NASA CR-120859
PWA-4148

TWO-STAGE FAN
I. AERODYNAMIC AND MECHANICAL DESIGN

January 1972

By
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Pratt & Whitney Aircraft Division
United Aircraft Corporation

Prepared for
National Aeronautics and Space Administration

NASA Lewis Research Center
Contract NAS3-13494
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1. Report No.
NASA CR-120859

2. Government Accession No.

3. Recipient's Catalog No.

4. Title and Subtitle

TWO-STAGE FAN
I. AERODYNAMIC AND MECHANICAL DESIGN

5. Report Date
January 1972

6. Performing Organization Code

7. Author(s)
H.E. Messenger
E.F. Kennedy

8. Performing Organization Report No.
PWA-4148

9. Performing Organization Name and Address
Pratt & Whitney Aircraft Division
United Aircraft Corporation
East Hartford, Connecticut 06108

10. Work Unit No.

11. Contract or Grant No.
NAS3-13494

12. Sponsoring Agency Name and Address
National Aeronautics and Space
Administration, Washington, D.C. 20546

13. Type of Report and Period Covered
Contractor Report

14. Sponsoring Agency Code

15. Supplementary Notes
Project Manager, R.S. Ruggeri, Fluid System Components Division
NASA-Lewis Research Center, Cleveland, Ohio 44135

16. Abstract

A two-stage, highly-loaded fan was designed to deliver an overall pressure ratio of 2.8 with an adiabatic efficiency of 83.9 percent. At the first rotor inlet, design flow per unit annulus area is 42 lbm/sec/ft^2 (205 kg/sec/m^2), hub/tip ratio is 0.4 with a tip diameter of 31 inches (0.787 m), and design tip speed is 1450 ft/sec (441.96 m/sec). Other features include use of multiple-circular-arc airfoils, resettable stators, and split casings over the rotor tip sections for casing treatment tests.

17. Key Words (Suggested by Author(s))
Two-Stage Fan
Aerodynamic Design
Mechanical Design

18. Distribution Statement
Unclassified-Unlimited

19. Security Classif. (of this report)
Unclassified

20. Security Classif. (of this page)
Unclassified

21. No. of Pages
138

22. Price*
3.00

* For sale by the National Technical Information Service, Springfield, Virginia 22151

FOREWORD

This report was prepared by the Pratt & Whitney Aircraft Division of United Aircraft Corporation, East Hartford, Connecticut, to describe the aerodynamic and mechanical design work conducted under Contract NAS3-13494, Experimental Evaluation of Performance for Two-Stage Fan. Mr. R. S. Ruggeri, NASA – Lewis Research Center, Fluid System Components Division, was Project Manager.

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TWO-STAGE FAN
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SUMMARY

A two-stage fan has been designed to demonstrate that the successful performance achieved in single-stage research programs can be extended to a two-stage fan. Concepts used in the design include moderately high tip-speeds, high blade-aerodynamic-loadings, and multiple-circular-arc airfoils. The important design parameters are:

Overall Total Pressure Ratio	2.8
Overall Adiabatic Efficiency (%)	83.9
Parameters at inlet to first rotor:	
Tip Diameter - inches (meters)	31.0 (0.787)
Tip Speed - ft/sec (meters/sec)	1450 (441.96)
Hub/Tip Ratio	0.4
Specific Flow - lbm/sec-ft^2 (kg/sec-m^2)	42 (205)

The size of the two-stage fan was governed by existing hardware and test facilities. Aerodynamic design goals were based on typical performance requirements of advanced multistage fans. Design criteria for good efficiency and stall margin were based on test data from successful single-stage fans. Axial spacing between blade rows was consistent with engine designs, except at the first stator exit where an allowance was made for tangential traverse instrumentation. The vanes for both stator rows were designed to have zero exit flow angle at all radii and to be resettable ±10 degrees (.17 radians) from the design stagger in increments of 2.5 degrees (0.044 radians).

Mechanical design included structural and vibration analyses. Predicted rotor and stator stresses due to static and dynamic loads are well within the capabilities of the materials selected. Blades of the first rotor have a partspan shroud at 61 percent span from the hub to avoid resonances. Blades of the second rotor are shroudless. Analyses predict that rotor blade and stator vane flutter will not be a problem.

Split casings over the rotor tip sections have been designed to accommodate on-stand changes required during the casing treatment test phase of the program. The casing design also provides for the possible addition of inlet guide vanes, and the rig is designed to permit testing of the first stage alone.

INTRODUCTION

Advanced aircraft engines require lightweight, efficient fans and compressors with adequate stall margin and high tolerance to inlet distortion. Many engine configurations for advanced supersonic aircraft feature moderate bypass ratio, high pressure ratio fans. Multistage fans are usually required to meet these performance goals. The use of high tip-speeds and highly loaded stages reduces the number of stages required.

Considerable experience with highly loaded single-stage fans has been gained from programs conducted under NASA contracts and from current fan research programs at Pratt & Whitney Aircraft. A fan stage with a tip speed of 1600 ft/sec (487.7 m/sec) [ref. 1] achieved an overall pressure ratio of 1.95 with an efficiency of 84.5 percent at 96.4 percent of design airflow. Another highly loaded fan stage with a tip speed of 1000 ft/sec (304.8 m/sec) [ref. 2], achieved an overall pressure ratio of 1.5 with an efficiency of 88.6 percent at 97.5 percent of the design airflow. The success of these single-stage fans has confirmed certain basic design concepts and led to valuable refinements of the techniques used to design the two-stage fan.

A logical extension of these research programs is the evaluation of a two-stage fan which utilizes the advanced single-stage technology to provide a high pressure ratio at moderately high tip-speeds. The two-stage program affords an opportunity to systematically investigate the matching of stages which operate with high aerodynamic loadings and rotor Mach numbers greater than one. Adjustable stator vanes provide a means of varying vane setting angles to improve stage matching.

The two-stage fan investigation consists of two principal tasks. Task I includes the aerodynamic and mechanical design of the two-stage fan and testing of the basic configuration with uniform inlet flow and with radial and circumferential inlet flow distortions. Task II includes tests of casing treatments over rotor tip sections aimed at improving stall margin and distortion tolerance.

This report presents the aerodynamic and mechanical design details of the two-stage fan.

FLOWPATH AND VELOCITY VECTOR DIAGRAMS

Velocity vector diagrams at the leading and trailing edges of each blade row were used to design the rotor and stator blade elements of the two-stage fan. Design of the flowpath and determination of these velocity vectors evolved from a series of iterations. Basic criteria such as hub/tip ratio, tip speed, and specific flow at the inlet to the first rotor were governed by contract specification. The iterations were started using a reasonable flowpath shape, estimated flow blockages, and estimated efficiency profiles. An axisymmetric streamline analysis, outlined in Appendix A, was used to obtain velocity vectors and flow conditions from which rotor and stator blade elements were generated. The analysis accounts for radial equilibrium including the effects of streamline curvature and for gradients of enthalpy and entropy. Flowpath calculation stations were then relocated to conform to blade edge locations; efficiencies were reestimated using correlated blade element losses, and blockage inputs to the streamline analysis calculation were adjusted to account for the partspan shroud of the first rotor. Subsequent blade element designs were revised to conform with updated velocity vector calculations, and the iterations were continued until the final flowpath design was compatible with blade element designs and mechanical requirements. Performance parameters at the design point are summarized in Table I.

TABLE I

DESIGN PERFORMANCE

Corrected Speed - rpm: 10720

Corrected flow - lbm/sec (kg/sec): 184.2 (83.5)

	Pressure Ratio		**Adiabatic Efficiency (%)**	
	Local (per blade row)	Cumulative	Local (per blade row)	Cumulative
Rotor 1	1.787	1.787	89.4	89.4
Stator 1	.977	1.744	—	85.4
Rotor 2	1.646	2.872	89.2	86.2
Stator 2	.975	2.80 (overall)	-	83.9 (overall)

The fan was designed without inlet guide vanes (IGV) but with the provision for adding a variable camber IGV at a later date. Both stators were designed to turn the flow to the axial direction, making it practical to test the first stage alone if desired. The first rotor inlet tip diameter was selected as 31 inches (0.787m) to permit use of existing hardware and to allow adequate drive engine horsepower margin. With a required first rotor tip-speed of 1450 ft/sec (441.96 m/sec), the design speed corrected to standard inlet conditions is 10,720 rpm. The inlet inner case diameter was held at a minimum of 10 inches (.254 m) to permit clearance for the front bearing compartment. The specific flow at the inlet to the first rotor was set at 42 lbm/sec-ft^2 (205 kg/sec-m^2), consistent with advanced fan technology. This, with the specified hub/tip ratio of 0.4 and the tip diameter chosen, yields a design inlet corrected flow of 184.2 lbm/sec (83.5 kg/sec).

The average Mach number at the fan exit is approximately 0.5, a practical value for thrust augmentation. Calculation of fan exit area was based on this exit Mach number, together with a value of fan exit corrected flow based on the predicted temperature rise for an overall total pressure ratio of 2.8.

Flowpath convergence and wall curvature between inlet and exit were used to control velocity profiles and blade aerodynamic loadings (diffusion factors) near the walls. Spanwise profiles of meridional velocity at the leading and trailing edges of the rotor blades and stator vanes are shown in Figures 1 and 2. Rotor inlet and exit relative Mach numbers and stator inlet and exit absolute Mach numbers are shown in Figures 3 and 4.

Design loadings (diffusion factors) for both rotors and stators (Figures 5 and 6) are moderately high. However, they are not in excess of levels at which good performance has been obtained, as seen from a comparison with loadings for the NASA 1600 ft/sec (487.7 meters/sec) tip-speed fan [ref. 1]. Aerodynamic loadings are distributed fairly uniformly throughout the two-stage fan. Stator hub loadings are expected to be most critical in terms of stage stall margin although some flexibility is available since the stator angles are resettable ±10 degrees (.17 radians) from their design stagger in increments of 2.5 degrees (0.044 radians).

Blockages were included in the aerodynamic design to account for boundary layer growth on the casing walls and for presence of the partspan shroud at 61 percent span from the hub of the first rotor. Boundary layer displacement thickness at the first rotor inlet was assumed equal to that measured downstream of inlet bellmouths during Pratt & Whitney Aircraft's research programs. Growth of the wall displacement thickness through the blade rows of the two-stage fan was estimated using a correlation developed by W. T. Hanley [ref. 3] wherein growth along the casing walls is chiefly a function of wall static pressure gradient. To account for the presence of the partspan shroud, a blockage equal to the percent of total annulus area occupied by the shroud was applied at the exit of the first rotor and the inlet of the first stator, and half this amount was used at the inlet of the first rotor. No allowance for shroud blockage was applied at the first stator exit or other downstream stations. This procedure has been shown to yield good agreement between calculated and experimentally determined velocity distributions of shrouded rotors similar to the first rotor of the two-stage fan. Total blockages, which were input to the streamline analysis calculation at various axial locations (Table II), were computed as the sum of endwall blockages and shroud blockages. These blockages were applied equally to all stream tubes at each of the axial locations.

TABLE II

ANNULUS BLOCKAGES

Location	Total Blockage (%)
Rotor 1 L.E.	2.4
Rotor 1 T.E. to Stator 1 L.E.	4.1
Stator 1 T.E. to Rotor 2 L.E.	2.8
Rotor 2 T.E. to Stator 2 L.E.	3.8
Stator 2 T.E.	3.5

Predicted rotor and stator total loss coefficients for the final aerodynamic design are shown in Figures 7 and 8, and predicted rotor adiabatic efficiency is given in Figure 9. The method used to determine rotor and stator losses is discussed in Appendix B. Tabulations of aerodynamic parameters versus percent flow at the rotor and stator leading and trailing edges are given in Appendix C, Tables IX through XVI. As shown in the final flowpath (Figure 10), axial spacings between the first rotor and first stator and between the second rotor and second stator were held to a minimum, which is in line with actual engine design practice. A spacing of slightly more than one inch was allowed between stages to provide room for a tangential traverse at the first stator exit. A schematic showing the mechanical layout of the rig is presented in Figure 11.

AIRFOIL DESIGN

Rotor and stator blade sections for both stages of the fan are multiple-circular-arc (MCA) airfoils designed on conical surfaces which approximate streamsurfaces of revolution. Figure 12 shows the variables which define an MCA airfoil; these include blade setting angles, total and front chord, total and front camber, maximum thickness and its chordwise location, and leading and trailing edge radii. Also shown are the assumed shock location C-A-B, and the blade spacing. Blade setting angles were determined from design flow angles and incidence and deviation angle criteria. Incidences for sections where Mach numbers exceeded 1.0 were set at a critical point on the suction surface and included allowance for blockage at the blade leading edge, boundary layer growth, and bow-wave loss. Incidences for subsonic sections were based on test data from previous experience. Deviation angles were calculated using either Carter's Rule or Pratt & Whitney Aircraft's cascade method, with results from each method modified by small adjustments derived from test data. Blade chords were chosen to be consistent with moderate axial lengths, acceptable rotor loadings, and structural requirements. Airfoil cambers were distributed chordwise to give adequate channel flow areas and proper entrance curvatures. Airfoil leading and trailing edge radii and thicknesses were chosen to provide mechanical integrity yet allow adequate flow area. Figure 13 shows a view of a rotor and stator from each blade row of the two-stage fan.

ROTORS

A summary of important parameters of rotor blading is given in Table III.

TABLE III

ROTOR BLADING PARAMETERS

	1st-Stage	2nd-Stage
Number of Airfoils	28	60
Aspect Ratio*	2.48	2.69
Hub Chord - inches (meters)	3.62 (.092)	2.10 (.053)
Tip Chord - inches (meters)	4.55 (.116)	2.10 (.053)
Tip Solidity	1.33	1.43

*Average length/axially-projected-root-chord.

Rotor chords (Figure 14) were chosen to be consistent with moderate axial lengths, acceptable rotor loadings, and structural requirements. The ratio of front-chord to total-chord was set to provide a transition point 0.8 of the distance from the leading edge to the normal shock location on the suction surface (point B in Figure 12).

Rotor maximum-thickness to chord ratios (t/c) were selected to provide mechanical stability while maintaining minimum airflow blockage. Rotor 1 has a hub t/c of 0.08 and a partspan shroud at 61 percent span from the hub. Rotor 2 has a hub t/c of 0.095 but no partspan shroud. Spanwise distributions of t/c for both rotors are linear from root values to a t/c of 0.025 at the tip. The chordwise location of maximum thickness for both rotors (Figure 15) was chosen such that for a given total and front camber and a given total and front chord, the leading edge wedge angle was the minimum possible without creating a cusp-shape in the front portion of the blade.

Incidence angles for sections whose inlet relative Mach number (M'_1) exceeded 1.0 were chosen at a location termed the a′ point, a point on the suction surface halfway between the leading edge and the point from which a Mach wave emanates that meets the leading edge of the following blade. This incidence alignment technique for supersonic flow is explained in Reference 4. Incidence at the a′ point (Figure 16), together with entrance region and channel area considerations, determined leading edge incidence. For most sections with M_1' greater than 1.0, incidence was set approximately 1.5 degrees (.026 radians) to the blade suction surface at a′, with the 1.5 degrees (.026 radians) intended to account for blockage at the blade leading edge, development of the suction surface boundary layer, and bow-wave loss. For sections where M_1' was only slightly greater than 1.0, higher values of incidence to the a′ point were required to provide adequate flow area while maintaining a smooth distribution of leading edge incidence. Incidence angles for subsonic sections were set at the leading edge in accordance with minimum loss data from previous experience. At the hub, design suction surface incidences at the leading edge are -0.9 degrees (-.016 radians) for rotor 1 and -0.1 degrees (-.002 radians) for rotor 2. These incidences fair in a smooth curve (Figure 17) to incidences for sections with M_1' greater than 1.0. (Note that the $M_1' = 1.0$ point occurs at a lower percent span for rotor 2 than for rotor 1 because of the relatively high hub convergence). Rotor deviation angles were calculated using Carter's Rule plus the adjustments shown in Figure 18. Data from tests of the highly loaded, 1600 ft/sec (487.7 meters/sec) rotor [ref. 1] were used as the basis for these adjustments.

The ratio of front-camber to total-camber (Figure 19) was chosen to provide a minimum channel flow critical area ratio (A/A^*_{min}) of approximately 1.04 over the outer forty percent of span, ranging to values as low as 1.02 at about twenty percent of span (Figure 20). As shown by the curve based on data from Reference 1, the margins provided above choke are compatible with good performance. Distributions of flow area ratio (A/A^*) through the blade channels of both rotors are shown in Figures 21 and 22 for several percents of span. To compute these flow area ratios for each streamline, actual area A was calculated by correcting the local channel widths between adjacent blades to account for streamtube annulus area convergence or divergence. Critical area A* at these locations was determined by modifying the value at the leading edge to account for losses and changes of radius. The loss calculated for each streamline was distributed in the following manner: 1) no loss was assumed from the leading edge to the location of the first covered section of the blade (point B in Figure 12), 2) a normal shock was assumed to be situated at the first covered section, and a normal shock loss based on the local Mach number determined as outlined in Appendix B was applied in the blade channel near point A in Figure 12, and 3) the profile loss (total minus shock loss) was applied linearly from a value of zero immediately downstream of this point to the full value at the trailing edge.

Rotor geometry on design conical surfaces is summarized in Appendix D, Tables XVII and XIX. For each airfoil section, two values of total and front camber are tabulated. Figure 23 gives a polar representation of a blade mean-camber-line and the two definitions used to calculate these values of camber. For manufacturing purposes, the airfoil sections were redefined on planes normal to the stacking line, a radial line through the center of gravity of the root conical section. Rotor blade coordinates for these redefined sections are tabulated in Appendix E, and Figure 24 gives the airfoil coordinate definitions used in these tabulations.

STATORS

A summary of important parameters of stator blading is given in Table IV.

TABLE IV

STATOR BLADING PARAMETERS

	1st-Stage	2nd-Stage
Number of Airfoils	46	59
Aspect Ratio*	2.75	2.20
Hub Chord - inches (meters)	2.75 (.070)	2.22 (.056)
Tip Chord - inches (meters)	3.10 (.079)	2.45 (.062)
Hub Solidity	2.52	2.25

*Average length/axially-projected-root-chord

Spanwise distributions of front chord, front camber, and location of maximum thickness were selected to give low curvature entrance regions for high Mach number hub sections, fairing smoothly to nearly double-circular-arc (DCA) airfoils in the lower Mach number region near the tip. This design concept was based on past experience where DCA stators have shown better performance than MCA stators when inlet Mach numbers drop below 0.7 [ref. 5]. Spanwise distributions of a chord-camber parameter for both stators are presented in Figure 25; their relationship to a DCA airfoil is shown.

Stator spanwise chord distributions (Figure 26) and the blading parameters of Table IV were chosen to give reasonable axial lengths and loadings. Front chord was selected to provide a transition at the first covered section for the standard MCA root sections and at approximately 50 percent of chord for the tip sections, as shown in axially projected views of both stators in Figures 27 and 28.

Maximum thickness to chord ratio was set to vary linearly from 0.04 at the hub to 0.075 at the tip to provide low losses while being adequate for mechanical integrity. Near the hub the chordwise location of maximum thickness (Figure 29) was chosen to provide a minimum leading edge wedge angle without creating a cusp-shape thickness distribution. At the tip sections, maximum thickness was set at midchord.

Incidence angles at the hub of both stators were set at approximately zero degrees to the suction surface based on minimum loss data from Reference 5, varying almost linearly to -6.1 and -6.9 degrees (-.11 and -.12 radians) to the suction surface for the first and second stator tips, respectively. Tip incidence angles were selected using Pratt & Whitney Aircraft's cascade method for DCA airfoils. Figure 30 shows predicted loss versus incidence angle for two cascade sections with approximately the same geometry as the tip sections of the two-stage stators. Incidence angles for the stator tip sections were chosen slightly less negative than values for minimum loss so that desired channel areas between vanes could be attained. This incidence selection is in good agreement with the incidence system of Reference 6.

Stator deviation angles were calculated using Pratt & Whitney Aircraft's cascade method modified by correction factors from the test results of References 1 and 2. Figure 31 shows the predicted deviations for the stators and their comparison with deviation angles calculated using Carter's Rule. Stator inlet and exit metal angles defined on conical surfaces are presented in Figure 32.

Leading edge incidence and front camber were used to control throat area of the channels between blades. Desired throat areas were established by a correlation from Reference 5 of capture-area/throat-area ratio as a function of stator inlet Mach number (Figure 33). Minimum flow area ratios (Figure 34) include a five percent choke margin near the hub of both stators compared to approximately four percent predicted for minimum loss. The extra throat area was provided to give smooth radial distributions of blade geometry and to reduce high local velocities which potential flow calculations (based on the method of Reference 7) showed existed near the leading edge of the pressure surface. A representative example of choke margin effects on velocity is presented in Figure 35. Channel distributions of A/A* (Figures 36 and 37) show that the minimum A/A* occurs near the channel entrance for each of the various spanwise positions. Stator geometry on design conical surfaces is summarized in Appendix C. For manufacturing purposes, the airfoil section coordinates were defined on planes normal to a radial stacking line. The resulting stator airfoil coordinates are given in Appendix E.

STRUCTURAL AND VIBRATION ANALYSIS

Design of the rotor and stator blades included structural and vibration analysis to determine configurations which satisfy mechanical requirements. Analysis included calculation of: 1) blade-disk frequencies and their resonances with rig excitations, 2) steady-state and vibratory stresses, 3) flutter parameters, and 4) rig critical speeds.

Rotor blades were fabricated from AMS 4928 (titanium alloy); stator vanes from AMS 5613 (stainless steel); and disks, hubs, and spacers from AMS 6415 (low-alloy steel).

ROTORS

Rotor 1

a. Blade-Disk Vibration

Blade frequencies were calculated with aid of the following assumptions:

1. The number of blades is much greater than the order of vibration.
2. Blade roots do not resist circumferential distortion of the disk rim.
3. Disks are uniformly restrained at a radius of fixity, such as a bolt circle.
4. The bending stiffness of a shroud ring is not increased by its intersection with a staggered airfoil.

A partspan shroud was required for the first-stage rotor to avoid first bending resonance with first and second rig order frequencies occurring in the operating range, which extends from 50 to 110 percent of design speed. The shroud location was chosen to provide the best compromise between high speed margin with a 3E resonance (3E = 3 excitations per rotor revolution) and the speed at which a 4E resonance would occur. The selected location of 61 percent span from the hub gave the first-stage rotor a predicted 8.9 percent 3E resonance frequency margin at 110 percent of design speed and positioned the 4E resonance associated with the first bending mode at about 82 percent of design speed (Figure 38).

Higher order excitations from instrumentation probes and the ten inlet struts are not expected to excite the system in the high speed range because experience with Pratt & Whitney Aircraft research fans has shown that wakes associated with inlet struts wash out sufficiently so that their excitation energy is negligible. Figure 39 shows that excitations associated with the 46 stator vanes in the first-stator row could result in a resonance with the third tip mode at about 64 percent of design speed, but this is not considered serious based on past experience. Resonances with first and second modes will not occur in the expected range of operation.

b. Blade Stresses

Stresses due to centrifugal and untwist forces were calculated for 110 percent of design speed. The results show three spanwise locations of high steady-stresses for rotor 1 (Figure 40):

1. The maximum combined steady stress (excluding local fiber stresses) is 70,000 psi (483,000,000 Nt/m^2) and occurs on the concave side of the blade at 14 percent span. This stress is well below the 0.2 percent yield stress for AMS 4928 at 150°F (338.7°K) of 108,000 psi (745,000,000 Nt/m^2).
2. Calculated local fiber stresses of 85,000 psi (586,000,000 Nt/m^2) occur at the blade leading edge at the hub. These stresses include a correction for platform angle and are not considered a problem since they are similar in magnitude to those of other successfully tested fan rotors.
3. Local fiber stresses of 81,000 psi (559,000,000 Nt/m^2), calculated at the leading edge of the blade immediately below the partspan shroud, are not considered critical for two reasons. First, this area has a relatively low percentage (22 percent) of the maximum vibratory stress associated with it, and second, the actual operating steady stresses should be considerably lower than the 81,000 psi (559,000,000 Nt/m^2) calculated because this value was determined using the con-

servative assumption that the blade at the shroud location is fixed along its entire chord length. In reality, the shroud extends only along approximately the rear half of the blade chord, and a correction for this fact would considerably reduce the calculated value of steady stress.

Figure 40 also shows areas of high vibratory stress associated with forced vibrations of rotor 1 (potential flutter problems associated with free vibrations are discussed later in the structural section). The maximum calculated vibratory stress in the first bending mode occurs just above the shroud—the combined steady stress at this location is 51,000 psi (352,000,000 Nt/m^2). The vibratory stress at the hub leading edge is 69 percent of this maximum, and the vibratory stress on the suction surface at 14 percent span is only one or two percent of the maximum. Figure 41 is a modified Goodman Diagram showing allowable vibratory stress as a function of steady stress. The maximum combined steady stress of 70,000 psi (483,000,000 Nt/m^2) at 14 percent span was chosen as the critical steady stress for determining the maximum continuous allowable vibratory stress. Except for the noncritical, high local fiber stresses, steady stresses for other locations would give less conservative (higher) values of allowable vibratory stress than the 10,000 psi (68,900,000 Nt/m^2) determined from the 70,000 psi (483,000,000 Nt/m^2) steady-stress point. Actual operating vibratory stresses should be less than 10,000 psi (68.000,000 Nt/m^2) since predicted critical resonances do not occur within the operating range, and the blade should have satisfactory fatigue characteristics.

The partspan shroud was sized and positioned to satisfy aerodynamic and structural requirements including the 3E margin requirement. Shroud design parameters and stresses are summarized in Table V, and a sketch of the shroud is shown in Figure 42. The shroud bearing stress is 6900 psi (47,600,000 Nt/m^2), which is below values for successfully tested Pratt & Whitney Aircraft research rigs (e.g., 8,500 psi or 58,600,000 Nt/m^2). The shrouds were designed to fit together tightly enough to provide adequate damping of vibrations without shingling. The Z-ratio*, a measure of the relative stiffnesses of shroud and adjacent blade, is within the realm of successful experience.

TABLE V

ROTOR 1 PARTSPAN SHROUD PARAMETERS

Parameter	**Design Value**
Spanwise location - percent span from the hub	61
Contact Angle-degrees (radians)	60 (1.05)
Z-ratio*	0.82
Bearing Stress - psi (Nt/m^2)	6,900 (47,600,000)
Bending Stress - psi (Nt/m^2)	75,000 (517,000,000)

*See symbol list for definition of Z-ratio

c. Blade Flutter

Flutter is a self-excited and self-sustaining vibration which occurs in either a torsional or bending mode or a combination of both. Supersonic flutter is restricted to the high speed operating region of the compressor where inlet relative Mach numbers exceed 1.0 over a significant portion of the blade span.

Values of flutter parameters for the first-stage rotor blade were calculated at design speed and at 110 percent of design speed and were compared with correlated data from previous tests. A value of the bending flutter parameter $\psi c/d$ for shrouded blades was calculated for 110 percent speed, the operating speed considered most critical in regard to flutter. The calculated value of 0.224 lies within the range of experience where no flutter problems have been encountered. Favorable results were also obtained in calculations of a dimensionless supersonic torsional flutter parameter $2V\,'/c\omega_t$, whose value of 1.0 at 110 percent of design speed indicated that no supersonic torsional flutter is to be anticipated.

d. Disk and Attachment Stresses

Conventional dovetail attachments were selected for both rotor blades. Table VI lists the calculated and allowable rotor 1 disk and attachment stresses for critical locations. Combined stresses (centrifugal plus untwist) are also presented. All calculated values fall below the maximum allowed. In addition, the dynamic stress ratio (airfoil-root-stress divided by attachment-stress) is above the minimum recommended value of 2.0, indicating that the attachment will withstand vibratory stresses greater than those the airfoil can tolerate.

Rotor 2

a. Blade and Disk Vibration

No partspan shroud was required on the second-stage rotor blades since resonances calculated initially could be avoided by increasing the hub t/c to its design value of 0.095. Figure 43 presents the vibratory response of the second-stage fan rotor blade showing that the first coupled bending mode has 24.2 percent 2E margin at 110 percent of design speed. The first blade-disk coupled mode 3E and 4E resonances occur relatively low in the operating range (at 78 and 51 percent of design speed respectively). The first chordwise bending mode at the blade tip will not be excited in the operating range by vane passing orders (Figure 44). Rotor excitation in the second mode will occur at approximately 67 percent and 86 percent of design speed; however, experience has shown that the response in the second mode should not constitute any vibrational problems in the speed ranges indicated. No significant third mode resonances occur within the operating range.

b. Blade Stresses

Combined centrifugal and untwist stresses were calculated at 110 percent of design speed. The results presented in Figure 45 show two locations of high steady stress for rotor 2. The maximum combined steady stress is 41,000 psi (283,000,000 Nt/m^2) and occurs on the

TABLE VI

ROTOR 1 DISK AND ATTACHMENT STRESSES AT 110% OF DESIGN SPEED

Location	**Type of Stress**	**Calculated Stress**		**Allowable Stress**	
		psi x 10^{-3}	Nt/m^2 x 10^{-6}	psi x 10^{-3}	Nt/m^2 x 10^{-6}
Blade Attachment	Combined Stress	61.3	423.	72.2	498.
	Bearing Stress	86.6	598.	97.2	670.
Blade Retaining Lug	Combined Stress	58.9	406.	95.1	656.
	Bearing Stress	86.	593.	126.	870.
Disk	Avg. Tangential Stress	46.	317.	95.	655.
	Maximum Radial Stress	46.	317.	86.	593.
Front Hub	Hoop Stress	33.	228.	140.	966.
	Bending Stress	59.	407.	140.	966.
1st Disk Front Seal	Hoop Stress	33.	228.	140.	966.
	Bending Stress	11.	76.	140.	966.
1st Disk Rear Seal	Hoop Stress	33.	228.	138.	952.
	Bending Stress	26.	179.	138.	952.
Disk Spacer (Between Rotor 1 and Rotor 2)	Hoop Stress	72.	497.	138.	952.
	Bending Stress	75.	518.	138.	952.

concave side of the blade at 22 percent span. This value is well below the 0.2 percent yield stress of 94,000 psi (649,000,000 Nt/m^2) for AMS 4928 at 300° F (421.9° K). The hub section has high local fiber stresses (40,000 psi or 276,000,000 Nt/m^2) at the leading edge, which from past experience should not present a problem.

Figure 45 also shows areas of high vibratory stress for rotor 2. The maximum calculated vibratory stress in the first bending mode occurs at the root trailing edge. The vibratory stress at the hub leading edge is 87 percent of the maximum, and the vibratory stress on the suction surface at 22 percent span is 20 percent of the maximum. Figure 46 shows a Goodman Diagram of allowable vibratory stress versus steady stress for rotor 2. Since the local fiber steady stresses at the hub are not considered critical, the maximum steady stress of 41,000 psi (283,000,000 Nt/m^2) at 22 percent span was used in determining a value of allowable vibratory stress for the blade. Since the maximum combined steady stress is low and no critical resonances are present in the high speed operating range, actual vibratory stress levels should be less than the allowable value of 16,000 psi (110,000,000 Nt/m^2) indicated by the Goodman Diagram.

c. Blade Flutter

Calculations of a dimensionless supersonic torsional flutter parameter ($2V'/c\omega_t$) were made for rotor 2 and compared with correlated data from rig tests. The value of flutter parameter computed for design speed (2.18) indicated stable operation at this speed. However, the value calculated for 110 percent of design speed (2.35) was near the correlated line separating stable and unstable operation, and flutter problems may exist at this speed. Rotor blades will be adequately instrumented with strain gages so that any blade flutter can be detected and avoided.

d. Disk and Attachment Stresses

Table VII lists the calculated and allowable rotor 2 disk and attachment stresses for critical locations. Combined stresses are also listed. It can be seen that all calculated values fall below the maximum allowed. The dynamic stress ratio (airfoil root stress divided by attachment stress) for this blade is well above the minimum recommended value of 2.0.

STATORS

a. Stator Vibration

The stator bending frequencies were calculated assuming that the vanes were fixed along the entire chord at the average gaspath I.D. and average gaspath O.D., while the torsional frequency calculation assumed the vanes fixed at the O.D. and free at the I.D. As shown in Figure 47, stator 1 first bending and first torsional frequencies will not be excited by blade passing orders in the operating range. Second bending or third torsion could be excited by the first rotor blade passing order (28E), but these are not expected to create vibratory problems. The results of Figure 48 show that stator 2 first, second, and fourth order vibratory modes could be excited by blade passing orders in the low operating range; however, excitation

TABLE VII

ROTOR 2 DISK AND ATTACHMENT STRESSES AT 110% OF DESIGN SPEED

Location	Type of Stress	Calculated Stress		Allowable Stress	
		psi x 10^{-3}	Nt/m^2 x 10^{-6}	psi x 10^{-3}	Nt/m^2 x 10^{-6}
Blade Attachment	Combined Stress	43.8	302.	64.4	444.
	Bearing Stress	49.5	342.	94.	649.
Blade Retaining Lug	Combed Stress	35.9	248.	95.3	657.
	Bearing Stress	49.5	342.	120.6	831.
Disk	Avg. Tangential Stress	64.5	445.	95.	656.
	Maximum Radial Stress	38.	262.	86.	594.
Rear Hub	Hoop Stress	54.	372.	138.	952.
	Bending Stress	43.	296.	138.	952.
2nd Disk Front Seal	Hoop Stress	75.	517.	138.	952.
	Bending Stress	13.	90.	138.	952.
2nd Disk Rear Seal	Hoop Stress	84.	579.	136.	939.
	Bending Stress	18.	124.	136.	939.

energy at these low speeds will be minimal and no vibrational problems are anticipated. Excitation of the third torsional mode by first rotor blade passing orders is also considered unlikely to occur with amplitudes sufficient to create problems.

b. Stator Stresses and Flutter

Stator vane gas bending stresses were calculated assuming two end-conditions: 1) a conventional guided cantilever and 2) the I.D. end-guided and the O.D. pinned. The maximum bending stresses were calculated as 21,300 psi (147,000,000 Nt/m^2) for stator 1 and 30,300 psi (209,000,000 Nt/m^2) for stator 2, which are well below the allowable of 106,000 psi (731,000,000 Nt/m^2). The maximum vibratory stress is not expected to exceed 10,000 psi (68,900,000 Nt/m^2) since there are no critical resonances in the operating range.

Flutter parameters were calculated for both stators and compared with correlated test data. Values of a dimensionless reduced velocity parameter for bending flutter ($V/c\omega_b$) calculated for stators 1 and 2 were 0.88 and 0.63 respectively, which are within the successful (no flutter) area determined through experience. A similar conclusion was indicated by the values of reduced velocity parameter ($V/c\omega_t$) for torsional flutter, which were computed as 1.24 and 1.05 for stators 1 and 2 respectively.

CRITICAL SPEEDS

A rotor-frame, critical-speed analysis was performed to determine the vibrational characteristics of the fan. The analysis was based on a model which included all significant structural members of the rig and used the spring-mass system shown in Figure 49.

Four critical speeds were calculated to occur within the range of operation of the rig, namely 1059, 3045, 5932, and 9049 rpm. The first three modes are predominantly case modes, which are harmless since they are insensitive to unbalance and since heavy damping due to the large number of joints of the system will keep their vibrational amplitudes small. The fourth mode, the first critical speed at which there is rotor participation (Figure 50), occurs at 9049 rpm and is expected to be sensitive to unbalance in the drive system. By controlling spline clearance at the drive shaft spline, the potential unbalance which can excite this mode will be minimized. Also, provisions have been made for field balancing the rear diaphragm coupling so that the drive system unbalance can be controlled if undesirable vibration should occur during testing.

Vibration accelerometers and amplitude pick ups will permit monitoring of rig and drive system vibration and aid in evaluating vibration difficulties should they be experienced.

RESUME

The purpose of this report is to present the design of a two-stage research fan with moderately high tip-speeds and high aerodynamic blade loadings. The design features include multiple-circular-arc airfoils, no inlet guide vanes, a part span shroud at 61 percent span from the hub of the first rotor, and split casings over rotor tip sections. Other design parameters include:

Specific flow* - lbm/sec-ft^2 (kg/sec-m^2)	42	(205)
Rotor tip speed* - ft/sec (m/sec)	1450	(441.96)
Hub/tip ratio*	0.4	
Tip diameter* - inches (meters)	31.0	(0.787)
Overall total pressure ratio	2.8	
Overall adiabatic efficiency (percent)	83.9	
Tip solidity - rotor 1 (rotor 2)	1.33	(1.43)
Hub solidity - stator 1 (stator 2)	2.52	(2.25)
Aspect ratio** - rotor 1 (rotor 2)	2.48	(2.69)
Aspect ratio** - stator 1 (stator 2)	2.75	(2.20)

* at inlet to first rotor

** average length/axially projected root chord

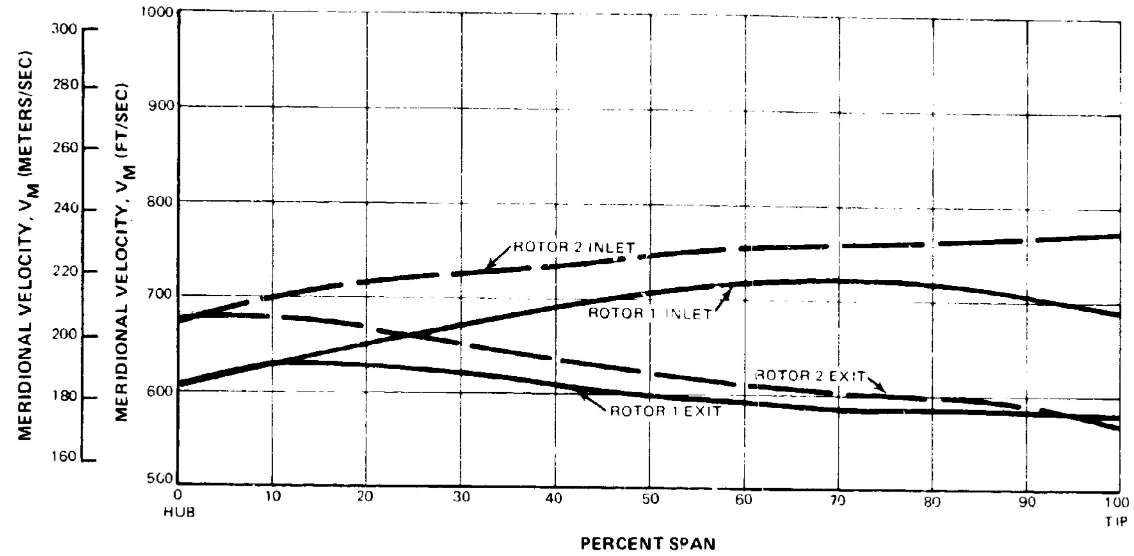


Figure 1 Meridional Velocity Profiles for Rotor 1 and Rotor 2

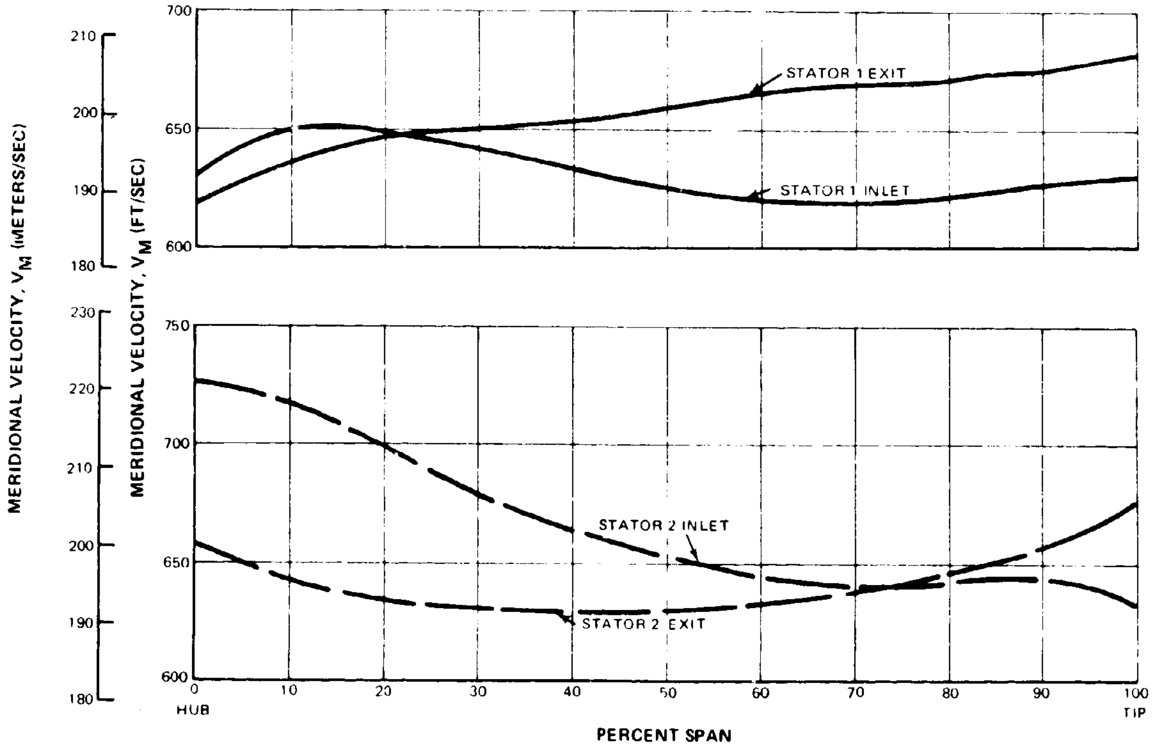


Figure 2 Meridional Velocity Profiles for Stator 1 and Stator 2

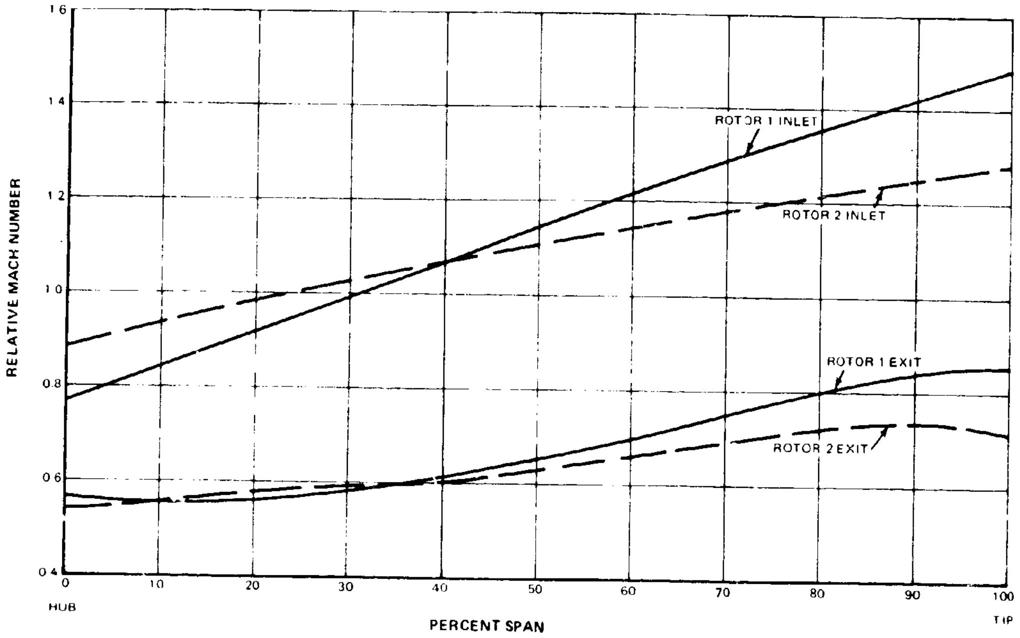


Figure 3 Inlet and Exit Mach Number Profiles for Rotors

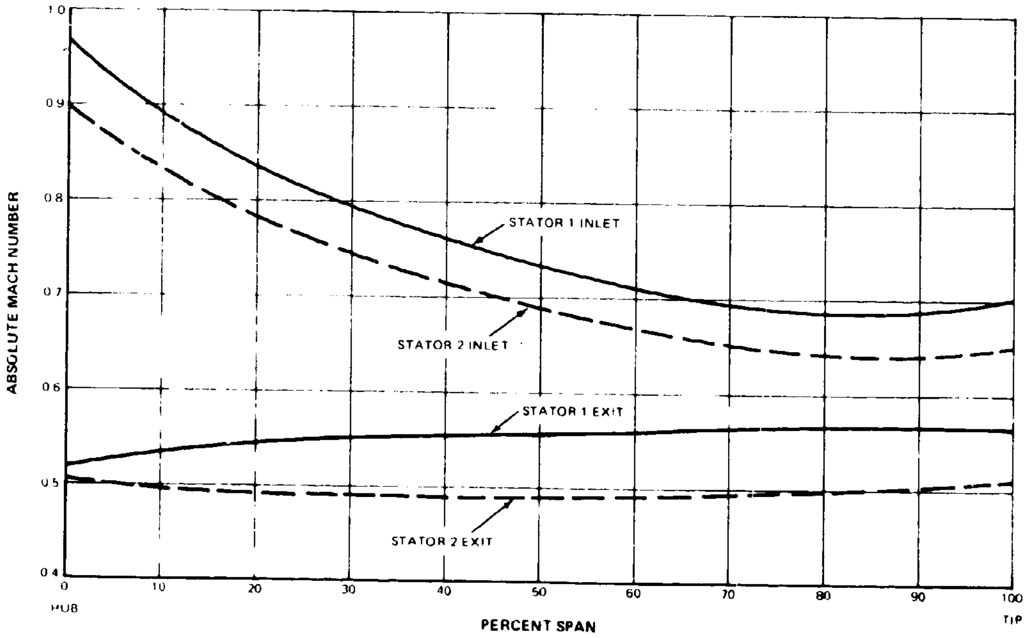


Figure 4 Inlet and Exit Mach Number Profiles for Stators

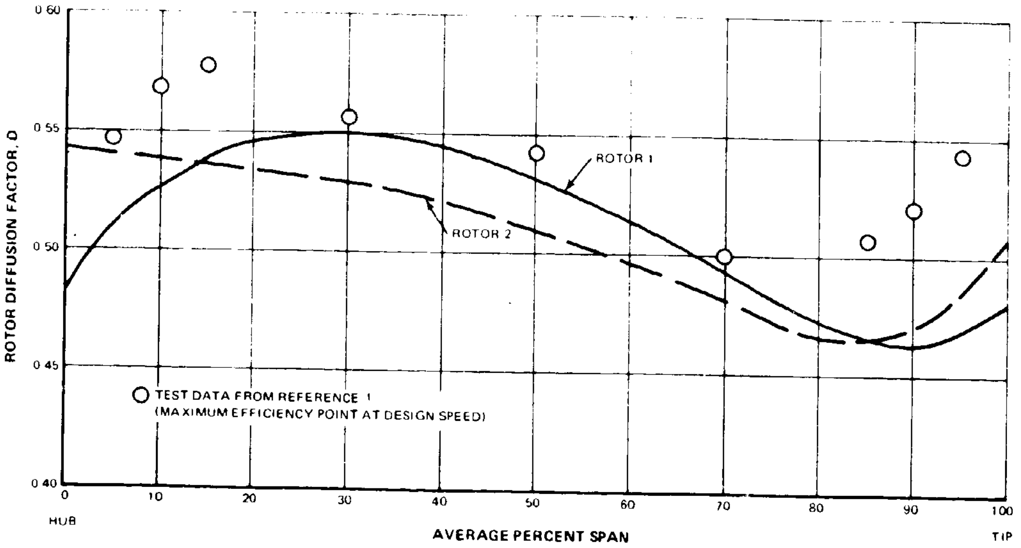


Figure 5 Rotor Diffusion Factor Profiles

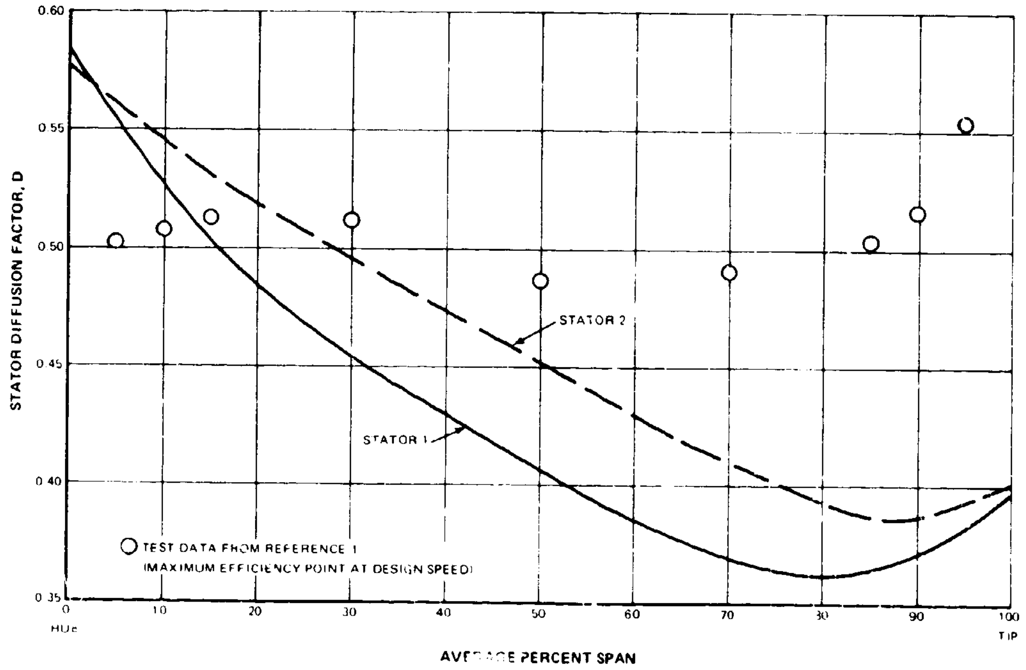


Figure 6 Stator Diffusion Factor Profiles

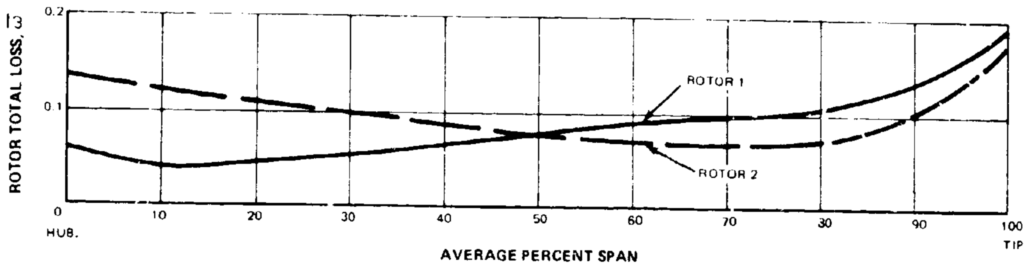


Figure 7 Rotor Total Loss Profiles

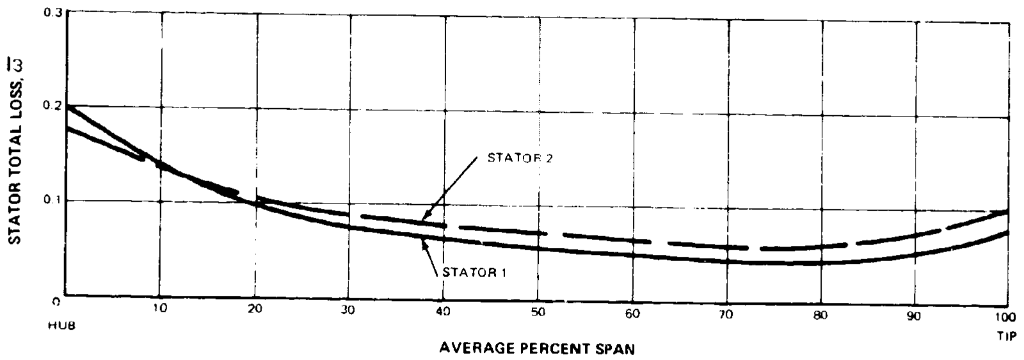


Figure 8 Stator Total Loss Profiles

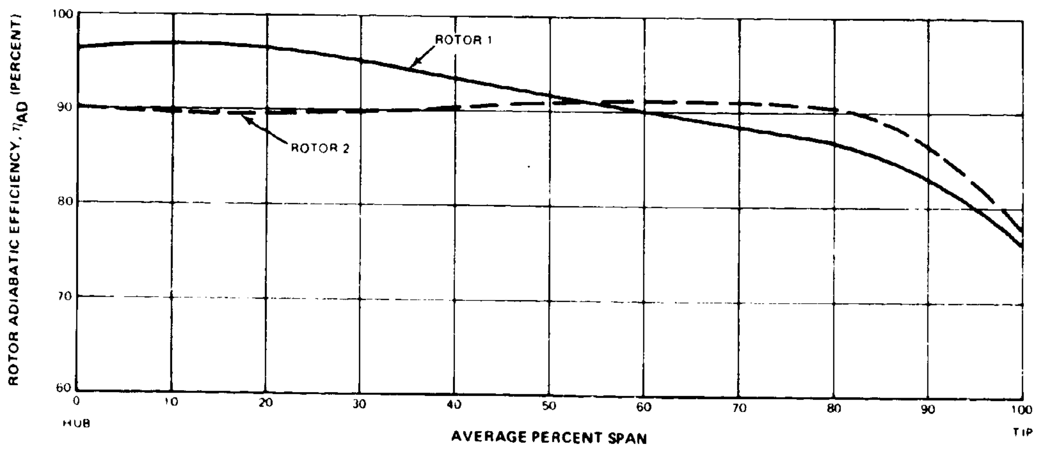
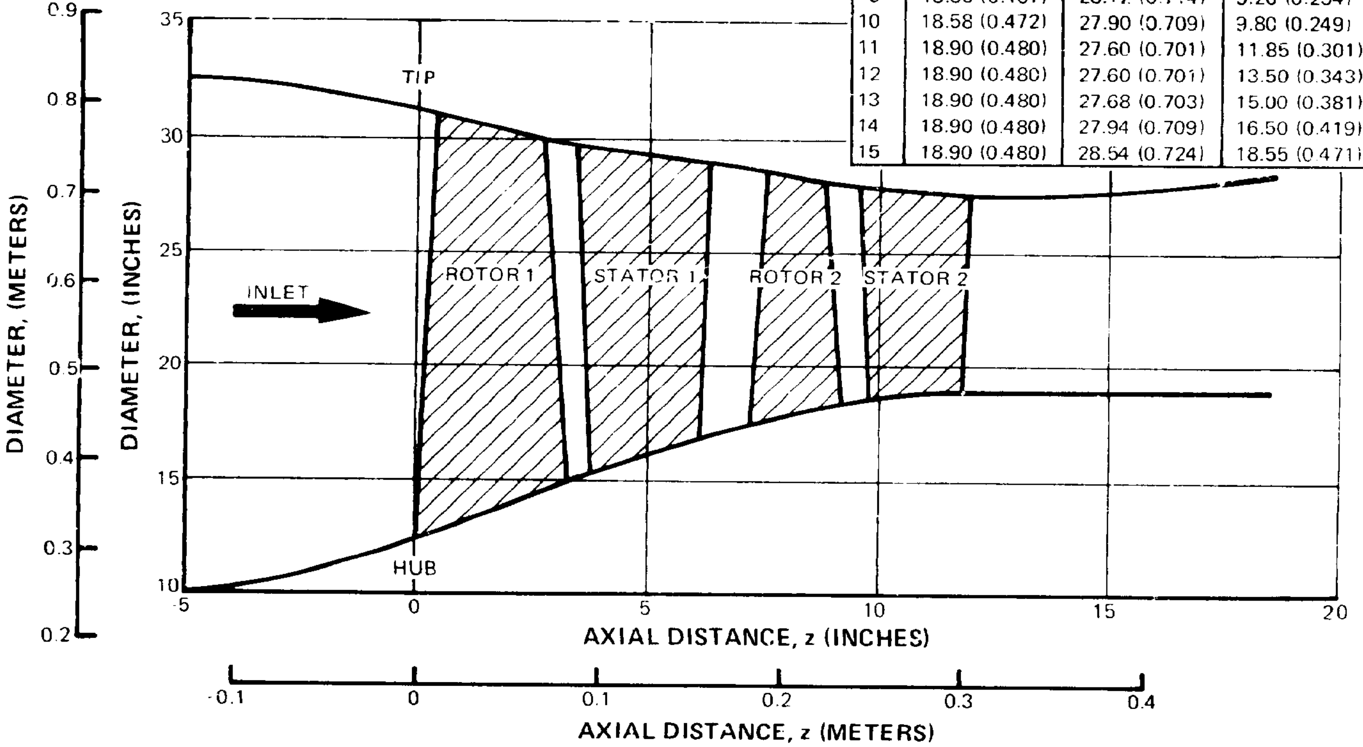


