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SINGLE STAGE EXPERIMENTAL EVALUATION OF SLOTTED ROTOR AND STATOR BLADING

PART VIII - DATA AND PERFORMANCE FOR SLOTTED STATOR 3

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ABSTRACT

A single stage investigation of a slotted stator was conducted as part of an overall program to evaluate the effect of slots on the performance of highly loaded compressor rotor and stator blade rows. A lightly loaded flow generation rotor was used to provide stator inlet flow. The stator vanes were 65-series airfoils having a calculated diffusion factor based on the turning for an unslotted vane of 0.704, and an inlet Mach number of 0.644 at a radial position 90% of the span from the vane tip. The measured stator total pressure losses were considerably higher than the predicted losses at all radial stations.

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SECTION I
SUMMARY

A single-stage investigation of a slotted stator was conducted as part of an overall program to evaluate the effect of slots on the performance of highly loaded compressor rotor and stator blade rows. The single-stage rig had a hub/tip ratio of 0.8 and a tip diameter of approximately 40 in. The stator vanes were 65-series airfoils having a calculated D-factor of 0.704 based on the turning for an unslotted vane and an inlet Mach number of 0.644 at a radial station 90% of the span from the tip. The vanes had a constant chord length of 2.18 in., an aspect ratio of 1.663, and solidity of 1.099 at the mean radius. The vanes were slotted at approximately 55% chord; the slots extended from 5 to 95% span in each vane. A lightly loaded flow generation rotor was used to provide stator inlet conditions.

The measured D-factor near the stator root was 0.53 at design incidence. The stator deviation angles exceeded the values predicted for design incidence by 9 deg near the root, 1 deg at the mean radius, and 6 deg near the tip. Measured loss coefficient values were considerably larger than the predicted values at all radial stations.

SECTION II
INTRODUCTION

Pratt & Whitney Aircraft is engaged in a program under NASA Contract NAS3-7603 to investigate the application of slots to axial flow compressor rotors and stators. A systematic investigation was conducted to establish the feasibility and extent to which slotted blade concepts can be used to increase allowable blade loadings and the stable operating range of compressor stages. To accomplish this objective, three stator vane rows and three rotor blade rows representing a progression in design diffusion factors were built for test. In the stator tests, a representative state-of-the-art rotor was used to generate the stator inlet flow.

The aerodynamic analysis and design of the test blading and associated hardware were accomplished under the design phase of the program (Reference 1). All rotors and stators were designed with the same rotor exit and stator inlet absolute velocities and air angle distributions to permit testing of any combination of rotor and stator. For design purposes, it was assumed that the flow deviation angle for slotted rotors and stators would be approximately half the values normally used for unslotted blades. As part of the design effort, a series of annular cascade tests with slotted stators was conducted to establish preliminary criteria for the design of rotor and stator slots for the rotating stage test program (Reference 2). The overall and blade element performance data for previously reported slotted blade rows are presented in References 3 through 7.

This report presents the data and performance results obtained with the third slotted stator configuration (Stator 3). Stator 3 blading was designed with 65-series airfoil sections and had calculated design hub values of D-factor loading and inlet Mach number (without slots) of 0.704 and 0.644, respectively. The stator vanes were slotted at approximately 55% chord and the slots extended from 5% to 95% span in each vane. A lightly loaded flow generation rotor was used to establish flow conditions into the test stator. Inlet guide vanes provided rotor prewhirl and exit guide vanes were used to turn the flow back to near-axial.

Overall performance and blade element data were obtained at 50, 70, 90, 100, and 110% of the design equivalent rotor speed. Blade element data were obtained at 10, 30, 50, 70, and 90% span locations behind each of the three blade rows.

Details of the test equipment, procedures, and test results for the slotted Stator 3 test configuration, as well as pertinent design details, are presented in this report. Complete aerodynamic and mechanical design details are included in Reference 1.

SECTION III
TEST EQUIPMENT

A. FACILITY

The compressor test facility is shown schematically in figure III-1. The compressor rotor is powered by a single-stage turbine using exhaust gases from a J75 slave engine. The turbine speed is regulated by a hydraulically actuated inlet flow control valve. The slave engine exhaust is also used to drive a two-stage exhaust ejector system.

Air entered the compressor test rig through a 103-ft combined inlet duct, plenum, and bellmouth inlet, and exhausted through an exit diffuser to the atmosphere. An area contraction ratio from plenum to compressor inlet of approximately 10:1 provided essentially stagnation conditions in the plenum. The inlet duct and plenum were mounted on a track and could be rolled away from the compressor rig inlet to facilitate configuration changes. The plenum was sealed to the compressor rig inlet section with an inflatable rubber tube seal.

B. COMPRESSOR TEST RIG

The compressor rig, shown in figure III-2, comprises bellmouth inlet, test section, and exhaust section. The test section has a hub/tip ratio of 0.8 and a rotor tip diameter of approximately 40 in. The rotor assembly and shaft are supported on two bearings that transmit loads to the outer case through struts located in the inlet and exhaust case assemblies. The test section has a split outer case that permits guide vane, rotor, and stator assembly changes without removing the rig from the test stand. A set of motor-driven throttle vanes is located in the exhaust case to vary flow rate.

A section view of the flow path is shown in figure III-3. Flow is accelerated through the inlet strut station and guide vanes in a convergent passage to the rotor inlet. Thereafter, the inner wall diameter remains constant at 32.85 in., whereas the outer wall converges further through the rotor blade and stator vane rows to a diameter of 40 in. In general, the flow path is designed to simulate the middle-stage environment of a state-of-the-art multistage compressor.

Provisions were made for end-wall bleed at the rotor tip and stator root and tip, as shown in figure III-4. Bleed air flowed through perforated plate shrouds, shroud manifolds, and 24 approximately equally spaced tubes to individual main collector manifolds for the rotor and stator. The collector manifolds exhausted through the facilities ejector system. Rotor and stator bleed flow rates were controlled and measured separately.

C. STAGE BLADING DESIGN

To expedite this research program, the aerodynamic and mechanical design of the blading was completed and fabrication initiated prior to the completion of the annular cascade program. Final slot configurations were based on the results of the cascade tests. The design details for the inlet guide vane, flow generation rotor, and slotted Stator 3 are given in Reference 1. Pertinent design information is given below for convenience.

1. Inlet Guide Vane

The inlet guide vanes were designed to provide a rotor prewhirl distribution of 38.2 deg at the hub (90% span) to 39.8 deg at the tip (10% span). NACA 63-series blade sections were chosen for this purpose. Details of the guide vane design are presented in table III-1.

2. Flow Generation Rotor

NACA 65-series blade sections were selected for the flow generation rotor blading. The blading was designed with a camber distribution of 36.8 deg at the hub (90% span) to 34.5 deg at the tip (10% span) and with a tip D-factor of 0.379. Details of the rotor design are presented in table III-1.

3. Stator 3

a. Blade Design

Sloted Stator 3 blading was designed with a constant equivalent circular arc camber of 58.34 deg and a constant blade-chord angle of 34.1 deg. The stators are 65-series airfoil sections with a design root (90% span) D-factor of 0.704 (unslotted) and a design inlet Mach number of 0.644.

Table III-1. Geometry Design Data

INLET GUIDE VANE

Airfoil Series: 63
No. of Blades: 50
Aspect Ratio: 1.530

Percent Span (from Tip)	κ_0	κ_1	ϕ	γ^o	c	σ	t/c	δ^o
90	-26.50	42.10	-68.60	24.70	2.560	1.212	0.060	3.86
50	-27.30	43.70	-71.00	25.50	2.560	1.109	0.060	4.65
10	-28.10	45.30	-73.40	26.30	2.560	1.021	0.060	5.51

FLOW GENERATION ROTOR

Airfoil Series: 65
No. of Blades: 60
Aspect Ratio: 1.707

Percent Span (from Tip)	κ_1'	κ_2'	ϕ	γ^o	i_m	O/O*	c	σ	t/c	δ^o	$\bar{\omega}'$
90	31.44	-5.38	36.82	13.11	-1.26	1.449	2.210	1.250	0.075	8.54	0.051
50	39.23	2.16	37.07	20.55	-2.20	1.468	2.210	1.149	0.059	8.37	0.045
10	45.36	10.87	34.49	27.85	-2.60	1.476	2.210	1.071	0.044	8.74	0.045

STATOR 3

Airfoil Series: 65
No. of Blades: 58
Aspect Ratio: 1.663

Percent Span (from Tip)	κ_2	κ_{2A}	ϕ	γ^o	i_m	O/O*	c	σ	t/c	δ^o	$\bar{\omega}$
90	57.7	-0.64	58.34	28.52	-7.23	1.209	2.182	1.192	0.090	17.29	0.053
50	57.7	-0.64	58.34	28.52	-5.77	1.299	2.182	1.099	0.090	17.26	0.047
10	57.7	-0.64	58.34	28.52	-4.94	1.385	2.182	1.026	0.090	18.18	0.044

Solidity, thickness ratios, and aspect ratios for the selected series airfoils were representative of the middle stage of a state-of-the-art compressor. Additional details of the Stator 3 design are presented in table III-1.

b. Slot Design

Stator 3 slot geometry and location were based on the results of preliminary annular cascade tests of slotted stator vanes and an analysis of Stator 3 suction surface boundary layer separation (References 1 and 2).

The selected slot geometry was similar to a preferred slot geometry determined in the annular cascade program. Blade thickness at the intersection of slot centerline and blade meanline was selected as an approximate scaling parameter to scale the slot size from the oversize (6.5 in. chord) annular cascade vanes to the 2.18-in. chord Stator 3 vanes.

The slot centerline intersected the blade suction surface at 55% chord, approximately halfway between the minimum pressure point and the calculated separation point. This slot location was determined under the annular cascade tests to be superior to an alternative location near the separation point. A schematic drawing and pertinent dimensions of the blade slot are presented in figure III-5. Figure III-6 is a photograph of a slotted Stator 3 vane.

D. INSTRUMENTATION

Instrumentation was provided for overall and blade element performance measurements for each blade row. Axial locations of instrumentation stations are indicated in figure III-3, and schematics showing the detailed instrumentation at each axial location are presented in figures III-7 through III-10.

1. Rig Inlet Conditions

Weight flow was measured with an ASME standard thin plate orifice located in the inlet duct.

Six static pressure taps and six temperature probes were located in the plenum chamber for measurement of inlet total pressure and temperature.

Six equally spaced static pressure taps were located on both the inner and outer walls upstream of the inlet guide vanes (Station 0). From a rig calibration over a wide range of weight flows, a correlation between these static pressures and weight flow was derived and used to check subsequent weight flow measurements.

2. Station 1 (Guide Vane Exit/Rotor Inlet)

A sectional view of the flow path at Station 1 showing the circumferential and radial locations of instrumentation is presented in figure III-7. Rotor inlet air angle measurements were obtained at two circumferential locations with 20-deg wedge traverse probes. A 20-tube wake traverse probe, aligned approximately with the average guide vane exit air angle, was installed to measure the guide vane wake total pressure distribution. Four static pressure taps were located on both the inner and outer walls. The wedge probes and static pressure taps were located approximately along extensions of guide vane midchannel lines. Total and static pressure data were available from the 20-deg wedge probe for comparison.

3. Station 2 (Rotor Exit/Stator Inlet)

A sectional view of the flow path showing the circumferential and radial locations of instrumentation at Station 2 is presented in figure III-8. Two 20-deg wedge traverse probes were used for air angle, total pressure, and total temperature measurements. Three sets of Kiel head total pressure probes were located at radial positions corresponding to 10, 30, 50, and 70% span and two Kiel probes were located at 90% span. The probes were circumferentially located so that the three probes at any given radial position averaged approximately the pressures across a guide vane wake. Four static pressure taps were located on both the inner and outer walls. An 8-deg wedge traverse probe was used for radial static pressure measurements.

4. Station 2A (Stator Exit)

A sectional view of the flow path showing circumferential and radial locations of instrumentation at Station 2A is presented in figure III-9. Stator exit air angle was measured with a 20-deg wedge traverse probe. A 20-tube rake traverse probe was used for measurement of stator vane wake total pressure distribution. Four static pressure taps were located on both the inner and outer walls, and an 8-deg wedge traverse probe was provided for radial static pressure measurement. An internal leak was discovered in the 20-deg wedge probe used at Station 2A introducing an error in probe air angle measurements. Measurements from this probe were therefore not used.

5. Station 3

Station 3 is one chord-length farther from the stator exit plane than Station 2A. Instrumentation at this station (figure III-10) included two 20-deg wedge traverse probes, four sets of Kiel head total pressure probes at 10, 30, 50, 70, and 90% span locations, four sets of Kiel head temperature probes at the same five span locations, and four static pressure taps on both the inner and outer walls. The 20-deg wedge probes were used for stator exit air angle measurements. Stage exit total temperature was based on Kiel head probe temperature measurements at Station 3. Data obtained from the other instrumentation at this station were generally used for comparison with the Station 2A data.

6. Description of Probes

Details of the 20- and 8-deg wedge probes, wake probes, and Kiel pressure and temperature probes are shown in figure III-11. The 20-deg wedge probe senses air angle, total pressure, and total temperature. The 8- and 20-deg wedge probes and the Kiel temperature probes were calibrated for Mach number effect appropriately on probe measurements of static pressure and total temperature.

The wake probes contained 20 total pressure pickups formed by 0.042-in. OD hypo tubing and spaced as shown in the figure.

7. Instrumentation Readout

Traverse probe data (total pressure, static pressure, air angle, total temperature, and radial travel) were recorded on magnetic tape at the rate of 60 samples (2.5 in. probe travel) per minute. Steady-state pressure measurements were obtained using a scannivalve multi-channel pressure transducer system, which includes automatic data recording on IBM cards. Kiel probe temperatures were indicated on a precision potentiometer, and manually recorded.

Plenum pressures, two OD static pressures at Station 0, primary and bleed system flow-measuring-orifice pressures, and two Station 3 midspan Kiel probe pressures were recorded on manometer tubes in the test stand control room to permit setting the desired flow conditions.

8. Special Instrumentation

a. Rotor Speed

Rotor rpm was measured with an electromagnetic pickup mounted adjacent to a 60-tooth gear on the rotor shaft. Gear tooth passing frequency was displayed as rpm on an Anadex digital readout system. A closed loop control system maintained rotor speed to within approximately $\pm 1\%$.

b. Stress

Five rotor blades and two stator vanes were instrumented with strain gages located as shown in figure III-12 to monitor torsional and bending stresses.

c. Vibration

Displacement pickups were mounted on forward and rear sections of the compressor rig outer case to monitor rig vibration.

d. Bleed Flow Rate

The end-wall bleed flow from the rotor and stator rows was measured by means of standard ASME thin plate orifices located in the bleed manifold exhaust ducts.

SECTION IV
PROCEDURES

A. TEST PROCEDURE

1. Wall Bleed Flow Rate Selection

a. Rotor Bleed

With the compressor operating at design speed, the bleed flow rate was adjusted to ensure that there was no recirculation through the bleed manifold from Station 2 (rotor exit) to Station 1 (rotor inlet). This was accomplished by monitoring the static pressure difference between Station 1 and the bleed manifold and adjusting the bleed valve until the manifold pressure was less than that of Station 1. The maximum bleed flow rate attainable with the bleed system was required to produce the desired results at choke conditions (lowest Station 1 static pressure). The valve setting for this flow rate was not changed at other rotor speed and flow conditions.

b. Stator Bleed

With the rotor OD wall bleed set at the maximum rate the procedure described above was repeated for the stator by monitoring the static pressure difference between Station 2 and the stator bleed manifold. It was also necessary to adjust the stator bleed valve for maximum flow to ensure no recirculation at choke conditions. This valve setting was used throughout the program.

2. Stress Survey

Blade stresses were monitored during rig operation at design speed and during operation into the stall region at all rotor speed conditions.

3. Overall and Blade Element Performance Tests

Overall and blade element performance data were obtained at five rotor speed conditions (50, 70, 90, 100, and 110% of design speed) and at approximately six points per speed line to adequately define stator and stage performance between choke and stall. The near-stall point was determined on the basis of strain gage output and stage exit total pressure indicated on manometers. At each speed and flow set point, the fixed pressure and temperature instrumentation data were recorded

five times, corresponding to five discrete radial locations of the inlet guide vane and stator vane wake probes. Traverse data were usually recorded during the last recording of fixed instrumentation. In this manner, representative average values of flow and pressures could be determined for the time period (approximately 45 min) of data recording at each point.

B. DATA REDUCTION PROCEDURES

1. Preliminary Data Reduction

Data reduction was accomplished in three steps using three computer programs. The first step involved conversion of raw data to engineering units. Traverse data (total pressure, static pressure, total temperature, and air angle), obtained at approximately 0.04-in. increments across the span, were automatically tabulated and plotted.

These data were reviewed to identify and eliminate any obviously questionable data prior to the subsequent data reduction step.

The second data reduction step accomplished the following:

1. Mach number corrections to temperature data
2. Mass average of wake probe data
3. Circumferential arithmetic average of fixed and traverse instrumentation data
4. Correction of all pressure and temperature data to NASA standard day ambient conditions
5. Selection by interpolation of total pressure, static pressure, total temperature, and air angle values at specified radial locations for input to the final data reduction step.

All corrected data were available for further inspection in the printed results from this computer program, which included individual data values as well as averaged quantities. The third step in the data reduction procedure involved calculation of overall and blade element performance parameters, which are defined in the following paragraphs.

2. Parameter Calculation

The following overall and blade element performance parameters were calculated for the analysis of test data and the evaluation of slotted Stator 3 performance. Symbols are defined in Appendix A.

a. Overall Performance

(1) Weight Flow

Weight flow is presented in terms of corrected weight flow, defined as

$$W_{corr} = W\sqrt{\theta}/\delta$$

where

W = actual weight flow

θ = ratio of total temperature (plenum) to NASA standard sea level temperature

δ = ratio of total pressure (plenum) to NASA standard sea level pressure.

Values of corrected weight flow presented in the figures and tables include rotor and stator bleed flow rates. Percentage bleed flow rates for the two blade rows are tabulated separately (table B-1).

(2) Pressure Ratio

Pressure ratios were calculated for the rotor, guide-vane-rotor and guide-vane-rotor-stator blade row combinations. Behind the rotor, fixed Kiel head and traverse probe total pressure data were arithmetically averaged at each span location and the profile thus determined was mass-flow averaged across the span.

Behind the guide vane and stator the wake probe pressures were first mass-flow integrated at each span location, and the resulting average pressures were then mass-flow averaged in the radial direction.

(3) Adiabatic Efficiency

Adiabatic efficiency across the rotor is defined as

$$\eta_{ad} = \frac{\left(\frac{\bar{P}_2}{\bar{P}_1}\right)^{\frac{\gamma - 1}{\gamma}} - 1}{\frac{\bar{T}_3}{T_1} - 1}$$

where:

$\bar{P}_1$ = mass averaged pressure behind the guide vane

T_1 = 518.7°R

$\bar{P}_2$ = mass averaged pressure behind the rotor

$\bar{T}_3$ = mass averaged temperature behind the stator.

To obtain adiabatic efficiencies for the guide vane-rotor combination or for the entire stage, appropriate average pressures were used.

b. Blade Element Performance

(1) Diffusion Factor

Diffusion factor for the rotor is defined as

$$D = 1 - \frac{V_2'}{V_1'} + \frac{\Delta V_\theta' (1 - 2)}{2\sigma V_1'}$$

Diffusion factor for the stator is defined as

$$D = 1 - \frac{V_{2A}}{V_2} + \frac{\Delta V_\theta (2 - 2A)}{2\sigma V_2}$$

(2) Deviation

Rotor blade deviation is defined as

$$\delta_2^o = \beta_2' - \kappa_2'$$

Stator deviation is defined as

$$\delta^o{}_{2A} = \beta_3 - \kappa_{2A}$$

where κ_2' and κ_{2A} are the rotor blade and stator vane trailing edge metal angles based on equivalent circular arc camber lines for the 65-series airfoil.

(3) Incidence Angle

Rotor incidence angle is defined as

$$i_{m1} = \beta_1' - \kappa_1'$$

Stator incidence angle is defined as

$$i_{m2} = \beta_2 - \kappa_2$$

where κ_1' and κ_2 are the rotor blade and stator vane leading edge metal angles based on the equivalent circular arc camber lines for the 65-series airfoil.

(4) Total Pressure Loss Coefficient

Total pressure loss coefficient for the rotor is defined as

$$\bar{\omega}'_{(1-2)} = \frac{\bar{P}_1' - P_2'}{\bar{P}_1' - p_1}$$

where (-) refers to mass-averaged wake total pressure.

For the inlet guide vanes, total pressure loss coefficient is defined as

$$\bar{\omega}_{(0-1)} = \frac{14.69 - \bar{P}_1}{q_o}$$

where q_o is obtained from isentropic flow relationships using orifice weight flow and the annular area at the guide vane inlet.

Total pressure loss coefficient for the stator is defined as

$$\bar{\omega}_{(2-2A)} = \frac{P_2 - \bar{P}_{2A}}{P_2 - p_2}$$

(5) Loss Parameter

Stator total pressure loss is also presented in terms of the loss parameter,

$$\frac{\bar{\omega}_{(2-2A)} \cos \beta_3}{2\sigma}$$

SECTION V
RESULTS AND DISCUSSION

Performance of slotted Stator 3 was evaluated on the basis of stage pressure rise and efficiency characteristics as functions of rotative speed and weight flow, as well as of blade element diffusion factor, deviation, and loss coefficient as functions of incidence angle, and of loss parameter as a function of D-factor.

Slotted Stator 3 performance results are compared (1) with predicted unslotted Stator 3 performance and (2) with available NASA rotating cascade performance results. Overall and blade element performance parameter values, bleed flow rates, and blade element vector diagram data for the guide vane, rotor, and stator are tabulated in Appendix B.

A. OVERALL PERFORMANCE

Overall performance for the slotted Stator 3 test configuration is presented in terms of efficiency and pressure ratio versus corrected weight flow, $W\sqrt{\theta}/\delta$, and corrected specific weight flow, $W\sqrt{\theta}/\delta A$, in figures V-1, V-2, and V-3, respectively, for the flow generation rotor, guide vane-rotor and guide vane-rotor-Stator 3 combinations. Each figure contains the performance results obtained at the five test rotor speed conditions. Overall performance and percent bleed flows are tabulated in table B-1.

The pressure rise and efficiency of the flow generation rotor (figure V-1) at design equivalent rotor speed and flow conditions are high compared to the predicted values. The rotor incidence was higher than predicted for design conditions, and rotor deviation angle was lower than predicted. These factors combined to increase the work and flow of the stage. Since the temperature rise of the stage is small (about 30 deg) it is expected that the efficiency data for the rotor will show considerable scatter; this source of error becomes significant as stage pressure and temperature rise decrease. Additional discussion of flow generation rotor performance is presented in Reference 6. Figures V-2 and V-3 indicate a large reduction of stage performance due to Stator 3 losses. The influence of high stator losses on a low-work stage (P_2/P_1 = 1.1 - 1.2) is expected to be greater than the influence of stator loss on a stage having a higher work input (P_2/P_1 = 1.3 - 1.4).

Therefore, the low value of stage efficiency for these tests is not significant.

A comparison of the measured airflow with the airflow calculated from traverse and fixed probe data is presented in figure V-4. The data relating to rotor discharge flow are within the allowable 5% band. Downstream of the stator, a bias toward high integrated weight flows is noticeable and many of the data points fall outside the 5% band. A detailed examination of the data and reduction procedure has shown that this bias is attributable to the numerical integration used in the calculation. As a part of this integration, the mass-averaged total pressure calculated from the stator wake data is used to generate a radial flow distribution, which is then integrated to determine the total flow. The employment of the mass-averaged total pressure in this calculation leads to erroneously high flows since no accounting is made of the displacement thicknesses of the wakes. The magnitude of this flow difference is dependent upon the size of the wake and thus varies with spanwise location and the configuration of the stator and the stator incidence and Mach number. A numerical example is used as an illustration. A data point from figure V-4 was selected for which a large (10%) difference between integrated and orifice-measured flow was noted. The wake rake data were used to calculate the circumferential and radial distribution of flow without recourse to the use of average quantities. A double integration (area) was then performed to determine the flow. Thus computed, the flow was 84.5 lb/sec, compared with 82.7 lb/sec based on the measured orifice flow with deductions for the wall bleed. This difference, 2.1%,is in keeping with the acceptable deviation.

The mass-averaged pressure ratio was subsequently recomputed for this point to observe the extent to which pressure ratio is also affected by the employment of the mass-averaged total pressure of each radial location behind the stator. The recomputed value of 1.118 was well within the plotting accuracy of the value of 1.116 originally computed. Since the calculation of mass-average pressure ratio utilizes the flow computed from the mass-average total pressure at the various diameters in both the numerator and denominator of the weighting fraction, $\Sigma WP/\Sigma W$, it is to be expected that the effect on pressure ratio would be small.

B. BLADE ELEMENT PERFORMANCE

1. Stator Inlet Conditions

The stator inlet air angle and Mach number distributions for design equivalent rotor speed are presented in figure V-5. The stator was operating within 1 to 2 deg of the indicated design air angle distribution at weight flows of 90.04 and 84.71 lb/sec (near choke flow conditions for the stage). The stator-inlet Mach number at design incidence operation was therefore slightly higher than the design inlet Mach number. Flow generation rotor overturning of about 3 deg accounts for the difference between the design weight flow of 80 lb/sec and the weight flow for which stator design incidence was achieved. As a consequence, the stator was subjected to incidence angles in the stall direction from the minimum loss incidence angle over the stator operating range.

2. Stator Loss Coefficient, Deviation, D-Factor

Slotted Stator 3 loss coefficient, deviation angle, and D-factor at design rotor speed are presented as functions of incidence angle in figures V-6 through V-10. Each figure corresponds to one span location. In general, the losses are extremely large relative to two-dimensional flow losses at all span locations. The large deviation angles at 10, 30, 70, and 90% span and the high loss coefficient values indicate a significant amount of flow separation. The diffusion factor values are correspondingly low relative to the predicted values.

Blade element parameters for all speed lines are combined in figures V-11 through V-15. The deviation and D-factor data form well-defined curves with incidence at each of the five span locations. Deviation values may be biased slightly low since measurements of stator exit flow angle were obtained at Station 3, approximately 1½ chord lengths downstream of the stator blade row. The loss coefficient data scatter is attributed to the inherent inaccuracy of pressure measurements in a separated (nonsteady) flow field.

3. Loss Parameter

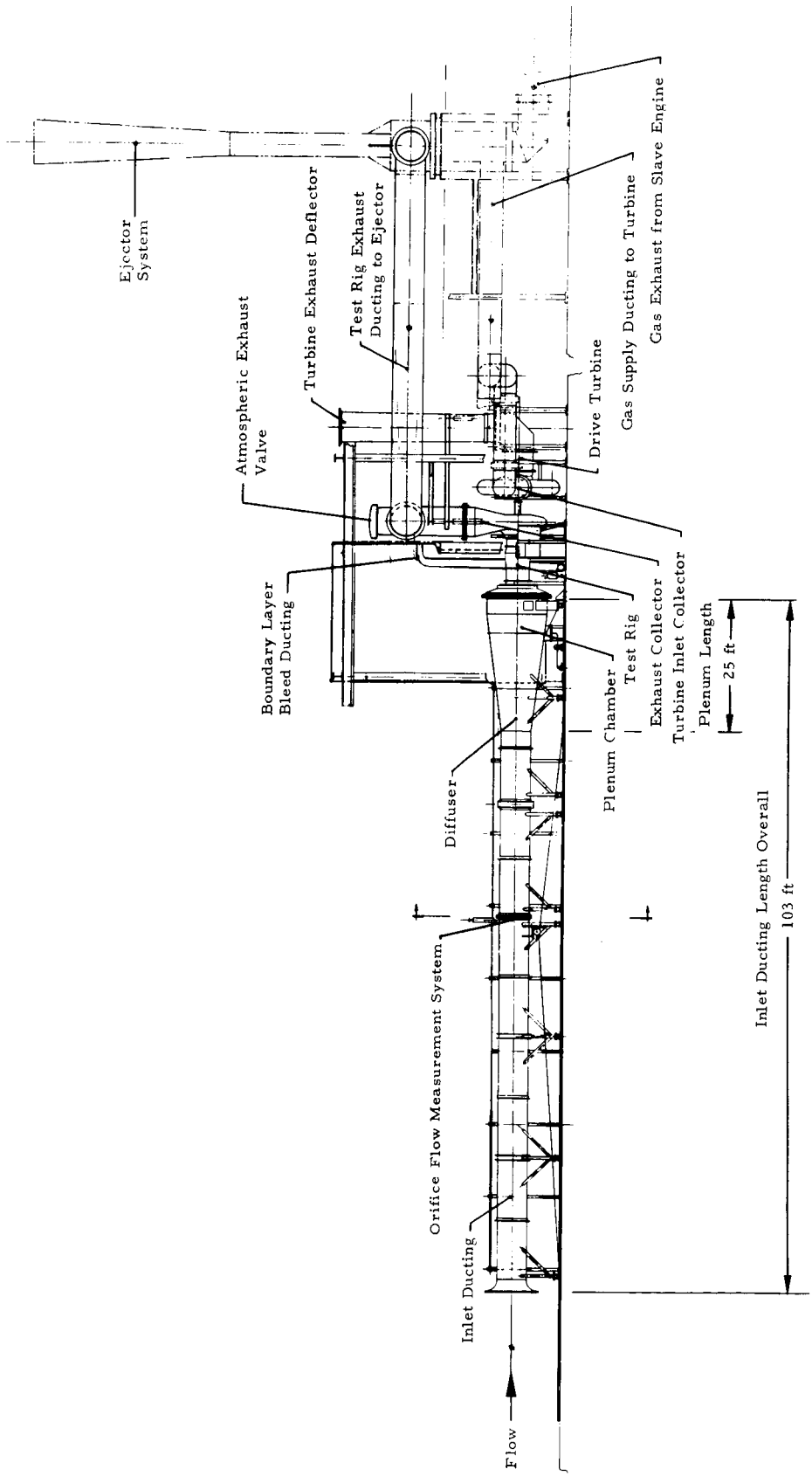
Loss parameter, $\bar{\omega}_{2-2A} \cos \beta_3/2\sigma$, is presented as a function of D-factor for the blade element data obtained at 90, 100 and 110% design rotor speeds in figures V-16a through V-16c. The NASA correlation curve for NASA 65-series annular cascade minimum loss (reference incidence) data reproduced from Reference 8 is shown for comparison. The slotted Stator 3 data are separated according to 90 and 10% span, 70 and 30% span, and 50% span. Darkened symbols refer to minimum loss points. The measured loss parameter values are considerably higher than the NASA correlation curve values.

SECTION VI
CONCLUDING DISCUSSION

Blade element data at five radial locations and overall performance data were obtained for a single stage comprising slotted Stator 3, a flow generation rotor, and inlet guide vanes. Slotted Stator 3 had a design D-factor of 0.704 at a radial location 90% of span from the tip and a constant equivalent camber angle of 58.3 deg. The stator operated close to its design incidence angle at maximum flow conditions. The loss and deviation angle values were high relative to predicted values at all span locations. Diffusion factor values were correspondingly lower than the predicted values. From these results, it is concluded that flow separation from the suction surface of the stator vanes occurred further upstream than predicted (Reference 1). This may have placed the separation point in close proximity to the slot; this condition was found to be undesirable in the preliminary annular cascade studies (Reference 2). It may be necessary to incorporate additional slots closer to the leading edge of highly cambered (60 deg) airfoil sections.

