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ARL 71-0061
MARCH 1971



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THE DESIGN OF AN AXIAL COMPRESSOR STAGE FOR A TOTAL PRESSURE RATIO OF 3 TO 1

A. J. WENNERSTROM

RICHARD M. HEARSEY

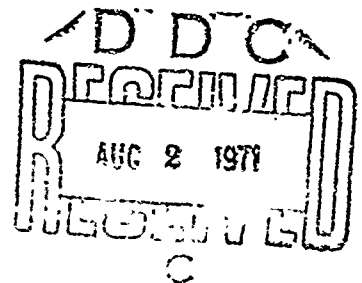
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PROJECT NO. 7065

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Security Classification

DOCUMENT CONTROL DATA - R & D		
<i>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)</i>		
1. ORIGINATING ACTIVITY (Corporate author) Aerospace Research Laboratories (ARL/LF) Wright-Patterson AF Base, Ohio 45433		2a. REPORT SECURITY CLASSIFICATION Unclassified
		2b. GROUP
3. REPORT TITLE THE DESIGN OF AN AXIAL COMPRESSOR STAGE FOR A TOTAL PRESSURE RATIO OF 3 TO 1		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Scientific. Final.		
5. AUTHOR(S) (First name, middle initial, last name) Arthur J. Wennerstrom, Richard M. Hearsey		
6. REPORT DATE March 1971	7a. TOTAL NO. OF PAGES 177	7b. NO. OF REFS 9
8a. CONTRACT OR GRANT NO. In-house research	8b. ORIGINATOR'S REPORT NUMBER(S)	
b. PROJECT NO. 7065-09		
c. DoD Element 61102F	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d. DoD Subelement 681307	ARL 71-0061	
10. DISTRIBUTION STATEMENT Approved for public release; distribution unlimited.		
11. SUPPLEMENTARY NOTES TECH OTHER	12. SPONSORING MILITARY ACTIVITY Fluid Dynamics Facilities Rsch Lab ARL/LF, Wright-Patterson AFB, OH	
13. ABSTRACT This report describes in detail the aerodynamic design of a supersonic axial compressor stage. The principal design-point characteristics of the stage are a corrected tip speed of 1600 ft/sec, an inlet hub/tip radius ratio of 0.75, a total pressure ratio of 3.0, and an isentropic efficiency of 82%. Four features distinguish this stage from other reported stages. A new type of rotor airfoil is employed. The stator leading edges are swept back from both walls toward mid-passage. Unusually large and variable fillet radii blend blades with platforms. Also, a new and precise technique was used to determine Cartesian manufacturing coordinates for the airfoils, aerodynamically defined on streamsurfaces. The preliminary design employed a technique resulting in equilibrium radial distributions of loss coefficient and flow angle which are fully consistent with relative Mach numbers and diffusion factors for each blade row and on each streamsurface according to a prescribed loss model. The detail design was accomplished using computing stations internal as well as external to both blade rows and attempted to optimize the axial distribution of static pressure.		

DD FORM 1473
1 NOV 65

UNCLASSIFIED

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
AXIAL COMPRESSOR SUPERSONIC COMPRESSOR GAS TURBINE TURBINE ENGINE						

ARL 71-0061

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AEROSPACE RESEARCH LABORATORIES
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

FOREWORD

This report was prepared by Mr. Richard M. Hearsey, Visiting Research Associate of the Ohio State University Research Foundation, and Dr. Arthur J. Wennerstrom of the Fluid Dynamics Facilities Research Laboratory, Aerospace Research Laboratories, Wright-Patterson Air Force Base, Ohio.

The report presents results from a portion of the effort of the Fluid Machinery Research Group, supervised by Dr. Arthur J. Wennerstrom and was conducted under Work Unit 09 of Project 7065, "Aerospace Simulation Techniques Research," under the over-all direction of Mr. Elmer G. Johnson.

ABSTRACT

This report describes in detail the aerodynamic design of a supersonic axial compressor stage. The principal design-point characteristics of the stage are a corrected tip speed of 1600 ft/sec, an inlet hub/tip radius ratio of 0.75, a total pressure ratio of 3.0, and an isentropic efficiency of 82%. Four features distinguish this stage from other reported stages. A new type of rotor airfoil is employed. The stator leading edges are swept back from both walls toward mid-passage. Unusually large and variable fillet radii blend blades with platforms. Also, a new and precise technique was used to determine Cartesian manufacturing coordinates for the airfoils, aerodynamically defined on streamsurfaces. The preliminary design employed a technique resulting in equilibrium radial distributions of loss coefficient and flow angle which are fully consistent with relative Mach numbers and diffusion factors for each blade row and on each streamsurface according to a prescribed loss model. The detail design was accomplished using computing stations internal as well as external to both blade rows and attempted to optimize the axial distribution of static pressure.

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SECTION I

INTRODUCTION

A major goal associated with research into and development of aircraft-related turbomachinery is reduction of the size, weight and cost of the compressor component. Reductions of size and weight would benefit many types of equipment, but most particularly aircraft turbine engines, gas-turbine powered ground support equipment and vehicles, and other air-transportable turbocompressor systems. Such reductions may be achieved through increases in specific performance levels such as pressure ratio per stage and flow per unit frontal area. Cost reductions accrue through two means. First, a reduced size and/or number of fabricated parts leads to lower component costs to meet a particular performance objective. Second, lower component weight allows higher payloads for associated vehicle systems. Increases in specific performance are achieved through increases in rotational speed and aerodynamic loading levels, normally at the expense of thermodynamic efficiency. This report addresses itself to the problem of raising thermodynamic efficiency in axial compressor stages designed for high Mach numbers and high pressure ratios.

The design of a heavily-loaded, supersonic axial compressor stage is described. The stage target performance calls for an overall total pressure ratio of 3:1, at an isentropic efficiency (based upon stagnation conditions) of 0.82. The rotor corrected tip speed is 1600 feet per second, with an inlet hub-to-tip radius ratio of 0.75:1. This performance level is beyond the current state-of-the-art. Accordingly, the intent is to produce a stage having the best obtainable performance, and hence with the maximum potential for development to the objective performance level.

Axial turbomachine design is generally considered to consist of first, the execution of an aerodynamic design procedure and, second, the determination of the geometry of blading that is compatible with the aerodynamic design and with pertinent mechanical restraints. These two steps were followed in an integrated manner for this design. Initially, an aerodynamic design was produced which satisfied the design objectives and criteria, calculations being made at the blade leading and trailing edges. This calculation included the use of selected loss models for the rotor and stator blades. Hence the results included relative inlet and outlet flow angles and total pressure loss coefficients for the rotor and stator that were consistent with the design assumptions. Subsequently, further aerodynamic calculations were made at locations both exterior to and within the blade rows to evaluate possible blading geometries and details of annulus wall contours within the blading.

The aerodynamic calculations were made using an axisymmetric flow analysis computed by the streamline curvature technique. This method is discussed in Ref 1. (The mechanical evaluation of the design was made separately from the aerodynamic design.)

With a view to achieving the previously stated goals, several novel features were incorporated into the design. A new rotor blade section was employed, a key characteristic of which is that it contains no discontinuities in surface curvature. This is intended to minimize boundary layer separation due to abrupt velocity gradient changes in the flow at the blade surfaces. Having designed the blade sections on streamsurfaces, an accurate procedure for the determination of Cartesian coordinates for the blade was employed to provide data convenient to the manufacturing process. A full description of the blade section and the method of determining manufacturing coordinate data is given in Ref 2. A swept leading edge configuration was included in the stator blade design. It is hoped that this will reduce the sensitivity of the stator blades to incidence at elevated Mach numbers.

Subsequent sections of the report describe the various aspects and phases of the design. The criteria incorporated into the design are presented followed by details of the aerodynamic evaluation method. The results of the various design calculations are described, and then the final stage configuration is given. Finally, the anticipated performance of the compressor is discussed.

SECTION II
DESIGN CRITERIA

1. LOADING AND LOSS DISTRIBUTIONS

a. Over-all Averaged Quantities

The target performance for the stage (outlined previously) together with some leading parameters specified at the outset of the design process, are as follows:

Total pressure ratio	3.0:1
Isentropic efficiency (total-to-total)	0.82
Inlet hub/tip radius ratio	0.75
Rotor tip speed (corrected to SLS)	1600 ft/sec
Inlet Mach number	0.55
Exit Mach number	0.5
Exit swirl	zero

An 18-inch diameter was selected for the compressor, resulting in a design flow-rate (corrected to SLS) of 30.0 lbs/sec. (This dimension resulted from consideration of power requirements for testing, as an upper bound, and a practical minimum size for instrumentation as a lower bound. Aerodynamically, only the blockage allowance attributed to annulus wall boundary layers is significantly affected.)

b. Radial Distributions

Because maximum design-point efficiency is a principal objective of this stage, blade element minimum loss values have been used for each element, consistent with local values of diffusion and Mach number. Losses, expressed as relative total pressure loss coefficients, are assumed to be composed of two additive components; a loss due to diffusion and a loss due to shock waves (where Mach number is high enough). Then, the over-all blade element loss coefficients for rotor and stator are defined.

$$\bar{\omega} = \bar{\omega}_d + \bar{\omega}_s \quad (1)$$

where $\bar{\omega}$ is the over-all relative total pressure loss coefficient
 $\bar{\omega}_d$ is the contribution due to diffusion losses
and $\bar{\omega}_s$ is the contribution due to shock losses.

The diffusion loss component model is based upon the well-known NACA correlation presented in Ref 3. A total pressure loss parameter and a diffusion factor are defined by

$$P = \frac{\bar{\omega}_d \cos \alpha_{2r}}{2\sigma} \quad (2a)$$

and

$$D = 1 - \frac{C_{2r}}{C_{1r}} + \frac{C_{\theta 1r} - C_{\theta 2r}}{2C_{1r}\sigma} \quad (2b)$$

where P is the total pressure loss parameter
 α_{2r} is the relative outlet flow angle
 σ is the cascade solidity
 D is the diffusion factor
 C_2 is the relative outlet velocity
 C_{1r} is the relative inlet velocity
 $C_{\theta 1r}$ is the relative inlet whirl velocity
 $C_{\theta 2r}$ is the relative outlet whirl velocity.

The relationship that was assumed between the total pressure loss parameter and the diffusion factor is shown in Fig 1. This is an extrapolation to higher diffusion factors of the data given in Fig 203 of Ref 3.

The shock loss component is determined from the loss across a normal shock, the strength of which is a function of the blade element relative inlet Mach number. Different blade profiles were selected for the rotor and stator (as discussed in the following section) and hence two different relationships for the shock Mach number as a function of the inlet Mach number were used.

The profile selected for the rotor blade has almost no camber upstream of the point where the main passage shock will probably impinge upon the blade suction surface so that, from the viewpoint of a two-dimensional cascade, the Mach number should be unchanged relative to the inlet value. Compounded with this are effects in the meridional (axial-radial) plane. The annulus walls were assumed (at this phase of the design) to be converged in the region of the rotor leading edge so that significant contraction and hence diffusion of the supersonic relative flow would occur. The average Mach number immediately upstream of the shock is assumed to be given by

$$M_s = 1.0 + 0.6667 (M_{1r} - 1.0) \quad (3)$$

where M_s is the Mach number immediately upstream of the shock
 M_{1r} is the blade section relative inlet Mach number.

Then the relative total pressure loss coefficient component due to shock losses is given by

$$\bar{w}_s = \frac{1 - \left[\frac{(\gamma+1)M_s^2}{(\gamma-1)M_s^2 + 2} \right]^{\frac{\gamma}{\gamma-1}} \left[\frac{\gamma+1}{2\gamma M_s^2 - (\gamma-1)} \right]^{\frac{1}{\gamma-1}}}{1 - \left[1 + \frac{\gamma-1}{2} M_{1r}^2 \right]^{\frac{\gamma}{\gamma-1}}} \quad (4)$$

The double circular arc profile used for the stator had convex curvature throughout the suction surface, and hence, from the viewpoint of a two-dimensional cascade, can be expected to expand a supersonic inlet flow to a yet higher Mach number upstream of the main passage shock. Miller, Hartman and Lewis examined shock losses in double circular arc rotors and presented (in Ref 4) a simple flow model that correlated well with experimental data. A normal shock is presumed to lie along a straight line from the leading edge of one blade to a shock-impingement point on the adjacent blade suction surface. The shock-impingement point is fixed by the assumption that the shock intersects normally a blade mean-line drawn in mid-passage. The flow Mach number at the shock-impingement point is determined by a Prandtl-Meyer expansion from the value at blade inlet through the angle subtended by the suction surface upstream of the shock. By assuming the shock strength to be given by the mean of the Mach number at each end of the shock, the shock loss may be determined. For the current design, it was assumed that the result of the two-dimensional analysis is further modified by annulus wall effects, as in the case of the rotor. The Mach number produced by the above analysis is presumed to be modified according to Eq (3), the elevated mean two-dimensional shock Mach number replacing the blade section relative inlet Mach number. Equation (4) is then applied to determine the relative total pressure loss coefficient component due to shocks in the stator.

c. Axial Distributions Within Blade Rows

The averaged quantities and radial distributions discussed above were associated with conditions spanning an entire blade row. The detailed aerodynamic analyses (described in Section III) include computations made at a number of axial stations internal to both

blade rows. For this purpose it is necessary to specify the axial distribution of total pressure losses along each streamsurface and within each blade row. The quantity chosen to define a distribution was the ratio of actual-to-ideal relative total pressure on a stream-surface, referred to conditions at the leading edge of the respective blade row. Then the (absolute) total pressure at any station may be determined from

$$P_n = P_1 \left(\frac{T_n}{T_1} \right)^{\frac{\gamma}{\gamma-1}} \frac{P_{nr}}{P_{nr(ideal)}} \quad (5)$$

where P_n is the desired total pressure
 P_1 is the total pressure at blade row inlet
 $\frac{T_n}{T_1}$ is the ratio of total temperatures between the point of interest and blade inlet
 $\frac{P_{nr}}{P_{nr(ideal)}}$ is the ratio of actual to ideal relative total pressures at the point of interest

The value of $P_{nr}/P_{nr(ideal)}$ at the blade outlet was obtained from

$$\frac{P_{2r}}{P_{2r(ideal)}} = 1 - \frac{\bar{\omega}}{\left[\frac{P_{2r(ideal)}}{P_{1r}} \right]} \left[1 - \left(1 + \frac{\gamma-1}{2} M_{1r}^2 \right)^{-\frac{\gamma}{\gamma-1}} \right] \quad (6)$$

where

$$\frac{P_{2r(ideal)}}{P_{1r}} = \left\{ 1 + \frac{\gamma-1}{2} \frac{U_2^2}{a_{01r}^2} \left[1 - \left(\frac{r_1}{r_2} \right)^2 \right] \right\}^{\frac{\gamma}{\gamma-1}} \quad (7)$$

where P_{1r} is the relative total pressure at blade inlet
 P_{2r} is the relative total pressure at the blade outlet
 r_1, r_2 are the streamsurface radii at the corresponding two points
 U_2 is the wheel speed at the blade outlet
 M_{1r} is the relative Mach number at the blade inlet
 a_{01r} is the stagnation speed of sound relative to the blade inlet.

Equations (5), (6) and (7) are equivalent to Eqs A2, A6 and A3, respectively, of Ref 3, page 253.

Although the losses due to the passage shock occur abruptly, the shock is not perpendicular to the meridional plane of the compressor and hence appears in mean effect as a continuous phenomenon. Arbitrarily, the variation of $P_{nr}/P_{nr}(\text{ideal})$ was made linear between values of unity at the blade leading edge and the determined value for the blade trailing edge. For the rotor it was convenient to make it linear with axial distance, while for the stator streamsurface length was utilized.

2. BLADE PROFILE AND SOLIDITY SELECTION

a. Rotor Blade

The rotor blade is required to operate (at design point) at Mach numbers varying from 1.22 at the hub to 1.58 at the casing. At these Mach number levels a prime consideration in the selection of a blade profile is the minimization of losses due to shock waves. This rotor design is based upon the concept of achieving essentially shock-free supersonic diffusion in the forward portion of the rotor passage, this terminating with an inevitable strong shock. Then subsonic diffusion to the exit condition occurs.

Supersonic diffusion implies an area decrease. In this design, the area reduction is achieved by a decrease in the compressor annulus height. The flow angle relative to the rotor decreases by an amount sufficiently small that the associated flow area increase in the cascade plane is relatively small. It is assumed that the supersonic diffusion will be achieved by compression waves propagated from the suction surface of the blade upstream of the shock. The compression waves should occur as the flow is deflected away from the suction surface, toward which it will tend to move in the presence of the flow area reduction. (A similar hypothesis leads naturally to the use of reverse or negative camber in the forward region of a supersonic blade section. A potential advantage of the design method pursued for this stage is that the amount of positive camber required to achieve a specific outlet angle will of course be less when it is not preceded by reverse camber. A comparison of the use of "annulus controlled" area reduction and the 'S' profile for supersonic rotor duty is an area for future research.)

In the past, the types of profile associated with this design philosophy have included multiple-circular-arc profiles, and profiles consisting (on the camber line) of a straight line followed by a circular arc. For this design a new profile is employed. This is comprised of a polynomial (quartic) camber line, with a thickness distribution applied about it that consists of two polynomial (cubic) curves, one ahead and one after the point of maximum thickness. By setting the second derivative of the camber line equal to zero at

the leading edge, and to one half of its maximum value at the trailing edge, a camber line is produced that is initially straight and has a maximum curvature forward of the trailing edge. The second derivative of the thickness distribution equation is also set equal to zero at the leading edge, thus maintaining a small leading edge wedge angle (assuming a conventional thickness to chord ratio) while preventing inverse curvature in the thickness distribution. At the point of maximum thickness, the section thickness and first and second derivatives of thickness are set equal for the two thickness equations. The result is a blade section with continuous surface curvature throughout. Further details of the profile are given in Ref 2.