Figure 9 Rotor Adiabatic Efficiency Profiles



DIMENSIONS
IN INCHES (METERS)

	DIAMETER		DISTANCE	
STA	I.D.	O.D.	z - I.D.	z - O.D.
1	10.00 (0.254)	32.48 (0.825)	-5.20 (-0.132)	5.20 (-0.132)
2	10.26 (0.261)	32.33 (0.821)	-3.70 (-0.094)	3.70 (-0.094)
3	10.94 (0.278)	31.96 (0.811)	-2.245 (-0.057)	-2.245 (-0.057)
4	12.40 (0.315)	31.00 (0.787)	0.0 (0.0)	0.42 (0.011)
5	14.84 (0.377)	29.93 (0.750)	3.30 (0.084)	2.75 (0.070)
6	15.22 (0.387)	29.67 (0.754)	3.80 (0.097)	3.45 (0.088)
7	16.85 (0.428)	28.96 (0.736)	6.15 (0.156)	6.33 (0.161)
8	17.39 (0.442)	28.58 (0.726)	7.23 (0.184)	7.57 (0.192)
9	18.35 (0.467)	28.12 (0.714)	9.20 (0.234)	8.82 (0.224)
10	18.58 (0.472)	27.90 (0.709)	9.80 (0.249)	9.59 (0.244)
11	18.90 (0.480)	27.60 (0.701)	11.85 (0.301)	11.93 (0.303)
12	18.90 (0.480)	27.60 (0.701)	13.50 (0.343)	13.50 (0.343)
13	18.90 (0.480)	27.68 (0.703)	15.00 (0.381)	15.00 (0.381)
14	18.90 (0.480)	27.94 (0.709)	16.50 (0.419)	16.50 (0.419)
15	18.90 (0.480)	28.54 (0.724)	18.55 (0.471)	18.55 (0.471)

Figure 10 Flowpath

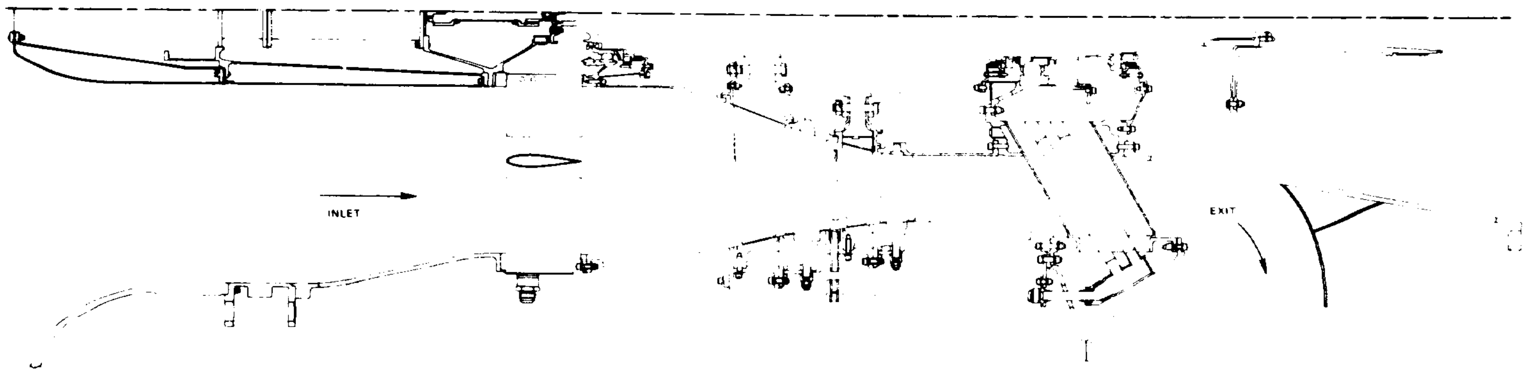


Figure 11   Schematic of the Rig

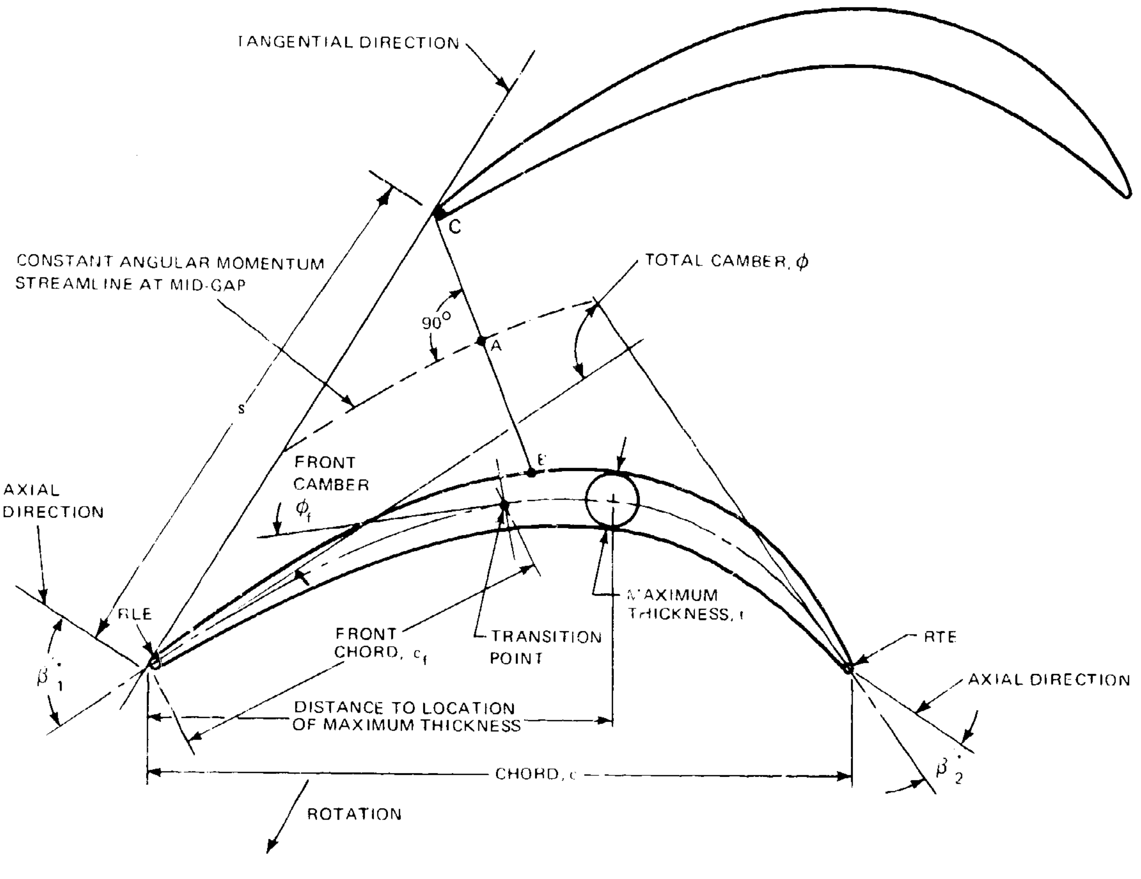
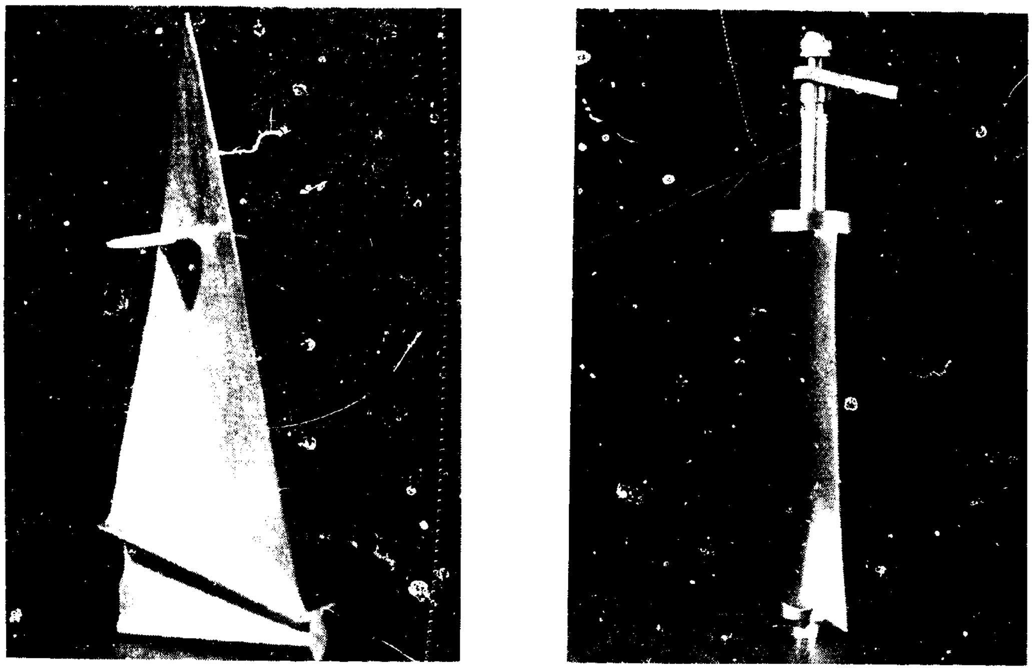
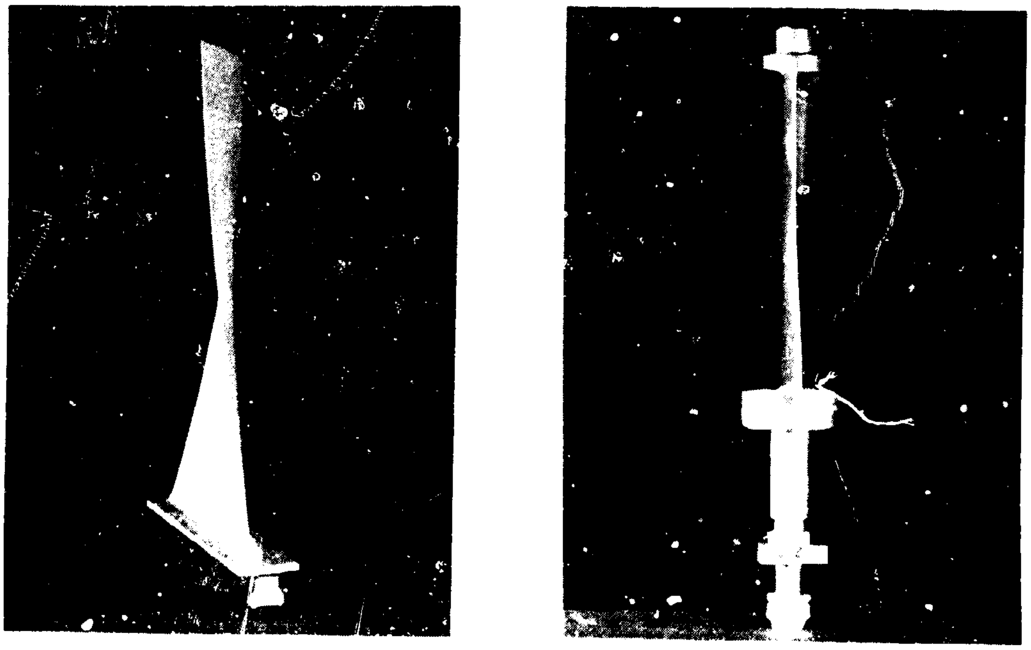


Figure 12 Multiple-Circular-Arc Airfoil Definitions



First-Stage Blade

First-Stage Vane



Second Stage Blade

Second Stage Vane

Figure 13 Photographs of Blades and Vanes

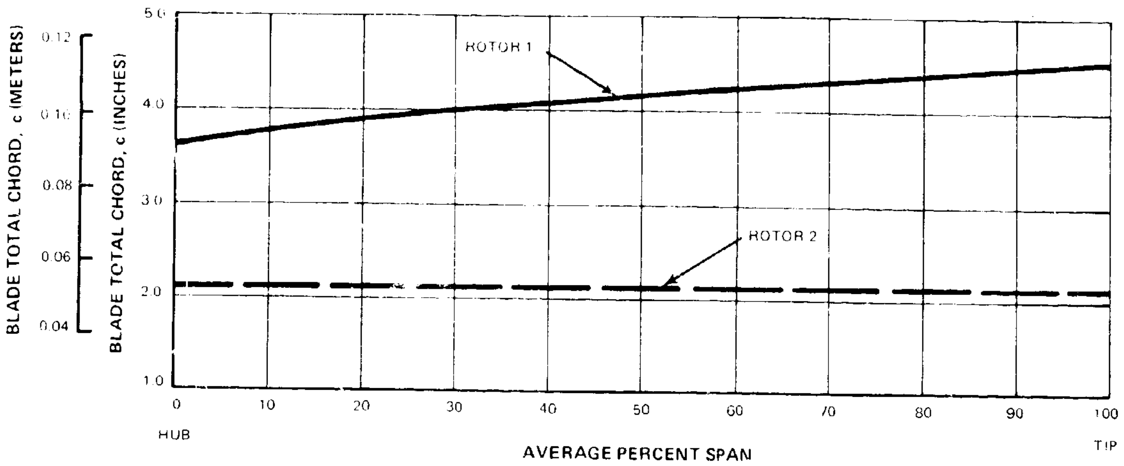


Figure 14 Rotor Blade Chords Versus Span

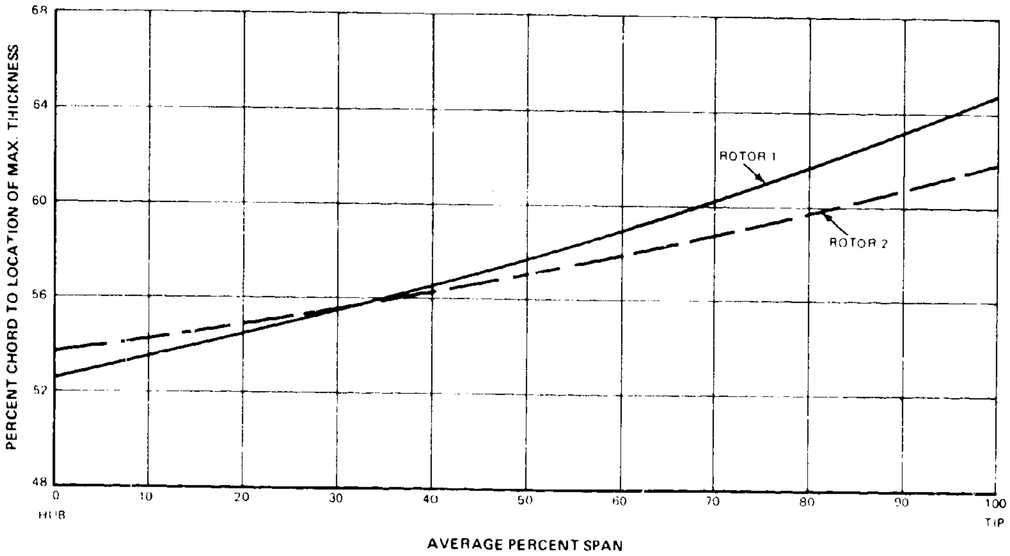


Figure 15 Chordwise Location of Airfoil Maximum Thickness Versus Span for Rotors

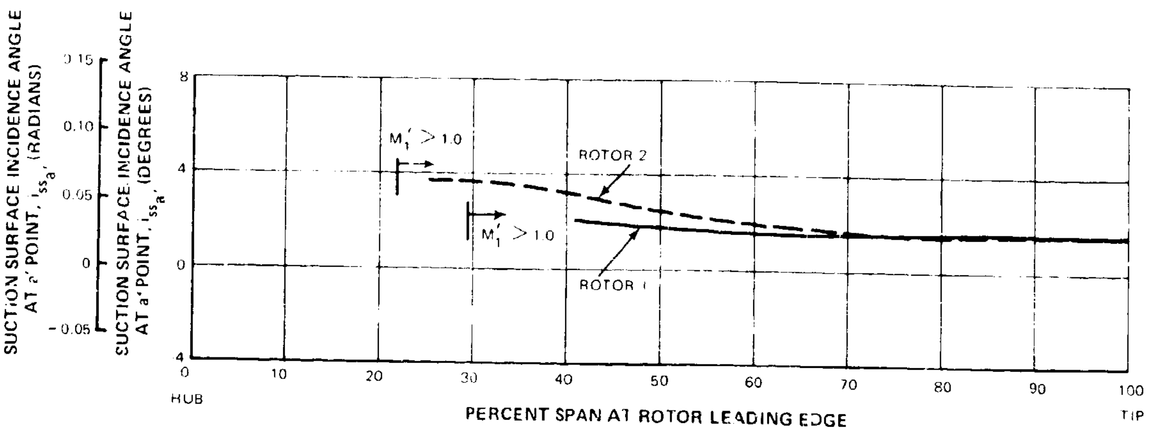


Figure 16 Rotor Blade Suction Surface Incidence Angle at a' Versus Span

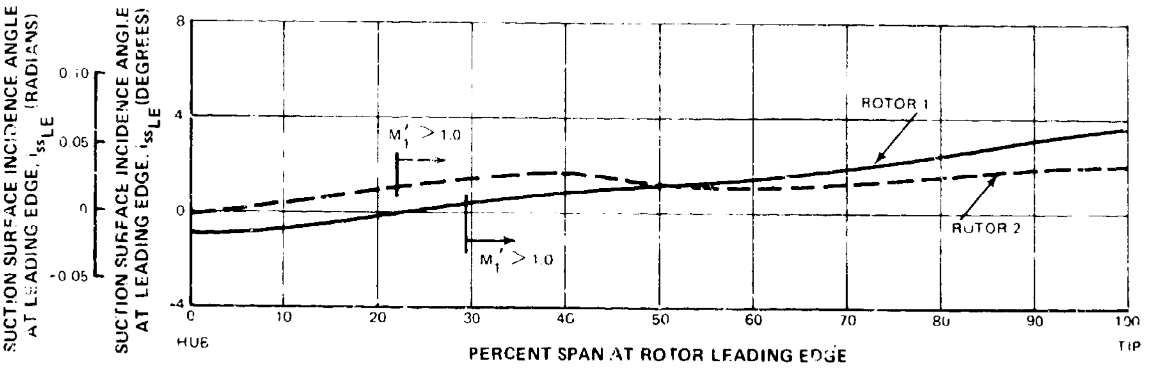


Figure 17 Rotor Blade Suction Surface Incidence Angle at Leading Edge Versus Span