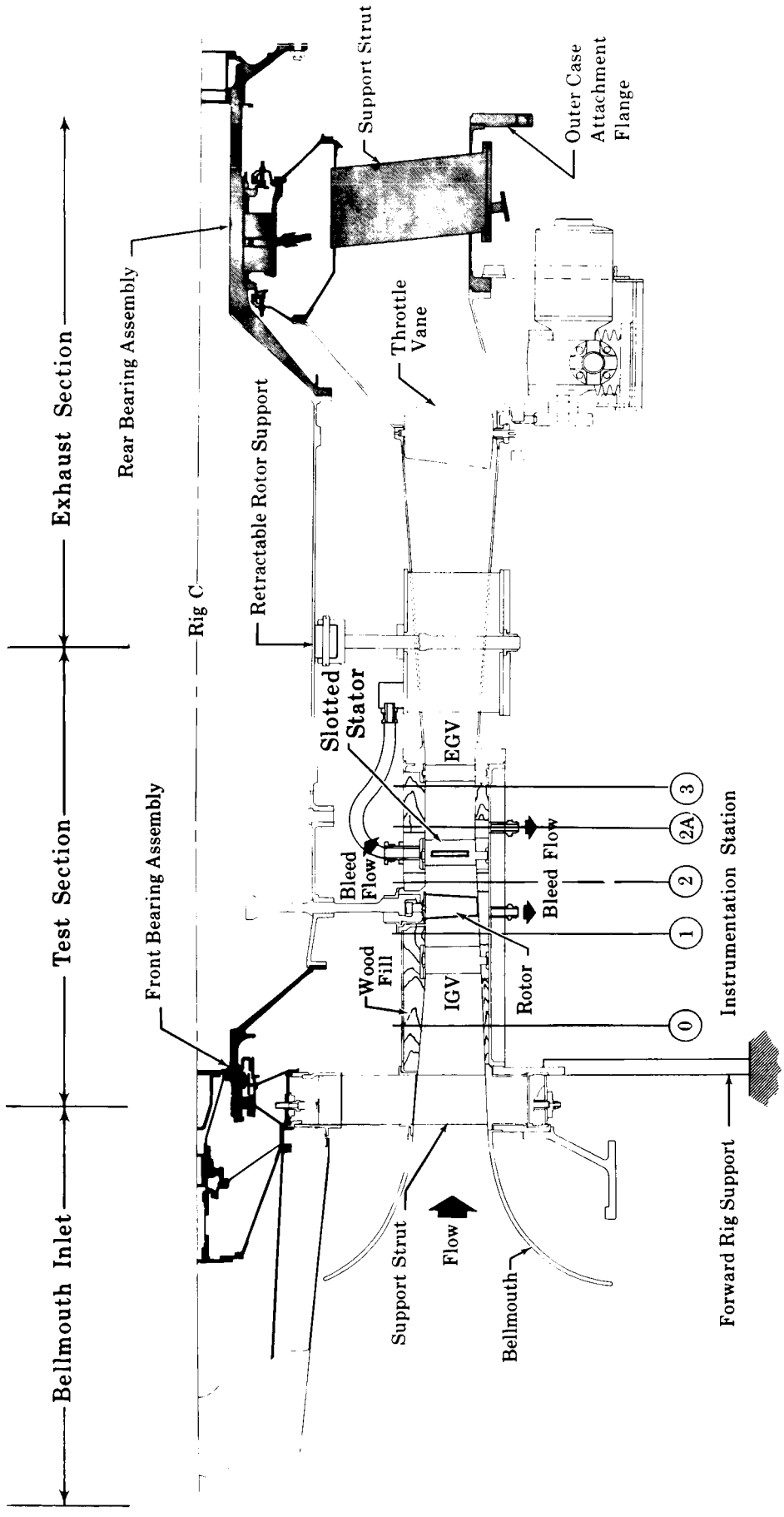
SECTION VII
ILLUSTRATIONS

This section contains the illustrations that have been referenced in the preceding sections.



FD 10891C

Figure III-1. Compressor Research Facility



FD 14681B

Figure III-2. Rotating Axial Flow Cascade Test Rig

FD 14685A

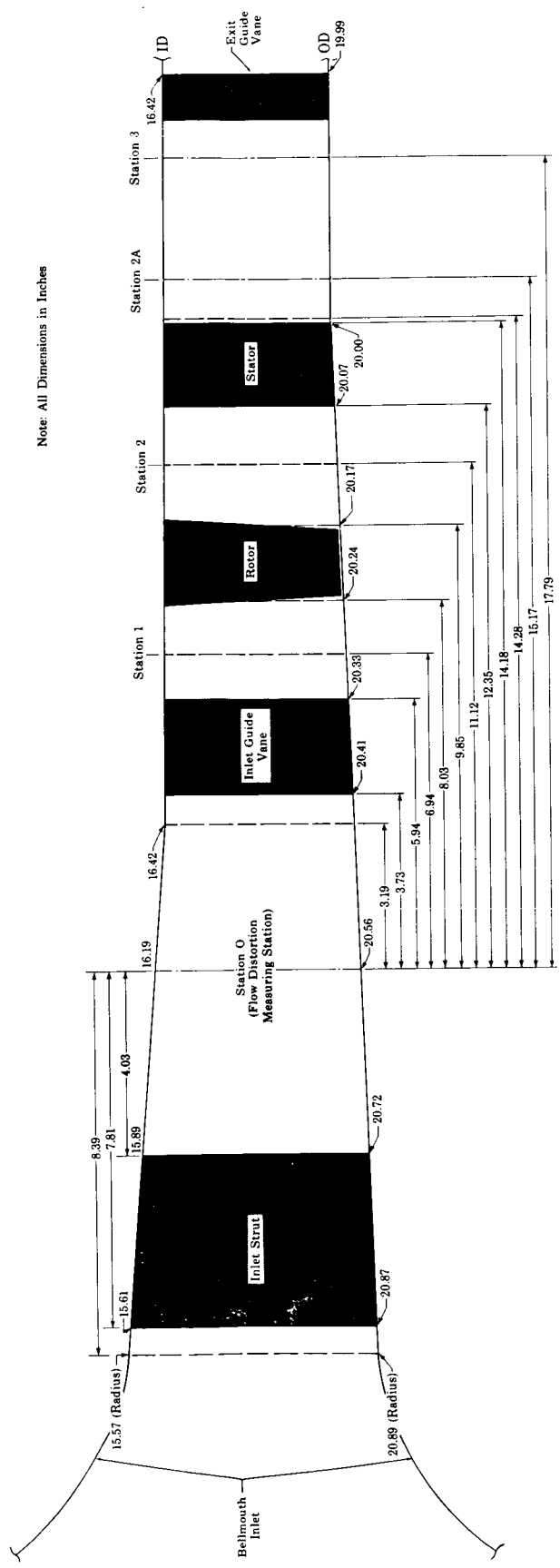


Figure III-3. Flow Path and Instrumentation Stations

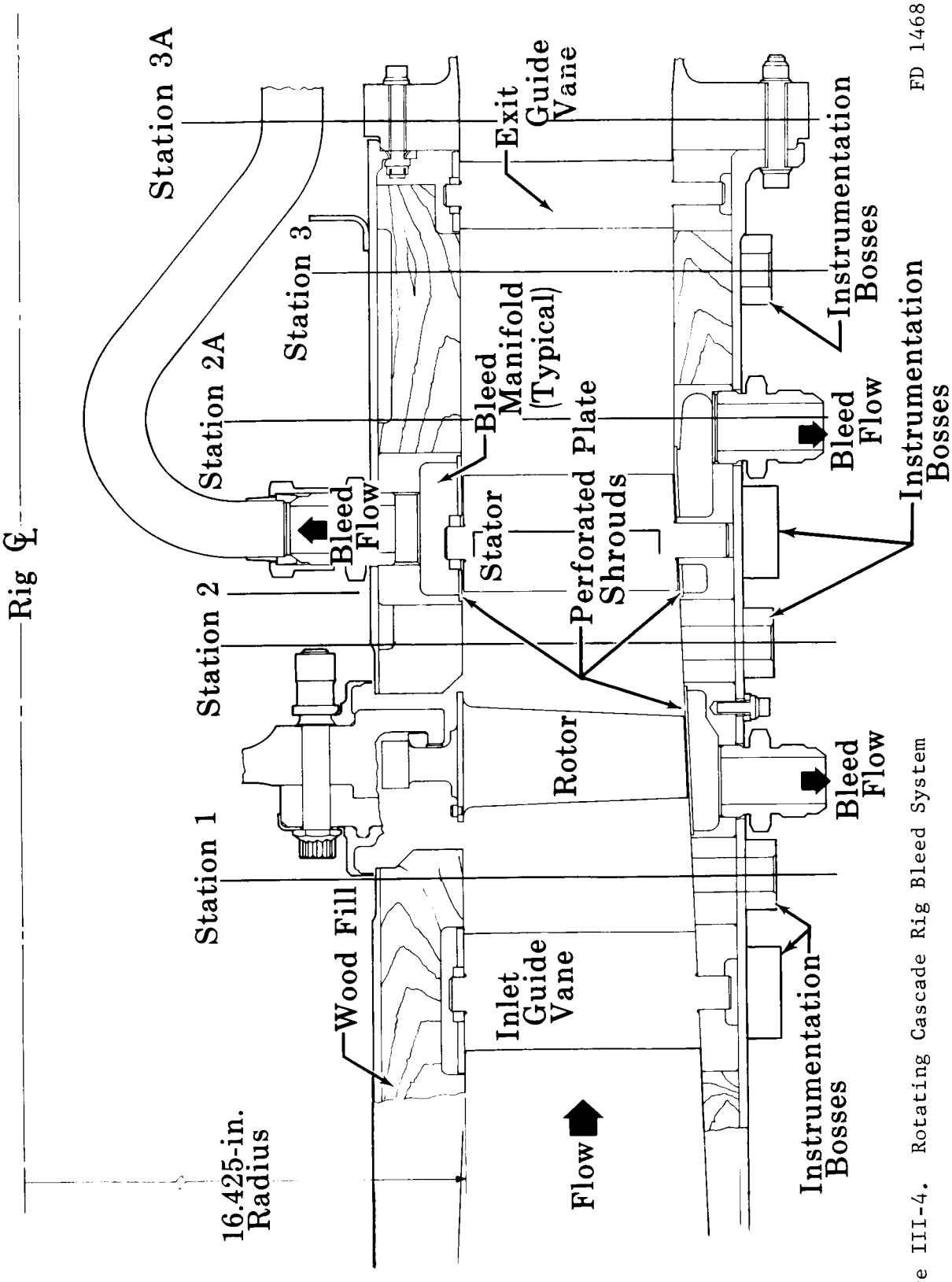
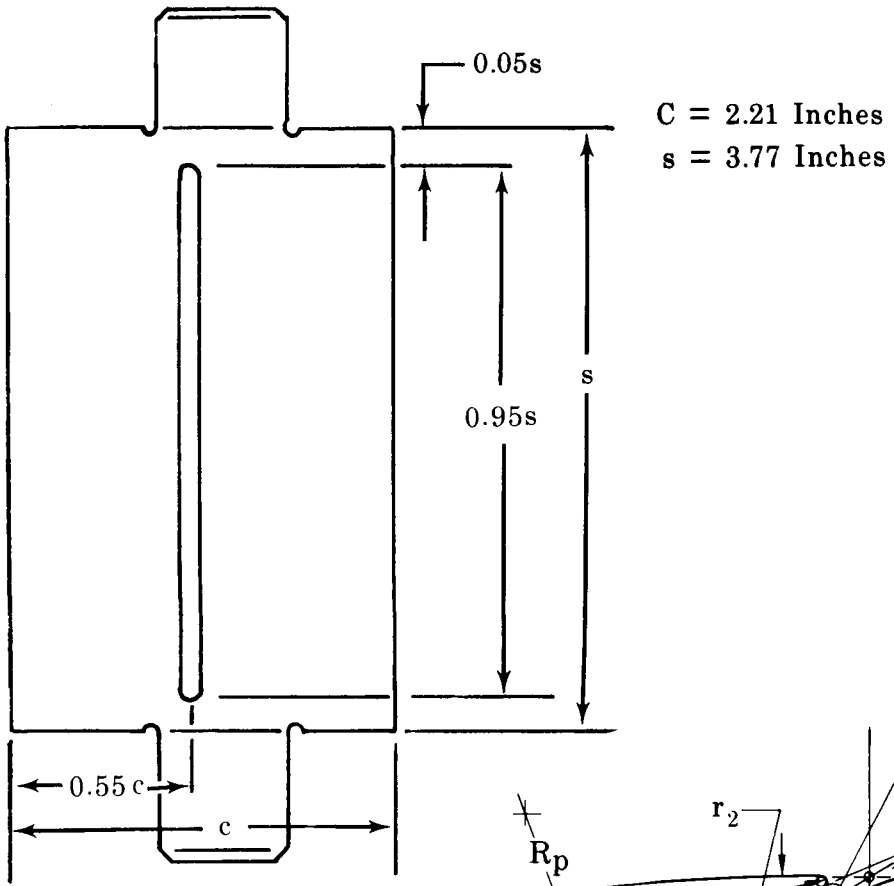


Figure III-4. Rotating Cascade Rig Bleed System



DIMENSIONS	
Y_2	0.050 in.
t	0.196 in.
R	0.152 in.
r_1	0.019 in.
Y_1	0.094 in.
r_2	0.005 in.
R_p	0.332 in.
ψ	30°

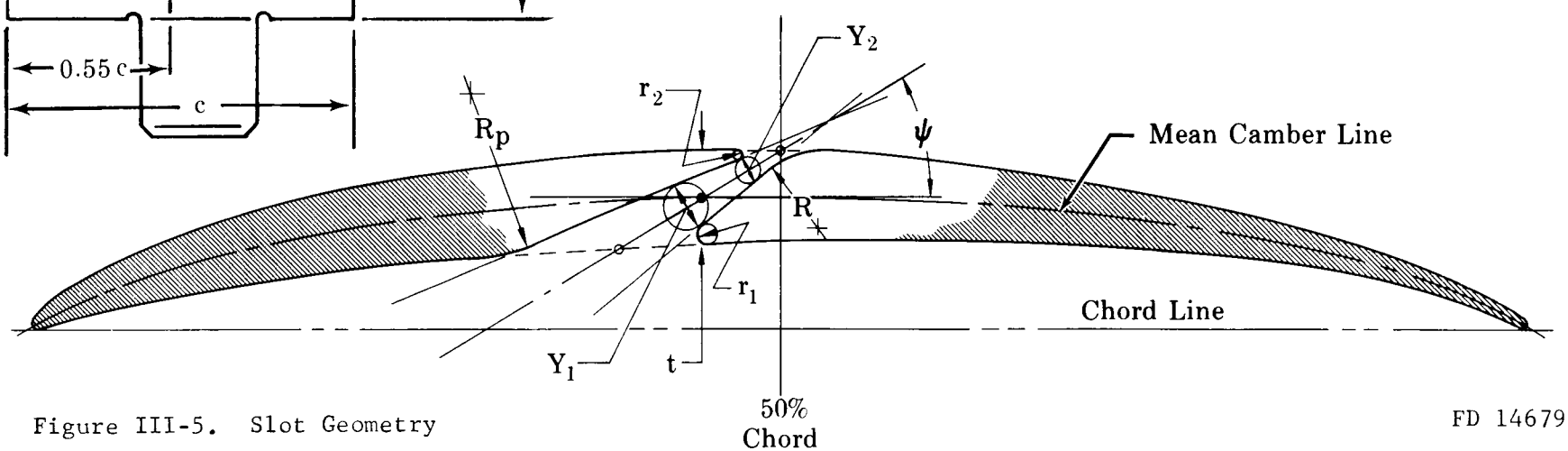


Figure III-5. Slot Geometry

FD 14679E

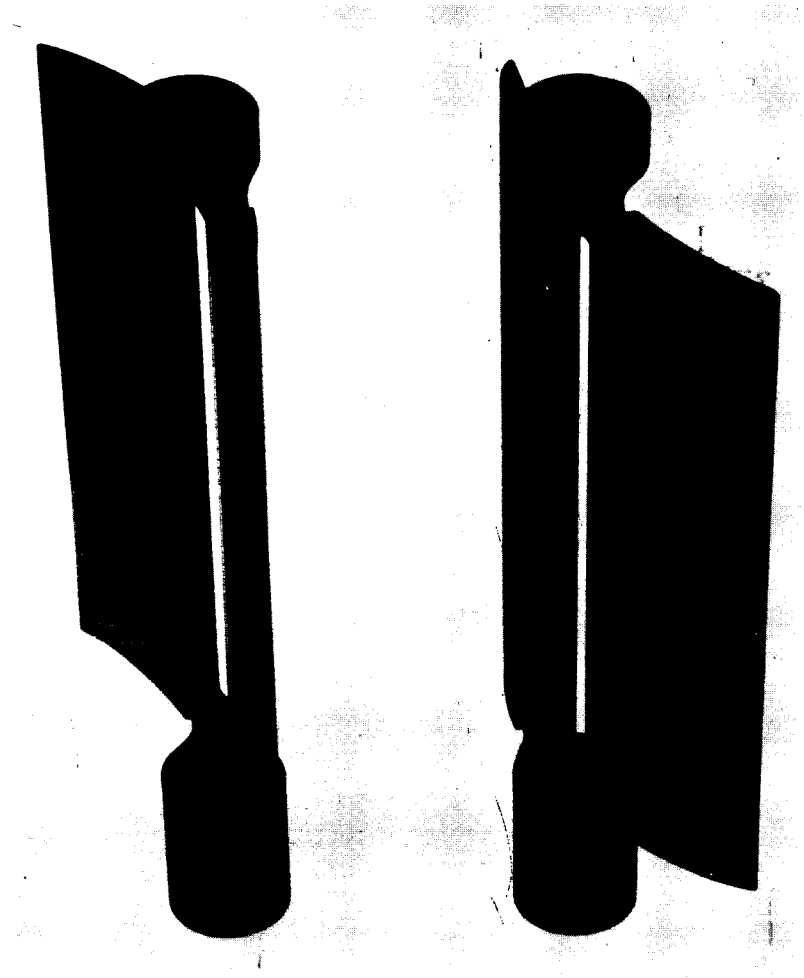
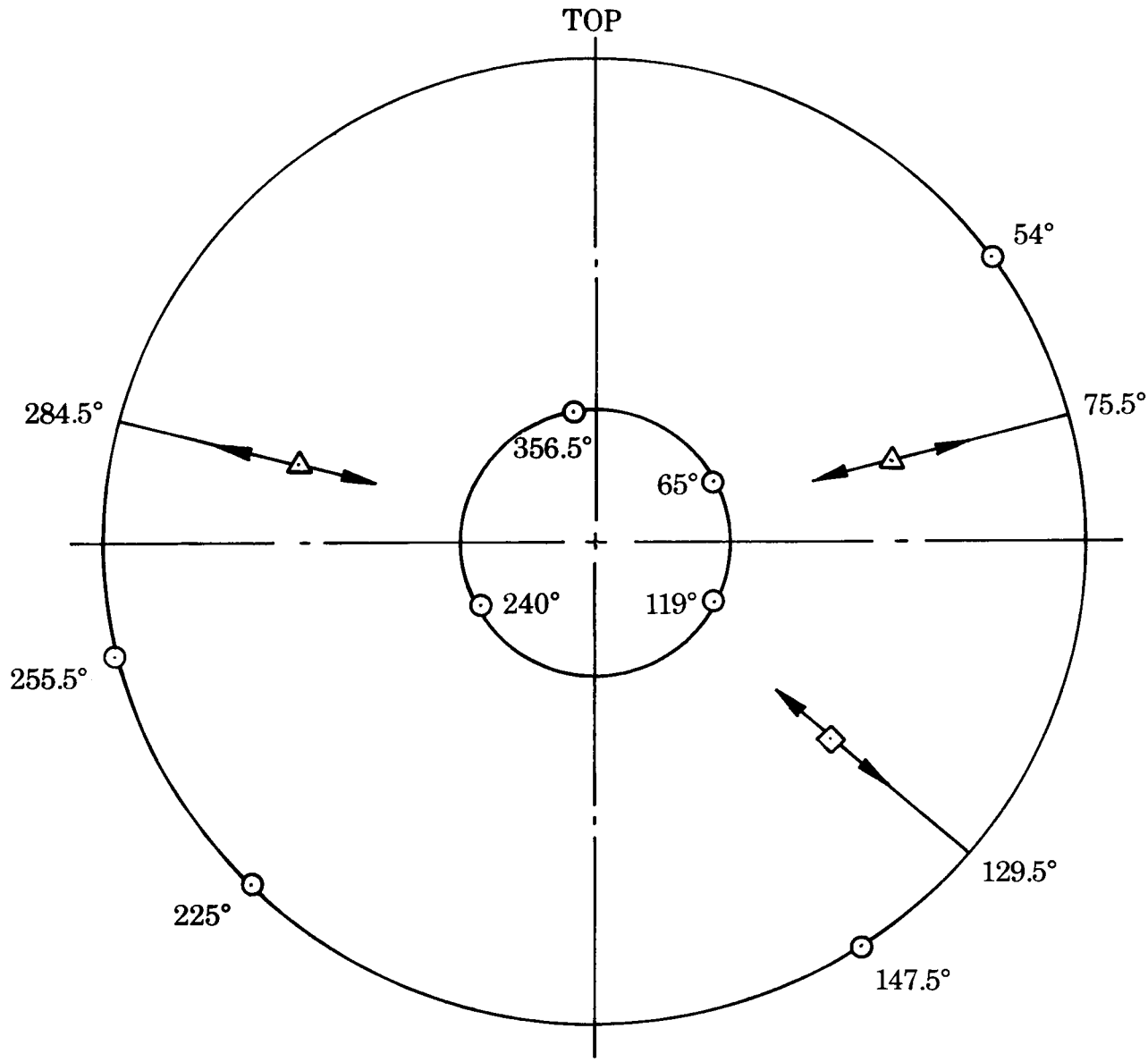


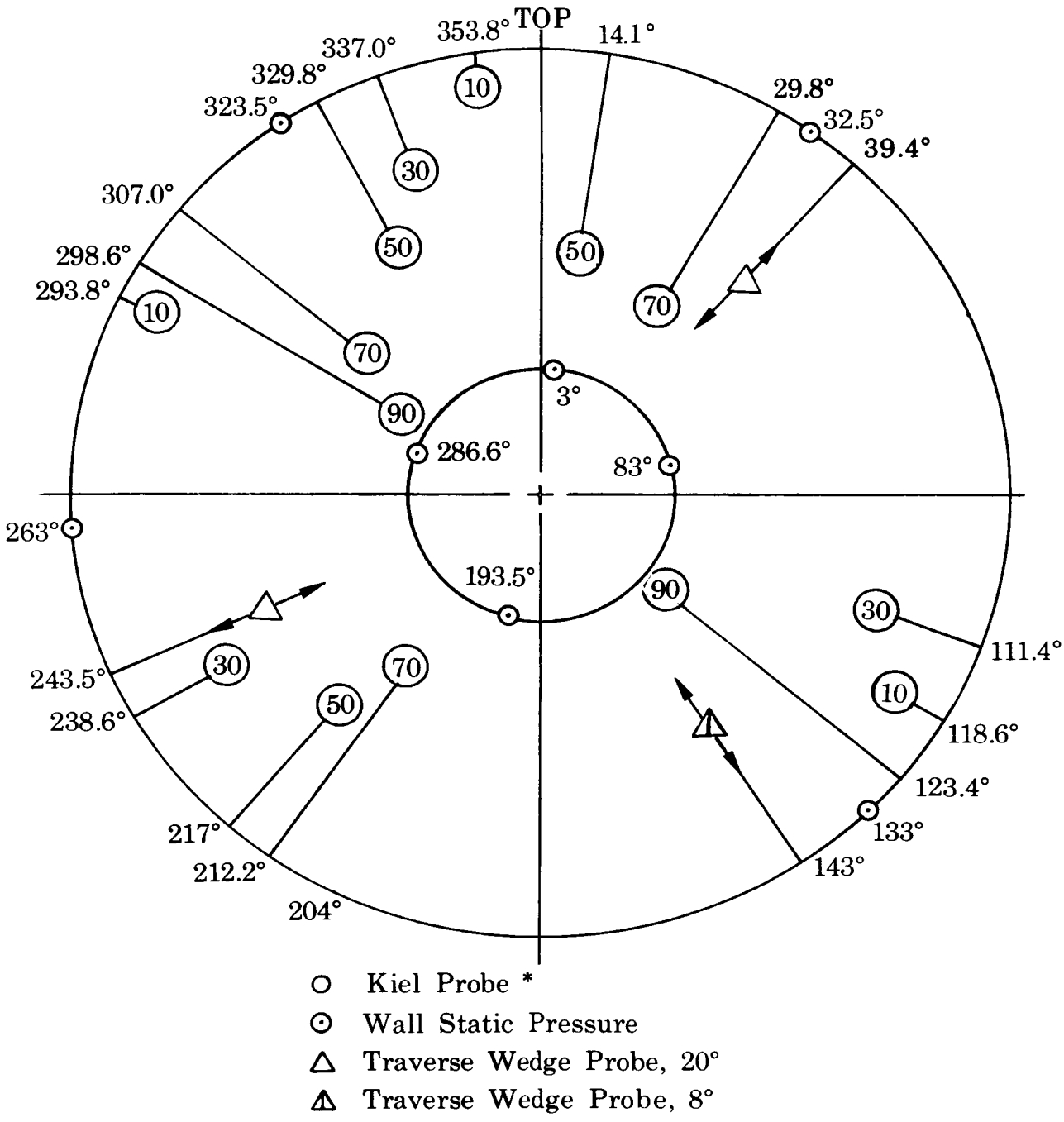
Figure III-6. Typical Slotted Stator 3 Vane FD 22751



⊙ Wall Static Pressure
△ Traverse Wedge Probe, 20°
◇ Traverse Wake Probe

Probe angular position is measured clockwise from the top.

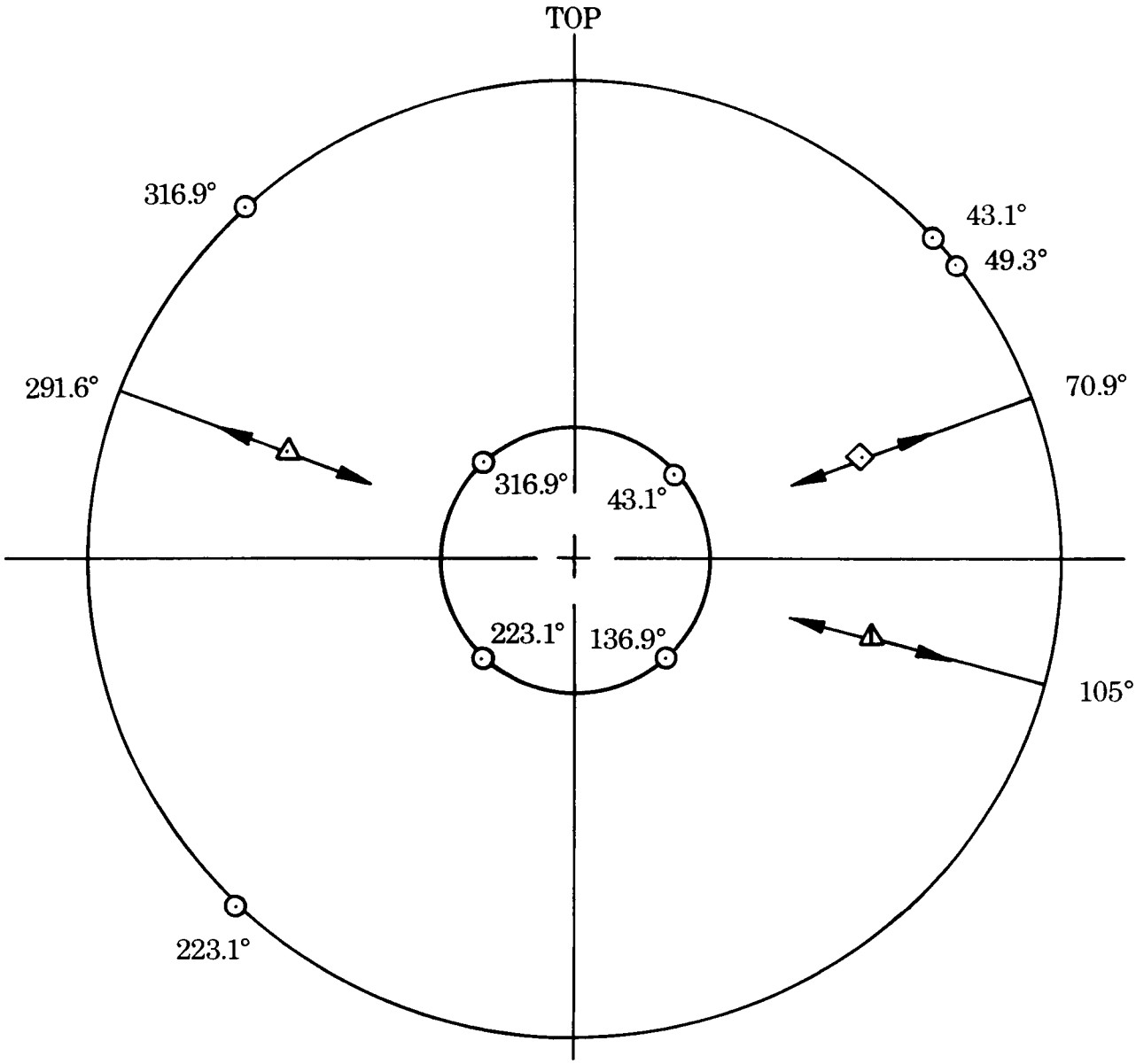
Figure III-7. Instrumentation, Station 1, View Looking Downstream FD 18596C



*Radial location as a percent of span from tip is denoted by the number within the symbol

Figure III-8. Instrumentation, Station 2, View Looking Downstream

FD 18595F



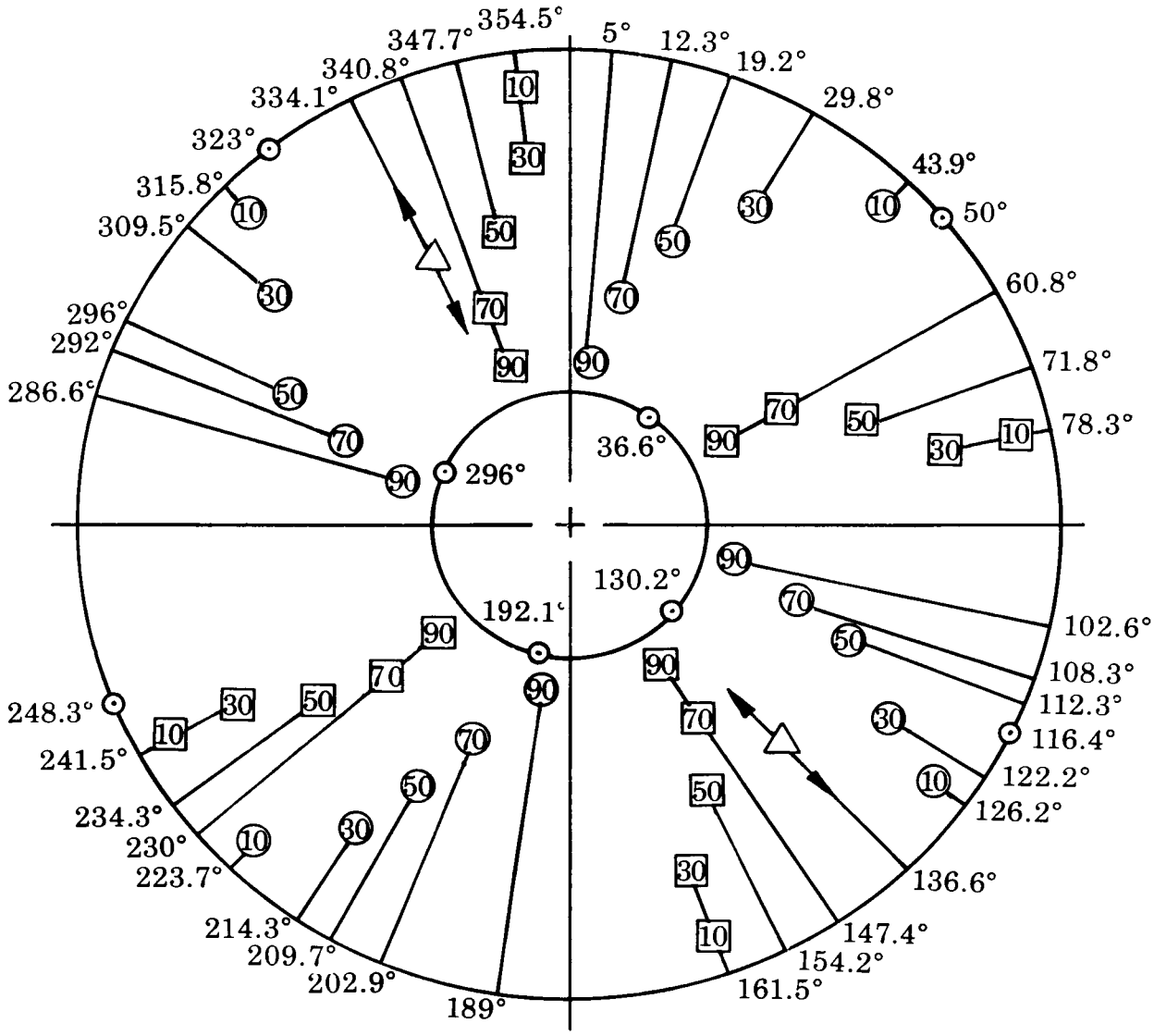
⊙ Wall Static Pressure
△ Traverse Wedge Probe, 20°
◭ Traverse Wedge Probe, 8°
◇ Traverse Wake Probe

Probe angular position is measured clockwise from the top.

