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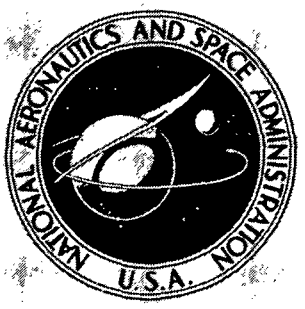

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PERFORMANCE OF 1380-FOOT-PER-SECOND TIP-SPEED AXIAL-FLOW COMPRESSOR ROTOR WITH BLADE TIP SOLIDITY OF 1.1

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16. Abstract

This report presents the aerodynamic design parameters, along with the overall and blade element performance, of an axial-flow compressor rotor designed to study the effects of blade solidity on efficiency and stall margin. At design speed the peak efficiency was 0.853 and occurred at an equivalent weight flow of 65.7 lb/sec (41.6 lb/sec/sq ft of inlet annulus area). The total pressure ratio was 1.68. Design efficiency, weight flow, pressure ratio, and temperature ratio were 0.822, 65.3, 1.65, and 1.187, respectively. Stall margin for design speed was 14 percent based on the weight flows and pressure ratios at peak efficiency and just prior to stall.

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SUMMARY

The overall performance and the blade element performance are presented for an axial-flow compressor rotor designed to study the effects of blade solidity on efficiency and stall margin. The rotor was designed for a tip speed of 1380 feet per second and a blade tip solidity of 1.1. Data were obtained for speeds from 50 to 100 percent of design and over a flow range from maximum flow to stall.

At design speed the peak efficiency was 0.853 and occurred at an equivalent weight flow of 65.7 pounds per second (41.6 lb/sec/sq ft of inlet annulus area). The total pressure ratio was 1.68 and the temperature ratio was 1.188. Design values of efficiency, weight flow, pressure ratio, and temperature ratio was 0.822, 65.3, 1.65, and 1.187, respectively. The stall margin for design speed was 14 percent based on the weight flow and pressure ratio values at peak efficiency and just prior to stall.

Calculations based on radial surveys of the flow parameters indicated that the losses are, in general, lower than design except in the region of the blade vibration damper and the hub. It is concluded that the higher-than-design pressure ratio and efficiency are primarily the result of generally lower-than-design losses. It is reasoned that the lower loss than that predicted based on the loss correlation used in the design of this rotor may, in part, be the result of the blade solidity. The blade solidity of this rotor is appreciably higher than the average solidity of the rotors used in the loss correlation. The Mach number for this rotor is also much higher than for those used in the correlation.

INTRODUCTION

The Lewis Research Center of the National Aeronautics and Space Administration is engaged in a research program on axial-flow fans and compressors for advanced air-breathing engines. The program is directed primarily towards providing the technology

to permit reducing the size and weight of the fans and compressors while maintaining a high level of performance. In support of this program, experimental studies are being conducted on improved blade shapes for high-Mach-number operation and on the effect of blade aspect ratio, blade solidity, blade loading, area margin above choke, weight flow per unit annulus area, contraction ratio (velocity ratio), and blade spacing on efficiency and stall margin.

This report presents the aerodynamic design parameters, along with the overall and blade element performance, of an axial-flow compressor rotor designed primarily to study the effect of blade row solidity on efficiency and stall margin. The rotor investigated in this report is designated rotor 4 and has a blade tip solidity of 1.1. It is one of a series of rotors designed with varying blade solidity achieved by changing the blade chord length. The design and performance of the other two rotors in this series, with blade tip solidities of 1.5 and 1.3, are presented in references 1 and 2, respectively. Overall and blade element performance data for rotor 4 were obtained for six speeds from 50 to 100 percent of design speed. Blade element data were obtained at 11 radial positions.

All symbols used in the report are defined in appendix A. Performance parameters are presented in appendix B. All parameters shown in this report are expressed in English units. The definitions and units for the symbols used in tables I to XV are given in appendix C.

AERODYNAMIC DESIGN

This rotor was designed by using the method discussed in reference 1. Basically this method consists of (1) calculating the flow field ahead of and behind the rotor to establish the desired velocity diagrams, (2) determining the blade element geometry to produce the desired velocity diagrams, (3) stacking the blade elements and generating coordinates for fabricating the blades.

A computer program referred to as the streamline analysis program was used to calculate the flow field at several axial locations, including the axial locations approximating the blade leading- and trailing-edge planes. This program accounts for streamline curvatures and entropy and enthalpy gradients. Inputs to the program are flow path geometry (fig. 1), weight flow, rotative speed, and the desired radial distribution of total pressure and total temperature at the blade inlet and outlet. Boundary layer blockages (actual area minus effective area divided by actual area) are also input to the program. For this design the boundary layer blockages at the rotor inlet and outlet were 0.02 and 0.04, respectively.

A computer program referred to as the blade geometry program was used to calculate a blade shape to produce the desired velocity diagrams as determined by the

streamline analysis program. The rotor losses and exit temperature distribution are calculated within the blade geometry program. If this calculated temperature distribution does not agree with that from the streamline analysis program, another flow field calculation is made with the streamline analysis program using the temperature distribution from the blade geometry program. This iterative procedure is continued until the temperature distribution is consistent with the losses and desired pressure distribution.

After the blade geometry has been defined, the blade coordinates program presented in reference 3 is used to compute the blade elements on conical surfaces approximating the stream surfaces passing through the blade. The program then stacks these blade elements on a radial line about their center of gravity and computes the Cartesian coordinates for fabrication.

The overall design parameters for the 19.77-inch-diameter rotor are presented in table I. The rotor was designed to have a blade tip solidity of 1.1. The inlet hub-tip ratio (0.51) and the number of blades (47) were chosen to be identical to those for the rotors presented in references 1 and 2. This resulted in a tip aerodynamic chord of 1.425 inches and an aspect ratio of 3.0 (based on mean blade height and cylindrical chord at the exit hub radius). The radially projected chord of each blade element was held constant and thus produced longer aerodynamic chords near the hub due to large streamline slopes. The design flow path is presented in figure 1. The rotor location and the radial survey instrumentation locations are also shown.

The design blade element and blade geometry parameters are presented in tables II and III, respectively. The design incidence angles, deviation angles, aerodynamic loadings, loss coefficients, and loss parameters are presented in table II.

The multiple-circular-arc (MCA) blade shape (ref. 4) was used for blade elements from the tip to 49 percent of span. The double-circular-arc (DCA) blade shape was used for the remainder of the blade. For the MCA blade elements, the maximum thickness and the transition point were located at the calculated shock position. The X-factor (ratio of suction-surface camber ahead of assumed shock location of the MCA blade section to that of a DCA blade section) was varied linearly from 0.463 at the tip to 1.0 at 49 percent of span (table III) to provide a smooth transition from MCA elements to DCA elements.

The area ratio margin calculation used in the design of this rotor assumed the minimum area to occur immediately behind the assumed shock location and accounted for both streamline convergence and the loss across the shock (see table III for radial distribution). The MCA elements should provide for a reduction in shock loss due to the lower suction-surface Mach number just ahead of the shock. The calculated peak suction-surface Mach numbers and suction-surface camber ahead of the assumed shock location are listed in tables II and III, respectively.

For the design of this rotor it was assumed that the minimum loss would occur at zero incidence angle. Deviation angle and loss calculations were based on the method

described in reference 1. The profile losses were based on the curves of losses as a function of diffusion factor shown in figure 2. These curves are based on the correlation of loss presented in reference 5.

APPARATUS AND PROCEDURE

Test Facility

The facility used in the investigation is the same as that described in detail in reference 1. A schematic of the facility is shown in figure 3. The facility is sized for a maximum flow rate of 100 pounds per second. A variable-frequency 15 000-horsepower synchronous motor and a gearbox are used to drive the research compressor to speeds up to 17 500 rpm. For the present study, air entered the test facility at an inlet on the roof of the building, went through the test section, and was exhausted to a low pressure (20 in. Hg vacuum) exhaust system. The research rotor was straddle mounted on a shaft supported by two hydrodynamic bearings, as depicted in figure 4. Carbon face seals were used to prevent bearing oil leakage.

Test Rotor

The test rotor is shown in figure 5. The rotor blades were machined from Maraging 200 steel bar stock. Dampers were located at 43 percent of span from the rotor tip to reduce blade vibration. The meanline of the damper formed a section of a conical surface with the cone angle set equal to the streamline angle. The aerodynamic chord of the damper is approximately 30 percent of the aerodynamic chord of the blade. The thickness of the damper is 15 percent of the aerodynamic chord of the damper. The leading- and trailing-edge radii were set equal to 0.010 inch. The inner and outer surfaces of the damper were formed by circular-arc sections passing through tangency points on the leading- and trailing-edge radii and on the maximum thickness radius, which was located at midchord.

Instrumentation

The axial locations of survey instrumentation are shown in figure 1, and the circumferential locations are shown in figure 6. In the plenum chamber, two pressure taps and two thermocouples were installed to measure plenum pressure and temperature. At the rotor inlet (station 1), a wedge probe (fig. 7) was used to measure static pressure. At

the rotor outlet (station 2), two combination probes (fig. 8) were used to measure total pressure, total temperature, and flow angle. Static pressure at station 2 was measured by two wedge probes. One inner-wall and one outer-wall static pressure tap were located at each of the survey planes. A hot film probe was located at station 1 for use in determining stall.

Strain-gage-type transducers were used in measuring pressures. Iron-constantan thermocouples were used in conjunction with a constant-temperature (610° R) oven to determine temperature. Flow through the compressor was determined from a thin-plate orifice installed according to ASME standards.

Compressor speed was indicated with the use of a magnetic pickup in conjunction with a gear mounted on the drive motor shaft. All data were measured by an automatic digital potentiometer and recorded on paper tape. The overall accuracy of measurements is estimated to be

Inlet pressure, psi	±0.05
Outlet pressure, psi	±0.10
Temperature, $^{\circ}$R	±1.0
Weight flow, lb/sec	±1.0
Speed, rpm	±50
Flow angle, deg	±2

Test Procedure

Compressor test data were taken over a range of weight flows from maximum flow to stall conditions. For each weight flow, measurements were recorded at 11 radial positions. The data were obtained at 50, 60, 70, 80, 90, and 100 percent of equivalent design speed. The air to the compressor inlet was not throttled during this series of tests. Thus, the pressure at the compressor inlet was equal to atmospheric pressure minus the pressure drop in the inlet line (measured to be approximately 3/4 psi at 65-lb/sec flow rate). Altitude exhaust was used to overcome system pressure losses. All probes were inserted into the flow stream simultaneously in obtaining the data. Initial tests indicated that the insertion of the probes in front of the rotor did not affect the readings from the probes behind the rotor.

The stall points were established by increasing the back pressure on the compressor until a rapid fluctuation was noted in the signal from a hot film gage located at the rotor inlet. Also fluctuations in compressor discharge pressure and blade stress were observed when stall was encountered. The flow at which this condition occurred was indicated on an X-Y plotter which recorded the compressor discharge pressure as a function of weight flow. When the stalled conditions were noted, the discharge throttle was

immediately opened. The weight flow was then set to within 1 pound of the weight flow at which stall occurred, and the blade element performance was recorded.

Performance Calculation Procedure

Measured outlet total temperatures and total pressures were corrected for Mach number and streamline slope. These corrections were based on instrument probe calibrations given in reference 6. The stream static pressure was corrected for Mach number and streamline slope based on an average calibration for the type of probe used.

The data presented here have been corrected to standard-day conditions at the plenum. The rotor inlet total pressure and total temperature were assumed to be radially constant and equal to the plenum values. The inlet flow angle was assumed to be zero degrees. At each radial position, the two outlet total pressures, static pressures, total temperatures, and flow angles were each averaged to obtain the rotor outlet radial distributions. Due to the physical size of the wedge probe, the static pressures at 5 and 10 percent of span were not measured. The probe was set at 0.75 inch from the outer wall for the first two radial positions, and the values measured were assumed to equal the static pressures at 5 and 10 percent of span. Comparisons of the static pressure measurement at this location with the outer-wall static measurement show almost no gradient and therefore justify this assumption. At 90 and 95 percent of span, the outlet static pressure was obtained from a fairing between the measured static pressures at 70 percent of span and the inner wall.

The overall performance and the blade element performance were calculated based on the equations presented in appendix B. Overall performance was obtained from the mass-averaged survey data at the rotor outlet and the plenum values of pressure and temperature. The blade element data have been translated from the measuring stations to planes approximating the blade leading and trailing edges by the method described in reference 1.

RESULTS AND DISCUSSION

The results from this investigation are presented in two sections: (1) overall performance and (2) blade element performance. Blade element performance is presented in two forms: (1) the radial variation of parameters and (2) the parameters as a function of incidence angle. Overall performance parameters are tabulated in tables IV to IX. Blade element parameters are tabulated in tables X to XV. Definitions and units for the symbols in the tables are presented in appendix C.

Overall Performance

The overall performance of rotor 4 is presented in figure 9. The rotor total pressure ratio, total temperature ratio, and temperature rise efficiency are plotted as a function of equivalent weight flow for rotative speeds of 50, 60, 70, 80, 90, and 100 percent of design speed. The design point is indicated by the solid symbol.

The peak efficiency for rotor 4 at design speed was 0.853, as compared to the design value of 0.822. Peak efficiency occurred at an equivalent weight flow of 65.7 pounds per second (41.6 lb/sec/sq ft of inlet annulus area), as compared to the design weight flow of 65.3 pounds per second. Total pressure ratio and total temperature ratio at the weight flow corresponding to peak efficiency were 1.68 and 1.188, respectively, as compared to design values of 1.65 and 1.187. Stall margin at design speed was calculated to be 14 percent based on the weight flows and pressure ratios at the peak efficiency point and the near-stall point. The equation for stall margin is given in appendix B.

At 50 percent of design speed the peak efficiency increased to 0.985. It must be pointed out that data accuracy at this speed is of the order of 3 percentage points in efficiency based on the probable measurement errors.

Blade Element Performance

Radial variation of performance parameters. - The radial distributions of several blade element and performance parameters at design speed are presented in figure 10 for operating points near maximum flow, design flow, and stall flow. The design distributions are indicated by dashed lines.

At the weight flow point of 64.3 pounds per second (slightly less than design flow) the pressure ratio is higher than design except in the region of the damper (45 percent of span). The temperature ratio is close to design along the entire span. The efficiency is, in general, higher than design as a result of the higher pressure ratio. The efficiency in the damper region and near the hub is markedly lower than design. The inlet velocity, even if increased by 20 feet per second to account for the difference in weight flow between design and the near design point, indicates higher tip velocity, lower mid-span velocity, and close to design hub velocity. The incidence angle is within $\pm 2^{\circ}$ of design. The velocity ratio is generally close to design except in the tip and damper regions, where it is significantly less than design. The deviation angle is much higher than design in the tip region and may be the result of having the maximum thickness located close to the trailing edge in this region. The deviation angle is also higher in the damper region but drops sharply below design near the hub. Although the blade loading as indicated by the diffusion factor was, in general, higher than design, the total loss was lower

than design except in the damper region and near the hub. Sharp gradients toward high losses exist in the damper region and near the hub.

The decremental effect of the damper on aerodynamic performance is quite evident in figure 10 for all three weight flows. The lower pressure ratio and efficiency are attributed to the high loss in the damper region. No attempt was made in the aerodynamic design of the rotor to account for the damper effects.

It is apparent from the performance parameters presented in figure 10 that the effects of the end walls are not adequately accounted for. This is particularly true at the hub, where the gradient toward high loss is definitely not accounted for.

In noting the radial variation of performance parameters it is apparent that the higher-than-design efficiency can be attributed to the generally lower-than-design level of loss over most of the blade span.

Performance parameters as function of incidence angle. - Several blade element and performance parameters are presented in figure 11 as a function of suction-surface incidence angle. The data are plotted for blade elements at 5, 10, 30, 50, 70, 90, and 95 percent of span for 60, 80, and 100 percent of design speed. Design values are indicated by the solid symbols.

The incidence angles (with reference to the suction surface) associated with minimum loss varied from -3° to $+2^{\circ}$ for design speed. At 5, 10, and 30 percent of span, minimum loss occurs at negative incidence angles; however, no well-defined minimums were established. At these positions the loss decreases with decreasing incidence angle. This may indicate that the shock has been pulled through the blade passage at high flow rates because of the low solidity of this rotor. At 90 percent of span, the minimum loss occurred at a slightly positive incidence angle. At 95 percent of span, minimum loss occurred at a positive incidence angle of 2°.

The deviation angles associated with minimum loss varied from approximately 5° greater than design at 5 percent of span to 6° less than design at 95 percent of span.

The loss parameter presented in figure 11 is based on the measured total loss coefficient, which includes a shock loss for elements operating at high subsonic and supersonic inlet relative velocities. In the tabulated data, a loss parameter is presented based on the measured total loss coefficient minus a calculated shock loss and is referred to as the profile loss. (The shock loss calculation is presented in reference 1.) In comparing the profile loss parameter presented in tables X to XV with that assumed in the design (fig. 2), it is concluded that the curves of loss as a function of loading and percent span used in the design did not adequately predict the level of loss or the gradient in loss which exists in the tip and hub regions of the blades. As indicated in the design section of this report the loss parameter as a function of loading used in the design was based on the correlation presented in reference 5. The generally lower calculated profile loss for the tip region may, in part, be a result of the calculated shock loss being too

high. However, even when the loss parameter based on total loss is compared with design, the same general conclusions can be drawn.

The design loss presented in table II is slightly higher in the hub region than the intended loss as given by the loss correlation in figure 2. This difference, in part, resulted from an error in the design program, as a result of which it did not properly account for the radius change in the calculation of the ideal relative pressure ratio. Also included in this difference is the degree of convergence in the design iterative procedure for the outlet temperature distribution. These factors could, in part, explain the difference between the measured loss and the design loss.

CONCLUDING REMARKS

It is concluded that the higher-than-design pressure ratio and efficiency are primarily the result of generally lower-than-design losses. The lower-than-design losses obtained in this investigation probably, in part, result from several differences between the test rotor and those rotors from which the design loss correlation (ref. 5) was obtained. First, the blade tip solidity of the test rotor was appreciably higher than the average of those used in the loss correlation. (The average was 0.83, with some as low as 0.6.) Second, in the loss correlation, a majority of the rotors had 65-series blade elements rather than circular-arc blade elements. Third, the inlet Mach number for this rotor is much higher than that for the rotors used in the loss correlation. The loading parameter (diffusion factor) used for the loss correlation was derived based on assuming blade velocity distributions typical of subsonic flow conditions (ref. 7).

It is concluded that a need exists to improve on the presently used loss correlation parameters to more accurately account for blade solidity, type of blade element, Mach number level, and secondary flow losses.

SUMMARY OF RESULTS

The overall performance and the blade element performance of an axial-flow compressor rotor have been presented. The rotor was designed for a tip speed of 1380 feet per second and a blade tip solidity of 1.1. It was tested over a range of flows from maximum flow to stall and at speeds from 50 to 100 percent of design speed. Radial surveys were taken at 11 radial positions. The investigation yielded the following principal results:

1. At design speed the peak efficiency was 0.853 and occurred at an equivalent weight flow of 65.7 pounds per second (41.6 lb/sec/sq ft of inlet annulus area). The total

pressure ratio was 1.68 and the temperature ratio was 1.215. Design values of efficiency, weight flow, pressure ratio, and temperature ratio were 0.822, 65.3, 1.65, and 1.187, respectively.

2. Stall margin for design speed was 14 percent based on the weight flow and pressure ratio at peak efficiency and that just prior to stall.

3. Incidence angles (with reference to the suction surface) associated with minimum loss varied from -3° to $+2^{\circ}$ for design speed. Minimum loss in the tip region tended to occur at negative incidence angles, while minimum loss at 90 percent of span tended to occur at slightly positive values. At 95 percent of span, minimum loss occurred at a positive incidence angle of about 2°.

4. Deviation angles associated with minimum loss vary from approximately 5° greater than design to 6° less than design at 95 percent of span.

5. The losses are, in general, lower than design with steep gradients existing in the end wall and damper regions of the blades.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, November 26, 1971,
764-74.

APPENDIX A

SYMBOLS

A_{an}	annulus area at rotor inlet, 1.586 ft^2
A_{fr}	frontal area at rotor inlet, 2.132 ft^2
a	distance from blade leading edge to maximum camber point
C_p	specific heat at constant pressure, 0.24 Btu/(lb)(^oR)
c	chord length, in.
D	diffusion factor
g	acceleration of gravity, 32.18 ft/sec^2
i_{mc}	incidence angle, angle between inlet air direction and line tangent to blade mean camber line at leading edge, deg
i_{ss}	incidence angle, angle between inlet air direction and line tangent to blade suction surface at leading edge, deg
J	mechanical equivalent of heat, 778.16 ft-lb/Btu
N	rotor speed, rpm
P	total pressure, psia
p	static pressure, psia
R	gas constant, 53.35 ft-lb/(lb)(^oR)
r	radius, in.
SM	stall margin
T	total temperature, ^oR
U	rotor speed, ft/sec
V	air velocity, ft/sec
W	weight flow, lb/sec
X-factor	ratio of suction-surface camber ahead of assumed shock location of MCA blade section to that of a DCA blade section
Z	displacement along compressor axis, in.
α_c	cone angle, deg
α_s	streamline slope, deg

β air angle, angle between air direction and meridional plane, deg

β'_c relative meridional air angle based on cone angle, arctan (tan β'_m cos α_c/cos α_s), deg

γ ratio of specific heats, 1.40 Btu/(lb)(^oR)

γ_b blade setting angle, deg

δ ratio of inlet total pressure to standard pressure of 14.69 psia

δ^o deviation angle, angle between exit air direction and tangent to blade mean camber line at trailing edge, $(\beta'_c)_{TE} - (\kappa_{mc})_{LE}$, deg

η efficiency

θ ratio of inlet total temperature to standard temperature of 518.7^o R

κ_{mc} angle between blade mean camber line at leading or trailing edge and meridional plane, deg

κ_{ss} angle between blade suction-surface camber line at leading edge and meridional plane, deg

σ solidity, ratio of chord to spacing

φ camber angle, deg

$\bar{\omega}$ total loss coefficient

$\bar{\omega}_p$ profile loss coefficient

$\bar{\omega}_s$ shock loss coefficient

Subscripts:

ad adiabatic (temperature rise)

id ideal

LE leading edge

m meridional direction

mc mean camber line

mom momentum rise

r radial direction

ss suction-surface camber line

TE blade trailing edge

z axial direction

θ tangential direction

1 instrument plane upstream of rotor

2 instrument plane downstream of rotor

Superscript:

' relative to rotor

APPENDIX B

PERFORMANCE PARAMETERS

The performance parameters referred to in the main text are defined as follows:

Incidence angle based on suction-surface blade angle:

$$i_{ss} = (\beta_c')_{LE} - (\kappa_{ss})_{LE} \tag{B1}$$

Incidence angle based on mean blade angle:

$$i_{mc} = (\beta_c')_{LE} - (\kappa_{mc})_{LE} \tag{B2}$$

Deviation:

$$\delta^o = (\beta_c')_{TE} - (\kappa_{mc})_{TE} \tag{B3}$$

Diffusion factor:

$$D = 1 - \frac{V'_{TE}}{V'_{LE}} + \frac{(rV_\theta)_{TE} - (rV_\theta)_{LE}}{(r_{LE} + r_{TE})\sigma V'_{LE}} \tag{B4}$$

Total loss coefficient:

$$\bar{\omega} = \frac{(P'_{id})_{TE} - P'_{TE}}{P'_{LE} - p_{LE}} \tag{B5}$$

Profile loss coefficient:

$$\bar{\omega}_p = \bar{\omega} - \bar{\omega}_s \tag{B6}$$

Total loss parameter:

$$\frac{\bar{\omega} \cos (\beta'_m)_{TE}}{2\sigma} \tag{B7}$$

Profile loss parameter:

$$\frac{(\omega - \omega_s)\cos(\beta'_m)_{TE}}{2\sigma} \tag{B8}$$

Adiabatic efficiency:

$$\eta_{ad} = \frac{\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma} - 1}{\frac{T_{TE}}{T_{LE}} - 1} \tag{B9}$$

Stall margin:

$$SM = \left[\frac{\left(\frac{P_{TE}}{P_{LE}}\right)_{STALL}}{\left(\frac{P_{TE}}{P_{LE}}\right)_{REF}} \times \frac{\left(\frac{W\sqrt{\theta}}{\delta}\right)_{REF}}{\left(\frac{W\sqrt{\theta}}{\delta}\right)_{STALL}} - 1\right] \times 100 \tag{B10}$$

Momentum rise efficiency:

$$\eta_{mom} = \frac{\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma} - 1}{\frac{(UV_\theta)_{TE} - (UV_\theta)_{LE}}{T_{LE} g J C_p}} \tag{B11}$$

Equivalent weight flow:

$$\frac{W\sqrt{\theta}}{\delta} \tag{B12}$$

Equivalent rotative speed:

$$\frac{N}{\sqrt{\theta}} \tag{B13}$$

Equivalent weight flow per unit annulus area:

$$\frac{W\sqrt{\theta}}{A_{an}\delta} \tag{B14}$$

Equivalent weight flow per unit frontal area:

$$\frac{W\sqrt{\theta}}{A_{fr}\delta} \tag{B15}$$

APPENDIX C

DEFINITIONS AND UNITS USED IN TABLES

ABS	absolute
AERO CHORD	aerodynamic chord, in.
AREA RATIO	ratio of actual flow area to critical area (where local Mach number is 1)
BETAM	meridional air angle, deg
CONE ANGLE	angle between axial direction and conical surface representing blade element, deg
DELTA INC	difference between mean camber blade angle and suction-surface blade angle, deg
DEV	deviation angle (defined by eq. (B3)), deg
D-FACT	diffusion factor (defined by eq. (B4))
EFF	adiabatic efficiency (defined by eq. (B9))
IN	inlet (leading edge of blade)
INCIDENCE	incidence angle (suction surface defined by eq. (B1) and mean defined by eq. (B2))
KIC	angle between blade mean camber line and meridional plane at leading edge, deg
KOC	angle between blade mean camber line and meridional plane at trailing edge, deg
KTC	angle between blade mean camber line and meridional plane at transition point, deg
LOSS COEFF	loss coefficient (total defined by eq. (B5) and profile defined by eq. (B6))
LOSS PARAM	loss parameter (total defined by eq. (B7) and profile defined by eq. (B8))
MERID	meridional
MERID VEL R	meridional velocity ratio
OUT	outlet (trailing edge of blade)
PERCENT SPAN	percent of blade span from tip at rotor outlet

PHISS	suction-surface camber ahead of assumed shock location, deg
PRESS	pressure, psia
PROF	profile
RADII	radius, in.
REL	relative to blade
RI	inlet radius (leading edge of blade), in.
RO	outlet radius (trailing edge of blade), in.
RP	radial position
RPM	equivalent rotative speed, rpm
SETTING ANGLE	angle between aerodynamic chord and meridional plane, deg
SOLIDITY	ratio of aerodynamic chord to blade spacing
SPEED	speed, ft/sec
SS	suction surface
STREAMLINE SLOPE	slope of streamline, deg
TANG	tangential
TEMP	temperature, ^{o}R
TI	thickness of blade at leading edge, in.
TM	thickness of blade at maximum thickness, in.
TO	thickness of blade at trailing edge, in.
TOT	total
TOTAL CAMBER	difference between inlet and outlet blade mean camber line, deg
VEL	velocity, ft/sec
WT FLOW	equivalent weight flow, lbm/sec
X FACTOR	ratio of suction-surface camber ahead of assumed shock location of multiple-circular-arc blade section to that of double-circular-arc blade section
ZMC	axial distance to blade maximum thickness point from inlet, in.
ZOC	axial distance to blade trailing edge from inlet, in.
ZTC	axial distance to transition point from inlet, in.

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TABLE I. - DESIGN OVERALL PARAMETERS FOR ROTOR 4

TOTAL PRESSURE RATIO	1.650
TOTAL TEMPERATURE RATIO	1.187
EFFICIENCY	0.822
WT FLOW PER UNIT FRONTAL AREA	30.614
WT FLOW PER UNIT ANNULUS AREA	41.139
WT FLOW	65.261
RPM	16000.000
TIP SPEED	1380.206

TABLE II. - DESIGN BLADE ELEMENT PARAMETERS FOR ROTOR 4

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
TIP	9.885	9.769	-0.	40.6	64.4	55.0	518.7	1.224	14.69	1.650
1	9.728	9.578	-0.	40.0	63.6	54.1	518.7	1.217	14.69	1.650
2	9.510	9.386	0.	39.5	62.9	53.2	518.7	1.211	14.69	1.650
3	8.609	8.620	0.	38.4	59.3	48.9	518.7	1.190	14.69	1.650
4	8.149	8.237	0.	39.1	57.4	45.9	518.7	1.187	14.69	1.650
5	8.034	8.142	0.	39.4	57.1	45.1	518.7	1.187	14.69	1.650
6	7.918	8.046	0.	39.6	56.6	44.2	518.7	1.186	14.69	1.650
7	7.801	7.950	0.	39.8	56.5	43.3	518.7	1.186	14.69	1.650
8	7.684	7.854	0.	39.9	56.2	42.3	518.7	1.185	14.69	1.650
9	6.711	7.089	0.	40.0	53.3	33.9	518.7	1.175	14.69	1.650
10	5.589	6.323	0.	39.9	52.8	23.6	518.7	1.164	14.69	1.650
11	5.252	6.131	0.	40.3	53.5	21.0	518.7	1.162	14.69	1.650
HUB	5.000	5.940	-0.	40.2	54.4	18.1	518.7	1.159	14.69	1.650

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
TIP	661.3	785.7	1530.4	1040.6	661.3	596.5	-0.	511.4	1380.2	1364.0
1	673.8	786.0	1516.2	1026.9	673.8	602.0	-0.	505.4	1358.3	1337.3
2	679.6	786.1	1491.7	1011.9	679.6	606.3	0.	500.4	1327.8	1310.5
3	713.2	792.2	1397.7	944.5	713.2	621.0	0.	491.9	1202.0	1203.6
4	727.9	803.0	1350.8	895.4	727.9	622.9	0.	506.8	1137.8	1150.1
5	725.8	806.6	1336.1	882.4	725.8	623.2	0.	512.1	1121.8	1136.8
6	728.2	810.2	1323.8	870.2	728.2	623.9	0.	516.9	1105.6	1123.4
7	721.5	813.9	1306.5	859.0	721.5	625.3	0.	521.1	1089.2	1110.0
8	718.3	817.9	1291.1	848.4	718.3	627.0	0.	525.1	1072.9	1096.6
9	698.3	855.2	1168.6	789.2	698.3	655.1	0.	549.8	937.0	989.8
10	591.5	903.9	979.2	756.6	591.5	693.3	0.	579.9	780.4	882.9
11	542.5	910.9	912.1	744.3	542.5	694.8	0.	589.0	733.3	856.0
HUB	500.0	927.4	858.7	745.2	500.0	708.5	-0.	598.4	698.1	829.4

	ABS MACH NO		REL MACH NO		MERID MACH NO		STREAMLINE SLOPE		MERID PEAK SS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
TIP	0.614	0.664	1.422	0.879	0.614	0.504	-9.40	-6.70	0.902	1.615
1	0.627	0.666	1.411	0.870	0.627	0.510	-8.50	-6.15	0.893	1.623
2	0.633	0.668	1.389	0.860	0.633	0.515	-6.85	-4.80	0.892	1.627
3	0.667	0.680	1.307	0.811	0.667	0.533	-0.65	0.35	0.871	1.627
4	0.682	0.691	1.265	0.771	0.682	0.536	2.60	3.20	0.856	1.647
5	0.680	0.694	1.251	0.760	0.680	0.537	3.65	4.00	0.859	1.653
6	0.682	0.698	1.240	0.750	0.682	0.538	4.35	4.70	0.857	1.659
7	0.675	0.702	1.223	0.741	0.675	0.539	5.30	5.45	0.867	1.654
8	0.672	0.706	1.208	0.732	0.672	0.541	6.20	6.25	0.873	1.649
9	0.652	0.745	1.090	0.688	0.652	0.571	15.35	13.45	0.938	1.600
10	0.545	0.797	0.903	0.667	0.545	0.611	28.70	24.00	1.172	1.363
11	0.498	0.805	0.837	0.657	0.498	0.614	32.90	26.60	1.281	1.268
HUB	0.457	0.822	0.785	0.660	0.457	0.628	35.70	31.00	1.417	1.189

	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
RP	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
TIP	0.	2.0	0.0	10.6	0.468	0.687	0.263	0.154	0.067	0.039
1	4.99	2.2	-0.0	8.8	0.468	0.709	0.241	0.131	0.062	0.034
2	10.00	2.6	0.0	7.7	0.464	0.730	0.223	0.116	0.057	0.030
3	30.01	4.1	0.0	5.1	0.462	0.809	0.160	0.067	0.041	0.017
4	40.01	5.2	0.0	4.6	0.477	0.822	0.155	0.063	0.040	0.016
5	42.49	5.5	0.0	4.4	0.481	0.823	0.156	0.065	0.040	0.017
6	45.00	5.8	0.0	4.1	0.484	0.825	0.156	0.066	0.040	0.017
7	47.51	6.2	0.0	4.1	0.486	0.828	0.155	0.069	0.040	0.018
8	50.01	6.5	0.0	3.9	0.487	0.832	0.154	0.071	0.040	0.018
9	69.99	8.0	0.0	5.6	0.473	0.881	0.121	0.066	0.031	0.017
10	90.00	8.8	0.0	8.2	0.381	0.936	0.082	0.077	0.018	0.017
11	95.01	8.8	0.0	9.4	0.340	0.950	0.072	0.071	0.015	0.015
HUB	100.00	8.8	0.0	10.9	0.289	0.965	0.056	0.056	0.011	0.011

TABLE III. - BLADE GEOMETRY FOR ROTOR 4

RP	PERCENT SPAN	RADII RI	RADII RO	BLADE ANGLES KIC	BLADE ANGLES KTC	BLADE ANGLES KOC	DELTA INC
TIP	0.	9.885	9.769	62.50	58.30	44.40	2.00
1	5.	9.728	9.578	61.49	57.13	45.25	2.21
2	10.	9.510	9.386	60.40	55.59	45.50	2.55
3	30.	8.609	8.620	55.20	49.68	43.75	4.12
4	40.	8.149	8.237	52.20	46.46	41.30	5.15
5	42.	8.034	8.142	51.60	45.62	40.60	5.45
6	45.	7.918	8.046	50.80	44.80	40.00	5.76
7	48.	7.801	7.950	50.25	44.03	39.10	6.15
8	50.	7.684	7.854	49.60	43.28	38.30	6.50
9	70.	6.711	7.089	45.12	36.49	27.90	8.00
10	90.	5.589	6.323	43.60	29.11	14.25	8.80
11	95.	5.252	6.131	44.00	27.22	10.00	8.83
HUB	100.	5.000	5.940	44.60	25.88	5.70	8.82

RP	BLADE THICKNESSES TI	BLADE THICKNESSES TM	BLADE THICKNESSES TO	AXIAL DIMENSIONS ZMC	AXIAL DIMENSIONS ZTC	AXIAL DIMENSIONS ZOC	CONE ANGLE
TIP	0.020	0.061	0.020	0.556	0.556	0.721	-7.700
1	0.020	0.065	0.020	0.563	0.563	0.761	-6.900
2	0.020	0.069	0.020	0.569	0.569	0.798	-5.600
3	0.020	0.084	0.020	0.558	0.558	0.923	0.050
4	0.020	0.093	0.020	0.539	0.539	0.988	4.100
5	0.020	0.095	0.020	0.533	0.533	1.005	5.000
6	0.020	0.098	0.020	0.527	0.527	1.022	6.000
7	0.020	0.100	0.020	0.522	0.522	1.038	6.900
8	0.020	0.102	0.020	0.516	0.516	1.055	7.900
9	0.020	0.122	0.020	0.554	0.554	1.177	16.700
10	0.020	0.146	0.020	0.581	0.581	1.251	30.300
11	0.020	0.154	0.020	0.576	0.576	1.245	35.000
HUB	0.020	0.161	0.020	0.569	0.569	1.236	38.400

RP	AERO CHORD	SETTING ANGLE	TOTAL CAMBER	SOLIDITY	X FACTOR	PHISS	AREA RATIO
TIP	1.425	58.68	18.10	1.120	0.463	5.70	1.073
1	1.464	57.50	16.24	1.142	0.510	6.25	1.071
2	1.468	56.12	14.90	1.168	0.571	7.00	1.067
3	1.467	50.34	11.45	1.280	0.797	9.32	1.058
4	1.473	46.99	10.90	1.347	0.921	11.05	1.060
5	1.479	46.16	11.00	1.365	0.956	11.60	1.061
6	1.484	45.32	10.80	1.390	0.982	12.05	1.061
7	1.491	44.50	11.15	1.408	0.996	12.36	1.061
8	1.498	43.69	11.30	1.430	1.000	12.59	1.060
9	1.558	36.49	17.22	1.634	1.000	13.70	1.051
10	1.679	29.03	29.35	2.050	1.000	14.60	1.072
11	1.733	27.13	34.00	2.230	1.000	14.73	1.091
HUB	1.741	25.55	38.90	2.415	1.000	14.75	1.109

TABLE IV. - OVERALL PERFORMANCE FOR ROTOR 4, 50 PERCENT DESIGN SPEED

PARAMETER	READING				
	886	887	888	889	890
TOTAL PRESSURE RATIO	1.148	1.137	1.114	1.072	1.033
TOTAL TEMPERATURE RATIO	1.049	1.041	1.032	1.021	1.011
TEMP RISE EFFICIENCY	0.828	0.919	0.978	0.951	0.853
MOMENTUM RISE EFFICIENCY	0.812	0.935	1.013	1.054	0.964
WT FLOW PER UNIT FRONTAL AREA	12.451	15.701	18.222	20.770	22.251
WT FLOW PER UNIT ANNULUS AREA	16.884	21.292	24.710	28.165	30.174
WT FLOW AT ORIFICE	26.381	33.269	38.609	44.008	47.146
WT FLOW AT INLET	26.424	33.555	38.981	44.180	47.231
WT FLOW AT OUTLET	26.135	32.441	37.373	42.022	43.910
RPM	8015.945	8002.156	8028.429	8026.128	8017.312
PERCENT OF DESIGN SPEED	50.100	50.013	50.178	50.165	50.108

