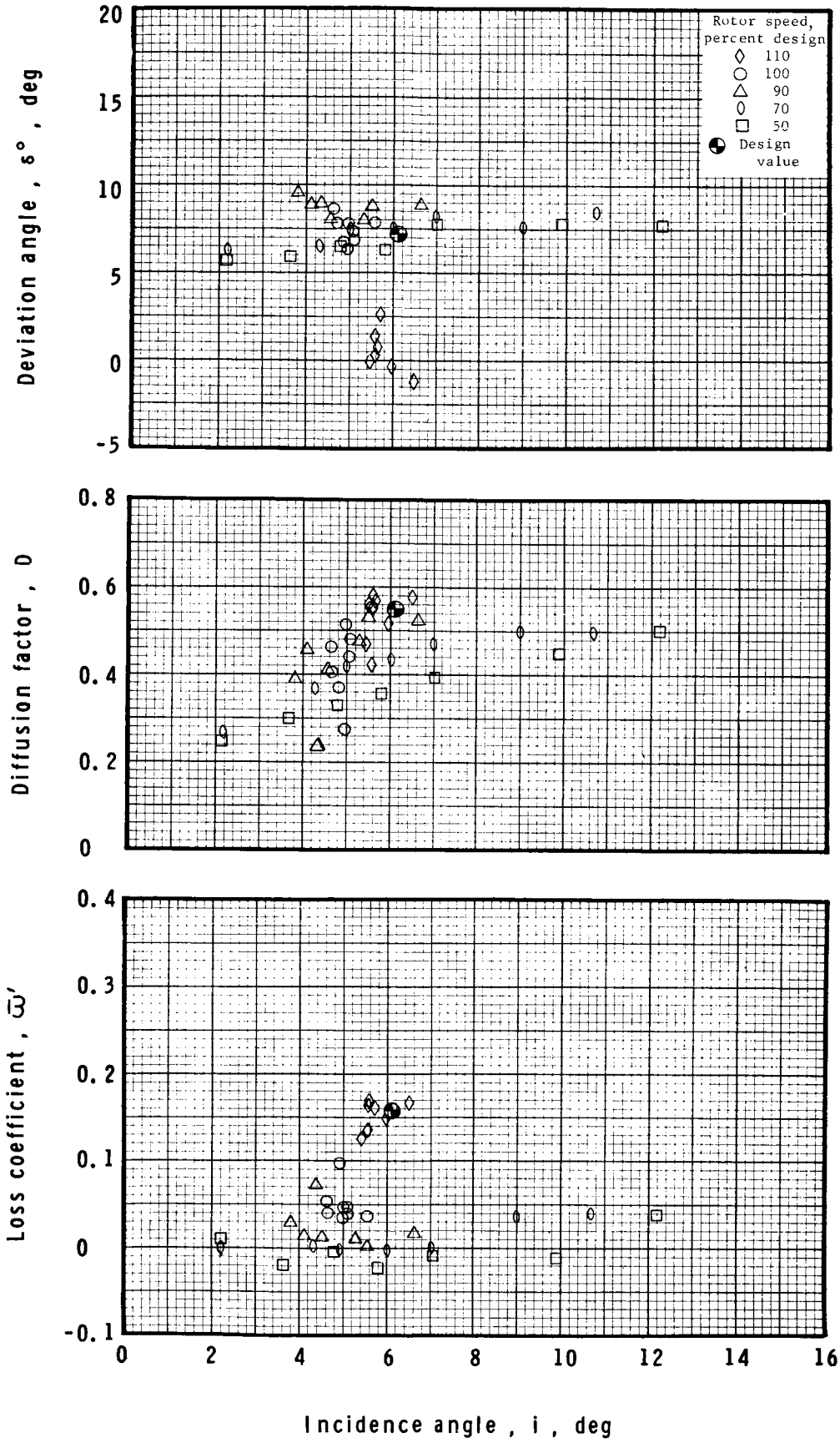


Figure 12(d). - Blade element data measured at 70% immersion from tip.