Figure III-9. Instrumentation, Station 2A, View Looking Downstream

FD 18594C

TOP



⊙ Wall Static
△ Traverse Wedge Probe, 20°
⚠ Traverse Wedge Probe, 8°
○ Kiel Probe *
□ Temperature *

*Radial location as a percent of span from tip is denoted by the number within the symbol

Figure III-10. Instrumentation, Station 3, View Looking Downstream FD 18597C

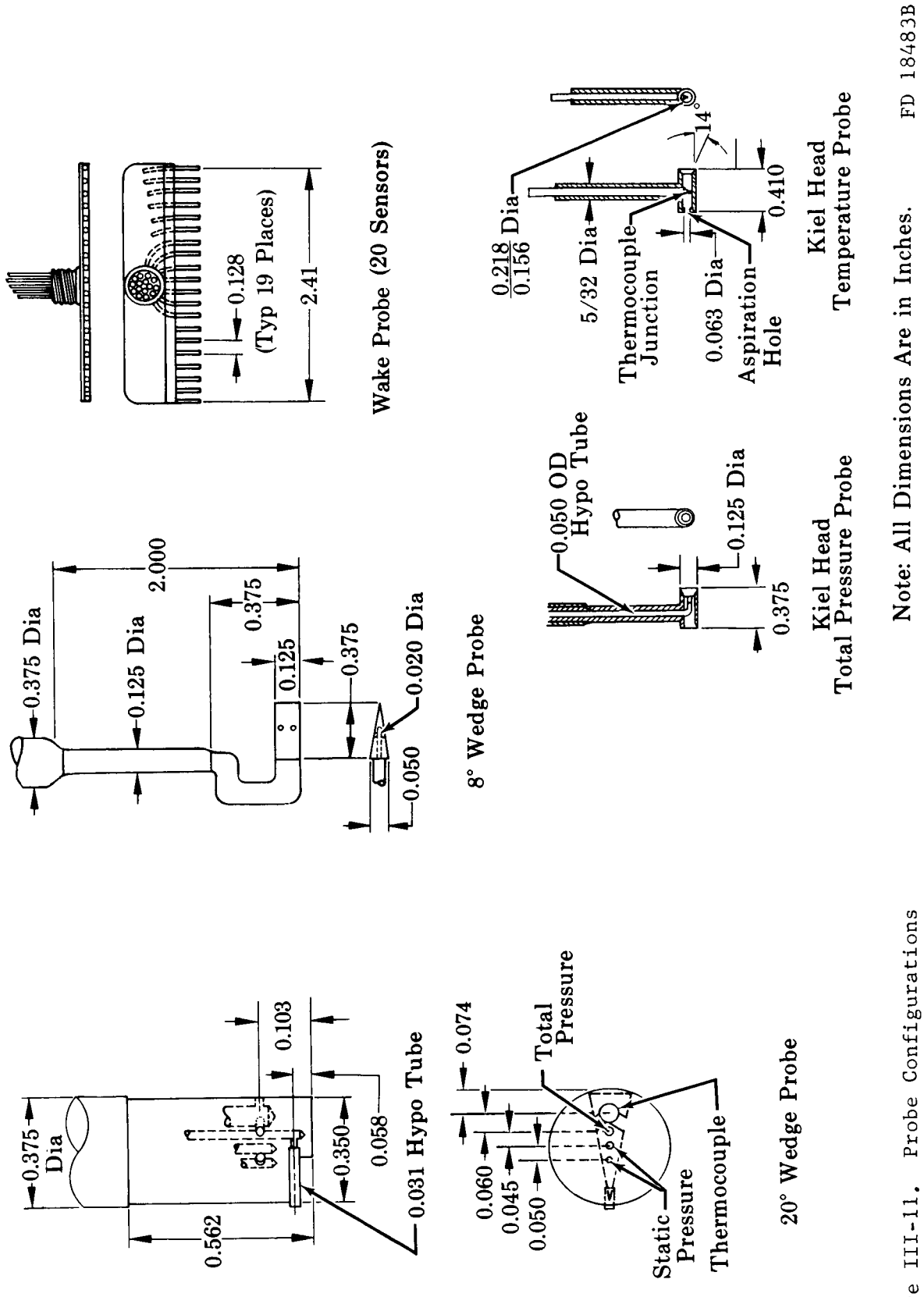
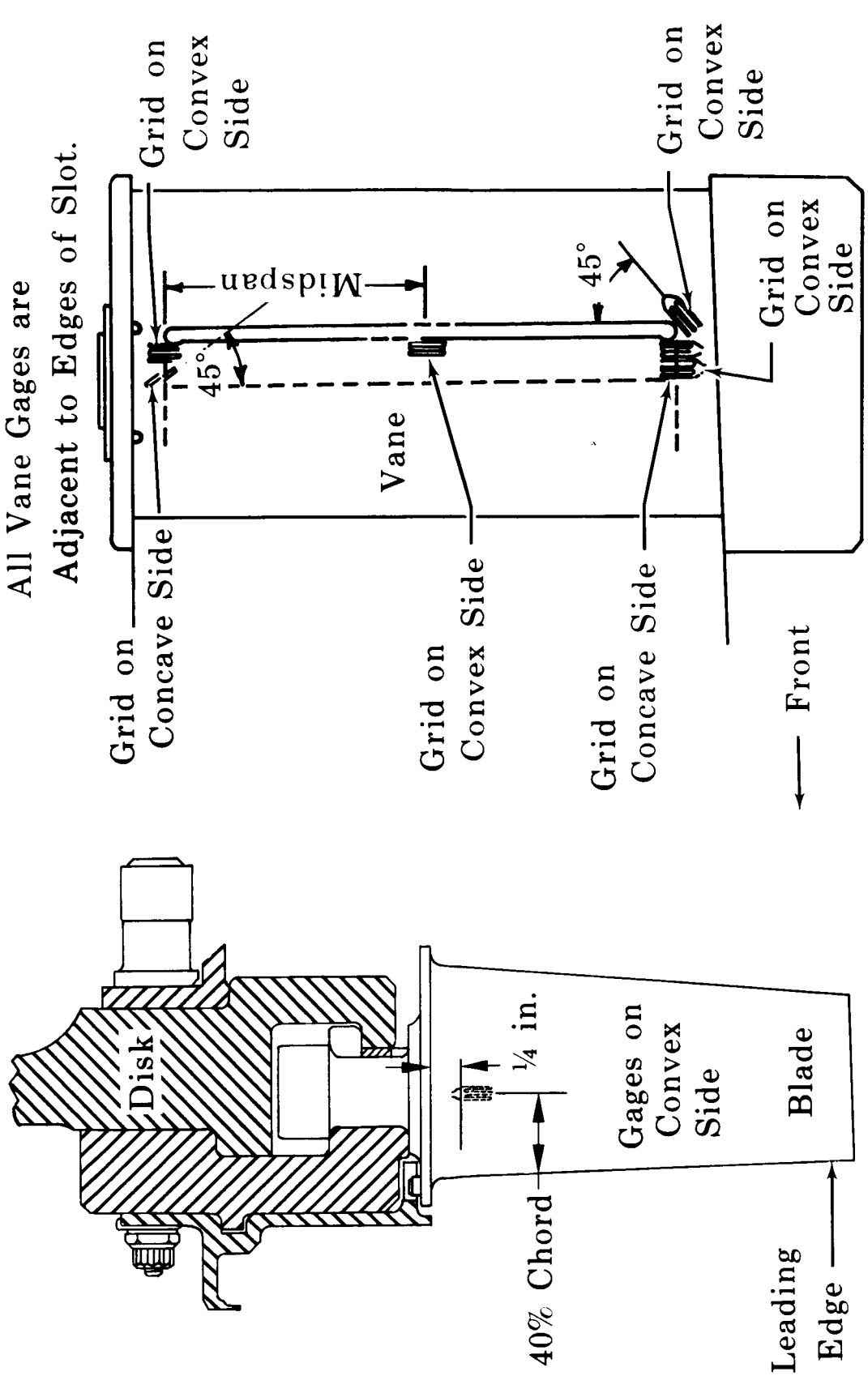


Figure III-11. Probe Configurations



FD 22582

Figure III-12. Strain Gage Locations

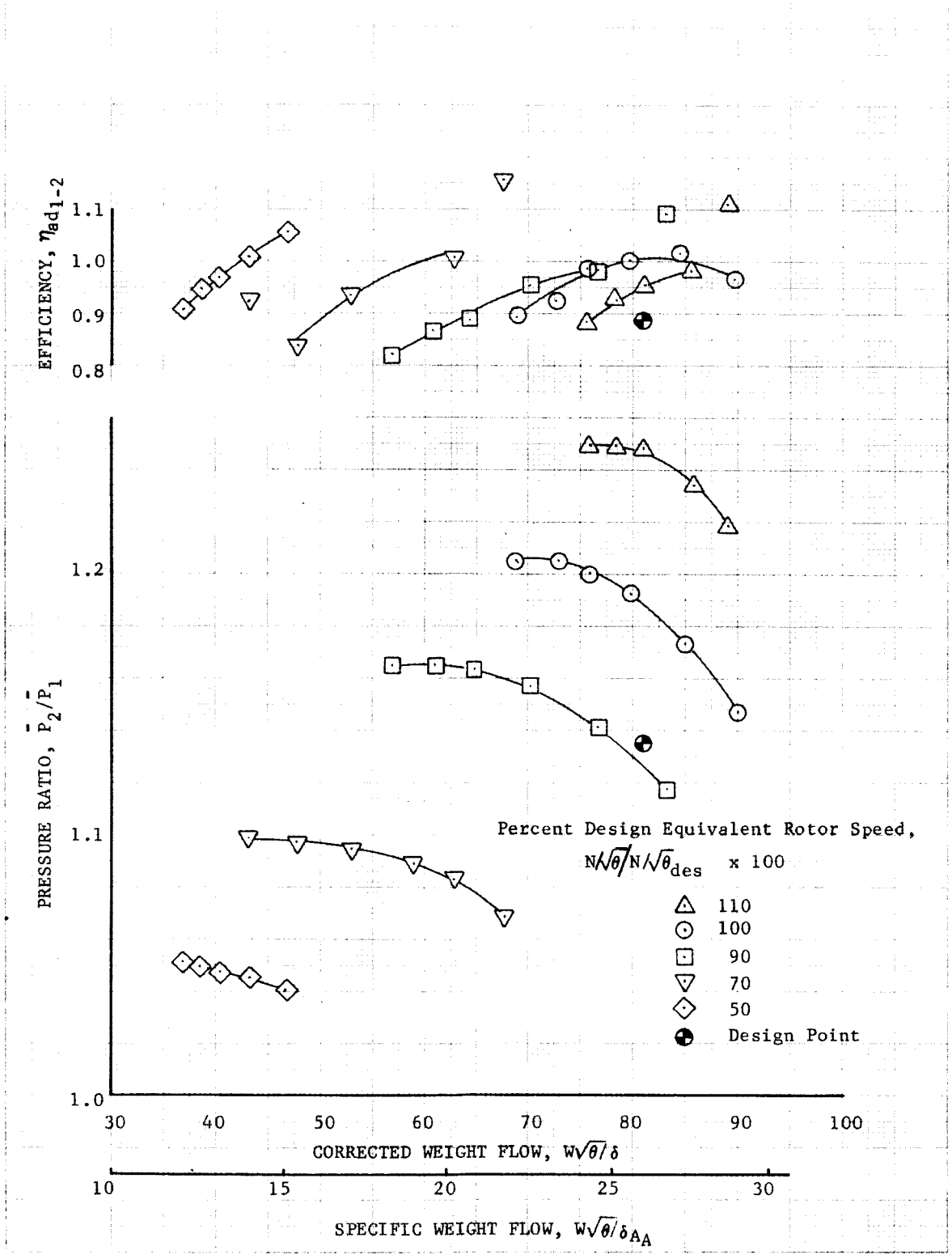


Figure V-1. Overall Performance: Flow Generation Rotor Only

DF 58413

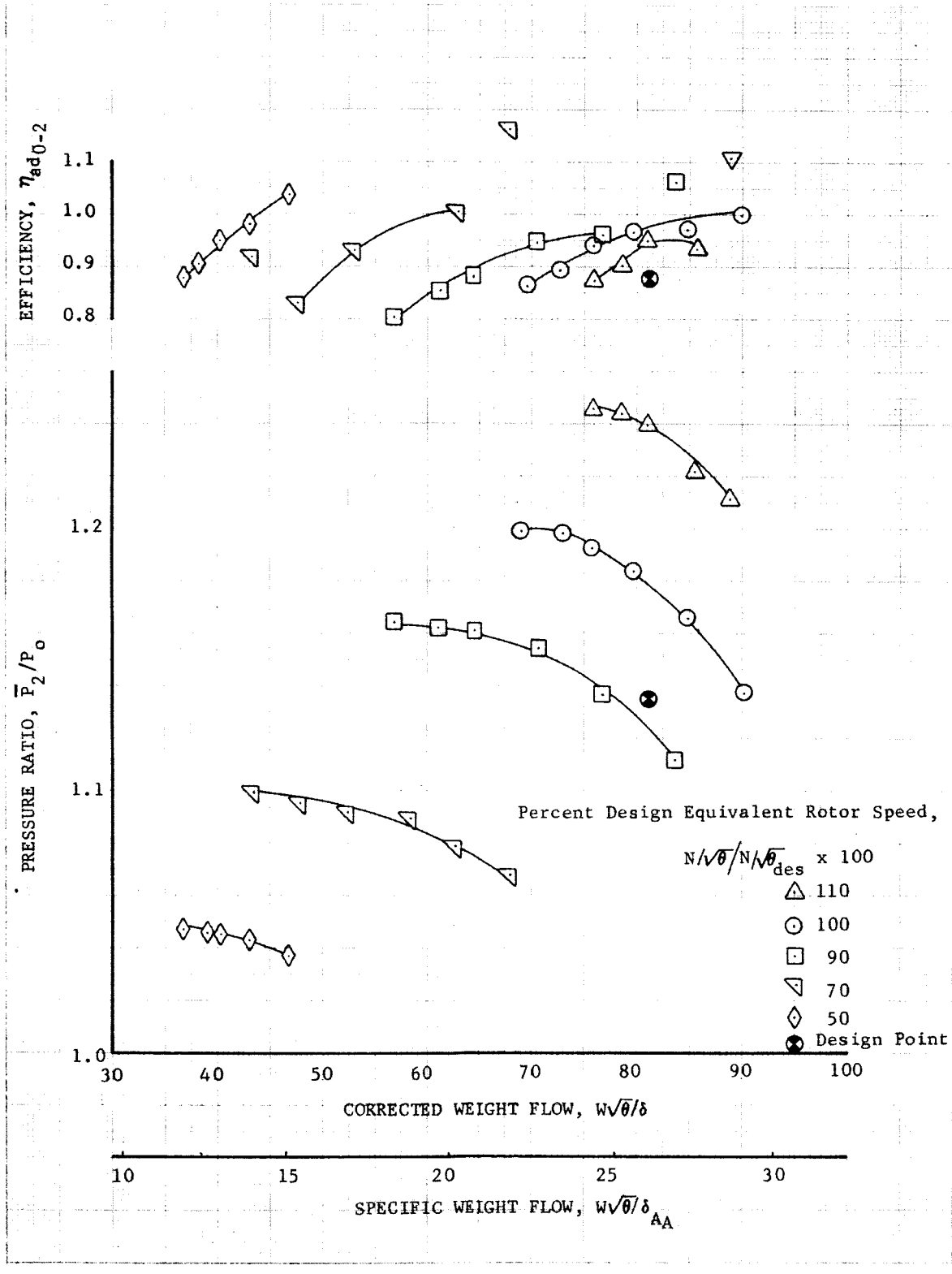


Figure V-2. Overall Performance: Guide Vane, Flow Generation Rotor

DF 58414

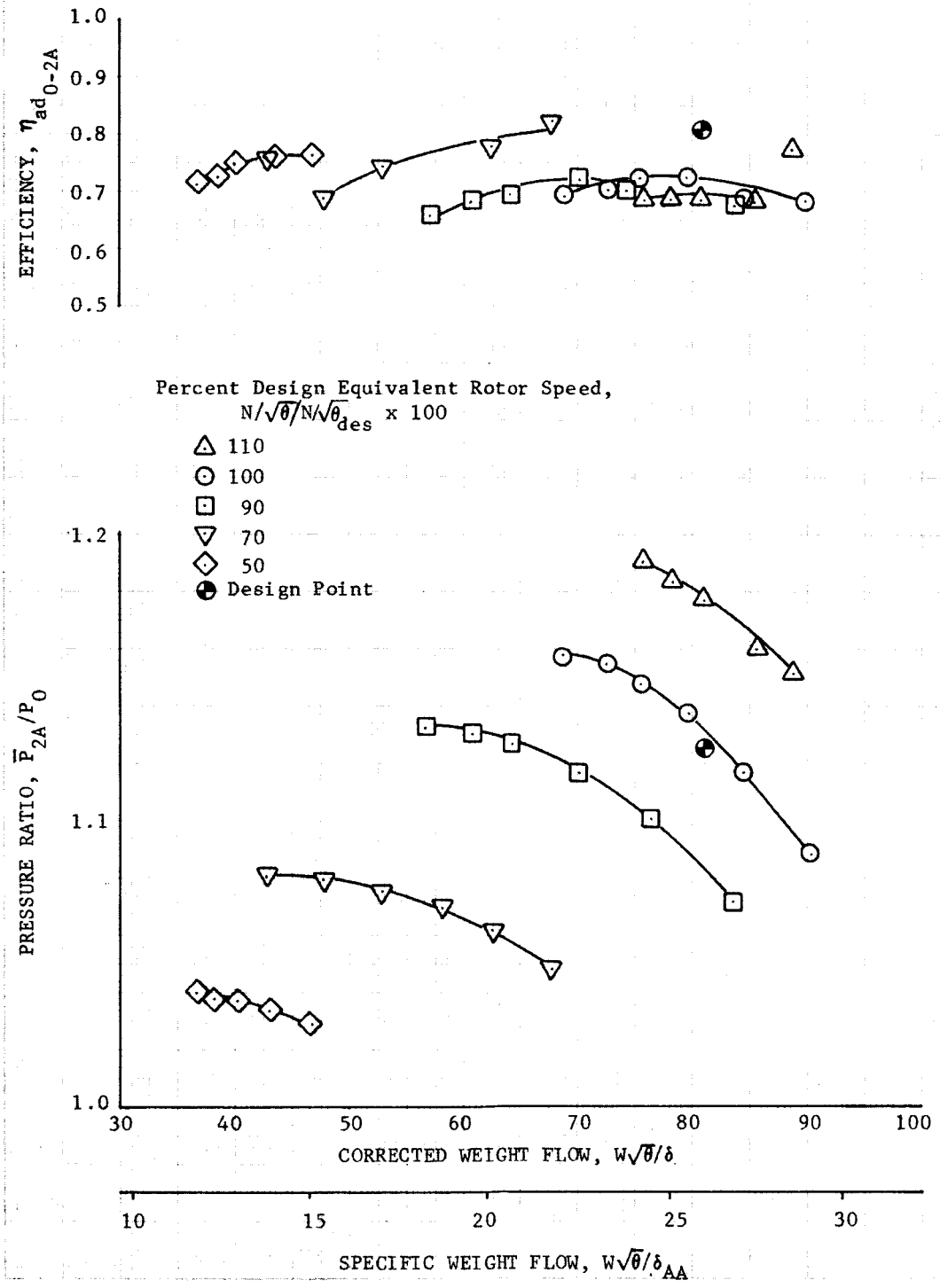


Figure V-3. Overall Performance: Guide Vane, Flow Generation Rotor, Slotted Stator 3

DF 58415

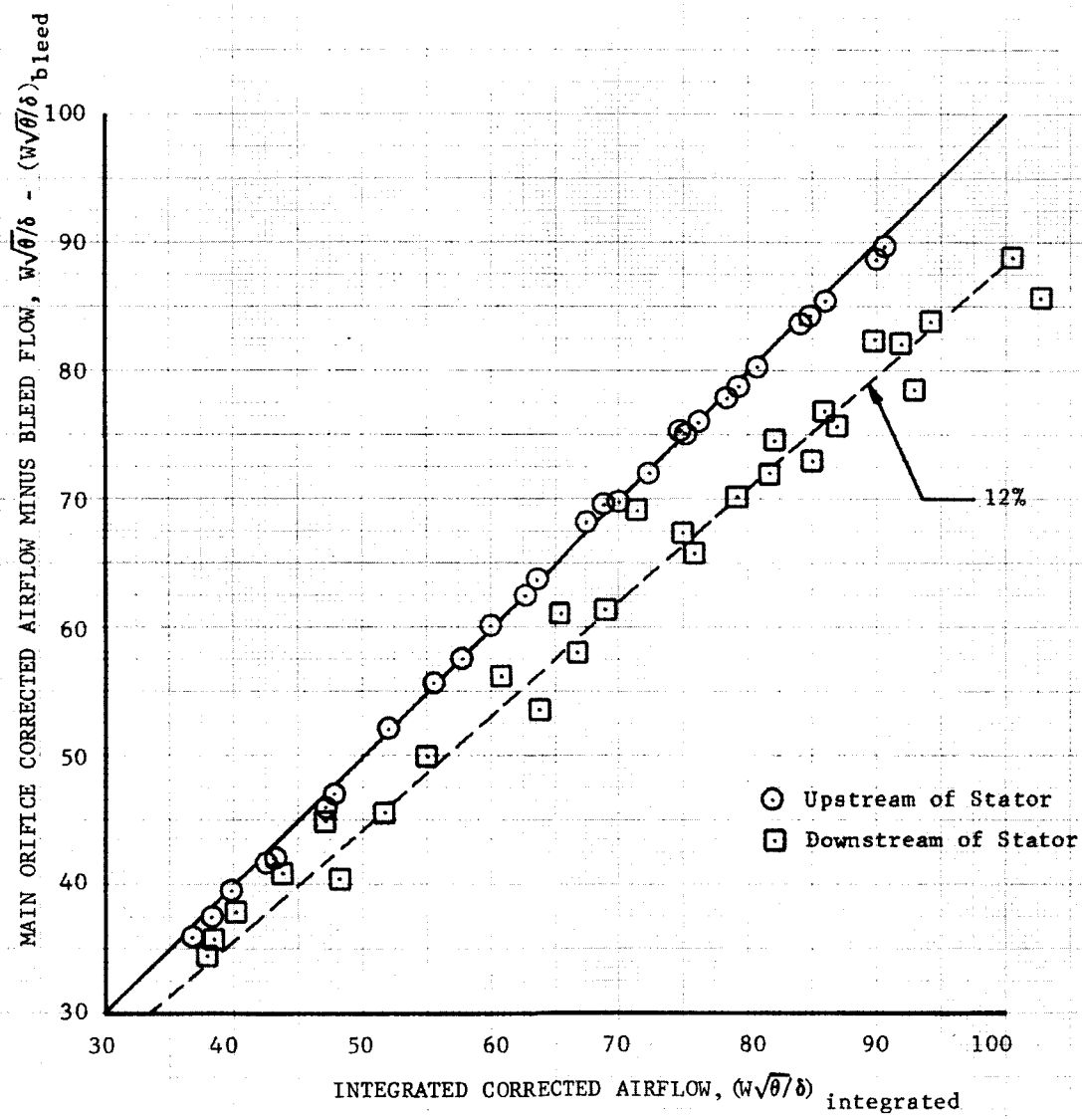


Figure V-4. Airflow Continuity Comparison DF 58416

DF 58417

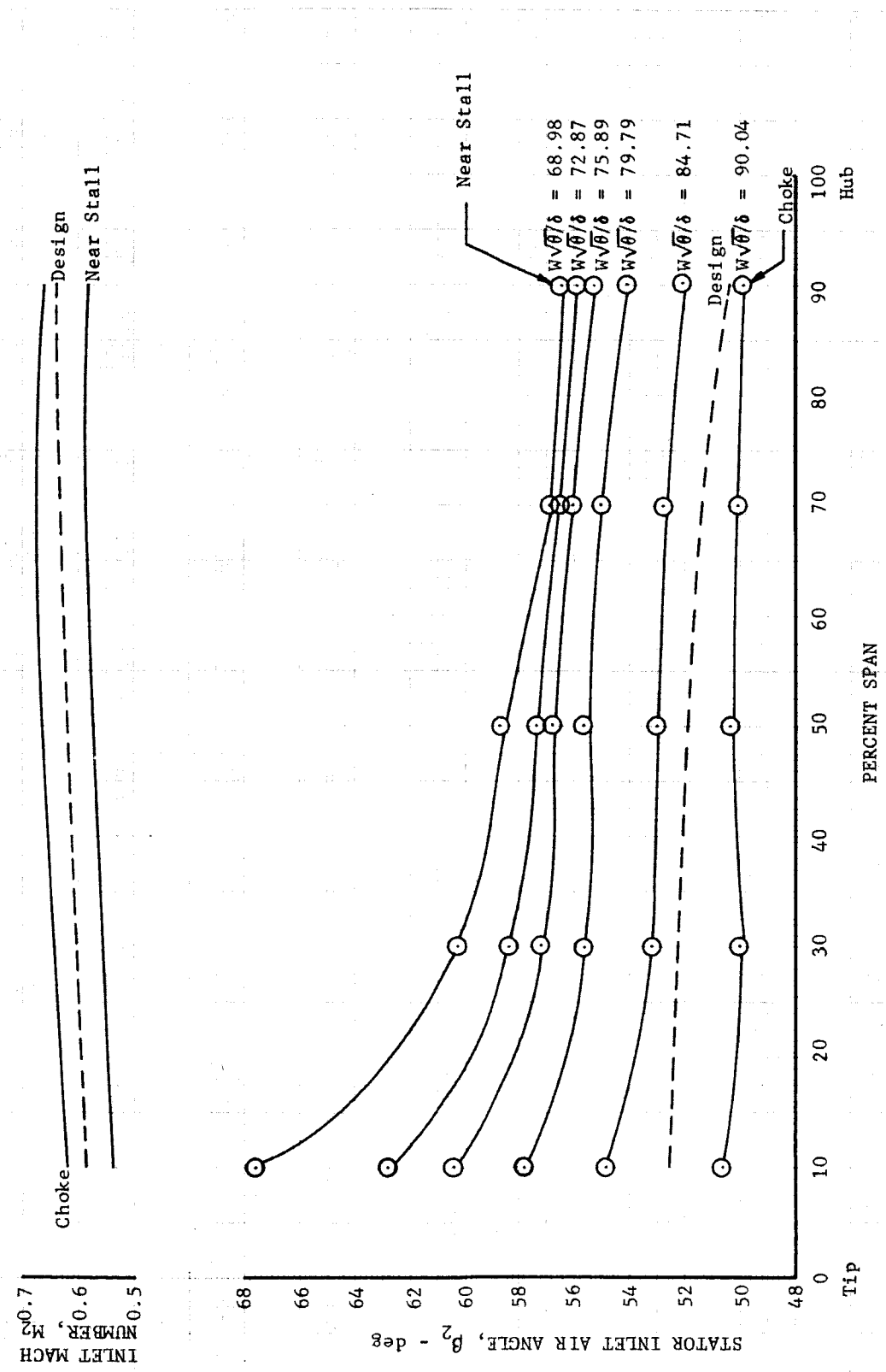


Figure V-5. Stator Inlet Air Angle and Mach Number Distribution: 100% Design Equivalent Rotor Speed

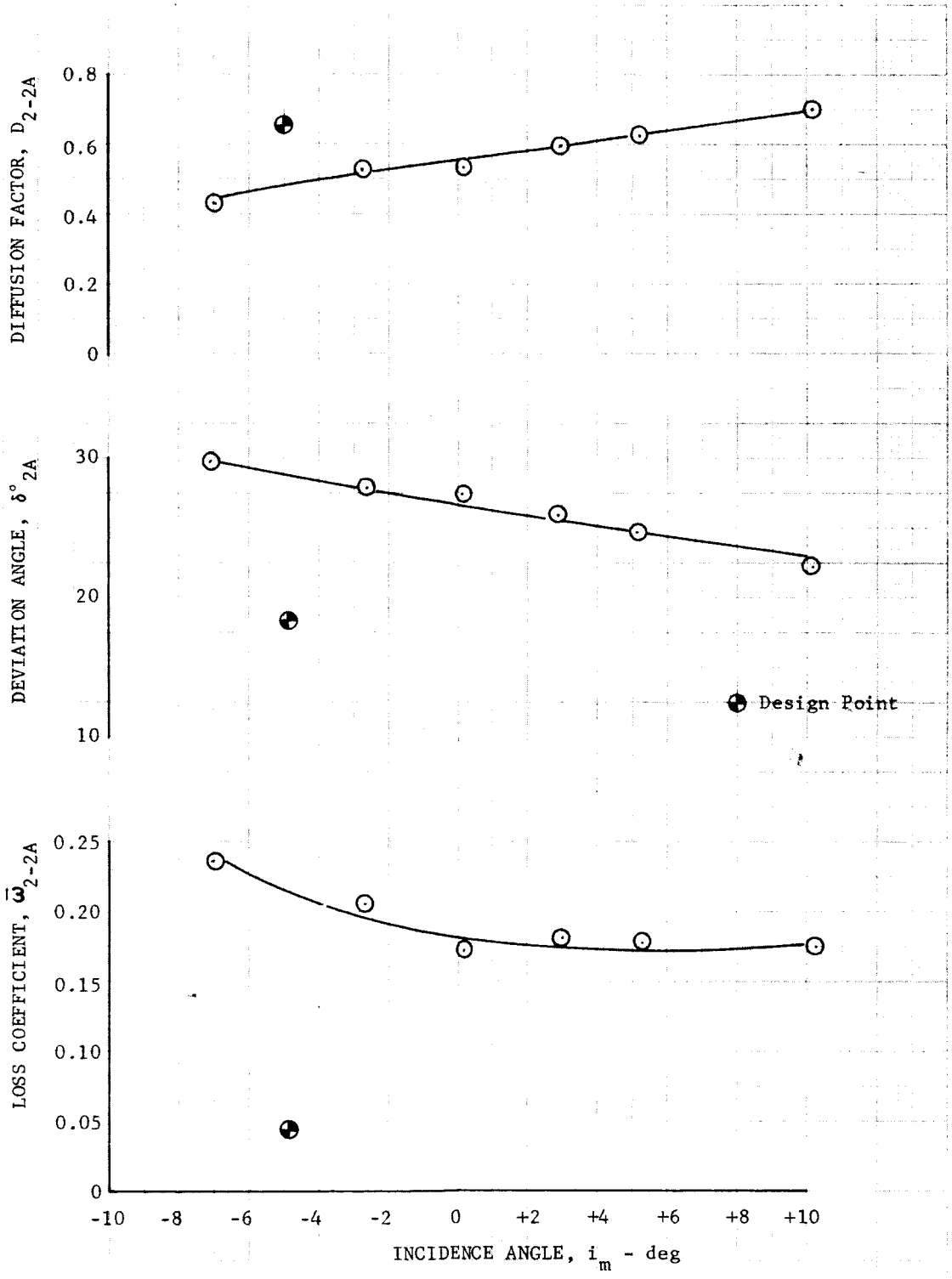


Figure V-6. Stator Blade Element Performance: 100% Design Equivalent Rotor Speed, 10% Span From Tip