TABLE V. - OVERALL PERFORMANCE FOR ROTOR 4, 60 PERCENT DESIGN SPEED

PARAMETER	READING				
	891	894	895	896	897
TOTAL PRESSURE RATIO	1.226	1.140	1.181	1.209	1.217
TOTAL TEMPERATURE RATIO	1.075	1.040	1.051	1.060	1.066
TEMP RISE EFFICIENCY	0.801	0.942	0.959	0.922	0.868
MOMENTUM RISE EFFICIENCY	0.729	1.011	0.991	0.943	0.879
WT FLOW PER UNIT FRONTAL AREA	15.248	22.865	21.075	18.856	17.057
WT FLOW PER UNIT ANNULUS AREA	20.678	31.007	28.577	25.571	23.131
WT FLOW AT ORIFICE	32.308	48.447	44.651	39.954	36.141
WT FLOW AT INLET	32.227	48.995	45.304	40.627	36.708
WT FLOW AT OUTLET	35.907	46.580	43.476	39.384	36.079
RPM	9730.456	9652.064	9643.265	9635.906	9653.242
PERCENT OF DESIGN SPEED	60.815	60.325	60.270	60.224	60.335

TABLE VI. - OVERALL PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

PARAMETER	READING					
	898	899	900	901	902	903
TOTAL PRESSURE RATIO	1.128	1.177	1.237	1.286	1.300	1.303
TOTAL TEMPERATURE RATIO	1.044	1.054	1.066	1.079	1.091	1.098
TEMP RISE EFFICIENCY	0.792	0.883	0.951	0.944	0.860	0.804
MOMENTUM RISE EFFICIENCY	0.897	0.959	1.005	0.970	0.871	0.788
WT FLOW PER UNIT FRONTAL AREA	26.228	25.917	25.094	23.197	19.947	17.756
WT FLOW PER UNIT ANNULUS AREA	35.568	35.146	34.030	31.457	27.050	24.078
WT FLOW AT ORIFICE	55.574	54.915	53.171	49.151	42.265	37.621
WT FLOW AT INLET	55.953	55.280	53.561	49.631	42.669	37.995
WT FLOW AT OUTLET	52.296	51.972	51.392	48.042	42.175	37.879
RPM	11225.047	11219.168	11206.975	11207.302	11215.323	11230.465
PERCENT OF DESIGN SPEED	70.157	70.120	70.044	70.046	70.096	70.190

TABLE VII. - OVERALL PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

PARAMETER	READING					
	905	906	907	908	928	929
TOTAL PRESSURE RATIO	1.420	1.412	1.329	1.223	1.419	1.401
TOTAL TEMPERATURE RATIO	1.121	1.110	1.093	1.072	1.116	1.121
TEMP RISE EFFICIENCY	0.869	0.942	0.915	0.827	0.903	0.833
MOMENTUM RISE EFFICIENCY	0.864	0.956	0.957	0.924	0.842	0.764
WT FLOW PER UNIT FRONTAL AREA	23.582	26.634	27.985	28.500	25.027	22.379
WT FLOW PER UNIT ANNULUS AREA	31.980	36.118	37.948	38.648	33.939	30.348
WT FLOW AT ORIFICE	49.968	56.434	59.293	60.387	53.029	47.418
WT FLOW AT INLET	50.387	57.002	59.765	60.692	52.885	46.880
WT FLOW AT OUTLET	49.939	55.534	56.913	56.490	49.272	43.637
RPM	12859.957	12858.691	12882.144	12870.481	12798.080	12781.652
PERCENT OF DESIGN SPEED	80.375	80.367	80.513	80.441	79.988	79.885

TABLE VIII. - OVERALL PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

PARAMETER	READING					
	911	914	915	916	917	933
TOTAL PRESSURE RATIO	1.263	1.393	1.500	1.573	1.596	1.587
TOTAL TEMPERATURE RATIO	1.087	1.118	1.137	1.153	1.161	1.160
TEMP RISE EFFICIENCY	0.792	0.844	0.893	0.904	0.888	0.883
MOMENTUM RISE EFFICIENCY	0.879	0.877	0.915	0.914	0.887	0.811
WT FLOW PER UNIT FRONTAL AREA	30.471	30.334	29.827	28.538	26.949	26.746
WT FLOW PER UNIT ANNULUS AREA	41.321	41.136	40.449	38.701	36.545	36.269
WT FLOW AT ORIFICE	64.564	64.273	63.200	60.469	57.101	56.670
WT FLOW AT INLET	64.463	64.379	63.085	60.758	57.179	56.484
WT FLOW AT OUTLET	60.819	60.872	61.024	59.338	56.557	52.433
RPM	14417.761	14430.523	14422.901	14404.568	14358.170	14798.072
PERCENT OF DESIGN SPEED	90.111	90.191	90.143	90.029	89.739	92.488

TABLE IX. - OVERALL PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

PARAMETER	READING					
	918	919	920	921	934	936
TOTAL PRESSURE RATIO	1.733	1.698	1.637	1.465	1.728	1.720
TOTAL TEMPERATURE RATIO	1.204	1.193	1.178	1.144	1.202	1.204
TEMP RISE EFFICIENCY	0.833	0.846	0.848	0.802	0.835	0.820
MOMENTUM RISE EFFICIENCY	0.818	0.854	0.866	0.844	0.767	0.749
WT FLOW PER UNIT FRONTAL AREA	28.177	30.342	31.516	31.913	29.038	28.135
WT FLOW PER UNIT ANNULUS AREA	38.211	41.147	42.739	43.276	39.379	38.153
WT FLOW AT ORIFICE	59.704	64.291	66.778	67.618	61.528	59.613
WT FLOW AT INLET	59.310	63.817	66.516	67.537	60.875	58.932
WT FLOW AT OUTLET	58.970	62.579	64.980	64.480	55.840	54.131
RPM	15924.574	15921.968	16004.730	15972.205	15946.792	15916.368
PERCENT OF DESIGN SPEED	99.529	99.512	100.030	99.826	99.667	99.477

TABLE X. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 50 PERCENT DESIGN SPEED

(a) Reading 886

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	54.1	71.0	61.3	518.7	548.8	14.69	16.81
2	9.510	9.386	0.	50.0	71.0	58.9	518.7	547.3	14.69	16.84
3	8.609	8.620	0.	46.3	68.6	52.7	518.7	544.9	14.69	16.88
4	8.149	8.237	0.	47.4	67.5	48.9	518.7	544.9	14.69	16.88
5	8.034	8.142	0.	49.2	67.2	49.3	518.7	544.6	14.69	16.84
6	7.918	8.046	0.	50.7	66.9	48.1	518.7	545.1	14.69	16.83
7	7.801	7.950	0.	52.3	66.4	46.4	518.7	545.8	14.69	16.83
8	7.684	7.854	0.	51.7	66.1	45.2	518.7	545.9	14.69	16.86
9	6.711	7.089	0.	41.1	62.8	37.1	518.7	541.0	14.69	16.87
10	5.589	6.325	0.	38.9	60.5	22.8	518.7	539.8	14.69	16.92
11	5.252	6.131	0.	40.6	60.8	17.4	518.7	542.4	14.69	16.95

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	233.5	355.0	717.5	433.8	233.5	208.2	0.	287.5	678.4	668.0
2	229.8	358.9	704.6	446.7	229.8	230.7	0.	274.9	666.1	657.4
3	236.6	370.1	647.3	421.7	236.6	255.5	0.	267.8	602.6	603.3
4	236.5	381.4	617.5	392.5	236.5	258.1	0.	280.8	570.4	576.6
5	236.6	376.8	611.7	377.5	236.6	246.0	0.	285.4	564.1	571.7
6	236.0	380.8	602.6	360.8	236.0	241.0	0.	294.9	554.4	565.4
7	237.8	386.8	593.4	342.6	237.8	236.4	0.	306.1	543.7	554.1
8	238.9	390.1	588.7	343.5	238.9	241.7	0.	306.2	538.0	549.9
9	241.8	404.2	528.4	382.0	241.8	304.6	0.	265.7	469.9	496.4
10	221.2	462.3	449.0	390.2	221.2	359.6	0.	290.6	390.7	442.0
11	205.2	482.3	420.2	383.8	205.2	366.4	0.	313.6	366.7	428.1

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.210	0.312	0.646	0.381	0.210	0.185	0.892	1.006	0.673
2	0.207	0.316	0.634	0.393	0.207	0.203	1.004	1.018	0.722
3	0.213	0.327	0.583	0.373	0.213	0.226	1.080	1.005	0.801
4	0.213	0.337	0.556	0.347	0.213	0.228	1.091	1.008	0.802
5	0.213	0.333	0.551	0.334	0.213	0.217	1.040	1.011	0.796
6	0.212	0.337	0.542	0.319	0.212	0.213	1.021	1.007	0.776
7	0.214	0.342	0.534	0.303	0.214	0.209	0.994	0.990	0.760
8	0.215	0.345	0.530	0.303	0.215	0.214	1.012	0.986	0.763
9	0.218	0.359	0.476	0.339	0.218	0.271	1.260	0.897	0.935
10	0.199	0.413	0.404	0.348	0.199	0.321	1.625	0.749	1.009
11	0.184	0.430	0.378	0.342	0.184	0.327	1.785	0.698	0.913

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	9.6	7.4	16.0	0.569	0.249	0.249	0.052	0.052
2	7.68	10.00	10.6	8.1	13.4	0.532	0.209	0.209	0.046	0.046
3	26.12	30.01	13.4	9.2	9.0	0.510	0.162	0.162	0.038	0.038
4	35.54	40.01	15.2	10.1	7.6	0.534	0.174	0.174	0.042	0.042
5	37.89	42.49	15.6	10.2	8.7	0.555	0.181	0.181	0.043	0.043
6	40.27	45.00	16.1	10.3	8.0	0.579	0.208	0.208	0.050	0.050
7	42.66	47.51	16.1	9.9	7.2	0.608	0.234	0.234	0.057	0.057
8	45.06	50.01	16.4	9.9	6.8	0.601	0.235	0.235	0.058	0.058
9	64.97	69.99	17.5	9.5	8.8	0.435	0.067	0.067	0.016	0.016
10	87.94	90.00	16.5	7.7	7.5	0.299	-0.011	-0.011	-0.003	-0.003
11	94.84	95.01	16.2	7.5	6.0	0.267	0.144	0.144	0.031	0.031

TABLE X. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 50 PERCENT DESIGN SPEED

(b) Reading 887

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	32.3	65.0	55.2	518.7	541.4	14.69	16.80
2	9.510	9.386	0.	31.0	64.6	54.6	518.7	539.7	14.69	16.75
3	8.609	8.620	0.	31.5	62.4	51.4	518.7	539.3	14.69	16.69
4	8.149	8.237	0.	34.2	61.5	48.1	518.7	539.7	14.69	16.69
5	8.034	8.142	0.	35.5	61.0	47.5	518.7	540.1	14.69	16.68
6	7.918	8.046	0.	37.4	60.8	46.9	518.7	540.5	14.69	16.62
7	7.801	7.950	0.	37.6	60.5	46.0	518.7	540.5	14.69	16.61
8	7.684	7.854	0.	36.5	60.3	44.7	518.7	540.8	14.69	16.65
9	6.711	7.089	0.	34.7	57.5	35.9	518.7	538.8	14.69	16.72
10	5.589	6.325	0.	34.0	56.0	22.4	518.7	539.4	14.69	16.84
11	5.252	6.131	0.	35.8	55.6	22.2	518.7	542.3	14.69	16.42

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	316.1	381.2	748.5	565.4	316.1	322.3	0.	203.5	678.5	668.0
2	312.9	378.7	730.5	559.7	312.9	324.4	0.	195.3	660.0	651.4
3	313.3	377.7	676.9	516.4	313.3	322.1	0.	197.2	600.0	600.8
4	310.1	388.7	649.3	481.0	310.1	321.3	0.	218.7	570.5	576.7
5	311.5	388.4	643.0	467.6	311.5	316.2	0.	225.6	562.5	570.1
6	308.9	386.0	633.5	448.9	308.9	306.8	0.	234.2	553.1	562.0
7	308.7	388.3	626.2	442.6	308.7	307.6	0.	237.0	544.8	555.2
8	306.4	394.8	618.3	446.5	306.4	317.3	0.	234.8	537.1	549.0
9	297.9	424.0	554.4	430.3	297.9	348.6	0.	241.5	467.5	493.8
10	263.5	490.8	471.5	440.2	263.5	406.9	0.	274.5	391.0	442.4
11	251.8	469.1	445.9	411.2	251.8	380.6	0.	274.1	368.0	429.6

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.285	0.338	0.676	0.501	0.285	0.286	1.020	0.915	0.891
2	0.283	0.336	0.660	0.497	0.283	0.288	1.037	0.918	0.944
3	0.283	0.336	0.611	0.459	0.283	0.286	1.028	0.928	0.934
4	0.280	0.345	0.586	0.427	0.280	0.286	1.036	0.943	0.919
5	0.281	0.345	0.581	0.415	0.281	0.281	1.015	0.942	0.893
6	0.279	0.343	0.572	0.399	0.279	0.272	0.993	0.942	0.852
7	0.279	0.345	0.565	0.393	0.279	0.275	0.996	0.933	0.846
8	0.277	0.351	0.558	0.397	0.277	0.282	1.035	0.928	0.856
9	0.269	0.378	0.500	0.384	0.269	0.311	1.170	0.852	0.971
10	0.237	0.439	0.425	0.394	0.237	0.364	1.544	0.722	0.992
11	0.227	0.418	0.402	0.366	0.227	0.339	1.511	0.669	0.709

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	3.6	1.4	10.0	0.363	0.060	0.060	0.015	0.015
2	7.68	10.00	4.3	1.7	9.0	0.347	0.030	0.030	0.007	0.007
3	26.12	30.01	7.2	3.1	7.7	0.351	0.039	0.039	0.010	0.010
4	35.54	40.01	9.2	4.1	6.8	0.385	0.053	0.053	0.013	0.013
5	37.89	42.49	9.4	3.9	6.8	0.402	0.073	0.073	0.018	0.018
6	40.27	45.00	9.9	4.2	6.8	0.425	0.104	0.104	0.026	0.026
7	42.66	47.51	10.1	4.0	6.8	0.429	0.111	0.111	0.027	0.027
8	45.06	50.01	10.6	4.1	6.3	0.412	0.108	0.108	0.027	0.027
9	64.97	69.99	12.2	4.2	7.6	0.361	0.025	0.025	0.006	0.006
10	87.94	90.00	12.0	3.2	7.1	0.217	0.009	0.009	0.002	0.002
11	94.84	95.01	11.0	2.1	10.5	0.226	0.426	0.426	0.089	0.089

TABLE X. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 50 PERCENT DESIGN SPEED

(c) Reading 888

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	21.0	61.4	55.7	518.7	534.3	14.69	16.20
2	9.510	9.386	0.	20.0	61.2	55.4	518.7	533.6	14.69	16.19
3	8.609	8.620	0.	21.5	58.6	50.8	518.7	533.9	14.69	16.25
4	8.149	8.237	0.	23.4	57.1	47.6	518.7	534.5	14.69	16.28
5	8.034	8.142	0.	25.1	56.9	46.3	518.7	536.1	14.69	16.29
6	7.918	8.046	0.	24.8	56.5	45.5	518.7	536.2	14.69	16.30
7	7.801	7.950	0.	24.1	56.1	44.6	518.7	535.4	14.69	16.35
8	7.684	7.854	0.	24.1	55.9	43.6	518.7	535.1	14.69	16.39
9	6.711	7.089	0.	25.6	53.0	35.6	518.7	535.5	14.69	16.44
10	5.589	6.323	0.	26.0	52.1	23.6	518.7	537.2	14.69	16.61
11	5.252	6.131	0.	27.9	51.2	19.2	518.7	541.1	14.69	16.70

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	369.9	386.2	772.0	640.1	369.9	360.6	0.	138.3	677.6	667.1
2	364.9	384.3	758.3	636.6	364.9	361.0	0.	131.8	664.7	656.0
3	368.5	401.0	707.0	590.4	368.5	373.2	0.	146.7	603.4	604.2
4	369.3	412.2	680.8	560.9	369.3	378.2	0.	163.9	571.9	578.1
5	367.6	416.5	672.7	546.0	367.6	377.3	0.	176.4	563.4	571.0
6	367.7	419.5	665.6	543.6	367.7	380.9	0.	175.9	554.8	563.7
7	367.4	425.7	658.9	545.9	367.4	388.5	0.	174.0	547.0	557.4
8	364.4	430.3	649.3	541.9	364.4	392.7	0.	175.8	537.4	549.2
9	354.5	460.7	589.2	511.0	354.5	415.4	0.	199.4	470.6	497.1
10	305.0	534.5	496.8	524.2	305.0	480.6	0.	234.1	392.1	443.6
11	297.1	556.3	474.1	520.6	297.1	491.7	0.	260.2	369.4	431.2

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.335	0.345	0.699	0.572	0.335	0.322	0.975	0.852	0.941
2	0.330	0.343	0.687	0.569	0.330	0.323	0.989	0.871	0.976
3	0.354	0.359	0.640	0.528	0.354	0.354	1.013	0.888	0.999
4	0.335	0.369	0.617	0.502	0.335	0.338	1.024	0.902	0.976
5	0.333	0.372	0.609	0.488	0.333	0.337	1.026	0.903	0.894
6	0.333	0.375	0.603	0.486	0.333	0.340	1.036	0.904	0.894
7	0.333	0.381	0.597	0.488	0.333	0.347	1.058	0.897	0.961
8	0.330	0.385	0.588	0.485	0.330	0.351	1.078	0.889	0.997
9	0.321	0.413	0.533	0.458	0.321	0.372	1.172	0.827	1.011
10	0.275	0.481	0.448	0.472	0.275	0.433	1.575	0.703	1.001
11	0.268	0.500	0.428	0.468	0.268	0.442	1.655	0.649	0.860

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-0.0	-2.2	10.4	0.249	0.021	0.021	0.005	0.005
2	7.68	10.00	0.9	-1.7	9.9	0.234	0.009	0.009	0.002	0.002
3	26.12	30.01	3.4	-0.7	7.0	0.246	0.000	0.000	0.000	0.000
4	35.54	40.01	4.9	-0.2	6.3	0.266	0.011	0.011	0.003	0.003
5	37.89	42.49	5.2	-0.2	5.6	0.285	0.054	0.054	0.014	0.014
6	40.27	45.00	5.6	-0.2	5.5	0.279	0.056	0.056	0.014	0.014
7	42.66	47.51	5.8	-0.4	5.4	0.266	0.020	0.020	0.005	0.005
8	45.06	50.01	6.2	-0.3	5.2	0.261	0.002	0.002	0.000	0.000
9	64.97	69.99	7.7	-0.3	7.3	0.239	-0.007	-0.007	-0.002	-0.002
10	87.94	90.00	8.1	-0.7	8.1	0.067	-0.001	-0.001	-0.000	-0.000
11	94.84	95.01	6.5	-2.3	7.7	0.034	0.176	0.176	0.037	0.037

TABLE X. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 50 PERCENT DESIGN SPEED

(d) Reading 889

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP OUT	TOTAL PRESS IN	TOTAL PRESS OUT
1	9.728	9.578	0.	7.9	58.4	56.7	518.7	525.9	14.69	15.33
2	9.510	9.386	0.	7.2	58.0	56.1	518.7	525.6	14.69	15.25
3	8.609	8.620	0.	9.2	54.9	51.0	518.7	526.7	14.69	15.43
4	8.149	8.237	0.	11.5	53.4	47.1	518.7	528.6	14.69	15.61
5	8.034	8.142	0.	13.2	52.9	46.0	518.7	529.2	14.69	15.60
6	7.918	8.046	0.	14.7	52.6	45.0	518.7	530.5	14.69	15.60
7	7.801	7.950	0.	14.0	52.2	44.0	518.7	529.6	14.69	15.70
8	7.684	7.854	0.	13.9	51.9	42.6	518.7	529.6	14.69	15.83
9	6.711	7.089	0.	15.3	48.7	34.9	518.7	531.5	14.69	16.05
10	5.589	6.323	0.	18.5	47.7	23.4	518.7	534.3	14.69	16.34
11	5.252	6.131	0.	21.8	46.9	18.4	518.7	538.9	14.69	16.42

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	419.6	409.0	801.4	737.2	419.6	405.1	0.	56.4	682.8	672.3
2	415.6	409.6	784.7	729.2	415.6	406.4	0.	51.5	665.6	656.9
3	422.4	435.2	735.8	682.9	422.4	429.6	0.	69.9	600.0	600.8
4	424.5	459.8	711.5	662.1	424.5	450.5	0.	92.0	571.0	577.2
5	423.6	459.4	703.0	644.1	423.6	447.2	0.	105.1	561.1	568.6
6	423.4	460.9	697.7	630.9	423.4	445.8	0.	117.0	554.5	563.5
7	423.7	472.2	691.6	637.3	423.7	458.2	0.	114.1	546.7	557.1
8	422.8	486.9	685.3	641.8	422.8	472.6	0.	117.0	539.2	551.2
9	411.8	529.4	624.3	622.3	411.8	510.6	0.	139.9	469.3	495.7
10	357.9	611.1	531.5	631.1	357.9	579.4	0.	194.2	393.0	444.6
11	344.5	631.5	504.4	617.9	344.5	586.2	0.	234.9	368.4	430.0

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO	EFF
1	0.381	0.369	0.728	0.665	0.381	0.365	0.966	0.789	0.876
2	0.378	0.369	0.713	0.658	0.378	0.367	0.978	0.811	0.803
3	0.384	0.393	0.667	0.616	0.384	0.388	1.017	0.834	0.908
4	0.386	0.415	0.647	0.598	0.386	0.407	1.061	0.861	0.916
5	0.385	0.414	0.639	0.581	0.385	0.403	1.056	0.860	0.850
6	0.385	0.415	0.634	0.568	0.385	0.402	1.053	0.867	0.752
7	0.385	0.426	0.629	0.575	0.385	0.414	1.082	0.861	0.903
8	0.384	0.440	0.623	0.580	0.384	0.427	1.118	0.857	1.026
9	0.374	0.479	0.567	0.563	0.374	0.462	1.240	0.796	1.034
10	0.324	0.556	0.481	0.574	0.324	0.527	1.619	0.681	1.021
11	0.312	0.575	0.456	0.561	0.312	0.532	1.702	0.625	0.826

RP	PERCENT SPAN IN	PERCENT SPAN OUT	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	3.21	4.99	-3.0	-5.2	11.4	0.111	0.020	0.020	0.005	0.005
2	7.68	10.00	-2.3	-4.9	10.6	0.099	0.031	0.031	0.007	0.007
3	26.12	30.01	-0.4	-4.5	7.3	0.107	0.019	0.019	0.005	0.005
4	35.54	40.01	1.1	-4.0	5.8	0.118	0.025	0.025	0.006	0.006
5	37.89	42.49	1.3	-4.2	5.4	0.139	0.043	0.043	0.011	0.011
6	40.27	45.00	1.8	-4.0	5.0	0.156	0.082	0.082	0.021	0.021
7	42.66	47.51	1.9	-4.3	4.8	0.138	0.030	0.030	0.008	0.008
8	45.06	50.01	2.2	-4.3	4.2	0.124	-0.008	-0.008	-0.002	-0.002
9	64.97	69.99	3.4	-4.6	6.6	0.074	-0.015	-0.015	-0.004	-0.004
10	87.94	90.00	3.6	-5.2	8.0	-0.093	-0.015	-0.015	-0.003	-0.003
11	94.84	95.01	2.2	-6.6	7.0	-0.113	0.175	0.175	0.037	0.037

TABLE X. - Concluded. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 50 PERCENT DESIGN SPEED

(e) Reading 890

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	-2.9	56.3	59.2	518.7	517.4	14.69	14.27
2	9.510	9.386	0.	-3.1	56.0	58.3	518.7	517.0	14.69	14.30
3	8.609	8.620	0.	0.3	52.9	52.1	518.7	519.1	14.69	14.71
4	8.149	8.237	0.	2.8	51.1	48.5	518.7	522.0	14.69	14.82
5	8.034	8.142	0.	4.0	50.8	47.6	518.7	523.8	14.69	14.81
6	7.918	8.046	0.	6.4	50.3	46.1	518.7	524.8	14.69	14.78
7	7.801	7.950	0.	7.9	49.9	45.5	518.7	525.1	14.69	15.04
8	7.684	7.854	0.	6.9	49.4	42.6	518.7	524.5	14.69	15.21
9	6.711	7.089	0.	10.3	46.3	34.1	518.7	527.7	14.69	15.65
10	5.589	6.325	0.	14.7	45.4	22.5	518.7	532.1	14.69	16.24
11	5.252	6.131	0.	17.3	45.1	18.9	518.7	537.2	14.69	16.23

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	454.0	413.1	818.2	804.7	454.0	412.5	0.	-20.8	680.6	670.1
2	449.8	421.4	804.0	799.9	449.8	420.8	0.	-22.5	666.4	657.7
3	454.9	467.4	754.8	761.3	454.9	467.4	0.	2.1	602.3	603.1
4	458.1	487.6	730.2	735.5	458.1	487.1	0.	23.6	568.6	574.7
5	458.6	490.1	725.3	724.9	458.6	488.9	0.	34.3	562.0	569.5
6	460.1	491.7	720.2	704.8	460.1	488.6	0.	55.1	554.0	563.0
7	459.5	516.4	713.7	705.2	459.5	511.5	0.	71.1	546.2	556.6
8	459.2	530.1	706.2	715.5	459.2	526.3	0.	63.7	536.5	548.4
9	448.4	586.9	649.2	697.3	448.4	577.4	0.	105.1	469.5	496.0
10	384.7	679.0	548.3	709.8	384.7	656.7	0.	172.5	390.7	442.0
11	368.0	689.3	520.9	695.8	368.0	658.2	0.	204.7	368.7	430.4

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.414	0.376	0.745	0.732	0.414	0.375	0.909	0.746	3.421
2	0.410	0.384	0.732	0.728	0.410	0.383	0.936	0.737	2.423
3	0.414	0.426	0.688	0.694	0.414	0.426	1.027	0.807	0.367
4	0.417	0.444	0.665	0.670	0.417	0.443	1.063	0.831	0.393
5	0.418	0.445	0.661	0.659	0.418	0.444	1.066	0.837	0.226
6	0.419	0.447	0.656	0.640	0.419	0.444	1.062	0.842	0.138
7	0.419	0.470	0.651	0.642	0.419	0.465	1.113	0.837	0.542
8	0.419	0.483	0.644	0.652	0.419	0.480	1.146	0.828	0.888
9	0.408	0.536	0.591	0.657	0.408	0.527	1.288	0.780	1.049
10	0.349	0.623	0.497	0.652	0.349	0.603	1.707	0.665	1.128
11	0.333	0.630	0.472	0.636	0.333	0.602	1.789	0.615	0.806

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-5.1	-7.3	13.9	0.027	0.066	0.066	0.015	0.015
2	7.68	10.00	-4.4	-6.9	12.7	0.017	0.053	0.053	0.012	0.012
3	26.12	30.01	-2.3	-6.4	8.4	-0.008	0.007	0.007	0.002	0.002
4	35.54	40.01	-1.1	-6.3	7.2	0.005	0.052	0.052	0.013	0.013
5	37.89	42.49	-0.9	-6.3	6.9	0.018	0.104	0.104	0.026	0.026
6	40.27	45.00	-0.6	-6.4	6.0	0.049	0.138	0.138	0.034	0.034
7	42.66	47.51	-0.4	-6.6	4.3	0.048	0.079	0.079	0.020	0.020
8	45.06	50.01	-0.3	-6.8	4.2	0.019	0.018	0.018	0.005	0.005
9	64.97	69.99	1.0	-7.0	5.8	-0.025	-0.014	-0.014	-0.004	-0.004
10	87.94	90.00	1.4	-7.4	6.9	-0.215	-0.075	-0.075	-0.017	-0.017
11	94.84	95.01	0.3	-8.5	7.4	-0.241	0.168	0.168	0.036	0.036

TABLE XI. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 60 PERCENT DESIGN SPEED

(a) Reading 891

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	60.0	70.6	54.6	518.7	569.5	14.69	18.14
2	9.510	9.386	0.	53.2	70.5	52.1	518.7	566.0	14.69	18.08
3	8.609	8.620	0.	46.3	68.3	46.9	518.7	557.9	14.69	17.97
4	8.149	8.237	0.	49.8	67.2	43.2	518.7	557.6	14.69	17.91
5	8.034	8.142	0.	49.3	67.1	42.7	518.7	558.0	14.69	17.86
6	7.918	8.046	0.	51.3	66.4	41.2	518.7	558.0	14.69	17.84
7	7.801	7.950	0.	51.4	66.3	39.8	518.7	558.9	14.69	17.88
8	7.684	7.854	0.	52.4	65.8	37.5	518.7	559.4	14.69	17.98
9	6.711	7.089	0.	40.8	62.3	33.4	518.7	552.2	14.69	18.00
10	5.589	6.323	0.	38.8	60.4	21.7	518.7	550.9	14.69	18.10
11	5.252	6.131	0.	42.8	60.6	14.3	518.7	554.3	14.69	18.19

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	290.2	516.9	873.5	445.9	290.2	258.3	0.	447.7	823.9	811.2
2	285.5	507.1	856.5	495.2	285.5	303.9	0.	405.9	807.5	797.0
3	291.2	501.2	786.7	506.6	291.2	346.5	0.	362.2	730.8	731.8
4	290.9	510.0	749.9	451.2	290.9	328.9	0.	389.8	691.2	698.6
5	289.9	510.3	743.4	452.3	289.9	332.5	0.	387.2	684.6	693.8
6	292.8	513.1	732.1	426.8	292.8	320.9	0.	400.4	670.9	681.8
7	291.0	519.7	724.4	421.4	291.0	323.9	0.	406.4	663.4	676.1
8	293.8	529.8	716.4	407.8	293.8	323.5	0.	419.5	653.4	667.9
9	299.9	522.3	644.3	473.9	299.9	395.5	0.	341.2	570.3	602.4
10	269.8	573.3	545.8	481.2	269.8	447.1	0.	358.8	474.5	536.8
11	251.4	600.7	511.7	455.1	251.4	441.0	0.	407.9	445.6	520.2

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.262	0.451	0.788	0.389	0.262	0.225	0.890	1.217	0.633
2	0.257	0.443	0.772	0.433	0.257	0.266	1.064	1.230	0.669
3	0.263	0.441	0.710	0.446	0.263	0.305	1.190	1.218	0.782
4	0.262	0.449	0.676	0.398	0.262	0.290	1.130	1.220	0.774
5	0.261	0.450	0.671	0.398	0.261	0.293	1.147	1.226	0.758
6	0.264	0.452	0.660	0.376	0.264	0.283	1.096	1.215	0.751
7	0.262	0.458	0.653	0.371	0.262	0.285	1.113	1.210	0.744
8	0.265	0.467	0.646	0.359	0.265	0.285	1.101	1.197	0.756
9	0.271	0.463	0.581	0.420	0.271	0.351	1.319	1.086	0.925
10	0.243	0.511	0.492	0.429	0.243	0.399	1.657	0.910	0.989
11	0.226	0.535	0.461	0.406	0.226	0.393	1.754	0.847	0.916

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	9.2	7.0	9.3	0.712	0.323	0.323	0.082	0.082
2	7.68	10.00	10.2	7.6	6.6	0.623	0.285	0.285	0.075	0.075
3	26.12	30.01	13.1	9.0	3.1	0.536	0.185	0.185	0.049	0.049
4	35.54	40.01	14.9	9.8	1.9	0.592	0.206	0.206	0.056	0.056
5	37.89	42.49	15.4	10.0	2.0	0.584	0.226	0.226	0.061	0.061
6	40.27	45.00	15.6	9.8	1.2	0.615	0.238	0.238	0.064	0.064
7	42.66	47.51	16.0	9.9	0.6	0.619	0.255	0.255	0.069	0.069
8	45.06	50.01	16.1	9.6	-0.9	0.638	0.251	0.251	0.070	0.070
9	64.97	69.99	17.0	9.0	5.1	0.431	0.079	0.079	0.020	0.020
10	87.94	90.00	16.4	7.6	6.4	0.289	0.015	0.015	0.003	0.003
11	94.84	95.01	16.0	7.1	3.1	0.303	0.143	0.143	0.031	0.031

TABLE XI. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 60 PERCENT DESIGN SPEED

(b) Reading 894

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	16.0	59.8	56.6	518.7	537.0	14.69	16.37
2	9.510	9.386	0.	14.9	59.4	55.7	518.7	536.5	14.69	16.37
3	8.609	8.620	0.	16.3	56.6	51.2	518.7	536.9	14.69	16.45
4	8.149	8.237	0.	18.4	55.0	47.7	518.7	538.7	14.69	16.56
5	8.034	8.142	0.	19.0	54.7	46.8	518.7	540.9	14.69	16.58
6	7.918	8.046	0.	20.9	54.3	45.4	518.7	541.5	14.69	16.57
7	7.801	7.950	0.	21.3	53.9	43.7	518.7	540.1	14.69	16.72
8	7.684	7.854	0.	19.0	53.6	43.5	518.7	539.4	14.69	16.82
9	6.711	7.089	0.	21.2	50.7	35.2	518.7	540.7	14.69	16.98
10	5.589	6.323	0.	23.1	49.1	23.7	518.7	543.5	14.69	17.25
11	5.252	6.131	0.	27.4	49.4	17.3	518.7	548.3	14.69	17.46

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	477.9	466.3	949.1	813.5	477.9	448.3	0.	128.5	820.0	807.3
2	473.8	472.0	930.7	810.0	473.8	456.2	0.	121.3	801.0	790.6
3	478.2	491.5	868.3	753.6	478.2	471.7	0.	138.1	724.8	725.8
4	479.3	509.9	836.4	719.3	479.3	484.0	0.	160.6	685.4	692.8
5	478.7	514.4	829.1	711.0	478.7	486.4	0.	167.5	676.9	686.0
6	479.4	519.3	821.4	691.7	479.4	485.3	0.	184.9	667.0	677.8
7	478.4	534.0	812.8	688.7	478.4	497.7	0.	193.6	657.2	669.7
8	477.8	541.8	805.2	706.1	477.8	512.3	0.	176.4	648.1	662.4
9	462.0	585.1	729.9	668.0	462.0	545.5	0.	211.5	565.1	597.0
10	408.2	668.9	623.0	672.1	408.2	615.4	0.	262.3	470.7	532.5
11	378.8	700.2	582.2	651.2	378.8	621.6	0.	322.3	442.2	516.2

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.436	0.418	0.866	0.729	0.436	0.402	0.938	0.996	0.886
2	0.432	0.423	0.849	0.726	0.432	0.409	0.963	1.016	0.915
3	0.436	0.441	0.793	0.676	0.436	0.423	0.987	1.042	0.932
4	0.438	0.457	0.763	0.645	0.438	0.434	1.010	1.061	0.900
5	0.437	0.461	0.757	0.637	0.437	0.436	1.016	1.066	0.820
6	0.438	0.465	0.750	0.619	0.438	0.435	1.012	1.068	0.797
7	0.437	0.479	0.742	0.618	0.437	0.447	1.040	1.060	0.914
8	0.436	0.487	0.735	0.635	0.436	0.461	1.072	1.054	0.988
9	0.421	0.527	0.665	0.602	0.421	0.492	1.181	0.980	0.995
10	0.371	0.607	0.566	0.609	0.371	0.558	1.508	0.828	0.981
11	0.343	0.634	0.528	0.590	0.343	0.563	1.641	0.768	0.885

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-1.7	-3.9	11.3	0.202	0.035	0.035	0.008	0.008
2	7.68	10.00	-1.0	-3.5	10.2	0.185	0.026	0.026	0.006	0.006
3	26.12	30.01	1.4	-2.7	7.5	0.194	0.024	0.024	0.006	0.006
4	35.54	40.01	2.8	-2.4	6.4	0.212	0.041	0.041	0.010	0.010
5	37.89	42.49	3.1	-2.4	6.2	0.217	0.082	0.082	0.020	0.020
6	40.27	45.00	3.4	-2.3	5.4	0.240	0.095	0.095	0.024	0.024
7	42.66	47.51	3.6	-2.5	4.5	0.238	0.039	0.039	0.010	0.010
8	45.06	50.01	3.9	-2.6	5.1	0.200	0.005	0.005	0.001	0.001
9	64.97	69.99	5.4	-2.6	6.9	0.176	0.003	0.003	0.001	0.001
10	87.94	90.00	5.0	-3.8	8.5	0.050	0.016	0.016	0.004	0.004
11	94.84	95.01	4.7	-4.1	5.9	0.015	0.130	0.130	0.028	0.028

TABLE XI. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 60 PERCENT DESIGN SPEED

(c) Reading 895

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	24.4	61.6	55.7	518.7	545.2	14.69	17.23
2	9.510	9.386	0.	23.4	61.4	55.1	518.7	544.0	14.69	17.22
3	8.609	8.620	0.	24.6	58.8	50.7	518.7	543.5	14.69	17.25
4	8.149	8.257	0.	26.8	57.5	47.5	518.7	544.6	14.69	17.25
5	8.034	8.142	0.	27.8	57.1	46.4	518.7	546.2	14.69	17.26
6	7.918	8.046	0.	29.3	56.8	45.4	518.7	546.2	14.69	17.25
7	7.801	7.950	0.	28.5	56.5	44.7	518.7	545.2	14.69	17.30
8	7.684	7.854	0.	28.0	56.1	43.4	518.7	544.9	14.69	17.36
9	6.711	7.089	0.	27.8	53.4	35.8	518.7	544.6	14.69	17.42
10	5.589	6.323	0.	29.1	52.5	23.0	518.7	546.4	14.69	17.59
11	5.252	6.131	0.	32.2	52.5	17.1	518.7	550.8	14.69	17.74

