

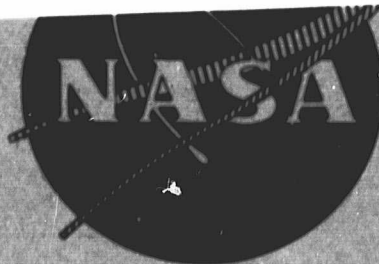
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SINGLE STAGE EXPERIMENTAL EVALUATION OF VARIABLE GEOMETRY GUIDE VANES AND STATOR BLADING

PART III - DATA AND PERFORMANCE FOR VARIABLE
CAMBER GUIDE VANE AND STATOR A

BY

B.A. JONES AND R.P. OSCARSON

Prepared For
National Aeronautics And Space Administration

Contract NAS3-7604



Pratt & Whitney Aircraft
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ABSTRACT

Tests were conducted with a 0.5 hub/tip ratio compressor stage comprising a variable camber inlet guide vane, rotor, and an adjustable trailing edge stator to determine the extent that these variable geometry features can be applied to extend the stable operating range of axial flow compressors. The stage was designed for zero prewhirl at design equivalent rotor speed (SLTO conditions) and 35- to 20-degree (hub/tip) prewhirl at 70% of design rotor speed (high Mach number cruise conditions). The design performance goals for the SLTO and cruise configurations were met. Comparing the two configurations, the cruise configuration permitted stable operation and good efficiency at lower flow for a given rotor speed than the SLTO configuration.

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SUMMARY

An experimental investigation was conducted to determine the extent that a variable camber inlet guide vane and an adjustable trailing edge geometry stator can increase the stable operating range of a low hub/tip ratio compressor stage. For this investigation a 0.5 hub/tip ratio single-stage compressor, resembling the front stage of a typical high cruise flight Mach number compressor, was used. The stage was designed for zero prewhirl at design equivalent rotor speed (SLTO conditions) and 35- to 20-degree (hub/tip) prewhirl at 70% of design rotor speed (high Mach number cruise conditions). The design rotor tip relative Mach number was 1.15 for the SLTO configuration and the design stage pressure ratio and efficiency were 1.32 and 85.1% respectively.

The SLTO configuration was tested over a range of rotor speeds from 50 to 110 percent of design equivalent rotor speed and the cruise configuration was tested from 50 to 100 percent of design equivalent rotor speed. At SLTO design operating conditions, the SLTO configuration achieved a pressure ratio and efficiency of 1.39 and 90%, respectively. At cruise rotor speed, the cruise configuration permitted stall free operation at lower flows than those possible with the SLTO configuration. The efficiency of the cruise configuration at cruise rotor speed and flow conditions was 89.8% compared with an efficiency of 80.5% for the SLTO configuration. Thus, the variable geometry features of the inlet guide vane and stator provided the blade row matching required for efficient operation at SLTO and cruise conditions.

INTRODUCTION

As cruise Mach number increases, the supersonic cruise operating point of fixed-geometry front stages in turbojet engine compressors tends to approach the stall line. This results from the flow limitation in the compressor rear stages at cruise rotor speed and pressure ratio conditions. This imposes a reduction in compressor inlet flow and axial velocity below that for which the front stages are designed to operate efficiently. When the reduction in axial velocity becomes proportionally greater than the reduction in blade tip velocity, rotor incidence angle increases above the sea level take-off (SLTO) design value. If the increase in incidence angle is sufficiently large, the front stages may be subject to stall. Front-stage stall can lead to reduced compressor performance and possibly to compressor surge. One approach to this problem is to provide mechanical adjustment of the guide vane and stator leading and/or trailing edge metal angles. Mechanical adjustment of these angles would permit selection of the proper stage velocity triangles over the required operating range.

An experimental investigation was conducted, using a single stage compressor, to evaluate the extent that variable geometry concepts can be applied to increase the stable operating range of a compressor front stage. A variable-camber inlet guide vane, a rotor, and two variable geometry stator configurations were designed, fabricated, and tested over a range of equivalent rotor speeds from 50 to 110% of the design rotor speed. The stage was designed with zero-degree rotor prewhirl at design equivalent rotor speed (SLTO conditions) and 35- to 20-degree (hub/tip) prewhirl at 70% speed (high Mach number cruise conditions). The SLTO design point equivalent rotor speed and flow were 6050 rpm and 265 lb/sec respectively. Cruise design point equivalent rotor speed and flow were 4235 rpm and 143 lb/sec, respectively.

The variable-camber guide vanes had modified 63 series airfoil sections and were configured with a fixed leading edge segment and two articulated flap segments. The rotor, designed with circular arc airfoils, had a tip inlet relative Mach number of 1.15. The stator configurations had 65 series airfoil sections and were designed to turn the flow back to the near-axial direction at the SLTO operating point. For

the cruise configuration, the stator camber was reduced to provide a hypothetical second stage rotor prewhirl distribution of approximately 30- to 25-degree (hub/tip) at the cruise operating point. One stator design had a fixed-geometry leading edge and an adjustable trailing edge (Stator A), and the other stator design had adjustable leading and trailing edge geometry (Stator B).

Details of the experimental stage aerodynamic and mechanical design are presented in Reference 1. The results of an annular cascade test program for the preliminary evaluation of candidate variable geometry designs are presented in Reference 2. This report presents the data and performance obtained with the variable-camber guide vane, rotor, and the Stator-A design having a fixed-geometry leading edge and variable geometry trailing edge.

TEST EQUIPMENT

Facility

The compressor test facility is shown in figure 1. The compressor rotor is driven by a single-stage free turbine that is powered by exhaust gases from a J75 slave engine. Drive turbine speed is controlled by means of the engine throttle. Air enters the compressor test section through a 103-ft combined inlet duct, plenum, and bellmouth inlet. Air is exhausted through an exit diffuser to the atmosphere. A 7-degree diffuser at the plenum inlet and 10:1 bellmouth contraction ratio ensured uniform flow conditions at the compressor inlet.

Compressor Test Rig

The compressor rig, shown in figure 2, comprises a bellmouth inlet section, a test section, and an exhaust section. The rotor assembly and shaft are supported on two bearings that transmit loads to the outer case through the stationary leading edge segments of the variable-geometry inlet guide vanes and the struts in the exhaust case. A set of motor-driven throttle vanes is located in the exhaust case to vary flow rate. A sectional view of the flow path is shown in figure 3. The inlet guide vane station is preceded by a flow straightening section approximately 10-inches long. The inner flow path wall converges from a diameter of 18.70 inches at the guide vane inlet to a diameter of

25.60 inches at the stator exit. The outer wall diameter converges slightly from 43.20 to 42.10 inches. The hub/tip ratio at the rotor leading edge is 0.492. In general, the flow path is designed to resemble the front stage environment of a state-of-the-art high cruise Mach number compressor. The blade rows were spaced to permit the installation of instrumentation.

The nominal rotor tip clearance measured during rig assembly was 0.028 inch, which resulted in essentially zero running tip clearance. A sprayed aluminum shroud was utilized to prevent damage to the rotor blade tips if the blades rubbed the shroud during operation near or in stall. Inspection of the rig after the test program revealed that the tip clearance had increased to approximately 0.080 inch near the leading edge and 0.036 inch near the trailing edge of the rotor due to shroud abrasion by the blade tips.

Blading Design

Inlet Guide Vane

The variable-camber inlet guide vane was designed to provide axial inlet flow (zero swirl) in the SLTO configuration and 35- to 20-degree (hub/tip) swirl distribution in the cruise configuration. Slightly modified 63 series airfoil sections were used. The basic camber was selected to provide approximately two-thirds of the anticipated air turning requirement at the cruise operating point. The SLTO and cruise positions were achieved by actuating two articulated flap segments in the appropriate direction to reduce or increase camber angle from the basic design camber angle. A photograph of the variable-camber guide vane is shown in figure 4. Guide vane geometry details are summarized in table 1. Symbols are defined in Appendix A. Additional design information is presented in Reference 1.

Rotor

The rotor had 34 blades designed with circular-arc airfoil sections. The design point inlet relative Mach number at the tip was 1.15 and the design diffusion factor was nominally 0.40. Blade chord length and solidity were representative state-of-the-art values for a high cruise Mach number front stage. A part span shroud was provided at 40 percent

Table 1. Inlet Guide Vane Geometry Design Data

Airfoil Series: 63
No. of Blades: 20

Aspect Ratio: 2.642
Thickness Ratio: 0.09

SLN Configuration

Percent Span (from Tip)	κ_1	κ_2	ϕ	γ°	c	σ	δ°
90	-20.2	5.4	25.6	1.2	4.55	1.412	Approximately
70	-20.2	3.7	23.9	0.5	4.55	1.245	1.0 Degree
50	-20.2	1.9	22.1	-0.2	4.55	1.080	Estimated
30	-20.2	0.3	20.5	-0.9	4.55	0.913	
10	-20.2	-1.6	18.6	-1.6	4.55	0.748	

Cruise Configuration

90	-20.2	36.0	56.2	21.1	4.47	1.412	2.2
70	-20.2	34.3	54.3	20.5	4.47	1.245	3.2
50	-20.2	32.5	52.7	19.9	4.47	1.080	4.3
30	-20.2	30.9	51.1	19.2	4.47	0.913	5.9
10	-20.2	29.0	49.2	18.5	4.47	0.748	7.1

span from the tip to reduce blade resonance stress to safe limits. Rotor geometry details are summarized in table 2 and additional rotor design information is contained in Reference 1.

Stator A

The variable geometry Stator A configuration, designed with 65 series airfoil sections, comprised a fixed forward segment with a flap hinged at approximately 40% chord. At the SLTO design point, midspan values of stator inlet Mach number and diffusion factor were 0.56 and 0.33, respectively. The stator equivalent camber at midspan was 42.2 degrees and the trailing edge metal angle was increased approximately 26 degrees (in a direction to unload the airfoil) for operation at cruise conditions. The design details for Stator A are summarized in table 3. In the cruise configuration, Stator A operated at relatively high incidence angles (i_m) because of the Stator A fixed-geometry leading edge. The prescribed minimum loss incidence angles for a conventional airfoil, designed for the same air-turning distribution, are indicated in parentheses.

Additional stator design information is presented in Reference 1. A photograph of Stator A is presented in figure 4.

Instrumentation

Instrumentation was provided to obtain overall and blade element performance data for each blade row. Axial locations of instrumentation stations are indicated in figure 2 and the circumferential locations of instrumentation at axial stations 1, 2, and 2a are shown in figures 5 through 7, respectively.

Airflow was measured with an ASME standard thin-plate orifice located in the inlet duct shown in figure 1. Inlet total pressure and temperature was measured in the plenum by means of three Kiel-type total pressure probes and six half-shielded total temperature probes. Four equally spaced static pressure taps were located on both the inner and outer wall at Station 0. The static pressure measurements at this station were used to check orifice weight flow.

Table 2. Rotor Geometry Design Data

Airfoil Series: Circular Arc
No. of Blades: 34
Aspect Ratio: 2.829

SLTO Configuration

Percent Span (from Tip)	κ_1	κ_2	ϕ	γ°	i_m	c	σ	t/c	δ°	$\bar{\omega}$
90	48.6	18.8	29.8	31.2	1.4	3.24	1.42	0.0744	6.1	0.024
70	52.5	32.5	20.0	41.2	1.4	3.43	1.30	0.0641	4.3	0.024
50	56.1	42.1	14.0	48.2	1.2	3.63	1.20	0.0542	3.8	0.033
30	59.6	48.6	11.0	53.6	0.4	3.82	1.12	0.0445	3.3	0.058
10	63.2	52.9	10.3	57.9	10.0	4.01	1.06	0.0355	3.8	0.097

Cruise Configuration

90	48.6	18.8	29.8	31.2	-1.7	3.24	1.42	0.0744	6.2	0.030
70	52.5	32.5	20.0	41.2	2.3	3.43	1.30	0.0641	4.3	0.018
50	56.1	42.1	14.0	48.2	4.3	3.63	1.20	0.0542	2.9	0.030
30	59.6	48.6	11.0	53.6	4.9	3.82	1.12	0.0445	2.3	0.064
10	63.2	52.9	10.3	57.9	4.5	4.01	1.06	0.0355	2.5	0.125

Table 3. Stator A Geometry Design Data

Airfoil Series: 65
No. of Blades: 40

Aspect Ratio: 2.939
Thickness Ratio: 0.08

SLTO Configuration

Percent Span (from Tip)	κ_1	κ_2	ϕ	γ°	i_m	c	σ	δ°	$\bar{\omega}$
90	40.9	-8.7	49.6	16.0	-4.2	2.75	1.28	12.8	0.026
70	37.1	-7.5	44.6	14.5	-3.3	2.88	1.19	10.1	0.025
50	34.7	-7.5	42.2	13.5	-3.2	3.00	1.12	9.3	0.026
30	34.0	-8.0	42.0	13.2	-3.2	3.13	1.07	9.8	0.029
10	36.0	-8.9	44.9	13.5	-4.8	3.27	1.02	11.0	0.032

Cruise Configuration

90	40.9	17.3	23.6	-	6.8(-2.2)*	-	1.28	11.9	0.040
70	46.1	18.5	29.6	-	10.7(1.7)	-	1.19	9.0	0.038
50	34.7	18.5	16.2	-	12.2(3.2)	-	1.12	8.2	0.030
30	43.0	18.0	25.0	-	12.2(3.2)	-	1.07	8.4	0.024
10	36.0	17.1	18.9	-	10.2(1.2)	-	1.02	9.3	0.027

*Numbers in parentheses refer to minimum loss incidence for conventional airfoil sections.

Air angle was measured by 20-degree wedge traverse probes. These probes were located circumferentially behind the inlet guide vane and stator to isolate the probes from vane wakes. The 20-degree wedge traverse probe shown in figure 8 includes a total pressure tube for total pressure measurement.

Total pressure measurement behind the guide vane and stator was accomplished by two stationary wake probes at each station. One wake probe had three sets of 14-tube rakes at 10, 50, and 90% span locations and the other wake probe had two sets of 14-tube rakes at 30 and 70% span locations. The rake heads were aligned with the air stream within approximately ± 5 degrees for both SLTO and cruise configuration operation. The acceptance yaw angle of the rake tubes was ± 10 degrees for a pressure accuracy within $\pm 1\%$ of P-p. The wake probe was translated circumferentially to keep the wake centered on the rakes when the guide vane and stator flaps were in the cruise position. A typical wake probe rake is shown in figure 9. The 20-degree wedge traverse probes used for air angle measurement behind the guide vane and stator also measured total pressure to provide a check on the mid-channel total pressures obtained with the wake probes. Total pressures behind the rotor were measured with the two 20-degree wedge traverse probes and two radial rakes with Kiel-type probes mounted at 10, 30, 50, 70, and 90% span. The traverse probes and radial rakes were spaced to approximately average the circumferential total pressure profile generated by the inlet guide vanes. Total temperatures were measured behind the stator using Kiel-type probes mounted on four radial rakes. The temperature rakes were spaced approximately 90-degrees apart and were located with respect to each other at 0, $1/4$, $1/2$, and $3/4$ of a guide vane gap. Total pressure and temperature rakes are shown in figure 10.

Radial distributions of static pressures behind the guide vane, rotor, and stator were measured by 8-degree wedge traverse probes, such as that shown in figure 11. Four approximately equally spaced static pressure taps were provided on the inner and outer walls behind the guide vane and stator. Four taps were located on the inner wall and 12 taps were located on the outer wall behind the rotor. The eight

additional outer wall taps behind the rotor were spaced across one equivalent guide vane gap (18-degree arc) to determine the circumferential static pressure variation associated with guide vane wakes.

Three Kistler high-response pressure transducers were installed approximately 30 and 60 degrees apart at 10 percent span behind the rotor to measure the number, size, and rotational speed of rotating stall zones.

Rotor blades and stator vanes were instrumented with strain gages to measure torsional and bending stresses.

Rotor speed was measured with an electromagnetic sensor mounted adjacent to a 60-tooth gear on the rotor shaft. Gear-tooth passing frequency was displayed as rpm on an Anadex digital counter.

Steady-state pressure measurements were recorded on a Scanni-valve multichannel pressure transducer system. Traverse probe data (total and static pressures, air angle, and radial position) were recorded on magnetic tape at the rate of 60 samples (20-inch probe travel) per minute. Temperatures were indicated on precision potentiometers and manually recorded.

Orifice static pressure, bellmouth static pressure, plenum pressure, and representative stage exit pressure instrumentation were close-coupled to transducers for high-response transient recording of flow and pressure ratio during operation into and out of stall. Similar instrumentation was connected to manometers in the control room to permit setting the desired steady-state pressure ratio and flow conditions.

PROCEDURES

Test Procedure

Overall and blade element performance data were obtained at the sea level take-off and cruise positions of the variable camber inlet guide vane and variable geometry Stator A. In the sea level take-off position (zero prewhirl), data were obtained at 50, 70, 80, 100 and 110 percent of design equivalent rotor speed. In the cruise position (35- to 20-degree hub/tip prewhirl), data were obtained at 50, 70, 80, and 100 percent of design rotor speed. For each geometry setting, data were

recorded at approximately six pressure-ratio and flow conditions on each speed line. Data points were distributed from maximum flow to near stall. For the sea level take-off configuration, data points near stall at 100 and 110% of design rotor speed were obtained with a reduced inlet pressure (approximately 11 psia) because of the test stand horsepower limit. For each data point, the fixed pressure and temperature instrumentation data were recorded with the traverse probes withdrawn. The traverse probes were subsequently immersed in the air stream and data was recorded as the probes were traversed from the inner to the outer wall.

Orifice and bellmouth static pressures, exit total pressure, and rotor speed were recorded on magnetic tape at the rate of 600 samples per minute as the compressor was operated into and out of stall at each of the test rotor speeds. Kistler transducer data were also recorded during the excursions into stall to define the rotating stall patterns. Time correlation between the Kistler and stall transient pressure recordings permitted correlation of the Kistler and stall transient data.

Data Reduction Procedure

Data reduction was accomplished in four steps. Initially, the raw data compiled on magnetic tape and IBM cards was converted to engineering units which were subsequently recompiled on a storage tape and tabulated for preliminary inspection. The second data reduction step accomplished the following:

1. Mach number corrections, as required, for traverse probe data.
2. Correction of pressure and temperature data to NASA Standard Day conditions.
3. Mass averages of guide vane and stator wake pressures (these were subsequently performed in a separate computer program).
4. Calculation of corrected flow.
5. Calculation of radial distribution of flow parameter (for radial mass flow averaging of total pressures in subsequent procedure).
6. Circumferential arithmetic averages of fixed and traverse instrumentation data.

The results of the second data reduction step were printed to permit a more detailed inspection of the data so that apparent inconsistencies could be eliminated prior to the calculation of performance and vector diagram variables.

Pressure ratios were calculated for the rotor, guide vane-rotor, and the entire stage. Stage inlet total pressure was corrected to the NASA Standard Day conditions, 14.69 psia. The exit total pressures for the guide vane, rotor, and stator were weighted according to local mass flow to obtain the average values. The guide vane and stator wake total pressures at each radial measuring station were mass averaged using the local total pressures in the wake and the 8-degree wedge probe static pressure to define the local Mach numbers. Mass flux was then obtained from the relationship

$$\dot{m} = \frac{W \sqrt{T}}{PA} = \sqrt{\gamma g/R} \quad M \left[1 + \frac{\gamma - 1}{2} M^2 \right]^{1/2} p/p$$

where T is the measured total temperature and A is the flow area associated with each total pressure tube. With the radial distribution of total pressure and mass flux calculated, the total pressures were mass averaged in the radial direction. Behind the rotor, the total pressures obtained with the two 20-degree wedge probes were arithmetically averaged. The resulting radial distribution was mass flow averaged using the 8-degree wedge probe static pressure and stator exit radial temperature distribution to define weight flow.

Performance and vector diagram calculations were performed two ways. The first method used the measured static pressure distributions to define the velocity distributions at each axial station. The second method, a streamline analysis, calculated a static pressure distribution that satisfied radial equilibrium and continuity. For the streamline analysis calculation, adjustments could be made to an input boundary layer displacement factor to achieve agreement between the calculated and measured static pressure.

The streamline analysis computer program was used to permit translation of the velocity diagram data from instrumentation axial stations to the respective adjacent blade row leading and trailing edge stations for

comparison with the design velocity diagram results (Reference 1). The translation was performed with the assumption of isentropic flow and constant angular momentum along design stream annuli. The centers of the design stream annuli intersected each blade row leading edge at the 10, 30, 50, 70, and 90% span positions from the tip.

The velocity diagram data presented herein were calculated using the streamline analysis computer program and correspond to the leading and trailing edges of the rotor and stator blade rows identified by the dashed lines in figure 3. Loss coefficient calculations for the guide vane and stator were performed in a separate computer program to permit use of the wake freestream total pressure as the upstream pressure and to permit the elimination of certain rake tube pressures that were apparently faulty and affected the credibility of the calculated loss coefficient.

Rotor overall performance and loss coefficients were based on the inlet total pressures that resulted from integration of the as-measured guide vane wake pressures. The discrepancies in guide vane wake pressures that influenced guide vane loss coefficients had a negligible effect on the calculated rotor loss. The rotor loss coefficients were based on the measured static pressure rather than the calculated static pressure. Measured static pressure was used because of the sensitivity of the calculated rotor blade relative total pressure to static pressure and because the calculated static pressure differed slightly from the measured values for test points near stall and maximum flow. Consequently, the loss coefficient data for the three blade rows correspond to the measuring stations ahead and behind each blade row (along the aforementioned design streamlines) rather than the blade row leading and trailing edges.

PRESENTATION OF DATA

Overall Performance

Overall performance data are presented in terms of pressure ratio and adiabatic efficiency as functions of corrected weight flow ($W\sqrt{\theta}/\delta$), specific weight flow $\left(\frac{W\sqrt{\theta}}{A_A\delta}\right)$, and equivalent rotor speed ($N/\sqrt{\theta}$).

Overall performance is also summarized in terms of pressure coefficient (ψ) as a function of flow coefficient (ϕ). Definitions of calculated performance variables and symbols are presented in Appendix A.

Pressure ratio and efficiency for the rotor, guide vane-rotor, and guide vane-rotor-Stator A are presented in figures 12, 13, and 14, respectively for the SLTO configuration and in figures 15, 16, and 17, respectively for the cruise configuration. The dashed-line portion of the speed lines in figures 14 and 17 refer to transient data and the data point on the stall line is the incipient stall point determined from the transient data. The corrected flows and pressure ratios for steady-state data points are tabulated in table B-1. The near stall data point at 110% design rotor speed for the rotor and guide vane-rotor (figures 12 and 13, respectively) was omitted because the transducer for guide vane exit pressure measurement was overscaled during the test. The near-stall point pressure ratio and efficiency for the stage are included in figure 14. Efficiency contours are presented for both configurations in figure 18. Pressure rise coefficient (ψ) is presented as a function of flow coefficient (ϕ) for both configurations in figure 19.

Two qualifying statements must be made concerning the efficiency data presented in figures 12, 13, 15, and 16. First, the mass average temperature used in the efficiency calculations was based on the temperature and flow distributions measured at Station 2A downstream of the stator. Redistribution of the flow through the stator may produce a slight difference between the mass average temperature behind the rotor and the value based on stator exit conditions. This temperature difference would be reflected in the rotor and guide vane-rotor efficiencies. The second qualification concerns the use of measured guide vane wake total pressure (as discussed under Data Reduction Procedure) in the calculation of rotor pressure ratio and efficiency. Discrepancies in rotor efficiency, resulting from observed discrepancies in the guide vane wake profiles, are within ± 1.0 percent.

Although the data in figures 12, 13, 15, and 16 are generally correct performance levels for the rotor and guide vane-rotor combination, the most valid assessment of stage and blade-row performance is presented in the overall performance data in figures 14 and 17 and the detailed blade element data in the following section.

Figure 14 indicates that the SLTO configuration exceeded its predicted performance. The predicted stage pressure ratio and efficiency were 1.32 and 85.1%, respectively as compared with the measured values of 1.39 and 90%. The higher measured performance is partially attributed to the initially low running-blade-tip clearance (see section on Compressor Test Rig, page 4) and high rotor tip loading due to slightly negative guide vane tip swirl in the SLTO position. After a few excursions through stall at design rotor speed, the tip clearance was noticeably increased due to abrasion of the aluminum-sprayed shroud by the blade tips. With the increased tip clearance, the cruise configuration performance (figure 17) was approximately as predicted. At cruise conditions, the predicted pressure ratio and efficiency for this configuration were 1.13 and 90.2%, respectively, compared with measured values of 1.146 and 89.5%. At the cruise rotor speed and flow conditions, the SLTO configuration efficiency (figure 14) was approximately 80.5%. As shown in figure 14, the stall limit for the cruise configuration shows a slight improvement over the stall limit of the SLTO configuration for equivalent rotor speeds between 50 and 80% of design rotor speed.

The relatively high efficiencies for the SLTO configuration at SLTO conditions and for the cruise configuration at cruise conditions are shown in the efficiency contours in figure 18.

Inspection of the pressure-coefficient/flow-coefficient data presented in figure 19 indicates that, at a given rotor speed, the cruise configuration permitted stable compressor operation at lower flow coefficients than obtained with the SLTO configuration. For 70% of design rotor speed, the flow coefficient for the cruise configuration is approximately 0.4 as compared with a value of 0.45 for the SLTO configuration.

Blade Element Performance For Sea Level Take-Off Configuration

Inlet Guide Vane

Guide vane exit air angle distributions for the SLTO configuration operating at design equivalent rotor speed are presented in figure 20. Comparison of the data with the design distribution indicates only a slight variation from the zero-swirl design distribution. Relative to

the design rotor incidence conditions, the swirl gradient shown in figure 20 would impose slightly lower incidence on the rotor hub and slightly higher incidence on the rotor tip.

Inspection of the guide vane loss coefficient results calculated by the initial data reduction computer program indicated that (1) values were unexpectedly low in the hub region for the SLTO configuration and (2) values were high, with considerable data scatter, in the tip region for the cruise configuration. Evaluation of the guide vane wake total pressures indicated that one or two tubes in each rake, that should have been reading freestream pressures, were actually reading slightly high or low when compared to a corrected pressure of 14.696 psia. The influence of these erroneous readings on the integrated wake pressure was significant. Consequently, a separate computer program was prepared to integrate the guide vane wakes with the freestream pressures corrected. Loss coefficient calculations for the hub, mean, and tip sections (90, 50, and 10% of span, respectively) were performed at the 70 and 100% design equivalent rotor speeds to obtain a representative distribution of guide vane loss with respect to Mach number and radial position. The results are presented in figure 21. The midspan loss coefficient value of approximately 0.02 for Mach numbers between 0.25 and 0.55 agrees with the annular cascade result (Reference 2) of 0.021 at an inlet Mach number of 0.214.

Guide vane velocity diagram data for all five spanwise measuring stations are presented in table B-2.

Rotor

The rotor inlet relative air angle and Mach number distributions achieved with the variable camber guide vane in the SLTO position at design equivalent rotor speed are shown in figure 22. The distributions that correspond to near-design flow conditions agree closely with the respective design distributions. The rotor diffusion factor, deviation angle, and loss coefficient obtained at each of the five radial stations are shown as functions of incidence angle in figures 23 through 27. The predicted values for design incidence conditions are shown in each figure

for comparison with the data.* The predicted and measured performance compare favorably. The relatively low loss coefficients in the hub region (figure 27), may be attributed to (1) local influence of guide vane wakes and/or the stator leading edge flow field on the static pressure measurement behind the rotor, and (2) the possibility of having omitted the influence of guide vane wakes in the total pressure average obtained with the two 20-degree wedge probes.

Static pressure measurements, obtained behind the rotor at the outer wall locations (figure 6), are presented as a function of equivalent guide vane and stator blade gap in figure 28. The pressure distribution presented in figure 28 indicates two regions of high and low pressure relative to a guide vane gap and one region of high and low pressure relative to a stator gap. The circumferential variation in static pressure was considered to be primarily associated with the stator flow field because (1) the measured guide vane wake at 10% span from the tip was relatively small (figure 29) and (2) the static pressure taps at Station 2 were in close proximity to the stator leading edge (figure 3).

The static pressure value at the outer wall, obtained from extrapolation of the 8-degree wedge traverse probe static pressure data, is shown in figure 28. The extrapolated value compares favorably with the average of the wall static pressures.

Table B-2 presents additional rotor velocity diagram and blade-element performance for other rotor speeds.

Stator A

Stator A inlet conditions for the SLTO configuration are shown in figure 30. The inlet Mach number and air angle distributions for near-design weight flow agree reasonably well with the design distributions.

* The rotor diffusion factor design points presented in figures 23 through 27 are defined by the corresponding equation in Appendix A. This definition accounts for the effect of the streamline diameter change across the rotor. The effect of this change was significant in the rotor hub region. The predicted rotor diffusion factors presented in Reference 1 do not account for the streamline diameter change and should not be used for comparison with the data in these figures.

Stator A diffusion factor, deviation angle, and loss coefficient are presented as functions of incidence angle at the five spanwise locations in figures 31 through 35. In general, the measured diffusion factors are slightly lower than the design value and the measured deviation angles and loss coefficients are slightly higher than the design values.

Stator exit air angle distributions are shown in figure 36. As indicated by the design air angle distribution, the Stator A SLTO configuration was intended to turn the flow to the near-axial direction. The experimental values for near design flow conditions were between 4 and 6 degrees above the design values across the span. At near design flow conditions, this difference between design and experimental values was caused by a higher deviation angle than predicted and resulted in a high stator exit tangential velocity component. The high value of this component lowered the diffusion factors slightly below the respective design values presented in figures 31 through 35. Stator exit tangential velocities for a corrected weight flow of 268.8 lb/sec are compared in table 4 with the design values for the design flow of 265 lb/sec.

Table 4. Comparisons of Stator Exit Tangential Velocities

Percent Span (from Tip)	V_{θ} Measured	V_{θ} Design
90	79.7	43.2
70	77.8	26.8
50	76.6	19.2
30	65.9	18.3
10	67.5	20.7

Table B-2 presents additional Stator A velocity-diagram and blade-element performance data.

Blade Element Performance For Cruise Configuration

Inlet Guide Vane

The swirl distribution achieved with the variable camber inlet guide vane in the cruise configuration at cruise rotor speed (70% of

design equivalent rotor speed) is compared with the cruise design distribution in figure 37. The guide vane exit air angle is about 2 degrees low between 20 and 70% span and approximately 5 degrees below the design swirl angle in the hub and tip regions.

Guide vane loss coefficient for the hub, mean, and tip sections are presented in figure 38. The method used to integrate the cruise configuration guide vane wakes was the same as that described previously for the SLTO configuration guide vane wakes. For a swirl angle of 26 degrees (figure 37), the average midspan value of loss coefficient presented in figure 38 is 0.025 as compared with a value of 0.0167 for the 30-degree swirl guide vane (Reference 2). The higher loss of the variable camber guide vane is attributed to the slight departure of the section geometry from a conventionally-designed fixed-camber guide vane. It was expected that the variable camber vane profile loss would be slightly greater than that of a conventional vane. Additional guide vane blade element data for the cruise configuration is presented in table B-3.

Rotor

The rotor inlet relative Mach number and air angle distribution achieved with the cruise configuration guide vane setting at cruise rotor speed are shown in figure 39. The measured Mach number levels for maximum flow, near-design, and stall flow conditions are slightly higher than the design Mach number level. The experimental values of inlet relative air angle for design flow conditions compare favorably with the design distribution.

For comparative purposes, figure 39 also includes the inlet relative air angle distribution obtained with the SLTO configuration guide vane setting at cruise rotor speed and flow conditions. This comparison illustrates the high incidence angles that a fixed SLTO configuration would encounter at cruise conditions.

Rotor diffusion factor, deviation angle, and loss coefficient for cruise rotor speed conditions are presented in figures 40 through 44. The data in figures 40 through 44 compare favorably with the indicated design values. For the 70 and 90% span locations (figures 43 and 44, respectively), the loss data show considerable scatter with several values below zero. These apparent errors are attributed to (1) guide vane wake

influence on the static pressure measurements and/or (2) improper averaging of the guide vane-induced circumferential total pressure profile. Additional rotor velocity diagram data are presented in table B-3.

Stator A

Stator A inlet conditions for cruise configuration and rotor speed are shown in figures 45 and 46. Figure 45 indicates that the data compare excellently with the design stator inlet Mach number distribution and with the expected range of rotor exit absolute air angle with respect to the design air angle distribution. The droop in the air angle distributions at 10% span from the tip, particularly for the stall point, is caused by a fairly steep negative radial velocity gradient at the outer wall (table B-3). The incidence distribution for the fixed-geometry leading edge Stator A configuration at cruise operating conditions is shown in figure 46. The incidence angles at midspan are approximately 9 degrees higher than the indicated minimum loss incidence for a conventional 65 series airfoil section designed for the same air turning angle. The measured incidence angles are similar in magnitude to those expected with the Stator A fixed leading edge at cruise rotor speed.

Stator A diffusion factor, deviation angle, and loss coefficient for cruise configuration and rotor speed are shown in figures 47 through 51. Additional Stator A velocity diagram and performance data for cruise geometry are presented in table B-3.

The predicted values of diffusion factor, deviation angle, and loss coefficient at the cruise design point were derived for a conventional 65 series stator having the same air turning requirement as the Stator A cruise configuration (Reference 1). These predicted values, shown for comparative purposes in figures 47 through 51, are plotted according to the incidence angles that correspond to cruise design point rotor exit conditions and the Stator A fixed leading edge metal angles. As noted previously in figure 46, the cruise design point stator incidence angles are approximately 9 degrees larger than the minimum loss incidence for conventional 65 series blading having the same loading. At this relatively high incidence angle, it might be expected that the stator losses would be high. However, inspection of the data in figures 47 through 51 indicates that the loss distributions at the relatively high level of

incidence angle define minimum losses that are not significantly greater than the minimum loss values predicted for the conventional stator. Furthermore, the diffusion factors and deviation angles at all five span locations agree favorably with the corresponding values predicted for the conventional airfoil. These results are illustrated in slightly more detail using the midspan data in figure 49. The minimum-loss incidence angle for Stator A is about 8 degrees higher than the minimum-loss incidence of the conventional airfoil. The minimum loss coefficient value of 0.06 is not considered prohibitively high, even though it is twice as large as the minimum loss predicted for the conventional airfoil. The design diffusion factor is achieved at an incidence angle of about 13.5 degrees. The minimum loss incidence angle for a conventional 65 series airfoil designed for this diffusion factor is 3.2 degrees. The apparent influence of the Stator A cruise configuration on low-loss incidence angle range ($\bar{\omega} \leq \bar{\omega}_{\min} + 0.02$) is also noted in figure 49. The cascade low-loss range for the conventional stator is approximately 15 degrees, compared with a low-loss range of 9 degrees for the Stator A cruise configuration.

These results are attributed to the effect of the Stator A flap position on the distribution of static pressure on the suction and pressure surfaces. As the flap is rotated to increase the trailing edge metal angle (decrease camber), the stator leading edge loading is progressively decreased, thus permitting low-loss operation at relatively high incidence angles. Simultaneously, the loading on the pressure surface is increased due to the local reversal of camber angle and the associated adverse pressure gradient in the region of the flap hinge. As incidence angle is decreased, associated pressure surface boundary layer growth and/or separation would lead to the development of high loss at a higher level of incidence angle than that for the conventional airfoil section.

The stator exit air angle distribution for the cruise configuration is compared with the predicted (design) distribution in figure 52. The air angles for near-cruise design flow compare favorably (within approximately 1.0 degree) with the design distribution.

In general, the blade element performance results obtained with the Stator A cruise configuration suggest that a variable camber stator, with a fixed leading edge section and variable flap, can be configured to operate with reasonably low losses over a wide range of inlet and exit air angle combinations.

Rotating Stall

Rotating stall data were obtained as part of the stall transient recordings at each rotor speed for the SLTO and cruise configurations. Time correlation between the Kistler probe data (used for rotating stall measurement) and the stall transient instrumentation permitted correlation of the rotating stall characteristics with overall performance. The method described in Appendix C was used to determine the number, size, and rotational speed of the stall zones. The results obtained at initial stall conditions for the SLTO configuration at 100 and 70% of design rotor speed are presented in table 5. In general, rotating stall for all rotor speeds was characterized by one stall zone, rotating at approximately one-half of rotor speed and covering about one-half of the annulus.

Table 5. Rotating Stall Results

	No. of Zones	Percent of Rotor Speed	Circumferential Extent of Zones (%)
SLTO Configuration			
Design Rotor Speed	1	56.5	43
70% Design Rotor Speed	1	60.5	52
Cruise Configuration			
70% Design Rotor Speed	1	45	60

A relatively severe transient into deep stall was obtained for the SLTO configuration at 70% rotor speed. The results are presented in figure 53. For the configuration and rotor speed conditions represented, the onset of rotating stall and the initial stall point, determined from the stall transient instrumentation, were coincident. As indicated by the table in figure 53, a single zone was measured at initial stall. The measured stall zone extended over more than 180 degrees of the annulus

and rotated at approximately one-half of the rotor speed. The stall zone persisted until Point 3 in the figure was reached and then disappeared. The stall zone reappeared at Point 4, and remained until Point 6 was reached. Comparison of the transient data, progressing into and out of stall, indicates an unstalling hysteresis. The pressure ratio at Point 6 is significantly lower than the pressure ratio at Point 1. The point numbers in figure 53 are shown on the transient data record in figure 54. Figure 54 is a reproduction of stall transient pressure and rotor speed data and Kistler rotating stall data. It is noted that the probes for rotating stall measurement were located at 10% span from the tip and therefore reflect only what was happening in the tip region. Future rotating stall measurements would be more informative if they were obtained in both the hub and tip regions. Moreover, valve positions would be useful as part of the transient data to ascertain the exact time the valve is opening or closing.

CONCLUDING DISCUSSION

Tests were conducted with a 0.5 hub-tip ratio compressor stage comprising a variable camber inlet guide vane, rotor, and an adjustable trailing edge stator to determine the extent that these variable geometry features can be applied to extend the stable operating range of axial flow compressors. Two design configurations were evaluated (1) a design configuration corresponding to SLTO operating conditions (100% design equivalent rotor speed and corrected airflow of 265 lb/sec) and (2) a configuration corresponding to supersonic cruise conditions (70% of design equivalent rotor speed and corrected airflow of 143.3 lb/sec). Each configuration was tested over a range of rotor speed and flow that encompassed both the SLTO and cruise design point conditions.

At SLTO operating conditions, the SLTO configuration achieved a pressure ratio and efficiency of 1.39 and 90%, respectively compared with predicted values of 1.32 and 85.1%. At cruise rotor speed, the cruise configuration permitted stall free operation at lower flows than those possible with the SLTO configuration. The efficiency of the cruise configuration at cruise rotor speed and flow conditions was 89.8% compared with an efficiency of 80.5% for the SLTO configuration. Thus, the variable

geometry features of the inlet guide vane and stator provided the blade row matching required for efficient operation at SLTO and cruise conditions.

Although the fixed leading edge variable Stator A design was initially of some concern because it required operation at relatively high incidence angles at cruise conditions, the test results indicated that low-loss operation at a high level of incidence angle is possible. This result was attributed to the influence of the stator flap position on the relative loading of the suction and pressure surfaces.

The overall and blade element performance results obtained with this compressor stage indicate that a variable camber inlet guide vane and a fixed leading edge-variable trailing edge stator (one moving part) can effectively accommodate a wide range of compressor inlet operating conditions.

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1. "Single Stage Experimental Evaluation of Variable Geometry Guide Vanes and Stators, Part I - Analysis and Design," NASA CR-54554, PWA FR-2112, 2 August 1968.
2. "Single Stage Experimental Evaluation of Variable Geometry Guide Vanes and Stators, Part II - Annular Cascade Investigation of Candidate Variable Geometry Designs," NASA CR-54555, PWA FR-2297, 14 July 1967.

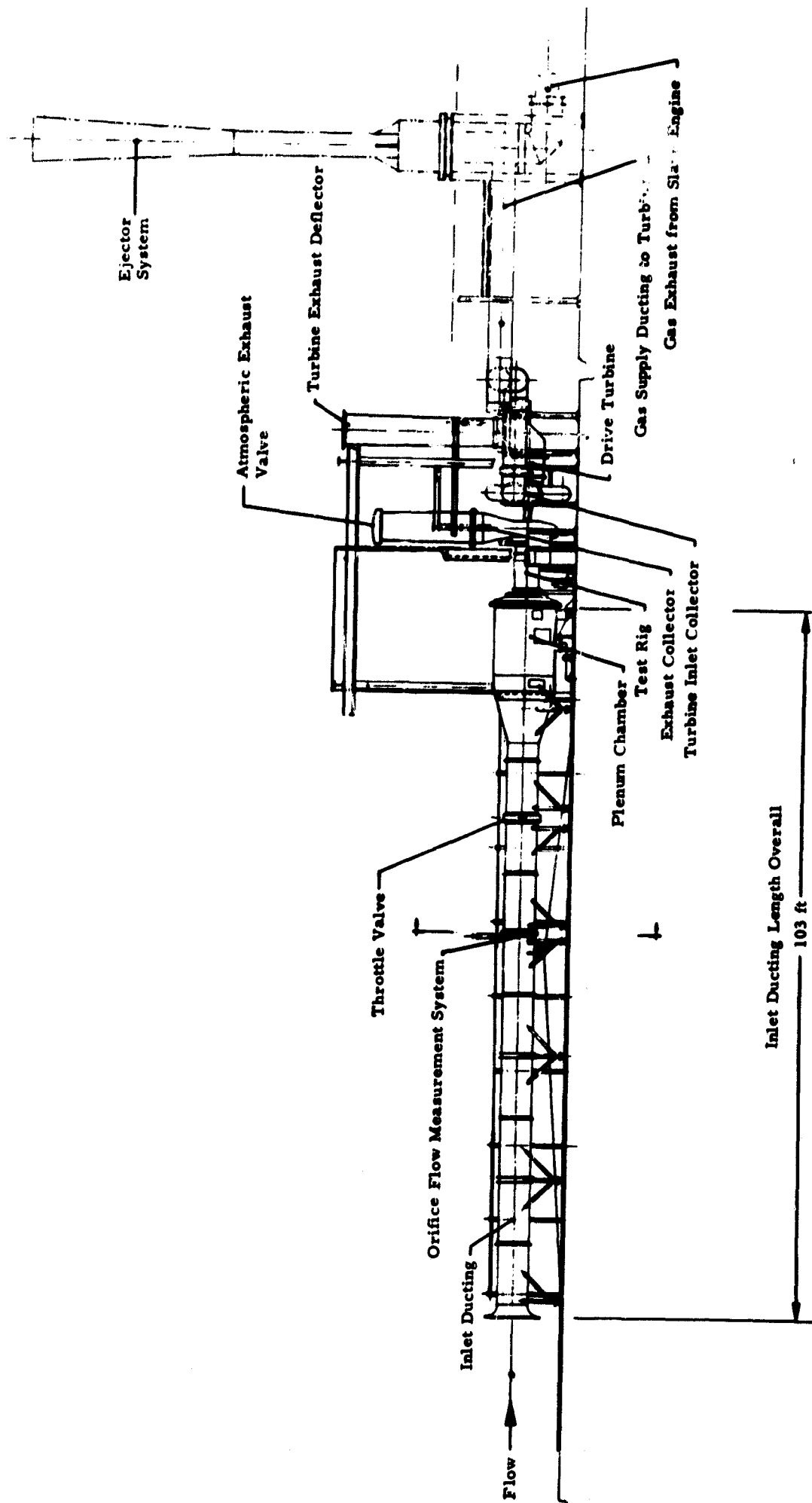


Figure 1. Compressor Research Facility

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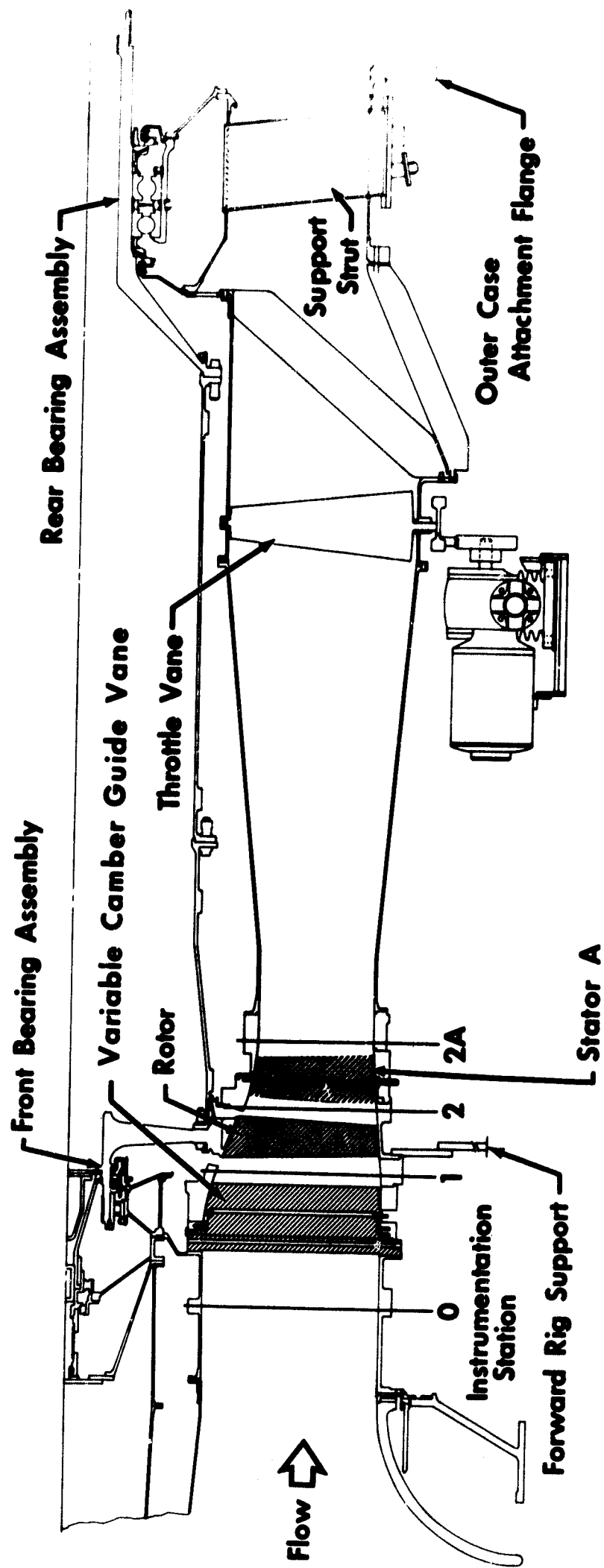
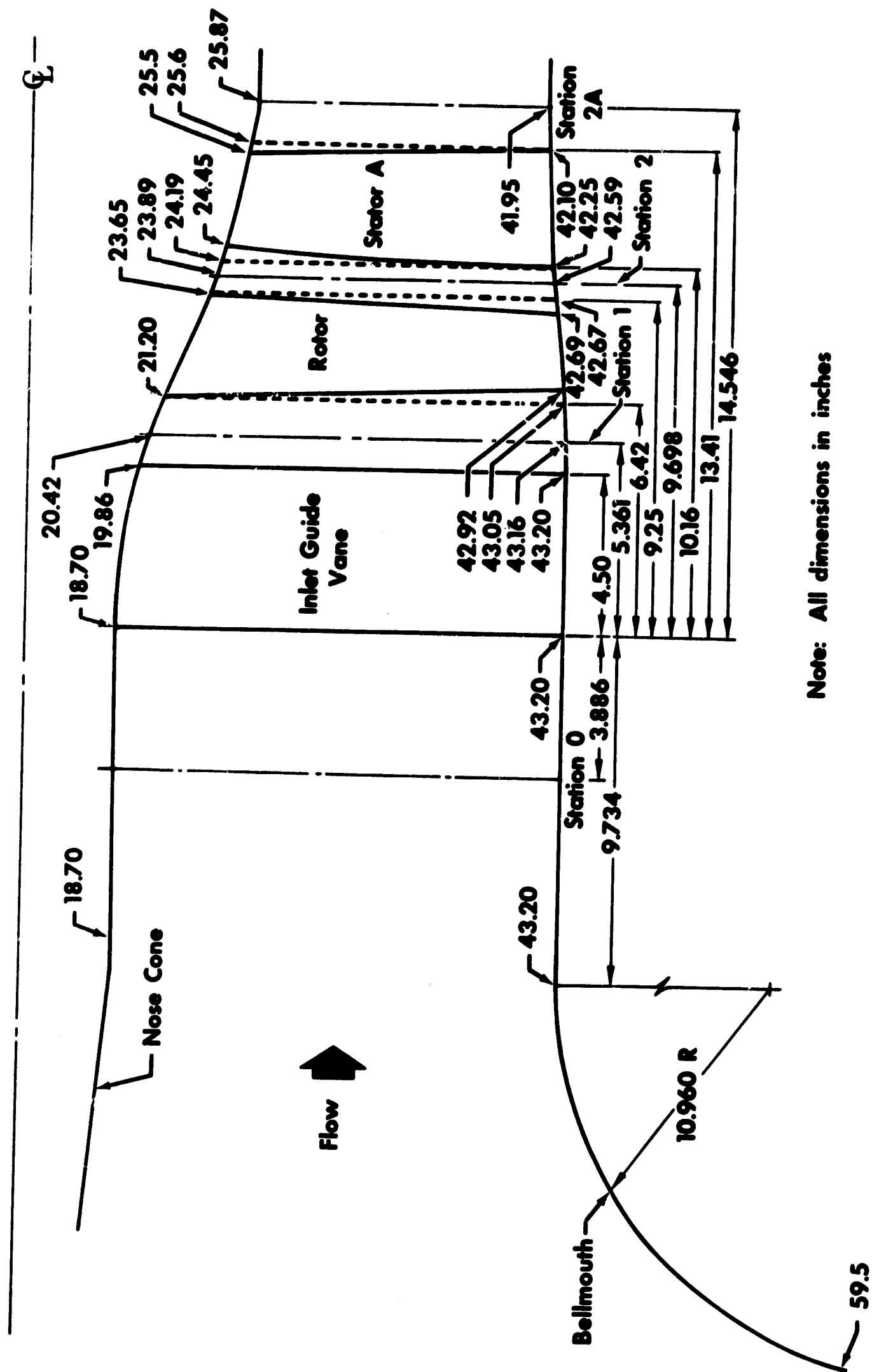