DF 58418

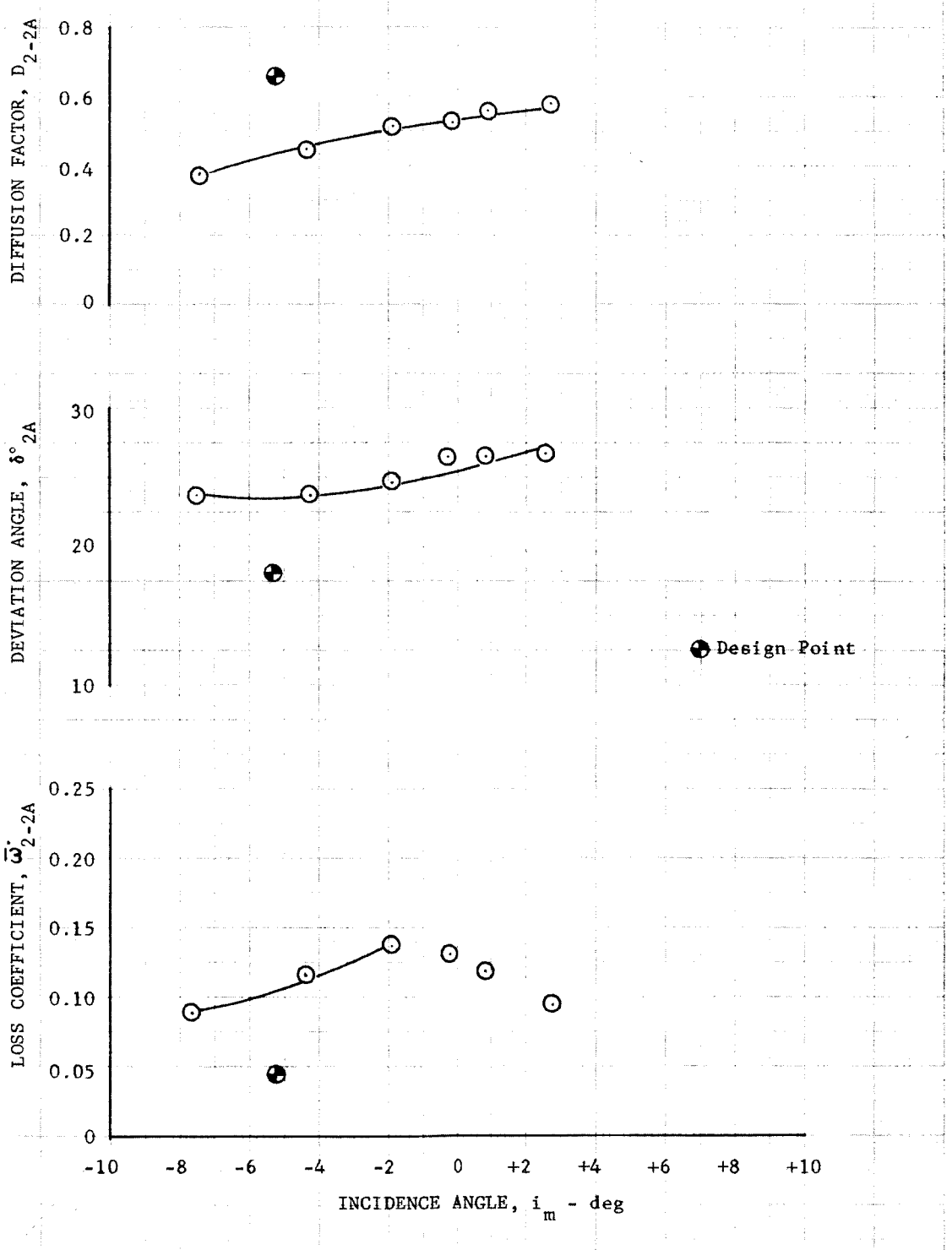


Figure V-7. Stator Blade Element Performance: 100% Design Equivalent Rotor Speed, 30% Span From Tip

DF 58419

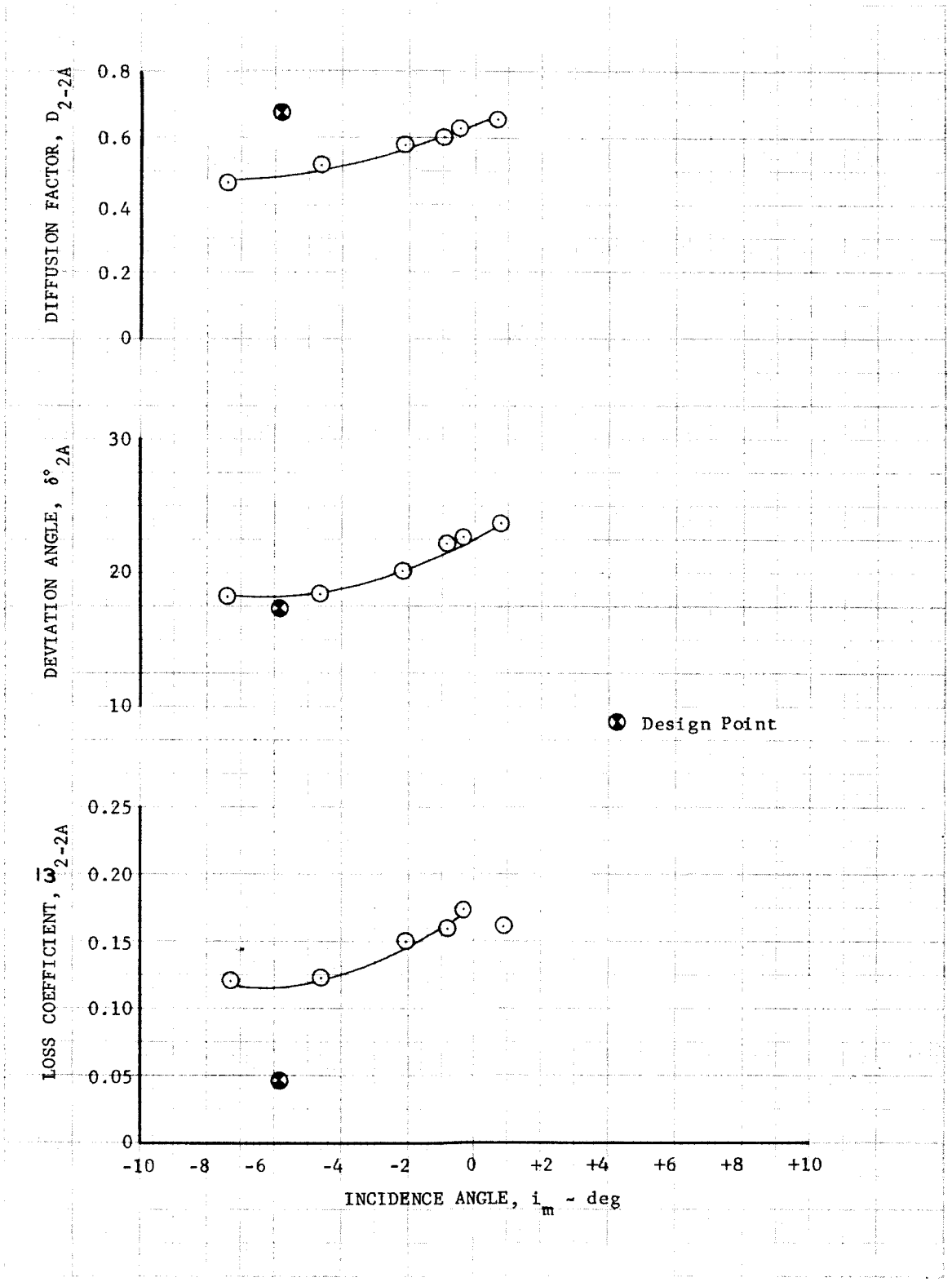


Figure V-8. Stator Blade Element Performance: 100% Design Equivalent Rotor Speed, 50% Span From Tip

DF 58420

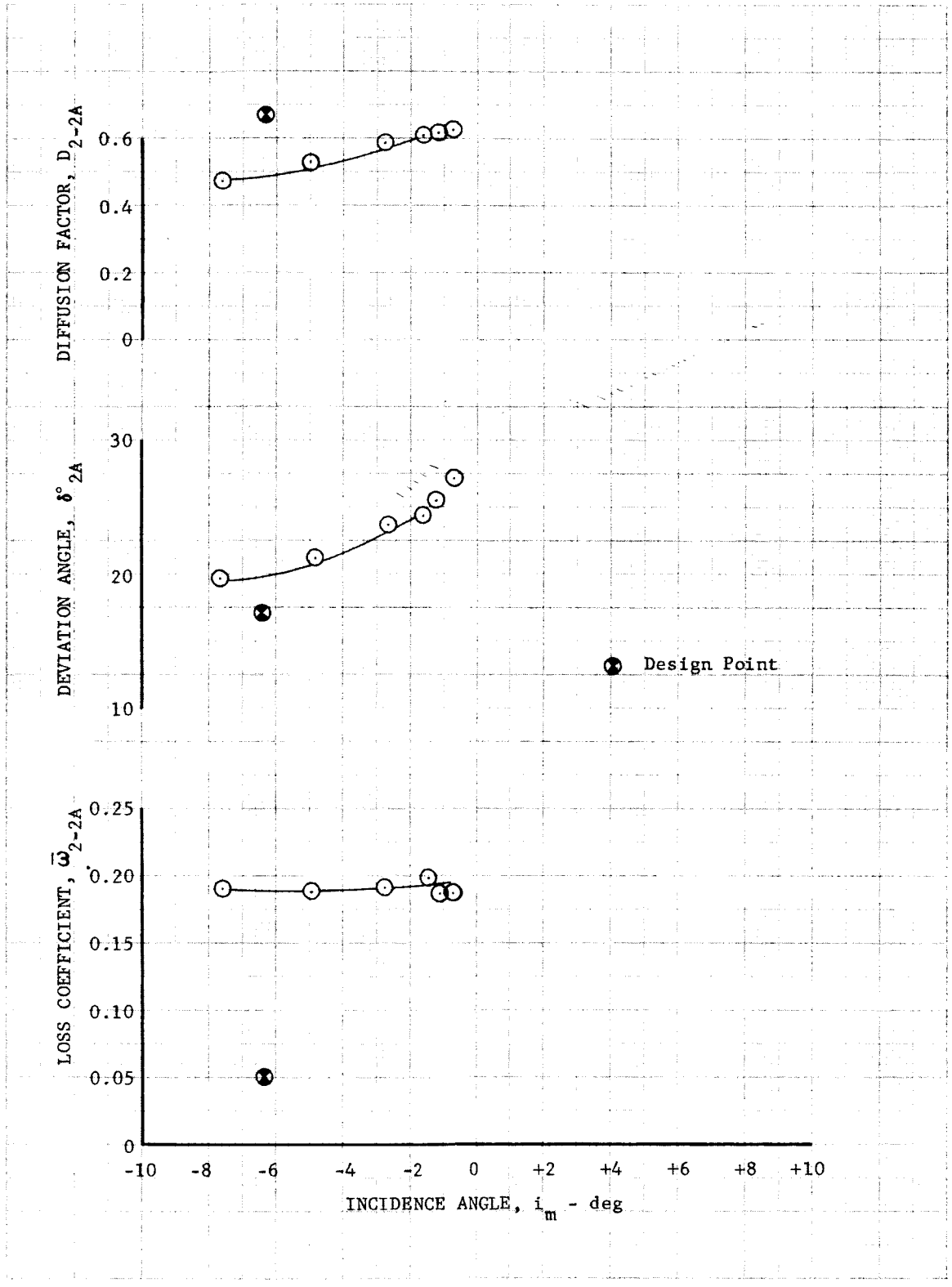


Figure V-9. Stator Blade Element Performance: 100% Design Equivalent Rotor Speed, 70% Span From Tip

DF 58421

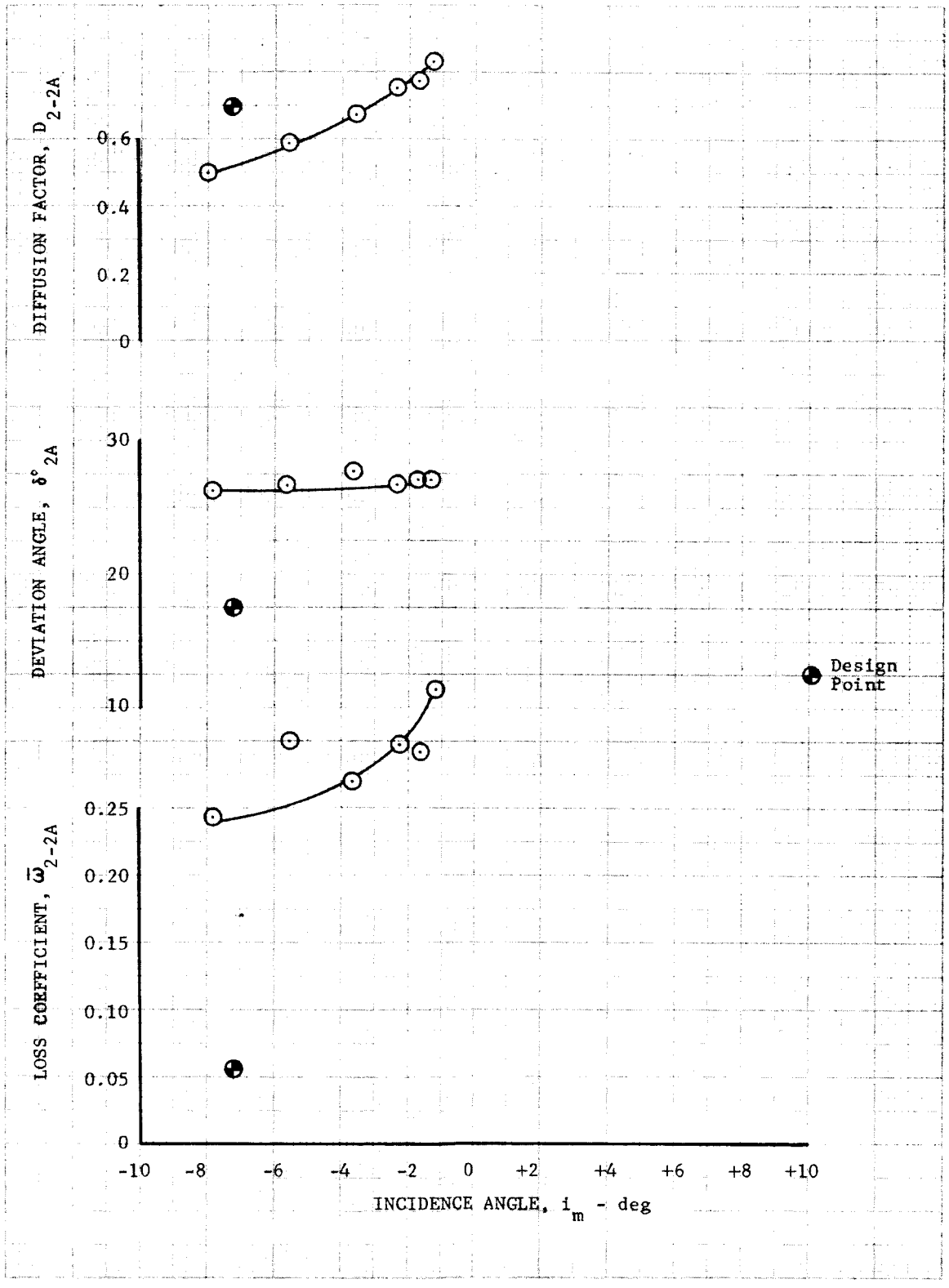


Figure V-10. Stator Blade Element Performance: 100% Design Equivalent Rotor Speed, 90% Span From Tip

DF 58422

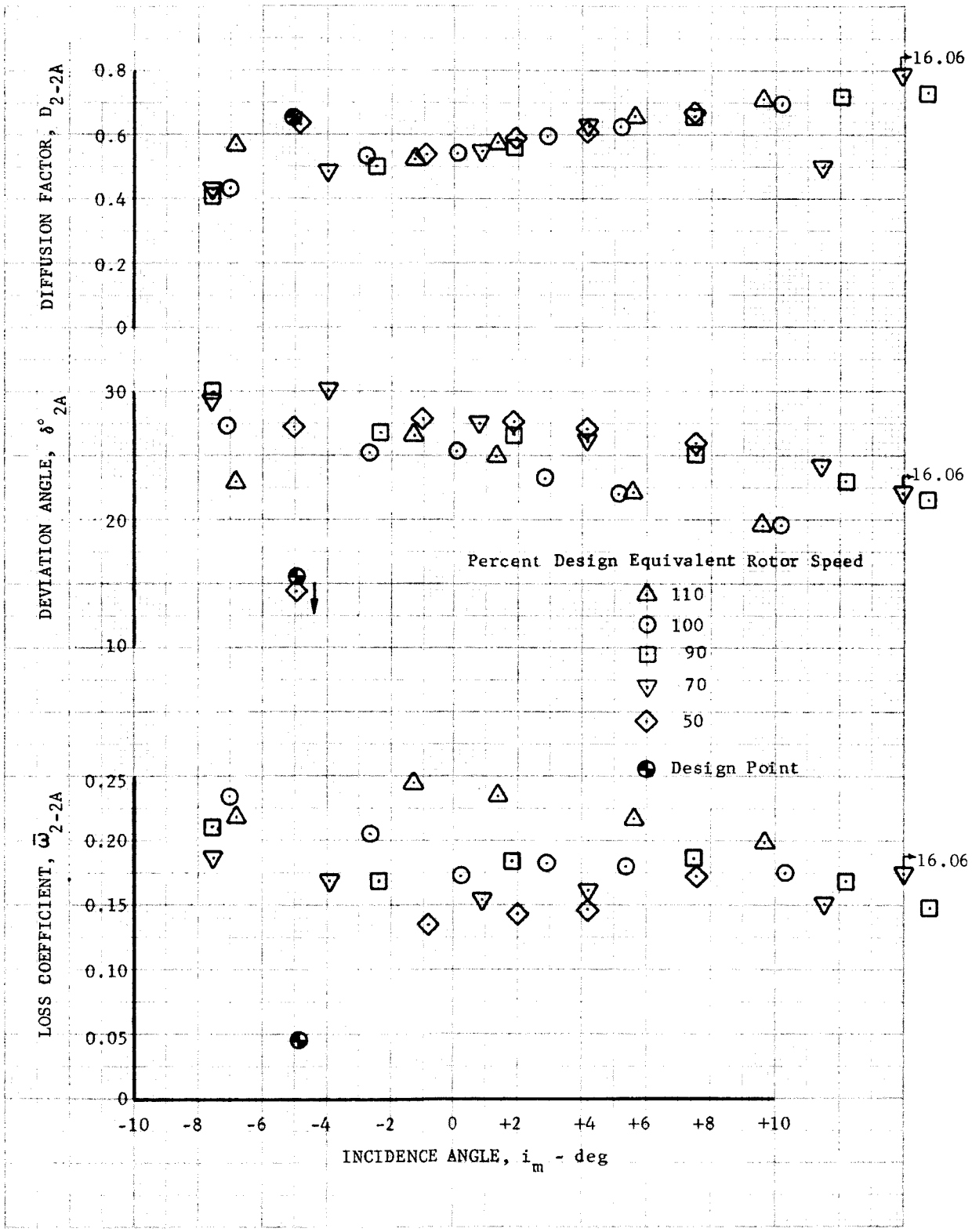


Figure V-11. Variation of Stator Blade Element Parameters With Incidence: Slotted Stator 3, 10% Span From Tip

DF 58423

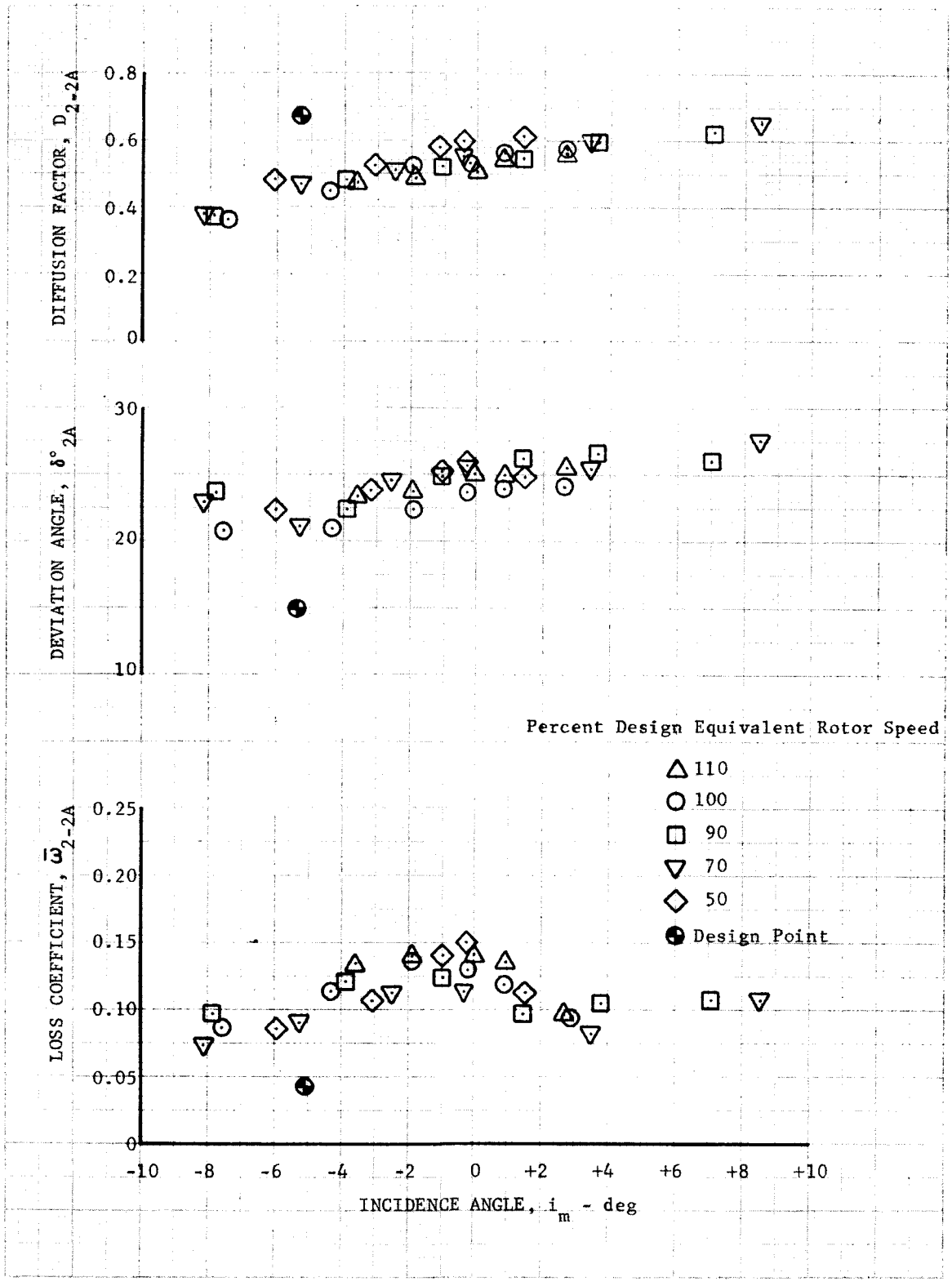


Figure V-12. Variation of Stator Blade Element Parameters With Incidence: Slotted Stator 3, 30% Span From Tip

DF 58424

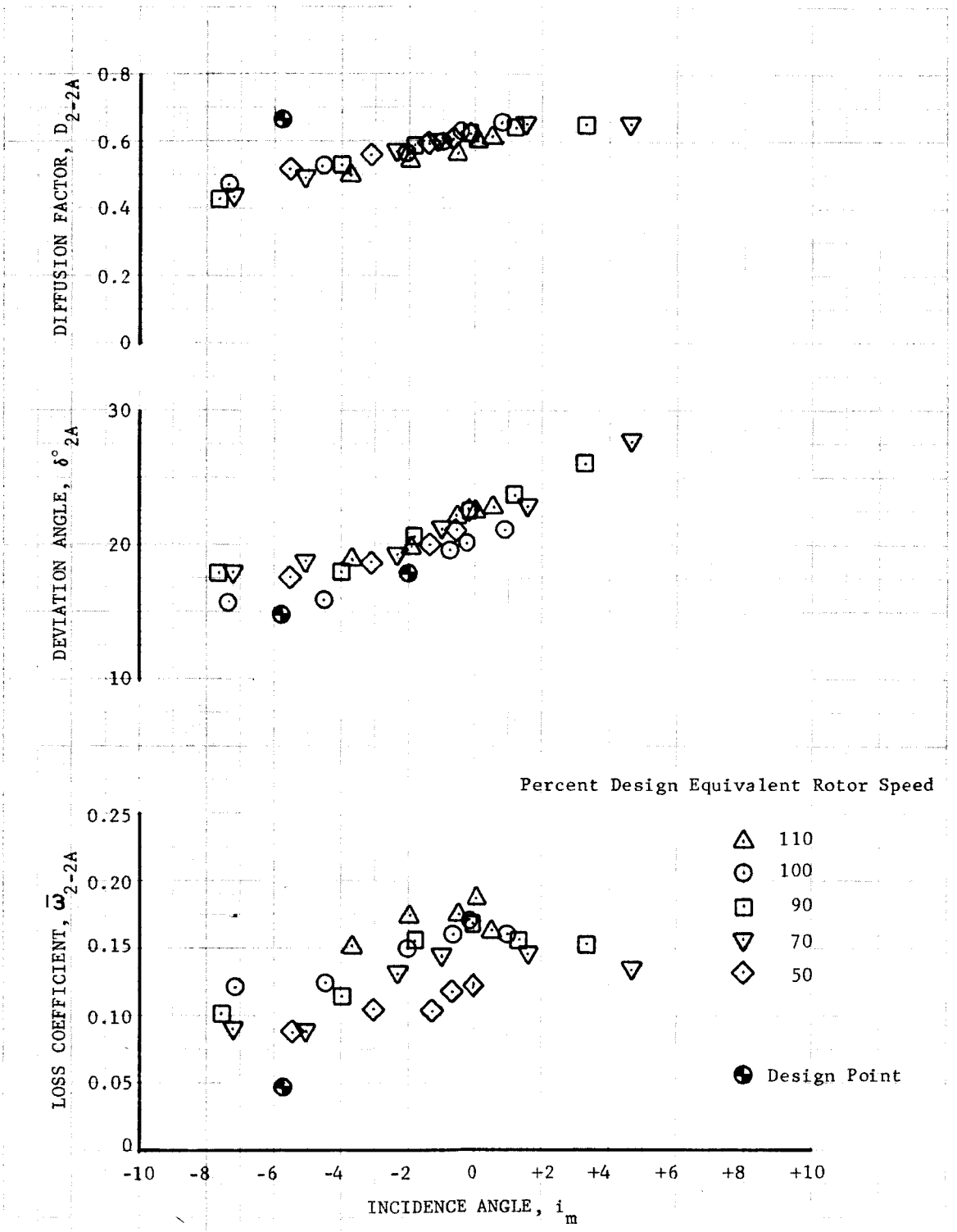


Figure V-13. Variation of Stator Blade Element Parameters With Incidence: Slotted Stator 3, 50% Span From Tip

DF 58425

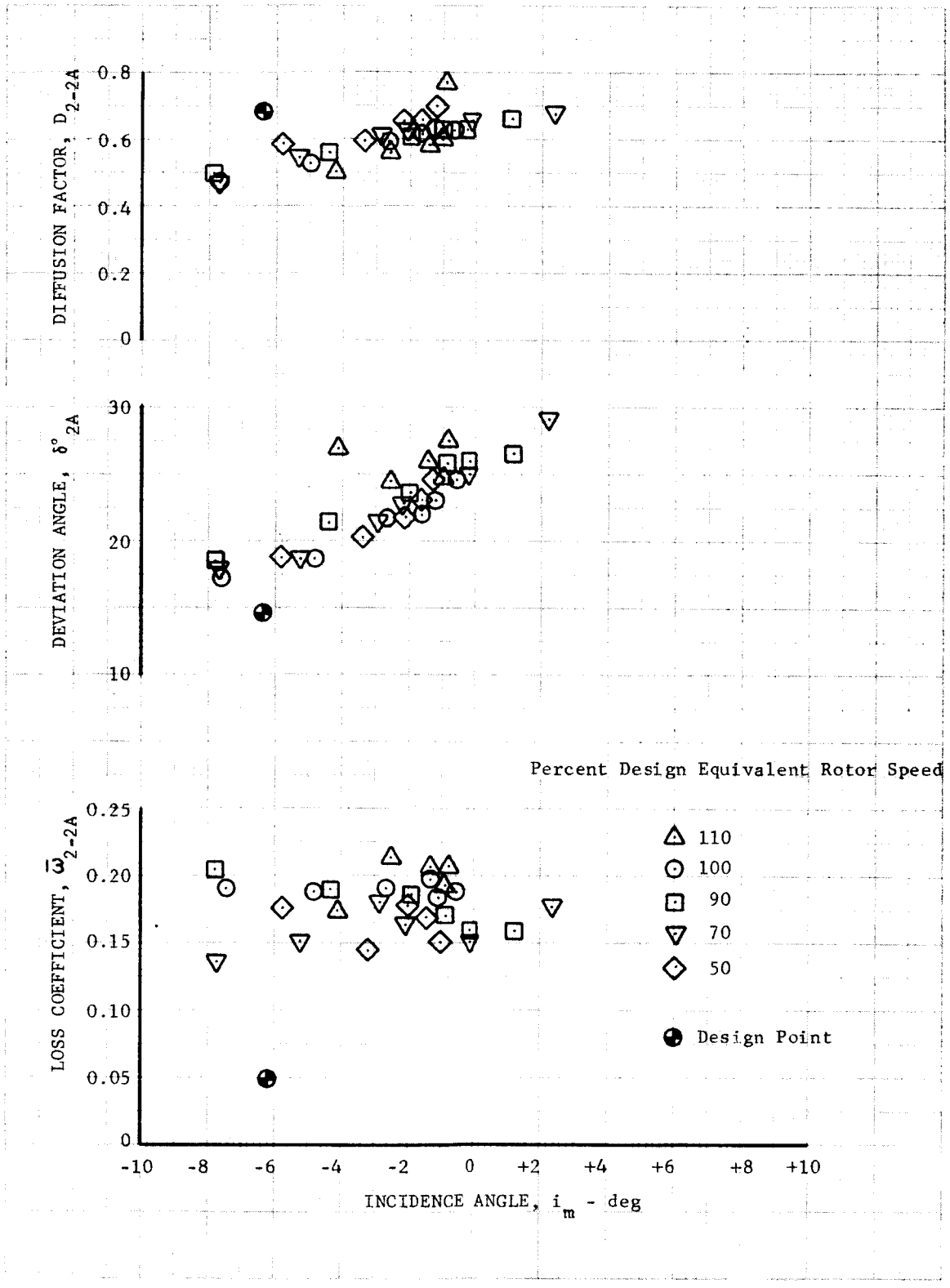


Figure V-14. Variation of Stator Blade Element Parameters With Incidence: Slotted Stator 3, 70% Span From Tip