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	442.9	460.8	931.1	745.4	442.9	419.7	0.	190.3	819.0	806.3
2	436.3	461.8	912.6	740.7	436.3	423.8	0.	183.6	801.6	791.1
3	439.5	475.6	847.6	682.0	439.5	432.4	0.	198.3	724.8	725.7
4	437.0	485.8	812.3	642.0	437.0	433.7	0.	218.8	684.8	692.2
5	436.4	490.7	803.8	628.9	436.4	434.0	0.	229.0	675.1	684.2
6	435.3	492.1	795.4	611.3	435.3	429.1	0.	241.0	665.7	676.4
7	435.8	497.6	789.0	615.1	435.8	437.2	0.	237.7	657.8	670.4
8	434.2	505.0	777.8	614.1	434.2	445.9	0.	237.2	645.3	659.6
9	419.4	539.8	703.3	589.0	419.4	477.6	0.	251.7	564.6	596.4
10	360.8	621.2	593.2	589.9	360.8	542.9	0.	301.9	470.8	532.6
11	339.7	651.6	557.8	577.0	339.7	551.5	0.	346.9	442.4	516.4

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.403	0.409	0.848	0.662	0.403	0.373	0.948	1.039	0.911
2	0.397	0.411	0.830	0.659	0.397	0.377	0.971	1.060	0.952
3	0.400	0.424	0.771	0.607	0.400	0.385	0.984	1.074	0.978
4	0.398	0.433	0.739	0.572	0.398	0.386	0.993	1.089	0.936
5	0.397	0.436	0.731	0.559	0.397	0.386	0.995	1.090	0.889
6	0.396	0.438	0.724	0.544	0.396	0.382	0.986	1.094	0.884
7	0.396	0.443	0.718	0.548	0.396	0.389	1.003	1.088	0.936
8	0.395	0.450	0.708	0.548	0.395	0.398	1.027	1.075	0.963
9	0.381	0.483	0.639	0.527	0.381	0.427	1.139	0.999	0.998
10	0.327	0.559	0.537	0.531	0.327	0.488	1.505	0.849	0.986
11	0.307	0.586	0.504	0.518	0.307	0.496	1.623	0.787	0.894

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	0.2	-2.0	10.4	0.288	0.040	0.040	0.010	0.010
2	7.68	10.00	1.1	-1.5	9.6	0.274	0.021	0.021	0.005	0.005
3	26.12	30.01	3.6	-0.6	6.9	0.287	0.011	0.011	0.003	0.003
4	35.54	40.01	5.2	0.1	6.2	0.310	0.035	0.035	0.009	0.009
5	37.89	42.49	5.5	0.0	5.7	0.323	0.065	0.065	0.016	0.016
6	40.27	45.00	5.9	0.2	5.4	0.341	0.069	0.069	0.017	0.017
7	42.66	47.51	6.1	-0.0	5.5	0.328	0.038	0.038	0.010	0.010
8	45.06	50.01	6.4	-0.1	5.0	0.318	0.022	0.022	0.006	0.006
9	64.97	69.99	8.1	0.1	7.5	0.275	0.001	0.001	0.000	0.000
10	87.94	90.00	8.5	-0.3	7.6	0.137	0.014	0.014	0.003	0.003
11	94.84	95.01	7.8	-1.0	5.7	0.116	0.140	0.140	0.030	0.030

TABLE XI. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 60 PERCENT DESIGN SPEED

(d) Reading 896

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	32.5	64.4	55.6	518.7	552.4	14.69	17.88
2	9.510	9.386	0.	30.9	64.1	55.0	518.7	550.7	14.69	17.86
3	8.609	8.620	0.	33.3	61.8	50.8	518.7	549.5	14.69	17.74
4	8.149	8.237	0.	35.1	60.8	48.1	518.7	550.2	14.69	17.68
5	8.034	8.142	0.	36.8	60.5	47.2	518.7	551.1	14.69	17.65
6	7.918	8.046	0.	37.8	60.2	46.9	518.7	551.4	14.69	17.59
7	7.801	7.950	0.	38.5	60.0	45.8	518.7	551.4	14.69	17.59
8	7.684	7.854	0.	38.1	59.7	44.3	518.7	551.2	14.69	17.62
9	6.711	7.089	0.	34.9	56.8	36.1	518.7	548.4	14.69	17.71
10	5.589	6.323	0.	34.2	55.8	22.8	518.7	548.4	14.69	17.85
11	5.252	6.131	0.	37.0	55.0	16.5	518.7	551.6	14.69	17.97

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	392.6	455.6	908.2	680.7	392.6	384.4	0.	244.5	819.0	806.3
2	387.9	453.8	889.7	679.6	387.9	389.3	0.	233.2	800.6	790.2
3	387.9	461.5	822.0	610.0	387.9	385.8	0.	253.3	724.8	725.7
4	382.0	465.6	784.2	570.2	382.0	380.9	0.	267.9	684.9	692.5
5	382.1	467.7	775.9	550.9	382.1	374.5	0.	280.5	675.2	684.5
6	381.0	465.5	765.8	535.6	381.0	366.2	0.	284.1	664.5	675.0
7	379.5	468.5	757.7	525.7	379.5	366.4	0.	291.5	655.9	668.4
8	377.7	476.5	748.1	524.4	377.7	375.2	0.	293.7	645.7	660.0
9	369.8	510.1	675.1	517.5	369.8	418.5	0.	292.0	564.9	596.7
10	319.8	584.9	568.7	524.6	319.8	483.7	0.	328.9	470.5	532.1
11	309.0	613.8	538.6	511.1	309.0	490.0	0.	369.6	441.2	515.0

	ABS MACH NO		REL MACH NO		MERID MACH NO			MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT		VEL R	MACH NO	
1	0.356	0.402	0.824	0.600	0.356	0.359		0.979	1.096	0.888
2	0.352	0.401	0.807	0.600	0.352	0.344		1.004	1.109	0.930
3	0.352	0.408	0.745	0.540	0.352	0.341		0.995	1.117	0.933
4	0.346	0.412	0.711	0.504	0.346	0.337		0.997	1.129	0.894
5	0.346	0.413	0.703	0.487	0.346	0.331		0.980	1.129	0.860
6	0.345	0.409	0.694	0.473	0.345	0.323		0.961	1.128	0.836
7	0.344	0.414	0.687	0.464	0.344	0.324		0.966	1.122	0.837
8	0.342	0.421	0.678	0.464	0.342	0.332		0.993	1.113	0.850
9	0.335	0.453	0.612	0.460	0.335	0.372		1.131	1.027	0.958
10	0.289	0.523	0.514	0.469	0.289	0.433		1.513	0.869	1.000
11	0.279	0.549	0.486	0.457	0.279	0.438		1.586	0.800	0.932

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	3.0	0.8	10.3	0.367	0.066	0.066	0.016	0.016
2	7.68	10.00	3.8	1.2	9.5	0.348	0.040	0.040	0.010	0.010
3	26.12	30.01	6.6	2.5	7.0	0.378	0.043	0.043	0.011	0.011
4	35.54	40.01	8.6	3.5	6.8	0.400	0.074	0.074	0.018	0.018
5	37.89	42.49	8.8	3.4	6.5	0.423	0.102	0.102	0.025	0.025
6	40.27	45.00	9.3	3.5	6.8	0.435	0.123	0.123	0.030	0.030
7	42.66	47.51	9.6	3.5	6.6	0.444	0.124	0.124	0.031	0.031
8	45.06	50.01	10.0	3.5	5.9	0.438	0.116	0.116	0.029	0.029
9	64.97	69.99	11.5	3.5	7.8	0.369	0.037	0.037	0.009	0.009
10	87.94	90.00	11.8	3.0	7.4	0.227	0.000	0.000	0.000	0.000
11	94.84	95.01	10.3	1.5	5.2	0.217	0.098	0.098	0.021	0.021

TABLE XI. - Concluded. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 60 PERCENT DESIGN SPEED

(e) Reading 897

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	41.6	67.1	57.1	518.7	557.9	14.69	17.93
2	9.510	9.386	0.	37.8	67.0	55.8	518.7	555.1	14.69	17.93
3	8.609	8.620	0.	39.2	64.8	51.6	518.7	553.4	14.69	17.87
4	8.149	8.237	0.	42.3	63.7	49.1	518.7	553.1	14.69	17.78
5	8.034	8.142	0.	43.3	63.5	48.7	518.7	553.5	14.69	17.72
6	7.918	8.046	0.	44.5	63.2	47.9	518.7	554.3	14.69	17.70
7	7.801	7.950	0.	44.9	62.9	46.3	518.7	555.2	14.69	17.74
8	7.684	7.854	0.	44.2	62.5	44.3	518.7	555.6	14.69	17.82
9	6.711	7.089	0.	38.1	59.4	36.4	518.7	550.1	14.69	17.86
10	5.589	6.323	0.	36.9	57.7	22.9	518.7	549.5	14.69	17.95
11	5.252	6.131	0.	39.3	57.1	16.8	518.7	553.4	14.69	18.03

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	346.0	443.5	889.8	610.9	346.0	331.8	0.	294.3	819.8	807.2
2	340.6	445.3	870.5	625.8	340.6	351.7	0.	273.1	801.2	790.7
3	340.5	450.5	800.0	561.7	340.5	349.1	0.	284.8	724.0	724.9
4	338.4	453.0	763.8	512.2	338.4	335.2	0.	304.8	684.8	692.1
5	337.6	452.4	755.8	498.7	337.6	329.0	0.	310.6	676.2	685.3
6	338.0	455.3	748.6	484.8	338.0	324.9	0.	319.0	668.0	678.8
7	337.2	462.8	739.0	474.7	337.2	327.7	0.	326.8	657.6	670.2
8	338.0	474.2	731.0	474.9	338.0	339.8	0.	330.7	648.1	662.5
9	333.7	498.8	656.3	487.4	333.7	392.5	0.	307.9	565.1	596.9
10	298.3	569.0	558.2	493.5	298.3	454.7	0.	342.0	471.8	533.7
11	286.5	595.7	527.0	481.5	286.5	461.0	0.	377.3	442.3	516.3

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.313	0.389	0.805	0.536	0.313	0.291	0.959	1.148	0.775
2	0.308	0.391	0.787	0.550	0.308	0.309	1.033	1.158	0.835
3	0.308	0.397	0.723	0.495	0.308	0.308	1.025	1.156	0.859
4	0.306	0.399	0.691	0.451	0.306	0.295	0.990	1.164	0.844
5	0.305	0.399	0.683	0.439	0.305	0.290	0.975	1.166	0.819
6	0.306	0.401	0.677	0.427	0.306	0.286	0.961	1.169	0.796
7	0.305	0.407	0.668	0.418	0.305	0.288	0.972	1.157	0.786
8	0.306	0.418	0.661	0.418	0.306	0.299	1.006	1.147	0.797
9	0.302	0.442	0.593	0.432	0.302	0.348	1.176	1.050	0.948
10	0.269	0.508	0.504	0.440	0.269	0.406	1.525	0.885	0.990
11	0.258	0.531	0.475	0.429	0.258	0.411	1.609	0.816	0.900

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	5.7	3.5	11.8	0.457	0.154	0.154	0.037	0.037
2	7.68	10.00	6.6	4.1	10.3	0.414	0.111	0.111	0.027	0.027
3	26.12	30.01	9.6	5.5	7.8	0.437	0.104	0.104	0.025	0.025
4	35.54	40.01	11.5	6.3	7.8	0.478	0.123	0.123	0.030	0.030
5	37.89	42.49	11.8	6.4	8.1	0.492	0.147	0.147	0.036	0.036
6	40.27	45.00	12.3	6.5	7.9	0.507	0.172	0.172	0.041	0.041
7	42.66	47.51	12.5	6.4	7.2	0.516	0.189	0.189	0.046	0.046
8	45.06	50.01	12.8	6.3	5.9	0.510	0.185	0.185	0.046	0.046
9	64.97	69.99	14.1	6.1	8.1	0.405	0.050	0.050	0.012	0.012
10	87.94	90.00	15.7	4.9	7.5	0.275	0.013	0.013	0.003	0.003
11	94.84	95.01	12.4	3.6	5.4	0.259	0.158	0.158	0.034	0.034

TABLE XII. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

(a) Reading 898

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	8.1	59.3	58.5	518.7	532.9	14.69	15.61
2	9.510	9.386	0.	8.0	59.0	57.9	518.7	532.4	14.69	15.56
3	8.609	8.620	0.	9.8	56.1	52.8	518.7	534.2	14.69	15.90
4	8.149	8.237	0.	13.3	54.5	49.3	518.7	540.1	14.69	16.06
5	8.034	8.142	0.	14.9	54.1	48.5	518.7	540.6	14.69	15.97
6	7.918	8.046	0.	15.0	53.7	48.4	518.7	542.5	14.69	15.84
7	7.801	7.950	0.	15.5	53.3	46.4	518.7	543.2	14.69	16.13
8	7.684	7.854	0.	16.2	52.9	44.1	518.7	543.2	14.69	16.53
9	6.711	7.089	0.	17.5	50.0	35.7	518.7	545.6	14.69	17.27
10	5.589	6.323	0.	21.8	49.2	24.4	518.7	552.8	14.69	18.03
11	5.252	6.131	0.	25.2	49.3	19.7	518.7	558.7	14.69	18.31

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	568.0	535.8	1111.0	1014.7	568.0	530.5	0.	75.2	954.8	940.1
2	560.3	535.9	1087.2	998.2	560.3	530.8	0.	74.1	931.7	919.5
3	566.5	574.9	1015.3	936.3	566.5	566.4	0.	98.2	842.6	843.6
4	569.9	595.1	981.0	885.1	569.9	577.2	0.	136.1	798.5	807.1
5	569.8	591.9	971.5	862.4	569.8	572.0	0.	152.1	786.9	797.5
6	570.0	585.7	962.9	851.8	570.0	565.7	0.	151.7	776.0	788.5
7	567.9	607.7	950.7	848.7	567.9	585.6	0.	162.7	762.4	777.0
8	569.5	636.0	944.7	850.8	569.5	610.6	0.	177.9	753.7	770.3
9	550.7	702.9	857.3	825.5	550.7	670.2	0.	212.0	657.0	694.0
10	472.5	785.2	723.8	798.3	472.5	727.2	0.	290.9	548.3	620.3
11	442.2	798.5	677.7	767.5	442.2	722.4	0.	340.1	513.5	599.5

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.523	0.485	1.022	0.918	0.523	0.480	0.934	1.134	0.638
2	0.515	0.485	0.999	0.903	0.515	0.480	0.947	1.180	0.626
3	0.521	0.521	0.934	0.849	0.521	0.513	1.000	1.210	0.762
4	0.524	0.535	0.903	0.799	0.524	0.521	1.013	1.236	0.625
5	0.524	0.534	0.894	0.778	0.524	0.516	1.004	1.239	0.573
6	0.525	0.527	0.886	0.767	0.525	0.509	0.992	1.244	0.474
7	0.522	0.548	0.875	0.765	0.522	0.528	1.031	1.230	0.572
8	0.524	0.575	0.869	0.769	0.524	0.552	1.072	1.226	0.727
9	0.506	0.638	0.787	0.750	0.506	0.609	1.217	1.141	0.910
10	0.431	0.713	0.660	0.727	0.431	0.662	1.539	0.970	0.918
11	0.403	0.724	0.617	0.696	0.403	0.655	1.635	0.895	0.840

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-2.1	-4.4	13.2	0.116	0.068	0.067	0.015	0.015
2	7.68	10.00	-1.4	-3.9	12.3	0.111	0.070	0.068	0.016	0.016
3	26.12	30.01	0.9	-3.3	9.0	0.116	0.056	0.055	0.013	0.013
4	35.54	40.01	2.2	-2.9	8.0	0.150	0.125	0.124	0.030	0.030
5	37.89	42.49	2.4	-3.0	7.8	0.170	0.148	0.147	0.036	0.036
6	40.27	45.00	2.8	-3.0	8.3	0.173	0.198	0.198	0.047	0.047
7	42.66	47.51	3.0	-3.2	7.2	0.169	0.170	0.169	0.042	0.042
8	45.06	50.01	3.2	-3.3	8.7	0.166	0.111	0.110	0.028	0.028
9	64.97	69.99	4.7	-3.3	7.4	0.115	0.047	0.047	0.012	0.012
10	87.94	90.00	5.2	-3.6	8.9	0.001	0.072	0.072	0.016	0.016
11	94.84	95.01	4.6	-4.3	8.2	-0.011	0.183	0.183	0.039	0.039

TABLE XII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

(b) Reading 899

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	14.4	59.4	58.1	518.7	540.9	14.69	16.49
2	9.510	9.386	0.	13.8	59.3	57.4	518.7	540.5	14.69	16.54
3	8.609	8.620	0.	15.4	56.5	52.4	518.7	542.2	14.69	16.84
4	8.149	8.237	0.	18.5	55.0	48.3	518.7	546.6	14.69	17.02
5	8.034	8.142	0.	20.2	54.6	47.4	518.7	549.1	14.69	16.96
6	7.918	8.046	0.	22.6	54.2	46.1	518.7	549.9	14.69	16.89
7	7.801	7.950	0.	22.6	53.8	44.5	518.7	548.7	14.69	17.11
8	7.684	7.854	0.	20.7	53.4	43.4	518.7	547.4	14.69	17.40
9	6.711	7.089	0.	21.1	50.6	35.7	518.7	548.4	14.69	17.75
10	5.589	6.323	0.	24.0	49.3	24.1	518.7	552.7	14.69	18.25
11	5.252	6.131	0.	28.1	50.0	18.0	518.7	560.4	14.69	18.52

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	561.1	518.5	1103.8	950.4	561.1	502.2	0.	129.0	950.6	935.9
2	553.5	524.2	1085.3	945.4	553.5	509.1	0.	124.8	933.6	921.4
3	557.4	556.9	1011.1	879.9	557.4	537.0	0.	147.6	843.6	844.7
4	558.5	583.6	974.5	852.5	558.5	553.5	0.	185.2	798.5	807.2
5	558.9	583.4	964.4	808.5	558.9	547.5	0.	201.7	786.0	796.6
6	558.3	585.7	955.5	780.2	558.3	540.7	0.	225.5	775.5	788.0
7	558.0	600.8	944.6	777.8	558.0	554.5	0.	231.3	762.3	776.8
8	559.5	620.9	937.9	799.8	559.5	580.8	0.	219.6	752.8	769.5
9	539.1	672.3	849.3	772.7	539.1	627.2	0.	241.9	656.2	693.2
10	471.2	760.0	722.8	760.8	471.2	694.4	0.	309.2	548.1	620.1
11	431.1	790.8	670.6	733.5	431.1	697.5	0.	372.7	513.6	599.6

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.516	0.465	1.015	0.852	0.516	0.450	0.895	1.140	0.780
2	0.508	0.470	0.997	0.848	0.508	0.457	0.920	1.192	0.818
3	0.512	0.500	0.929	0.790	0.512	0.482	0.963	1.220	0.880
4	0.513	0.523	0.896	0.746	0.513	0.496	0.991	1.244	0.797
5	0.514	0.522	0.886	0.723	0.514	0.489	0.980	1.244	0.714
6	0.513	0.523	0.878	0.697	0.513	0.483	0.968	1.250	0.676
7	0.513	0.538	0.868	0.697	0.513	0.497	0.994	1.236	0.771
8	0.514	0.558	0.862	0.719	0.514	0.522	1.038	1.230	0.893
9	0.495	0.607	0.779	0.697	0.495	0.566	1.163	1.144	0.968
10	0.430	0.690	0.659	0.691	0.430	0.631	1.474	0.970	0.974
11	0.392	0.716	0.610	0.664	0.392	0.631	1.618	0.900	0.850

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-1.9	-4.2	12.8	0.190	0.064	0.063	0.015	0.015
2	7.68	10.00	-1.0	-3.6	11.9	0.178	0.054	0.052	0.012	0.012
3	26.12	30.01	1.3	-2.8	8.6	0.187	0.042	0.041	0.010	0.010
4	35.54	40.01	2.8	-2.4	7.0	0.217	0.089	0.088	0.022	0.022
5	37.89	42.49	2.9	-2.5	6.7	0.239	0.137	0.136	0.034	0.034
6	40.27	45.00	3.4	-2.4	6.0	0.269	0.161	0.160	0.040	0.040
7	42.66	47.51	3.4	-2.7	5.3	0.264	0.112	0.112	0.028	0.028
8	45.06	50.01	3.7	-2.8	5.0	0.250	0.051	0.051	0.013	0.013
9	64.97	69.99	5.3	-2.7	7.4	0.180	0.019	0.019	0.005	0.005
10	87.94	90.00	5.3	-3.5	8.7	0.058	0.023	0.023	0.005	0.005
11	94.84	95.01	5.3	-3.5	6.6	0.040	0.182	0.182	0.039	0.039

TABLE XII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

(c) Reading 900

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	22.5	60.2	56.0	518.7	552.2	14.69	17.97
2	9.510	9.386	0.	21.8	60.0	55.3	518.7	550.6	14.69	17.95
3	8.609	8.620	0.	22.3	57.4	50.9	518.7	550.5	14.69	17.99
4	8.149	8.237	0.	24.5	56.0	47.5	518.7	553.6	14.69	18.03
5	8.034	8.142	0.	25.8	55.7	46.7	518.7	555.7	14.69	18.00
6	7.918	8.046	0.	26.8	55.3	45.4	518.7	555.4	14.69	18.01
7	7.801	7.950	0.	26.4	55.0	44.2	518.7	553.0	14.69	18.14
8	7.684	7.854	0.	26.5	54.6	43.1	518.7	552.8	14.69	18.22
9	6.711	7.089	0.	25.9	51.9	36.1	518.7	552.5	14.69	18.29
10	5.589	6.323	0.	27.7	51.1	25.8	518.7	555.1	14.69	18.56
11	5.252	6.131	0.	31.6	51.1	17.2	518.7	561.7	14.69	18.83

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	545.1	534.4	1097.0	883.1	545.1	493.6	0.	204.9	951.9	937.3
2	536.6	535.6	1074.2	874.6	536.6	497.4	0.	199.0	930.6	918.4
3	538.1	555.0	998.5	813.5	538.1	513.3	0.	211.1	841.1	842.2
4	537.8	572.0	960.8	770.2	537.8	520.6	0.	237.1	796.2	804.8
5	536.8	572.9	952.8	752.5	536.8	515.7	0.	249.7	787.2	797.8
6	535.9	580.2	941.6	738.0	535.9	518.1	0.	261.3	774.3	786.8
7	534.2	590.4	931.0	737.7	534.2	528.8	0.	262.7	762.5	777.1
8	533.7	598.3	921.4	732.8	533.7	535.4	0.	267.3	751.0	767.6
9	515.3	634.5	834.2	706.4	515.3	570.9	0.	276.9	656.0	693.0
10	442.4	724.1	704.0	700.8	442.4	641.1	0.	336.5	547.6	619.6
11	413.5	761.2	658.9	678.9	413.5	648.6	0.	398.4	513.0	598.9

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.500	0.474	1.007	0.784	0.500	0.438	0.905	1.171	0.916
2	0.492	0.476	0.985	0.778	0.492	0.442	0.927	1.205	0.957
3	0.494	0.494	0.916	0.724	0.494	0.457	0.954	1.231	0.970
4	0.493	0.509	0.881	0.685	0.493	0.463	0.968	1.253	0.895
5	0.492	0.508	0.874	0.668	0.492	0.458	0.961	1.260	0.857
6	0.491	0.515	0.864	0.656	0.491	0.460	0.967	1.261	0.845
7	0.490	0.526	0.854	0.658	0.490	0.471	0.990	1.250	0.939
8	0.489	0.534	0.845	0.654	0.489	0.478	1.003	1.241	0.964
9	0.472	0.568	0.764	0.633	0.472	0.511	1.108	1.154	0.990
10	0.403	0.653	0.641	0.632	0.403	0.578	1.449	0.981	0.982
11	0.376	0.685	0.599	0.611	0.376	0.584	1.568	0.907	0.886

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-1.2	-3.4	10.7	0.276	0.037	0.035	0.009	0.009
2	7.68	10.00	-0.3	-2.9	9.8	0.265	0.019	0.017	0.005	0.004
3	26.12	30.01	2.2	-1.9	7.1	0.268	0.014	0.013	0.004	0.003
4	35.54	40.01	3.7	-1.4	6.1	0.290	0.059	0.058	0.015	0.014
5	37.89	42.49	4.0	-1.4	6.1	0.307	0.097	0.096	0.024	0.024
6	40.27	45.00	4.4	-1.3	5.3	0.317	0.093	0.092	0.023	0.023
7	42.66	47.51	4.6	-1.5	5.0	0.309	0.035	0.035	0.009	0.009
8	45.06	50.01	4.9	-1.6	4.7	0.307	0.021	0.021	0.005	0.005
9	64.97	69.99	6.5	-1.5	7.8	0.258	0.007	0.007	0.002	0.002
10	87.94	90.00	7.0	-1.8	8.4	0.128	0.018	0.018	0.004	0.004
11	94.84	95.01	6.4	-2.4	5.8	0.116	0.147	0.147	0.032	0.032

TABLE XII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

(d) Reading 901

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	30.6	62.4	55.0	518.7	562.0	14.69	19.09
2	9.510	9.386	0.	29.7	62.0	54.0	518.7	560.7	14.69	19.06
3	8.609	8.620	0.	30.5	59.8	50.1	518.7	558.9	14.69	18.94
4	8.149	8.257	0.	32.7	58.6	47.8	518.7	560.0	14.69	18.77
5	8.034	8.142	0.	34.2	58.3	47.0	518.7	561.4	14.69	18.74
6	7.918	8.046	0.	35.0	58.0	46.3	518.7	561.2	14.69	18.67
7	7.801	7.950	0.	35.2	57.7	45.4	518.7	560.5	14.69	18.65
8	7.684	7.854	0.	35.0	57.3	44.3	518.7	560.1	14.69	18.70
9	6.711	7.089	0.	32.9	54.8	36.3	518.7	557.6	14.69	18.78
10	5.589	6.323	0.	33.5	53.7	22.8	518.7	558.0	14.69	18.99
11	5.252	6.131	0.	36.3	53.5	16.6	518.7	563.8	14.69	19.14

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	497.7	539.5	1074.8	809.4	497.7	464.2	0.	274.9	952.6	937.9
2	493.3	542.0	1051.6	800.9	493.3	470.8	0.	268.7	928.7	916.6
3	491.5	548.1	975.7	737.1	491.5	472.4	0.	278.1	842.9	844.0
4	486.4	549.4	934.7	688.7	486.4	462.5	0.	296.6	798.2	806.8
5	486.4	550.3	924.5	666.5	486.4	455.0	0.	309.7	786.2	796.8
6	484.1	549.7	912.9	651.7	484.1	450.3	0.	315.3	774.0	786.5
7	482.1	552.9	902.1	643.5	482.1	451.8	0.	318.8	762.5	777.0
8	481.8	558.8	891.6	639.2	481.8	457.7	0.	320.6	750.3	766.9
9	463.4	598.1	804.2	623.0	463.4	502.0	0.	325.2	657.2	694.2
10	401.9	686.0	678.9	620.8	401.9	572.3	0.	378.3	547.1	619.0
11	379.0	718.7	637.4	604.6	379.0	579.3	0.	425.3	512.5	598.3

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.455	0.475	0.983	0.712	0.455	0.408	0.933	1.236	0.929
2	0.451	0.478	0.961	0.706	0.451	0.415	0.955	1.247	0.953
3	0.449	0.484	0.892	0.651	0.449	0.417	0.961	1.272	0.971
4	0.444	0.485	0.854	0.608	0.444	0.408	0.951	1.292	0.910
5	0.444	0.485	0.844	0.587	0.444	0.401	0.935	1.291	0.874
6	0.442	0.484	0.834	0.574	0.442	0.397	0.930	1.292	0.865
7	0.440	0.488	0.824	0.568	0.440	0.399	0.937	1.282	0.876
8	0.440	0.493	0.814	0.564	0.440	0.404	0.950	1.270	0.893
9	0.423	0.531	0.733	0.553	0.423	0.446	1.083	1.181	0.969
10	0.365	0.614	0.616	0.556	0.365	0.513	1.424	0.998	1.003
11	0.344	0.642	0.578	0.540	0.344	0.518	1.529	0.922	0.902

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	1.0	-1.2	9.7	0.358	0.041	0.038	0.010	0.010
2	7.68	10.00	1.7	-0.9	8.4	0.347	0.027	0.024	0.007	0.006
3	26.12	30.01	4.5	0.4	6.4	0.356	0.018	0.016	0.004	0.004
4	35.54	40.01	6.4	1.2	6.5	0.382	0.062	0.060	0.015	0.015
5	37.89	42.49	6.6	1.2	6.3	0.403	0.090	0.089	0.022	0.022
6	40.27	45.00	7.1	1.3	6.2	0.411	0.098	0.097	0.024	0.024
7	42.66	47.51	7.4	1.2	6.2	0.413	0.090	0.089	0.022	0.022
8	45.06	50.01	7.6	1.1	5.9	0.410	0.078	0.078	0.020	0.020
9	64.97	69.99	9.5	1.5	8.0	0.352	0.026	0.026	0.006	0.006
10	87.94	90.00	9.7	0.9	7.4	0.230	-0.003	-0.003	-0.001	-0.001
11	94.84	95.01	8.8	0.0	5.3	0.213	0.141	0.141	0.030	0.030

TABLE XII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

(e) Reading 902

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	37.7	66.5	56.4	518.7	570.2	14.69	19.30
2	9.510	9.386	0.	37.3	66.3	55.4	518.7	568.4	14.69	19.28
3	8.609	8.620	0.	40.7	64.5	51.5	518.7	567.0	14.69	19.09
4	8.149	8.237	0.	44.4	63.5	49.6	518.7	567.0	14.69	18.89
5	8.034	8.142	0.	45.5	63.3	49.3	518.7	566.9	14.69	18.79
6	7.918	8.046	0.	45.6	63.0	48.2	518.7	567.9	14.69	18.75
7	7.801	7.950	0.	47.8	62.7	46.7	518.7	568.6	14.69	18.81
8	7.684	7.854	0.	45.9	62.3	44.4	518.7	569.6	14.69	18.96
9	6.711	7.089	0.	37.9	58.8	37.0	518.7	560.9	14.69	19.03
10	5.589	6.323	0.	37.3	57.1	22.7	518.7	560.1	14.69	19.25
11	5.252	6.131	0.	40.6	57.3	15.8	518.7	565.1	14.69	19.35

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	413.7	518.3	1035.7	741.4	413.7	410.0	0.	317.2	949.5	934.9
2	407.8	521.7	1014.5	730.0	407.8	415.0	0.	316.2	928.9	916.8
3	402.1	525.3	933.5	639.6	402.1	398.0	0.	342.9	842.5	843.6
4	397.6	523.4	891.2	577.2	397.6	373.8	0.	366.4	797.6	806.2
5	395.5	520.9	879.6	559.8	395.5	365.0	0.	371.7	785.6	796.2
6	394.8	524.7	868.5	551.5	394.8	367.5	0.	374.7	773.6	786.1
7	394.9	535.4	859.9	524.6	394.9	359.7	0.	396.6	763.9	778.5
8	395.3	549.8	850.7	536.0	395.3	382.7	0.	394.8	753.3	770.0
9	397.6	574.1	768.5	567.3	397.6	452.8	0.	353.0	657.6	694.7
10	354.9	661.0	652.8	569.9	354.9	525.9	0.	400.4	547.9	619.9
11	330.9	694.6	612.3	548.4	330.9	527.6	0.	451.7	515.2	601.4

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.376	0.452	0.941	0.646	0.376	0.357	0.991	1.320	0.817
2	0.370	0.456	0.921	0.638	0.370	0.362	1.017	1.334	0.842
3	0.365	0.460	0.847	0.559	0.365	0.348	0.990	1.345	0.833
4	0.361	0.458	0.809	0.505	0.361	0.327	0.940	1.357	0.798
5	0.359	0.456	0.798	0.490	0.359	0.319	0.923	1.356	0.782
6	0.358	0.459	0.788	0.482	0.358	0.321	0.930	1.355	0.761
7	0.358	0.468	0.780	0.459	0.358	0.314	0.911	1.346	0.759
8	0.359	0.481	0.772	0.469	0.359	0.335	0.968	1.336	0.770
9	0.361	0.507	0.697	0.501	0.361	0.400	1.139	1.220	0.942
10	0.321	0.589	0.591	0.508	0.321	0.469	1.482	1.025	1.004
11	0.299	0.618	0.553	0.488	0.299	0.470	1.595	0.955	0.916

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	5.0	2.8	11.1	0.417	0.129	0.124	0.031	0.030
2	7.68	10.00	5.9	3.4	9.8	0.413	0.111	0.106	0.027	0.026
3	26.12	30.01	9.3	5.2	7.8	0.458	0.131	0.128	0.032	0.031
4	35.54	40.01	11.3	6.1	8.3	0.506	0.170	0.168	0.041	0.040
5	37.89	42.49	11.6	6.2	8.7	0.519	0.186	0.185	0.045	0.044
6	40.27	45.00	12.1	6.3	8.2	0.521	0.212	0.210	0.051	0.050
7	42.66	47.51	12.3	6.2	7.5	0.555	0.221	0.220	0.054	0.054
8	45.06	50.01	12.6	6.1	6.0	0.534	0.218	0.217	0.054	0.054
9	64.97	69.99	13.5	5.5	8.7	0.406	0.056	0.056	0.014	0.014
10	87.94	90.00	13.1	4.3	7.3	0.286	-0.005	-0.005	-0.001	-0.001
11	94.84	95.01	12.6	3.8	4.6	0.282	0.135	0.135	0.029	0.029

TABLE XII. - Concluded. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 70 PERCENT DESIGN SPEED

(f) Reading 903

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	54.0	69.7	59.1	518.7	582.6	14.69	19.22
2	9.510	9.386	0.	48.3	69.5	56.7	518.7	577.6	14.69	19.23
3	8.609	8.620	0.	47.4	67.7	51.9	518.7	571.1	14.69	19.18
4	8.149	8.237	0.	51.1	66.7	49.2	518.7	571.3	14.69	19.01
5	8.034	8.142	0.	51.2	66.4	48.4	518.7	571.8	14.69	18.95
6	7.918	8.046	0.	51.9	66.1	48.5	518.7	571.2	14.69	18.89
7	7.801	7.950	0.	52.0	65.6	47.3	518.7	572.0	14.69	18.85
8	7.684	7.854	0.	52.6	65.3	45.0	518.7	572.3	14.69	18.95
9	6.711	7.089	0.	40.3	61.5	36.7	518.7	562.1	14.69	19.10
10	5.589	6.323	0.	38.7	59.5	22.5	518.7	560.7	14.69	19.27
11	5.252	6.131	0.	41.7	59.1	15.8	518.7	565.5	14.69	19.40

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	353.6	524.3	1016.9	600.0	353.6	308.4	0.	424.0	953.4	938.7
2	347.6	523.1	994.2	632.7	347.6	347.8	0.	390.8	931.5	919.4
3	347.1	528.6	913.3	580.6	347.1	358.1	0.	388.8	844.8	845.9
4	344.5	537.4	871.0	516.1	344.5	337.5	0.	418.2	800.0	808.6
5	344.2	538.2	860.5	507.5	344.2	336.9	0.	419.7	788.6	799.2
6	344.8	532.1	850.2	495.7	344.8	328.6	0.	418.5	777.1	789.7
7	346.5	535.1	838.8	485.3	346.5	329.2	0.	421.9	764.0	778.5
8	346.7	548.4	828.3	471.4	346.7	333.2	0.	435.4	752.3	768.9
9	357.4	572.5	749.1	544.7	357.4	436.9	0.	370.0	658.3	695.4
10	321.7	651.0	633.7	550.2	321.7	508.2	0.	406.8	545.9	617.6
11	307.8	684.3	599.2	531.3	307.8	511.1	0.	455.0	514.1	600.1

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.320	0.452	0.920	0.517	0.320	0.266	0.872	1.392	0.646
2	0.314	0.453	0.899	0.548	0.314	0.301	1.001	1.402	0.703
3	0.314	0.461	0.826	0.506	0.314	0.312	1.031	1.400	0.785
4	0.312	0.469	0.788	0.450	0.312	0.294	0.980	1.408	0.754
5	0.311	0.469	0.778	0.442	0.311	0.294	0.979	1.406	0.757
6	0.312	0.464	0.769	0.432	0.312	0.287	0.953	1.405	0.735
7	0.313	0.466	0.759	0.423	0.313	0.287	0.950	1.386	0.718
8	0.314	0.478	0.749	0.411	0.314	0.291	0.961	1.373	0.729
9	0.324	0.505	0.678	0.481	0.324	0.385	1.222	1.249	0.931
10	0.291	0.579	0.572	0.490	0.291	0.452	1.580	1.042	0.995
11	0.278	0.608	0.541	0.472	0.278	0.454	1.661	0.967	0.914

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	8.2	6.0	13.8	0.591	0.303	0.294	0.068	0.066
2	7.68	10.00	9.2	6.6	11.1	0.531	0.247	0.239	0.058	0.056
3	26.12	30.01	12.5	8.5	8.2	0.531	0.189	0.185	0.045	0.044
4	35.54	40.01	14.5	9.3	7.8	0.587	0.231	0.228	0.056	0.055
5	37.89	42.49	14.8	9.3	7.8	0.590	0.253	0.250	0.062	0.061
6	40.27	45.00	15.2	9.5	8.4	0.595	0.258	0.256	0.062	0.061
7	42.66	47.51	15.3	9.1	8.1	0.602	0.284	0.282	0.068	0.068
8	45.06	50.01	15.6	9.1	6.6	0.617	0.280	0.279	0.069	0.069
9	64.97	69.99	16.2	8.2	8.4	0.428	0.072	0.072	0.018	0.018
10	87.94	90.00	15.5	6.7	7.2	0.298	0.007	0.007	0.001	0.001
11	94.84	95.01	14.5	5.6	4.6	0.297	0.144	0.144	0.031	0.031