It can reasonably be assumed that the terminal shock in the rotor passage will be nearly perpendicular to the relative flow and will extend from the leading edge of one blade to the suction surface of the adjacent blade. (Correlations of such a flow model with experimental data were made by Miller, Lewis and Hartmann in Ref 4 as mentioned before.) The design philosophy outlined previously calls for little camber in the region of the blade between the leading edge and shock impingement point. This places a lower limit on solidity for the blade profile selected. The leading portion of the blade is essentially straight, whatever camber is specified being concentrated toward the rear of the blade. As solidity is decreased, the predicted point of shock impingement moves rearward along the blade suction surface, so that there is a solidity below which the requirement of little camber (in the forward region) is not met. The minimum acceptable solidity indicated by this means is about 1.7 at all radii.

The diffusion factor loss correlation described above also presents a method of determining solidity. For a given air-angle design, the variation of minimum low-speed loss coefficient with solidity may be obtained. Generally, a shallow minimum exists at a solidity which increases with diffusion factor. Using this method, "optimum" solidities of 1.3, 1.4 and 1.0 at hub, mid and tip respectively may be calculated. (These figures are consistent with the velocity triangle data produced by the final run in the first phase of the design. Similar figures were calculated from preliminary results.) Intuitively, these figures appear to be somewhat low, and may represent a minimum feasible solidity for low-speed flow.

Mechanical considerations also affect the choice of rotor solidity distribution. The requirement of a high solidity at the tip section conflicts with the requirement to keep the ratio of the cross-sectional areas of the casing and hub sections down to such a value that unacceptable centrifugal stresses are not generated in the rotor blade.

Taking into account the three factors described above, the following distribution of rotor blade solidity was derived.

<u>Section</u>	<u>Solidity</u>
Hub	2.172
Mean	1.937
Casing	1.861

Evidence presented in Ref 5 indicates that no loss attributable to trailing-edge thickness was observed for compressor cascades having trailing-edge thicknesses up to about one-third of the maximum blade-element thickness. Therefore, for this design, rotor trailing edges were simply truncated at one-third of maximum blade-element thickness in order to compensate to some extent for the annulus convergence required between rotor and stator in order to achieve smooth wall contours.

b. Stator Blade

The stator blade operates (at design point) at relative inlet Mach numbers between 1.0 and 1.1. The double circular arc profile has performed well at this Mach number level. It constitutes a good compromise between expanding the incoming flow to a yet higher Mach number, and maintaining a sufficiently large throat width to pass the design flow without choking. It was therefore selected for the stator design.

The same considerations applied to the rotor to derive solidities may again be used to obtain solidities for the stator. From a two-dimensional viewpoint, emphasis should be placed on minimizing the expansion of the incoming supersonic flow upstream of the terminal shock. As the blade suction surface is a circular arc, the expansion is continuously decreased as the solidity is increased. However, the modest inlet Mach number precludes the assumption that an extreme solidity is desirable. The diffusion factor loss coefficient correlation may again be used to determine optimum solidities, and indicates values varying from 1.2 at the hub to 1.9 at the casing.

The final stator solidity distribution was influenced considerably by the use of the swept leading edge, described later. However, the concepts described above guided the selection of the general solidity level. Final stator solidities are as follows:

<u>Section</u>	<u>Solidity</u>
Hub	2.393
Mean	1.803
Casing	2.145

3. DEVIATION ANGLES

a. Rotor Blade

In order to relate blade angles to design air angles it is necessary to have a knowledge of the flow deviation angles that will occur. This presents a problem for the rotor design as the profile type selected has not been previously investigated and hence a correlation of deviation with camber, outlet angle, solidity, and so fourth, is not available. Fortunately, at the loading level for which the rotor is designed, a small error in deviation angle is not crucial. An important result from the testing of the stage will be the determination of the actual rotor deviation angles achieved.

A form of Carter's rule was used to determine rotor blade deviation angles. Deviation is related to cascade geometry by

$$\delta = m\theta \sqrt{1/\sigma} \quad (8)$$

where δ is the deviation angle

θ is the blade section camber angle

σ is the cascade solidity

m is a function of the blade section stagger angle.

Figure 2 shows the relationship that was assumed between m and the stagger angle. (Also shown are Carter's curves for conventional blades having their points of maximum camber at 0.4 and 0.5 of the chord. These are taken from Fig 160, Ref 3.)

In order to perform detail design calculations on proposed rotor configurations, it is necessary to have a means of determining mean relative flow angles within the rotor blade. This was accomplished by using a generalized relationship for the deviation angle (from the local blade camber line direction) as a function of distance along the section meridionally-projected chord and the final deviation angle. The relationship assumed is shown in Fig 3. The rapid increase of deviation angle near the blade exit arises from consideration of the physical requirements necessary to satisfy the "Kutta" condition at the trailing edge.

b. Stator Blade

The same requirements of knowing final and intermediate deviation exist for the stator blade as for the rotor blade. However, in this case the double circular arc profile was specified.

Final deviation angles were calculated from Carter's rule, which was described above in connection with the rotor blade. In this case the $m/stagger$ curve for conventional blades having maximum camber at mid-chord was used. Carter's rule has been widely and successfully used for double circular arc blade sections.

Within the stator blade, the same generalized relationship for local deviation angle was assumed as was described above for the rotor blade.

4. ASPECT RATIOS, FILLET RADII, AND STATOR LEADING EDGE FORM

Some novel features of the design are related to attempts to minimize the detrimental effects of secondary flows within the compressor. Conclusions drawn from data presented in Ref 6 inspire these attempts. A supersonic radial compressor diffuser of unusually high performance is described. The diffuser is comprised of a series of uniformly distributed circular cylindrical passages in a radial plane, all tangent to a circle in that plane. They mutually intersect at the inner radius or inlet of the diffuser, forming a series of sharp, elliptical leading edges. The significant features which may have contributed to the performance of the diffuser are believed to be the use of a circular (corner-free) passage, and the "swept" leading edge configuration.

The circular passage concept was applied to both rotor and stator. It was incorporated by choosing the number of blades so that the flow passages are approximately square when viewed normal to the flow near the blade row exits. Also large fillet radii were applied at the rotor hub, and the stator hub and casing.

The swept leading edge concept has been applied to the stator blade. Swept wing theory indicates that section performance is related to the normal component of the incident Mach number. High Mach number operation of compressor blade sections is characterized by relatively large loss penalties for small variations in incidence angle away from the optimum. The hub and the casing are regions where the stator design incidence is most likely to be violated. Accordingly, the stator leading edge at the hub and casing has been swept forward to such an angle that the normal Mach number is approximately 0.4. A simple parabolic form connects the two extremities.

SECTION III
AERODYNAMIC CALCULATION METHOD

1. AXISYMMETRIC FLOW ANALYSIS

The principal means used to incorporate the design criteria into the stage design was an axisymmetric flow analysis. The most important assumptions made are that the flow is axisymmetric, and that there is no transport of mass or energy across streamsurfaces in the flow. The fluid (air) is assumed to be a perfect gas. Briefly, the calculation consists of the following elements:

(1) A number of computing stations are located in the flow

(2) The locations of a number of axisymmetric streamsurfaces are estimated at each computing station

(3) The continuity, momentum, and energy equations are simultaneously solved (iteratively) at each station in turn. The continuity equation is satisfied in an integrated sense, that is, the specified flow-rate at each station is maintained. The energy equation is satisfied by one of essentially three means. At a station following a blade-free space, the enthalpy, entropy and angular momentum are constant along streamsurfaces from the preceding station. At a station within or immediately following a blade row, there may be specified (for each streamsurface) either the work input downstream of a preceding station, or the flow angle relative to the blade. In both cases, the angular momentum and enthalpy change are established, directly or indirectly. A number of means of specifying the entropy rise on each streamsurface exist. For the current purpose, two alternative specifications were sufficient; an inlet dynamic head total pressure loss coefficient, or the ratio of actual to ideal relative total pressure. The solution to the momentum equation, which may be considered to be the principal equation, yields the variation of velocity, and hence all other undetermined parameters of the flow, along the computing station.

(4) The estimated streamsurface pattern used to obtain the solution described in (3) is refined to more nearly satisfy continuity on a detailed basis. That is, using the mass flux distributions derived in (3), the streamsurface location estimates are revised to maintain a constant proportion of the total flow in each streamtube.

(5) The procedure is re-entered at (3) to obtain an improved solution to the system of equations. The new solution differs from that previously determined because it is a function of the assumed streamsurface pattern. This is repeated until the desired accuracy is achieved.

The momentum equation used for the above calculations is

$$\frac{dC_m^2}{d\ell} = 2 \cos^2 \alpha C_m^2 \left[\frac{\cos(\gamma+\phi)}{r_c} - \frac{\tan \alpha}{r} \frac{d(r \tan \alpha)}{d\ell} + \frac{\sin(\gamma+\phi)}{C_m} \frac{dC_m}{dm} \right] + 2 \cos^2 \alpha \left[\frac{dH}{d\ell} - t \frac{dS}{d\ell} \right] \quad (9)$$

where C_m is the meridional velocity

ℓ is the direction of the computing station

α is the whirl angle, defined $\tan \alpha = C_\theta / C_m$

C_θ is the tangential velocity

γ is the angle made by the computing station with the radial direction, positive values indicating an increase in radius with axial distance

ϕ is the streamsurface slope angle

r_c is the radius of curvature of the streamsurface

m is the meridional streamline direction

H is the enthalpy

S is the entropy

t is the static temperature.

The continuity equation is

$$W = \int_{\text{hub}}^{\text{case}} C_m \cos \phi w dA \quad (10)$$

where W is the flow-rate

w is the specific weight

A is flow area normal to the axis.

The energy equation is either

$$T = \begin{array}{l} \text{constant along stream-} \\ \text{lines between blade rows.} \end{array} \quad (11)$$

$$T = \begin{array}{l} \text{specified value within} \\ \text{or immediately following} \\ \text{a rotor row} \end{array} \quad (12)$$

or

$$T = \frac{U_n (U_n / C_{mn} + \tan \alpha_{nr}) - U_1 C_{\theta 1}}{gJ C_p} + T_1 \quad (13)$$

when relative flow angle is specified. In Eq (13),

T is total temperature

U is blade speed

g is the acceleration due to gravity

J is Joule's equivalent

C_p is specific heat at constant pressure

n indicates the location where the temperature is derived

1 indicates blade inlet

r indicates relative conditions.

Equations (5), (6) and (7) (given previously) relate total pressure to total temperature.

2. ITERATION PROCEDURE FOR CONSISTENT LOSSES

One of the problems faced by the designer of a compressor (or turbine) is how to specify losses in such a manner that they are completely consistent with local values of Mach number and diffusion along every streamsurface. When using a streamline-curvature calculation technique, it is convenient to solve this problem iteratively. The general procedure followed was:

(1) A complete aerodynamic solution was obtained using initially estimated loss distributions (which could be zero loss throughout)

(2) Mach numbers and diffusion factors were calculated on each streamsurface for each blade row and new loss coefficients were obtained using Eqs (1), (2), (3) and (4)

(3) A new aerodynamic solution was obtained using the loss coefficients obtained in step (2).

Steps (2) and (3) were repeated until the change in loss coefficients fell within a prescribed tolerance. For these calculations, computing stations within blade rows were not employed; only those corresponding to blade-row leading and trailing edge planes and elsewhere in the compressor were used. The radial distribution of any one of three parameters could be defined in order to control stage performance. The three options were to specify:

- (1) Stage total pressure ratio at the stator trailing edge plane,
- (2) Total temperature rise at the rotor trailing edge plane, or
- (3) Relative flow angle at the rotor trailing edge plane.

3. ALTERNATIVE FORMULATION OF MOMENTUM EQUATION

Some difficulty was experienced in selecting a radial distribution of work (total temperature or pressure rise) that would yield a satisfactory velocity profile at the rotor exit when making the computations described in the previous section. An alternative formulation of the momentum equation was therefore derived in which the total temperature rise is the dependent variable, and the velocity profile is specified. The equation to be solved is formed by combining Eqs (9), (13) and (5), and using the fact that for a perfect gas we may write

$$\frac{dH}{d\ell} - t \frac{dS}{d\ell} = gJ C_p \frac{dT}{d\ell} - \frac{t}{T} \left(gJ C_p \frac{dT}{d\ell} - \frac{1}{\rho_T} \frac{dP}{d\ell} \right) \quad (14)$$

Algebraic manipulation yields the following result

$$gJ C_p \frac{dT}{d\ell} = \left\{ C_m^2 \left[\frac{\cos(\phi+\gamma)}{r_c} + \frac{\sin(\phi+\gamma)}{C_m} \frac{dC_m}{dm} \right] + \frac{U_1 C_{\theta 1} + gJ C_p (T - T_1)}{\omega r^2} \right\} \times$$

$$\frac{d}{d\ell} \left[\frac{gJ C_p T_1}{\omega} - r_1 C_{\theta 1} \right] + gRt \frac{d}{d\ell} \ln \left[\frac{P_1}{T_1^{\frac{\gamma}{\gamma-1}}} \frac{P_R/P_{1R}}{(P_R/P_{1R})_{ideal}} \right] -$$

$$C_m \frac{dC_m}{d\ell} \left\{ \frac{U_1 C_{\theta 1} + gJ C_p (T - T_1)}{U^2} \right\} \quad (15)$$

Thus the total temperature gradient is a function of the meridional velocity gradient, the gradient of actual to ideal relative total pressure (a function of the losses), and other quantities. By choosing a value of total temperature at one radius, the values at all other radii may be calculated. The starting point value is adjusted so that together with the iteratively determined losses, the desired mean stage total pressure ratio is achieved. This is further described in Ref 7.

4. ANNULUS WALL BOUNDARY LAYER DETERMINATION

A constant phenomenon in axial compressors is the build-up of boundary layers of significant thickness upon the annulus walls. The following simple calculation was included in the computing scheme used for the stage design.

Jansen presents a method of estimating the blockage due to annulus wall boundary layers in Ref 8. Boundary layer displacement thicknesses are specified at a location upstream of the compressor proper. Here they will generally be negligible. Then the momentum thickness of each boundary layer is obtained from

$$\theta_n = \theta_1 + 0.006 C_{mn}^{-3.4} \left[\int_{m_1}^{m_n} C_m^4 dm \right]^{0.8} \quad (16)$$

where θ is momentum thickness. (Note that units of feet and seconds are assumed for the dimensional quantities.)

The shape factor is obtained from

$$H_n = 30 \frac{\theta_n - \theta_{n-1}}{m_n - m_{n-1}} + 1.5 \quad (17)$$

subject to the restraints $1.1 \leq H \leq 2.2$ where H is the shape factor.

The displacement thickness is given by

$$\delta_n = H_n \theta_n \quad (18)$$

where δ is displacement thickness.

The blockage due to the two boundary layers is incorporated into the calculation by locating the outermost streamsurfaces away from the annulus walls by the amount of the displacement thickness.

5. USE OF STATIC PRESSURE DISTRIBUTIONS TO OPTIMIZE INCIDENCE ANGLES AND ANNULUS GEOMETRY

Given the results of the iterative loss reestimation procedure, it is possible to determine feasible blade geometries by assuming incidence angle variations for rotor and stator. The calculation method employed includes the calculation of conditions, on an axisymmetric basis, at points within the blade rows. Hence, within the limits of the assumptions, it is possible to determine the variation of any parameter through the blade rows. A rational method of evaluating various designs was required to enable incidence variations and annulus configurations to be optimized.

The parameter selected for prime consideration was the static pressure. The basic concept employed in the optimization process was that the static pressure should rise in a smooth manner with minimum slope. This minimum was limited by the requirement that the rate of increase of static pressure with flow-path length should fall smoothly to zero at the blade trailing edge. The validity of this approach is debatable for the rotor blade sections, which operate transonically with a strong shock in the flow. However, the shock is approximately normal to the relative flow direction and hence, when viewed in the meridional plane and considered in mean effect, appears not as a discontinuity but as a region through which conditions change in an apparently continuous manner.

An implicit result of the intra-blade analysis is a check upon the maximum or choking flow of the blade row.

6. COMPUTER PROGRAM

A computer program to perform the calculations described above was created by modifying the program presented in Ref 9, which describes a program for the analysis of non-axisymmetric flows in axial compressors. The program is considerably more complicated than the axisymmetric analysis outlined above requires, and extensive simplifications were made to the deck. The principal changes made were as follows.

(1) The system of equations solved was modified to reflect the assumption of axial symmetry. (The equations, in the modified form, were presented previously (Eqs (9), (10), (11), (12) and (13))

(2) The loss estimation procedure described previously was programmed and incorporated into an overall iteration procedure.

(3) The method of solution of the momentum equation in which the dependent variable is the total temperature gradient (Eq (15)) was programmed as an alternative calculation at the rotor exit.

(4) One novel feature incorporated into the program is that the station lean angle (γ) may vary along a computing station. This provision was included in order to be able to locate calculating stations along the leading edge of the stator and within the stator blade row at constant fractions of the projected blade chord.

SECTION IV

RESULTS FROM DESIGN CALCULATIONS

1. ITERATIVE LOSS REESTIMATION PROCEDURE

a. Path to a Solution

As mentioned in the previous section, several different input options to the calculation scheme (i.e., computer program) were available that would determine, directly or indirectly, the rotor work distribution. The criteria for selection of an option for the first phase of the design are that the mass-averaged total pressure ratio of the stage should be readily controllable, and that satisfactory radial distributions of the significant parameters of both rotor and stator should be easily obtained. The latter criterion is closely allied to the rotor exit meridional velocity profile.

Specification of the distribution of either total temperature rise across the rotor or relative outlet flow angle from the rotor satisfies neither criteria. Specification of the distribution of rotor (or stage) outlet total pressure gives relatively good control. For this stage design, the specification of a nondimensionalized rotor outlet meridional velocity profile together with a mass-averaged total pressure ratio was selected, this being thought to be the most direct method of achieving the desired result. In fact, the total pressure distribution is probably as easy to manipulate.