Figure 2. Compressor Rig

GS 2120C

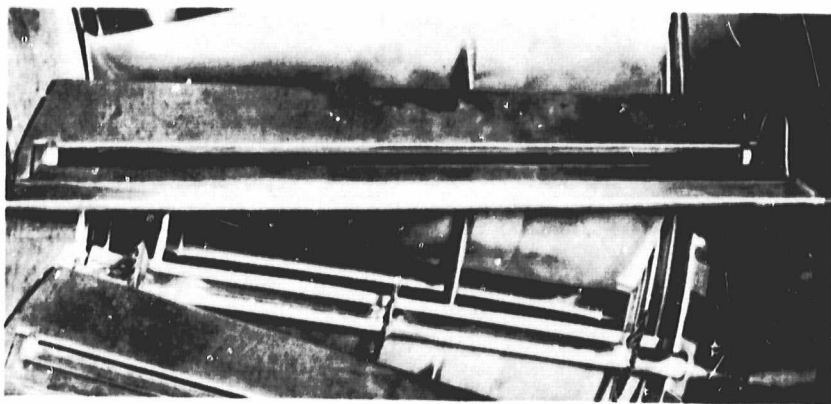
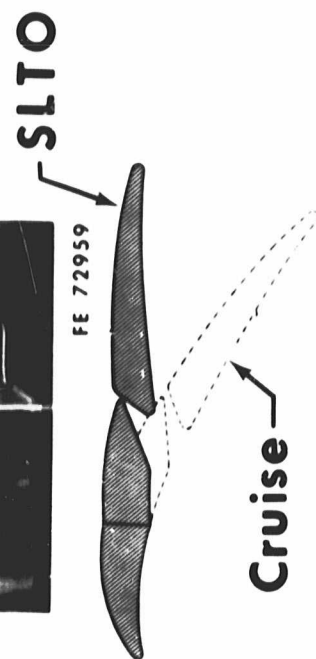


Note: All dimensions in inches

Figure 3. Sectional View of Flowpath

CS 6614A

Variable-Camber Inlet Guide Vane (Cruise Position)



Stator A (Cruise Position)

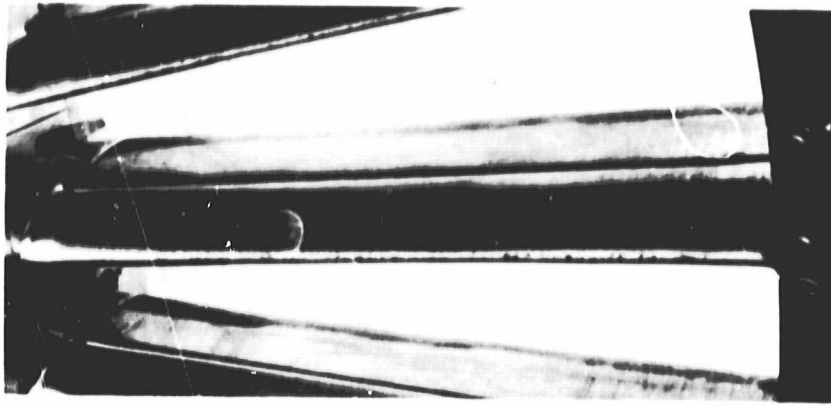
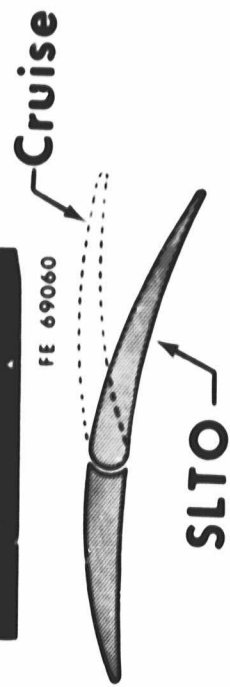


Figure 4. Variable Camber Inlet Guide Vane and Stator A

GS 6612A

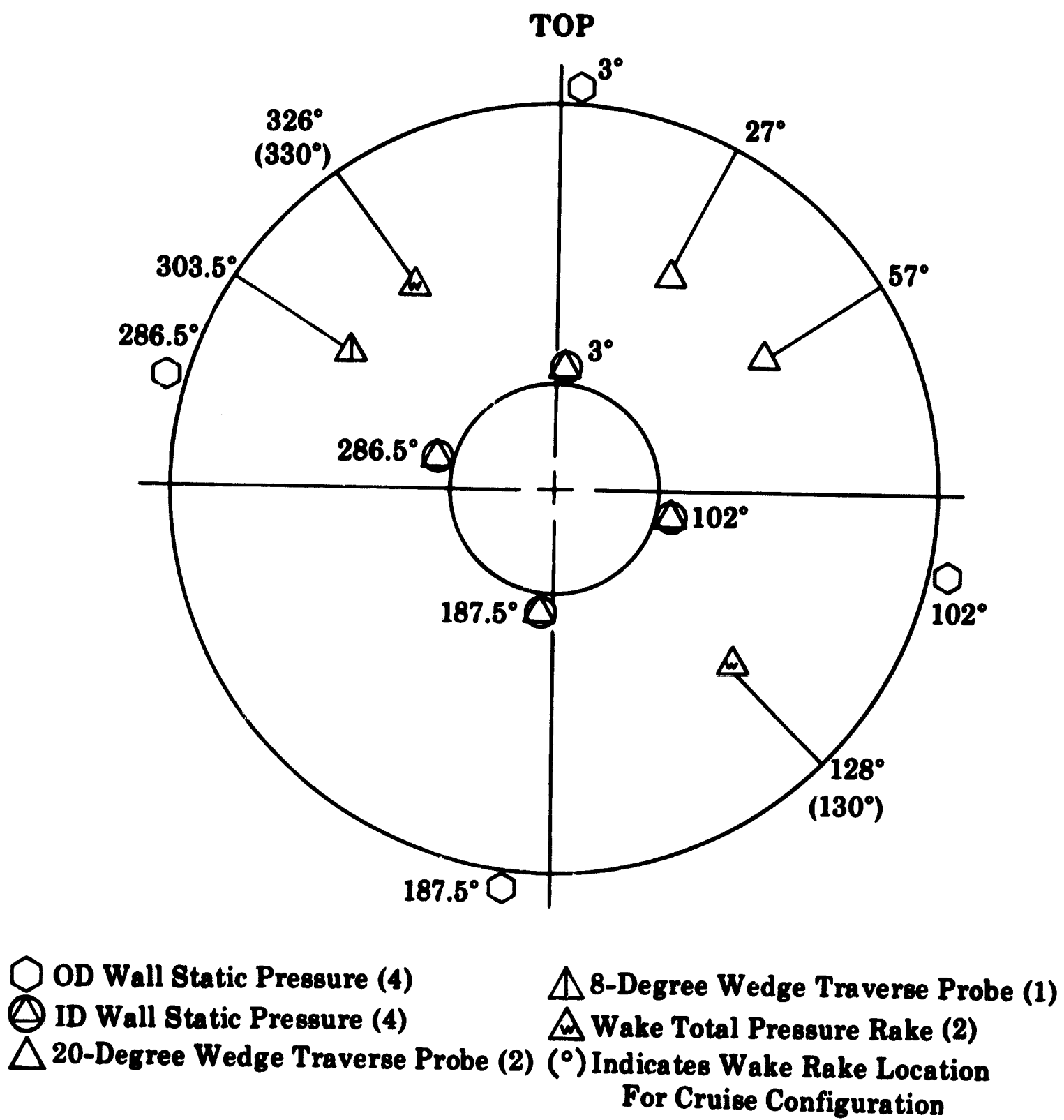


Figure 5. Instrumentation Station 1, View Looking Forward

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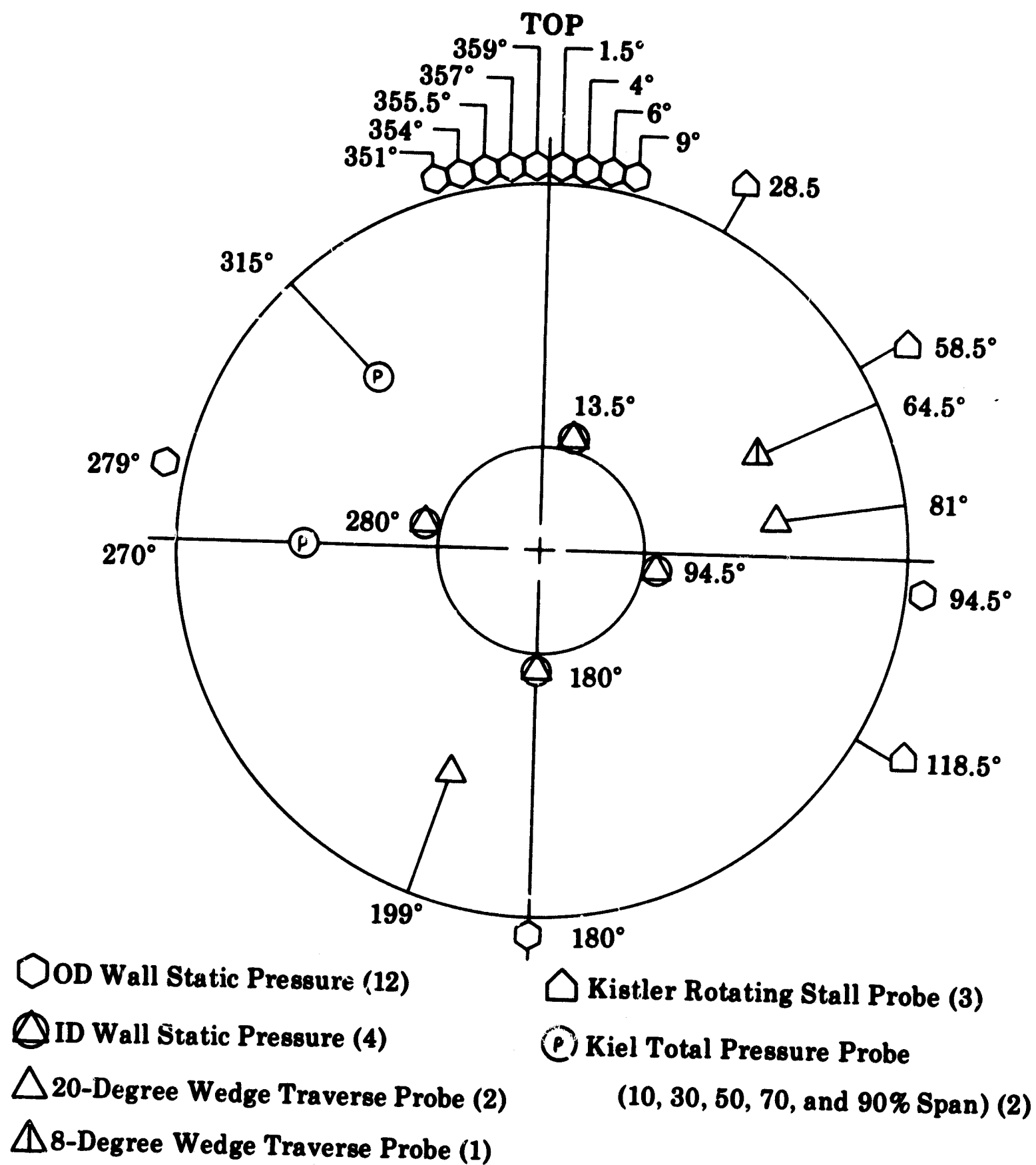
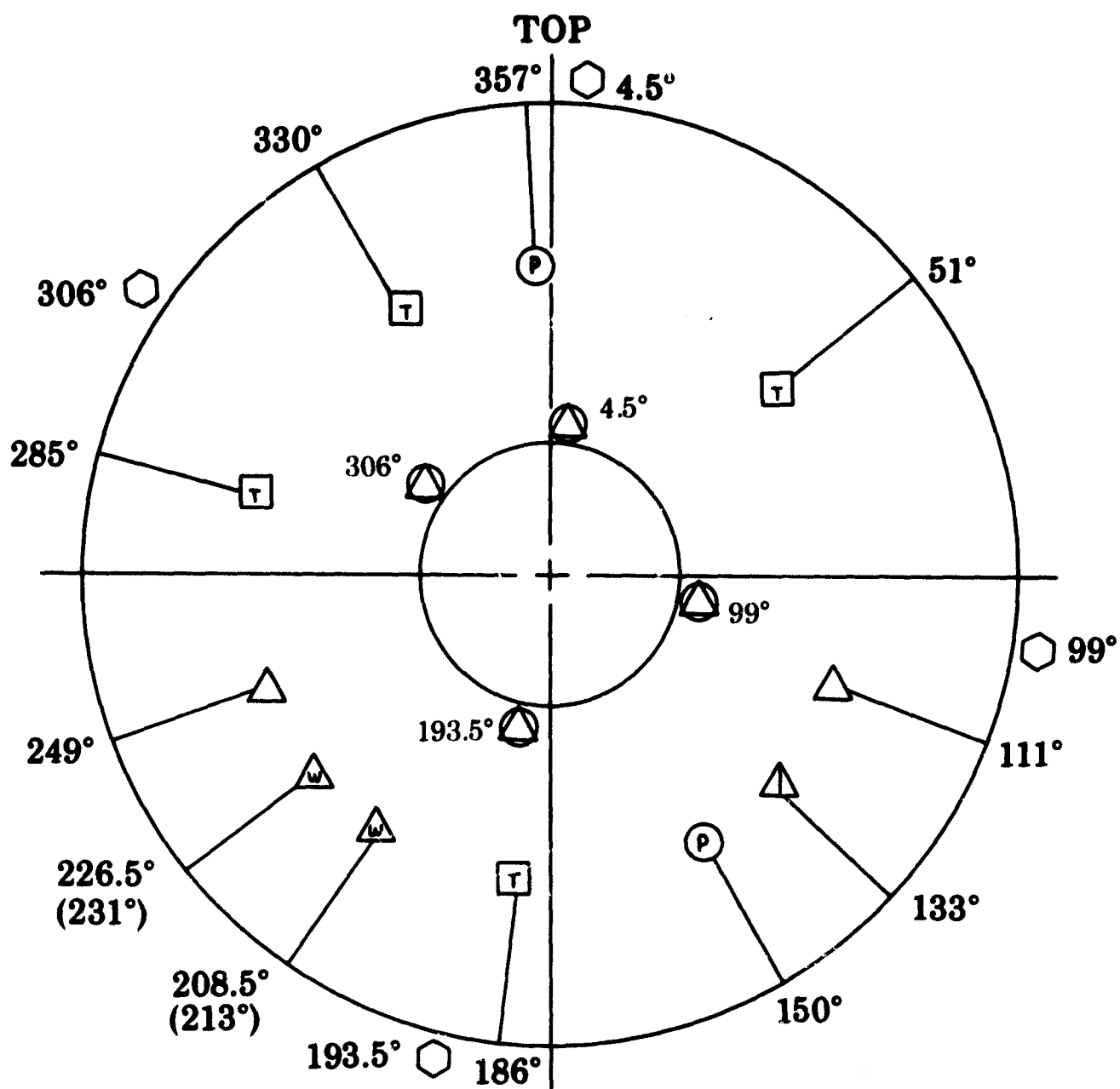


Figure 6. Instrumentation Station 2, View Looking Forward

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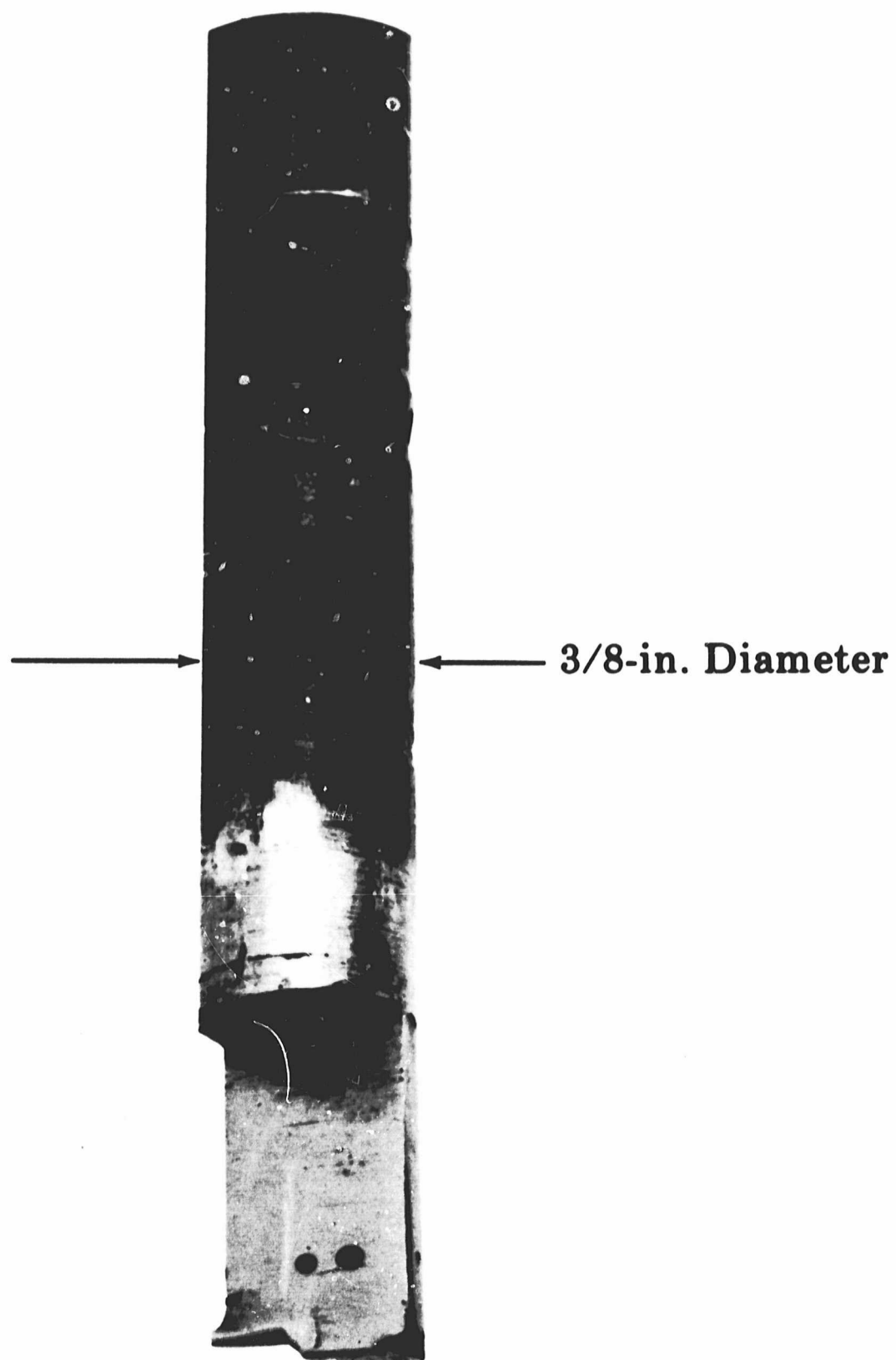


- OD Wall Static Pressure (4)
- ID Wall Static Pressure (4)
- △ 20-Degree Wedge Probe (2)
- △ 8-Degree Wedge Traverse Probe (1)
- △_W Wake Total Pressure Rake (2)
- (°) Indicates Wake Rake Location For Cruise Configuration

- Temperature Rake (10, 30, 50, 70 and 90% Span) (4)
- ⊙ Kiel Total Pressure Probe (10, 30, 50, 70 and 90% Span) (2)

Figure 7. Instrumentation Station 2A, View Looking Forward

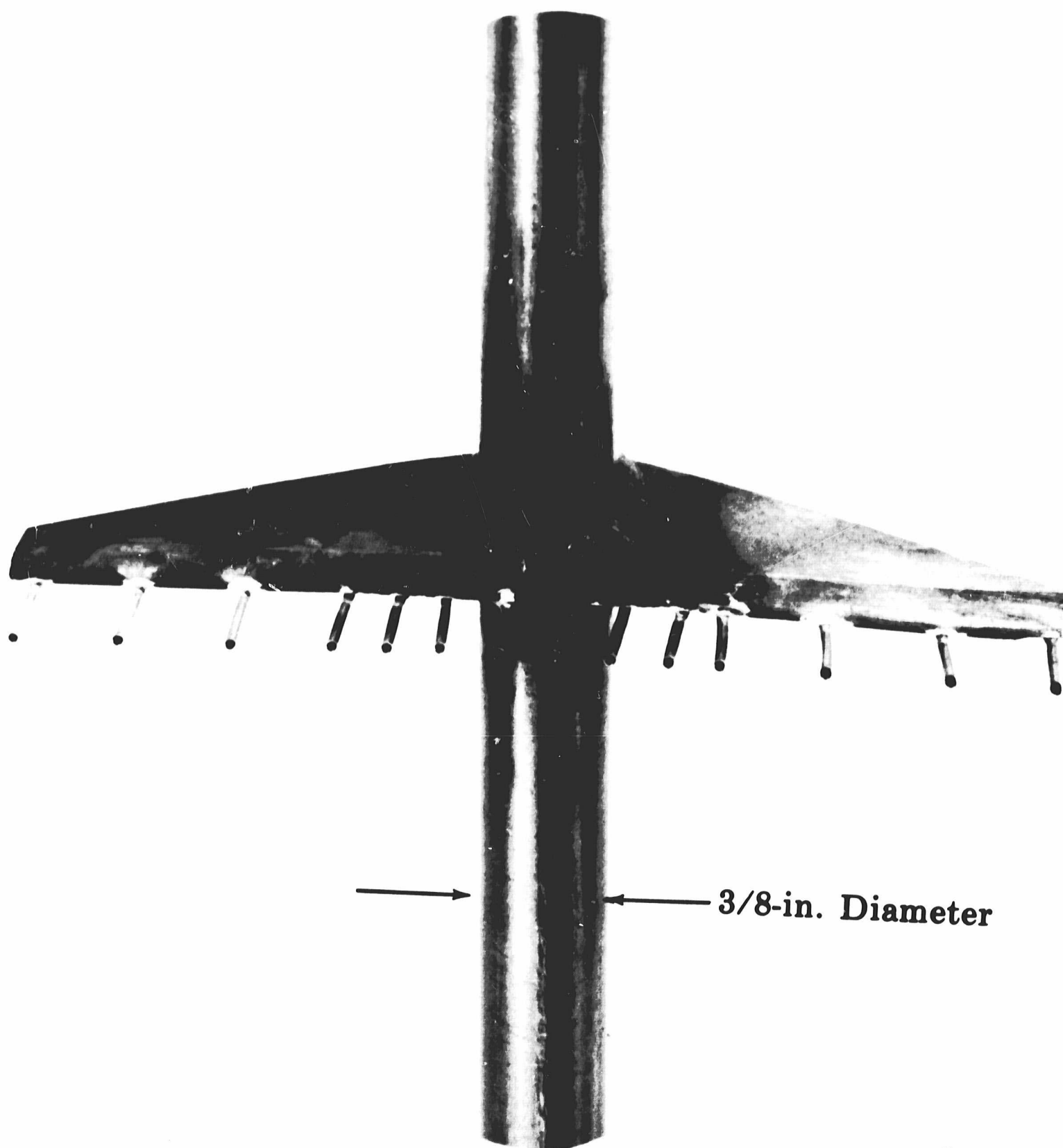
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Figure 8. 20-Degree Wedge Probe

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FE 68612

Figure 9. Typical Wake Probe Rake

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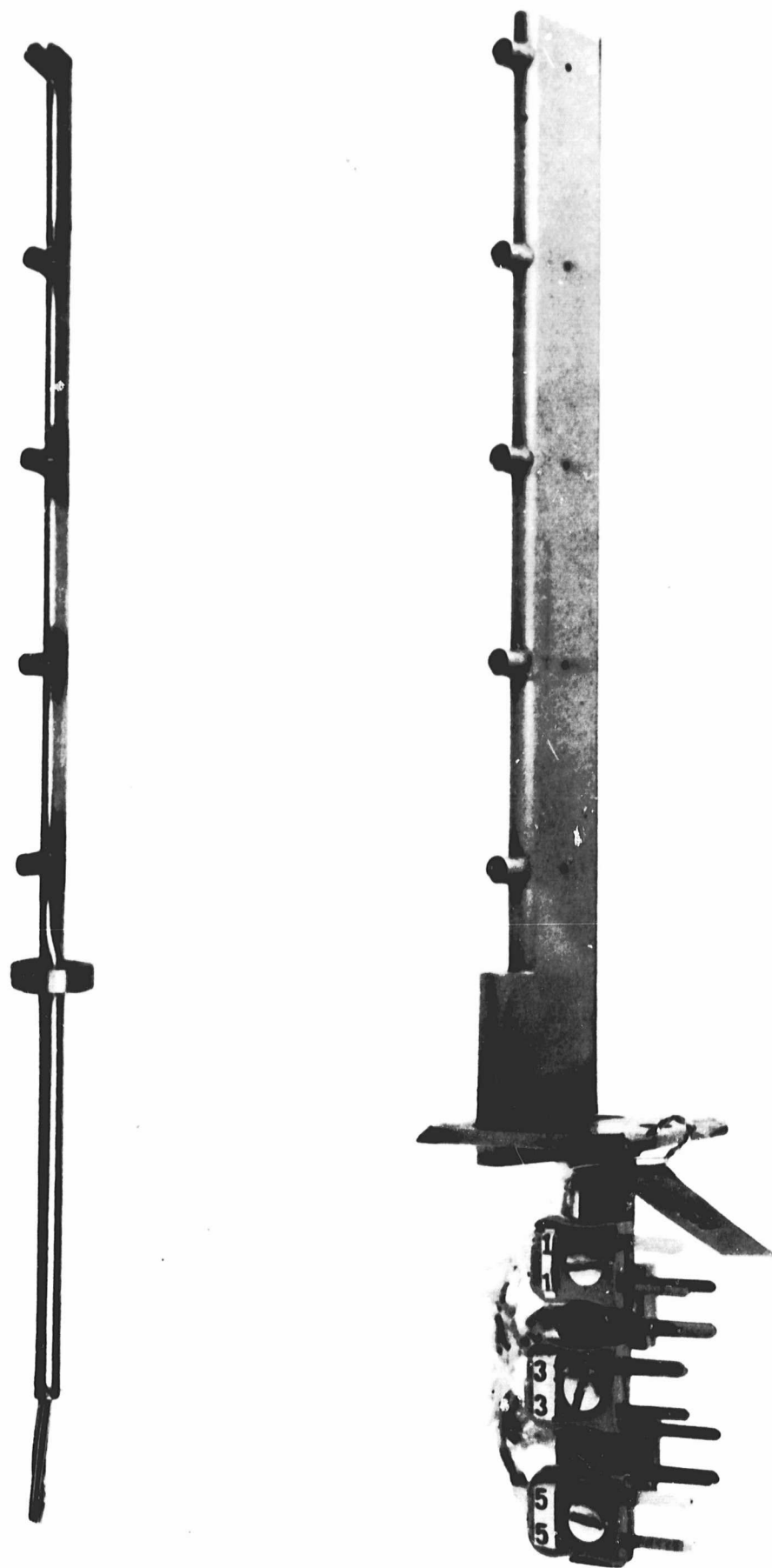
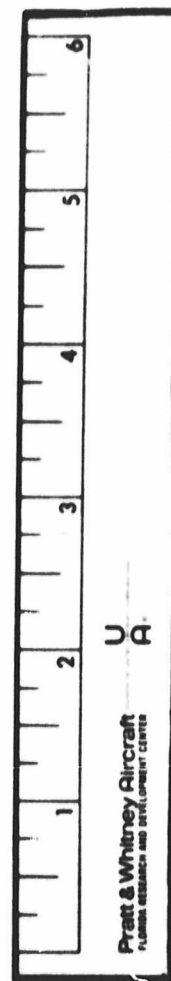
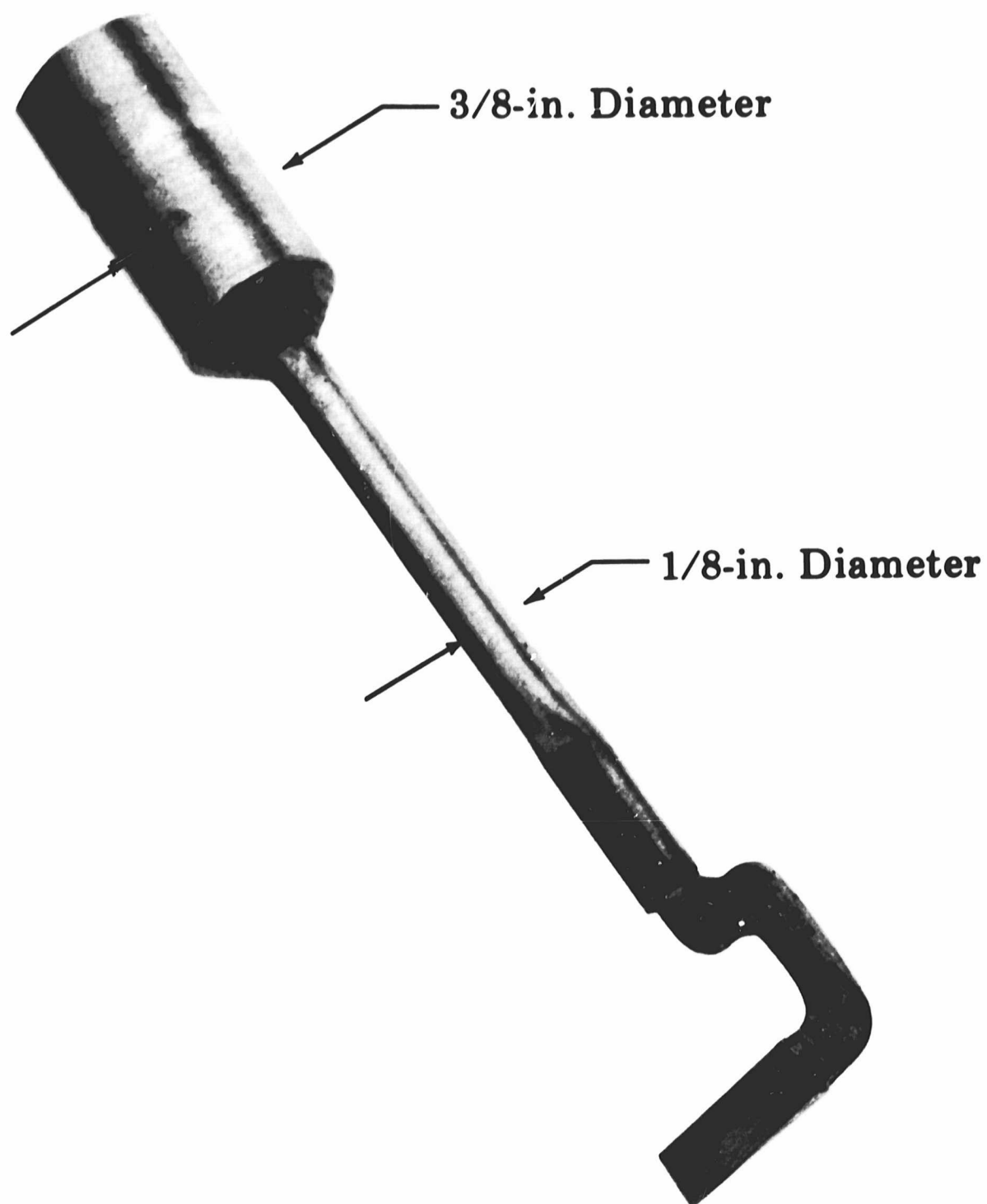


Figure 10. Total Temperature and Total Pressure Rakes

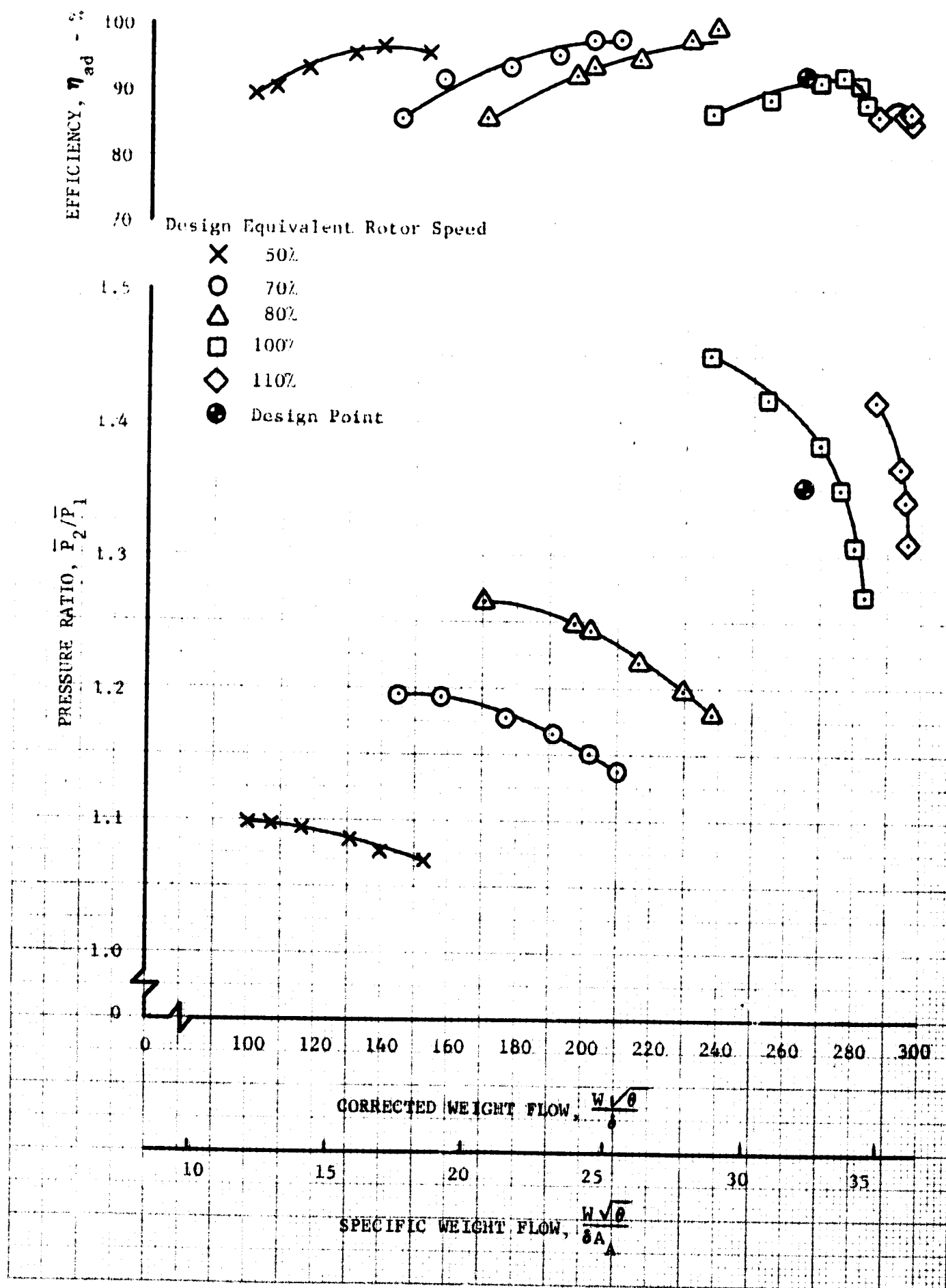
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FE 73904

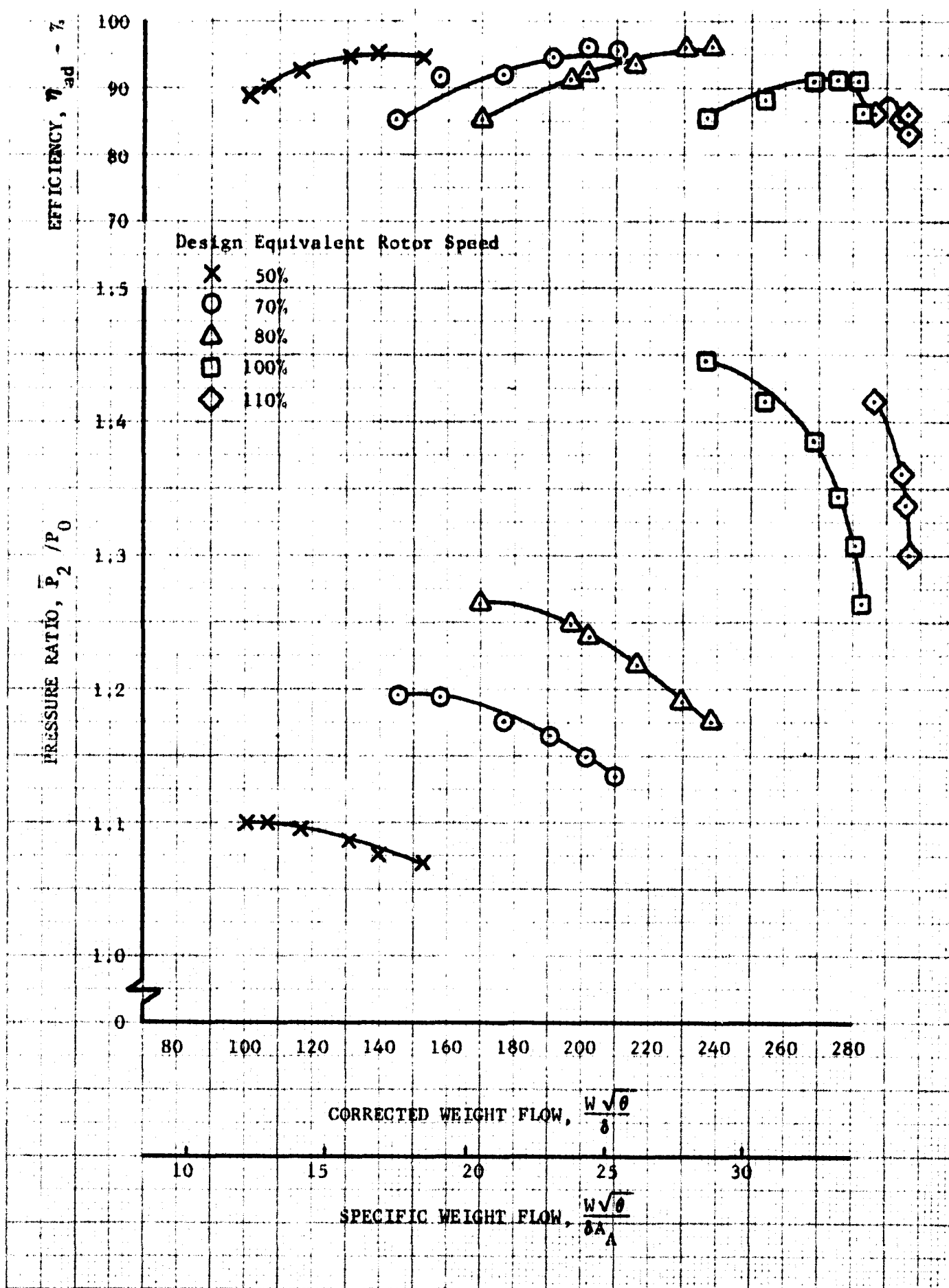
Figure 11. 8-Degree Wedge Probe

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Figure 12. Overall Rotor Performance for SLTO Configuration



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Figure 13. Overall Guide Vane-Rotor Performance for SLTO Configuration

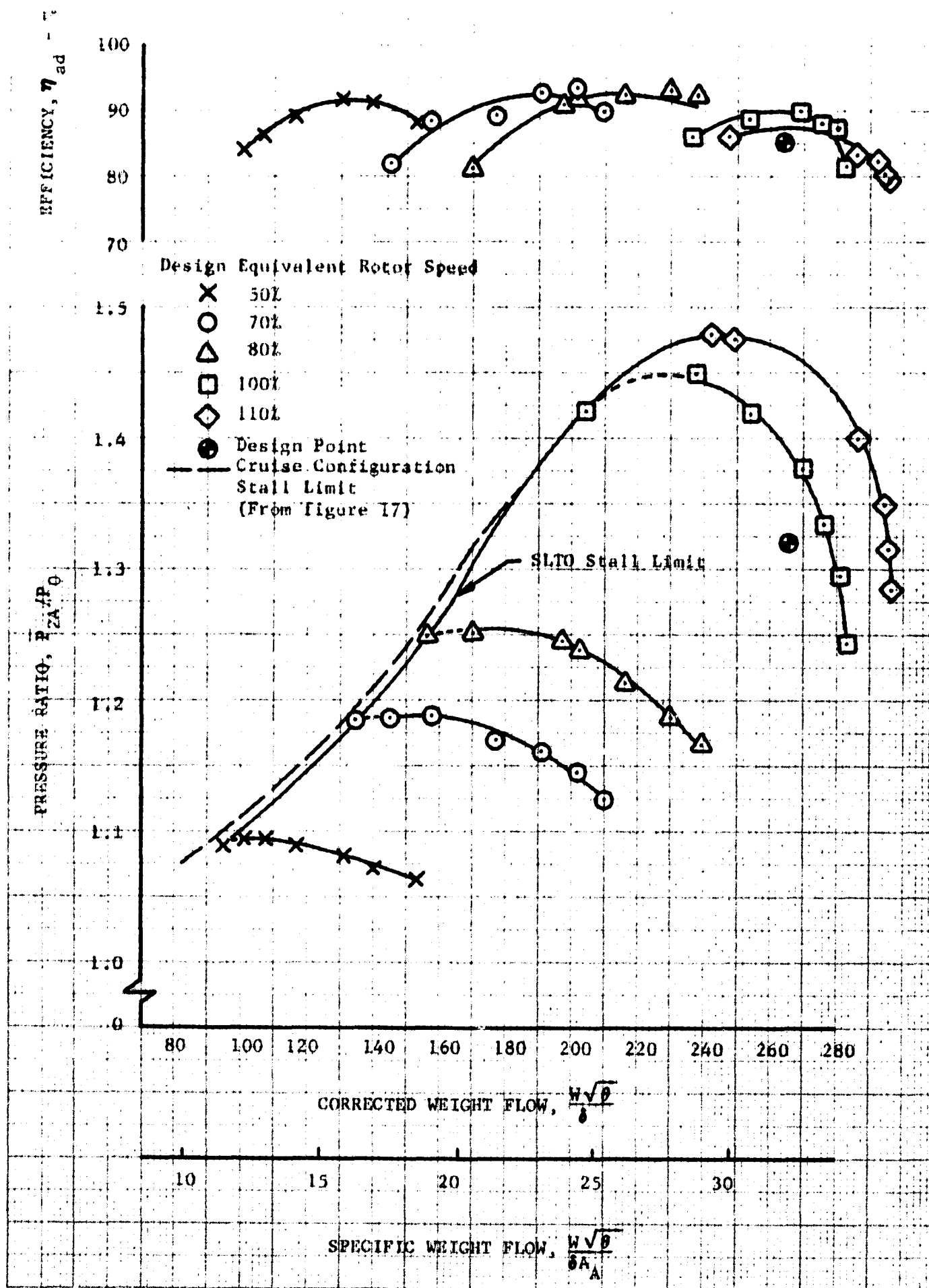
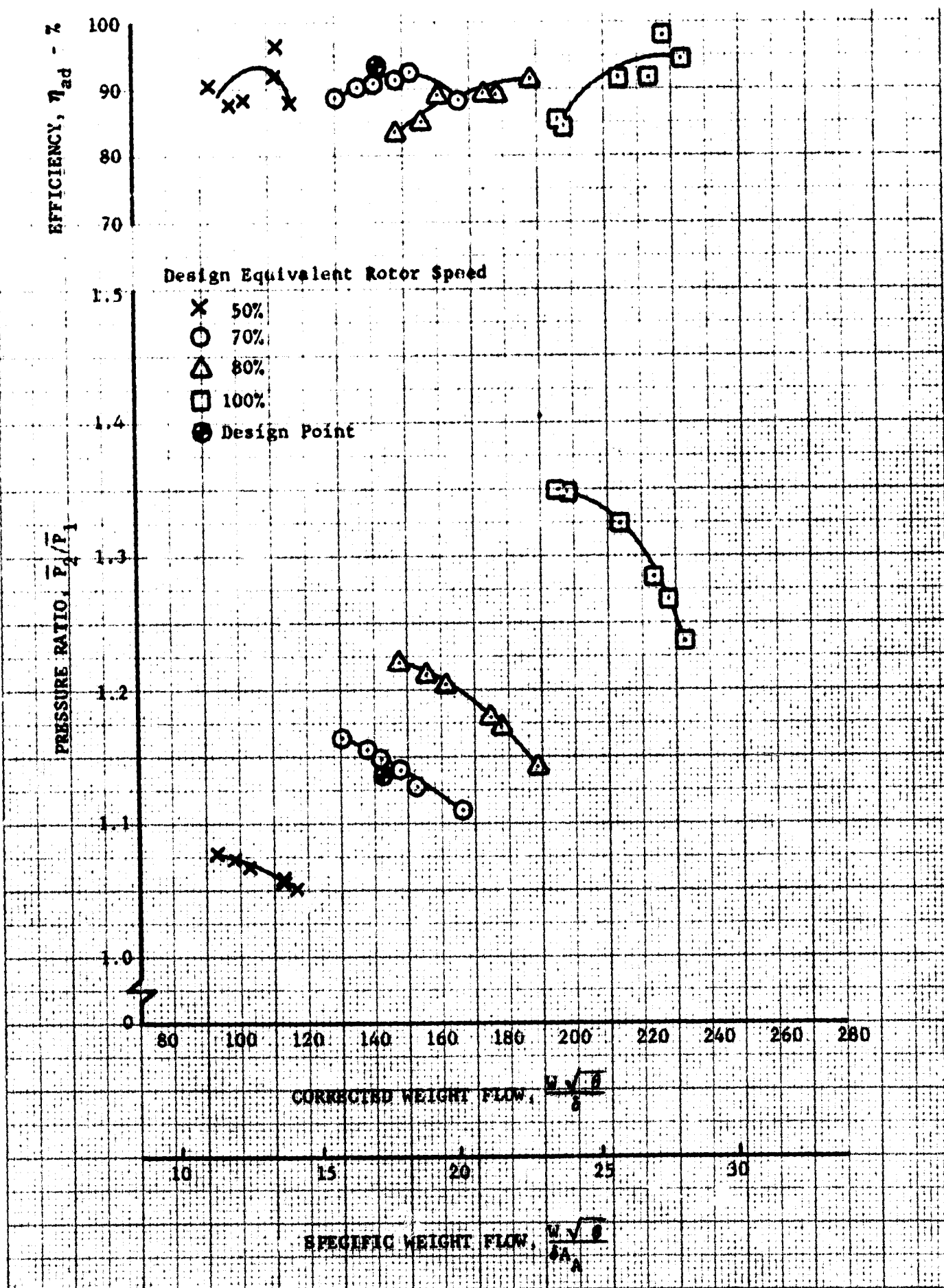


Figure 14. Overall Guide Vane-Rotor - Stator A
Performance for SLTO Configuration



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Figure 15. Overall Rotor Performance for Cruise Configuration

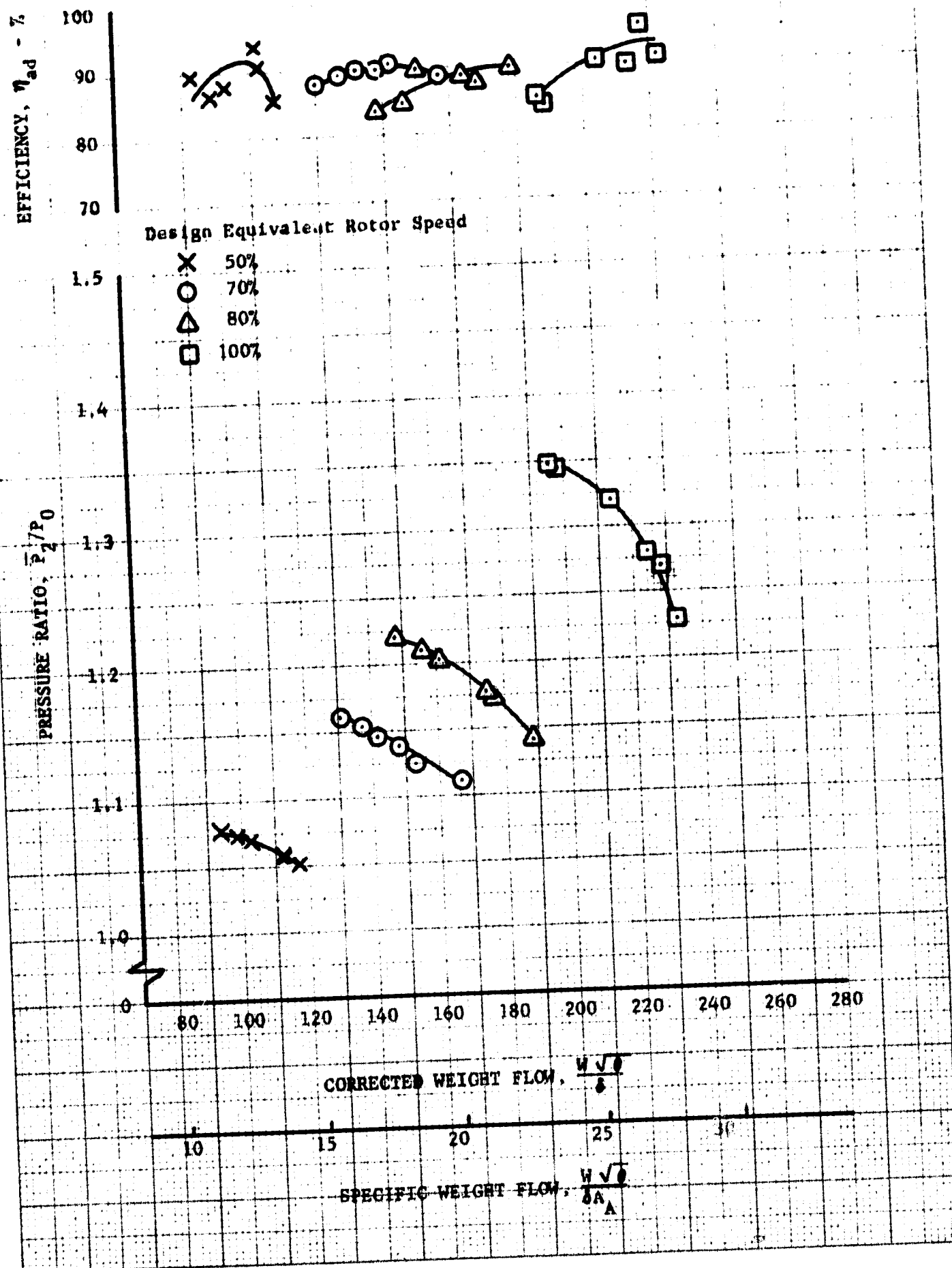


Figure 16. Overall Guide Vane-Rotor Performance for Cruise Configuration

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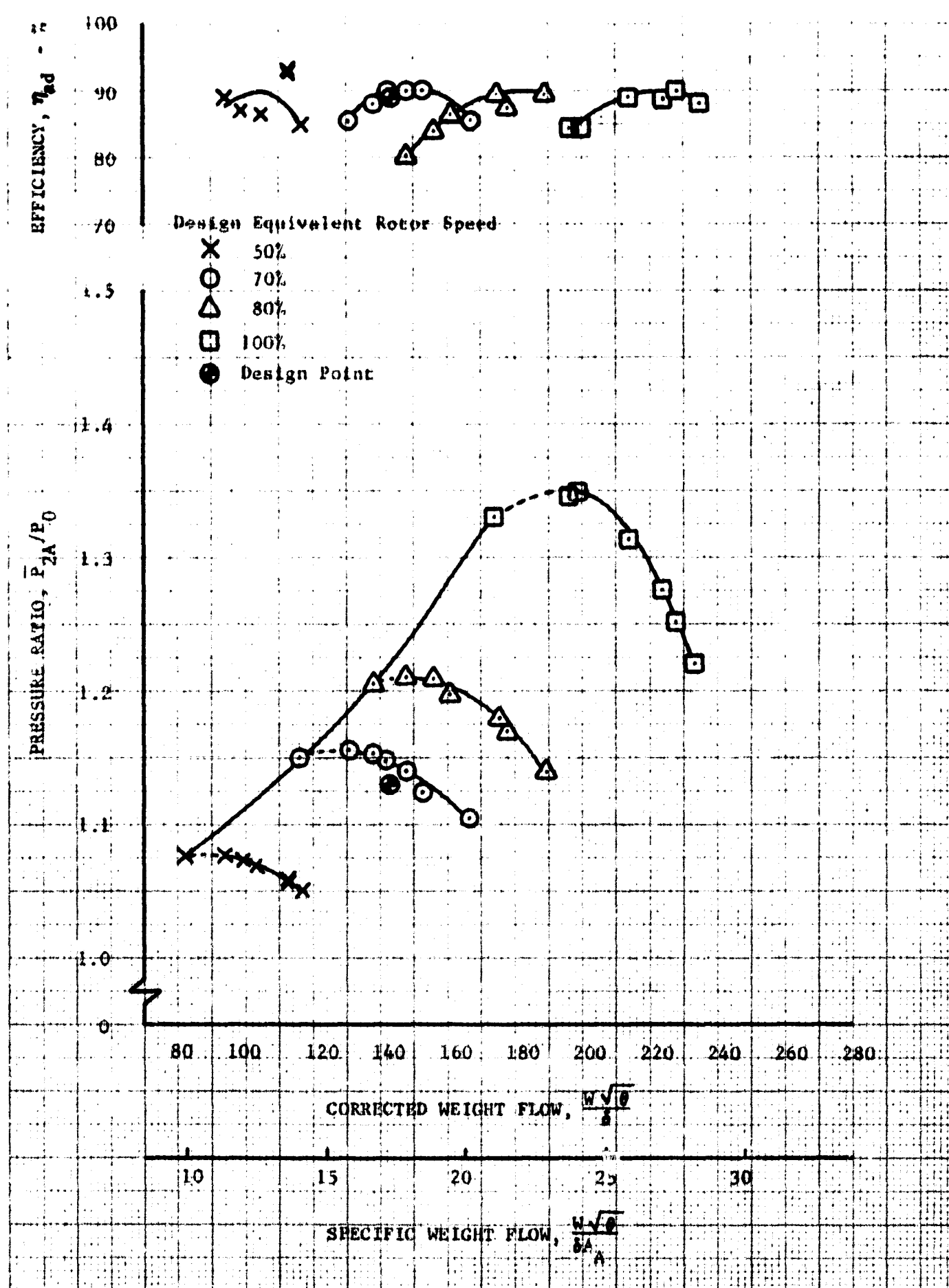