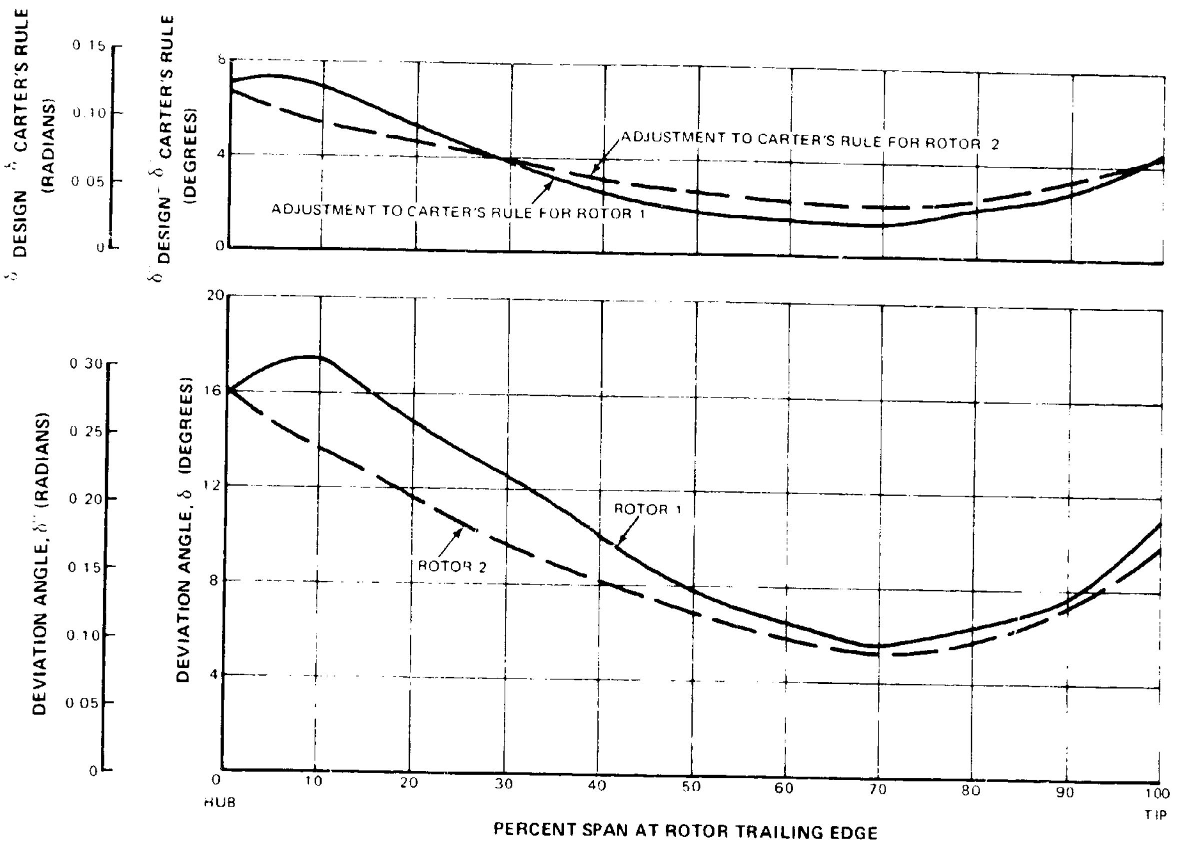


Figure 18 Rotor Blade Deviation Angles Versus Span

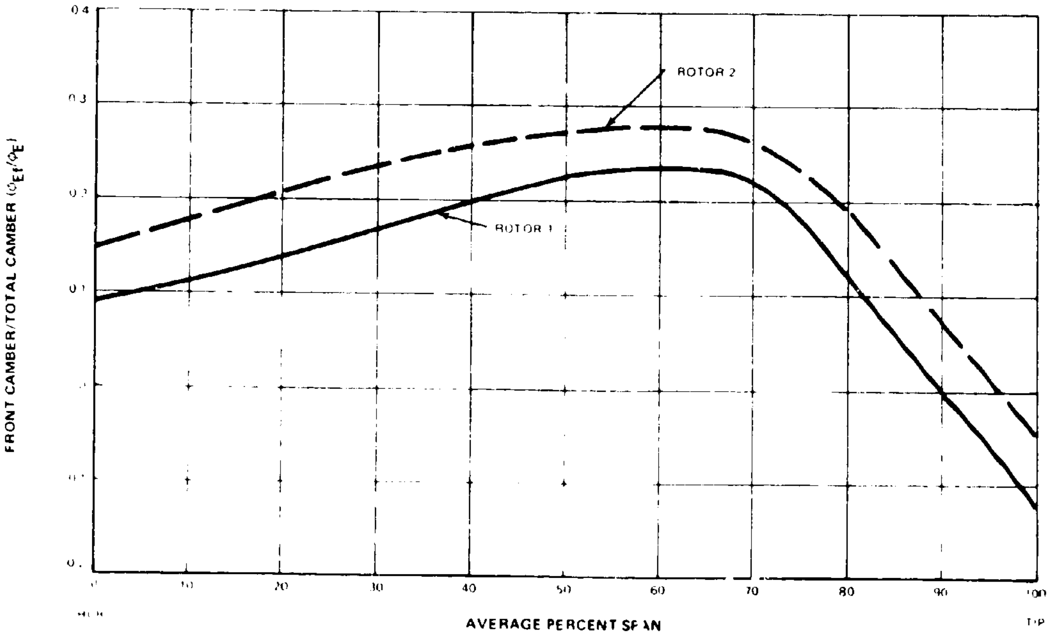


Figure 19 Rotor Front-Camber/Total-Camber Ratio Versus Span

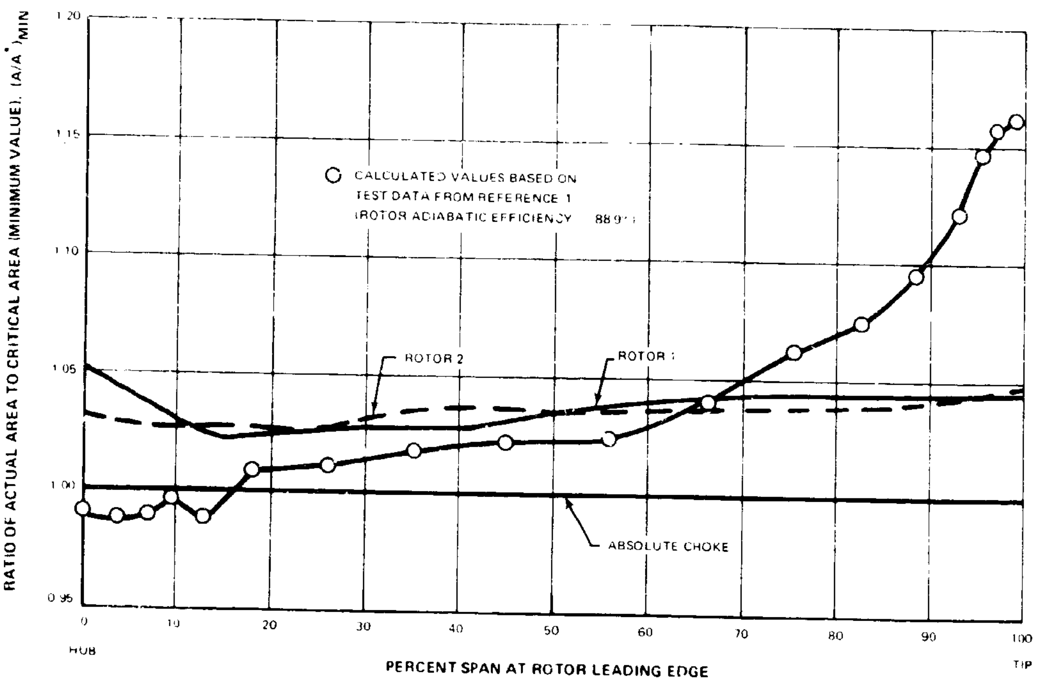


Figure 20 Minimum Rotor Channel Area Ratios Versus Span

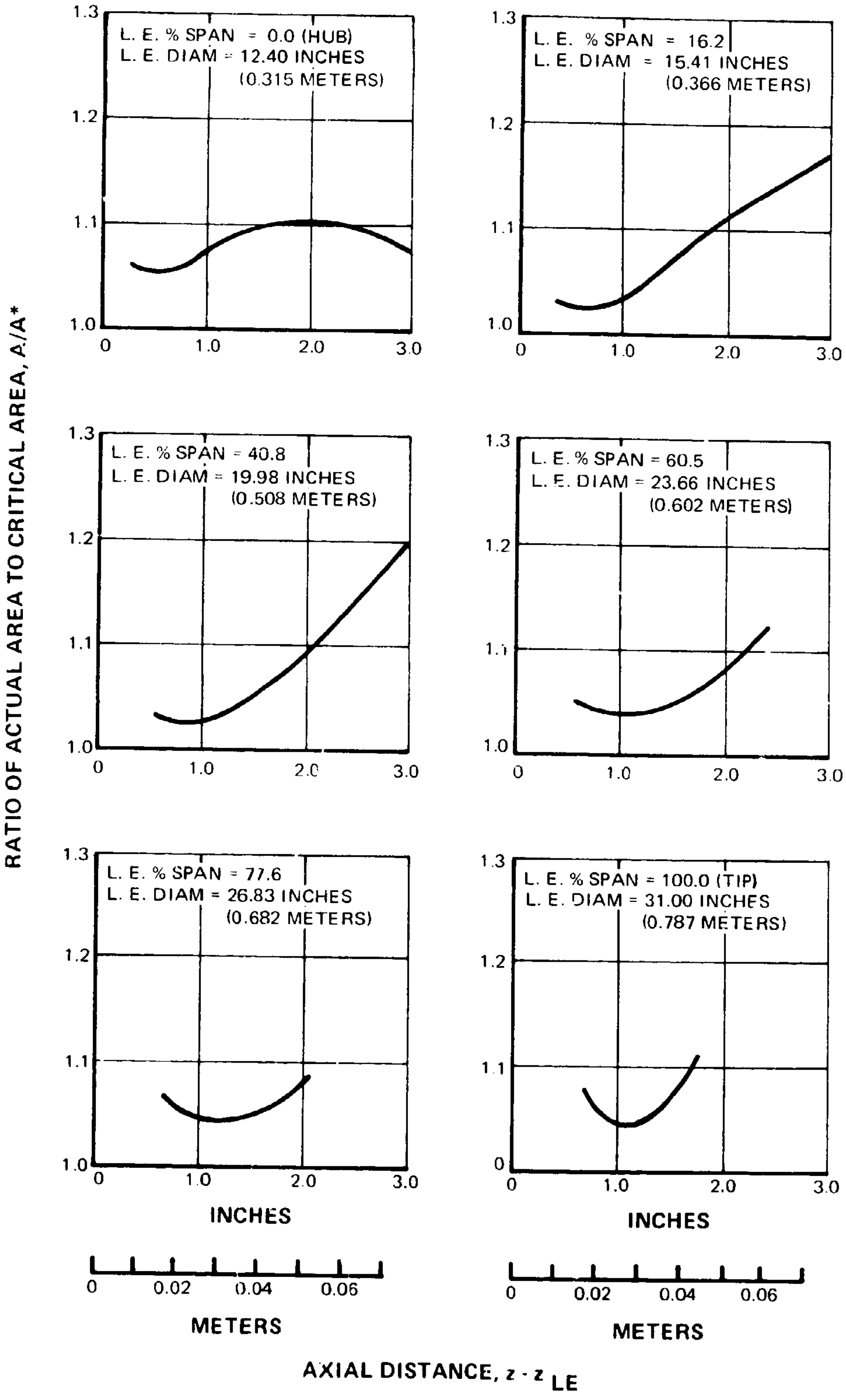


Figure 21 Rotor 1 Channel Area Ratios Versus Axial Distance

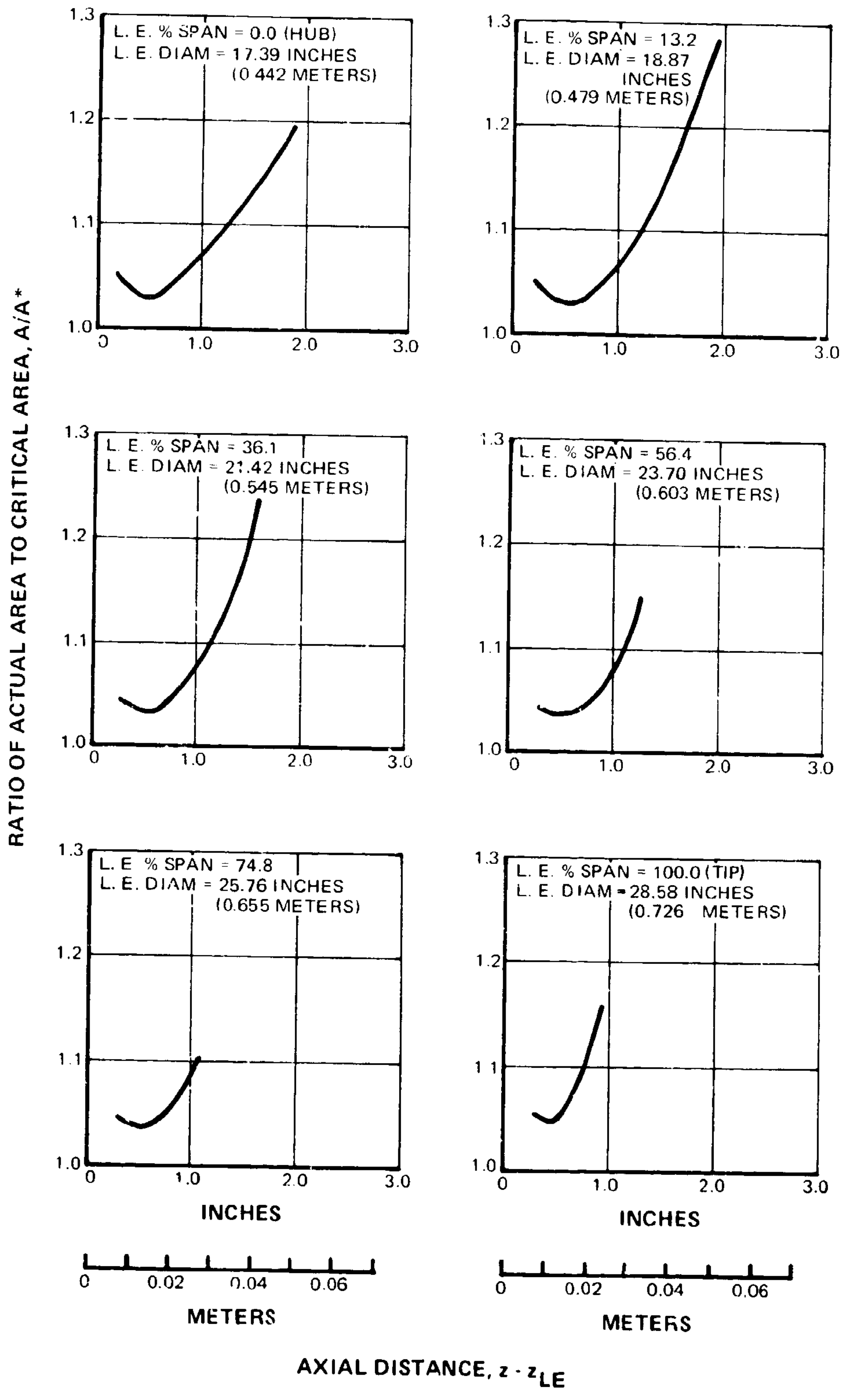


Figure 22 Rotor 2 Channel Area Ratios Versus Axial Distance

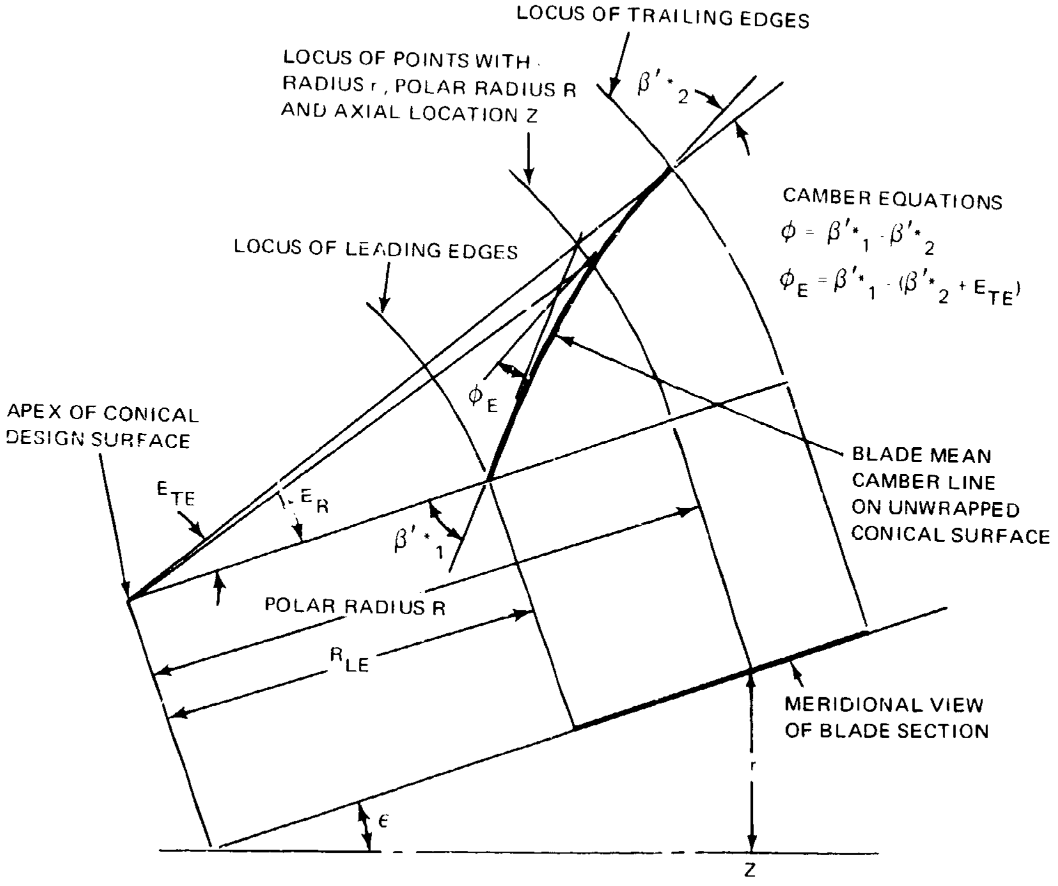


Figure 23 Meridional View and Polar Representation of Blade Mean-Camber-Line

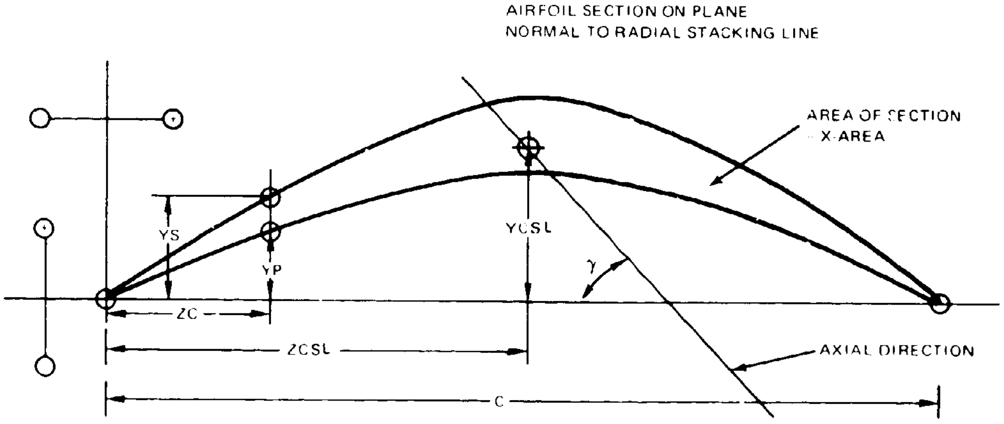


Figure 24 Airfoil Coordinate Definitions for Manufacturing Sections

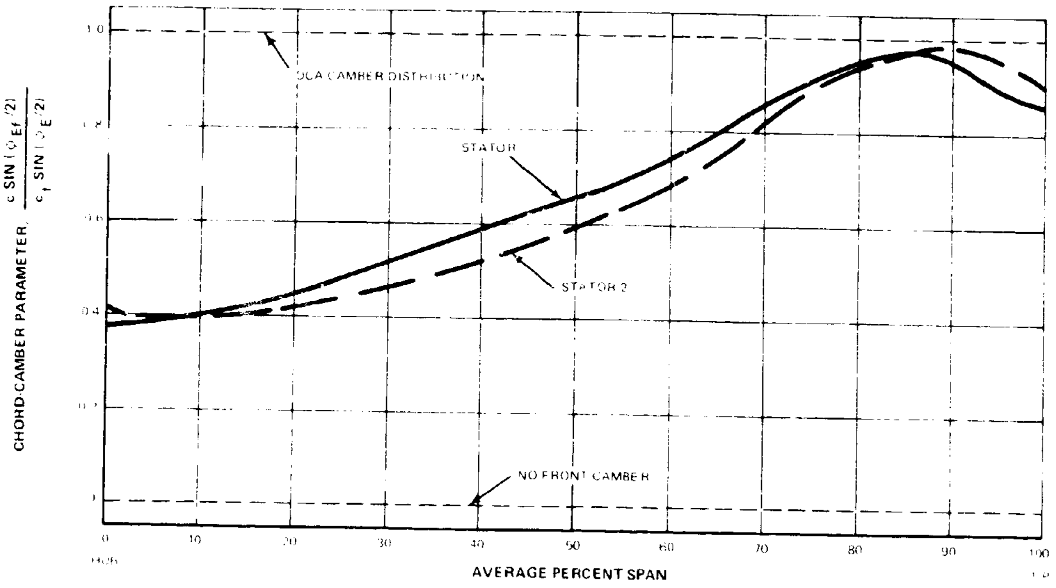


Figure 25 Stator Chord-Camber Parameter Versus Span

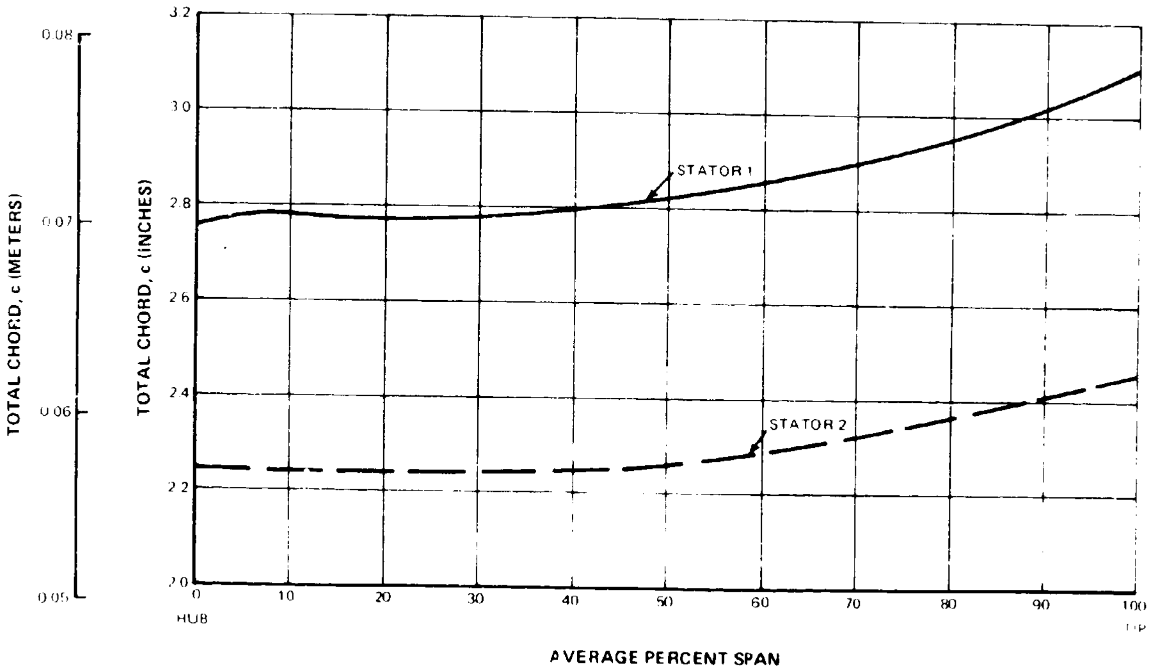


Figure 26 Stator Chords Versus Span

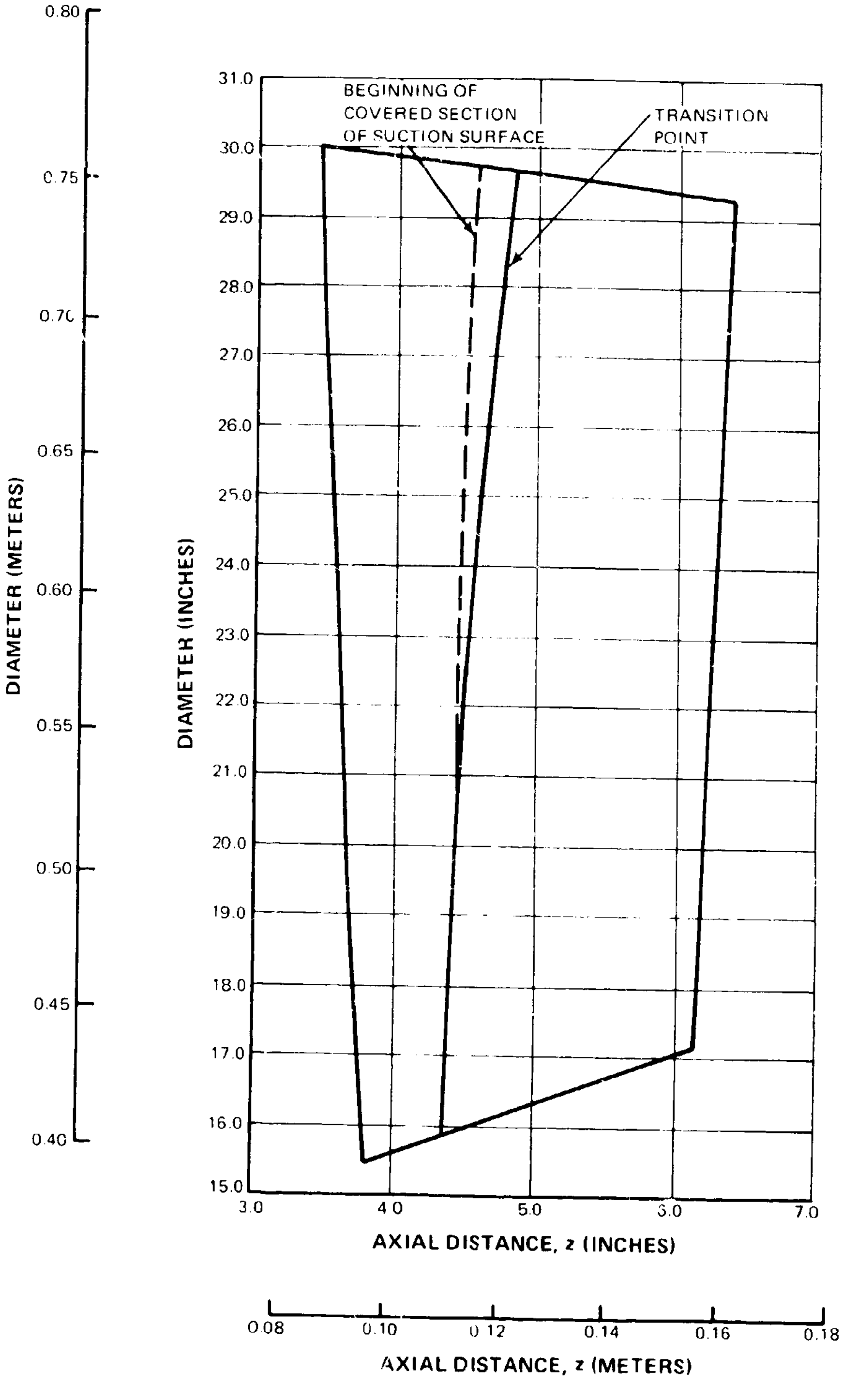


Figure 27 Axial Projection of Stator 1

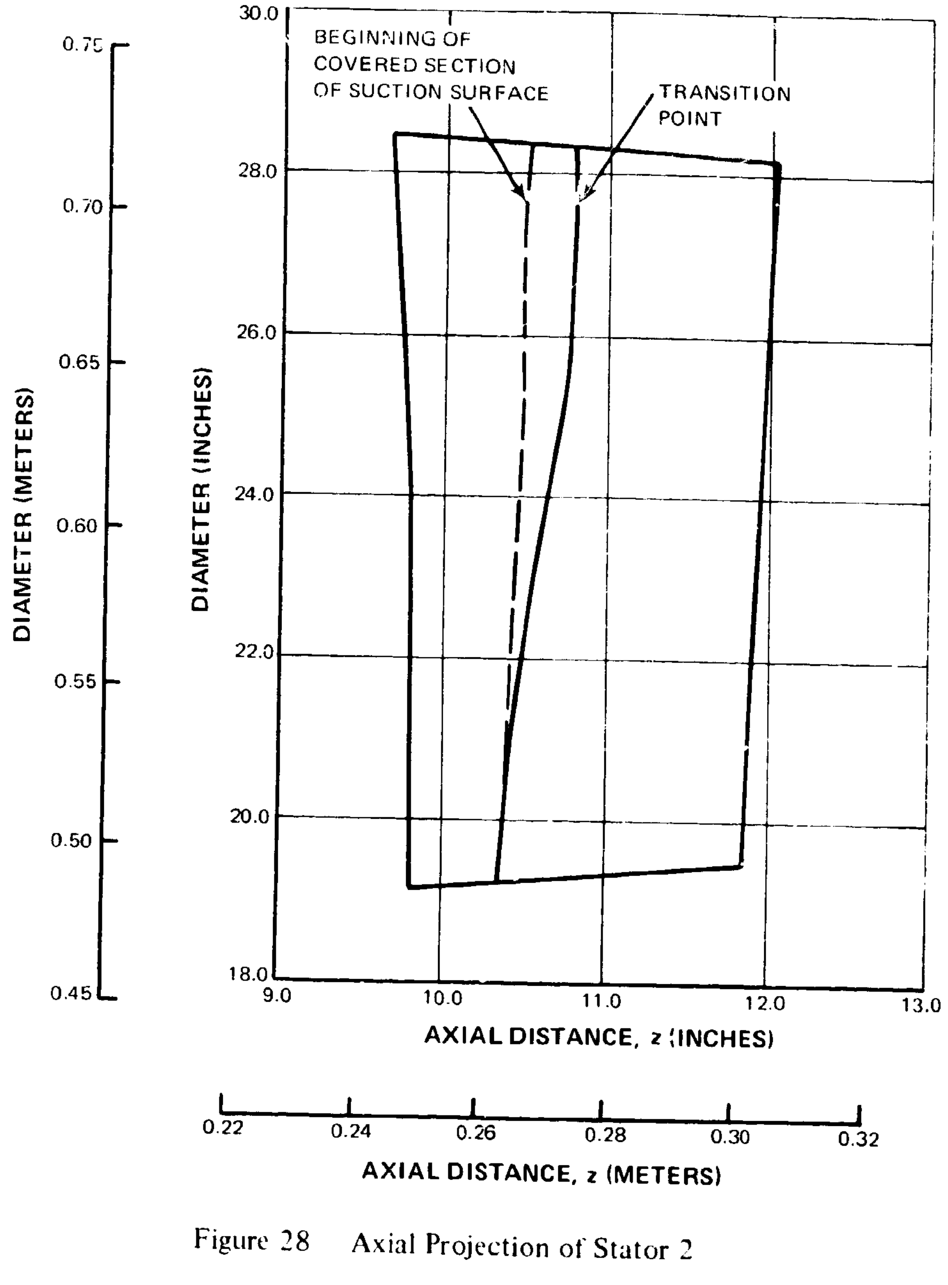


Figure 28 Axial Projection of Stator 2

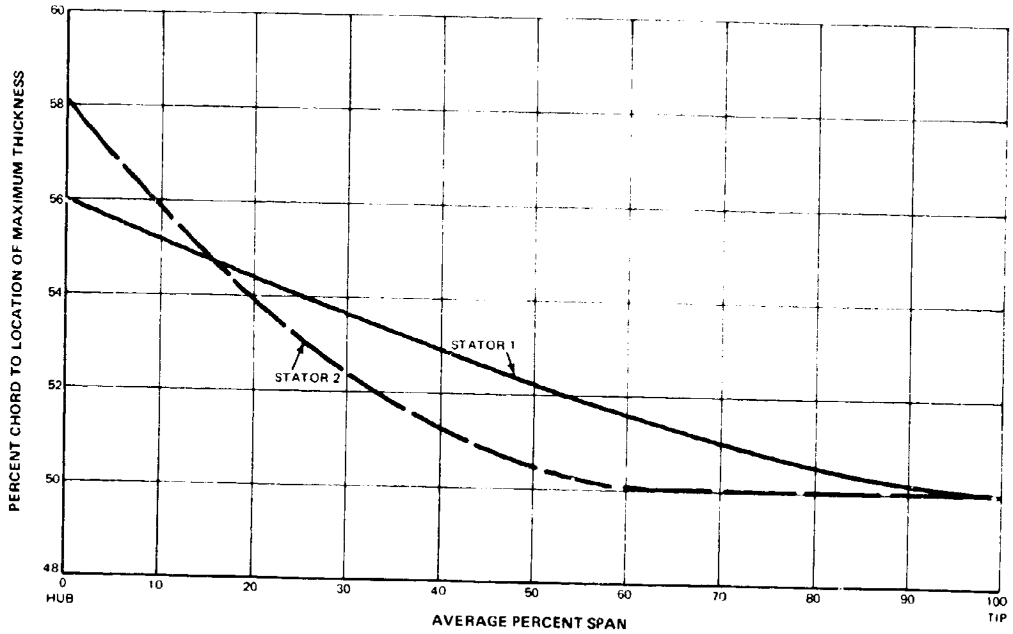


Figure 29 Chordwise Location of Airfoil Maximum Thickness for Stators

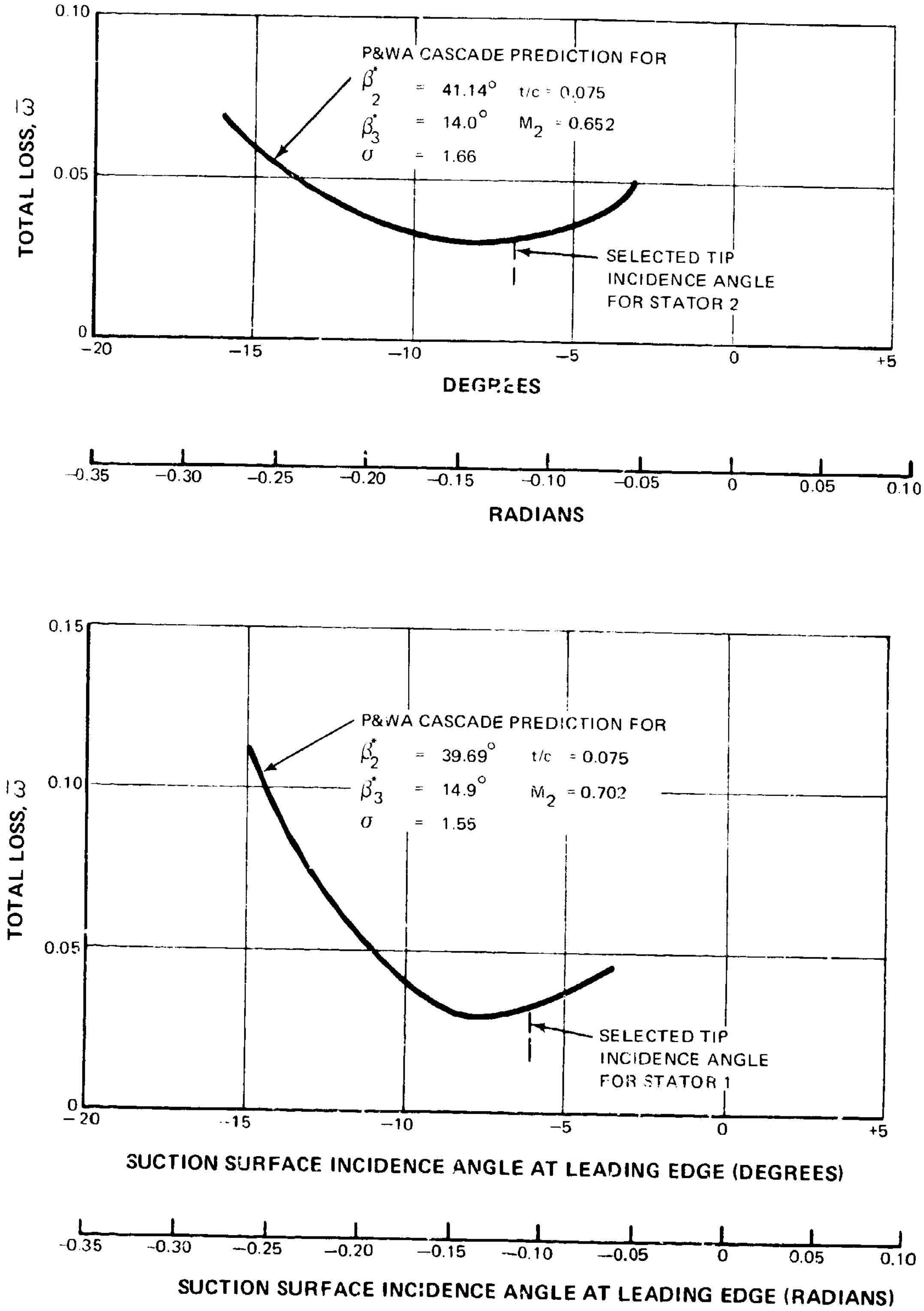


Figure 30 Cascade Loss Predictions and Incidence Angle Selections for Stator Tip Sections

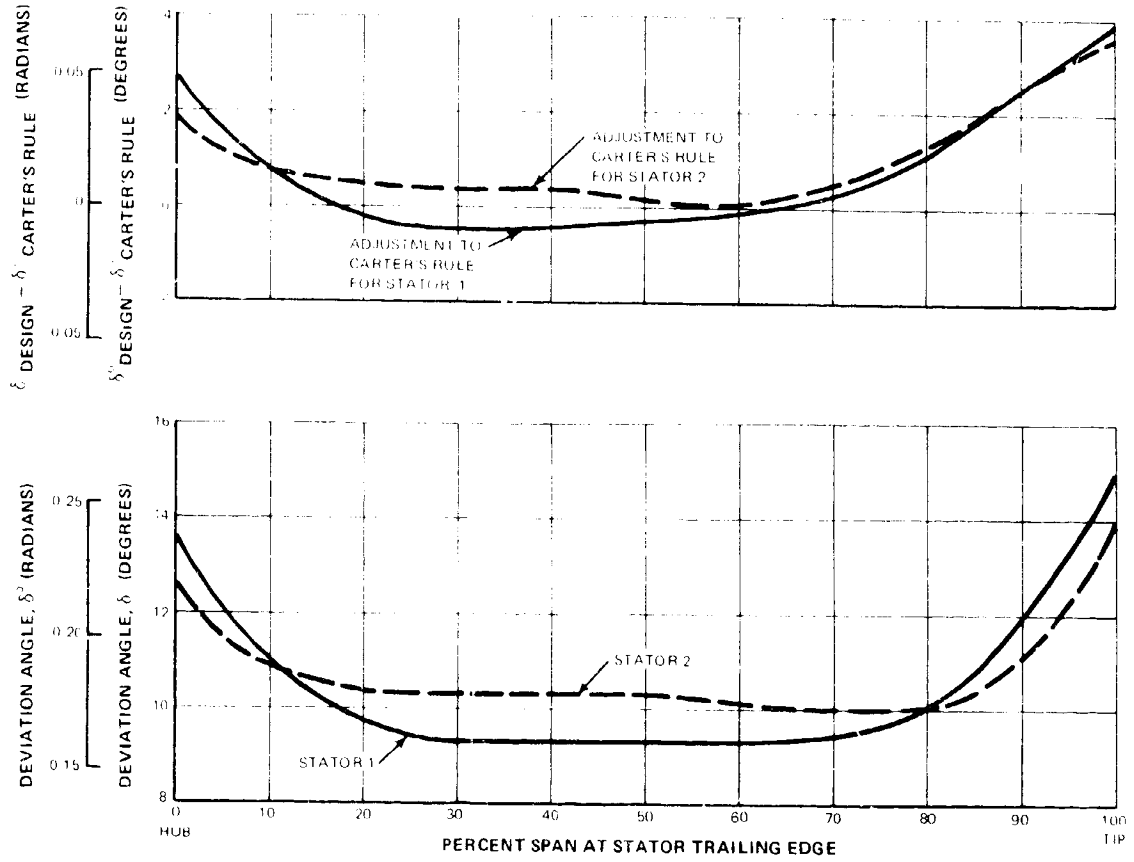


Figure 31 Stator Deviation Angles Versus Span

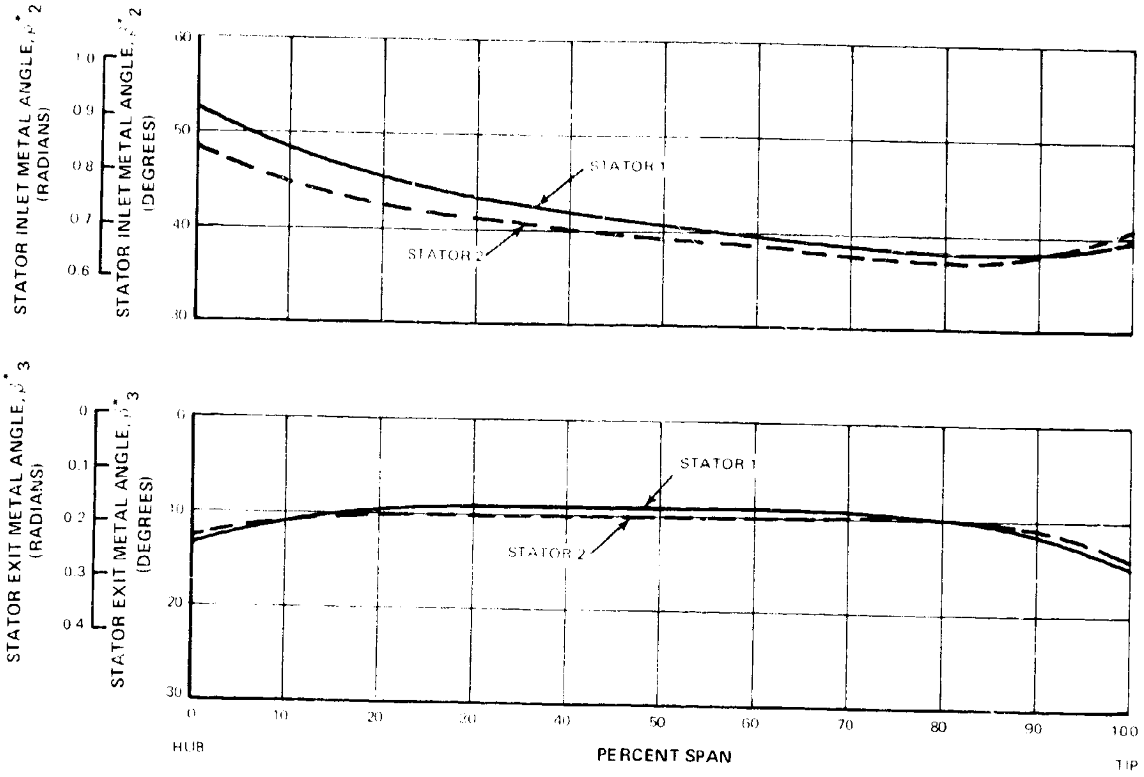


Figure 32 Stator Inlet and Exit Metal Angles Versus Span

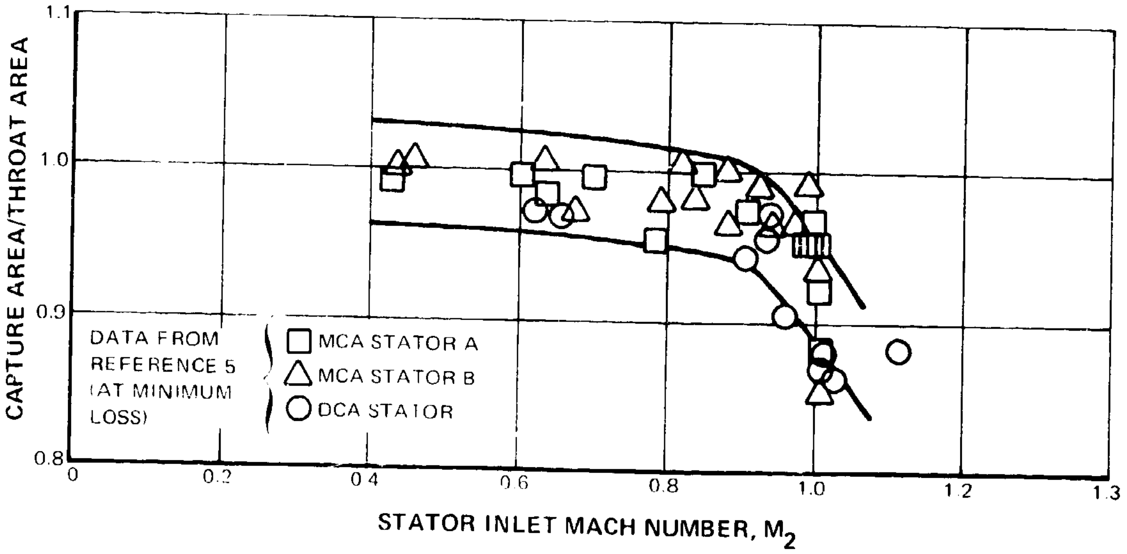


Figure 33 Stator Capture-Area/Throat-Area Correlation at Minimum Loss

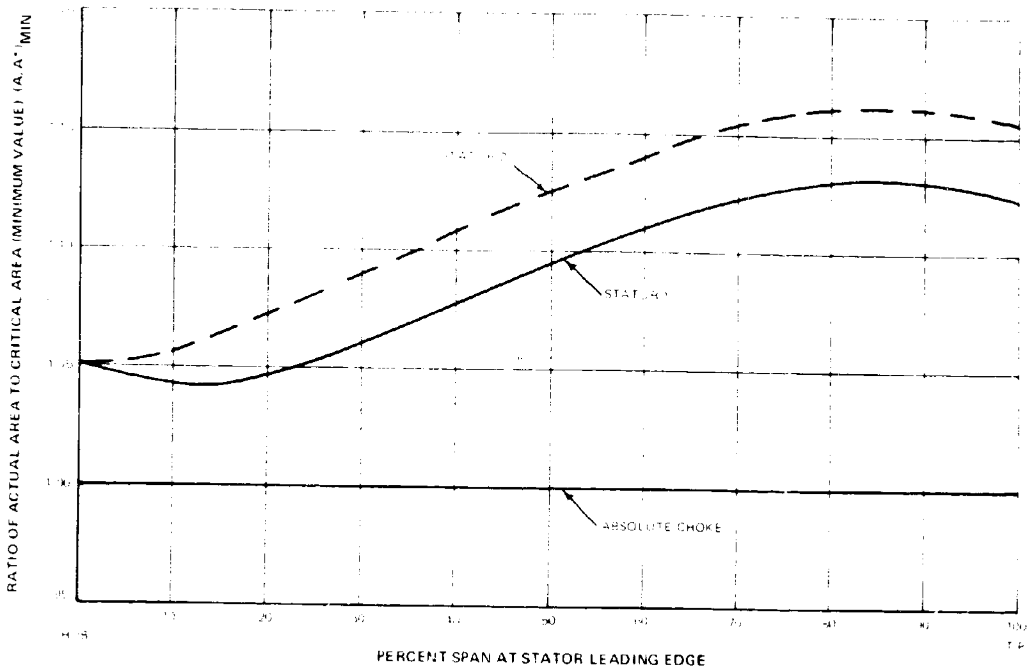


Figure 34 Minimum Stator Channel Area Ratios Versus Span

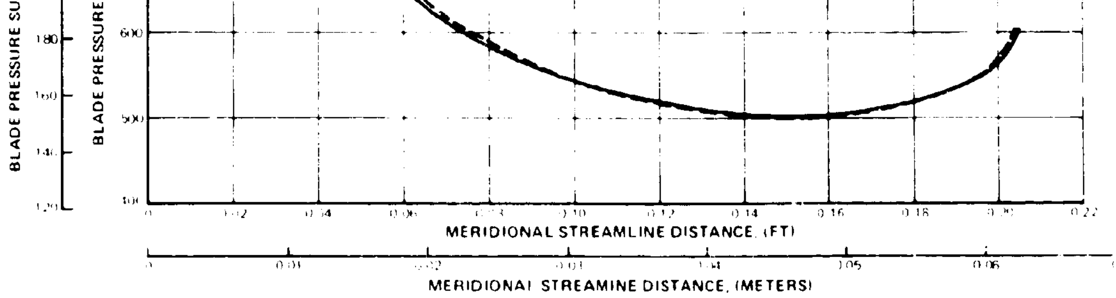


Figure 35 Stator 1 Pressure Surface Velocity Versus Streamline Distance

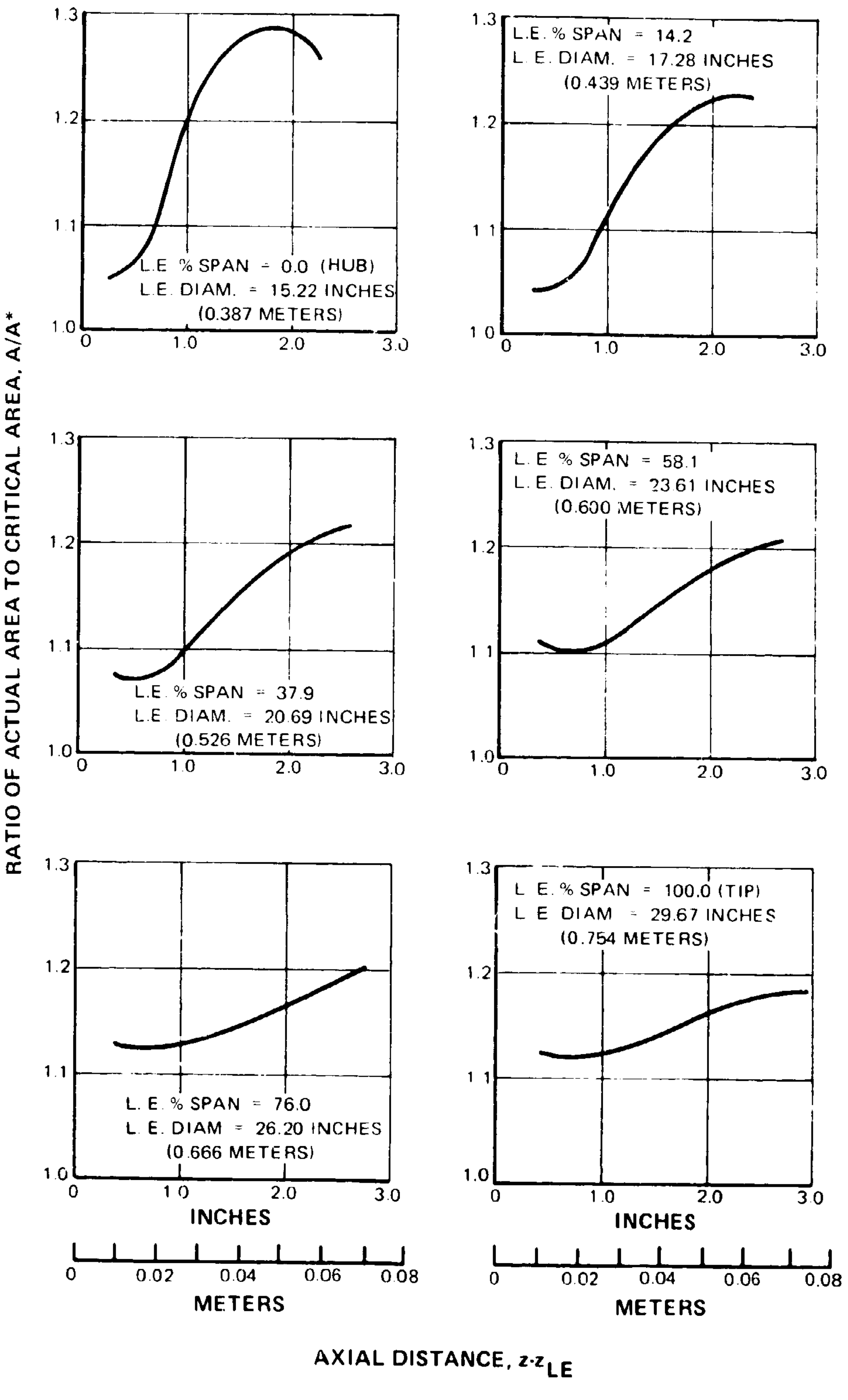


Figure 36 Stator 1 Channel Area Ratios Versus Axial Distance

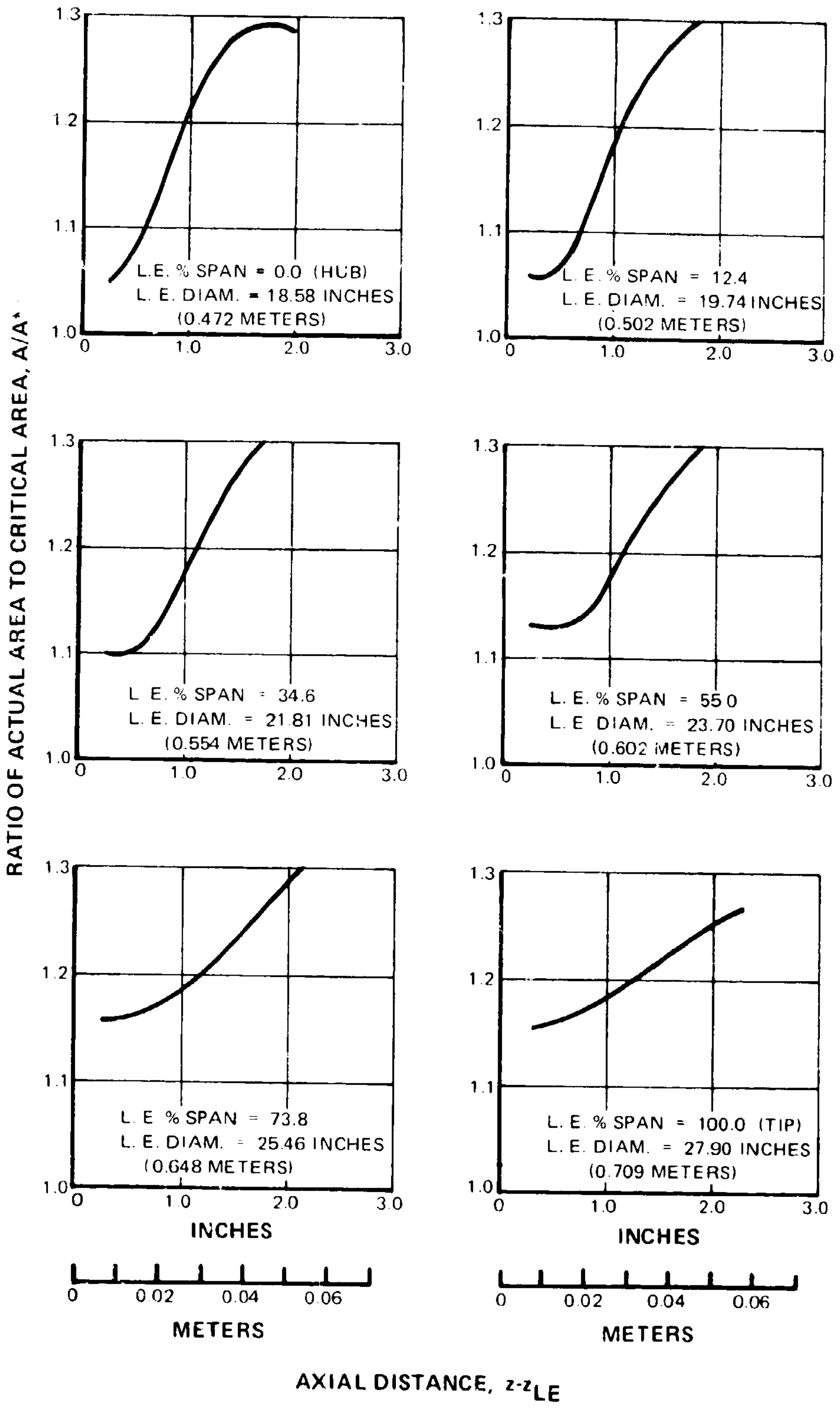


Figure 37 Stator 2 Channel Area Ratios Versus Axial Distance

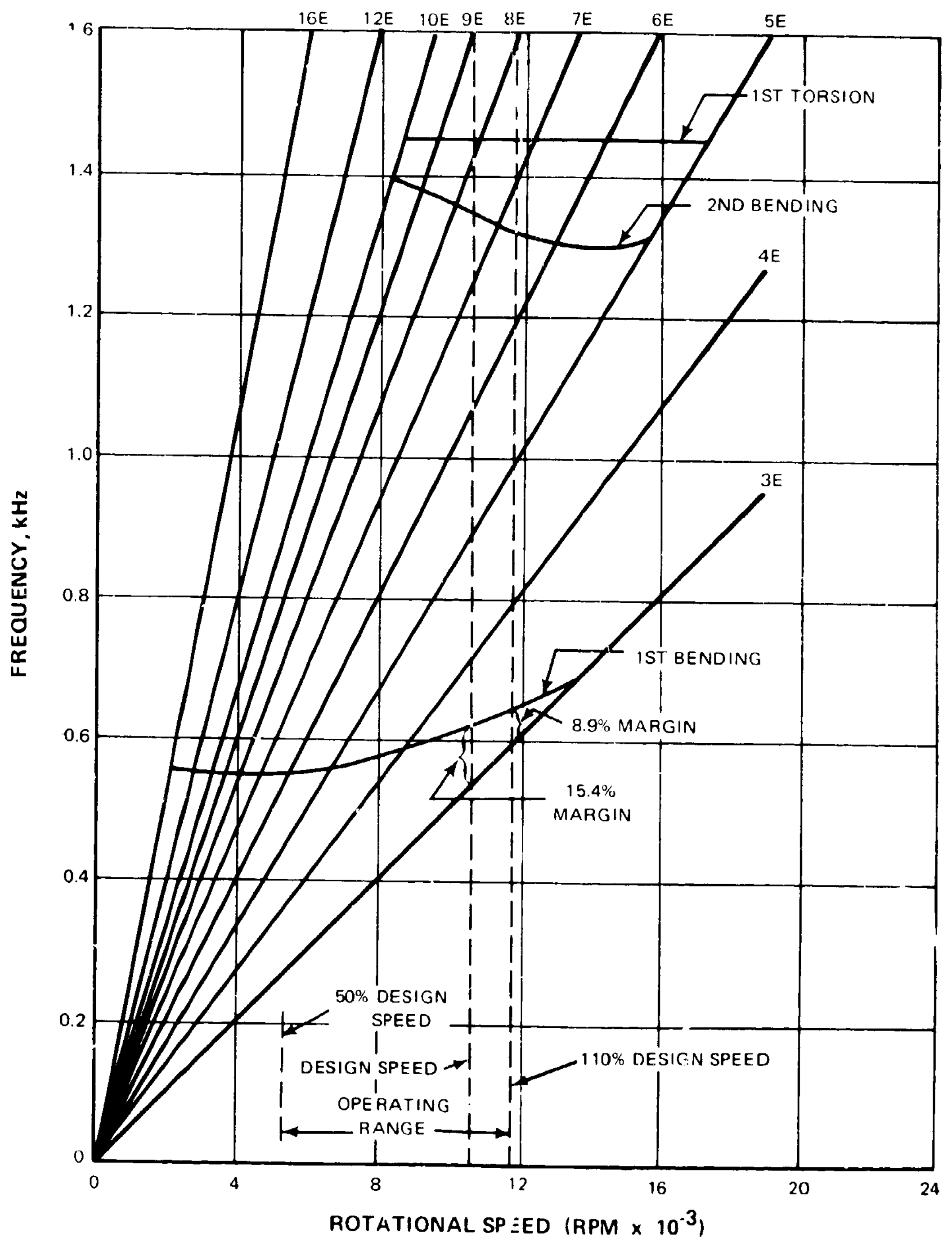


Figure 38 Resonance Diagram for Rotor 1

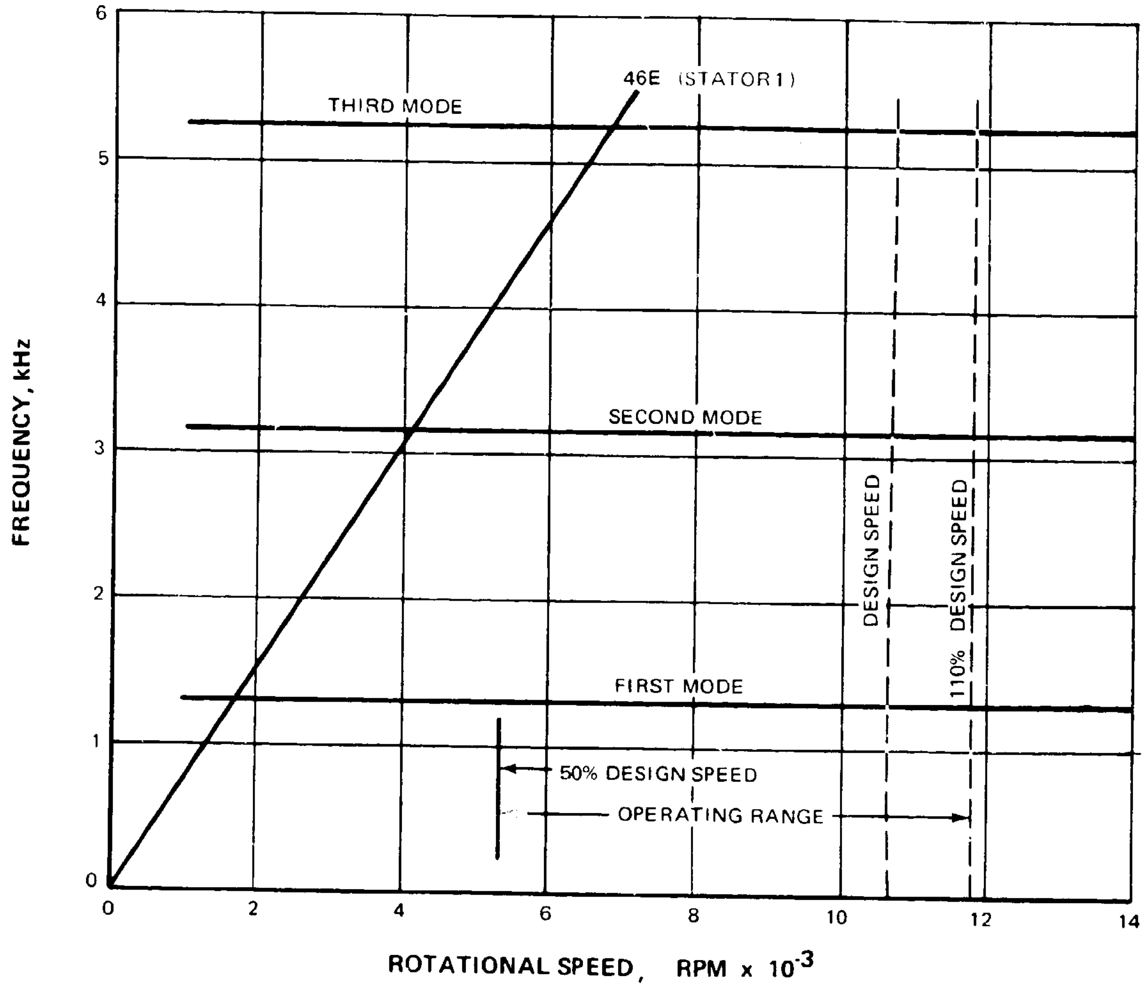
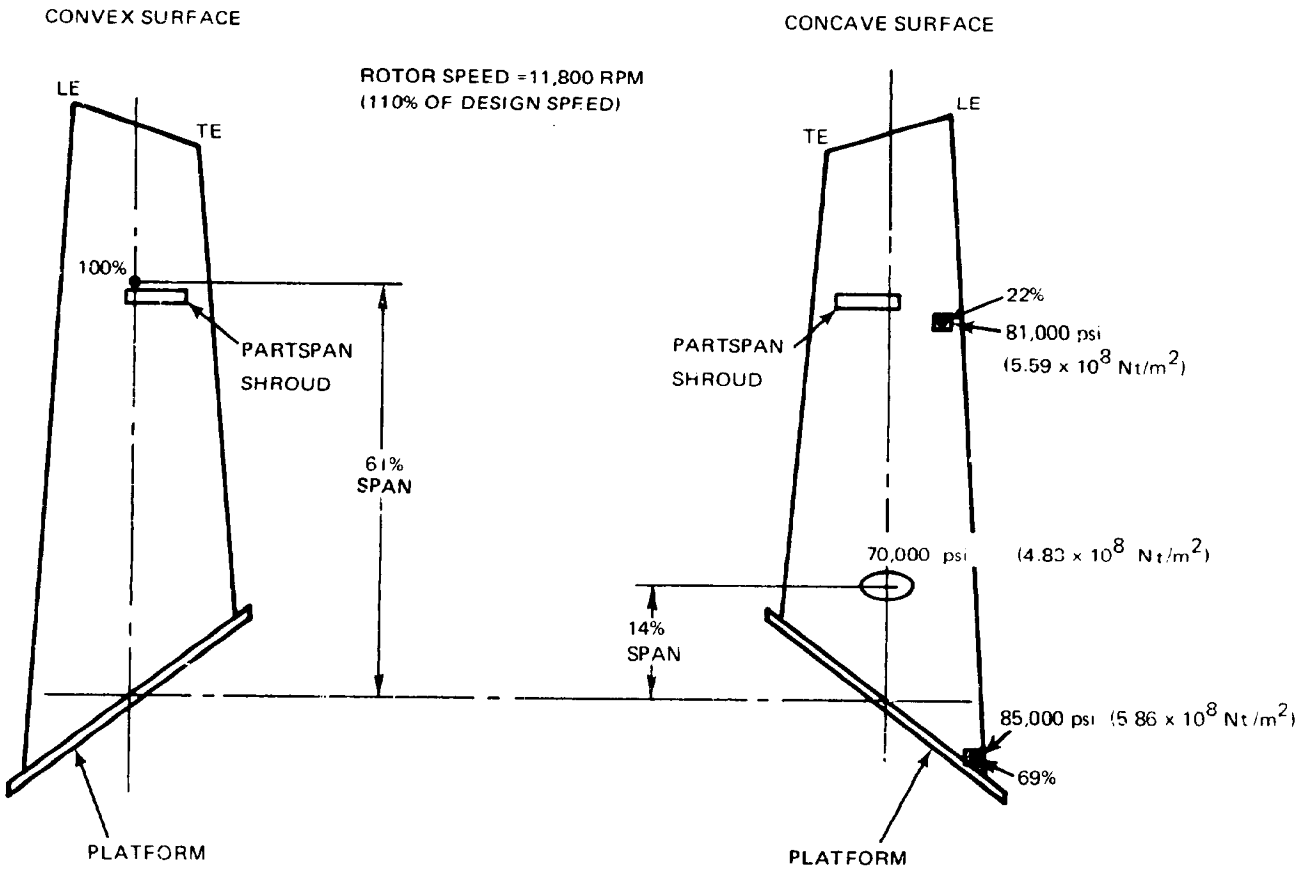


Figure 39 Tip Mode Frequencies - Rotor 1



○ AREA OF HIGHEST STEADY STRESS (COMBINED CENTRIFUGAL AND UNTWIST STRESSES)

☐ AREAS OF HIGH LOCAL FIBER STEADY STRESS
(FROM PAST EXPERIENCE SHOULD NOT PRESENT A PROBLEM)

● AREAS OF HIGH VIBRATORY STRESS (% OF MAX) IN FIRST BENDING MODE

Figure 40 Locations of High Stress - Rotor 1

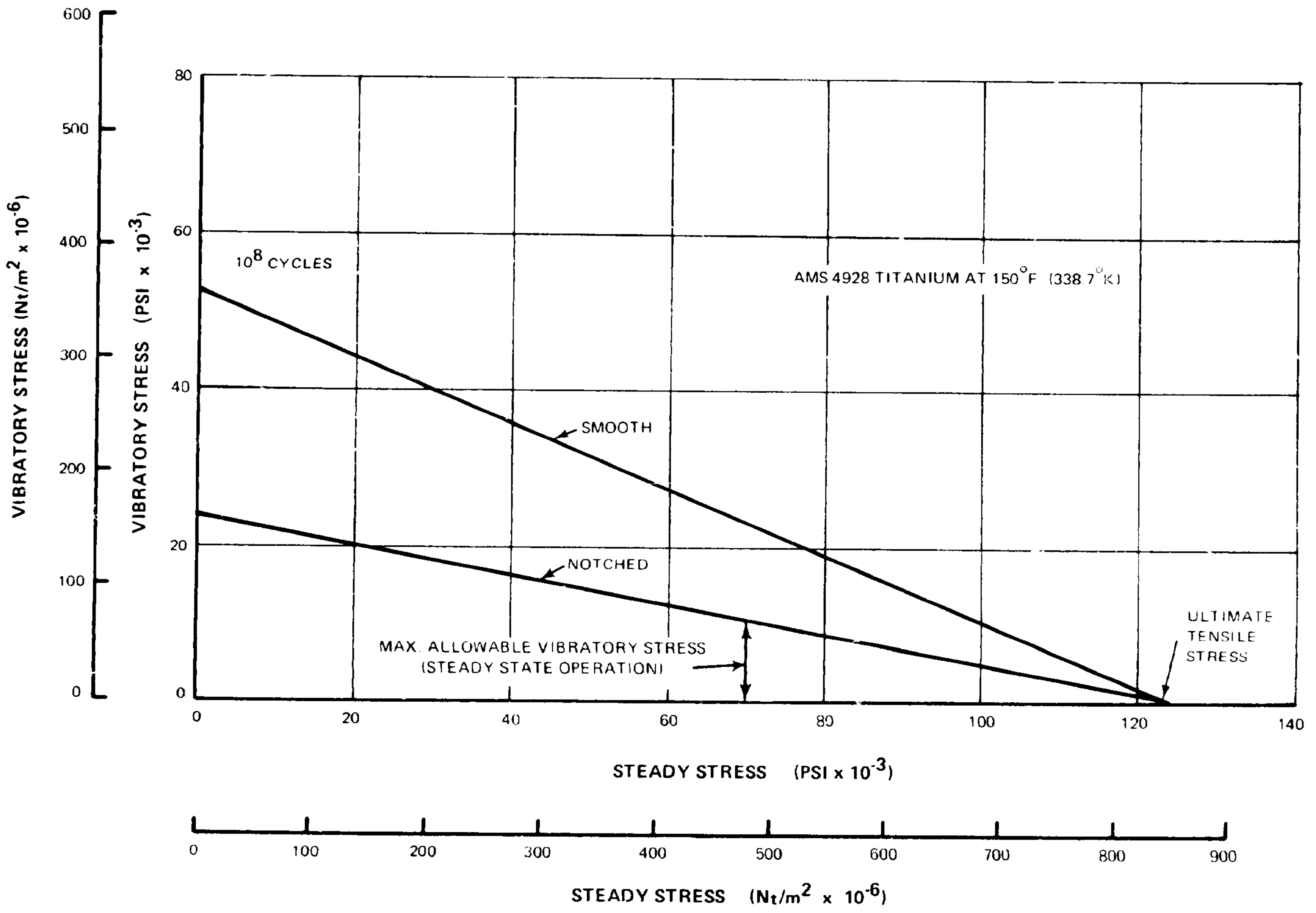


Figure 41 Goodman Diagram for Rotor 1

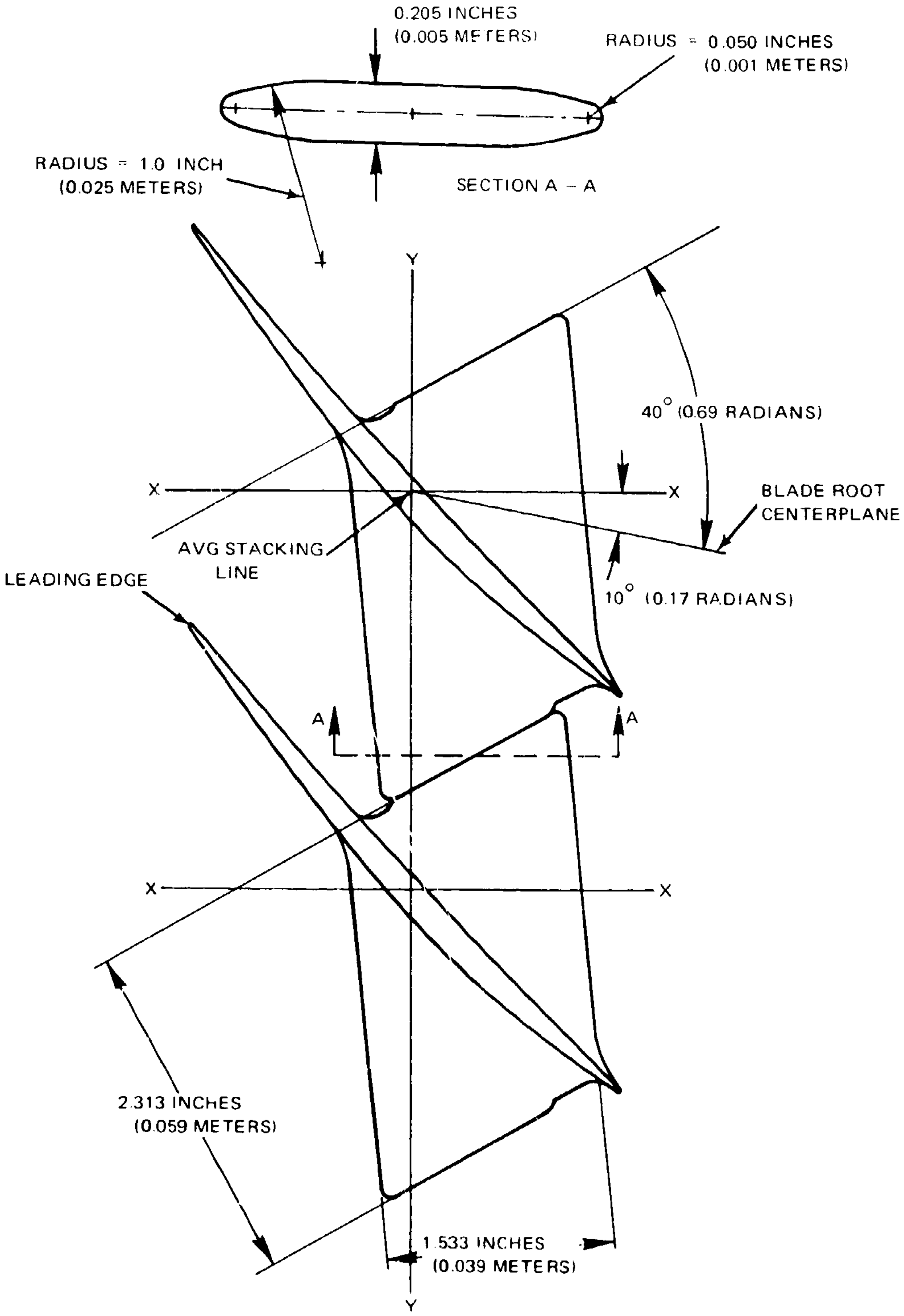


Figure 42 Partspan Shroud Rotor 1 (Not to Scale)