Having achieved a satisfactory aerodynamic result by the above means, it remains to ensure that the blades implied by the foregoing calculations are mechanically acceptable, especially in the case of the rotor blade. The rotor relative flow angles must vary along the length of the blade in such a manner that no severe blade twists occur. In order to achieve this for the current design, aerodynamic analyses were made for specified relative rotor outlet angle distributions which were produced by "smoothing" the distributions determined in the preceding calculations. This resulted in a stage mass-averaged total pressure ratio little different from the defined value of 3.0:1, and mechanically acceptable blade shapes.

b. Design-Point Conditions

An important result of the calculations described above was the over-all stage efficiency produced by the loss model discussed earlier. Actually, it was originally anticipated that a more optimistic diffusion-loss model would be required to produce the objective stage efficiency. However, this was achieved with the loss-model described, which is believed to be quite realistic as far as diffusion loss is concerned, if somewhat optimistic with respect to shock losses. Some degree of optimism may also be involved in the diffusion loss model inasmuch as the elevated tip loss incorporated in the NACA model

... however, because the origin of this loss is suspected to be boundary-layer centrifuging in the wake region, it was not included in the iterative loss reestimation procedure for two reasons. First, if the increased tip loss is viewed as a radial redistribution of mass within the gap between blades, it need not significantly affect the rotor design and its omission would result in only a radial redistribution of stator conditions. Second, it is anticipated that the stated design objectives of this program will be achieved after appropriate boundary-layer control devices have been added, these modifications, if successful, should reduce rotor wake thickness and the associated radial migration. A further practical consideration is that an attempt to compensate for increased tip loss assumed to occur within the rotor can lead to mechanically undesirable blade twists in the tip region.

Figure 5 shows the annulus geometry and computing station locations used for the final computation of this phase of the design. The compressor inlet and outlet areas were determined from the initially established design objectives. The area at the rotor outlet was determined by maximizing the static pressure rise across the rotor while still maintaining satisfactory rotor diffusion levels. This resulted in a slightly higher static pressure rise across the rotor than across the stator, but the mean meridional velocity rises over 100 feet per second across the rotor and falls by a similar amount across the stator. (Actually, from stator leading edge to trailing edge the mean meridional velocity falls about 180 feet per second because it rises about 80 feet per second in the space between rotor and stator.)

Figure 6 shows the meridional velocity distributions at inlet and outlet to the rotor and stator. Figure 6 shows the relative Mach number distributions at inlet and outlet to the rotor and stator. The relative inlet and outlet flow angle distributions for the rotor and stator are shown in Fig 7. Figure 8 shows the distribution of diffusion factors for the rotor and stator and the relative total pressure loss coefficient distributions are shown in Fig 9. Figures 10 and 11 show the distributions of total pressure ratio and isentropic efficiency at the rotor and stage outlets. The non-dimensional total temperature rise distribution is shown in Fig 12. The axial distributions of computed boundary layer thickness are shown in Fig 13.

The next design phase consisted of establishing detailed blade and annulus geometries consistent with the above results and the design criteria. The data extracted from this first phase of the design was the flowpath as specified by the annulus and boundary layers at the blade leading and trailing edges, and in the inlet and exit, and also the distributions of relative total pressure loss coefficient and relative outlet flow angle for each blade.

The computer program output from the first phase of the design is reproduced on the following pages.

ARF AXIAL COMPRESSOR PROGRAM RMH3

JOB TITLE = PHASE 1, INTER-BLADE DESIGN LOSS DETERMINATION

NUMBER OF STATIONS = 10
NUMBER OF STREAMLINES = 15
NUMBER OF BLADING DATA RADII = 8
NUMBER OF INLET CONDITION DATA RADII = 1
IFSIMP = 1 (2 -S.R.E. -NE.2 -L.S.O. STREAMLINES,NPOINT = IFSIMP+2)
MAXIMUM NUMBER OF PASSES PER CYCLE = 10
IFBL = 2 (1 -BLOCKAGE HELD AT DATA VALUES 2 -ANNULUS WALL B.L. CALCULATED)
ITER = 2 (1 -PRINT ALL VELOCITIES DURING ITERATIONS 2 -NORMAL OPTION)
NPLUT = 31 (FIRST PASS DURING WHICH CASCADE ANALYSIS IS PRINTED)
INCPD = 0 (INCREMENT FOR ABOVE)
NMRIT = 31 (FIRST PASS DURING WHICH VELOCITY TRIANGLE DATA IS PRINTED)
INCMRI = 0 (INCREMENT FOR ABOVE)
IFTYPE = 0 (0 -ALL STATIONS UPRIGHT, ALL SOLUTIONS SUBSONIC 1 -STATION LEAN ANGLES AND SOLUTION TYPES SPECIFIED)
CONTINUITY TOLERANCE = 0.0002
FRACTION OF INLET BLOCKAGE ON HUB = 0.5000
GAS CONSTANT = 53.3200
SPECIFIC HEAT = 0.24000
FIRST VISCOSITY COEFFICIENT = 0.500E 00
SECOND VISCOSITY COEFFICIENT = -0.

STATION-TO-STATION CHANGES ARE PRESCRIBED THUS

STATION 2 FOLLOWS A BLADE FREE SPACE
 STATION 3 FOLLOWS A BLADE FREE SPACE
 STATION 4 FOLLOWS A BLADE FREE SPACE
 STATION 5 FOLLOWS A BLADE FREE SPACE
 STATION 6 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 20371.4 RPM

IBETA2 =1 IFTHIC =0 IFCAX =0 IFMACH =0 IFREYN =0 ILOSS =1 IFHLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE ANGLE	FLOW COEFFICIENT	LOSS COEFFICIENT	BLOCKAGE FRACTION
7.5000	-24.00	0.08000	0.08000	0.02600
7.6000	-26.70	0.09000	0.09000	0.02600
7.8000	-30.80	0.11000	0.11000	0.02600
8.0000	-33.18	0.13000	0.13000	0.02600
8.2000	-34.68	0.15000	0.15000	0.02600
8.4000	-35.52	0.18000	0.18000	0.02600
8.6000	-35.80	0.21000	0.21000	0.02600
8.7000	-35.77	0.24000	0.24000	0.02600

STATION 7 FOLLOWS A BLADE FREE SPACE

IBEND(I) = 6

RADIUS	'Z'
7.6000	2.4700
7.8000	2.7950
8.0000	2.9720
8.2000	2.9930
8.4000	2.8900
8.6200	2.5000

STATION 8 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. RPM

IBETA2 =1 IFTHIC =0 IFCAX =0 IFMACH =0 IFREYN =0 ILOSS =1 IFHLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE ANGLE	FLOW COEFFICIENT	LOSS COEFFICIENT	BLOCKAGE FRACTION
7.6400	-0.	0.13000	0.13000	-0.
7.7770	-0.	0.13000	0.13000	-0.
7.9140	-0.	0.13000	0.13000	-0.
8.0510	-0.	0.13000	0.13000	-0.
8.1880	-0.	0.13000	0.13000	-0.
8.3260	-0.	0.13000	0.13000	-0.
8.4620	-0.	0.13000	0.13000	-0.
8.6000	-0.	0.13000	0.13000	-0.

STATION 9 FOLLOWS A BLADE FREE SPACE

STATION 10 FOLLOWS A BLADE FREE SPACE

ANNULUS GEOMETRY SPECIFICATION AND SOLUTION TYPE INDICATORS

STATION NUMBER	AXIAL LOCATION	HUB RADIUS	CASING RADIUS	LEAN ANGLE	BLOCK AGE	MACH# (0 -SUBSONIC 1 -SUPERSONIC)
1	-9.0000	4.3000	11.1740	0.	0.	0
2	-6.0000	4.8400	9.7380	0.	0.	0
3	-4.0000	5.2600	9.2900	0.	0.	0
4	-2.0000	5.9880	9.1000	0.	0.	0
5	0.	6.7500	9.0600	0.	0.	0
6	2.0000	7.5500	8.6700	0.	0.	0
7	2.6000	7.6200	8.6200	0.	0.	0
8	4.7250	7.6400	8.6000	0.	0.	0
9	5.5000	7.6400	8.6000	0.	0.	0
10	7.0000	7.6400	8.6000	0.	0.	0

FLOW = 30.00

FRACTIONS OF INLET BETWEEN HUB AND EACH STREAMLINE

0.	0.0714	0.1429	0.2143	0.2857	0.3571	0.4286	0.5000	0.5714
0.6429	0.7143	0.7857	0.8571	0.9286	1.0000			

INLET CONDITIONS

RADIUS	TOTAL TEMPERATURE	TOTAL PRESSURE	FLOW ANGLE
1.0000	518.70	2116.0	0.

NUMBER OF OUTER LOOPS = 20
NUMBER OF BLADES TO BE REVIEWED = 2

BLADE EXIT STATION NO. 6
NO. OF DATA POINTS = 3
SHOCK LOSS OPTIMISM FACTOR(A) = 0.6667
DIFFUSION LOSS OPTIMISM FACTOR(B) = 1.0000

RADIUS SOLIDITY

7.550 2.0010
8.066 1.9360
8.670 2.0260

BLADE EXIT STATION NO. 8
NO. OF DATA POINTS = 5
SHOCK LOSS OPTIMISM FACTOR(A) = 0.6667
DIFFUSION LOSS OPTIMISM FACTOR(B) = 1.0000

RADIUS SOLIDITY

7.696 2.3690
7.825 2.0170
8.148 1.7440
8.404 1.8580
8.590 2.1550

LOSS CALCULATION FOR BLADE 1 ON OUTER LOOP 20

STREAM -LINE	RADIUS	2-D MACH	3-D MACH	D FACTOR	2-D SHOCK LOSS	3-D SHOCK LOSS	REAL D. FACTOR LOSS	OUR D. FACTOR LOSS	2-D SHOCK + REAL D.	11	12	13	14	15
1	7.5585	1.2335	1.1557	0.4759	0.01790	0.00605	0.07334	0.07334	0.09125	0.07939				
2	7.6056	1.2533	1.1689	0.4888	0.02176	0.00743	0.07743	0.07743	0.09918	0.08485				
3	7.6581	1.2745	1.1830	0.5024	0.02628	0.00906	0.08201	0.08201	0.10829	0.09108				
4	7.7159	1.2966	1.1978	0.5162	0.03145	0.01096	0.08708	0.08708	0.11853	0.09804				
5	7.7790	1.3197	1.2131	0.5302	0.03730	0.01314	0.09262	0.09262	0.12991	0.10376				
6	7.8471	1.3434	1.2290	0.5442	0.04378	0.01560	0.09862	0.09862	0.14240	0.11422				
7	7.9201	1.3678	1.2452	0.5581	0.05089	0.01834	0.10513	0.10513	0.15602	0.12347				
8	7.9976	1.3925	1.2617	0.5719	0.05857	0.02134	0.11221	0.11221	0.17077	0.13355				
9	8.0792	1.4176	1.2784	0.5853	0.06677	0.02461	0.11997	0.11997	0.18674	0.14458				
10	8.1650	1.4428	1.2952	0.5986	0.07547	0.02813	0.12854	0.12854	0.20401	0.15667				
11	8.2544	1.4682	1.3121	0.6117	0.08459	0.03188	0.13799	0.13799	0.22257	0.16987				
12	8.3473	1.4936	1.3291	0.6257	0.09408	0.03566	0.14909	0.14909	0.24318	0.18495				
13	8.4439	1.5191	1.3460	0.6433	0.10391	0.04004	0.16392	0.16392	0.26783	0.20396				
14	8.5454	1.5445	1.3630	0.6711	0.11407	0.04444	0.18893	0.18893	0.30300	0.23337				
15	8.6557	1.5701	1.3801	0.7259	0.12452	0.04905	0.24440	0.24440	0.36892	0.29345				
J														
CAMBER	52.521	53.097	53.776	54.524	55.222	55.855	56.453	57.471	58.005	58.568	59.236	60.247	62.251	66.584
BETAI	44.359	44.598	44.880	45.205	45.524	45.848	46.212	46.575	47.408	47.932	48.609	49.637	51.513	55.268
SOLIDITY	2.4110	2.2710	2.1241	1.9888	1.8827	1.8092	1.7474	1.7441	1.7529	1.7806	1.8344	1.9199	2.0308	2.1533

LOSS CALCULATION FOR BLADE 2 ON OUTER LOOP 20

STREAM -LINE	RADIUS	2-D MACH	3-D MACH	D FACTOR	2-D SHOCK LOSS	3-D SHOCK LOSS	REAL D. FACTOR LOSS	OUR D. FACTOR LOSS	2-D SHOCK + REAL D.	11	12	13	14	15
1	7.6819	1.3679	1.2453	0.6986	0.06458	0.02327	0.20963	0.20963	0.27421	0.23290				
2	7.7290	1.3730	1.2487	0.7038	0.06782	0.02450	0.20208	0.20208	0.26990	0.22658				
3	7.7813	1.3821	1.2547	0.7103	0.07303	0.02649	0.19448	0.19448	0.26750	0.22096				
4	7.8382	1.3938	1.2625	0.7169	0.07965	0.02904	0.18744	0.18744	0.26709	0.21648				
5	7.8994	1.4060	1.2707	0.7207	0.08667	0.03178	0.18040	0.18040	0.26707	0.21217				
6	7.9642	1.4171	1.2780	0.7183	0.09312	0.03431	0.17156	0.17156	0.26468	0.20588				
7	8.0315	1.4260	1.2840	0.7092	0.09840	0.03695	0.16095	0.16095	0.25936	0.19736				
8	8.1003	1.4328	1.2886	0.6961	0.10233	0.03797	0.15018	0.15018	0.25251	0.18816				
9	8.1702	1.4383	1.2922	0.6808	0.10537	0.03919	0.13991	0.13991	0.24528	0.17911				
10	8.2409	1.4431	1.2954	0.6638	0.10786	0.04021	0.13000	0.13000	0.23786	0.17020				
11	8.3115	1.4459	1.2973	0.6437	0.10913	0.04073	0.12018	0.12018	0.22931	0.16091				
12	8.3818	1.4462	1.2975	0.6196	0.10886	0.04064	0.11054	0.11054	0.21941	0.15118				
13	8.4515	1.4447	1.2965	0.5932	0.10765	0.04016	0.10236	0.10236	0.21001	0.14252				
14	8.5207	1.4470	1.2980	0.5674	0.10887	0.04065	0.09657	0.09657	0.20543	0.13722				
15	8.5891	1.4671	1.3114	0.5433	0.12048	0.04539	0.09250	0.09250	0.21298	0.13789				

RESULTS FROM ANNULUS WALL BOUNDARY LAYER CALCULATIONS PERFORMED DURING PASS 3

STATION	BLOCKAGE
1	-0.
2	0.0050
3	0.0062
4	0.0073
5	0.0084
6	0.0208
7	0.0160
8	0.0532
9	0.0538
10	0.0580

OUTPUT FROM PASS 3

STATION 1

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
1	4.3000	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	10.436	0.	0.0756	1
2	4.2908	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	7.520	0.	0.0756	2
3	5.2823	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	4.737	0.	0.0756	3
4	5.7731	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	2.054	0.	0.0756	4
5	6.2639	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-0.965	0.	0.0756	5
6	6.7547	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-3.142	0.	0.0756	6
7	7.2452	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-5.698	0.	0.0756	7
8	7.7370	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-8.234	0.	0.0756	8
9	8.2278	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-10.761	0.	0.0756	9
10	8.7193	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-13.286	0.	0.0756	10
11	9.2101	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-15.802	0.	0.0756	11
12	9.7009	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-18.312	0.	0.0756	12
13	10.1917	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-20.811	0.	0.0756	13
14	10.6832	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-23.300	0.	0.0756	14
15	11.1740	176.865	176.865	0.	518.7	516.1	2116.00	2079.04	0.1589	0.	-25.766	0.	0.0756	15

STATION 2

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
1	4.8526	237.282	237.282	0.	518.7	514.0	2116.00	2049.81	0.2136	0.	11.309	100.71	0.0748	1
2	5.1668	239.578	239.578	0.	518.7	513.9	2116.00	2048.54	0.2137	0.	9.102	55.25	0.0748	2
3	5.5309	242.385	242.385	0.	518.7	513.8	2116.00	2046.97	0.2181	0.	6.902	40.16	0.0747	3
4	5.8807	245.571	245.571	0.	518.7	513.7	2116.00	2045.16	0.2211	0.	4.715	32.51	0.0747	4
5	6.2343	249.036	249.036	0.	518.7	513.5	2116.00	2043.18	0.2243	0.	2.539	27.75	0.0746	5
6	6.5900	252.703	252.703	0.	518.7	513.4	2116.00	2041.04	0.2276	0.	0.378	24.40	0.0746	6
7	6.9469	256.523	256.523	0.	518.7	513.2	2116.00	2038.79	0.2311	0.	-1.771	21.82	0.0745	7
8	7.3029	260.452	260.452	0.	518.7	513.1	2116.00	2036.44	0.2347	0.	-3.898	19.73	0.0744	8
9	7.6576	264.475	264.475	0.	518.7	512.9	2116.00	2034.00	0.2383	0.	-6.003	17.96	0.0744	9
10	8.0109	268.590	268.590	0.	518.7	512.7	2116.00	2031.46	0.2421	0.	-8.089	16.44	0.0743	10
11	8.3611	272.786	272.786	0.	518.7	512.5	2116.00	2028.84	0.2459	0.	-10.148	15.12	0.0742	11
12	8.7081	277.074	277.074	0.	518.7	512.3	2116.00	2026.12	0.2498	0.	-12.181	13.96	0.0742	12
13	9.0515	281.458	281.458	0.	518.7	512.1	2116.00	2023.30	0.2538	0.	-14.189	12.94	0.0741	13
14	9.3912	285.948	285.948	0.	518.7	511.9	2116.00	2020.37	0.2579	0.	-16.174	12.04	0.0740	14
15	9.7260	290.529	290.529	0.	518.7	511.7	2116.00	2017.33	0.2621	0.	-18.131	11.26	0.0739	15