Figure 17. Overall Guide Vane-Rotor - Stator A Performance for Cruise Configuration

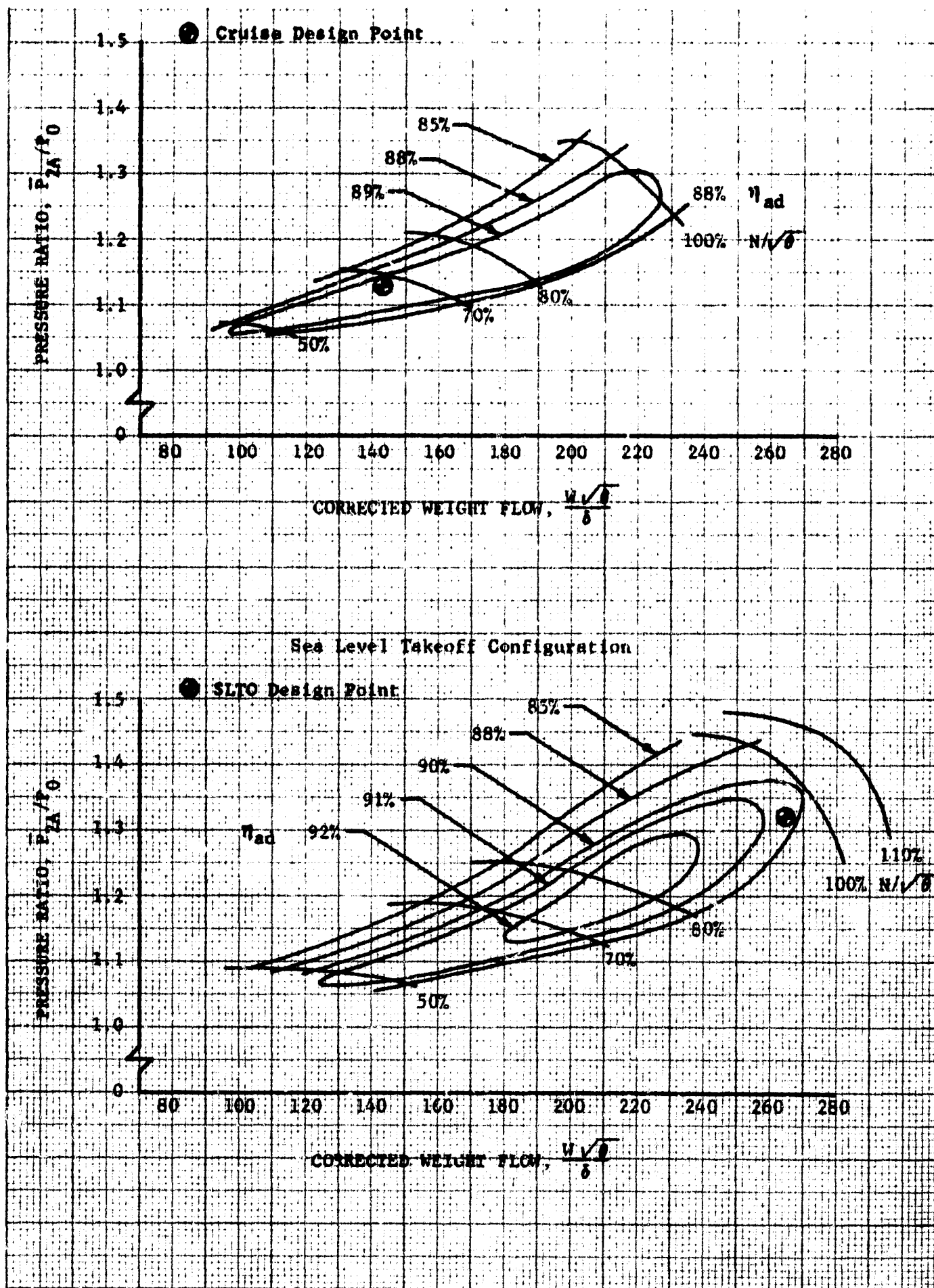


Figure 18. Stage Efficiency Contours

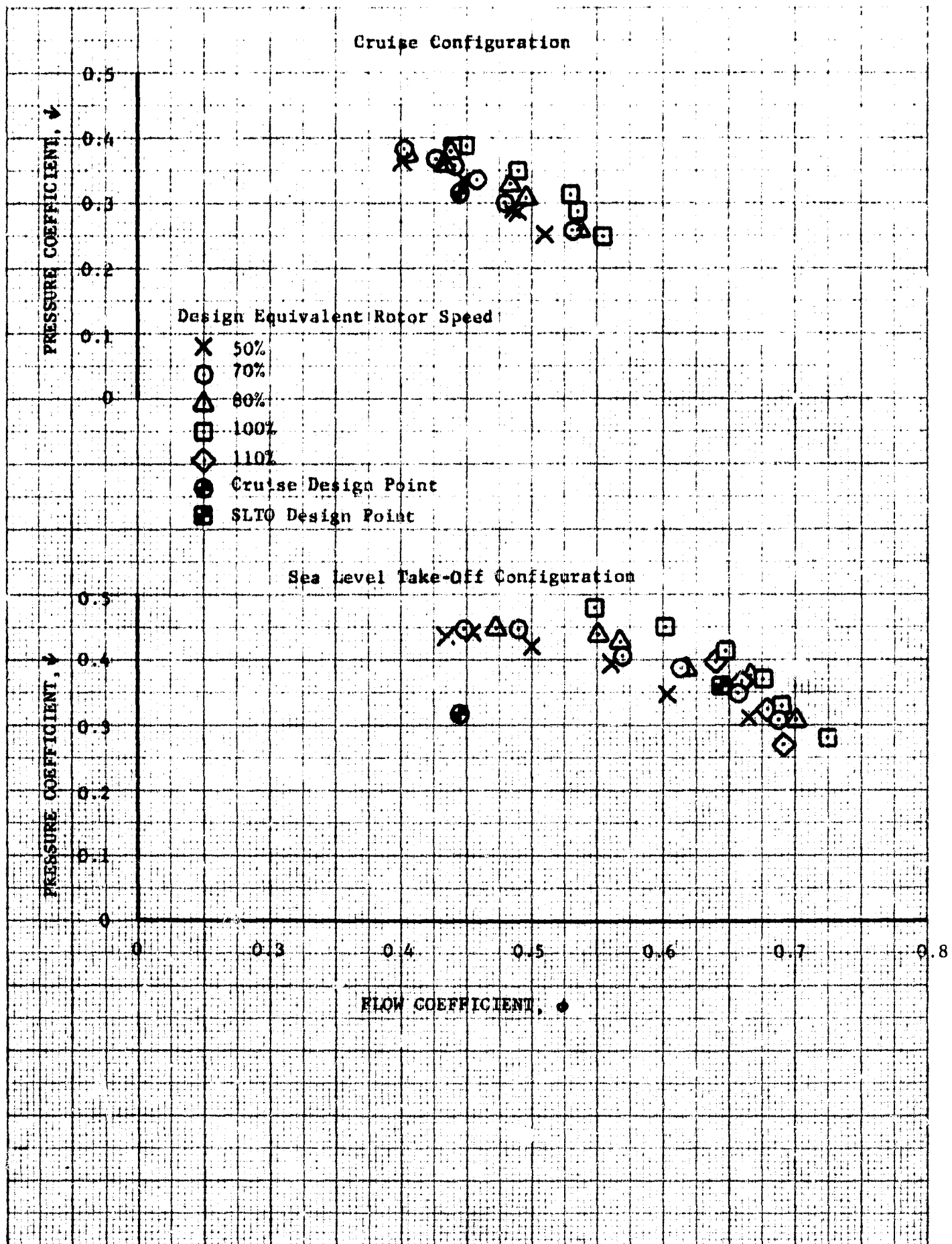


Figure 19. Stage Performance Comparison, Guide Vane-Rotor - Stator A

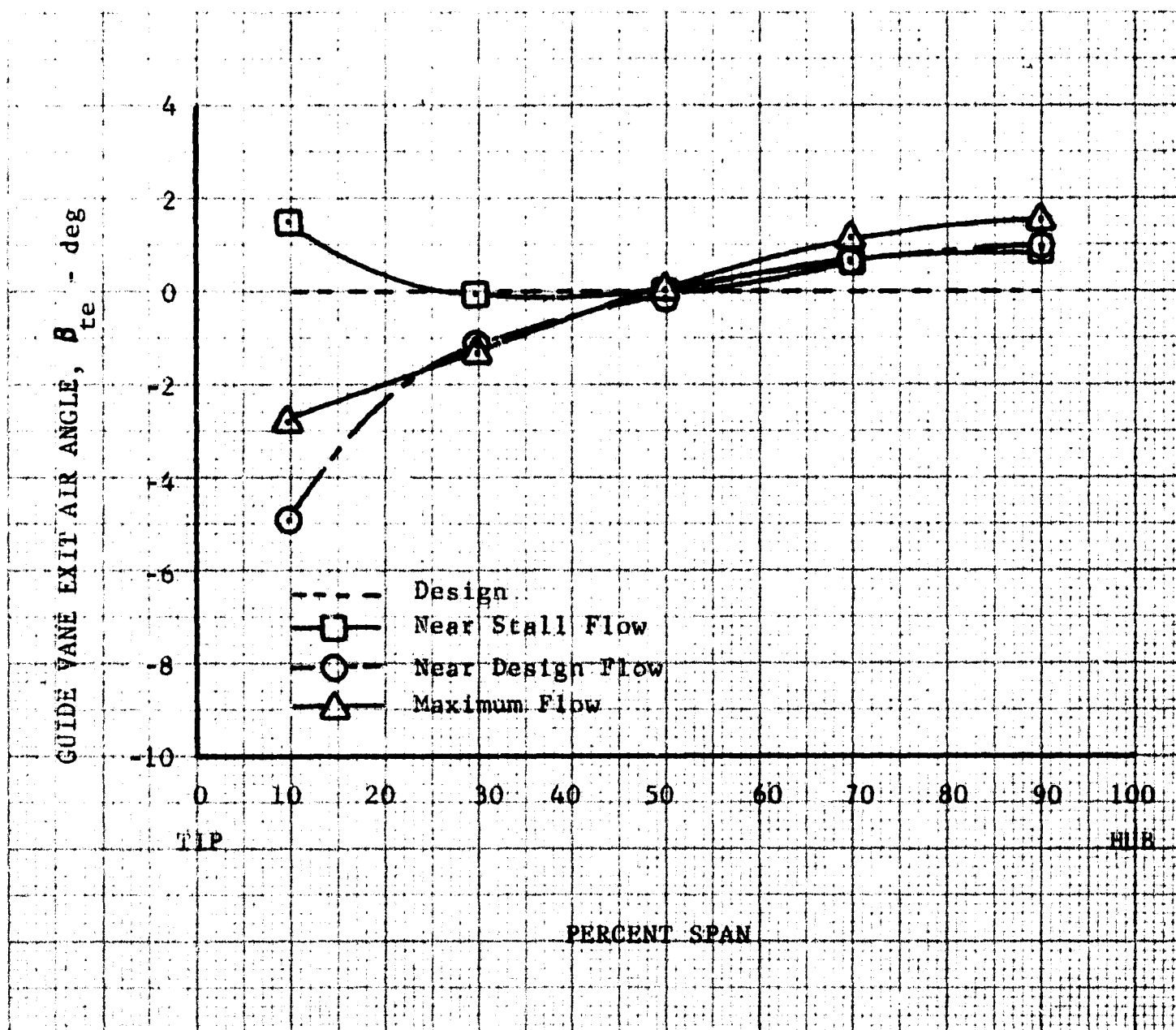


Figure 20. Guide Vane Exit Air Angle for SLTO Configuration

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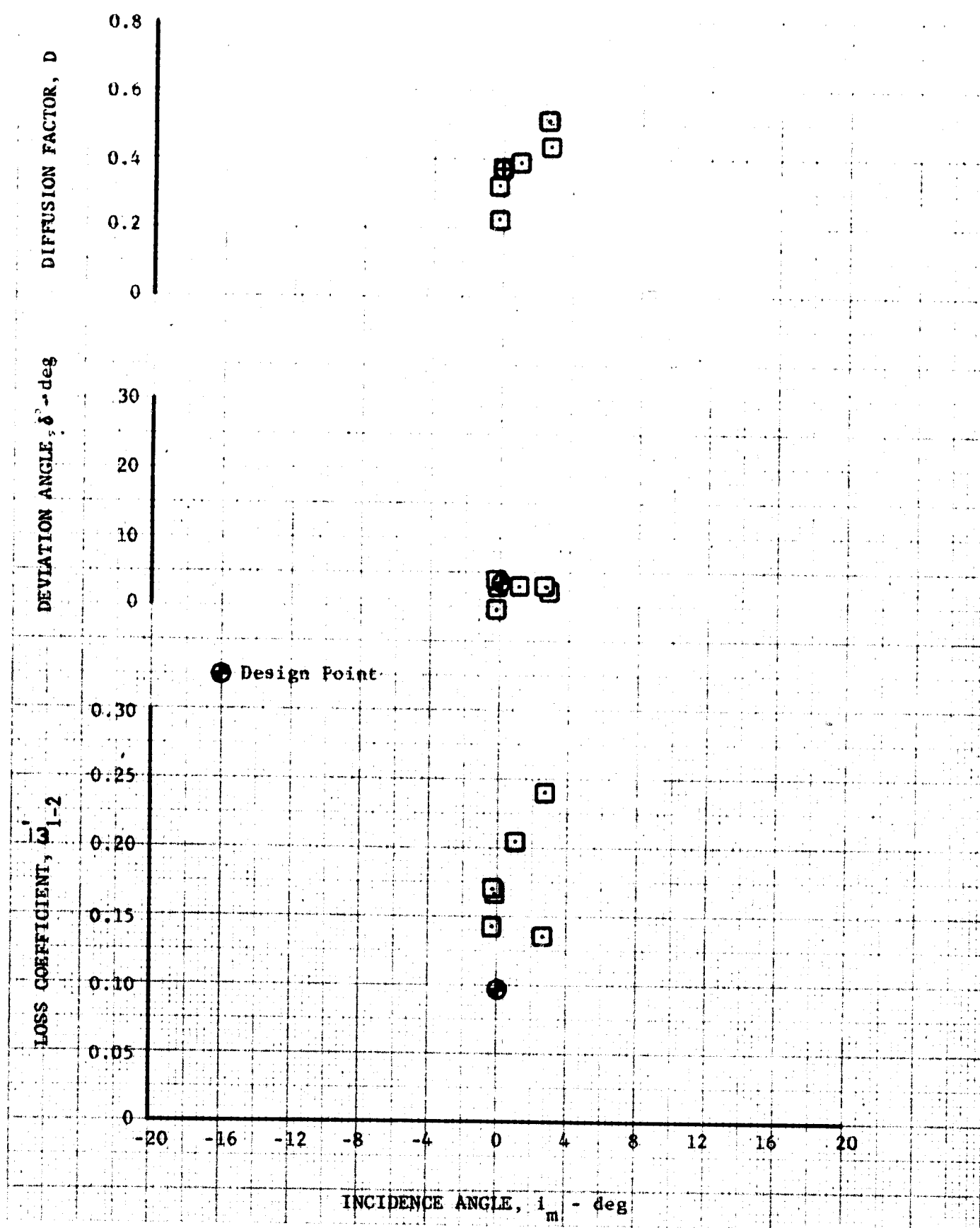


Figure 23. Rotor Blade Element Performance for SLT0 Configuration at 100% Design Equivalent Rotor Speed (10% Span from Tip)

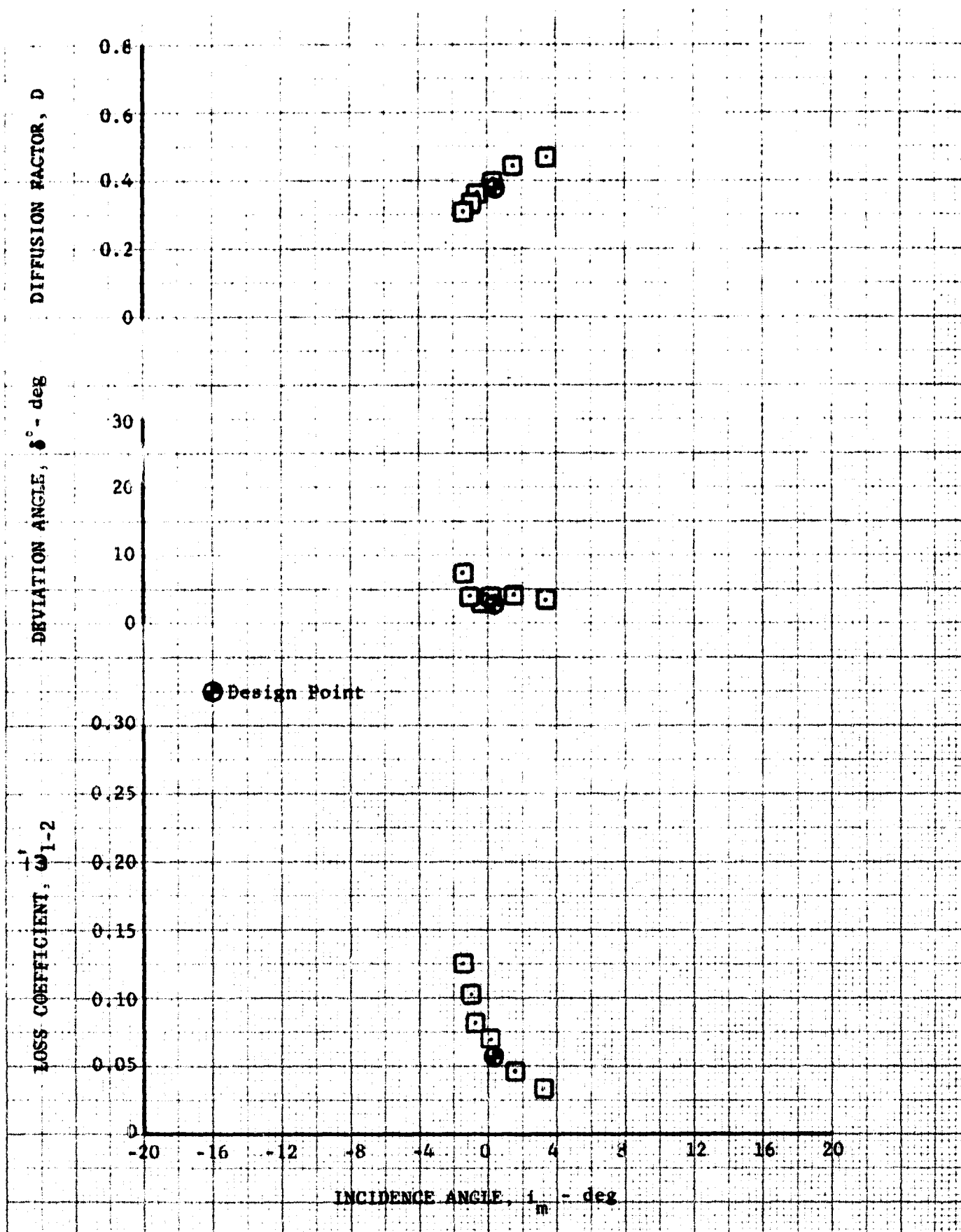
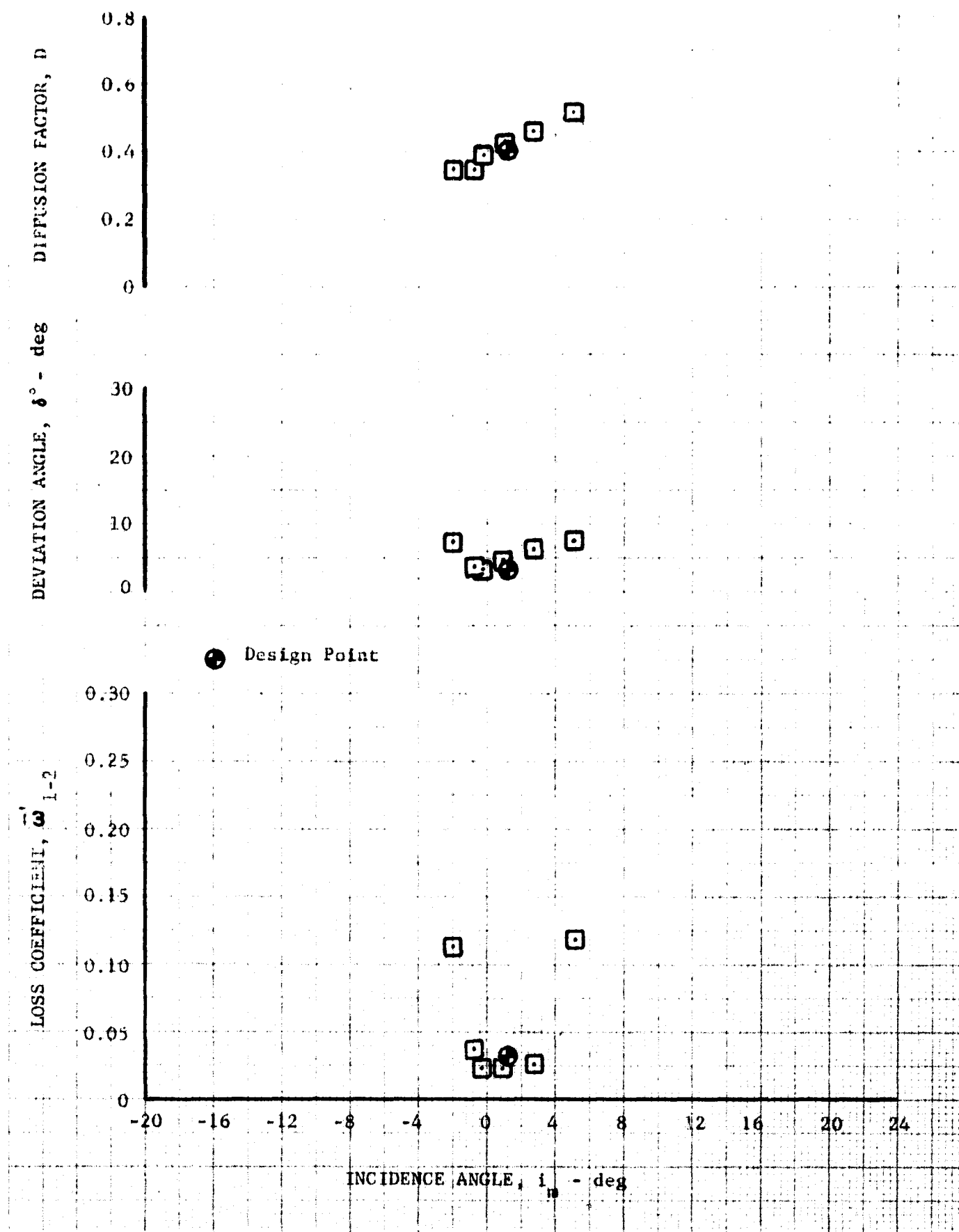


Figure 24. Rotor Blade Element Performance for SLT0 Configuration at 100% Design Equivalent Rotor Speed (30% Span from Tip)

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Figure 25. Rotor Blade Element Performance for SLTO Configuration at 100% Design Equivalent Rotor Speed (50% Span from Tip)

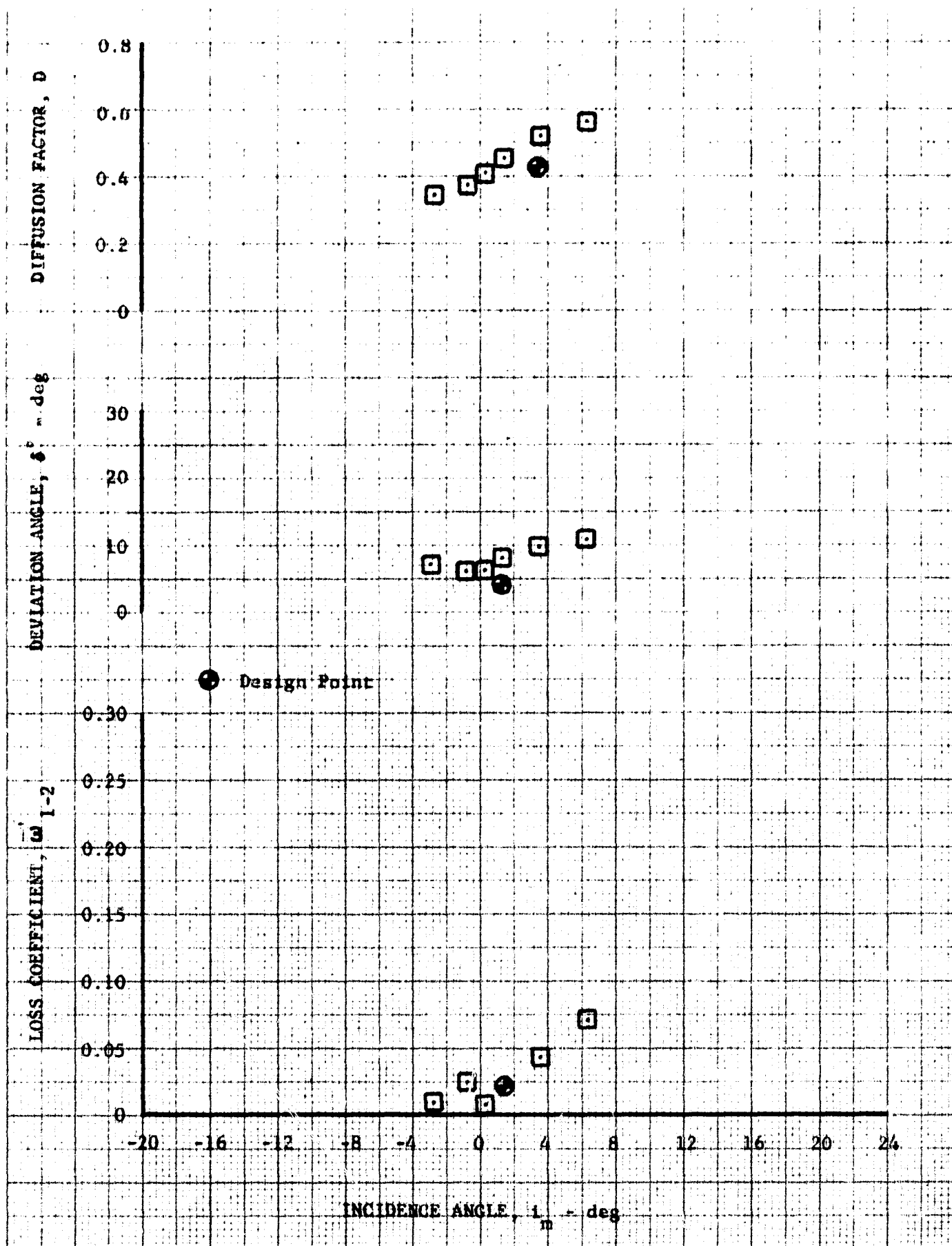


Figure 26. Rotor Blade Element Performance for SLTO Configuration at 100% Design Equivalent Rotor Speed (70% Span from Tip)

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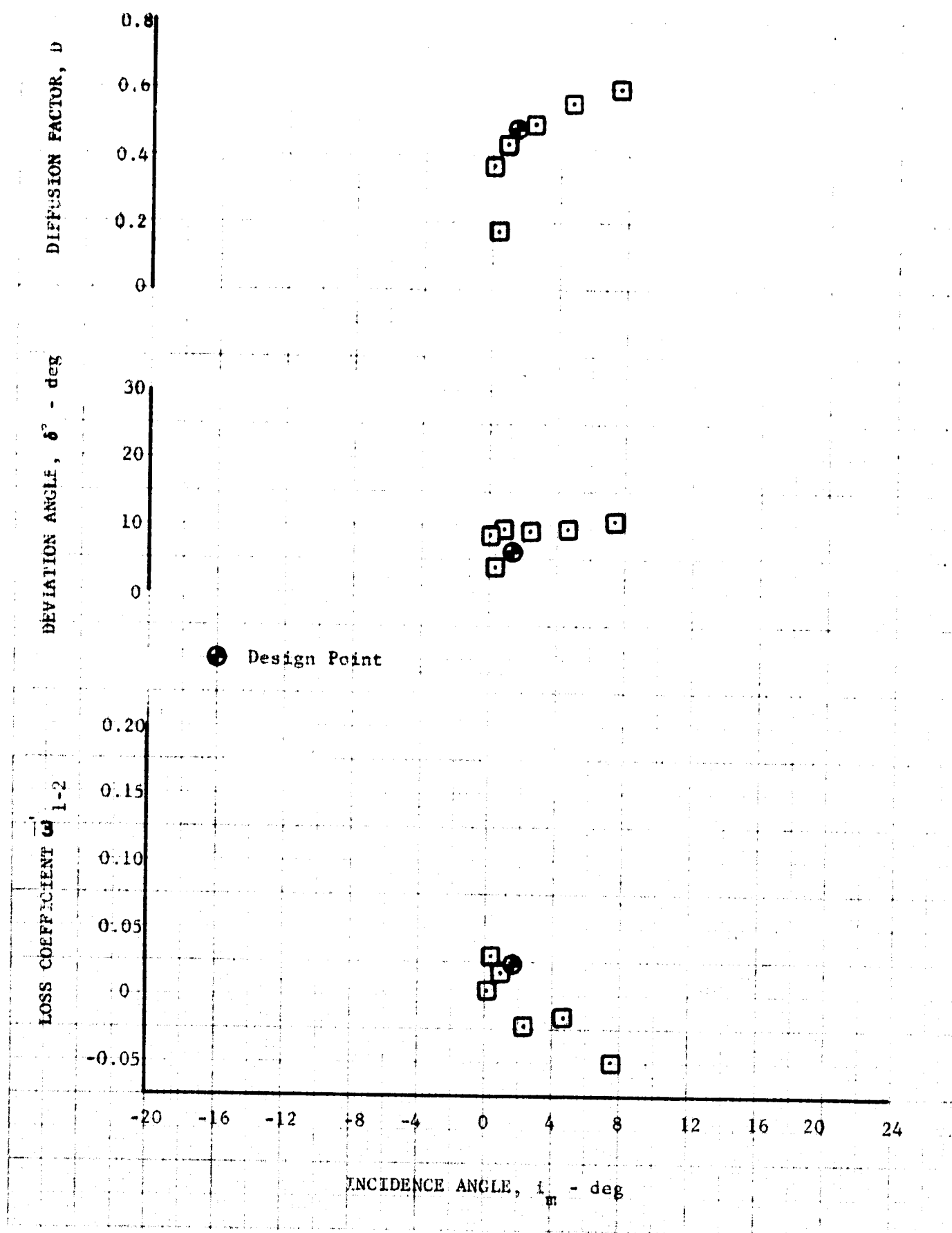


Figure 27. Rotor Blade Element Performance for SLTO Configuration at 100% Design Equivalent Rotor Speed (90% Span from Tip)

DF 66627

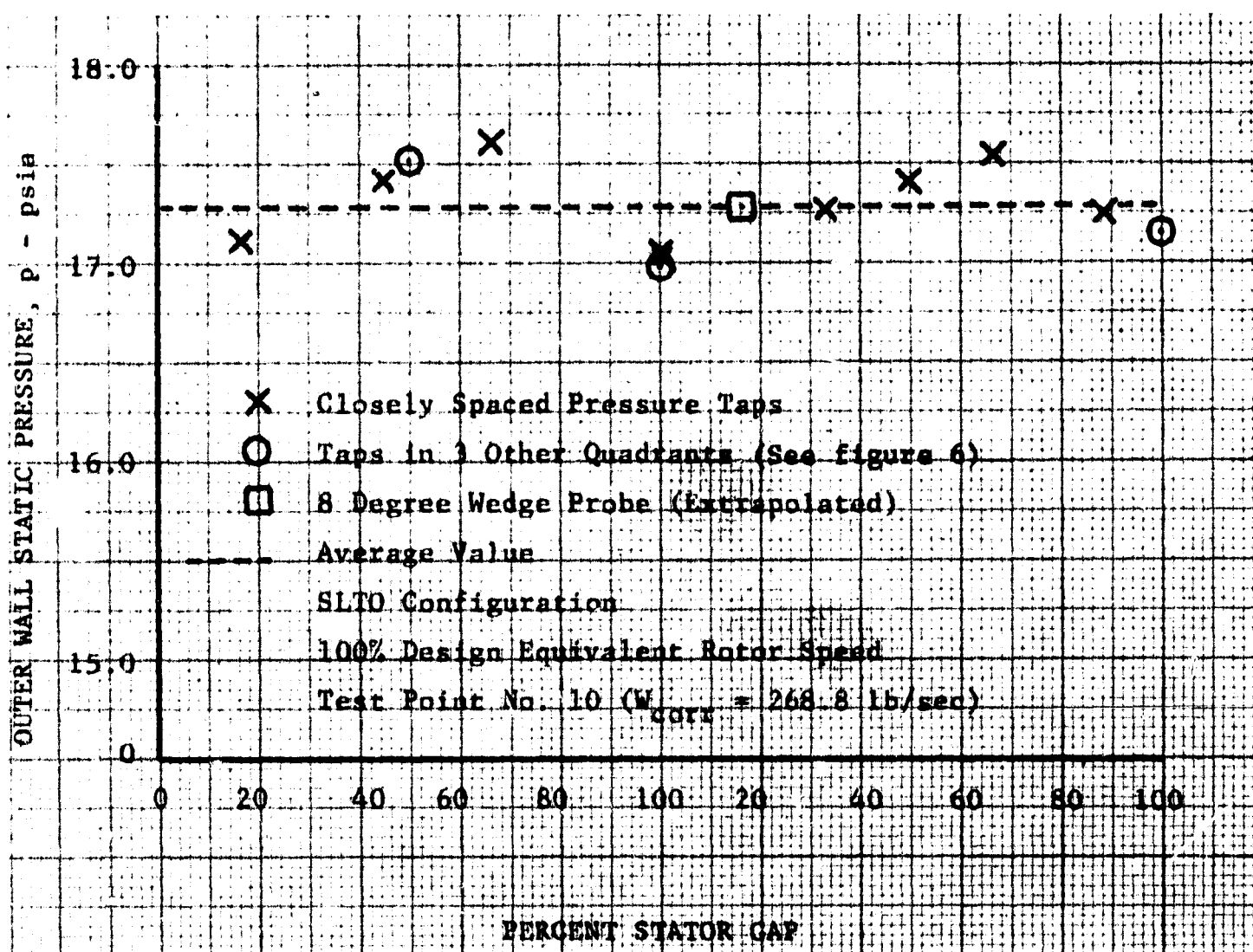


Figure 28. Influence of Guide Vane Wake and/or Stator Leading Edge on Station 2 Outer Wall Static Pressure

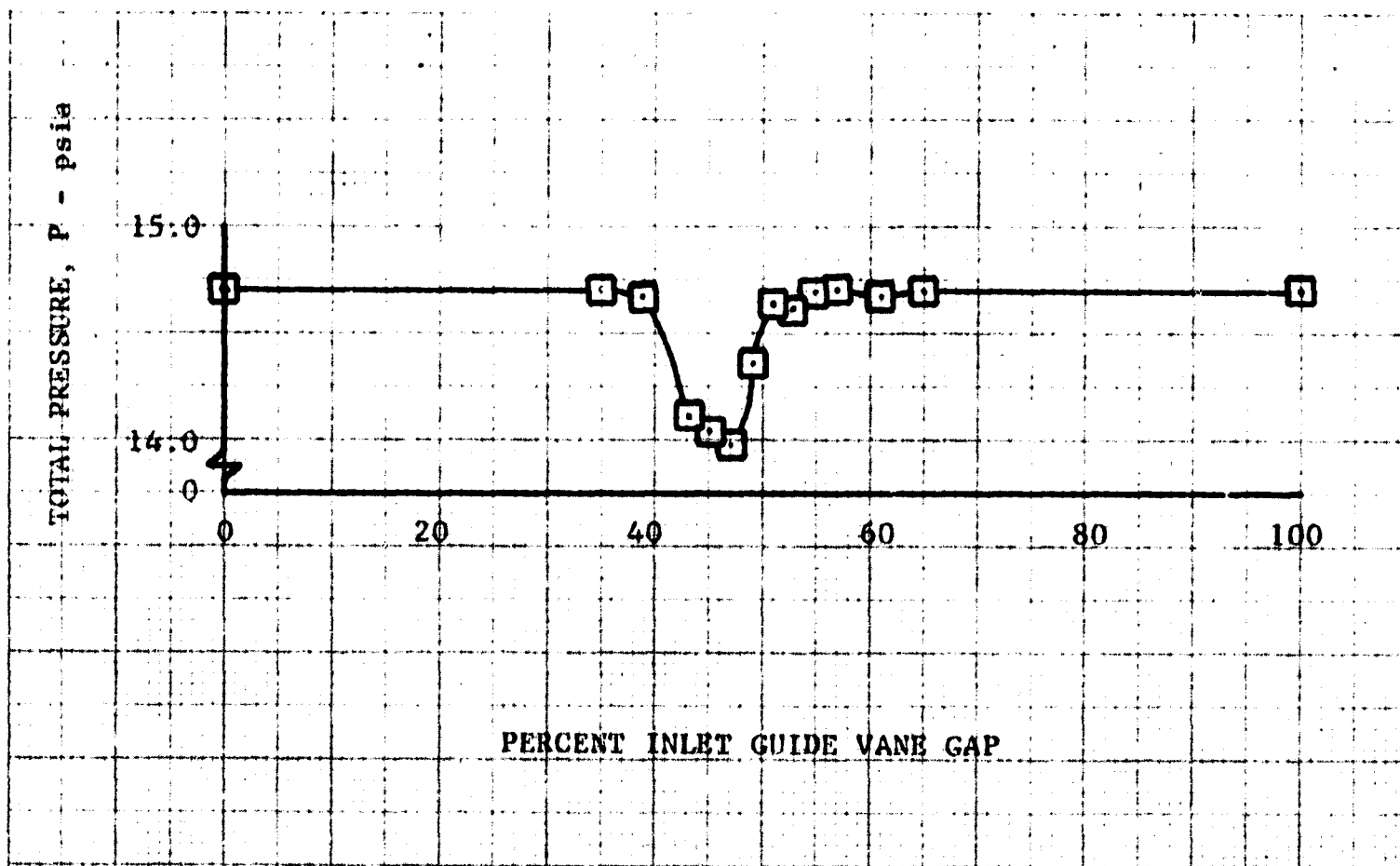


Figure 29. Guide Vane Wake at 10% Span from Tip

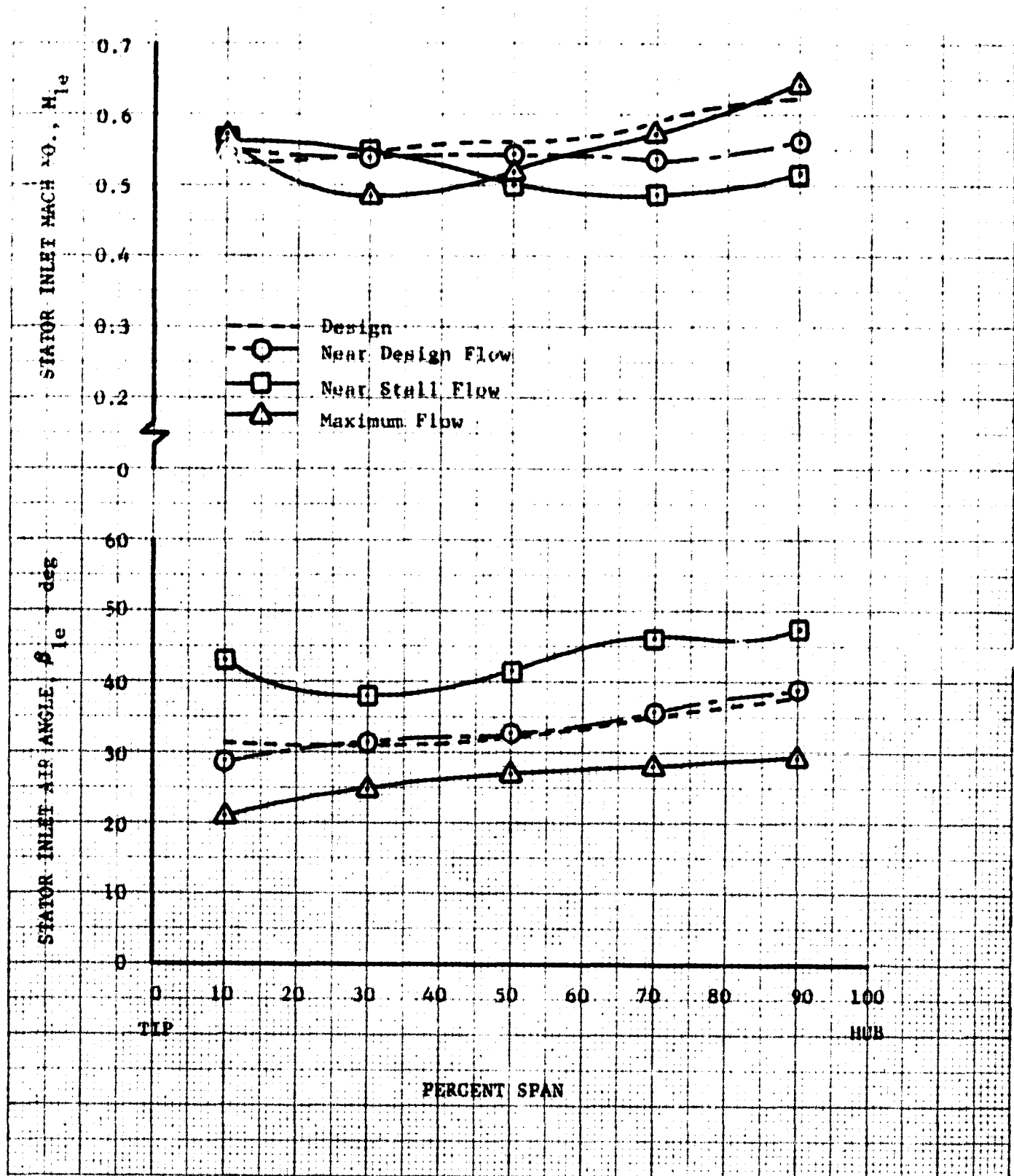


Figure 30. Stator Inlet Air Angle and Mach Number Distribution for SLTO Configuration at 100% Design Equivalent Rotor Speed

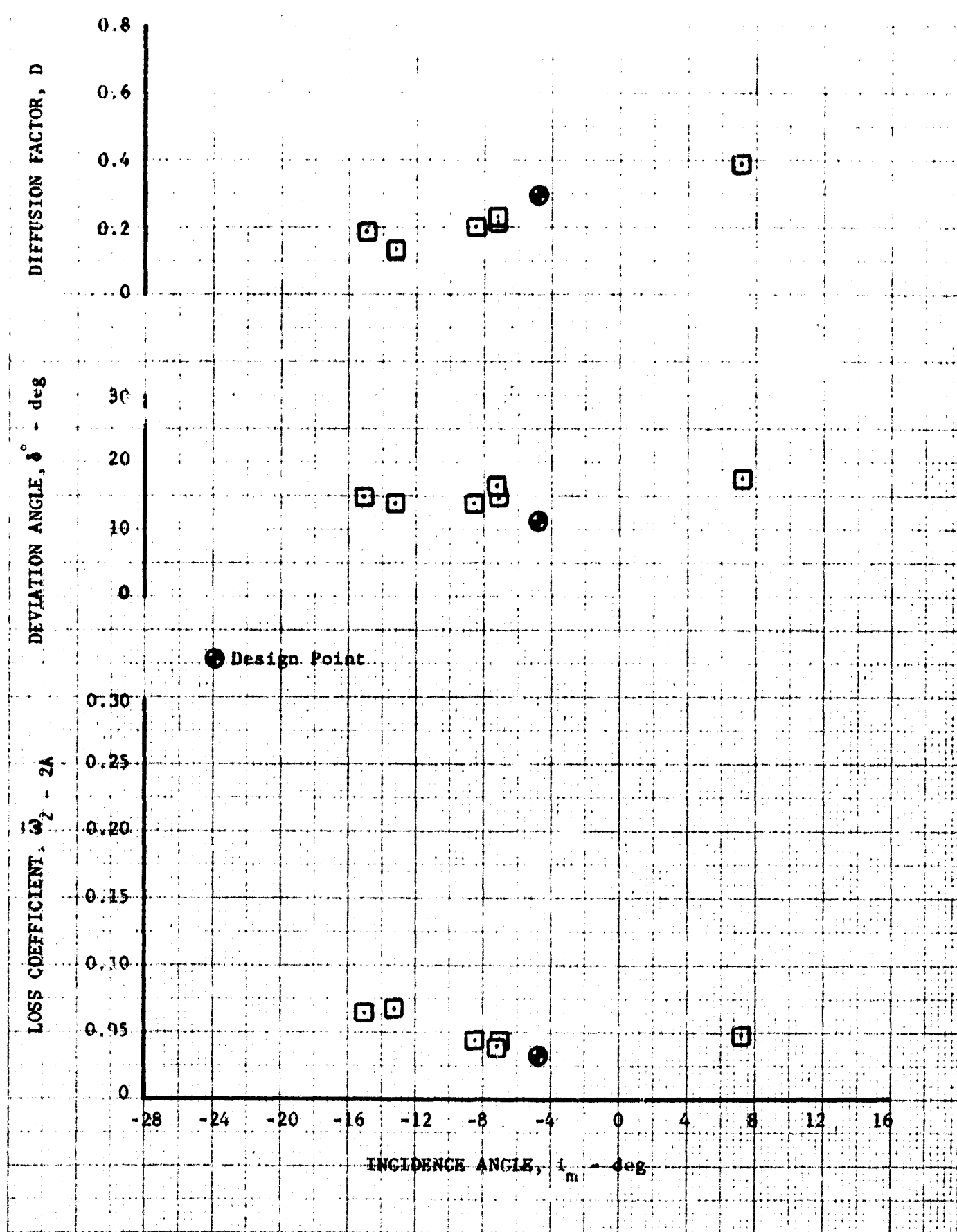


Figure 31. Stator Blade Element Performance for SLT0 Configuration at 100% Design Equivalent Rotor Speed (10% Span from Tip)