TABLE XIII. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

(a) Reading 905

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	39.3	64.8	53.6	518.7	591.3	14.69	21.56
2	9.510	9.386	0.	37.9	64.5	53.0	518.7	586.9	14.69	21.50
3	8.609	8.620	0.	39.9	62.8	50.2	518.7	581.2	14.69	20.89
4	8.149	8.237	0.	45.1	62.0	48.3	518.7	583.4	14.69	20.46
5	8.034	8.142	0.	45.9	61.7	48.3	518.7	583.5	14.69	20.32
6	7.918	8.046	0.	46.2	61.5	47.4	518.7	583.6	14.69	20.24
7	7.801	7.950	0.	47.1	61.3	46.0	518.7	585.2	14.69	20.28
8	7.684	7.854	0.	47.3	60.9	44.1	518.7	585.4	14.69	20.41
9	6.711	7.089	0.	39.2	57.8	36.6	518.7	575.0	14.69	20.59
10	5.589	6.323	0.	38.1	56.4	22.7	518.7	573.9	14.69	20.83
11	5.252	6.131	0.	41.2	56.2	15.8	518.7	580.0	14.69	21.04

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	514.1	638.0	1206.4	832.7	514.1	493.9	0.	404.1	1091.4	1074.6
2	508.9	635.0	1183.4	831.9	508.9	501.0	0.	390.4	1068.4	1054.5
3	497.3	619.4	1086.1	741.5	497.3	475.1	0.	397.6	965.6	966.9
4	486.2	615.6	1035.4	653.2	486.2	434.4	0.	436.2	914.1	924.0
5	485.7	609.6	1023.8	637.4	485.7	424.4	0.	437.7	901.3	913.4
6	481.7	611.7	1009.6	625.3	481.7	423.5	0.	441.5	887.3	901.6
7	479.4	620.6	998.0	607.9	479.4	422.3	0.	454.8	875.3	892.0
8	479.8	632.9	986.7	598.4	479.8	429.6	0.	464.8	862.2	881.3
9	475.7	660.5	892.1	637.1	475.7	511.7	0.	417.7	754.7	797.2
10	416.8	749.9	753.1	639.4	416.8	589.9	0.	463.0	627.3	709.7
11	394.9	789.5	709.6	617.8	394.9	594.3	0.	519.7	589.5	688.2

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.471	0.551	1.104	0.720	0.471	0.427	0.961	1.394	0.826
2	0.466	0.551	1.083	0.722	0.466	0.435	0.985	1.422	0.874
3	0.455	0.539	0.993	0.645	0.455	0.414	0.955	1.518	0.877
4	0.444	0.535	0.946	0.567	0.444	0.377	0.893	1.538	0.795
5	0.444	0.529	0.935	0.553	0.444	0.368	0.874	1.538	0.778
6	0.440	0.531	0.922	0.543	0.440	0.368	0.879	1.539	0.766
7	0.438	0.538	0.911	0.527	0.438	0.366	0.881	1.529	0.752
8	0.438	0.550	0.901	0.520	0.438	0.373	0.895	1.516	0.766
9	0.434	0.581	0.814	0.560	0.434	0.450	1.076	1.394	0.932
10	0.379	0.666	0.684	0.568	0.379	0.524	1.415	1.172	0.985
11	0.358	0.701	0.644	0.548	0.358	0.528	1.505	1.086	0.913

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	3.3	1.1	8.3	0.455	0.134	0.110	0.035	0.029
2	7.68	10.00	4.2	1.6	7.4	0.437	0.095	0.069	0.024	0.018
3	26.12	30.01	7.5	3.4	6.4	0.460	0.098	0.068	0.024	0.017
4	35.54	40.01	9.7	4.6	7.0	0.526	0.178	0.151	0.044	0.037
5	37.89	42.49	10.0	4.6	7.6	0.535	0.196	0.170	0.048	0.042
6	40.27	45.00	10.6	4.9	7.3	0.539	0.212	0.187	0.052	0.046
7	42.66	47.51	11.0	4.8	6.8	0.554	0.233	0.210	0.057	0.052
8	45.06	50.01	11.2	4.7	5.7	0.560	0.224	0.204	0.056	0.051
9	64.97	69.99	12.5	4.5	8.2	0.433	0.068	0.064	0.017	0.016
10	87.94	90.00	12.4	3.6	7.3	0.310	0.019	0.019	0.004	0.004
11	94.84	95.01	11.5	2.7	4.6	0.306	0.140	0.140	0.030	0.030

TABLE XIII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

(b) Reading 906

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	34.9	61.1	54.5	518.7	582.9	14.69	21.00
2	9.510	9.386	0.	32.7	60.9	53.9	518.7	578.8	14.69	20.96
3	8.609	8.620	0.	33.3	58.6	49.3	518.7	575.8	14.69	20.92
4	8.149	8.237	0.	35.2	57.4	45.8	518.7	577.9	14.69	20.84
5	8.034	8.142	0.	36.9	57.0	44.8	518.7	579.3	14.69	20.71
6	7.918	8.046	0.	36.7	56.7	44.4	518.7	577.9	14.69	20.68
7	7.801	7.950	0.	35.6	56.5	43.6	518.7	575.8	14.69	20.70
8	7.684	7.854	0.	35.9	56.2	42.6	518.7	574.9	14.69	20.71
9	6.711	7.089	0.	34.7	53.8	36.1	518.7	570.1	14.69	20.41
10	5.589	6.325	0.	34.6	53.2	25.2	518.7	573.2	14.69	20.58
11	5.252	6.131	0.	38.1	52.9	16.4	518.7	578.7	14.69	20.76

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	601.7	624.0	1245.5	880.4	601.7	511.7	0.	357.3	1090.6	1073.7
2	594.6	621.8	1222.1	888.0	594.6	523.1	0.	336.2	1067.7	1053.8
3	589.3	635.8	1131.0	814.7	589.3	531.6	0.	349.2	965.3	966.6
4	585.7	652.0	1086.1	764.5	585.7	532.7	0.	376.2	914.6	924.5
5	584.0	654.1	1073.2	737.1	584.0	523.0	0.	393.1	900.4	912.5
6	583.3	652.7	1063.3	733.1	583.3	523.4	0.	390.1	889.0	903.4
7	581.1	658.7	1052.2	739.8	581.1	535.6	0.	383.6	877.2	893.9
8	578.0	662.3	1038.4	728.6	578.0	536.4	0.	388.7	862.7	881.7
9	551.4	679.6	932.7	691.5	551.4	558.7	0.	387.0	752.2	794.5
10	469.6	771.0	783.9	690.1	469.6	634.3	0.	438.3	627.7	710.1
11	445.5	809.2	738.5	663.6	445.5	636.5	0.	499.7	589.0	687.6

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.555	0.543	1.150	0.766	0.555	0.445	0.850	1.298	0.868
2	0.548	0.543	1.127	0.775	0.548	0.456	0.880	1.326	0.922
3	0.543	0.557	1.043	0.714	0.543	0.466	0.902	1.399	0.964
4	0.540	0.571	1.001	0.670	0.540	0.467	0.910	1.469	0.919
5	0.538	0.572	0.989	0.645	0.538	0.458	0.896	1.470	0.882
6	0.537	0.572	0.980	0.642	0.537	0.458	0.897	1.477	0.898
7	0.535	0.578	0.969	0.650	0.535	0.470	0.922	1.468	0.934
8	0.532	0.582	0.956	0.641	0.532	0.472	0.928	1.455	0.950
9	0.507	0.601	0.857	0.612	0.507	0.494	1.013	1.350	0.992
10	0.428	0.687	0.715	0.615	0.428	0.565	1.351	1.146	0.962
11	0.406	0.721	0.672	0.591	0.406	0.567	1.429	1.059	0.898

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-0.3	-2.5	9.2	0.418	0.088	0.070	0.022	0.018
2	7.68	10.00	0.5	-2.0	8.4	0.390	0.051	0.032	0.013	0.008
3	26.12	30.01	3.4	-0.8	5.5	0.400	0.025	0.006	0.006	0.002
4	35.54	40.01	5.1	-0.1	4.5	0.425	0.062	0.038	0.016	0.010
5	37.89	42.49	5.4	-0.1	4.1	0.448	0.092	0.070	0.024	0.018
6	40.27	45.00	5.8	0.1	4.4	0.444	0.079	0.057	0.020	0.015
7	42.66	47.51	6.1	-0.0	4.4	0.428	0.051	0.031	0.013	0.008
8	45.06	50.01	6.5	-0.0	4.2	0.431	0.039	0.021	0.010	0.006
9	64.97	69.99	8.4	0.4	7.8	0.389	0.006	0.003	0.002	0.001
10	87.94	90.00	9.2	0.4	7.8	0.264	0.046	0.046	0.010	0.010
11	94.84	95.01	8.2	-0.6	5.1	0.265	0.150	0.150	0.032	0.032

TABLE XIII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

(c) Reading 907

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	26.2	60.1	57.0	518.7	568.4	14.69	19.19
2	9.510	9.386	0.	25.4	59.8	56.1	518.7	565.6	14.69	19.18
3	8.609	8.620	0.	25.4	57.1	51.1	518.7	564.9	14.69	19.40
4	8.149	8.237	0.	28.5	55.6	47.6	518.7	569.6	14.69	19.37
5	8.034	8.142	0.	30.0	55.3	46.9	518.7	570.6	14.69	19.22
6	7.918	8.046	0.	31.0	55.0	46.2	518.7	570.3	14.69	19.17
7	7.801	7.950	0.	29.9	54.6	44.9	518.7	567.9	14.69	19.35
8	7.684	7.854	0.	29.0	54.2	43.3	518.7	567.1	14.69	19.65
9	6.711	7.089	0.	27.2	51.8	36.9	518.7	564.3	14.69	19.67
10	5.589	6.323	0.	29.8	50.7	23.9	518.7	566.8	14.69	20.04
11	5.252	6.131	0.	33.8	50.8	17.3	518.7	576.2	14.69	20.34

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	631.1	591.4	1264.2	974.8	631.1	530.8	0.	260.9	1095.4	1078.5
2	622.5	594.5	1236.3	962.7	622.5	536.9	0.	255.2	1068.2	1054.3
3	626.3	625.4	1152.3	899.5	626.3	564.9	0.	268.5	967.3	968.5
4	627.1	643.1	1110.7	838.7	627.1	565.1	0.	306.9	916.8	926.7
5	625.2	641.0	1097.0	812.5	625.2	555.2	0.	320.3	901.4	913.5
6	622.8	641.5	1086.1	794.0	622.8	549.5	0.	331.1	889.9	904.2
7	623.7	655.7	1075.8	802.2	623.7	568.4	0.	327.2	876.6	893.3
8	622.5	674.9	1065.1	810.7	622.5	590.2	0.	327.5	864.3	883.4
9	593.6	709.0	959.8	788.5	593.6	630.7	0.	323.6	754.3	796.8
10	514.8	805.9	812.7	764.9	514.8	699.1	0.	400.9	628.8	711.4
11	481.4	845.7	762.0	736.5	481.4	703.0	0.	470.1	590.7	689.6

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID VEL R	PEAK SS MACH NO	EFF
RP	IN	OUT	IN	OUT	IN	OUT			
1	0.584	0.520	1.171	0.856	0.584	0.466	0.841	1.277	0.826
2	0.576	0.524	1.144	0.848	0.576	0.473	0.863	1.298	0.876
3	0.580	0.553	1.066	0.795	0.580	0.500	0.902	1.359	0.928
4	0.580	0.567	1.028	0.740	0.580	0.498	0.901	1.418	0.836
5	0.579	0.565	1.015	0.716	0.579	0.489	0.888	1.428	0.797
6	0.576	0.565	1.005	0.700	0.576	0.484	0.882	1.449	0.793
7	0.577	0.580	0.995	0.709	0.577	0.503	0.911	1.442	0.862
8	0.576	0.599	0.985	0.719	0.576	0.523	0.948	1.434	0.929
9	0.547	0.633	0.885	0.704	0.547	0.563	1.062	1.336	0.989
10	0.471	0.726	0.744	0.689	0.471	0.630	1.358	1.130	1.000
11	0.439	0.759	0.696	0.661	0.439	0.631	1.461	1.047	0.877

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-1.3	-3.6	11.7	0.319	0.090	0.075	0.021	0.017
2	7.68	10.00	-0.6	-3.1	10.6	0.309	0.063	0.046	0.015	0.011
3	26.12	30.01	1.9	-2.2	7.3	0.310	0.040	0.023	0.010	0.006
4	35.54	40.01	3.4	-1.8	6.3	0.348	0.104	0.084	0.026	0.021
5	37.89	42.49	3.6	-1.9	6.3	0.367	0.133	0.113	0.033	0.028
6	40.27	45.00	4.1	-1.7	6.1	0.379	0.136	0.115	0.034	0.029
7	42.66	47.51	4.2	-2.0	5.7	0.363	0.090	0.070	0.023	0.018
8	45.06	50.01	4.5	-2.0	4.9	0.348	0.046	0.028	0.012	0.007
9	64.97	69.99	6.5	-1.5	8.6	0.285	0.008	0.005	0.002	0.001
10	87.94	90.00	6.6	-2.2	8.5	0.186	0.000	0.000	0.000	0.000
11	94.84	95.01	6.1	-2.7	6.0	0.182	0.164	0.164	0.035	0.035

TABLE XIII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

(d) Reading 908

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	15.1	59.7	59.1	518.7	550.9	14.69	17.04
2	9.510	9.386	0.	15.0	59.4	57.6	518.7	549.9	14.69	17.20
3	8.609	8.620	0.	16.4	56.6	53.1	518.7	550.0	14.69	17.40
4	8.149	8.237	0.	19.0	55.1	50.3	518.7	554.3	14.69	17.35
5	8.034	8.142	0.	19.7	54.7	50.1	518.7	553.3	14.69	17.13
6	7.918	8.046	0.	20.1	54.3	49.7	518.7	553.9	14.69	17.01
7	7.801	7.950	0.	20.1	53.8	48.1	518.7	556.0	14.69	17.26
8	7.684	7.854	0.	21.1	53.5	45.8	518.7	556.5	14.69	17.67
9	6.711	7.089	0.	20.8	50.8	37.6	518.7	558.2	14.69	18.66
10	5.589	6.323	0.	25.7	50.4	25.2	518.7	565.0	14.69	19.53
11	5.252	6.131	0.	30.9	49.6	18.5	518.7	573.7	14.69	19.95

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	639.2	573.9	1265.9	1079.0	639.2	554.0	0.	149.9	1092.6	1075.8
2	632.3	591.4	1241.0	1066.9	632.3	571.3	0.	152.8	1067.8	1053.9
3	636.7	620.1	1156.9	990.8	636.7	595.0	0.	174.9	965.9	967.1
4	639.7	632.7	1116.9	936.1	639.7	598.4	0.	205.5	915.5	925.4
5	640.3	625.1	1106.9	918.2	640.3	588.6	0.	210.4	903.0	915.1
6	639.4	622.2	1094.6	903.6	639.4	584.4	0.	213.5	888.4	902.7
7	640.4	642.6	1085.6	903.2	640.4	603.4	0.	221.2	876.5	893.3
8	639.1	668.9	1073.8	894.9	639.1	624.2	0.	240.7	862.9	882.0
9	615.7	741.4	974.1	875.1	615.7	693.2	0.	263.2	754.9	797.4
10	519.9	827.5	815.3	824.3	519.9	745.7	0.	359.1	628.0	710.5
11	501.2	859.1	773.7	777.9	501.2	737.5	0.	440.9	589.4	688.1

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.592	0.512	1.173	0.962	0.592	0.494	0.867	1.265	0.697
2	0.585	0.529	1.149	0.954	0.585	0.511	0.904	1.288	0.766
3	0.590	0.556	1.072	0.888	0.590	0.533	0.935	1.346	0.820
4	0.593	0.566	1.035	0.857	0.593	0.535	0.935	1.401	0.706
5	0.593	0.559	1.026	0.821	0.593	0.526	0.919	1.412	0.671
6	0.593	0.556	1.014	0.807	0.593	0.522	0.914	1.426	0.630
7	0.594	0.574	1.006	0.807	0.594	0.539	0.942	1.426	0.655
8	0.592	0.599	0.995	0.801	0.592	0.559	0.977	1.422	0.742
9	0.569	0.668	0.900	0.789	0.569	0.625	1.126	1.328	0.927
10	0.476	0.749	0.747	0.746	0.476	0.675	1.434	1.126	0.950
11	0.458	0.774	0.708	0.701	0.458	0.665	1.472	1.035	0.861

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-1.7	-3.9	15.8	0.199	0.104	0.088	0.025	0.020
2	7.68	10.00	-1.0	-3.5	12.1	0.193	0.080	0.064	0.018	0.015
3	26.12	30.01	1.4	-2.7	9.3	0.203	0.069	0.053	0.016	0.012
4	35.54	40.01	2.8	-2.3	8.9	0.231	0.132	0.114	0.031	0.027
5	37.89	42.49	3.0	-2.4	9.5	0.241	0.145	0.127	0.034	0.030
6	40.27	45.00	3.4	-2.4	9.6	0.245	0.168	0.149	0.039	0.035
7	42.66	47.51	3.5	-2.6	8.9	0.241	0.168	0.149	0.040	0.035
8	45.06	50.01	3.7	-2.8	7.3	0.246	0.130	0.113	0.032	0.028
9	64.97	69.99	5.4	-2.6	9.3	0.187	0.045	0.042	0.011	0.010
10	87.94	90.00	6.3	-2.5	9.7	0.103	0.049	0.049	0.011	0.011
11	94.84	95.01	4.9	-5.9	7.1	0.132	0.172	0.172	0.037	0.037

TABLE XIII. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

(e) Reading 928

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	42.1	63.2	54.8	518.7	589.8	14.69	21.34
2	9.510	9.386	0.	39.5	63.0	53.4	518.7	584.4	14.69	21.41
3	8.609	8.620	0.	40.3	60.9	49.7	518.7	578.5	14.69	21.01
4	8.149	8.257	0.	43.8	59.9	47.7	518.7	579.4	14.69	20.63
5	8.034	8.142	0.	45.1	59.7	47.5	518.7	580.1	14.69	20.48
6	7.918	8.046	0.	47.2	59.5	46.8	518.7	580.5	14.69	20.36
7	7.801	7.950	0.	47.8	59.4	45.7	518.7	580.1	14.69	20.38
8	7.684	7.854	0.	46.1	58.9	43.9	518.7	580.1	14.69	20.47
9	6.711	7.089	0.	41.6	56.4	34.7	518.7	573.5	14.69	20.54
10	5.589	6.323	0.	41.2	55.5	19.3	518.7	572.5	14.69	20.72
11	5.252	6.131	0.	43.5	55.0	12.7	518.7	579.5	14.69	20.89

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	549.1	622.5	1219.0	801.1	549.1	462.1	0.	417.2	1088.4	1071.6
2	542.3	625.2	1192.9	810.4	542.3	482.6	0.	397.6	1062.5	1048.7
3	536.4	623.4	1101.5	734.9	536.4	475.6	0.	403.1	962.0	963.3
4	526.8	618.5	1050.6	663.4	526.8	446.5	0.	428.1	908.9	918.8
5	523.5	614.6	1039.0	642.5	523.5	433.7	0.	435.5	897.5	909.5
6	520.7	616.4	1026.4	611.7	520.7	418.5	0.	452.6	884.4	898.7
7	516.6	622.3	1013.9	598.7	516.6	418.3	0.	460.8	872.5	889.1
8	516.6	630.7	999.9	606.9	516.6	437.4	0.	454.4	856.2	875.1
9	498.1	669.3	899.8	608.6	498.1	500.1	0.	444.8	749.4	791.6
10	428.5	765.0	756.8	610.0	428.5	575.6	0.	503.9	623.9	705.8
11	410.5	803.9	715.9	598.2	410.5	583.5	0.	553.0	586.5	684.7

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.504	0.538	1.119	0.692	0.504	0.399	0.842	1.351	0.821
2	0.498	0.543	1.095	0.704	0.498	0.419	0.890	1.376	0.897
3	0.492	0.544	1.010	0.642	0.492	0.415	0.887	1.465	0.933
4	0.483	0.539	0.963	0.578	0.483	0.389	0.848	1.498	0.870
5	0.480	0.535	0.952	0.560	0.480	0.378	0.829	1.503	0.839
6	0.477	0.537	0.940	0.533	0.477	0.364	0.804	1.506	0.820
7	0.473	0.542	0.928	0.522	0.473	0.365	0.810	1.497	0.828
8	0.473	0.550	0.916	0.529	0.473	0.382	0.847	1.478	0.839
9	0.455	0.590	0.823	0.536	0.455	0.441	1.004	1.370	0.950
10	0.390	0.682	0.688	0.544	0.390	0.513	1.343	1.158	0.994
11	0.373	0.715	0.650	0.532	0.373	0.519	1.422	1.071	0.903

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	1.8	-0.4	9.5	0.491	0.133	0.113	0.034	0.028
2	7.68	10.00	2.6	0.1	7.9	0.462	0.075	0.054	0.019	0.014
3	26.12	30.01	5.6	1.5	5.9	0.476	0.051	0.027	0.013	0.007
4	35.54	40.01	7.6	2.5	6.4	0.521	0.105	0.082	0.026	0.020
5	37.89	42.49	8.1	2.6	6.9	0.536	0.133	0.111	0.033	0.027
6	40.27	45.00	8.6	2.9	6.8	0.564	0.153	0.130	0.038	0.032
7	42.66	47.51	9.0	2.9	6.5	0.572	0.148	0.128	0.037	0.032
8	45.06	50.01	9.2	2.7	5.5	0.554	0.142	0.126	0.036	0.032
9	64.97	69.99	11.1	3.1	6.4	0.479	0.048	0.045	0.012	0.011
10	87.94	90.00	11.5	2.7	4.1	0.366	0.008	0.008	0.002	0.002
11	94.84	95.01	10.3	1.5	1.7	0.351	0.153	0.153	0.033	0.033

TABLE XIII. - Concluded. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 80 PERCENT DESIGN SPEED

(f) Reading 929

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	45.4	66.9	56.2	518.7	590.6	14.69	20.97
2	9.510	9.386	0.	43.9	66.6	55.2	518.7	586.1	14.69	20.93
3	8.609	8.620	0.	49.9	65.1	52.4	518.7	584.6	14.69	20.44
4	8.149	8.237	0.	53.4	64.2	50.6	518.7	584.9	14.69	20.15
5	8.034	8.142	0.	54.5	63.9	50.9	518.7	584.4	14.69	20.01
6	7.918	8.046	0.	54.1	63.6	50.0	518.7	584.7	14.69	19.98
7	7.801	7.950	0.	54.4	63.2	47.9	518.7	585.8	14.69	20.07
8	7.684	7.854	0.	53.6	62.8	44.6	518.7	586.0	14.69	20.30
9	6.711	7.089	0.	43.1	59.3	34.8	518.7	574.6	14.69	20.56
10	5.589	6.323	0.	42.1	57.6	19.1	518.7	573.5	14.69	20.77
11	5.252	6.131	0.	45.3	57.4	11.4	518.7	578.6	14.69	20.93

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	463.4	606.9	1180.9	766.5	463.4	426.0	0.	432.3	1086.2	1069.5
2	459.2	605.9	1156.8	764.7	459.2	436.7	0.	420.1	1061.7	1047.9
3	447.2	601.1	1060.8	634.8	447.2	387.0	0.	460.0	961.9	963.1
4	440.4	601.6	1010.7	564.5	440.4	358.3	0.	483.3	909.7	919.5
5	438.5	594.0	997.8	547.3	438.5	345.0	0.	483.5	896.3	908.3
6	438.3	595.0	986.0	542.9	438.3	349.1	0.	481.8	883.2	897.5
7	438.8	608.7	974.5	528.5	438.8	354.5	0.	494.8	870.1	886.7
8	439.0	628.9	960.9	524.1	439.0	373.5	0.	506.0	854.7	873.7
9	443.9	663.5	869.9	589.9	443.9	484.3	0.	453.5	748.1	790.2
10	395.2	760.0	738.0	596.3	395.2	563.5	0.	510.0	623.3	705.1
11	373.8	801.6	694.4	575.6	373.8	564.2	0.	569.5	585.2	683.2

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.422	0.523	1.077	0.661	0.422	0.367	0.919	1.449	0.771
2	0.418	0.524	1.054	0.662	0.418	0.378	0.951	1.478	0.818
3	0.407	0.521	0.966	0.550	0.407	0.335	0.865	1.552	0.778
4	0.401	0.521	0.920	0.489	0.401	0.310	0.813	1.564	0.740
5	0.399	0.514	0.908	0.474	0.399	0.299	0.787	1.563	0.727
6	0.399	0.515	0.897	0.470	0.399	0.302	0.797	1.563	0.721
7	0.399	0.527	0.887	0.458	0.399	0.307	0.808	1.547	0.720
8	0.399	0.546	0.874	0.455	0.399	0.324	0.851	1.529	0.745
9	0.404	0.584	0.792	0.519	0.404	0.426	1.091	1.398	0.934
10	0.359	0.676	0.670	0.531	0.359	0.502	1.426	1.175	0.984
11	0.339	0.714	0.629	0.512	0.339	0.502	1.510	1.088	0.921

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	5.21	4.99	5.5	3.3	10.9	0.510	0.178	0.150	0.043	0.037
2	7.68	10.00	6.2	3.7	9.6	0.493	0.140	0.109	0.034	0.027
3	26.12	30.01	9.9	5.7	8.7	0.571	0.188	0.157	0.045	0.037
4	35.54	40.01	11.9	6.8	9.3	0.620	0.238	0.209	0.056	0.049
5	37.89	42.49	12.3	6.8	10.3	0.630	0.252	0.226	0.058	0.052
6	40.27	45.00	12.7	7.0	9.9	0.627	0.263	0.238	0.061	0.055
7	42.66	47.51	12.9	6.8	8.7	0.640	0.274	0.252	0.065	0.060
8	45.06	50.01	13.1	6.6	6.1	0.641	0.256	0.237	0.064	0.059
9	64.97	69.99	14.0	6.0	6.5	0.486	0.068	0.066	0.017	0.016
10	87.94	90.00	13.6	4.8	3.9	0.371	0.022	0.022	0.005	0.005
11	94.84	95.01	12.8	4.0	0.5	0.369	0.129	0.129	0.028	0.028

TABLE XIV. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

(a) Reading 911

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	13.2	60.0	59.1	518.7	554.4	14.69	17.16
2	9.510	9.386	0.	13.8	59.9	58.0	518.7	553.2	14.69	17.25
3	8.609	8.620	0.	15.8	57.0	53.0	518.7	556.7	14.69	17.76
4	8.149	8.257	0.	18.6	55.4	50.6	518.7	558.0	14.69	17.58
5	8.034	8.142	0.	17.4	55.0	51.3	518.7	558.0	14.69	17.21
6	7.918	8.046	0.	17.8	54.6	50.9	518.7	560.3	14.69	17.09
7	7.801	7.950	0.	18.8	54.3	48.7	518.7	564.3	14.69	17.61
8	7.684	7.854	0.	20.5	53.8	46.6	518.7	564.4	14.69	18.03
9	6.711	7.089	0.	21.9	51.2	38.6	518.7	570.8	14.69	19.74
10	5.589	6.323	0.	28.4	51.3	26.8	518.7	577.1	14.69	20.93
11	5.252	6.131	0.	34.4	51.2	19.2	518.7	587.2	14.69	21.42

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	706.5	648.3	1412.7	1231.0	706.5	631.3	0.	147.6	1223.4	1204.5
2	695.5	658.8	1384.8	1207.9	695.5	639.7	0.	157.3	1197.4	1181.8
3	703.5	699.9	1292.7	1120.2	703.5	673.4	0.	190.8	1084.6	1085.9
4	707.3	704.7	1246.1	1051.2	707.3	667.8	0.	225.2	1025.9	1037.0
5	706.1	686.9	1231.4	1047.3	706.1	655.4	0.	205.6	1008.9	1022.4
6	708.3	685.6	1222.6	1034.4	708.3	652.6	0.	210.1	996.5	1012.6
7	705.9	714.9	1208.5	1024.5	705.9	676.8	0.	230.4	980.9	999.6
8	706.7	737.9	1197.6	1005.7	706.7	691.4	0.	257.9	966.9	988.3
9	679.7	801.4	1083.8	951.2	679.7	743.7	0.	298.7	844.2	891.7
10	564.2	865.6	901.9	852.7	564.2	761.3	0.	412.0	703.6	796.0
11	531.8	904.4	848.1	790.4	531.8	746.4	0.	511.0	660.7	771.3

	ABS MACH NO		REL MACH NO		MERID MACH NO			MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT		VEL R	MACH NO	
1	0.660	0.580	1.319	1.102	0.660	0.565		0.894	1.412	0.658
2	0.649	0.591	1.292	1.084	0.649	0.574		0.920	1.432	0.705
3	0.657	0.629	1.207	1.006	0.657	0.605		0.957	1.461	0.760
4	0.661	0.632	1.164	0.943	0.661	0.599		0.944	1.495	0.693
5	0.659	0.615	1.150	0.938	0.659	0.587		0.928	1.500	0.609
6	0.662	0.613	1.142	0.924	0.662	0.583		0.921	1.511	0.550
7	0.659	0.639	1.129	0.915	0.659	0.604		0.959	1.505	0.603
8	0.660	0.661	1.119	0.901	0.660	0.619		0.978	1.501	0.683
9	0.635	0.719	1.009	0.853	0.635	0.667		1.094	1.489	0.876
10	0.519	0.778	0.829	0.767	0.519	0.685		1.349	1.275	0.944
11	0.488	0.810	0.778	0.708	0.488	0.668		1.404	1.179	0.861

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-1.4	-3.6	13.9	0.174	0.113	0.061	0.025	0.014
2	7.68	10.00	-0.5	-3.0	12.5	0.176	0.097	0.046	0.022	0.010
3	26.12	30.01	1.8	-2.3	9.3	0.191	0.095	0.049	0.022	0.012
4	35.54	40.01	3.2	-2.0	9.2	0.224	0.131	0.085	0.031	0.020
5	37.89	42.49	3.4	-2.1	10.6	0.211	0.169	0.124	0.039	0.028
6	40.27	45.00	3.7	-2.0	10.8	0.216	0.205	0.159	0.047	0.036
7	42.66	47.51	3.9	-2.2	9.5	0.221	0.200	0.157	0.047	0.037
8	45.06	50.01	4.1	-2.4	8.2	0.236	0.163	0.122	0.039	0.029
9	64.97	69.99	5.9	-2.1	10.2	0.209	0.085	0.059	0.020	0.014
10	87.94	90.00	7.2	-1.6	11.2	0.173	0.058	0.057	0.013	0.012
11	94.84	95.01	6.5	-2.4	7.7	0.213	0.183	0.183	0.039	0.039

TABLE XIV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

(b) Reading 914

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP OUT	TOTAL PRESS IN	TOTAL PRESS OUT
1	9.728	9.578	0.	27.2	60.0	58.6	518.7	580.9	14.69	19.62
2	9.510	9.386	0.	27.1	59.9	57.6	518.7	579.0	14.69	19.60
3	8.609	8.620	0.	26.7	57.2	51.3	518.7	576.8	14.69	20.37
4	8.149	8.237	0.	30.4	55.6	49.2	518.7	579.5	14.69	19.90
5	8.034	8.142	0.	30.5	55.2	49.5	518.7	579.5	14.69	19.52
6	7.918	8.046	0.	31.1	54.8	48.8	518.7	581.3	14.69	19.42
7	7.801	7.950	0.	31.5	54.3	46.1	518.7	581.2	14.69	19.90
8	7.684	7.854	0.	30.4	54.0	44.2	518.7	582.3	14.69	20.35
9	6.711	7.089	0.	28.6	51.3	36.1	518.7	577.7	14.69	21.10
10	5.589	6.323	0.	31.8	51.2	23.9	518.7	581.3	14.69	21.56
11	5.252	6.131	0.	35.5	50.6	17.8	518.7	590.3	14.69	21.93

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	707.0	631.1	1415.2	1076.8	707.0	561.4	0.	288.2	1226.0	1207.1
2	694.1	637.7	1385.9	1058.0	694.1	567.5	0.	290.9	1199.5	1183.9
3	700.7	694.7	1292.1	993.2	700.7	620.8	0.	311.7	1085.6	1087.0
4	704.0	690.7	1245.9	911.0	704.0	595.6	0.	349.7	1027.9	1039.0
5	703.9	676.4	1231.9	896.8	703.9	582.9	0.	345.1	1011.0	1024.5
6	703.2	679.2	1221.2	882.6	703.2	581.6	0.	350.7	998.4	1014.5
7	703.6	709.2	1207.0	872.5	703.6	604.8	0.	370.7	980.8	999.5
8	702.6	733.8	1194.8	883.2	702.6	632.9	0.	371.7	966.3	987.7
9	675.1	796.4	1080.9	865.3	675.1	699.0	0.	381.7	844.1	891.7
10	566.7	881.4	903.6	819.1	566.7	749.0	0.	464.6	705.8	796.2
11	541.7	914.5	854.0	781.8	541.7	744.2	0.	531.4	660.2	770.7

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO	EFF
1	0.660	0.550	1.322	0.939	0.660	0.489	0.794	1.416	0.719
2	0.647	0.557	1.292	0.925	0.647	0.496	0.818	1.436	0.758
3	0.654	0.612	1.206	0.875	0.654	0.547	0.886	1.465	0.875
4	0.657	0.606	1.163	0.800	0.657	0.523	0.846	1.501	0.772
5	0.657	0.593	1.150	0.786	0.657	0.511	0.828	1.505	0.721
6	0.656	0.595	1.140	0.773	0.656	0.509	0.827	1.518	0.688
7	0.657	0.623	1.127	0.766	0.657	0.531	0.860	1.507	0.751
8	0.656	0.646	1.115	0.777	0.656	0.557	0.901	1.504	0.796
9	0.628	0.709	1.006	0.770	0.628	0.622	1.035	1.495	0.957
10	0.521	0.791	0.831	0.735	0.521	0.672	1.322	1.275	0.959
11	0.497	0.818	0.784	0.699	0.497	0.665	1.374	1.174	0.878

RP	PERCENT SPAN IN	PERCENT SPAN OUT	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	3.21	4.99	-1.4	-3.6	13.3	0.328	0.153	0.100	0.035	0.023
2	7.68	10.00	-0.4	-2.9	12.0	0.326	0.143	0.090	0.033	0.021
3	26.12	30.01	2.0	-2.2	7.6	0.326	0.075	0.029	0.018	0.007
4	35.54	40.01	3.4	-1.8	7.8	0.374	0.145	0.098	0.035	0.024
5	37.89	42.49	3.5	-1.9	8.8	0.375	0.179	0.133	0.043	0.032
6	40.27	45.00	4.0	-1.8	8.7	0.381	0.206	0.160	0.049	0.038
7	42.66	47.51	4.0	-2.1	6.9	0.387	0.169	0.126	0.042	0.031
8	45.06	50.01	4.3	-2.2	5.8	0.371	0.143	0.102	0.036	0.026
9	64.97	69.99	6.0	-2.0	7.8	0.311	0.034	0.006	0.008	0.002
10	87.94	90.00	7.1	-1.7	8.5	0.227	0.045	0.045	0.010	0.010
11	94.84	95.01	5.9	-2.9	6.4	0.235	0.165	0.165	0.035	0.035

TABLE XIV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

(c) Reading 915

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	35.5	60.5	57.6	518.7	594.8	14.69	21.61
2	9.510	9.386	0.	34.6	60.4	56.4	518.7	592.9	14.69	21.72
3	8.609	8.620	0.	33.8	57.8	50.3	518.7	591.2	14.69	22.18
4	8.149	8.237	0.	36.0	56.3	46.5	518.7	594.6	14.69	22.18
5	8.034	8.142	0.	37.4	56.0	45.9	518.7	596.0	14.69	21.98
6	7.918	8.046	0.	38.5	55.6	44.9	518.7	595.4	14.69	21.89
7	7.801	7.950	0.	36.8	55.4	43.6	518.7	593.2	14.69	22.11
8	7.684	7.854	0.	35.6	55.0	42.7	518.7	590.4	14.69	22.27
9	6.711	7.089	0.	32.9	52.5	36.5	518.7	585.7	14.69	22.02
10	5.589	6.323	0.	35.3	52.3	22.9	518.7	584.7	14.69	22.09
11	5.252	6.131	0.	38.4	52.2	16.7	518.7	592.9	14.69	22.31

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	691.8	645.4	1404.5	981.6	691.8	525.7	0.	374.6	1222.3	1203.5
2	679.8	653.7	1377.6	973.1	679.8	537.9	0.	371.5	1198.1	1182.5
3	683.6	698.6	1282.7	908.3	683.6	580.7	0.	388.3	1085.3	1086.7
4	684.3	719.3	1232.8	845.7	684.3	581.9	0.	422.8	1025.4	1036.5
5	683.4	717.8	1221.1	819.7	683.4	569.9	0.	436.4	1011.9	1025.5
6	682.7	721.9	1208.5	798.5	682.7	565.2	0.	449.4	997.2	1013.3
7	677.5	734.7	1192.3	811.3	677.5	587.9	0.	440.8	981.2	999.9
8	677.2	742.4	1180.8	820.5	677.2	603.4	0.	432.7	967.3	988.7
9	647.9	768.3	1063.8	799.9	647.9	644.8	0.	417.7	843.7	891.2
10	542.9	862.7	888.6	763.7	542.9	703.7	0.	499.1	703.4	795.8
11	512.7	901.3	836.4	737.7	512.7	706.6	0.	559.6	660.9	771.5