STATION 3

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		DIRECTION		TEMPERATURES	PRESSURES		MACH	WHIRL	SLOPE	RAD. OF	STATIC	LOCATION
		ABSOLUTE	MERIDNL.	TANGENTL.	TOTAL		STATIC	TOTAL						
1	5.2736	276.576	276.576	0.	518.7	512.3	2116.00	2026.44	0.2494	0.	15.987	14.81	0.0742	1
2	5.5448	283.901	283.901	0.	518.7	512.0	2116.00	2021.71	0.2560	0.	13.982	15.64	0.0741	2
3	5.8239	291.079	291.079	0.	518.7	511.6	2116.00	2016.97	0.2626	0.	11.954	16.37	0.0739	3
4	6.1078	298.019	298.019	0.	518.7	511.3	2116.00	2012.27	0.2690	0.	9.933	16.99	0.0738	4
5	6.3953	304.690	304.690	0.	518.7	511.0	2116.00	2007.66	0.2751	0.	7.935	17.48	0.0737	5
6	6.6852	311.069	311.069	0.	518.7	510.6	2116.00	2003.17	0.2809	0.	5.972	17.83	0.0736	6
7	6.9769	317.157	317.157	0.	518.7	510.3	2116.00	1998.80	0.2865	0.	4.052	18.04	0.0735	7
8	7.2687	322.941	322.941	0.	518.7	510.0	2116.00	1994.58	0.2918	0.	2.187	18.13	0.0733	8
9	7.5605	328.443	328.443	0.	518.7	509.7	2116.00	1990.50	0.2969	0.	0.382	18.11	0.0732	9
10	7.8520	333.692	333.692	0.	518.7	509.4	2116.00	1986.54	0.3017	0.	-1.363	17.98	0.0731	10
11	8.1418	338.702	338.702	0.	518.7	509.2	2116.00	1982.72	0.3063	0.	-3.039	17.76	0.0730	11
12	8.4298	343.516	343.516	0.	518.7	508.9	2116.00	1978.99	0.3108	0.	-4.648	17.46	0.0729	12
13	8.7154	348.176	348.176	0.	518.7	508.6	2116.00	1975.34	0.3151	0.	-6.187	17.07	0.0728	13
14	8.9987	352.737	352.737	0.	518.7	508.3	2116.00	1971.72	0.3193	0.	-7.658	16.62	0.0727	14
15	9.2781	357.240	357.240	0.	518.7	508.1	2116.00	1968.11	0.3234	0.	-9.059	16.10	0.0726	15

STATION 4

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		DIRECTION		TEMPERATURES	PRESSURES		MACH	WHIRL	SLOPE	RAD. OF	STATIC	LOCATION
		ABSOLUTE	MERIDNL.	TANGENTL.	TOTAL		STATIC	TOTAL						
1	5.9986	383.723	383.723	0.	518.7	506.4	2116.00	1946.05	0.3480	0.	20.367	138.63	0.0721	1
2	6.1828	388.861	388.861	0.	518.7	506.1	2116.00	1941.61	0.3527	0.	18.412	84.22	0.0719	2
3	6.3778	394.172	394.172	0.	518.7	505.8	2116.00	1936.96	0.3577	0.	16.431	63.11	0.0718	3
4	6.5812	399.523	399.523	0.	518.7	505.4	2116.00	1932.22	0.3627	0.	14.452	52.40	0.0717	4
5	6.7918	404.812	404.812	0.	518.7	505.1	2116.00	1927.49	0.3676	0.	12.489	46.27	0.0716	5
6	7.0084	409.934	409.934	0.	518.7	504.7	2116.00	1922.85	0.3724	0.	10.555	42.59	0.0715	6
7	7.2302	414.805	414.805	0.	518.7	504.4	2116.00	1918.39	0.3769	0.	8.659	40.41	0.0713	7
8	7.4557	419.335	419.335	0.	518.7	504.1	2116.00	1914.21	0.3811	0.	6.815	39.24	0.0712	8
9	7.6843	423.471	423.471	0.	518.7	503.8	2116.00	1910.35	0.3850	0.	5.028	38.78	0.0711	9
10	7.9157	427.176	427.176	0.	518.7	503.5	2116.00	1906.87	0.3885	0.	3.303	38.88	0.0710	10
11	8.1487	430.416	430.416	0.	518.7	503.3	2116.00	1903.81	0.3915	0.	1.652	39.42	0.0709	11
12	8.3829	433.192	433.192	0.	518.7	503.1	2116.00	1901.17	0.3941	0.	0.079	40.30	0.0709	12
13	8.6179	435.518	435.518	0.	518.7	502.9	2116.00	1898.94	0.3963	0.	-1.411	41.43	0.0708	13
14	8.8534	437.428	437.428	0.	518.7	502.8	2116.00	1897.11	0.3981	0.	-2.814	42.70	0.0708	14
15	9.0882	438.966	438.966	0.	518.7	502.7	2116.00	1895.63	0.3995	0.	-4.120	43.99	0.0707	15

STATION 5

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	VELOCITY TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
1	6.7586	588.440	588.440	0.	518.7	489.9	2116.00	1732.14	0.5425	0.	21.305	123.83	0.0663	1
2	6.8764	593.086	593.086	0.	518.7	489.4	2116.00	1726.49	0.5471	0.	19.580	134.09	0.0662	2
3	7.0035	597.534	597.534	0.	518.7	489.0	2116.00	1721.05	0.5514	0.	17.749	160.04	0.0660	3
4	7.1387	601.605	601.605	0.	518.7	488.6	2116.00	1716.05	0.5554	0.	15.838	226.93	0.0659	4
5	7.2813	605.155	605.155	0.	518.7	488.2	2116.00	1711.67	0.5589	0.	13.863	526.23	0.0658	5
6	7.4305	608.050	608.050	0.	518.7	487.9	2116.00	1708.08	0.5617	0.	11.841	-773.81	0.0657	6
7	7.5860	610.170	610.170	0.	518.7	487.7	2116.00	1705.45	0.5638	0.	9.786	-192.55	0.0656	7
8	7.7467	611.397	611.397	0.	518.7	487.6	2116.00	1703.92	0.5650	0.	7.715	-102.05	0.0655	8
9	7.9124	611.626	611.626	0.	518.7	487.6	2116.00	1703.64	0.5653	0.	5.639	-66.19	0.0655	9
10	8.0828	610.761	610.761	0.	518.7	487.7	2116.00	1704.71	0.5644	0.	3.566	-47.37	0.0656	10
11	8.2571	608.720	608.720	0.	518.7	487.9	2116.00	1707.25	0.5624	0.	1.514	-36.00	0.0656	11
12	8.4353	605.434	605.434	0.	518.7	488.2	2116.00	1711.32	0.5592	0.	-0.510	-28.51	0.0657	12
13	8.6169	600.860	600.860	0.	518.7	488.7	2116.00	1716.97	0.5547	0.	-2.492	-23.31	0.0659	13
14	8.8021	595.015	595.015	0.	518.7	489.2	2116.00	1724.13	0.5490	0.	-4.405	-19.64	0.0661	14
15	8.9900	588.146	588.146	0.	518.7	489.9	2116.00	1732.50	0.5423	0.	-6.172	-17.24	0.0663	15

STATION 6

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	VELOCITY TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
1	7.5585	1254.090	815.276	952.926	731.8	600.9	6774.75	3397.94	1.0440	49.452	10.651	-4.97	0.1060	1
2	7.6056	1240.627	802.793	945.874	731.6	603.5	6736.98	3433.44	1.0306	49.678	9.511	-5.29	0.1067	2
3	7.6581	1227.669	789.806	939.882	731.7	606.3	6706.36	3471.31	1.0175	49.959	8.456	-5.78	0.1074	3
4	7.7159	1216.046	776.885	935.532	732.3	609.2	6686.57	3510.64	1.0054	50.293	7.458	-6.50	0.1081	4
5	7.7790	1206.475	764.539	933.307	733.5	612.4	6680.68	3550.75	0.9949	50.677	6.488	-7.54	0.1087	5
6	7.8471	1199.658	753.272	933.681	735.5	615.7	6691.80	3591.06	0.9866	51.104	5.497	-9.05	0.1094	6
7	7.9201	1195.770	743.225	936.740	738.2	619.2	6720.01	3631.20	0.9806	51.571	4.471	-11.36	0.1100	7
8	7.9975	1194.429	734.170	942.155	741.7	622.9	6761.92	3670.73	0.9766	52.073	3.405	-15.25	0.1105	8
9	8.0792	1195.067	725.667	949.522	745.7	626.8	6813.41	3709.44	0.9741	52.612	2.297	-23.15	0.1110	9
10	8.1650	1197.766	717.673	958.952	750.4	631.0	6874.75	3747.21	0.9731	53.189	1.155	-47.78	0.1114	10
11	8.2543	1202.793	710.239	970.707	755.8	635.4	6947.41	3783.83	0.9738	53.808	-0.013	885.38	0.1117	11
12	8.3472	1210.293	702.176	985.778	762.2	640.3	7031.41	3819.40	0.9761	54.538	-1.205	43.65	0.1119	12
13	8.4438	1220.458	690.525	1006.326	770.1	646.2	7125.82	3854.30	0.9798	55.543	-2.431	22.77	0.1119	13
14	8.5452	1234.313	666.975	1038.591	781.3	654.5	7231.15	3889.71	0.9846	57.292	-3.824	16.37	0.1115	14
15	8.6556	1256.741	609.553	1099.019	800.3	668.8	7364.29	3927.67	0.9917	60.986	-5.856	15.73	0.1101	15

STATION 6 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20371.4 RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN. INLET	RELATIVE GAS ANGLES OUTLET	RELATIVE VELOCITIES INLET	RELATIVE VELOCITIES OUTLET	RELATIVE MACH NO.S INLET	RELATIVE MACH NO.S OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUSION FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	BLADE SPEEDS OUTLET	STREAM -LINE
1	-63.907	-25.612	1337.858	904.110	1.2335	0.7526	0.0794	0.676	0.4757	0.6270	1201.5	1343.7	1
2	-64.119	-26.841	1358.713	899.724	1.2533	0.7474	0.0549	0.662	0.4887	0.6174	1222.4	1352.1	2
3	-64.362	-28.092	1380.999	895.273	1.2745	0.7420	0.0911	0.648	0.5022	0.6067	1245.0	1361.4	3
4	-64.637	-29.313	1404.444	890.965	1.2966	0.7366	0.0980	0.634	0.5161	0.5949	1269.1	1371.7	4
5	-64.944	-30.460	1428.892	886.956	1.3197	0.7314	0.1058	0.621	0.5301	0.5821	1294.4	1382.9	5
6	-65.283	-31.487	1454.182	883.335	1.3434	0.7265	0.1142	0.607	0.5440	0.5681	1321.0	1395.0	6
7	-65.656	-32.380	1480.210	880.056	1.3678	0.7217	0.1234	0.595	0.5580	0.5531	1348.6	1408.0	7
8	-66.061	-33.157	1506.785	876.962	1.3925	0.7170	0.1335	0.582	0.5717	0.5372	1377.2	1421.8	8
9	-66.500	-33.855	1533.840	873.822	1.4176	0.7122	0.1446	0.570	0.5852	0.5206	1406.6	1436.3	9
10	-66.972	-34.466	1561.331	870.477	1.4428	0.7072	0.1567	0.558	0.5984	0.5032	1436.9	1451.5	10
11	-67.477	-34.970	1589.114	866.726	1.4682	0.7017	0.1697	0.545	0.6115	0.4854	1467.9	1467.4	11
12	-68.014	-35.357	1617.176	860.971	1.4936	0.6944	0.1848	0.532	0.6295	0.4672	1499.6	1483.9	12
13	-68.583	-35.626	1645.487	849.526	1.5191	0.6820	0.2045	0.516	0.6430	0.4488	1531.9	1501.1	13
14	-69.181	-35.775	1674.088	822.084	1.5445	0.6557	0.2357	0.491	0.6710	0.4307	1564.8	1519.1	14
15	-69.796	-35.791	1702.968	751.459	1.5701	0.5930	0.2923	0.441	0.7269	0.4132	1598.2	1536.7	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS		INLET-TO-STATION-PARAMETERS		STATION-TO-STATION-PARAMETERS		INLET-TO-STATION-PARAMETERS	
	PRESSURE RATIO	DELTA T ON T	EFFICIENCY	ISENTROPIC	PRESSURE RATIO	DELTA T ON T	EFFICIENCY	ISENTROPIC
1	3.2017	0.4109	0.9593	3.2017	0.4109	0.9593	3.2608	0.4497
2	3.1838	0.4104	0.9551	3.1838	0.4104	0.9551	0.4497	0.8928
3	3.1694	0.4106	0.9502	3.1694	0.4106	0.9502		
4	3.1600	0.4118	0.9446	3.1600	0.4118	0.9446		
5	3.1572	0.4142	0.9383	3.1572	0.4142	0.9383		
6	3.1625	0.4180	0.9314	3.1625	0.4180	0.9314		
7	3.1758	0.4232	0.9237	3.1758	0.4232	0.9237		
8	3.1956	0.4298	0.9153	3.1956	0.4298	0.9153		
9	3.2199	0.4376	0.9059	3.2199	0.4376	0.9059		
10	3.2489	0.4467	0.8956	3.2489	0.4467	0.8956		
11	3.2833	0.4571	0.8844	3.2833	0.4571	0.8844		
12	3.3230	0.4694	0.8714	3.3230	0.4694	0.8714		
13	3.3676	0.4847	0.8550	3.3676	0.4847	0.8550		
14	3.4174	0.5063	0.8303	3.4174	0.5063	0.8303		
15	3.4803	0.5428	0.7861	3.4803	0.5428	0.7861		

STATION 7

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		COORDINATES		TEMPERATURES	PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCATION
		ABSOLUTE	RELATIVE	LONGITUDE	LATITUDE		TOTAL	STATIC						
1	7.6272	1305.073	900.757	944.379	731.8	590.1	6774.75	3187.81	1.0964	46.354	6.450	-12.76	0.1013	1
2	7.6698	1291.121	887.223	937.991	731.6	592.8	6736.98	3226.17	1.0821	46.593	5.280	-16.75	0.1021	2
3	7.7173	1277.926	873.589	932.704	731.7	595.8	6706.36	3265.74	1.0684	46.875	4.313	-23.42	0.1028	3
4	7.7697	1266.265	860.355	929.094	732.3	598.9	6686.57	3305.77	1.0559	47.200	3.538	-36.55	0.1035	4
5	7.8268	1257.843	849.498	927.643	733.5	601.9	6680.68	3341.47	1.0463	47.518	2.593	-67.36	0.1041	5
6	7.8884	1252.985	840.983	928.826	735.5	604.8	6691.80	3373.68	1.0397	47.842	2.592	-212.69	0.1046	6
7	7.9544	1251.097	833.813	932.738	738.2	608.0	6720.01	3405.10	1.0354	48.205	2.228	220.88	0.1050	7
8	8.0242	1252.492	828.802	939.054	741.7	611.1	6761.92	3432.51	1.0339	48.569	1.898	84.89	0.1053	8
9	8.0977	1256.191	824.910	947.385	745.7	614.4	6813.41	3457.44	1.0342	48.953	1.550	59.93	0.1055	9
10	8.1747	1261.527	820.962	957.848	750.4	617.9	6874.75	3482.79	1.0356	49.401	1.151	48.10	0.1057	10
11	8.2547	1268.597	816.745	970.704	755.8	621.9	6947.41	3509.02	1.0381	49.923	0.667	42.64	0.1058	11
12	8.3376	1277.266	810.757	986.956	762.2	626.4	7031.41	3537.51	1.0414	50.598	0.079	38.95	0.1059	12
13	8.4236	1286.789	798.866	1008.781	770.1	632.3	7125.82	3572.82	1.0449	51.624	-0.673	35.26	0.1060	13
14	8.5138	1296.718	771.192	1042.468	781.3	641.4	7231.15	3622.99	1.0449	53.507	-1.905	27.83	0.1059	14
15	8.6113	1312.300	708.612	1104.536	800.3	656.9	7364.29	3689.23	1.0449	57.318	-4.092	18.09	0.1053	15

STATION 8

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		COORDINATES		TEMPERATURES	PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCATION
		ABSOLUTE	RELATIVE	LONGITUDE	LATITUDE		TOTAL	STATIC						
1	7.6819	589.206	589.071	589.206	731.8	702.9	5939.65	5158.22	0.4535	0.	0.291	-56.22	0.1376	1
2	7.7290	589.071	590.003	590.003	731.6	702.7	5941.37	5159.79	0.4535	0.	0.367	-50.38	0.1377	2
3	7.7813	590.003	592.250	592.250	731.7	702.7	5946.07	5161.63	0.4542	0.	0.451	-44.72	0.1378	3
4	7.8382	592.250	597.791	597.791	732.3	703.1	5954.35	5163.76	0.4558	0.	0.544	-39.42	0.1377	4
5	7.8994	597.791	609.724	609.724	733.5	703.8	5972.10	5166.29	0.4598	0.	0.632	-35.23	0.1377	5
6	7.9641	609.724	627.904	627.904	735.5	704.6	6008.95	5169.36	0.4688	0.	0.703	-32.36	0.1376	6
7	8.0314	627.904	649.433	649.433	738.2	705.4	6065.82	5173.00	0.4824	0.	0.760	-30.18	0.1375	7
8	8.1003	649.433	672.543	672.543	741.7	706.6	6135.22	5177.16	0.4986	0.	0.779	-29.31	0.1374	8
9	8.1702	672.543	697.307	697.307	745.7	708.1	6212.23	5181.62	0.5158	0.	0.740	-30.39	0.1372	9
10	8.2408	697.307	724.558	724.558	750.4	709.9	6297.35	5186.15	0.5341	0.	0.669	-32.81	0.1370	10
11	8.3115	724.558	754.837	754.837	755.8	712.1	6393.97	5190.47	0.5541	0.	0.544	-38.63	0.1367	11
12	8.3818	754.837	786.153	786.153	762.2	714.8	6504.49	5194.21	0.5762	0.	0.383	-50.54	0.1363	12
13	8.4515	786.153	817.354	817.354	770.1	718.7	6620.16	5196.84	0.5984	0.	0.190	-81.38	0.1356	13
14	8.5206	817.354	855.125	855.125	781.3	725.7	6731.24	5197.84	0.6192	0.	-0.027	-267.77	0.1343	14
15	8.5891	855.125			800.3	739.4	6856.59	5197.76	0.6418	0.	-0.248	192.29	0.1318	15