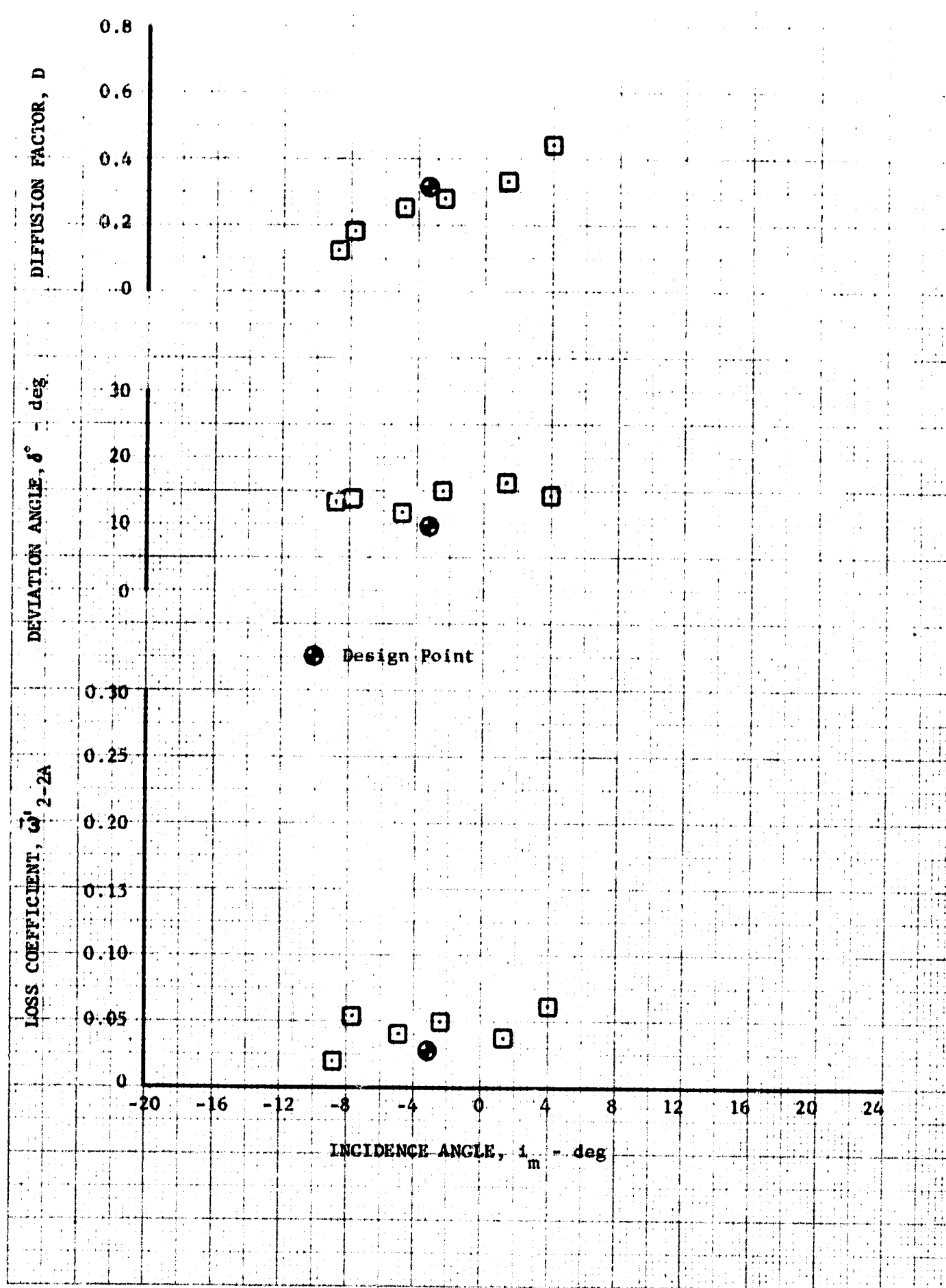
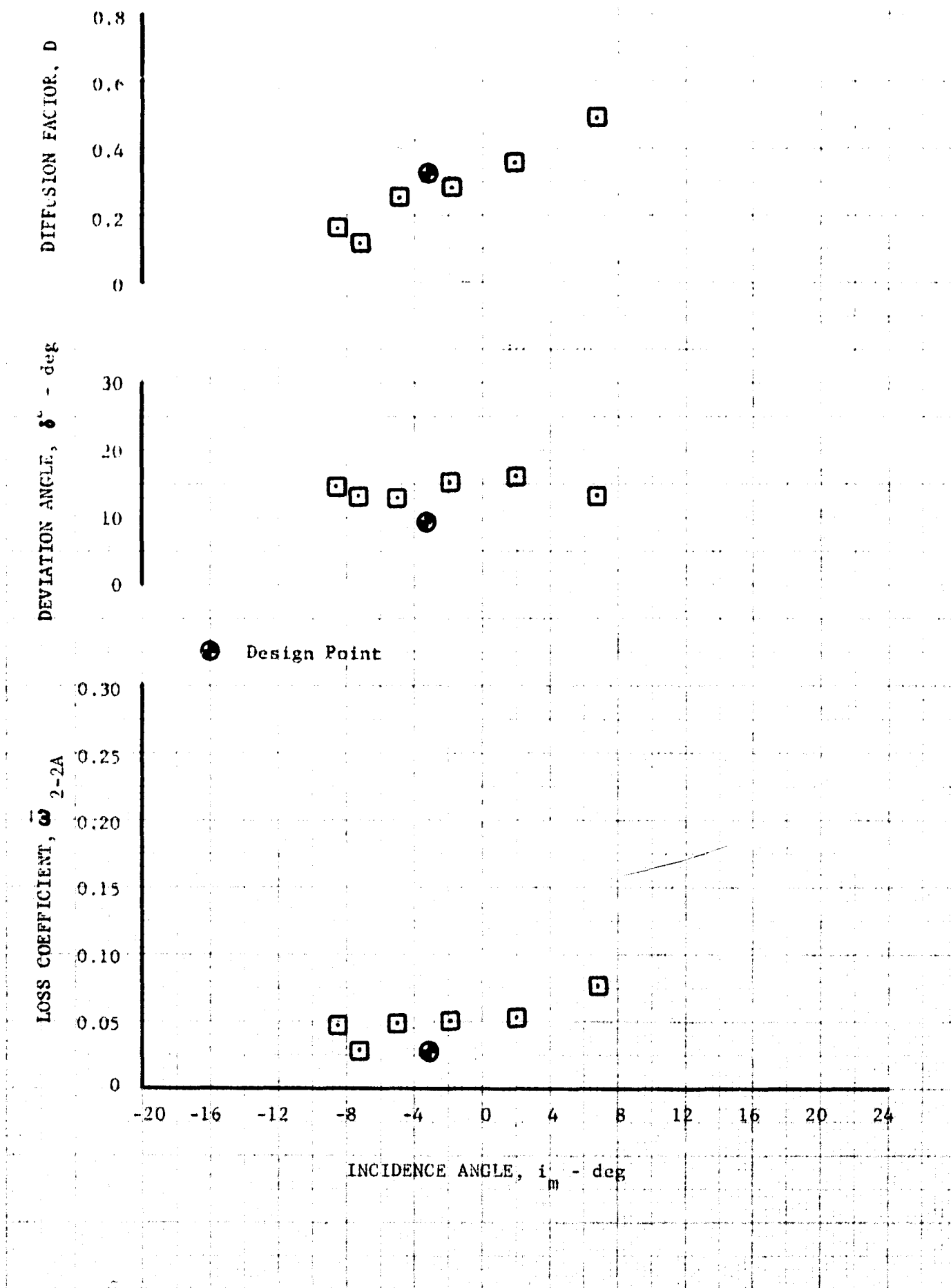


Figure 32. Stator Blade Element Performance for SLT0 Configuration at 100% Design Equivalent Rotor Speed (30% Span from Tip)



DF 66633

Figure 33. Stator Blade Element Performance for SLT0 Configuration at 100% Design Equivalent Rotor Speed (50% Span from Tip)

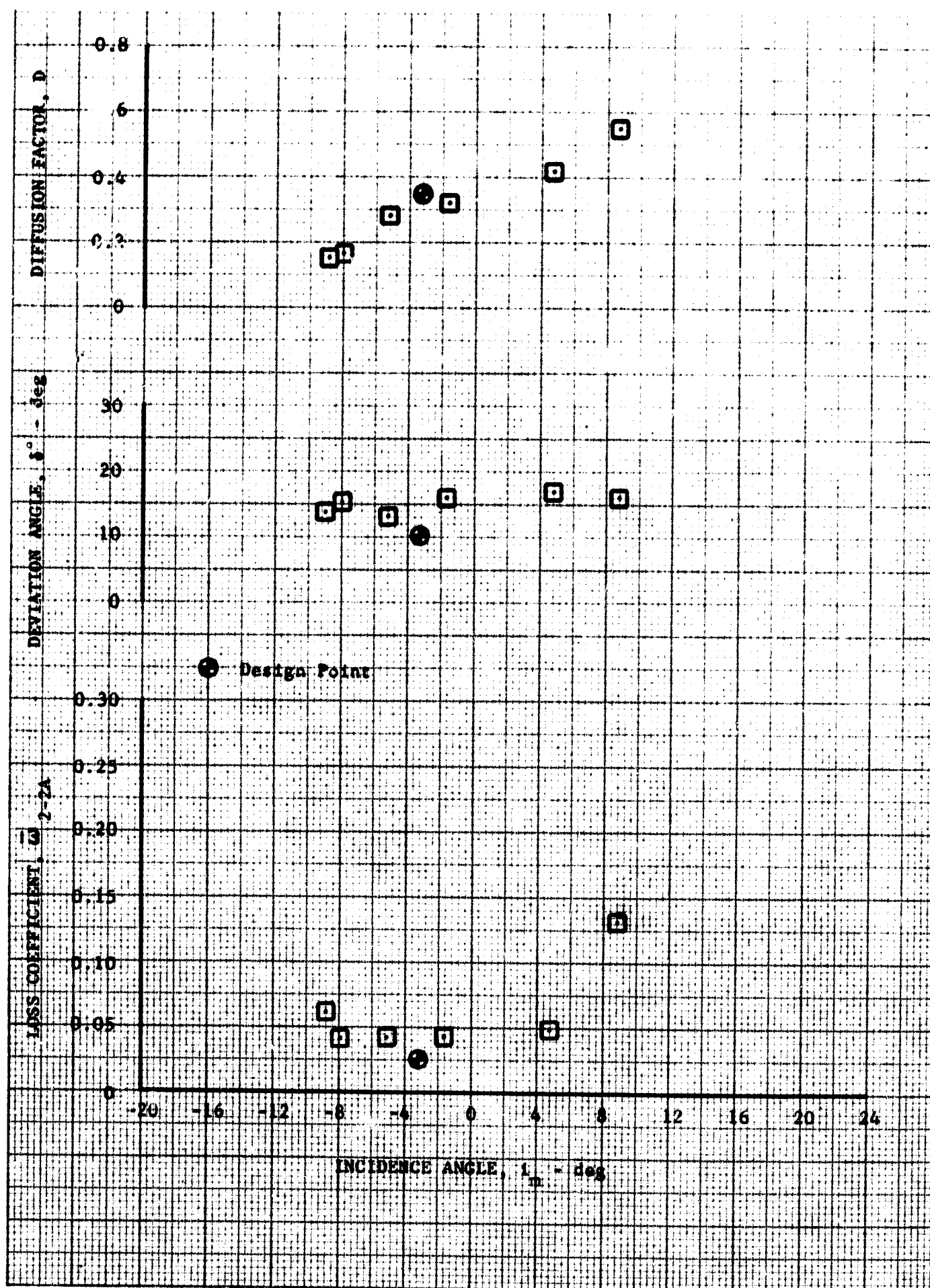


Figure 34. Stator Blade Element Performance for SLTO Configuration at 100% Design Equivalent Rotor Speed (70% Span from Tip)

DF 66634

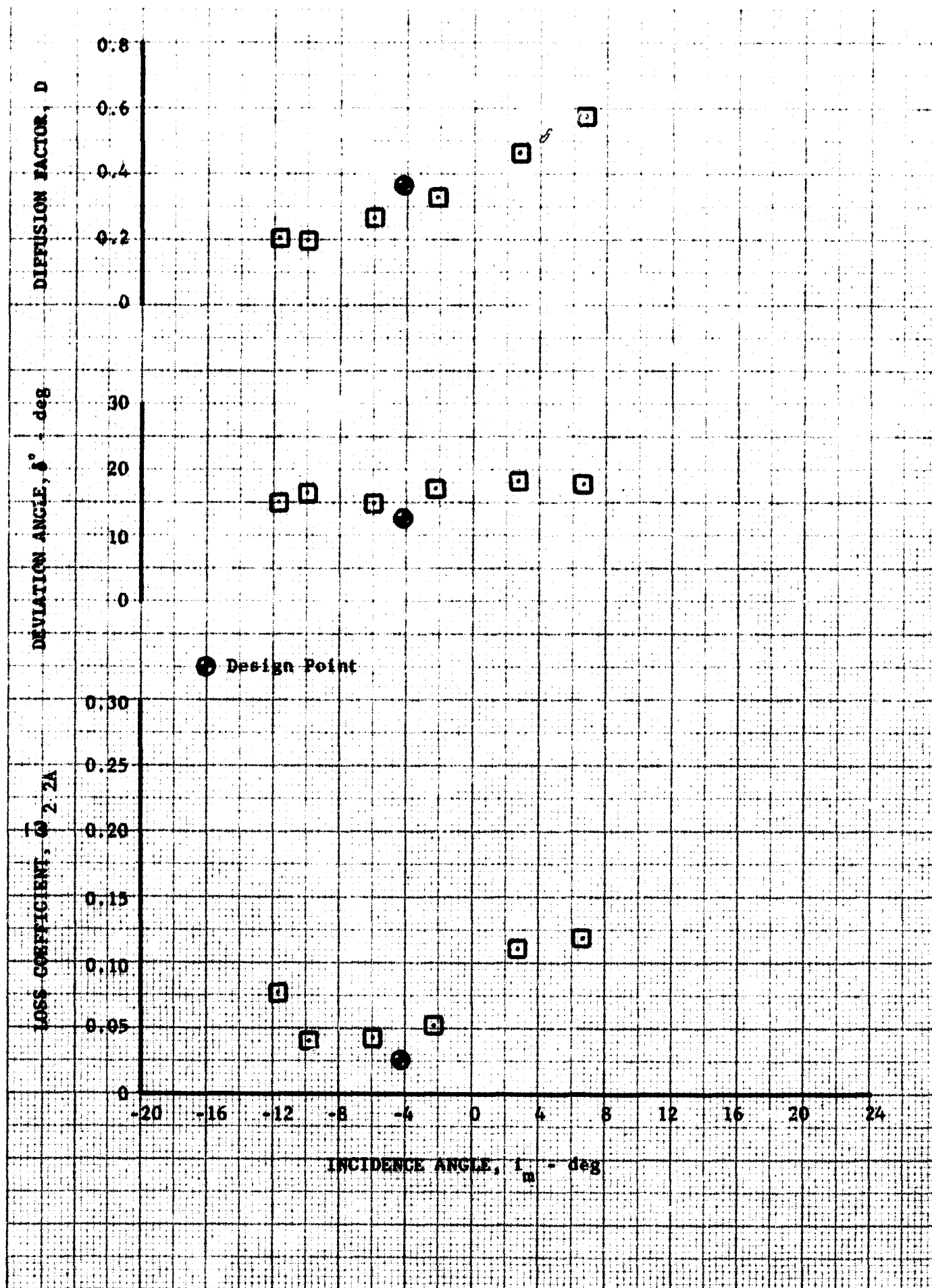


Figure 35. Stator Blade Element Performance for SLTO Configuration at 100% Design Equivalent Rotor Speed (90% Span from Tip)

DF 66635

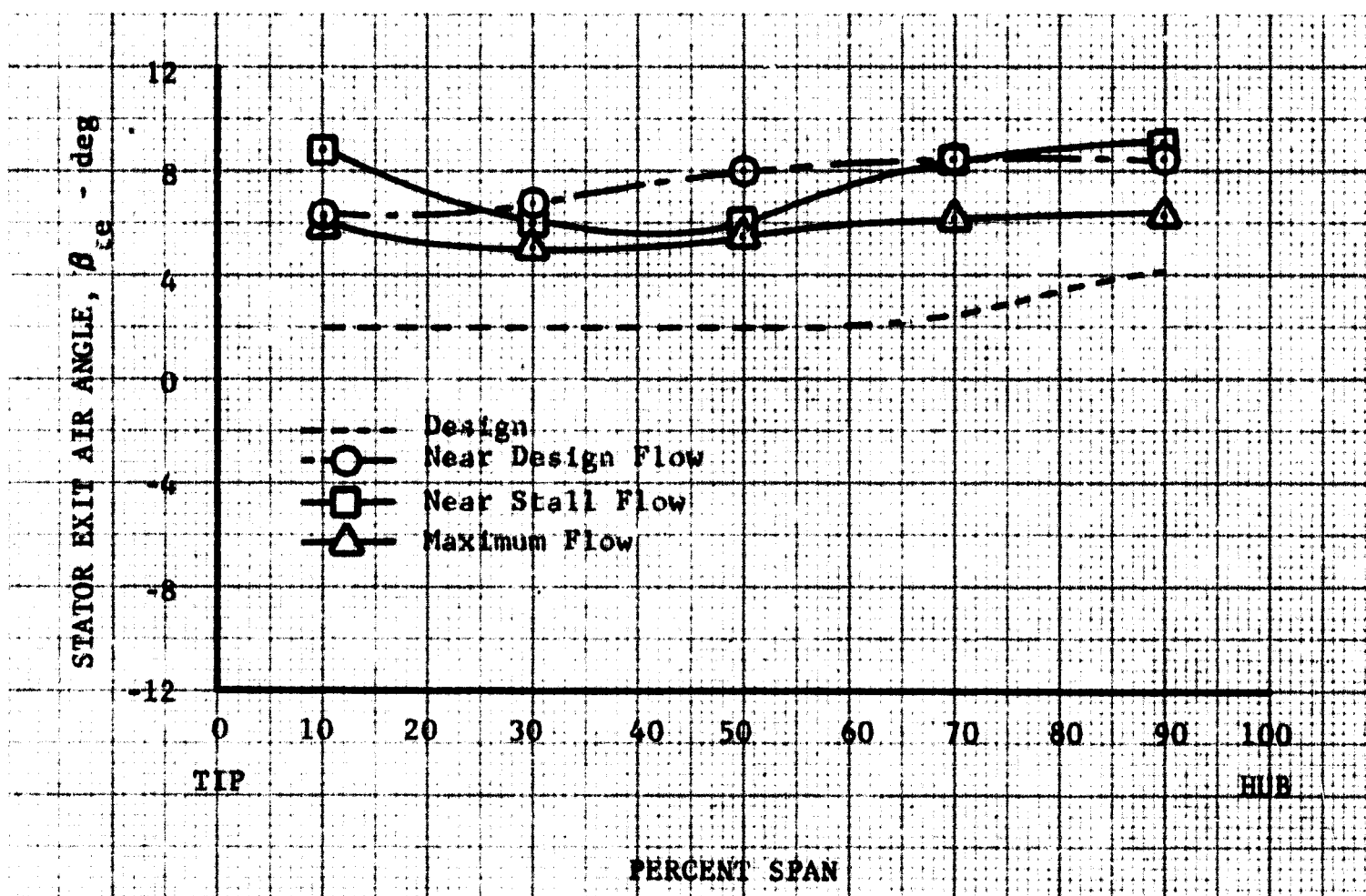


Figure 36. Stator Exit Air Angle vs Percent Span for SLTO Configuration at 100% Design Equivalent Rotor Speed

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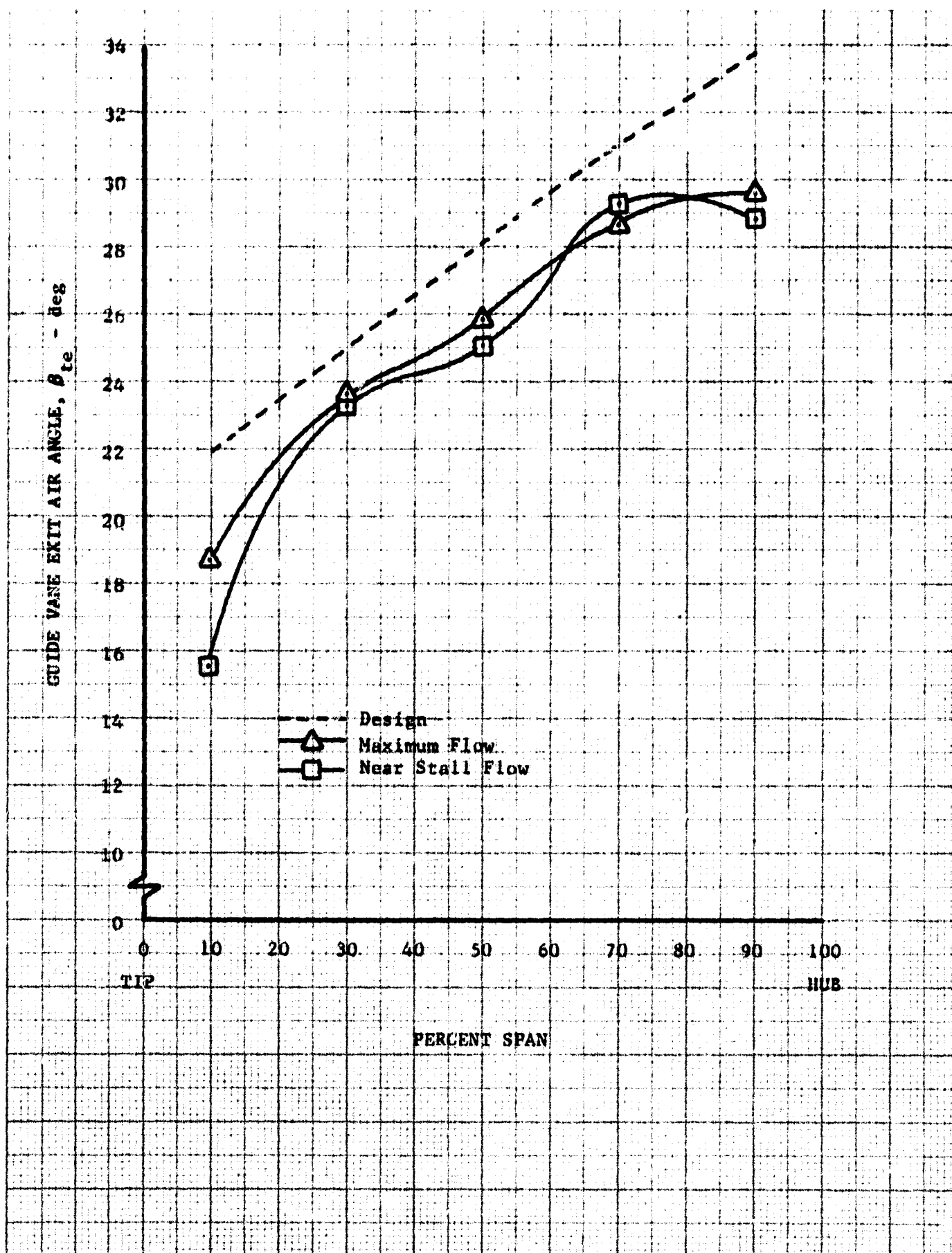


Figure 37. Guide Vane Exit Air Angle for Cruise Configuration

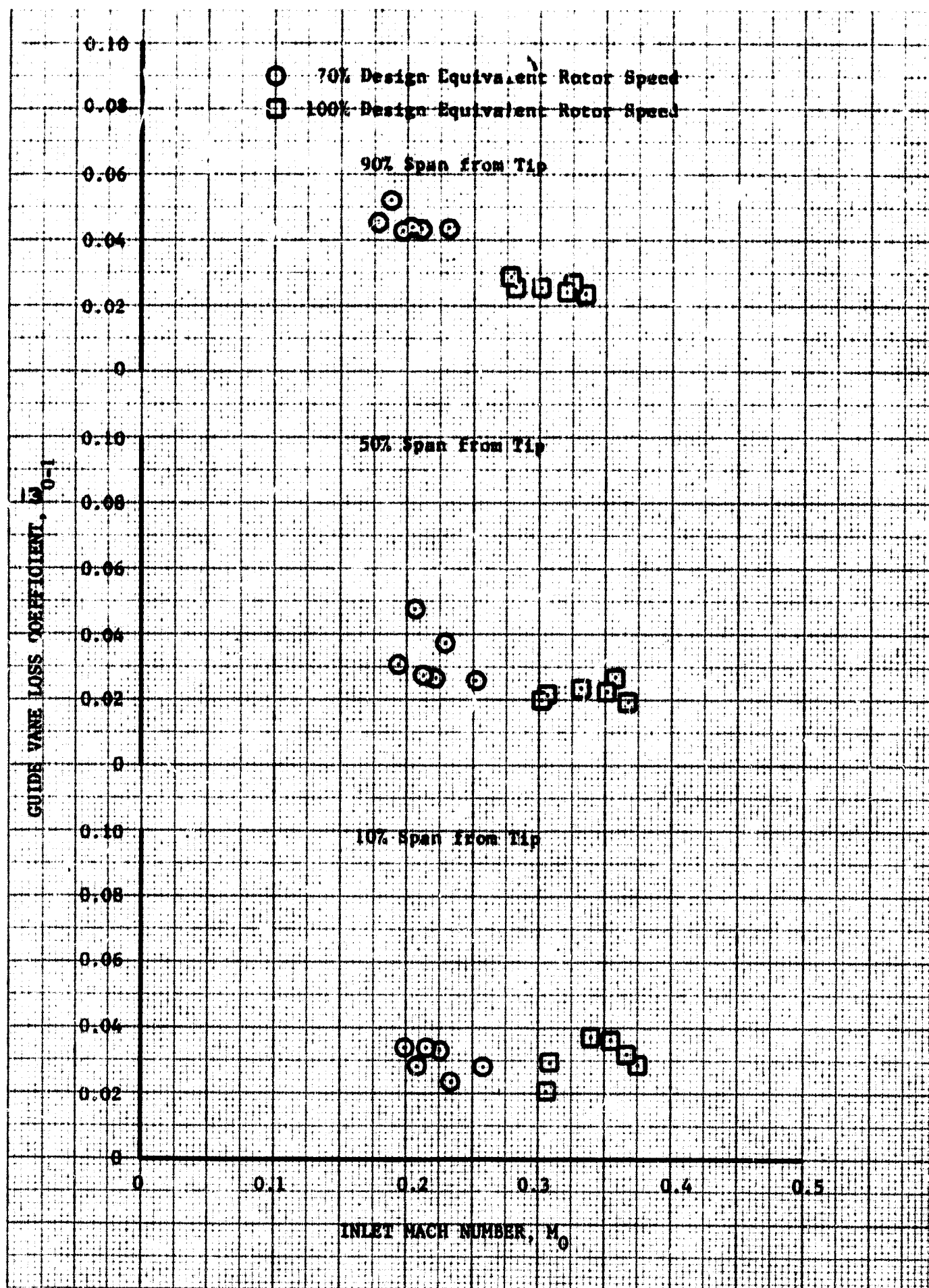


Figure 38. Guide Vane Loss Coefficient vs Inlet Mach Number for Cruise Configuration

DF 66638

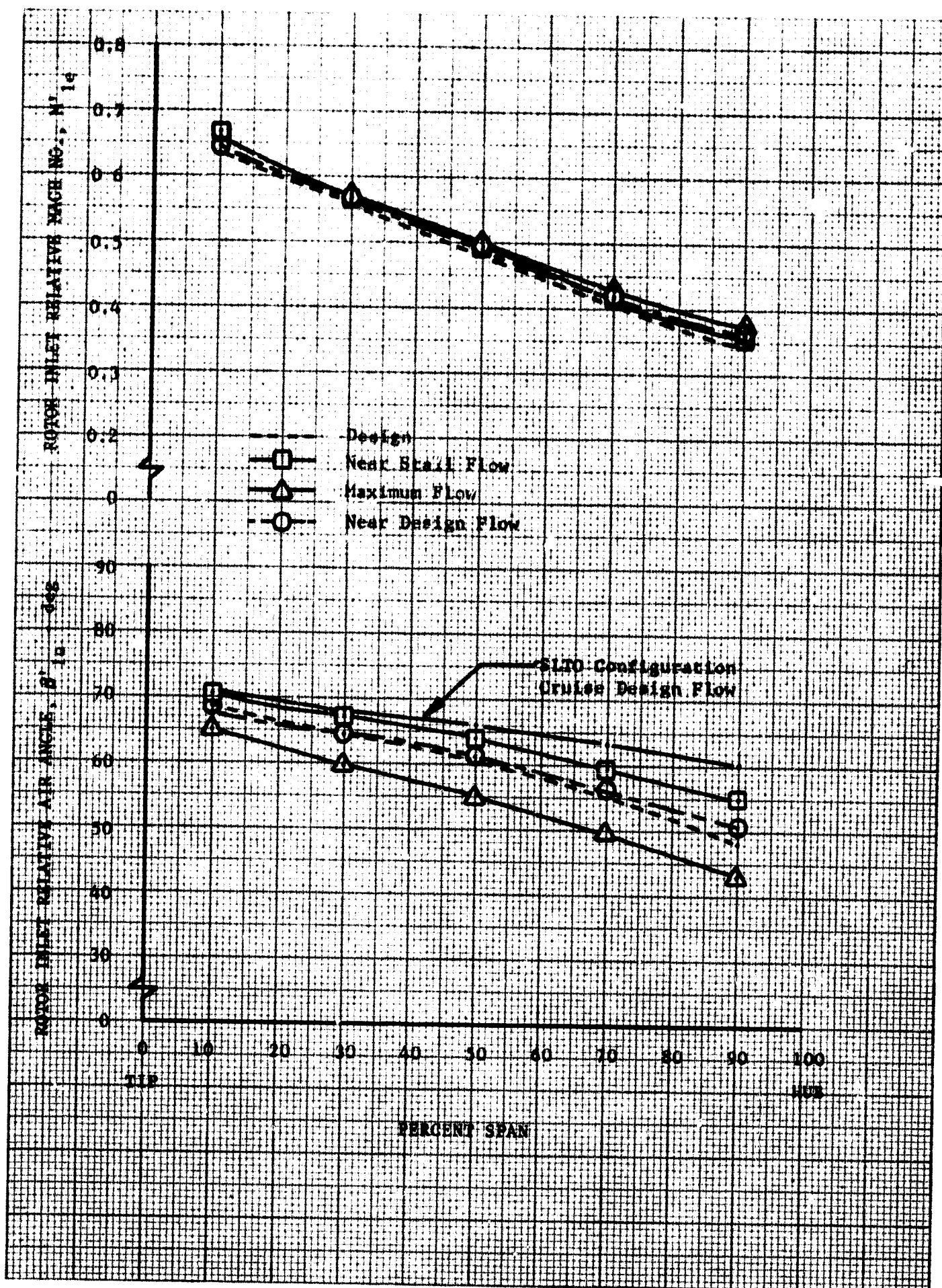
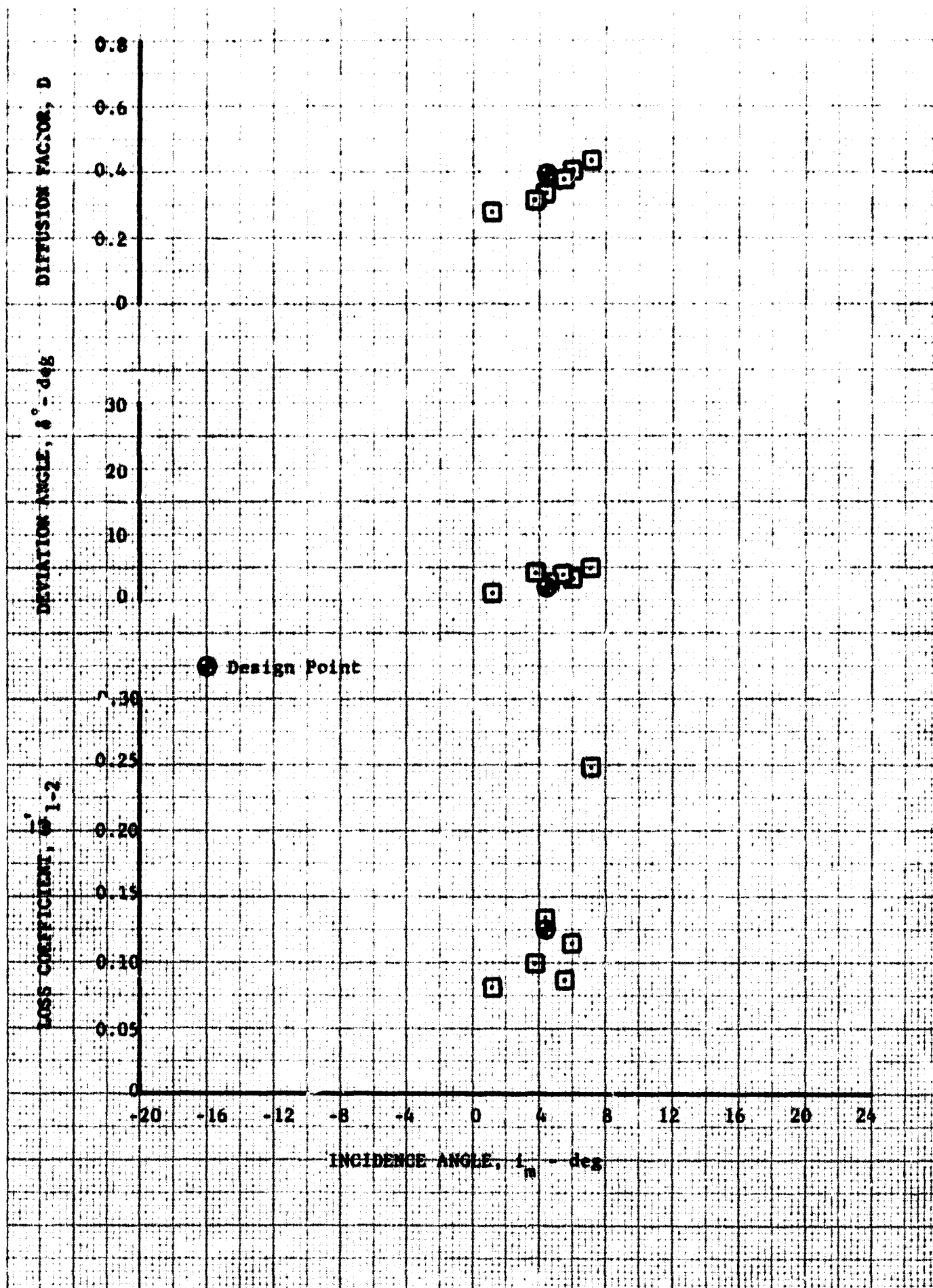


Figure 39. Rotor Inlet Air Angle and Mach Number Distribution for Cruise Configuration at 70% Design Equivalent Rotor Speed



DF 66640

Figure 40. Rotor Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (10% Span from Tip)

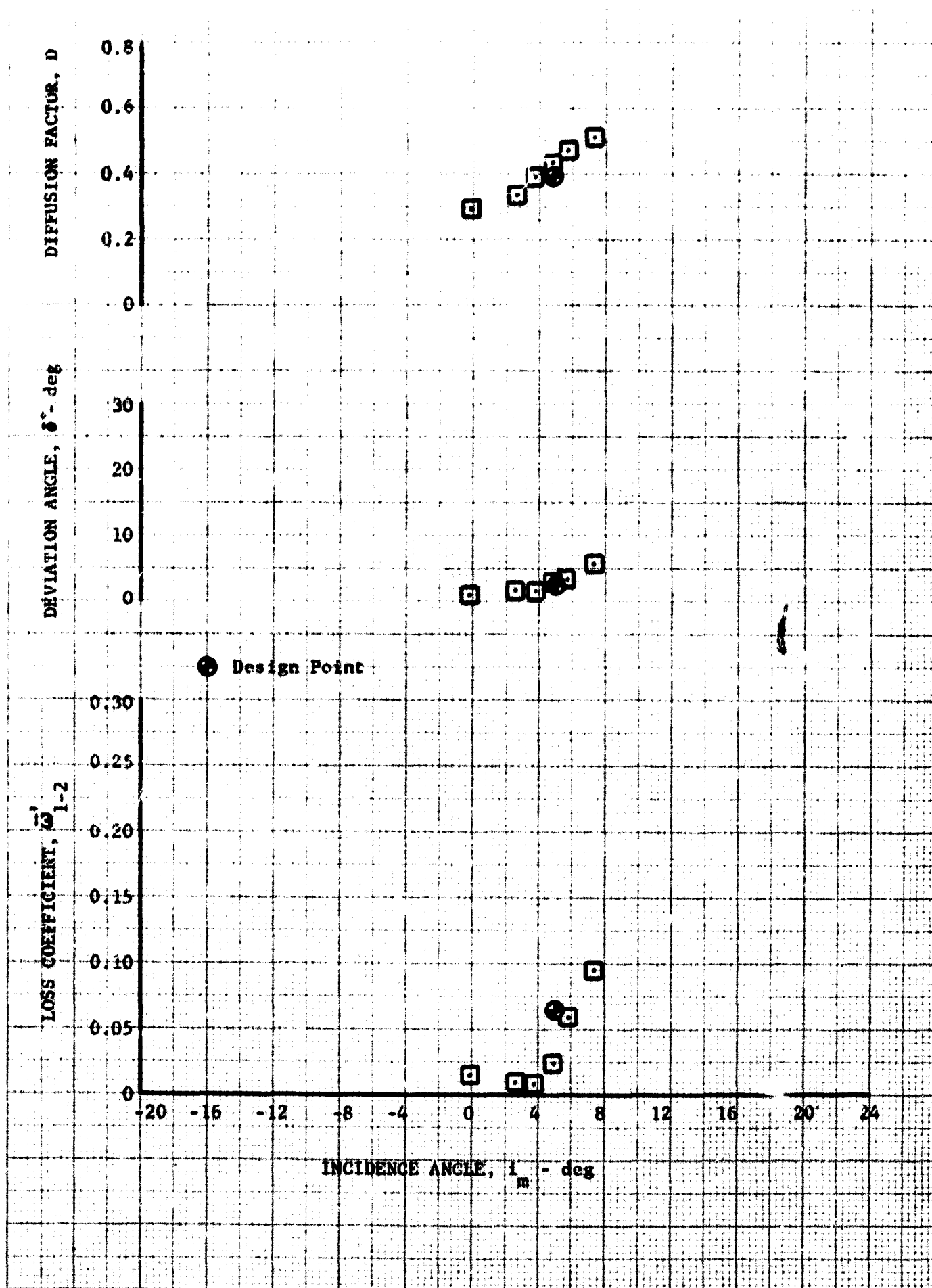


Figure 41. Rotor Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (30% Span from Tip)

DF 66641

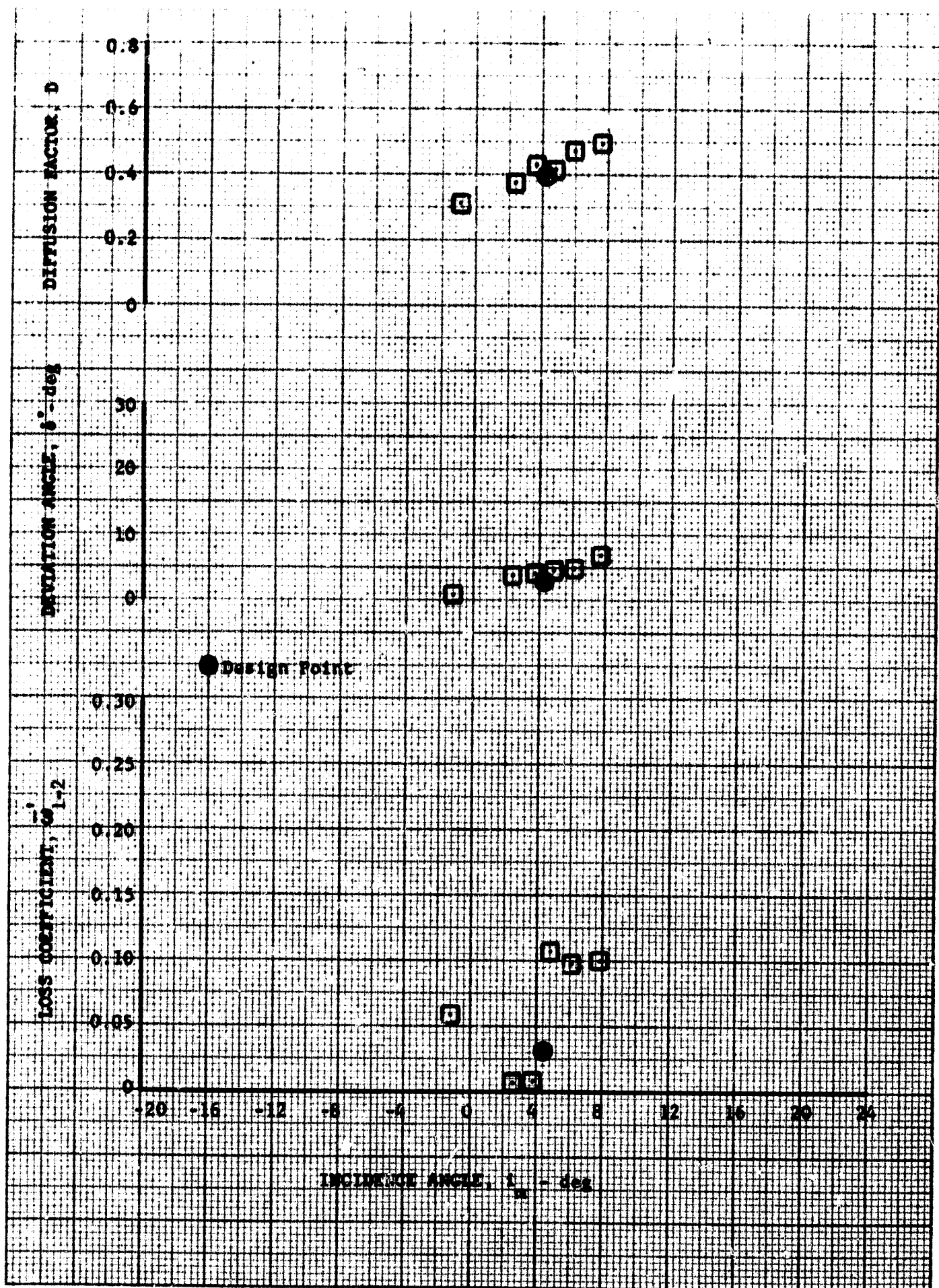


Figure 42. Rotor Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (50% Span from Tip)

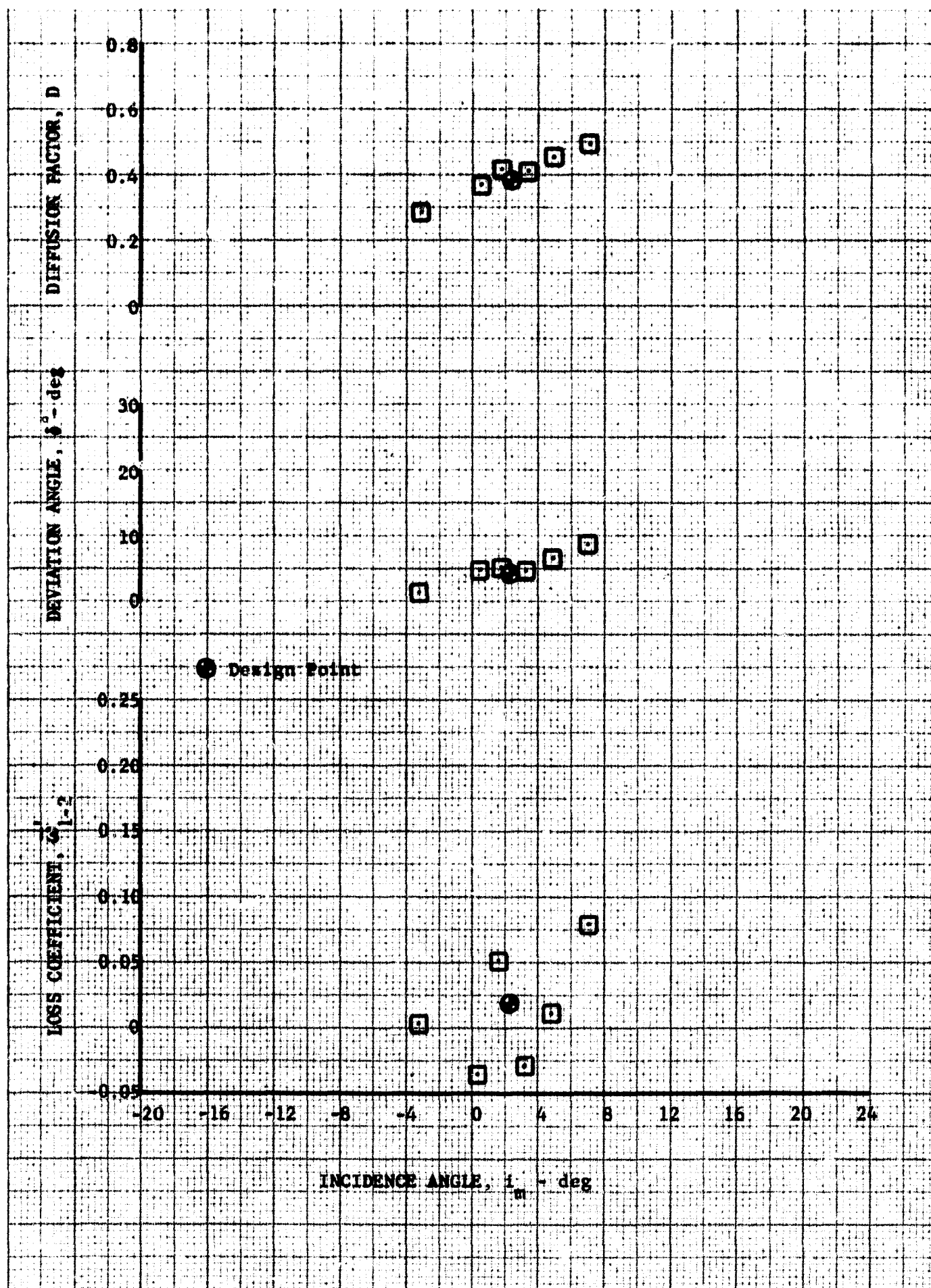


Figure 43. Rotor Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (70% Span from Tip)

DF 66643

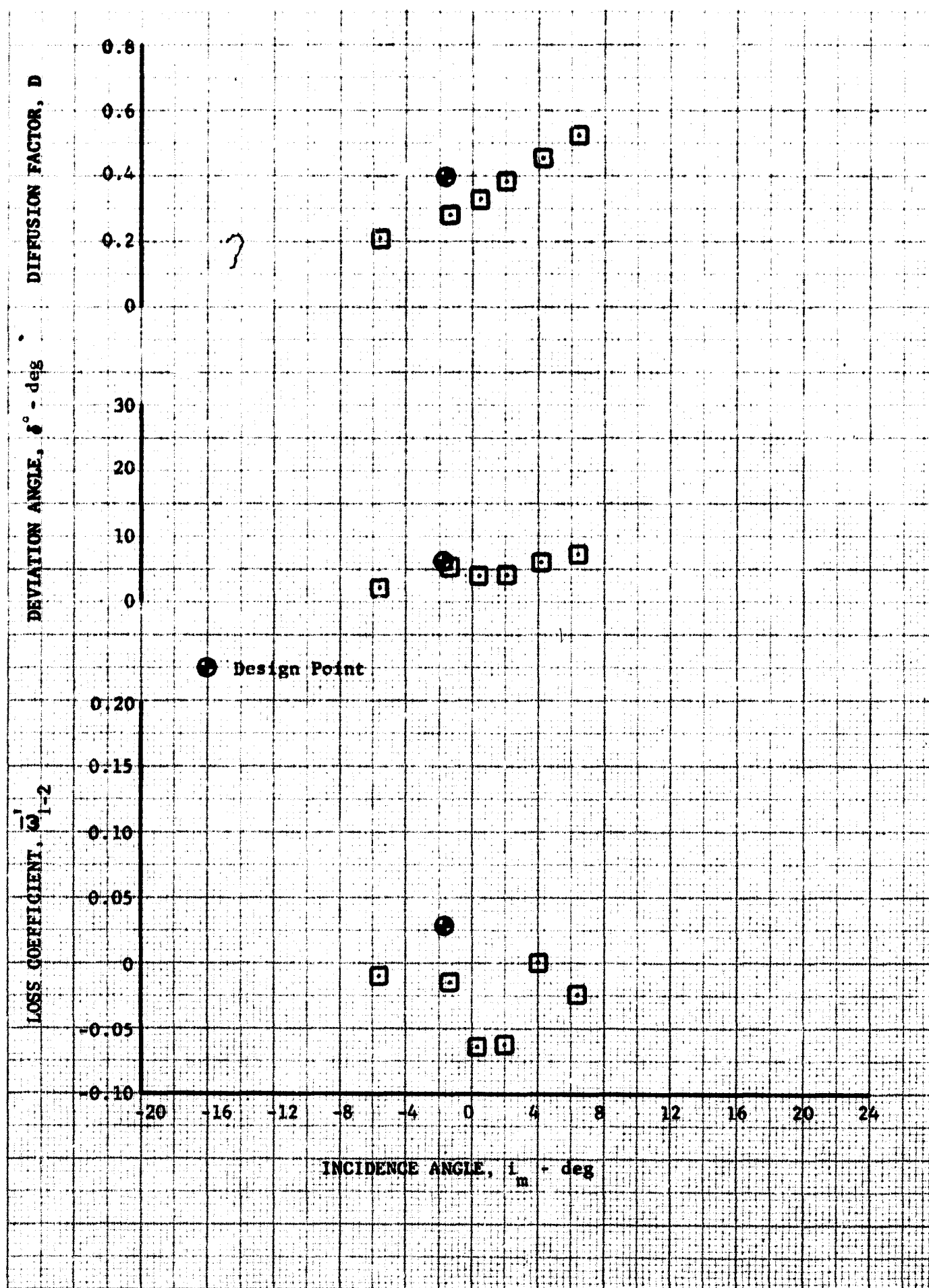


Figure 44. Rotor Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (90% Span from Tip)

DF 66644

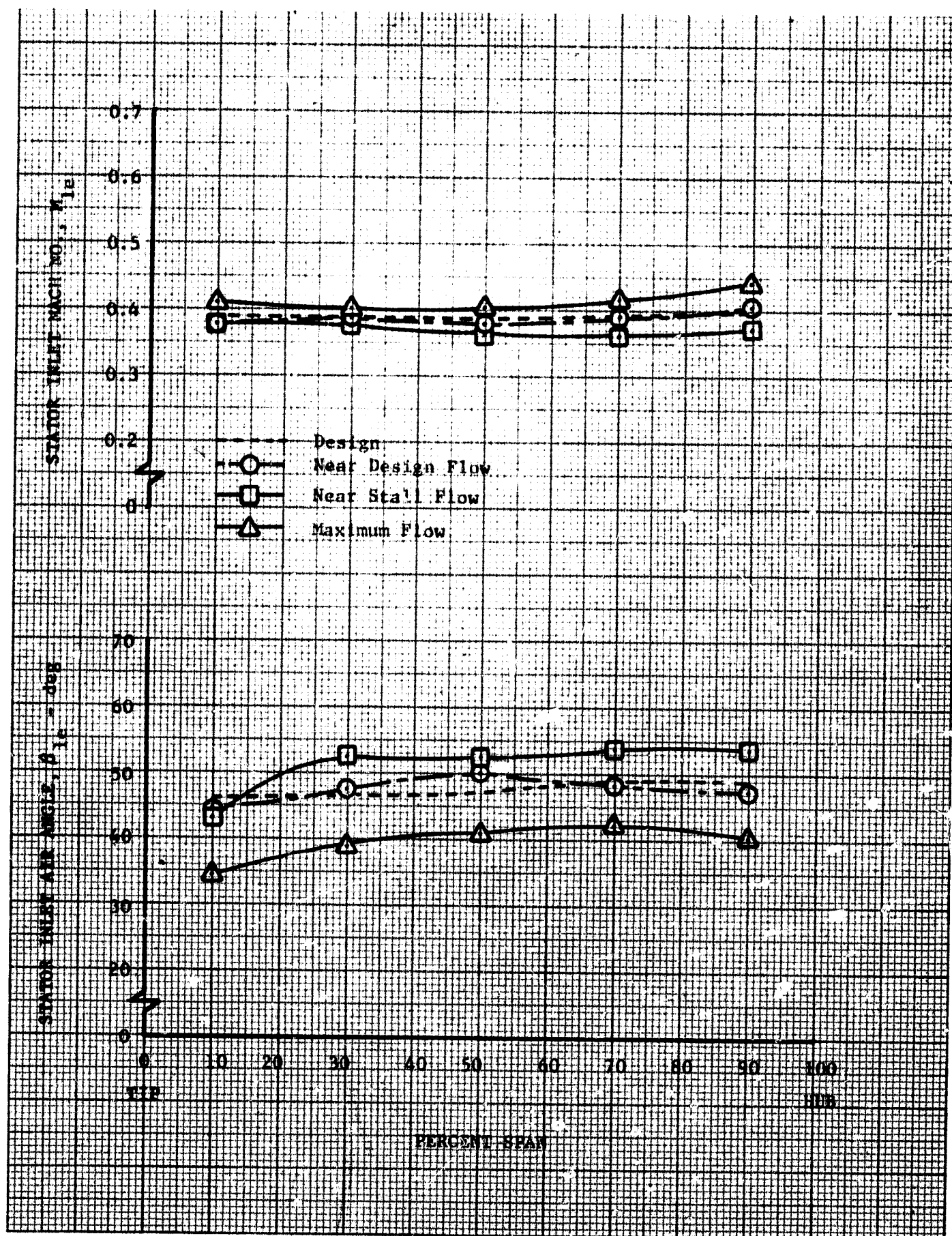


Figure 45. Stator Inlet Air Angle and Mach Number Distribution for Cruise Configuration at 70% Design Equivalent Rotor Speed