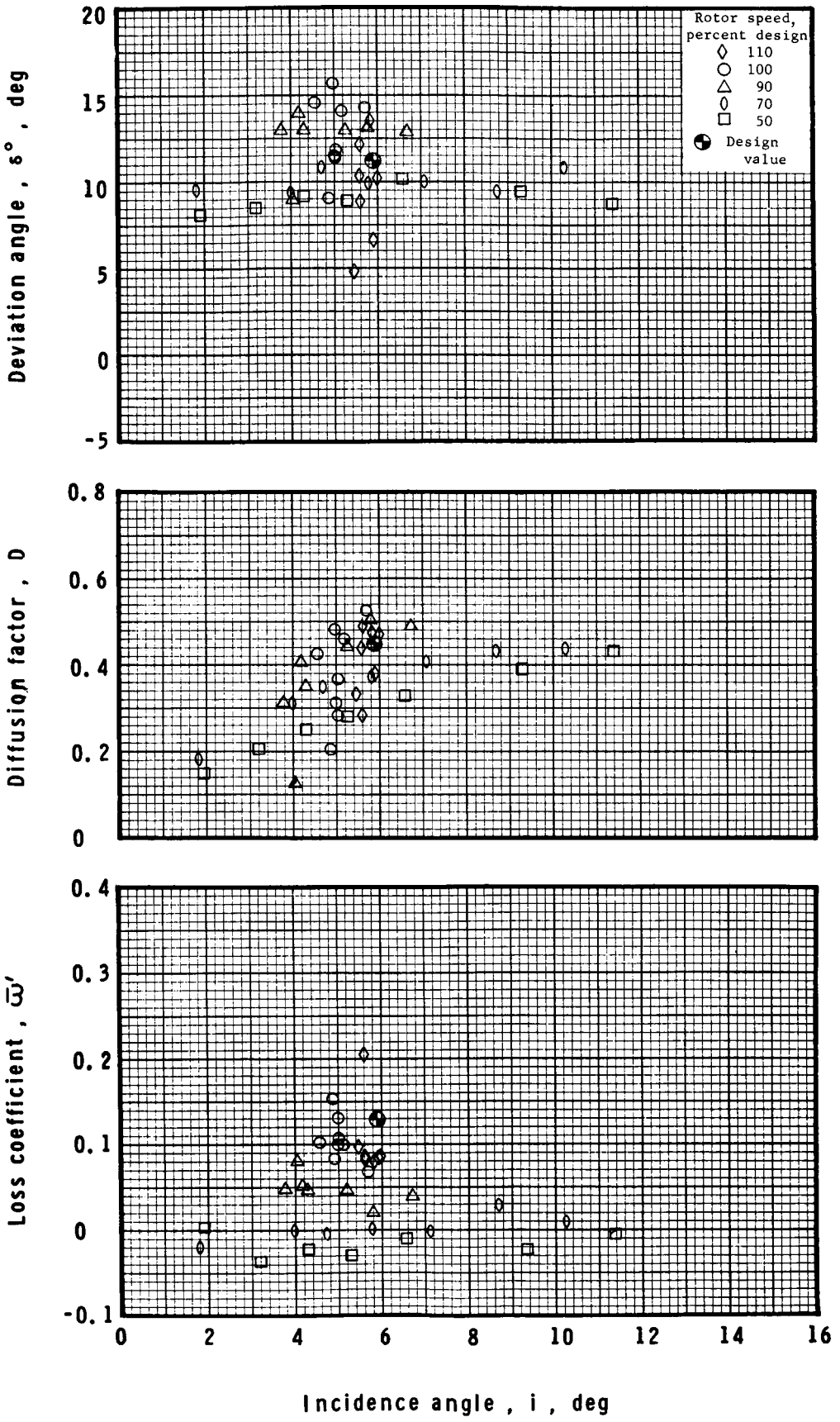


Figure 12(e). - Blade element data measured at 90% immersion from tip.