STREAM -LINE	RELATIVE GAS ANGLES		RELATIVE VELOCITIES		RELATIVE MACH NO.'S		LOSS		DE HALL		DIFFUS		DELTA P		BLADE SPEEDS		STREAM -LINE
	OPT-IN.	OUTLET	INLET	OUTLET	INLET	OUTLET	COEFF	NUMBER	FACTOR	UPON Q	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET	
1	46.354	0.	1305.073	589.206	1.0964	0.4535	0.2328	0.451	0.6986	0.5493	0.	0.	0.	0.	0.	0.	1
2	46.593	0.	1291.121	589.071	1.0821	0.4535	0.2266	0.456	0.7037	0.5507	0.	0.	0.	0.	0.	0.	2
3	46.875	0.	1277.926	590.003	1.0684	0.4542	0.2210	0.462	0.7101	0.5510	0.	0.	0.	0.	0.	0.	3
4	47.200	0.	1266.265	592.250	1.0559	0.4558	0.2166	0.468	0.7168	0.5495	0.	0.	0.	0.	0.	0.	4
5	47.518	0.	1257.843	597.791	1.0463	0.4598	0.2122	0.475	0.7206	0.5464	0.	0.	0.	0.	0.	0.	5
6	47.842	-0.	1252.985	609.724	1.0397	0.4688	0.2058	0.487	0.7182	0.5411	0.	0.	0.	0.	0.	0.	6
7	48.205	-0.	1251.097	627.904	1.0354	0.4824	0.1973	0.502	0.7092	0.5333	0.	0.	0.	0.	0.	0.	7
8	48.569	0.	1252.492	649.433	1.0339	0.4986	0.1882	0.519	0.6960	0.5240	0.	0.	0.	0.	0.	0.	8
9	48.953	0.	1256.191	672.543	1.0342	0.5158	0.1791	0.535	0.6808	0.5137	0.	0.	0.	0.	0.	0.	9
10	49.401	-0.	1261.527	697.307	1.0356	0.5341	0.1702	0.553	0.6638	0.5021	0.	0.	0.	0.	0.	0.	10
11	49.923	-0.	1268.597	724.558	1.0381	0.5541	0.1610	0.571	0.6437	0.4890	0.	0.	0.	0.	0.	0.	11
12	50.598	0.	1277.266	754.837	1.0414	0.5762	0.1508	0.591	0.6196	0.4741	0.	0.	0.	0.	0.	0.	12
13	51.624	0.	1286.789	786.153	1.0443	0.5984	0.1423	0.611	0.5932	0.4570	0.	0.	0.	0.	0.	0.	13
14	53.507	-0.	1296.718	817.354	1.0449	0.6192	0.1385	0.630	0.5676	0.4364	0.	0.	0.	0.	0.	0.	14
15	57.318	-0.	1312.300	855.125	1.0449	0.6418	0.1382	0.652	0.5438	0.4106	0.	0.	0.	0.	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS		INLET-TO-STATION-PARAMETERS		MEAN PARAMETERS		STATION-TO-STATION		INLET-TO-STATION		
	PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	DELTA T ON T	DELTA T ON T	EFFICIENCY	PRESSURE RATIO	DELTA T ON T	DELTA T ON T	ISEN. EFFICY.	
1	0.8767	0.	0.	0.4109	0.4109	0.8342	2.8070	0.4109	0.8342	0.9108	2.9714
2	0.8819	0.	0.	0.4104	0.4104	0.8355	2.8078	0.4104	0.8355	0.	0.4497
3	0.8866	0.	0.	0.4106	0.4106	0.8358	2.8101	0.4106	0.8358	0.	0.8112
4	0.8905	0.	0.	0.4118	0.4118	0.8347	2.8140	0.4118	0.8347	0.	
5	0.8939	0.	0.	0.4142	0.4142	0.8327	2.8224	0.4142	0.8327	0.	
6	0.8980	0.	0.	0.4180	0.4180	0.8308	2.8398	0.4180	0.8308	0.	
7	0.9027	0.	0.	0.4232	0.4232	0.8290	2.8666	0.4232	0.8290	0.	
8	0.9073	0.	0.	0.4298	0.4298	0.8265	2.8994	0.4298	0.8265	0.	
9	0.9118	0.	0.	0.4376	0.4376	0.8228	2.9358	0.4376	0.8228	0.	
10	0.9160	0.	0.	0.4467	0.4467	0.8180	2.9761	0.4467	0.8180	0.	
11	0.9203	0.	0.	0.4571	0.4571	0.8124	3.0217	0.4571	0.8124	0.	
12	0.9251	0.	0.	0.4694	0.4694	0.8054	3.0740	0.4694	0.8054	0.	
13	0.9290	0.	0.	0.4847	0.4847	0.7943	3.1286	0.4847	0.7943	0.	
14	0.9309	0.	0.	0.5063	0.5063	0.7735	3.1811	0.5063	0.7735	0.	
15	0.9311	0.	0.	0.5428	0.5428	0.7350	3.2404	0.5428	0.7350	0.	

STATION 9

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	VELOCITY TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	TEMPERATURES TOTAL	TEMPERATURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURV. RE.	STATIC DENSITY	LOCATION
1	7.6805	582.757	582.757	0.	731.8	703.6	5939.65	5174.39	0.4483	0.	-0.079	955.52	0.1379	1
2	7.7280	583.277	583.277	0.	731.6	703.3	5941.37	5174.33	0.4488	0.	-0.057	1397.49	0.1380	2
3	7.7806	584.970	584.970	0.	731.7	703.2	5946.07	5174.29	0.4502	0.	-0.032	2491.50	0.1380	3
4	7.8379	588.089	588.089	0.	732.3	703.5	5954.35	5174.26	0.4525	0.	-0.016	9860.53	0.1379	4
5	7.8994	594.664	594.664	0.	733.5	704.1	5972.10	5174.26	0.4573	0.	-0.000	-6050.95	0.1378	5
6	7.9643	607.825	607.825	0.	735.5	704.7	6008.95	5174.29	0.4672	0.	0.010	-2743.09	0.1377	6
7	8.0317	627.405	627.405	0.	738.2	705.5	6065.82	5174.32	0.4820	0.	0.014	-2029.94	0.1376	7
8	8.1006	650.426	650.426	0.	741.7	706.4	6135.22	5174.38	0.4994	0.	0.012	-1893.17	0.1374	8
9	8.1703	675.034	675.034	0.	745.7	707.8	6212.23	5174.45	0.5178	0.	0.002	-2057.60	0.1371	9
10	8.2407	701.215	701.215	0.	750.4	709.5	6297.35	5174.51	0.5372	0.	-0.015	-2827.70	0.1368	10
11	8.3111	729.710	729.710	0.	755.8	711.5	6393.97	5174.55	0.5583	0.	-0.033	5131.50	0.1364	11
12	8.3810	760.956	760.956	0.	762.2	714.0	6504.49	5174.57	0.5812	0.	-0.055	61018.54	0.1359	12
13	8.4504	792.860	792.860	0.	770.1	717.8	6620.16	5174.53	0.6039	0.	-0.078	4136.75	0.1352	13
14	8.5192	824.170	824.170	0.	781.3	724.3	6731.24	5174.49	0.6247	0.	-0.098	2289.22	0.1339	14
15	8.5873	861.736	861.736	0.	800.3	738.5	6856.59	5174.52	0.6471	0.	-0.116	1617.34	0.1314	15

STATION 10

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	VELOCITY TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	TEMPERATURES TOTAL	TEMPERATURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURV. RE.	STATIC DENSITY	LOCATION
1	7.6811	587.340	587.340	0.	731.8	703.1	5939.65	5162.91	0.4520	0.	0.022	0.	0.1377	1
2	7.7283	587.830	587.830	0.	731.6	702.8	5941.37	5162.91	0.4525	0.	0.011	0.	0.1378	2
3	7.7806	589.493	589.493	0.	731.7	702.8	5946.07	5162.91	0.4538	0.	-0.002	0.	0.1378	3
4	7.8375	592.582	592.582	0.	732.3	703.1	5954.35	5162.91	0.4561	0.	-0.015	0.	0.1377	4
5	7.8987	599.112	599.112	0.	733.5	703.7	5972.10	5162.90	0.4609	0.	-0.029	0.	0.1376	5
6	7.9632	612.192	612.192	0.	735.5	704.3	6008.95	5162.90	0.4707	0.	-0.042	0.	0.1375	6
7	8.0303	631.657	631.657	0.	738.2	705.0	6065.82	5162.89	0.4855	0.	-0.056	0.	0.1373	7
8	8.0988	654.557	654.557	0.	741.7	706.0	6135.22	5162.89	0.5027	0.	-0.068	0.	0.1372	8
9	8.1683	679.047	679.047	0.	745.7	707.3	6212.23	5162.89	0.5210	0.	-0.080	0.	0.1369	9
10	8.2384	705.109	705.109	0.	750.4	709.0	6297.35	5162.88	0.5404	0.	-0.090	0.	0.1366	10
11	8.3085	733.480	733.480	0.	755.8	711.0	6393.97	5162.87	0.5613	0.	-0.099	0.	0.1362	11
12	8.3782	764.593	764.593	0.	762.2	713.5	6504.49	5162.86	0.5841	0.	-0.107	0.	0.1357	12
13	8.4474	796.363	796.363	0.	770.1	717.3	6620.16	5162.85	0.6068	0.	-0.114	0.	0.1350	13
14	8.5160	827.555	827.555	0.	781.3	724.3	6731.24	5162.87	0.6275	0.	-0.120	0.	0.1337	14
15	8.5840	865.003	865.003	0.	800.3	738.0	6856.59	5163.02	0.6498	0.	-0.125	0.	0.1312	15

STREAM -LINE	STATION-TO-STATION-PARAMETERS				OVERALL PERFORMANCE PARAMETERS				MEAN PARAMETERS			
	STATION-TO- PRESSURE RATIO	STATION- DELTA T ON T	STATION- ISENTROPIC EFFICIENCY	INLET-TO- PRESSURE RATIO	INLET-TO- DELTA T ON T	STATION- ISENTROPIC EFFICIENCY	STATION-TO- PRESSURE RATIO	STATION-TO- DELTA T ON T	STATION-TO- ISENTROPIC EFFICIENCY	STATION-TO-STATION PRESSURE RATIO	STATION-TO-STATION DELTA T ON T	INLET-TO-STATION ISENTROPIC EFFICY.
1	1.0000	0.	0.	2.8070	0.4109	0.8342	2.8070	0.4109	0.8342	1.0000	0.	2.9714
2	1.0000	0.	0.	2.8078	0.4104	0.8355	2.8078	0.4104	0.8355	1.0000	0.	0.4497
3	1.0000	0.	0.	2.8101	0.4106	0.8358	2.8101	0.4106	0.8358	1.0000	0.	0.8112
4	1.0000	0.	0.	2.8140	0.4118	0.8347	2.8140	0.4118	0.8347	1.0000	0.	
5	1.0000	0.	0.	2.8224	0.4142	0.8327	2.8224	0.4142	0.8327	1.0000	0.	
6	1.0000	0.	0.	2.8398	0.4180	0.8308	2.8398	0.4180	0.8308	1.0000	0.	
7	1.0000	0.	0.	2.8666	0.4232	0.8290	2.8666	0.4232	0.8290	1.0000	0.	
8	1.0000	0.	0.	2.8994	0.4298	0.8265	2.8994	0.4298	0.8265	1.0000	0.	
9	1.0000	0.	0.	2.9358	0.4376	0.8228	2.9358	0.4376	0.8228	1.0000	0.	
10	1.0000	0.	0.	2.9761	0.4467	0.8180	2.9761	0.4467	0.8180	1.0000	0.	
11	1.0000	0.	0.	3.0217	0.4571	0.8124	3.0217	0.4571	0.8124	1.0000	0.	
12	1.0000	0.	0.	3.0740	0.4694	0.8054	3.0740	0.4694	0.8054	1.0000	0.	
13	1.0000	0.	0.	3.1286	0.4847	0.7943	3.1286	0.4847	0.7943	1.0000	0.	
14	1.0000	0.	0.	3.1811	0.5063	0.7735	3.1811	0.5063	0.7735	1.0000	0.	
15	1.0000	0.	0.	3.2404	0.5428	0.7350	3.2404	0.5428	0.7350	1.0000	0.	

2. INTRA-BLADE FLOW ANALYSIS

The objective of the intra-blade flow analysis was to determine details of blade and annulus geometries that were consistent with the results obtained from the iterative loss re-estimation procedure, and would also satisfy the design criteria stated earlier. The approach that was followed consisted of analyzing conditions within the compressor for possible detailed blade and annulus geometries, and then modifying the assumed geometries until the desired results were achieved. A somewhat lengthy trial-and-error process is implied and was indeed necessary.

The input data to the computer program consisted of the annulus geometry, the performance of the blading, the flow-rate, and the rotational speed of the machine. The annulus geometry is, of course, specified by giving the radius of the hub and of the casing at each computing station. Hence this was adjusted by changing these radii within the blade-rows, the values elsewhere being those established by the results of the previous design phase. The flow boundaries used were the inner limits of the boundary layer displacement thicknesses, previously established. A linear variation in displacement thickness with length was assumed within the blade rows. The annulus geometry finally derived and the computing stations used for the calculations are shown in Fig 14. The performance of the blading is specified by giving, at each computing station within or immediately following a blade row, the radial variations of the relative flow angle, the ratio of actual to ideal relative total pressure, and the blockage due to the blades. The relative flow angle was obtained from the local camberline direction, the assumed deviation angle at the trailing edge, and the assumed variation of deviation angle within the blade. These items were all discussed in Section II. The ratio of actual to ideal relative total pressure was obtained from the results of the iterative loss re-estimation procedure and Eq's (6) and (7). The blockage due to blades is the ratio of blocked to total circumference.

The computer output obtained for the analysis of the configuration that was finally selected is shown on the following pages. Compatibility between the intra-blade calculations and the inter-blade calculations performed with the iterative loss re-estimation procedure is shown by plots of the meridional velocity profile at the rotor leading and trailing edges (Fig 15), and the stator leading and trailing edges (Fig 16). Results from both calculations are displayed, and it is seen that differences are quite small, except at the stator leading edge. At this computing station in particular, the streamline characteristics are computed to be significantly different in the two cases. This is due to details of the annulus wall contours which are not apparent to the inter-blade calculations.

The static pressure distribution through the stage (which was considered to be a key criterion) is shown in Fig 17. The established design criteria regarding the static pressure rise through the blade rows is reasonably well satisfied. The resulting incidence and deviation angle variations for the rotor and stator are shown in Figs 18 and 19.

APF AXIAL COMPRESSOR PROGRAM RMH3

JCH TITLE = PHASE 2, FINAL INTRA-BLADE FLOW ANALYSIS

NUMBER OF STATIONS = 17
NUMBER OF STREAMLINES = 15
NUMBER OF BLADING DATA RADII = 15
NUMBER OF INLET CONDITION DATA RADII = 1
IFSTMP = 12 -S.P.R. -NE,2 -L.S.G. STREAMLINES,NPOINT = IFSIMP*2)
MAXIMUM NUMBER OF PASSES PER CYCLE = 30
IFBL = 1 (1 -BLOCKAGE HELD AT DATA VALUES 2 -ANNULUS WALL B.L. CALCULATED)
ITER = 2 (1 -PRINT ALL VELOCITIES DURING ITERATIONS 2 -NORMAL OPTION)
RPLST = 31 (FIRST PASS DURING WHICH CASCADE ANALYSIS IS PRINTED)
INCPO = 1 (INCREMENT FOR ABOVE)
NWRIT = 31 (FIRST PASS DURING WHICH VELOCITY TRIANGLE DATA IS PRINTED)
INCRI = 1 (INCREMENT FOR ABOVE)
IFTYPE = 1 (0 -ALL STATIONS UPRIGHT,ALL SOLUTIONS SUBSONIC 1 -STATION LEAN ANGLES AND SOLUTION TYPES SPECIFIED)
CONTINUITY TOLERANCE = 0.0002
FRACTION OF INLET BLOCKAGE UN HUB = 0.5000
GAS CONSTANT = 53.3200
SPECIFIC HEAT = 0.24000
FIRST VISCOSITY COEFFICIENT = -0.
SECOND VISCOSITY COEFFICIENT = -0.