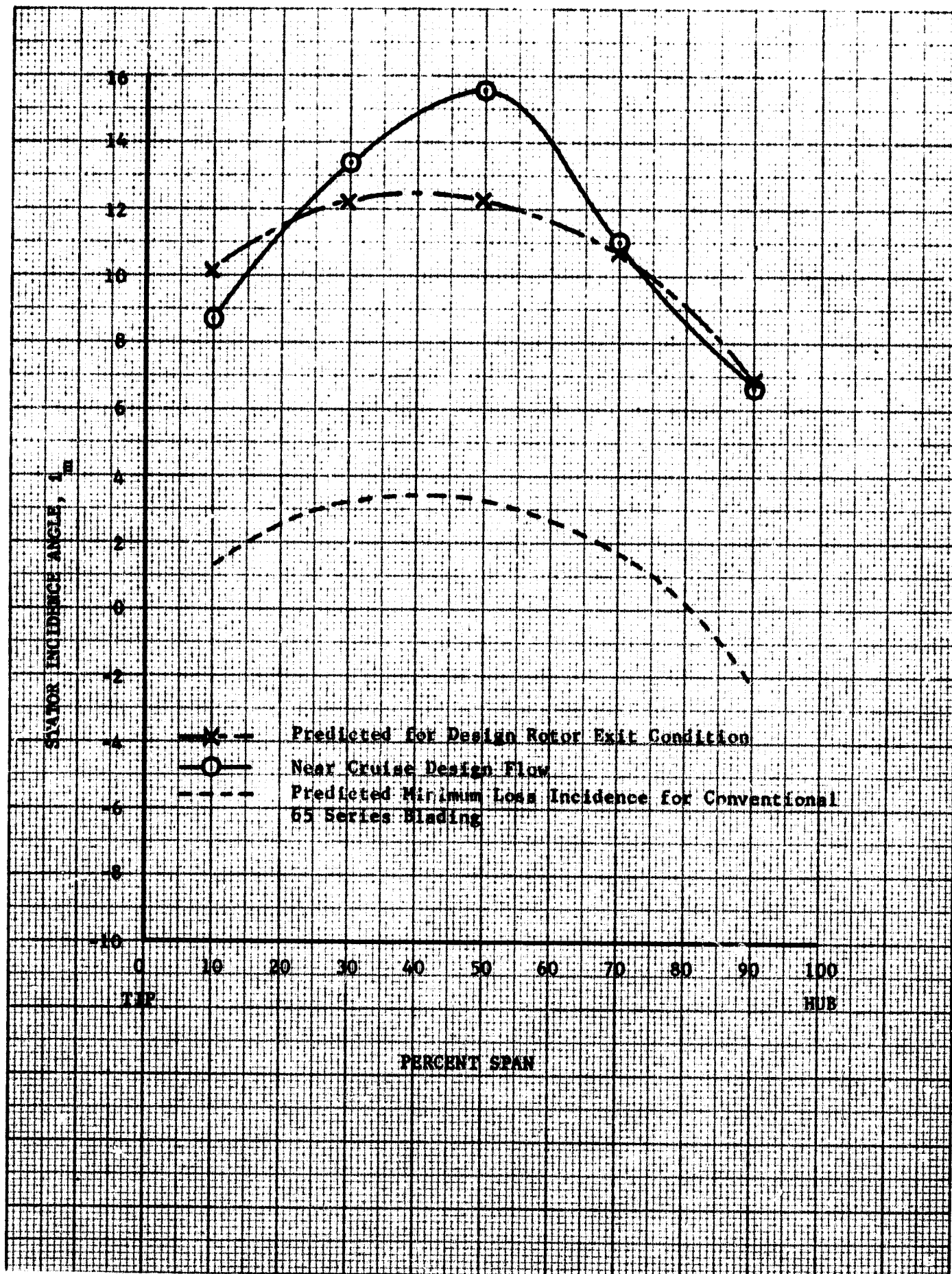


Figure 46. Stator Incidence Angle Distribution for Cruise Configuration at 70% Design Equivalent Rotor Speed

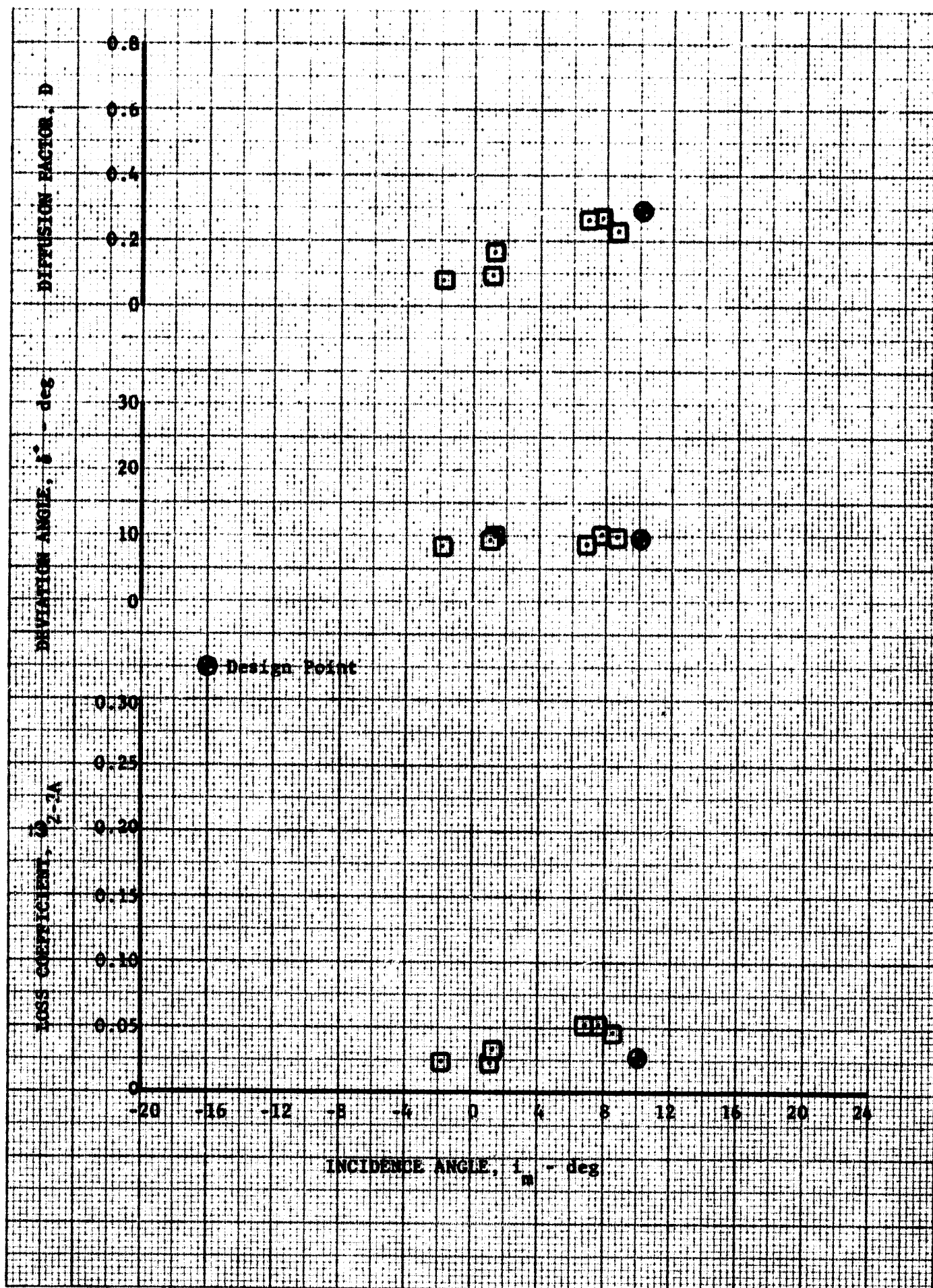


Figure 47. Stator Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (10% Span from Tip)

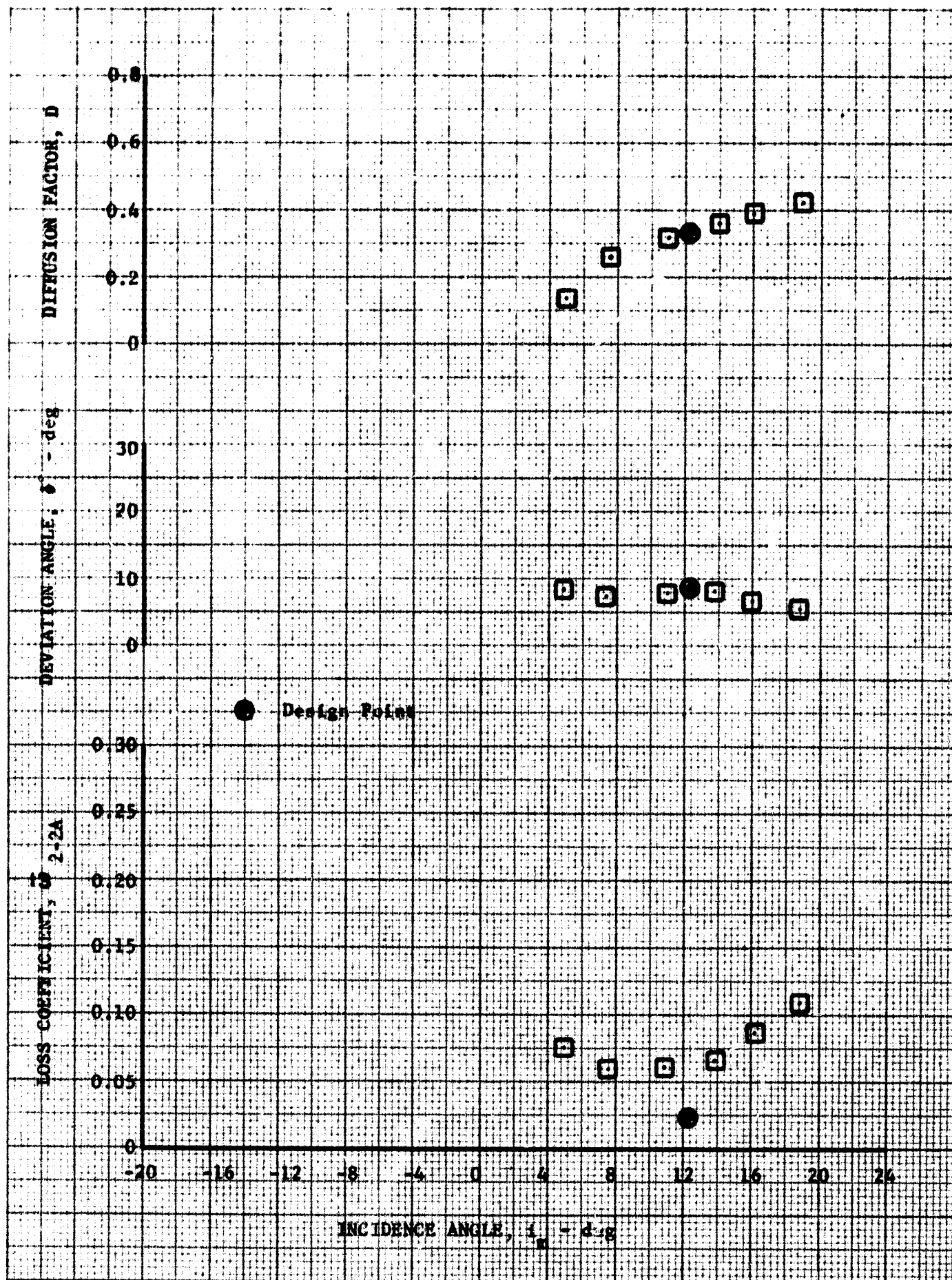


Figure 48. Stator Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (30% Span from Tip)

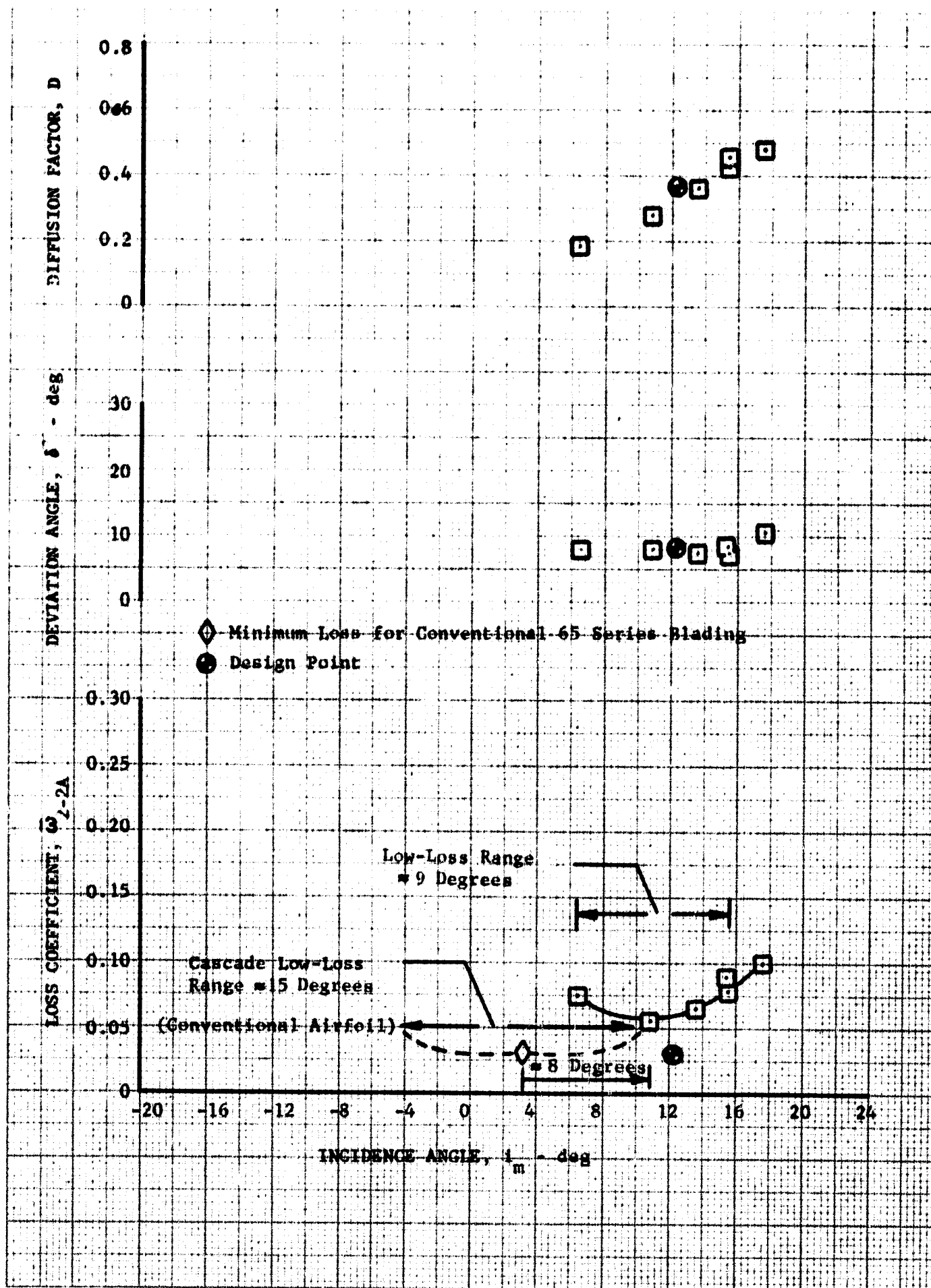


Figure 49. Stator Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (50% Span from Tip)

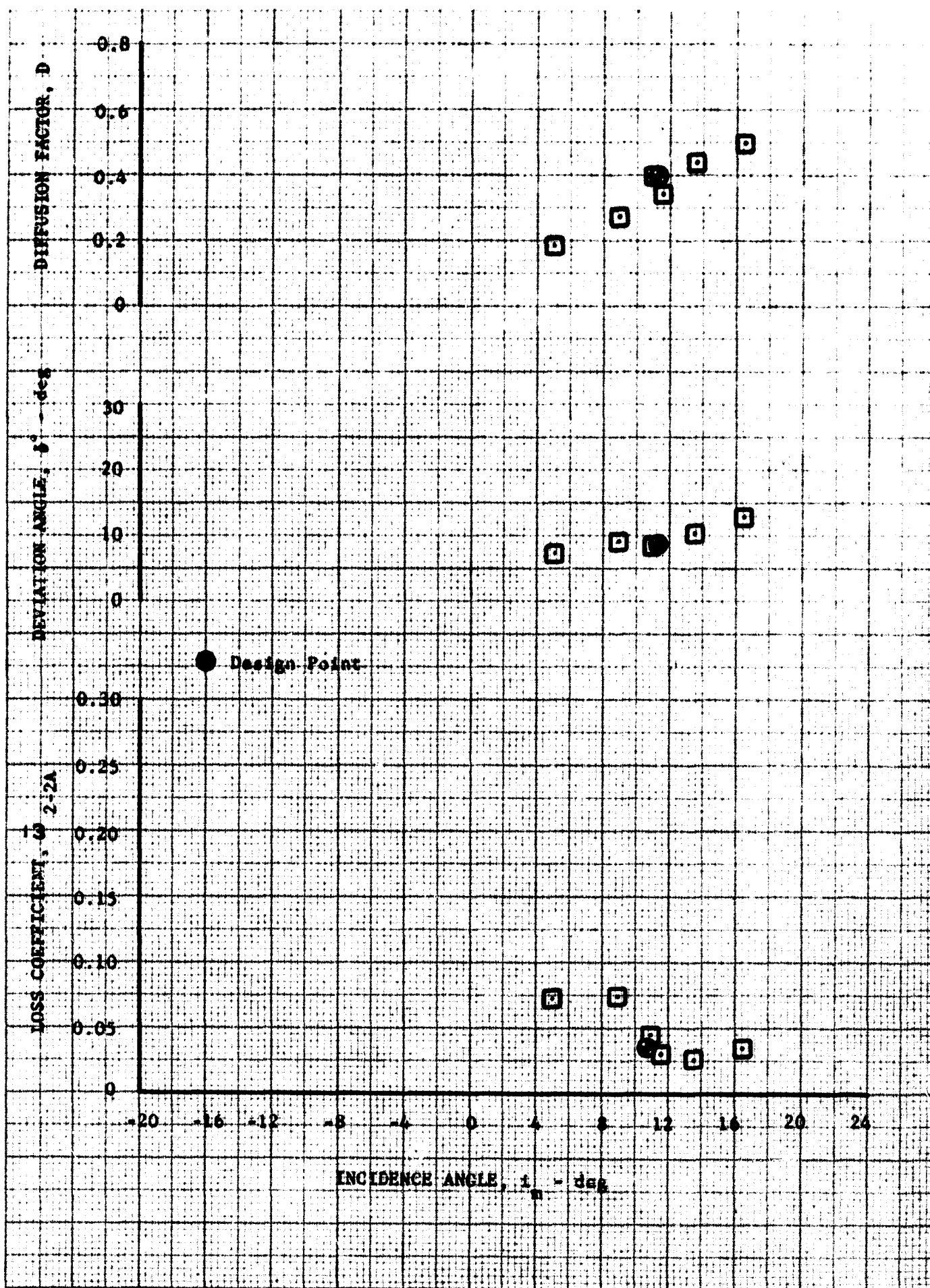


Figure 50. Stator Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (70% Span from Tip)

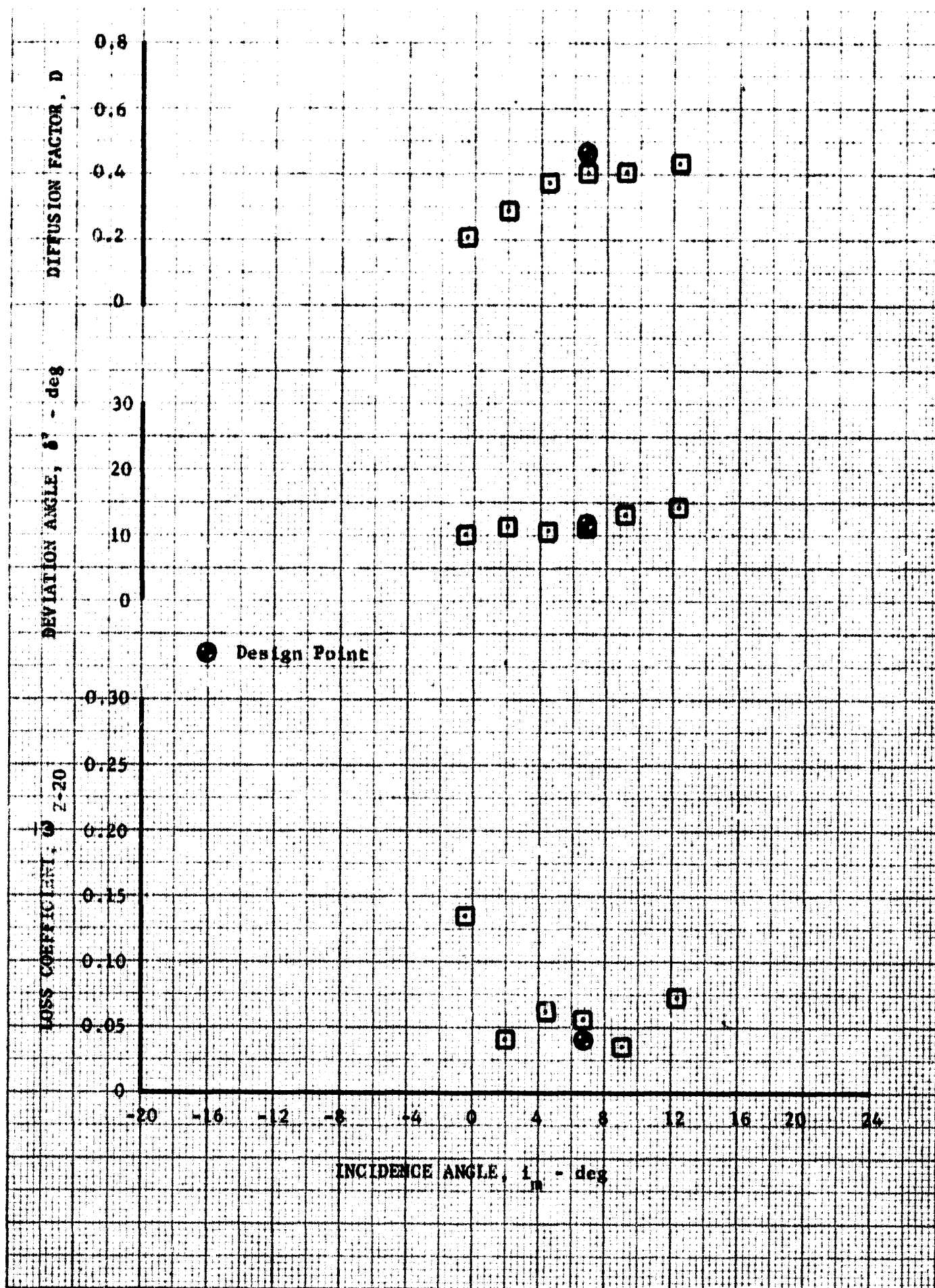


Figure 51. Stator Blade Element Performance for Cruise Configuration at 70% Design Equivalent Rotor Speed (90% Span from Tip)

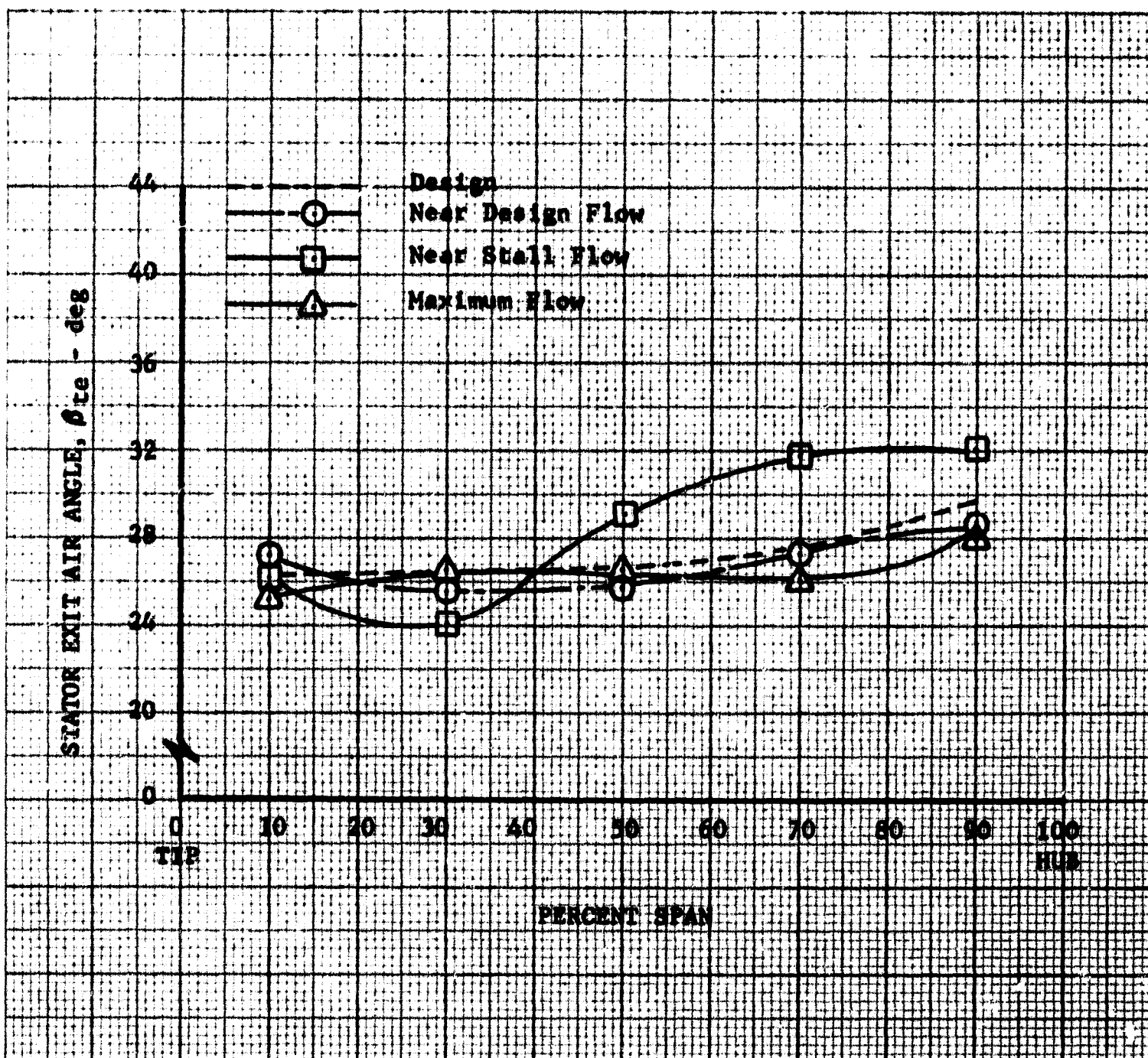


Figure 52. Stator Exit Air Angle vs Percent Span for Cruise Configuration at 70% Design Equivalent Rotor Speed

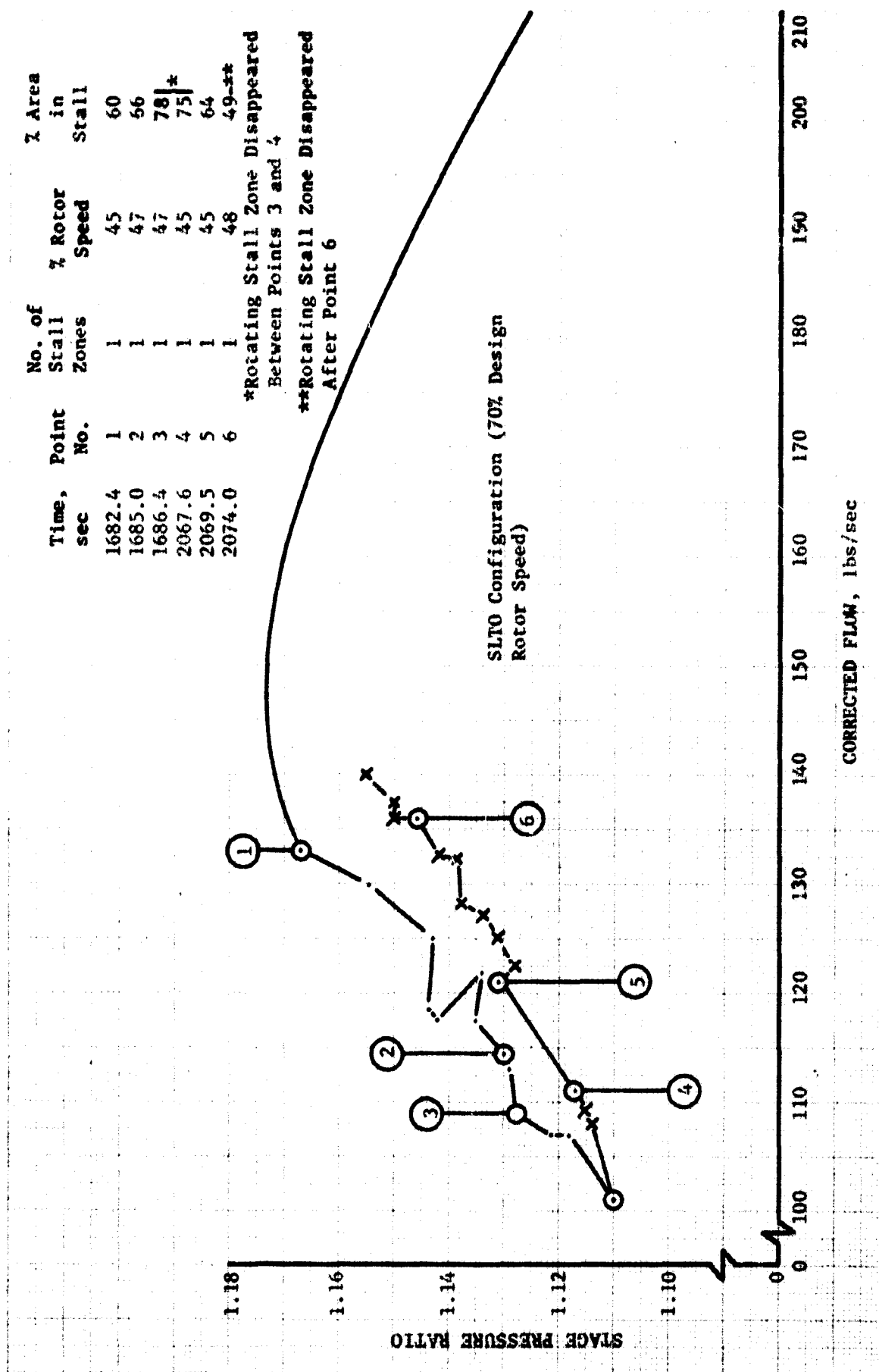


Figure 53. Stage Stall Characteristics

Transient Data

Stage Exit Pressure

Rotor Speed

Orifice Pressure

TIME - sec

Rotating Stall Data

PRESSURE

Figure 54. Transient and Rotating Stall (Kistler Trace) Data

FD 25203

APPENDIX A DEFINITION OF SYMBOLS

A_A	Flowpath annular area, in. ²
a'_{01}	Inlet relative stagnation velocity of sound, ft/sec
c	Chord length, in.
C_p	Specific heat of air, 0.24 Btu/lb ^o F
d	Diameter
D	Diffusion factor
g	Gravitational constant, 32.2 ft/sec ²
i_m	Incidence angle, deg (based on equivalent circular arc for stators)
J	Mechanical equivalent of heat, 778 ft-lb/Btu
$\bar{m}$	Mass flow parameter, $\sqrt{\gamma g/R} \ M \left[1 + \frac{\gamma - 1}{2} M^2 \right]^{1/2} p/P$
M	Absolute Mach number
P	Total pressure, psia
p	Static pressure, psia
q	Pressure equivalent of the velocity head, psia
R	Gas constant for air, 53.3 $\frac{\text{ft-lbs}}{\text{lb-}^{\circ}\text{R}}$
S	Blade spacing, in.
s	Blade span, in.
T	Total temperature, ^o R
T_s	Static temperature, ^o R
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 (from axial direction)
γ	Ratio of specific heats
γ°	Blade-Chord angle, deg
δ	Ratio of total pressure to NASA standard sea level pressure of 2116 psf
δ°	Deviation angle, deg
η_{ad}	Adiabatic efficiency
η_p	Polytropic efficiency

θ	Ratio of total temperature to NASA standard sea level temperature of 518.7°R
κ	Blade metal angle, deg (based on equivalent circular arc meanline for Stator A and on the 0.5% chord and 95% chord for the IGV)
ρ	Density, lb _m /ft ³
σ	Solidity, c/S
ϕ	Blade camber angle, deg (based on equivalent circular arc for stator A) or flow coefficient
ψ	Pressure rise coefficient
$\bar{\omega}$	Total pressure loss coefficient

Subscripts

0	Compressor inlet instrumentation station
1	Guide vane exit/rotor inlet instrumentation station
2	Rotor exit/stator inlet instrumentation station
2A	Stator exit instrumentation station
fs	Freestream value of guide vane or stator rake total pressure
id	Isentropic condition
le	Leading Edge
te	Trailing edge
m	Midspan
s	Static condition
z	Axial component
θ	Tangential component

Superscripts

'	Relative rotor blade
-	Mass average value corrected to standard inlet conditions (used for overall and blade element performance)

Nomenclature used for blade element data tabulation (tables B-2 and B-3)

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
$\bar{\omega}$	Loss coefficient
DFAC	Diffusion factor
EFFP	Polytropic efficiency
EFF	Adiabatic efficiency
INCIDM	Incidence, degrees
DEVM	Deviation, degrees

NOTE

The numbers following the nomenclature in Tables B-2 and B-3 refer to the leading and trailing edges of the respective blade rows, as indicated below:

3	IGV _{le}
4	IGV _{te}
6	Rotor _{le}
7	Rotor _{te}
9	Stator _{le}
10	Stator _{te}

DEFINITION OF CALCULATED PERFORMANCE VARIABLES

Overall Performance Data

Inlet Mach Number:

$$\frac{W\sqrt{\theta}\sqrt{518.7}}{\delta P_o A_o} = g\sqrt{\gamma/g} M_o \left[1 + \frac{\gamma-1}{2} M_o^2 \right]^{1/2}$$

Pressure Ratio:

$$\text{Rotor: } \frac{\bar{P}_2}{\bar{P}_1} \quad \text{Rotor-Guide Vane: } \frac{\bar{P}_2}{14.696} \quad \text{Stage: } \frac{\bar{P}_{2A}}{14.696}$$

Corrected Flow:

$$W\sqrt{\theta/\delta}$$

Corrected Specific Flow:

$$\frac{W\sqrt{\theta}}{\delta A_A}$$

Corrected Rotor Speed:

$$N/\sqrt{\theta}$$

Adiabatic Efficiency (overall):

$$\frac{(\bar{P}_2/\bar{P}_1)^{\frac{\gamma-1}{\gamma}} - 1}{\bar{T}_{2A}/\bar{T}_1 - 1} \quad (\text{e.g., for rotor})$$

Pressure Rise Coefficient:

$$\psi = \frac{C_p J g T_o \left[(\bar{P}_{2A}/P_o)^{\frac{\gamma-1}{\gamma}} - 1 \right]}{U_{1e_m}^2 \Big|_{\text{rotor}}}$$

Flow Coefficient:

$$\phi = V_{z1e_m} / U_{1e_m} \Big|_{\text{rotor}}$$

Blade Element Data

Incidence Angle:

$$i_m = \beta_{1e} - \kappa_{1e}$$

Diffusion Factor:

$$\text{Rotor: } D = 1 - \frac{V'_{te}}{V'_{1e}} + \left(\frac{d_{te} V_{\theta te} - d_{1e} V_{\theta 1e}}{(d_{1e} + d_{te}) \sigma V'_{1e}} \right)$$

$$\text{Stator: } D = 1 - \frac{V_{te}}{V_{1e}} + \left(\frac{d_{1e} V_{\theta 1e} - d_{te} V_{\theta te}}{(d_{1e} + d_{te}) \sigma V_{1e}} \right)$$

Deviation Angle:

$$\delta^\circ = \beta_{te} - \kappa_{te}$$

Loss Coefficient:

$$\text{IGV: } \bar{\omega} = \frac{P_{fs} - \bar{P}_1}{P_{fs} - P_o}$$

(p_o was found from linear interpolation of inner and outer wall static pressures at Station 0.)

$$\text{Rotor: } \bar{\omega} = \frac{\bar{P}'_{2id} - P'_2}{\bar{P}'_1 - P_1}$$

where:

$$P'_{2id} = P'_1 \left\{ 1 + \frac{\gamma-1}{2} \left(\frac{U_{te}^2}{a_{01}^2} \right) \left[1 - \left(\frac{\gamma_{1e}}{\gamma_{te}} \right)^2 \right] \right\}^{\frac{\gamma}{\gamma-1}}$$

$$P' \text{ is found from } p/P' = \left[1 + \frac{\gamma-1}{2} M'^2 \right]^{\frac{\gamma}{\gamma-1}}$$

and M' is calculated using trigonometric functions and the measurements of U , β , P , and p .

$$\text{Stator: } \bar{\omega} = \frac{P_{fs} - \bar{P}_{2A}}{P_{fs} - P_2}$$

Adiabatic Efficiency:

$$\text{Rotor: } \frac{\left[(P_{te}/P_{le})^{\frac{\gamma-1}{\gamma}} - 1 \right]}{T_{te}/T_o - 1}$$

Polytropic Efficiency:

$$\text{IGV: } \eta_p = \frac{\ln \left(T_{s_{le}} / T_{s_{te}} \right)}{\frac{\gamma-1}{\gamma} \ln P_{le}/P_{te}}$$

$$\text{Rotor: } \eta_p = \frac{\frac{\gamma-1}{\gamma} \ln (P_{te}/P_{le})}{\ln T_{te}/T_o}$$

$$\text{Stator: } \eta_p = \frac{\frac{\gamma-1}{\gamma} \ln (P_{te}/P_{le})}{\ln T_{s_{te}}/T_{s_{le}}}$$

APPENDIX B TABULATED PERFORMANCE

Overall performance and corrected weight flow for each test point are presented in table B-1.

SLTO and cruise configuration blade element data for each test point are presented in tables B-2 and B-3, respectively. The tables are arranged in the order of increasing rotor speed and increasing corrected flow at each rotor speed. At 110% of design rotor speed, blade element performance for the SLTO configuration near stall data point was not calculated because of an overscaled guide vane exit pressure transducer. Definition of the blade element velocity triangle and performance variables as tabulated in the computer printout is given in Appendix A.

Table B-1. Overall Performance

SLTO Configuration

Point Number	Corrected Weight Flow $W\sqrt{\theta/\delta}$ lb/sec	Rotor			Guide Vane-Rotor			Stage		
		$\bar{P}_2/P_1$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_2/P_0$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_{2A}/P_0$	$\eta_{ad}\%$	$\eta_p\%$
50% Design Equivalent Rotor Speed										
52	101.32	1.0980	89.03	89.2	1.0978	88.85	89.1	1.0922	83.91	84
50	107.31	1.0986	90.29	90.4	1.0985	90.18	90.3	1.0938	86.03	86
48	116.66	1.0941	93.04	93.2	1.0935	92.55	92.7	1.0898	89.00	89
46	130.93	1.0867	95.28	95.3	1.0862	94.79	94.9	1.0833	91.73	92
43	139.68	1.0771	96.40	96.5	1.0761	95.18	95.2	1.0727	91.00	91
41	153.09	1.0704	95.46	95.5	1.0699	94.40	94.5	1.0648	88.09	88
70% Design Equivalent Rotor Speed										
22	145.11	1.1969	85.63	86.0	1.1958	85.18	85.5	1.1874	81.72	82
20	157.99	1.1953	91.70	92.0	1.1941	91.15	91.4	1.1878	88.36	88
24	177.41	1.1782	93.31	93.4	1.1752	91.81	92.1	1.1699	89.22	89
17	191.28	1.1669	95.28	95.5	1.1652	94.39	94.5	1.1622	92.72	92
26	201.72	1.1522	97.82	97.9	1.1503	96.64	97.7	1.1455	93.72	93
15	209.98	1.1381	97.66	97.8	1.1351	95.70	95.8	1.1259	89.43	89

Table B-1. Overall Performance (Continued)

SLTO Configuration											
Point Number	Corrected Weight Flow $W\sqrt{\theta/\delta}$ lb/sec	Rotor			Guide Vane-Rotor			Stage			
		$\bar{P}_2/P_1$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_2/P_0$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_{2A}/P_0$	$\eta_{ad}\%$	$\eta_p\%$	
		80% Design Equivalent Rotor Speed									
30	170.19	1.2657	85.51	86.1	1.2644	85.14	85.6	1.2511	81.16	81.8	
33	196.53	1.2490	92.08	92.4	1.2476	91.60	91.9	1.2456	90.91	91.2	
35	201.56	1.2435	93.48	93.7	1.2412	92.65	92.9	1.2386	91.75	92.0	
37	215.71	1.2198	94.83	95.0	1.2174	93.90	94.0	1.2142	92.60	92.8	
39	230.46	1.1976	97.65	97.8	1.1947	96.29	96.4	1.1884	93.35	93.5	
28	238.46	1.1811	99.62	99.7	1.1752	96.56	96.7	1.1676	92.60	92.8	
100% Design Equivalent Rotor Speed											
6	236.98	1.4515	86.13	86.9	1.4474	85.44	86.2	1.4509	86.03	86.8	
8	254.28	1.4166	88.93	89.0	1.4139	88.42	89.0	1.4169	88.99	89.5	
10	268.85	1.3839	91.14	91.6	1.3839	91.13	91.5	1.3776	89.79	90.2	
1	275.64	1.3508	92.16	92.5	1.3461	91.04	91.4	1.3347	88.33	88.8	
12	280.79	1.3058	91.07	91.4	1.3064	91.24	91.6	1.2944	87.96	88.3	
3	282.91	1.2701	87.99	88.4	1.2647	86.35	86.8	1.2479	81.29	81.9	

Table B-1. Overall Performance (Continued)

SLTO Configuration											
Point Number	Corrected Weight Flow $W\sqrt{\theta/\delta}$ lb/sec	Rotor			Guide Vane-Rotor			Stage			
		$\bar{P}_2/P_1$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_2/P_0$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_{2A}/P_0$	$\eta_{ad}\%$	$\eta_p\%$	
110% Design Equivalent Rotor Speed											
57	248.40	*	*	*	*	*	*	1.4740	86.40	87.1	
62	286.32	1.4189	86.22	86.9	1.4158	86.22	86.9	1.3994	83.21	84.0	
56	294.02	1.3667	86.79	87.4	1.3633	85.17	85.8	1.3485	82.24	83.0	
64	295.60	1.3431	86.68	87.2	1.3386	85.65	86.2	1.3159	80.44	81.1	
54	295.96	1.3088	85.09	85.7	1.3033	83.69	84.3	1.2847	78.99	79.7	
Cruise Configuration											
50% Design Equivalent Rotor Speed											
83	93.56	1.0784	90.58	90.8	1.0775	89.62	89.8	1.0768	88.79	90.0	
85	99.16	1.0737	87.56	87.8	1.0725	86.09	86.3	1.0729	86.65	86.9	
87	103.40	1.0709	88.62	88.9	1.0701	87.70	88.0	1.0691	86.45	86.6	
91	112.54	1.0610	96.07	96.2	1.0596	93.82	93.9	1.0591	93.02	93.2	
89	112.88	1.0590	91.79	92.0	1.0580	90.27	90.4	1.0599	93.11	93.3	
80	117.41	1.0533	87.93	88.1	1.0516	85.26	85.5	1.0512	84.65	84.9	

*Pressure transducer overscaled

Table B-1. Overall Performance (Continued)

Cruise Configuration											
Point Number	Corrected Weight Flow $W\sqrt{\theta/\delta}$ lb/sec	Rotor			Guide Vane-Rotor				Stage		
		$\bar{P}_2/P_1$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_2/P_0$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_{2A}/P_0$	$\eta_{ad}\%$	$\eta_p\%$	
		70% Design Equivalent Rotor Speed									
72	130.51	1.1643	88.69	89.0	1.1618	87.39	87.7	1.1572	85.05	85.4	
76	137.51	1.1574	90.15	90.4	1.1551	88.93	89.2	1.1533	87.93	88.2	
74	142.01	1.1493	90.80	91.0	1.1469	89.41	89.7	1.1478	89.93	90.2	
78	148.24	1.1420	91.40	91.7	1.1386	89.27	89.5	1.1390	89.52	90.2	
69	152.55	1.1277	92.56	92.8	1.1245	90.33	90.6	1.1243	90.14	90.3	
67	167.45	1.1100	88.67	88.9	1.1097	88.44	88.7	1.1061	85.61	85.9	
80% Design Equivalent Rotor Speed											
109	148.13	1.2228	83.98	84.6	1.2210	83.33	84.0	1.2112	79.87	80.3	
111	156.43	1.2126	85.21	85.6	1.2100	84.24	84.7	1.2095	84.03	84.6	
113	160.69	1.2055	89.91	90.4	1.2034	89.05	89.4	1.1966	86.26	86.6	
115	174.75	1.1798	89.38	90.2	1.1778	88.44	88.8	1.1802	89.54	89.8	
117	178.19	1.1727	89.21	89.5	1.1699	87.83	88.1	1.1685	87.17	87.5	
106	189.03	1.1431	91.76	92.0	1.1402	89.94	90.2	1.1393	89.43	89.6	

Table B-1. Overall Performance (Continued)

Point Number	Corrected Weight Flow $W \sqrt{\theta/\delta}$ lb/sec	Cruise Configuration									
		Rotor			Guide Vane-Rotor				Stage		
		$\bar{P}_2/P_1$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_2/P_0$	$\eta_{ad}\%$	$\eta_p\%$	$\bar{P}_{2A}/P_0$	$\eta_{ad}\%$	$\eta_p\%$	
100% Design Equivalent Rotor Speed											
96	196.07	1.3501	85.34	86.0	1.3482	84.93	85.6	1.3451	84.25	84.9	
98	198.05	1.3492	84.78	85.4	1.3450	83.85	84.6	1.3480	84.51	85.2	
100	214.27	1.3256	91.98	92.3	1.3195	90.42	90.8	1.3139	89.41	89.9	
102	223.95	1.2862	91.83	92.1	1.2789	89.68	90.0	1.2750	88.50	88.9	
104	227.73	1.2711	98.17	98.3	1.2693	95.37	85.5	1.2528	89.96	90.3	
93	232.91	1.2373	94.64	94.8	1.2273	90.91	91.2	1.2191	87.85	88.2	

Table B-2. Blade Element Data SLTO Configuration

		CONFIGURATION		W/S		W/S	
		SLTO	PT.52	SLTO	PT.52	SLTO	PT.52
		INLET GUIDE VANE		ROTOR			
PCT SPAN		90	70	50	30	10	
DIA 3		21.130	26.050	30.950	35.850	40.750	
BETA 3		0.000	0.000	0.000	0.000	0.000	
BETA 4		1.009	1.193	0.056	-0.081	-7.003	
V 3		150.22	159.64	165.37	170.42	171.42	
V 4		154.84	170.61	178.55	191.54	177.48	
VZ 3		150.21	159.45	166.36	170.42	171.41	
VZ 4		154.82	169.22	178.54	181.50	176.15	
V-THETA 3		0.00	0.00	0.00	0.00	0.00	
V-THETA 4		2.73	3.55	0.17	-2.79	-21.64	
M 3		0.1348	0.1433	0.1494	0.1530	0.1539	
M 4		0.1390	0.1532	0.1603	0.1630	0.1594	
TURN		-1.01	-1.19	-0.06	0.88	7.00	
(REFER TO 70% & 100% SPEED DATA)							
DFAC		-0.021	-0.057	-0.073	-0.073	-0.098	
EFFP		1.0088	1.4210	1.3066	1.1668	0.6536	
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200	
DEVM		4.391	2.507	1.844	1.181	5.403	
PCT SPAN		90	70	50	30	10	
DIA 9		26.021	29.683	33.345	37.007	40.669	
BETA 9		49.582	48.021	46.344	41.421	35.199	
BETA 10		7.389	3.039	4.323	4.146	7.760	
V 9		303.72	275.16	270.63	287.52	294.73	
V 10		207.74	196.89	208.06	236.00	262.84	
VZ 9		193.23	182.14	185.86	215.30	240.83	
VZ 10		204.48	194.35	206.31	235.00	260.43	
V-THETA 9		231.23	204.56	195.80	190.22	169.89	
V-THETA 10		26.72	10.44	15.68	17.06	35.49	
M 9		0.2707	0.2449	0.2405	0.2554	0.2615	
M 10		0.1844	0.1747	0.1845	0.2092	0.2328	
TURN		42.192	44.982	42.021	37.276	27.439	
W		.1204	.1033	.1094	.1072	.0851	
DFAC		0.5712	0.5739	0.5238	0.4611	0.3305	
EFFP		0.7042	0.6709	0.5891	0.3498	0.1471	
INCIDM		8.682	10.921	11.644	7.421	-0.801	
DEVM		16.089	10.539	11.823	12.146	16.660	
PCT SPAN		90	70	50	30	10	
DIA 6		23.385	27.755	32.125	36.495	40.865	
BETA 6		0.874	1.052	0.003	-0.834	-7.014	
BETA 7		51.113	49.379	47.736	42.874	37.865	
RETA(PRI) 6		61.500	63.933	66.477	68.514	71.677	
RETA(PRI) 7		27.179	44.983	52.688	54.932	58.540	
V 6		167.48	179.14	185.92	192.11	198.98	
V 7		306.67	275.39	268.36	281.50	282.36	
VZ 6		167.42	178.90	185.91	192.09	187.57	
VZ 7		191.62	179.14	180.42	206.29	222.91	
V-THETA 6		2.55	3.29	0.01	-2.80	-23.08	
V-THETA 7		238.71	209.03	198.60	191.53	173.31	
V(PRI) 6		350.9	407.2	465.8	524.4	596.6	
V(PRI) 7		216.4	253.5	297.7	359.1	427.1	
VTHETA PR6		308.4	365.7	427.1	488.0	566.4	
VTHETA PR7		98.9	179.2	236.8	293.9	364.3	
U 6		310.90	369.00	427.10	485.20	543.30	
U 7		337.56	388.22	435.41	485.40	537.65	
M 6		0.1504	0.1609	0.1670	0.1726	0.1698	
M 7		0.2733	0.2451	0.2385	0.2500	0.2504	
M(PRI) 6		0.3150	0.3657	0.4184	0.4712	0.5360	
M(PRI) 7		0.1929	0.2256	0.2646	0.3188	0.3787	
TURN(PRI)		34.316	18.923	13.788	13.583	13.137	
W		0.0086	0.1748	0.2203	0.1444	0.2233	
DFAC		.6303	.5766	.5403	.4806	.4388	
EFFP		0.9649	0.9359	0.9042	0.9337	0.9074	
EFF		0.9645	0.9351	0.9031	0.9328	0.9060	
INCIDM		12.900	11.433	10.377	8.914	8.477	
DEVM		8.379	12.483	10.588	6.332	5.640	