DF 58426

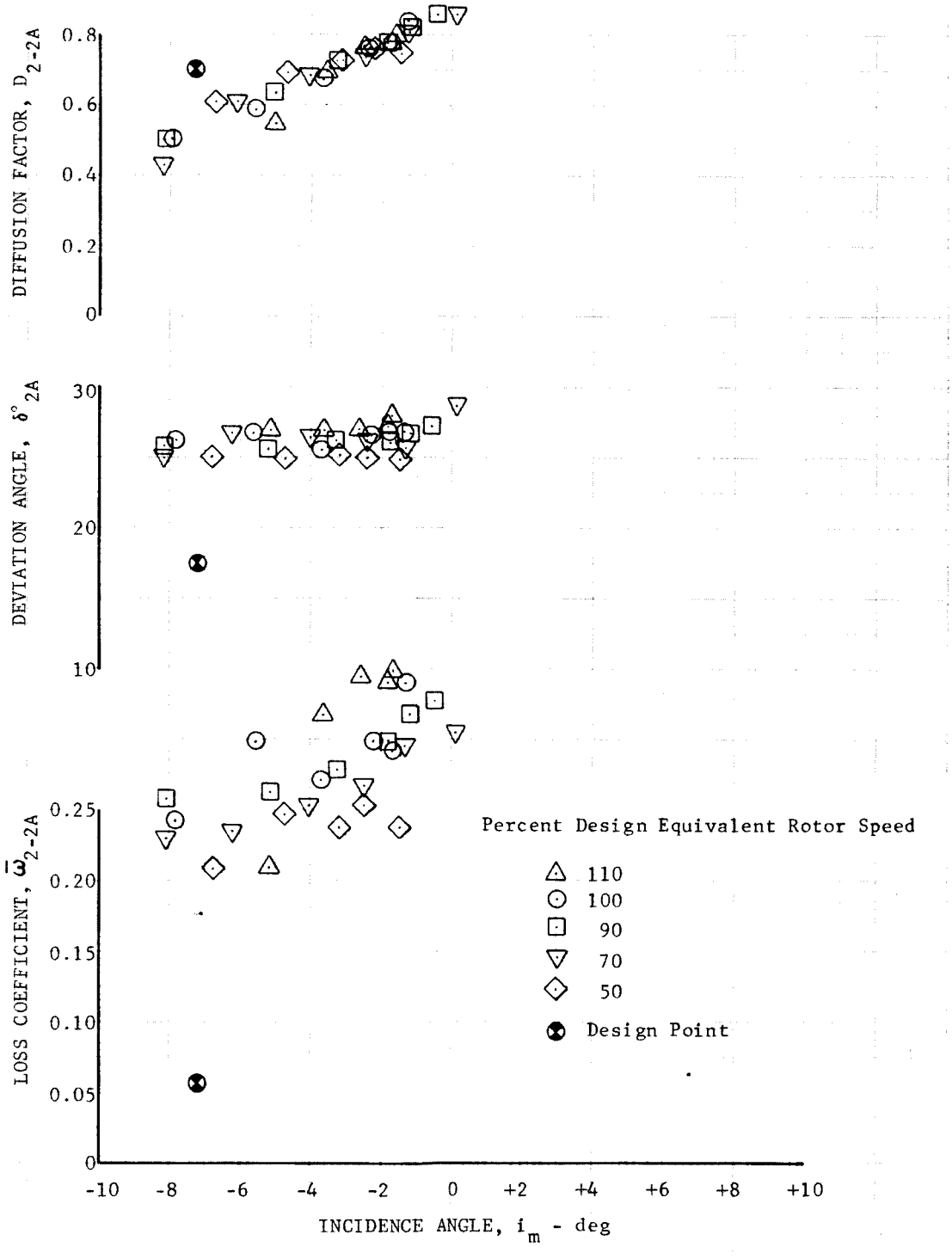


Figure V-15. Variation of Stator Blade Element Parameters With Incidence: Slotted Stator 3, 90% Span From Tip

DF 58427

DF 58428

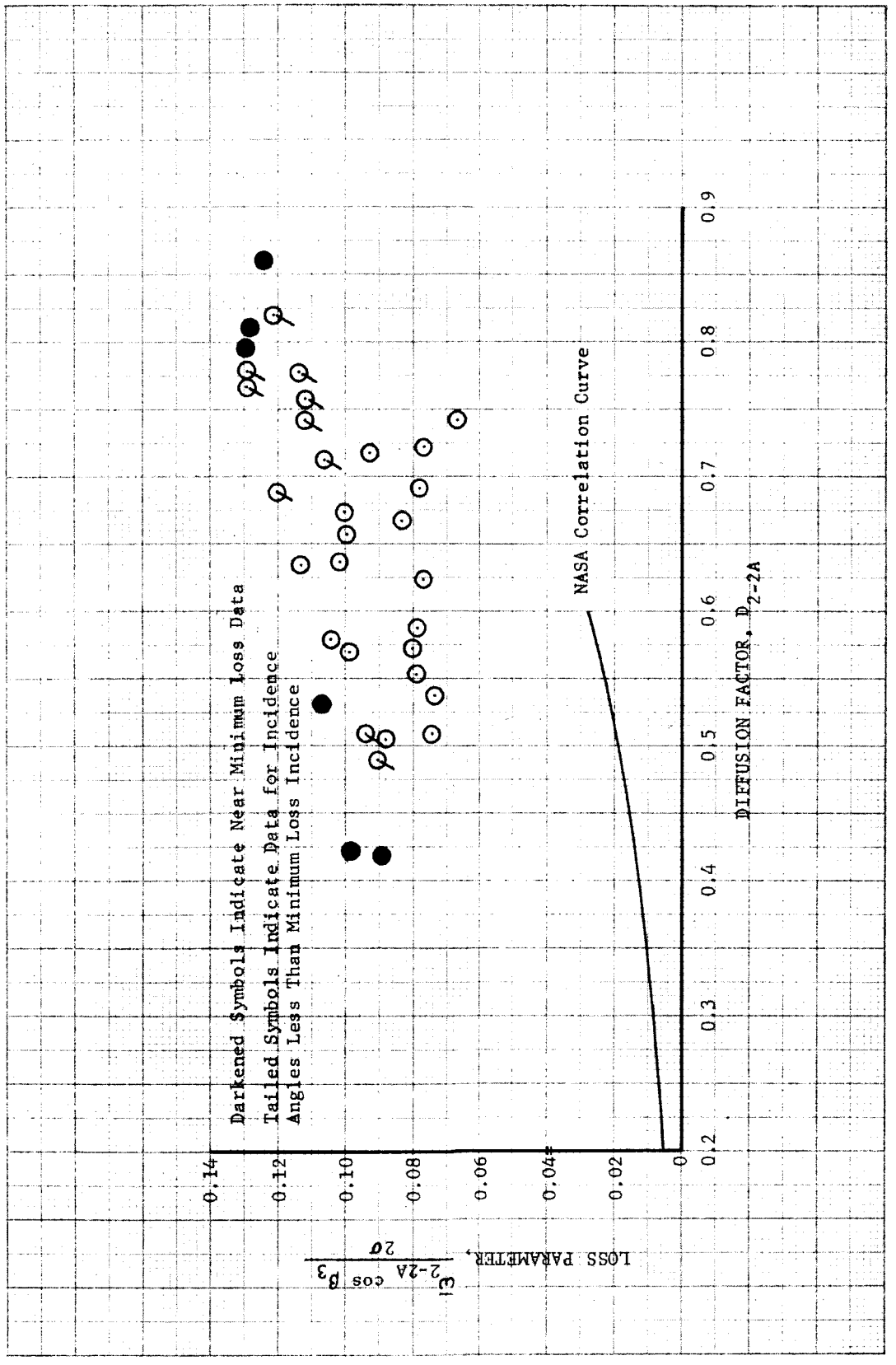


Figure V-16a. Loss Parameter versus Diffusion Factor: 90 and 10% Span (From Tip); 90,100, and 110% Design Equivalent Rotor Speed

DF 58429

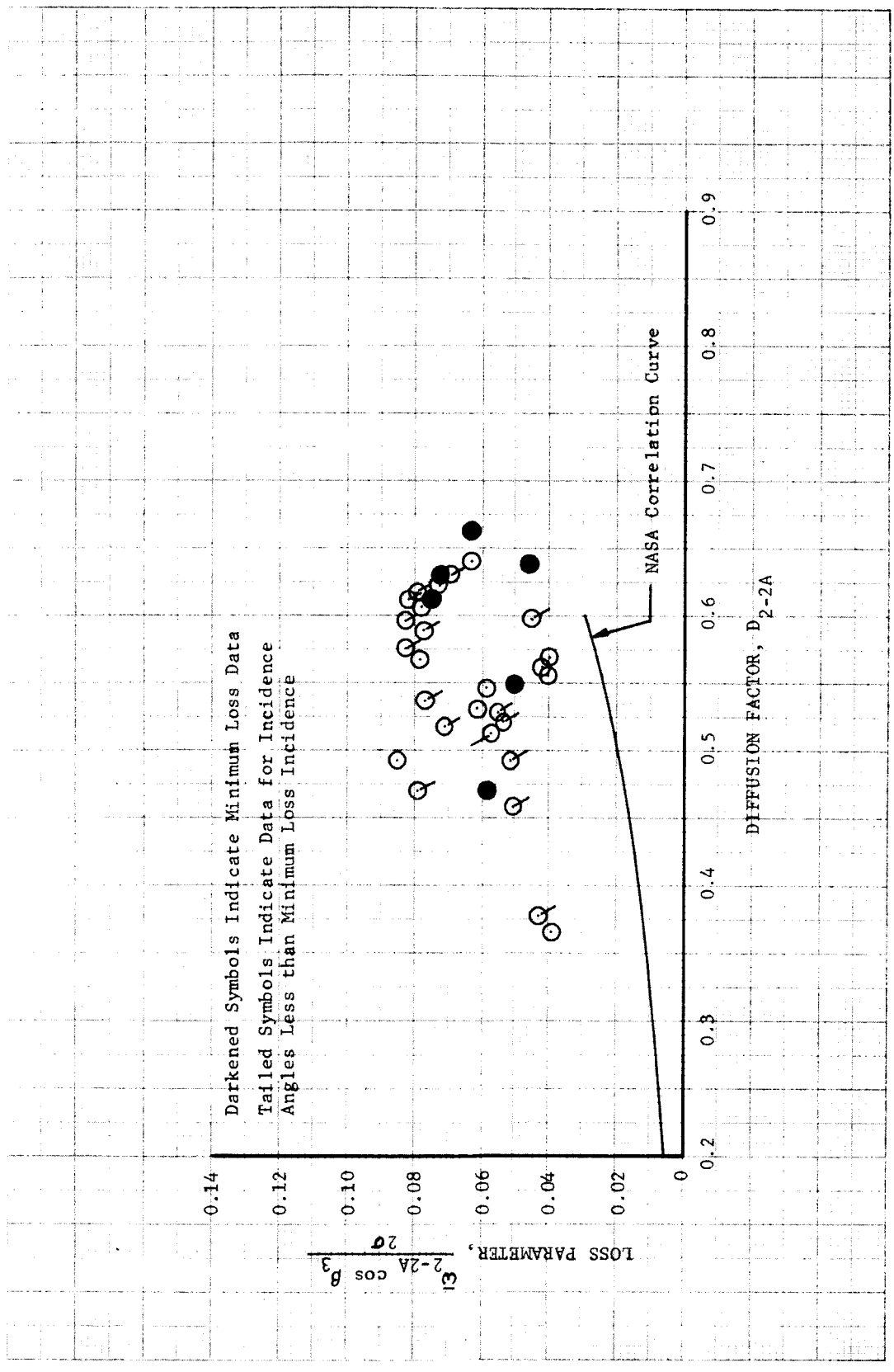


Figure V-16b. Loss Parameter versus Diffusion Factor: 70 and 30% Span (From Tip); 90, 100, and 110% Design Equivalent Rotor Speed

DF 58430

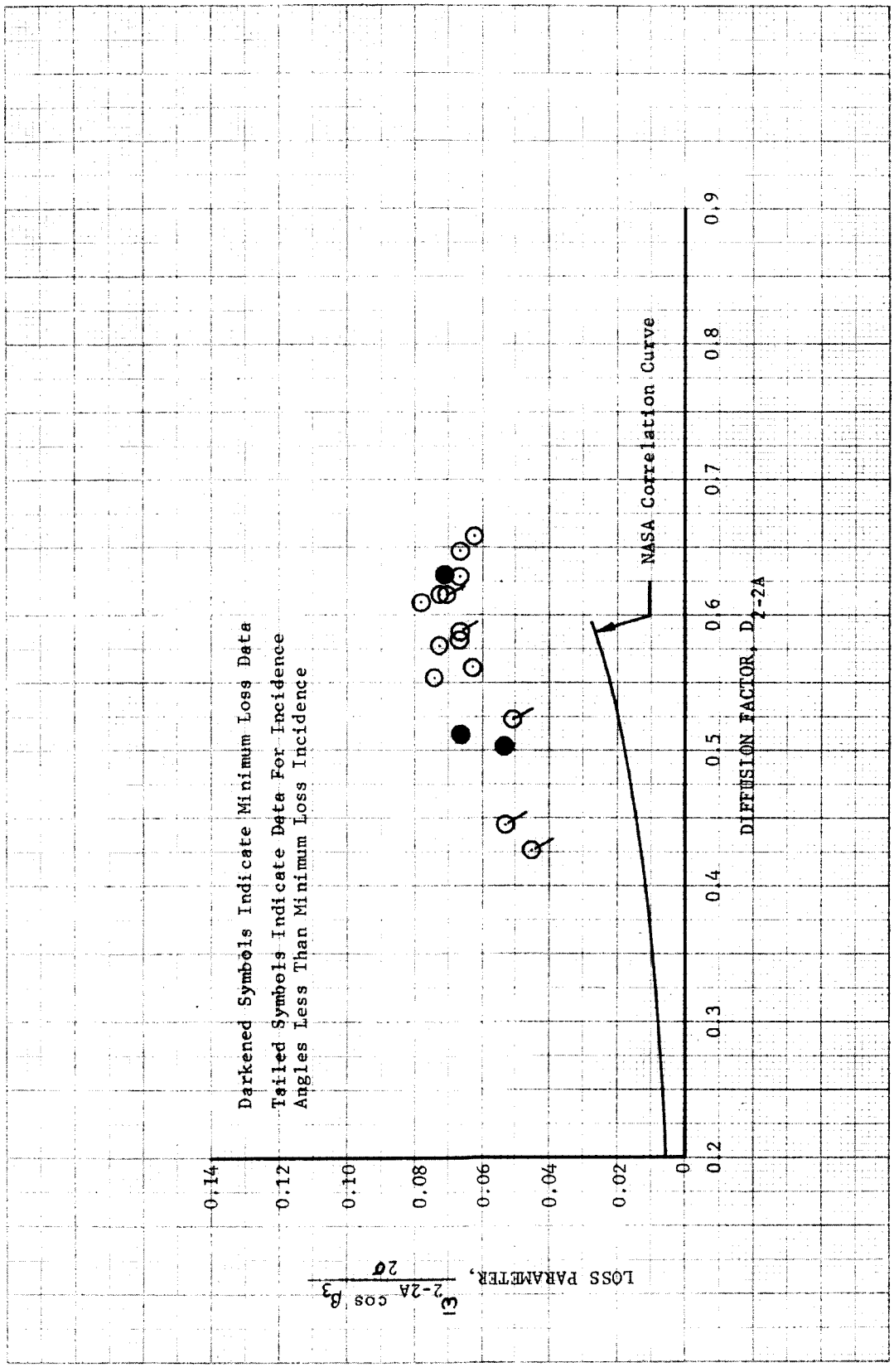


Figure V-16c. Loss Parameter versus Diffusion Factor: 50% Span (From Tip); 90, 100, and 110% Design Equivalent Rotor Speed

APPENDIX A
DEFINITION OF SYMBOLS

A. GENERAL NOMENCLATURE

A_A	Flow path annular area, $in.^2$
c	Chord length, in.
D	Diffusion factor
i_m	Incidence angle based on an equivalent circular arc, deg
M	Absolute Mach number
O	Minimum blade passage gap, in.
O*	Critical blade passage gap, in.
P	Total pressure, psia
p	Static pressure, psia
q	Pressure equivalent of the velocity head, psia
R	Reynolds number based on chord length
S	Blade spacing, in.
s	Blade span, in.
T	Total temperature, ^oR
t	Blade maximum thickness, in.
U	Rotor speed, ft/sec
V	Absolute velocity, ft/sec
W	Actual flow rate, lb_m/sec
β	Absolute air angle, deg
γ	Ratio of specific heats
γ^o	Blade-chord angle, deg
δ	Ratio of total pressure to NASA standard sea level pressure of 2116 psf
δ^o	Deviation angle, deg
η_{ad}	Adiabatic efficiency
θ	Ratio of total temperature to NASA standard sea level temperature of 518.7^oR
κ	Blade metal angle, deg
ρ	Density, lb_m/ft^3
σ	Solidity, c/S

ϕ	Blade camber angle, $\kappa_1 - \kappa_2$, deg
$\bar{\omega}$	Total pressure loss coefficient

Subscripts:

0	Guide vane inlet
1	Rotor inlet
2	Rotor exit
2A	Stator exit
3	Downstream of stator exit
z	Axial component
θ	Tangential component

Superscripts:

'	Related to rotor blade
-	Mass average value

B. SLOT NOMENCLATURE

A_2	Slot throat area, $in.^2$
R	Coanda radius, in.
R_p	Pressure surface edge radius, in.
r_1	Slot leading edge radius, in.
r_2	Slot trailing edge radius, in.
t	Blade thickness at intersection of slot centerline and mean camber line, in.
Y_1	Slot capture dimension, in.
Y_2	Slot throat dimension, in.
ψ	Angle formed by slot centerline and mean camber line, deg

C. BLADE ELEMENT TABULATION NOMENCLATURE FOR TABLE B-2

PCT SPAN	Percent span
DIA	Diameter, inches
BETA	Absolute air angle, degrees
BETA(PR)	Relative air angle, degrees
V	Absolute velocity, ft/sec

VZ	Axial component of velocity, ft/sec
V-THETA	Tangential component of absolute velocity, ft/sec
V(PR)	Relative velocity, ft/sec
V-THETA PR	Tangential component of relative velocity, ft/sec
U	Wheel speed, ft/sec
M	Absolute Mach number
M(PR)	Relative Mach number
TURN	Air turning, degrees
TURN(PR)	Relative air turning, degrees
UUBAR	Loss coefficient
DFAC	Diffusion factor
EFFP	Polytropic efficiency
EFF	Adiabatic efficiency
INCID	Incidence, degrees
DEV	Deviation, degrees
LOSS PARA	Loss parameter

APPENDIX B
TABULATED PERFORMANCE

The overall performance and percent rotor and stator bleed flow rates for each test point are presented in table B-1.

Table B-2 presents blade element data for each test point. Definitions of the blade element parameters as tabulated in the computer printouts are presented in Appendix A.

Table B-1. Tabulation of Overall Performance and Percent Bleed

Corrected Main Orifice Weight Flow $W\sqrt{\theta}/\delta$, lb_m/sec	Overall Performance: Stage $\overline{P}_{2A}/P_0$	Stage $\eta_{ad_{0-2A}}$, %	Flow Generation Rotor $\overline{P}_2/\overline{P}_1$	Flow Generation Rotor $\eta_{ad_{1-2}}$, %	Percent Bleed: Rotor	Percent Bleed: Stator
50% Design Equivalent Rotor Speed						
36.68	1.040	71.53	1.051	90.90	1.960	4.53
38.20	1.038	72.66	1.049	94.06	1.810	4.35
40.22	1.037	75.34	1.048	96.26	1.670	3.92
43.15	1.035	77.07	1.046	100.46	1.440	3.28
46.75	1.029	76.20	1.041	105.89	1.270	2.65
70% Design Equivalent Rotor Speed						
43.08	1.081	75.91	1.099	92.19	1.700	4.32
47.75	1.079	68.75	1.097	83.67	1.490	3.45
52.87	1.074	74.36	1.094	93.64	1.220	2.97
58.14	1.069	*	1.090	*	0.912	2.28
62.70	1.061	77.52	1.080	100.90	0.650	1.56
67.82	1.048	82.03	1.068	116.13	0.480	0.77
90% Design Equivalent Rotor Speed						
56.83	1.132	65.65	1.165	81.27	1.580	4.21
60.95	1.130	68.73	1.165	86.30	1.450	3.60
64.43	1.127	69.98	1.163	88.94	1.320	3.31
70.31	1.118	77.34	1.157	95.97	1.040	2.63
76.68	1.100	70.26	1.142	98.12	0.780	1.63
83.42	1.071	67.67	1.117	109.94	0.440	0.61

* Indicated mass-averaged temperatures behind rotor and stator were less than ambient.

Table B-1. Tabulation of Overall Performance and Percent Bleed (Continued)

Corrected Main Orifice Weight Flow $W\sqrt{\theta}/\delta$, lb_m/sec	Overall Performance: Stage $\overline{P}_{2A}/P_0$	Stage $\eta_{ad_{0-2A}}$, %	Flow Generation Rotor $\overline{P}_2/\overline{P}_1$	Flow Generation Rotor $\eta_{ad_{1-2}}$, %	Percent Bleed: Rotor	Percent Bleed: Stator
100% Design Equivalent Rotor Speed						
68.98	1.156	69.38	1.204	89.42	1.29	3.49
72.87	1.154	70.48	1.205	91.33	1.52	3.53
75.89	1.148	72.13	1.201	98.63	1.21	3.06
79.79	1.137	72.69	1.193	100.68	1.06	2.71
84.71	1.116	69.46	1.174	101.85	0.57	1.87
90.04	1.088	69.30	1.147	96.45	0.46	1.04
110% Design Equivalent Rotor Speed						
75.90	1.190	68.80	1.250	88.91	1.01	2.91
78.46	1.184	69.21	1.251	93.00	0.97	2.61
81.00	1.178	69.50	1.248	95.60	0.80	2.38
85.87	1.160	68.94	1.235	98.71	0.59	1.82
89.00	1.151	77.96	1.220	111.05	0.37	1.31

Table B-2. Blade Element Performance

PERCENT DESIGN SPEED = 50.26

CORRECTED WEIGHT FLOW = 36.68

CORRECTED ROTOR SPEED = 1935.00

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	150.12	150.12	150.12	150.12	150.12
V 1	215.64	213.87	209.81	206.26	191.31
VZ 0	150.12	150.12	150.12	150.12	150.12
VZ 1	177.07	171.25	166.23	164.29	152.99
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	123.07	128.11	128.01	124.70	114.87
M 0	0.1347	0.1347	0.1347	0.1347	0.1347
M 1	0.1939	0.1923	0.1886	0.1854	0.1719
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0540	0.0216	0.0378	0.0378	0.2376
DFAC	-0.047	0.013	0.041	0.058	0.128
EFFP	0.9999	1.0303	1.0158	1.0171	0.7879
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	56.250	56.587	57.517	59.123	65.220
BETA 3	24.342	23.974	21.977	24.056	25.516
V 2	333.90	332.80	328.98	320.00	311.97
V 2A	166.75	201.84	213.45	213.18	196.91
VZ 2	185.51	183.27	176.68	164.22	130.76
VZ 2A	151.93	184.43	197.93	194.66	177.70
V-THETA 2	277.63	277.80	277.51	274.65	283.24
V-THETA 2A	68.73	82.01	79.88	86.90	84.82
M 2	0.2992	0.2982	0.2946	0.2862	0.2785
M 2A	0.1485	0.1801	0.1904	0.1902	0.1755
TURN	31.908	32.613	35.540	35.067	39.704
UUBAR	0.2395	0.1517	0.1229	0.1102	0.1718
DFAC	0.7616	0.6501	0.6245	0.6119	0.6823
EFFP	0.7761	0.9905	1.0459	1.4194	1.9549
INCID	-1.45	-1.11	-0.18	1.42	7.52
LOSS PARA	.09156	.06067	.05188	.04748	.07557
DEV	24.98	24.61	22.62	24.70	26.16
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	56.250	56.587	57.517	59.123	65.220
BETA(PR) 1	42.243	44.587	47.585	50.358	55.328
BETA(PR) 2	1.841	5.694	9.964	15.771	21.028
V 1	215.64	213.87	209.81	206.26	191.31
V 2	333.90	332.80	328.98	320.00	311.97
VZ 1	177.07	171.25	166.23	164.29	152.99
VZ 2	185.51	183.27	176.68	164.22	130.76
V-THETA 1	123.07	128.11	128.01	124.70	114.87
V-THETA 2	277.63	277.80	277.51	274.65	283.24
V(PR) 1	239.2	240.5	246.4	257.5	268.9
V(PR) 2	185.6	184.2	179.4	170.6	140.1
VTHETA PR1	-160.8	-168.8	-181.9	-198.3	-221.2
VTHETA PR2	-6.0	-18.3	-31.0	-46.4	-50.3
U 1	283.87	296.92	309.96	323.00	336.04
U 2	283.59	296.07	308.55	321.03	333.51
M 1	0.1939	0.1923	0.1886	0.1854	0.1719
M 2	0.2992	0.2982	0.2946	0.2862	0.2785
M(PR) 1	0.2151	0.2162	0.2216	0.2315	0.2416
M(PR) 2	0.1663	0.1650	0.1607	0.1526	0.1251
TURN(PR)	40.402	38.893	37.621	34.587	34.300
UUBAR	0.0438	0.0118	0.0400	0.1248	0.2898
DFAC	0.4817	0.4952	0.5393	0.6062	0.7809
EFFP	0.7756	0.8064	0.8115	0.7206	0.6600
EFF	0.7740	0.8050	0.8101	0.7186	0.6575
INCID	10.80	8.95	8.35	7.94	9.97
DEV	7.221	7.654	7.804	9.151	10.158

Blade B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 50.14

CORRECTED WEIGHT FLOW = 38.20

CORRECTED ROTOR SPEED = 1930.29

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	156.49	156.49	156.49	156.49	156.49
V 1	225.99	224.84	220.99	217.06	204.70
VZ 0	156.49	156.49	156.49	156.49	156.49
VZ 1	185.57	180.04	175.09	172.90	163.70
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	128.97	134.69	134.83	131.24	122.91
M 0	0.1405	0.1405	0.1405	0.1405	0.1405
M 1	0.2033	0.2022	0.1987	0.1952	0.1840
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0448	0.0149	0.0348	0.0497	0.2138
DFAC	-0.046	0.005	0.031	0.049	0.105
EFFP	1.0040	1.0317	1.0140	0.9996	0.8232
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.264	56.171	56.948	57.425	61.896
BETA 3	24.709	22.504	20.451	25.229	26.672
V 2	333.24	333.64	326.97	326.00	306.66
V 2A	163.97	201.68	216.63	218.50	203.00
VZ 2	189.88	185.74	178.33	175.52	144.46
VZ 2A	148.96	186.32	202.97	197.66	181.40
V-THETA 2	273.86	277.16	274.06	274.72	270.50
V-THETA 2A	68.54	77.19	75.69	93.13	91.12
M 2	0.2988	0.2992	0.2931	0.2920	0.2742
M 2A	0.1461	0.1800	0.1934	0.1950	0.1810
TURN	30.555	33.667	36.497	32.196	35.224
UUBAR	0.2546	0.1713	0.1188	0.1475	0.1507
DFAC	0.7650	0.6569	0.6135	0.5939	0.6265
EFFP	0.7289	0.8995	0.9201	0.9701	1.1044
INCID	-2.44	-1.53	-0.75	-0.28	4.20
LOSS PARA	.09702	.06923	.05066	.06295	.06567
DEV	25.35	23.14	21.09	25.87	27.31
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.264	56.171	56.948	57.425	61.896
BETA(PR) 1	39.727	41.894	44.882	47.844	52.367
BETA(PR) 2	2.728	5.595	10.713	14.541	23.295
V 1	225.99	224.84	220.99	217.06	204.70
V 2	333.24	333.64	326.97	326.00	306.66
VZ 1	185.57	180.04	175.09	172.90	163.70
VZ 2	189.88	185.74	178.33	175.52	144.46
V-THETA 1	128.97	134.69	134.83	131.24	122.91
V-THETA 2	273.86	277.16	274.06	274.72	270.50
V(PR) 1	241.3	241.9	247.1	257.6	268.1
V(PR) 2	190.1	186.6	181.5	181.3	157.3
VTHETA PR1	-154.2	-161.5	-174.4	-191.0	-212.3
VTHETA PR2	-9.0	-18.2	-33.7	-45.5	-62.2
U 1	283.18	296.19	309.20	322.21	335.22
U 2	282.90	295.35	307.80	320.25	332.70
M 1	0.2033	0.2022	0.1987	0.1952	0.1840
M 2	0.2988	0.2992	0.2931	0.2920	0.2742
M(PR) 1	0.2170	0.2176	0.2222	0.2317	0.2410
M(PR) 2	0.1704	0.1674	0.1627	0.1624	0.1406
TURN(PR)	36.999	36.299	34.169	33.303	29.073
UUBAR	0.0066	-0.0257	-0.0094	0.0233	0.1644
DFAC	0.4516	0.4755	0.5139	0.5534	0.6795
EFFP	0.8124	0.8684	0.8633	0.8576	0.7516
EFF	0.8112	0.8675	0.8624	0.8565	0.7499
INCID	8.29	6.25	5.65	5.42	7.01
DEV	8.108	7.555	8.553	7.921	12.425

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 50.42

CORRECTED WEIGHT FLOW = 40.22

CORRECTED ROTOR SPEED = 1941.26

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	164.96	164.96	164.96	164.96	164.96
V 1	234.27	233.42	230.76	227.27	213.84
VZ 0	164.96	164.96	164.96	164.96	164.96
VZ 1	192.37	186.91	182.83	181.03	171.01
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	133.70	139.83	140.80	137.41	128.40
M 0	0.1481	0.1481	0.1481	0.1481	0.1481
M 1	0.2108	0.2100	0.2076	0.2044	0.1923
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0090	-0.0224	-0.0179	0.0	0.1791
DFAC	-0.029	0.020	0.040	0.055	0.113
EFFP	1.0343	1.0675	1.0656	1.0488	0.8445
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	54.515	55.598	56.267	56.627	59.689
BETA 3	24.572	21.251	19.444	24.673	27.020
V 2	336.82	339.97	333.00	331.08	315.06
V 2A	173.65	207.38	228.38	227.14	216.11
VZ 2	195.52	192.08	184.92	182.12	159.01
VZ 2A	157.93	193.28	215.36	206.40	192.52
V-THETA 2	274.26	280.51	276.94	276.49	271.99
V-THETA 2A	72.21	75.16	76.03	94.82	98.18
M 2	0.3021	0.3051	0.2986	0.2966	0.2818
M 2A	0.1549	0.1852	0.2041	0.2029	0.1929
TURN	29.943	34.347	36.823	31.954	32.669
UUBAR	0.2391	0.1817	0.1028	0.1400	0.1441
DFAC	0.7347	0.6534	0.5887	0.5741	0.5862
EFFP	0.7951	0.8496	1.0928	1.1665	1.2615
INCID	-3.18	-2.10	-1.43	-1.07	1.99
LOSS PARA	.09118	.07410	.04412	.06004	.06256
DEV	25.21	21.89	20.08	25.31	27.66
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	54.515	55.598	56.267	56.627	59.689
BETA(PR) 1	38.146	40.218	42.946	45.873	50.673
BETA(PR) 2	3.001	4.916	10.002	14.051	21.489
V 1	234.27	233.42	230.76	227.27	213.84
V 2	336.82	339.97	333.00	331.08	315.06
VZ 1	192.37	186.91	182.83	181.03	171.01
VZ 2	195.52	192.08	184.92	182.12	159.01
V-THETA 1	133.70	139.83	140.80	137.41	128.40
V-THETA 2	274.26	280.51	276.94	276.49	271.99
V(PR) 1	244.6	244.8	249.8	260.0	269.8
V(PR) 2	195.8	192.8	187.8	187.7	170.9
VTHETA PR1	-151.1	-158.0	-170.2	-186.6	-208.7
VTHETA PR2	-10.2	-16.5	-32.6	-45.6	-62.6
U 1	284.79	297.88	310.96	324.04	337.13
U 2	284.51	297.03	309.55	322.07	334.59
M 1	0.2108	0.2100	0.2076	0.2044	0.1923
M 2	0.3021	0.3051	0.2986	0.2966	0.2818
M(PR) 1	0.2201	0.2202	0.2247	0.2339	0.2426
M(PR) 2	0.1756	0.1730	0.1684	0.1682	0.1529
TURN(PR)	35.146	35.301	32.944	31.821	29.184
UUBAR	0.0402	-0.0040	0.0042	0.0243	0.1248
DFAC	0.4288	0.4535	0.4885	0.5252	0.6242
EFFP	0.7817	0.8945	0.8397	0.8034	0.7526
EFF	0.7803	0.8939	0.8386	0.8020	0.7508
INCID	6.71	4.58	3.72	3.45	5.31
DEV	8.381	6.876	7.842	7.431	10.619