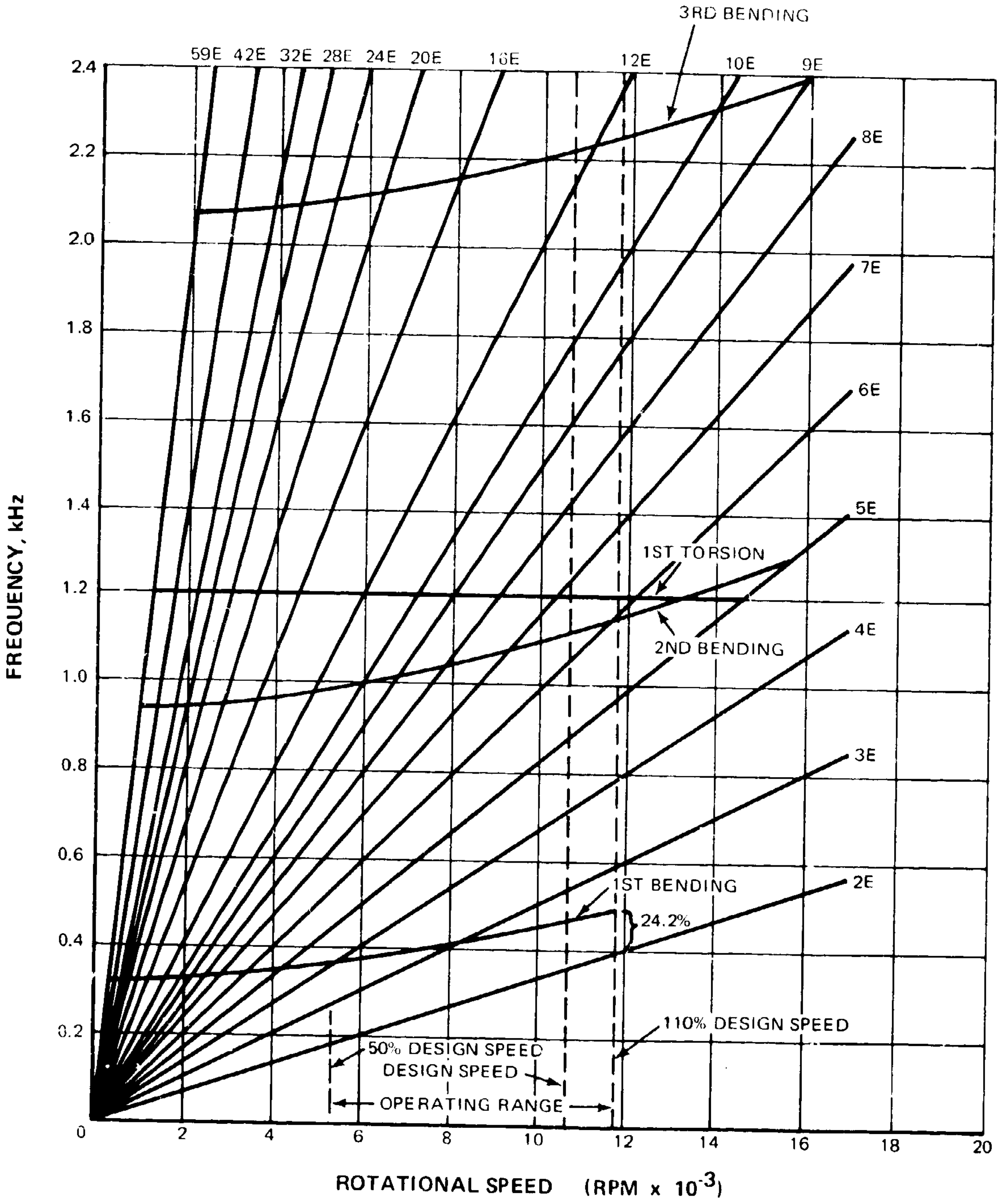


Figure 43 Resonance Diagram for Rotor 2

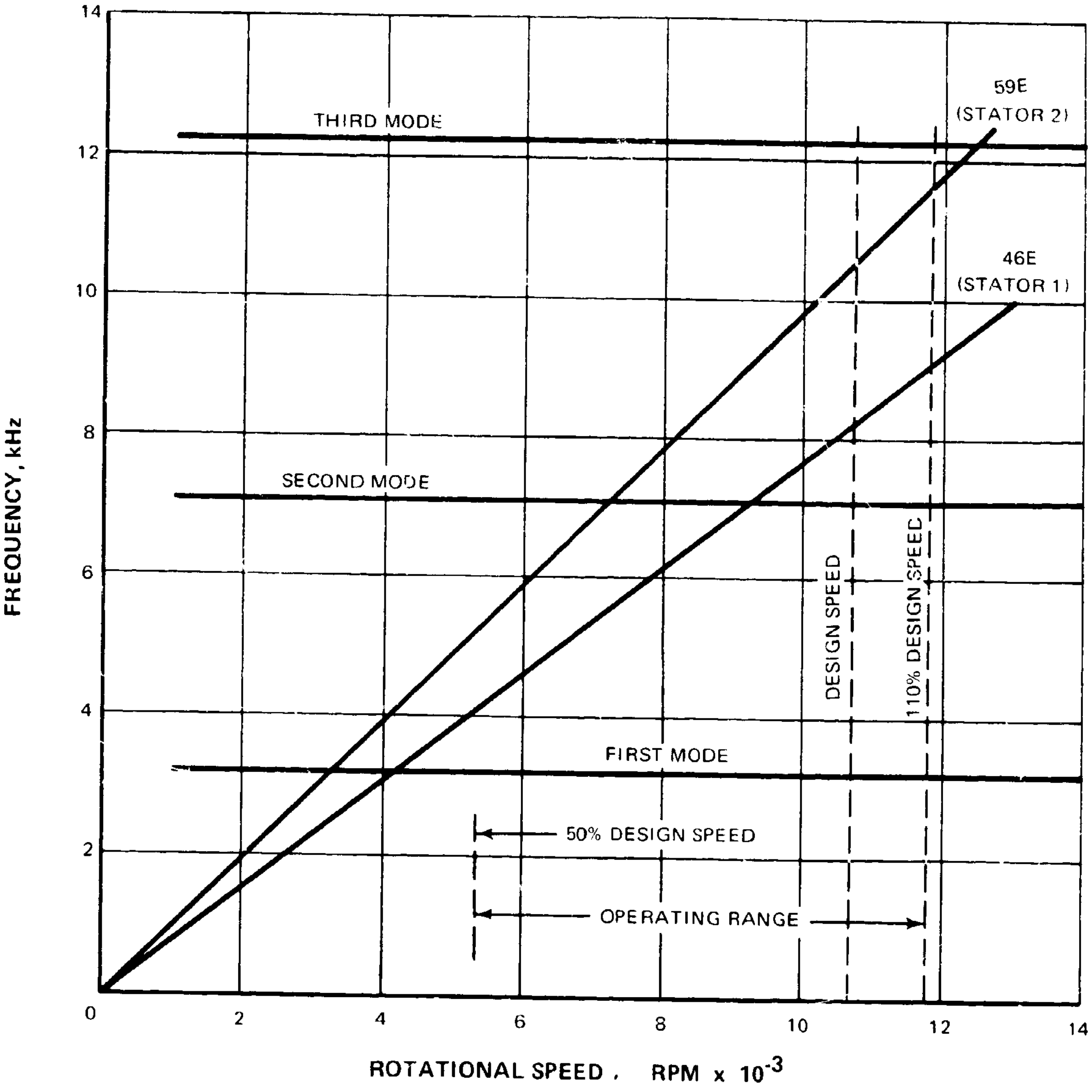


Figure 44 Tip Mode Frequencies – Rotor 2

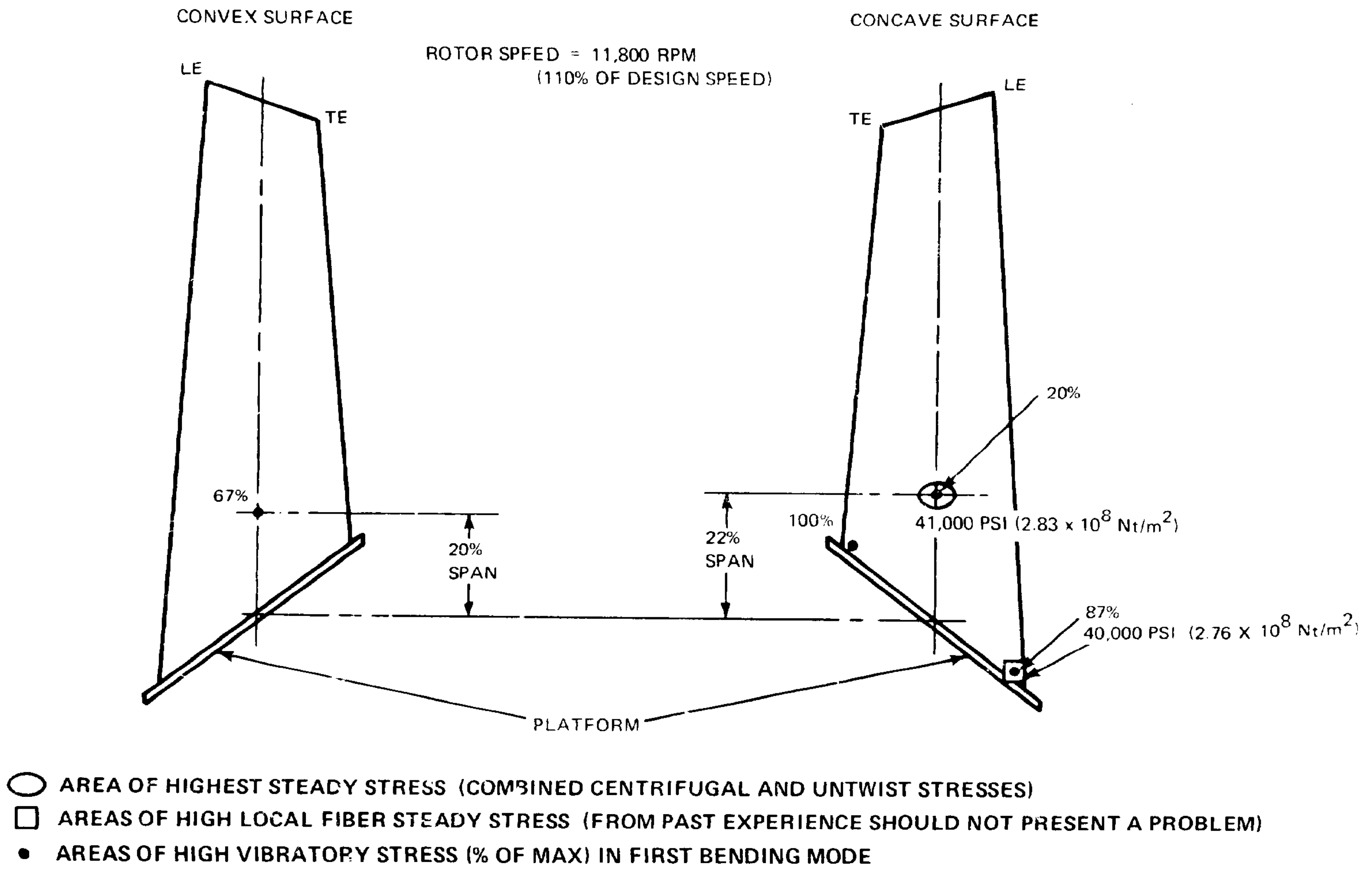


Figure 45 Locations of High Stress - Rotor 2

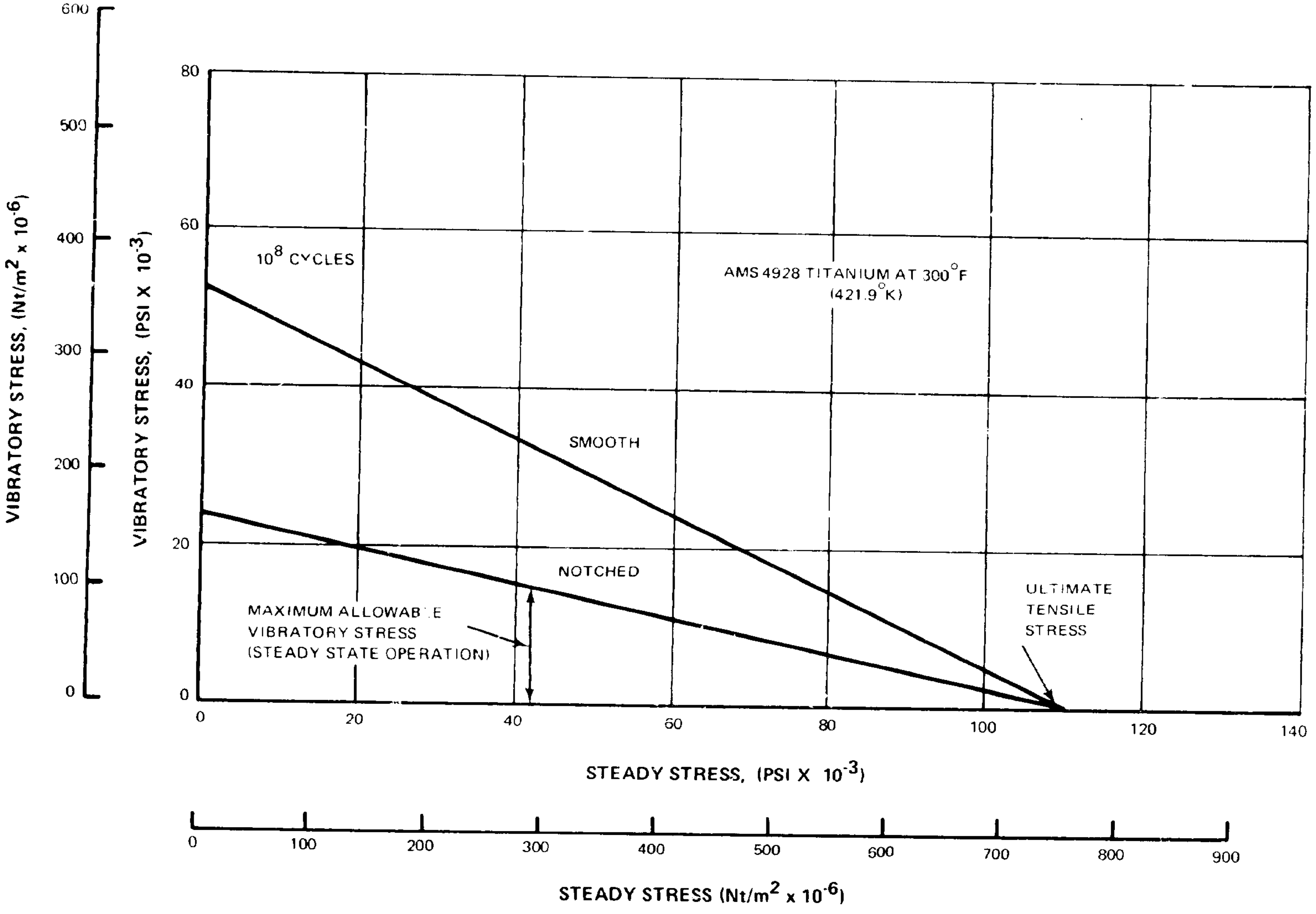


Figure 46 Goodman Diagram for Rotor 2

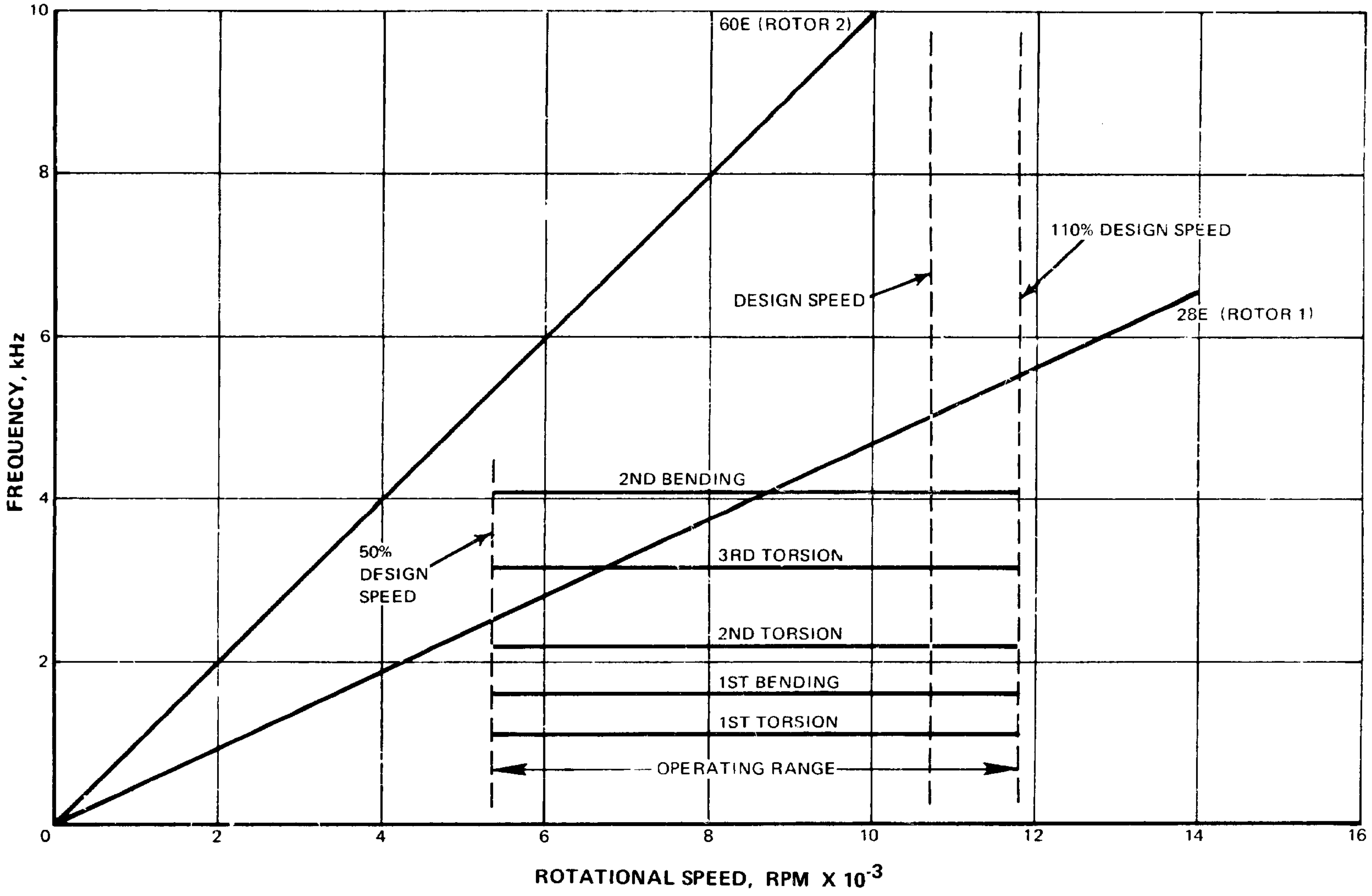


Figure 47 Resonance Diagram for Stator 1

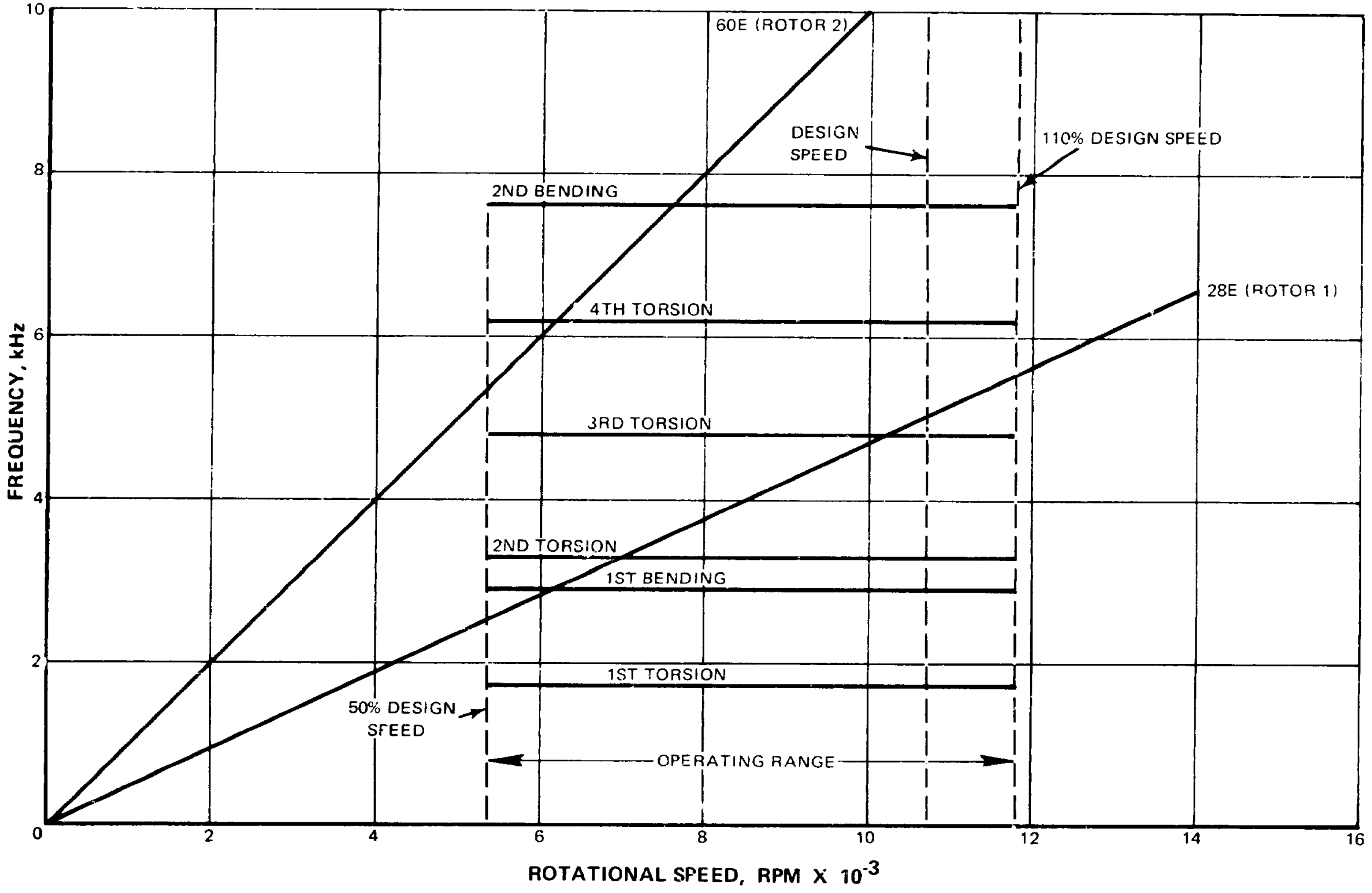
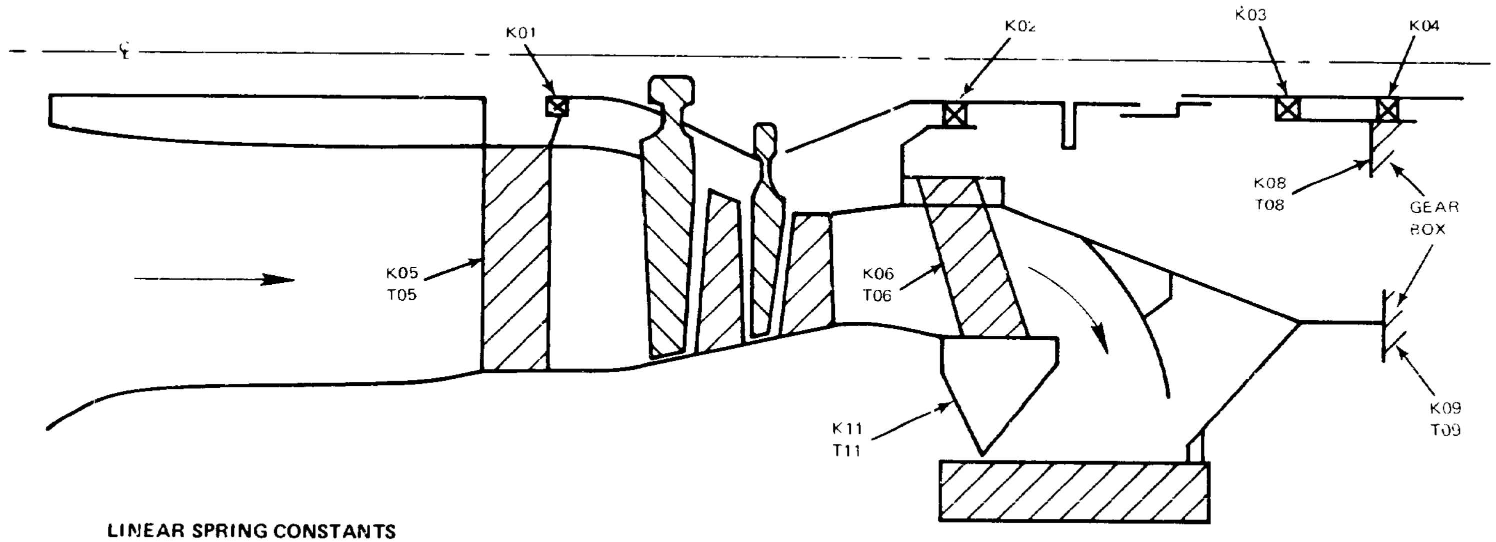


Figure 48 Resonance Diagram for Stator 2



LINEAR SPRING CONSTANTS

	LB/IN X 10^{9}	NT/M X 10^{-10}
K01	.040	.070
K02	.017	.030
K03	.007	.012
K04	.009	.016
K05	.020	.035
K06	19	.33
K08	1.0	1.8
K09	1.0	1.8
K11	18	.32

TORSIONAL SPRING CONSTANTS

	IN-LB/DEGREE X 10^{-7}	M-NT/RADIAN X 10^{-10}
T05	.26	.13
T06	.038	.019
T08	1.7	.89
T09	1.7	.89
T11	2.3	1.1

Figure 49 Spring-Mass Model for Critical Speed Analysis

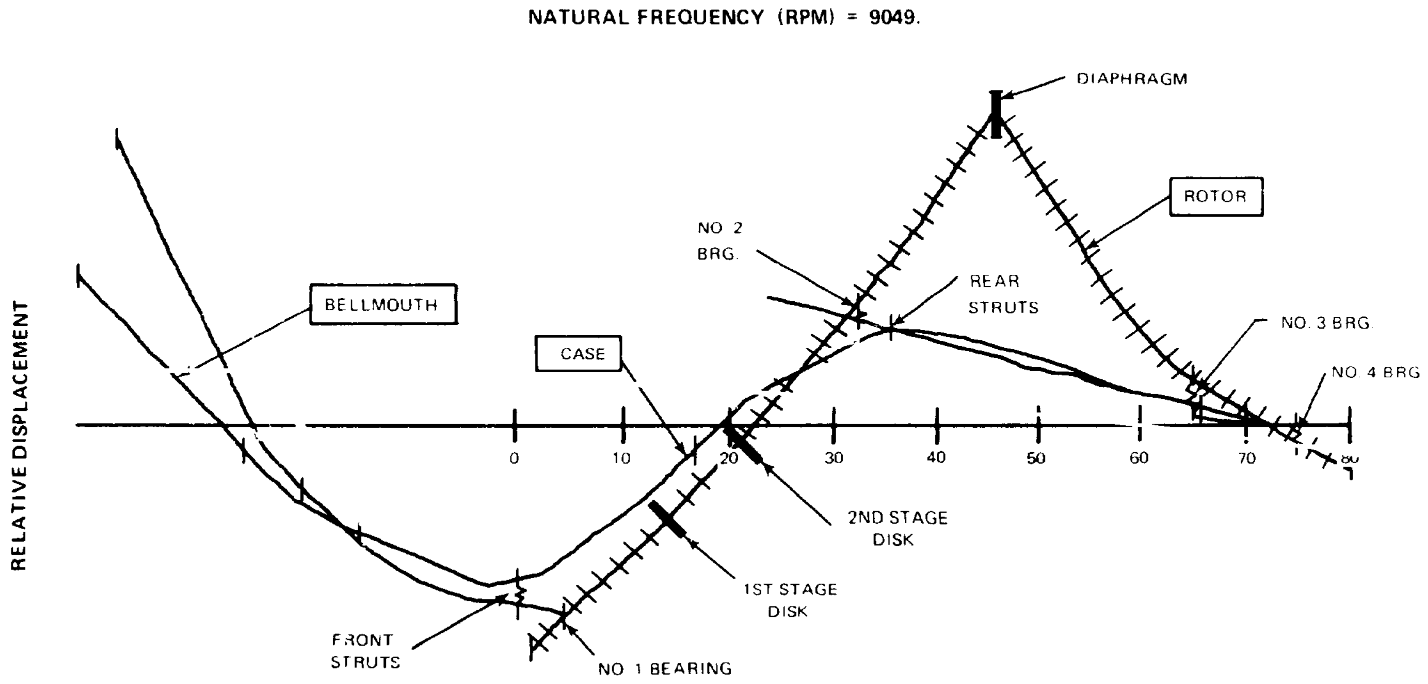


Figure 50 Critical Speed Fourth Mode Shape

APPENDIX A

FLOW FIELD CALCULATION PROCEDURES

The aerodynamic flow field calculation used in this design assumes axisymmetric flow and uses solutions of continuity, energy, and radial equilibrium equations. These equations account for streamline curvature and radial gradients of enthalpy and entropy but neglect viscous terms. Calculations were performed on stations oriented at an angle λ with respect to the axial direction.

The equation of motion is in the form:

$$\frac{1}{2}\frac{\partial V^2{}_m}{\partial m}\cos(\lambda-\epsilon)+\frac{V^2{}_m}{R_c}\sin(\lambda-\epsilon)-\frac{V^2{}_\theta}{r}+\frac{1}{\rho}\frac{\partial p}{\partial r}=0$$

$$R_c = \frac{\partial\epsilon}{\partial m} = \text{streamline radius of curvature}$$

Enthalpy rise across a rotor for a streamline, ψ, is given by the Euler relationship:

$$\Delta H_{Rotor} = (U_2 V_{\theta 2})_\psi - (U_1 V_{\theta 1})_\psi$$

Weight flow is calculated by the continuity equation:

$$W = 2\pi\int_{y\ root}^{y\ tip} \overline{K}\rho\ V_m\ \frac{\sin(\lambda-\epsilon)}{\sin\lambda}\ y\ dy$$

where $\overline{K}$ is the local blockage factor and y is the length along the calculation station from the centerline to the point of interest.

APPENDIX B

LOSS SYSTEM

ROTORS

Rotor losses were estimated using a model in which total loss is calculated as the sum of shock loss and profile loss. The loss model assumes that a normal shock is situated at the first covered section of the blade passage. The Mach number immediately upstream of the shock is determined by free-streamline relationships that satisfy continuity to the shock position, midway between blades. This free-stream flow calculation accounts for streamtube contraction and radius change from the blade leading edge to the shock position. The effect of blade blockage is introduced by adjusting the free-stream area ratio, A/A*, by the ratio of blade channel width to s cos β'_1, were s is the blade spacing. The resulting A/A* then establishes the Mach number immediately upstream of the shock.

Rotor loss correlations were based on data obtained in tests of both high tip-speed and low tip-speed single-stage fans [ref. 1 and 2]. Losses were separated into shock and profile components by subtracting calculated shock losses from measured [illegible] losses. Rotor profile losses were correlated in terms of a profile loss parameter ($\bar{\omega}_p \cos\beta'_2/2\sigma$) versus diffusion factor, with percent span as a parameter (Figure 51). Design estimates of rotor losses are tabulated in Appendix C.

In applying the loss model to the actual design of airfoil sections, no loss was assumed in the blade channel upstream of the first covered section, at which point the full shock loss was applied. The profile loss was then applied linearly from a value of zero at the first covered section to the full value at the trailing edge.

STATORS

Stator loss estimates for the two-stage fan were based upon experimental midspan data for the transonic stators used in the studies of References 1, 2, and 5. Losses for these MCA airfoil stators (with Mach numbers up to 1.1) were correlated in terms of total loss parameter ($\bar{\omega} \cos\beta_3/2\sigma$) versus diffusion factor without subtracting shock losses from total measured losses. Loss predictions for the two-stage stators were made from a single curve of loss parameter as a function of diffusion factor plus an endwall increment determined from data from References 1 and 2, (Figure 52). Design estimates of stator losses are tabulated in Appendix C.

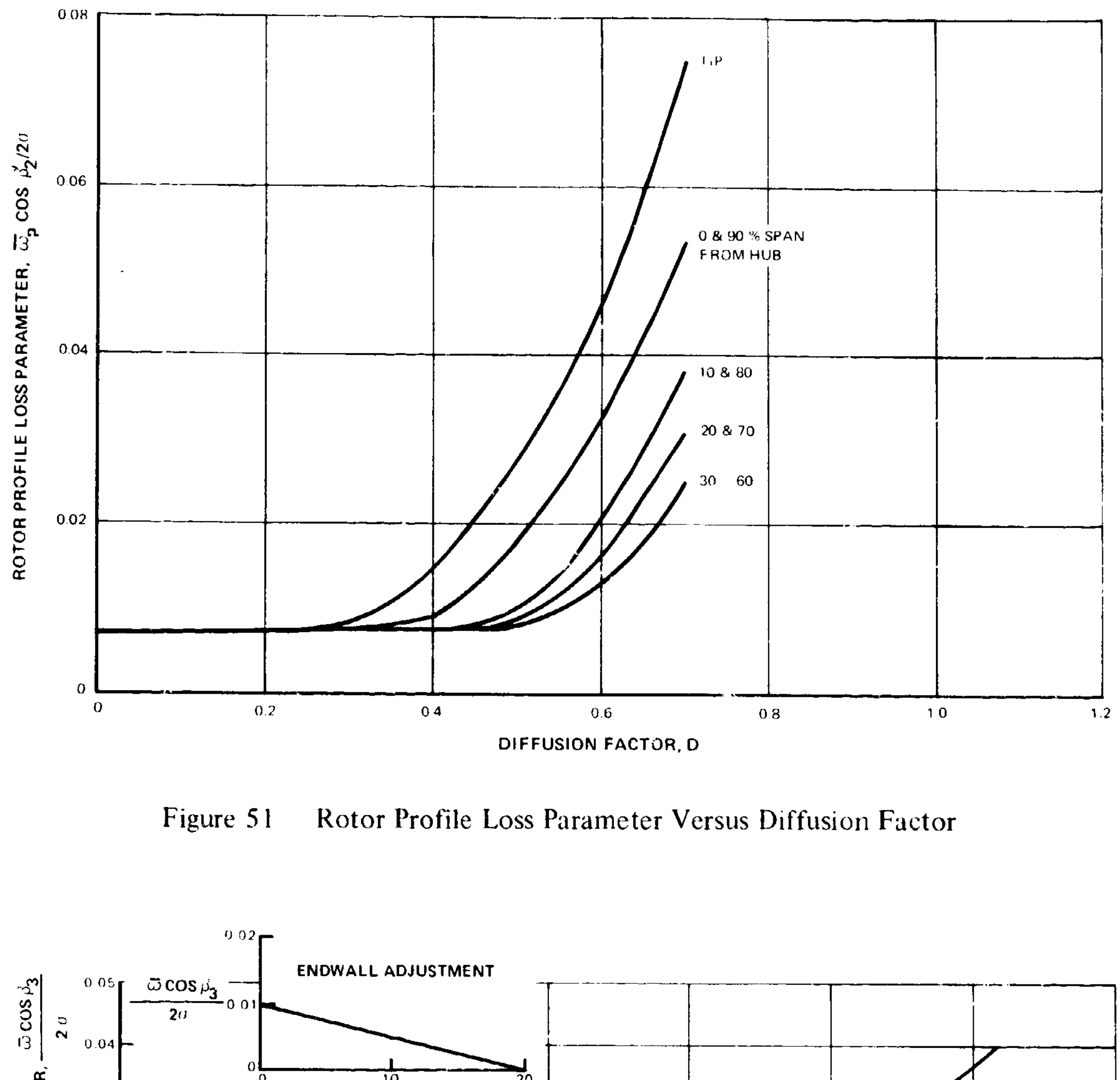


Figure 51 Rotor Profile Loss Parameter Versus Diffusion Factor

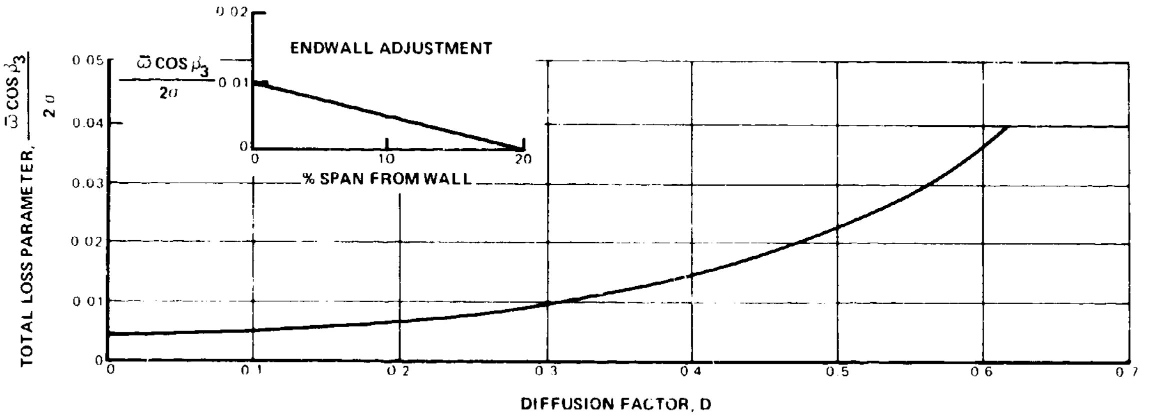


Figure 52 Stator Total Loss Parameter Versus Diffusion Factor

APPENDIX C

AERODYNAMIC SUMMARY

TABLE VIII

IDENTIFICATION OF BLADE-ELEMENT AND OVERALL PERFORMANCE TABLE HEADINGS

AIRFOIL AERODYNAMIC SUMMARY PRINT

% FLOW	DIA-1 IN	DIA-2 IN	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VO-1 FT/SEC	VO-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	B'-1 DEGREE	B'-2 DEGREE	V'-1 FT/SEC	V'-2 FT/SEC	VO'-1 FT/SEC	VO'-2 FT/SEC	U-1 FT/SEC	U-2 FT/SEC
0.00																		
3.15																		
6.70																		
10.40																		
22.70																		
31.65																		
41.45	$2r_1$	$2r_2$	V_1	V_2	V_{m_1}	V_{m_2}	V_{θ_1}	V_{θ_2}	β_1	β_2	β'_1	β'_2	V'_1	V'_2	V'_{θ_1}	V'_{θ_2}	U_1	U_2
51.85																		
62.90																		
74.60																		
80.70																		
87.00																		
93.40																		
100.00																		

% FLOW	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOCM1/ RHOCM2	OMEGA-B SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-P PROFILE	PO2/ PO1	EFF-P TOTAL	EFF-AD TOTAL	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00																		
3.15																		
6.70																		
10.40																		
22.70																		
31.65	i_{ss_1}	i_{m_1}	δ°	$\Delta\beta$	$\frac{(\rho V_m)_1}{(\rho V_m)_2}$	$\bar{\omega}_{sh}$	D	$\bar{\omega}$	$\frac{\bar{\omega}\cos\beta'_2}{2\sigma}$	$\frac{(\bar{\omega}-\bar{\omega}_{sh})\cos\beta'_2}{2\sigma}$	$\frac{P_2}{P_1}$	η_p	η_{ad}	η_p	M_1	M_2	M'_1	M'_2
41.45																		
51.85																		
62.90																		
74.60																		
80.70																		
87.00																		
93.40																		
100.00																		

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	AREA SQ FT	NCORR LOCAL RPM	WCORR LOCAL LEM/SEC	TO/TO LOCAL	PO/PO LOCAL	EFF-AD LOCAL	EFF-P LOCAL	STA-1	STA-2
													- - LOCAL - -	
$\frac{N}{\sqrt{\theta_{in}}}$	$\frac{W\sqrt{\theta_{in}}}{\delta_{in}}$	$\frac{T_2}{T_{in}}$	$\frac{P_2}{P_{in}}$	η_{ad}	η_p	A	$\frac{N}{\sqrt{\theta_2}}$	$\frac{W\sqrt{\theta_2}}{\delta_2}$	$\frac{T_2}{T_1}$	$\frac{P_2}{P_1}$	η_{ad}	η_p	1	2

TABLE IX

AERODYNAMIC SUMMARY – ROTOR 1
(ENGLISH UNITS)

%FLOW	DIA-1 IN	DIA-2 IN	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VC-1 FT/SEC	VC-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	B'-1 DEGREE	B'-2 DEGREE	V'-1 FT/SEC	V'-2 FT/SEC	VC'-1 FT/SEC	VC'-2 FT/SEC	U-1 FT/SEC	U-2 FT/SEC
0.00	12.400	14.840	607.9	1093.0	607.9	603.3	.0	911.5	.00	56.50	43.66	-19.81	840.2	641.2	-580.0	217.4	580.0	694.1
3.15	13.450	15.600	617.4	1048.2	617.4	617.0	.0	847.3	.00	53.94	45.54	-10.79	881.4	628.1	-629.1	117.6	629.1	729.7
6.70	14.490	16.350	629.6	1008.6	629.6	627.3	.0	789.8	.00	51.54	47.11	-2.29	925.1	627.8	-677.8	25.0	677.8	764.8
10.40	15.490	17.100	641.8	977.8	641.8	628.4	.0	749.1	.00	50.01	48.46	4.62	968.0	630.5	-724.5	-50.8	724.5	799.8
22.70	18.420	19.370	676.0	900.2	676.0	620.7	.0	651.9	.00	46.41	51.88	22.26	1095.2	670.7	-861.6	-254.1	861.6	906.0
31.65	20.290	20.860	694.5	862.9	694.5	610.1	.0	610.2	.00	45.00	53.80	30.93	1176.0	711.3	-949.1	-365.6	949.1	975.7
41.45	22.140	22.390	708.5	831.1	708.5	599.4	.0	575.7	.00	43.85	55.62	38.19	1254.8	762.7	-1035.6	-471.6	1035.6	1047.3
51.85	23.960	23.900	717.0	806.0	717.0	590.9	.0	548.1	.00	42.85	57.39	43.96	1330.4	820.9	-1120.7	-569.8	1120.7	1117.9
62.90	25.740	25.410	719.4	787.1	719.4	586.2	.0	525.2	.00	41.86	59.14	46.53	140[illegible].5	885.3	-1204.0	-663.4	1204.0	1188.5
74.60	27.510	26.910	715.4	773.[illegible]	715.4	584.1	.0	506.9	.00	40.95	60.93	52.16	1472.[illegible]	952.0	-1286.8	-751.8	1286.8	1258.7
80.70	28.380	27.670	710.9	773.5	710.9	583.4	.0	507.8	.00	41.04	61.83	53.43	1505.[illegible]	979.2	-1327.5	-786.4	1327.5	1294.3
87.00	29.260	28.420	704.6	774.4	704.6	583.3	.0	509.4	.00	41.13	62.75	54.57	1539.4	1006.2	-1368.6	-819.9	1368.6	1329.3
93.40	30.130	29.180	697.0	781.1	697.0	580.6	.0	522.6	.00	41.99	63.68	55.42	1572.3	1023.1	-1409.3	-842.3	1409.3	1364.9
100.0	31.000	29.930	687.6	792.1	687.6	576.4	.0	543.3	.00	43.31	64.63	56.07	1604.8	1032.5	-1450.0	-856.7	1450.0	1400.0

%FLOW	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOCM1/RHOCM2	OMEGA-B SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-P PROFILE	PO2/PO1	EFF-P TOTAL	EFF-AD TOTAL	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	-0.9	3.9	15.9	63.47	.8577	.0000	.4815	.0617	.0120	.0120	1.8720	.9687	.9660	.9235	.5612	.9734	.7756	.5711
3.15	-0.9	3.7	17.1	56.33	.8236	.0000	.5121	.0507	.0106	.0106	1.8508	.9715	.9690	.9418	.5706	.9286	.8148	.5564
6.70	-0.7	3.6	17.4	49.39	.8024	.0000	.5277	.0410	.0093	.0093	1.8300	.9743	.9720	.9543	.5826	.8899	.8559	.5539
10.40	-0.4	3.7	16.1	43.85	.7969	.0000	.5415	.0440	.0104	.0104	1.8173	.9703	.9677	.9524	.5947	.8592	.8970	.5540
22.70	0.5	4.0	12.6	29.62	.8012	.0000	.5500	.0564	.0139	.0139	1.7855	.9540	.9500	.9410	.6289	.7833	1.0189	.5836
31.65	0.9	3.9	10.1	22.88	.8134	.0361	.5447	.0697	.0169	.0082	1.7751	.9375	.9322	.9274	.6474	.7466	1.0960	.6155
41.45	1.2	3.8	7.8	17.43	.8252	.0419	.5307	.0814	.0192	.0093	1.7685	.9207	.9139	.9142	.6616	.7155	1.1720	.6564
51.85	1.5	3.8	6.5	13.43	.8327	.0495	.5131	.0911	.0207	.0095	1.7660	.9049	.8969	.9022	.6702	.6908	1.2436	.7036
62.90	1.9	3.8	5.6	10.61	.8330	.0593	.4923	.0987	.0217	.0087	1.7675	.8910	.8819	.8911	.6726	.6720	1.3117	.7558
74.60	2.5	4.1	6.4	8.77	.8278	.0672	.4714	.1070	.0228	.0085	1.7710	.8763	.8660	.8780	.6686	.6579	1.3757	.8099
80.70	2.8	4.2	6.6	8.40	.8255	.0709	.4675	.1210	.0255	.0105	1.7790	.8596	.8479	.8610	.6640	.6562	1.4068	.8308
87.00	3.1	4.4	7.6	8.18	.8218	.0736	.4639	.1345	.0281	.0127	1.7870	.8431	.8300	.8437	.6578	.6552	1.4367	.8514
93.40	3.3	4.5	9.1	8.26	.8235	.0744	.4696	.1611	.0336	.0181	1.8001	.8146	.7988	.8129	.6498	.6581	1.4663	.8619
100.0	3.6	4.7	11.0	8.56	.8282	.0805	.4812	.1944	.0407	.0238	1.8170	.7810	.7620	.7753	.6404	.6637	1.4947	.8651

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
10776.	184.20	1.2016	1.7866	89.39	90.21

AREA SQFT	NCORR LOCAL RPM	WCORR LOCAL LBM/SEC	TO/TO LOCAL	PO/PO LOCAL	EFF-AD LOCAL %	EFF-P LOCAL %	STA-1 ---LOCAL---	STA-2 ---LOCAL---
4.359	9779.	113.02	1.2016	1.7866	89.39	90.21	7.0	8.0

TABLE X

AERODYNAMIC SUMMARY – ROTOR 1 (SI UNITS)

%FLOW	DIA-1 CM	DIA-2 CM	V-1 M/SEC	V-2 M/SEC	VM-1 M/SEC	VM-2 M/SEC	VU-1 M/SEC	VO-2 M/SEC	B-1 RADIAN	B-2 RADIAN	B'-1 RADIAN	B'-2 RADIAN	V'-1 M/SEC	V'-2 M/SEC	VO'-1 M/SEC	VO'-2 M/SEC	U-1 M/SEC	U-2 M/SEC
0.00	31.50	37.69	185.28	333.16	185.28	183.87	.00	277.82	.0000	.9862	.7620	-.3458	256.1	195.4	-176.8	66.3	176.8	211.6
3.15	34.16	39.67	188.18	319.48	188.18	188.06	.00	258.27	.0000	.9414	.7948	-.1884	268.7	191.5	-191.8	35.9	191.8	222.4
6.70	36.80	41.53	191.91	307.43	191.91	191.21	.00	240.73	.0000	.8996	.8222	-.0399	282.0	191.4	-206.6	7.6	206.6	233.1
10.40	39.34	43.43	195.64	298.03	195.64	191.54	.00	228.33	.0000	.8728	.8458	.0806	295.0	192.2	-220.8	-15.5	220.8	243.8
22.70	46.79	49.20	206.05	274.37	206.05	189.19	.00	198.71	.0000	.8099	.9055	.3885	333.8	204.4	-262.6	-77.4	262.6	276.2
31.65	51.54	52.98	211.69	263.01	211.69	185.97	.00	185.98	.0000	.7854	.9390	.5398	358.5	216.8	-289.3	-111.4	289.3	297.4
41.45	56.24	56.87	215.94	253.33	215.94	182.70	.00	175.48	.0000	.7652	.9708	.6666	382.4	232.5	-315.7	-143.7	315.7	319.2
51.85	60.86	60.71	218.53	245.66	218.53	180.11	.00	167.06	.0000	.7478	1.0017	.7672	405.5	250.2	-341.6	-173.7	341.6	340.7
62.90	65.38	64.54	219.27	239.89	219.27	178.66	.00	160.07	.0000	.7305	1.0322	.8471	427.5	269.8	-367.0	-202.2	367.0	362.3
74.60	69.88	66.35	218.04	235.72	218.04	178.03	.00	154.51	.0000	.7146	1.0634	.9103	448.7	290.2	-392.2	-229.1	392.2	383.7
80.70	72.09	70.28	216.69	235.75	216.69	177.82	.00	154.79	.0000	.7163	1.0791	.9325	459.0	298.5	-404.6	-239.7	404.6	394.5
87.00	74.32	72.19	214.81	236.04	214.81	177.79	.00	155.26	.0000	.7179	1.0953	.9525	469.2	306.7	-417.2	-249.9	417.2	405.2
93.40	76.53	74.12	212.45	238.09	212.45	176.97	.00	159.28	.0000	.7328	1.1115	.9673	479.2	311.8	-429.6	-256.7	429.6	416.0
100.0	78.74	76.02	209.58	241.42	209.58	175.68	.00	165.60	.0000	.7559	1.1280	.9786	489.1	314.7	-442.0	-261.1	442.0	426.7