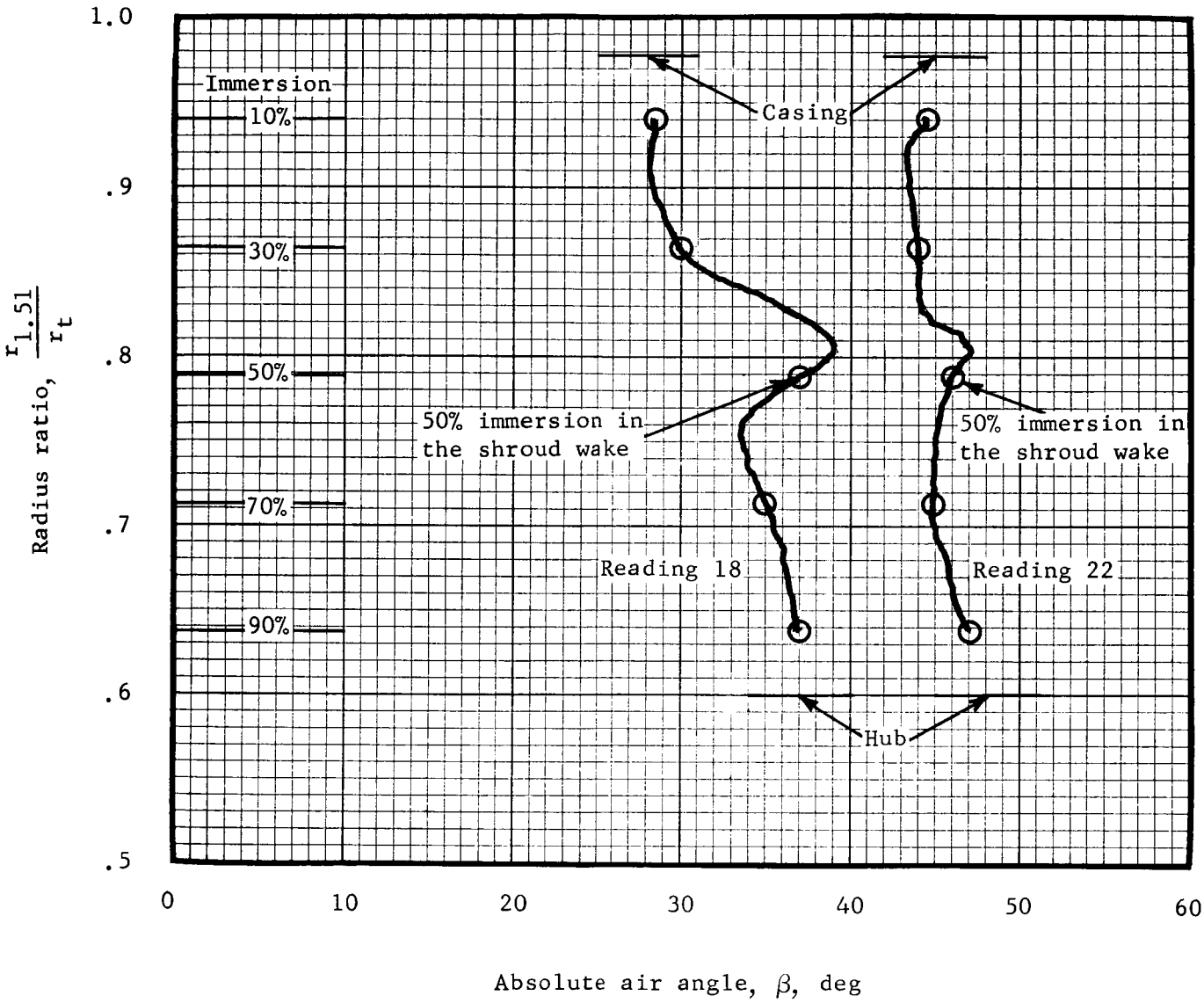


Figure 13. - Two rotor exit flow angle traverses at 90% speed. No radial movement of the part-span shroud wake is observed as the rotor is throttled.

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