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.645	0.556	1.309	0.846	0.645	0.453	0.760	1.420	0.794
2	0.633	0.565	1.282	0.841	0.633	0.465	0.791	1.443	0.826
3	0.637	0.607	1.195	0.790	0.637	0.505	0.849	1.477	0.893
4	0.637	0.625	1.148	0.735	0.637	0.505	0.850	1.513	0.854
5	0.637	0.623	1.137	0.711	0.637	0.494	0.834	1.523	0.817
6	0.636	0.627	1.125	0.693	0.636	0.491	0.828	1.533	0.815
7	0.631	0.640	1.110	0.707	0.631	0.512	0.868	1.530	0.861
8	0.630	0.649	1.099	0.717	0.630	0.528	0.891	1.527	0.913
9	0.601	0.678	0.987	0.706	0.601	0.569	0.995	1.512	0.978
10	0.498	0.770	0.816	0.681	0.498	0.628	1.296	1.284	0.970
11	0.469	0.802	0.766	0.657	0.469	0.629	1.378	1.187	0.887

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-0.9	-3.1	12.3	0.417	0.136	0.084	0.032	0.020
2	7.68	10.00	0.1	-2.5	10.9	0.408	0.116	0.063	0.027	0.015
3	26.12	30.01	2.6	-1.5	6.5	0.410	0.078	0.031	0.019	0.008
4	35.54	40.01	4.0	-1.1	5.2	0.442	0.115	0.068	0.029	0.017
5	37.89	42.49	4.3	-1.1	5.3	0.461	0.147	0.100	0.038	0.026
6	40.27	45.00	4.7	-1.0	4.9	0.474	0.151	0.103	0.038	0.026
7	42.66	47.51	5.0	-1.1	4.4	0.452	0.113	0.068	0.029	0.017
8	45.06	50.01	5.3	-1.2	4.2	0.435	0.070	0.027	0.018	0.007
9	64.97	69.99	7.2	-0.8	8.0	0.371	0.020	-0.008	0.005	-0.002
10	87.94	90.00	8.3	-0.5	7.5	0.286	0.056	0.035	0.008	0.008
11	94.84	95.01	7.5	-1.3	5.4	0.280	0.165	0.165	0.035	0.035

TABLE XIV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

(d) Reading 916

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	41.6	61.7	55.9	518.7	610.0	14.69	23.44
2	9.510	9.386	0.	40.0	61.6	54.8	518.7	605.7	14.69	23.47
3	8.609	8.620	0.	39.6	59.3	49.1	518.7	601.0	14.69	23.57
4	8.149	8.237	0.	41.3	58.2	46.3	518.7	601.1	14.69	23.26
5	8.034	8.142	0.	41.9	57.8	45.7	518.7	601.2	14.69	23.07
6	7.918	8.046	0.	43.3	57.5	44.9	518.7	601.3	14.69	22.94
7	7.801	7.950	0.	41.4	57.2	44.1	518.7	599.1	14.69	22.94
8	7.684	7.854	0.	40.2	56.9	42.9	518.7	597.5	14.69	23.09
9	6.711	7.089	0.	38.3	54.4	35.9	518.7	589.6	14.69	22.67
10	5.589	6.323	0.	38.7	53.0	22.3	518.7	587.5	14.69	22.63
11	5.252	6.131	0.	41.8	53.1	15.3	518.7	596.2	14.69	22.85

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	657.6	680.4	1387.6	906.9	657.6	508.6	0.	452.2	1221.8	1203.0
2	647.0	681.7	1359.1	906.6	647.0	522.2	0.	438.5	1195.2	1179.6
3	641.3	708.3	1257.5	834.0	641.3	545.5	0.	452.2	1081.6	1083.0
4	635.3	716.8	1205.9	779.1	635.3	538.6	0.	473.2	1025.0	1036.1
5	635.0	714.9	1191.8	760.8	635.0	531.8	0.	478.1	1008.6	1022.1
6	633.9	716.3	1180.1	735.8	633.9	521.0	0.	491.8	995.4	1011.5
7	630.4	719.5	1165.2	751.4	630.4	539.7	0.	475.9	979.9	998.6
8	630.0	729.0	1153.5	760.0	630.0	556.8	0.	470.5	966.3	987.7
9	605.5	751.2	1038.9	727.1	605.5	589.3	0.	465.9	844.2	891.8
10	529.6	841.6	880.5	709.6	529.6	656.5	0.	526.6	703.5	795.9
11	496.0	886.0	825.9	685.3	496.0	661.0	0.	590.1	660.5	771.0

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.611	0.581	1.289	0.774	0.611	0.434	0.773	1.442	0.811
2	0.600	0.584	1.261	0.777	0.600	0.447	0.807	1.462	0.854
3	0.594	0.611	1.166	0.720	0.594	0.471	0.851	1.506	0.911
4	0.588	0.619	1.117	0.673	0.588	0.465	0.848	1.556	0.882
5	0.588	0.617	1.104	0.657	0.588	0.459	0.838	1.562	0.865
6	0.587	0.618	1.093	0.635	0.587	0.450	0.822	1.574	0.853
7	0.584	0.623	1.079	0.650	0.584	0.467	0.856	1.575	0.876
8	0.583	0.632	1.068	0.659	0.583	0.483	0.884	1.572	0.907
9	0.559	0.658	0.959	0.637	0.559	0.516	0.973	1.530	0.965
10	0.485	0.747	0.807	0.630	0.485	0.583	1.240	1.289	0.990
11	0.453	0.785	0.755	0.607	0.453	0.585	1.333	1.194	0.900

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	0.3	-1.9	10.6	0.488	0.148	0.095	0.036	0.023
2	7.68	10.00	1.2	-1.5	9.3	0.470	0.114	0.061	0.028	0.015
3	26.12	30.01	4.1	0.0	5.4	0.477	0.074	0.026	0.019	0.007
4	35.54	40.01	6.0	0.8	4.9	0.500	0.103	0.053	0.027	0.014
5	37.89	42.49	6.2	0.7	5.0	0.510	0.121	0.071	0.031	0.018
6	40.27	45.00	6.6	0.8	4.9	0.528	0.133	0.082	0.034	0.021
7	42.66	47.51	6.9	0.8	4.9	0.502	0.112	0.063	0.029	0.016
8	45.06	50.01	7.2	0.7	4.5	0.485	0.084	0.037	0.022	0.010
9	64.97	69.99	9.0	1.0	7.5	0.441	0.034	0.006	0.008	0.002
10	87.94	90.00	9.0	0.2	6.9	0.349	0.013	0.012	0.003	0.003
11	94.84	95.01	8.4	-0.4	4.1	0.343	0.155	0.155	0.034	0.034

TABLE XIV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

(e) Reading 917

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	45.6	63.7	54.5	518.7	619.7	14.69	24.36
2	9.510	9.386	0.	43.2	63.5	53.9	518.7	612.2	14.69	24.25
3	8.609	8.620	0.	42.9	61.4	49.1	518.7	604.5	14.69	23.92
4	8.149	8.237	0.	44.6	60.3	47.2	518.7	603.4	14.69	23.34
5	8.034	8.142	0.	46.3	59.9	47.0	518.7	604.0	14.69	23.09
6	7.918	8.046	0.	46.3	59.7	45.9	518.7	604.7	14.69	23.06
7	7.801	7.950	0.	45.9	59.4	44.1	518.7	605.0	14.69	23.23
8	7.684	7.854	0.	46.6	59.1	42.1	518.7	603.4	14.69	23.36
9	6.711	7.089	0.	41.7	56.5	36.0	518.7	592.2	14.69	22.76
10	5.589	6.323	0.	40.6	55.6	22.1	518.7	589.7	14.69	22.81
11	5.252	6.131	0.	43.2	55.4	15.5	518.7	596.0	14.69	23.04

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	602.6	706.8	1358.0	851.4	602.6	494.5	0.	505.2	1217.0	1198.2
2	595.2	698.9	1333.2	864.8	595.2	509.6	0.	478.6	1192.9	1177.4
3	589.8	708.5	1230.4	791.9	589.8	518.7	0.	482.8	1079.8	1081.2
4	582.7	700.9	1175.6	735.2	582.7	499.1	0.	492.3	1021.1	1032.1
5	582.6	696.1	1162.4	705.8	582.6	481.2	0.	503.0	1005.8	1019.3
6	580.7	702.7	1150.0	696.8	580.7	485.1	0.	508.5	992.6	1008.7
7	578.3	715.6	1136.2	693.9	578.3	498.2	0.	513.8	978.0	996.7
8	576.4	731.0	1123.3	677.5	576.4	502.4	0.	531.0	964.1	985.5
9	556.9	734.4	1008.2	677.9	556.9	548.1	0.	488.8	840.4	887.7
10	479.2	824.7	847.7	676.2	479.2	626.4	0.	536.4	699.3	791.1
11	454.0	866.6	799.3	655.6	454.0	631.8	0.	593.1	657.9	768.0

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.556	0.600	1.254	0.722	0.556	0.420	0.821	1.477	0.798
2	0.549	0.596	1.230	0.738	0.549	0.435	0.856	1.500	0.853
3	0.544	0.609	1.134	0.681	0.544	0.446	0.880	1.549	0.902
4	0.537	0.603	1.083	0.632	0.537	0.429	0.857	1.603	0.865
5	0.537	0.598	1.071	0.606	0.537	0.414	0.826	1.612	0.838
6	0.535	0.604	1.059	0.599	0.535	0.417	0.835	1.628	0.828
7	0.533	0.616	1.046	0.597	0.533	0.429	0.861	1.628	0.840
8	0.531	0.631	1.034	0.585	0.531	0.434	0.872	1.631	0.867
9	0.512	0.640	0.927	0.591	0.512	0.478	0.984	1.545	0.940
10	0.437	0.729	0.774	0.598	0.437	0.554	1.307	1.303	0.979
11	0.414	0.765	0.728	0.579	0.414	0.558	1.392	1.209	0.920

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	2.3	0.0	9.2	0.535	0.176	0.122	0.045	0.031
2	7.68	10.00	3.1	0.6	8.3	0.504	0.124	0.069	0.031	0.017
3	26.12	30.01	6.1	2.0	5.3	0.510	0.087	0.035	0.022	0.009
4	35.54	40.01	8.0	2.9	5.9	0.531	0.125	0.070	0.032	0.018
5	37.89	42.49	8.3	2.8	6.4	0.552	0.153	0.098	0.038	0.024
6	40.27	45.00	8.8	3.0	5.8	0.554	0.166	0.109	0.042	0.027
7	42.66	47.51	9.1	2.9	4.9	0.551	0.158	0.102	0.040	0.026
8	45.06	50.01	9.4	2.9	3.7	0.564	0.132	0.078	0.034	0.020
9	64.97	69.99	11.1	3.1	7.7	0.480	0.063	0.037	0.016	0.009
10	87.94	90.00	11.6	2.8	6.8	0.366	0.029	0.029	0.007	0.007
11	94.84	95.01	10.7	1.9	4.2	0.359	0.131	0.131	0.028	0.028

TABLE XIV. - Concluded. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 90 PERCENT DESIGN SPEED

(f) Reading 933

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	49.1	63.9	55.0	518.7	617.4	14.69	24.18
2	9.510	9.386	0.	47.1	63.8	53.8	518.7	611.6	14.69	24.11
3	8.609	8.620	0.	46.5	61.7	49.0	518.7	603.8	14.69	23.70
4	8.149	8.237	0.	49.2	60.6	47.5	518.7	602.2	14.69	23.10
5	8.034	8.142	0.	51.0	67.3	62.6	518.7	603.2	14.69	22.88
6	7.918	8.046	0.	51.8	60.0	45.9	518.7	605.0	14.69	22.89
7	7.801	7.950	0.	51.3	59.9	43.8	518.7	605.2	14.69	23.08
8	7.684	7.854	0.	50.8	59.6	41.8	518.7	603.4	14.69	23.24
9	6.711	7.089	0.	46.6	56.9	34.0	518.7	591.9	14.69	22.72
10	5.589	6.323	0.	44.3	55.8	19.1	518.7	589.3	14.69	22.71
11	5.252	6.131	0.	47.6	55.9	10.7	518.7	596.2	14.69	22.99

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	593.4	707.1	1350.9	806.9	593.4	463.4	0.	534.3	1213.6	1194.9
2	584.5	704.0	1323.2	811.7	584.5	478.8	0.	516.3	1187.1	1171.7
3	580.1	709.5	1222.0	744.0	580.1	488.0	0.	515.3	1075.5	1076.9
4	572.4	699.6	1167.2	676.4	572.4	457.2	0.	529.7	1017.2	1028.2
5	572.2	696.3	1483.1	952.3	572.2	438.2	0.	541.2	1368.3	1386.7
6	570.6	706.2	1142.7	628.2	570.6	437.0	0.	554.7	990.0	1006.0
7	565.1	721.2	1128.4	624.6	565.1	450.8	0.	563.0	976.7	995.4
8	564.9	733.5	1115.1	622.2	564.9	464.0	0.	568.1	961.4	982.7
9	548.3	746.2	1003.2	618.4	548.3	512.9	0.	542.0	840.1	887.4
10	474.8	836.0	845.3	632.9	474.8	598.0	0.	584.2	699.4	791.3
11	445.8	886.4	794.3	608.9	445.8	598.2	0.	654.1	657.4	767.4

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.547	0.601	1.246	0.686	0.547	0.394	0.781	1.479	0.804
2	0.539	0.601	1.219	0.693	0.539	0.409	0.819	1.501	0.848
3	0.534	0.611	1.126	0.640	0.534	0.420	0.841	1.553	0.893
4	0.527	0.602	1.074	0.582	0.527	0.394	0.799	1.609	0.857
5	0.527	0.599	1.365	0.819	0.527	0.377	0.766	2.126	0.828
6	0.525	0.607	1.051	0.540	0.525	0.376	0.766	1.637	0.812
7	0.520	0.621	1.038	0.538	0.520	0.388	0.798	1.643	0.826
8	0.520	0.633	1.026	0.537	0.520	0.401	0.821	1.643	0.858
9	0.503	0.652	0.921	0.540	0.503	0.448	0.936	1.549	0.939
10	0.435	0.740	0.771	0.560	0.435	0.529	1.260	1.306	0.973
11	0.406	0.785	0.725	0.539	0.406	0.530	1.342	1.212	0.913

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	2.5	0.3	9.7	0.574	0.169	0.115	0.042	0.029
2	7.68	10.00	3.4	0.9	8.3	0.552	0.129	0.075	0.033	0.019
3	26.12	30.01	6.4	2.3	5.3	0.556	0.095	0.044	0.024	0.011
4	35.54	40.01	8.4	3.2	6.1	0.590	0.132	0.077	0.033	0.019
5	37.89	42.49	15.7	10.2	22.0	0.492	0.125	-0.119	0.021	-0.020
6	40.27	45.00	9.2	3.4	5.9	0.626	0.183	0.126	0.046	0.031
7	42.66	47.51	9.6	3.5	4.6	0.625	0.174	0.117	0.045	0.030
8	45.06	50.01	9.9	3.4	3.4	0.622	0.143	0.087	0.037	0.023
9	64.97	69.99	11.6	3.6	5.7	0.553	0.064	0.038	0.016	0.010
10	87.94	90.00	11.8	3.0	3.9	0.430	0.037	0.037	0.009	0.009
11	94.84	95.01	11.2	2.4	-0.2	0.432	0.144	0.144	0.032	0.032

TABLE XV. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

(a) Reading 918

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	51.8	65.2	56.8	518.7	649.8	14.69	26.09
2	9.510	9.386	0.	48.2	65.2	55.4	518.7	640.1	14.69	26.12
3	8.609	8.620	0.	46.3	62.9	49.5	518.7	631.2	14.69	25.98
4	8.149	8.237	0.	50.2	61.7	49.1	518.7	625.5	14.69	25.05
5	8.034	8.142	0.	51.2	61.4	49.6	518.7	625.7	14.69	24.57
6	7.918	8.046	0.	52.0	61.2	48.5	518.7	626.7	14.69	24.55
7	7.801	7.950	0.	51.2	60.8	46.9	518.7	627.3	14.69	24.66
8	7.684	7.854	0.	50.7	60.4	44.0	518.7	626.6	14.69	25.00
9	6.711	7.089	0.	43.2	57.3	34.6	518.7	609.8	14.69	25.28
10	5.589	6.323	0.	42.0	56.2	21.4	518.7	606.8	14.69	25.02
11	5.252	6.131	0.	44.6	56.0	14.4	518.7	615.3	14.69	25.27

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	622.3	767.4	1486.4	867.2	622.3	474.5	0.	603.2	1349.9	1329.1
2	612.2	762.2	1457.2	895.0	612.2	508.1	0.	568.4	1322.4	1305.1
3	611.9	781.3	1342.6	830.7	611.9	539.7	0.	565.1	1195.1	1196.6
4	611.5	760.0	1288.1	743.5	611.5	486.7	0.	583.8	1133.6	1145.9
5	608.8	746.7	1272.1	722.2	608.8	468.1	0.	581.9	1116.9	1131.9
6	606.4	753.9	1257.1	700.8	606.4	464.3	0.	594.0	1101.2	1119.0
7	605.8	763.3	1242.3	699.2	605.8	478.1	0.	595.1	1084.6	1105.3
8	604.8	786.9	1226.0	692.1	604.8	497.9	0.	609.3	1066.4	1090.0
9	598.4	829.4	1107.6	734.1	598.4	604.5	0.	567.9	932.0	984.5
10	519.6	915.6	934.7	731.1	519.6	680.8	0.	612.3	776.9	878.9
11	493.5	962.8	881.7	707.4	493.5	685.0	0.	676.6	730.6	852.9

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.576	0.639	1.375	0.722	0.576	0.395	0.762	1.644	0.705
2	0.566	0.639	1.346	0.751	0.566	0.426	0.830	1.663	0.763
3	0.565	0.662	1.241	0.703	0.565	0.457	0.882	1.689	0.815
4	0.565	0.645	1.190	0.631	0.565	0.413	0.796	1.728	0.799
5	0.562	0.633	1.175	0.612	0.562	0.397	0.769	1.735	0.767
6	0.560	0.639	1.161	0.594	0.560	0.394	0.766	1.747	0.758
7	0.559	0.647	1.147	0.593	0.559	0.405	0.789	1.740	0.761
8	0.558	0.669	1.132	0.589	0.558	0.424	0.823	1.734	0.788
9	0.552	0.720	1.022	0.637	0.552	0.525	1.010	1.700	0.955
10	0.476	0.806	0.856	0.644	0.476	0.599	1.310	1.461	0.966
11	0.451	0.847	0.806	0.622	0.451	0.602	1.388	1.353	0.900

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	3.8	1.6	11.5	0.593	0.279	0.171	0.067	0.041
2	7.68	10.00	4.8	2.3	9.9	0.552	0.220	0.112	0.053	0.027
3	26.12	30.01	7.7	3.6	5.7	0.546	0.182	0.085	0.046	0.021
4	35.54	40.01	9.4	4.3	7.8	0.592	0.200	0.101	0.049	0.024
5	37.89	42.49	9.7	4.3	9.0	0.601	0.234	0.136	0.056	0.032
6	40.27	45.00	10.3	4.5	8.4	0.614	0.249	0.149	0.059	0.036
7	42.66	47.51	10.5	4.3	7.7	0.609	0.251	0.156	0.061	0.038
8	45.06	50.01	10.7	4.2	5.6	0.611	0.227	0.135	0.057	0.034
9	64.97	69.99	12.0	4.0	6.3	0.498	0.050	-0.017	0.013	-0.004
10	87.94	90.00	12.2	3.4	6.1	0.387	0.048	0.038	0.011	0.009
11	94.84	95.01	11.3	2.5	3.3	0.383	0.171	0.169	0.037	0.037

TABLE XV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

(b) Reading 919

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	45.6	62.4	57.7	518.7	638.5	14.69	25.11
2	9.510	9.386	0.	42.9	62.2	56.2	518.7	629.5	14.69	25.18
3	8.609	8.620	0.	41.2	59.8	49.1	518.7	623.6	14.69	25.69
4	8.149	8.237	0.	43.9	58.8	48.1	518.7	620.8	14.69	24.70
5	8.034	8.142	0.	45.4	58.4	47.9	518.7	620.8	14.69	24.47
6	7.918	8.046	0.	46.5	58.2	47.7	518.7	620.5	14.69	24.14
7	7.801	7.950	0.	45.7	57.8	47.0	518.7	619.7	14.69	24.11
8	7.684	7.854	0.	46.1	57.6	44.9	518.7	619.7	14.69	24.35
9	6.711	7.089	0.	40.3	54.8	34.7	518.7	609.1	14.69	24.95
10	5.589	6.323	0.	40.1	53.4	21.8	518.7	603.0	14.69	24.60
11	5.252	6.131	0.	43.3	54.3	14.6	518.7	612.1	14.69	24.89

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	708.0	733.6	1529.9	959.9	708.0	513.4	0.	524.2	1356.2	1335.3
2	695.2	734.9	1493.0	967.5	695.2	538.4	0.	500.2	1321.2	1304.0
3	693.8	783.5	1381.1	899.7	693.8	589.5	0.	516.0	1194.2	1195.7
4	686.4	764.4	1324.3	824.7	686.4	550.5	0.	530.6	1132.5	1144.7
5	687.3	758.9	1310.3	794.3	687.3	532.4	0.	541.0	1115.6	1130.6
6	681.9	754.3	1294.9	771.9	681.9	519.1	0.	547.4	1100.9	1118.7
7	682.5	754.4	1281.4	772.8	682.5	526.9	0.	539.9	1084.5	1105.3
8	677.5	775.0	1264.5	756.6	677.5	535.9	0.	557.1	1067.6	1091.2
9	658.5	838.1	1141.3	778.1	658.5	639.7	0.	541.6	932.2	984.7
10	575.9	923.3	965.9	760.5	575.9	706.1	0.	594.8	775.5	877.3
11	523.2	973.2	897.6	732.3	523.2	708.7	0.	667.1	729.3	851.4

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.661	0.614	1.429	0.804	0.661	0.430	0.725	1.601	0.716
2	0.648	0.620	1.392	0.816	0.648	0.454	0.775	1.609	0.779
3	0.647	0.668	1.288	0.767	0.647	0.503	0.850	1.628	0.856
4	0.640	0.652	1.234	0.703	0.640	0.470	0.802	1.667	0.812
5	0.640	0.647	1.221	0.677	0.640	0.454	0.775	1.671	0.797
6	0.635	0.643	1.206	0.658	0.635	0.442	0.761	1.684	0.776
7	0.636	0.643	1.193	0.659	0.636	0.449	0.772	1.676	0.781
8	0.631	0.661	1.177	0.647	0.631	0.458	0.791	1.672	0.797
9	0.612	0.729	1.060	0.676	0.612	0.556	0.971	1.632	0.937
10	0.530	0.817	0.889	0.673	0.530	0.624	1.226	1.432	0.976
11	0.479	0.860	0.822	0.647	0.479	0.626	1.354	1.335	0.902

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	1.0	-1.2	12.4	0.521	0.243	0.136	0.057	0.032
2	7.68	10.00	1.9	-0.6	10.6	0.494	0.186	0.083	0.044	0.020
3	26.12	30.01	4.6	0.5	5.3	0.495	0.130	0.040	0.033	0.010
4	35.54	40.01	6.5	1.4	6.8	0.527	0.174	0.082	0.043	0.020
5	37.89	42.49	6.7	1.3	7.3	0.546	0.190	0.100	0.047	0.025
6	40.27	45.00	7.4	1.6	7.7	0.557	0.211	0.120	0.051	0.029
7	42.66	47.51	7.5	1.3	7.8	0.548	0.209	0.122	0.051	0.030
8	45.06	50.01	7.9	1.4	6.5	0.557	0.198	0.114	0.049	0.028
9	64.97	69.99	9.5	1.5	6.4	0.467	0.067	0.010	0.017	0.002
10	87.94	90.00	9.4	0.6	6.5	0.372	0.032	0.022	0.007	0.005
11	94.84	95.01	9.7	0.8	5.4	0.364	0.159	0.157	0.034	0.034

TABLE XV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

(c) Reading 920

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	39.7	61.0	58.4	518.7	622.7	14.69	23.55
2	9.510	9.386	0.	37.6	60.9	57.0	518.7	617.6	14.69	23.68
3	8.609	8.620	0.	36.4	58.2	50.9	518.7	612.3	14.69	24.19
4	8.149	8.237	0.	39.6	56.8	48.0	518.7	612.8	14.69	23.87
5	8.034	8.142	0.	40.7	56.5	48.3	518.7	613.7	14.69	23.39
6	7.918	8.046	0.	41.2	56.2	48.0	518.7	614.1	14.69	23.16
7	7.801	7.950	0.	41.5	55.9	46.3	518.7	614.8	14.69	23.33
8	7.684	7.854	0.	39.9	55.5	44.5	518.7	612.4	14.69	23.72
9	6.711	7.089	0.	36.4	52.7	34.9	518.7	605.3	14.69	24.65
10	5.589	6.323	0.	37.7	52.4	22.8	518.7	600.9	14.69	24.30
11	5.252	6.131	0.	40.9	52.2	16.2	518.7	611.9	14.69	24.55

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	752.6	708.1	1553.8	1039.5	752.6	544.6	0.	452.9	1359.3	1338.3
2	738.9	714.2	1517.9	1039.6	738.9	565.5	0.	436.2	1325.9	1308.6
3	743.9	758.6	1412.3	968.1	743.9	610.3	0.	450.6	1200.5	1202.1
4	745.4	771.1	1360.8	888.1	745.4	594.6	0.	491.0	1138.5	1150.8
5	744.0	756.3	1346.7	862.2	744.0	573.1	0.	493.5	1122.6	1137.6
6	739.7	751.3	1330.6	845.0	739.7	564.9	0.	495.6	1106.1	1123.9
7	739.9	768.2	1318.1	833.7	739.9	575.8	0.	508.7	1090.8	1111.7
8	736.2	786.2	1300.9	845.4	736.2	603.4	0.	504.2	1072.6	1096.3
9	713.7	859.0	1179.0	842.3	713.7	691.3	0.	510.0	938.5	991.3
10	600.4	935.5	984.5	805.3	600.4	740.7	0.	571.8	780.3	882.7
11	570.3	980.1	929.5	771.8	570.3	741.2	0.	641.4	734.0	856.9

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.707	0.599	1.460	0.880	0.707	0.461	0.724	1.584	0.720
2	0.693	0.608	1.423	0.884	0.693	0.481	0.765	1.593	0.766
3	0.698	0.651	1.325	0.831	0.698	0.524	0.820	1.608	0.848
4	0.700	0.665	1.277	0.763	0.700	0.511	0.798	1.638	0.820
5	0.698	0.649	1.264	0.739	0.698	0.491	0.770	1.644	0.775
6	0.694	0.644	1.248	0.724	0.694	0.484	0.764	1.653	0.755
7	0.694	0.659	1.236	0.715	0.694	0.494	0.778	1.645	0.762
8	0.690	0.677	1.220	0.728	0.690	0.520	0.820	1.638	0.811
9	0.667	0.751	1.102	0.737	0.667	0.605	0.969	1.588	0.954
10	0.554	0.830	0.909	0.713	0.554	0.658	1.234	1.432	0.975
11	0.525	0.867	0.855	0.683	0.525	0.656	1.300	1.325	0.879

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-0.4	-2.6	13.1	0.458	0.212	0.103	0.049	0.024
2	7.68	10.00	0.5	-2.0	11.5	0.437	0.176	0.072	0.041	0.017
3	26.12	30.01	3.0	-1.1	7.2	0.439	0.122	0.030	0.030	0.007
4	35.54	40.01	4.5	-0.6	6.6	0.482	0.151	0.059	0.037	0.015
5	37.89	42.49	4.8	-0.6	7.7	0.495	0.191	0.100	0.046	0.024
6	40.27	45.00	5.4	-0.4	8.0	0.500	0.211	0.121	0.051	0.029
7	42.66	47.51	5.5	-0.6	7.1	0.506	0.209	0.122	0.051	0.030
8	45.06	50.01	5.8	-0.7	6.0	0.487	0.167	0.085	0.042	0.021
9	64.97	69.99	7.4	-0.6	6.8	0.422	0.045	-0.010	0.011	-0.002
10	87.94	90.00	8.4	-0.4	7.4	0.335	0.032	0.020	0.007	0.005
11	94.84	95.01	7.5	-1.4	4.9	0.336	0.183	0.181	0.039	0.039

TABLE XV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

(d) Reading 921

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	28.2	60.5	59.2	518.7	595.4	14.69	20.57
2	9.510	9.386	0.	27.4	60.4	58.2	518.7	591.8	14.69	20.59
3	8.609	8.620	0.	26.9	57.5	51.8	518.7	591.8	14.69	21.57
4	8.149	8.237	0.	33.1	56.0	50.5	518.7	591.5	14.69	20.45
5	8.034	8.142	0.	33.5	55.6	52.8	518.7	589.7	14.69	19.40
6	7.918	8.046	0.	32.7	55.3	52.8	518.7	592.3	14.69	19.21
7	7.801	7.950	0.	31.7	54.8	49.6	518.7	594.5	14.69	20.03
8	7.684	7.854	0.	30.9	54.6	46.6	518.7	594.4	14.69	20.88
9	6.711	7.089	0.	29.0	51.9	38.0	518.7	591.7	14.69	22.41
10	5.589	6.323	0.	33.4	51.4	25.9	518.7	595.0	14.69	23.29
11	5.252	6.131	0.	37.6	51.1	19.5	518.7	605.8	14.69	23.69

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	769.2	686.2	1560.7	1179.3	769.2	604.6	0.	324.6	1358.1	1337.1
2	753.8	692.0	1525.4	1165.9	753.8	614.6	0.	318.1	1326.2	1308.9
3	762.8	757.0	1420.8	1091.9	762.8	675.3	0.	342.2	1198.7	1200.2
4	767.3	735.4	1371.7	969.2	767.3	616.3	0.	401.2	1137.0	1149.3
5	766.5	687.8	1357.6	948.8	766.5	573.5	0.	379.8	1120.5	1135.6
6	765.4	680.5	1343.2	946.3	765.4	572.5	0.	368.1	1103.8	1121.6
7	765.8	726.6	1329.5	953.3	765.8	618.3	0.	381.9	1086.7	1107.5
8	761.4	770.1	1313.3	961.2	761.4	660.7	0.	395.6	1070.0	1093.7
9	734.2	845.6	1189.0	938.6	734.2	739.6	0.	409.9	935.2	987.9
10	622.0	922.5	997.0	856.3	622.0	770.3	0.	507.5	779.1	881.4
11	590.3	958.6	939.7	805.3	590.3	759.3	0.	585.2	731.1	853.5

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.724	0.594	1.470	1.020	0.724	0.523	0.786	1.575	0.682
2	0.708	0.601	1.433	1.012	0.708	0.534	0.815	1.586	0.718
3	0.718	0.662	1.337	0.955	0.718	0.591	0.885	1.595	0.822
4	0.722	0.642	1.291	0.846	0.722	0.538	0.803	1.624	0.706
5	0.721	0.598	1.278	0.825	0.721	0.499	0.748	1.628	0.603
6	0.720	0.590	1.264	0.820	0.720	0.496	0.748	1.634	0.561
7	0.721	0.632	1.251	0.829	0.721	0.538	0.807	1.624	0.633
8	0.716	0.673	1.235	0.840	0.716	0.577	0.868	1.618	0.723
9	0.688	0.748	1.114	0.830	0.688	0.654	1.007	1.567	0.911
10	0.575	0.822	0.922	0.763	0.575	0.686	1.238	1.421	0.957
11	0.544	0.850	0.866	0.714	0.544	0.673	1.286	1.310	0.870

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	-0.9	-3.1	13.9	0.335	0.186	0.078	0.042	0.017
2	7.68	10.00	0.0	-2.5	12.7	0.324	0.163	0.059	0.037	0.013
3	26.12	30.01	2.3	-1.8	8.0	0.326	0.114	0.023	0.028	0.006
4	35.54	40.01	3.7	-1.4	9.2	0.403	0.193	0.103	0.046	0.024
5	37.89	42.49	4.0	-1.5	12.2	0.404	0.255	0.166	0.056	0.037
6	40.27	45.00	4.4	-1.4	12.7	0.395	0.292	0.204	0.064	0.044
7	42.66	47.51	4.5	-1.7	10.4	0.386	0.257	0.173	0.059	0.040
8	45.06	50.01	4.9	-1.6	8.2	0.375	0.200	0.119	0.048	0.029
9	64.97	69.99	6.6	-1.4	9.7	0.319	0.074	0.022	0.018	0.005
10	87.94	90.00	7.3	-1.5	10.4	0.273	0.050	0.038	0.011	0.008
11	94.84	95.01	6.4	-2.5	7.9	0.295	0.182	0.180	0.039	0.038

TABLE XV. - Continued. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

(e) Reading 934

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	53.1	64.2	57.4	518.7	645.2	14.69	26.02
2	9.510	9.386	0.	50.4	64.1	55.5	518.7	638.4	14.69	26.09
3	8.609	8.620	0.	49.1	61.9	49.1	518.7	629.9	14.69	26.12
4	8.149	8.237	0.	53.0	60.7	49.5	518.7	623.4	14.69	24.86
5	8.034	8.142	0.	54.7	60.5	50.4	518.7	623.8	14.69	24.36
6	7.918	8.046	0.	54.5	60.3	49.5	518.7	624.9	14.69	24.29
7	7.801	7.950	0.	55.5	60.0	47.3	518.7	625.4	14.69	24.47
8	7.684	7.854	0.	55.0	59.7	44.6	518.7	625.9	14.69	24.76
9	6.711	7.089	0.	46.3	56.6	32.7	518.7	611.6	14.69	25.17
10	5.589	6.325	0.	45.0	55.4	18.1	518.7	605.9	14.69	24.85
11	5.252	6.131	0.	47.7	55.5	10.2	518.7	613.7	14.69	25.15

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	656.6	767.5	1506.1	855.9	656.6	461.3	0.	613.5	1355.4	1334.5
2	644.1	769.5	1473.1	866.4	644.1	490.3	0.	593.2	1324.9	1307.6
3	640.5	794.0	1358.6	792.9	640.5	519.6	0.	600.6	1198.1	1199.7
4	635.7	761.8	1299.5	705.8	635.7	458.0	0.	608.7	1133.4	1145.7
5	632.3	747.6	1283.7	677.5	632.3	431.9	0.	610.3	1117.2	1132.2
6	629.4	750.3	1269.4	670.0	629.4	435.5	0.	611.0	1102.3	1120.1
7	626.4	768.2	1252.5	642.3	626.4	435.2	0.	633.0	1084.6	1105.4
8	624.7	790.1	1238.8	635.7	624.7	453.0	0.	647.3	1069.7	1093.4
9	614.5	843.8	1116.5	692.3	614.5	582.5	0.	610.6	932.2	984.7
10	537.4	937.3	945.5	697.3	537.4	662.6	0.	662.9	777.9	880.1
11	503.1	991.3	887.7	677.3	503.1	666.6	0.	733.8	731.4	853.8

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.610	0.641	1.398	0.715	0.610	0.385	0.703	1.629	0.727
2	0.597	0.647	1.366	0.728	0.597	0.412	0.761	1.645	0.772
3	0.594	0.674	1.259	0.673	0.594	0.441	0.811	1.671	0.833
4	0.589	0.648	1.204	0.600	0.589	0.390	0.721	1.707	0.803
5	0.586	0.635	1.189	0.575	0.586	0.367	0.683	1.716	0.766
6	0.583	0.637	1.175	0.569	0.583	0.370	0.692	1.728	0.754
7	0.580	0.653	1.159	0.546	0.580	0.370	0.695	1.721	0.762
8	0.578	0.673	1.146	0.541	0.578	0.386	0.725	1.720	0.778
9	0.568	0.755	1.052	0.601	0.568	0.506	0.948	1.680	0.928
10	0.493	0.828	0.867	0.616	0.493	0.586	1.235	1.454	0.964
11	0.460	0.877	0.812	0.599	0.460	0.590	1.325	1.350	0.906

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	2.7	0.5	12.1	0.609	0.249	0.140	0.059	0.033
2	7.68	10.00	3.7	1.2	10.0	0.583	0.207	0.100	0.050	0.024
3	26.12	30.01	6.7	2.6	5.3	0.589	0.161	0.065	0.041	0.017
4	35.54	40.01	8.5	3.3	8.2	0.632	0.191	0.095	0.046	0.023
5	37.89	42.49	8.8	3.4	9.8	0.648	0.229	0.133	0.053	0.031
6	40.27	45.00	9.4	3.6	9.4	0.647	0.247	0.150	0.058	0.035
7	42.66	47.51	9.6	3.5	8.2	0.668	0.244	0.151	0.059	0.036
8	45.06	50.01	10.0	3.5	6.2	0.672	0.233	0.143	0.058	0.036
9	64.97	69.99	11.3	3.3	4.4	0.552	0.080	0.016	0.021	0.004
10	87.94	90.00	11.3	2.5	3.0	0.444	0.051	0.041	0.012	0.009
11	94.84	95.01	10.8	2.0	-0.6	0.437	0.157	0.156	0.035	0.034