%FLOW	INCS RADIAN	INCM RADIAN	DEV RADIAN	RHOCM1/ RHOCM2	CAMBER RADIAN	OMEGA-B SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-P PROFILE	PO2/ PO1	EFF-P TOTAL	EFF-AD TOTAL	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	-.016	.068	.278	.8577	1.3331	.0000	.4815	.0617	.0120	.0120	1.8720	.9687	.9660	.9235	.5612	.9734	.7756	.5711
3.15	-.016	.065	.298	.8236	1.2237	.0000	.5121	.0507	.0108	.0108	1.8508	.9715	.9690	.9418	.5706	.9286	.8148	.5564
6.70	-.012	.063	.304	.8024	1.1008	.0000	.5277	.0410	.0093	.0093	1.8300	.9743	.9720	.9543	.5826	.8899	.8559	.5539
10.40	-.007	.065	.281	.7969	.9816	.0000	.5415	.0440	.0104	.0104	1.8174	.9703	.9677	.9524	.5947	.8592	.8970	.5540
22.70	.009	.070	.220	.8012	.6640	.0000	.5500	.0564	.0139	.0139	1.7855	.9540	.9500	.9410	.6289	.7833	1.0189	.5836
31.65	.016	.068	.176	.8134	.5043	.0361	.5442	.0647	.0169	.0082	1.7751	.9375	.9322	.9274	.6474	.7466	1.0960	.6155
41.45	.021	.066	.136	.8252	.3728	.0419	.5307	.0614	.0192	.0093	1.7685	.9207	.9139	.9142	.6616	.7155	1.1720	.6566
51.85	.026	.066	.113	.8327	.2798	.0495	.5131	.0911	.0207	.0095	1.7660	.9049	.8969	.9022	.6702	.6908	1.2436	.7036
62.90	.033	.066	.098	.8330	.2147	.0593	.4923	.0987	.0217	.0087	1.7675	.8910	.8819	.8911	.6726	.6720	1.3117	.7558
74.60	.044	.072	.112	.8278	.1898	.0672	.4714	.1070	.0228	.0085	1.7710	.8763	.8660	.8780	.6686	.6579	1.3757	.8099
80.70	.049	.073	.115	.8255	.1862	.0709	.4675	.1210	.0255	.0106	1.7790	.8596	.8479	.8610	.6640	.6562	1.4068	.8308
87.00	.054	.077	.133	.8218	.1987	.0736	.4639	.1345	.0281	.0127	1.7870	.8431	.8300	.8437	.6578	.6552	1.4367	.8514
93.40	.058	.079	.159	.8235	.2232	.0744	.4696	.1611	.0336	.0181	1.8001	.8146	.7988	.8129	.6498	.6581	1.4663	.8619
100.0	.063	.082	.192	.8282	.2579	.0865	.4812	.1944	.0407	.0236	1.9170	.7810	.7620	.7753	.6404	.6637	1.4947	.8651

NCORR INLET RAD/SEC	WCORR INLET KG/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
122.60	83.551	1.2016	1.7866	89.39	90.21

AREA SQM	NCORR LOCAL RAD/SEC	WCORR LOCAL KG/SEC	TO/TO LOCAL	PO/PO LOCAL	EFF-AD LOCAL %	EFF-P LOCAL %	STA-1 ---LOCAL---	STA-2 ---LOCAL---
.4050	1024.10	51.264	1.2016	1.7866	89.39	90.21	7.0	8.0

TABLE XI

AERODYNAMIC SUMMARY – STATOR 1
(ENGLISH UNITS)

%FLOW	DIA-1 IN	DIA-2 IN	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VO-1 FT/SEC	VO-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	B'-1 DEGREE	B'-2 DEGREE	V'-1 FT/SEC	V'-2 FT/SEC	VO'-1 FT/SEC	VO'-2 FT/SEC	U-1 FT/SEC	U-2 FT/SEC
0.00	15.220	16.850	1069.5	616.6	630.1	616.6	868.7	.0	54.66	.00	-15.67	51.87	654.5	1001.9	176.8	-788.2	711.9	788.2
3.15	15.730	17.410	1048.7	627.1	641.1	627.1	829.9	.0	52.32	.00	-7.53	52.40	646.6	1027.8	84.8	-814.3	745.1	814.3
6.70	16.640	17.970	1012.1	632.9	649.6	632.9	776.1	.0	50.07	.00	.20	53.02	649.6	1052.2	-2.2	-840.5	778.3	840.5
10.40	17.350	18.530	983.7	642.4	650.1	642.4	738.3	.0	48.64	.00	6.43	53.45	654.2	1078.9	-73.2	-866.7	811.5	866.7
22.70	19.510	20.290	912.1	649.8	642.7	649.8	647.2	.0	45.20	.00	22.43	55.60	695.3	1150.2	-265.3	-949.1	912.6	949.1
31.65	20.940	21.480	878.1	653.4	633.8	653.4	607.8	.0	43.80	.00	30.39	56.96	734.7	1198.5	-371.6	-1004.7	979.5	1004.7
41.45	22.400	22.700	849.9	657.1	625.5	657.1	575.4	.0	42.61	.00	37.06	58.25	783.8	1248.7	-472.3	-1061.8	1047.6	1061.8
51.85	23.860	23.940	828.2	664.0	620.0	664.0	549.1	.0	41.53	.00	42.44	59.33	840.2	1301.8	-567.0	-1119.8	1116.0	1119.8
62.90	25.310	25.180	813.1	669.0	619.0	669.0	527.2	-.0	40.42	-.00	46.69	60.40	902.4	1354.5	-656.6	-1177.8	1183.9	1177.8
74.60	26.760	26.430	803.9	670.2	621.6	670.2	509.8	.0	39.36	.00	50.04	61.54	967.5	1406.2	-741.9	-1236.3	1251.7	1236.3
80.70	27.490	27.040	806.5	673.9	623.8	673.9	511.2	.0	39.33	.00	51.16	61.97	994.6	1433.9	-774.7	-1265.7	1285.8	1265.7
87.00	28.220	27.690	810.3	674.0	627.1	674.0	513.2	.0	39.29	.00	52.14	62.51	1021.9	1460.1	-806.8	-1295.2	1320.0	1295.2
93.40	28.940	28.320	820.1	677.2	628.6	677.2	526.6	.0	39.95	.00	52.76	62.92	1038.9	1487.7	-827.1	-1324.7	1353.7	1324.7
100.0	29.670	28.960	834.6	682.1	629.4	682.1	548.1	.0	41.05	.00	53.15	63.27	1049.4	1516.6	-839.8	-1354.6	1387.8	1354.6

%FLOW	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOCM1/ RHOCM2	OMEGA-R SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-F PROFILE	PO2/ PO1	EFF-P TOTAL	EFF-AD CUM	E-F-P STATIC	M-1	M-2	M'-1	M'-2
0.00	0.0	1.9	13.6	54.66	.8306	.0000	.5847	.2013	.0397	.0397	.9088	.0000	.8070	.7704	.9697	.5187	.5825	.8401
3.15	-0.2	1.8	12.2	52.32	.8487	.0000	.5562	.1729	.0352	.0352	.9261	.0000	.8386	.7899	.9288	.5273	.5729	.8642
6.70	-0.8	1.7	11.2	50.07	.8646	.0000	.5306	.1448	.0306	.0306	.9414	.0000	.8671	.8125	.8932	.5335	.5734	.8869
10.40	-1.0	1.8	10.4	48.64	.8633	.0000	.5065	.1189	.0261	.0261	.9541	.0000	.8852	.8350	.8653	.5424	.5754	.9108
22.70	-1.8	1.9	9.3	45.20	.8731	.0000	.4574	.0756	.0185	.0185	.9742	.0000	.9035	.8744	.7950	.5496	.6060	.9729
31.65	-2.4	2.0	9.3	43.80	.8730	.0000	.4327	.0642	.0166	.0166	.9795	.0000	.8958	.8812	.7613	.5525	.6371	1.0134
41.45	-2.9	2.1	9.3	42.61	.8713	.0000	.4106	.0573	.0157	.0157	.9828	.0000	.8838	.8814	.7335	.5552	.6763	1.0551
51.85	-3.5	2.1	9.3	41.53	.8662	.0000	.3877	.0473	.0136	.0135	.9864	.0000	.8736	.8886	.7117	.5606	.7270	1.0992
62.90	-4.2	1.9	9.4	40.42	.8669	.0000	.3702	.0429	.0127	.0127	.9881	.0000	.8619	.8880	.6963	.5642	.7728	1.1423
74.60	-5.1	1.6	9.9	39.36	.8743	.0000	.3621	.0439	.0132	.0132	.9884	.0000	.8458	.8806	.6863	.5641	.8263	1.1837
80.70	-5.3	1.6	10.6	39.33	.8739	.0000	.3633	.0461	.0144	.0144	.9875	.0000	.8279	.8708	.6868	.5660	.8470	1.2043
87.00	-5.6	1.4	11.8	39.29	.8788	.0000	.3701	.0546	.0173	.0173	.9852	.0000	.8066	.8511	.6884	.5645	.8679	1.2228
93.40	-5.6	1.5	13.2	39.95	.8764	.0000	.3813	.0643	.0205	.0205	.9823	.0000	.7729	.8288	.6939	.5645	.8750	1.2403
100.0	-6.1	1.4	14.9	41.05	.8696	.0000	.3962	.0752	.0242	.0242	.9789	.0000	.7324	.8080	.7027	.5652	.8836	1.2567

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
10720.	184.20	1.2016	1.7444	85.40	86.50

AREA SQFT	NCORR LOCAL RPM	WCORR LOCAL LBM/SEC	TO/TO LOCAL	PO/PO LOCAL
3.501	9779.	115.75	1.0000	.9766

STA-1	STA-2
---LOCAL---	
9.0	10.0

TABLE XII

AERODYNAMIC SUMMARY – STATOR 1
(SI UNITS)

%FLOW	DIA-1 CM	DIA-2 CM	V-1 M/SEC	V-2 M/SEC	VM- M/SEC	VM-2 M/SEC	VO-1 M/SEC	VO-2 M/SEC	B-1 RADIAN	B-2 RADIAN	B'-1 RADIAN	B'-2 RADIAN	V'-1 M/SEC	V'-2 M/SEC	VO'-1 M/SEC	VO'-2 M/SEC	U-1 M/SEC	U-2 M/SEC
0.00	38.66	42.80	332.07	188.55	192.06	188.55	270.89	.00	.9540	.0000	-.2736	.9053	199.5	305.4	53.9	-240.2	217.0	240.2
3.15	40.46	44.22	319.64	191.13	195.40	191.13	252.56	.00	.9131	.0000	-.1315	.9146	197.1	312.3	25.8	-248.2	227.1	248.2
6.70	42.27	45.64	308.46	192.91	197.55	192.91	236.56	.00	.8739	.0000	.0034	.9254	198.0	320.7	-.7	-256.2	237.2	256.2
10.40	44.07	47.07	299.84	195.82	198.14	195.82	225.04	.00	.8469	.0000	.1122	.9329	199.4	328.8	-22.3	-264.2	247.4	264.2
22.70	49.56	51.54	278.02	198.05	195.89	198.05	197.28	.00	.7889	.0000	.3915	.9705	211.9	350.6	-80.9	-289.3	278.2	289.3
31.65	53.19	54.56	267.66	199.15	193.18	199.15	185.27	.00	.7645	.0000	.5303	.9942	223.9	365.3	-113.2	-306.2	298.5	306.2
41.45	56.90	57.66	259.06	200.28	190.66	200.28	175.39	.00	.7437	.0000	.6467	1.0166	238.9	380.6	-144.0	-323.6	319.4	323.6
51.85	60.60	60.81	252.43	207.38	168.96	202.38	167.35	.00	.7248	.0000	.7408	1.0356	256.1	396.8	-172.8	-341.3	340.2	341.3
62.90	64.29	63.96	247.63	203.91	188.67	203.91	160.70	-.00	.7055	-.0000	.8149	1.0542	275.1	412.9	-200.1	-359.0	360.8	359.0
74.60	67.97	67.13	245.02	204.27	169.45	204.27	155.38	.00	.6869	.0000	.8734	1.0740	295.0	428.6	-226.1	-376.8	381.5	376.8
80.70	69.82	68.73	245.82	205.40	190.14	205.40	155.80	.00	.6865	.0000	.8928	1.0816	303.2	437.1	-236.1	-385.8	391.9	385.8
87.00	71.68	70.33	246.99	205.44	191.15	205.44	156.42	.00	.6856	.0000	.9101	1.0910	311.5	445.0	-245.9	-394.8	402.3	394.8
93.40	73.51	71.93	249.95	206.40	191.61	206.40	160.51	.00	.6973	.0000	.9209	1.0982	316.6	453.5	-252.1	-403.8	412.6	403.8
100.0	75.36	73.56	254.38	207.90	191.84	207.90	167.05	.00	.7164	.0000	.9276	1.1043	319.9	462.3	-256.0	-412.9	423.0	412.9

%FLOW	INCS RADIAN	INCM RADIAN	DEV RADIAN	TURN RADIAN	RHOCM1/RHOCM2	OMEGA-B SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-P PROFILE	PO2/PO1	EFF-P TOTAL	EFF-AD CUM	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	0.0	.033	.238	.9540	.8306	.0000	.5847	.2013	.0397	.0397	.9088	.0000	.8070	.7704	.9697	.5187	.5825	.6401
3.15	-.003	.031	.213	.9131	.8487	.0000	.5562	.1729	.0352	.0352	.9261	.0000	.8396	.7899	.9288	.5273	.5729	.8642
6.70	-.014	.030	.196	.8739	.8646	.0000	.5306	.1448	.0306	.0306	.9414	.0000	.8671	.8125	.8932	.5335	.5734	.8869
10.40	-.017	.031	.182	.8489	.8633	.0000	.5065	.1189	.0261	.0261	.9541	.0000	.8852	.8350	.8653	.5424	.5754	.9108
22.70	-.031	.033	.162	.7889	.8731	.0000	.4574	.0758	.0185	.0185	.9742	.0000	.9035	.8744	.7950	.5496	.6060	.9729
31.58	-.042	.035	.142	.7645	.8730	.0000	.4327	.0642	.0166	.0166	.9795	.0000	.8958	.8812	.7613	.5525	.6371	1.0134
41.45	-.051	.037	.162	.7437	.8713	.0000	.4106	.0573	.0157	.0157	.9828	.0000	.8838	.8814	.7335	.5552	.6763	1.0551
51.85	-.061	.037	.162	.7248	.8662	.0000	.3877	.0473	.0135	.0135	.9864	.0000	.8736	.8888	.7117	.5606	.7220	1.0992
62.90	-.073	.033	.164	.7055	.8669	.0000	.3702	.0429	.0127	.0127	.9881	.0000	.8619	.8880	.6963	.5642	.7728	1.1423
74.60	-.089	.028	.173	.6869	.8743	.0000	.3621	.0430	.0132	.0132	.9884	.0000	.8468	.8806	.6863	.5641	.8263	1.1837
80.70	-.093	.028	.185	.6665	.8739	.0000	.3633	.0461	.0144	.0144	.9875	.0000	.8279	.8708	.6868	.5660	.8470	1.2043
87.00	-.098	.024	.206	.6858	.8788	.0000	.3701	.0546	.0173	.0173	.9852	.0000	.8068	.8511	.6884	.5645	.8679	1.2228
93.40	-.098	.026	.230	.6973	.8764	.0000	.3813	.0643	.0205	.0205	.9823	.0000	.7729	.8288	.6939	.5645	.8790	1.2403
100.0	-.104	.024	.260	.7164	.8696	.0000	.3962	.0752	.0242	.0242	.97[illegible]	.0000	.7324	.8080	.7027	.5652	.8836	1.2567

NCORR INLET RAD/SEC	WCORR INLET KG/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
1122.60	83.551	1.2016	1.7444	85.40	86.50

AREA SQM	NCORR LOCAL RAD/SEC	WCORR LOCAL KG/SEC	TO/TO LOCAL	PO/PO LOCAL
.3252	1024.10	52.503	1.0000	.9766

STA-1 ---LOCAL---	STA-2 ---LOCAL---
9.0	10.0

TABLE XIII

AERODYNAMIC SUMMARY – ROTOR 2
(ENGLISH UNITS)

%FLOW	DIA-1 IN	DIA-2 IN	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VO-1 FT/SEC	VO-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	B'-1 DEGREE	B'-2 DEGREE	V'-1 FT/SEC	V'-2 FT/SEC	VO'-1 FT/SEC	VO'-2 FT/SEC	U-1 FT/SEC	U-2 FT/SEC
0.00	17.390	18.350	673.4	1095.0	673.4	677.0	.0	860.6	.00	51.91	50.38	-.20	1056.0	677.0	-813.4	2.3	813.4	858.3
3.15	17.900	18.770	685.6	1059.2	685.6	680.8	.0	811.4	.00	50.00	50.69	5.58	1082.2	684.0	-837.3	-66.6	837.3	878.0
6.70	18.400	19.200	694.8	1026.4	694.8	679.1	.0	768.3	.00	48.53	51.09	10.82	1106.1	691.4	-860.7	-129.8	860.7	898.1
10.40	18.910	19.620	707.2	996.2	707.2	676.0	.0	729.9	.00	47.11	51.36	15.48	1132.5	703.6	-884.5	-187.8	884.5	917.7
22.70	20.520	20.990	723.7	923.8	723.7	654.3	.0	652.1	.00	44.90	52.98	26.74	1202.1	732.7	-959.8	-329.7	959.8	981.6
31.65	21.610	21.930	737.6	888.0	737.6	639.7	.0	616.0	.00	43.92	54.07	32.65	1248.4	759.7	-1010.8	-409.8	1010.8	1025.8
41.45	22.740	22.920	740.9	854.6	740.9	626.2	.0	581.8	.00	42.89	55.14	38.06	1296.2	795.4	-1063.7	-490.3	1063.7	1072.1
51.85	23.880	23.920	750.9	825.1	750.9	614.5	.0	550.7	.00	41.87	56.09	42.76	1345.9	836.9	-1117.0	-568.1	1117.0	1118.9
62.90	25.040	24.940	758.4	800.7	758.4	603.2	-.0	526.5	-.00	41.11	57.08	46.70	1395.4	879.5	-1171.2	-640.1	1171.2	1166.6
74.60	26.210	25.980	761.2	783.1	761.2	599.6	.0	503.7	.00	40.04	58.16	49.88	1443.0	930.4	-1226.0	-711.5	1226.0	1215.2
80.70	26.800	26.510	764.9	779.4	764.9	597.0	.0	501.1	.00	40.01	58.61	51.06	1468.5	950.0	-1253.6	-738.9	1253.6	1240.0
87.00	27.390	27.040	765.0	779.2	765.0	591.9	.0	506.8	.00	40.57	59.16	52.01	1492.2	961.7	-1281.2	-758.0	1281.2	1264.8
93.40	27.930	27.580	767.7	785.9	767.7	584.0	.0	525.9	.00	42.00	59.61	52.61	1517.3	961.7	-1308.8	-764.1	1308.8	1290.0
100.0	28.580	28.120	771.7	794.5	771.7	567.6	.0	555.8	.00	44.40	60.00	53.23	1543.6	948.1	-1336.8	-759.5	1336.8	1315.3

%FLOW	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOCM1/ RHOCM2	OMEGA-P SHOCK	D-FAC	OMEGA-P	LOSS-P TOTAL	LOSS-P PROFILE	PO2/ PO1	EFF-P TOTAL	EFF-AD TOTAL	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	-0.1	5.4	16.2	50.57	.8213	.0000	.5430	.1346	.0296	.0296	1.7751	.9109	.9034	.8404	.5675	.8789	.8899	.5434
3.15	0.1	5.4	14.9	45.10	.8197	.0000	.5413	.1314	.0295	.0295	1.7418	.9068	.8997	.8470	.5795	.8504	.9145	.5492
6.70	0.3	5.4	13.8	40.27	.8211	.0000	.5394	.1253	.0285	.0285	1.7153	.9054	.8979	.8559	.5893	.8235	.9362	.5553
10.40	0.5	5.4	13.1	35.87	.8263	.0000	.5348	.1201	.0275	.0275	1.6897	.9035	.8958	.8627	.6007	.7996	.9619	.5647
22.70	1.4	5.6	10.1	26.24	.8436	.0485	.5312	.1033	.0237	.0126	1.6574	.9052	.8982	.8838	.6166	.7385	1.0242	.5857
31.65	1.7	5.4	8.6	21.42	.8537	.0519	.5254	.0912	.0207	.0089	1.6507	.9100	.9035	.8974	.6243	.7073	1.0639	.6051
41.45	1.3	4.5	7.3	17.08	.8635	.0450	.5137	.0768	.0175	.0075	1.6451	.9164	.9103	.9103	.6313	.6784	1.1047	.6313
51.85	1.1	3.9	6.1	13.33	.8771	.0397	.4994	.0719	.0156	.0070	1.6354	.9180	.9121	.9168	.6397	.6527	1.1467	.6620
62.90	1.2	3.5	5.3	10.38	.8916	.0392	.4861	.0713	.0151	.0066	1.6269	.9138	.9076	.9161	.6455	.6311	1.1875	.6933
74.60	1.5	3.4	5.6	8.29	.8929	.0391	.4674	.0666	.0139	.0057	1.6224	.9149	.9087	.9191	.6467	.6153	1.2259	.7311
80.70	1.6	3.7	6.1	7.65	.9012	.0393	.4649	.0763	.0156	.0077	1.6181	.9017	.8945	.9072	.6483	.6102	1.2446	.7437
87.00	1.9	3.3	7.0	7.14	.9121	.0410	.4690	.0945	.0196	.0111	1.6177	.8795	.8713	.8862	.6466	.6071	1.2612	.7493
93.40	2.0	3.2	8.1	7.00	.9348	.0422	.4642	.1285	.0268	.0181	1.6175	.8411	.8301	.8493	.6456	.6075	1.2766	.7434
100.0	2.0	3.1	9.8	6.78	.9788	.0440	.5100	.1763	.0369	.0277	1.6136	.7903	.7756	.6008	.6452	.6075	1.2905	.7250

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
10720.	184.20	1.4065	2.6717	86.23	88.10

AREA SQFT	NCORR LOCAL RPM	WCORR LOCAL LBM/SEC	TO/TO LOCAL	PO/PO LOCAL	EFF-AD LOCAL %	EFF-P LOCAL %	STA-1 ---LOCAL---	STA-2
2.787	9039.	76.07	1.1705	1.6465	89.19	89.95	11.0	12.0

TABLE XIV
AERODYNAMIC SUMMARY – ROTOR 2
(SI UNITS)

%FLOW	DIA-1 CM	DIA-2 CM	V-1 M/SEC	V-2 M/SEC	VM-1 M/SEC	VM-2 M/SEC	VO-1 M/SEC	VO-2 M/SEC	B-1 RADIAN	B-2 RADIAN	B'-1 RADIAN	B'-2 RADIAN	V'-1 M/SEC	V'-2 M/SEC	VO'-1 M/SEC	VO'-2 M/SEC	U-1 M/SEC	U-2 M/SEC
0.00	44.17	46.61	205.26	333.75	205.26	206.34	.00	262.32	.0000	.9043	.8793	-.0034	321.9	206.3	-247.9	.7	247.9	261.6
3.15	45.47	47.66	206.98	322.83	206.98	207.50	.00	247.32	.0000	.8727	.8844	.0975	329.8	208.5	-255.2	-20.3	255.2	267.6
6.70	46.74	48.77	211.78	312.55	211.76	206.99	.00	234.18	.0000	.8469	.8916	.1888	337.1	210.7	-262.3	-39.6	262.3	273.7
10.40	48.03	49.83	215.55	303.65	215.55	206.66	.00	222.47	.0000	.8222	.8963	.2702	345.2	214.4	-269.6	-57.3	269.6	279.7
22.70	52.17	53.31	220.60	261.58	220.60	199.45	.00	198.77	.0000	.7837	.9247	.4667	366.4	223..	-292.6	-100.5	292.6	299.3
31.65	54.89	55.70	223.29	270.67	223.29	194.97	.00	167.75	.0000	.7665	.9437	.5698	380.5	231.5	-308.1	-124.9	308.1	312.7
41.45	57.76	58.22	225.81	260.54	225.81	190.88	.00	177.33	.0000	.7486	.9624	.6642	395.1	242.4	-324.2	-149.4	324.2	326.8
51.85	60.66	60.76	228.89	251.50	228.89	187.29	.00	167.86	.0000	.7307	.9789	.7462	410.2	255.1	-340.5	-173.2	340.5	341.0
62.90	63.60	63.35	231.17	244.04	231.17	183.66	-.00	160.47	-.0000	.7176	.9961	.8150	425.3	268.1	-357.0	-195.1	357.0	355.6
74.60	66.57	65.99	232.01	238.69	232.01	162.75	.00	153.54	.0000	.6988	1.0157	.8705	439.8	283.6	-373.7	-216.9	373.7	370.4
80.70	68.07	67.34	233.14	237.56	233.14	181.98	.00	157.73	.0000	.6982	1.0229	.8912	447.6	289.6	-382.1	-225.2	382.1	378.0
87.00	69.57	68.68	233.19	237.51	233.19	180.41	.00	154.46	.0000	.7061	1.0325	.9078	454.8	293.1	-390.5	-231.0	390.5	385.5
93.40	71.07	70.05	233.99	239.55	233.99	178.01	.00	160.31	.0000	.7331	1.0403	.9182	462.5	293.1	-398.9	-232.9	398.9	393.2
100.0	72.59	71.43	235.21	242.15	235.21	173.01	.00	169.42	.0000	.7749	1.0473	.9290	470.5	289.0	-407.5	-231.5	407.5	400.9

%FLOW	INCS RADIAN	INCM RADIAN	DEV RADIAN	TURN RADIAN	RHOCM1/ RHOCM2	OMEGA-B SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-P PROFILE	PO2/ PO1	EFF-P TOTAL	EFF-AD TOTAL	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	-.002	.094	.283	.8827	.8213	.0000	.5430	.1348	.0296	.0296	1.7751	.9109	.9034	.8404	.5675	.8789	.8899	.5434
3.15	.002	.094	.260	.7672	.8197	.0000	.5413	.1314	.0295	.0295	1.7418	.9068	.6997	.8470	.5795	.8504	.9145	.5492
6.70	.005	.094	.241	.7026	.8211	.0000	.5394	.1253	.0285	.0285	1.7153	.9054	.6979	.8559	.5893	.8235	.9382	.5553
10.40	.009	.094	.228	.6261	.8263	.0000	.5348	.1201	.0275	.0275	1.6897	.9035	.6958	.8627	.6007	.7996	.9619	.5647
22.70	.024	.098	.176	.4580	.8436	.0485	.5312	.1033	.0237	.0126	1.6574	.9052	.8982	.8838	.6166	.7385	1.0242	.5857
31.65	.030	.094	.150	.3739	.8537	.0519	.5254	.0912	.0207	.0089	1.6507	.9100	.9035	.8974	.6243	.7073	1.0639	.6051
41.45	.023	.079	.127	.2982	.8635	.0450	.5137	.0788	.0175	.0075	1.6451	.9164	.9103	.9103	.6313	.6784	1.1047	.6313
51.85	.019	.068	.106	.2327	.8771	.0397	.4994	.0719	.0156	.0070	1.6354	.9180	.9121	.9168	.6397	.6527	1.1467	.6620
62.90	.021	.061	.093	.1811	.8916	.0392	.4661	.0713	.0151	.0068	1.6269	.9138	.9076	.9161	.6455	.6311	1.1875	.6933
74.60	.026	.059	.098	.1446	.8929	.0391	.4674	.0666	.0139	.0057	1.6224	.9149	.9087	.9191	.6467	.6153	1.2259	.7311
80.70	.028	.056	.106	.1317	.9012	.0393	.4649	.0763	.0158	.0077	1.6161	.9017	.8945	.9072	.6483	.6102	1.2446	.7437
87.00	.033	.058	.122	.1247	.9121	.0410	.4690	.0945	.0196	.0111	1.6177	.8795	.8713	.8863	.6466	.6071	1.2612	.7493
93.40	.035	.056	.141	.1221	.9348	.0422	.4842	.1289	.0268	.0181	1.6175	.8411	.8301	.8493	.6458	.6075	1.2766	.7434
100.0	.035	.054	.171	.1183	.9788	.0440	.5106	.1763	.0369	.0277	1.6136	.7903	.7756	.8008	.6452	.6075	1.2905	.7250

NCORR INLET RAD/SEC	WCORR INLET KG/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
1122.60	83.551	1.4065	2.8717	86.23	88.10

AREA SGM	NCORR LOCAL RAD/SEC	WCORR LOCAL KG/SEC	TO/TO LOCAL	PO/PO LOCAL	EFF-AD LOCAL %	EFF-P LOCAL %	STA-1 ---LOCAL---	STA-2 ---LOCAL---
.2589	946.57	34.506	1.1705	1.6465	89.19	89.95	11.0	12.0

TABLE XV

AERODYNAMIC SUMMARY – STATOR 2
(ENGLISH UNITS)

%FLOW	DIA-1 IN	DIA-2 IN	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VC-1 FT/SEC	VC-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	B'-1 DEGREE	B'-2 DEGREE	V'-1 FT/SEC	V'-2 FT/SEC	VO'-1 FT/SEC	VO'-2 FT/SEC	U-1 FT/SEC	U-2 FT/SEC
0.00	18.580	18.900	1118.1	658.7	726.4	658.7	850.0	.0	49.48	.00	1.51	53.31	726.6	1102.4	-19.1	-884.0	869.1	884.0
3.15	18.980	19.270	1081.[illegible]	651.3	724.6	651.3	802.2	.0	47.90	.00	6.73	54.15	729.6	1112.0	-85.6	-901.4	887.8	901.4
6.70	19.380	19.640	1047.2	644.8	719.0	644.8	761.4	.0	46.64	.00	11.41	54.93	733.5	1122.4	-145.1	-918.7	906.5	918.7
10.40	19.790	20.020	1016.4	639.8	714.2	639.8	723.2	.0	45.36	.00	15.83	55.66	742.4	1134.1	-202.5	-936.4	925.7	936.4
22.70	21.080	21.220	944.0	630.8	665.1	630.8	649.4	.0	43.46	.00	26.17	57.56	763.4	1176.1	-336.0	-992.6	986.0	992.6
31.65	21.980	22.050	908.[illegible]	629.0	669.3	629.0	614.6	.0	42.56	.00	31.71	58.62	786.6	1208.1	-413.6	-1031.4	1028.1	1031.4
41.45	22.920	22.930	877.5	629.3	656.0	629.3	581.8	.0	41.54	.00	36.75	59.60	819.5	1243.6	-490.3	-1072.5	1072.1	1072.5
51.85	23.880	23.830	850.4	631.7	647.2	631.7	551.6	.0	40.44	.00	41.14	60.48	859.3	1281.2	-565.3	-1114.6	1117.0	1114.6
62.90	24.860	24.740	829.8	636.3	640.0	636.3	528.2	.0	39.53	.00	44.76	61.20	901.3	1320.6	-634.7	-1157.2	1162.8	1157.2
74.60	25.850	25.680	817.6	642.5	641.9	642.5	506.3	.0	38.26	.00	47.59	61.86	951.9	1362.2	-702.9	-1201.2	1209.1	1201.2
80.70	26.360	26.150	817.2	647.8	643.3	647.8	504.0	.0	38.08	.00	48.58	62.09	972.3	1384.1	-729.0	-1223.2	1233.0	1223.2
87.00	26.870	26.630	820.7	654.3	642.9	654.3	510.1	.0	38.43	.00	49.27	62.29	985.3	1407.0	-746.7	-1245.6	1256.8	1245.6
93.40	27.380	27.110	831.5	663.4	641.1	663.4	529.6	-.0	39.56	-.00	49.52	62.38	987.5	1431.1	-751.1	-1268.1	1280.7	1268.1
100.0	27.900	27.600	845.1	674.9	632.7	674.9	560.2	.0	41.53	.00	49.65	62.40	977.2	1456.8	-744.8	-1291.0	1305.0	1291.0

%FLOW	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOCM1/RHOCM2	OMEGA-B SHOCK	D-FAC	OMEGA-B	LOSS-P TOTAL	LOSS-P PROFILE	PO2/PO1	EFF-P TOTAL	EFF-AD CUM	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	-0.3	0.8	12.7	49.48	.9250	.0000	.5783	.1783	.0396	.0396	.9272	.0000	.7767	.7819	.9004	.5049	.5852	.8451
3.15	-0.4	1.2	11.6	47.90	.9425	.0000	.5646	.1597	.0362	.0362	.9378	.0000	.8005	.7974	.8706	.5013	.5878	.8559
6.70	-0.6	1.5	11.0	46.64	.9525	.0000	.5514	[illegible]	.0327	.0327	.9474	.0000	.8231	.8144	.8433	.4982	.5907	.8672
10.40	-1.1	1.5	10.7	45.36	.9617	.0000	.5376	.1242	.0293	.0293	.9559	.0000	.8397	.8309	.8179	.4956	.5974	.8785
22.70	-2.0	2.0	10.3	43.46	.9591	.0000	.5038	.0911	.0229	.0229	.9713	.0000	.8654	.8616	.7563	.4905	.6117	.9144
31.65	-2.5	2.3	10.3	42.56	.9545	.0000	.4639	.0826	.0216	.0216	.9756	.0000	.8680	.8646	.7256	.4892	.6260	.9396
41.45	-3.2	2.3	10.3	41.54	.9492	.0000	.4618	.0746	.0202	.0202	.9793	.0000	.8684	.8675	.6981	.4895	.6519	.9673
51.85	-4.0	1.9	10.2	40.44	.9433	.0000	.4379	.0663	.0182	.0182	.9829	.0000	.8668	.8730	.6745	.4913	.6815	.9965
62.90	-4.5	1.8	10.0	39.53	.9356	.0000	.4153	.0560	.0166	.0166	.9855	.0000	.8602	.8764	.6561	.4945	.7122	1.0263
74.60	-5.4	1.2	10.0	38.26	.9372	.0000	.3951	.0579	.0169	.0169	.9859	.0000	.8520	.8657	.6445	.4969	.7506	1.0577
80.70	-5.7	1.0	10.2	38.08	.9349	.0000	.3894	.0621	.0183	.0183	.9850	.0000	.8333	.8547	.6421	.5015	.7638	1.0716
87.00	-6.1	0.8	10.9	38.43	.9282	.0000	.3879	.0700	.0208	.0206	.9631	.0000	.8081	.8339	.6419	.5044	.7707	1.0848
93.40	-6.2	0.9	12.0	39.56	.9161	.0000	.3933	.0856	.0256	.0256	.9791	.0000	.7660	.7976	.6455	.5076	.7667	1.0950
100.0	-6.9	0.5	14.0	41.53	.8913	.0000	.4017	.0991	.0298	.0298	.9756	.0000	.7141	.7631	.6493	.5110	.7508	1.1030

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
10720.	184.20	1.4065	2.6000	83.85	85.99

AREA SQFT	NCORR LOCAL RPM	WCORR LOCAL LBM/SEC	TO/TO LOCAL	PO/PO LOCAL
2.352	9039.	78.02	1.0000	.9752

STA-1	STA-2
---LOCAL---	
13.0	14.0

TABLE XVI

AERODYNAMIC SUMMARY – STATOR 2
(SI UNITS)

%FLOW	DIA-1 CM	DIA-2 CM	V-1 M/SEC	V-2 M/SEC	VM-1 M/SEC	VM-2 M/SEC	VO-1 M/SEC	VO-2 M/SEC	B-1 RADIAN	B-2 RADIAN	B'-1 RADIAN	B'-2 RADIAN	V'-1 M/SEC	V'-2 M/SEC	VO'-1 M/SEC	VO'-2 M/SEC	U-1 M/SEC	U-2 M/SEC
0.00	47.19	48.03	340.79	200.76	221.40	200.76	259.07	.00	.8636	.0000	.0263	.9305	221.5	336.0	-5.8	-269.5	264.9	269.5
3.15	48.21	48.95	324.54	198.50	220.92	198.50	244.51	.00	.8360	.0000	.1175	.9451	222.5	338.9	-26.1	-274.7	270.6	274.7
6.70	49.23	49.89	319.18	196.55	219.14	196.55	232.06	.00	.8140	.0000	.1992	.9588	223.6	342.1	-44.2	-280.0	276.3	280.0
10.40	50.27	50.85	309.81	195.02	217.69	195.02	220.44	.00	.7917	.0000	.2762	.9714	226.3	345.7	-61.7	-285.4	282.1	285.4
22.70	53.54	53.90	287.73	192.28	208.83	192.28	197.93	.00	.7566	.0000	.4567	1.0046	232.7	358.5	-102.6	-302.5	300.5	302.5
31.65	55.83	56.01	276.95	191.72	204.00	191.72	187.32	.00	.7426	.0000	.5535	1.0232	239.8	368.2	-126.1	-314.4	313.4	314.4
41.45	58.22	58.24	267.40	191.82	200.14	191.82	177.33	.00	.7251	.0000	.6414	1.0402	249.8	379.0	-149.4	-326.9	326.8	326.9
51.85	60.64	60.53	259.19	192.55	197.25	192.55	168.14	.00	.7059	.0000	.7180	1.0552	261.9	390.5	-172.3	-339.7	340.5	339.7
62.90	63.14	62.84	252.93	193.93	195.08	193.93	160.99	.00	.6899	.0000	.7417	1.0681	274.7	402.5	-193.4	-352.7	354.4	352.7
74.60	65.66	65.23	249.19	195.85	195.66	195.85	154.31	.00	.6678	.0000	.8307	1.0796	290.1	415.2	-214.2	-366.1	368.5	366.1
80.70	66.95	66.42	249.08	197.45	196.07	197.45	153.61	.00	.6646	.0000	.8478	1.0838	296.3	421.9	-222.2	-372.8	375.8	372.8
87.00	68.25	67.64	250.15	199.42	195.95	199.42	155.49	.00	.6708	.0000	.8600	1.0872	300.3	428.9	-227.6	-379.7	383.1	379.7
93.40	69.55	68.86	253.45	202.20	195.40	202.20	161.41	-.00	.6904	-.0000	.8643	1.0888	301.0	436.2	-228.9	-386.5	390.4	386.5
100.0	70.87	70.10	257.57	205.71	192.84	205.71	170.76	.00	.7248	.0000	.8666	1.0891	297.9	444.0	-227.0	-393.5	397.8	393.5

%FLOW	INCS RADIAN	INCH RADIAN	DEV RADIAN	TURN RADIAN	RHOCM1/ RHOCM2	OMEGA-B SHOCK	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	LOSS-P PROFILE	PO2/ PO1	EFF-P TOTAL	EFF-AD CUM	EFF-P STATIC	M-1	M-2	M'-1	M'-2
0.00	-.005	.014	.222	.8636	.9250	.0000	.5783	.1783	.0396	.0396	.9272	.0000	.7767	.7819	.9004	.5049	.5852	.8451
3.15	-.007	.021	.202	.8360	.9425	.0000	.5646	.1597	.0362	.0362	.9378	.0000	.8005	.7974	.8708	.5013	.5876	.8559
6.70	-.010	.026	.192	.8140	.9525	.0000	.5514	.1414	.0327	.0327	.9474	.0000	.8231	.8144	.8433	.4982	.5907	.8672
10.40	-.019	.026	.187	.7917	.9617	.0000	.5376	.1242	.0293	.0293	.9559	.0000	.8397	.8309	.8179	.4956	.5974	.8785
22.70	-.035	.035	.180	.7584	.9591	.0000	.5038	.0911	.0229	.0229	.9713	.0000	.8654	.8616	.7563	.4905	.6117	.9144
31.65	-.044	.040	.180	.7428	.9545	.0000	.4839	.0828	.0216	.0216	.9756	.0000	.8680	.8646	.7256	.4892	.6280	.9396
41.45	-.056	.040	.180	.7251	.9492	.0000	.4618	.0746	.0202	.0202	.9793	.0000	.8684	.8675	.6981	.4895	.6519	.9673
51.85	-.070	.033	.178	.7059	.9433	.0000	.4379	.0653	.0182	.0182	.9829	.0000	.8668	.8730	.6745	.4913	.6815	.9965
62.90	-.079	.031	.174	.6899	.9356	.0000	.4153	.0580	.0166	.0166	.9855	.0000	.8602	.8764	.6561	.4945	.7122	1.0263
74.60	-.094	.021	.174	.6678	.9372	.0000	.3951	.0579	.0169	.0169	.9859	.0000	.8520	.8657	.6445	.4989	.7506	1.0577
80.70	-.100	.017	.178	.6646	.9349	.0000	.3894	.0621	.0183	.0163	.9850	.0000	.8333	.8547	.6421	.5015	.7638	1.0716
87.00	-.106	.014	.190	.6708	.9282	.0000	.3879	.0700	.0208	.0208	.9831	.0000	.8081	.8339	.6419	.5044	.7707	1.0848
93.40	-.108	.016	.210	.6904	.9161	.0000	.3933	.0858	.0256	.0256	.9791	.0000	.7660	.7976	.6455	.5076	.7667	1.0950
100.0	-.120	.087	.244	.7248	.8913	.0000	.4017	.0991	.0298	.0298	.9756	.0000	.7141	.7631	.6493	.5110	.7508	1.1030

NCORR INLET RAD/SEC	WCORR INLET KG/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %
1122.60	83.551	1.4065	2.8000	83.85	85.99

AREA SQM	NCORR LOCAL RAD/SEC	WCORR LOCAL KG/SEC	TO/TO LOCAL	PO/PO LOCAL
.2185	946.57	35.389	1.0000	.9752

STA-1 ---LOCAL---	STA-2 ---LOCAL---
13.0	14.0

APPENDIX D

AIRFOIL GEOMETRY ON CONICAL SURFACES

TABLE XVII

AIRFOIL GEOMETRY ON CONICAL SURFACES – ROTOR 1

Airfoil Geometry on Conical Surfaces - Rotor 1

Inlet Root Diameter = 12.50 Inches (.318 Meters) Inlet Tip Diameter = 31.00 Inches .787 Meters
Exit Root Diameter = 14.71 Inches (.374 Meters Exit Tip Diameter = 29.94 Inches .761 Meters
Axial Tilt = 0 Degrees (0 Radians Tangential Tilt = 0 Inches (0 Meters

Multiple - Circular - Arc Airfoils, 28 Blades

	Hub													Tip
Percent Flow	0	3.15	6.70	10.40	22.70	31.65	41.45	51.35	62.90	74.50	80.70	87.00	93.40	100.0
% Span at Leading Edge	0.0	5.7	11.2	16.6	32.4	42.4	52.4	62.1	71.7	81.2	85.9	90.7	95.3	100.0
Average % Span	0.0	5.35	10.6	15.8	31.2	41.2	51.2	61.05	70.85	80.6	85.45	90.35	95.15	100.0
% Span at Trailing Edge	0.0	5.0	10.0	15.0	30.0	40.0	50.0	60.0	70.0	80.0	85.0	90.0	95.0	100.0
English Units (Inches and Degrees														
c	3.62	3.70	3.76	3.83	4.00	4.08	4.17	4.25	4.32	4.40	4.45	4.48	4.51	4.55
c_f	0.85	0.92	1.00	1.08	1.29	1.49	1.65	1.83	1.98	2.14	2.21	2.30	2.40	2.50
t/c	0.0798	0.0770	0.0740	0.0710	0.0630	0.0570	0.0520	0.0460	0.0410	0.0355	0.0330	0.0300	0.0275	0.0250
% c to max t	52.8	53.0	53.5	54.0	55.5	56.5	57.6	59.0	60.5	62.0	62.6	63.5	64.3	64.8
a/c	0.518	0.520	0.522	0.525	0.535	0.540	0.544	0.550	0.570	0.600	0.615	0.634	0.649	0.665
RLE	0.0140	0.0139	0.0138	0.0135	0.0129	0.0120	0.0112	0.0106	0.0100	0.0092	0.0088	0.0083	0.0078	0.0073
RTE	0.0140	0.0139	0.0138	0.0135	0.0129	0.0120	0.0112	0.0106	0.0100	0.0092	0.0088	0.0083	0.0078	0.0073
$\beta'^*_{ss_1}$	44.6	46.4	47.8	48.9	51.4	52.9	54.4	55.9	57.2	58.4	59.0	59.7	60.4	61.0
β'^*_1	39.8	41.8	43.6	44.8	47.9	49.9	51.8	53.6	55.3	56.3	57.6	58.4	59.2	59.9
ϕ	75.5	69.7	63.1	56.4	38.2	29.1	21.4	16.1	12.4	11.0	10.8	11.4	12.9	14.8
ϕ_E	74.0	66.9	59.0	52.5	35.5	27.3	21.0	16.5	13.5	13.0	13.3	14.0	16.0	18.5
ϕ_f	8.5	8.4	8.2	8.0	6.9	6.0	4.8	3.6	2.5	0.8	-0.4	-1.5	-2.8	-4.0
ϕ_{Ef}	6.9	6.88	6.7	6.6	6.0	5.5	4.7	3.9	2.8	1.6	0.8	-0.2	-1.2	-2.3
i	20.3	18.3	16.2	14.3	8.9	5.5	2.3	-0.8	-3.9	-6.9	-8.4	-9.9	-11.4	-12.9
σ	2.38	2.27	2.17	2.09	1.88	1.77	1.67	1.58	1.51	1.44	1.41	1.38	1.36	1.33
Metric Units (Meters and Radians)														
c	0.0919	0.0940	0.0955	0.0973	0.1016	0.1036	0.1059	0.1080	0.1097	0.1118	0.1130	0.1138	0.1146	0.1156
c_f	0.0216	0.0234	0.0254	0.0274	0.0328	0.0376	0.0419	0.0465	0.0503	0.0544	0.0561	0.0584	0.0602	0.0635
t/c	0.0798	0.0770	0.0740	0.0710	0.0630	0.0570	0.0520	0.0460	0.0410	0.0355	0.0330	0.0300	0.0275	0.0250
% c to max. t	52.8	53.0	53.5	54.0	55.5	56.5	57.6	59.0	60.5	62.0	62.6	63.5	64.3	64.8
a/c	0.518	0.520	0.522	0.525	0.535	0.540	0.544	0.550	0.570	0.600	0.615	0.634	0.649	0.665
RLE	0.000356	0.000353	0.000351	0.000343	0.000328	0.000305	0.000284	0.000269	0.000254	0.000234	0.000224	0.000211	0.000198	0.000185
RTE	0.000356	0.000353	0.000351	0.000343	0.000328	0.000305	0.000284	0.000269	0.000254	0.000234	0.000224	0.000211	0.000198	0.000185
$\beta'^*_{ss_1}$	0.779	0.811	0.834	0.853	0.899	0.925	0.949	0.977	0.999	1.019	1.029	1.042	1.053	1.064
β'^*_1	0.695	0.731	0.761	0.782	0.836	0.871	0.905	0.936	0.966	0.992	1.005	1.019	1.032	1.045
ϕ	1.316	1.217	1.102	0.984	0.667	0.508	0.374	0.281	0.215	-.192	0.188	0.199	0.225	0.258
ϕ_E	1.291	1.167	1.030	0.916	0.620	0.476	0.366	0.288	0.236	0.227	0.232	0.244	0.279	0.323
ϕ_f	0.148	0.147	0.143	0.140	0.120	0.105	0.084	0.063	0.044	0.014	-0.007	-0.026	-0.049	-0.070
ϕ_{Ef}	0.120	0.120	0.117	0.115	0.106	0.096	0.082	0.068	0.050	0.028	0.014	-0.004	-.020	-0.040
i	0.354	0.320	0.283	0.250	0.155	0.096	0.040	-0.014	-0.068	-0.120	-0.147	-0.1728	-0.199	-0.225
σ	2.38	2.27	2.17	2.09	1.88	1.77	1.67	1.58	1.51	1.44	1.41	1.38	1.36	1.33

TABLE XVIII

AIRFOIL GEOMETRY ON CONICAL SURFACES – STATOR 1

Airfoil Geometry on Conical Surfaces - Stator 1

Inlet Root Diameter = 1[illegible] Inches .387 Meters Inlet Tip Diameter = 29.67 .7[illegible]4 Meters
Exit Root Diameter = [illegible] Inches .[illegible] Meters Exit Tip Diameter = [illegible] .7[illegible] Meters

Multiple - Circular - Arc Airfoils, 46 Vanes

	Hub													Tip
Percent Flow	0	3.15	6.70	10.40	22.70	31.60	41.45	51.85	62.90	74.60	80.70	87.00	93.40	100.0
% Span at Leading Edge	0.0	4.9	9.8	14.7	29.7	39.6	49.7	59.8	69.9	79.9	84.9	90.0	95.0	100.0
Average % Span	0.0	4.75	9.5	14.3	29.05	38.9	49.0	59.15	69.3	79.5	84.6	89.75	94.85	100.0
% Span at Trailing Edge	0.0	4.6	9.2	13.9	28.4	38.2	[illegible]	58.5	68.8	79.1	84.3	89.5	94.7	100.0
English Units (Inches and Degrees)														
c	2.75	2.76	2.76	2.77	2.78	2.79	2.82	2.86	2.90	2.95	2.98	3.01	3.05	3.11
c_f	0.89	0.89	0.90	0.91	0.96	1.03	1.09	1.18	1.25	1.35	1.40	1.46	1.54	1.60
t/c	0.0400	0.0410	0.0430	0.0500	0.0500	0.0549	0.0579	0.0610	0.0649	0.0689	0.0700	0.0715	0.0740	0.0750
% c to max. t	56.0	55.6	55.2	54.9	53.7	53.0	[illegible]	51.6	51.1	50.6	50.4	50.2	50.1	50.0
a/c	0.538	0.537	0.536	0.536	0.536	0.535	0.534	0.531	0.522	0.509	0.508	0.514	0.520	0.532
RLE	0.0050	0.0050	0.0052	0.0054	0.0058	0.0060	0.0065	0.0066	0.0070	0.0072	0.0074	0.0075	0.0078	0.0080
RTE	0.0050	0.0050	0.0052	0.0054	0.0058	0.0060	0.0065	0.0066	0.0070	0.0072	0.0074	0.0075	0.0078	0.0080
β^*_{ss}	54.7	52.5	50.9	49.6	47.0	46.2	45.6	45.0	44.5	44.6	44.6	44.9	45.6	47.1
β^*_2	52.8	50.5	48.4	46.8	43.3	41.8	40.5	39.4	38.5	37.8	37.7	37.9	38.5	39.6
ϕ	66.4	62.7	59.6	57.1	52.6	51.1	49.8	48.7	47.9	47.7	[illegible]	49.7	51.7	54.6
ϕ_E	63.5	59.8	57.3	55.3	51.5	50.5	49.5	48.5	47.8	48.0	48.8	50.0	52.0	55.0
ϕ_f	8.8	8.5	8.4	8.5	9.3	10.6	12.3	14.5	17.3	20.0	21.3	22.2	22.9	23.3
ϕ_{Ef}	7.5	6.3	6.4	7.0	9.3	10.6	12.5	14.8	17.8	20.8	22.0	22.5	23.0	23.5
ϵ	19.1	17.3	15.4	13.7	[illegible]	5.9	3.2	0.8	-1.3	-3.6	-4.4	-5.3	-6.2	-7.1
σ	2.51	2.39	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.69	[illegible]	1.60	1.58	1.56	[illegible]
Metric Units (Meters and Radians)														
c	0.0699	0.0706	0.0705	0.070[illegible]	0.0706	0.0709	0.0716	0.0727	0.0737	0.0749	0.0757	0.0764	0.0775	0.0790
c_f	0.0226	[illegible]	[illegible]	0.0231	0.0244	0.0262	0.0277	0.0299	0.0320	0.0343	0.0356	0.0371	0.0391	0.0406
t/c	0.0400	0.0410	0.0430	0.0450	0.0500	0.0549	0.0579	0.0610	0.0645	0.0689	0.0700	0.0715	0.0740	0.0750
% c to max. t	56.0	55.6	55.2	54.9	[illegible]	53.0	[illegible]	51.6	51.1	50.6	50.4	50.2	50.1	50.0
a/c	0.538	0.537	0.536	[illegible]	0.536	[illegible]	0.534	0.531	0.522	0.509	[illegible]	[illegible]	[illegible]	0.532
RLE	0.000127	0.000127	0.000132	0.000137	0.000147	0.000152	0.000165	0.000168	0.000178	0.000183	0.000188	0.000191	0.000198	0.000203
RTE_s	0.000127	0.000127	0.000132	0.000137	0.000147	0.000152	0.000165	0.000168	0.000178	0.000183	0.000188	0.000191	0.000198	0.000203
β^*_{ss}	0.946	0.917	0.890	0.866	0.820	0.807	0.795	0.790	0.778	0.778	0.779	0.785	0.796	0.822
β^*_2	0.922	0.881	0.846	0.817	0.756	0.730	0.707	0.689	0.672	0.660	0.659	0.662	0.672	0.692
ϕ	1.159	1.094	1.041	0.998	0.919	0.892	0.870	0.851	0.838	0.834	[illegible]	0.869	0.903	0.953
ϕ_E	1.108	1.044	1.000	0.965	0.899	0.881	0.864	0.846	0.834	0.838	0.852	0.872	0.907	0.960
ϕ_f	0.154	0.148	0.147	0.148	0.162	0.185	0.215	0.253	0.302	0.349	[illegible]	0.387	0.400	0.407
ϕ_{Ef}	0.131	0.110	0.112	0.122	0.162	0.185	0.219	0.258	0.311	0.363	[illegible]	0.393	0.401	0.410
ϵ	0.334	0.302	0.269	0.239	[illegible]	0.10	0.056	0.014	-0.023	-0.063	-0.077	-0.092	-0.108	-0.124
σ	[illegible]	[illegible]	[illegible]	[illegible]	2.04	1.9	[illegible]	[illegible]	1.69	1.6	[illegible]	[illegible]	1.56	1.55