STATION-TO-STATION CHANGES ARE PRESCRIBED THUS

- STATION 2 FOLLOWS A BLADE FREE SPACE
- STATION 3 FOLLOWS A BLADE FREE SPACE
- STATION 4 FOLLOWS A BLADE FREE SPACE
- STATION 5 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 20371.4 RPM

IBETA2 = 1 IFTHC = 0 IFCAK = 0 IFMACH = 0 IFREYN = 0 ILOSS = 4 IFMLOS = 0 IFLVSI = 0 IFPROF = 0 IFREYL = 0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
6.9066	-60.902	0.9918	0.12839
7.0522	-61.119	0.9907	0.11789
7.1970	-61.318	0.9895	0.10982
7.3403	-61.520	0.9881	0.10356
7.4841	-61.745	0.9867	0.09844
7.6270	-61.956	0.9851	0.09409
7.7698	-62.276	0.9833	0.09042
7.9125	-62.570	0.9814	0.08704
8.0554	-62.871	0.9793	0.08432
8.1987	-63.150	0.9770	0.08151
8.3420	-63.411	0.9745	0.07919
8.4858	-63.573	0.9714	0.07719
8.6302	-63.948	0.9676	0.07551
8.7760	-64.245	0.9618	0.07407
8.9231	-64.552	0.9527	0.07276

IANCHR(1) = 1

- STATION 6 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 20371.4 RPM

IBETA2 = 1 IFTHC = 0 IFCAK = 0 IFMACH = 0 IFREYN = 0 ILOSS = 4 IFMLOS = 0 IFLVSI = 0 IFPROF = 0 IFREYL = 0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.0871	-56.024	0.9836	0.16214
7.2273	-56.299	0.9813	0.15174
7.3542	-56.577	0.9788	0.14374
7.4832	-56.869	0.9761	0.13725
7.6102	-57.183	0.9731	0.13179
7.7358	-57.520	0.9699	0.12692
7.8607	-57.879	0.9664	0.12274
7.9847	-58.246	0.9626	0.11874
8.1084	-58.615	0.9584	0.11562
8.2321	-58.955	0.9538	0.11218
8.3557	-59.280	0.9487	0.10921
8.4794	-59.592	0.9427	0.10664
8.6037	-59.913	0.9351	0.10437
8.7291	-60.253	0.9235	0.10229
8.8562	-60.598	0.9054	0.10018

IANCHR(1) = 2

STATION 7 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 20371.4 RPM

IBETA2 =1 IFTHIC =0 IFCAX =0 IFMACH =0 IFREYN =0 ILOSS =4 IFMLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.3207	-47.320	0.9754	0.14329
7.4232	-47.605	0.9721	0.13493
7.5247	-47.986	0.9683	0.12863
7.6258	-48.423	0.9643	0.12357
7.7269	-48.892	0.9599	0.11929
7.8284	-49.380	0.9551	0.11541
7.9308	-49.875	0.9498	0.11200
8.0339	-50.367	0.9441	0.10866
8.1379	-50.844	0.9378	0.10606
8.2430	-51.296	0.9309	0.10312
8.3491	-51.722	0.9234	0.10059
8.4563	-52.123	0.9144	0.09836
8.5649	-52.520	0.9028	0.09635
8.6757	-52.924	0.8855	0.09444
8.7894	-53.329	0.8581	0.09243

IANC-R(I) = 3

STATION 8 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 20371.4 RPM

IBETA2 =1 IFTHIC =0 IFCAX =0 IFMACH =0 IFREYN =0 ILOSS =4 IFMLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.4879	-34.727	0.9673	0.10416
7.5628	-35.119	0.9628	0.09719
7.6354	-35.737	0.9579	0.09221
7.7179	-36.460	0.9525	0.08835
7.7984	-37.209	0.9467	0.08515
7.8810	-37.944	0.9404	0.08221
7.9659	-38.634	0.9334	0.07982
8.0526	-39.285	0.9257	0.07740
8.1413	-39.890	0.9173	0.07546
8.2321	-40.466	0.9081	0.07336
8.3247	-41.003	0.8981	0.07161
8.4193	-41.478	0.8860	0.07005
8.5163	-41.911	0.8706	0.06865
8.6166	-42.310	0.8474	0.06733
8.7225	-42.681	0.8109	0.06597

IANC-R(I) = 4

STATION 9 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 20371.4 RPM

IBETA2 =1 IFTHIC =0 IFCAX =0 IFMACH =0 IFREYN =0 ILOSS =4 IFMLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL	BLOCKAGE
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	ANGLE	RELATIVE PTOTAL	FRACTION
7.5585	-25.612	0.9591	0.03379
7.6209	-26.841	0.9535	0.03202
7.6860	-28.092	0.9475	0.03067
7.7535	-29.314	0.9407	0.02957
7.8236	-30.461	0.9334	0.02860
7.8962	-31.488	0.9254	0.02773
7.9712	-32.380	0.9167	0.02691
8.0483	-33.158	0.9072	0.02606
8.1276	-33.856	0.8966	0.02542
8.2092	-34.467	0.8852	0.02468
8.2926	-34.971	0.8725	0.02403
8.3782	-35.358	0.8575	0.02344
8.4661	-35.627	0.8383	0.02288
8.5576	-35.775	0.8094	0.02231
8.6556	-35.791	0.7636	0.02166

IANCHR(I) = 5

STATION 10 FOLLOWS A BLADE FREE SPACE

IEND(I) = 6

RADIUS	Z
7.6000	2.2250
7.8000	2.3350
8.0000	2.3950
8.2000	2.4080
8.4000	2.3500
8.6000	2.2250

STATION 11 FOLLOWS A BLADE FREE SPACE

IEND(I) = 15

RADIUS	Z
7.6272	2.5129
7.6865	2.5117
7.7472	2.6998
7.8093	2.7762
7.8730	2.8402
7.9381	2.8904
8.0049	2.9262
8.0730	2.9460
8.1427	2.9491
8.2142	2.9340
8.2873	2.8995
8.3624	2.8442
8.4401	2.7656
8.5220	2.5591
8.6114	2.5153

STATION 12 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. RPM

IBETA2 = 1 IFTHC = 0 IFCAX = 0 IFMACH = 0 IFREYN = 0 ILOSS = 4 IFMLOS = 0 IFLVSI = 0 IFPROF = 0 IFRREV = 0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.7326	30.849	0.9592	0.09244
7.7823	30.794	0.9708	0.09750
7.8326	30.743	0.9721	0.08307
7.8865	30.733	0.9730	0.07925
7.9410	30.752	0.9740	0.07602
7.9972	30.773	0.9750	0.07338
8.0550	30.818	0.9762	0.07138
8.1141	30.890	0.9773	0.07007
8.1746	30.990	0.9783	0.06947
8.2365	31.132	0.9793	0.06964
8.2994	31.323	0.9803	0.07064
8.3635	31.625	0.9814	0.07251
8.4287	32.124	0.9823	0.07580
8.4953	33.155	0.9827	0.08106
8.5638	34.175	0.9828	0.09811

IANCHR(I) = 1

IREND(I) = 15

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.7326	3.0659		
7.7823	3.1401		
7.8326	3.2061		
7.8865	3.2634		
7.9410	3.3114		
7.9972	3.3491		
8.0550	3.3759		
8.1141	3.3908		
8.1746	3.3931		
8.2365	3.3818		
8.2994	3.3580		
8.3635	3.3144		
8.4287	3.2554		
8.4953	3.1756		
8.5638	3.0678		

STATION 13 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. RPM

IBETA2 = 1 IFTHC = 0 IFCAX = 0 IFMACH = 0 IFREYN = 0 ILOSS = 4 IFMLOS = 0 IFLVSI = 0 IFPROF = 0 IFRREV = 0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.7447	17.995	0.9383	0.09800
7.7942	17.903	0.9416	0.09282
7.8456	17.814	0.9442	0.09819
7.8988	17.751	0.9460	0.08413
7.9538	17.708	0.9479	0.08068
8.0104	17.671	0.9501	0.07787
8.0686	17.656	0.9524	0.07572
8.1279	17.667	0.9545	0.07429

8.1985	17.704	0.9566	0.07360
8.2501	17.776	0.9586	0.07370
9.3126	17.899	0.9606	0.07463
8.3758	18.071	0.9628	0.07647
3.4397	18.368	0.9646	0.07935
8.5045	18.944	0.9655	0.08361
8.5702	19.528	0.9656	0.08947

IANCHR(I) = 2

IBEND(I) = 15

RADIUS	Z
7.7447	3.6199
7.7942	3.5684
7.8456	3.7124
7.8988	3.7506
7.9538	3.7825
3.0104	3.8077
3.0686	3.8255
8.1279	3.8355
8.1985	3.8370
9.2501	3.8295
3.3126	3.8123
8.3758	3.7845
8.4397	3.7453
8.5045	3.5921
8.5702	3.6202

STATION 14 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING, AND ROTATING AT 0. RPM

IBETA2 = 1 IFTHIC = 0 IFCAH = 0 IFMACH = 0 IFREYN = 0 ILOSS = 0 IFMLOS = 4 IFMOSI = 0 IFREVL = 0 IFPROF = 0 IFREVL = 0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE FLOW	BLOCKAGE FRACTION
7.7057	6.449	0.9075	0.06947
7.7619	6.333	0.9124	0.06595
7.8195	6.220	0.9162	0.06280
7.8787	6.118	0.9191	0.06003
7.9392	6.029	0.9219	0.05767
8.0008	5.952	0.9251	0.05573
8.0633	5.894	0.9286	0.05425
8.1264	5.858	0.9318	0.05323
8.1900	5.847	0.9349	0.05272
8.2542	5.866	0.9373	0.05272
8.3187	5.917	0.9410	0.05326
8.3835	6.008	0.9443	0.05437
8.4485	6.148	0.9470	0.05511
8.5140	6.379	0.9482	0.05855
8.5797	6.638	0.9484	0.06196

IANCHR(I) = 3

IBEND(I) = 15

RADIUS	Z'
7.7057	4.1720
7.7618	4.1967
7.8195	4.2197
7.8787	4.2378
7.9392	4.2538
8.0008	4.2694
8.0633	4.2753
8.1264	4.2803
8.1900	4.2810
8.2542	4.2773
8.3187	4.2637
8.3835	4.2548
8.4485	4.2351
8.5140	4.2085
8.5797	4.1725

STATION 15 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. RPM

IBETA2 =1 IFTHIC =0 IFCAH =0 IFMACH =0 IFREYN =0 ILOSS =4 IFMLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE FLOW ANGLE	ACTUAL/IDEAL RELATIVE PTOTAL	BLOCKAGE FRACTION
7.6819	0.	0.8767	0.00959
7.7431	0.	0.8833	0.00952
7.8051	-0.	0.8883	0.00946
7.8682	-0.	0.8921	0.00939
7.9323	0.	0.8958	0.00933
7.9972	-0.	0.8990	0.00926
8.0625	0.	0.9047	0.00919
8.1280	0.	0.9091	0.00912
8.1936	-0.	0.9132	0.00905
8.2595	0.	0.9171	0.00898
8.3254	0.	0.9213	0.00891
8.3912	-0.	0.9257	0.00884
8.4570	0.	0.9293	0.00877
8.5230	-0.	0.9310	0.00870
8.5891	0.	0.9312	0.00864

IANCHR(1) = 4

STATION 16 FOLLOWS A BLADE FREE SPACE

STATION 17 FOLLOWS A BLADE FREE SPACE

ANNULUS GEOMETRY SPECIFICATION AND SOLUTION TYPE INDICATORS

STATION NUMBER	AXIAL LOCATION	HUB RADIUS	CASING RADIUS	LEAN ANGLE	BLOCK -AGE	IMACHI (0--SUBSONIC 1 --SUPERSONIC)
1	-1.8000	6.0686	9.0900	0.	0.	0
2	-1.0000	5.3746	9.0900	-0.	-0.	0
3	-0.4000	6.6016	9.0500	-0.	-0.	0
4	0.	5.7536	8.9900	-0.	-0.	0
5	0.4000	6.9066	8.9231	-0.	-0.	1
6	0.8000	7.0871	8.8562	-0.	-0.	-0
7	1.2000	7.3207	8.7894	-0.	-0.	-0
8	1.6000	7.4879	8.7225	-0.	-0.	-0
9	2.0000	7.5585	8.6555	-0.	-0.	-0
10	2.2000	7.5840	8.6279	0.	0.	-0
11	2.5000	7.6272	8.6114	-0.	-0.	-0
12	3.1000	7.7326	8.5538	-0.	-0.	-0
13	3.7000	7.7467	8.5692	-0.	-0.	0
14	4.2000	7.7077	8.5797	-0.	-0.	-0
15	4.7250	7.6819	8.5891	-0.	-0.	-0
16	5.4000	7.6819	8.5891	-0.	-0.	-0
17	7.0000	7.6920	8.5890	-0.	-0.	-0

FLW = 30.00

FRACTIONS OF INLET BETWEEN HUB AND EACH STREAMLINE

0.	0.0714	0.1429	0.2143	0.2857	0.3571	0.4286	0.5000	0.5714
0.6429	0.7143	0.7857	0.8571	0.9286	1.0000			

INLET CONDITIONS

RADIUS	TOTAL TEMPERATURE	TOTAL PRESSURE	FLOW ANGLE
1.0000	518.70	2116.0	0.

OUTPUT FROM PASS 20

STATION 1

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	V E L O C I T I E S ABSOLUTE	M E R I D I A L TANGENTL.	T E M P E R A T U R E S TOTAL	P R E S S U R E S TOTAL	M A C H NUMBER	W H I R L ANGLE	S L O P E ANGLE	R A D I U S CURVATURE	S T A T I C DENSITY	LOCA TION
1	6.0585	431.080	431.080	519.7	2116.00	0.3921	0.	20.932	0.	0.0709	1
2	6.2843	431.080	431.080	519.7	2116.00	0.3921	0.	19.538	0.	0.0709	2
3	5.5004	431.080	431.080	519.7	2116.00	0.3921	0.	17.707	0.	0.0709	3
4	6.7161	431.080	431.080	519.7	2116.00	0.3921	0.	16.050	0.	0.0709	4
5	6.9318	431.080	431.080	519.7	2116.00	0.3921	0.	14.571	0.	0.0709	5
6	7.1475	431.080	431.080	519.7	2116.00	0.3921	0.	12.681	0.	0.0709	6
7	7.3535	431.080	431.080	519.7	2116.00	0.3921	0.	10.990	0.	0.0709	7
8	7.5793	431.080	431.080	519.7	2116.00	0.3921	0.	9.518	0.	0.0709	8
9	7.7950	431.080	431.080	519.7	2116.00	0.3921	0.	7.580	0.	0.0709	9
10	8.0111	431.080	431.080	519.7	2116.00	0.3921	0.	6.095	0.	0.0709	10
11	8.2263	431.080	431.080	519.7	2116.00	0.3921	0.	4.592	0.	0.0709	11
12	8.4425	431.080	431.080	519.7	2116.00	0.3921	0.	3.197	0.	0.0709	12
13	8.6582	431.080	431.080	519.7	2116.00	0.3921	0.	1.943	0.	0.0709	13
14	8.8743	431.080	431.080	519.7	2116.00	0.3921	0.	0.865	0.	0.0709	14
15	9.0900	431.080	431.080	519.7	2116.00	0.3921	0.	0.	0.	0.0709	15

STATION 2

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	V E L O C I T I E S ABSOLUTE	M E R I D I A L TANGENTL.	T E M P E R A T U R E S TOTAL	P R E S S U R E S TOTAL	M A C H NUMBER	W H I R L ANGLE	S L O P E ANGLE	R A D I U S CURVATURE	S T A T I C DENSITY	LOCA TION
1	6.3746	470.028	470.028	518.7	2116.00	0.4288	0.	20.813	-205.84	0.0599	1
2	6.5551	473.379	473.379	519.7	2116.00	0.4320	0.	19.173	-145.83	0.0598	2
3	6.7559	476.533	476.533	519.7	2116.00	0.4350	0.	17.486	-108.73	0.0597	3
4	6.9464	479.359	479.359	519.7	2116.00	0.4377	0.	15.772	-85.82	0.0596	4
5	7.1370	481.775	481.775	519.7	2116.00	0.4400	0.	14.036	-70.75	0.0595	5
6	7.3277	483.597	483.597	518.7	2116.00	0.4418	0.	12.286	-59.53	0.0595	6
7	7.5191	485.033	485.033	518.7	2116.00	0.4430	0.	10.526	-50.28	0.0595	7
8	7.7108	485.560	485.560	518.7	2116.00	0.4436	0.	8.768	-42.15	0.0595	8
9	7.9031	485.445	485.445	518.7	2116.00	0.4434	0.	7.020	-34.95	0.0595	9
10	8.0966	484.223	484.223	518.7	2116.00	0.4423	0.	5.292	-28.50	0.0595	10
11	8.2912	481.826	481.826	518.7	2116.00	0.4400	0.	3.605	-23.21	0.0596	11
12	8.4873	478.073	478.073	518.7	2116.00	0.4364	0.	1.978	-18.79	0.0598	12
13	8.6854	472.799	472.799	518.7	2116.00	0.4314	0.	0.441	-15.24	0.0598	13
14	8.8864	465.876	465.876	518.7	2116.00	0.4249	0.	-0.968	-12.50	0.0700	14
15	9.0900	457.525	457.525	518.7	2116.00	0.4170	0.	0.	-10.50	0.0702	15

STATION 3

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		TEMPERATURES		TOTAL PRESSURE	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
		ABSOLUTE	MERIDNL. TANGENTL.	TOTAL	STATIC							
1	6.5016	515.518	515.618	518.7	496.6	2116.00	1816.42	0.4722	21.148	43.50	0.0685	1
2	6.7723	522.734	522.734	518.7	495.0	2116.00	1808.55	0.4790	19.257	85.99	0.0584	2
3	6.9931	528.734	528.734	518.7	495.4	2116.00	1801.86	0.4848	17.422	174.20	0.0682	3
4	7.1135	534.023	534.023	518.7	495.0	2116.00	1795.91	0.4898	15.607	399.04	0.0680	4
5	7.2843	538.745	538.745	518.7	494.5	2116.00	1790.56	0.4944	15.781	-6190.53	0.0679	5
6	7.4553	542.857	542.857	518.7	494.2	2116.00	1785.87	0.4985	11.930	-299.52	0.0578	6
7	7.5270	546.214	546.214	518.7	493.9	2116.00	1782.02	0.5016	10.043	-130.98	0.0677	7
8	7.7990	548.592	548.592	518.7	493.7	2116.00	1779.28	0.5039	8.121	-74.52	0.0576	8
9	7.9718	549.738	549.738	518.7	493.5	2116.00	1777.96	0.5050	6.160	-47.54	0.0676	9
10	8.1459	549.348	549.348	518.7	493.6	2116.00	1778.41	0.5046	4.153	-32.21	0.0576	10
11	8.3212	547.055	547.055	518.7	493.8	2116.00	1781.05	0.5024	2.104	-22.84	0.0576	11
12	8.4985	542.405	542.405	518.7	494.2	2116.00	1786.38	0.4979	0.006	-15.24	0.0578	12
13	8.6733	534.806	534.806	518.7	494.9	2116.00	1795.02	0.4906	-2.148	-11.75	0.0680	13
14	8.8519	523.445	523.445	518.7	495.9	2116.00	1807.76	0.4797	-4.367	-8.52	0.0584	14
15	9.0500	507.233	507.233	518.7	491.3	2116.00	1825.58	0.4642	-6.654	-5.12	0.0688	15