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 50.11

CORRECTED WEIGHT FLOW = 43.15

CORRECTED ROTOR SPEED = 1929.31

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	177.29	177.29	177.29	177.29	177.29
V 1	253.85	248.02	247.69	244.17	239.87
VZ 0	177.29	177.29	177.29	177.29	177.29
VZ 1	208.45	198.60	196.24	194.49	191.82
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	144.88	148.57	151.13	147.63	144.02
M 0	0.1592	0.1592	0.1592	0.1592	0.1592
M 1	0.2286	0.2233	0.2230	0.2198	0.2159
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0116	0.0621	0.0233	0.0349	0.0582
DFAC	-0.037	0.031	0.042	0.055	0.074
EFFP	1.0249	0.9772	1.0156	1.0037	0.9783
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	52.991	54.370	54.485	54.537	56.885
BETA 3	24.422	19.798	18.001	23.355	27.248
V 2	349.57	350.59	344.56	339.08	325.35
V 2A	189.49	230.46	242.61	244.80	230.92
VZ 2	210.42	204.24	200.16	196.73	177.75
VZ 2A	172.54	216.83	230.73	224.74	205.29
V-THETA 2	279.15	284.96	280.46	276.18	272.51
V-THETA 2A	78.35	78.06	74.97	97.04	105.72
M 2	0.3139	0.3148	0.3091	0.3041	0.2914
M 2A	0.1692	0.2061	0.2170	0.2189	0.2062
TURN	28.569	34.572	36.484	31.182	29.637
UUBAR	0.2443	0.1431	0.1045	0.1067	0.1365
DFAC	0.6976	0.6000	0.5672	0.5286	0.5432
EFFP	0.7923	1.0587	1.2486	1.2309	1.0448
INCID	-4.71	-3.33	-3.21	-3.16	-0.82
LOSS PARA	.09332	.05880	.04521	.04622	.05916
DEV	25.06	20.44	18.64	24.00	27.89
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	52.991	54.370	54.485	54.537	56.885
BETA(PR) 1	33.536	36.596	38.824	41.886	44.881
BETA(PR) 2	0.983	2.871	7.733	12.583	18.658
V 1	253.85	248.02	247.69	244.17	239.87
V 2	349.57	350.59	344.56	339.08	325.35
VZ 1	208.45	198.60	196.24	194.49	191.82
VZ 2	210.42	204.24	200.16	196.73	177.75
V-THETA 1	144.88	148.57	151.13	147.63	144.02
V-THETA 2	279.15	284.96	280.46	276.18	272.51
V(PR) 1	250.1	247.4	251.9	261.2	270.7
V(PR) 2	210.5	204.5	202.0	201.6	187.6
VTHETA PR1	-138.2	-147.5	-157.9	-174.4	-191.0
VTHETA PR2	-3.6	-10.2	-27.2	-43.9	-60.0
U 1	283.04	296.04	309.04	322.05	335.05
U 2	282.76	295.20	307.64	320.09	332.53
M 1	0.2286	0.2233	0.2230	0.2198	0.2159
M 2	0.3139	0.3148	0.3091	0.3041	0.2914
M(PR) 1	0.2252	0.2227	0.2268	0.2352	0.2436
M(PR) 2	0.1890	0.1836	0.1812	0.1808	0.1680
TURN(PR)	32.553	33.725	31.091	29.304	26.223
UUBAR	0.0188	-0.0243	-0.0373	-0.0171	0.0754
DFAC	0.3726	0.4047	0.4245	0.4562	0.5371
EFFP	0.7955	0.8691	0.8261	0.8279	0.7503
EFF	0.7943	0.8683	0.8249	0.8268	0.7486
INCID	2.10	0.96	-0.41	-0.53	-0.48
DEV	6.363	4.831	5.573	5.963	7.788

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 50.26

CORRECTED WEIGHT FLOW = 46.75

CORRECTED ROTOR SPEED = 1935.00

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	192.54	192.54	192.54	192.54	192.54
V 1	271.44	272.02	268.62	265.17	250.41
VZ 0	192.53	192.53	192.53	192.53	192.53
VZ 1	222.90	217.81	212.82	211.21	200.25
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	154.92	162.95	163.90	160.32	150.35
M 0	0.1730	0.1730	0.1730	0.1730	0.1730
M 1	0.2446	0.2451	0.2420	0.2389	0.2255
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0231	-0.0164	0.0033	0.0231	0.2009
DFAC	-0.021	0.021	0.043	0.055	0.110
EFFP	1.0093	1.0493	1.0305	1.0104	0.8136
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	50.963	51.921	52.077	51.658	52.826
BETA 3	24.090	18.218	16.958	21.703	26.759
V 2	362.45	364.09	356.27	349.80	391.69
V 2A	221.06	243.04	264.10	265.36	239.14
VZ 2	228.28	224.55	218.96	217.00	236.68
VZ 2A	201.81	230.86	252.62	246.55	213.53
V-THETA 2	281.53	286.60	281.04	274.36	312.10
V-THETA 2A	90.23	75.98	77.03	98.13	107.67
M 2	0.3259	0.3275	0.3203	0.3143	0.3527
M 2A	0.1977	0.2177	0.2367	0.2377	0.2138
TURN	26.873	33.703	35.119	29.955	26.067
UUBAR	0.2098	0.1752	0.0876	0.0859	0.3975
DFAC	0.6103	0.5847	0.5192	0.4803	0.6468
EFFP	0.8261	0.9836	1.2852	1.1156	0.4217
INCID	-6.74	-5.78	-5.62	-6.04	-4.87
LOSS PARA	.08037	.07280	.03813	.03762	.17306
DEV	24.73	18.86	17.60	22.34	27.40
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	50.963	51.921	52.077	51.658	52.826
BETA(PR) 1	30.052	31.594	34.462	37.603	42.838
BETA(PR) 2	0.518	2.416	7.161	12.138	5.168
V 1	271.44	272.02	268.62	265.17	250.41
V 2	362.45	364.09	356.27	349.80	391.69
VZ 1	222.90	217.81	212.82	211.21	200.25
VZ 2	228.28	224.55	218.96	217.00	236.68
V-THETA 1	154.92	162.95	163.90	160.32	150.35
V-THETA 2	281.53	286.60	281.04	274.36	312.10
V(PR) 1	257.5	255.7	258.1	266.6	273.1
V(PR) 2	228.3	224.8	220.7	222.0	237.6
VTHETA PR1	-129.0	-134.0	-146.1	-162.7	-185.7
VTHETA PR2	-2.1	-9.5	-27.5	-46.7	-21.4
U 1	283.87	296.92	309.96	323.00	336.04
U 2	283.59	296.07	308.55	321.03	333.51
M 1	0.2446	0.2451	0.2420	0.2389	0.2255
M 2	0.3259	0.3275	0.3203	0.3143	0.3527
M(PR) 1	0.2321	0.2305	0.2326	0.2402	0.2459
M(PR) 2	0.2053	0.2022	0.1984	0.1994	0.2140
TURN(PR)	29.534	29.178	27.300	25.465	37.670
UUBAR	0.0629	0.0099	-0.0059	-0.0063	-0.1171
DFAC	0.3096	0.3241	0.3455	0.3658	0.4151
EFFP	0.8023	0.8906	0.8746	0.8619	1.3284
EFF	0.8012	0.8899	0.8739	0.8610	1.3315
INCID	-1.39	-4.05	-4.77	-4.82	-2.52
DEV	5.898	4.376	5.001	5.518	-5.702

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 70.01

CORRECTED WEIGHT FLOW = 43.08

CORRECTED ROTOR SPEED = 2695.51

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	177.01	177.01	177.01	177.01	177.01
V 1	246.09	245.27	241.50	238.67	224.35
VZ 0	177.01	177.01	177.01	177.01	177.01
VZ 1	202.07	196.39	191.33	190.10	179.41
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	140.44	146.92	147.35	144.30	134.70
M 0	0.1590	0.1590	0.1590	0.1590	0.1590
M 1	0.2215	0.2208	0.2174	0.2148	0.2018
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.1362	-0.1634	-0.1439	-0.1401	0.0389
DFAC	-0.007	0.040	0.064	0.075	0.133
EFFP	1.2157	1.2624	1.2500	1.2588	0.9998
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	57.880	60.010	62.271	66.196	73.760
BETA 3	28.041	28.564	26.970	26.902	21.296
V 2	458.89	459.95	451.56	436.91	418.91
V 2A	188.08	265.31	281.32	280.52	244.70
VZ 2	243.99	229.91	210.11	176.34	117.15
VZ 2A	166.00	233.02	250.72	250.16	227.99
V-THETA 2	388.65	398.37	399.71	399.74	402.20
V-THETA 2A	88.42	126.86	127.59	126.93	88.87
M 2	0.4106	0.4118	0.4037	0.3899	0.3725
M 2A	0.1676	0.2353	0.2496	0.2488	0.2168
TURN	29.839	31.446	35.301	39.294	52.464
UUBAR	0.3062	0.1772	0.1328	0.1080	0.1724
DFAC	0.8631	0.6806	0.6513	0.6539	0.7842
EFFP	2.1057	0.8880	1.0439	1.1833	1.7238
INCID	0.18	2.31	4.57	8.50	16.06
LOSS PARA	.11340	.06812	.07417	.04543	.07828
DEV	28.68	29.20	27.61	27.54	21.94
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	57.880	60.010	62.271	66.196	73.760
BETA(PR) 1	51.605	53.632	56.072	58.120	61.715
BETA(PR) 2	1.504	3.501	8.156	15.064	28.037
V 1	246.09	245.27	241.50	238.67	224.35
V 2	458.89	459.95	451.56	436.91	418.91
VZ 1	202.07	196.39	191.33	190.10	179.41
VZ 2	243.99	229.91	210.11	176.34	117.15
V-THETA 1	140.44	146.92	147.35	144.30	134.70
V-THETA 2	388.65	398.37	399.71	399.74	402.20
V(PR) 1	325.4	331.2	342.8	359.9	378.6
V(PR) 2	244.1	230.3	212.3	182.6	132.7
VTHETA PR1	-255.0	-266.7	-284.4	-305.6	-333.4
VTHETA PR2	-6.4	-14.1	-30.1	-47.5	-62.4
U 1	395.44	413.61	431.78	449.94	468.11
U 2	395.05	412.44	429.82	447.20	464.59
M 1	0.2215	0.2208	0.2174	0.2148	0.2018
M 2	0.4106	0.4118	0.4037	0.3899	0.3725
M(PR) 1	0.2929	0.2981	0.3085	0.3239	0.3406
M(PR) 2	0.2184	0.2062	0.1897	0.1629	0.1180
TURN(PR)	50.102	50.130	47.915	43.055	33.678
UUBAR	0.2775	0.2974	0.3543	0.4526	0.5671
DFAC	0.5539	0.6226	0.7044	0.8193	0.9892
EFFP	0.7433	0.8048	0.7659	0.7142	0.6348
EFF	0.7399	0.8020	0.7627	0.7103	0.6299
INCID	20.17	17.99	16.84	15.70	16.35
DEV	6.884	5.461	5.996	8.444	17.16

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 69.90

CORRECTED WEIGHT FLOW = 47.75

CORRECTED ROTOR SPEED = 2691.16

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	196.77	196.77	196.77	196.77	196.77
V 1	272.71	273.70	268.74	272.39	255.50
VZ 0	196.77	196.77	196.77	196.77	196.77
VZ 1	223.94	219.16	212.92	216.97	204.32
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	155.64	163.95	163.97	164.69	153.41
M 0	0.1768	0.1768	0.1768	0.1768	0.1768
M 1	0.2458	0.2467	0.2422	0.2455	0.2301
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0158	-0.0662	-0.0347	-0.1230	0.0725
DFAC	-0.004	0.037	0.063	0.051	0.112
EFFP	1.0511	1.1102	1.0780	1.1906	0.9464
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	56.422	57.534	59.208	61.242	69.193
BETA 3	24.908	24.529	22.331	24.699	23.551
V 2	457.14	453.45	450.10	441.10	425.52
V 2A	204.99	274.39	284.20	303.73	270.81
VZ 2	252.83	243.41	230.42	212.22	151.15
VZ 2A	185.92	249.63	262.88	275.94	248.25
V-THETA 2	380.86	382.58	386.65	386.70	397.77
V-THETA 2A	86.33	113.92	107.98	126.91	108.21
M 2	0.4092	0.4061	0.4025	0.3934	0.3780
M 2A	0.1813	0.2436	0.2522	0.2696	0.2402
TURN	31.514	33.005	36.877	36.543	45.642
UUBAR	0.2957	0.1524	0.1452	0.0788	0.1500
DFAC	0.6203	0.6533	0.6503	0.5907	0.6989
EFFP	0.7055	0.9209	0.9467	1.4593	3.6976
INCID	-1.28	-0.17	1.51	3.54	11.49
LOSS PARA	.11250	.06067	.06112	.03377	.06704
DEV	25.55	25.17	22.97	25.34	24.19
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	56.422	57.534	59.208	61.242	69.193
BETA(PR) 1	46.883	48.646	51.442	52.673	56.944
BETA(PR) 2	3.070	6.839	10.445	15.734	23.610
V 1	272.71	273.70	268.74	272.39	255.50
V 2	457.14	453.45	450.10	441.10	425.52
VZ 1	223.94	219.16	212.92	216.97	204.32
VZ 2	252.83	243.41	230.42	212.22	151.15
V-THETA 1	155.64	163.95	163.97	164.69	153.41
V-THETA 2	380.86	382.58	386.65	386.70	397.77
V(PR) 1	327.6	331.7	341.6	357.8	374.6
V(PR) 2	253.2	245.2	234.3	220.5	165.0
VTHETA PR1	-239.2	-249.0	-267.1	-284.5	-313.9
VTHETA PR2	-13.6	-29.2	-42.5	-59.8	-66.1
U 1	394.81	412.94	431.08	449.22	467.36
U 2	394.42	411.77	429.13	446.48	463.84
M 1	0.2458	0.2467	0.2422	0.2455	0.2301
M 2	0.4092	0.4061	0.4025	0.3934	0.3780
M(PR) 1	0.2953	0.2990	0.3078	0.3225	0.3373
M(PR) 2	0.2266	0.2195	0.2095	0.1966	0.1466
TURN(PR)	43.813	41.807	40.997	36.939	33.333
UUBAR	0.1307	0.1270	0.1671	0.2429	0.4169
DFAC	0.5013	0.5373	0.6010	0.6700	0.8738
EFFP	0.7493	0.7940	0.7669	0.6739	0.5958
EFF	0.7460	0.7912	0.7638	0.6695	0.5904
INCID	15.44	13.01	12.21	10.25	11.58
DEV	8.450	8.799	8.285	9.114	12.740

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 69.90

CORRECTED WEIGHT FLOW = 52.78

CORRECTED ROTOR SPEED = 2690.97

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	218.25	218.25	218.25	218.25	218.25
V 1	249.32	249.23	244.53	241.47	220.27
VZ 0	218.25	218.25	218.25	218.25	218.25
VZ 1	204.73	199.56	193.74	192.34	176.15
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	142.29	149.29	149.20	145.99	132.26
M 0	0.1963	0.1963	0.1963	0.1963	0.1963
M 1	0.2245	0.2244	0.2201	0.2173	0.1981
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0180	-0.0462	-0.0257	-0.0231	0.1567
DFAC	0.172	0.209	0.231	0.241	0.310
EFFP	1.1484	1.2718	1.2186	1.2370	0.2531
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.314	55.585	56.619	57.398	61.848
BETA 3	25.547	22.600	20.589	24.946	25.375
V 2	458.04	459.76	455.18	448.53	428.04
V 2A	229.64	289.41	303.40	317.05	288.45
VZ 2	260.66	259.85	250.44	241.67	201.96
VZ 2A	207.19	267.18	284.02	287.48	260.62
V-THETA 2	376.64	379.29	380.09	377.86	377.40
V-THETA 2A	99.03	111.22	106.69	133.72	123.61
M 2	0.4102	0.4125	0.4076	0.4012	0.3815
M 2A	0.2036	0.2575	0.2700	0.2823	0.2566
TURN	29.767	32.985	36.030	32.452	36.473
UUBAR	0.2676	0.1637	0.1434	0.1139	0.1622
DFAC	0.7515	0.6248	0.6067	0.5512	0.6185
EFFP	0.8071	0.9196	1.0923	1.3571	3.0854
INCID	-2.39	-2.11	-1.08	-0.30	4.15
LOSS PARA	.10132	.06611	.06111	.04873	.07140
DEV	26.19	23.24	21.23	25.59	26.02
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.314	55.585	56.619	57.398	61.848
BETA(PR) 1	50.963	52.874	55.496	57.610	62.269
BETA(PR) 2	3.895	7.120	11.072	15.845	23.162
V 1	249.32	249.23	244.53	241.47	220.27
V 2	458.04	459.76	455.18	448.53	428.04
VZ 1	204.73	199.56	193.74	192.34	176.15
VZ 2	260.66	259.85	250.44	241.67	201.96
V-THETA 1	142.29	149.29	149.20	145.99	132.26
V-THETA 2	376.64	379.29	380.09	377.86	377.40
V(PR) 1	325.1	330.6	342.0	359.1	378.5
V(PR) 2	261.3	261.9	255.2	251.2	219.7
VTHETA PR1	-252.5	-263.6	-281.9	-303.2	-335.1
VTHETA PR2	-17.7	-32.5	-49.0	-68.6	-86.4
U 1	394.78	412.91	431.05	449.19	467.32
U 2	394.39	411.74	429.10	446.45	463.80
M 1	0.2245	0.2244	0.2201	0.2173	0.1981
M 2	0.4102	0.4125	0.4076	0.4012	0.3815
M(PR) 1	0.2927	0.2977	0.3079	0.3232	0.3404
M(PR) 2	0.2340	0.2349	0.2285	0.2247	0.1958
TURN(PR)	47.068	45.755	44.424	41.765	39.106
UUBAR	0.3143	0.2623	0.2767	0.3018	0.4251
DFAC	0.4837	0.4996	0.5509	0.5981	0.7318
EFFP	0.7135	0.8387	0.7838	0.7686	0.6873
EFF	0.7101	0.8367	0.7809	0.7654	0.6831
INCID	19.52	17.23	16.27	15.19	16.91
DEV	9.275	9.080	8.912	9.225	12.292

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 68.97

CORRECTED WEIGHT FLOW = 58.14

CORRECTED ROTOR SPEED = 2655.22

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	241.40	241.40	241.40	241.40	241.40
V 1	340.66	339.94	334.47	330.53	312.72
VZ 0	241.40	241.40	241.40	241.40	241.40
VZ 1	279.73	272.20	265.00	263.28	250.08
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	194.42	203.63	204.08	199.84	187.76
M 0	0.2172	0.2172	0.2172	0.2172	0.2172
M 1	0.3081	0.3074	0.3024	0.2987	0.2824
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0379	-0.0673	-0.0379	-0.0273	0.1367
DFAC	-0.022	0.025	0.049	0.061	0.114
EFFP	1.0600	1.0937	1.0648	1.0555	0.8605
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	53.713	54.785	55.256	55.191	58.636
BETA 3	25.634	20.856	18.752	23.875	26.988
V 2	467.87	474.03	465.59	460.43	441.90
V 2A	256.07	307.88	326.46	338.06	314.85
VZ 2	276.90	273.35	265.35	262.83	230.00
VZ 2A	230.87	287.71	309.13	309.13	280.57
V-THETA 2	377.13	387.28	382.58	378.04	377.33
V-THETA 2A	110.78	109.61	104.95	136.83	142.88
M 2	0.4260	0.4322	0.4240	0.4190	0.4009
M 2A	0.2308	0.2786	0.2953	0.3059	0.2844
TURN	28.079	33.929	36.504	31.316	31.648
UUBAR	0.2551	0.1804	0.1312	0.1124	0.1536
DFAC	0.6902	0.6059	0.5701	0.5142	0.5493
EFFP	0.8160	0.9709	1.0294	1.1003	1.2199
INCID	-3.99	-2.91	-2.44	-2.51	0.94
LOSS PARA	.09650	.07377	.05654	.04851	.06675
DEV	26.27	21.50	19.39	24.52	27.63
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	53.713	54.785	55.256	55.191	58.636
BETA(PR) 1	34.896	36.823	39.859	42.751	47.546
BETA(PR) 2	2.485	3.975	8.745	13.372	19.249
V 1	340.66	339.94	334.47	330.53	312.72
V 2	467.87	474.03	465.59	460.43	441.90
VZ 1	279.73	272.20	265.00	263.28	250.08
VZ 2	276.90	273.35	265.35	262.83	230.00
V-THETA 1	194.42	203.63	204.08	199.84	187.76
V-THETA 2	377.13	387.28	382.58	378.04	377.33
V(PR) 1	341.1	340.0	345.2	358.5	370.5
V(PR) 2	277.2	274.0	268.5	270.2	243.6
VTHETA PR1	-195.1	-203.8	-221.2	-243.4	-273.4
VTHETA PR2	-12.0	-19.0	-40.8	-62.5	-80.3
U 1	389.53	407.43	425.32	443.22	461.11
U 2	389.15	406.27	423.40	440.52	457.64
M 1	0.3081	0.3074	0.3024	0.2987	0.2824
M 2	0.4260	0.4322	0.4240	0.4190	0.4009
M(PR) 1	0.3084	0.3075	0.3121	0.3240	0.3345
M(PR) 2	0.2523	0.2498	0.2445	0.2459	0.2210
TURN(PR)	32.411	32.848	31.114	29.379	28.297
UUBAR	0.0387	-0.0192	-0.0243	-0.0143	0.1035
DFAC	0.4010	0.4209	0.4504	0.4765	0.5901
EFFP	6.8659	17.7649	10.5006	8.5633	4.2052
EFF	6.9318	17.9732	10.6205	8.6618	4.2472
INCID	3.46	1.18	0.63	0.33	2.19
DEV	7.865	5.935	6.585	6.752	8.379

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 69.84

CORRECTED WEIGHT FLOW = 62.70

CORRECTED ROTOR SPEED = 2688.95

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.712	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	261.33	261.33	261.33	261.33	261.33
V 1	369.82	369.92	364.87	359.91	340.86
VZ 0	261.33	261.33	261.33	261.33	261.33
VZ 1	303.67	296.20	289.08	286.68	272.58
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	211.06	221.59	222.62	217.60	204.66
M 0	0.2354	0.2354	0.2354	0.2354	0.2354
M 1	0.3350	0.3351	0.3304	0.3258	0.3082
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0414	-0.0755	-0.0522	-0.0306	0.1385
DFAC	-0.032	0.020	0.042	0.055	0.108
EFFP	1.0597	1.0972	1.0755	1.0541	0.8595
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	51.482	52.328	52.499	52.430	53.712
BETA 3	26.000	18.200	18.000	20.400	29.500
V 2	495.50	497.72	488.30	481.34	457.76
V 2A	302.43	348.77	369.46	372.35	332.68
VZ 2	308.58	304.18	297.26	293.49	270.92
VZ 2A	271.82	331.32	351.38	349.00	289.55
V-THETA 2	387.68	393.96	387.39	381.51	368.98
V-THETA 2A	132.58	108.93	114.17	129.79	163.82
M 2	0.4469	0.4492	0.4402	0.4337	0.4115
M 2A	0.2699	0.3124	0.3311	0.3335	0.2971
TURN	25.482	34.128	34.499	32.030	24.212
UUBAR	0.2354	0.1520	0.0877	0.0900	0.1693
DFAC	0.6045	0.5490	0.4980	0.4744	0.4946
EFFP	0.7479	0.9521	1.0942	0.9684	0.7897
INCID	-6.22	-5.37	-5.20	-5.27	-3.99
LOSS PARA	0.08872	0.06325	0.03831	.0.03979	0.07183
DEV	26.64	18.84	18.64	21.04	30.14
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	51.482	52.328	52.499	52.430	53.712
BETA(PR) 1	31.133	32.817	35.749	38.891	43.900
BETA(PR) 2	1.190	3.288	7.925	12.414	19.225
V 1	369.82	369.92	364.87	359.91	340.86
V 2	495.50	497.72	488.30	481.34	457.76
VZ 1	303.67	296.20	289.08	286.68	272.58
VZ 2	308.58	304.18	297.26	293.49	270.92
V-THETA 1	211.06	221.59	222.62	217.60	204.66
V-THETA 2	387.68	393.96	387.39	381.51	368.98
V(PR) 1	354.8	352.5	356.2	368.3	378.3
V(PR) 2	308.6	304.7	300.1	300.5	286.9
VTHETA PR1	-183.4	-191.0	-208.1	-231.2	-262.3
VTHETA PR2	-6.4	-17.5	-41.4	-64.6	-94.5
U 1	394.48	412.60	430.73	448.85	466.97
U 2	394.09	411.43	428.77	446.11	463.46
M 1	0.3350	0.3351	0.3304	0.3258	0.3082
M 2	0.4469	0.4492	0.4402	0.4337	0.4115
M(PR) 1	0.3214	0.3193	0.3226	0.3334	0.3421
M(PR) 2	0.2784	0.2750	0.2706	0.2708	0.2579
TURN(PR)	29.943	29.530	27.823	26.477	24.675
UUBAR	0.0767	0.0211	0.0058	0.0137	0.0712
DFAC	0.3286	0.3409	0.3617	0.3904	0.4527
EFFP	0.8058	0.8969	0.8802	0.9159	0.8645
EFF	0.8038	0.8957	0.8789	0.9149	0.8630
INCID	-0.31	-2.82	-3.48	-3.53	-1.46
DEV	6.570	5.248	5.766	5.794	8.355

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 69.96

CORRECTED WEIGHT FLOW = 67.82

CORRECTED ROTOR SPEED = 2693.46

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	284.02	284.02	284.02	284.02	284.02
V 1	407.73	406.60	400.83	394.22	373.77
VZ 0	284.02	284.02	284.02	284.02	284.02
VZ 1	334.81	325.58	317.58	314.01	298.90
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	232.70	243.57	244.57	238.34	224.42
M 0	0.2561	0.2561	0.2561	0.2561	0.2561
M 1	0.3702	0.3692	0.3638	0.3576	0.3387
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0321	-0.0672	-0.0519	-0.0305	0.1252
DFAC	-0.040	0.008	0.032	0.048	0.100
EFFP	1.0442	1.0805	1.0687	1.0491	0.8750
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	49.605	49.959	50.366	49.632	50.201
BETA 3	24.632	17.495	17.484	22.315	28.826
V 2	510.53	517.51	506.32	496.29	477.83
V 2A	341.34	393.25	405.68	409.73	366.03
VZ 2	330.85	332.93	322.97	321.44	305.86
VZ 2A	310.28	375.06	386.94	379.05	320.68
V-THETA 2	388.82	395.20	389.94	378.12	367.11
V-THETA 3	142.27	118.22	121.88	155.57	176.48
M 2	0.4614	0.4684	0.4580	0.4482	0.4299
M 2A	0.3062	0.3543	0.3653	0.3688	0.3281
TURN	24.973	32.464	32.882	27.317	21.375
UUBAR	0.2281	0.1344	0.0890	0.0705	0.1872
DFAC	0.5329	0.4744	0.4397	0.3872	0.4312
EFFP	0.9272	1.3801	1.2771	1.5340	1.1503
INCID	-8.10	-7.74	-7.33	-8.07	-7.50
LOSS PARA	.08699	.05607	.03864	.03077	.07994
DEV	25.27	18.14	18.12	22.96	29.47
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	49.605	49.959	50.366	49.632	50.201
BETA(PR) 1	25.882	27.534	30.476	33.932	39.149
BETA(PR) 2	1.027	2.738	6.983	12.071	17.617
V 1	407.73	406.60	400.83	394.22	373.77
V 2	510.53	517.51	506.32	496.29	477.83
VZ 1	334.81	325.58	317.58	314.01	298.90
VZ 2	330.85	332.93	322.97	321.44	305.86
V-THETA 1	232.70	243.57	244.57	238.34	224.42
V-THETA 2	388.82	396.20	389.94	378.12	367.11
V(PR) 1	372.1	367.2	368.5	378.5	385.4
V(PR) 2	330.9	333.3	325.4	328.7	320.9
VTHETA PR1	-162.4	-169.7	-186.9	-211.3	-243.3
VTHETA PR2	-5.9	-15.9	-39.6	-68.7	-97.1
U 1	395.14	413.30	431.45	449.60	467.75
U 2	394.75	412.12	429.49	446.86	464.23
M 1	0.3702	0.3692	0.3638	0.3576	0.3387
M 2	0.4614	0.4684	0.4580	0.4482	0.4299
M(PR) 1	0.3379	0.3334	0.3344	0.3433	0.3492
M(PR) 2	0.2991	0.3017	0.2943	0.2968	0.2887
TURN(PR)	24.855	24.796	23.493	21.862	21.532
UUBAR	0.1074	0.0225	0.0223	0.0184	0.0508
DFAC	0.2782	0.2669	0.2915	0.3032	0.3481
EFFP	0.7151	0.8692	0.8942	0.8389	0.7277
EFF	0.7126	0.8679	0.8932	0.8373	0.7250
INCID	-5.56	-8.11	-8.75	-8.49	-6.21
DEV	6.407	4.698	4.823	5.451	6.747