TABLE XIX

AIRFOIL GEOMETRY ON CONICAL SURFACES – ROTOR 2

Airfoil Geometry on Conical Surfaces - Rotor 2

Inlet Root Diameter = 17.39 Inches (.442 Meters)   Inlet Tip Diameter = 28.58 Inches (.726 Meters)
Exit Root Diameter = 18.34 Inches (.466 Meters)   Exit Tip Diameter = 28.11 Inches (.714 Meters)
Axial Tilt = 0 Degrees (0 Radians)   Tangential Tilt = 0 Inches (0 Meters)

Multiple - Circular - Arc Airfoils, 60 Blades

	Hub													Tip
Percent Flow	0	3.15	5.70	10.40	22.70	31.65	41.45	51.85	62.90	74.60	80.70	87.00	93.10	100.0
% Span at Leading Edge	0.0	4.5	9.0	13.6	28.0	37.7	47.8	58.0	68.4	78.8	84.1	89.4	94.7	100.0
Average % Span	0.0	4.4	8.85	13.3	27.5	37.15	47.25	57.5	67.95	78.45	83.8	89.2	94.6	100.0
% Span at Trailing Edge	0.0	4.3	8.7	13.0	27.0	36.6	46.7	57.0	67.5	78.1	83.5	89.0	94.5	100.0
English Units (Inches and Degrees)														
c	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
c_f	0.60	0.60	0.63	0.65	0.70	0.75	0.79	0.84	0.90	0.94	0.95	0.98	1.00	1.05
t/c	0.0950	0.0920	0.0890	0.0860	0.0760	0.0690	0.0620	0.0545	0.0475	0.0400	0.0369	0.0330	0.0290	0.0250
% c to max. t	53.8	54.0	54.0	54.5	55.3	55.8	56.6	57.6	58.5	59.8	60.3	61.0	61.4	62.0
a/c	0.518	0.519	0.518	0.520	0.520	0.525	0.526	0.530	0.543	0.565	0.580	0.595	0.610	0.625
RLE	0.0100	0.0099	0.0095	0.0093	0.0085	0.0079	0.0074	0.0070	0.0065	0.0060	0.0058	0.0055	0.0052	0.0050
RTE	0.0100	0.0099	0.0095	0.0093	0.0085	0.0079	0.0074	0.0070	0.0065	0.0060	0.0058	0.0055	0.0052	0.0050
β_1^* ss	50.5	50.6	50.8	50.9	51.6	52.4	53.8	55.0	55.9	56.7	57.0	57.3	57.6	58.0
β_2^*	45.0	45.3	45.7	46.0	47.4	48.7	50.6	52.2	53.6	54.8	55.1	55.9	56.4	56.9
ø	61.4	54.6	48.7	43.6	30.8	24.7	19.8	15.5	12.2	10.5	10.4	10.9	11.9	13.5
$ø_E$	60.0	54.0	48.0	42.5	29.5	24.0	19.8	15.5	12.5	11.0	11.0	11.5	13.0	14.9
$ø_f$	9.5	9.0	8.8	8.3	7.2	6.4	5.4	4.2	3.3	2.0	1.3	0.5	-0.5	-1.3
$ø_{Ef}$	8.9	8.6	8.3	7.9	6.8	6.0	5.3	4.4	3.4	2.4	1.7	1.0	0.2	-0.7
i	13.7	12.7	11.7	10.6	7.3	5.1	2.7	0.2	-2.3	-4.9	-6.3	-7.6	-9.0	-10.4
δ	2.26	2.20	2.15	2.10	1.94	1.85	1.77	1.69	1.62	1.55	1.52	1.48	1.46	1.43
Metric Units (Meters and Radians)														
c	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533	0.0533
c_f	0.0152	0.0152	0.0160	0.0165	0.0178	0.0191	0.0201	0.0213	0.0229	0.0239	0.0241	0.0249	0.0254	0.0267
t/c	0.0950	0.0920	0.0890	0.0860	0.0760	0.0690	0.0620	0.0545	0.0475	0.0400	0.0369	0.0330	0.0290	0.0250
% c to max. t	53.8	54.0	54.0	54.5	55.3	55.8	56.6	57.6	58.5	59.8	60.3	61.0	61.4	62.0
a/c	0.518	0.519	0.518	0.520	0.520	0.525	0.526	0.530	0.543	0.565	0.580	0.595	0.610	0.625
RLE	0.000254	0.000251	0.000241	0.000236	0.000216	0.000201	0.000188	0.000178	0.000165	0.000152	0.000147	0.000140	0.000132	0.000127
RTE	0.000254	0.000251	0.000241	0.000236	0.000216	0.000201	0.000188	0.000178	0.000165	0.000152	0.000147	0.000140	0.000132	0.000127
β_1^* ss	0.881	0.883	0.8865	0.890	0.900	0.914	0.940	0.961	0.976	0.991	0.995	1.001	1.005	1.012
β_2^*	0.785	0.790	0.798	0.803	0.829	0.851	0.884	0.912	0.936	0.956	0.961	0.975	0.984	0.994
ø	1.071	0.953	0.851	0.761	0.538	0.431	0.346	0.270	0.213	0.183	0.182	0.190	0.208	0.236
$ø_E$	1.047	0.942	0.838	0.742	0.515	0.419	0.346	0.270	0.218	0.192	0.192	0.201	0.227	0.260
$ø_f$	0.166	0.157	0.154	0.145	0.126	0.112	0.094	0.073	0.058	0.035	0.023	0.009	-0.009	-0.023
$ø_{Ef}$	0.155	0.150	0.145	0.138	0.120	0.106	0.092	0.077	0.059	0.041	0.030	0.017	0.004	-0.012
i	0.239	0.218	0.204	0.185	0.127	0.089	0.047	0.004	-0.040	-0.086	-0.110	-0.133	-0.157	-0.182
δ	2.26	2.20	2.15	2.10	1.94	1.85	1.78	1.69	1.62	1.55	1.52	1.45	1.46	1.43

TABLE XX

AIRFOIL GEOMETRY ON CONICAL SURFACES – STATOR 2

Airfoil Geometry on Conical Surfaces – Stator [illegible]

Inlet Root Diameter = 1[illegible]. Inches .[illegible]7[illegible] Meters Inlet Tip Diameter = [illegible].[illegible]0 Inches .[illegible]09 Meters
Exit Root Diameter = 1[illegible].[illegible] Inches .[illegible]30 Meters Exit Tip Diameter = [illegible].60 Inches .70[illegible] Meters

Multiple – [illegible]ircular – Arc Airfoils, [illegible] Vanes

	Hub													Tip
Percent Flow	0	3.15	5.70	10.40	22.70	[illegible]	[illegible]	[illegible]	52.90	74.50	80.70	87.00	97.40	100.0
% Span at Leading Edge	0.0	4.[illegible]	8.6	12.9	26.3	[illegible]	45.[illegible]	[illegible]	57.[illegible]	78.0	[illegible]	88.0	94.4	100.0
Average % Span	0.0	4.[illegible]	8.55	12.85	25.7	35.[illegible]	45.[illegible]	56.7	67.2	77.9	[illegible]	[illegible]	94.4	100.0
% Span at Trailing Edge	0.0	4.3	8.	12.8	25.6	36.2	[illegible]	56.5	67.2	77.9	[illegible].4	85.9	94.4	100.0
English Units (Inches and Degrees)														
c	2.2[illegible]	2.24	2.24	2.24	[illegible]	[illegible]	2.26	2.2[illegible]	2.[illegible]1	2.[illegible]	2.[illegible]	2.40	2.4[illegible]	[illegible]
c_f	0.7[illegible]	0.76	0.75	0.77	0.79	0.8	0.9	1.0[illegible]	1.1[illegible]	1.20	1.20	1.[illegible]	1.2[illegible]	[illegible]
t/c	0.0400	0.0420	0.04[illegible]	0.0[illegible]	0.049[illegible]	0.05[illegible]0	0.0[illegible]50	0.0600	0.0640	0.0675	0.069[illegible]	0.0710	0.07[illegible]0	0.07[illegible]0
% c to max. t	58.1	57.1	55.2	[illegible]	52.9	51.6	50.7	50.1	50.0	50.0	50.0	50.0	50.0	50.[illegible]
a/c	0.538	0.539	0.[illegible]40	0.[illegible]40	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]20	[illegible]	0.50[illegible]	0.510	[illegible]
RLE	0.0050	0.0050	0.00[illegible]	0.0054	0.0058	0.0060	0.006[illegible]	0.0066	0.0070	0.0072	0.0074	0.007[illegible]	0.007[illegible]	[illegible]
RTE	0.0050	0.0050	0.00[illegible]	0.0054	0.00[illegible]	0.0060	0.006[illegible]	0.00[illegible]	0.0070	0.0072	0.0074	0.007[illegible]	0.007[illegible]	[illegible]
β_{ss_1}	49.8	48.[illegible]	47.2	4[illegible]	[illegible]	45.2	[illegible]	44.4	44.0	4[illegible]	4[illegible]	44.[illegible]	[illegible]	[illegible]
β^*_2	48.7	45.7	4[illegible]	4[illegible].9	[illegible]	40.[illegible]	[illegible]	[illegible]	37.2	37.1	[illegible]	37.6	[illegible]	[illegible]
ϕ	61.4	58.[illegible]	5[illegible].2	[illegible]	51.3	50.6	49.[illegible]	[illegible]	47.[illegible]	47.1	[illegible]	[illegible]	[illegible]	[illegible]
ϕ_E	61.0	58.5	56.0	[illegible]	51.5	50.[illegible]	49.5	4[illegible]	47.[illegible]	47.[illegible]	47.[illegible]	4[illegible]	[illegible]	[illegible]
ϕ_f	8.5	8.0	7.[illegible]	7.4	[illegible]	[illegible]	11.2	14.0	[illegible]	21.[illegible]	22.[illegible]	[illegible].9	24.[illegible]	[illegible]
ϕ_{Ef}	8.3	7.5	7.[illegible]	7.0	[illegible]	9.5	11.[illegible]	14.[illegible]	13.0	21.4	22.[illegible]	24.0	24.6	[illegible]
ϵ	4.5	4.0	[illegible].5	[illegible].1	1.[illegible]	1.0	0.2	-0.2	-1.4	-2.2	-2.6	-2.9	[illegible]	[illegible]
σ	2.25	2.21	2.1[illegible]	2.1[illegible]	1.99	1.91	1.8[illegible]	1.[illegible]	1.7[illegible]	1.70	1.69	1.68	1.67	[illegible]
Metric Units (Meters and Radians)														
c	0.0572	0.05[illegible]	0.05[illegible]	0.05[illegible]	[illegible]	0.0[illegible]72	0.0574	0.0[illegible]	0.0[illegible]7	0.0[illegible]97	0.0604	0.060[illegible]	[illegible]	0.0625
c_f	0.0191	0.01[illegible]	0.019[illegible]	0.01[illegible]	[illegible]	0.0216	0.02[illegible]	0.0252	0.02[illegible]7	0.0[illegible]	0.0[illegible]	0.0[illegible]	0.0[illegible]	0.0315
t/c	0.0400	0.042[illegible]	0.04[illegible]	0.04[illegible]	[illegible]	0.05[illegible]0	0.0[illegible]50	0.0600	0.0640	0.0675	0.069[illegible]	0.0710	0.07[illegible]0	0.0750
% c to max. t	58.1	57.1	55.2	[illegible]	[illegible]	[illegible]1.6	50.7	[illegible].1	50.0	50.0	50.0	50.0	[illegible]	50.0
a/c	0.538	0.5[illegible]	0.[illegible]40	0.540	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]50	0.5[illegible]	0.520	0.[illegible]	0.50[illegible]	[illegible]	0.52[illegible]
RLE	0.000127	0.000127	.0001[illegible]	0.0001[illegible]7	0.000147	0.0001[illegible]2	0.00016[illegible]	0.0001[illegible]	0.000178	0.00018[illegible]	0.0001[illegible]	0.0001[illegible]1	0.000[illegible]	0.00020[illegible]
RTE	0.000127	0.000127	0.0001[illegible]	0.0001[illegible]7	0.0001[illegible]	0.0001[illegible]	0.00016[illegible]	0.0001[illegible]	0.00017[illegible]	0.00018[illegible]	0.0001[illegible]	0.000191	0.000[illegible]	0.00020[illegible]
β_{ss_1}	0.870	0.844	0.824	0.[illegible]	0.79[illegible]	0.78[illegible]	0.781	0.776	0.769	0.764	0.7[illegible]	0.77[illegible]	0.800	0.846
β^*_2	0.851	0.81[illegible]	0.787	0.7[illegible]	0.72[illegible]	0.704	0.58[illegible]	0.67	0.6[illegible]	0.648	0.6[illegible]	0.6[illegible]	0.675	0.715
ϕ	1.072	1.01[illegible]	0.98[illegible]	0.9[illegible]	0.90[illegible]	[illegible]	0.864	0.851	0.8[illegible]	0.82[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.960
ϕ_E	1.064	1.021	0.977	0.94[illegible]	0.900	[illegible]	0.866	0.[illegible]	0.[illegible]2	0.82[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.968
ϕ_f	0.150	0.140	0.1[illegible]	0.1[illegible]	0.1[illegible]	[illegible]	0.19[illegible]	0.244	0.[illegible]	0.[illegible]72	0.[illegible]	0.[illegible]	0.[illegible]	0.431
ϕ_{Ef}	0.14[illegible]	0.13[illegible]	0.137	0.122	0.1[illegible]	0.166	0.197	0.244	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.4[illegible]
ϵ	0.079	0.070	0.06[illegible]	0.05[illegible]	0.0[illegible]	0.01[illegible]	0.00	-0.00	-0.02[illegible]	-0.0[illegible]	-0.0[illegible]	-0.0[illegible]	-0.0[illegible]	-0.05[illegible]
σ	2.2[illegible]	2.21	2.1[illegible]	2.1[illegible]	1.[illegible]	1.[illegible]	1.8[illegible]	1.8[illegible]	1.[illegible]	1.70	1.[illegible]	1.6[illegible]	1.67	1.66

APPENDIX E

AIRFOIL COORDINATES ON MANUFACTURING SURFACES

(For definition of symbols see Figure 24, page 31 of text)

TABLE XXI(a)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0165	.0202	.0000	-.0004	.0005
.0091	-.0083	.0317	.0002	-.0002	.0008
.1048	.0785	.1517	.0027	.0020	.0039
.2096	.1639	.2760	.0053	.0043	.0070
.3144	.2543	.3932	.0080	.0065	.0100
.4192	.3348	.5038	.0106	.0085	.0128
.5240	.4111	.6086	.0133	.0104	.0155
.6288	.4825	.7041	.0160	.0123	.0179
.7336	.5480	.7872	.0186	.0139	.0200
.8384	.6061	.8590	.0213	.0154	.0218
.9431	.6570	.9210	.0240	.0167	.0234
1.0479	.7008	.9735	.0266	.0178	.0247
1.1527	.7380	1.0175	.0293	.0187	.0258
1.2575	.7687	1.0534	.0319	.0195	.0268
1.3623	.7927	1.0814	.0346	.0201	.0275
1.4671	.8103	1.1016	.0373	.0206	.0280
1.5719	.8213	1.1141	.0399	.0209	.0283
1.6767	.8259	1.1190	.0476	.0210	.0284
1.7815	.8238	1.1162	.0453	.0209	.0284
1.8863	.8148	1.1053	.0479	.0207	.0281
1.9911	.7989	1.0862	.0506	.0203	.0276
2.0959	.7759	1.0588	.0532	.0197	.0269
2.2007	.7455	1.0226	.0559	.0189	.0260
2.3055	.7075	.9771	.0586	.0180	.0248
2.4103	.6616	.9219	.0612	.0168	.0234
2.5151	.6077	.8562	.0639	.0154	.0217
2.6199	.5453	.7797	.0665	.0139	.0198
2.7247	.4741	.6915	.0692	.0120	.0176
2.8294	.3736	.5906	.0719	.0100	.0150
2.9343	.3037	.4770	.0745	.0077	.0121
3.0390	.2039	.3483	.0772	.0052	.0088
3.1438	.0941	.2042	.0799	.0024	.0052
3.2379	-.0141	.0585	.0822	-.0004	.0015
3.2486	-.0264	.0419	.0825	-.0007	.0011

RADIUS (INCHES) =	6.192	RADIUS (METERS) =	.1573
CHORD (INCHES) =	3.249	CHORD (METERS) =	.0825
ZCSL (INCHES) =	1.6631	ZCSL (METERS) =	.0422
YCSL (INCHES) =	.7472	YCSL (METERS) =	.0190
RLE (INCHES) =	.0135	RLE (METERS) =	.000343
RTE (INCHES) =	.0216	RTE (METERS) =	.000549
X-AREA (SQ. IN.) =	.7351	X-AREA(SQ.METERS) =	.000474
GAMMA-CHORD(DEG.) =	-3.41	GAMMA-CHORD(RAD.) =	-.0595

TABLE XXI(b)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0156	.0184	.0000	-.0004	.0005
.0099	-.0079	.0289	.0003	-.0002	.0007
.1064	.0659	.1315	.0027	.0017	.0033
.2128	.1463	.2398	.0054	.0037	.0061
.3191	.2218	.3430	.0081	.0056	.0087
.4255	.2936	.4414	.0108	.0075	.0112
.5319	.3617	.5351	.0135	.0092	.0136
.6383	.4264	.6247	.0162	.0108	.0159
.7447	.4870	.7060	.0189	.0124	.0179
.8511	.5428	.7783	.0216	.0138	.0198
.9575	.5924	.8414	.0243	.0150	.0214
1.0638	.6361	.8963	.0270	.0162	.0228
1.1702	.6739	.9430	.0297	.0171	.0240
1.2766	.7060	.9821	.0324	.0179	.0249
1.3830	.7322	1.0140	.0351	.0186	.0258
1.4894	.7525	1.0386	.0378	.0191	.0264
1.5958	.7669	1.0560	.0405	.0195	.0268
1.7021	.7754	1.0662	.0432	.0197	.0271
1.8085	.7778	1.0692	.0459	.0198	.0272
1.9149	.7739	1.0647	.0486	.0197	.0270
2.0213	.7634	1.0524	.0513	.0194	.0267
2.1277	.7462	1.0320	.0540	.0190	.0262
2.2341	.7219	1.0032	.0567	.0183	.0255
2.3405	.6901	.9652	.0594	.0175	.0245
2.4468	.6504	.9174	.0621	.0165	.0233
2.5532	.6024	.8588	.0649	.0153	.0218
2.6596	.5455	.7888	.0676	.0139	.0200
2.7660	.4791	.7058	.0703	.0122	.0179
2.8724	.4024	.6095	.0730	.0102	.0155
2.9788	.3149	.4955	.0757	.0080	.0126
3.0851	.2157	.3643	.0784	.0055	.0093
3.1915	.1039	.2116	.0811	.0026	.0054
3.2893	-.0117	.0478	.0835	-.0003	.0012
3.2979	-.0219	.0333	.0838	-.0006	.0008

RADIUS (INCHES) =	6.692	RADIUS (METERS) =	.1700
CHORD (INCHES) =	3.298	CHORD (METERS) =	.0838
ZCSL (INCHES) =	1.7261	ZCSL (METERS) =	.0438
YCSL (INCHES) =	.7140	YCSL (METERS) =	.0181
RLE (INCHES) =	.0135	RLE (METERS) =	.000343
RTE (INCHES) =	.0170	RTE (METERS) =	.000432
X-AREA (SQ. IN.) =	.7299	X-AREA(SQ.METERS) =	.000471
GAMMA-CHORD(DEG.) =	2.24	GAMMA-CHORD(RAD.) =	.0391

TABLE XXI(c)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0145	.0165	.0000	-.0004	.0004
.0107	-.0078	.0257	.0003	-.0002	.0007
.1100	.0543	.1107	.0028	.0014	.0028
.2200	.1209	.2016	.0056	.0031	.0051
.3301	.1844	.2889	.0084	.0047	.0073
.4401	.2450	.3726	.0112	.0062	.0095
.5501	.3027	.4527	.0140	.0077	.0115
.6601	.3576	.5304	.0168	.0091	.0135
.7702	.4097	.6039	.0196	.0104	.0153
.8802	.4590	.6720	.0224	.0117	.0171
.9902	.5041	.7334	.0252	.0128	.0186
1.1002	.5445	.7869	.0279	.0138	.0200
1.2102	.5802	.8336	.0307	.0147	.0212
1.3203	.6110	.8735	.0335	.0155	.0222
1.4303	.6371	.9069	.0363	.0162	.0230
1.5403	.6564	.9338	.0391	.0167	.0237
1.6503	.6747	.9543	.0419	.0171	.0242
1.7603	.6859	.9684	.0447	.0174	.0246
1.8704	.6919	.9759	.0475	.0176	.0248
1.9804	.6925	.9769	.0503	.0176	.0248
2.0904	.6874	.9709	.0531	.0175	.0247
2.2004	.6754	.9575	.0559	.0172	.0243
2.3105	.6590	.9365	.0587	.0167	.0238
2.4205	.6398	.9072	.0615	.0161	.0230
2.5305	.6033	.8686	.0643	.0153	.0221
2.6405	.5637	.8200	.0671	.0143	.0208
2.7505	.5153	.7598	.0699	.0131	.0193
2.8606	.4572	.6866	.0727	.0116	.0174
2.9706	.3881	.5979	.0755	.0099	.0152
3.0806	.3070	.4909	.0782	.0078	.0125
3.1906	.2142	.3642	.0810	.0054	.0093
3.3007	.1068	.2109	.0838	.0027	.0054
3.4037	-.0085	.0359	.0865	-.0002	.0009
3.4107	-.0164	.0239	.0866	-.0004	.0006

RADIUS (INCHES) = 7.291
CHORD (INCHES) = 3.411
ZCSL (INCHES) = 1.8207
YCSL (INCHES) = .6498
RLE (INCHES) = .0134
RTE (INCHES) = .0128
X-AREA (SQ. IN.) = .7227
GAMMA-CHORD(DEG.)= 9.50

RADIUS (METERS) = .1852
CHORD (METERS) = .0866
ZCSL (METERS) = .0462
YCSL (METERS) = .0165
RLE (METERS) = .000340
RTE (METERS) = .000325
X-AREA(SQ.METERS)= .000466
GAMMA-CHORD(RAD.)= .1658

TABLE XXI(d)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0136	.0145	.0000	-.0003	.0004
.0116	-.0081	.0225	.0003	-.0002	.0006
.1164	.0409	.0908	.0030	.0010	.0023
.2329	.0936	.1645	.0059	.0024	.0042
.3493	.1438	.2355	.0089	.0037	.0060
.4657	.1916	.3038	.0118	.0049	.0077
.5822	.2371	.3694	.0148	.0060	.0094
.6986	.2803	.4327	.0177	.0071	.0110
.8150	.3212	.4934	.0207	.0082	.0125
.9314	.3600	.5514	.0237	.0091	.0140
1.0479	.3960	.6056	.0266	.0101	.0154
1.1643	.4288	.6536	.0296	.0109	.0166
1.2807	.4579	.6957	.0325	.0116	.0177
1.3972	.4831	.7314	.0355	.0123	.0186
1.5136	.5044	.7613	.0384	.0128	.0193
1.6300	.5217	.7854	.0414	.0133	.0199
1.7465	.5351	.8037	.0444	.0136	.0204
1.8629	.5442	.8163	.0473	.0138	.0207
1.9793	.5491	.8229	.0503	.0139	.0209
2.0958	.5496	.8237	.0532	.0140	.0209
2.2122	.5455	.8180	.0562	.0139	.0208
2.3286	.5365	.8065	.0591	.0136	.0205
2.4451	.5225	.7881	.0621	.0133	.0200
2.5615	.5032	.7625	.0651	.0128	.0194
2.6779	.4781	.7293	.0680	.0121	.0185
2.7944	.4468	.6876	.0710	.0113	.0175
2.9108	.4087	.6365	.0739	.0104	.0162
3.0272	.3632	.5749	.0769	.0092	.0146
3.1436	.3095	.5012	.0798	.0079	.0127
3.2601	.2466	.4130	.0828	.0063	.0105
3.3765	.1731	.3076	.0858	.0044	.0078
3.4929	.0868	.1793	.0887	.0022	.0046
3.6029	-.0074	.0316	.0915	-.0002	.0008
3.6094	-.0148	.0199	.0917	-.0004	.0005

RADIUS (INCHES) =	7.988	RADIUS (METER) =	.2029
CHORD (INCHES) =	3.609	CHORD (METERS) =	.0917
ZCSL (INCHES) =	1.9355	ZCSL (METERS) =	.0492
YCSL (INCHES) =	.5367	YCSL (METERS) =	.0136
RLE (INCHES) =	.0133	RLE (METERS) =	.000338
RTE (INCHES) =	.0129	RTE (METERS) =	.000328
X-AREA (SQ. IN.) =	.7138	X-AREA(SQ.METERS) =	.000461
GAMMA-CHORD(DEG.) =	18.08	GAMMA-CHORD(RAD.) =	.3156

TABLE XXI(e)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0126	.0134	.0000	-.0003	.0003
.0120	-.0088	.0188	.0003	-.0002	.0005
.1238	.0257	.0693	.0031	.0007	.0018
.2476	.0624	.1235	.0063	.0016	.0031
.3714	.0971	.1758	.0094	.0025	.0045
.4952	.1299	.2260	.0126	.0033	.0057
.6190	.1604	.2742	.0157	.0041	.0070
.7428	.1898	.3204	.0189	.0048	.0081
.8666	.2171	.3648	.0220	.0055	.0093
.9904	.2424	.4075	.0252	.0062	.0104
1.1142	.2659	.4481	.0283	.0068	.0114
1.2380	.2874	.4861	.0314	.0073	.0123
1.3618	.3065	.5201	.0346	.0078	.0132
1.4856	.3229	.5490	.0377	.0082	.0139
1.6094	.3355	.5728	.0409	.0085	.0145
1.7332	.3472	.5916	.0440	.0088	.0150
1.8570	.3552	.6056	.0472	.0090	.0154
1.9808	.3578	.6146	.0503	.0091	.0156
2.1046	.3616	.6186	.0535	.0092	.0157
2.2284	.3602	.6176	.0566	.0091	.0157
2.3522	.3557	.6115	.0597	.0090	.0155
2.4760	.3478	.6001	.0629	.0088	.0152
2.5999	.3365	.5834	.0660	.0085	.0148
2.7237	.3216	.5607	.0692	.0082	.0142
2.8475	.3030	.5326	.0723	.0077	.0135
2.9713	.2805	.4979	.0755	.0071	.0126
3.0951	.2538	.4564	.0786	.0064	.0116
3.2189	.2226	.4075	.0818	.0057	.0103
3.3427	.1867	.3504	.0849	.0047	.0089
3.4665	.1456	.2843	.0880	.0037	.0072
3.5903	.0990	.2073	.0912	.0025	.0053
3.7141	.0461	.1191	.0943	.0012	.0030
3.8263	-.0077	.0259	.0972	-.0002	.0007
3.8379	-.0133	.0163	.0975	-.0003	.0004

RADIUS (INCHES) =	8.986	RADIUS (METERS) =	.2282
CHORD (INCHES) =	3.838	CHORD (METERS) =	.0975
ZCSL (INCHES) =	2.0579	ZCSL (METERS) =	.0523
YCSL (INCHES) =	.3827	YCSL (METERS) =	.0097
RLE (INCHES) =	.0129	RLE (METERS) =	.000328
RTE (INCHES) =	.1400	RTE (METERS) =	.003556
X-AREA (SQ. IN.) =	.6817	X-AREA(SQ.METERS) =	.000440
GAMMA-CHORD(DEG.) =	28.41	GAMMA-CHORD(RAD.) =	.4958

TABLE XXI(f)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0118	.0123	.0000	-.0003	.0003
.0119	-.0094	.0161	.0003	-.0002	.0004
.1295	.0144	.0535	.0033	.0004	.0014
.2590	.0393	.0935	.0066	.0010	.0024
.3886	.0620	.1319	.0099	.0016	.0034
.5181	.0844	.1688	.0132	.0021	.0043
.6476	.1046	.2040	.0164	.0027	.0052
.7771	.1233	.2378	.0197	.0031	.0060
.9067	.1405	.2700	.0230	.0036	.0069
1.0362	.1560	.3006	.0263	.0040	.0076
1.1657	.1700	.3296	.0296	.0043	.0084
1.2952	.1825	.3576	.0329	.0046	.0091
1.4248	.1934	.3833	.0362	.0049	.0097
1.5543	.2026	.4059	.0395	.0051	.0103
1.6838	.2099	.4246	.0428	.0053	.0108
1.8133	.2153	.4391	.0461	.0055	.0112
1.9429	.2188	.4495	.0493	.0056	.0114
2.0724	.2203	.4559	.0526	.0056	.0116
2.2019	.2199	.4581	.0559	.0056	.0116
2.3314	.2174	.4562	.0592	.0055	.0116
2.4610	.2130	.4502	.0625	.0054	.0114
2.5905	.2065	.4401	.0658	.0052	.0112
2.7200	.1979	.4257	.0691	.0050	.0108
2.8495	.1872	.4069	.0724	.0048	.0103
2.9791	.1744	.3837	.0757	.0044	.0097
3.1086	.1594	.3560	.0790	.0040	.0090
3.2381	.1422	.3235	.0822	.0036	.0082
3.3676	.1226	.2861	.0855	.0031	.0073
3.4972	.1007	.2434	.0888	.0026	.0062
3.6267	.0764	.1952	.0921	.0019	.0050
3.7562	.0496	.1411	.0954	.0013	.0036
3.8857	.0202	.0806	.0987	.0005	.0020
4.0030	-.0087	.0197	.1017	-.0002	.0005
4.0153	-.0118	.0134	.1020	-.0003	.0003

RADIUS (INCHES) =	9.984		RADIUS (METERS) =	.2536
CHORD (INCHES) =	4.015		CHORD (METERS) =	.1020
ZCSL (INCHES) =	2.1539		ZCSL (METERS) =	.0547
YCSL (INCHES) =	.2640		YCSL (METERS) =	.0067
RLE (INCHES) =	.0123		RLE (METERS) =	.000312
RTE (INCHES) =	.0132		RTE (METERS) =	.000335
X-AREA (SQ. IN.) =	.6423		X-AREA(SQ.METERS) =	.000414
GAMMA-CHORD(DEG.) =	36.37		GAMMA-CHORD(RAD.) =	.6348

TABLE XXI(g)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0110	.0113	.0000	-.0003	.0003
.0113	-.0096	.0139	.0003	-.0002	.0004
.1338	.0062	.0415	.0034	.0002	.0011
.2676	.0224	.0707	.0068	.0006	.0018
.4013	.0373	.0986	.0102	.0009	.0025
.5351	.0510	.1253	.0136	.0013	.0032
.6689	.0635	.1509	.0170	.0016	.0038
.8027	.0748	.1752	.0204	.0019	.0045
.9365	.0849	.1984	.0238	.0022	.0050
1.0702	.0938	.2203	.0272	.0024	.0056
1.2040	.1015	.2410	.0306	.0026	.0061
1.3378	.1080	.2605	.0340	.0027	.0066
1.4716	.1132	.2791	.0374	.0029	.0071
1.6054	.1173	.2964	.0408	.0030	.0075
1.7392	.1202	.3111	.0442	.0031	.0079
1.8729	.1220	.3228	.0476	.0031	.0082
2.0067	.1226	.3310	.0510	.0031	.0084
2.1405	.1220	.3360	.0544	.0031	.0085
2.2743	.1204	.3377	.0578	.0031	.0086
2.4081	.1177	.3360	.0612	.0030	.0085
2.5418	.1138	.3311	.0646	.0029	.0084
2.6756	.1089	.3229	.0680	.0028	.0082
2.8094	.1029	.3114	.0714	.0026	.0079
2.9432	.0959	.2967	.0748	.0024	.0075
3.0770	.0878	.2787	.0782	.0022	.0071
3.2107	.0787	.2572	.0816	.0020	.0065
3.3445	.0687	.2325	.0850	.0017	.0059
3.4783	.0577	.2045	.0883	.0015	.0052
3.6121	.0457	.1730	.0917	.0012	.0044
3.7459	.0328	.1380	.0951	.0008	.0035
3.8797	.0192	.0994	.0985	.0005	.0025
4.0134	.0046	.0572	.1019	.0001	.0015
4.1355	-.0094	.0154	.1050	-.0002	.0004
4.1472	-.0107	.0114	.1053	-.0003	.0003

RADIUS (INCHES) = 10.981
CHORD (INCHES) = 4.147
ZCSL (INCHES) = 2.2326
YCSL (INCHES) = .1777
RLE (INCHES) = .0115
RTE (INCHES) = .0120
X-AREA (SQ. IN.) = .5949
GAMMA-CHORD(DEG.)= 42.82

RADIUS (MFTER) = .2789
CHORD (METERS) = .1053
ZCSL (METERS) = .0567
YCSL (METERS) = .0045
RLE (MFTERS) = .000292
RTE (METERS) = .000305
X-AREA(SQ.METERS)= .000384
GAMMA-CHORD(RAD.)= .7473

TABLE XXI(h)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0103	.0105	.0000	-.0003	.0003
.0137	-.0095	.0121	.0003	-.0002	.0003
.1371	.0001	.0318	.0035	.0000	.0008
.2742	.0097	.0525	.0070	.0002	.0013
.4113	.0185	.0723	.0104	.0005	.0018
.5484	.0264	.0913	.0139	.0007	.0023
.6855	.0334	.1094	.0174	.0008	.0028
.8227	.0395	.1267	.0209	.0010	.0032
.9598	.0449	.1432	.0244	.0011	.0036
1.0969	.0494	.1588	.0279	.0013	.0040
1.2340	.0531	.1736	.0313	.0013	.0044
1.3711	.0559	.1876	.0348	.0014	.0048
1.5082	.0579	.2006	.0383	.0015	.0051
1.6453	.0592	.2133	.0418	.0015	.0054
1.7824	.0597	.2249	.0453	.0015	.0057
1.9195	.0595	.2350	.0488	.0015	.0060
2.0567	.0586	.2424	.0522	.0015	.0062
2.1938	.0571	.2470	.0557	.0015	.0063
2.3309	.0552	.2490	.0592	.0014	.0063
2.4680	.0527	.2484	.0627	.0013	.0063
2.6051	.0498	.2451	.0662	.0013	.0062
2.7422	.0464	.2392	.0697	.0012	.0061
2.8793	.0426	.2307	.0731	.0011	.0059
3.0164	.0383	.2196	.0766	.0010	.0056
3.1535	.0337	.2061	.0801	.0009	.0052
3.2907	.0289	.1900	.0836	.0007	.0048
3.4278	.0238	.1715	.0871	.0006	.0044
3.5649	.0186	.1506	.0905	.0005	.0038
3.7020	.0130	.1273	.0940	.0003	.0032
3.8391	.0074	.1015	.0975	.0002	.0026
3.9762	.0017	.0733	.1010	.0000	.0019
4.1133	-.0040	.0426	.1045	-.0001	.0011
4.2399	-.0096	.0126	.1077	-.0002	.0003
4.2504	-.0095	.0101	.1080	-.0002	.0003

RADIUS (INCHES) =	11.979	RADIUS (METERS) =	.3043
CHORD (INCHES) =	4.250	CHORD (METERS) =	.1080
ZCSL (INCHES) =	2.3009	ZCSL (METERS) =	.0584
YCSL (INCHES) =	.1172	YCSL (METERS) =	.0030
RLE (INCHES) =	.0107	RLE (METERS) =	.000272
RTE (INCHES) =	.0107	RTE (METERS) =	.000272
X-AREA (SQ. IN.) =	.5402	X-AREA(SQ.METERS) =	.000349
GAMMA-CHORD(DEG.) =	47.85	GAMMA-CHORD(RAD.) =	.8351

TABLE XXI(i)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0096	.0096	.0000	-.0002	.0002
.0099	-.0092	.0107	.0003	-.0002	.0003
.1397	-.0038	.0245	.0035	-.0001	.0006
.2794	.0016	.0390	.0071	.0000	.0010
.4191	.0064	.0530	.0106	.0002	.0013
.5588	.0107	.0665	.0142	.0003	.0017
.6985	.0145	.0795	.0177	.0004	.0020
.8382	.0177	.0920	.0213	.0005	.0023
.9779	.0206	.1040	.0248	.0005	.0026
1.1176	.0229	.1156	.0284	.0006	.0029
1.2573	.0248	.1267	.0319	.0006	.0032
1.3970	.0262	.1373	.0355	.0007	.0035
1.5367	.0273	.1475	.0390	.0007	.0037
1.6764	.0279	.1573	.0426	.0007	.0040
1.8161	.0282	.1669	.0461	.0007	.0042
1.9558	.0282	.1758	.0497	.0007	.0045
2.0955	.0279	.1840	.0532	.0007	.0047
2.2352	.0271	.1899	.0568	.0007	.0048
2.3749	.0261	.1935	.0603	.0007	.0049
2.5146	.0248	.1948	.0639	.0006	.0049
2.6543	.0231	.1938	.0674	.0006	.0049
2.7940	.0213	.1905	.0710	.0005	.0048
2.9337	.0193	.1848	.0745	.0005	.0047
3.0734	.0171	.1770	.0781	.0004	.0045
3.2131	.0147	.1670	.0816	.0004	.0042
3.3528	.0122	.1548	.0852	.0003	.0039
3.4925	.0096	.1405	.0887	.0002	.0036
3.6322	.0068	.1240	.0923	.0002	.0031
3.7719	.0039	.1053	.0958	.0001	.0027
3.9116	.0009	.0844	.0994	.0000	.0021
4.0513	-.0022	.0614	.1029	-.0001	.0016
4.1911	-.0054	.0363	.1065	-.0001	.0009
4.3212	-.0084	.0110	.1098	-.0002	.0003
4.3308	-.0087	.0091	.1100	-.0002	.0002

RADIUS (INCHES) = 12.978
CHORD (INCHES) = 4.331
ZCSL (INCHES) = 2.3595
YCSL (INCHES) = .0840
RLE (INCHES) = .0099
RTE (INCHES) = .0096
X-AREA (SQ. IN.) = .4764
GAMMA-CHORD(DEG.)= 52.48

RADIUS (METERS) = .3296
CHORD (METERS) = .1100
ZCSL (METERS) = .0599
YCSL (METERS) = .0021
RLE (METERS) = .000251
RTE (METERS) = .000244
X-AREA(SQ.METERS)= .000307
GAMMA-CHORD(RAD.)= .9159

TABLE XXI(j)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0087	.0086	.0000	-.0002	.0002
.0088	-.0085	.0092	.0002	-.0002	.0002
.1427	-.0060	.0188	.0036	-.0002	.0005
.2853	-.0034	.0289	.0072	-.0001	.0007
.4280	-.0010	.0388	.0109	-.0000	.0010
.5706	.0013	.0486	.0145	.0000	.0012
.7133	.0035	.0583	.0181	.0001	.0015
.8560	.0056	.0679	.0217	.0001	.0017
.9986	.0077	.0774	.0254	.0002	.0020
1.1413	.0096	.0868	.0290	.0002	.0022
1.2839	.0117	.0962	.0326	.0003	.0024
1.4266	.0136	.1056	.0362	.0003	.0027
1.5693	.0157	.1149	.0399	.0004	.0029
1.7119	.0177	.1242	.0435	.0005	.0032
1.8546	.0199	.1336	.0471	.0005	.0034
1.9973	.0222	.1432	.0507	.0006	.0036
2.1399	.0248	.1533	.0544	.0006	.0039
2.2826	.0273	.1621	.0580	.0007	.0041
2.4252	.0293	.1692	.0616	.0007	.0043
2.5679	.0307	.1738	.0652	.0008	.0044
2.7106	.0316	.1759	.0688	.0008	.0045
2.8532	.0320	.1756	.0725	.0008	.0045
2.9959	.0317	.1729	.0761	.0008	.0044
3.1385	.0309	.1678	.0797	.0008	.0043
3.2812	.0295	.1602	.0833	.0007	.0041
3.4239	.0275	.1502	.0870	.0007	.0038
3.5665	.0243	.1377	.0906	.0006	.0035
3.7092	.0215	.1228	.0942	.0005	.0031
3.8518	.0174	.1052	.0978	.0004	.0027
3.9945	.0126	.0851	.1015	.0003	.0022
4.1372	.0068	.0623	.1051	.0002	.0016
4.2798	.0001	.0366	.1087	.0000	.0009
4.4141	-.0072	.0099	.1121	-.0002	.0003
4.4225	-.0077	.0082	.1123	-.0002	.0002

RADIUS (INCHES) = 13.977
CHORD (INCHES) = 4.422
ZCSL (INCHES) = 2.4218
YCSL (INCHES) = .0758
RLE (INCHES) = .0089
RTE (INCHES) = .0085
X-AREA (SQ. IN.) = .4105
GAMMA-CHORD(DEG.) = 56.33

RADIUS (METERS) = .3550
CHORD (METERS) = .1123
ZCSL (METERS) = .0615
YCSL (METERS) = .0019
RLE (METERS) = .000226
RTE (METERS) = .000216
X-AREA(SQ.METERS) = .000265
GAMMA-CHORD(RAD.) = .9831

TABLE XXI(k)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0079	.0080	.0000	-.0002	.0002
.0081	-.0078	.0084	.0002	-.0002	.0002
.1447	-.0064	.0157	.0037	-.0002	.0004
.2894	-.0047	.0236	.0073	-.0001	.0006
.4340	-.0028	.0316	.0110	-.0001	.0008
.5787	-.0007	.0398	.0147	-.0000	.0010
.7234	.0015	.0482	.0184	.0000	.0012
.8681	.0040	.0568	.0220	.0001	.0014
1.0128	.0068	.0656	.0257	.0002	.0017
1.1575	.0099	.0748	.0294	.0003	.0019
1.3022	.0134	.0842	.0331	.0003	.0021
1.4468	.0172	.0939	.0367	.0004	.0024
1.5915	.0213	.1040	.0404	.0005	.0026
1.7362	.0259	.1145	.0441	.0007	.0029
1.8809	.0311	.1253	.0478	.0008	.0032
2.0256	.0367	.1369	.0514	.0009	.0035
2.1703	.0432	.1489	.0551	.0011	.0038
2.3149	.0502	.1612	.0588	.0013	.0041
2.4596	.0571	.1732	.0625	.0014	.0044
2.6043	.0632	.1827	.0661	.0016	.0046
2.7490	.0680	.1893	.0698	.0017	.0048
2.8937	.0714	.1927	.0735	.0018	.0049
3.0384	.0734	.1932	.0772	.0019	.0049
3.1830	.0739	.1904	.0808	.0019	.0048
3.3277	.0728	.1846	.0845	.0018	.0047
3.4724	.0701	.1756	.0882	.0018	.0045
3.6171	.0658	.1631	.0919	.0017	.0041
3.7618	.0594	.1471	.0955	.0015	.0037
3.9065	.0511	.1275	.0992	.0013	.0032
4.0512	.0405	.1040	.1029	.0010	.0026
4.1959	.0274	.0763	.1066	.0007	.0019
4.3405	.0116	.0442	.1102	.0003	.0011
4.4779	-.0060	.0093	.1137	-.0002	.0002
4.4952	-.0069	.0074	.1139	-.0002	.0002

RADIUS (INCHES) = 14.777
CHORD (INCHES) = 4.485
ZCSL (INCHES) = 2.4642
YCSL (INCHES) = .0903
RLE (INCHES) = .0081
RTE (INCHES) = .0075
X-AREA (SQ. IN.) = .3523
GAMMA-CHORD(DEG.)= 58.97

RADIUS (METER') = .3753
CHORD (METERS) = .1139
ZCSL (METERS) = .0626
YCSL (METERS) = .0023
RLE (METERS) = .000206
RTE (METERS) = .000190
X-AREA(SQ.METERS'= .000227
GAMMA-CHORD(RAD.)= 1.0292

TABLE XXI (1)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0070	.0069	.0000	-.0002	.0002
.0071	-.0070	.0072	.0002	-.0002	.0002
.1463	-.0065	.0125	.0037	-.0002	.0003
.2926	-.0057	.0185	.0074	-.0001	.0005
.4390	-.0043	.0251	.0111	-.0001	.0006
.5853	-.0022	.0321	.0149	-.0001	.0008
.7316	.0004	.0397	.0186	.0000	.0010
.8779	.0036	.0479	.0223	.0001	.0012
1.0243	.0074	.0567	.0260	.0002	.0014
1.1706	.0119	.0662	.0297	.0003	.0017
1.3169	.0170	.0762	.0334	.0004	.0019
1.4632	.0230	.0870	.0372	.0006	.0022
1.6096	.0296	.0984	.0409	.0008	.0025
1.7559	.0370	.1106	.0446	.0009	.0028
1.9022	.0451	.1236	.0483	.0011	.0031
2.0485	.0542	.1373	.0520	.0014	.0035
2.1949	.0645	.1522	.0557	.0016	.0039
2.3412	.0758	.1684	.0595	.0019	.0043
2.4875	.0875	.1846	.0632	.0022	.0047
2.6338	.0985	.1991	.0669	.0025	.0051
2.7801	.1076	.2100	.0706	.0027	.0053
2.9265	.1142	.2170	.0743	.0029	.0055
3.0728	.1182	.2202	.0780	.0030	.0056
3.2191	.1198	.2192	.0818	.0030	.0056
3.3654	.1188	.2142	.0855	.0030	.0054
3.5118	.1151	.2052	.0892	.0029	.0052
3.6581	.1085	.1916	.0929	.0028	.0049
3.8044	.0988	.1736	.0966	.0025	.0044
3.9507	.0859	.1509	.1003	.0022	.0038
4.0971	.0695	.1231	.1041	.0018	.0031
4.2434	.0491	.0898	.1078	.0012	.0023
4.3897	.0244	.0508	.1115	.0006	.0013
4.5311	-.0038	.0068	.1151	-.0001	.0002
4.5360	-.0048	.0053	.1152	-.0001	.0001

RADIUS (INCHES) = 15.477
CHORD (INCHES) = 4.536
ZCSL (INCHES) = 2.4950
YCSL (INCHES) = .1090
RLE (INCHES) = .0071
RTE (INCHES) = .0052
X-AREA (SQ. IN.) = .2999
GAMMA-CHORD(DEG.)= 61.19

RADIUS (METERS) = .3931
CHORD (METERS) = .1152
ZCSL (METERS) = .0634
YCSL (METERS) = .0028
RLE (METERS) = .000180
RTE (METERS) = .000132
X-AREA(SQ.METERS)= .000193
GAMMA-CHORD(RAD.)= 1.0680

TABLE XXII(a)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0052	.0056	.0000	-.0001	.0001
.0047	-.0031	.0078	.0001	-.0001	.0002
.0829	.0269	.0445	.0021	.0007	.0011
.1658	.0586	.0833	.0042	.0015	.0021
.2486	.0899	.1217	.0063	.0023	.0031
.3315	.1204	.1594	.0084	.0031	.0040
.4144	.1501	.1961	.0105	.0038	.0050
.4973	.1769	.2320	.0126	.0045	.0059
.5802	.2067	.2672	.0147	.0053	.0068
.6630	.2341	.3012	.0168	.0059	.0077
.7459	.2604	.3353	.0189	.0066	.0085
.8288	.2850	.3668	.0211	.0072	.0093
.9117	.3074	.3945	.0232	.0078	.0100
.9946	.3267	.4165	.0253	.0083	.0106
1.0774	.3426	.4382	.0274	.0087	.0111
1.1603	.3553	.4540	.0295	.0090	.0115
1.2432	.3649	.4658	.0316	.0093	.0118
1.3261	.3715	.4738	.0337	.0094	.0120
1.4090	.3747	.4779	.0358	.0095	.0121
1.4918	.3745	.4780	.0379	.0095	.0121
1.5747	.3713	.4741	.0400	.0094	.0120
1.6576	.3645	.4661	.0421	.0093	.0118
1.7405	.3552	.4538	.0442	.0090	.0115
1.8233	.3402	.4372	.0463	.0086	.0111
1.9062	.3223	.4159	.0484	.0082	.0106
1.9891	.3004	.3897	.0505	.0076	.0099
2.0720	.2741	.3579	.0526	.0070	.0091
2.1549	.2431	.3202	.0547	.0062	.0081
2.2377	.2067	.2759	.0568	.0053	.0070
2.3206	.1645	.2241	.0589	.0042	.0057
2.4035	.1156	.1633	.0610	.0029	.0041
2.4864	.0600	.0922	.0632	.0015	.0023
2.5659	-.0027	.0094	.0652	-.0001	.0002
2.5693	-.0052	.0064	.0653	-.0001	.0002