TABLE XV. - Concluded. BLADE ELEMENT PERFORMANCE FOR ROTOR 4, 100 PERCENT DESIGN SPEED

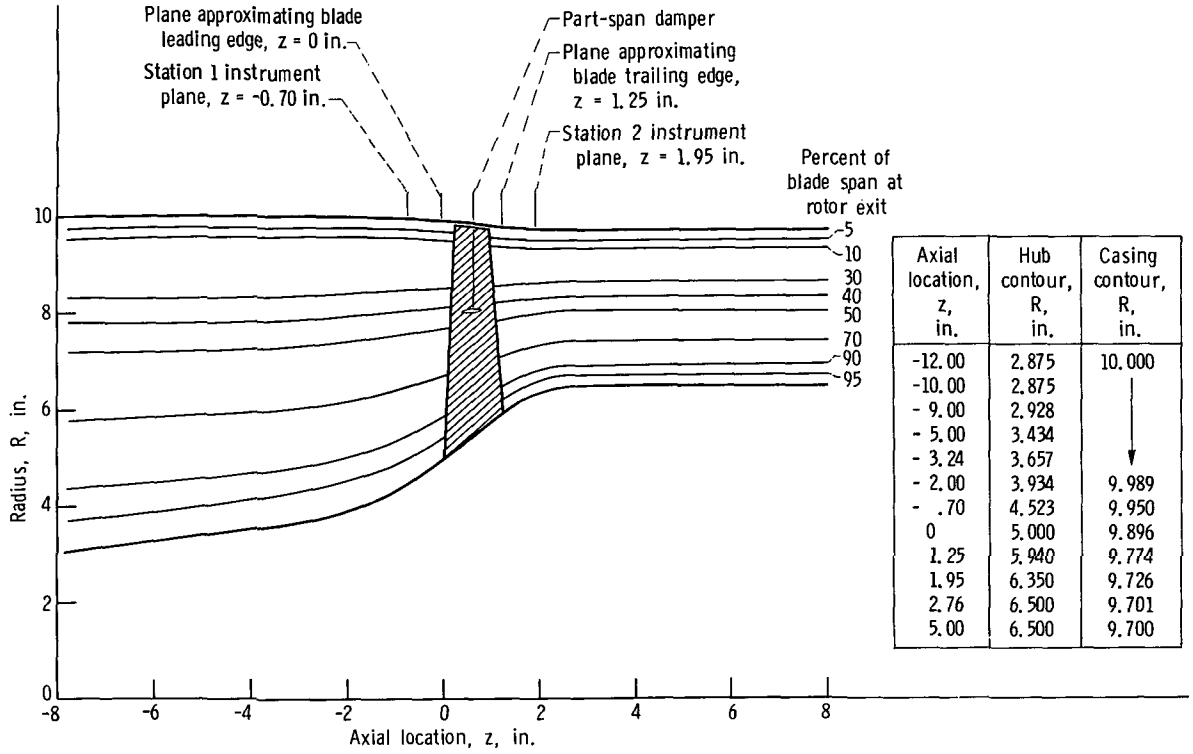
(f) Reading 936

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	9.728	9.578	0.	54.7	65.4	57.1	518.7	648.0	14.69	25.90
2	9.510	9.386	0.	51.8	65.4	55.0	518.7	641.0	14.69	26.00
3	8.609	8.620	0.	50.3	63.0	49.6	518.7	630.1	14.69	25.62
4	8.149	8.237	0.	54.6	62.1	49.8	518.7	624.7	14.69	24.66
5	8.034	8.142	0.	55.7	61.7	50.9	518.7	623.8	14.69	24.13
6	7.918	8.046	0.	56.7	61.3	50.0	518.7	625.6	14.69	24.24
7	7.801	7.950	0.	57.4	61.0	47.4	518.7	627.1	14.69	24.55
8	7.684	7.854	0.	56.2	60.6	44.5	518.7	627.9	14.69	24.84
9	6.711	7.089	0.	47.8	57.6	32.5	518.7	611.4	14.69	25.15
10	5.589	6.323	0.	45.2	56.3	18.2	518.7	606.7	14.69	24.96
11	5.252	6.131	0.	48.9	56.6	9.2	518.7	614.7	14.69	25.24

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	619.4	777.3	1485.7	827.8	619.4	449.3	0.	634.3	1350.4	1329.6
2	605.9	780.5	1453.7	843.2	605.9	483.2	0.	613.2	1321.4	1304.2
3	608.6	787.7	1342.4	777.2	608.6	503.4	0.	605.9	1196.5	1198.0
4	599.3	762.6	1280.8	683.9	599.3	441.5	0.	621.9	1131.9	1144.1
5	601.5	744.0	1267.8	665.1	601.5	419.2	0.	614.7	1116.1	1131.1
6	601.5	749.6	1252.8	640.4	601.5	411.9	0.	626.4	1099.0	1116.7
7	599.7	772.9	1238.5	616.0	599.7	416.9	0.	650.8	1083.6	1104.3
8	601.6	791.8	1224.9	617.0	601.6	440.1	0.	658.2	1067.0	1090.6
9	592.1	842.7	1104.0	671.1	592.1	566.3	0.	624.1	931.7	984.2
10	517.6	933.3	933.2	692.2	517.6	657.6	0.	662.3	776.5	878.4
11	481.1	991.3	874.2	660.5	481.1	652.1	0.	746.7	729.9	852.1

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID	PEAK SS	EFF
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO	
1	0.573	0.649	1.374	0.691	0.573	0.375	0.725	1.646	0.705
2	0.559	0.655	1.342	0.708	0.559	0.406	0.797	1.666	0.751
3	0.562	0.668	1.240	0.659	0.562	0.427	0.827	1.695	0.802
4	0.553	0.648	1.182	0.581	0.553	0.375	0.737	1.736	0.780
5	0.555	0.632	1.170	0.565	0.555	0.356	0.697	1.741	0.751
6	0.555	0.636	1.156	0.543	0.555	0.349	0.685	1.749	0.746
7	0.553	0.656	1.143	0.523	0.553	0.354	0.695	1.745	0.756
8	0.555	0.673	1.131	0.525	0.555	0.374	0.732	1.738	0.769
9	0.546	0.732	1.018	0.583	0.546	0.492	0.956	1.708	0.929
10	0.474	0.824	0.855	0.611	0.474	0.580	1.270	1.461	0.964
11	0.439	0.876	0.798	0.584	0.439	0.576	1.355	1.358	0.903

	PERCENT SPAN		INCIDENCE		DEV	D-FACT	LOSS COEFF		LOSS PARAM	
RP	IN	OUT	MEAN	SS			TOT	PROF	TOT	PROF
1	3.21	4.99	5.9	1.7	11.8	0.628	0.277	0.168	0.066	0.040
2	7.68	10.00	5.0	2.5	9.5	0.599	0.233	0.124	0.057	0.031
3	26.12	30.01	7.8	3.7	5.9	0.597	0.193	0.095	0.049	0.024
4	35.54	40.01	9.8	4.7	8.5	0.647	0.219	0.119	0.052	0.028
5	37.89	42.49	10.0	4.6	10.3	0.654	0.247	0.148	0.057	0.034
6	40.27	45.00	10.4	4.7	9.9	0.670	0.260	0.161	0.060	0.037
7	42.66	47.51	10.7	4.5	8.2	0.691	0.257	0.161	0.062	0.039
8	45.06	50.01	10.9	4.4	6.1	0.686	0.249	0.157	0.062	0.039
9	64.97	69.99	12.2	4.2	4.2	0.570	0.081	0.012	0.021	0.003
10	87.94	90.00	12.3	3.5	3.0	0.442	0.053	0.043	0.012	0.010
11	94.84	95.01	12.0	3.1	-1.6	0.451	0.168	0.166	0.037	0.037



Axial location, z, in.	Hub contour, R, in.	Casing contour, R, in.
-12.00	2.875	10.000
-10.00	2.875	↓
- 9.00	2.928	
- 5.00	3.434	
- 3.24	3.657	
- 2.00	3.934	9.989
- .70	4.523	9.950
0	5.000	9.896
1.25	5.940	9.774
1.95	6.350	9.726
2.76	6.500	9.701
5.00	6.500	9.700

Figure 1. - Compressor flow path for rotor 4.

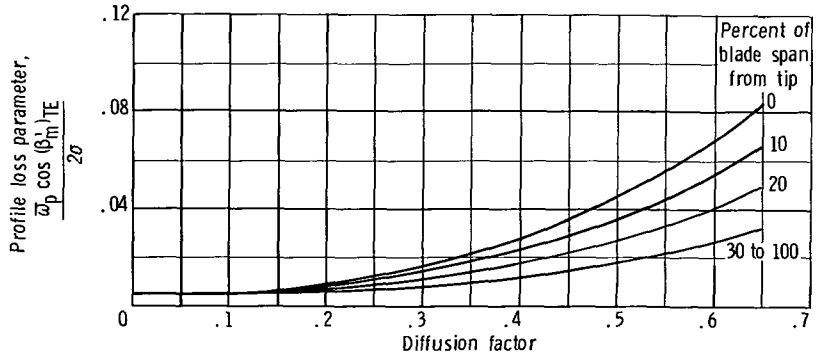


Figure 2. - Profile loss parameter as function of loading and percent span used in design of rotor 4.

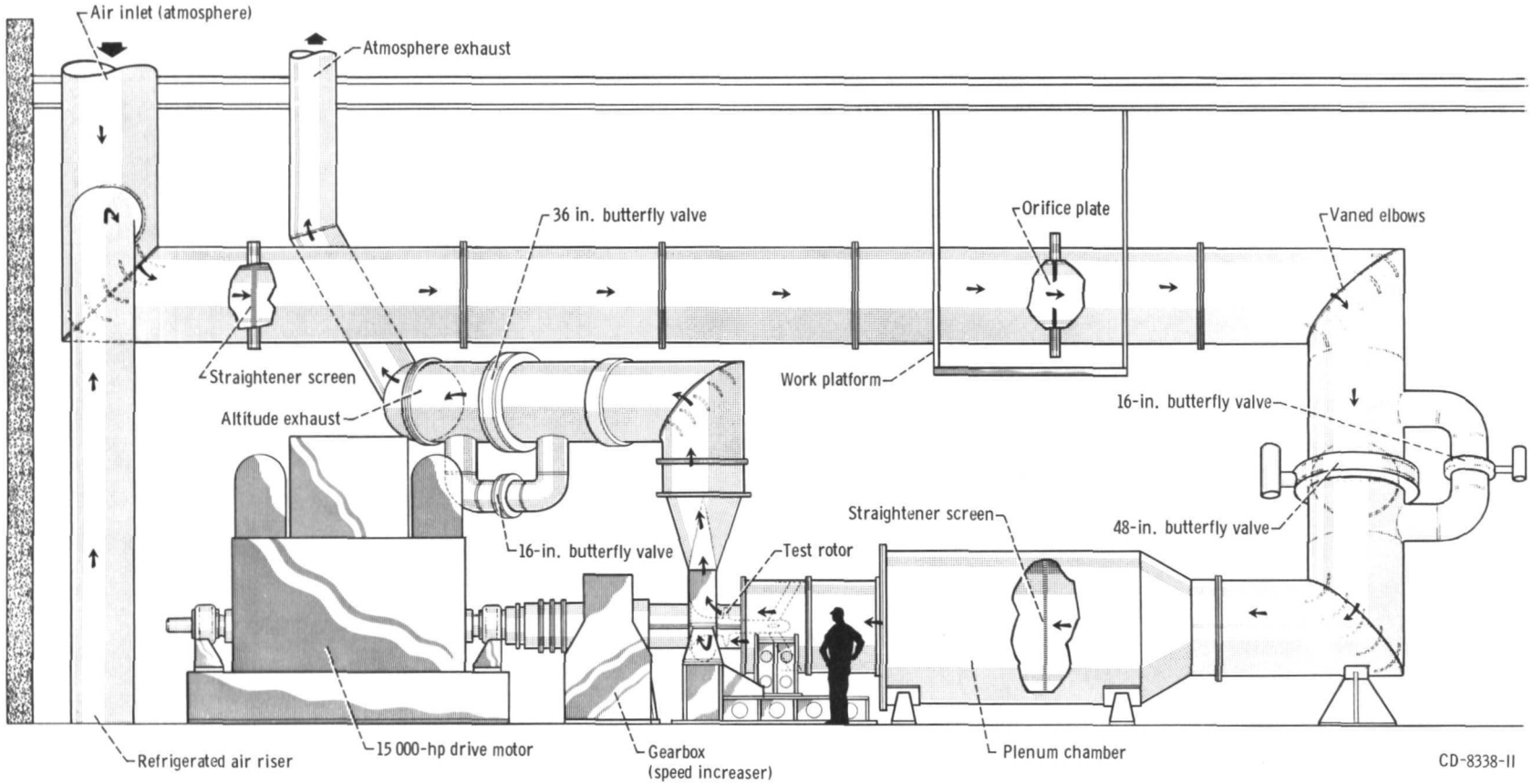


Figure 3. - Compressor test facility.

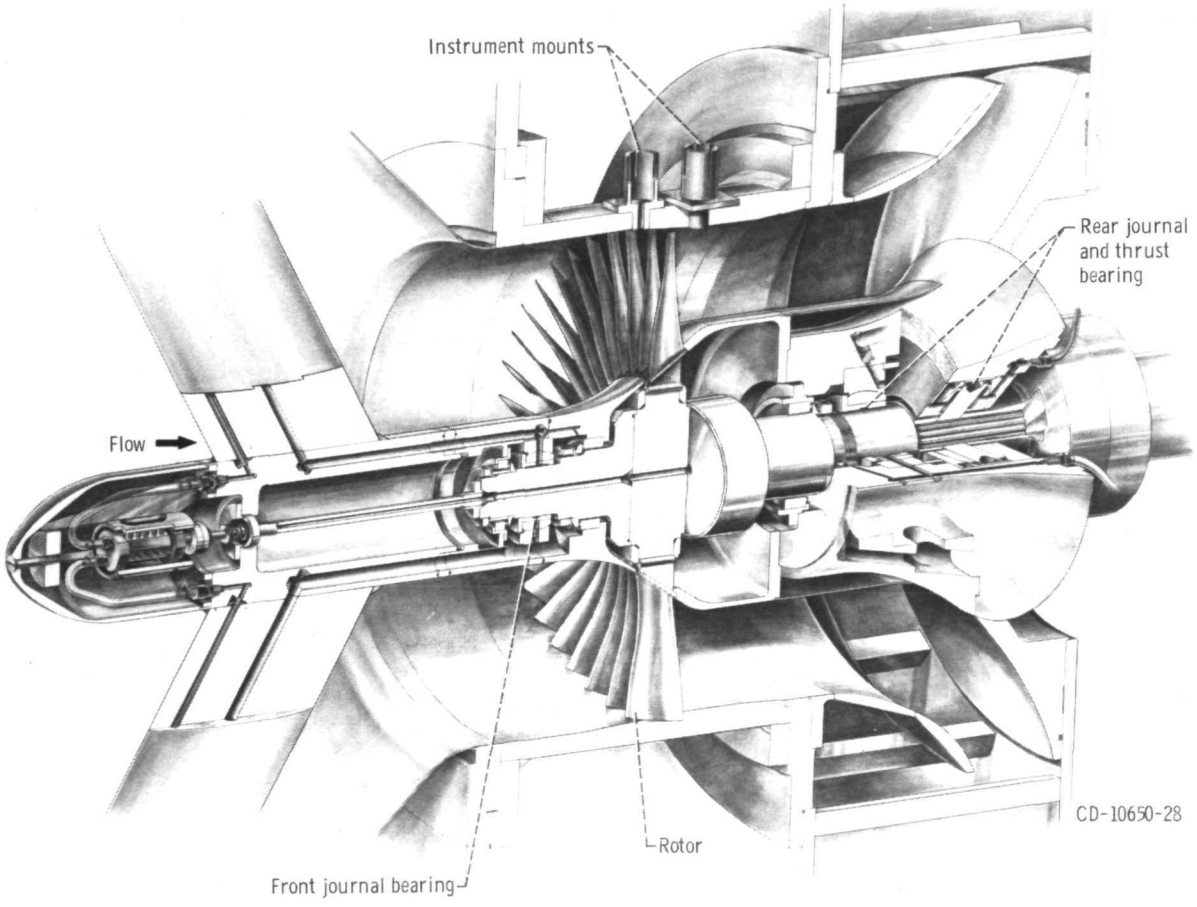


Figure 4. - Compressor assembly.

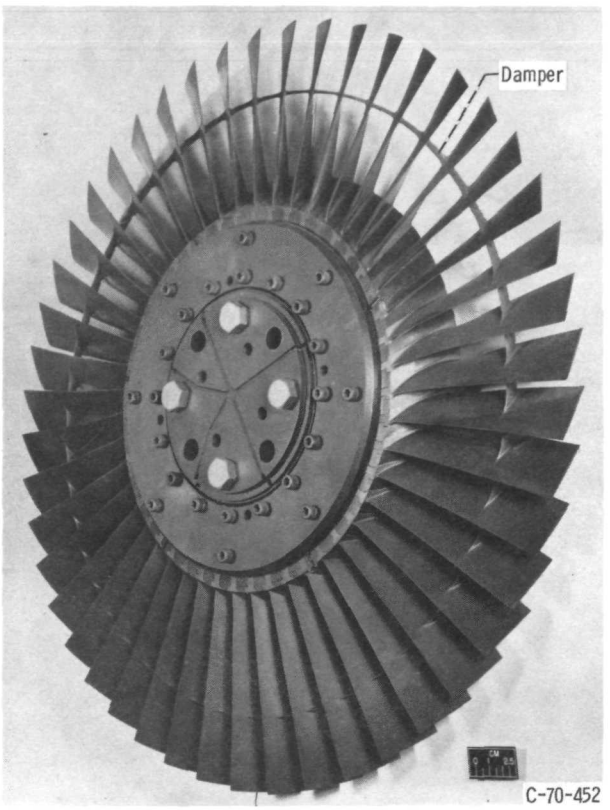


Figure 5. - Test rotor 4.

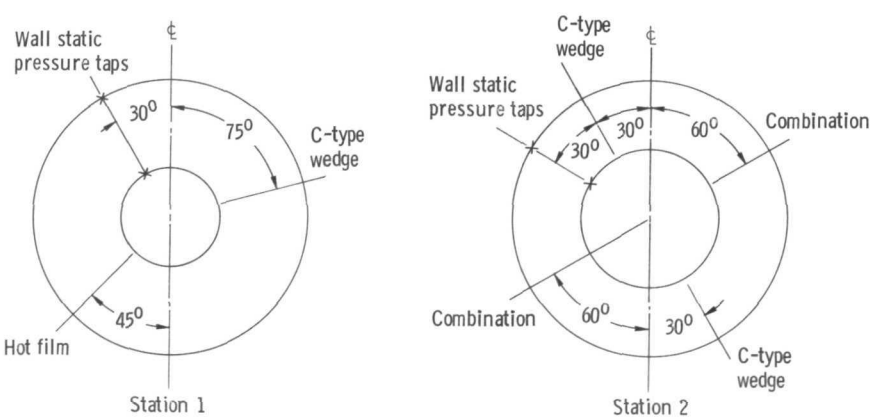


Figure 6. - Circumferential location of survey instrumentation and type of probes employed at each location - looking downstream.

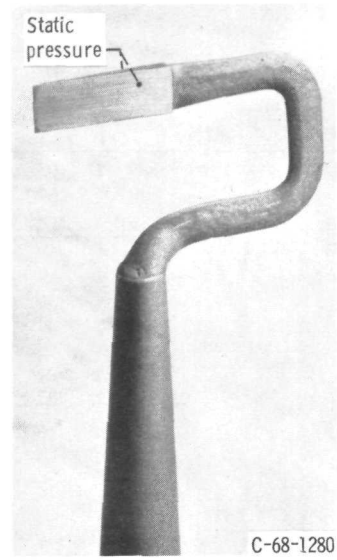


Figure 7. - Static pressure probe (C type; $7\frac{1}{2}°$ wedge).

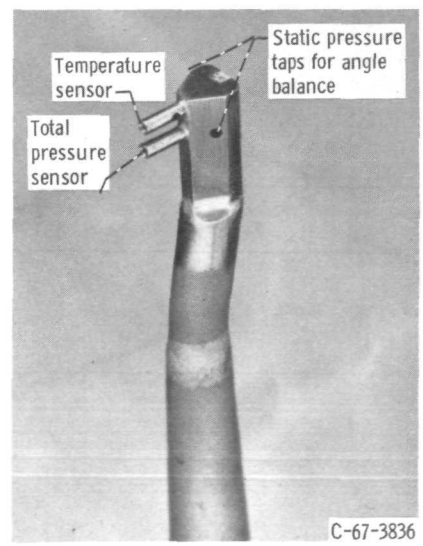


Figure 8. - Combination total pressure, total temperature, and flow angle probe.

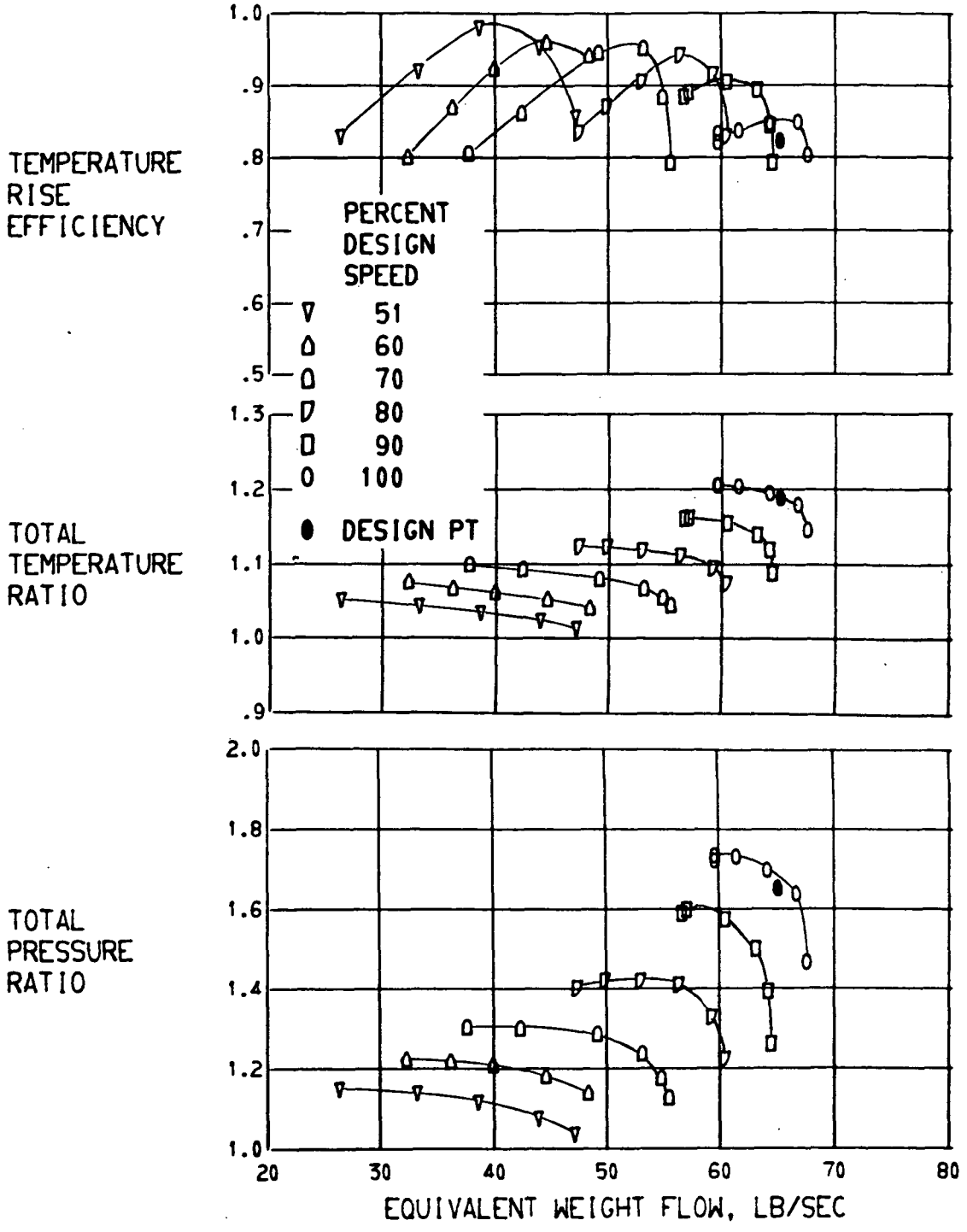


FIGURE 9. - OVERALL PERFORMANCE FOR ROTOR 4.

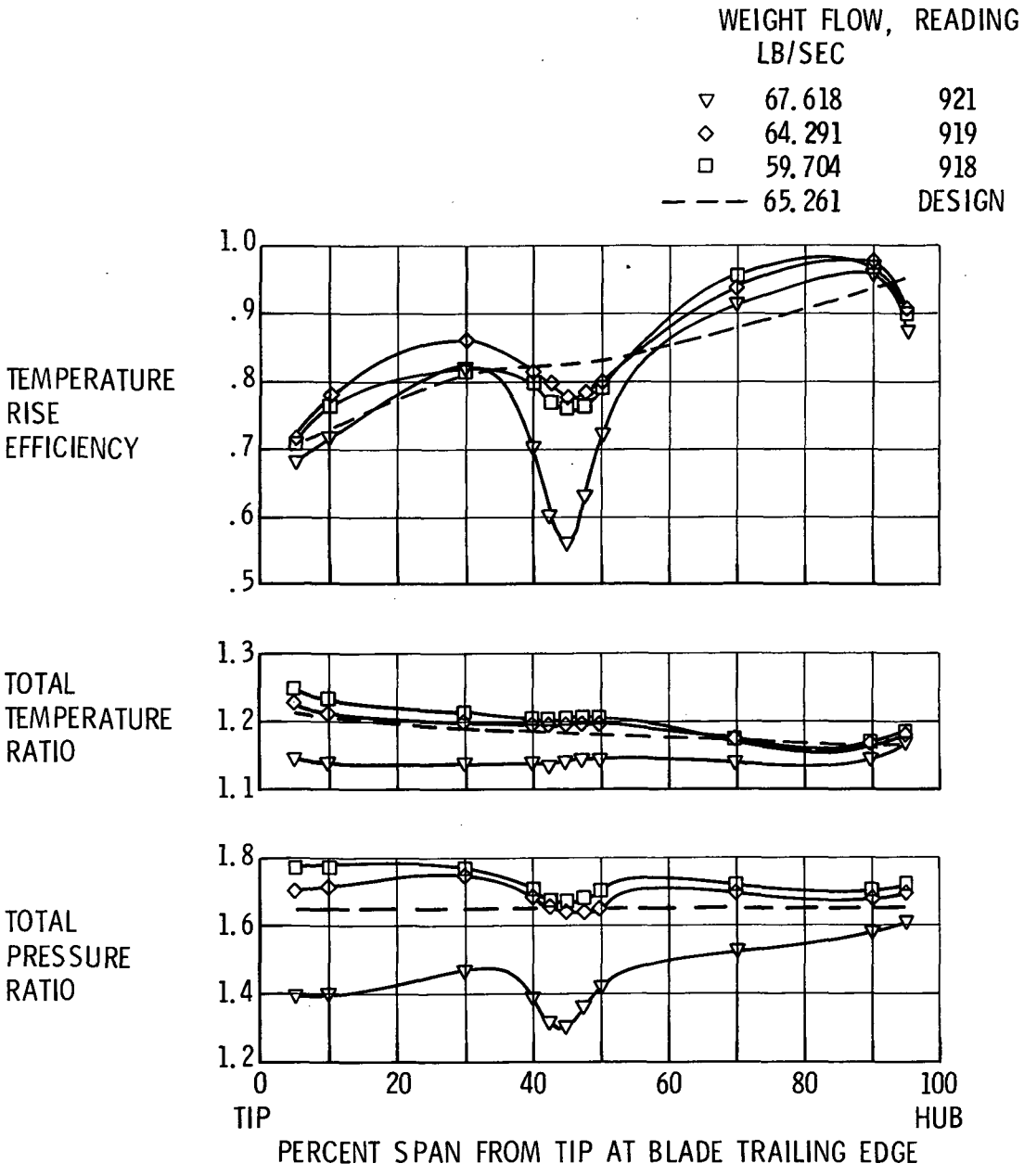


FIGURE 10. - RADIAL VARIATION OF PERFORMANCE PARAMETERS FOR ROTOR 4.

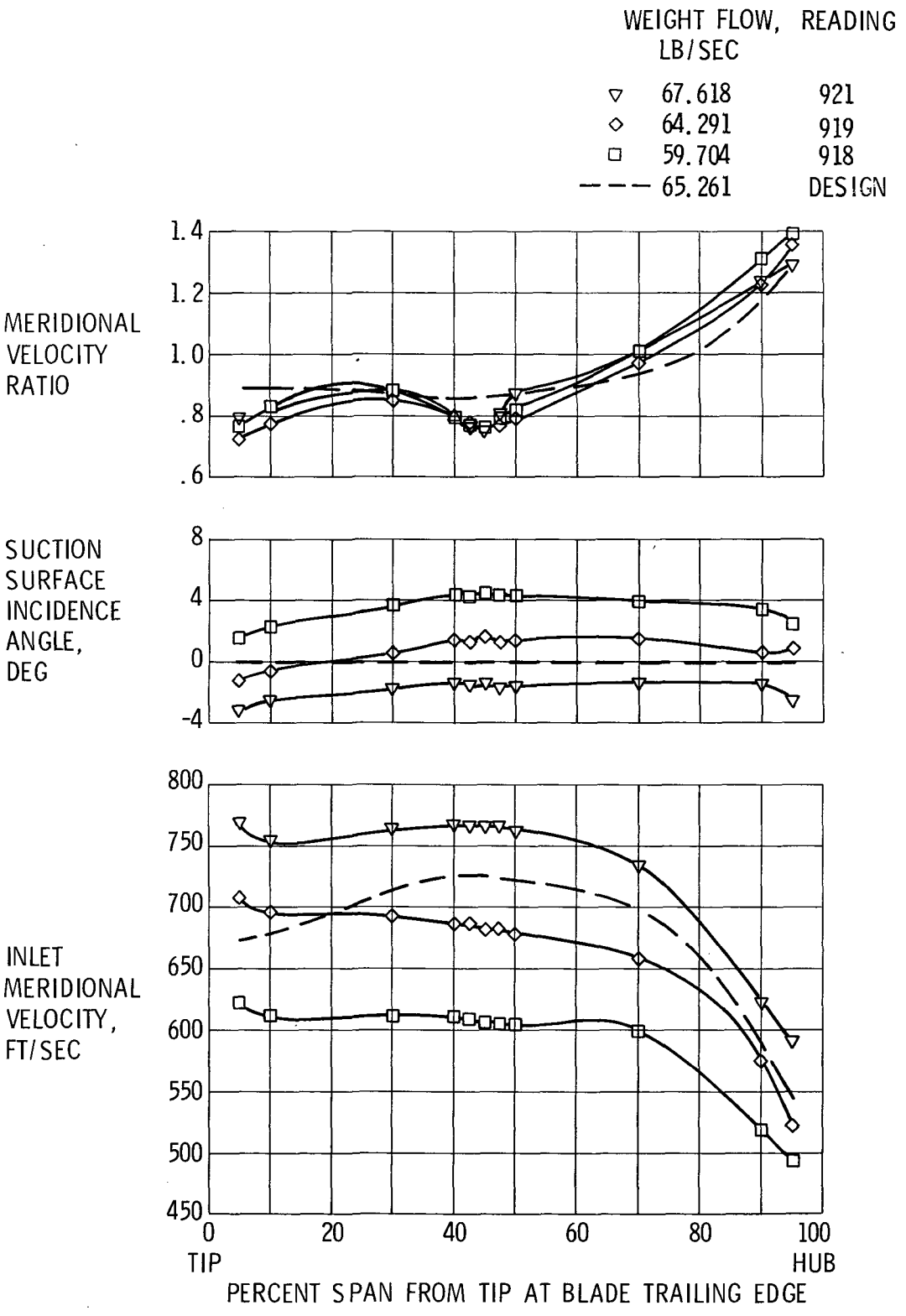


FIGURE 10. - CONTINUED. RADIAL VARIATION OF PERFORMANCE PARAMETERS FOR ROTOR 4.

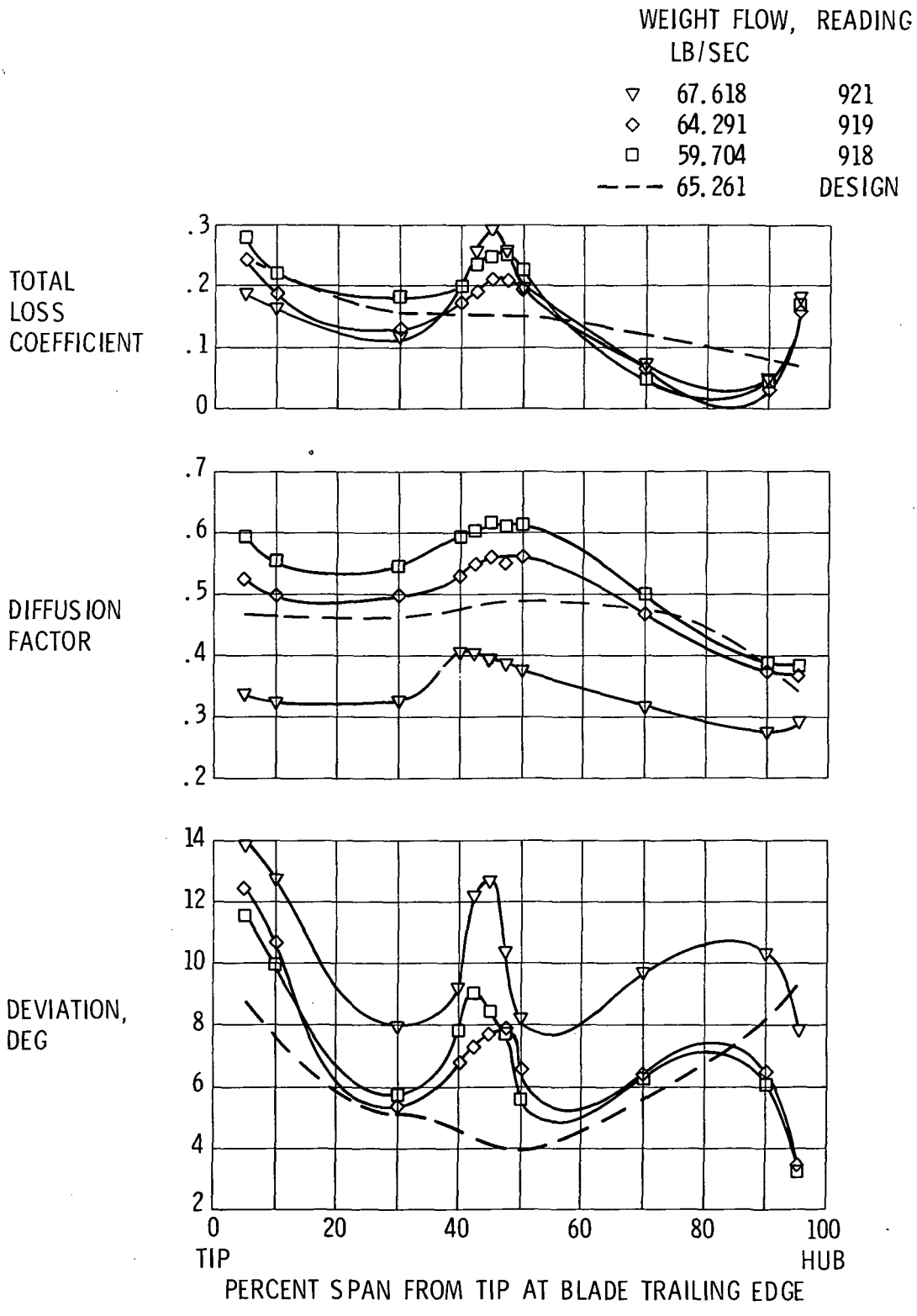
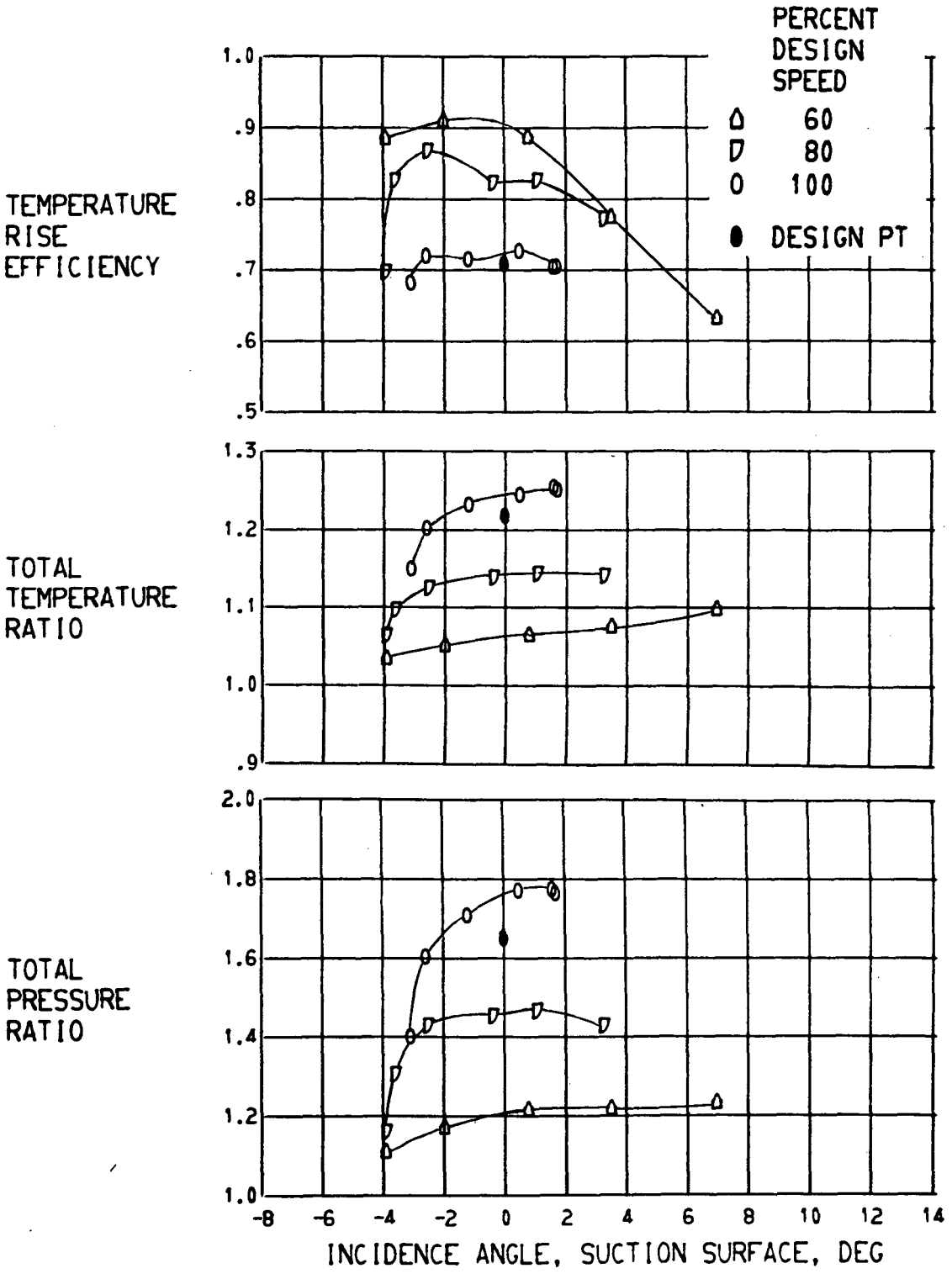
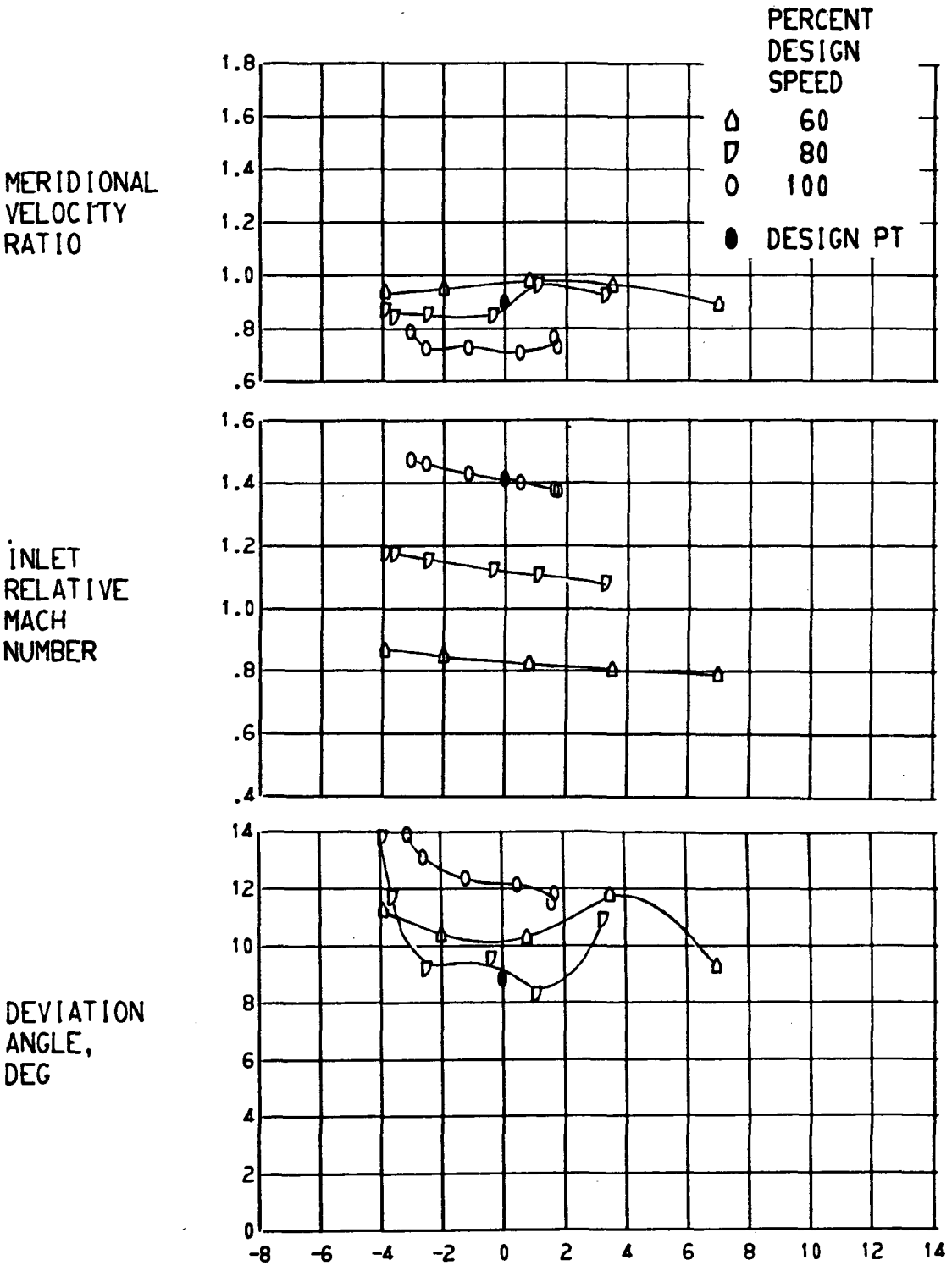


FIGURE 10. - CONCLUDED. RADIAL VARIATION OF PERFORMANCE PARAMETERS FOR ROTOR 4.