Table B-2. Blade Element Data SLTO Configuration (Continued)

CONFIGURATION				ROTOR			
N $\sqrt{S}$				N $\sqrt{S}$			
3069.				107.3			
INLET GUIDE VANE				ROTOR			
SUPERCENT SPEED PT.50				SUPERCENT SPEED PT.50			
PT.50				PT.50			
PCT SPAN				PCT SPAN			
90				90			
70				70			
50				50			
30				30			
10				10			
PCT SPAN				PCT SPAN			
DIA 3				DIA 6			
BETA 3				BETA 6			
BETA 4				BETA 7			
V 3				BETA(PR) 6			
V 4				BETA(PR) 7			
VZ 3				V 6			
VZ 4				V 7			
V-THETA 3				VZ 6			
V-THETA 4				VZ 7			
M 3				V-THETA 6			
M 4				V-THETA 7			
TURN				V(PR) 6			
W				V(PR) 7			
UFAC				VTHETA PR6			
EFFP				VTHETA PR7			
INCIDM				U 6			
DEVM				U 7			
				M 6			
				M 7			
				M(PR) 6			
				M(PR) 7			
				TURN(PR)			
				W			
				DFAC			
				EFFP			
				EFF			
				INCIDM			
				DEVM			
</							

Table B-2. Blade Element Data SLTO Configuration (Continued)

		CONFIGURATION		N/√S		√S/g	
		SLTO		3049.		116.6	
		SUPERCENT SPEED		PT.48			
		INLET GUIDE VANE					
						ROTOR	
PCT SPAN		90	70	50	30	10	
DIA 3		21.150	26.050	30.950	35.850	40.750	
BETA 3		0.000	0.000	0.000	0.000	0.000	
BETA 4		0.896	0.715	-0.510	-1.603	-3.403	
V 3		174.37	185.18	192.51	196.76	197.52	
V 4		181.75	186.76	192.40	196.69	205.12	
VZ 3		174.35	184.96	192.50	196.75	197.51	
VZ 4		181.73	195.26	202.39	209.60	204.76	
V-THETA 3		0.00	0.00	0.00	0.00	0.00	
V-THETA 4		2.84	2.45	-1.80	-5.87	-12.17	
M 3		0.1566	0.1663	0.1730	0.1768	0.1775	
M 4		0.1632	0.1768	0.1819	0.1885	0.1844	
TURN		-0.90	-0.71	0.51	1.60	3.40	
ω		(REFER TO 70% & 100% SPEED DATA)					
DFAC		-0.034	-0.056	-0.056	-0.081	-0.069	
EFFP		0.9752	1.1154	0.7930	1.1215	0.6585	
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200	
DEVM		4.504	2.985	2.410	1.903	1.803	
PCT SPAN		90	70	50	30	10	
DIA 9		26.021	29.683	33.345	37.007	40.669	
BETA 9		44.355	40.548	37.835	33.584	33.171	
BETA 10		6.767	3.693	3.569	2.344	6.154	
V 9		315.48	294.81	292.17	298.74	306.33	
V 10		250.79	235.41	249.99	267.67	286.40	
VZ 9		221.30	221.92	229.92	248.74	256.40	
VZ 10		247.44	232.55	248.57	267.28	284.74	
V-THETA 9		220.55	191.65	179.21	165.25	167.60	
V-THETA 10		29.55	15.16	15.56	10.95	30.70	
M 9		0.2815	0.2628	0.2601	0.2659	0.2722	
M 10		0.2231	0.2093	0.2222	0.2379	0.2543	
TURN		37.588	36.854	34.265	31.240	27.017	
ω		0.030	0.043	0.050	0.0479	0.0493	
DFAC		0.4342	0.4469	0.3906	0.3458	0.2829	
EFFP		0.7623	0.5835	0.5935	0.4707	0.2675	
INCIDM		3.455	3.448	3.135	-0.416	-2.829	
DEVM		15.467	11.193	11.069	10.344	15.054	
PCT SPAN		90	70	50	30	10	
DIA 6		23.385	27.755	32.125	36.495	40.965	
BETA 6		0.792	0.624	-0.502	-1.559	-3.294	
BETA 7		46.067	42.147	39.447	36.909	34.245	
BETA(PR) 6		57.577	60.428	63.522	65.586	68.930	
BETA(PR) 7		26.431	41.578	48.877	53.177	56.661	
V 6		195.95	202.48	213.85	222.18	214.56	
V 7		317.15	292.35	286.67	291.28	295.72	
VZ 6		195.89	208.24	213.81	222.10	214.56	
VZ 7		219.05	216.56	221.27	238.84	246.45	
V-THETA 6		2.71	2.27	-1.87	-6.04	-12.34	
V-THETA 7		228.40	196.18	182.14	166.69	166.41	
V(PR) 6		365.4	422.1	479.6	539.4	595.8	
V(PR) 7		245.7	289.8	336.6	388.5	444.8	
VTHETA PR6		308.4	367.0	429.3	491.6	556.0	
VTHETA PR7		109.4	192.3	253.6	319.0	371.6	
U 6		311.11	369.25	427.38	485.52	543.66	
U 7		337.78	388.47	435.70	485.72	538.00	
M 6		0.1761	0.1874	0.1923	0.1998	0.1920	
M 7		0.2830	0.2605	0.2552	0.2592	0.2627	
M(PR) 6		0.3283	0.3794	0.4312	0.4851	0.5357	
M(PR) 7		0.2193	0.2582	0.2997	0.3547	0.3951	
TURN(PR)		31.140	18.823	14.642	12.508	12.269	
ω		-0.0056	0.0877	0.1026	0.0790	0.0994	
DFAC		0.503	0.4944	0.4956	0.4042	0.3943	
EFFP		0.9735	0.9837	0.9716	0.9928	0.9284	
EFF		0.9732	0.9835	0.9712	0.9927	0.9276	
INCIDM		8.977	7.928	7.422	6.086	5.730	
DEVM		7.631	9.078	6.777	4.577	3.761	

Table B-2. Blade Element Data SLTO Configuration (Continued)

CONFIGURATION				N/S		W/S					
SOPERCENT SPEED PT.46		SL TO		3062.		130.9					
INLET GUIDE VANE											
ROTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.485	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.810	0.645	-0.407	-1.633	-7.395
BETA 4	0.916	0.714	-0.450	-1.709	-7.130	BETA 7	40.693	35.827	33.066	29.594	25.121
V 3	196.44	208.64	216.79	221.54	222.37	BETA(PR) 6	54.295	57.221	60.744	63.220	67.332
V 4	205.54	222.96	228.51	236.97	231.88	BETA(PR) 7	25.787	39.978	47.391	52.213	56.147
VZ 3	196.42	208.40	216.77	221.53	222.36	V 6	222.36	237.32	241.42	249.79	243.12
VZ 4	205.51	221.33	228.51	236.86	230.08	V 7	333.12	308.37	300.44	301.97	304.57
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	222.29	237.06	241.39	249.68	241.13
V-THETA 4	3.28	2.78	-1.79	-7.07	-28.78	VZ 7	251.50	249.82	251.68	262.55	275.76
M 3	0.1765	0.1875	0.1949	0.1992	0.2000	V-THETA 6	3.14	2.67	-1.71	-7.12	-31.29
M 4	0.1847	0.2005	0.2056	0.2132	0.2086	V-THETA 7	217.19	180.50	163.92	149.12	129.39
TURN	-0.92	-0.71	0.45	1.71	7.13	V(PR) 6	380.9	438.0	493.9	554.1	625.6
(REFER TO 70% & 100% SPEED DATA)								V(PR) 7	371.8	428.5	494.9
DFAC	-0.038	-0.062	-0.058	-0.086	-0.107	VTHETA PR6	280.5	326.3	371.8	428.5	494.9
EFFP	0.9223	1.1198	0.7710	1.1427	0.7544	VTHETA PR7	309.3	368.2	430.9	494.7	577.3
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	122.0	209.6	273.6	338.7	411.0
DEVN	4.484	2.986	2.350	2.009	5.530	U 7	312.44	270.82	429.21	487.59	545.98
STATOR A								U 7	437.56	487.79	540.39
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 6	23.385	27.755	32.125	36.485	40.865
BETA 9	38.756	34.230	31.668	28.553	23.111	BETA 6	0.810	0.645	-0.407	-1.633	-7.395
BETA 10	4.830	2.903	2.933	1.755	5.624	BETA 7	40.693	35.827	33.066	29.594	25.121
V 9	334.05	313.11	307.68	309.77	317.36	BETA(PR) 6	54.295	57.221	60.744	63.220	67.332
V 10	294.95	278.03	287.04	294.53	313.48	BETA(PR) 7	25.787	39.978	47.391	52.213	56.147
VZ 9	255.75	256.59	260.99	271.93	291.89	V 6	222.36	237.32	241.42	249.79	243.12
VZ 10	292.23	275.07	285.68	294.20	311.96	V 7	333.12	308.37	300.44	301.97	304.57
V-THETA 9	209.12	176.13	161.53	148.06	124.57	VZ 6	222.29	237.06	241.39	249.68	241.13
V-THETA 10	24.83	14.08	14.69	9.02	30.72	VZ 7	251.50	249.82	251.68	262.55	275.76
M 9	0.2985	0.2796	0.2745	0.2762	0.2827	V-THETA 6	3.14	2.67	-1.71	-7.12	-31.29
M 10	0.2630	0.2479	0.2558	0.2624	0.2792	V-THETA 7	217.19	180.50	163.92	149.12	129.39
TURN	33.926	31.327	28.736	26.798	17.487	V(PR) 6	380.9	438.0	493.9	554.1	625.6
DFAC	0.336	0.469	0.516	0.375	0.460	V(PR) 7	280.5	326.3	371.8	428.5	494.9
EFFP	0.3261	0.3242	0.2769	0.2593	0.1565	VTHETA PR6	309.3	368.2	430.9	494.7	577.3
INCIDM	0.7219	0.5330	0.5354	0.0113	-2.1756	VTHETA PR7	122.0	209.6	273.6	338.7	411.0
DEVN	-2.144	-2.870	-3.032	-5.447	-12.889	U 6	312.44	270.82	429.21	487.59	545.98
	13.530	10.403	10.433	9.755	14.524	U 7	339.22	390.13	437.56	487.79	540.39
						M 6	0.2000	0.2135	0.2173	0.2249	0.2188
						M 7	0.2976	0.2753	0.2680	0.2692	0.2711
						M(PR) 6	0.3426	0.3941	0.4445	0.4989	0.5630
						M(PR) 7	0.2506	0.2913	0.3316	0.3620	0.4406
						TURN(PR)	28.503	17.218	13.360	11.006	11.192
						DFAC	-0.0093	0.0475	0.0463	0.0440	0.0871
						EFFP	0.4703	0.4150	0.3880	0.3529	0.3297
						EFF	0.9732	0.9986	0.9977	0.9975	0.9594
						INCIDM	0.9729	0.9986	0.9977	0.9974	0.9588
						DEVN	5.695	4.721	4.644	3.620	4.132
							6.987	7.478	5.281	3.613	3.240

Table B-2. Blade Element Data SLT0 Configuration (Continued)

50PERCENT SPEED PT.43		INLET GUIDE VANE					CONFIGURATION		N/√S	N/√S/6
							SLT		3054.	139.6
PCT SPAN		90	70	50	30	10				
DIA 3		21.150	26.050	30.950	35.850	40.750				
BETA 3		0.000	0.000	0.000	0.000	0.000				
BETA 4		1.059	0.776	-0.109	-1.455	0.171				
V 3		211.52	224.23	232.25	236.40	236.61				
V 4		220.74	238.74	243.51	252.66	246.44				
VZ 3		211.50	223.97	232.24	236.39	236.60				
VZ 4		220.71	237.26	243.51	252.58	246.44				
V-THETA 3		0.00	0.00	0.00	0.00	0.00				
V-THETA 4		4.08	3.23	-0.46	-6.41	0.74				
M 3		0.1902	0.2017	0.2089	0.2127	0.2129				
M 4		0.1985	0.2148	0.2192	0.2275	0.2218				
TURN		-1.06	-0.78	0.11	1.45	-0.17				
Ω										
DFAC		-0.034	-0.057	-0.049	-0.082	-0.040				
EFFP		0.8788	1.0350	0.6734	1.0873	0.6456				
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200				
DEVM		4.341	2.924	2.009	1.755	-0.331				
(REFER TO 70% & 100% SPEED DATA)										
PCT SPAN		90	70	50	30	10				
DIA 9		26.021	29.683	33.345	37.007	40.669				
BETA 9		33.163	29.715	26.567	23.540	26.663				
BETA 10		4.108	2.929	2.730	1.387	5.251				
V 9		349.16	331.04	325.34	321.55	325.51				
V 10		330.07	310.98	313.06	312.39	325.58				
VZ 9		287.31	285.41	290.37	294.75	290.86				
VZ 10		327.43	308.23	312.06	312.25	324.16				
V-THETA 9		191.00	164.09	145.51	128.42	146.07				
V-THETA 10		23.65	15.89	14.91	7.56	29.80				
M 9		0.3126	0.2961	0.2908	0.2873	0.2906				
M 10		0.2952	0.2779	0.2797	0.2790	0.2906				
TURN		29.055	26.786	23.838	22.153	21.411				
Ω		.0268	.0453	.0491	.0297	.0463				
DFAC		0.2362	0.2441	0.2141	0.2044	0.1739				
EFFP		0.4683	0.2373	0.0035	-0.6485	11.1746				
INCIDM		-7.737	-7.385	-8.133	-10.460	-9.337				
DEVM		12.808	10.429	10.230	9.387	14.151				

50PERCENT SPEED PT.43		INLET GUIDE VANE					CONFIGURATION		N/√S	N/√S/6
							SLT		3054.	139.6
PCT SPAN		90	70	50	30	10				
DIA 6		23.385	27.755	32.125	36.495	40.865				
BETA 6		0.933	0.669	-0.185	-1.516	0.681				
BETA 7		35.054	31.319	27.880	24.727	26.459				
BETA(PR) 6		52.013	55.135	58.861	61.640	64.865				
BETA(PR) 7		26.341	38.654	45.687	51.335	54.690				
V 6		240.38	255.83	259.19	266.42	254.10				
V 7		345.36	323.42	317.85	313.18	315.23				
VZ 6		240.29	255.60	259.14	266.31	244.08				
VZ 7		281.50	276.05	280.82	284.43	292.21				
V-THETA 6		3.91	2.99	-0.84	-7.05	3.02				
V-THETA 7		198.36	168.12	148.63	131.00	140.45				
V(PR) 6		390.4	447.2	501.1	560.7	598.2				
V(PR) 7		315.5	353.8	402.2	455.3	488.3				
VTHETA PR6		307.7	366.9	428.9	493.4	541.5				
VTHETA PR7		140.0	221.0	287.8	355.5	398.4				
U 6		311.62	369.85	428.08	486.32	544.55				
U 7		338.34	389.11	436.41	486.52	538.89				
M 6		0.2163	0.2304	0.2334	0.2400	0.2288				
M 7		0.3091	0.2892	0.2843	0.2797	0.2813				
M(PR) 6		0.3514	0.4027	0.4513	0.5051	0.5386				
M(PR) 7		0.2824	0.3163	0.3594	0.4067	0.4357				
TURN(PR)		25.665	16.458	13.169	10.305	10.175				
Ω		0.0198	0.0309	0.0157	0.0332	0.0079				
DFAC		.3749	.3546	.3225	.2980	.2918				
EFFP		0.9912	0.9855	1.0242	0.9902	0.9581				
EFF		0.9911	0.9854	1.0245	0.9901	0.9576				
INCIDM		3.413	2.635	2.761	2.040	1.665				
DEVM		7.541	6.154	3.587	2.735	1.790				

Table B-2. Blade Element Data SLTO Configuration (Continued)

CONFIGURATION				N/√C		W/√C					
SUPERCENT SPEED		PT.41	SL TO	3064.		153.0					
INLET GUIDE VANE											
ROTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.713	0.596	0.007	-1.326	-3.657
BETA 4	0.821	0.704	0.097	-1.243	-3.699	BETA 7	31.528	27.453	24.284	21.433	18.481
V 3	233.20	247.18	255.81	260.25	260.74	BETA(PR) 6	49.355	52.426	56.358	59.488	63.636
V 4	243.02	263.19	268.65	277.37	271.19	BETA(PR) 7	24.567	36.050	43.955	49.925	54.477
VZ 3	233.16	246.90	255.78	260.23	260.72	V 6	265.63	283.46	285.83	291.60	280.20
VZ 4	243.00	261.66	268.65	277.30	270.63	V 7	371.96	352.67	339.38	331.64	328.57
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	265.55	283.22	285.79	291.51	279.63
V-THETA 4	3.48	3.23	0.45	-6.02	-17.49	VZ 7	315.72	312.68	309.21	308.67	311.62
M 3	0.2098	0.2225	0.2304	0.2344	0.2348	V-THETA 6	3.31	2.95	0.03	-6.75	-17.47
M 4	0.2187	0.2371	0.2421	0.2500	0.2444	V-THETA 7	194.50	162.59	139.57	121.19	104.15
TURN	-0.82	-0.70	-0.10	1.24	3.70	V(PR) 6	407.7	464.6	515.9	574.2	629.7
(REFER TO 70% & 100% SPEED DATA)							V(PR) 7	348.6	429.7	479.5	536.3
ω						VTHETA PR6	309.3	368.1	429.5	494.7	564.2
DFAC	-0.034	-0.058	-0.049	-0.077	-0.074	VTHETA PR7	144.9	227.8	298.3	366.9	436.5
EFFP	0.9836	1.1563	0.7498	1.1369	0.7648	U 6	312.64	371.06	429.49	487.91	546.33
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 7	339.44	390.38	437.84	488.11	540.65
DEVM	4.579	2.996	1.803	1.543	2.092	M 6	0.2393	0.2556	0.2577	0.2630	0.2525
STATOR A							M 7	0.3159	0.3038	0.2967	0.2937
PCT SPAN	90	70	50	30	10	M(PR) 5	0.3673	0.4189	0.4652	0.5179	0.5675
DIA 9	26.021	29.683	33.345	37.007	40.669	M(PR) 7	0.3126	0.3467	0.3847	0.4290	0.4795
BETA 9	29.679	25.925	23.079	20.322	17.808	TURN(PR)	24.781	16.354	12.398	9.562	9.159
BETA 10	4.398	3.192	2.631	2.130	1.761	ω	-0.0012	-0.0119	-0.0006	0.0192	0.0658
V 9	378.02	362.15	347.29	340.02	338.95	DFAC	.3172	.3024	.2808	.2645	.2122
V 10	375.53	354.69	349.21	343.11	353.22	EFFP	0.9696	0.9814	1.0063	0.9574	0.9451
VZ 9	323.02	323.51	318.89	318.81	322.68	EFF	0.9693	0.9812	1.0063	0.9571	0.9448
VZ 10	372.48	351.66	348.20	342.83	351.95	INCIDM	0.755	-0.074	0.258	-0.112	0.436
V-THETA 9	187.17	158.33	136.14	118.08	103.66	DEVM	5.767	3.550	1.855	1.325	1.577
V-THETA 10	28.80	19.75	16.03	12.75	29.32						
M 9	0.3391	0.3246	0.3111	0.3043	0.3032						
M 10	0.3368	0.3178	0.3128	0.3072	0.3162						
TURN	25.261	22.733	20.449	18.192	13.047						
ω	.0536	.0437	.0532	.0537	.0610						
DFAC	0.1650	0.1773	0.1464	0.1359	0.0649						
EFFP	-4.0547	-1.4162	7.0049	6.5016	1.7274						
INCIDM	-11.221	-11.175	-11.621	-13.678	-18.192						
DEVM	13.098	10.692	10.131	10.130	13.661						

Table B-2. Blade Element Data SLTO Configuration (Continued)

		CONFIGURATION		W/S/g	
70 PERCENT SPEED PT. 22		SLTO	4250.	145.1	
INLET GUIDE VANE					
MOTOR					
PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750
BETA 3	0.000	0.000	0.000	0.000	0.000
BETA 4	0.835	0.485	-0.559	-1.454	-4.218
V 3	218.98	232.03	241.08	246.90	248.20
V 4	224.58	246.28	255.39	264.07	258.75
VZ 3	218.97	231.73	241.08	246.89	248.19
VZ 4	224.55	244.59	255.38	263.99	258.04
V-THETA 3	0.00	0.00	0.00	0.00	0.00
V-THETA 4	3.27	2.08	-2.49	-6.70	-19.03
M 3	0.1969	0.2087	0.2170	0.2223	0.2234
M 4	0.2020	0.2217	0.2300	0.2379	0.2330
TURN	-0.83	-0.48	0.56	1.45	4.22
W	0.0306		0.0197		0.0216
DFAC	-0.018	-0.057	-0.065	-0.083	-0.081
EFFP	0.7936	1.0645	0.8291	1.0899	0.6505
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200
DEVN	4.565	3.215	2.459	1.754	2.518
STATOR A					
PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669
BETA 9	48.096	48.663	46.805	40.955	39.307
BETA 10	6.651	6.705	6.762	6.882	6.842
V 9	422.55	387.39	380.45	406.23	418.20
V 10	280.81	271.66	289.77	328.88	368.03
VZ 9	277.20	253.46	259.21	306.48	323.58
VZ 10	276.63	266.95	286.34	326.11	365.41
V-THETA 9	314.49	290.87	277.36	266.27	264.92
V-THETA 10	32.52	31.72	34.12	39.41	43.85
M 9	0.3749	0.3424	0.3354	0.3579	0.3672
M 10	0.2472	0.2388	0.2543	0.2885	0.3222
TURN	41.445	41.958	40.043	34.073	32.465
W	0.1115	0.0944	0.0973	0.1006	0.0807
DFAC	0.5885	0.5728	0.5192	0.4519	0.3776
EFFP	0.7058	0.7079	0.6777	0.4895	0.4223
INCIDM	7.196	11.563	12.105	6.955	3.307
DEVN	15.351	14.205	14.262	14.882	15.742
PCT SPAN	90	70	50	30	10
DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 6	0.726	0.416	-0.603	-1.394	-4.098
BETA 7	49.474	49.916	48.342	42.793	40.974
BETA(PRI) 6	60.376	63.188	65.998	67.641	70.627
BETA(PRI) 7	27.933	44.460	52.417	54.713	57.945
V 6	244.90	259.47	266.57	281.00	274.05
V 7	426.23	387.61	377.04	394.49	402.88
VZ 6	244.82	259.18	266.52	280.91	273.35
VZ 7	275.54	249.34	250.49	289.45	304.18
V-THETA 6	3.10	1.89	-2.80	-6.83	-19.59
V-THETA 7	323.99	296.56	281.69	268.00	264.10
V(PRI) 6	495.3	574.7	655.2	739.1	824.1
V(PRI) 7	313.5	349.9	410.9	501.1	573.1
VTHETA PR6	430.6	512.8	596.5	683.6	777.4
VTHETA PR7	146.8	244.9	325.6	409.0	485.7
U 6	433.65	514.69	595.73	676.77	757.81
U 7	470.84	541.49	607.32	677.05	749.92
M 6	0.2204	0.2337	0.2402	0.2533	0.2470
M 7	0.3783	0.3427	0.3324	0.3474	0.3535
M(PRI) 6	0.4458	0.5176	0.5903	0.6663	0.7426
M(PRI) 7	0.2782	0.3091	0.3623	0.4413	0.5029
TURN(PRI)	32.438	18.702	13.577	12.947	12.682
W	0.0060	0.1473	0.2065	0.1552	0.2061
DFAC	.6047	0.5939	.5521	.4880	.4667
EFFP	0.9834	0.9178	0.8897	0.9148	0.8605
EFF	0.9830	0.9159	0.8871	0.9125	0.8648
INCIDM	11.776	10.688	9.898	8.061	7.427
DEVN	9.133	11.960	10.317	6.113	5.045

Table B-2. Blade Element Data SLTO Configuration (Continued)

		CONFIGURATION		N/VS		WVS/g	
		SLTO		4275.		177.4	
		70 PERCENT SPEED		PT. 24			
		INLET GUIDE VANE		RETURN			
PCT SPAN		90	70	50	30	10	
DIA 3		21.150	26.050	30.950	35.850	40.750	
BETA 3		0.000	0.000	0.000	0.000	0.000	
BETA 4		0.546	0.406	-0.771	-0.857	-5.478	
V 3		270.04	287.28	299.94	305.52	306.73	
V 4		282.74	305.99	317.22	328.34	319.19	
VZ 3		270.02	286.94	298.92	305.50	306.72	
VZ 4		282.72	303.66	317.19	328.30	317.76	
V-THEIA 3		0.00	0.00	0.00	0.00	0.00	
V-THEIA 4		2.69	2.17	-4.27	-4.91	-30.08	
M 3		0.2433	0.2590	0.2657	0.2757	0.2769	
M 4		0.2549	0.2762	0.2865	0.2967	0.2883	
TURN		-0.55	-0.41	0.77	0.86	5.41	
DEV		0.0312	0.0218	0.0218	0.0212	0.0212	
DFAC		-0.042	-0.061	-0.068	-0.083	-0.090	
EFFP		0.6481	0.8485	0.7369	0.9714	0.5487	
INCLIDM		-20.200	-20.200	-20.200	-20.200	-20.200	
DEVM		4.854	3.294	2.671	1.157	3.808	
STATUS A							
PCT SPAN		90	70	50	30	10	
DIA 9		26.021	29.683	33.345	37.007	40.669	
BETA 9		45.449	35.666	32.722	31.309	27.003	
BETA 10		8.489	8.283	8.317	8.418	8.405	
V 9		476.97	427.34	416.11	422.64	434.26	
V 10		384.93	366.92	379.69	397.19	422.10	
VZ 9		324.16	343.98	348.67	360.86	386.91	
VZ 10		378.36	359.52	374.35	392.64	417.56	
V-THEIA 9		339.90	249.16	224.93	219.63	197.17	
V-THEIA 10		56.83	52.86	54.92	58.14	61.70	
M 9		0.4241	0.3801	0.3695	0.3747	0.3942	
M 10		0.3402	0.3252	0.3364	0.3516	0.3732	
TURN		36.960	27.383	24.405	22.892	18.598	
DEV		0.0519	0.0408	0.0394	0.0399	0.0498	
DFAC		0.4171	0.3290	0.2667	0.2391	0.1803	
EFFP		0.6208	0.5902	0.6799	0.5319	0.7726	
INCLIDM		4.519	-1.434	-1.978	-2.691	-8.997	
DEVM		17.189	15.783	15.817	16.418	17.305	

Table B-2. Blade Element Data SLTO Configuration (Continued)

		70 PERCENT SPEED PT. 15		CONFIGURATION		N/√S		√S/g			
		INLET GUIDE VANE		SLTO		4250.0		209.9			
		AUTOR									
		PCT SPAN		PCT SPAN							
		90	70	50	30	10	90	70	50	30	10
PCT SPAN	DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495
	BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.759	0.430	-0.553	-1.074
	BETA 4	0.880	0.552	-0.732	-1.120	-5.940	BETA 7	31.102	26.764	23.362	21.347
	V 3	327.87	347.80	360.27	366.39	366.70	BETA(PR) 6	48.823	51.876	55.667	58.777
	V 4	341.61	370.68	383.69	393.70	383.49	BETA(PR) 7	25.722	37.168	45.160	50.733
	VZ 3	327.82	347.40	360.24	366.36	366.68	V 6	375.10	401.85	409.66	415.04
	VZ 4	341.56	368.59	383.66	393.63	381.43	V 7	506.79	480.36	460.19	450.38
	V-THETA 3	0.000	0.000	0.000	0.000	0.000	VZ 6	374.98	401.55	409.58	414.95
	V-THETA 4	5.24	3.57	-4.90	-7.69	-39.69	VZ 7	432.04	428.51	422.27	419.43
	M 3	0.2963	0.3146	0.3261	0.3318	0.3321	V-THETA 6	4.97	3.02	-3.95	-7.78
	M 4	0.3089	0.3358	0.3478	0.3571	0.3476	V-THETA 7	261.79	216.31	182.48	163.94
	TURN	-0.88	-0.55	0.73	1.12	5.94	V(PR) 6	569.6	650.6	726.2	800.5
	ω	0.0269	0.0202	0.0202	0.0209	0.0209	V(PR) 7	481.7	538.2	599.1	662.7
	DFAC	-0.034	-0.061	-0.072	-0.085	-0.100	VTHETA PR6	428.7	511.7	599.7	684.5
	EFFP	0.7307	0.9418	0.8282	1.0148	0.6439	VTHETA PR7	209.0	325.2	424.8	513.1
	INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	433.65	514.69	595.73	676.77
	DEVN	4.520	3.148	2.632	1.420	4.340	U 7	470.84	541.49	607.32	677.05
STATOR A											
PCT SPAN	DIA 9	26.021	29.683	33.345	37.007	40.669	U 6	470.84	541.49	607.32	677.05
	BETA 9	29.176	25.212	22.405	20.487	15.319	M 6	0.3399	0.3647	0.3720	0.3770
	BETA 10	8.135	7.984	6.891	6.950	6.969	M 7	0.4547	0.4323	0.4118	0.4025
	V 9	516.77	495.33	472.58	464.24	459.63	M(PR) 6	0.5161	0.5905	0.6595	0.7272
	V 10	521.69	495.09	484.40	478.25	490.64	M(PR) 7	0.4322	0.4822	0.5361	0.5923
	VZ 9	443.73	445.13	436.07	434.81	443.27	TURN(PR)	23.094	14.688	10.502	8.043
	VZ 10	513.65	486.87	479.98	474.66	486.95	ω	-0.0234	-0.0141	0.0317	0.0969
	V-THETA 9	251.92	211.00	180.13	162.48	121.43	DFAC	.3196	.3022	.2830	.2668
	V-THETA 10	73.82	68.77	58.12	57.87	59.53	EFFP	1.0153	1.0295	1.0257	0.9768
	M 9	0.4641	0.4443	0.4232	0.4152	0.4104	EFF	1.0156	1.0301	1.0262	0.9763
	M 10	0.4687	0.4441	0.4342	0.4282	0.4391	INCIDM	0.223	-0.624	-0.433	-0.823
	TURN	21.041	17.228	15.515	13.537	8.350	DEVN	6.922	4.668	3.060	2.133
	ω	0.0494	0.0425	0.0531	0.0443	0.0679					
	DFAC	0.1194	0.1172	0.0880	0.0753	-0.0015					
	EFFP	5.2647	-85.0266	2.2406	2.3551	1.2602					
	INCIDM	-11.724	-11.888	-12.295	-13.513	-20.681					
	DEVN	16.835	15.484	14.391	14.950	15.869					

Table B-2. Blade Element Data SLT0 Configuration (Continued)

80 PERCENT SPEED				PT. 30		CONFIGURATION		N/√S		4839.		N/√S		170.1		ROTOR			
INLET GUIDE VANE																			
PCT SPAN		90	70	30	10	PCT SPAN		90	70	50	30	10							
DIA 5		21.150	20.650	30.950	40.750	DIA 6		23.395	27.755	32.125	36.495	40.865							
BETA 3		0.000	0.000	0.000	0.000	BETA 6		0.725	0.237	-0.616	-1.368	-3.059							
BETA 4		0.815	0.253	-0.603	-3.064	BETA 7		50.866	46.452	46.961	44.202	42.412							
V 3		259.77	275.66	291.62	292.95	BETA (PR) 6		59.489	62.058	64.961	66.992	69.767							
V 4		266.92	290.36	313.26	307.54	BETA (PR) 7		28.379	43.372	51.109	55.352	57.337							
VZ 3		259.76	275.28	291.61	292.93	V 6		28.92	310.48	318.53	330.67	324.88							
VZ 4		266.89	289.47	313.17	307.10	V 7		480.09	448.16	438.16	444.43	467.58							
V-THETA 3		0.00	0.00	0.00	0.00	VZ 7		301.43	308.43	300.57	318.56	345.21							
V-THETA 4		3.80	1.33	-7.80	-16.44	V-THETA 6		3.66	1.28	-3.43	-7.89	-17.34							
M 3		0.2340	0.2484	0.2577	0.2642	V-THETA 7		372.39	324.83	318.66	309.86	315.34							
M 4		0.2405	0.2619	0.2628	0.2776	V (PR) 6		568.9	662.1	752.5	845.7	938.0							
TURN		-0.52	-0.26	1.43	3.06	V (PR) 7		344.4	424.8	479.0	560.4	639.6							
(REFER TO 70% & 100% SPEED DATA)										VTHETA PR6		490.1	584.7	681.7					
DFAC		-0.020	-0.051	-0.063	-0.078	VTHETA PR7		163.7	291.7	372.8	461.0	538.5							
EFFP		0.8558	1.1085	1.0417	0.7218	U 6		493.75	586.02	678.29	770.56	862.83							
INCIDM		-20.200	-20.200	-20.200	-20.200	U 7		536.09	616.53	691.49	770.88	853.85							
DEVM		4.585	3.437	1.727	1.464	M 6		0.2606	0.2803	0.2877	0.2988	0.2935							
										M 7		0.4247	0.3953	0.3848	0.4075				
										M (PR) 6		0.5130	0.5977	0.6796	0.8475				
										M (PR) 7		0.3046	0.3747	0.4207	0.5576				
										TURN (PR)		31.103	18.660	13.848	12.430				
										ω		-0.0109	0.1580	0.2442	0.1715				
										DFAC		.6328	.5504	.5430	.4845				
										EFFP		0.9795	0.9912	0.9232	0.8628				
										EFF		0.9788	0.9909	0.9208	0.8576				
										INCIDM		10.889	9.558	8.861	15.867				
										DEVM		9.579	10.872	9.009	6.752				
																	4.437		

Table B-2. Blade Element Data SLTO Configuration (Continued)

80PERCENT SPEED PT.33		CONFIGURATION		N/√σ		196.5					
INLET GUIDE VANE											
REFLECT											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.619	0.243	-0.684	-0.947	0.878
BETA 4	0.710	0.315	-0.787	-0.916	0.563	BETA 7	44.728	40.447	37.695	35.778	36.231
V 3	302.18	320.99	333.83	341.34	343.03	BETA(PR) 6	55.269	58.218	61.301	63.529	66.196
V 4	315.73	341.11	353.21	364.15	360.01	BETA(PR) 7	27.492	41.774	48.877	52.544	54.913
VZ 3	302.16	320.62	333.82	341.32	343.01	V 6	341.02	363.80	375.17	388.31	379.44
VZ 4	315.70	338.54	353.17	364.10	359.99	V 7	501.16	465.70	457.19	470.66	492.64
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 4	340.93	363.42	375.09	388.25	379.39
V-THETA 4	3.91	1.88	-4.85	-5.82	3.54	VZ 7	354.34	354.08	361.59	381.79	397.38
M 3	0.2727	0.2899	0.3017	0.3087	0.3102	V-THETA 6	3.68	1.54	-4.48	-6.42	5.81
M 4	0.2851	0.3084	0.3196	0.3297	0.3259	V-THETA 7	352.69	302.12	279.55	275.17	291.17
TURN	-0.71	-0.31	0.79	0.92	-0.56	V(PR) 6	598.5	690.2	781.1	871.0	940.0
(REFER TO 70% & 100% SPEED DATA)								V(PR) 7	401.4	475.2	627.9
DFAC	-0.038	-0.060	-0.065	-0.075	-0.044	VTHETA PR6	491.8	586.5	685.2	779.7	860.0
EFFP	0.9763	1.0350	0.8176	0.9947	0.7619	VTHETA PR7	185.3	316.6	414.4	498.4	565.7
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	495.49	588.08	680.67	773.27	865.86
DEVN	4.690	3.385	1.113	1.216	-1.037	U 7	537.97	618.70	693.92	773.58	856.85
STATOR A								M 6	0.3084	0.3294	0.3521
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 9	43.104	38.805	36.337	34.083	35.414	BETA 6	0.619	0.243	-0.684	-0.947	0.878
BETA 10	5.905	3.075	2.824	1.599	6.180	BETA 7	44.728	40.447	37.695	35.778	36.231
V 9	498.23	470.60	467.02	485.93	513.66	BETA(PR) 6	55.269	58.218	61.301	63.529	66.196
V 10	387.12	381.28	399.96	425.17	470.55	BETA(PR) 7	27.492	41.774	48.877	52.544	54.913
VZ 9	356.67	363.21	374.80	402.20	418.62	V 6	341.02	363.80	375.17	388.31	379.44
VZ 10	382.43	376.75	397.89	424.70	467.80	V 7	501.16	465.70	457.19	470.66	492.64
V-THETA 9	340.45	294.91	276.72	272.31	297.66	VZ 4	340.93	363.42	375.09	388.25	379.39
V-THETA 10	39.82	20.45	19.71	11.86	50.65	VZ 7	354.34	354.08	361.59	381.79	397.38
M 9	0.4420	0.4167	0.4125	0.4284	0.4518	V-THETA 6	3.68	1.54	-4.48	-6.42	5.81
M 10	0.3408	0.3356	0.3517	0.3733	0.4126	V-THETA 7	352.69	302.12	279.55	275.17	291.17
TURN	37.199	35.730	33.513	32.484	29.235	V(PR) 6	598.5	690.2	781.1	871.0	940.0
DEVN	0.077	0.0533	0.0565	0.0393	0.0396	V(PR) 7	401.4	475.2	550.1	627.9	691.3
STATOR B								VTHETA PR6	491.8	586.5	685.2
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 9	43.104	38.805	36.337	34.083	35.414	BETA 6	0.619	0.243	-0.684	-0.947	0.878
BETA 10	5.905	3.075	2.824	1.599	6.180	BETA 7	44.728	40.447	37.695	35.778	36.231
V 9	498.23	470.60	467.02	485.93	513.66	BETA(PR) 6	55.269	58.218	61.301	63.529	66.196
V 10	387.12	381.28	399.96	425.17	470.55	BETA(PR) 7	27.492	41.774	48.877	52.544	54.913
VZ 9	356.67	363.21	374.80	402.20	418.62	V 6	341.02	363.80	375.17	388.31	379.44
VZ 10	382.43	376.75	397.89	424.70	467.80	V 7	501.16	465.70	457.19	470.66	492.64
V-THETA 9	340.45	294.91	276.72	272.31	297.66	VZ 4	340.93	363.42	375.09	388.25	379.39
V-THETA 10	39.82	20.45	19.71	11.86	50.65	VZ 7	354.34	354.08	361.59	381.79	397.38
M 9	0.4420	0.4167	0.4125	0.4284	0.4518	V-THETA 6	3.68	1.54	-4.48	-6.42	5.81
M 10	0.3408	0.3356	0.3517	0.3733	0.4126	V-THETA 7	352.69	302.12	279.55	275.17	291.17
TURN	37.199	35.730	33.513	32.484	29.235	V(PR) 6	598.5	690.2	781.1	871.0	940.0
DEVN	0.077	0.0533	0.0565	0.0393	0.0396	V(PR) 7	401.4	475.2	550.1	627.9	691.3
STATOR C								VTHETA PR6	491.8	586.5	685.2
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 9	43.104	38.805	36.337	34.083	35.414	BETA 6	0.619	0.243	-0.684	-0.947	0.878
BETA 10	5.905	3.075	2.824	1.599	6.180	BETA 7	44.728	40.447	37.695	35.778	36.231
V 9	498.23	470.60	467.02	485.93	513.66	BETA(PR) 6	55.269	58.218	61.301	63.529	66.196
V 10	387.12	381.28	399.96	425.17	470.55	BETA(PR) 7	27.492	41.774	48.877	52.544	54.913
VZ 9	356.67	363.21	374.80	402.20	418.62	V 6	341.02	363.80	375.17	388.31	379.44
VZ 10	382.43	376.75	397.89	424.70	467.80	V 7	501.16	465.70	457.19	470.66	492.64
V-THETA 9	340.45	294.91	276.72	272.31	297.66	VZ 4	340.93	363.42	375.09	388.25	379.39
V-THETA 10	39.82	20.45	19.71	11.86	50.65	VZ 7	354.34	354.08	361.59	381.79	397.38
M 9	0.4420	0.4167	0.4125	0.4284	0.4518	V-THETA 6	3.68	1.54	-4.48	-6.42	5.81
M 10	0.3408	0.3356	0.3517	0.3733	0.4126	V-THETA 7	352.69	302.12	279.55	275.17	291.17
TURN	37.199	35.730	33.513	32.484	29.235	V(PR) 6	598.5	690.2	781.1	871.0	940.0
DEVN	0.077	0.0533	0.0565	0.0393	0.0396	V(PR) 7	401.4	475.2	550.1	627.9	691.3
STATOR D								VTHETA PR6	491.8	586.5	685.2
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 9	43.104	38.805	36.337	34.083	35.414	BETA 6	0.619	0.243	-0.684	-0.947	0.878
BETA 10	5.905	3.075	2.824	1.599	6.180	BETA 7	44.728	40.447	37.695	35.778	36.231
V 9	498.23	470.60	467.02	485.93	513.66	BETA(PR) 6	55.269	58.218	61.301	63.529	66.196
V 10	387.12	381.28	399.96	425.17	470.55	BETA(PR) 7	27.492	41.774	48.877	52.544	54.913
VZ 9	356.67	363.21	374.80	402.20	418.62	V 6	341.02	363.80	375.17	388.31	379.44
VZ 10	382.43	376.75	397.89	424.70	467.80	V 7	501.16	465.70	457.19	470.66	492.64
V-THETA 9	340.45	294.91	276.72	272.31	297.66	VZ 4	340.93	363.42	375.09	388.25	379.39
V-THETA 10	39.82	20.45	19.71	11.86	50.65	VZ 7	354.34	354.08	361.59	381.79	397.38
M 9	0.4420	0.4167	0.4125	0.4284	0.4518	V-THETA 6	3.68	1.54	-4.48	-6.42	5.81
M 10	0.3408	0.3356	0.3517	0.3733	0.4126	V-THETA 7	352.69	302.12	279.55	275.17	291.17
TURN	37.199	35.730	33.513	32.484	29.235	V(PR) 6	598.5	690.2	781.1	871.0	940.0
DEVN	0.077	0.0533	0.0565	0.0393	0.0396	V(PR) 7	401.4	475.2	550.1	627.9	691.3
STATOR E								VTHETA PR6	491.8	586.5	685.2
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 9	43.104	38.805	36.337	34.083	35.414	BETA 6	0.619	0.243	-0.684	-0.947	0.878
BETA 10	5.905										

Table B-2. Blade Element Data SLTO Configuration (Continued)

BLPERCENT SPEED					PT.35	CONFIGURATION					N/√S	4849.	INLET GUIDE VANE					N/√S	201.5	ROTOR					N/√S	201.5															
PCT SPAN					90	70	50	30	10	(REFER TO 70% & 100% SPEED DATA)					PCT SPAN					90	70	50	30	10	PCT SPAN					90	70	50	30	10							
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865	DIA 9	26.021	29.683	33.345	37.007	40.669	DFAC	.5211	.4760	.4347	.4070	.3808	DIA 12	28.677	32.339	36.001	39.663	43.325	46.987											
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.759	0.315	-0.264	-1.387	-4.922	BETA 9	41.669	38.085	34.962	32.587	28.823	EFFP	0.9772	0.9786	1.0013	0.9775	0.9465	BETA 15	44.289	40.651	37.013	33.375	29.737	26.100											
BETA 4	0.856	0.406	-0.193	-1.455	-4.963	BETA 7	43.299	39.749	36.511	33.976	30.610	BETA 12	5.213	3.131	2.936	1.413	6.279	EFF	0.9766	0.9780	1.0013	0.9748	0.9446	BETA 18	46.891	43.253	39.615	35.977	32.339	28.701											
V 3	309.63	329.35	343.17	351.55	353.83	V 6	351.56	373.98	386.05	399.90	392.60	V 9	502.71	471.38	471.65	483.16	504.24	INCIDM	5.755	4.945	4.372	3.318	3.270	V 21	52.891	49.253	45.615	41.977	38.339	34.701											
V 4	325.85	351.98	363.87	375.74	370.04	V 7	505.47	466.47	462.40	468.54	481.77	V 10	406.62	396.12	413.65	437.44	480.47	DEVM	8.583	9.199	6.246	4.132	2.908	V 24	55.491	51.853	48.215	44.577	40.939	37.301											
VZ 3	309.80	329.00	343.15	351.53	353.81	VZ 6	351.47	373.58	386.00	399.77	391.15	VZ 9	367.98	367.18	384.88	406.72	441.77																								
VZ 4	325.81	349.10	363.86	375.61	368.64	VZ 7	366.20	358.35	371.49	388.51	414.64	VZ 10	402.44	391.13	411.26	436.87	477.58																								
V-THETA 3	0.00	0.00	0.00	0.00	0.00	V-THETA 6	4.66	2.06	-1.70	-9.68	-33.68	V-THETA 9	344.34	290.76	270.27	260.22	243.10																								
V-THETA 4	4.87	2.49	-1.22	-9.54	-32.02	V-THETA 7	346.65	298.28	275.11	261.84	245.31	V-THETA 10	36.94	21.63	21.20	13.79	52.54																								
M 3	0.2197	0.2976	0.3103	0.3181	0.3202	V(PR) 6	603.1	694.5	783.2	878.1	979.8	M 6	334.34	290.76	270.27	260.22	243.10																								
M 4	0.2944	0.3185	0.3255	0.3404	0.3352	V(PR) 7	414.3	480.3	559.2	641.6	737.8	M 7	367.98	367.18	384.88	406.72	441.77																								
TURN	-0.86	-0.41	0.19	1.46	4.96	VTHETA PR6	490.1	585.2	681.5	781.8	896.3	M 10	402.44	391.13	411.26	436.87	477.58																								
ω	-0.044	-0.065	-0.062	-0.082	-0.091	VTHETA PR7	190.5	319.5	417.8	510.6	610.3	M 12	334.34	290.76	270.27	260.22	243.10																								
DFAC	0.8848	0.9624	0.7347	0.9823	0.7273	U 6	494.77	587.23	679.69	772.15	864.61	M 15	402.44	391.13	411.26	436.87	477.58																								
EFFP	0.8848	0.9624	0.7347	0.9823	0.7273	U 7	537.20	617.81	692.92	772.47	855.62	M 18	402.44	391.13	411.26	436.87	477.58																								
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	M 6	0.3181	0.3388	0.3500	0.3629	0.3561	M 21	334.34	290.76	270.27	260.22	243.10																								
DEVM	4.544	3.294	2.093	1.755	3.363	M 7	0.4490	0.4131	0.4087	0.4132	0.4234	M 24	334.34	290.76	270.27	260.22	243.10																								
														STATOR A																											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10																								
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 12	28.677	32.339	36.001	39.663	43.325	DIA 15	31.233	34.895	38.557	42.219	45.881																								
BETA 9	41.669	38.085	34.962	32.587	28.823	BETA 12	44.289	40.651	37.013	33.375	29.737	BETA 18	46.891	43.253	39.615	35.977	32.339																								
BETA 12	5.213	3.131	2.936	1.413	6.279	BETA 15	49.493	45.855	42.217	38.579	34.941	BETA 21	52.095	48.457	44.819	41.181	37.543																								
V 9	502.71	471.38	471.65	483.16	504.24	V 12	528.91	497.58	497.85	509.36	520.87	V 18	554.91	523.58	523.85	535.36	546.87																								
V 10	406.62	396.12	413.65	437.44	480.47	V 15	430.91	419.58	437.11	458.62	479.13	V 21	456.91	445.58	463.11	484.62	505.13																								
VZ 9	367.98	367.18	384.88	406.72	441.77	VZ 12	383.91	372.58	390.11	411.62	432.13	VZ 18	383.91	372.58	390.11	411.62	432.13																								
VZ 10	402.44	391.13	411.26	436.87	477.58	VZ 15	402.44	391.13	411.26	436.87	477.58	VZ 21	402.44	391.13	411.26	436.87	477.58																								
V-THETA 9	344.34	290.76	270.27	260.22	243.10	V-THETA 12	36.94	21.63	21.20	13.79	52.54	V-THETA 18	36.94	21.63	21.20	13.79	52.54																								
V-THETA 10	36.94	21.63	21.20	13.79	52.54	V-THETA 15	36.94	21.63	21.20	13.79	52.54	V-THETA 21	36.94	21.63	21.20	13.79	52.54																								
M 9	0.4465	0.4176	0.4171	0.4264	0.4437	M 12	0.4465	0.4176	0.4171	0.4264	0.4437	M 18	0.4465	0.4176	0.4171	0.4264	0.4437																								
M 10	0.3557	0.3491	0.3493	0.3848	0.4221	M 15	0.3557	0.3491	0.3493	0.3848	0.4221	M 21	0.3557	0.3491	0.3493	0.3848	0.4221																								
TURN	36.476	34.954	32.025	31.174	22.545	TURN	36.476	34.954	32.025	31.174	22.545	TURN	36.476	34.954	32.025	31.174	22.545																								
ω	.0671	.0501	.0557	.0420	.0446	ω	.0671	.0501	.0557	.0420	.0446	ω	.0671	.0501	.0557	.0420	.0446																								
DFAC	0.4154	0.3937	0.3591	0.3363	0.2314	DFAC	0.4154	0.3937	0.3591	0.3363	0.2314	DFAC	0.4154	0.3937	0.3591	0.3363	0.2314																								
EFFP	0.2228	0.3207	0.7422	0.5491	0.3691	EFFP	0.2228	0.3207	0.7422	0.5491	0.3691	EFFP	0.2228	0.3207	0.7422	0.5491	0.3691																								
INCIDM	0.789	0.985	0.262	-1.413	-7.177	INCIDM	0.789	0.985	0.262	-1.413	-7.177	INCIDM	0.789	0.985	0.262	-1.413	-7.177																								
DEVM	13.913	10.631	10.438	9.413	15.179	DEVM	13.913	10.631	10.438	9.413	15.179	DEVM	13.913	10.631	10.438	9.413	15.179																								