RADIUS (INCHES) =	7.610	RADIUS (METERS) =	.1933
CHORD (INCHES) =	2.569	CHORD (METERS) =	.0653
ZCSL (INCHES) =	1.3836	ZCSL (METERS) =	.0351
YCSL (INCHES) =	.3297	YCSL (METERS) =	.0084
RLE (INCHES) =	.0051	RLE (METERS) =	.000131
RTE (INCHES) =	.0046	RTE (METERS) =	.000117
X-AREA (SQ. IN.) =	.1864	X-AREA(SQ.METERS) =	.000120
GAMMA-CHORD(DEG.) =	26.63	GAMMA-CHORD(RAD.) =	.4648

TABLE XXII(b)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

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              INCHES                               METERS

      ZC        YP        YS              ZC        YP        YS

   -.0000    -.0053     .0057           .0000    -.0001     .0001
    .0049    -.0035     .0079           .0001    -.0001     .0002
    .0848     .0255     .0446           .0022     .0006     .0011
    .1695     .0556     .0828           .0043     .0014     .0021
    .2543     .0847     .1199           .0065     .0022     .0030
    .3390     .1130     .1561           .0086     .0029     .0040
    .4238     .1405     .1913           .0108     .0036     .0049
    .5086     .1671     .2255           .0129     .0042     .0057
    .5933     .1928     .2587           .0151     .0049     .0066
    .6781     .2173     .2914           .0172     .0055     .0074
    .7628     .2419     .3233           .0194     .0061     .0082
    .8476     .2647     .3529           .0215     .0067     .0090
    .9324     .2854     .3792           .0237     .0072     .0096
   1.0171     .3031     .4017           .0258     .0077     .0102
   1.1019     .3178     .4203           .0280     .0081     .0107
   1.1866     .3295     .4351           .0301     .0084     .0111
   1.2714     .3382     .4461           .0323     .0086     .0113
   1.3562     .3441     .4532           .0344     .0087     .0115
   1.4409     .3460     .4567           .0366     .0088     .0116
   1.5257     .3465     .4563           .0388     .0088     .0116
   1.6104     .3431     .4521           .0409     .0087     .0115
   1.6952     .3304     .4440           .0431     .0084     .0113
   1.7800     .3265     .4317           .0452     .0083     .0110
   1.8647     .3131     .4153           .0474     .0080     .0105
   1.9495     .2961     .3943           .0495     .0075     .0100
   2.0342     .2754     .3685           .0517     .0070     .0094
   2.1190     .2506     .3375           .0538     .0064     .0086
   2.2038     .2214     .3011           .0560     .0056     .0076
   2.2885     .1875     .2585           .0581     .0048     .0066
   2.3733     .1485     .2089           .0603     .0038     .0053
   2.4580     .1038     .1515           .0624     .0026     .0038
   2.5428     .0527     .0848           .0646     .0013     .0022
   2.6238    -.0020     .0098           .0666    -.0001     .0002
   2.6275    -.0053     .0064           .0667    -.0001     .0002

RADIUS (INCHES)  =   8.100      RADIUS  (METERS) =   .2057
CHORD  (INCHES)  =   2.628      CHORD   (METERS) =   .0667
ZCSL   (INCHES)  =   1.4017     ZCSL    (METERS) =   .0356
YCSL   (INCHES)  =    .3105     YCSL    (METERS) =   .0079
RLE    (INCHES)  =    .0053     RLE (METERS)     =   .000135
RTE    (INCHES)  =    .0049     RTE (METERS)     =   .000124
X-AREA (SQ. IN.) =    .2024     X-AREA(SQ.METERS)=   .000131
GAMMA-CHORD(DEG.)=  25.04       GAMMA-CHORD(RAD.)=   .4370
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TABLE XXII(c)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YF	YS	ZC	YF	YS
-.0010	-.0055	.0058	.0000	-.0001	.0001
.0051	-.0037	.0081	.0001	-.0001	.0002
.0865	.0234	.0447	.0022	.0006	.0011
.1731	.0516	.0828	.0044	.0013	.0021
.2596	.0796	.1196	.0066	.0020	.0030
.3461	.1054	.1552	.0088	.0027	.0039
.4327	.1309	.1895	.0110	.0033	.0048
.5192	.1556	.2226	.0132	.0040	.0057
.6057	.1793	.2545	.0154	.0046	.0065
.6923	.2022	.2858	.0176	.0051	.0073
.7788	.2241	.3157	.0198	.0057	.0080
.8653	.2451	.3435	.0220	.0062	.0087
.9519	.2637	.3684	.0242	.0067	.0094
1.0384	.2794	.3891	.0264	.0071	.0099
1.1249	.292	.4061	.0286	.0074	.0103
1.2115	.3025	.4192	.0308	.0077	.0106
1.2980	.3103	.4286	.0330	.0079	.0109
1.3845	.3149	.4343	.0352	.0080	.0110
1.4711	.3165	.4363	.0374	.0080	.0111
1.5576	.3154	.4346	.0396	.0080	.0110
1.6441	.3113	.4291	.0418	.0079	.0109
1.7306	.3043	.4199	.0440	.0077	.0107
1.8172	.2943	.4068	.0462	.0075	.0103
1.9037	.2811	.3876	.0484	.0071	.0099
1.9902	.2646	.3683	.0506	.0067	.0094
2.0768	.2451	.3426	.0528	.0062	.0087
2.1633	.2219	.3123	.0549	.0056	.0079
2.2498	.1950	.2771	.0571	.0050	.0070
2.3364	.1647	.2365	.0593	.0042	.0060
2.4229	.1292	.1900	.0615	.0033	.0048
2.5094	.0894	.1366	.0637	.0023	.0035
2.5960	.0446	.0756	.0659	.0011	.0019
2.6783	-.0024	.0097	.0680	-.0001	.0002
2.6825	-.0053	.0064	.0681	-.0001	.0002

RADIUS (INCHES) = 8.700
CHORD (INCHES) = 2.682
ZCSL (INCHES) = 1.4077
YCSL (INCHES) = .2905
RLE (INCHES) = .0055
RTE (INCHES) = .0052
X-AREA (SQ. IN.) = .2244
GAMMA-CHORD(DEG.)= 23.60

RADIUS (METERS) = .2210
CHORD (METERS) = .0681
ZCSL (METERS) = .0358
YCSL (METERS) = .0074
RLE (METERS) = .000140
RTE (METERS) = .000132
X-AREA(SQ.METERS)= .000145
GAMMA-CHORD(RAD.)= .4119

TABLE XXII(d)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0057	.0061	.0000	-.0001	.0002
.0055	-.0040	.0085	.0001	-.0001	.0002
.0876	.0212	.0450	.0022	.0005	.0011
.1752	.0472	.0825	.0044	.0012	.0021
.2627	.0723	.1185	.0067	.0018	.0030
.3503	.0964	.1530	.0089	.0024	.0039
.4379	.1195	.1858	.0111	.0030	.0047
.5255	.1416	.2172	.0133	.0036	.0055
.6130	.1626	.2472	.0156	.0041	.0063
.7006	.1830	.2759	.0178	.0046	.0070
.7882	.2025	.3033	.0200	.0051	.0077
.8758	.2209	.3292	.0222	.0056	.0084
.9633	.2375	.3523	.0245	.0060	.0089
1.0509	.2518	.3717	.0267	.0064	.0094
1.1385	.2635	.3874	.0289	.0067	.0098
1.2261	.2725	.3994	.0311	.0069	.0101
1.3137	.2788	.4078	.0334	.0071	.0104
1.4012	.2825	.4127	.0356	.0072	.0105
1.4888	.2836	.4140	.0378	.0072	.0105
1.5764	.2821	.4117	.0400	.0072	.0105
1.6640	.2778	.4058	.0423	.0071	.0103
1.7515	.2709	.3963	.0445	.0069	.0101
1.8391	.2612	.3830	.0467	.0066	.0097
1.9267	.2488	.3660	.0489	.0063	.0093
2.0143	.2334	.3449	.0512	.0059	.0088
2.1019	.2151	.3199	.0534	.0055	.0081
2.1894	.1938	.2905	.0556	.0049	.0074
2.2770	.1694	.2567	.0578	.0043	.0065
2.3646	.1416	.2179	.0601	.0036	.0055
2.4522	.1104	.1741	.0623	.0028	.0044
2.5397	.0756	.1246	.0645	.0019	.0032
2.6273	.0370	.0688	.0667	.0009	.0017
2.7102	-.0032	.0097	.0688	-.0001	.0002
2.7149	-.0054	.0064	.0690	-.0001	.0002

RADIUS (INCHES) =	9.400	RADIUS (METERS) =	.2388
CHORD (INCHES) =	2.715	CHORD (METERS) =	.0690
ZCSL (INCHES) =	1.4125	ZCSL (METERS) =	.0359
YCSL (INCHES) =	.2687	YCSL (METERS) =	.0068
RLE (INCHES) =	.0059	RLE (METERS) =	.000149
RTE (INCHES) =	.0055	RTE (METERS) =	.000140
X-AREA (SQ. IN.) =	.2474	X-AREA(SQ.METERS)=	.000160
GAMMA-CHORD(DEG.)=	22.25	GAMMA-CHORD(RAD.)=	.3883

TABLE XXII(e)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0059	.0063	.0000	-.0001	.0002
.0057	-.0042	.0089	.0001	-.0001	.0002
.0889	.0200	.0464	.0023	.0005	.0012
.1777	.0452	.0850	.0045	.0011	.0022
.2666	.0692	.1215	.0068	.0018	.0031
.3555	.0921	.1562	.0090	.0023	.0040
.4443	.1139	.1890	.0113	.0029	.0048
.5332	.1347	.2199	.0135	.0034	.0056
.6221	.1544	.2490	.0158	.0039	.0063
.7109	.1731	.2764	.0181	.0044	.0070
.7998	.1907	.3024	.0203	.0048	.0077
.8886	.2073	.3268	.0226	.0053	.0083
.9775	.2227	.3485	.0248	.0057	.0089
1.0664	.2359	.3670	.0271	.0060	.0093
1.1552	.2465	.3818	.0293	.0063	.0097
1.2441	.2548	.3930	.0316	.0065	.0100
1.3330	.2605	.4008	.0339	.0066	.0102
1.4218	.2636	.4050	.0361	.0067	.0103
1.5107	.2643	.4057	.0384	.0067	.0103
1.5996	.2625	.4028	.0406	.0067	.0102
1.6884	.2582	.3964	.0429	.0066	.0101
1.7773	.2519	.3865	.0451	.0064	.0098
1.8662	.2419	.3729	.0474	.0061	.0095
1.9550	.2299	.3557	.0497	.0058	.0090
2.0439	.2152	.3346	.0519	.0055	.0085
2.1328	.1978	.3097	.0542	.0050	.0079
2.2216	.1777	.2806	.0564	.0045	.0071
2.3105	.1548	.2473	.0587	.0039	.0063
2.3994	.1289	.2094	.0609	.0033	.0053
2.4882	.1000	.1668	.0632	.0025	.0042
2.5771	.0680	.1190	.0655	.0017	.0030
2.6659	.0327	.0657	.0677	.0008	.0017
2.7497	-.0034	.0101	.0698	-.0001	.0003
2.7548	-.0056	.0067	.0700	-.0001	.0002

RADIUS (INCHES) =	10.100	RADIUS (METERS) =	.2565
CHORD (INCHES) =	2.755	CHORD (METERS) =	.0700
ZCSL (INCHES) =	1.4206	ZCSL (METERS) =	.0361
YCSL (INCHES) =	.2582	YCSL (METERS) =	.0066
RLE (INCHES) =	.0061	RLE (METERS) =	.000156
RTE (INCHES) =	.0059	RTE (METERS) =	.000150
X-AREA (SQ. IN.) =	.2729	X-AREA(SQ.METERS)=	.000176
GAMMA-CHORD(DEG.)=	20.89	GAMMA-CHORD(RAD.)=	.3646

TABLE XXII(f)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0059	.0066	.0000	-.0002	.0002
.0059	-.0043	.0094	.0002	-.0001	.0002
.0900	.0195	.0487	.0023	.0005	.0012
.1800	.0438	.0887	.0046	.0011	.0023
.2700	.0670	.1264	.0069	.0017	.0032
.3600	.0891	.1617	.0091	.0023	.0041
.4500	.1100	.1948	.0114	.0028	.0049
.5400	.1297	.2258	.0137	.0033	.0057
.6300	.1483	.2547	.0160	.0038	.0065
.7200	.1659	.2815	.0183	.0042	.0072
.8100	.1822	.3064	.0206	.0046	.0078
.9000	.1975	.3294	.0229	.0050	.0084
.9900	.2118	.3502	.0251	.0054	.0089
1.0800	.2242	.3681	.0274	.0057	.0094
1.1700	.2344	.3824	.0297	.0060	.0097
1.2599	.2422	.3933	.0320	.0062	.0100
1.3499	.2476	.4006	.0343	.0063	.0102
1.4399	.2505	.4043	.0366	.0064	.0103
1.5299	.2511	.4046	.0389	.0064	.0103
1.6199	.2493	.4014	.0411	.0063	.0102
1.7099	.2451	.3947	.0434	.0062	.0100
1.7999	.2364	.3845	.0457	.0061	.0098
1.8899	.2293	.3706	.0480	.0058	.0094
1.9799	.2177	.3532	.0503	.0055	.0090
2.0699	.2035	.3320	.0526	.0052	.0084
2.1599	.1869	.3069	.0549	.0047	.0078
2.2499	.1677	.2777	.0571	.0043	.0071
2.3399	.1458	.2445	.0594	.0037	.0062
2.4299	.1211	.2069	.0617	.0031	.0053
2.5199	.0934	.1646	.0640	.0024	.0042
2.6099	.0635	.1174	.0663	.0016	.0030
2.6999	.0302	.0648	.0686	.0008	.0016
2.7844	-.0037	.0104	.0707	-.0001	.0003
2.7899	-.0059	.0069	.0709	-.0001	.0002

RADIUS (INCHES) =	10.800	RADIUS (METERS) =	.2743
CHORD (INCHES) =	2.790	CHORD (METERS) =	.0709
ZCSL (INCHES) =	1.4269	ZCSL (METERS) =	.0362
YCSL (INCHES) =	.2531	YCSL (METERS) =	.0064
RLE (INCHES) =	.0064	RLE (METERS) =	.000162
RTE (INCHES) =	.0062	RTE (METERS) =	.000158
X-AREA (SQ. IN.) =	.3016	X-AREA(SQ.METERS)=	.000195
GAMMA-CHORD(DEG.)=	19.55	GAMMA-CHORD(RAD.)=	.3413

TABLE XXII(g)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0062	.0070	.0000	-.0002	.0002
.0062	-.0045	.0099	.0002	-.0001	.0003
.0911	.0187	.0506	.0023	.0005	.0013
.1821	.0426	.0921	.0046	.0011	.0023
.2732	.0652	.1308	.0069	.0017	.0033
.3643	.0866	.1669	.0093	.0022	.0042
.4553	.1067	.2005	.0116	.0027	.0051
.5464	.1256	.2315	.0139	.0032	.0059
.6375	.1433	.2602	.0162	.0036	.0066
.7285	.1597	.2865	.0185	.0041	.0073
.8196	.1749	.3100	.0208	.0044	.0079
.9107	.1869	.3322	.0231	.0048	.0084
1.0017	.2018	.3519	.0254	.0051	.0089
1.0928	.2133	.3689	.0278	.0054	.0094
1.1839	.2230	.3828	.0301	.0057	.0097
1.2750	.2305	.3932	.0324	.0059	.0100
1.3660	.2356	.4001	.0347	.0060	.0102
1.4571	.2385	.4036	.0370	.0061	.0103
1.5482	.2390	.4036	.0393	.0061	.0103
1.6392	.2372	.4001	.0416	.0060	.0102
1.7303	.2330	.3932	.0439	.0059	.0100
1.8214	.2266	.3827	.0463	.0058	.0097
1.9124	.2178	.3687	.0486	.0055	.0094
2.0035	.2066	.3511	.0509	.0052	.0089
2.0946	.1930	.3298	.0532	.0049	.0084
2.1856	.1771	.3047	.0555	.0045	.0077
2.2767	.1587	.2755	.0578	.0040	.0070
2.3678	.1377	.2424	.0601	.0035	.0062
2.4588	.1142	.2050	.0625	.0029	.0052
2.5499	.0882	.1630	.0648	.0022	.0041
2.6410	.0594	.1161	.0671	.0015	.0030
2.7320	.0279	.0642	.0694	.0007	.0016
2.8173	-.0039	.0108	.0716	-.0001	.0003
2.8231	-.0061	.0072	.0717	-.0002	.0002

RADIUS (INCHES) =	11.500	RADIUS (METERS) =	.2921
CHORD (INCHES) =	2.823	CHORD (METERS) =	.0717
ZCSL (INCHES) =	1.4354	ZCSL (METERS) =	.0365
YCSL (INCHES) =	.2486	YCSL (METERS) =	.0063
RLE (INCHES) =	.0067	RLE (METERS) =	.000171
RTE (INCHES) =	.0066	RTE (METERS) =	.000167
X-AREA (SQ. IN.) =	.3288	X-AREA(SQ.METERS)=	.000212
GAMMA-CHORD(DEG.)=	18.38	GAMMA-CHORD(RAD.)=	.3208

TABLE XXII(h)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0063	.0071	.0000	-.0002	.0002
.0064	-.0046	.0103	.0002	-.0001	.0003
.0925	.0191	.0536	.0023	.0005	.0014
.1850	.0431	.0972	.0047	.0011	.0025
.2775	.0657	.1376	.0070	.0017	.0035
.3700	.0869	.1749	.0094	.0022	.0044
.4625	.1066	.2094	.0117	.0027	.0053
.5550	.1250	.2409	.0141	.0032	.0061
.6475	.1426	.2696	.0164	.0036	.0068
.7400	.1576	.2955	.0188	.0040	.0075
.8325	.1717	.3188	.0211	.0044	.0081
.9250	.1845	.3395	.0235	.0047	.0086
1.0175	.1958	.3577	.0258	.0050	.0091
1.1100	.2060	.3732	.0282	.0052	.0095
1.2024	.2145	.3861	.0305	.0054	.0098
1.2949	.2211	.3956	.0329	.0056	.0100
1.3874	.2256	.4018	.0352	.0057	.0102
1.4799	.2278	.4045	.0376	.0058	.0103
1.5724	.2280	.4039	.0399	.0058	.0103
1.6649	.2259	.3998	.0423	.0057	.0102
1.7574	.2217	.3923	.0446	.0056	.0100
1.8499	.2152	.3814	.0470	.0055	.0097
1.9424	.2065	.3670	.0493	.0052	.0093
2.0349	.1956	.3490	.0517	.0050	.0089
2.1274	.1825	.3275	.0540	.0046	.0083
2.2199	.1671	.3022	.0564	.0042	.0077
2.3124	.1495	.2731	.0587	.0038	.0069
2.4049	.1295	.2399	.0611	.0033	.0061
2.4974	.1072	.2026	.0634	.0027	.0051
2.5899	.0825	.1610	.0658	.0021	.0041
2.6824	.0554	.1147	.0681	.0014	.0029
2.7749	.0257	.0635	.0705	.0007	.0016
2.8612	-.0042	.0110	.0727	-.0001	.0003
2.8674	-.0064	.0073	.0728	-.0002	.0002

RADIUS (INCHES) = 12.200
CHORD (INCHES) = 2.867
ZCSL (INCHES) = 1.4498
YCSL (INCHES) = .2459
RLE (INCHES) = .0069
RTE (INCHES) = .0068
X-AREA (SQ. IN.) = .3578
GAMMA-CHORD(DEG.)= 17.01

RADIUS (METERS) = .3099
CHORD (METERS) = .0728
ZCSL (METERS) = .0368
YCSL (METERS) = .0062
RLE (METERS) = .000176
RTE (METERS) = .000174
X-AREA(SQ.METERS)= .000231
GAMMA-CHORD(RAD.)= .2968

TABLE XXII(i)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0067	.0076	.0000	-.0002	.0002
.0068	-.0048	.0112	.0002	-.0001	.0003
.0942	.0195	.0574	.0024	.0005	.0015
.1884	.0443	.1041	.0048	.0011	.0026
.2826	.0674	.1470	.0072	.0017	.0037
.3768	.0888	.1864	.0096	.0023	.0047
.4710	.1086	.2224	.0120	.0028	.0056
.5652	.1268	.2549	.0144	.0032	.0065
.6594	.1432	.2843	.0167	.0036	.0072
.7536	.1581	.3105	.0191	.0040	.0079
.8477	.1713	.3336	.0215	.0044	.0085
.9419	.1830	.3536	.0239	.0046	.0090
1.0361	.1930	.3707	.0263	.0049	.0094
1.1303	.2014	.3849	.0287	.0051	.0098
1.2245	.2082	.3961	.0311	.0053	.0101
1.3187	.2133	.4043	.0335	.0054	.0103
1.4129	.2165	.4093	.0359	.0055	.0104
1.5071	.2177	.4109	.0383	.0055	.0104
1.6013	.2167	.4092	.0407	.0055	.0104
1.6955	.2141	.4041	.0431	.0054	.0103
1.7897	.2093	.3957	.0455	.0053	.0101
1.8839	.2026	.3839	.0479	.0051	.0098
1.9781	.1938	.3688	.0502	.0049	.0094
2.0723	.1831	.3501	.0526	.0047	.0089
2.1665	.1703	.3279	.0550	.0043	.0083
2.2607	.1555	.3020	.0574	.0039	.0077
2.3549	.1386	.2724	.0598	.0035	.0069
2.4491	.1197	.2390	.0622	.0030	.0061
2.5432	.0986	.2015	.0646	.0025	.0051
2.6374	.0755	.1598	.0670	.0019	.0041
2.7316	.0503	.1139	.0694	.0013	.0029
2.8258	.0228	.0631	.0718	.0006	.0016
2.9134	-.0045	.0117	.0740	-.0001	.0003
2.9200	-.0066	.0078	.0742	-.0002	.0002

RADIUS (INCHES) = 12.900
CHORD (INCHES) = 2.920
ZCSL (INCHES) = 1.4710
YCSL (INCHES) = .2460
RLE (INCHES) = .0074
RTE (INCHES) = .0073
X-AREA (SQ. IN.) = .3984
GAMMA-CHORD(DEG.)= 15.43

RADIUS (METERS) = .3277
CHORD (METERS) = .0742
ZCSL (METERS) = .0374
YCSL (METERS) = .0062
RLE (METERS) = .000188
RTE (METERS) = .000186
X-AREA(SQ.METERS)= .000257
GAMMA-CHORD(RAD.)= .2694

TABLE XXII(j)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0067	.0078	.0000	-.0002	.0002
.0068	-.0047	.0117	.0002	-.0001	.0003
.0960	.0210	.0622	.0024	.0005	.0016
.1920	.0471	.1124	.0049	.0012	.0029
.2879	.0712	.1584	.0073	.0018	.0040
.3839	.0935	.2003	.0098	.0024	.0051
.4799	.1139	.2362	.0122	.0029	.0061
.5759	.1323	.2724	.0146	.0034	.0069
.6718	.1491	.3031	.0171	.0038	.0077
.7678	.1640	.3302	.0195	.0042	.0084
.8638	.1771	.3539	.0219	.0045	.0090
.9598	.1884	.3742	.0244	.0048	.0095
1.0558	.1940	.3912	.0268	.0050	.0099
1.1517	.2058	.4047	.0293	.0052	.0103
1.2477	.2118	.4155	.0317	.0054	.0106
1.3437	.2161	.4229	.0341	.0055	.0107
1.4397	.2186	.4270	.0366	.0056	.0108
1.5356	.2192	.4279	.0390	.0056	.0109
1.6316	.2179	.4254	.0414	.0055	.0108
1.7276	.2147	.4196	[illegible]	.0055	.0107
1.8236	.2097	.4104	.0463	.0053	.0104
1.9195	.2027	.3976	.0488	.0051	.0101
2.0155	.1937	.381[illegible]	[illegible]	.0049	.0097
2.1115	.1829	.3623	.0536	.0046	.0092
2.2075	.1700	.3392	.0561	.0043	.0086
2.3035	.1552	.3124	.0585	.0039	.0079
2.3994	.1383	.2817	.0609	.0035	.0072
2.4954	.1194	.2471	.0634	.0030	.0063
2.5914	.0984	.2084	.0658	.0025	.0053
2.6874	.0753	.1654	.0683	.0019	.0042
2.7833	.0501	.1178	.0707	.0013	.0030
2.8793	.0227	.0653	.0731	.0006	.0017
2.9685	-.0047	.0120	.0754	-.0001	.0003
2.9753	-.0068	.0079	.0756	-.0002	.0002

RADIUS (INCHES) = 13.600
CHORD (INCHES) = 2.975
ZCSL (INCHES) = 1.4938
YCSL (INCHES) = .2547
RLE (INCHES) = .0075
RTE (INCHES) = .0075
X-AREA (SQ. IN.) = .4389
GAMMA-CHORD(DEG.)= 14.06

RADIUS (METERS) = .3454
CHORD (METERS) = .0756
ZCSL (METERS) = .0379
YCSL (METERS) = .0065
RLE (METERS) = .000191
RTE (METERS) = .000192
X-AREA(SQ.METERS)= .000283
GAMMA-CHORD(RAD.)= .2454

TABLE XXII(k)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0072	.0084	.0000	-.0002	.0002
.0073	-.0050	.0127	.0002	-.0001	.0003
.0980	.0216	.0657	.0025	.0005	.0017
.1961	.0488	.1192	.0050	.0012	.0030
.2941	.0751	.1680	.0075	.0019	.0043
.3922	.0975	.2125	.0100	.0025	.0054
.4902	.1190	.2530	.0125	.0030	.0064
.5883	.1387	.2895	.0149	.0035	.0074
.6863	.1566	.3222	.0174	.0040	.0082
.7843	.1726	.3512	.0199	.0044	.0089
.8824	.1872	.3767	.0224	.0048	.0096
.9804	.1996	.3987	.0249	.0051	.0101
1.0785	.2106	.4173	.0274	.0054	.0106
1.1765	.2198	.4326	.0299	.0056	.0110
1.2745	.2272	.4447	.0324	.0058	.0113
1.3726	.2330	.4536	.0349	.0059	.0115
1.4706	.2372	.4593	.0374	.0060	.0117
1.5687	.2394	.4615	.0398	.0061	.0117
1.6667	.2396	.4601	.0423	.0061	.0117
1.7648	.2374	.4551	.0448	.0060	.0116
1.8628	.2331	.4464	.0473	.0059	.0113
1.9608	.2265	.4340	.0498	.0058	.0110
2.0589	.2176	.4177	.0523	.0055	.0106
2.1569	.2065	.3975	.0548	.0052	.0101
2.2550	.1929	.3732	.0573	.0049	.0095
2.3530	.1767	.3448	.0598	.0045	.0088
2.4511	.1565	.3120	.0623	.0040	.0079
2.5491	.1375	.2746	.0647	.0036	.0070
2.6471	.1140	.2324	.0672	.0029	.0059
2.7452	.0878	.1851	.0697	.0022	.0047
2.8432	.0589	.1323	.0722	.0015	.0034
2.9413	.0271	.0735	.0747	.0007	.0019
3.0322	-.0048	.0133	.0770	-.0001	.0003
3.0393	-.0073	.0086	.0772	-.0002	.0002

RADIUS (INCHES) = 14.300
CHORD (INCHES) = 3.039
ZCSL (INCHES) = 1.5253
YCSL (INCHES) = .2759
RLE (INCHES) = .0081
RTE (INCHES) = .0080
X-AREA (SQ. IN.) = .4794
GAMMA-CHORD(DEG.)= 13.78

RADIUS (METERS) = .3632
CHORD (METERS) = .0772
ZCSL (METERS) = .0387
YCSL (METERS) = .0070
RLE (METERS) = .000205
RTE (METERS) = .000204
X-AREA(SQ.METERS)= .000309
GAMMA-CHORD(RAD.)= .2405

TABLE XXII (1)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0072	.0086	.0000	-.0002	.0002
.0073	-.0049	.0131	.0002	-.0001	.0003
.1004	.0236	.0707	.0025	.0006	.0018
.2008	.0528	.1283	.0051	.0013	.0033
.3011	.0801	.1811	.0076	.0020	.0046
.4015	.1055	.2294	.0102	.0027	.0058
.5019	.1291	.2733	.0127	.0033	.0069
.6023	.1508	.3130	.0153	.0038	.0080
.7027	.1706	.3488	.0178	.0043	.0089
.8030	.1887	.3807	.0204	.0048	.0097
.9034	.2051	.4089	.0229	.0052	.0104
1.0038	.2198	.4336	.0255	.0056	.0110
1.1042	.2327	.4547	.0280	.0059	.0116
1.2046	.2440	.4725	.0306	.0062	.0120
1.3049	.2536	.4869	.0331	.0064	.0124
1.4053	.2615	.4979	.0357	.0066	.0126
1.5057	.2679	.5056	.0382	.0068	.0128
1.6061	.2723	.5099	.0408	.0069	.0130
1.7065	.2742	.5102	.0433	.0070	.0130
1.8068	.2734	.5064	.0459	.0069	.0129
1.9072	.2699	.4982	.0484	.0069	.0127
2.0076	.2637	.4856	.0510	.0067	.0123
2.1080	.2547	.4690	.0535	.0065	.0119
2.2084	.2428	.4478	.0561	.0062	.0114
2.3088	.2280	.4218	.0586	.0058	.0107
2.4091	.2101	.3909	.0612	.0053	.0099
2.5095	.1892	.3549	.0637	.0048	.0090
2.6099	.1650	.3135	.0663	.0042	.0080
2.7103	.1377	.2664	.0688	.0035	.0068
2.8107	.1070	.2130	.0714	.0027	.0054
2.9110	.0727	.1528	.0739	.0018	.0039
3.0114	.0346	.0850	.0765	.0009	.0022
3.1052	-.0043	.0136	.0789	-.0001	.0004
3.1118	-.0071	.0068	.0790	-.0002	.0002

RADIUS (INCHES) = 14.835 RADIUS (METERS) = .3768
CHORD (INCHES) = 3.112 CHORD (METERS) = .0790
ZCSL (INCHES) = 1.5627 ZCSL (METERS) = .0397
YCSL (INCHES) = .3079 YCSL (METERS) = .0078
RLE (INCHES) = .0081 RLE (METERS) = .000206
RTE (INCHES) = .0078 RTE (METERS) = .000197
X-AREA (SQ. IN.) = .5275 X-AREA(SQ.METERS) = .000340
GAMMA-CHORD(DEG.)= 14.33 GAMMA-CHORD(RAD.)= .2501

TABLE XXIII(a)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0098	.0114	.0000	-.0002	.0003
.0080	-.0055	.0180	.0002	-.0001	.0005
.0655	.0253	.0653	.0017	.0006	.0017
.1310	.0589	.1168	.0033	.0015	.0030
.1965	.0905	.1659	.0050	.0023	.0042
.2620	.1204	.2127	.0067	.0031	.0054
.3275	.1484	.2572	.0083	.0038	.0065
.3930	.1746	.3002	.0100	.0044	.0076
.4585	.1990	.3404	.0116	.0051	.0086
.5240	.2217	.3772	.0133	.0056	.0096
.5895	.2422	.4098	.0150	.0062	.0104
.6550	.2604	.4379	.0166	.0066	.0111
.7205	.2762	.4619	.0183	.0070	.0117
.7860	.2896	.4820	.0200	.0074	.0122
.8515	.3007	.4983	.0216	.0076	.0127
.9170	.3094	.5108	.0233	.0079	.0130
.9825	.3155	.5195	.0250	.0080	.0132
1.0480	.3191	.5246	.0266	.0081	.0133
1.1135	.3200	.5259	.0283	.0081	.0134
1.1790	.3184	.5234	.0299	.0081	.0133
1.2445	.3140	.5169	.0316	.0080	.0131
1.3100	.3067	.5065	.0333	.0078	.0129
1.3755	.2966	.4919	.0349	.0075	.0125
1.4410	.2833	.4727	.0366	.0072	.0120
1.5065	.2667	.4488	.0383	.0068	.0114
1.5720	.2467	.4197	.0399	.0063	.0107
1.6375	.2232	.3851	.0416	.0057	.0098
1.7030	.1957	.3444	.0433	.0050	.0087
1.7685	.1643	.2967	.0449	.0042	.0075
1.8340	.1285	.2412	.0466	.0033	.0061
1.8995	.0878	.1766	.0482	.0022	.0045
1.9650	.0420	.1009	.0499	.0011	.0026
2.0249	-.0044	.0202	.0514	-.0001	.0005
2.0305	-.0087	.0126	.0516	-.0002	.0003

RADIUS (INCHES) = 8.631
CHORD (INCHES) = 2.030
ZCSL (INCHES) = 1.0615
YCSL (INCHES) = .3313
RLE (INCHES) = .0097
RTE (INCHES) = .0084
X-AREA (SQ. IN.) = .3022
GAMMA-CHORD(DEG.) = 12.03

RADIUS (METERS) = .2192
CHORD (METERS) = .0516
ZCSL (METERS) = .0270
YCSL (METERS) = .0084
RLE (METERS) = .000246
RTE (METERS) = .000213
X-AREA(SQ.METERS) = .000195
GAMMA-CHORD(RAD.) = .2100

TABLE XXIII(b)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0090	.0101	.0000	-.0002	.0003
.0083	-.0058	.0152	.0002	-.0001	.0004
.0659	.0162	.0503	.0017	.0004	.0013
.1318	.0404	.0892	.0033	.0010	.0023
.1977	.0631	.1264	.0050	.0016	.0032
.2636	.0844	.1620	.0067	.0021	.0041
.3295	.1043	.1960	.0084	.0026	.0050
.3954	.1228	.2287	.0100	.0031	.0058
.4613	.1400	.2597	.0117	.0036	.0066
.5272	.1558	.2892	.0134	.0040	.0073
.5931	.1702	.3164	.0151	.0043	.0080
.6590	.1830	.3402	.0167	.0046	.0086
.7249	.1943	.3608	.0184	.0049	.0092
.7908	.2040	.3782	.0201	.0052	.0096
.8567	.2120	.3925	.0218	.0054	.0100
.9226	.2183	.4037	.0234	.0055	.0103
.9885	.2228	.4118	.0251	.0057	.0105
1.0544	.2257	.4169	.0268	.0057	.0106
1.1203	.2266	.4188	.0285	.0058	.0106
1.1862	.2257	.4176	.0301	.0057	.0106
1.2521	.2227	.4131	.0318	.0057	.0105
1.3180	.2178	.4053	.0335	.0056	.0103
1.3839	.2106	.3940	.0352	.0054	.0100
1.4498	.2013	.3791	.0368	.0051	.0096
1.5157	.1897	.3603	.0385	.0048	.0092
1.5816	.1756	.3374	.0402	.0045	.0086
1.6475	.1588	.3099	.0418	.0040	.0079
1.7134	.1392	.2775	.0435	.0035	.0070
1.7793	.1166	.2395	.0452	.0030	.0061
1.8452	.0907	.1953	.0469	.0023	.0050
1.9111	.0613	.1438	.0485	.0016	.0037
1.9770	.0280	.0834	.0502	.0007	.0021
2.0354	-.0049	.0206	.0517	-.0001	.0005
2.0429	-.0091	.0126	.0519	-.0002	.0003

RADIUS (INCHES) = 9.130
CHORD (INCHES) = 2.043
ZCSL (INCHES) = 1.0835
YCSL (INCHES) = .2532
RLE (INCHES) = .0093
RTE (INCHES) = .0098
X-AREA (SQ. IN.) = .2769
GAMMA-CHORD(DEG.)= 20.02

RADIUS (METERS) = .2319
CHORD (METERS) = .0519
ZCSL (METERS) = .0275
YCSL (METERS) = .0064
RLE (METERS) = .000236
RTE (METERS) = .000249
X-AREA(SQ.METERS)= .000179
GAMMA-CHORD(RAD.)= .3494

TABLE XXIII(c)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0086	.0095	.0000	-.0002	.0002
.0085	-.0061	.0136	.0002	-.0002	.0003
.0667	.0108	.0419	.0017	.0003	.0011
.1335	.0293	.0734	.0034	.0007	.0019
.2002	.0466	.1036	.0051	.0012	.0026
.2670	.0627	.1325	.0068	.0016	.0034
.3337	.0776	.1601	.0085	.0020	.0041
.4005	.0913	.1865	.0102	.0023	.0047
.4672	.1038	.2115	.0119	.0026	.0054
.5340	.1 1	.2356	.0136	.0029	.0060
.6007	.1252	.2580	.0153	.0032	.0066
.6675	.1341	.2781	.0170	.0034	.0071
.7342	.1418	.2956	.0186	.0036	.0075
.8010	.1483	.3102	.0203	.0038	.0079
.8677	.1536	.3221	.0220	.0039	.0082
.9345	.1576	.3314	.0237	.0040	.0084
1.0012	.1604	.3380	.0254	.0041	.0086
1.0679	.1617	.3419	.0271	.0041	.0087
1.1347	.1621	.3431	.0288	.0041	.0087
1.2014	.1608	.3416	.0305	.0041	.0087
1.2682	.1582	.3374	.0322	.0040	.0086
1.3349	.1541	.3302	.0339	.0039	.0084
1.4017	.1484	.3201	.0356	.0038	.0081
1.4684	.1411	.3070	.0373	.0036	.0078
1.5352	.1323	.2906	.0390	.0034	.0074
1.6019	.1217	.2709	.0407	.0031	.0069
1.6687	.1093	.2475	.0424	.0028	.0063
1.7354	.0950	.2203	.0441	.0024	.0056
1.8022	.0788	.1889	.0458	.0020	.0048
1.8689	.0604	.1528	.0475	.0015	.0039
1.9357	.0398	.1115	.0492	.0010	.0028
2.0024	.0168	.0644	.0509	.0004	.0016
2.0609	-.0053	.0173	.0523	-.0001	.0004
2.0692	-.0084	.0107	.0526	-.0002	.0003

RADIUS (INCHES) =	9.530	RADIUS (METERS) =	.2421
CHORD (INCHES) =	2.069	CHORD (METERS) =	.0526
ZCSL (INCHES) =	1.0970	ZCSL (METERS) =	.0279
YCSL (INCHES) =	.1984	YCSL (METERS) =	.0050
RLE (INCHES) =	.0092	RLE (METERS) =	.000234
RTE (INCHES) =	.0096	RTE (METERS) =	.000244
X-AREA (SQ. IN.) =	.2584	X-AREA(SQ.METERS)=	.000167
GAMMA-CHORD(DEG.)=	25.78	GAMMA-CHORD(RAD.)=	.4499

TABLE XXIII(d)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0082	.0087	.0000	-.0002	.0002
.0084	-.0064	.0119	.0002	-.0002	.0003
.0674	.0062	.0344	.0017	.0002	.0009
.1348	.0197	.0593	.0034	.0005	.0015
.2023	.0323	.0832	.0051	.0008	.0021
.2697	.0439	.1061	.0069	.0011	.0027
.3371	.0546	.1280	.0086	.0014	.0033
.4045	.0643	.1489	.0103	.0016	.0038
.4720	.0730	.1687	.0120	.0019	.0043
.5394	.0806	.1877	.0137	.0020	.0048
.6068	.0872	.2056	.0154	.0022	.0052
.6742	.0928	.2221	.0171	.0024	.0056
.7417	.0976	.2366	.0188	.0025	.0060
.8091	.1015	.2488	.0206	.0026	.0063
.8765	.1045	.2587	.0223	.0027	.0066
.9439	.1067	.2663	.0240	.0027	.0068
1.0113	.1080	.2716	.0257	.0027	.0069
1.0789	.1084	.2746	.0274	.0028	.0070
1.1462	.1080	.2753	.0291	.0027	.0070
1.2136	.1065	.2737	.0308	.0027	.0070
1.2810	.1041	.2697	.0325	.0026	.0069
1.3485	.1008	.2635	.0343	.0026	.0067
1.4159	.0964	.2547	.0360	.0024	.0065
1.4833	.0911	.2434	.0377	.0023	.0062
1.5507	.0847	.2295	.0394	.0022	.0058
1.6182	.0772	.2130	.0411	.0020	.0054
1.6856	.0687	.1937	.0428	.0017	.0049
1.7530	.0589	.1715	.0445	.0015	.0044
1.8204	.0480	.1462	.0462	.0012	.0037
1.8878	.0359	.1175	.0480	.0009	.0030
1.9553	.0226	.0853	.0497	.0006	.0022
2.0227	.0079	.0492	.0514	.0002	.0012
2.0816	-.0059	.0143	.0529	-.0001	.0004
2.0901	-.0079	.0093	.0531	-.0002	.0002

RADIUS (INCHES) =	10.029	RADIUS (METERS) =	.2547
CHORD (INCHES) =	2.090	CHORD (METERS) =	.0531
ZCSL (INCHES) =	1.1091	ZCSL (METERS) =	.0282
YCSL (INCHES) =	.1504	YCSL (METERS) =	.0038
RLE (INCHES) =	.0087	RLE (METERS) =	.000221
RTE (INCHES) =	.0093	RTE (METERS) =	.000236
X-AREA (SQ. IN.) =	.2371	X-AREA(SQ.METERS) =	.000153
GAMMA-CHORD(DEG.) =	31.50	GAMMA-CHORD(RAD.) =	.5498

TABLE XXIII(e)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0077	.0080	.0000	-.0002	.0002
.0080	-.0064	.0105	.0002	-.0002	.0003
.0678	.0033	.0291	.0017	.0001	.0007
.1357	.0135	.0493	.0034	.0003	.0013
.2035	.0230	.0686	.0052	.0006	.0017
.2713	.0315	.0870	.0069	.0008	.0022
.3392	.0392	.1046	.0086	.0010	.0027
.4070	.0461	.1214	.0103	.0012	.0031
.4748	.0522	.1373	.0121	.0013	.0035
.5427	.0574	.1525	.0138	.0015	.0039
.6105	.0616	.1667	.0155	.0016	.0042
.6783	.0651	.1803	.0172	.0017	.0046
.7462	.0678	.1924	.0190	.0017	.0049
.8140	.0698	.2026	.0207	.0018	.0051
.8819	.0712	.2109	.0224	.0018	.0054
.9497	.0721	.2173	.0241	.0018	.0055
1.0175	.0725	.2216	.0258	.0018	.0056
1.0854	.0722	.2241	.0276	.0018	.0057
1.1532	.0714	.2246	.0293	.0018	.0057
1.2210	.0699	.2231	.0310	.0018	.0057
1.2889	.0679	.2197	.0327	.0017	.0056
1.3567	.0652	.2142	.0345	.0017	.0054
1.4245	.0619	.2068	.0362	.0016	.0053
1.4924	.0580	.1972	.0379	.0015	.0050
1.5602	.0534	.1855	.0396	.0014	.0047
1.6280	.0482	.1717	.0414	.0012	.0044
1.6959	.0423	.1557	.0431	.0011	.0040
1.7637	.0358	.1374	.0448	.0009	.0035
1.8315	.0286	.1167	.0465	.0007	.0030
1.8994	.0206	.0936	.0482	.0005	.0024
1.9672	.0120	.0679	.0500	.0003	.0017
2.0351	.0026	.0394	.0517	.0001	.0010
2.0946	-.0061	.0121	.0532	-.0002	.0003
2.1029	-.0073	.0083	.0534	-.0002	.0002

RADIUS (INCHES) = 10.528
CHORD (INCHES) = 2.103
ZCSL (INCHES) = 1.1181
YCSL (INCHES) = .1161
RLE (INCHES) = .0082
RTE (INCHES) = .0086
X-AREA (SQ. IN.) = .2159
GAMMA-CHORD(DEG.)= 36.18

RADIUS (METERS) = .2674
CHORD (METERS) = .0534
ZCSL (METERS) = .0284
YCSL (METERS) = .0029
RLE (METERS) = .000208
RTE (METERS) = .000218
X-AREA(SQ.METERS)= .000139
GAMMA-CHORD(RAD.)= .6315

TABLE XXIII(f)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0073	.0076	.0000	-.0002	.0002
.0076	-.0064	.0094	.0002	-.0002	.0002
.0681	.0007	.0240	.0017	.0000	.0006
.1362	.0081	.0398	.0035	.0002	.0010
.2043	.0148	.0549	.0052	.0004	.0014
.2724	.0208	.0694	.0069	.0005	.0018
.3404	.0261	.0832	.0086	.0007	.0021
.4085	.0308	.0964	.0104	.0008	.0024
.4766	.0348	.1089	.0121	.0009	.0028
.5447	.0381	.1206	.0138	.0010	.0031
.6128	.0407	.1318	.0156	.0010	.0033
.6809	.0426	.1423	.0173	.0011	.0036
.7490	.0439	.1521	.0190	.0011	.0039
.8171	.0446	.1608	.0208	.0011	.0041
.8852	.0450	.1679	.0225	.0011	.0043
.9533	.0450	.1734	.0242	.0011	.0044
1.0213	.0446	.1771	.0259	.0011	.0045
1.0894	.0440	.1792	.0277	.0011	.0046
1.1575	.0429	.1797	.0294	.0011	.0046
1.2256	.0416	.1786	.0311	.0011	.0045
1.2937	.0399	.1758	.0329	.0010	.0045
1.3619	.0379	.1712	.0346	.0010	.0043
1.4299	.0355	.1651	.0363	.0009	.0042
1.4980	.0327	.1574	.0380	.0008	.0040
1.5661	.0297	.1478	[illegible]	.0008	.0038
1.6342	.0262	.1366	[illegible]	.0007	.0035
1.7022	.0225	.1237	.0432	.0006	.0031
1.7703	.0165	.1090	.0450	.0005	.0028
1.8384	.0140	.0924	.0467	.0004	.0023
1.9065	.0093	.0741	.0484	.0002	.0019
1.9746	.0042	.0537	.0502	.0001	.0014
2.0427	-.0012	.0315	.0519	-.0000	.0008
2.1030	-.0063	.0192	.0534	-.0002	.0003
2.1108	-.0069	.0074	.0536	-.0002	.0002

RADIUS (INCHES) =	11.128	RADIUS (METERS) =	.2827
CHORD (INCHES) =	2.111	CHORD (METERS) =	.0536
ZCSL (INCHES) =	1.1259	ZCSL (METERS) =	.0286
YCSL (INCHES) =	.0871	YCSL (METERS) =	.0022
RLE (INCHES) =	.0078	RLE (METERS) =	.000198
RTE (INCHES) =	.0080	RTE (METERS) =	.000203
X-AREA (SQ. IN.) =	.1919	X-AREA(SQ.METERS)=	.000124
GAMMA-CHORD(DEG.)=	41.42	GAMMA-CHORD(RAD.)=	.7229

TABLE XXIII(g)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0070	.0072	.0000	-.0002	.0002
.0073	-.0063	.0086	.0002	-.0002	.0002
.0682	-.0011	.0202	.0017	-.0000	.0005
.1364	.0042	.0328	.0035	.0001	.0008
.2046	.0089	.0449	.0052	.0002	.0011
.2727	.0132	.0565	.0069	.0003	.0014
.3409	.0169	.0675	.0087	.0004	.0017
.4091	.0201	.0780	.0104	.0005	.0020
.4773	.0227	.0880	.0121	.0006	.0022
.5455	.0248	.0975	.0139	.0006	.0025
.6137	.0263	.1064	.0156	.0007	.0027
.6819	.0273	.1148	.0173	.0007	.0029
.7501	.0279	.1228	.0191	.0007	.0031
.8182	.0279	.1301	.0208	.0007	.0033
.8864	.0276	.1363	.0225	.0007	.0035
.9546	.0270	.1411	.0242	.0007	.0036
1.0228	.0263	.1444	.0260	.0007	.0037
1.0910	.0255	.1464	.0277	.0006	.0037
1.1592	.0244	.1470	.0294	.0006	.0037
1.2274	.0232	.1462	.0312	.0006	.0037
1.2956	.0218	.1439	.0329	.0006	.0037
1.3637	.0203	.1403	.0346	.0005	.0036
1.4319	.0186	.1353	.0364	.0005	.0034
1.5001	.0167	.1289	.0381	.0004	.0033
1.5683	.0147	.1211	.0398	.0004	.0031
1.6365	.0125	.1119	.0416	.0003	.0028
1.7047	.0101	.1012	.0433	.0003	.0026
1.7729	.0076	.0891	.0450	.0002	.0023
1.8411	.0051	.0756	.0468	.0001	.0019
1.9092	.0023	.0606	.0485	.0001	.0015
1.9774	-.0006	.0441	.0502	-.0000	.0011
2.0456	-.0035	.0261	.0520	-.0001	.0007
2.1065	-.0061	.0090	.0535	-.0002	.0002
2.1138	-.0065	.0069	.0537	-.0002	.0002

RADIUS (INCHES) =	11.627	RADIUS (METERS) =	.2953
CHORD (INCHES) =	2.114	CHORD (METERS) =	.0537
ZCSL (INCHES) =	1.1307	ZCSL (METERS) =	.0287
YCSL (INCHES) =	.0668	YCSL (METERS) =	.0017
RLE (INCHES) =	.0074	RLE (METERS) =	.000188
RTE (INCHES) =	.0074	RTE (METERS) =	.000188
X-AREA (SQ. IN.) =	.1717	X-AREA(SQ.METERS)=	.000111
GAMMA-CHORD(DEG.)=	45.44	GAMMA-CHORD(RAD.)=	.7931