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 89.69

CORRECTED WEIGHT FLOW = 56.83

CORRECTED ROTOR SPEED = 3453.23

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	235.71	235.71	235.71	235.71	235.71
V 1	331.72	321.31	325.52	321.09	300.73
VZ 0	235.71	235.71	235.71	235.71	235.71
VZ 1	272.39	257.28	257.90	255.75	240.49
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	189.31	192.47	198.61	194.13	180.56
M 0	0.2121	0.2121	0.2121	0.2121	0.2121
M 1	0.2998	0.2903	0.2941	0.2900	0.2714
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0573	-0.0904	-0.0662	-0.0551	0.1367
DFAC	-0.019	0.056	0.053	0.066	0.127
EFFP	1.0835	1.1423	1.1017	1.0936	0.8523
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	57.146	58.869	60.930	64.817	72.411
BETA 3	26.178	27.305	25.447	25.580	20.919
V 2	586.59	581.78	579.55	562.44	543.61
V 2A	241.57	345.16	359.54	368.70	337.19
VZ 2	318.22	300.78	281.59	239.33	164.27
VZ 2A	216.79	306.70	324.66	332.56	314.96
V-THETA 2	492.77	497.99	506.54	508.99	518.20
V-THETA 2A	106.57	158.33	154.49	159.19	120.39
M 2	0.5257	0.5215	0.5178	0.5014	0.4819
M 2A	0.2115	0.3040	0.3167	0.3247	0.2966
TURN	30.968	31.564	35.483	39.237	51.492
UUBAR	0.3271	0.1626	0.1524	0.1064	0.1475
DFAC	0.8628	0.6614	0.6561	0.6393	0.7402
EFFP	0.6102	0.7591	0.8793	0.9724	1.3961
INCID	-0.55	1.17	3.23	7.12	14.71
LOSS PARA	.12311	.06320	.06262	.04530	.06714
DEV	26.82	27.95	26.09	26.22	21.56
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	57.146	58.869	60.930	64.817	72.411
BETA(PR) 1	49.355	52.674	53.966	56.218	60.154
BETA(PR) 2	2.400	5.768	8.902	14.955	25.110
V 1	331.72	321.31	325.52	321.09	300.73
V 2	586.59	581.78	579.55	562.44	543.61
VZ 1	272.39	257.28	257.90	255.75	240.49
VZ 2	318.22	300.78	281.59	239.33	164.27
V-THETA 1	189.31	192.47	198.61	194.13	180.56
V-THETA 2	492.77	497.99	506.54	508.99	518.20
V(PR) 1	418.2	424.3	438.4	460.0	483.2
V(PR) 2	318.5	302.3	285.0	247.7	181.4
VTHETA PR1	-317.3	-337.4	-354.5	-382.3	-419.1
VTHETA PR2	-13.3	-30.4	-44.1	-63.9	-77.0
U 1	506.61	529.88	553.15	576.43	599.70
U 2	506.10	528.37	550.64	572.91	595.18
M 1	0.2998	0.2903	0.2941	0.2900	0.2714
M 2	0.5257	0.5215	0.5178	0.5014	0.4819
M(PR) 1	0.3780	0.3833	0.3961	0.4155	0.4361
M(PR) 2	0.2855	0.2710	0.2547	0.2208	0.1608
TURN(PR)	46.954	46.906	45.065	41.262	35.044
UUBAR	0.2027	0.2579	0.2731	0.3871	0.5236
DFAC	0.5276	0.5893	0.6588	0.7767	0.9607
EFFP	0.8045	0.8416	0.7832	0.7455	0.6642
EFF	0.8003	0.8382	0.7783	0.7399	0.6567
INCID	17.91	17.03	14.74	13.80	14.79
DEV	7.780	7.728	6.742	8.335	14.240

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 90.17

CORRECTED WEIGHT FLOW = 60.95

CORRECTED ROTOR SPEED = 3471.71

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	253.65	253.65	253.65	253.65	253.65
V 1	357.43	358.69	353.80	348.50	328.37
VZ 0	253.65	253.65	253.65	253.65	253.65
VZ 1	293.51	287.22	280.31	277.59	262.59
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	203.99	214.86	215.87	210.70	197.16
M 0	0.2284	0.2284	0.2284	0.2284	0.2284
M 1	0.3235	0.3247	0.3202	0.3153	0.2967
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0038	-0.0572	-0.0401	-0.0191	0.1603
DFAC	-0.021	0.021	0.043	0.058	0.114
EFFP	1.0225	1.0783	1.0632	1.0425	0.8343
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	56.544	57.473	58.984	61.392	69.902
BETA 3	25.959	25.621	22.981	26.084	22.350
V 2	588.35	585.84	580.52	571.57	549.69
V 2A	261.57	358.61	365.28	387.44	341.79
VZ 2	324.35	315.00	299.13	273.68	188.89
VZ 2A	235.18	323.35	336.29	347.98	316.11
V-THETA 2	490.86	493.94	497.51	501.79	516.22
V-THETA 2A	114.50	155.07	142.62	170.35	129.97
M 2	0.5286	0.5268	0.5210	0.5116	0.4891
M 2A	0.2295	0.3167	0.3226	0.3423	0.3009
TURN	30.585	31.852	36.003	35.308	47.552
UUBAR	0.3180	0.1616	0.1582	0.1042	0.1695
DFAC	0.8223	0.6402	0.6489	0.5971	0.7244
EFFP	0.5885	0.7278	0.7594	0.8897	0.9979
INCID	-1.16	-0.23	1.28	3.69	12.20
LOSS PARA	.11999	.06374	.06630	.04417	.07642
DEV	26.60	26.26	23.62	26.72	22.99
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	56.544	57.473	58.984	61.392	69.902
BETA(PR) 1	46.131	47.898	50.516	53.032	57.090
BETA(PR) 2	3.167	6.746	10.618	15.167	23.504
V 1	357.43	358.69	353.80	348.50	328.37
V 2	588.35	585.84	580.52	571.57	549.69
VZ 1	293.51	287.22	280.31	277.59	262.59
VZ 2	324.35	315.00	299.13	273.68	188.89
V-THETA 1	203.99	214.86	215.87	210.70	197.16
V-THETA 2	490.86	493.94	497.51	501.79	516.22
V(PR) 1	423.5	428.4	440.8	461.6	483.3
V(PR) 2	324.9	317.2	304.3	283.6	206.0
VTHETA PR1	-305.3	-317.8	-340.2	-368.8	-405.7
VTHETA PR2	-17.9	-37.3	-56.1	-74.2	-82.1
U 1	509.32	532.71	556.11	579.51	602.91
U 2	508.81	531.20	553.59	575.98	598.37
M 1	0.3235	0.3247	0.3202	0.3153	0.2967
M 2	0.5286	0.5268	0.5210	0.5116	0.4891
M(PR) 1	0.3834	0.3878	0.3989	0.4176	0.4368
M(PR) 2	0.2919	0.2852	0.2731	0.2538	0.1833
TURN(PR)	42.963	41.153	39.898	37.866	33.585
UUBAR	0.1245	0.1166	0.1606	0.2509	0.4424
DFAC	0.5030	0.5328	0.5909	0.6765	0.8917
EFFP	0.8697	0.9332	0.8974	0.8459	0.7298
EFF	0.8670	0.9317	0.8951	0.8425	0.7238
INCID	14.69	12.26	11.29	10.61	11.73
DEV	8.547	8.706	8.458	8.547	12.634

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 90.16

CORRECTED WEIGHT FLOW = 64.43

CORRECTED ROTOR SPEED = 3471.06

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	268.96	268.96	268.96	268.96	268.96
V 1	389.14	388.61	381.80	374.71	353.44
VZ 0	268.95	268.95	268.95	268.95	268.95
VZ 1	319.54	311.17	302.50	298.47	282.64
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	222.09	232.79	232.95	226.55	212.21
M 0	0.2423	0.2423	0.2423	0.2423	0.2423
M 1	0.3529	0.3524	0.3461	0.3395	0.3198
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0102	-0.0561	-0.0323	-0.0068	0.1632
DFAC	-0.048	-0.001	0.026	0.045	0.101
EFFP	1.0242	1.0683	1.0484	1.0246	0.8393
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.904	56.706	57.683	59.173	65.249
BETA 3	25.782	25.158	22.094	25.619	24.581
V 2	588.96	589.53	584.22	569.77	552.78
V 2A	280.75	366.16	377.11	402.43	357.80
VZ 2	330.16	323.61	312.33	291.98	231.44
VZ 2A	252.80	331.42	349.42	362.87	325.37
V-THETA 2	487.72	492.76	493.73	489.27	502.00
V-THETA 2A	122.11	155.66	141.84	174.01	148.84
M 2	0.5299	0.5310	0.5255	0.5111	0.4930
M 2A	0.2467	0.3239	0.3336	0.3562	0.3155
TURN	30.122	31.548	35.589	33.554	40.668
UUBAR	0.2997	0.1746	0.1706	0.0964	0.1886
DFAC	0.7823	0.6283	0.6286	0.5561	0.6676
EFFP	0.5811	0.6957	0.6929	0.8097	0.8653
INCID	-1.80	-0.99	-0.02	1.47	7.55
LOSS PARA	.11328	.06916	.07191	.04100	.08364
DEV	26.42	25.80	22.73	26.26	25.22
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.904	56.706	57.683	59.173	65.249
BETA(PR) 1	41.942	43.936	46.882	49.773	54.109
BETA(PR) 2	3.639	6.756	10.832	16.520	22.583
V 1	389.14	388.61	381.80	374.71	353.44
V 2	588.96	589.53	584.22	569.77	552.78
VZ 1	319.54	311.17	302.50	298.47	282.64
VZ 2	330.16	323.61	312.33	291.98	231.44
V-THETA 1	222.09	232.79	232.95	226.55	212.21
V-THETA 2	487.72	492.76	493.73	489.27	502.00
V(PR) 1	429.6	432.1	442.6	462.2	482.1
V(PR) 2	330.8	325.9	318.0	304.5	250.7
VTHETA PR1	-287.1	-299.8	-323.1	-352.9	-390.6
VTHETA PR2	-21.0	-38.3	-59.8	-86.6	-96.3
U 1	509.22	532.61	556.01	579.40	602.80
U 2	508.72	531.10	553.49	575.87	598.26
M 1	0.3529	0.3524	0.3461	0.3395	0.3198
M 2	0.5299	0.5310	0.5255	0.5111	0.4930
M(PR) 1	0.3896	0.3919	0.4012	0.4188	0.4363
M(PR) 2	0.2976	0.2935	0.2860	0.2732	0.2235
TURN(PR)	38.303	37.180	36.051	33.254	31.526
UUBAR	0.0490	0.0180	0.0371	0.1117	0.2740
DFAC	0.4765	0.4983	0.5411	0.6036	0.7701
EFFP	0.8890	0.9742	0.9738	0.9116	0.7941
EFF	0.8867	0.9736	0.9732	0.9096	0.7894
INCID	10.50	8.30	7.65	7.35	8.75
DEV	9.019	8.716	8.672	9.900	11.713

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 89.86

CORRECTED WEIGHT FLOW = 70.31

CORRECTED ROTOR SPEED = 3459.53

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	295.21	295.21	295.21	295.21	295.21
V 1	430.32	429.17	422.24	414.32	391.66
VZ 0	295.20	295.20	295.20	295.20	295.20
VZ 1	353.36	343.65	334.53	330.02	313.21
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	245.59	257.08	257.63	250.50	235.16
M 0	0.2663	0.2663	0.2663	0.2663	0.2663
M 1	0.3914	0.3903	0.3838	0.3764	0.3553
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0057	-0.0424	-0.0184	0.0127	0.1825
DFAC	-0.056	-0.007	0.019	0.037	0.092
EFFP	1.0169	1.0506	1.0303	1.0013	0.8260
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	54.373	55.696	55.812	56.690	59.530
BETA 3	25.768	23.163	19.900	24.314	26.285
V 2	601.57	604.81	597.37	591.01	570.07
V 2A	317.31	389.20	411.49	432.56	398.28
VZ 2	350.42	340.86	335.67	324.57	289.07
VZ 2A	285.76	357.83	386.92	394.19	357.10
V-THETA 2	488.97	499.61	494.14	493.92	491.34
V-THETA 2A	137.94	153.09	140.06	178.10	176.37
M 2	0.5443	0.5484	0.5408	0.5339	0.5119
M 2A	0.2801	0.3456	0.3657	0.3847	0.3528
TURN	28.605	32.533	35.912	32.376	33.245
UUBAR	0.2810	0.1899	0.1566	0.1244	0.1862
DFAC	0.7160	0.6064	0.5808	0.5215	0.5739
EFFP	0.5482	0.5905	0.6024	0.6346	0.6389
INCID	-3.33	-2.00	-1.89	-1.01	1.83
LOSS PARA	.10621	.07635	.06699	.05348	.08091
DEV	26.41	23.80	20.54	24.95	26.93
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	54.373	55.696	55.812	56.690	59.530
BETA(PR) 1	36.549	38.542	41.554	44.735	49.416
BETA(PR) 2	2.950	4.985	9.722	13.853	19.951
V 1	430.32	429.17	422.24	414.32	391.66
V 2	601.57	604.81	597.37	591.01	570.07
VZ 1	353.36	343.65	334.53	330.02	313.21
VZ 2	350.42	340.86	335.67	324.57	289.07
V-THETA 1	245.59	257.08	257.63	250.50	235.16
V-THETA 2	488.97	499.61	494.14	493.92	491.34
V(PR) 1	439.9	439.4	447.0	464.6	481.4
V(PR) 2	350.9	342.2	340.6	334.3	307.5
VTHETA PR1	-261.9	-273.8	-296.5	-327.0	-365.6
VTHETA PR2	-18.1	-29.7	-57.5	-80.0	-104.9
U 1	507.53	530.85	554.16	577.48	600.79
U 2	507.03	529.34	551.65	573.96	596.27
M 1	0.3914	0.3903	0.3838	0.3764	0.3553
M 2	0.5443	0.5484	0.5408	0.5339	0.5119
M(PR) 1	0.4000	0.3995	0.4063	0.4220	0.4367
M(PR) 2	0.3175	0.3103	0.3083	0.3020	0.2762
TURN(PR)	33.599	33.557	31.833	30.882	29.465
UUBAR	0.0301	-0.0090	-0.0311	0.0116	0.1084
DFAC	0.4230	0.4529	0.4715	0.5227	0.6186
EFFP	1.0109	1.2015	1.1828	1.1376	0.9669
EFF	1.0111	1.2057	1.1867	1.1406	0.9661
INCID	5.11	2.90	2.32	2.32	4.06
DEV	8.330	6.945	7.562	7.233	9.081

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 89.81

CORRECTED WEIGHT FLOW = 76.68

CORRECTED ROTOR SPEED = 3457.51

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	324.26	324.26	324.26	324.26	324.26
V 1	473.03	471.85	464.56	457.66	433.83
VZ 0	324.26	324.26	324.26	324.26	324.26
VZ 1	388.43	377.83	368.07	364.54	346.93
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	269.96	282.65	283.45	276.70	260.48
M 0	0.2929	0.2929	0.2929	0.2929	0.2929
M 1	0.4316	0.4305	0.4236	0.4171	0.3946
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0153	-0.0176	0.0071	0.0259	0.1942
DFAC	-0.057	-0.008	0.017	0.032	0.085
EFFP	0.9970	1.0254	1.0042	0.9867	0.8203
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	52.507	53.273	53.632	53.871	55.309
BETA(PR) 1	31.419	33.268	36.301	39.494	44.419
BETA(PR) 2	0.829	2.704	7.503	11.909	18.032
V 1	473.03	471.85	464.56	457.66	433.83
V 2	631.65	637.59	624.15	615.45	591.48
VZ 1	388.43	377.83	368.07	364.54	346.93
VZ 2	384.46	381.28	370.10	362.87	336.64
V-THETA 1	269.96	282.65	283.45	276.70	260.48
V-THETA 2	501.17	511.02	502.58	497.09	486.33
V(PR) 1	455.2	451.9	456.7	472.4	485.7
V(PR) 2	384.5	381.7	373.3	370.9	354.0
VTHETA PR1	-237.3	-247.9	-270.4	-300.4	-340.0
VTHETA PR2	-5.6	-18.0	-48.7	-76.5	-109.6
U 1	507.23	530.54	553.84	577.14	600.44
U 2	506.73	529.03	551.33	573.62	595.92
M 1	0.4316	0.4305	0.4236	0.4171	0.3946
M 2	0.5723	0.5784	0.5652	0.5563	0.5322
M(PR) 1	0.4153	0.4122	0.4164	0.4305	0.4419
M(PR) 2	0.3484	0.3463	0.3381	0.3352	0.3185
TURN(PR)	30.590	30.564	28.798	27.585	26.387
UUBAR	0.0639	-0.0039	-0.0086	0.0145	0.0739
DFAC	0.3578	0.3675	0.3944	0.4310	0.4967
EFFP	0.8534	0.9688	0.9546	0.9374	0.8628
EFF	0.8509	0.9682	0.9538	0.9362	0.8600
INCID	-0.02	-2.37	-2.93	-2.93	-0.94
DEV	6.209	4.664	5.343	5.289	7.162

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	52.507	53.273	53.632	53.871	55.309
BETA 3	25.315	21.070	17.331	21.922	26.341
V 2	631.65	637.59	624.15	615.45	591.48
V 2A	369.95	431.62	463.26	466.34	434.27
VZ 2	384.46	381.28	370.10	362.87	336.64
VZ 2A	334.43	402.77	442.23	432.62	389.18
V-THETA 2	501.17	511.02	502.58	497.09	486.33
V-THETA 2A	158.19	155.17	138.00	174.11	192.69
M 2	0.5723	0.5784	0.5652	0.5563	0.5322
M 2A	0.3284	0.3854	0.4141	0.4167	0.3867
TURN	27.192	32.203	36.301	31.949	28.968
UUBAR	0.2659	0.1923	0.1154	0.1205	0.1702
DFAC	0.6408	0.5665	0.5235	0.4911	0.5108
EFFP	0.6471	0.7631	0.8421	0.8359	0.8226
INCID	-5.19	-4.43	-4.07	-3.83	-2.39
LOSS PARA	1.0033	.07853	.05012	.05273	.07435
DEV	25.96	21.71	17.97	22.56	26.98
DIA	33.564	34.992	36.420	37.848	39.276

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 89.76

CORRECTED WEIGHT FLOW = 83.42

CORRECTED ROTOR SPEED = 3455.95

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	355.88	355.88	355.88	355.88	355.88
V 1	538.94	533.66	522.99	511.42	480.18
VZ 0	355.87	355.87	355.87	355.87	355.87
VZ 1	442.55	427.32	414.36	407.36	383.99
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	307.58	319.68	319.10	309.20	288.31
M 0	0.3221	0.3221	0.3221	0.3221	0.3221
M 1	0.4945	0.4894	0.4791	0.4681	0.4383
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0137	-0.0157	0.0039	0.0285	0.2130
DFAC	-0.097	-0.039	-0.008	0.014	0.077
EFFP	0.9971	1.0194	1.0047	0.9838	0.8106
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	49.556	49.811	50.020	49.884	50.255
BETA 3	25.245	17.997	17.323	22.885	29.042
V 2	655.76	666.30	650.99	638.70	617.69
V 2A	447.64	493.21	529.03	530.13	479.26
VZ 2	425.40	429.97	418.28	411.54	394.94
VZ 2A	404.88	469.08	505.03	488.40	419.00
V-THETA 2	499.06	509.00	498.84	488.44	474.94
V-THETA 2A	190.91	152.39	157.52	206.16	232.66
M 2	0.5983	0.6093	0.5942	0.5819	0.5604
M 2A	0.4016	0.4449	0.4780	0.4784	0.4298
TURN	24.311	31.814	32.697	26.999	21.213
UUBAR	0.2486	0.2059	0.1036	0.0983	0.2116
DFAC	0.5135	0.4932	0.4260	0.3798	0.4180
EFFP	0.6459	0.7137	0.8519	0.7747	0.5558
INCID	-8.14	-7.89	-7.68	-7.82	-7.44
LOSS PARA	.09435	.08571	.04500	.04275	.09019
DEV	25.89	18.64	17.96	23.53	29.68
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	49.556	49.811	50.020	49.884	50.255
BETA(PR) 1	24.257	26.238	29.506	33.309	39.083
BETA(PR) 2	1.002	2.635	7.119	11.660	16.996
V 1	538.94	533.66	522.99	511.42	480.18
V 2	655.76	666.30	650.99	638.70	617.69
VZ 1	442.55	427.32	414.36	407.36	383.99
VZ 2	425.40	429.97	418.28	411.54	394.94
V-THETA 1	307.58	319.68	319.10	309.20	288.31
V-THETA 2	499.06	509.00	498.84	488.44	474.94
V(PR) 1	485.4	476.4	476.1	487.4	494.7
V(PR) 2	425.5	430.4	421.5	420.2	413.0
VTHETA PR1	-199.4	-210.6	-234.5	-267.7	-311.9
VTHETA PR2	-7.4	-19.8	-52.2	-84.9	-120.7
U 1	507.00	530.30	553.59	576.88	600.17
U 2	506.50	528.79	551.08	573.36	595.65
M 1	0.4945	0.4894	0.4791	0.4681	0.4383
M 2	0.5983	0.6093	0.5942	0.5819	0.5604
M(PR) 1	0.4454	0.4369	0.4362	0.4461	0.4516
M(PR) 2	0.3882	0.3936	0.3848	0.3829	0.3747
TURN(PR)	23.255	23.603	22.386	21.649	22.087
UUBAR	0.0666	-0.0252	-0.0214	0.0053	0.0345
DFAC	0.2809	0.2636	0.2817	0.3090	0.3492
EFFP	0.8685	1.0747	1.0496	1.0285	0.9586
EFF	0.8666	1.0759	1.0504	1.0290	0.9579
INCID	-7.18	-9.40	-9.72	-9.11	-6.28
DEV	6.382	4.595	4.959	5.040	6.126

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 100.00

CORRECTED WEIGHT FLOW = 68.98

CORRECTED ROTOR SPEED = 3849.81

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	289.21	289.21	289.21	289.21	289.21
V 1	413.97	414.14	407.31	400.78	380.33
VZ 0	289.21	289.21	289.21	289.21	289.21
VZ 1	339.93	331.62	322.71	319.24	304.15
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	236.26	248.08	248.52	242.31	228.36
M 0	0.2608	0.2608	0.2608	0.2608	0.2608
M 1	0.3761	0.3762	0.3698	0.3638	0.3447
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0412	-0.0044	0.0236	0.0457	0.2018
DFAC	-0.044	0.008	0.034	0.050	0.100
EFFP	0.9764	1.0176	0.9915	0.9690	0.8037
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

STATOR 3

STATION 2 - STATION 3

PCT. SPAN	90	70	50	30	10
BETA 2	56.370	56.906	58.630	60.289	67.736
BETA 3	26.213	26.475	23.069	25.803	21.670
V 2	654.77	651.71	643.48	627.19	613.67
V 2A	294.24	401.24	416.39	437.89	396.49
VZ 2	362.63	355.84	334.97	310.85	232.51
VZ 2A	263.98	359.16	383.09	394.23	368.47
V-THETA 2	545.19	545.99	549.42	544.74	567.92
V-THETA 2A	129.97	178.87	163.16	190.60	146.41
M 2	0.5897	0.5878	0.5790	0.5620	0.5463
M 2A	0.2574	0.3537	0.3671	0.3864	0.3486
TURN	30.157	30.431	35.561	34.486	46.066
UUBAR	0.3399	0.1853	0.1617	0.0924	0.1743
DFAC	0.8152	0.6300	0.6261	0.5696	0.6923
EFFP	0.5697	0.6744	0.7030	0.8617	0.9935
INCID	-1.33	-0.79	0.93	2.59	10.04
LOSS PARA	.12793	.07260	.06771	.03923	.07897
DEV	26.85	27.12	23.71	26.44	22.31
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	56.370	56.906	58.630	60.289	67.736
BETA(PR) 1	44.023	45.937	48.764	51.429	55.359
BETA(PR) 2	3.006	6.900	10.892	16.820	22.354
V 1	413.97	414.14	407.31	400.78	380.33
V 2	654.77	651.71	643.48	627.19	613.67
VZ 1	339.93	331.62	322.71	319.24	304.15
VZ 2	362.63	355.84	334.97	310.85	232.51
V-THETA 1	236.26	248.08	248.52	242.31	228.36
V-THETA 2	545.19	545.99	549.42	544.74	567.92
V(PR) 1	472.7	476.8	489.6	512.0	535.1
V(PR) 2	363.1	358.4	341.1	324.7	251.4
VTHETA PR1	-328.5	-342.7	-368.2	-400.3	-440.2
VTHETA PR2	-19.0	-43.1	-64.5	-94.0	-95.6
U 1	564.79	590.73	616.68	642.62	668.57
U 2	564.23	589.05	613.88	638.71	663.54
M 1	0.3761	0.3762	0.3698	0.3638	0.3447
M 2	0.5897	0.5878	0.5790	0.5620	0.5463
M(PR) 1	0.4294	0.4332	0.4445	0.4647	0.4850
M(PR) 2	0.3270	0.3233	0.3070	0.2910	0.2238
TURN(PR)	41.017	39.037	37.872	34.609	33.005
UUBAR	0.0819	0.0553	0.1062	0.1842	0.3644
DFAC	0.4924	0.5104	0.5739	0.6384	0.8360
EFFP	0.9115	0.9965	0.9675	0.8786	0.7729
EFF	0.9092	0.9964	0.9666	0.8753	0.7667
INCID	12.58	10.30	9.53	9.01	10.00
DEV	8.386	8.860	8.732	10.200	11.484

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 100.54

CORRECTED WEIGHT FLOW = 72.87

CORRECTED ROTOR SPEED = 3870.98

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	306.79	306.79	306.79	306.79	306.79
V 1	447.55	447.04	439.63	432.51	409.07
VZ 0	306.79	306.79	306.79	306.79	306.79
VZ 1	367.50	357.96	348.32	344.51	327.13
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	255.42	267.79	268.24	261.50	245.61
M 0	0.2769	0.2769	0.2769	0.2769	0.2769
M 1	0.4075	0.4071	0.4001	0.3934	0.3715
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0485	0.0066	0.0315	0.0525	0.2243
DFAC	-0.057	-0.009	0.017	0.033	0.088
EFFP	0.9710	1.0055	0.9837	0.9635	0.7947
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.999	56.578	57.377	58.439	62.824
BETA 3	25.978	24.634	21.897	26.122	24.081
V 2	658.33	660.20	655.50	637.90	620.66
V 2A	325.34	413.92	431.84	451.69	420.44
VZ 2	368.14	363.64	353.39	333.88	283.47
VZ 2A	292.47	376.25	400.69	405.55	383.85
V-THETA 2	545.78	551.02	552.08	543.55	552.15
V-THETA 2A	142.51	172.53	161.05	198.87	171.55
M 2	0.5936	0.5964	0.5915	0.5737	0.5542
M 2A	0.2852	0.3650	0.3815	0.3995	0.3707
TURN	30.021	31.944	35.480	32.317	38.743
UUBAR	0.2926	0.1843	0.1747	0.1170	0.1750
DFAC	0.7614	0.6231	0.6126	0.5482	0.6249
EFFP	0.5960	0.6422	0.6674	0.7607	0.9026
INCID	-1.70	-1.12	-0.32	0.74	5.12
LOSS PARA	.11041	.07329	.07379	.04955	.07784
DEV	26.62	25.27	22.54	26.76	24.72
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.999	56.578	57.377	58.439	62.824
BETA(PR) 1	40.373	42.342	45.287	48.152	52.521
BETA(PR) 2	3.351	6.475	10.449	16.464	22.088
V 1	447.55	447.04	439.63	432.51	409.07
V 2	658.33	660.20	655.50	637.90	620.66
VZ 1	367.50	357.96	348.32	344.51	327.13
VZ 2	368.14	363.64	353.39	333.88	283.47
V-THETA 1	255.42	267.79	268.24	261.50	245.61
V-THETA 2	545.78	551.02	552.08	543.55	552.15
V(PR) 1	482.4	484.3	495.1	516.4	537.6
V(PR) 2	368.8	366.0	359.3	348.2	305.9
VTHETA PR1	-312.5	-326.2	-351.8	-384.7	-426.6
VTHETA PR2	-21.6	-41.3	-65.2	-98.7	-115.0
U 1	567.89	593.98	620.07	646.16	672.25
U 2	567.33	592.29	617.26	642.22	667.18
M 1	0.4075	0.4071	0.4001	0.3934	0.3715
M 2	0.5936	0.5964	0.5915	0.5737	0.5542
M(PR) 1	0.4393	0.4410	0.4506	0.4697	0.4882
M(PR) 2	0.3325	0.3306	0.3243	0.3131	0.2732
TURN(PR)	37.022	35.867	34.838	31.688	30.432
UUBAR	0.0510	-0.0008	0.0026	0.0643	0.1901
DFAC	0.4755	0.4897	0.5268	0.5782	0.7064
EFFP	0.9016	1.0129	1.0367	0.9749	0.8464
EFF	0.8991	1.0132	1.0377	0.9742	0.8420
INCID	8.93	6.70	6.06	5.73	7.16
DEV	8.731	8.435	8.289	9.844	11.218

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 100.28

CORRECTED WEIGHT FLOW = 75.89

CORRECTED ROTOR SPEED = 3860.80

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	320.61	320.61	320.61	320.61	320.61
V 1	464.67	464.93	458.08	452.17	428.45
VZ 0	320.61	320.61	320.61	320.61	320.61
VZ 1	381.57	372.29	362.93	360.17	342.62
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	265.19	278.51	279.49	273.38	257.25
M 0	0.2896	0.2896	0.2896	0.2896	0.2896
M 1	0.4237	0.4239	0.4175	0.4119	0.3896
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0566	0.0132	0.0361	0.0505	0.2214
DFAC	-0.050	-0.004	0.020	0.033	0.086
EFFP	0.9630	0.9989	0.9785	0.9644	0.7980
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.393	56.097	56.952	57.353	60.533
BETA(PR) 1	38.287	40.138	43.043	45.855	50.337
BETA(PR) 2	2.940	5.341	9.495	14.641	20.487
V 1	464.67	464.93	458.08	452.17	428.45
V 2	663.95	669.67	662.39	651.65	631.08
VZ 1	381.57	372.29	362.93	360.17	342.62
VZ 2	377.09	373.53	361.23	351.54	310.44
V-THETA 1	265.19	278.51	279.49	273.38	257.25
V-THETA 2	546.47	555.81	555.22	548.69	549.44
V(PR) 1	486.1	487.0	496.6	517.1	536.8
V(PR) 2	377.6	375.2	366.2	363.3	331.4
VTHETA PR1	-301.2	-313.9	-338.9	-371.1	-413.2
VTHETA PR2	-19.4	-34.9	-60.4	-91.8	-116.0
U 1	566.40	592.42	618.44	644.46	670.48
U 2	565.84	590.74	615.63	640.53	665.43
M 1	0.4237	0.4239	0.4175	0.4119	0.3896
M 2	0.5999	0.6065	0.5989	0.5880	0.5652
M(PR) 1	0.4432	0.4440	0.4525	0.4711	0.4881
M(PR) 2	0.3412	0.3398	0.3312	0.3278	0.2968
TURN(PR)	35.348	34.797	33.548	31.213	29.850
UUBAR	0.0545	-0.0064	-0.0025	0.0288	0.1312
DFAC	0.4540	0.4686	0.5072	0.5435	0.6458
EFFP	0.9139	1.0547	1.0572	1.0370	0.8878
EFF	0.9118	1.0561	1.0588	1.0380	0.8847
INCID	6.85	4.50	3.81	3.43	4.98
DEV	8.320	7.301	7.335	8.021	9.617

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.393	56.097	56.952	57.353	60.533
BETA 3	26.108	24.301	21.666	25.752	24.980
V 2	663.95	669.67	662.39	651.65	631.08
V 2A	335.14	424.18	452.24	470.83	439.67
VZ 2	377.09	373.53	361.23	351.54	310.44
VZ 2A	300.94	386.60	420.29	424.07	398.54
V-THETA 2	546.47	555.81	555.22	548.69	549.44
V-THETA 2A	147.48	174.56	166.96	204.57	185.68
M 2	0.5999	0.6065	0.5989	0.5880	0.5652
M 2A	0.2944	0.3755	0.4009	0.4174	0.3887
TURN	29.285	31.796	35.286	31.601	35.553
UUBAR	0.2971	0.1976	0.1601	0.1290	0.1789
DFAC	0.7459	0.6149	0.5840	0.5280	0.5875
EFFP	0.5927	0.6638	0.6955	0.7031	0.8412
INCID	-2.31	-1.60	-0.75	-0.35	2.83
LOSS PARA	.11194	.07577	.06772	.05453	.07908
DEV	26.75	24.94	22.31	26.39	25.62
DIA	33.564	34.992	36.420	37.848	39.276