Table B-2. Blade Element Data SLTO Configuration (Continued)

		CONFIGURATION		N/100		N/100	
80PERCENT SPEED		PT.37	SLTO	4830.	215.7		
INLET GUIDE VANE							
PCT SPAN	90	70	50	30	10	PCT SPAN	90
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.837
BETA 4	0.955	0.651	-0.484	-1.168	-1.977	BETA 7	38.263
V 3	335.49	356.37	370.40	378.43	380.14	BETA(PR) 6	51.892
V 4	351.79	380.33	392.35	405.05	398.25	BETA(PR) 7	27.164
VZ 3	335.46	355.96	370.37	378.40	380.12	V 6	382.28
VZ 4	351.74	377.64	392.35	404.97	398.01	V 7	523.48
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	382.16
V-THETA 4	5.86	4.32	-3.31	-8.26	-13.74	VZ 7	409.19
M 3	0.3033	0.3225	0.3355	0.3429	0.3445	V-THETA 6	5.58
M 4	0.3183	0.3447	0.3559	0.3677	0.3614	V-THETA 7	324.17
TURN	-0.95	-0.65	0.48	1.17	1.98	V(PR) 6	619.3
(REFER TO 70% & 100% SPEED DATA)							
DFAC	-0.040	-0.061	-0.064	-0.081	-0.066	V(PR) 7	462.0
EFFP	0.8056	0.9359	0.7549	1.0021	0.7365	VTHETA PR6	487.3
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	VTHETA PR7	210.9
DEVN	4.445	3.049	2.384	1.468	0.377	U 6	492.83
STATOR A							
PCT SPAN	90	70	50	30	10	U 7	535.09
DIA 9	26.021	29.683	33.345	37.007	40.669	M 6	0.3465
BETA 9	36.419	32.570	29.807	27.618	27.471	M 7	0.4667
BETA 10	3.801	2.320	2.745	1.626	5.540	M(PR) 6	0.5613
V 9	525.90	500.03	492.87	498.24	516.70	M(PR) 7	0.4119
V 10	471.73	448.37	460.58	470.36	506.40	TURN(PR)	24.722
VZ 9	415.36	417.68	426.32	441.26	458.43	W	0.0280
VZ 10	467.96	443.83	458.58	469.94	504.01	DFAC	.4429
V-THETA 9	312.22	269.18	245.60	230.97	238.35	EFFP	0.9881
V-THETA 10	31.27	18.15	22.06	13.35	48.89	EFF	0.9878
M 9	0.4689	0.4450	0.4378	0.4418	0.4570	INCIDM	3.292
M 10	0.4188	0.3975	0.4081	0.4162	0.4475	DEVN	8.364
TURN	32.618	30.250	27.062	25.992	21.931		
W	.0437	.0492	.0473	.0349	.0460		
DFAC	0.3056	0.3092	0.2643	0.2604	0.1987		
EFFP	0.8281	0.6407	0.6825	0.3150	-0.2027		
INCIDM	-4.481	-4.530	-1.893	-6.382	-8.529		
DEVN	12.501	9.820	10.245	9.626	14.440		

Table B-2. Blade Element Data SLTO Configuration (Continued)

		CONFIGURATION		N/100		ROTOR	
		SLIU		4832.		230.4	
		80PERCENT SPEED PT.39					
		INLET GUIDE VANE					
PCT SPAN		90	70	50	30	10	
DIA 3		21.150	26.050	30.950	35.850	40.750	
BETA 3		0.000	0.000	0.000	0.000	0.000	
BETA 4		1.160	0.817	-0.670	-1.713	-5.668	
V 3		362.46	384.84	399.50	407.72	409.22	
V 4		381.28	412.28	424.23	438.40	430.24	
VZ 3		362.41	384.43	399.53	407.69	409.19	
VZ 4		361.20	409.54	424.20	438.21	428.13	
V-THETA 3		0.00	0.00	0.00	0.00	0.00	
V-THETA 4		7.72	5.88	-4.96	-13.10	-42.49	
M 3		0.3282	0.3489	0.3026	0.3702	0.3716	
M 4		0.3456	0.3744	0.3850	0.3989	0.3912	
TURN		-1.16	-0.82	0.67	1.71	5.67	
(REFER TO 70% & 100% SPEED DATA)							
DFAC		-0.041	-0.064	-0.068	-0.091	-0.103	
EFFP		0.6230	0.9458	0.7365	0.9922	0.7439	
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200	
DEVN		4.240	2.883	2.570	2.013	4.068	
PCT SPAN		90	70	50	30	10	
DIA 9		26.021	29.683	33.345	37.007	40.669	
BETA 9		31.362	28.020	24.909	22.897	18.478	
BETA 10		3.416	2.538	2.145	1.409	5.458	
V 9		551.47	531.79	516.40	510.80	522.71	
V 10		535.88	510.34	513.07	511.79	540.79	
VZ 9		462.40	465.64	460.91	470.37	495.76	
VZ 10		532.11	505.49	511.33	511.44	538.30	
V-THETA 9		287.18	249.82	218.34	196.74	165.67	
V-THETA 10		31.93	22.60	19.21	12.58	51.44	
M 9		0.4940	0.4755	0.4627	0.4350	0.4646	
M 10		0.4794	0.4555	0.4378	0.4359	0.4814	
TURN		27.966	25.461	22.704	21.488	13.020	
DFAC		0.0362	0.0554	0.0039	0.0520	-0.0006	
EFFP		0.2037	0.2155	0.1731	0.1687	0.0721	
INCIDM		0.3359	-0.0021	-1.2741	19.2480	1.5708	
DEVN		-9.518	-9.080	-9.791	-11.103	-17.522	
PCT SPAN		90	70	50	30	10	
DIA 6		23.385	27.755	32.125	36.445	40.865	
BETA 6		1.031	0.701	-0.586	-1.609	-5.806	
BETA 7		33.237	29.682	26.113	23.787	20.045	
BETA(PR) 6		49.401	52.532	56.365	59.315	63.600	
BETA(PR) 7		27.475	38.630	46.012	51.565	55.453	
V 6		416.29	444.71	453.77	464.53	451.08	
V 7		544.54	517.57	503.87	494.58	499.42	
VZ 6		416.15	444.33	453.69	464.33	448.76	
VZ 7		453.47	449.28	452.24	452.51	469.16	
V-THETA 6		7.49	5.44	-4.64	-13.04	-45.63	
V-THETA 7		298.46	256.29	221.77	199.48	171.18	
V(PR) 6		639.5	730.6	819.1	909.9	1012.1	
V(PR) 7		513.4	575.6	651.5	728.0	827.3	
VTHETA PR6		485.5	579.7	682.0	782.5	907.2	
VTHETA PR7		236.8	359.3	468.7	570.3	681.4	
U 6		535.31	585.17	677.31	769.44	861.58	
U 7		0.3782	0.4048	0.4133	0.4235	0.4108	
M 6		0.4875	0.4622	0.4493	0.4401	0.4432	
M 7		0.5810	0.6651	0.7461	0.8295	0.9218	
M(PR) 6		0.4596	0.5140	0.5809	0.6479	0.7343	
M(PR) 7		21.921	13.880	10.349	7.749	8.227	
TURN(PR)		0.0220	0.0277	0.0538	0.0542	0.1159	
DFAC		0.3642	0.3473	0.3212	0.3043	0.2837	
EFFP		1.0111	1.0233	1.0492	0.9959	0.9633	
EFF		1.0113	1.0239	1.0505	0.9958	0.9623	
INCIDM		0.801	0.032	0.265	-0.285	0.480	
DEVN		8.675	6.130	3.912	2.965	2.553	

Table B-2. Blade Element Data SLTO Configuration (Continued)

80PERCENT SPEED		CONFIGURATION		WAVE	
PT.2P		SLTC		230.	
INLET GUIDE VANE					
ROTOR					
PCT SPAN	50	70	50	70	50
DIA 3	21.150	26.050	30.950	27.750	32.125
BETA 3	0.000	0.000	0.000	0.000	0.000
BETA 4	1.001	0.385	-1.051	0.317	-1.092
V 3	378.72	401.44	423.53	25.573	23.040
V 4	366.72	430.71	444.34	51.395	50.020
VZ 3	378.26	400.58	423.50	28.342	45.544
VZ 4	396.64	428.21	444.33	467.65	476.37
V-THETA 3	0.000	0.000	0.000	0.000	0.000
V-THETA 4	7.555	2.922	-1.466	467.65	476.37
M 3	0.3428	0.3443	0.3450	487.52	478.74
M 4	0.3555	0.3917	0.4045	7.555	-1.74
TURN	-1.09	-0.39	1.05	235.23	273.70
(REFER TO 70% & 100% SPEED DATA)					
DFAC	-0.038	-0.060	-0.093	748.07	830.0
EFFP	0.6605	0.8544	0.9427	615.7	680.7
INCIDM	-20.200	-20.200	-20.200	584.63	478.09
DEVN	4.309	3.311	1.351	171.57	62.20
STATOR A					
PCT SPAN	90	70	50	30	10
DIA 5	26.021	25.683	33.345	37.017	47.440
BETA 9	28.510	24.398	21.842	20.080	15.137
BETA 10	5.128	4.770	2.233	2.290	3.323
V 9	579.16	555.09	535.01	523.16	529.51
V 10	582.52	556.03	542.84	538.75	551.50
VZ 9	580.31	561.52	546.23	491.26	510.52
VZ 10	577.09	550.60	541.30	537.50	550.50
V-THETA 9	276.44	225.29	193.52	173.61	140.05
V-THETA 10	52.06	46.28	21.14	21.41	32.55
M 9	0.5206	0.4802	0.4671	0.4577	0.4728
M 10	0.5237	0.4804	0.4671	0.4577	0.4728
TURN	23.382	19.429	15.630	17.700	17.014
DFAC	0.008	0.000	0.009	0.0279	0.0367
EFFP	0.1403	0.1310	0.1221	0.1131	0.0786
INCIDM	-12.390	-12.702	-12.838	-13.920	-20.663
DEVN	13.828	12.270	9.733	10.280	12.223

Table B-2. Blade Element Data SLTO Configuration (Continued)

100 PERCENT SPEED		PT. 06	CONFIGURATION		M/√σ	W/σ
			SLTO		6090.	236.9
INLET GUIDE VANE						
ROTOR						
PCT SPAN	90	70	50	30	10	PCT SPAN
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6
BETA 4	1.042	0.596	-0.054	-0.111	1.462	BETA 7
V 3	371.44	395.19	412.54	422.80	424.37	BETA(PR) 6
V 4	394.48	419.27	436.69	454.49	452.09	BETA(PR) 7
VZ 3	371.42	394.69	412.53	422.78	424.35	V 6
VZ 4	384.41	415.69	436.69	454.49	451.94	V 7
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6
V-THETA 4	6.99	4.36	-0.41	-0.88	11.54	VZ 7
M 3	0.3365	0.3585	0.3747	0.3843	0.3857	V-THETA 6
M 4	0.3486	0.3810	0.3973	0.4140	0.4118	V-THETA 7
TURN	-1.04	-0.60	0.05	0.11	-1.46	V(PR) 6
ω	0.0258		0.0206		0.0311	V(PR) 7
DFAC	-0.025	-0.055	-0.059	-0.076	-0.052	VTHETA PR6
EFFP	0.6986	0.9508	0.8261	1.0363	0.7705	VTHETA PR7
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6
DEVM	4.358	3.104	1.954	0.411	-3.062	U 7
STATOR A						
PCT SPAN	90	70	50	30	10	
DIA 9	26.021	29.683	33.345	37.007	40.669	DFAC
BETA 9	47.253	45.908	41.273	37.990	43.117	EFFP
BETA 10	9.092	8.555	6.122	6.146	8.751	EFF
V 9	590.78	559.18	573.51	624.19	660.41	INCIDM
V 10	390.01	393.90	437.96	503.53	577.10	DEVM
VZ 9	392.29	384.46	428.96	491.58	482.05	
VZ 10	381.66	384.41	433.14	500.14	570.37	
V-THETA 9	433.84	401.62	378.31	384.21	451.38	
V-THETA 10	61.63	58.60	46.71	53.91	47.80	
M 9	0.5193	0.4888	0.5003	0.5433	0.5694	
M 10	0.3378	0.3404	0.3782	0.4342	0.4944	
TURN	38.161	37.353	35.151	31.844	34.366	
ω	0.1196	0.1317	0.0774	0.0616	0.0461	
DFAC	0.5782	0.5466	0.4904	0.4410	0.3945	
EFFP	0.8457	0.8466	0.7946	0.7510	0.9449	
INCIDM	6.353	8.808	6.573	3.990	7.117	
DEVM	17.792	16.055	13.622	14.146	17.651	

Table B-2. Blade Element Data SLTO Configuration (Continued)

100 PERCENT SPEED		PT. 8	CONFIGURATION		N/√σ	M/√σ					
			SLTO		6070.	254.2					
INLET GUIDE VANE											
ROTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.757	0.752	0.213	-0.450	-8.957
BETA 4	0.860	0.801	0.251	-0.500	-8.939	BETA 7	44.998	43.540	38.116	36.763	31.779
V 3	401.70	428.07	447.80	459.67	462.28	BETA(PR) 6	53.375	56.173	58.865	61.118	65.840
V 4	424.59	462.07	478.88	497.78	490.92	BETA(PR) 7	28.051	42.534	48.478	52.750	55.666
VZ 3	401.68	427.64	447.78	459.65	462.26	V 6	456.03	488.87	512.86	535.53	528.89
VZ 4	424.54	457.64	478.84	497.72	484.94	V 7	620.42	571.22	576.02	585.32	604.69
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	455.92	488.30	512.83	535.51	522.44
V-THETA 4	6.38	6.46	2.10	-4.34	-76.28	VZ 7	436.54	413.76	453.03	468.88	514.04
M 3	0.3646	0.3892	0.4077	0.4189	0.4214	V-THETA 6	6.03	6.42	1.91	-4.20	-82.34
M 4	0.3860	0.4212	0.4371	0.4550	0.4485	V-THETA 7	438.69	393.49	355.56	350.32	318.46
TURN	-0.86	-0.80	-0.25	0.50	8.94	V(PR) 6	764.3	877.5	991.8	1108.7	1276.5
ω	0.0258	0.0217	0.0217	0.0245	0.0245	V(PR) 7	497.1	561.9	683.6	774.7	911.4
DFAC	-0.049	-0.072	-0.067	-0.088	-0.144	VTHETA PR6	613.3	728.7	848.9	970.8	1164.7
EFFP	0.9151	1.0868	0.9126	1.0824	0.8057	VTHETA PR7	233.8	379.9	511.8	616.7	752.6
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	619.36	735.10	850.84	966.58	1082.32
DEVM	4.540	2.899	1.649	0.800	7.339	U 7	672.46	773.37	867.40	966.98	1071.07
STATOR A								M 6	0.4155	0.4694	0.4848
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DFAC	-0.0168	0.0441	0.0272	0.0476	0.2399
BETA 9	43.783	41.933	36.491	35.389	28.729	EFFP	-5579	0.5338	-4610	-4438	-4337
BETA 10	5.523	9.425	8.765	8.043	7.865	EFF	0.9713	0.9419	1.0175	0.9803	0.8997
V 9	612.31	574.37	548.76	604.15	638.36	INCIDM	0.9700	0.9394	1.0183	0.9793	0.8939
V 10	459.22	462.23	495.18	535.43	597.49	DEVM	4.775	3.673	2.765	1.518	2.640
VZ 9	432.39	421.97	470.80	491.90	559.78		9.251	10.034	6.376	4.150	2.766
VZ 10	449.99	449.83	486.53	529.35	591.87						
V-THETA 9	423.68	383.83	350.13	349.88	306.84						
V-THETA 10	75.97	75.69	75.46	74.91	81.76						
M 9	0.5400	0.5040	0.5164	0.5274	0.5528						
M 10	0.3999	0.4020	0.4310	0.4647	0.5155						
TURN	34.260	32.508	27.726	27.346	20.864						
ω	0.1120	0.0497	0.0557	0.0372	0.0391						
DFAC	0.4643	0.4145	0.3636	0.3268	0.2361						
EFFP	0.8380	0.9263	0.7492	0.6903	0.6324						
INCIDM	2.883	4.833	1.791	1.389	-7.271						
DEVM	18.223	16.925	16.265	16.043	16.765						

Table B-2. Blade Element Data SLTO Configuration (Continued)

100 PERCENT SPEED PT. 10					COMPI.URATION		N/A		N/A		
					SLTO		6070.		268.8		
INLET GUIDE VANE											
ROTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.902	0.638	-0.063	-1.066	-4.895
BETA 4	1.040	0.774	0.068	-1.176	-4.871	BETA 7	40.512	37.301	34.250	32.343	30.316
V 3	432.68	460.36	479.58	490.30	492.18	BETA(PR) 6	51.085	53.967	57.080	59.866	64.139
V 4	454.43	492.64	510.76	527.07	518.77	BETA(PR) 7	28.010	40.703	46.870	52.294	55.563
VZ 3	432.65	459.87	479.55	490.27	492.15	V 6	493.89	530.90	551.31	567.32	549.36
VZ 4	454.36	488.92	510.76	526.94	516.90	V 7	638.00	599.39	600.83	594.01	607.26
V-THEIA 3	0.000	0.000	0.000	0.000	0.000	VZ 6	493.75	530.42	551.25	567.21	547.36
V-THEIA 4	8.24	6.65	0.61	-10.82	-44.05	VZ 7	482.74	476.39	496.43	501.80	524.22
M 3	0.3935	0.4196	0.4377	0.4479	0.4497	V-THEIA 6	7.77	5.91	-0.60	-10.55	-46.08
M 4	0.4140	0.4501	0.4674	0.4830	0.4751	V-THEIA 7	414.45	363.23	338.15	317.79	306.52
TURN	-1.04	-0.77	-0.07	1.18	4.87	V(PR) 6	786.1	902.0	1014.3	1129.8	1254.9
W	0.0244	0.0202	0.0202	0.0255	0.0255	V(PR) 7	549.4	628.9	725.8	820.6	927.0
DFAC	-0.040	-0.063	-0.064	-0.086	-0.099	VTHETA PR6	611.6	729.2	851.4	977.1	1129.2
EFFP	1.1387	1.2305	1.0194	1.2168	0.8781	VTHETA PR7	258.0	410.1	529.2	649.2	764.5
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	619.36	735.10	850.84	966.58	1082.32
DEVN	4.360	2.926	1.832	1.476	3.271	U 7	672.46	773.37	867.40	966.98	1071.07
STATOR A											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DFAC	-0.0224	0.0231	0.0239	0.0716	0.2011
BETA 9	38.809	35.548	32.565	31.142	28.809	EFFP	4910	4591	4242	4037	3933
BETA 10	8.401	8.474	7.957	6.743	6.294	EFF	1.0043	1.0010	1.0249	0.9669	0.8972
V 9	637.84	608.92	615.85	616.59	631.33	INCIDM	1.0045	1.0011	1.0261	0.9653	0.8919
V 10	545.71	527.62	553.55	561.68	615.37	DEVN	2.485	1.467	0.580	0.266	0.939
VZ 9	487.24	490.57	517.21	527.45	553.18	W	9.210	8.203	4.724	3.694	2.663
VZ 10	536.72	516.43	546.20	557.46	611.63						
V-THEIA 9	399.75	354.02	331.49	318.87	304.23						
V-THEIA 10	79.73	77.75	76.63	65.95	67.46						
M 9	0.5655	0.5379	0.5426	0.5409	0.5495						
M 10	0.4797	0.4627	0.4850	0.4904	0.5350						
TURN	30.407	27.075	24.608	24.399	22.515						
W	0.0519	0.0422	0.0506	0.0511	0.0420						
DFAC	0.3335	0.3188	0.2827	0.2811	0.2082						
EFFP	0.7712	0.6561	0.5641	0.3564	0.3695						
INCIDM	-2.091	-1.552	-2.135	-2.858	-7.191						
DEVN	17.101	15.974	15.457	14.743	15.194						

Table B-2. Blade Element Data SLTO Configuration (Continued)

100% SPEED Pt. 1		INLET GUIDE VANE					ROTOR				
CONFIGURATION		SLIT					275.639				
N/A		6050.					275.639				
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	1.107	0.781	-0.180	-0.850	-2.765
BETA 4	1.308	1.018	-0.220	-0.867	-2.742	BETA 7	36.749	33.874	30.953	29.857	28.679
V 3	447.73	475.97	494.86	504.88	506.62	BETA(PR) 6	49.591	52.527	55.957	58.988	63.016
V 4	472.29	512.11	529.93	545.81	535.80	BETA(PR) 7	28.009	39.345	45.695	52.148	59.362
VZ 3	447.68	475.45	494.82	504.85	506.59	V 6	517.24	556.29	574.23	584.43	563.78
VZ 4	472.17	508.63	529.92	545.75	535.19	V 7	654.21	622.62	620.63	597.21	610.07
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	517.05	555.84	574.16	584.34	563.12
V-THETA 4	10.78	9.10	-2.04	-8.26	-25.63	VZ 7	521.77	516.51	532.01	517.88	535.22
M 3	0.4077	0.4343	0.4522	0.4618	0.4635	V-THETA 6	9.99	7.58	-1.81	-8.67	-27.20
M 4	0.4308	0.4687	0.4858	0.5010	0.4914	V-THETA 7	391.43	347.03	319.21	297.31	292.77
TURN	-1.31	-1.02	0.22	0.87	2.74	V(PR) 6	797.7	913.9	1025.7	1134.2	1241.1
W	0.0217	0.0198	0.0198	0.0301	0.0301	V(PR) 7	593.7	658.5	762.0	844.1	941.7
DFAC	-0.043	-0.066	-0.073	-0.089	-0.083	VTHETA PR6	607.3	725.1	849.8	972.1	1106.0
EFFP	0.8539	1.0023	0.8569	1.0188	0.7593	VTHETA PR7	278.8	423.8	545.3	666.5	774.8
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	617.32	732.68	848.04	963.40	1078.76
DEVN	4.092	2.682	2.120	1.167	1.142	U 7	670.25	770.82	864.54	963.79	1067.54
						M 6	0.4736	0.5111	0.5285	0.5385	0.5184
						M 7	0.5826	0.5519	0.5486	0.5253	0.5334
						M(PR) 6	0.7304	0.8397	0.9440	1.0450	1.1412
						M(PR) 7	0.5287	0.5925	0.6736	0.7424	0.8233
						TURN(PR)	21.577	13.162	10.258	6.839	7.654
						W	0.0170	0.0082	0.0225	0.0835	0.1656
						DFAC	4317	4150	3891	3761	3621
						EFFP	1.0124	1.0069	1.0214	0.9343	0.8896
						EFF	1.9128	1.0072	1.0224	0.9315	0.8866
						INCIDM	0.391	0.027	-0.143	-0.012	-0.144
						DEVN	9.209	6.845	3.555	3.346	2.462
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 9	23.385	27.755	32.125	36.495	40.865
BETA 9	35.009	32.009	29.530	28.496	27.446	BETA 9	1.0124	1.0069	1.0214	0.9343	0.8896
BETA 10	6.360	5.723	5.435	4.181	4.884	BETA 10	1.9128	1.0072	1.0224	0.9315	0.8866
V 9	359.42	638.86	639.48	618.82	634.72	V 9	0.391	0.027	-0.143	-0.012	-0.144
V 10	348.52	578.00	595.36	581.23	624.38	V 10	9.209	6.845	3.555	3.346	2.462
VZ 9	530.10	537.09	554.89	543.66	563.26	VZ 9	517.24	556.29	574.23	584.43	563.78
VZ 10	591.67	569.98	591.62	579.47	622.07	VZ 10	654.21	622.62	620.63	597.21	610.07
V-THETA 9	378.31	338.63	315.18	295.24	292.55	V-THETA 9	517.05	555.84	574.16	584.34	563.12
V-THETA 10	66.30	57.64	56.39	42.37	53.15	V-THETA 10	521.77	516.51	532.01	517.88	535.22
M 9	0.5875	0.5672	0.5661	0.5451	0.5558	M 9	9.99	7.58	-1.81	-8.67	-27.20
M 10	0.5300	0.5102	0.5248	0.5102	0.5463	M 10	391.43	347.03	319.21	297.31	292.77
TURN	28.649	26.286	24.095	24.315	22.563	TURN	797.7	913.9	1025.7	1134.2	1241.1
W	0.0136	0.0122	0.0193	0.0100	0.0118	W	593.7	658.5	762.0	844.1	941.7
DFAC	0.2710	0.2751	0.2466	0.2520	0.2001	DFAC	607.3	725.1	849.8	972.1	1106.0
EFFP	0.8008	0.5846	0.5416	0.2058	-0.6023	EFFP	278.8	423.8	545.3	666.5	774.8
INCIDM	-5.891	-5.091	-5.170	-5.504	-8.554	INCIDM	617.32	732.68	848.04	963.40	1078.76
DEVN	15.060	13.223	12.935	12.181	13.784	DEVN	670.25	770.82	864.54	963.79	1067.54

100 PERCENT SPEED	PT. 03	CONFURATION	N/√5	4076
		SLTU	6070.	282.9

INLET GUIDE VANE						ROTOR					
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.455	40.865
BETA 3	C.000	C.000	0.000	0.000	0.000	BETA 6	1.190	0.911	0.066	-1.267	-2.470
BETA 4	1.503	1.116	0.056	-1.276	-2.828	BETA 7	26.487	28.800	27.594	26.886	18.929
V 3	464.00	480.58	493.57	501.51	512.04	BETA(PR) 6	49.148	49.760	54.136	58.155	63.086
V 4	426.62	534.70	573.62	577.13	489.32	BETA(PR) 7	22.692	39.675	49.599	54.451	51.915
VZ 3	463.94	475.92	493.52	501.48	512.01	V 6	526.36	614.24	614.64	608.88	562.25
VZ 4	426.22	532.94	573.62	576.83	488.59	V 7	825.06	643.29	583.74	547.29	705.07
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	526.15	613.82	614.59	608.72	561.72
V-THETA 4	11.19	10.41	0.56	-12.85	-24.14	VZ 7	735.45	563.23	517.22	496.47	666.90
M 3	C.4230	C.4387	0.4510	0.4586	0.4686	V-THETA 6	10.93	9.77	0.71	-13.46	-24.23
M 4	C.3879	C.45C3	0.5279	C.5314	0.4470	V-THETA 7	367.97	309.90	270.40	230.31	228.72
TURN	-1.50	-1.12	-0.06	1.28	2.83	V(PIR) 6	804.4	950.4	1049.1	1153.7	1241.0
Σ	0.0280	0.0193	0.0193	0.0284	0.0284	V(PIR) 7	800.4	732.4	798.2	898.3	1081.2
DFAC	C.C93	-C.102	-0.162	-0.164	0.021	VTHETA PR6	608.4	725.3	850.1	980.0	1106.6
EFFP	1.2056	C.5727	0.9203	0.9998	2.0759	VTHETA PR7	308.8	467.6	607.9	748.7	931.0
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	619.36	735.10	850.84	966.58	1082.32
DEVH	3.897	2.584	1.844	1.576	1.228	U 7	676.75	777.50	878.25	979.01	1079.76
						M 6	0.4823	0.5677	0.5681	0.5624	0.5169
						M 7	0.7519	0.5737	0.5174	0.4834	0.6252
						M(PR) 6	0.7371	0.8783	0.9695	1.0656	1.1409
						M(PR) 7	0.7255	0.6532	0.7075	0.7935	0.9649
						TURN(PR)	26.450	10.069	4.534	1.704	11.171
						Σ	0.0292	0.0129	0.1143	0.1262	0.1422
						DFAC	.1681	.3540	.3471	.3153	.2247
						EFFP	1.0135	1.0181	0.9357	0.8152	0.8209
						EFF	1.0140	1.0188	0.9335	0.8096	0.8147
						INCIDM	0.548	-2.740	-1.964	-1.145	-0.114
						DEVH	3.892	7.175	7.499	7.851	-0.985

STATOR A					
PCT SPAN	90	70	50	30	10
DIA 9	26.C21	25.683	33.345	37.007	40.669
BETA 9	25.451	28.276	27.151	24.886	20.960
BETA 10	6.348	6.201	5.631	5.146	6.234
V 9	712.65	643.44	587.58	546.39	642.63
V 10	665.03	647.14	511.14	565.09	606.40
VZ 9	614.65	564.40	521.94	494.91	599.38
VZ 10	660.71	640.35	607.28	562.72	602.32
V-THETA 9	350.42	304.81	268.14	229.93	229.88
V-THETA 10	73.58	65.91	59.57	50.69	65.84
M 9	C.64C4	C.5738	0.521C	0.4826	0.5699
M 10	C.55E3	C.5773	C.5431	0.4598	0.5358
TURN	23.103	22.C75	21.52C	19.740	14.727
Σ	0.0770	0.0627	0.0277	0.0190	0.0658
DFAC	C.2C71	C.1423	C.1148	0.1188	0.1808
EFFP	C.2665	11.1951	2.0C36	3.3141	0.5952
INCIDM	-11.449	-8.824	-7.549	-9.114	-15.040
DEVH	15.048	13.701	13.131	13.146	15.134

Table B-2. Blade Element Data SLTO Configuration (Continued)

		CONFIGURATION		N/√δ		√δ/δ					
110PERCENT SPEED PT.62		SLTO		6628.		296.3					
INLET GUIDE VANE											
ROTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 6	21.150	26.050	30.950	35.850	40.750	DIA 6	23.395	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	0.704	0.810	-0.577	-0.897	-1.617
BETA 4	0.836	0.947	-0.631	-1.035	0.259	BETA 7	39.725	36.278	32.903	32.689	34.596
V 3	472.90	501.56	520.54	529.13	530.78	BETA(PRI) 6	50.717	53.725	56.743	67.153	63.777
V 4	497.86	530.26	558.91	568.95	573.89	BETA(PRI) 7	28.274	40.156	45.987	53.311	56.491
VZ 3	472.86	500.95	520.50	529.10	530.76	V 6	547.87	583.50	613.50	611.21	596.95
VZ 4	497.80	527.08	558.83	568.83	573.88	V 7	697.46	663.94	670.66	632.39	645.78
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	547.70	583.03	613.35	611.09	596.91
V-THETA 4	7.26	8.77	-6.15	-10.28	2.60	VZ 7	533.80	534.68	562.75	532.10	531.57
M 3	0.4314	0.4586	0.4767	0.4850	0.4866	V-THETA 6	6.74	8.25	-6.18	-9.57	6.47
M 4	0.4551	0.4861	0.5137	0.5234	0.5282	V-THETA 7	445.75	392.85	364.31	341.74	366.67
TURN	-0.84	-0.95	0.63	1.04	-0.26	V(PRI) 6	865.1	985.7	1118.5	1227.9	1318.3
(REFER TO 70% & 100% SPEED DATA)						V(PRI) 7	609.1	700.3	810.4	890.8	962.9
ω						VTHETA PR6	669.6	794.4	935.2	1065.0	1175.4
DFAC	-0.045	-0.048	-0.080	-0.085	-0.079	VTHETA PR7	288.5	451.6	582.8	714.3	802.9
EFFP	0.8657	0.7191	0.9023	0.8457	0.9799	U 6	676.30	802.68	929.06	1055.44	1191.82
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 7	734.28	844.47	947.13	1055.87	1169.53
DEVM	4.564	2.753	2.531	1.335	-1.859	M 6	0.5030	0.5376	0.5669	0.5647	0.5507
						M 7	0.6176	0.5853	0.5891	0.5516	0.5597
						M(PRI) 6	0.7943	0.9081	1.0436	1.1344	1.2161
						M(PRI) 7	0.5394	0.6173	0.7118	0.7769	0.8346
						TURN(PRI)	22.436	13.550	10.750	6.840	6.584
						ω	0.0479	0.0388	0.1099	0.1759	0.2114
						DFAC	.4823	.4438	.4443	.4027	.3982
						EFFP	0.9586	0.9927	0.9780	0.8818	0.8124
						EFF	0.9566	0.9923	0.9768	0.8759	0.8026
						INCIDM	2.117	1.225	0.643	0.553	-0.123
						DEVM	9.474	7.656	3.887	4.711	3.591
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 9	26.021	29.683	33.345	37.007	40.669
BETA 9	37.943	34.306	31.413	31.753	34.194	BETA 9	37.943	34.306	31.413	31.753	34.194
BETA 10	3.552	2.867	3.084	1.328	2.928	BETA 10	3.552	2.867	3.084	1.328	2.928
V 9	699.71	681.78	691.56	649.44	671.46	V 9	699.71	681.78	691.56	649.44	671.46
V 10	590.94	580.77	609.98	588.24	624.30	V 10	590.94	580.77	609.98	588.24	624.30
VZ 9	541.77	559.01	589.15	552.19	555.34	VZ 9	541.77	559.01	589.15	552.19	555.34
VZ 10	586.16	575.61	607.97	588.04	623.37	VZ 10	586.16	575.61	607.97	588.04	623.37
V-THETA 9	430.24	384.24	360.44	341.77	377.36	V-THETA 9	430.24	384.24	360.44	341.77	377.36
V-THETA 10	36.61	29.05	32.82	13.63	31.88	V-THETA 10	36.61	29.05	32.82	13.63	31.88
M 9	0.6197	0.6020	0.6084	0.5671	0.5830	M 9	0.6197	0.6020	0.6084	0.5671	0.5830
M 10	0.5177	0.5079	0.5324	0.5109	0.5397	M 10	0.5177	0.5079	0.5324	0.5109	0.5397
TURN	34.392	31.439	28.329	30.425	31.266	TURN	34.392	31.439	28.329	30.425	31.266
ω	.0545	.0551	.0508	.0333	.0501	ω	.0545	.0551	.0508	.0333	.0501
DFAC	0.3690	0.3618	0.3267	0.3309	0.3208	DFAC	0.3690	0.3618	0.3267	0.3309	0.3208
EFFP	0.7058	0.6234	0.6483	0.8261	0.8305	EFFP	0.7058	0.6234	0.6483	0.8261	0.8305
INCIDM	-2.957	-2.794	-3.287	-2.247	-1.806	INCIDM	-2.957	-2.794	-3.287	-2.247	-1.806
DEVM	12.252	10.367	10.584	9.328	11.828	DEVM	12.252	10.367	10.584	9.328	11.828

Table B-2. Blade Element Data SLTO Configuration (Continued)

110 PERCENT SPEED		PT. 56		CONFIGURATION		SLTO		N/√g		294.0		w/√g	
												6633.	
INLET GUIDE VANE													
ROTOR													
PCT SPAN		70		50		30		10		PCT SPAN		70	
DIA 3	21.150	26.050	36.950	40.750	40.750	DIA 6	23.385	32.125	36.495	DIA 6	27.755	32.125	36.495
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	1.094	0.458	-1.905	BETA 6	0.759	0.458	-1.905
BETA 4	1.279	0.978	0.773	-2.025	-8.032	BETA 7	35.645	30.366	28.812	BETA 7	31.334	30.366	28.812
V 3	469.89	515.71	538.37	547.57	549.18	BETA(PI) 6	49.104	55.660	59.572	BETA(PI) 6	52.045	55.660	59.572
V 4	517.69	559.93	579.40	600.19	586.99	BETA(PI) 7	28.159	46.493	55.652	BETA(PI) 7	39.489	46.493	55.652
VZ 3	489.83	515.18	538.33	547.54	549.15	V 6	576.86	631.85	633.12	V 6	620.55	631.85	633.12
VZ 4	517.55	556.80	579.34	599.82	581.23	V 7	722.02	670.09	598.99	V 7	688.06	670.09	598.99
V-THETA 3	0.000	0.000	0.000	0.000	0.000	VZ 6	576.65	631.75	632.75	VZ 6	620.16	631.75	632.75
V-THETA 4	11.55	9.56	7.82	-21.21	-82.02	VZ 7	584.17	577.91	524.79	VZ 7	583.46	577.91	524.79
M 3	0.4475	0.4760	0.4939	0.5027	0.5043	V-THETA 6	11.02	8.22	-21.05	V-THETA 6	8.22	5.04	-21.05
M 4	0.4740	0.5147	0.5336	0.5539	0.5410	V-THETA 7	420.77	338.74	288.67	V-THETA 7	363.94	338.74	288.67
TURN	-1.28	-C.98	-0.77	2.03	8.03	V(PI) 6	880.9	1120.0	1249.4	V(PI) 6	1008.5	1120.0	1249.4
(REFER TO 70% & 100% SPEED DATA)													
DFAC	-0.045	-0.068	-0.069	-0.116	-0.143	V(PI) 7	665.5	756.6	930.2	V(PI) 7	756.6	839.8	930.2
EFFP	0.9347	C.9804	0.8144	1.0120	0.8384	VTHETA PR6	665.8	795.1	1077.3	VTHETA PR6	795.1	924.7	1077.3
	-20.200	-20.200	-20.200	-20.200	-20.200	VTHETA PR7	314.1	481.2	768.0	VTHETA PR7	481.2	609.1	768.0
	4.121	2.722	1.127	2.325	6.432	U 6	676.81	803.28	1056.24	U 6	803.28	929.76	1056.24
						U 7	734.84	845.10	1056.67	U 7	845.10	947.85	1056.67
						M 6	0.5311	0.5739	0.5863	M 6	0.5739	0.5850	0.5863
						M 7	0.6432	0.6102	0.5243	M 7	0.6102	0.5915	0.5243
						M(PI) 6	0.8110	0.9327	1.1570	M(PI) 6	0.9327	1.0370	1.1570
						M(PI) 7	0.5929	0.6711	0.8141	M(PI) 7	0.6711	0.7413	0.8141
						TURN(PI)	20.940	12.541	3.919	TURN(PI)	12.541	9.164	3.919
						ω	0.0440	0.0591	0.2356	ω	0.0591	0.1244	0.2356
						DFAC	.4269	.3890	.3657	DFAC	.3890	.3754	.3657
						EFFP	0.9811	0.9912	0.7932	EFFP	0.9912	0.9614	0.7932
						EFF	0.9802	0.9908	0.7849	EFF	0.9908	0.9595	0.7849
						INCIDM	0.504	-0.455	-0.028	INCIDM	-0.455	-0.440	-0.028
						DEVM	9.359	6.989	7.052	DEVM	6.989	4.393	7.052
											</		

Table B-2. Blade Element Data SLTO Configuration (Continued)

110PERCENT SPEED PT.64				CONFIGURATION		N/√S		√S/6			
				SLTO		6619.		295.6			
INLET GUIDE VANE											
MOTOR											
PCT SPAN	90	70	50	30	10	HCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	1.297	0.592	-0.607	-1.831	-7.203
BETA 4	1.492	0.803	-0.739	-1.546	-7.032	BETA 7	35.763	31.408	29.025	28.444	22.059
V 3	469.64	497.87	514.23	522.14	523.61	BETA(PRI) 6	50.569	52.966	57.572	60.998	65.214
V 4	488.34	542.84	549.38	570.10	551.34	BETA(PRI) 7	29.184	40.395	49.328	57.947	59.790
VZ 3	468.59	497.39	514.20	522.11	523.58	V 6	345.45	600.44	593.53	595.16	583.38
VZ 4	488.17	540.01	549.33	569.80	547.19	V 7	706.68	676.08	629.39	560.70	613.00
V-TWETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	545.23	600.11	593.44	594.84	579.77
V-TWETA 4	12.71	7.60	-7.09	-18.37	-67.50	VZ 7	570.97	576.63	550.16	492.98	568.12
M 3	0.4274	0.4551	0.4707	0.4783	0.4797	V-TWETA 6	12.35	6.21	-6.29	-19.02	-73.15
M 4	0.4460	0.4982	0.5045	0.5245	0.5064	V-TWETA 7	413.01	352.33	305.38	267.07	230.22
TURN	-1.49	-0.80	0.74	1.85	7.03	V(PRI) 6	858.5	996.6	1106.7	1226.9	1380.5
(REFER TO 70% & 100% SPEED DATA)											
ω	-0.029	-0.083	-0.075	-0.110	-0.117	V(PRI) 7	656.8	757.6	844.4	929.0	1096.4
DFAC	0.8465	1.5040	0.7728	1.0214	0.6997	VTWETA PR6	663.0	795.4	934.1	1073.0	1253.4
EFFP	-20.200	-20.200	-20.200	-20.200	-20.200	VTWETA PR7	320.3	491.0	640.5	787.4	937.7
INCIDM	3.908	2.897	2.639	2.146	5.432	U 6	675.38	801.59	927.80	1054.01	1180.22
DEVM	-20.200	-20.200	-20.200	-20.200	-20.200	U 7	733.24	843.32	945.85	1054.44	1167.94
STATOR A											
PCT SPAN	90	70	50	30	10	M 6	0.5007	0.5541	0.5473	0.5489	0.5374
DIA 9	26.021	29.683	33.345	37.007	40.669	M 7	0.6292	0.5997	0.5553	0.4910	0.5360
BETA 9	33.431	29.437	27.910	27.475	19.704	M(PRI) 6	0.7880	0.9197	1.0206	1.1316	1.2718
BETA 10	3.191	2.569	1.083	0.878	4.717	M(PRI) 7	0.5848	0.6720	0.7451	0.8136	0.9586
V 9	722.86	701.01	642.25	570.98	653.34	TURN(PRI)	21.380	12.557	8.241	3.050	6.423
V 10	690.40	672.03	626.05	568.17	460.53	ω	0.0291	0.0814	0.1881	0.2471	0.2628
VZ 9	593.69	606.86	566.62	506.42	615.08	DFAC	1.066	.3768	.3554	.3473	.3094
VZ 10	686.14	667.02	624.83	567.95	658.27	EFFP	0.9824	0.9630	0.9350	0.7713	0.8420
V-TWETA 9	398.24	344.52	300.63	263.43	220.28	EFF	0.9816	0.9613	0.9322	0.7631	0.8350
V-TWETA 10	38.43	30.12	11.83	8.70	54.32	INCIDM	1.969	0.466	1.652	1.398	2.014
M 9	0.6448	0.6235	0.5673	0.5003	0.5730	DEVM	10.384	7.895	7.228	9.347	5.890
M 10	0.6136	0.5958	0.5521	0.4977	0.5797						
TURN	30.240	26.868	26.827	26.598	14.987						
ω	.0518	.0522	.0591	.1311	.0605						
DFAC	0.2337	0.2252	0.2230	0.2138	0.1129						
EFFP	0.0930	0.0622	-0.6536	-10.6805	7.8153						
INCIDM	-7.469	-7.663	-6.790	-6.525	-16.296						
DEVM	11.891	10.069	8.583	8.878	13.617						

Table B-2. Blade Element Data SLTO Configuration (Continued)

110 PERCENT SPEED PT. 54				CONFIGURATION		N/√S		√S/6	
INLET GUIDE VANE				SLT		6607.		795.9	
ROTOR									
PCT SPAN		90	70	50	30	10			
DIA 3	DIA 6	21.150	26.050	30.950	35.850	40.750			
BETA 3	BETA 6	0.500	0.000	0.000	0.000	0.000			
BETA 4	BETA 7	1.328	0.900	-0.268	-1.651	6.831			
V 3	BETA(PR) 6	499.44	528.61	544.65	550.92	548.44			
V 4	MEY(PR) 7	521.22	565.35	585.64	605.11	597.96			
VZ 3	V 6	499.36	528.02	544.60	550.89	548.41			
VZ 4	V 7	521.06	562.88	585.55	604.82	593.61			
V-THETA 3	VZ 6	0.00	0.00	0.00	0.00	0.00			
V-THETA 4	VZ 7	12.07	8.88	-2.74	-17.43	71.11			
M 3	V-THETA 6	0.4566	0.4845	0.4999	0.5060	0.5036			
M 4	V-THETA 7	0.4774	0.5199	0.5396	0.5587	0.5516			
TURN	V(PR) 6	-1.33	-0.90	0.27	1.65	-6.83			
(REFER TO 70% & 10% SPEED DATA)									
DFAC	V(PR) 7	-0.031	-0.061	-0.078	-0.114	-0.025			
EFFP	VTMETHA PR6	0.8766	0.9822	0.9149	1.0169	0.8392			
INCIDM	U 6	-20.200	-20.200	-20.200	-20.200	-20.200			
DEVM	U 7	4.072	2.800	2.168	1.951	-8.431			
STATOR A									
PCT SPAN	DFAC	90	70	50	30	10			
DIA 9	EFFP	26.021	29.683	33.345	37.007	40.669			
BETA 9	EFF	29.159	25.774	23.413	20.770	33.030			
BETA 10	INCIDM	3.023	2.455	0.228	0.506	4.490			
V 9	DEVM	785.22	765.02	680.40	642.62	721.86			
V 10		793.19	756.00	682.34	631.84	714.61			
VZ 9		675.55	685.77	623.91	600.86	605.02			
VZ 10		787.95	751.71	681.80	631.82	712.22			
V-THETA 9		382.59	332.64	270.35	227.88	393.47			
V-THETA 10		41.83	32.39	2.71	5.58	55.95			
M 9		0.7071	0.6870	0.6064	0.5696	0.6407			
M 10		0.7150	0.6781	0.6082	0.5595	0.6340			
TURN		26.136	23.318	23.185	20.264	28.540			
		-0.083	-0.824	-0.436	-0.437	-0.683			
DFAC	DEVM	0.1544	0.1726	0.1702	0.1787	0.2379			
EFFP		4.7285	-2.3426	12.5913	-3.6891	-6.9502			
INCIDM		-11.741	-11.326	-11.287	-13.230	-2.970			
DEVM		11.723	9.955	7.728	8.506	13.390			

Table B-3. Blade Element Data Cruise Configuration

50 PERCENT SPEED PT. 83				CRUISE		3030.		93.5		ROTOR				
INLET GUIDE VANE														
PCT SPAN		90	70	50	30	10	PCT SPAN			90	70	50	30	10
DIA 3		21.150	26.050	30.950	35.850	40.750	DIA 6		23.385	27.755	32.125	36.495	40.865	
BETA 3		0.000	0.000	0.000	0.000	0.000	BETA 6		26.072	26.798	24.386	22.414	17.660	
BETA 4		29.872	28.794	25.748	23.522	18.744	BETA 7		50.452	50.764	51.825	52.743	45.206	
V 3		142.27	149.79	153.81	155.70	156.06	BETA(PRI) 6		54.882	59.260	64.056	67.193	70.648	
V 4		169.63	178.76	178.72	180.30	172.23	BETA(PRI) 7		28.885	40.851	49.267	53.669	56.187	
VZ 3		142.27	149.63	153.81	155.69	156.05	V 6		180.12	188.11	185.91	187.04	179.11	
VZ 4		148.54	155.90	160.96	165.32	163.09	V 7		299.08	292.00	287.91	298.12	303.50	
V-THETA 3		0.000	0.000	0.000	0.000	0.000	VZ 6		161.76	167.79	169.29	172.90	170.67	
V-THETA 4		81.90	86.10	77.64	71.96	55.34	VZ 7		189.35	184.54	177.87	180.46	213.83	
M 3		0.1276	0.1344	0.1380	0.1397	0.1401	V-THETA 6		79.17	84.81	76.76	71.32	54.38	
M 4		0.1523	0.1605	0.1605	0.1619	0.1546	V-THETA 7		230.62	226.17	226.34	237.28	215.38	
TURN		-28.87	-28.79	-25.75	-23.52	-18.74	V(PRI) 6		281.2	328.3	387.0	446.1	515.0	
(REFER TO 70% & 100% SPEED DATA)														
DFAC		0.103	0.098	0.092	0.074	0.073	V(PRI) 7		217.5	244.3	272.7	304.6	384.3	
EFFP		0.8891	1.0394	0.9118	0.9572	0.6984	VTHETA PR6		230.0	282.1	348.0	411.2	485.8	
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200	VTHETA PR7		105.1	159.9	206.6	245.4	319.3	
DEVM		7.128	5.506	6.752	7.378	10.256	U 6		309.17	366.95	424.72	482.50	540.27	
STATOR A														
PCT SPAN		90	70	50	30	10	DFAC		0.0130	-0.0061	0.0847	0.0862	0.1724	
DIA 9		26.021	29.683	33.345	37.007	40.669	EFFP		4327	4302	4592	4831	4002	
BETA 9		49.103	49.650	51.126	51.109	43.326	EFF		1.0186	1.0617	0.9788	0.9020	0.9540	
BETA 10		31.075	29.414	27.069	24.949	25.926	INCIDM		1.0188	1.0623	0.9786	0.9009	0.9534	
V 9		296.57	292.38	289.98	302.87	310.05			6.282	6.760	7.956	7.593	7.448	
V 10		224.73	208.38	215.87	248.30	268.83	DEVM		10.085	8.381	7.167	5.069	3.287	
VZ 9		190.86	188.26	181.69	190.10	225.54								
VZ 10		190.77	180.27	191.79	225.05	241.76								
V-THETA 9		224.18	222.82	225.76	235.73	212.74								
V-THETA 10		115.99	102.34	98.23	104.73	117.54								
M 9		0.2653	0.2614	0.2587	0.2698	0.2761								
M 10		0.2004	0.1857	0.1921	0.2207	0.2389								
TURN		18.029	20.235	24.057	26.160	17.400								
		0.452	0.927	1.037	0.823	0.113								
DFAC		0.3736	0.4534	0.4470	0.3814	0.2802								
EFFP		0.9442	0.6960	0.7504	0.7657	0.5367								
INCIDM		8.203	12.550	16.426	17.109	7.326								
DEVM		13.775	10.914	8.569	6.949	8.826								

Table B-3. Blade Element Data Cruise Configuration (Continued)