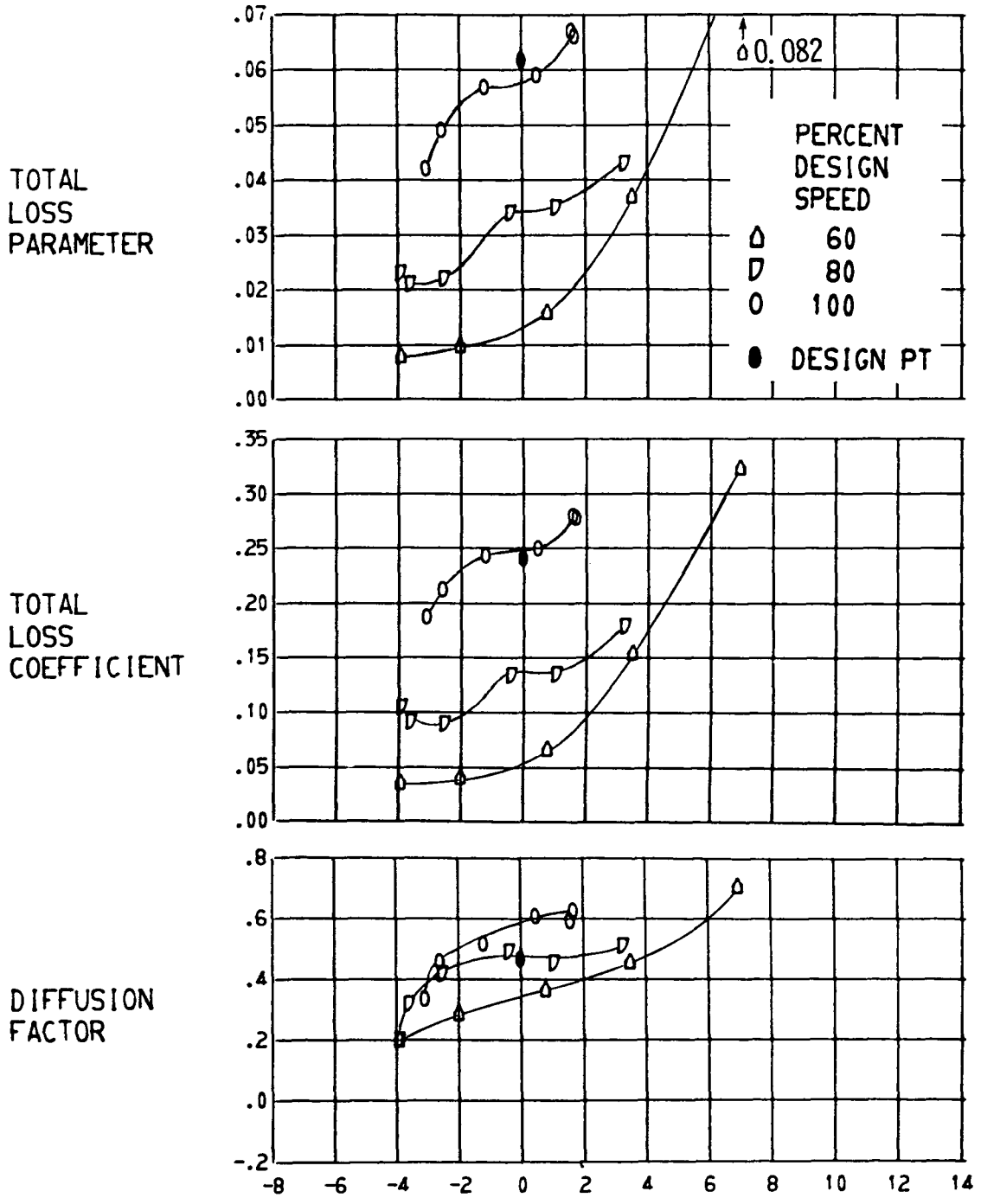
(A) 5.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



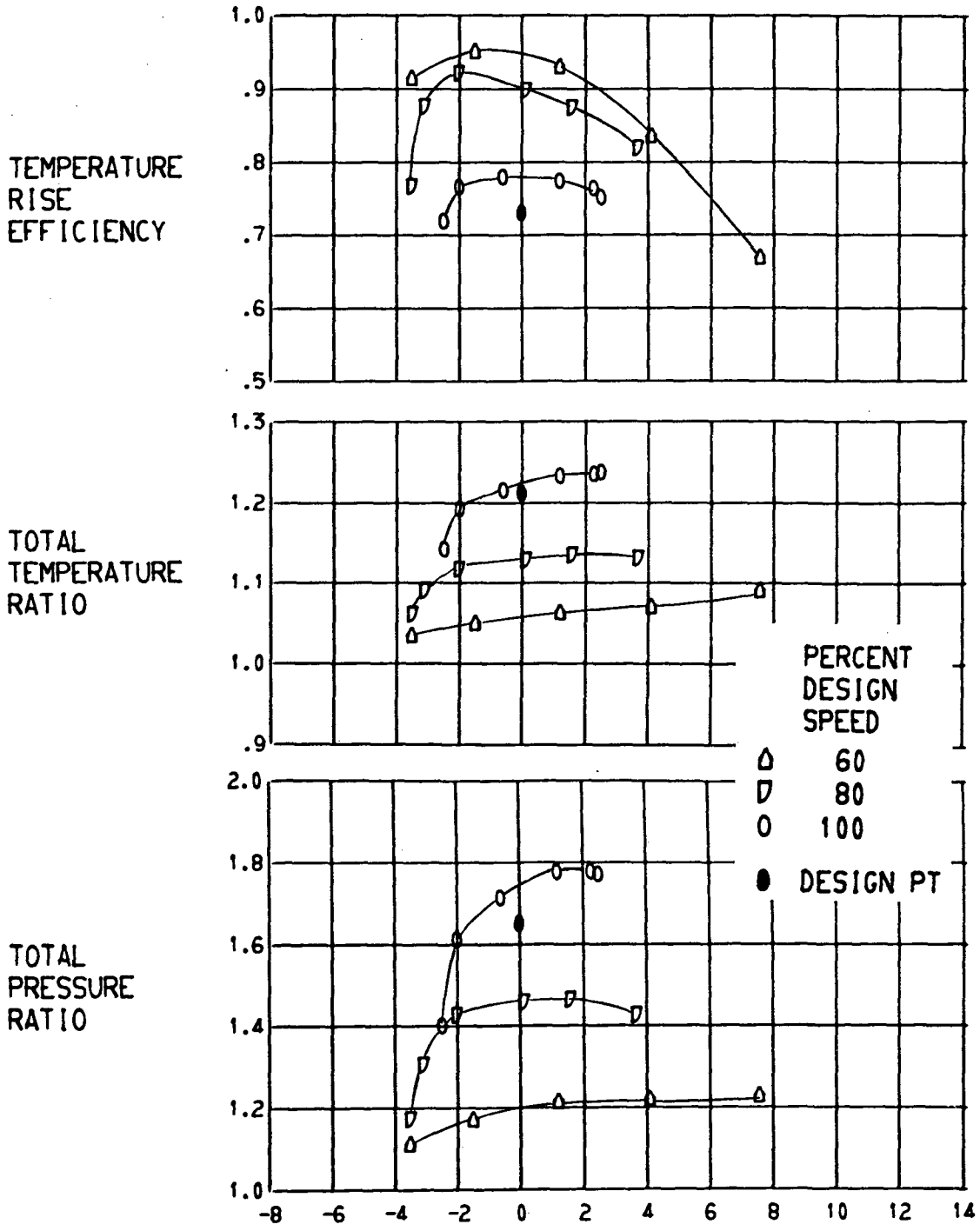
(A) CONTINUED. 5.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



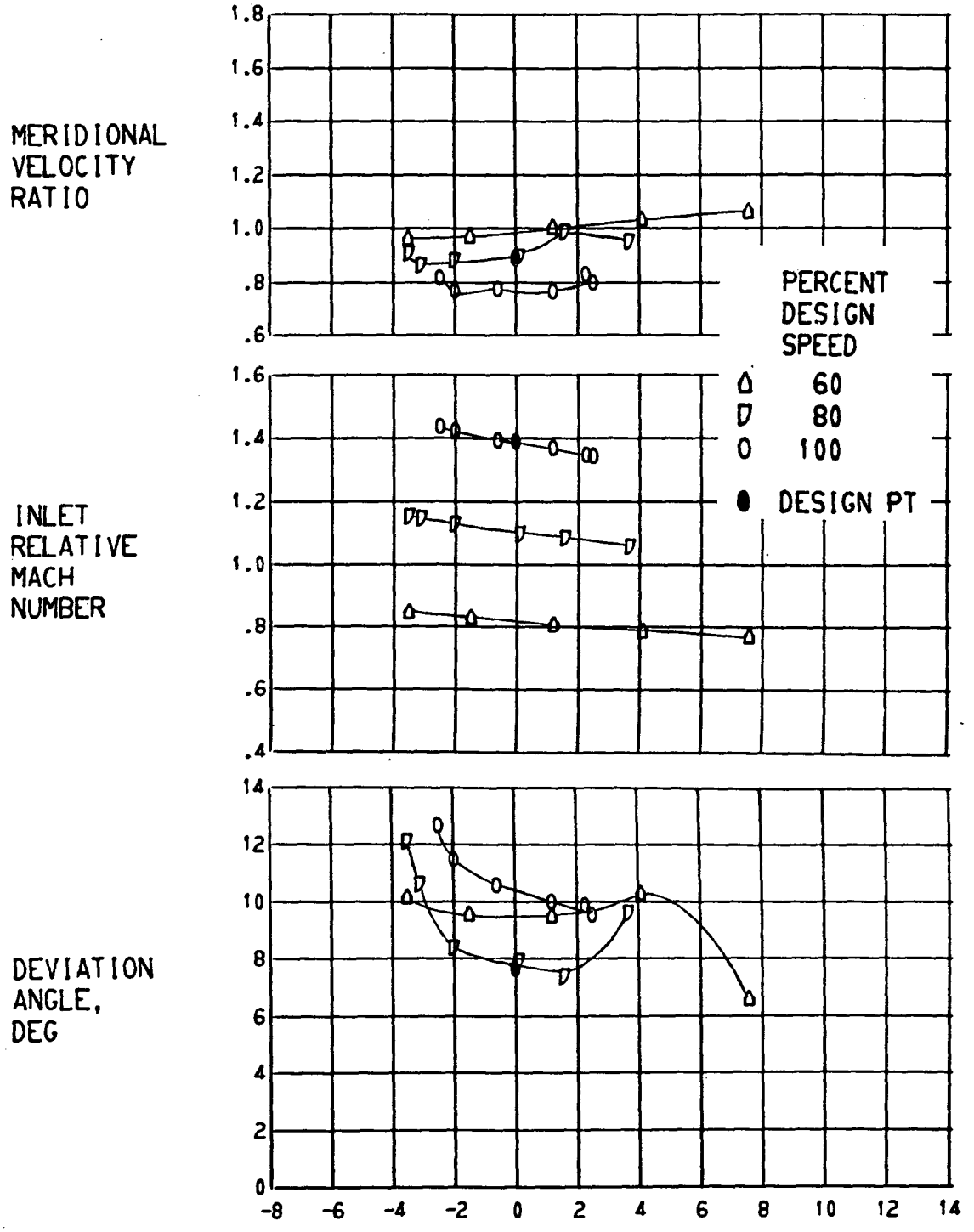
(A) CONCLUDED. 5.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



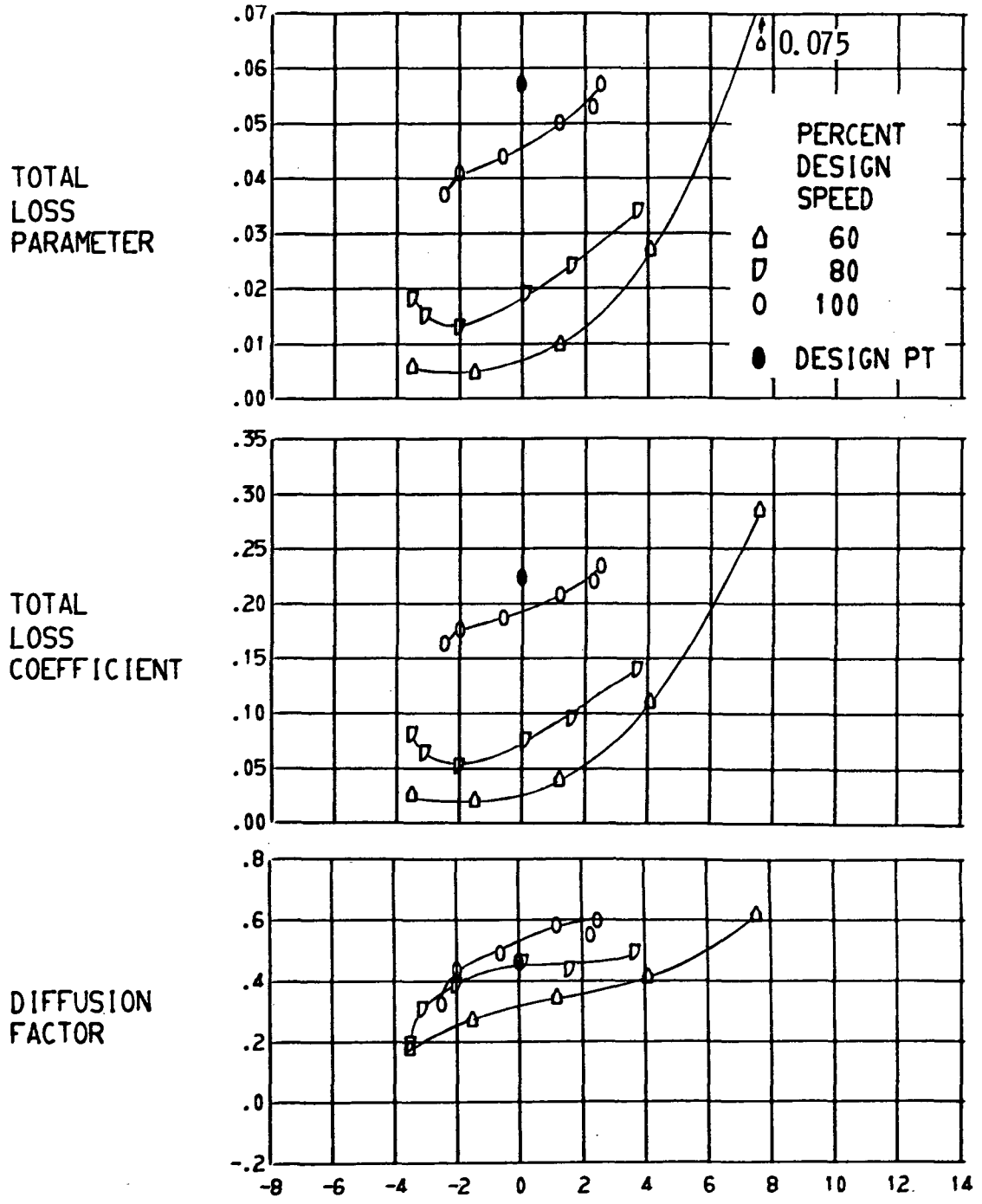
(B) 10.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



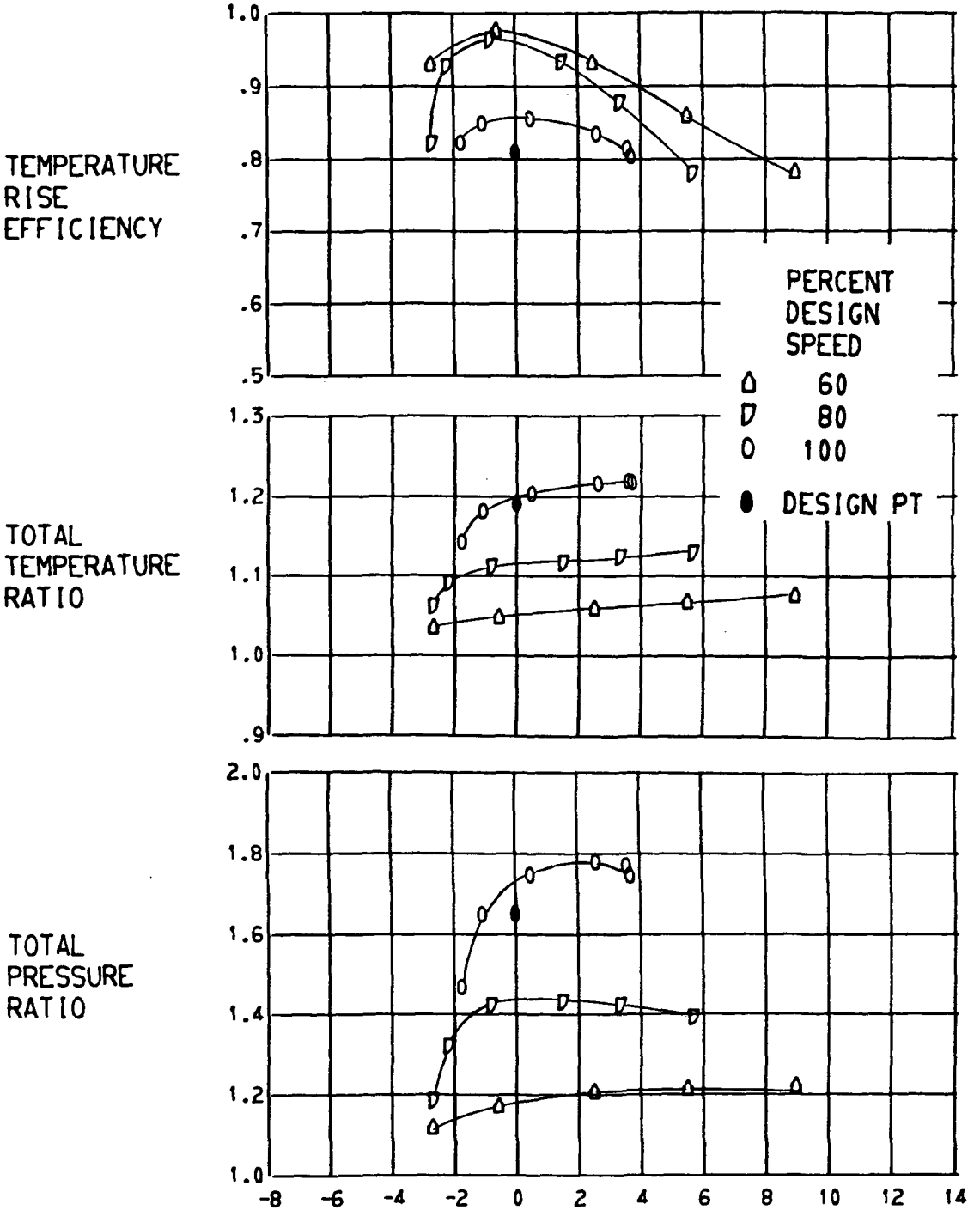
(B) CONTINUED. 10.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



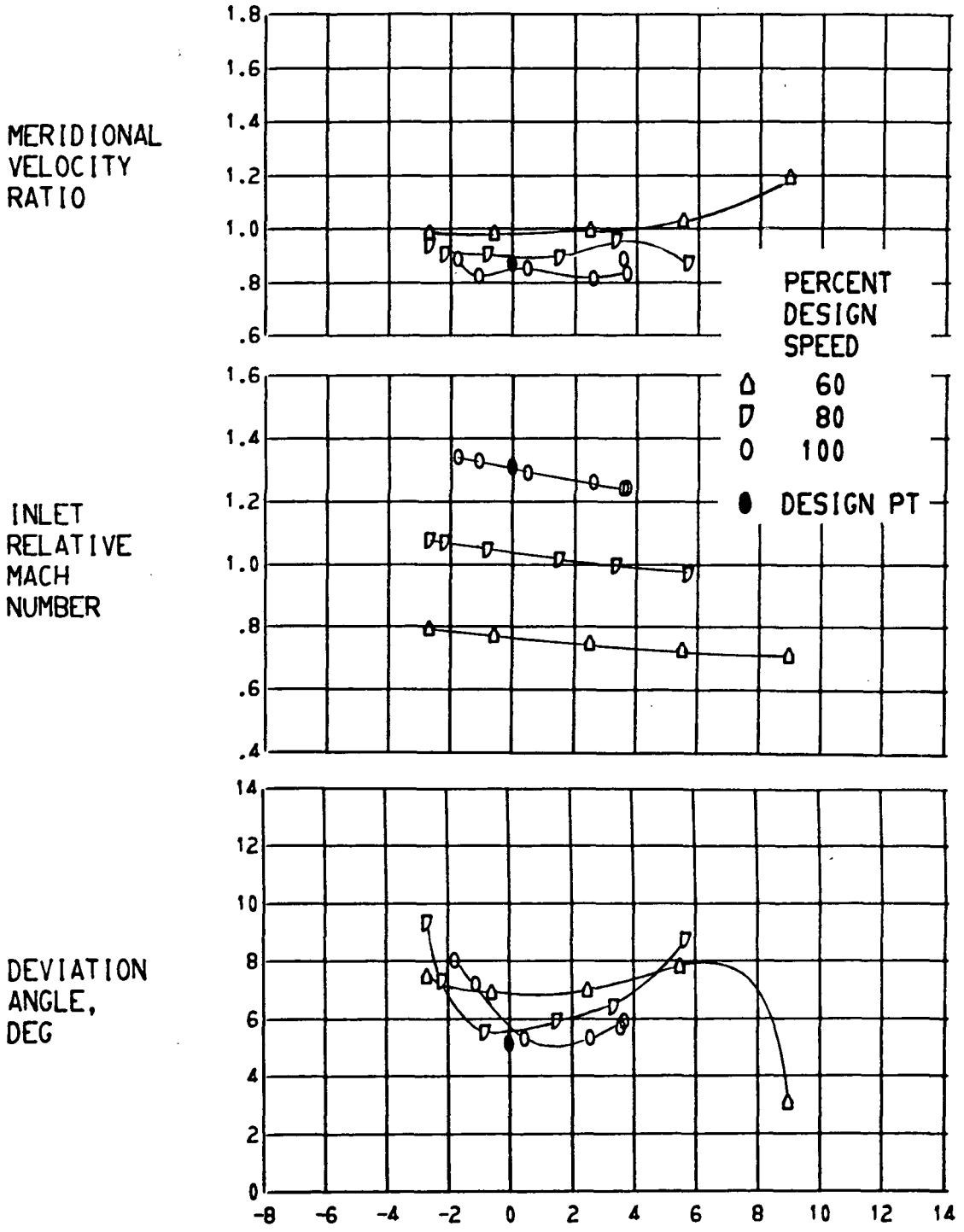
(B) CONCLUDED. 10.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



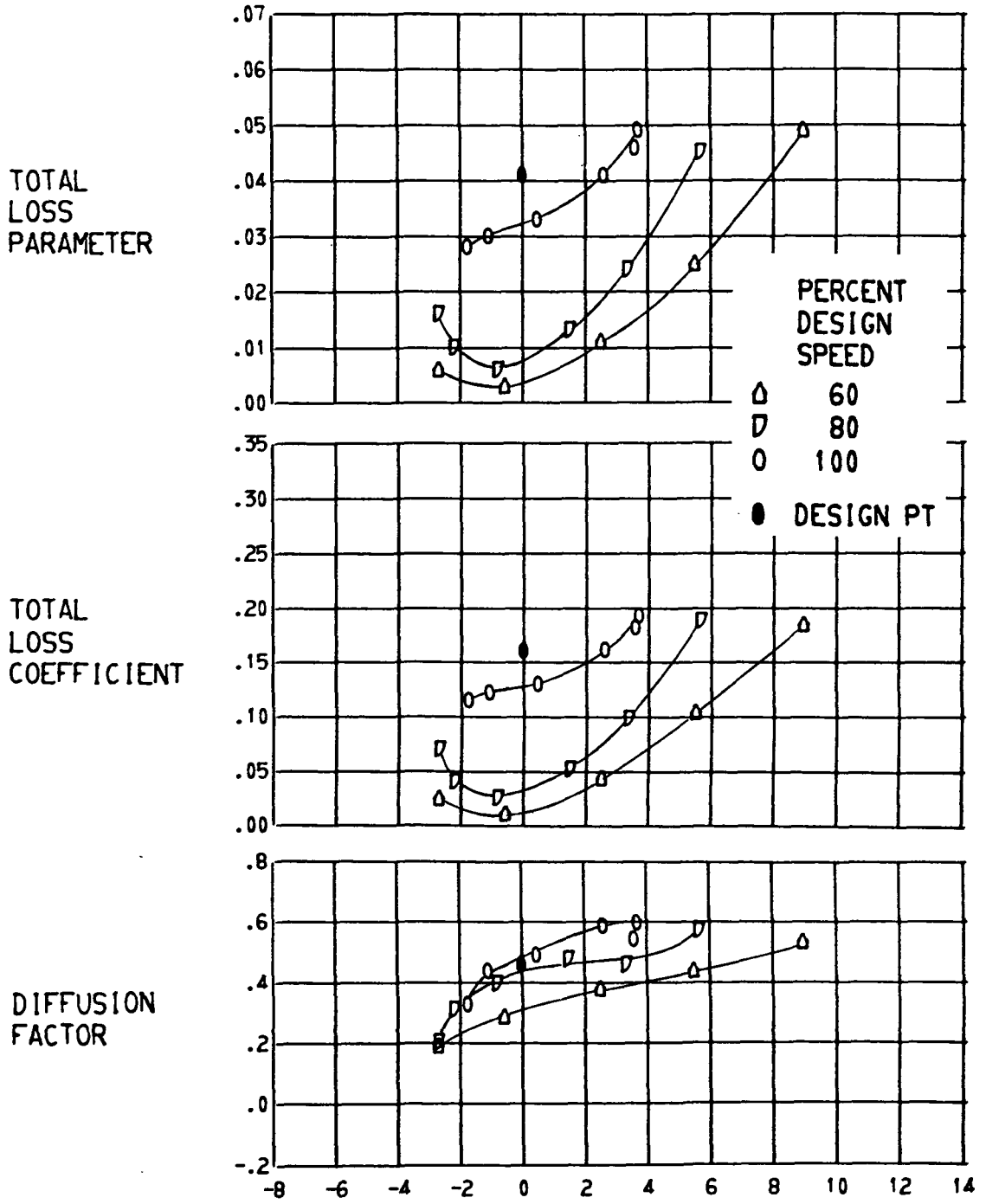
(C) 30.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



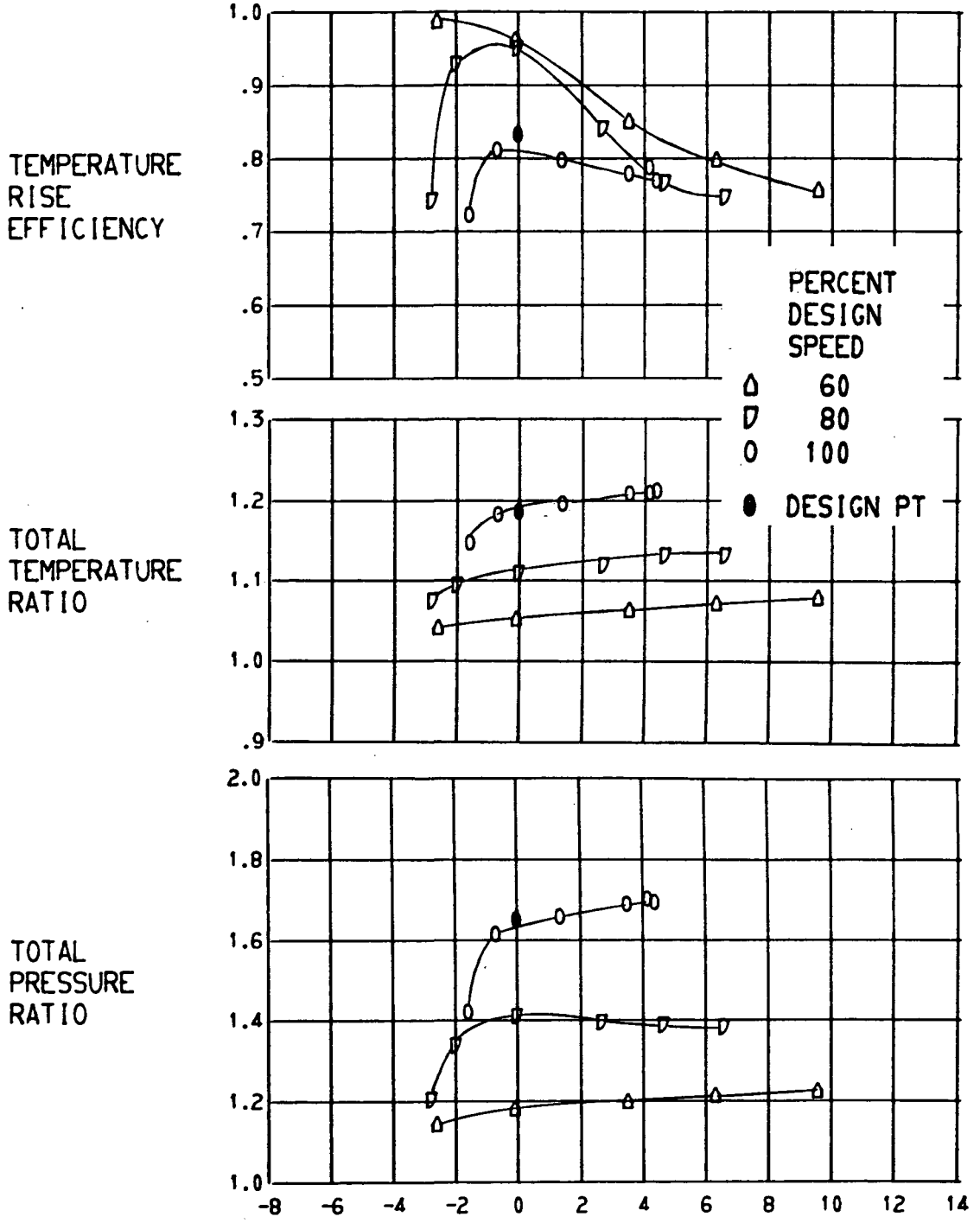
(C) CONTINUED. 30.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



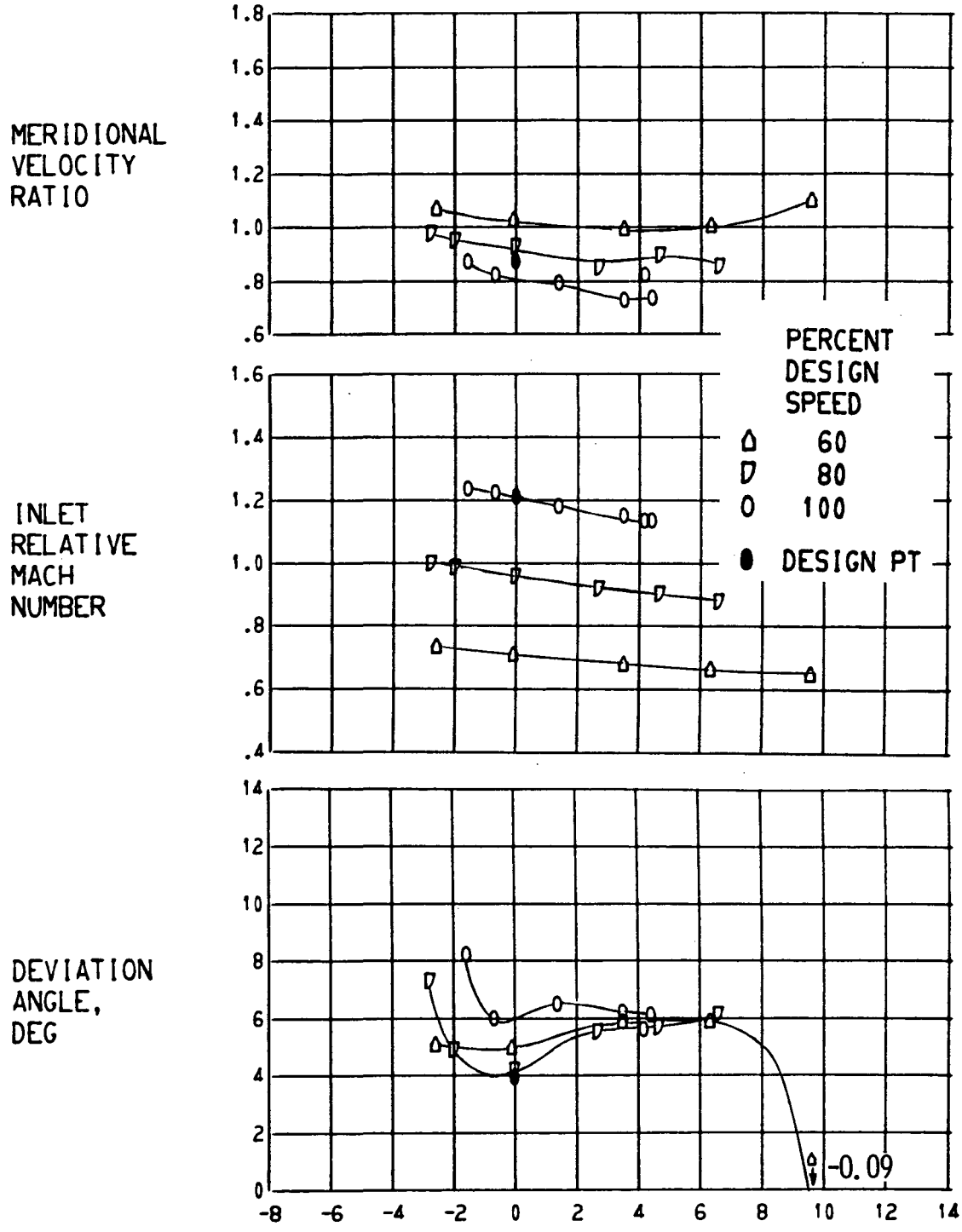
(C) CONCLUDED. 30.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