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 100.05

CORRECTED WEIGHT FLOW = 79.79

CORRECTED ROTOR SPEED = 3852.05

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.712	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	338.72	338.72	338.72	338.72	338.72
V 1	491.73	491.16	483.52	476.27	454.82
VZ 0	338.72	338.72	338.72	338.72	338.72
VZ 1	403.78	393.29	383.09	379.37	363.71
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	280.64	294.22	295.02	287.95	273.08
M 0	0.3062	0.3062	0.3062	0.3062	0.3062
M 1	0.4493	0.4488	0.4415	0.4346	0.4144
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0919	0.0486	0.0692	0.0865	0.2216
DFAC	-0.058	-0.004	0.021	0.036	0.081
EFFP	0.9353	0.9686	0.9496	0.9319	0.8009
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	54.029	55.057	55.649	55.795	57.934
BETA 3	27.200	23.100	19.600	24.000	26.800
V 2	679.71	688.09	678.69	668.40	647.96
V 2A	376.62	451.55	478.59	492.10	466.08
VZ 2	399.25	394.11	382.96	375.75	344.00
VZ 2A	334.97	415.35	450.86	449.55	416.01
V-THETA 2	550.10	564.04	560.32	552.79	549.10
V-THETA 2A	172.15	177.16	160.55	200.15	210.14
M 2	0.6168	0.6253	0.6158	0.6052	0.5830
M 2A	0.3324	0.4014	0.4261	0.4377	0.4136
TURN	26.829	31.957	36.049	31.795	31.134
UUBAR	0.2696	0.1918	0.1491	0.1316	0.1720
DFAC	0.6779	0.5890	0.5628	0.5140	0.5388
EFFP	0.6012	0.6899	0.7311	0.6946	0.7851
INCID	-3.67	-2.64	-2.05	-1.90	0.23
LOSS PARA	.1005	.07716	.01392	.05669	.07392
DEV	27.84	23.74	20.24	24.64	27.44
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	54.029	55.057	55.649	55.795	57.934
BETA(PR) 1	35.166	37.046	40.050	43.103	47.425
BETA(PR) 2	2.074	3.681	8.014	12.934	18.458
V 1	491.73	491.16	483.52	476.27	454.82
V 2	679.71	688.09	678.69	668.40	647.96
VZ 1	403.78	393.29	383.09	379.37	363.71
VZ 2	399.25	394.11	382.96	375.75	344.00
V-THETA 1	280.64	294.22	295.02	287.95	273.08
V-THETA 2	550.10	564.04	560.32	552.79	549.10
V(PR) 1	493.9	492.7	500.5	519.6	537.6
V(PR) 2	399.5	394.9	386.7	385.5	362.7
VTHETA PR1	-284.5	-296.9	-322.0	-355.0	-395.9
VTHETA PR2	-14.5	-25.4	-53.9	-86.3	-114.8
U 1	565.11	591.08	617.04	643.00	668.96
U 2	564.56	589.40	614.24	639.08	663.92
M 1	0.4493	0.4488	0.4415	0.4346	0.4144
M 2	0.6168	0.6253	0.6158	0.6052	0.5830
M(PR) 1	0.4513	0.4502	0.4570	0.4742	0.4898
M(PR) 2	0.3626	0.3589	0.3509	0.3491	0.3263
TURN(PR)	33.092	33.365	32.036	30.169	28.967
UUBAR	0.0510	-0.0024	-0.0055	0.0180	0.0982
DFAC	0.4087	0.4283	0.4610	0.4938	0.5739
EFFP	0.9661	1.0788	1.0842	1.0679	0.9388
EFF	0.9654	1.0808	1.0864	1.0697	0.9372
INCID	3.73	1.41	0.82	0.68	2.06
DEV	7.454	5.641	5.854	6.314	7.598

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 100.14

CORRECTED WEIGHT FLOW = 84.71

CORRECTED ROTOR SPEED = 3855.26

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	362.04	362.04	362.04	362.04	362.04
V 1	530.98	531.20	524.17	516.58	490.05
VZ 0	362.04	362.04	362.04	362.04	362.04
VZ 1	436.02	425.35	415.29	411.47	391.88
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	303.04	318.20	319.82	312.33	294.23
M 0	0.3278	0.3278	0.3278	0.3278	0.3278
M 1	0.4868	0.4870	0.4803	0.4730	0.4477
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0484	0.0085	0.0304	0.0560	0.2335
DFAC	-0.062	-0.016	0.007	0.021	0.074
EFFP	0.9693	1.0007	0.9825	0.9596	0.7976
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	52.140	52.825	53.118	53.240	54.940
BETA(PR) 1	31.054	32.728	35.638	38.832	43.760
BETA(PR) 2	0.932	3.132	7.433	11.923	17.362
V 1	530.98	531.20	524.17	516.58	490.05
V 2	706.72	710.83	700.03	689.60	665.71
VZ 1	436.02	425.35	415.29	411.47	391.88
VZ 2	433.74	429.52	420.14	412.70	382.40
V-THETA 1	303.04	318.20	319.82	312.33	294.23
V-THETA 2	557.97	566.38	559.94	552.47	544.91
V(PR) 1	509.0	505.6	511.0	528.2	542.6
V(PR) 2	433.8	430.2	423.7	421.8	400.7
VTHETA PR1	-262.5	-273.4	-297.7	-331.2	-375.3
VTHETA PR2	-7.1	-23.5	-54.8	-87.1	-119.6
U 1	565.59	591.57	617.55	643.53	669.52
U 2	565.03	589.89	614.75	639.61	664.48
M 1	0.4868	0.4870	0.4803	0.4730	0.4477
M 2	0.6440	0.6486	0.6373	0.6265	0.6016
M(PR) 1	0.4666	0.4636	0.4682	0.4837	0.4957
M(PR) 2	0.3953	0.3925	0.3857	0.3832	0.3621
TURN(PR)	30.122	29.596	28.204	26.909	26.398
UUBAR	0.0826	0.0165	0.0010	0.0195	0.0844
DFAC	0.3475	0.3553	0.3783	0.4121	0.4857
EFFP	0.9186	1.0371	1.0137	1.0053	0.9317
EFF	0.9168	1.0380	1.0141	1.0054	0.9300
INCID	-0.39	-2.91	-3.59	-3.59	-1.60
DEV	6.312	5.092	5.273	5.303	6.492

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	52.140	52.825	53.118	53.240	54.940
BETA 3	25.917	21.297	17.658	23.018	27.004
V 2	706.72	710.83	700.03	689.60	665.71
V 2A	412.98	496.19	529.12	536.93	489.18
VZ 2	433.74	429.52	420.14	412.70	382.40
VZ 2A	371.45	462.31	504.19	494.18	435.85
V-THETA 2	557.97	566.38	559.94	552.47	544.91
V-THETA 2A	180.50	180.22	160.50	209.95	222.12
M 2	0.6440	0.6486	0.6373	0.6265	0.6016
M 2A	0.3663	0.4442	0.4740	0.4807	0.4357
TURN	26.223	31.528	35.460	30.222	27.936
UUBAR	0.2992	0.1879	0.1236	0.1154	0.2035
DFAC	0.6385	0.5389	0.5038	0.4570	0.5045
EFFP	0.5876	0.7473	0.7953	0.7720	0.6810
INCID	-5.56	-4.87	-4.58	-4.46	-2.76
LOSS PARA	.11286	.07658	.05330	.05010	.08836
DEV	26.56	21.94	18.30	23.66	27.64
DIA	33.564	34.992	36.420	37.848	39.276

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 100.32

CORRECTED WEIGHT FLOW = 90.04

CORRECTED ROTOR SPEED = 3862.14

INLET GUIDE VANE

STATION 0 - STATION 1

PCT SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	387.96	387.96	387.96	387.96	387.96
V 1	584.70	581.27	571.73	561.23	530.19
VZ 0	387.96	387.96	387.96	387.96	387.96
VZ 1	480.12	465.44	452.98	447.03	423.98
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	333.69	348.19	348.84	339.32	318.33
M 0	0.3518	0.3518	0.3518	0.3518	0.3518
M 1	0.5388	0.5354	0.5262	0.5160	0.4860
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0448	0.0141	0.0332	0.0589	0.2415
DFAC	-0.092	-0.038	-0.011	0.008	0.065
EFFP	0.9740	0.9957	0.9806	0.9587	0.7987
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT SPAN	90	70	50	30	10
BETA 2	49.859	50.100	50.498	50.169	50.687
BETA 3	25.404	19.092	17.799	22.792	29.007
V 2	725.55	738.30	723.73	709.03	685.87
V 2A	507.80	558.45	575.73	598.60	531.43
VZ 2	467.74	473.59	460.37	454.15	434.54
VZ 2A	458.70	527.73	548.17	551.86	464.77
V-THETA 2	554.65	566.40	558.43	544.49	530.66
V-THETA 2A	217.84	182.66	175.99	231.89	257.70
M 2	0.6650	0.6787	0.6639	0.6488	0.6260
M 2A	0.4569	0.5094	0.5344	0.5435	0.4805
TURN	24.455	31.008	32.699	27.377	21.680
UUBAR	0.2410	0.1900	0.1211	0.0884	0.2329
DFAC	0.4938	0.4703	0.4450	0.3650	0.4219
EFFP	0.6962	1.4601	-0.8497	1.0826	0.7747
INCID	-7.84	-7.60	-7.20	-7.53	-7.01
LOSS PARA	.09131	.07858	.05248	.03846	.09736
DEV	26.04	19.73	18.44	23.43	29.65
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	49.859	50.100	50.498	50.169	50.687
BETA(PR) 1	25.878	27.707	30.780	34.337	39.730
BETA(PR) 2	1.394	2.966	7.109	11.968	17.259
V 1	584.70	581.27	571.73	561.23	530.19
V 2	725.55	738.30	723.73	709.03	685.87
VZ 1	480.12	465.44	452.98	447.03	423.98
VZ 2	467.74	473.59	460.37	454.15	434.54
V-THETA 1	333.69	348.19	348.84	339.32	318.33
V-THETA 2	554.65	566.40	558.43	544.49	530.66
V(PR) 1	533.6	525.7	527.2	541.4	551.3
V(PR) 2	467.9	474.2	463.9	464.2	455.0
VTHETA PR1	-232.9	-244.4	-269.8	-305.4	-352.4
VTHETA PR2	-11.4	-24.5	-57.4	-96.3	-135.0
U 1	566.59	592.62	618.65	644.68	670.71
U 2	566.03	590.94	615.85	640.75	665.66
M 1	0.5388	0.5354	0.5262	0.5160	0.4860
M 2	0.6650	0.6787	0.6639	0.6488	0.6260
M(PR) 1	0.4917	0.4843	0.4852	0.4977	0.5054
M(PR) 2	0.4288	0.4359	0.4256	0.4248	0.4153
TURN(PR)	24.484	24.741	23.671	22.369	22.472
UUBAR	0.1168	0.0152	0.0161	0.0298	0.0550
DFAC	0.2884	0.2724	0.2959	0.3187	0.3623
EFFP	0.8789	1.1043	1.0892	1.0595	1.1153
EFF	0.8768	1.1064	1.0910	1.0607	1.1178
INCID	-5.56	-7.93	-8.45	-8.08	-5.63
DEV	6.774	4.926	4.949	5.348	6.389

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 110.01

CORRECTED WEIGHT FLOW = 75.90

CORRECTED ROTOR SPEED = 4235.53

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	320.66	320.66	320.66	320.66	320.66
V 1	466.11	465.07	457.05	450.31	424.82
VZ 0	320.66	320.66	320.66	320.66	320.66
VZ 1	382.75	372.39	362.11	358.69	339.72
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	266.02	278.58	278.86	272.26	255.07
M 0	0.2896	0.2896	0.2896	0.2896	0.2896
M 1	0.4250	0.4240	0.4165	0.4101	0.3862
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0060	-0.0289	0.0024	0.0205	0.2033
DFAC	-0.053	-0.005	0.022	0.037	0.094
EFFP	1.0050	1.0362	1.0088	0.9918	0.8062
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	56.043	56.679	58.229	59.974	67.494
BETA(PR) 1	42.875	44.918	47.817	50.476	54.738
BETA(PR) 2	3.804	6.739	11.226	17.036	22.173
V 1	466.11	465.07	457.05	450.31	424.82
V 2	716.32	719.67	707.46	689.52	676.04
VZ 1	382.75	372.39	362.11	358.69	339.72
VZ 2	400.11	395.33	372.50	345.03	258.78
V-THETA 1	266.02	278.58	278.86	272.26	255.07
V-THETA 2	594.15	601.36	601.46	596.98	624.56
V(PR) 1	522.3	525.9	539.3	563.6	588.5
V(PR) 2	401.0	398.1	379.8	360.9	279.4
VTHETA PR1	-355.4	-371.3	-399.6	-434.8	-480.5
VTHETA PR2	-26.6	-46.7	-73.9	-105.7	-105.5
U 1	621.37	649.92	678.46	707.01	735.56
U 2	620.76	648.07	675.39	702.70	730.02
M 1	0.4250	0.4240	0.4165	0.4101	0.3862
M 2	0.6464	0.6504	0.6383	0.6192	0.6015
M(PR) 1	0.4763	0.4795	0.4914	0.5133	0.5350
M(PR) 2	0.3619	0.3598	0.3426	0.3241	0.2486
TURN(PR)	39.071	38.179	36.592	33.440	32.566
UUBAR	0.0569	0.0206	0.0702	0.1548	0.3427
DFAC	0.4827	0.5005	0.5593	0.6258	0.8278
EFFP	0.9299	1.0139	1.0159	0.9274	0.7898
EFF	0.9277	1.0144	1.0164	0.9251	0.7828
INCID	11.43	9.28	8.59	8.06	9.38
DEV	9.184	8.699	9.066	10.416	11.303

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	56.043	56.679	58.229	59.974	67.494
BETA 3	27.139	26.600	22.522	24.966	19.043
V 2	716.32	719.67	707.46	689.52	676.04
V 2A	328.41	452.12	464.48	488.23	432.94
VZ 2	400.11	395.33	372.50	345.03	258.78
VZ 2A	292.25	404.26	429.06	442.61	409.24
V-THETA 2	594.15	601.36	601.46	596.98	624.56
V-THETA 2A	149.80	202.44	177.91	206.07	141.26
M 2	0.6464	0.6504	0.6383	0.6192	0.6015
M 2A	0.2858	0.3974	0.4084	0.4298	0.3791
TURN	28.904	30.079	35.707	35.008	48.451
UUBAR	0.3476	0.1933	0.1697	0.0975	0.2013
DFAC	0.8003	0.6136	0.6159	0.5607	0.7117
EFFP	0.5309	0.6502	0.6549	0.7836	0.8967
INCID	-1.66	-1.02	0.53	2.27	9.79
LOSS PARA	.12979	.07561	.07132	.04171	.09275
DEV	27.78	27.24	23.16	25.61	19.68
DIA	33.564	34.992	36.420	37.848	39.276

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 110.09

CORRECTED WEIGHT FLOW = 78.46

CORRECTED ROTOR SPEED = 4238.62

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	332.52	332.52	332.52	332.52	332.52
V 1	475.20	476.93	472.77	464.31	442.18
VZ 0	332.51	332.51	332.51	332.51	332.51
VZ 1	390.21	381.89	374.57	369.84	353.61
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	271.20	285.69	288.46	280.72	265.49
M 0	0.3005	0.3005	0.3005	0.3005	0.3005
M 1	0.4336	0.4353	0.4313	0.4233	0.4025
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0101	-0.0235	-0.0022	0.0571	0.2297
DFAC	-0.035	0.007	0.025	0.042	0.090
EFFP	1.0009	1.0318	1.0125	0.9563	0.7877
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.960	56.790	57.686	58.626	63.593
BETA 3	26.769	26.158	22.177	24.652	21.605
V 2	716.53	721.55	715.46	701.62	684.65
V 2A	340.38	456.50	478.54	501.37	454.54
VZ 2	401.09	395.20	382.46	365.28	304.49
VZ 2A	303.90	409.74	443.13	455.67	422.60
V-THETA 2	593.75	603.70	604.66	599.03	613.21
V-THETA 2A	153.30	201.25	180.63	209.12	167.36
M 2	0.6468	0.6529	0.6467	0.6320	0.6109
M 2A	0.2969	0.4020	0.4217	0.4423	0.3989
TURN	29.191	30.632	35.509	33.974	41.988
UUBAR	0.3427	0.2070	0.1868	0.1362	0.2196
DFAC	0.7814	0.6106	0.6008	0.5489	0.6570
EFFP	0.5493	0.6462	0.6291	0.7029	0.8015
INCID	-1.74	-0.91	-0.01	0.93	5.89
LOSS PARA	.12842	.08131	.07873	.05841	.09950
DEV	27.41	26.80	22.82	25.29	22.25
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.960	56.790	57.686	58.626	63.593
BETA(PR) 1	41.941	43.681	46.193	49.090	53.079
BETA(PR) 2	3.917	6.474	10.548	15.919	21.074
V 1	475.20	476.93	472.77	464.31	442.18
V 2	716.53	721.55	715.46	701.62	684.65
VZ 1	390.21	381.89	374.57	369.84	353.61
VZ 2	401.09	395.20	382.46	365.28	304.49
V-THETA 1	271.20	285.69	288.46	280.72	265.49
V-THETA 2	593.75	603.70	604.66	599.03	613.21
V(PR) 1	524.6	528.1	541.1	564.7	588.6
V(PR) 2	402.0	397.7	389.0	379.8	326.3
VTHETA PR1	-350.6	-364.7	-390.5	-426.8	-470.6
VTHETA PR2	-27.5	-44.8	-71.2	-104.2	-117.3
U 1	621.83	650.39	678.96	707.53	736.09
U 2	621.21	648.54	675.88	703.21	730.55
M 1	0.4336	0.4353	0.4313	0.4233	0.4025
M 2	0.6468	0.6529	0.6467	0.6320	0.6109
M(PR) 1	0.4787	0.4819	0.4937	0.5149	0.5358
M(PR) 2	0.3629	0.3599	0.3517	0.3421	0.2911
TURN(PR)	38.024	37.207	35.644	33.171	32.005
UUBAR	0.0786	0.0293	0.0348	0.0816	0.2208
DFAC	0.4788	0.4995	0.5385	0.5878	0.7307
EFFP	0.9078	1.0216	1.0491	1.0055	0.8453
EFF	0.9050	1.0223	1.0507	1.0057	0.8400
INCID	10.50	8.04	6.96	6.67	7.72
DEV	9.297	8.434	8.388	9.299	10.204

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 110.07

CORRECTED WEIGHT FLOW = 81.00

CORRECTED ROTOR SPEED = 4237.80

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	344.41	344.41	344.41	344.41	344.41
V 1	563.11	550.10	530.29	509.95	468.68
VZ 0	344.41	344.41	344.41	344.41	344.41
VZ 1	462.40	440.48	420.15	406.19	374.80
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	321.38	329.52	323.56	308.31	281.40
M 0	0.3115	0.3115	0.3115	0.3115	0.3115
M 1	0.5178	0.5052	0.4862	0.4667	0.4275
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0513	0.0126	0.0366	0.0596	0.2542
DFAC	-0.184	-0.106	-0.056	-0.015	0.069
EFFP	0.9776	0.9987	0.9824	0.9626	0.7868
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	55.650	56.294	57.113	57.715	50.925
BETA 3	26.532	25.879	21.795	24.558	22.448
V 2	721.01	727.72	721.41	710.47	693.55
V 2A	348.26	467.21	496.48	516.17	474.92
VZ 2	406.83	403.84	391.71	379.48	437.17
VZ 2A	311.58	420.36	460.99	469.48	438.94
V-THETA 2	595.27	605.39	605.79	600.63	538.42
V-THETA 2A	155.57	203.92	184.34	214.53	181.35
M 2	0.6517	0.6597	0.6527	0.6414	0.6203
M 2A	0.3042	0.4124	0.4386	0.4563	0.4177
TURN	29.118	30.415	35.318	33.157	28.477
UUBAR	0.3440	0.2084	0.1746	0.1427	0.2188
DFAC	0.7714	0.5986	0.5776	0.5312	0.5691
EFFP	0.5504	0.6500	0.6531	0.6714	0.7494
INCID	-2.05	-1.41	-0.59	0.02	-6.77
LOSS PARA	.12912	.08207	.07375	.06125	.09857
DEV	27.17	26.52	22.44	25.20	23.09
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	55.650	56.294	57.113	57.715	50.925
BETA(PR) 1	33.004	36.061	40.218	44.494	50.493
BETA(PR) 2	3.632	6.082	10.126	15.108	23.709
V 1	563.11	550.10	530.29	509.95	468.68
V 2	721.01	727.72	721.41	710.47	693.55
VZ 1	462.40	440.48	420.15	406.19	374.80
VZ 2	406.83	403.84	391.71	379.48	437.17
V-THETA 1	321.38	329.52	323.56	308.31	281.40
V-THETA 2	595.27	605.39	605.79	600.63	538.42
V(PR) 1	551.4	544.9	550.2	569.4	589.1
V(PR) 2	407.6	406.1	397.9	393.1	477.5
VTHETA PR1	-300.3	-320.7	-355.3	-399.1	-454.5
VTHETA PR2	-25.8	-43.0	-70.0	-102.4	-192.0
U 1	621.71	650.27	678.83	707.39	735.95
U 2	621.09	648.42	675.75	703.08	730.41
M 1	0.5178	0.5052	0.4862	0.4667	0.4275
M 2	0.6517	0.6597	0.6527	0.6414	0.6203
M(PR) 1	0.5070	0.5004	0.5044	0.5211	0.5373
M(PR) 2	0.3684	0.3681	0.3600	0.3548	0.4271
TURN(PR)	29.372	29.979	30.092	29.386	26.783
UUBAR	0.1063	-0.1464	-0.1110	-0.0298	-0.1901
DFAC	0.4588	0.4673	0.5031	0.5472	0.4019
EFFP	0.9008	1.0419	1.0454	1.0350	0.8812
EFF	0.8980	1.0432	1.0469	1.0362	0.8771
INCID	1.56	0.42	0.99	2.07	5.13
DEV	9.012	8.042	7.966	8.488	12.839

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 110.41

CORRECTED WEIGHT FLOW = 85.87

CORRECTED ROTOR SPEED = 4250.91

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	367.62	367.62	367.62	367.62	367.62
V 1	546.29	544.44	535.96	527.35	500.97
VZ 0	367.62	367.62	367.62	367.62	367.62
VZ 1	448.59	435.95	424.64	420.05	400.62
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	311.77	326.13	327.01	318.83	300.79
M 0	0.3329	0.3329	0.3329	0.3329	0.3329
M 1	0.5015	0.4998	0.4916	0.4833	0.4581
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0433	0.0101	0.0341	0.0580	0.2229
DFAC	-0.076	-0.026	-0.000	0.016	0.068
EFFP	0.9743	0.9992	0.9797	0.9586	0.8098
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	54.097	55.103	55.608	55.757	59.122
BETA 3	26.372	23.851	19.445	23.179	24.267
V 2	738.81	748.53	740.67	730.43	711.79
V 2A	398.49	497.76	528.80	549.34	499.30
VZ 2	433.25	428.24	418.37	411.01	365.30
VZ 2A	357.02	455.25	498.64	505.00	455.19
V-THETA 2	598.44	613.93	611.20	603.81	610.91
V-THETA 2A	177.01	201.28	176.04	216.22	205.21
M 2	0.6764	0.6874	0.6784	0.6676	0.6449
M 2A	0.3503	0.4420	0.4698	0.4889	0.4407
TURN	27.725	31.252	36.163	32.578	34.855
UUBAR	0.3190	0.2156	0.1731	0.1406	0.2359
DFAC	0.6986	0.5755	0.5534	0.4996	0.5796
EFFP	0.4702	0.5161	0.5157	0.5279	0.4750
INCID	-3.60	-2.60	-2.09	-1.94	1.42
LOSS PARA	.11995	.08264	.07428	.06100	.10485
DEV	27.01	24.49	20.09	23.82	24.91
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATION ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	54.097	55.103	55.608	55.757	59.122
BETA(PR) 1	34.807	36.801	39.809	42.930	47.516
BETA(PR) 2	3.246	4.871	9.050	13.864	18.434
V 1	546.29	544.44	535.96	527.35	500.97
V 2	738.81	748.53	740.67	730.43	711.79
VZ 1	448.59	435.95	424.64	420.05	400.62
VZ 2	433.25	428.24	418.37	411.01	365.30
V-THETA 1	311.77	326.13	327.01	318.83	300.79
V-THETA 2	598.44	613.93	611.20	603.81	610.91
V(PR) 1	546.3	544.4	552.8	573.7	593.2
V(PR) 2	433.9	429.8	423.6	423.3	385.1
VTHETA PR1	-311.9	-326.1	-353.9	-390.7	-437.4
VTHETA PR2	-24.6	-36.5	-66.6	-101.4	-121.8
U 1	623.63	652.28	680.93	709.58	738.23
U 2	623.01	650.43	677.84	705.25	732.67
M 1	0.5015	0.4998	0.4916	0.4833	0.4581
M 2	0.6764	0.6874	0.6784	0.6676	0.6449
M(PR) 1	0.5016	0.4998	0.5070	0.5258	0.5424
M(PR) 2	0.3973	0.3947	0.3880	0.3869	0.3489
TURN(PR)	31.561	31.930	30.759	29.066	29.081
UUBAR	0.0612	0.0005	-0.0071	0.0167	0.1327
DFAC	0.4150	0.4325	0.4604	0.4919	0.6038
EFFP	1.2161	1.4663	1.4144	1.3925	1.1361
EFF	1.2220	1.4803	1.4274	1.4050	1.1406
INCID	3.97	1.16	0.58	0.51	2.16
DEV	8.626	6.831	6.890	7.244	7.564

Table B-2. Blade Element Performance (Continued)

PERCENT DESIGN SPEED = 109.98

CORRECTED WEIGHT FLOW = 89.00

CORRECTED ROTOR SPEED = 4234.06

INLET GUIDE VANE

STATION 0 - STATION 1

PCT. SPAN	90	70	50	30	10
DIA	33.622	35.167	36.711	38.256	39.801
BETA 0	0.000	0.000	0.000	0.000	0.000
BETA 1	34.800	36.800	37.600	37.200	36.900
V 0	382.84	382.84	382.84	382.84	382.84
V 1	591.14	586.25	577.00	567.31	537.72
VZ 0	382.84	382.84	382.84	382.84	382.84
VZ 1	485.42	469.43	457.15	451.88	430.01
V-THETA 0	0.00	0.00	0.00	0.00	0.00
V-THETA 1	337.37	351.17	352.05	342.99	322.86
M 0	0.3470	0.3470	0.3470	0.3470	0.3470
M 1	0.5451	0.5403	0.5313	0.5219	0.4933
TURN	-34.80	-36.80	-37.60	-37.20	-36.90
UUBAR	0.0324	0.0128	0.0315	0.0528	0.2307
DFAC	-0.119	-0.061	-0.034	-0.016	0.039
EFFP	0.9842	0.9970	0.9835	0.9667	0.8235
INCID	******	26.9001	27.3001	27.7001	28.1001
DEV	7.300	6.100	6.100	7.700	8.400

SLOTTED STATOR 3

STATION 2 - STATION 2A

PCT. SPAN	90	70	50	30	10
BETA 2	52.603	53.435	53.921	54.088	56.423
BETA 3	26.378	22.158	18.333	22.880	26.073
V 2	759.45	766.74	754.15	748.25	720.71
V 2A	499.11	549.45	565.24	577.05	521.13
VZ 2	461.24	456.78	444.12	438.88	398.59
VZ 2A	447.15	508.87	536.55	531.65	468.10
V-THETA 2	603.34	615.83	609.51	606.02	600.46
V-THETA 3	221.75	207.23	177.79	224.36	229.05
M 2	0.6984	0.7072	0.6937	0.6799	0.6555
M 2A	0.4439	0.4924	0.5064	0.5172	0.4634
TURN	26.225	31.277	35.588	31.208	30.350
UUBAR	0.2103	0.1757	0.1532	0.1347	0.2460
DFAC	0.5524	0.5158	0.5110	0.4707	0.5312
EFFP	0.5585	0.5822	0.5612	0.9466	0.4925
INCID	-5.10	-4.26	-3.78	-3.61	-1.28
LOSS PARA	.07908	.07120	.06617	.05857	.10774
DEV	27.02	22.80	18.97	23.52	26.71
DIA	33.564	34.992	36.420	37.848	39.276

FLOW GENERATOR ROTOR

STATION 1 - STATION 2

PCT. SPAN	90	70	50	30	10
DIA	33.589	35.067	36.545	38.023	39.501
BETA 1	34.800	36.800	37.600	37.200	36.900
BETA 2	52.603	53.435	53.921	54.088	56.423
BETA(PR) 1	30.311	32.453	35.508	38.835	43.805
BETA(PR) 2	2.136	4.009	8.408	12.393	17.974
V 1	591.14	586.25	577.00	567.31	537.72
V 2	759.45	766.74	754.15	748.25	720.71
VZ 1	485.42	469.43	457.15	451.88	430.01
VZ 2	461.24	456.78	444.12	438.88	398.59
V-THETA 1	337.37	351.17	352.05	342.99	322.86
V-THETA 2	603.34	615.83	609.51	606.02	600.46
V(PR) 1	562.3	556.3	561.6	580.1	595.8
V(PR) 2	461.6	457.9	448.9	449.3	419.0
VTHETA PR1	-283.8	-298.5	-326.2	-363.8	-412.4
VTHETA PR2	-17.2	-32.0	-65.6	-96.4	-129.3
U 1	621.16	649.69	678.23	706.76	735.30
U 2	620.54	647.85	675.15	702.46	729.76
M 1	0.5451	0.5403	0.5313	0.5219	0.4933
M 2	0.6984	0.7072	0.6937	0.6799	0.6555
M(PR) 1	0.5185	0.5127	0.5171	0.5336	0.5466
M(PR) 2	0.4244	0.4223	0.4130	0.4083	0.3811
TURN(PR)	28.176	28.444	27.099	26.442	25.832
UUBAR	0.0351	-0.0409	-0.0490	-0.0202	0.0593
DFAC	0.3678	0.3767	0.4030	0.4355	0.5227
EFFP	1.2435	1.5274	1.4856	0.9831	1.1763
EFF	1.2497	1.5426	1.4998	0.9826	1.1817
INCID	-1.13	-3.19	-3.72	-3.59	-1.55
DEV	7.516	5.969	6.248	5.773	7.104

APPENDIX C
REFERENCES

1. "Single Stage Experimental Evaluation of Slotted Rotor and Stator Blading, Part I - Analysis and Design," NASA CR-54544, PWA FR-1713, July 1966.

2. "Single Stage Experimental Evaluation of Slotted Rotor and Stator Blading, Part II - Annular Cascade Investigation of Slot Location and Geometry," NASA CR-54545, PWA FR-1669, September 1966.

3. "Single Stage Experimental Evaluation of Slotted Rotor and Stator Blading, Part III - Data and Performance for Slotted Rotor 1," NASA CR-54546, PWA FR-2110, February 1967.

4. "Single Stage Experimental Evaluation of Slotted Rotor and Stator Blading, Part IV - Data and Performance for Slotted Rotor 2," NASA CR-54547, PWA FR-2111, February 1967.

5. "Single Stage Experimental Evaluation of Slotted Rotor and Stator Blading, Part V - Data and Performance for Slotted Rotor 3," NASA CR-54548, PWA FR-2285, August 1967.

6. "Single Stage Experimental Evaluation of Slotted Rotor and Stator Blading, Part VI - Data and Performance for Slotted Stator 1," NASA CR-54549, PWA FR-2286, August 1967.

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8. Aerodynamic Design of Axial Flow Compressors (Revised), NASA SP-36, 1965, p 248.

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