STATION 4

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		TEMPERATURES		TOTAL PRESSURE	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
		ABSOLUTE	MERIDNL. TANGENTL.	TOTAL	STATIC							
1	6.7586	573.071	573.071	518.7	491.4	2116.00	1750.61	0.5276	20.869	-21.79	0.0668	1
2	6.9132	575.765	575.765	518.7	491.1	2115.00	1747.40	0.5302	19.327	-173.48	0.0667	2
3	7.0592	581.001	581.001	518.7	490.6	2116.00	1741.13	0.5353	17.694	59.39	0.0566	3
4	7.2255	587.593	587.593	518.7	490.0	2116.00	1733.18	0.5417	15.972	32.57	0.0653	4
5	7.3824	594.698	594.698	518.7	489.3	2116.00	1724.53	0.5487	14.157	31.22	0.0661	5
6	7.5396	601.588	601.588	518.7	488.6	2116.00	1715.96	0.5555	12.257	34.97	0.0559	6
7	7.5972	608.126	608.126	518.7	487.9	2116.00	1708.00	0.5518	10.277	35.97	0.0557	7
8	7.9550	613.676	613.676	518.7	487.4	2116.00	1701.09	0.5573	8.227	44.27	0.0555	8
9	8.0133	619.112	619.112	518.7	486.9	2116.00	1695.54	0.5716	6.105	61.45	0.0653	9
10	8.1726	621.222	621.222	518.7	486.6	2115.00	1691.63	0.5747	3.898	114.15	0.0552	10
11	8.3325	622.724	622.724	518.7	486.4	2116.00	1689.30	0.5757	1.594	-2145.02	0.0551	11
12	8.4935	622.279	622.279	518.7	486.5	2116.00	1693.78	0.5730	-0.826	-88.93	0.0652	12
13	8.6565	619.516	619.516	518.7	486.8	2116.00	1693.78	0.5730	-3.383	-43.57	0.0653	13
14	8.8219	614.082	614.082	518.7	487.3	2116.00	1700.58	0.5677	-6.103	-29.44	0.0554	14
15	8.9900	605.737	605.737	518.7	488.2	2116.00	1710.96	0.5595	-9.013	-24.07	0.0557	15

STATION 5

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY	ANGLE	RELATIVE	VELOCITIES	RELATIVE	TEMPERATURES	PRESSURES	MACH	WHIRL	SLOPE	RADIAL	STATIC	LOCATION
		ABSOLUTE	MERIDIANL.	TANGENTL.	INLET	OUTLET	TOTAL	TOTAL	NUMBER	ANGLE	ANGLE	CURVATURE	DENSITY	
1	6.9066	614.448	552.279	163.563	552.1	520.7	2611.89	2127.37	0.5495	15.438	22.324	6.22	0.0766	1
2	7.0530	623.552	602.266	151.918	552.5	520.1	2614.89	2116.58	0.5580	15.048	21.187	5.45	0.0759	2
3	7.1984	533.002	612.380	160.255	552.8	519.5	2617.27	2104.89	0.5568	14.665	19.713	5.73	0.0760	3
4	7.3427	641.950	622.056	158.577	553.1	518.9	2618.76	2092.92	0.5751	14.301	17.983	7.25	0.0757	4
5	7.4862	650.105	630.934	156.709	553.4	518.2	2619.31	2081.25	0.5828	13.943	16.050	7.93	0.0753	5
6	7.5292	657.326	638.822	154.868	553.7	517.7	2619.15	2070.30	0.5876	13.627	13.923	8.91	0.0750	6
7	7.7722	663.475	645.568	153.109	553.9	517.3	2618.55	2060.60	0.5953	13.342	11.719	10.47	0.0747	7
8	7.9148	668.365	651.449	151.642	554.2	517.0	2618.58	2052.58	0.6003	13.104	9.375	13.06	0.0745	8
9	8.0575	673.475	656.599	150.679	554.6	516.9	2619.80	2046.52	0.5087	12.925	6.934	17.85	0.0743	9
10	8.2006	678.579	661.667	150.552	555.2	515.9	2623.86	2042.55	0.5091	12.819	4.400	28.21	0.0741	10
11	8.3436	583.544	656.619	151.167	555.0	517.2	2630.33	2040.56	0.6134	12.777	1.780	58.31	0.0740	11
12	8.4871	688.133	671.040	152.421	557.0	517.6	2637.95	2040.14	0.6172	12.797	-0.929	362.11	0.0739	12
13	8.6311	692.047	674.685	154.045	558.1	518.2	2645.39	2040.73	0.6204	12.861	-3.720	-165.98	0.0739	13
14	8.7764	695.000	677.155	156.435	559.4	519.2	2650.38	2041.53	0.6225	13.008	-6.585	-130.63	0.0737	14
15	8.9231	697.229	678.586	160.152	561.0	520.6	2653.27	2041.46	0.6236	13.279	-9.495	46733.66	0.0735	15

STATION 5 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20371.4 RPM.

STREAM	RELATIVE	RELATIVE	RELATIVE	RELATIVE	RELATIVE	LOSS	DE HALL	DIFFUS	DELTA P	BLADE	BLADE	STREAM
-LINE	OPT.IN.	GAS	VELOCITIES	VELOCITIES	MACH NO.S	COEFF	NUMBER	FACTOR	UPON Q	INLET	OUTLET	-LINE
		INLET	OUTLET	INLET	OUTLET							
1		-64.501	-60.902	1331.172	1217.926	1.0892	0.0140	0.915	0.1428	1201.5	1227.8	1
2		-64.898	-61.120	1357.159	1246.974	1.1158	0.0156	0.919	0.1329	1229.0	1253.8	2
3		-65.188	-61.319	1384.515	1275.966	1.1424	0.0172	0.922	0.1243	1255.7	1279.7	3
4		-65.419	-61.522	1412.537	1304.599	1.1688	0.0191	0.924	0.1167	1284.5	1305.3	4
5		-65.623	-61.748	1440.858	1332.914	1.1949	0.0208	0.925	0.1098	1312.4	1330.9	5
6		-65.825	-61.999	1469.193	1360.670	1.2204	0.0228	0.926	0.1036	1340.3	1353.3	6
7		-66.039	-62.279	1497.413	1387.830	1.2452	0.0250	0.927	0.0979	1368.4	1381.7	7
8		-66.277	-62.574	1525.315	1414.313	1.2594	0.0273	0.927	0.0928	1395.4	1407.0	8
9		-66.544	-62.874	1552.881	1440.061	1.2926	0.0298	0.927	0.0881	1424.6	1432.4	9
10		-66.849	-63.153	1580.105	1465.123	1.3150	0.0325	0.927	0.0839	1452.9	1457.9	10
11		-67.199	-63.414	1606.897	1489.495	1.3366	0.0354	0.927	0.0798	1481.3	1485.3	11
12		-67.603	-63.675	1633.149	1513.150	1.3572	0.0391	0.926	0.0758	1509.9	1508.8	12
13		-68.072	-63.949	1658.921	1536.266	1.3772	0.0435	0.926	0.0716	1538.9	1534.4	13
14		-68.617	-64.246	1684.237	1558.423	1.3958	0.0505	0.925	0.0671	1568.3	1560.2	14
15		-69.243	-64.552	1709.123	1579.230	1.4125	0.0615	0.924	0.0620	1598.2	1586.3	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LIVE	STATION-TJ- PRESSURE RATIO	STATION-TJ- DELTA T ON T	STATION-PARAMETERS ISENTHROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTHROPIC EFFICIENCY	MEAN PARAMETERS PRESSURE RATIO DELTA T ON T ISEN. EFFICY.	STATION-TO-STATION PRESSURE RATIO DELTA T ON T ISEN. EFFICY.	STATION-TO-STATION DELTA T ON T	INLET-TO-STATION PRESSURE RATIO DELTA T ON T ISEN. EFFICY.
1	1.2144	0.0645	0.9612	1.2344	0.0645	0.9612				
2	1.2353	0.0552	0.9564	1.2358	0.0652	0.9564				
3	1.2369	0.0658	0.9512	1.2369	0.0658	0.9512				
4	1.2376	0.0664	0.9451	1.2375	0.0664	0.9451				
5	1.2379	0.0669	0.9391	1.2379	0.0669	0.9391				
6	1.2378	0.0574	0.9321	1.2378	0.0574	0.9321				
7	1.2375	0.0579	0.9244	1.2375	0.0579	0.9244				
8	1.2375	0.0535	0.9164	1.2375	0.0535	0.9164				
9	1.2381	0.0693	0.9080	1.2381	0.0693	0.9080				
10	1.2400	0.0705	0.8993	1.2400	0.0705	0.8993				
11	1.2431	0.0720	0.8905	1.2431	0.0720	0.8905				
12	1.2467	0.0739	0.8799	1.2467	0.0739	0.8799				
13	1.2502	0.0759	0.8672	1.2502	0.0759	0.8672				
14	1.2528	0.0784	0.8478	1.2528	0.0784	0.8478				
15	1.2539	0.0816	0.8179	1.2539	0.0816	0.8179				

STATION 6

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITY ABSOLUTE	TEMPERATURES TOTAL	STATICS	PRESSURES TOTAL	STATICS	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCA TION
1	7.0871	720.305	627.5	584.4	4056.03	3160.21	0.6080	45.127	27.367	4.30	0.1014	1
2	7.2233	726.533	628.5	584.6	4057.20	3155.70	0.6133	45.000	24.867	7.07	0.1012	2
3	7.3559	733.180	629.9	585.2	4088.31	3159.89	0.6195	44.193	22.248	15.96	0.1012	3
4	7.4854	739.555	631.7	585.2	4118.62	3169.63	0.6234	43.635	19.556	-268.41	0.1014	4
5	7.6127	745.851	633.9	587.6	4156.64	3187.31	0.6279	43.320	16.819	-17.25	0.1017	5
6	7.7384	751.705	636.5	589.4	4201.10	3210.93	0.6318	43.181	14.060	-10.01	0.1022	6
7	7.8633	757.172	639.2	591.5	4250.32	3239.23	0.6353	43.179	11.290	-7.73	0.1027	7
8	7.9872	762.421	642.2	593.8	4302.97	3270.57	0.6385	43.269	8.532	-6.83	0.1033	8
9	8.1107	767.567	645.3	596.3	4357.21	3303.72	0.6415	43.413	5.795	-6.58	0.1039	9
10	8.2342	773.042	648.5	598.8	4412.87	3336.94	0.6447	43.569	3.088	-5.81	0.1045	10
11	8.3574	778.737	651.8	601.3	4467.60	3368.77	0.6480	43.713	0.431	-5.58	0.1051	11
12	8.4807	784.425	655.1	603.9	4518.95	3397.89	0.6514	43.853	-2.172	-5.21	0.1055	12
13	8.5045	789.909	658.5	606.6	4564.48	3423.11	0.6545	44.020	-4.711	-4.77	0.1058	13
14	8.7295	795.594	662.5	609.8	4603.13	3443.37	0.6575	44.362	-7.170	-23.84	0.1059	14
15	8.8562	802.451	667.5	614.0	4635.54	3457.56	0.6609	45.027	-9.488	1776.42	0.1056	15

STATION 6 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20771.4 RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT. IN. INLET	RELATIVE GAS ANGLES OUTLET	RELATIVE VELOCITIES INLET	RELATIVE VELOCITIES OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	BLADE SPEEDS OUTLET	STREAM -LINE
1	-60.903	-56.024	1217.959	893.301	0.0291	0.733	0.	0.4387	1227.4	1259.9	1
2	-61.120	-53.301	1246.997	926.048	0.0324	0.743	0.	0.4170	1253.6	1284.1	2
3	-61.319	-56.580	1275.979	954.828	0.0357	0.748	0.	0.4001	1279.7	1307.7	3
4	-61.523	-56.873	1304.608	979.559	0.0394	0.751	0.	0.3872	1305.3	1330.7	4
5	-61.749	-57.189	1332.924	1001.402	0.0433	0.751	0.	0.3773	1330.9	1353.3	5
6	-61.999	-57.526	1360.593	1020.994	0.0481	0.750	0.	0.3697	1355.3	1375.7	6
7	-62.280	-57.885	1387.363	1038.597	0.0514	0.748	0.	0.3635	1381.7	1397.9	7
8	-62.575	-58.252	1414.353	1055.065	0.0558	0.744	0.	0.3579	1407.0	1419.9	8
9	-62.875	-58.621	1440.129	1070.301	0.0607	0.744	0.	0.3524	1432.4	1441.9	9
10	-63.155	-58.963	1465.208	1086.336	0.0658	0.741	0.	0.3466	1457.9	1463.8	10
11	-63.416	-59.293	1489.502	1101.949	0.0715	0.740	0.	0.3402	1483.3	1485.7	11
12	-63.677	-59.595	1513.273	1117.657	0.0781	0.739	0.	0.3331	1508.8	1507.7	12
13	-63.952	-59.915	1536.400	1133.139	0.0867	0.738	0.	0.3253	1534.4	1529.7	13
14	-64.248	-60.254	1558.538	1146.404	0.1001	0.736	0.	0.3174	1560.2	1551.9	14
15	-64.554	-60.598	1579.354	1155.253	0.1212	0.731	0.	0.3098	1586.3	1574.4	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO- STATION PRESSURE RATIO	STATION-TO- STATION ISENTROPIC EFFICIENCY	INLET-TO- STATION PRESSURE RATIO	INLET-TO- STATION ISENTROPIC EFFICIENCY	MEAN PARAMETERS PRESSURE RATIO	MEAN PARAMETERS DELTA T ON T	MEAN PARAMETERS ISEN. EFFICY.	STATION-TO- STATION PRESSURE RATIO	STATION-TO- STATION ISENTROPIC EFFICIENCY	INLET-TO- STATION PRESSURE RATIO	INLET-TO- STATION ISENTROPIC EFFICIENCY
1	1.5529	0.1366	0.9803	0.9775	1.9168	0.2059	0.9728	1.6525	0.9329	1.6525	0.9329
2	1.5554	0.1375	0.9775	0.9746	1.9221	0.2117	0.9692	1.61618	0.9268	1.61618	0.9268
3	1.5621	0.1354	0.9746	0.9719	1.9321	0.2143	0.9654	0.95534	0.9210	0.95534	0.9210
4	1.5727	0.1420	0.9719	0.9688	1.9454	0.2179	0.9615				
5	1.5869	0.1455	0.9688	0.9659	1.9644	0.2221	0.9572				
6	1.6040	0.1495	0.9659	0.9629	1.9854	0.2270	0.9529				
7	1.6232	0.1541	0.9629	0.9597	2.0087	0.2324	0.9484				
8	1.6432	0.1588	0.9597	0.9562	2.0335	0.2381	0.9436				
9	1.6631	0.1635	0.9562	0.9524	2.0592	0.2441	0.9384				
10	1.6818	0.1680	0.9524	0.9480	2.0855	0.2503	0.9329				
11	1.6985	0.1723	0.9480	0.9430	2.1113	0.2567	0.9268				
12	1.7131	0.1762	0.9430	0.9363	2.1355	0.2631	0.9197				
13	1.7254	0.1800	0.9363	0.9258	2.1571	0.2698	0.9106				
14	1.7365	0.1844	0.9258	0.9095	2.1754	0.2772	0.8964				
15	1.7471	0.1899	0.9095		2.1907	0.2870	0.8745				

STATION 7

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY		TEMPERATURES		PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STAT. DENSITY	LOCATION
		ABSOLUTE	RELATIVE	TANGENTIAL	TOTAL	STATIC	TOTAL						
1	7.3207	883.693	61.5	591.4	4708.59	3268.22	0.7415	40.025	26.611	-3.37	0.1036	1	
2	7.4237	891.565	61.8	593.6	4775.37	3298.22	0.7468	46.074	23.001	-3.35	0.1042	2	
3	7.5255	897.791	62.0	596.1	4843.71	3333.94	0.7504	46.280	19.530	-3.43	0.1049	3	
4	7.5267	903.043	62.0	598.8	4913.87	3373.63	0.7531	45.573	16.223	-3.53	0.1057	4	
5	7.7278	907.766	61.9	601.7	4985.39	3415.98	0.7552	46.928	13.087	-3.85	0.1065	5	
6	7.9293	912.210	61.8	604.8	5057.47	3452.54	0.7570	47.314	10.121	-4.23	0.1073	6	
7	7.9315	916.514	61.6	607.9	5129.69	3503.37	0.7584	47.714	7.320	-4.74	0.1081	7	
8	8.0345	921.063	61.5	611.1	5201.29	3546.62	0.7604	48.105	4.682	-5.43	0.1088	8	
9	8.1384	925.783	61.3	614.3	5272.48	3588.81	0.7622	48.491	2.197	-6.28	0.1096	9	
10	8.2434	930.948	61.2	617.6	5343.59	3629.63	0.7644	48.864	-0.146	-7.49	0.1102	10	
11	8.3494	936.545	61.1	620.9	5414.12	3668.70	0.7670	49.217	-2.342	-9.22	0.1108	11	
12	8.4555	942.795	61.0	624.5	5484.30	3705.87	0.7699	49.616	-4.398	-11.83	0.1113	12	
13	8.5650	949.554	60.9	628.4	5552.99	3740.94	0.7731	50.135	-6.310	-16.73	0.1116	13	
14	8.6757	958.025	60.3	633.5	5621.51	3773.60	0.7768	50.989	-8.046	-24.93	0.1117	14	
15	8.7894	970.047	59.0	640.6	5694.93	3803.03	0.7821	52.500	-9.488	-1818.92	0.1113	15	

STATION 7 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20371.4 RPM.