TABLE XXIII(h)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0065	.0066	.0000	-.0002	.0002
.0068	-.0061	.0076	.0002	-.0002	.0002
.0682	-.0025	.0168	.0017	-.0001	.0004
.1364	.0011	.0268	.0035	.0000	.0007
.2046	.0045	.0363	.0052	.0001	.0009
.2728	.0073	.0454	.0069	.0002	.0012
.3410	.0097	.0540	.0087	.0002	.0014
.4092	.0118	.0623	.0104	.0003	.0016
.4774	.0134	.0702	.0121	.0003	.0018
.5456	.0146	.0777	.0139	.0004	.0020
.6138	.0155	.0848	.0156	.0004	.0022
.6820	.0160	.0916	.0173	.0004	.0023
.7502	.0160	.0980	.0191	.0004	.0025
.8184	.0157	.1040	.0208	.0004	.0026
.8866	.0150	.1093	.0225	.0004	.0028
.9548	.0143	.1136	.0243	.0004	.0029
1.0230	.0134	.1167	.0260	.0003	.0030
1.0912	.0125	.1187	.0277	.0003	.0030
1.1594	.0115	.1194	.0294	.0003	.0030
1.2276	.0104	.1189	.0312	.0003	.0030
1.2958	.0094	.1172	.0329	.0002	.0030
1.3640	.0082	.1145	.0346	.0002	.0029
1.4322	.0070	.1105	.0364	.0002	.0028
1.5004	.0058	.1053	.0381	.0001	.0027
1.5686	.0045	.0990	.0398	.0001	.0025
1.6368	.0033	.0915	.0416	.0001	.0023
1.7050	.0020	.0828	.0433	.0001	.0021
1.7732	.0007	.0730	.0450	.0000	.0019
1.8414	-.0007	.0620	.0468	-.0000	.0016
1.9096	-.0020	.0499	.0485	-.0001	.0013
1.9778	-.0034	.0366	.0502	-.0001	.0009
2.0460	-.0047	.0220	.0520	-.0001	.0006
2.1074	-.0060	.0078	.0535	-.0002	.0002
2.1142	-.0061	.0063	.0537	-.0002	.0002

RADIUS (INCHES) = 12.127
CHORD (INCHES) = 2.114
ZCSL (INCHES) = 1.1343
YCSL (INCHES) = .0508
RLE (INCHES) = .0069
RTE (INCHES) = .0068
X-AREA (SQ. IN.) = .1509
GAMMA-CHORD(DEG.)= 48.85

RADIUS (METERS) = .3080
CHORD (METERS) = .0537
ZCSL (METERS) = .0288
YCSL (METERS) = .0013
RLE (METERS) = .000175
RTE (METERS) = .000173
X-AREA(SQ.METERS) = .000097
GAMMA-CHORD(RAD.)= .8526

TABLE XXIII(i)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0062	.0063	.0000	-.0002	.0002
.0064	-.0059	.0070	.0002	-.0002	.0002
.0682	-.0034	.0142	.0017	-.0001	.0004
.1363	-.0009	.0220	.0035	-.0000	.0006
.2045	.0013	.0294	.0052	.0000	.0007
.2726	.0032	.0366	.0069	.0001	.0009
.3408	.0049	.0435	.0087	.0001	.0011
.4090	.0063	.0501	.0104	.0002	.0013
.4771	.0074	.0564	.0121	.0002	.0014
.5453	.0082	.0624	.0139	.0002	.0016
.6135	.0088	.0683	.0156	.0002	.0017
.6816	.0091	.0738	.0173	.0002	.0019
.7498	.0091	.0791	.0190	.0002	.0020
.8179	.0089	.0842	.0208	.0002	.0021
.8861	.0084	.0889	.0225	.0002	.0023
.9543	.0077	.0930	.0242	.0002	.0024
1.0224	.0071	.0960	.0260	.0002	.0024
1.0906	.0064	.0981	.0277	.0002	.0025
1.1587	.0056	.0992	.0294	.0001	.0025
1.2269	.0049	.0991	.0312	.0001	.0025
1.2951	.0041	.0981	.0329	.0001	.0025
1.3632	.0033	.0960	.0346	.0001	.0024
1.4314	.0025	.0928	.0364	.0001	.0024
1.4996	.0017	.0887	.0381	.0000	.0023
1.5677	.0009	.0836	.0398	.0000	.0021
1.6359	.0000	.0775	.0416	.0000	.0020
1.7040	-.0008	.0703	.0433	-.0000	.0018
1.7722	-.0016	.0620	.0450	-.0000	.0016
1.8404	-.0025	.0528	.0467	-.0001	.0013
1.9085	-.0033	.0427	.0485	-.0001	.0011
1.9767	-.0041	.0315	.0502	-.0001	.0008
2.0448	-.0049	.0192	.0519	-.0001	.0005
2.1067	-.0057	.0072	.0535	-.0001	.0002
2.1130	-.0057	.0060	.0537	-.0001	.0002

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RADIUS (INCHES)   = 12.627      RADIUS   (METERS) =   .3207
CHORD  (INCHES)   =  2.113      CHORD    (METERS) =   .0537
ZCSL   (INCHES)   =  1.1365     ZCSL     (METERS) =   .0289
YCSL   (INCHES)   =   .0403     YCSL     (METERS) =   .0010
RLE    (INCHES)   =   .0065     RLE  (METERS)     =   .000165
RTE    (INCHES)   =   .0064     RTE  (METERS)     =   .000163
X-AREA (SQ. IN.)  =   .1313     X-AREA(SQ.METERS)=   .000085
GAMMA-CHORD(DEG.)= 51.79        GAMMA-CHORD(RAD.)=   .9039
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TABLE XXIII(j)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0057	.0058	.0000	-.0001	.0001
.0059	-.0055	.0063	.0001	-.0001	.0002
.0681	-.0037	.0121	.0017	-.0001	.0003
.1362	-.0018	.0183	.0035	-.0000	.0005
.2042	-.0001	.0243	.0052	-.0000	.0006
.2723	.0015	.0301	.0069	.0000	.0008
.3404	.0028	.0358	.0086	.0001	.0009
.4085	.0041	.0414	.0104	.0001	.0011
.4766	.0052	.0467	.0121	.0001	.0012
.5447	.0062	.0519	.0138	.0002	.0013
.6127	.0070	.0569	.0156	.0002	.0014
.6808	.0076	.0618	.0173	.0002	.0016
.7489	.0082	.0666	.0190	.0002	.0017
.8170	.0086	.0713	.0208	.0002	.0018
.8851	.0089	.0759	.0225	.0002	.0019
.9532	.0091	.0802	.0242	.0002	.0020
1.0212	.0092	.0837	.0259	.0002	.0021
1.0893	.0092	.0863	.0277	.0002	.0022
1.1574	.0090	.0879	.0294	.0002	.0022
1.2255	.0087	.0885	.0311	.0002	.0022
1.2936	.0084	.0881	.0329	.0002	.0022
1.3616	.0079	.0867	.0346	.0002	.0022
1.4297	.0074	.0844	.0363	.0002	.0021
1.4978	.0068	.0810	.0380	.0002	.0021
1.5659	.0059	.0767	.0398	.0002	.0019
1.6340	.0050	.0713	.0415	.0001	.0018
1.7021	.0040	.0649	.0432	.0001	.0016
1.7701	.0028	.0576	.0450	.0001	.0015
1.8382	.0015	.0492	.0467	.0000	.0013
1.9063	.0000	.0398	.0484	.0000	.0010
1.9744	-.0016	.0294	.0501	-.0000	.0007
2.0425	-.0034	.0179	.0519	-.0001	.0005
2.1048	-.0051	.0066	.0535	-.0001	.0002
2.1106	-.0053	.0055	.0536	-.0001	.0001

RADIUS (INCHES) =	13.126	RADIUS (METERS) =	.3334
CHORD (INCHES) =	2.111	CHORD (METERS) =	.0536
ZCSL (INCHES) =	1.1375	ZCSL (METERS) =	.0289
YCSL (INCHES) =	.0367	YCSL (METERS) =	.0009
RLE (INCHES) =	.0059	RLE (METERS) =	.000150
RTE (INCHES) =	.0058	RTE (METERS) =	.000147
X-AREA (SQ. IN.) =	.1113	X-AREA(SQ.METERS)=	.000072
GAMMA-CHORD(DEG.)=	54.11	GAMMA-CHORD(RAD.)=	.9444

TABLE XXIII(k)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0054	.0054	.0000	-.0001	.0001
.0055	-.0052	.0059	.0001	-.0001	.0001
.0680	-.0035	.0107	.0017	-.0001	.0003
.1360	-.0016	.0159	.0035	-.0000	.0004
.2040	.0001	.0210	.0052	.0000	.0005
.2720	.0019	.0261	.0069	.0000	.0007
.3400	.0036	.0312	.0086	.0001	.0008
.4080	.0053	.0362	.0104	.0001	.0009
.4760	.0070	.0412	.0121	.0002	.0010
.5439	.0086	.0462	.0138	.0002	.0012
.6119	.0102	.0511	.0155	.0003	.0013
.6799	.0118	.0560	.0173	.0003	.0014
.7479	.0134	.0609	.0190	.0003	.0015
.8159	.0151	.0658	.0207	.0004	.0017
.8839	.0167	.0707	.0225	.0004	.0018
.9519	.0184	.0755	.0242	.0005	.0019
1.0199	.0199	.0802	.0259	.0005	.0020
1.0879	.0213	.0839	.0276	.0005	.0021
1.1559	.0223	.0865	.0294	.0006	.0022
1.2239	.0229	.0880	.0311	.0006	.0022
1.2919	.0233	.0885	.0328	.0006	.0022
1.3599	.0233	.0878	.0345	.0006	.0022
1.4279	.0228	.0860	.0363	.0006	.0022
1.4959	.0220	.0832	.0380	.0006	.0021
1.5639	.0208	.0793	.0397	.0005	.0020
1.6318	.0192	.0742	.0414	.0005	.0019
1.6998	.0172	.0679	.0432	.0004	.0017
1.7678	.0147	.0604	.0449	.0004	.0015
1.8358	.0118	.0518	.0466	.0003	.0013
1.9038	.0084	.0421	.0484	.0002	.0011
1.9718	.0045	.0310	.0501	.0001	.0008
2.0398	.0000	.0187	.0518	.0000	.0005
2.1025	-.0045	.0062	.0534	-.0001	.0002
2.1078	-.0049	.0052	.0535	-.0001	.0001

RADIUS (INCHES) = 13.626
CHORD (INCHES) = 2.108
ZCSL (INCHES) = 1.1372
YCSL (INCHES) = .0406
RLE (INCHES) = .0055
RTE (INCHES) = .0053
X-AREA (SQ. IN.) = .0917
GAMMA-CHORD(DEG.)= 55.94

RADIUS (METERS) = .3461
CHORD (METERS) = .0535
ZCSL (METERS) = .0289
YCSL (METERS) = .0010
RLE (METERS) = .000140
RTE (METERS) = .000135
X-AREA(SQ.METERS) = .000059
GAMMA-CHORD(RAD.)= .9763

TABLE XXIII (1)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0048	.0048	.0000	-.0001	.0001
.0049	-.0046	.0051	.0001	-.0001	.0001
.0679	-.0029	.0091	.0017	-.0001	.0002
.1358	-.0009	.0135	.0034	-.0000	.0003
.2036	.0012	.0180	.0052	.0000	.0005
.2715	.0034	.0227	.0069	.0001	.0006
.3394	.0058	.0274	.0086	.0001	.0007
.4073	.0083	.0323	.0103	.0002	.0008
.4752	.0109	.0373	.0121	.0003	.0009
.5431	.0137	.0424	.0138	.0003	.0011
.6110	.0166	.0476	.0155	.0004	.0012
.6789	.0197	.0530	.0172	.0005	.0013
.7467	.0230	.0585	.0190	.0006	.0015
.8146	.0263	.0641	.0207	.0007	.0016
.8825	.0300	.0699	.0224	.0008	.0018
.9504	.0336	.0762	.0241	.0009	.0019
1.0183	.0377	.0824	.0259	.0010	.0021
1.0862	.0415	.0879	.0276	.0011	.0022
1.1540	.0446	.0923	.0293	.0011	.0023
1.2219	.0459	.0954	.0310	.0012	.0024
1.2898	.0474	.0971	.0328	.0012	.0025
1.3577	.0470	.0974	.0345	.0012	.0025
1.4256	.0479	.0964	.0362	.0012	.0024
1.4935	.0479	.0940	.0379	.0012	.0024
1.5613	.0461	.0901	.0397	.0012	.0023
1.6292	.0433	.0847	.0414	.0011	.0022
1.6971	.0376	.0780	.0431	.0010	.0020
1.7650	.0350	.0698	.0448	.0009	.0018
1.8329	.0293	.0600	.0466	.0007	.0015
1.9008	.0227	.0486	.0483	.0006	.0012
1.9687	.0148	.0356	.0500	.0004	.0009
2.0366	.0056	.0208	.0517	.0001	.0005
2.1000	-.0035	.0057	.0533	-.0001	.0001
2.1041	-.0042	.0047	.0535	-.0001	.0001

RADIUS (INCHES) = 14.216
CHORD (INCHES) = 2.104
ZCSL (INCHES) = 1.1315
YCSL (INCHES) = .0504
RLE (INCHES) = .0049
RTE (INCHES) = .0045
X-AREA (SQ. IN.) = .0694
GAMMA-CHORD(DEG.)= 57.81

RADIUS (METERS) = .3611
CHORD (METERS) = .0535
ZCSL (METERS) = .0287
YCSL (METERS) = .0013
RLE (METERS) = .000124
RTE (METERS) = .000114
X-AREA(SQ.METERS)= .000045
GAMMA-CHORD(RAD.)= 1.0090

TABLE XXIV(a)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0052	.0055	.0000	-.0001	.0001
.0045	-.0033	.0076	.0001	-.0001	.0002
.0717	.0243	.0389	.0018	.0006	.0010
.1435	.0530	.0716	.0036	.0013	.0018
.2152	.0804	.1036	.0055	.0020	.0026
.2870	.1067	.1346	.0073	.0027	.0034
.3588	.1316	.1646	.0091	.0033	.0042
.4305	.1553	.1939	.0109	.0039	.0049
.5023	.1776	.2222	.0128	.0045	.0056
.5740	.1991	.2499	.0146	.0051	.0063
.6458	.2191	.2765	.0164	.0056	.0070
.7175	.2377	.3015	.0182	.0060	.0077
.7893	.2540	.3237	.0200	.0065	.0082
.8610	.2676	.3424	.0219	.0068	.0087
.9328	.2766	.3575	.0237	.0071	.0091
1.0045	.2869	.3690	.0255	.0073	.0094
1.0763	.2925	.3772	.0273	.0074	.0096
1.1480	.2955	.3821	.0292	.0075	.0097
1.2198	.2956	.3836	.0310	.0075	.0097
1.2915	.2935	.3817	.0328	.0075	.0097
1.3633	.2885	.3766	.0346	.0073	.0096
1.4350	.2809	.3682	.0364	.0071	.0094
1.5068	.2705	.3562	.0383	.0069	.0090
1.5785	.2573	.3407	.0401	.0065	.0087
1.6503	.2413	.3216	.0419	.0061	.0082
1.7220	.2223	.2987	.0437	.0056	.0076
1.7938	.2002	.2717	.0456	.0051	.0069
1.8655	.1751	.2405	.0474	.0044	.0061
1.9373	.1466	.2047	.0492	.0037	.0052
2.0090	.1144	.1640	.0510	.0029	.0042
2.0808	.0786	.1178	.0529	.0020	.0030
2.1525	.0389	.0654	.0547	.0010	.0017
2.2235	-.0026	.0092	.0564	-.0001	.0002
2.2243	-.0049	.0061	.0565	-.0001	.0002

RADIUS (INCHES) = 9.290
CHORD (INCHES) = 2.224
ZCSL (INCHES) = 1.2187
YCSL (INCHES) = .2635
RLE (INCHES) = .0050
RTE (INCHES) = .0048
X-AREA (SQ. IN.) = .1328
GAMMA-CHORD(DEG.)= 23.54

RADIUS (METERS) = .2360
CHORD (METERS) = .0565
ZCSL (METERS) = .0310
YCSL (METERS) = .0067
RLE (METERS) = .000127
RTE (METERS) = .000122
X-AREA(SQ.METERS)= .000086
GAMMA-CHORD(RAD.)= .4108

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TABLE XXIV(b)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0054	.0057	.0000	-.0001	.0001
.0050	-.0037	.0078	.0001	-.0001	.0002
.0719	.0196	.0371	.0018	.0005	.0009
.1438	.0439	.0678	.0037	.0011	.0017
.2158	.0673	.0977	.0055	.0017	.0025
.2877	.0898	.1265	.0073	.0023	.0032
.3596	.1114	.1545	.0091	.0028	.0039
.4315	.1321	.1815	.0110	.0034	.0046
.5035	.1515	.2077	.0128	.0039	.0053
.5754	.1707	.2331	.0146	.0043	.0059
.6473	.1887	.2575	.0164	.0048	.0065
.7192	.2058	.2808	.0183	.0052	.0071
.7911	.2209	.3015	.0201	.0056	.0077
.8631	.2339	.3188	.0219	.0059	.0081
.9350	.2440	.3328	.0237	.0062	.0085
1.0069	.2519	.3436	.0256	.0064	.0087
1.0788	.2573	.3511	.0274	.0065	.0089
1.1508	.2603	.3555	.0292	.0066	.0090
1.2227	.2609	.3568	.0311	.0066	.0091
1.2946	.2591	.3549	.0329	.0066	.0090
1.3665	.2567	.3500	.0347	.0065	.0089
1.4384	.2480	.3418	.0365	.0063	.0087
1.5104	.2388	.3304	.0384	.0061	.0084
1.5823	.2271	.3158	.0402	.0058	.0080
1.6542	.2127	.2977	.0420	.0054	.0076
1.7261	.1958	.2760	.0438	.0050	.0070
1.7981	.1761	.2507	.0457	.0045	.0064
1.8700	.1536	.2216	.0475	.0039	.0056
1.9419	.1282	.1882	.0493	.0033	.0048
2.0138	.0998	.1504	.0512	.0025	.0038
2.0858	.0681	.1078	.0530	.0017	.0027
2.1577	.0330	.0598	.0548	.0008	.0015
2.2253	-.0030	.0094	.0565	-.0001	.0002
2.2296	-.0053	.0062	.0566	-.0001	.0002

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RADIUS (INCHES) = 9.700         RADIUS   (METERS) =  .2464
CHORD  (INCHES) = 2.230         CHORD    (METERS) =  .0566
ZCSL   (INCHES) = 1.1885        ZCSL     (METERS) =  .0302
YCSL   (INCHES) =  .2375        YCSL     (METERS) =  .0060
RLE    (INCHES) =  .0053        RLE  (METERS)     =  .000136
RTE    (INCHES) =  .0052        RTE  (METERS)     =  .000132
X-AREA (SQ. IN.) = .1481        X-AREA(SQ.METERS)=  .000096
GAMMA-CHORD(DEG.)= 22.48        GAMMA-CHORD(RAD.)=  .3923
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TABLE XXIV(c)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0054	.0059	.0000	-.0001	.0001
.0052	-.0038	.0081	.0001	-.0001	.0002
.0721	.0173	.0375	.0018	.0004	.0010
.1442	.0394	.0682	.0037	.0010	.0017
.2162	.0607	.0977	.0055	.0015	.0025
.2883	.0812	.1261	.0073	.0021	.0032
.3604	.1010	.1533	.0092	.0026	.0039
.4325	.1197	.1794	.0110	.0030	.0046
.5046	.1381	.2044	.0128	.0035	.0052
.5767	.1555	.2284	.0146	.0039	.0058
.6488	.1723	.2512	.0165	.0044	.0064
.7208	.1880	.2732	.0183	.0048	.0069
.7929	.2025	.2926	.0201	.0051	.0074
.8650	.2148	.3089	.0220	.0055	.0078
.9371	.2247	.3221	.0238	.0057	.0082
1.0092	.2323	.3322	.0256	.0059	.0084
1.0813	.2376	.3391	.0275	.0060	.0086
1.1534	.2405	.3431	.0293	.0061	.0087
1.2254	.2411	.3440	.0311	.0061	.0087
1.2975	.2395	.3419	.0330	.0061	.0087
1.3696	.2356	.3367	.0348	.0060	.0086
1.4417	.2293	.3286	.0366	.0058	.0083
1.5138	.2207	.3173	.0385	.0056	.0081
1.5859	.2097	.3029	.0403	.0053	.0077
1.6579	.1963	.2852	.0421	.0050	.0072
1.7300	.1804	.2641	.0439	.0046	.0067
1.8021	.1621	.2395	.0458	.0041	.0061
1.8742	.1412	.2113	.0476	.0036	.0054
1.9463	.1176	.1792	.0494	.0030	.0046
2.0184	.0911	.1430	.0513	.0023	.0036
2.0905	.0619	.1024	.0531	.0016	.0026
2.1625	.0296	.0567	.0549	.0008	.0014
2.2300	-.0032	.0096	.0566	-.0001	.0002
2.2346	-.0054	.0064	.0568	-.0001	.0002

RADIUS (INCHES) = 10.100
CHORD (INCHES) = 2.235
ZCSL (INCHES) = 1.161
YCSL (INCHES) = .2238
RLE (INCHES) = .0056
RTE (INCHES) = .0055
X-AREA (SQ. IN.) = .1617
GAMMA-CHORD(DEG.) = 21.44

RADIUS (METERS) = .2565
CHORD (METERS) = .0568
ZCSL (METERS) = .0295
YCSL (METERS) = .0057
RLE (METERS) = .000142
RTE (METERS) = .000139
X-AREA(SQ.METERS) = .000104
GAMMA-CHORD(RAD.) = .3742

TABLE XXIV(d)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0056	.0061	.0000	-.0001	.0002
.0054	-.0040	.0085	.0001	-.0001	.0002
.0722	.0156	.0382	.0018	.0004	.0010
.1444	.0361	.0693	.0037	.0009	.0018
.2166	.0559	.0989	.0055	.0014	.0025
.2888	.0751	.1272	.0073	.0019	.0032
.3610	.0935	.1541	.0092	.0024	.0039
.4332	.1112	.1796	.0110	.0028	.0046
.5054	.1282	.2039	.0128	.0033	.0052
.5777	.1445	.2269	.0147	.0037	.0058
.6499	.1602	.2486	.0165	.0041	.0063
.7221	.1749	.2694	.0183	.0044	.0068
.7943	.1890	.2879	.0202	.0048	.0073
.8665	.2011	.3039	.0220	.0051	.0077
.9387	.2111	.3167	.0238	.0054	.0080
1.0109	.2187	.3265	.0257	.0056	.0083
1.0831	.2241	.3332	.0275	.0057	.0085
1.1553	.2272	.3370	.0293	.0058	.0086
1.2275	.2280	.3377	.0312	.0058	.0086
1.2997	.2267	.3355	.0330	.0058	.0085
1.3719	.2231	.3303	.0348	.0057	.0084
1.4441	.2173	.3222	.0367	.0055	.0082
1.5164	.2092	.3110	.0385	.0053	.0079
1.5886	.1969	.2967	.0403	.0051	.0075
1.6608	.1862	.2792	.0422	.0047	.0071
1.7330	.1711	.2585	.0440	.0043	.0066
1.8052	.1536	.2343	.0459	.0039	.0060
1.8774	.1337	.2066	.0477	.0034	.0052
1.9496	.1113	.1752	.0495	.0028	.0044
2.0218	.0861	.1397	.0514	.0022	.0035
2.0940	.0583	.1001	.0532	.0015	.0025
2.1662	.0277	.0557	.0550	.0007	.0014
2.2336	-.0033	.0099	.0567	-.0001	.0003
2.2384	-.0055	.0066	.0569	-.0001	.0002

RADIUS (INCHES) = 10.500
CHORD (INCHES) = 2.238
ZCSL (INCHES) = 1.1508
YCSL (INCHES) = .2156
RLE (INCHES) = .0058
RTE (INCHES) = .0057
X-AREA (SQ. IN.) = .1749
GAMMA-CHORD(DEG.)= 20.63

RADIUS (METERS) = .2667
CHORD (METERS) = .0569
ZCSL (METERS) = .0292
YCSL (METERS) = .0055
RLE (METERS) = .000148
RTE (METERS) = .000145
X-AREA(SQ.METERS)= .000113
GAMMA-CHORD(RAD.)= .3601

TABLE XXIV(e)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0010	-.0058	.0063	.0000	-.0001	.0002
.0057	-.0042	.0069	.0001	-.0001	.0002
.0724	.0191	.0390	.0018	.0004	.0010
.1448	.0333	.0703	.0037	.0008	.0018
.2171	.0519	.1011	.0055	.0013	.0026
.2895	.0699	.1283	.0074	.0018	.0033
.3619	.0871	.1549	.0092	.0022	.0039
.4343	.1037	.1801	.0110	.0026	.0046
.5066	.1196	.2037	.0129	.0030	.0052
.5790	.1344	.2260	.0147	.0034	.0057
.6514	.1495	.2468	.0165	.0038	.0063
.7238	.1634	.2662	.0184	.0042	.0068
.7962	.1769	.2841	.0202	.0045	.0072
.8685	.1889	.2999	.0221	.0048	.0076
.9409	.1994	.3126	.0239	.0051	.0079
1.0133	.2068	.3223	.0257	.0053	.0082
1.0857	.2124	.3290	.0276	.0054	.0084
1.1581	.2159	.3327	.0294	.0055	.0085
1.2304	.2172	.3335	.0313	.0055	.0085
1.3028	.2162	.3314	.0331	.0055	.0084
1.3752	.2130	.3263	.0349	.0054	.0083
1.4476	.2077	.3182	.0368	.0053	.0081
1.5200	.2001	.3072	.0386	.0051	.0078
1.5923	.1904	.2930	.0404	.0048	.0074
1.6647	.1763	.2757	.0423	.0045	.0070
1.7371	.1639	.2553	.0441	.0042	.0065
1.8095	.1471	.2314	.0460	.0037	.0059
1.8819	.1282	.2040	.0478	.0033	.0052
1.9542	.1064	.1729	.0496	.0027	.0044
2.0266	.0823	.1379	.0515	.0021	.0035
2.0990	.0556	.0987	.0533	.0014	.0025
2.1714	.0262	.0551	.0552	.0007	.0014
2.2416	-.0035	.0103	.0569	-.0001	.0003
2.2433	-.0053	.0068	.0570	-.0001	.0002

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RADIUS (INCHES)    =  10.900      RADIUS   (METER )   =   .2769
CHORD  (INCHES)    =   2.244      CHORD    (METERS)   =   .0570
ZCSL   (INCHES)    =   1.1412     ZCSL     (METERS)   =   .0290
YCSL   (INCHES)    =    .2092     YCSL     (METERS)   =   .0053
RLE    (INCHES)    =    .0061     RLE (METERS)        =   .000156
RTE    (INCHES)    =    .0060     RTE (METERS)        =   .000152
X-AREA (SQ. IN.)   =    .1877     X-AREA(SQ.METERS)   =   .000121
GAMMA-CHORD(DEG.)= 19.94          GAMMA-CHORD(RAD.)=      .3481
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TABLE XXIV(f)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0057	.0065	.0000	-.0002	.0002
.0060	-.0044	.0093	.0002	-.0001	.0002
.0724	.0127	.0401	.0018	.0003	.0010
.1455	.0309	.0722	.0037	.0008	.0018
.2183	.0483	.1023	.0055	.0012	.0026
.2911	.0651	.1306	.0074	.0017	.0033
.3639	.0811	.1571	.0092	.0021	.0040
.4367	.0964	.1817	.0111	.0024	.0046
.5094	.1110	.2047	.0129	.0028	.0052
.5822	.1248	.2260	.0148	.0032	.0057
.6550	.1380	.2457	.0166	.0035	.0062
.7278	.1506	.2636	.0185	.0038	.0067
.8006	.1624	.2803	.0203	.0041	.0071
.8733	.1735	.2950	[illegible]	.0044	.0075
.9461	.1834	.3075	.0240	.0047	.0078
1.0189	.1915	.3172	.0259	.0049	.0081
1.0917	.1974	.3239	.0277	.0050	.0082
1.1645	.2012	.3277	.0296	.0051	.0083
1.2372	.2028	.3285	.0314	.0052	.0083
1.3100	.2024	.3264	.0333	.0051	.0083
1.3828	.1997	.3219	.0351	.0051	.0082
1.4556	.1949	.3135	.0370	.0050	.0080
1.5283	.1880	.3027	.0388	.0048	.0077
1.6011	.1789	.2867	.0407	.0045	.0073
1.6739	.1677	.2716	.0425	.0043	.0069
1.7467	.1542	.2514	.0444	.0039	.0064
1.8195	.1385	.2279	.0462	.0035	.0058
1.8922	.1205	.2009	.0481	.0031	.0051
1.9650	.1001	.1702	.0499	.0025	.0043
2.0378	.0772	.1359	.0518	.0020	.0034
2.1106	.0520	.0973	.0536	.0013	.0025
2.1834	.0241	.0543	.0555	.0006	.0014
2.2506	-.0038	.0106	.0572	-.0001	.0003
2.2561	-.0061	.0070	.0573	-.0002	.0002

RADIUS (INCHES) = 11.400
CHORD (INCHES) = 2.256
ZCSL (INCHES) = 1.1378
YCSL (INCHES) = .2020
RLE (INCHES) = .0064
RTE (INCHES) = .0063
X-AREA (SQ. IN.) = .2048
GAMMA-CHORD(DEG.)= 18.94

RADIUS (METERS) = .2896
CHURD (METERS) = .0573
ZCSL (METERS) = .0289
YCSL (METERS) = .0051
RLE (METERS) = .000163
RTE (METERS) = .000161
X-AREA(SQ.METERS)= .000132
GAMMA-CHORD(RAD.)= .3305

TABLE XXIV(g)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0062	.0068	.0000	-.0002	.0002
.0063	-.0046	.0098	.0002	-.0001	.0002
.0735	.0122	.0416	.0019	.0003	.0011
.1470	.0299	.0745	.0037	.0008	.0019
.2205	.0467	.1053	.0056	.0012	.0027
.2940	.0627	.1339	.0075	.0016	.0034
.3675	.0779	.1605	.0093	.0020	.0041
.4411	.0923	.1851	.0112	.0023	.0047
.5146	.1056	.2077	.0131	.0027	.0053
.5881	.1185	.2283	.0149	.0030	.0058
.6616	.1304	.2471	.0168	.0033	.0063
.7351	.1415	.2640	.0187	.0036	.0067
.8086	.1518	.2790	.0205	.0039	.0071
.8821	.1613	.2922	.0224	.0041	.0074
.9556	.1699	.3038	.0243	.0043	.0077
1.0291	.1777	.3131	.0261	.0045	.0080
1.1027	.1838	.3199	.0280	.0047	.0081
1.1762	.1878	.3237	.0299	.0048	.0082
1.2497	.1898	.3247	.0317	.0048	.0082
1.3232	.1897	.3227	.0336	.0048	.0082
1.3967	.1879	.3179	.0355	.0048	.0081
1.4702	.1833	.3101	.0373	.0047	.0079
1.5437	.1770	.2994	.0392	.0045	.0076
1.6172	.1686	.2856	.0411	.0043	.0073
1.6907	.1581	.2687	.0429	.0040	.0068
1.7642	.1454	.2487	.0448	.0037	.0063
1.8378	.1306	.2254	.0467	.0033	.0057
1.9113	.1136	.1987	.0485	.0029	.0050
1.9848	.0943	.1684	.0504	.0024	.0043
2.0583	.0727	.1344	.0523	.0018	.0034
2.1318	.0488	.0964	.0541	.0012	.0024
2.2053	.0224	.0541	.0560	.0006	.0014
2.2730	-.0040	.0111	.0577	-.0001	.0003
2.2788	-.0062	.0074	.0579	-.0002	.0002

RADIUS (INCHES) = 11.900
CHORD (INCHES) = 2.279
ZCSL (INCHES) = 1.1447
YCSL (INCHES) = .1966
RLE (INCHES) = .0067
RTE (INCHES) = .0067
X-AREA (SQ. IN.) = .2221
GAMMA-CHORD(DEG.)= 18.01

RADIUS (METERS) = .3023
CHORD (METERS) = .0579
ZCSL (METERS) = .0291
YCSL (METERS) = .0050
RLE (METERS) = .000171
RTE (METERS) = .000169
X-AREA(SQ.METERS)= .000143
GAMMA-CHORD(RAD.)= .3144

TABLE XXIV(h)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0063	.0071	.0000	-.0002	.0002
.0065	-.0047	.0103	.0002	-.0001	.0003
.0744	.0125	.0436	.0019	.0003	.0011
.1487	.0305	.0781	.0038	.0008	.0020
.2231	.0475	.1100	.0057	.0012	.0028
.2974	.0636	.1395	.0076	.0016	.0035
.3718	.0786	.1667	.0094	.0020	.0042
.4462	.0927	.1916	.0113	.0024	.0049
.5205	.1058	.2143	.0132	.0027	.0054
.5949	.1176	.2348	.0151	.0030	.0060
.6693	.1290	.2533	.0170	.0033	.0064
.7436	.1392	.2696	.0189	.0035	.0068
.8180	.1484	.2839	.0208	.0038	.0072
.8924	.1566	.2961	.0227	.0040	.0075
.9667	.1639	.3062	.0246	.0042	.0078
1.0411	.1703	.3145	.0264	.0043	.0080
1.1155	.1759	.3205	.0283	.0045	.0081
1.1898	.1789	.3238	.0302	.0045	.0082
1.2642	.1804	.3243	.0321	.0046	.0082
1.3385	.1800	.3219	.0340	.0046	.0082
1.4129	.1777	.3166	.0359	.0045	.0080
1.4873	.1734	.3084	.0378	.0044	.0078
1.5616	.1671	.2974	.0397	.0042	.0076
1.6360	.1589	.2834	.0416	.0040	.0072
1.7104	.1487	.2663	.0434	.0038	.0068
1.7847	.1366	.2462	.0453	.0035	.0063
1.8591	.1224	.2228	.0472	.0031	.0057
1.9335	.1062	.1962	.0491	.0027	.0050
2.0078	.0879	.1661	.0510	.0022	.0042
2.0822	.0675	.1324	.0529	.0017	.0034
2.1565	.0449	.0949	.0548	.0011	.0024
2.2309	.0202	.0533	.0567	.0005	.0014
2.2991	-.0042	.0113	.0584	-.0001	.0003
2.3053	-.0065	.0075	.0586	-.0002	.0002

RADIUS (INCHES) = 12.300
CHORD (INCHES) = 2.305
ZCSL (INCHES) = 1.1566
YCSL (INCHES) = .1946
RLE (INCHES) = .0070
RTE (INCHES) = .0070
X-AREA (SQ. IN.) = .2389
GAMMA-CHORD(DEG.)= 16.84

RADIUS (METERS) = .3124
CHORD (METERS) = .0586
ZCSL (METERS) = .0294
YCSL (METERS) = .0049
RLE (METERS) = .000177
RTE (METERS) = .000177
X-AREA(SQ.METERS)= .000154
GAMMA-CHORD(RAD.)= .2939

TABLE XXIV(i)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0064	.0074	.0000	-.0002	.0002
.0066	-.0047	.0109	.0002	-.0001	.0003
.0754	.0135	.0466	.0019	.0003	.0012
.1507	.0325	.0832	.0038	.0008	.0021
.2261	.0513	.1169	.0057	.0013	.0030
.3014	.0669	.1478	.0077	.0017	.0038
.3768	.0823	.1760	.0096	.0021	.0045
.4522	.0964	.2016	.0115	.0024	.0051
.5275	.1093	.2247	.0134	.0028	.0057
.6029	.1210	.2453	.0153	.0031	.0062
.6783	.1314	.2634	.0172	.0033	.0067
.7536	.1407	.2792	.0191	.0036	.0071
.8290	.1488	.2926	.0211	.0038	.0074
.9044	.1557	.3037	.0230	.0040	.0077
.9797	.1614	.3125	.0249	.0041	.0079
1.0551	.1659	.3192	.0268	.0042	.0081
1.1304	.1692	.3234	.0287	.0043	.0082
1.2058	.1711	.3252	.0306	.0043	.0083
1.2812	.1713	.3244	.0325	.0044	.0082
1.3565	.1698	.3208	.0345	.0043	.0081
1.4319	.1666	.3146	.0364	.0042	.0080
1.5073	.1617	.3056	.0383	.0041	.0078
1.5826	.1551	.2938	.0402	.0039	.0075
1.6580	.1468	.2792	.0421	.0037	.0071
1.7334	.1368	.2619	.0440	.0035	.0066
1.8087	.1250	.2414	.0459	.0032	.0061
1.8841	.1116	.2180	.0479	.0028	.0055
1.9594	.0963	.1915	.0498	.0024	.0049
2.0348	.0793	.1618	.0517	.0020	.0041
2.1102	.0605	.1287	.0536	.0015	.0033
2.1855	.0399	.0921	.0555	.0010	.0023
2.2609	.0174	.0517	.0574	.0004	.0013
2.3297	-.0045	.0115	.0592	-.0001	.0003
2.3363	-.0067	.0077	.0593	-.0002	.0002

RADIUS (INCHES) = 12.700
CHORD (INCHES) = 2.336
ZCSL (INCHES) = 1.1709
YCSL (INCHES) = .1935
RLE (INCHES) = .0072
RTE (INCHES) = .0073
X-AREA (SQ. IN.) = .2571
GAMMA-CHORD(DEG.)= 15.19

RADIUS (METERS) = .3226
CHORD (METERS) = .0593
ZCSL (METERS) = .0297
YCSL (METERS) = .0049
RLE (METERS) = .000183
RTE (METERS) = .000185
X-AREA(SQ.METERS)= .000166
GAMMA-CHORD(RAD.)= .2652

TABLE XXIV(j)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0068	.0079	.0000	-.0002	.0002
.0070	-.0049	.0117	.0002	-.0001	.0003
.0765	.0145	.0495	.0019	.0004	.0013
.1530	.0346	.0885	.0039	.0009	.0022
.2295	.0533	.12[illegible]1	.0058	.0014	.0032
.3060	.0705	.1[illegible]6[illegible]	.0078	.0018	.0040
.3825	.0864	.1860	.0097	.0022	.0047
.4591	.1008	.2126	.0117	.0026	.0054
.5356	.1138	.2363	.0136	.0029	.0060
.6121	.1255	.2574	.0155	.0032	.0065
.6886	.1358	.2758	.0175	.0034	.0070
.7651	.1447	.2916	.0194	.0037	.0074
.8416	.1523	.3048	.0214	.0039	.0077
.9181	.1585	.3155	.0233	.0040	.0080
.9946	.1633	.3236	.0253	.0041	.0082
1.0711	.1669	.3294	.0272	.0042	.0084
1.1476	.1690	.3326	.0292	.0043	.0084
1.2241	.1698	.3333	.0311	.0043	.0085
1.3007	.1689	.3314	.0330	.0043	.0084
1.3772	.1666	.3270	.0350	.0042	.0083
1.4537	.1627	.3199	.0369	.0041	.0081
1.5302	.1572	.3101	.0389	.0040	.0079
1.6067	.1502	.2976	.0408	.0038	.0076
1.6832	.1417	.2823	.0428	.0036	.0072
1.7597	.1315	.2642	.0447	.0033	.0067
1.8362	.1198	.2433	.0466	.0030	.0062
1.9127	.1066	.2194	.0486	.0027	.0056
1.9892	.0918	.1925	.0505	.0023	.0049
2.0657	.0753	.1625	.0525	.0019	.0041
2.1423	.0572	.1291	.0544	.0015	.0033
2.2188	.0375	.0924	.0564	.0010	.0023
2.2953	.0161	.0519	.0583	.0004	.0013
2.3650	-.0047	.0118	.0601	-.0001	.0003
2.3716	-.0067	.0079	.0602	-.0002	.0002

RADIUS (INCHES) = 13.100
CHORD (INCHES) = 2.372
ZCSL (INCHES) = 1.1879
YCSL (INCHES) = .1970
RLE (INCHES) = .0076
RTE (INCHES) = .0075
X-AREA (SQ. IN.) = .2768
GAMMA-CHORD(DEG.)= 13.93

RADIUS (METERS) = .3327
CHORD (METERS) = .0602
ZCSL (METERS) = .0302
YCSL (METERS) = .0050
RLE (METERS) = .000194
RTE (METERS) = .000190
X-AREA(SQ.METERS)= .000179
GAMMA-CHORD(RAD.)= .2432

TABLE XXIV(k)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0070	.0082	.0000	-.0002	.0002
.0071	-.0049	.0123	.0002	-.0001	.0003
.0778	.0157	.0530	.0020	.0004	.0013
.1557	.0371	.0945	.0040	.0009	.0024
.2335	.0569	.1324	.0059	.0014	.0034
.3113	.0751	.1669	.0079	.0019	.0042
.3892	.0918	.1981	.0099	.0023	.0050
.4670	.1070	.2261	.0119	.0027	.0057
.5449	.1206	.2510	.0138	.0031	.0064
.6227	.1327	.2730	.0158	.0034	.0069
.7005	.1433	.2922	.0178	.0036	.0074
.7784	.1525	.3086	.0198	.0039	.0078
.8562	.1602	.3223	.0217	.0041	.0082
.9340	.1665	.3332	.0237	.0042	.0085
1.0119	.1713	.3415	.0257	.0044	.0087
1.0897	.1747	.3473	.0277	.0044	.0088
1.1676	.1766	.3504	.0297	.0045	.0089
1.2454	.1771	.3509	.0316	.0045	.0089
1.3232	.1761	.3488	.0336	.0045	.0089
1.4011	.1735	.3440	.0356	.0044	.0087
1.4789	.1694	.3364	.0376	.0043	.0085
1.5567	.1637	.3261	.0395	.0042	.0083
1.6346	.1564	.3130	.0415	.0040	.0080
1.7124	.1476	.2970	.0435	.0038	.0075
1.7903	.1372	.2782	.0455	.0035	.0071
1.8681	.1251	.2564	.0474	.0032	.0065
1.9459	.1114	.2314	.0494	.0028	.0059
2.0238	.0960	.2033	.0514	.0024	.0052
2.1016	.0789	.1717	.0534	.0020	.0044
2.1794	.0601	.1366	.0554	.0015	.0035
2.2573	.0395	.0978	.0573	.0010	.0025
2.3351	.0171	.0549	.0593	.0004	.0014
2.4059	-.0048	.0124	.0611	-.0001	.0003
2.4130	-.0069	.0082	.0613	-.0002	.0002

RADIUS (INCHES) = 13.500
CHORD (INCHES) = 2.413
ZCSL (INCHES) = 1.2082
YCSL (INCHES) = .2074
RLE (INCHES) = .0079
RTE (INCHES) = .0078
X-AREA (SQ. IN.) = .2995
GAMMA-CHORD(DEG.)= 13.5

RADIUS (METERS) = .3429
CHORD (METERS) = .0613
ZCSL (METERS) = .0307
YCSL (METERS) = .0053
RLE (METERS) = .000200
RTE (METERS) = .000197
X-AREA(SQ.METERS)= .000193
GAMMA-CHORD(RAD.)= .2359

TABLE XXIV (3)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

INCHES			METERS		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0073	.0087	.0000	-.0002	.0002
.0073	-.0049	.0133	.0002	-.0001	.0003
.0795	.0181	.0584	.0020	.0005	.0015
.1590	.0421	.1045	.0040	.0011	.0027
.2385	.0644	.1465	.0061	.0016	.0037
.3179	.0851	.1847	.0081	.0022	.0047
.3974	.1042	.2194	.0101	.0026	.0056
.4769	.1216	.2506	.0121	.0031	.0064
.5564	.1375	.2786	.0141	.0035	.0071
.6359	.1518	.3034	.0162	.0039	.0077
.7154	.1647	.3252	.0182	.0042	.0083
7949	.1760	.3440	.0202	.0045	.0087
.8744	.1859	.3601	.0222	.0047	.0091
.9538	.1942	.3733	.0242	.0049	.0095
1.0333	.2010	.3837	.0262	.0051	.0097
1.1128	.2065	.3915	.0283	.0052	.0099
1.1923	.2105	.3966	.0303	.0053	.0101
1.2718	.2129	.3990	.0323	.0054	.0101
1.3513	.2134	.3982	.0343	.0054	.0101
1.4308	.2116	.3942	.0363	.0054	.0100
1.5103	.2083	.3871	.0384	.0053	.0098
1.5898	.2027	.3768	.0404	.0051	.0096
1.6692	.1950	.3630	.0424	.0050	.0092
1.7487	.1852	.3459	.0444	.0047	.0088
1.8282	.1732	.3253	.0464	.0044	.0083
1.9077	.1589	.3010	.0485	.0040	.0076
1.9872	.1425	.2730	.0505	.0036	.0069
2.0667	.1237	.2408	.0525	.0031	.0061
2.1462	.1025	.2044	.0545	.0026	.0052
2.2257	.0789	.1634	.0565	.0020	.0042
2.3051	.0527	.1176	.0586	.0013	.0030
2.3846	.0240	.0661	.0606	.0006	.0017
2.4573	-.0045	.0138	.0624	-.0001	.0004
2.4641	-.0072	.0049	.0626	-.0002	.0002

RADIUS (INCHES) = 13.950
CHORD (INCHES) = 2.464
ZCSL (INCHES) = 1.2354
YCSL (INCHES) = .2400
RLE (INCHES) = .0082
RTE (INCHES) = .0079
X-AREA (SQ. IN.) = .3299
GAMMA-CHORD(DEG.)= 15.01

RADIUS (METERS) = .3543
CHORD (METERS) = .0626
ZCSL (METERS) = .0314
YCSL (METERS) = .0061
RLE (METERS) = .000208
RTE (METERS) = .000202
X-AREA(SQ.METERS)= .000213
GAMMA-CHORD(RAD.)= .2620

APPENDIX F

SYMBOLS AND DEFINITIONS

A - area - inches^2 (meters^2)

A/A* - ratio of actual area to critical area (where local Mach number is 1.0)

a - distance along chord from leading edge of airfoil to point of maximum elevation of airfoil above chord line - inches (meters)

a' - a point on the suction surface of a blade halfway between the leading edge and the point from which a Mach wave emanates that meets the leading edge of the following blade

C - distance from center of gravity to most remote fiber - inches (meters)

c - chord (aerodynamic on flow surface) - inches (meters)

D - diffusion factor, for rotor

$$= 1 - V'_2/V'_1 + \frac{r_2 V_{\theta 2} - r_1 V_{\theta 1}}{(r_1 + r_2)\, V'_1\, \sigma}$$

for stator

$$= 1 - V_3/V_2 + \frac{r_2 V_{\theta 2} - r_3\, V_{\theta 3}}{(r_2 + r_3)\, V_2 \sigma}$$

d - displacement in the direction normal to the minimum moment of inertia axis - inches (meters)

E - epse, the angle between rays drawn to a conical design surface, one ray to the leading edge of an airfoil section, the second to some other point on the airfoil (see Figure 23) - degrees (radians)

H - enthalpy

I - moment of inertia about minor axis

ID - inner diameter of casing - inches (meters)

i - incidence angle, inlet air angle minus blade metal angle - degrees (radians)

K blockage factor

K01 → K11 - linear spring constants - lb/in (Nt/m)

M - Mach number

N - rotor speed (rpm)

OD - outer diameter of casing - inches (meters)

p - static pressure (psfa)

P - total or stagnation pressure (psfa)

R - distance from apex of design conical surface to point on blade - inches (meters)

R_c - steamline radius of curvature - inches (meters)

RLE - leading edge airfoil radius - inches (meters)

RTE - trailing edge airfoil radius - inches (meters)

r - radius measured from rig centerline - inches (meters)

r, θ, z - cylindrical coordinate system, with z axis as rig centerline

s - blade spacing - inches (meters)

T - total temperature - °R (°K)

T05 → T11 - torsional spring constants - in-lb/degree (m-Nt/radian)

t - blade maximum thickness - inches (meters)

U - rotor speed - ft/sec (meters/sec)

V - air velocity - ft/sec (meters/sec)

W - weight flow - lbm/sec (kg/sec)

Z*-ratio - $(I/C)_{\text{shroud cross-section}}/(I/C)_{\text{airfoil cross-section above shroud}}$

z - axial distance - inches (meters)

β - absolute air angle ($\cot^{-1}$ (V_m/V_θ) - degrees (radians))

β^* - metal angle, on conical surface, between tangent to mean camber line and meridional direction at leading and trailing edge - degrees (radians)

$\Delta\beta$ - air turning angle - degrees (radians)

γ - blade chord angle, angle between a chord line and axial direction (measured in a plane parallel to z-axis) - degrees (radians); ratio of specific heats for air

δ - ratio of total pressure to standard pressure of 2116 psfa

$\delta°$ - deviation angle, exit air angle minus tangent to blade mean camber line at trailing edge - degrees (radians)

ϵ - angle between tangent to streamline projected on meridional plane and axial direction - degrees (radians)

η - efficiency (percent)

θ - ratio of total temperature to standard temperature of 518.7°R

ρ - mass density - lbm/ft^3 ($kg/meters^3$)

σ - solidity, ratio of aerodynamic chord to gap between blades

ϕ - blade camber angle, difference between blade angles at leading and trailing edges on conical surface, $\beta'^*_1 - \beta'^*_2$ for rotors and $\beta^*_2 - \beta^*_3$ for stators - degrees (radians)

ϕ_E - blade camber angle on plane of "unwrapped" conical surface $\beta'^*_1 - \beta'^*_2 - E_{TE}$ for rotors and $\beta^*_2 - \beta^*_3 - E_{TE}$ for stators - degrees (radians)

ψ - total amount of chord line twist displacement - degrees (radians)

$\bar{\omega}$ - total pressure loss coefficient,

$$\frac{P'_1\left[\dfrac{T'_2}{T'_1}\right]^{\frac{\gamma}{\gamma-1}} - P'_2}{P'_1 - p_1} \quad \text{(rotors)}$$

$$\frac{P_2 - P_3}{P_2 - p_2} \quad \text{(stators)}$$

ω_b - bending vibrational frequency (cycles/sec)

ω_t - torsional vibrational frequency (radians/sec)

Subscripts

ad - adiabatic

E - refers to camber definitions which include epse angle E (See Figure 23)

f - front

Ef - refers to front camber definitions which include epse angle E (see Figure 23)

in - inlet

LE - leading edge

m - meridional (velocity); mean camber line (angle)

p - profile (loss); polytropic (efficiency)

ss - suction surface

sh - shock

t - transition

TE - trailing edge

z - axial component

θ - tangential component

1 - station into rotor

2 - station out of rotor or into stator

3 - station out of stator

Superscripts

$'$ - relative to rotor

$*$ - blade metal (angle); critical, at Mach number unity (area)

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