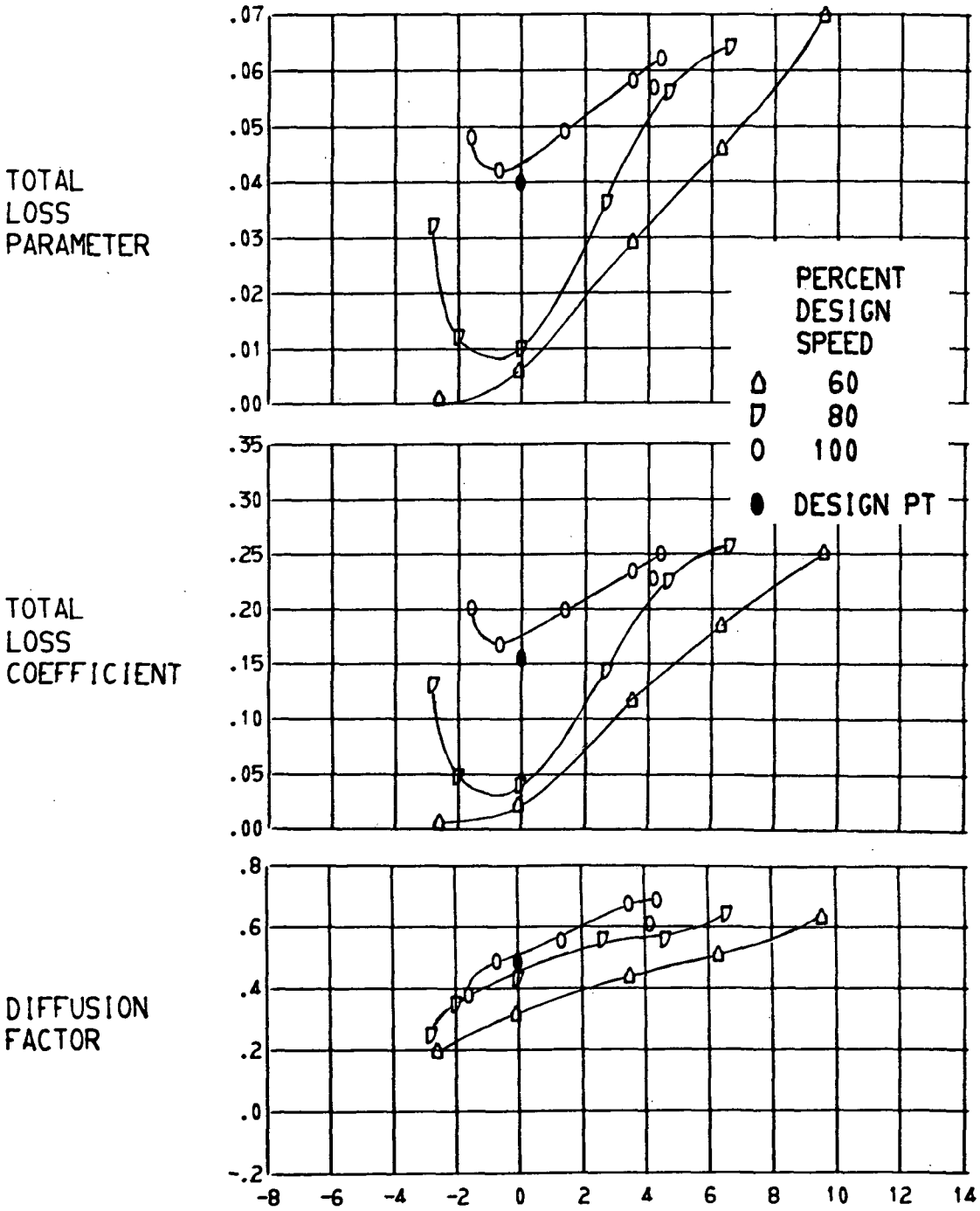
(D) 50.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



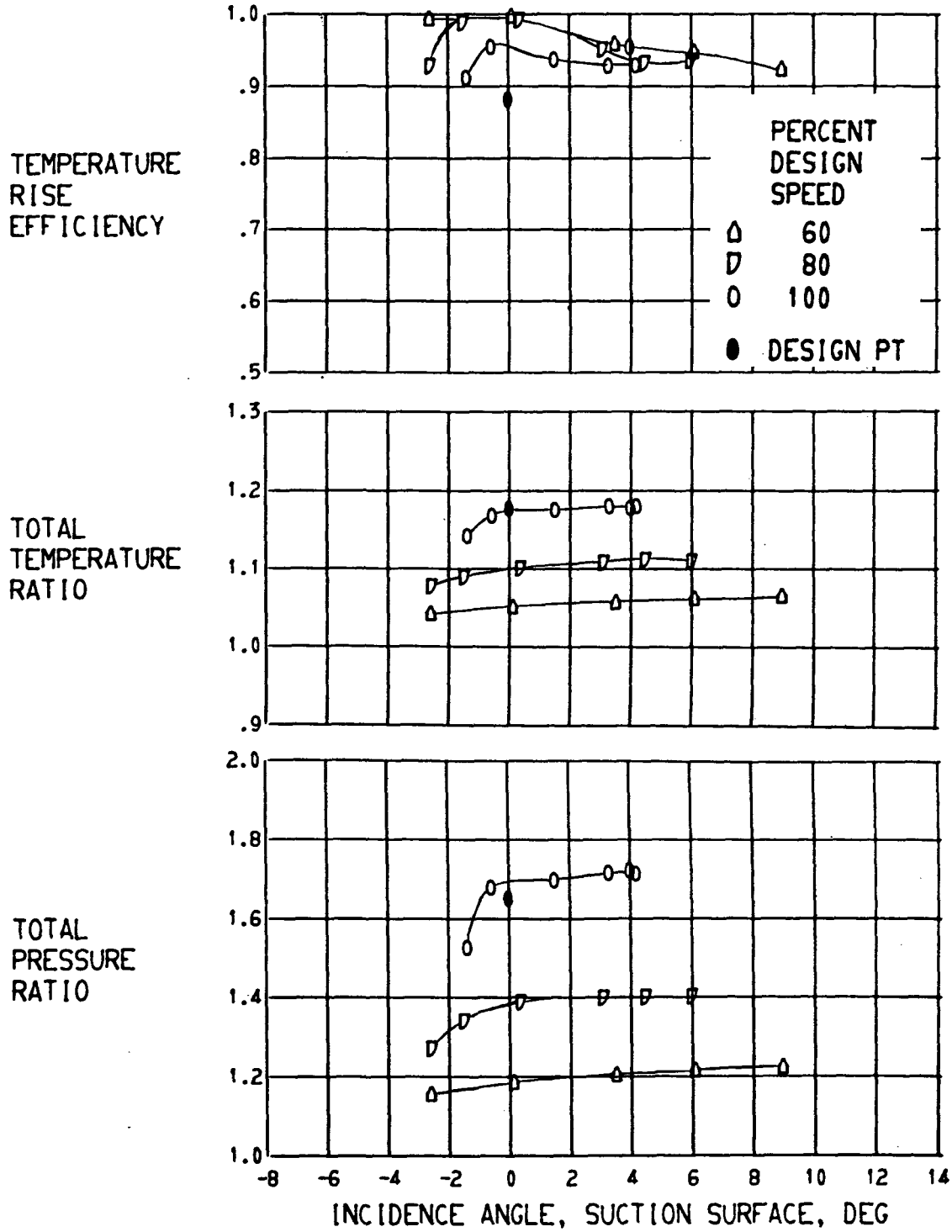
(D) CONTINUED. 50.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



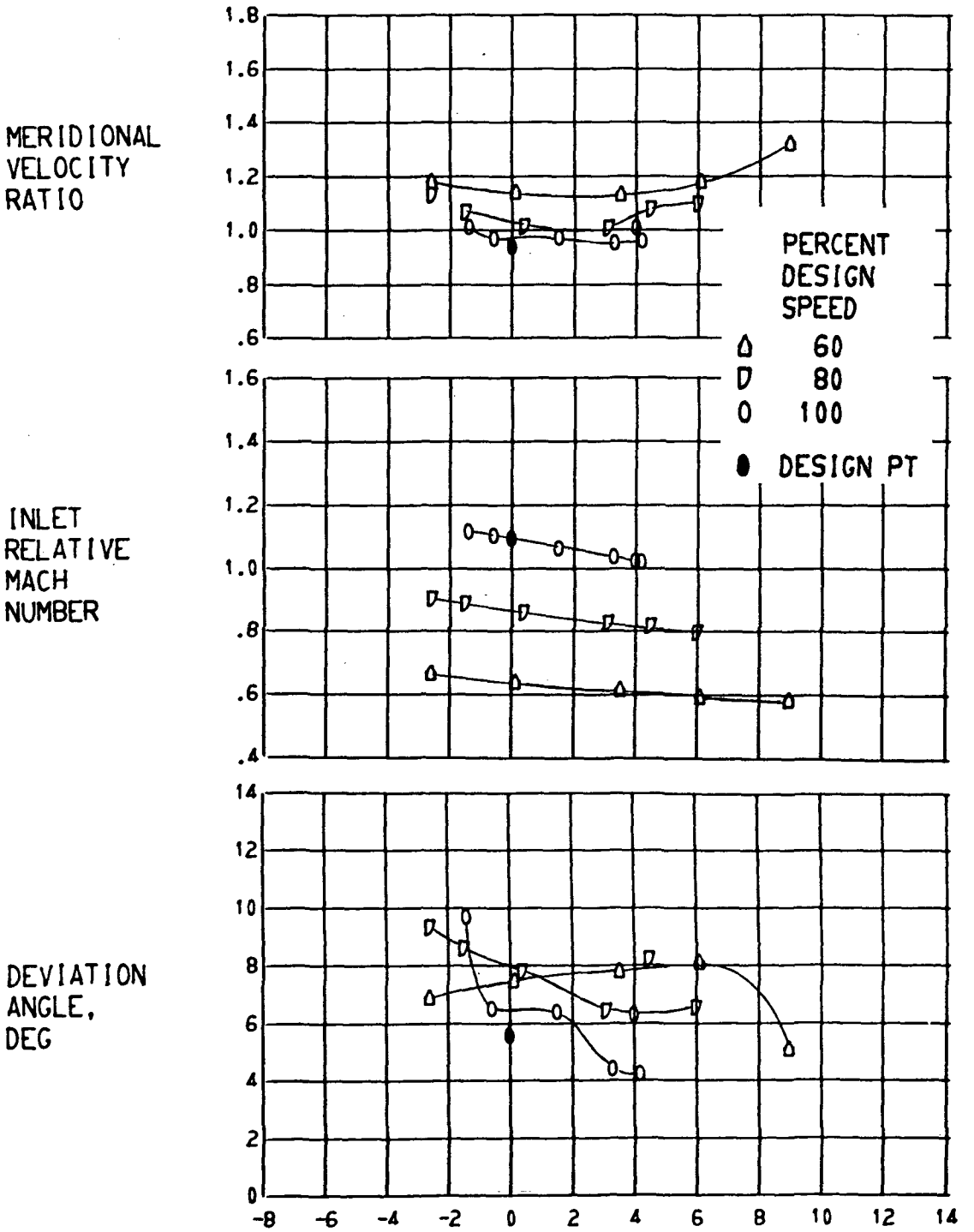
(D) CONCLUDED.. 50.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



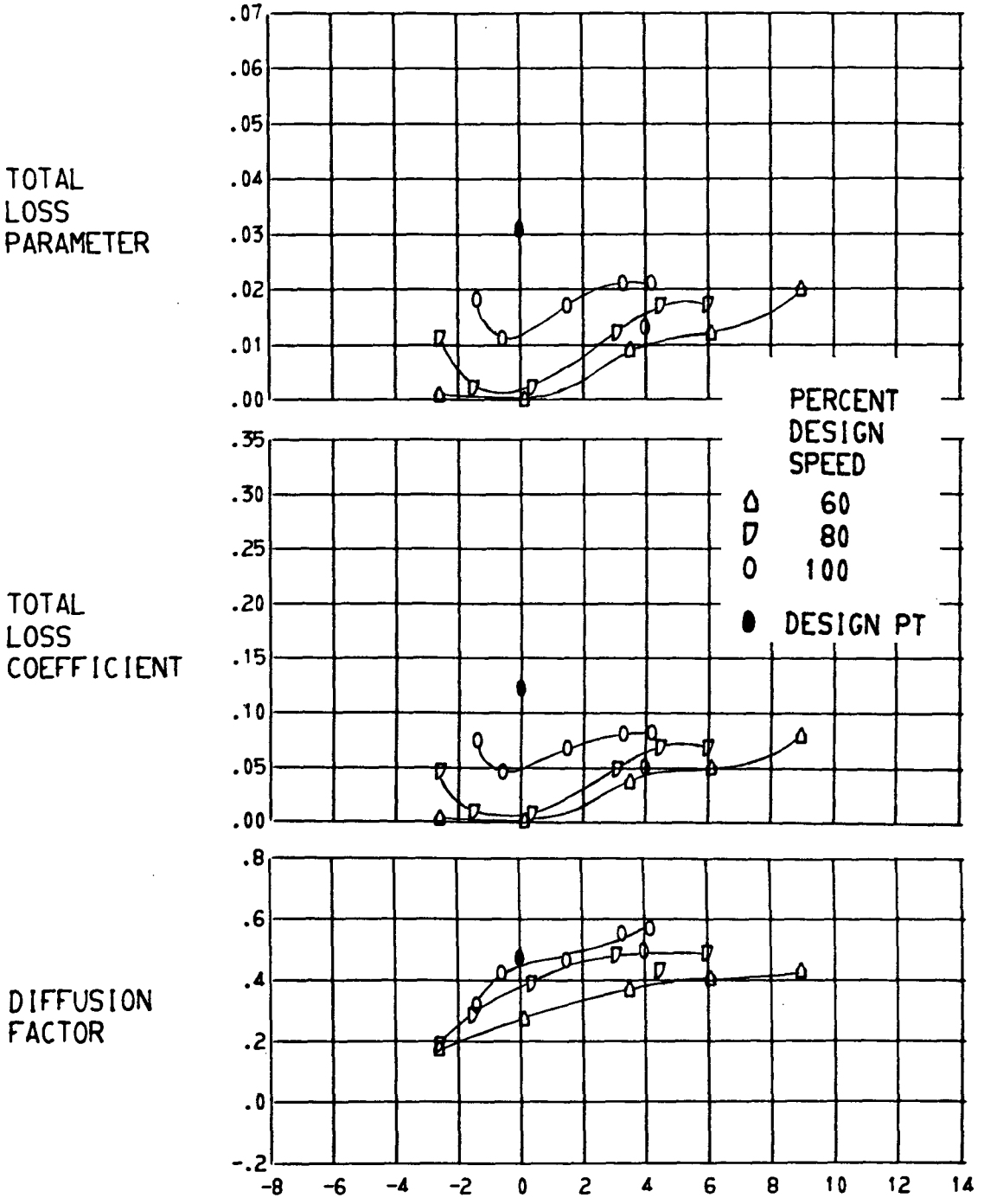
(E) 70.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



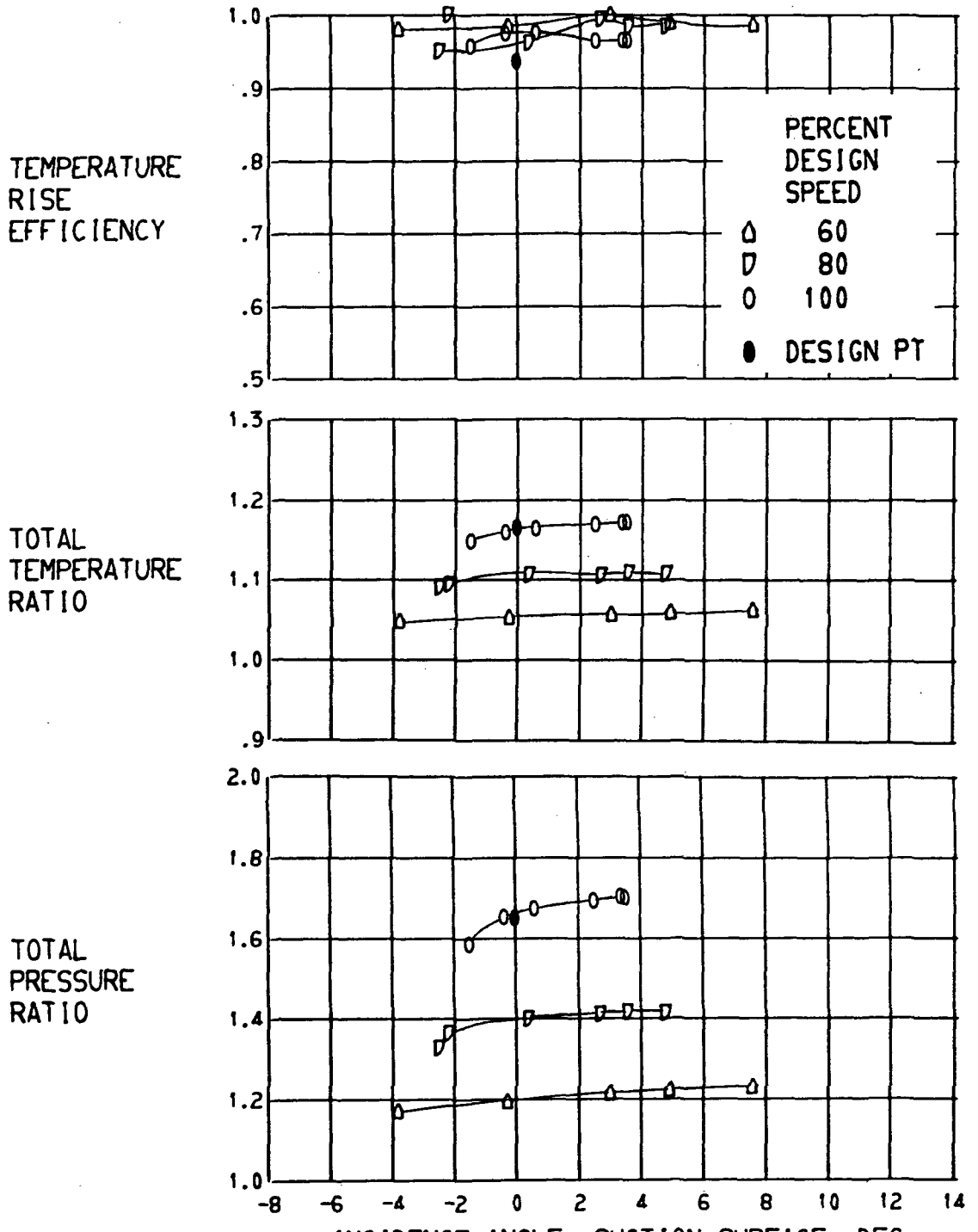
(E) CONTINUED. 70.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



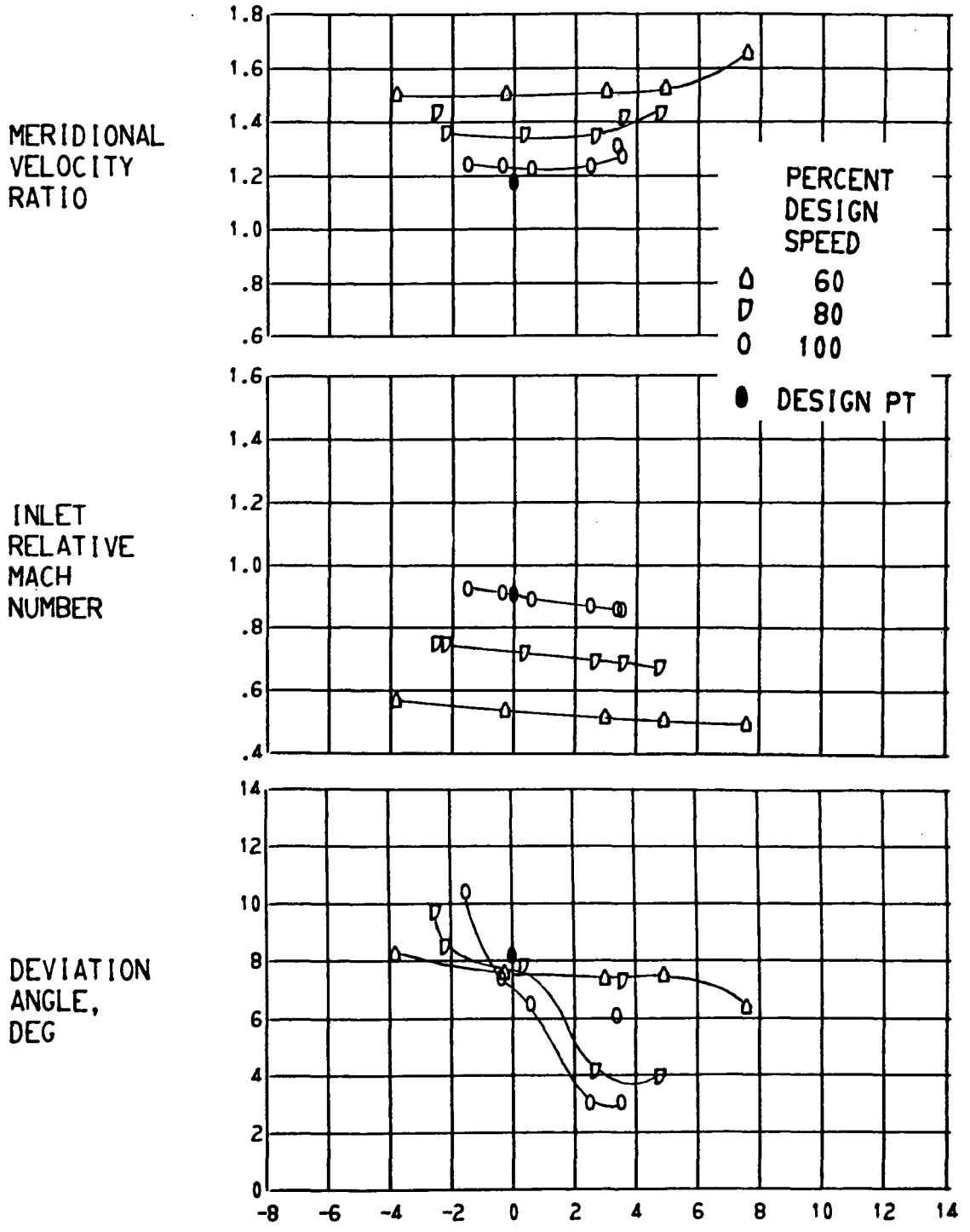
(E) CONCLUDED. 70.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



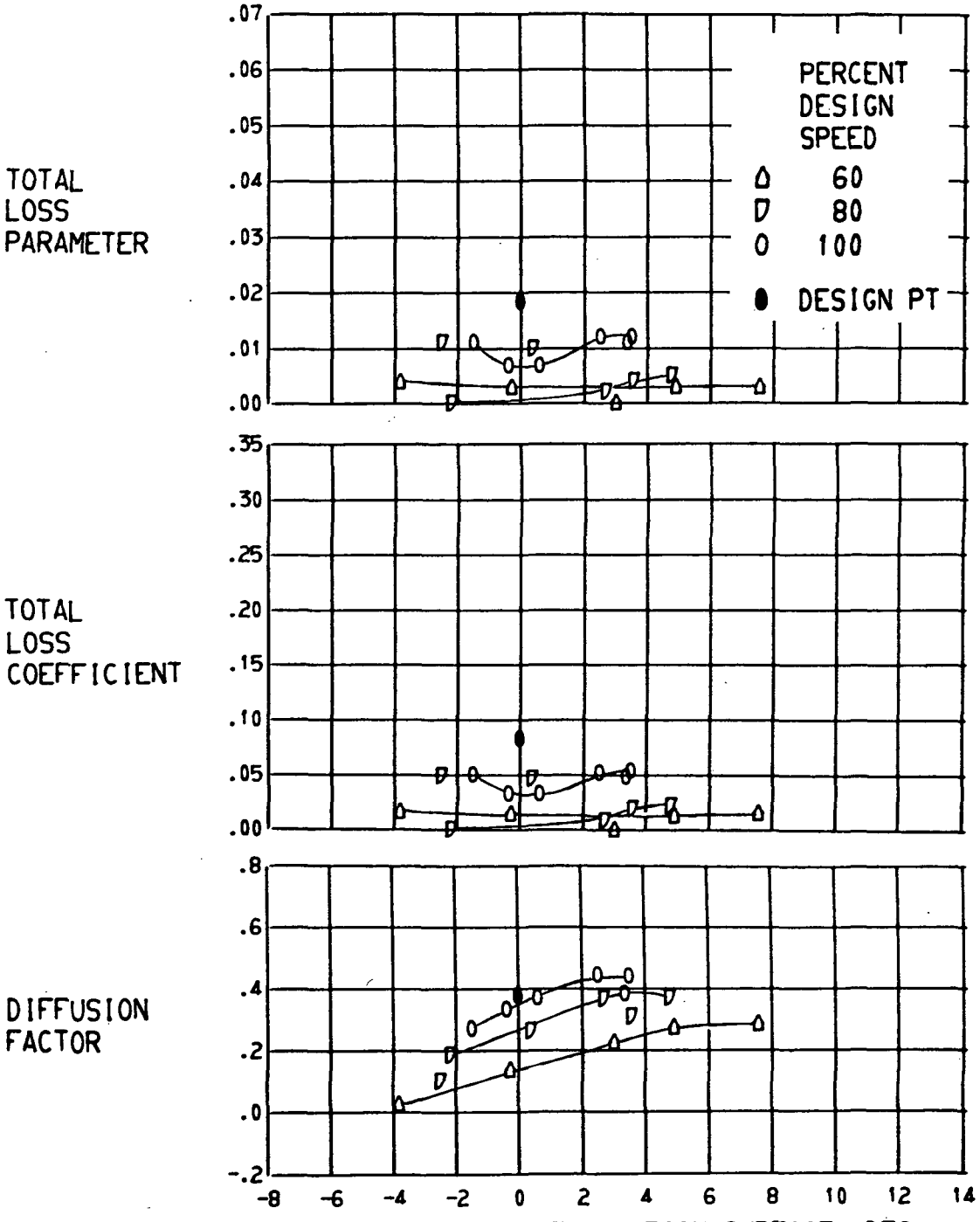
(F) 90.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



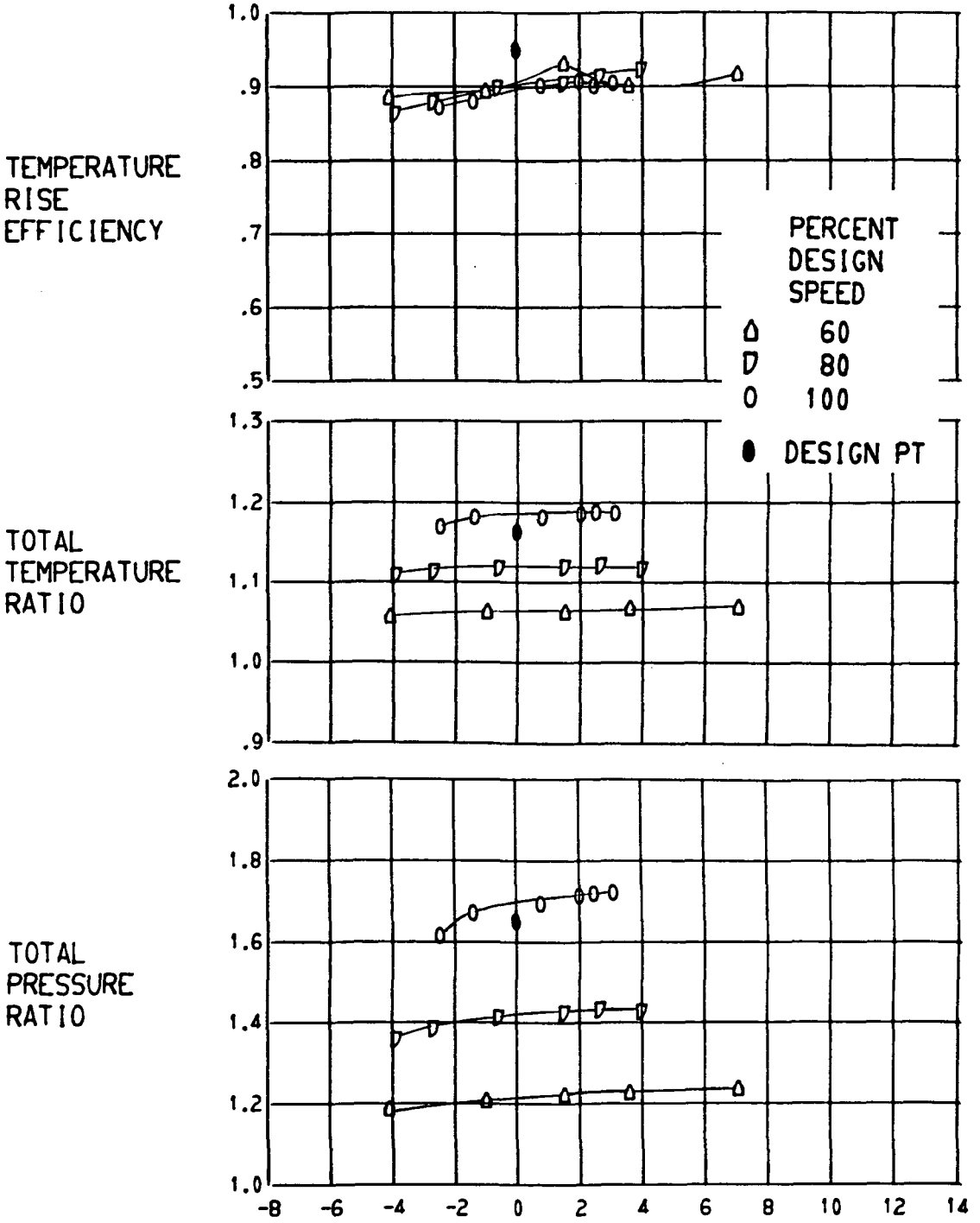
(F) CONTINUED. 90.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



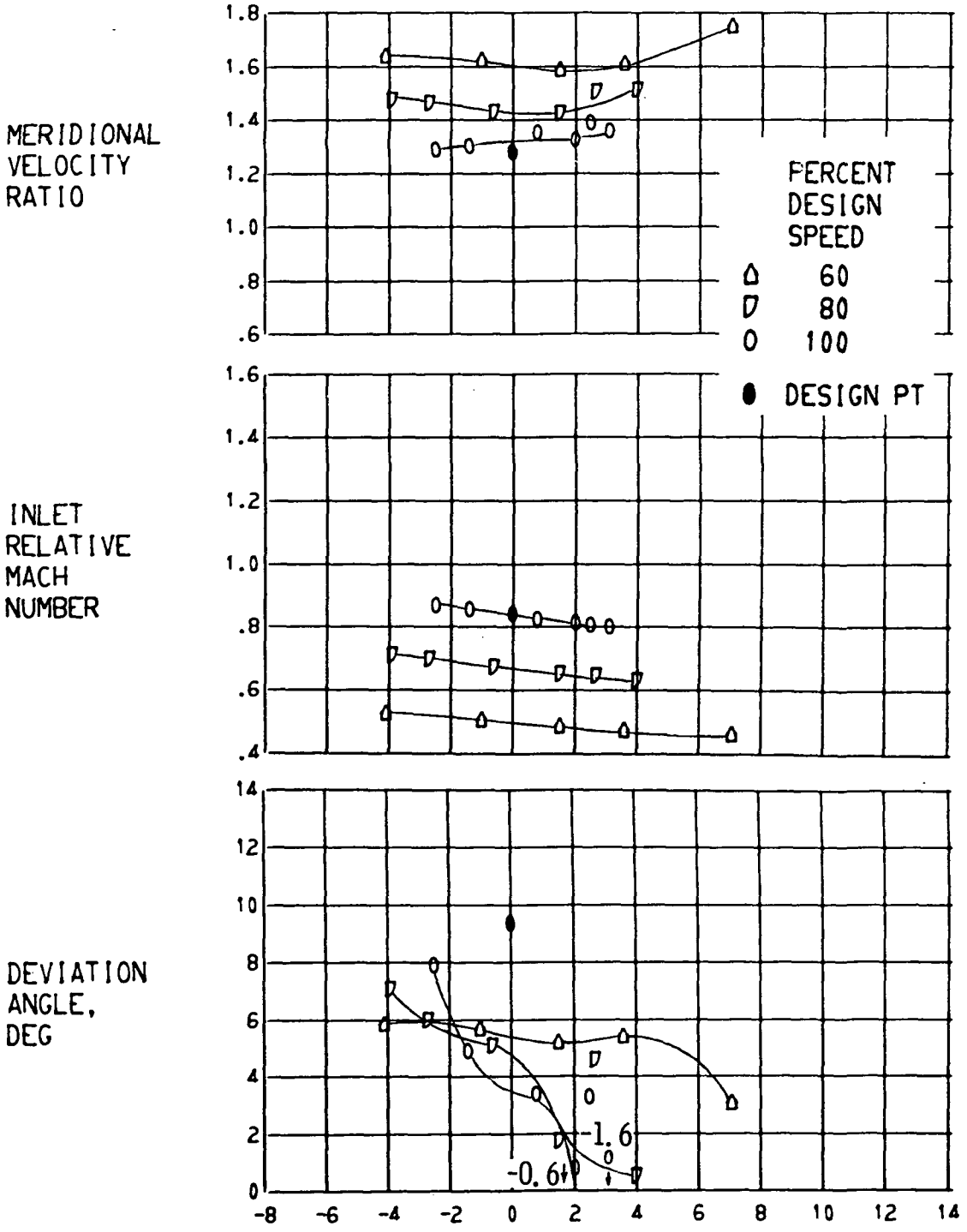
(F) CONCLUDED. 90.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



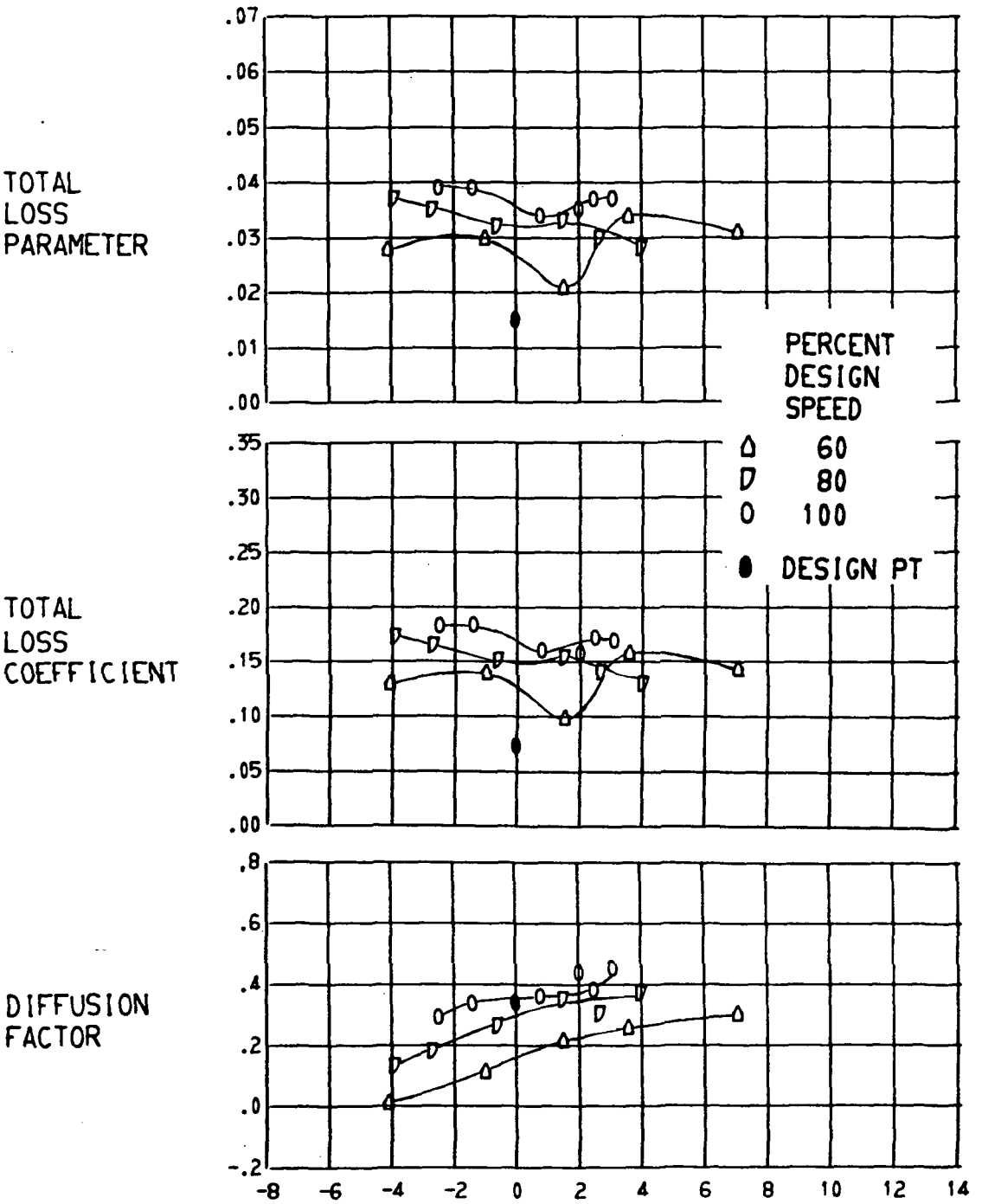
(G) 95.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



(G) CONTINUED. 95.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.



(G) CONCLUDED. 95.0 PERCENT SPAN.

FIGURE 11. - BLADE ELEMENT PERFORMANCE FOR ROTOR 4.

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—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

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