50 PERCENT SPEED PT. 85				CONFIGURATION		N ₁₀ /6		405/6		90.1	
				CRUISE		3025.					
				INLET GUIDE VANE				ROTOR			
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.493	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	26.076	26.698	24.549	22.450	18.848
BETA 4	29.123	28.719	25.967	23.747	19.720	BETA 7	48.315	51.072	51.035	50.016	43.796
V 3	151.06	159.14	163.44	165.28	164.96	V-TETA(PRI) 6	52.922	56.878	62.003	65.372	69.696
V 4	177.16	191.59	191.65	192.84	181.96	V-TETA(PRI) 7	24.489	36.554	45.617	50.954	55.121
VZ 3	151.06	158.95	163.43	165.28	164.95	V 6	189.67	201.55	199.44	200.89	187.23
VZ 4	154.75	167.29	172.28	176.51	171.29	V 7	319.25	309.87	304.40	309.22	308.97
V-TETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	170.27	179.94	181.38	185.65	177.19
V-TETA 4	86.22	92.06	83.91	77.66	61.40	VZ 7	211.11	194.53	191.34	198.68	223.01
M 3	0.1356	0.1428	0.1467	0.1484	0.1481	V-TETA 6	83.35	90.55	82.86	76.72	60.49
M 4	0.1591	0.1721	0.1722	0.1733	0.1634	V-TETA 7	238.42	241.06	236.68	236.93	213.83
TURN	-29.12	-28.72	-25.97	-23.75	-19.72	V(PRI) 6	282.4	329.4	386.4	445.5	510.6
(REFER TO 70% & 100% SPEED DATA)											
DFAC	0.170	0.089	0.086	0.069	0.093	V(PRI) 7	233.3	242.4	273.7	315.4	390.0
EFFP	0.7228	1.0227	0.9351	1.0122	0.6508	V-TETA PR6	225.3	275.8	341.2	405.0	478.9
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	V-TETA PR7	96.7	144.4	195.6	245.0	319.9
DEV4	6.877	5.581	6.533	7.153	9.280	U 6	308.64	366.34	424.02	481.70	539.38
STATOR A											
DIA 9	26.021	29.683	33.345	37.007	40.669	U 7	335.12	385.41	432.27	481.90	533.77
BETA 9	46.996	49.860	50.040	48.235	42.991	M 6	0.1703	0.1811	0.1792	0.1805	0.1682
BETA 10	29.388	26.920	25.666	25.792	26.541	M 7	0.2858	0.2771	0.2718	0.2753	0.2753
V 9	317.84	310.96	317.00	314.52	310.15	M(PRI) 6	0.2537	0.2960	0.3472	0.4004	0.4587
V 10	234.79	232.13	234.86	258.96	274.15	M(PRI) 7	0.2089	0.2167	0.2443	0.2812	0.3674
VZ 9	213.46	199.44	196.89	209.47	226.81	TURN(PRI)	28.425	20.306	16.381	14.417	14.574
VZ 10	202.75	205.71	211.32	214.11	245.21	ω	-0.0739	-0.0288	0.0343	0.0173	0.0729
V-TETA 9	232.44	237.72	235.32	234.60	211.48	DFAC	.3839	.4489	.4612	.4531	.3764
V-TETA 10	115.27	105.10	101.73	110.64	127.50	EFFP	0.9871	0.9499	0.9094	0.8819	0.8903
M 9	0.2845	0.2781	0.2741	0.2805	0.2763	EFF	0.9870	0.9494	0.9086	0.8806	0.9295
M 10	0.2094	0.2069	0.2091	0.2304	0.2438	INCIDM	4.322	4.378	5.903	5.772	6.496
TURN	17.608	22.940	24.374	22.944	16.450	DEV4	5.689	4.054	3.517	2.354	2.221
ω	.0548	.0488	.0721	.0679	.0378						
DFAC	0.3946	0.4256	0.4244	0.3400	0.2538						
EFFP	0.9590	0.8469	0.876	0.8283	0.8879						
INCIDM	0.095	12.760	15.340	14.235	6.991						
DEV4	12.088	8.420	7.166	7.292	9.441						

Table B-3. Blade Element Data Cruise Configuration (Continued)

50 PERCENT SPEED PT. 91		CONFIGURATION		N/√S		W/√S					
		CRUISE		3040.		112.5					
INLET GUIDE VANE											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	26.164	26.894	24.548	22.326	22.619
BETA 4	29.179	28.944	26.008	23.704	22.729	BETA 7	41.778	44.456	44.458	41.565	40.049
V 3	172.24	181.33	186.25	188.20	187.06	BETA(PR) 6	46.737	51.818	57.810	61.819	66.849
V 4	208.06	220.32	219.40	219.82	208.96	BETA(PR) 7	25.158	35.844	44.277	50.106	55.136
VZ 3	172.23	181.17	186.25	188.19	187.05	V 6	222.45	232.15	229.06	229.82	213.12
VZ 4	181.65	191.94	197.18	201.27	192.73	V 7	331.32	318.53	311.10	310.74	307.89
V-THEIA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	199.62	206.94	208.34	212.58	196.73
V-THEIA 4	101.44	106.62	96.21	88.37	80.73	VZ 7	245.82	227.22	222.00	232.49	235.69
M 3	0.1547	0.1629	0.1673	0.1691	0.1680	V-THEIA 6	98.09	105.01	95.17	87.30	81.97
M 4	0.1870	0.1981	0.1973	0.1977	0.1878	V-THEIA 7	220.74	223.08	217.89	206.16	198.11
TURN	-29.18	-28.94	-26.01	-23.70	-22.73	V(PR) 6	291.5	334.8	391.1	450.1	500.4
ω						V(PR) 7	273.0	280.5	310.1	362.5	412.3
DFAC	0.094	0.083	0.082	0.068	0.098	VTHETA PR6	212.1	263.1	331.0	396.8	460.1
EFFP	0.8599	1.0261	0.9350	0.9866	0.6749	VTHETA PR7	116.0	164.2	216.5	278.1	338.3
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	310.19	368.16	426.12	484.09	542.05
DEVN	6.821	5.356	6.492	7.196	6.271	U 7	336.79	387.32	434.41	484.29	536.42
						M 6	0.2001	0.2089	0.2061	0.2067	0.1916
						M 7	0.2973	0.2855	0.2784	0.2779	0.2752
						M(PR) 6	0.2620	0.3012	0.3518	0.4049	0.4499
						M(PR) 7	0.2450	0.2514	0.2776	0.3242	0.3685
						TURN(PR)	21.573	15.960	13.530	11.713	11.713
						ω	0.0033	-0.0188	0.0137	0.0106	-0.0049
						DFAC	.2272	.3077	.3388	.3129	.2841
						EFFP	1.0616	1.0135	0.9491	0.9683	1.0008
						EFF	1.0621	1.0137	0.9497	0.9680	1.0008
						INCIDM	-1.863	-0.682	1.710	2.219	3.643
						DEVN	6.358	3.384	2.177	1.506	2.236
STATOR A											
PCT SPAN	90	70	50	30	10						
DIA 9	26.021	29.683	33.345	37.007	40.669						
BETA 9	40.250	43.086	43.286	39.888	40.228						
BETA 10	28.024	27.324	26.984	26.664	26.108						
V 9	332.12	321.96	315.84	316.94	310.98						
V 10	286.24	281.79	278.04	289.01	300.36						
VZ 9	249.47	233.94	229.63	243.19	237.34						
VZ 10	250.97	248.86	247.41	258.27	269.63						
V-THEIA 9	214.59	219.93	216.55	203.25	200.84						
V-THEIA 10	134.49	129.35	126.16	129.69	132.18						
M 9	0.2980	0.2886	0.2827	0.2836	0.2780						
M 10	0.2563	0.2521	0.2484	0.2582	0.2684						
TURN	12.226	15.762	16.301	13.224	14.121						
ω	.0753	.0745	.0641	.0559	.0265						
DFAC	0.2224	0.2368	0.2433	0.1962	0.1406						
EFFP	0.5147	0.6622	0.6131	0.6859	1.5908						
INCIDM	-0.650	5.986	6.586	5.888	4.228						
DEVN	10.724	6.824	8.484	8.664	9.006						

Table B-3. Blade Element Data Cruise Configuration (Continued)

50 PERCENT SPEED		PT. #9		CONFIGURATION		N/A		N/A		N/A	
				CRUISE		3040.		112.8		112.8	
						</					

Table B-3. Blade Element Data Cruise Configuration (Continued)

INLET GUIDE VANE						CONFIGURATION		$N/\sqrt{\sigma}$	$\sqrt{V}/\delta$
						CRUISE		3020.	117.4
						50 PERCENT SPEED	PT. 80		
PCT SPAN	90	70	50	30	10				
DIA 3	21.150	26.050	36.950	35.850	40.750				
BETA 3	0.000	0.000	0.000	0.000	0.000				
BETA 4	29.017	28.340	25.809	23.343	19.546				
V 3	179.77	189.13	194.31	196.58	196.18				
V 4	215.43	227.55	227.17	228.13	216.22				
VZ 3	179.75	186.75	154.30	196.57	196.17				
VZ 4	168.39	159.41	204.49	209.45	203.76				
V-THETA 3	0.00	0.00	0.00	0.00	0.00				
V-THETA 4	164.50	108.02	98.90	90.39	72.34				
M 3	0.1614	0.1699	0.1746	0.1766	0.1763				
M 4	0.1937	0.2047	0.2043	0.2052	0.1944				
TURN	-29.02	-28.34	-25.81	-23.34	-19.55				
	(REFER TO 70% & 100% SPEED DATA)								
DFAC	6.100	6.086	0.087	0.070	0.082				
EFFP	0.6216	0.9728	0.8981	0.9976	0.6719				
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200				
DEVM	6.983	5.960	6.691	7.557	9.455				
STATOR A									
PCT SPAN	90	70	50	30	10				
DIA 9	26.021	25.683	35.345	37.007	40.669				
BETA 9	37.505	40.997	41.135	39.135	35.317				
BETA 10	27.538	26.964	26.773	26.649	25.694				
V 9	342.72	326.27	320.99	318.73	315.83				
V 10	307.93	302.02	292.01	300.55	310.86				
VZ 9	267.76	246.54	241.47	247.22	257.65				
VZ 10	276.24	267.70	260.36	268.61	280.05				
V-THETA 9	208.65	215.35	211.16	201.17	182.58				
V-THETA 10	144.27	136.94	131.54	134.80	134.78				
M 9	0.3079	0.2945	0.2875	0.2853	0.2824				
M 10	0.2761	0.2706	0.2612	0.2688	0.2779				
TURN	9.567	14.033	14.363	12.486	9.622				
	.2038	.0612	.0798	.0610	.0234				
DFAC	0.1653	0.1744	0.1572	0.1540	0.0891				
EFFP	0.3765	0.7097	0.5454	0.7470	2.0151				
INCIDM	-3.395	3.897	6.435	5.135	-0.583				
DEVM	10.638	8.164	8.273	8.649	8.594				

Table B-3. Blade Element Data Cruise Configuration (Continued)

CONFIGURATION					N/√S		N/√S					
CRUISE					4255.		137.5					
INLET GUIDE VANE					ROTOR							
70 PERCENT SPEED		PT. 76										
PCT SPAN		90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865	
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	25.609	26.638	23.906	22.457	18.649	
BETA 4	28.284	28.464	25.325	23.729	19.590	BETA 7	51.286	51.880	51.102	51.685	45.791	
V 3	210.15	221.64	228.66	232.17	232.69	BETA(PR) 6	52.793	57.423	62.196	65.426	69.285	
V 4	253.18	266.65	267.07	270.55	257.60	BETA(PR) 7	24.799	39.176	46.691	51.947	56.002	
VZ 3	210.14	221.44	228.65	232.16	232.69	V 6	268.05	275.11	278.88	281.98	268.53	
VZ 4	222.95	233.03	241.40	247.68	242.69	V 7	440.86	420.33	420.96	429.93	428.88	
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	241.67	249.30	254.92	260.59	254.44	
V-THETA 4	119.97	127.09	114.24	108.87	86.37	VZ 7	274.23	259.29	264.25	266.52	299.05	
M 3	0.1889	0.1993	0.2057	0.2089	0.2093	V-THETA 6	115.86	125.14	113.31	107.71	85.87	
M 4	0.2280	0.2402	0.2406	0.2438	0.2320	V-THETA 7	343.99	330.68	327.62	337.33	307.42	
TURN	-28.28	-28.46	-25.33	-23.73	-19.59	V(PR) 6	399.7	463.1	546.5	626.6	719.3	
ω	0.0520		0.0467		0.0280	V(PR) 7	303.7	334.7	385.4	432.4	534.8	
DFAC	0.088	0.088	0.083	0.070	0.078	VTHETA PR6	318.3	390.2	483.4	569.9	672.8	
EFFP	0.8899	1.0057	0.9164	0.9781	0.6921	VTHETA PR7	127.4	211.4	280.4	340.5	443.4	
INCIDM	-20.200	-20.203	-20.200	-20.200	-20.200	U 6	434.16	515.30	596.43	677.56	758.70	
DEVN	7.716	5.836	7.175	7.171	9.410	U 7	471.39	542.13	608.03	677.84	750.81	
STATOR A												
PCT SPAN	90	70	50	30	10	ω	0.0016	0.0116	0.0973	0.0592	0.1130	
DIA 9	26.021	29.683	33.345	37.007	40.669	DFAC	4577	4567	4619	4736	4800	
BETA 9	50.071	50.618	50.022	50.010	43.918	EFFP	0.9281	0.9833	0.9561	0.9137	0.9510	
BETA 10	30.638	29.480	27.176	24.809	27.144	EFF	0.9269	0.9830	0.9552	0.9118	0.9498	
V 9	435.63	420.73	425.28	435.75	439.47	INCIDM	4.193	4.923	6.096	5.826	6.085	
V 10	318.65	305.54	313.87	356.32	384.85	DEVN	5.999	6.676	4.591	3.347	3.102	
VZ 9	274.47	265.03	272.58	279.93	316.56							
VZ 10	272.08	263.69	278.37	323.78	342.45							
V-THETA 9	334.05	325.20	325.89	333.85	304.83							
V-THETA 10	162.39	150.36	143.35	148.38	175.58							
M 9	0.3892	0.3753	0.3783	0.3865	0.3894							
M 10	0.2827	0.2708	0.2775	0.3146	0.3398							
TURN	19.433	21.138	22.846	25.401	16.774							
ω	0.0360	0.0280	0.0901	0.0882	0.0502							
DFAC	0.4113	0.4412	0.4488	0.3803	0.2655							
EFFP	0.9380	0.7933	0.6849	0.7422	0.5998							
INCIDM	9.171	13.518	15.322	16.010	7.918							
DEVN	13.338	10.980	8.676	6.609	10.044							

Table B-3. Blade Element Data Cruise Configuration (Continued)

		CONFIGURATION		N/√S		4V/S	
		CRUISE		4255.		142.0	
		70 PERCENT SPEED		PT. 74			
		INLET GUIDE VANE		ROTOR			
PCT SPAN		90	70	50	30	10	
DIA 3		21.150	26.050	30.950	35.850	40.750	
BETA 3		0.000	0.000	0.000	0.000	0.000	
BETA 4		25.244	28.572	26.365	23.259	20.161	
V 3		219.00	230.34	236.69	239.64	239.21	
V 4		264.90	276.28	278.69	279.22	266.60	
VZ 3		218.99	230.12	236.68	239.63	239.20	
VZ 4		231.05	241.47	249.69	256.52	250.27	
V-TWETA 3		0.00	0.00	0.00	0.00	0.00	
V-TWETA 4		129.36	132.13	123.76	110.26	91.89	
M 3		0.1969	0.2072	0.2130	0.2157	0.2153	
M 4		0.2395	0.2490	0.2512	0.2517	0.2402	
TURN		-29.24	-28.57	-26.36	-23.26	-20.16	
ω		0.0420	0.0277	0.0277	0.0340	0.0340	
DFAC		0.094	0.091	0.086	0.066	0.077	
EFFP		0.884	0.9785	0.9338	0.9663	0.6919	
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200	
DEVN		6.756	5.728	6.135	7.641	8.839	
PCT SPAN		90	70	50	30	10	
DIA 9		26.021	25.683	33.345	37.007	40.669	
BETA 9		47.615	48.180	45.988	47.407	44.704	
BETA 10		28.423	27.262	25.445	25.487	26.885	
V 9		452.18	435.56	426.76	437.77	427.16	
V 10		330.78	327.07	325.75	362.14	388.66	
VZ 9		259.70	288.83	273.95	296.24	303.54	
VZ 10		288.61	268.75	292.13	326.84	346.59	
V-TWETA 9		334.00	324.59	326.86	322.27	300.49	
V-TWETA 10		157.45	149.80	141.75	155.83	175.75	
M 9		0.4047	0.3892	0.3900	0.3889	0.3788	
M 10		0.2923	0.2903	0.2880	0.3203	0.3438	
TURN		15.192	20.917	24.142	21.920	17.819	
ω		0.0568	0.0461	0.0785	0.0677	0.0463	
DFAC		0.4103	0.4100	0.4266	0.3447	0.2514	
EFFP		0.7978	0.7726	0.7658	0.8147	1.1498	
INCIDM		0.715	11.060	15.268	13.407	8.704	
DEVN		11.123	8.762	7.345	7.467	9.785	
PCT SPAN		90	70	50	30	10	
DIA 6		23.385	27.755	32.125	36.495	40.865	
BETA 6		26.282	26.566	24.908	22.027	19.610	
BETA 7		48.871	49.539	50.766	49.224	44.905	
BETA (PR) 6		50.679	55.907	60.928	64.522	68.775	
BETA (PR) 7		23.043	37.104	46.213	51.660	56.372	
V 6		282.44	291.48	290.61	292.00	274.78	
V 7		456.33	433.11	423.89	428.19	423.98	
VZ 6		253.19	260.55	263.54	270.67	258.84	
VZ 7		298.51	280.85	268.00	279.63	300.30	
V-TWETA 6		125.06	130.36	122.39	109.51	92.22	
V-TWETA 7		343.72	329.53	328.33	324.25	299.30	
V (PR) 6		399.6	464.9	542.4	629.2	715.0	
V (PR) 7		326.2	352.4	387.4	450.8	542.3	
VTHETA PR6		309.1	384.9	474.0	568.1	666.5	
VTHETA PR7		127.7	212.6	279.7	353.6	451.5	
U 6		434.16	515.30	596.43	677.56	758.70	
U 7		471.39	542.13	608.03	677.84	750.81	
M 6		0.2546	0.2629	0.2621	0.2634	0.2476	
M 7		0.4085	0.3869	0.3775	0.3803	0.3759	
M (PR) 6		0.3602	0.4193	0.4892	0.5675	0.6444	
M (PR) 7		0.2920	0.3148	0.3450	0.4004	0.4808	
TURN (PR)		27.630	18.787	14.711	12.862	12.403	
ω		-0.0601	-0.0281	0.1065	0.0236	0.0856	
DFAC		.3937	.4158	.4475	.4364	.3773	
EFFP		0.9903	1.0238	0.9513	0.9126	0.9420	
EFF		0.9902	1.0242	0.9503	0.9107	0.9406	
INCIDM		2.079	3.407	4.828	4.922	5.575	
DEVN		4.243	4.604	4.113	3.060	3.472	

Table B-3. Blade Element Data Cruise Configuration (Continued)

		CONFIGURATION		N/√δ		√δ/δ	
70 PERCENT SPEED		PT. 78		CRUISE		148.2	
		INLET GUIDE VANE				ROTOR	
PCT SPAN		90	70	50	30	10	
DIA 3		21.150	26.050	30.950	35.950	40.750	
BETA 3		0.000	0.000	0.000	0.000	0.000	
BETA 4		25.239	28.364	25.956	23.795	16.732	
V 3		227.48	239.55	247.08	251.36	251.43	
V 4		277.22	292.01	297.93	289.84	278.35	
VZ 3		227.46	239.36	247.07	251.35	251.42	
VZ 4		241.90	255.52	261.58	265.20	266.56	
V-THETA 3		0.00	0.00	0.00	0.00	0.00	
V-THETA 4		135.41	138.73	127.33	116.94	80.14	
M 3		0.2046	0.2156	0.2224	0.2263	0.2264	
M 4		0.2499	0.2634	0.2624	0.2614	0.2509	
TURN		-29.24	-78.36	-75.96	-23.79	-16.73	
ω		0.0430		0.0263		0.0330	
DFAC		0.087	0.075	0.082	0.080	0.052	
EFFD		0.8914	1.0072	0.9043	0.9070	0.6312	
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200	
DEVM		6.761	5.936	6.544	7.105	12.268	
		STATOR A					
PCT SPAN		90	70	50	30	10	
DIA 9		26.021	29.683	33.345	37.007	40.669	
BETA 9		45.352	48.630	49.098	44.453	37.380	
BETA 10		28.082	26.955	26.290	25.727	26.303	
V 9		461.62	433.54	431.23	447.37	433.53	
V 10		347.27	348.94	349.21	377.23	405.08	
VZ 9		318.79	284.41	287.14	319.24	344.38	
VZ 10		304.30	309.35	312.04	339.67	363.09	
V-THETA 9		328.41	325.35	320.96	313.31	263.20	
V-THETA 10		163.47	158.17	154.67	163.75	179.50	
M 9		0.4138	0.3875	0.3843	0.3984	0.3851	
M 10		0.3090	0.3103	0.3097	0.3344	0.3591	
TURN		17.270	21.675	21.808	18.727	11.077	
ω		0.0620	0.0325	0.0655	0.0615	0.0323	
DFAC		0.3769	0.3502	0.3577	0.3124	0.1588	
EFFD		0.7617	0.9797	0.7917	0.6404	1.0541	
INCIDM		4.452	11.530	13.396	10.453	1.380	
DEVM		10.732	8.455	7.790	7.727	9.203	
PCT SPAN		90	70	50	30	10	
DIA 6		23.385	27.755	32.125	36.495	40.865	
BETA 6		26.366	26.674	24.571	22.393	19.274	
BETA 7		46.676	49.914	49.682	46.149	39.501	
BETA(PI) 6		49.043	54.444	59.909	63.448	67.812	
BETA(PI) 7		22.862	37.521	46.114	50.240	55.612	
V 6		295.15	304.50	301.51	304.75	289.63	
V 7		465.24	431.93	425.17	437.78	427.25	
VZ 6		264.40	271.92	274.18	281.77	279.40	
VZ 7		317.57	277.97	275.02	303.26	329.67	
V-THETA 6		131.08	136.69	125.37	116.10	76.30	
V-THETA 7		338.46	330.46	324.18	315.70	271.77	
V(PI) 6		403.4	467.7	546.9	630.3	739.9	
V(PI) 7		346.4	350.7	396.8	474.2	583.7	
V-THETA PR6		304.6	380.4	473.2	563.9	685.1	
V-THETA PR7		134.6	213.6	286.0	364.5	481.7	
U 6		435.69	517.11	598.53	679.95	761.37	
U 7		473.83	544.04	610.18	680.23	753.45	
M 6		0.2662	0.2748	0.2721	0.2750	0.2612	
M 7		0.4171	0.3860	0.3789	0.3896	0.3794	
M(PI) 6		0.3639	0.4221	0.4935	0.5689	0.6672	
M(PI) 7		0.3106	0.3134	0.3536	0.4221	0.5183	
TURN(PI)		26.176	16.906	13.794	13.208	12.201	
ω		-0.0643	0.0506	0.0064	0.0078	0.1317	
DFAC		-3.389	-4.184	-4.286	-3.894	-3.349	
EFFD		0.9812	0.9296	0.9086	0.9599	0.9615	
EFF		0.9809	0.9285	0.9070	0.9591	0.9606	
INCIDM		0.443	1.944	3.809	3.848	4.612	
DEVM		4.062	5.031	4.014	1.640	2.712	

Table B-3. Blade Element Data Cruise Configuration (Continued)

		70 PERCENT SPEED		PT. 69		CONFIGURATION		N/√B		√B/6	
						CRUISE		4232.		152.5	
INLET GUIDE VANE											
ROTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.365	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	26.091	27.050	24.335	22.439	16.120
BETA 4	28.990	28.931	25.798	23.849	17.323	BETA 7	44.189	47.475	46.549	43.057	38.914
V 3	234.49	246.81	254.67	259.01	259.55	BETA(PR) 6	47.335	53.009	58.582	62.294	67.186
V 4	286.84	299.74	299.08	299.40	284.92	BETA(PR) 7	24.140	37.383	45.787	50.116	56.874
VZ 3	234.48	246.60	254.66	259.00	259.53	V 6	305.37	313.23	311.63	314.66	294.60
VZ 4	250.90	260.85	269.28	273.84	271.99	V 7	460.38	430.17	422.06	432.97	410.18
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	274.20	278.76	283.91	290.83	283.02
V-THETA 4	139.02	145.00	130.16	121.06	84.84	VZ 7	328.46	290.57	290.17	316.33	319.15
M 3	0.2110	0.2222	0.2293	0.2333	0.2338	V-THETA 6	134.30	142.44	128.42	120.10	81.79
M 4	0.2587	0.2704	0.2698	0.2701	0.2569	V-THETA 7	320.90	317.03	306.40	295.60	257.65
TURN	-28.99	-28.93	-25.80	-23.85	-17.32	V(PR) 6	404.6	463.4	544.7	625.5	729.9
Ω	0.0430		0.0369		0.0230	V(PR) 7	361.7	365.9	416.3	493.4	584.0
DFAC	0.081	0.083	0.083	0.079	0.065	VTHETA PR6	297.5	370.1	464.8	553.8	672.8
EFFP	0.9054	0.9802	0.9072	0.9478	0.6362	VTHETA PR7	147.9	222.2	298.3	378.6	489.1
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	431.82	512.51	593.21	673.90	754.60
DEVM	7.010	5.369	6.702	7.051	11.677	U 7	468.84	539.19	604.75	674.18	746.75
						M 6	0.2756	0.2828	0.2813	0.2841	0.2657
						M 7	0.4133	0.3851	0.3768	0.3863	0.3647
						M(PR) 6	0.3652	0.4184	0.4917	0.5648	0.6584
						M(PR) 7	0.3248	0.3275	0.3717	0.4402	0.5193
						TURN(PR)	23.191	15.608	12.792	12.177	10.312
						Ω	-0.0137	-0.0365	0.0054	0.0090	0.0982
						DFAC	.2858	.3639	.3753	.3363	.3125
						EFFP	1.0140	0.9736	0.9447	1.0082	0.9334
						EFF	1.0142	0.9732	0.9438	1.0084	0.9322
						INCIDM	-1.265	0.509	2.402	2.694	3.985
						DEVM	5.340	4.883	3.687	1.516	3.974
STATOR A											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 9	26.021	29.683	33.345	37.007	40.669
BETA 9	42.955	46.024	45.082	41.537	37.316	BETA 9	42.955	46.024	45.082	41.537	37.316
BETA 10	28.830	27.761	26.479	25.270	26.266	BETA 10	28.830	27.761	26.479	25.270	26.266
V 9	457.53	433.37	428.58	442.23	415.60	V 9	457.53	433.37	428.58	442.23	415.60
V 10	371.62	365.93	367.33	390.37	414.42	V 10	371.62	365.93	367.33	390.37	414.42
VZ 9	329.06	298.76	301.84	330.94	330.50	VZ 9	329.06	298.76	301.84	330.94	330.50
VZ 10	323.46	321.15	327.87	352.89	371.59	VZ 10	323.46	321.15	327.87	352.89	371.59
V-THETA 9	311.77	311.87	303.48	293.24	251.94	V-THETA 9	311.77	311.87	303.48	293.24	251.94
V-THETA 10	179.20	170.47	163.78	166.64	183.40	V-THETA 10	179.20	170.47	163.78	166.64	183.40
M 9	0.4107	0.3880	0.3828	0.3948	0.3696	M 9	0.4107	0.3880	0.3828	0.3948	0.3696
M 10	0.3317	0.3262	0.3264	0.3473	0.3686	M 10	0.3317	0.3262	0.3264	0.3473	0.3686
TURN	14.125	14.263	14.603	16.266	11.050	TURN	14.125	14.263	14.603	16.266	11.050
Ω	0.0425	0.0764	0.0563	0.0600	0.0239	Ω	0.0425	0.0764	0.0563	0.0600	0.0239
DFAC	0.2907	0.2461	0.2841	0.2505	0.0827	DFAC	0.2907	0.2461	0.2841	0.2505	0.0827
EFFP	0.6052	0.7170	0.6335	0.5107	-31.1111	EFFP	0.6052	0.7170	0.6335	0.5107	-31.1111
INCIDM	2.055	8.924	10.382	7.537	1.316	INCIDM	2.055	8.924	10.382	7.537	1.316
DEVM	11.530	9.261	7.973	7.270	9.166	DEVM	11.530	9.261	7.973	7.270	9.166

Table B-3. Blade Element Data Cruise Configuration (Continued)

[illegible]

Table B-3. Blade Element Data Cruise Configuration (Continued)

[illegible]

Table B-3. Blade Element Data Cruise Configuration (Continued)

80 PERCENT SPEED PT. 111		CONFIGURATION		N/D	
PT. 111		CRUISE		4850.	
				156.4	
INLET GUIDE VANE		ROTOR			
PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750
BETA 3	0.000	0.000	0.000	0.000	0.000
BETA 4	28.425	28.008	25.471	22.897	19.198
V 3	240.42	254.43	262.46	265.57	264.74
V 4	290.95	301.88	304.46	308.13	296.18
VZ 3	240.41	254.19	262.46	265.56	264.73
VZ 4	255.87	264.80	274.84	283.83	279.71
V-THETA 3	0.00	0.00	0.00	0.00	0.00
V-THETA 4	138.49	141.76	130.93	119.88	97.39
M 3	0.2164	0.2291	0.2364	0.2392	0.2385
M 4	0.2624	0.2724	0.2748	0.2781	0.2672
TURN	-28.43	-28.01	-25.47	-22.90	-19.20
(REFER TO 70% & 100% SPEED DATA)					
DFAC	0.085	0.096	0.091	0.066	0.065
EFFP	0.9351	1.0185	0.9412	0.9972	0.7239
INCIDOM	-20.200	-20.200	-20.200	-20.200	-20.200
DEVN	7.575	6.292	7.029	8.003	9.802
STATOR A					
PCT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669
BETA 9	56.102	49.663	49.246	49.480	46.488
BETA 10	31.626	31.224	28.455	25.585	27.265
V 9	520.59	493.99	498.44	515.72	497.68
V 10	360.99	340.06	358.35	404.48	431.78
VZ 9	284.40	317.40	324.88	335.07	342.51
VZ 10	305.02	288.29	314.41	364.80	383.67
V-THETA 9	432.11	376.54	377.58	392.04	360.93
V-THETA 10	189.29	176.28	170.74	174.67	197.80
M 9	0.4635	0.4402	0.4427	0.4559	0.4385
M 10	0.3179	0.3000	0.3156	0.3550	0.3787
TURN	24.477	18.439	20.790	23.895	19.223
DEVN	0.429	0.123	0.1039	0.0979	0.0617
DFAC	0.4769	0.4749	0.4615	0.4118	0.2896
EFFP	0.8974	0.7147	0.7185	0.7762	0.9849
INCIDOM	15.202	12.563	14.546	15.480	10.488
DEVN	14.326	12.724	9.955	7.565	10.165

Table B-3. Blade Element Data Cruise Configuration (Continued)

80 PERCENT SPEED PT. 113				CONFIGURATION		N/√S		√S/δ	
				CRUISE		4845.		160.6	
INLET GUIDE VANE									
ROTOR									
PCT SPAN									
DIA :									
BETA 6									
BETA 7									
BETA(PR) 6									
BETA(PR) 7									
V 6									
V 7									
VZ 6									
VZ 7									
V-TWETA 6									
V-TWETA 7									
V(PR) 6									
V(PR) 7									
VTHETA PR6									
VTHETA PR7									
U 6									
U 7									
M 6									
M 7									
M(PR) 6									
M(PR) 7									
TURN(PR)									
ω									
DFAC									
EFFP									
FEE									
INCIDM									
DEVM									
ω									
DFAC									
EFFP									
FEE									
INCIDM									
DEVM									
ω									
DFAC									
EFFP									
INCIDM									
DEVM									

Table B-3. Blade Element Data Cruise Configuration (Continued)

80PERCENT SPEED PT.115		INLET GULVE VANE				CONFIGURATION	$N/\sqrt{S}$	$\sqrt{S}/S$
						CRUISE	484.8	174.7
PCT SPAN		90	70	50	30	10		
DIA 3		21.150	26.050	30.950	35.850	40.750		
BETA 3		0.000	0.000	0.000	0.000	0.000		
BETA 4		29.078	27.585	25.386	22.342	16.650		
V 3		271.33	285.75	294.35	299.01	295.70		
V 4		327.42	340.78	342.89	341.26	332.42		
VZ 3		271.31	285.45	294.34	298.99	299.69		
VZ 4		286.15	300.48	309.76	315.62	318.48		
V-TWETA 3		0.00	0.00	0.00	0.00	0.00		
V-TWETA 4		159.13	157.80	147.00	129.72	95.25		
M 3		0.2445	0.2577	0.2655	0.2698	0.2704		
M 4		0.2458	0.3081	0.3101	0.3086	0.3004		
TURN		-29.08	-27.59	-25.39	-22.34	-16.65		
	(REFER TO 70% & 100% SPEED DATA)							
DFAC		0.094	0.087	0.086	0.076	0.050		
EFFP		0.9456	0.9927	0.9402	0.9738	0.8269		
INCIDM		-20.200	-20.200	-20.200	-20.200	-20.200		
DEVM		6.922	6.715	7.114	8.558	12.350		
	STATUS A							
PCT SPAN		90	70	50	30	10		
DIA 9		26.021	29.683	33.345	37.007	40.669		
BETA 9		44.889	45.580	46.437	42.258	35.390		
BETA 10		30.326	28.936	27.533	27.118	27.250		
V 9		527.32	510.21	500.17	517.37	503.36		
V 10		424.97	420.07	423.82	447.73	477.09		
VZ 9		367.26	354.79	343.99	382.87	410.25		
VZ 10		364.14	364.91	374.99	398.46	424.02		
V-TWETA 9		372.14	364.41	362.43	347.92	291.51		
V-TWETA 10		214.58	203.24	194.91	204.08	218.45		
M 9		0.4731	0.4565	0.4458	0.4605	0.4464		
M 10		0.3783	0.3734	0.3757	0.3465	0.4224		
TURN		14.562	16.645	18.904	15.141	8.140		
		.0586	.0695	.0611	.0667	.0275		
DFAC		0.3002	0.3029	0.2969	0.2640	0.1226		
EFFP		0.7123	0.7307	0.7474	0.6052	1.1644		
INCIDM		3.989	8.480	11.737	8.258	-0.610		
DEVM		13.026	10.436	9.033	9.118	10.150		

Table B-3. Blade Element Data Cruise Configuration (Continued)

80 PERCENT SPEED PT. 117					CONFIGURATION		N/V		45%		
					CRUISE		4845.		178.1		
INLET GUIDE VANE											
ROTOR											
PGT SPAN	90	70	50	30	10	PGT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	25.768	26.048	23.332	21.247	10.957
BETA 4	28.137	28.098	25.543	22.604	13.193	BETA 7	51.713	45.006	46.117	43.209	32.556
V 3	273.57	289.99	300.36	306.36	306.07	BETA(PRI) 6	47.215	52.233	57.654	61.697	66.493
V 4	335.59	348.13	350.53	349.31	340.24	BETA(PRI) 7	17.743	35.412	44.381	50.282	54.301
VZ 3	273.55	289.71	300.34	306.34	308.06	V 6	351.22	367.25	367.45	368.61	353.02
VZ 4	295.93	304.90	316.27	322.48	331.26	V 7	545.94	510.22	494.04	494.12	499.61
V-TWETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	316.23	329.65	336.06	343.54	349.01
V-TWETA 4	158.26	163.97	151.15	134.26	77.65	VZ 7	336.70	360.45	342.85	360.08	421.09
M 3	0.2465	0.2615	0.2710	0.2765	0.2781	V-TWETA 6	152.69	161.27	148.47	133.58	65.03
M 4	0.3034	0.3149	0.3171	0.3160	0.3076	V-TWETA 7	428.52	360.81	356.66	338.30	268.85
TURN	-28.14	-28.10	-25.54	-22.60	-13.19	V(PRI) 6	465.6	538.4	628.2	724.6	871.8
(REFER TO 70% & 100% SPEED DATA)						V(PRI) 7	355.2	442.6	479.9	563.6	721.7
DFAC	0.070	0.086	0.086	0.080	0.021	VTWETA PR6	341.7	425.5	530.7	637.9	798.9
EFFP	0.9228	0.9653	0.9270	0.9568	0.7720	VTWETA PR7	108.2	256.5	335.7	433.5	586.1
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	494.37	586.75	675.13	771.52	863.90
DEVN	7.863	6.202	6.957	8.296	15.807	U 7	536.75	617.30	692.34	771.83	854.91
						M 6	0.3178	0.3326	0.3328	0.3338	0.3213
						M 7	0.4886	0.4572	0.4416	0.4400	0.4439
						M(PRI) 6	0.4213	0.4876	0.5689	0.6522	0.7889
						M(PRI) 7	0.3179	0.3967	0.4283	0.5014	0.6412
						TURN(PRI)	29.466	16.795	13.269	11.413	12.099
						Σ	-0.0348	-0.0164	0.0140	0.0282	0.1452
						DFAC	4638	3294	3773	3481	2813
						EFFP	0.8135	1.0330	0.9535	0.9711	0.9823
						EFF	0.8098	1.0337	0.9525	0.9704	0.9918
						INCIDM	1.385	0.267	1.554	2.497	3.200
						DEVN	-1.057	2.912	2.261	1.662	1.401
STATOR A											
PGT SPAN	90	70	50	30	10	PGT SPAN	90	70	50	30	10
DIA 9	26.021	29.683	33.345	37.007	40.669	DIA 9	26.021	29.683	33.345	37.007	40.669
BETA 9	49.764	43.356	44.636	41.665	27.925	BETA 9	49.764	43.356	44.636	41.665	27.925
BETA 10	29.497	28.897	27.365	27.026	26.738	BETA 10	29.497	28.897	27.365	27.026	26.738
V 9	539.63	514.83	502.08	507.07	501.03	V 9	539.63	514.83	502.08	507.07	501.03
V 10	434.16	433.38	434.84	458.61	487.54	V 10	434.16	433.38	434.84	458.61	487.54
VZ 9	341.70	371.11	356.19	378.67	442.62	VZ 9	341.70	371.11	356.19	378.67	442.62
VZ 10	375.51	375.78	334.94	408.35	435.34	VZ 10	375.51	375.78	334.94	408.35	435.34
V-TWETA 9	411.95	353.44	352.76	337.09	234.64	V-TWETA 9	411.95	353.44	352.76	337.09	234.64
V-TWETA 10	213.77	209.43	199.88	208.39	219.35	V-TWETA 10	213.77	209.43	199.88	208.39	219.35
M 9	0.4828	0.4616	0.4482	0.4519	0.4451	M 9	0.4828	0.4616	0.4482	0.4519	0.4451
M 10	0.3853	0.3961	0.3862	0.4073	0.4327	M 10	0.3853	0.3961	0.3862	0.4073	0.4327
TURN	20.267	14.459	17.270	14.639	1.188	TURN	20.267	14.459	17.270	14.639	1.188
Σ	0.0747	0.0866	0.0637	0.0688	0.0217	Σ	0.0747	0.0866	0.0637	0.0688	0.0217
DFAC	0.3277	0.2695	0.2656	0.2137	0.0429	DFAC	0.3277	0.2695	0.2656	0.2137	0.0429
EFFP	0.6054	0.5878	0.5827	0.5265	0.8164	EFFP	0.6054	0.5878	0.5827	0.5265	0.8164
INCIDM	8.864	6.256	9.936	7.655	-8.075	INCIDM	8.864	6.256	9.936	7.655	-8.075
DEVN	12.197	10.327	8.865	9.026	9.638	DEVN	12.197	10.327	8.865	9.026	9.638

Table B-3. Blade Element Data Cruise Configuration (Continued)

80 PERCENT SPEED		PT. 106		CONFIGURATION		CRUISE		N ^o 35		N ^o 45/5	
						4840.				189.0	
INLET GUIDE VANE											
MOTOR											
PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
DIA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.965
BETA 3	0.000	0.000	0.000	0.000	0.000	BETA 6	26.013	25.622	23.774	22.005	19.386
BETA 4	28.749	27.708	25.433	23.457	19.954	BETA 7	45.355	42.292	41.095	39.864	36.347
V 3	294.01	310.38	320.61	325.82	326.24	BETA(PRI) 6	43.258	49.204	54.979	59.395	64.262
V 4	362.46	375.91	378.26	378.52	364.62	BETA(PRI) 7	18.168	34.730	43.071	49.620	55.300
VZ 3	293.99	310.13	320.59	325.81	326.22	V 6	384.60	396.97	396.98	396.85	377.00
VZ 4	317.78	330.81	341.60	347.24	342.73	V 7	569.16	520.08	507.87	499.54	486.28
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 6	345.58	357.72	363.26	367.94	355.70
V-THETA 4	174.33	174.78	162.45	150.67	124.43	VZ 7	398.10	384.48	382.63	383.40	391.67
M 3	0.2652	0.2802	0.2896	0.2944	0.2948	V-THETA 6	168.68	171.66	160.03	148.69	125.16
M 4	0.3281	0.3406	0.3428	0.3430	0.3301	V-THETA 7	404.94	349.97	333.82	320.19	289.20
TURN	-28.75	-27.71	-25.43	-23.46	-19.95	V(PRI) 6	474.6	547.6	633.0	722.7	819.1
(REFER TO 70% & 100% SPEED DATA)						V(PRI) 7	420.9	468.1	523.9	591.8	688.2
DFAC	0.071	0.074	0.075	0.070	0.073	VTHETA PR6	325.2	414.5	518.4	622.0	737.8
EFFP	0.9407	0.9828	0.9448	0.9773	0.7867	VTHETA PR7	131.3	266.7	337.8	450.9	565.8
INCIDM	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	493.86	586.14	678.43	770.72	863.01
DEVH	7.251	6.592	7.067	7.443	9.046	U 7	536.20	616.66	691.63	771.04	854.03
STATION A						M 6	0.3487	0.3602	0.3602	0.3601	0.3417
PCT SPAN	90	70	50	30	10	M 7	0.5121	0.4674	0.4554	0.4470	0.4342
DIA 9	26.021	29.683	33.345	37.007	40.669	M(PRI) 6	0.4302	0.4969	0.5743	0.6557	0.7422
BETA 9	43.620	40.566	39.863	37.967	36.219	M(PRI) 7	0.3768	0.4207	0.4598	0.5296	0.6145
BETA 10	28.262	27.421	26.761	26.938	25.868	TURN(PRI)	25.045	14.456	11.906	9.774	8.954
V 9	566.44	527.14	515.51	511.34	492.00	ω	-0.0316	0.0092	0.0327	0.0226	0.0432
V 10	491.92	486.64	473.60	487.60	507.83	DFAC	3059	2749	2895	2869	2527
VZ 9	402.80	397.58	394.82	403.04	396.89	EFFP	0.8373	0.9582	0.9791	0.9655	1.0033
VZ 10	430.89	428.52	421.84	434.58	456.89	EFF	0.8344	0.9575	0.9787	0.9668	1.0034
V-THETA 9	390.77	342.81	330.42	314.58	290.71	INCIDM	-5.342	-3.296	-1.121	-0.205	1.062
V-THETA 10	232.92	224.11	213.25	220.89	221.56	DEVH	-0.632	2.230	0.971	1.020	2.409
M 9	0.5096	0.4741	0.4625	0.4579	0.4395						
M 10	0.4398	0.4362	0.4235	0.4358	0.4542						
TURN	15.358	13.146	13.102	11.029	10.351						
ω	0.1386	0.0685	0.0765	0.0664	0.0244						
DFAC	0.2299	0.1656	0.1790	0.1318	0.0361						
EFFP	0.3900	0.0166	0.0941	0.4438	0.1623						
INCIDM	2.720	3.466	5.163	3.967	0.219						
DEVH	10.962	8.921	8.261	8.936	8.768						

Table B-3. Blade Element Data Cruise Configuration (Continued)

[illegible]

Table B-3. Blade Element Data Cruise Configuration (Continued)

[illegible]

Table B-3. Blade Element Data Cruise Configuration

100 PERCENT SPEED	PT. 10C	CONFIGURATION	N/√S	W/√S
		CKUISE	609C.	214.2

CONFIGURATION
CRUIS

609c.
N/√B.

214. ?
WJTB/8

INLET GUIDE VANĒ

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PCT SPAN	90	70	50	30	10	PCT SPAN	90	70	50	30	10
BETA 3	21.150	26.050	30.950	35.850	40.750	DIA 6	23.385	27.755	32.125	36.495	40.865
BETA 4	0.000	0.000	0.000	0.000	0.000	BETA 4	26.186	26.321	23.840	21.550	17.956
BETA 5	28.826	28.202	25.373	22.913	18.875	RTA 7	48.537	50.228	40.134	49.848	43.553
V 3	335.24	354.58	367.35	374.90	377.00	BETA(PI) 6	47.097	52.756	58.005	61.753	66.072
V 4	418.58	433.88	437.50	439.64	418.67	BETA(PI) 7	24.664	36.774	45.838	51.525	54.381
VZ 3	335.22	354.29	367.34	374.89	376.99	V 6	44.74	454.94	456.04	462.09	442.95
VZ 4	366.71	379.71	395.38	404.94	396.15	V 7	640.56	622.35	608.59	615.71	631.89
V-THETA 3	0.00	0.00	0.00	0.00	0.00	VZ 4	396.34	407.38	417.02	429.78	423.14
V-THETA 4	201.82	205.04	187.51	171.17	135.44	VZ 7	422.21	397.80	398.08	397.00	457.05
M 3	0.3030	0.3209	0.3327	0.3397	0.3416	V-THETA 6	194.93	201.69	186.69	169.73	132.26
M 4	0.3803	0.3947	0.3981	0.4001	0.3804	V-THETA 7	479.90	478.33	466.23	470.61	435.39
TURN	-28.83	-28.20	-25.37	-22.91	-18.87	V(PI) 6	582.2	673.3	788.8	908.2	1043.3
W	0.0250	0.0228	0.0228	0.0370	0.0370	V(PI) 7	467.0	497.1	571.6	638.1	786.3
DFAC	0.060	0.069	0.066	0.056	0.069	VTHETA PR6	426.5	535.8	669.0	802.0	953.6
EFFP	1.0040	0.9921	0.9516	0.9805	0.6900	VTHETA PR7	194.9	297.6	410.0	499.6	630.2
INC10M	-20.200	-20.200	-20.200	-20.200	-20.200	U 6	621.40	737.52	853.65	969.77	1085.80
DEVM	7.174	6.098	7.127	7.987	10.125	U 7	674.68	775.92	870.25	970.17	1074.67
						M 6	0.4020	0.4144	0.4163	0.4212	0.4035
						M 7	0.5740	0.5550	0.5401	0.5427	0.5553
						M(PI) 6	0.5299	0.5134	0.7187	0.8278	0.8405
						M(PI) 7	0.4185	0.4433	0.5073	0.5625	0.5910
						TURN(PI)	22.429	15.959	12.145	10.230	11.691
W						W	-0.0264	-0.0039	0.0594	0.0774	0.1125
DFAC						DFAC	.3871	.4292	.4238	.4439	.3817
EFFP						EFFP	0.9699	0.9015	0.9878	0.9264	0.9848
INC10M						INC10M	-1.503	0.256	1.905	2.135	2.872
DEVM						DEVM	5.364	4.276	3.736	2.925	1.481

APPENDIX C METHOD OF DEDUCING ROTATING STALL CHARACTERISTICS

Three Kistler high-response pressure probes (transducers) located at Station 2 (figure 6) were used to obtain data for the determination of rotating stall characteristics. The three transducers were positioned at the 28.5, 58.5, and 118.5 degree points on the circumference 10% of span from the outer wall. The 28.5 and 58.5 degree probes and the 58.5 and 118.5 degree probes were spaced 30 and 60 degrees apart, respectively. The transducer signal traces presented in figure C-1 illustrate the method used to determine the number, rotational speed, and size of rotating stall zones. The method is predicated on a maximum of twelve stall zones and equal rotational speed for all zones.

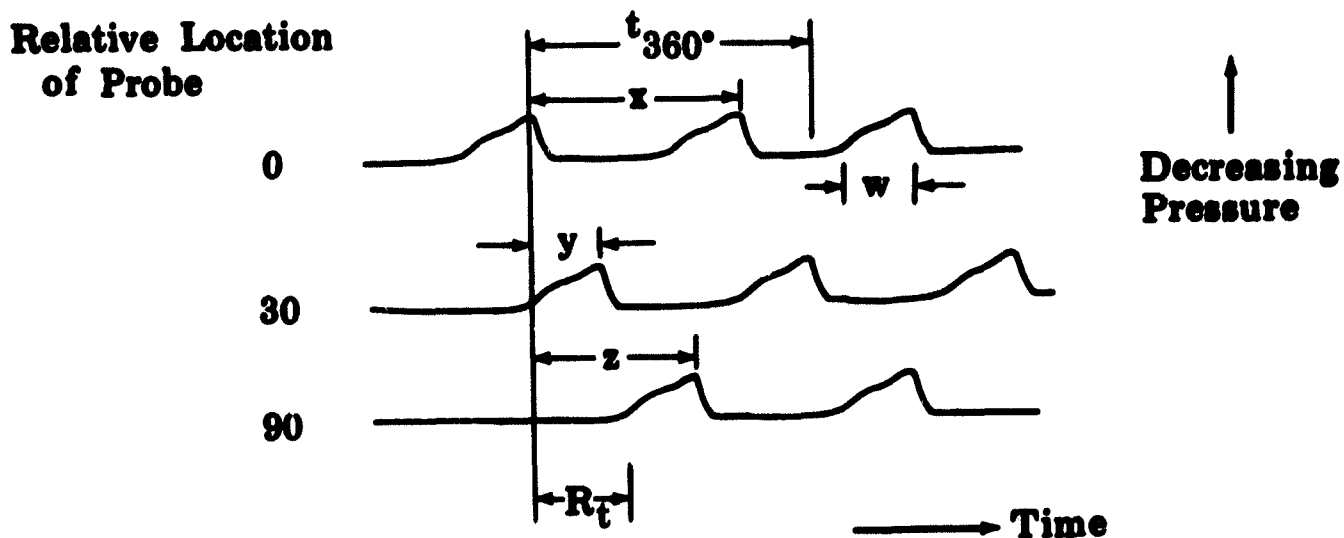


Figure C-1. Transducer Signal Diagram

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In figure C-1:

- x = time between any two adjacent stall zones (or the cycle time of a single stall zone)
- y = time for one of twelve or less stall zones to move from the 0-degree probe to the 30-degree probe
- z = time between a simultaneous stall zone intercept at the 0-degree probe and a stall zone intercept at the 90-degree probe

w = the circumferential extent of a stall zone

R_t = time for one rotor revolution

t_{360° = time equivalent of 360 degrees on the transducer signal trace

The minimum angular spacing of stall zones is obtained from:

$$\frac{30}{y/x}$$

Thus, if $y = x$, the minimum angular spacing would be 30 degrees. With the angular spacing known for any two adjacent zones, it is possible to identify the time-equivalent of 360 degrees on the transducer signal trace. The number of stall zones within this time period is the number of stall zones present. The rotational speed of the stall zone in terms of rotor speed is obtained from the ratio

$$\frac{R_t}{t_{360^\circ}}$$

The extent of the stall zone is:

$$\frac{w}{t_{360^\circ}}$$

The third probe can be used to check the number of stall zones when the minimum spacing is equal to or greater than 60 or 90 degrees. The third probe also defines the direction of rotation of the stall zones, although this direction is usually that of the rotor.