STREAM LINE	RELATIVE GAS ANGLES		RELATIVE VELOCITIES		RELATIVE MACH NO.'S		LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS		STREAM LINE
	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET					INLET	OUTLET	
1	-55.019	-47.320	893.134	905.131	0.7540	0.7595	0.0458	1.013	0.0	0.0747	1259.9	1301.4	1
2	-55.297	-47.606	925.949	917.350	0.7815	0.7584	0.0504	0.991	0.0	0.0909	1284.1	1319.7	2
3	-55.577	-47.989	954.556	927.106	0.8053	0.7749	0.0555	0.971	0.0	0.1041	1307.7	1337.8	3
4	-55.872	-48.426	979.520	935.689	0.8256	0.7801	0.0606	0.955	0.0	0.1142	1330.7	1355.8	4
5	-57.189	-48.896	1001.400	942.957	0.8430	0.7845	0.0660	0.942	0.0	0.1212	1353.3	1373.8	5
6	-57.527	-49.364	1020.932	950.042	0.8581	0.7884	0.0717	0.931	0.0	0.1254	1375.7	1391.8	6
7	-57.888	-49.873	1038.674	957.036	0.8715	0.7921	0.0778	0.921	0.0	0.1274	1397.9	1410.0	7
8	-58.256	-50.369	1055.179	964.274	0.8836	0.7960	0.0842	0.914	0.0	0.1275	1419.9	1428.3	8
9	-58.625	-50.845	1070.949	971.705	0.8950	0.8000	0.0911	0.907	0.0	0.1265	1441.9	1446.8	9
10	-58.969	-51.298	1086.512	979.443	0.9061	0.8043	0.0986	0.901	0.0	0.1249	1463.8	1465.5	10
11	-59.299	-51.723	1102.149	987.516	0.9172	0.8097	0.1065	0.896	0.0	0.1231	1485.7	1484.3	11
12	-59.601	-52.123	1117.876	994.913	0.9283	0.8125	0.1160	0.890	0.0	0.1218	1507.7	1503.3	12
13	-59.922	-52.520	1133.359	1000.378	0.9391	0.8143	0.1286	0.883	0.0	0.1213	1529.7	1522.6	13
14	-60.241	-52.924	1146.641	1000.278	0.9476	0.8110	0.1479	0.872	0.0	0.1226	1551.9	1542.3	14
15	-63.605	-53.329	1155.488	988.799	0.9516	0.7972	0.1791	0.856	0.0	0.1264	1574.4	1552.5	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS			INLET-TO-STATION-PARAMETERS			MEAN-PARAMETERS			STATION-TO-STATION			INLET-TO-STATION				
	RADIUS	DELTA T ON T	ISENTPROPIC EFFICIENCY	PRESSURE RATIO	DELTA T ON T	ISENTPROPIC EFFICIENCY	DELTA T ON T	EFFICIENCY	PRESSURE RATIO	DELTA T ON T	ISEN. EFFICY.	STATION-TO-STATION	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTR.	STATIC DENSITY	LOCA TTION
1	1.1609	0.0460	0.9457	2.2252	0.2656	0.9662											
2	1.1741	0.0497	0.9433	2.2563	0.2719	0.9623											
3	1.1848	0.0529	0.9387	2.2891	0.2785	0.9579											
4	1.1931	0.0554	0.9340	2.3222	0.2853	0.9534											
5	1.1994	0.0574	0.9284	2.3550	0.2923	0.9486											
6	1.2038	0.0590	0.9215	2.3931	0.2995	0.9434											
7	1.2069	0.0604	0.9135	2.4242	0.3068	0.9378											
8	1.2088	0.0615	0.9048	2.4531	0.3142	0.9318											
9	1.2101	0.0625	0.8951	2.4917	0.3219	0.9253											
10	1.2109	0.0635	0.8844	2.5253	0.3297	0.9184											
11	1.2119	0.0646	0.8735	2.5587	0.3378	0.9109											
12	1.2136	0.0661	0.8604	2.5918	0.3465	0.9019											
13	1.2166	0.0682	0.8438	2.6243	0.3562	0.8904											
14	1.2212	0.0715	0.8215	2.6567	0.3585	0.8733											
15	1.2285	0.0769	0.7871	2.6914	0.3860	0.8465											

STATION 8

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITY		TEMPERATURES		PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTR.	STATIC DENSITY	LOCA TTION	
		ABSOLUTE	RELATIVE	TOTAL	STATIC	TOTAL	STATIC							
1	7.4879	1102.903	739.038	818.669	700.1	598.9	5851.29	3385.66	0.9197	47.927	16.555	-1.88	0.1060	1
2	7.5328	1105.463	726.089	833.572	705.3	603.5	5975.02	3462.72	0.9183	48.942	13.844	-2.15	0.1076	2
3	7.6393	1105.455	712.648	845.082	709.8	608.0	6077.99	3535.61	0.9149	49.860	11.329	-2.50	0.1091	3
4	7.7177	1104.706	699.802	854.782	713.9	612.3	6169.06	3603.80	0.9110	50.692	8.990	-2.95	0.1104	4
5	7.7982	1104.228	688.285	863.600	718.0	615.5	6254.69	3667.41	0.9077	51.446	6.800	-3.55	0.1116	5
6	7.8807	1104.786	678.233	872.096	722.1	620.5	6337.87	3726.69	0.9051	52.128	4.741	-4.35	0.1126	6
7	7.9655	1106.480	669.600	880.871	726.3	624.4	6421.50	3782.07	0.9036	52.760	2.793	-5.45	0.1136	7
8	8.0522	1109.167	662.103	889.871	730.7	628.3	6504.71	3833.82	0.9030	53.349	0.945	-7.04	0.1144	8
9	8.1409	1112.931	655.662	899.289	735.3	632.3	6588.97	3882.51	0.9032	53.905	-0.816	-9.48	0.1152	9
10	8.2317	1117.505	649.848	909.129	740.1	636.2	6673.54	3928.70	0.9041	54.443	-2.499	-13.57	0.1158	10
11	8.3243	1123.008	644.567	919.609	745.2	640.3	6759.84	3972.80	0.9057	54.973	-4.104	-21.29	0.1164	11
12	8.4189	1130.054	638.446	932.421	751.0	644.7	6851.32	4015.58	0.9082	55.600	-5.636	-39.91	0.1168	12
13	8.5158	1138.832	629.702	946.901	757.3	649.9	6949.26	4057.99	0.9116	56.431	-7.088	-114.15	0.1171	13
14	8.6163	1150.977	612.489	974.477	767.2	656.9	7060.56	4101.57	0.9164	57.850	-8.421	2781.98	0.1171	14
15	8.7225	1170.489	578.030	1017.605	781.4	667.4	7205.61	4148.28	0.9246	60.407	-9.495	16793.09	0.1166	15

STATION 8 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20371.4 RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT. IN. INLET	RELATIVE GAS ANGLES OUTLET	RELATIVE VELOCITIES INLET	RELATIVE VELOCITIES OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q.	BLADE SPEEDS INLET	BLADE SPEEDS OUTLET	STREAM -LINE
1	-47.324	-34.727	905.191	899.209	0.7498	0.0630	0.993	0.0772	1301.4	1331.2	1
2	-47.611	-35.119	917.439	887.581	0.7374	0.0591	0.968	0.1044	1319.7	1344.5	2
3	-47.994	-35.737	927.206	877.937	0.7266	0.0755	0.947	0.1241	1337.8	1358.1	3
4	-48.232	-35.459	935.502	870.090	0.7175	0.0821	0.930	0.1378	1355.8	1372.0	4
5	-48.902	-37.207	943.071	854.133	0.7845	0.0890	0.916	0.1468	1373.8	1388.3	5
6	-49.389	-37.942	950.144	860.019	0.7885	0.0951	0.905	0.1523	1391.8	1401.0	6
7	-49.882	-38.631	957.115	857.152	0.7922	0.1039	0.896	0.1552	1410.0	1416.1	7
8	-50.371	-39.282	964.321	855.391	0.7961	0.1122	0.887	0.1562	1428.3	1431.5	8
9	-50.856	-39.888	971.715	854.501	0.8000	0.1211	0.879	0.1561	1445.8	1447.2	9
10	-51.296	-40.464	979.715	854.150	0.8042	0.1307	0.872	0.1553	1465.5	1463.4	10
11	-51.720	-41.001	987.451	854.076	0.8087	0.1408	0.865	0.1542	1484.3	1479.8	11
12	-52.119	-41.477	994.318	852.138	0.8124	0.1532	0.857	0.1539	1503.5	1496.7	12
13	-52.515	-41.909	1000.252	846.137	0.8143	0.1692	0.845	0.1552	1522.6	1513.9	13
14	-52.916	-42.309	1000.148	828.218	0.8109	0.1844	0.823	0.1607	1542.3	1531.9	14
15	-53.324	-42.681	988.570	785.290	0.7971	0.2352	0.795	0.1746	1582.5	1550.6	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	STATION-TO-STATION-PARAMETERS INLET-TO-STATION-PARAMETERS PRESSURE RATIO	STATION-TO-STATION-PARAMETERS DELTA T ON T	STATION-TO-STATION-PARAMETERS DELTA T ON T	MEAN PARAMETERS PRESSURE RATIO DELTA T ON T ISEN. EFFICY.	STATION-TO-STATION INLET-TO-STATION	STATION-TO-STATION INLET-TO-STATION
1	1.2427	0.0665	0.9619	0.3498	0.9635	1.2522	3.0997
2	1.2512	0.0690	0.9576	0.3537	0.9593	0.0737	0.4186
3	1.2548	0.0703	0.9532	0.3683	0.9547	0.8998	0.9111
4	1.2554	0.0709	0.9471	0.3764	0.9495		
5	1.2546	0.0711	0.9408	0.3842	0.9441		
6	1.2532	0.0713	0.9339	0.3921	0.9383		
7	1.2518	0.0715	0.9260	0.4003	0.9319		
8	1.2506	0.0719	0.9167	0.4088	0.9249		
9	1.2497	0.0724	0.9071	0.4176	0.9174		
10	1.2489	0.0731	0.8967	0.4269	0.9093		
11	1.2476	0.0739	0.8854	0.4357	0.9006		
12	1.2493	0.0752	0.8721	0.4478	0.8902		
13	1.2514	0.0772	0.8565	0.4610	0.8771		
14	1.2560	0.0807	0.8332	0.4790	0.8575		
15	1.2653	0.0869	0.7996	0.5065	0.8272		

STATION 9

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ANGLES		RELATIVE VELOCITIES		TEMPERATURES		PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCATION
		INLET	OUTLET	INLET	OUTLET	TOTAL	STATIC	TOTAL	STATIC						
1	7.5585	1246.730	787.262	892.342	875.263	0.7503	0.7260	3483.90	605.2	1.0344	50.723	7.898	-5.43	0.1080	1
2	7.5207	1235.367	775.898	887.813	869.561	0.7375	0.7193	3530.17	609.5	1.0224	51.111	6.508	-6.57	0.1289	2
3	7.6856	1225.545	763.417	878.081	865.308	0.7267	0.7094	3573.44	611.8	1.0111	51.471	5.266	-8.52	0.1095	3
4	7.7529	1216.283	751.719	870.198	862.044	0.7176	0.7001	3613.29	615.0	1.0009	51.827	4.102	-12.05	0.1132	4
5	7.8229	1209.803	741.531	864.259	860.188	0.7103	0.7001	3649.61	610.1	0.9922	52.161	3.015	-21.05	0.1107	5
6	7.8953	1203.641	732.963	860.071	859.440	0.7046	0.7021	3682.57	615.01	0.9855	52.486	1.962	-74.31	0.1112	6
7	7.9703	1200.945	726.047	857.195	859.639	0.7000	0.7010	3711.87	624.3	0.9809	52.803	0.913	55.07	0.1115	7
8	8.0474	1200.317	720.411	855.397	860.467	0.6964	0.7000	3738.30	627.4	0.9779	53.117	13.02	20.83	0.1117	8
9	8.1267	1201.215	715.409	854.480	861.420	0.6935	0.7000	3761.77	630.7	0.9761	53.447	-2.141	9.55	0.1119	9
10	8.2082	1203.772	711.407	854.102	862.829	0.6910	0.6993	3782.48	634.0	0.9756	53.774	-3.135	7.59	0.1118	10
11	8.2917	1208.205	707.853	854.003	863.784	0.6887	0.6982	3800.49	637.4	0.9766	54.136	-4.134	5.44	0.1116	11
12	8.3773	1214.745	703.603	852.041	862.702	0.6848	0.6952	3816.10	641.4	0.9788	54.605	-5.187	5.75	0.1112	12
13	8.4654	1223.589	695.869	846.015	856.094	0.6772	0.6873	3830.58	645.2	0.9823	55.340	-6.438	5.83	0.1104	13
14	8.5571	1235.575	676.105	828.072	833.337	0.6593	0.6552	3846.84	653.5	0.9864	55.828	-8.227	9.29	0.1104	14
15	8.6556	1254.613	628.236	786.145	774.493	0.6210	0.6125	3873.97	665.8	0.9922	59.951	-8.227	9.29	0.1091	15

STATION 9 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20371.6 RPM.

STREAMLINE	RELATIVE GAS ANGLES		RELATIVE VELOCITIES		RELATIVE MACH NOS.		LOSS COEFF		DE HALL NUMBER		DIFFUSION FACTOR	BLADE SPEEDS		STREAMLINE
	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET		INLET	OUTLET	
1	-34.739	-25.612	892.342	875.263	0.7503	0.7260	0.0800	0.0973	0.0642	0.0479	0.0642	1331.2	1343.7	1
2	-35.131	-26.838	887.813	869.561	0.7375	0.7193	0.0875	0.0973	0.0448	0.0479	0.0448	1344.5	1354.8	2
3	-35.748	-28.085	878.081	865.308	0.7267	0.7094	0.0950	0.0985	0.0254	0.0479	0.0254	1358.1	1366.3	3
4	-36.468	-29.306	870.198	862.044	0.7176	0.7001	0.1032	0.0991	0.0064	0.0479	0.0064	1372.0	1378.3	4
5	-37.215	-30.452	864.259	860.188	0.7103	0.7001	0.1117	0.0995	-0.0121	0.0479	-0.0121	1385.3	1390.7	5
6	-37.947	-31.478	860.071	859.440	0.7046	0.7021	0.1206	0.0999	-0.0303	0.0479	-0.0303	1401.0	1403.6	6
7	-38.634	-32.372	857.195	859.639	0.7000	0.7010	0.1300	1.0003	-0.0479	0.0479	-0.0479	1416.1	1415.9	7
8	-39.283	-33.151	855.397	860.467	0.6964	0.7000	0.1400	1.0006	-0.0651	0.0479	-0.0651	1431.5	1430.6	8
9	-39.886	-33.850	854.480	861.420	0.6935	0.7000	0.1509	1.0008	-0.0821	0.0479	-0.0821	1447.2	1444.7	9
10	-40.461	-34.462	854.102	862.829	0.6910	0.6993	0.1623	1.010	-0.0990	0.0479	-0.0990	1463.4	1459.2	10
11	-40.996	-34.967	854.003	863.784	0.6887	0.6982	0.1748	1.011	-0.1162	0.0479	-0.1162	1479.8	1474.2	11
12	-41.469	-35.355	852.041	862.702	0.6848	0.6952	0.1896	1.013	-0.1348	0.0479	-0.1348	1495.7	1489.3	12
13	-41.900	-35.626	846.015	856.094	0.6772	0.6873	0.2090	1.012	-0.1560	0.0479	-0.1560	1513.9	1504.9	13
14	-42.298	-35.775	828.072	833.337	0.6593	0.6552	0.2396	1.006	-0.1833	0.0479	-0.1833	1531.8	1521.2	14
15	-42.670	-35.791	786.145	774.493	0.6210	0.6125	0.2896	0.985	-0.2227	0.0479	-0.2227	1550.6	1538.7	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TJ-STATION-PARAMETERS		INLET-TO-STATION-PARAMETERS		MEAN PARAMETERS		STATION-TO-STATION		INLET-TO-STATION	
	PRESSURE RATIO	DELTA T ON T	ISENTHROPIC EFFICIENCY	PRESSURE RATIO	DELTA T ON T	DELTA T ON T	ISEN. EFFICY.	DELTA T ON T	DELTA T ON T	DELTA T ON T
1	1.1735	0.0493	0.9483	3.2451	0.4163	0.9597				
2	1.1483	0.0432	0.9332	3.2424	0.4184	0.9542				
3	1.1276	0.0381	0.9155	3.2389	0.4205	0.9484				
4	1.1099	0.0339	0.8919	3.2358	0.4230	0.9418				
5	1.0946	0.0303	0.8633	3.2354	0.4261	0.9348				
6	1.0814	0.0273	0.8283	3.2331	0.4301	0.9273				
7	1.0701	0.0248	0.7882	3.2475	0.4350	0.9192				
9	1.0603	0.0227	0.7421	3.2594	0.4408	0.9104				
10	1.0511	0.0210	0.6845	3.2731	0.4474	0.9008				
11	1.0429	0.0195	0.6206	3.2893	0.4547	0.8906				
12	1.0356	0.0184	0.5458	3.3083	0.4631	0.8794				
13	1.0285	0.0175	0.4619	3.3305	0.4732	0.8654				
14	1.0219	0.0171	0.3630	3.3561	0.4860	0.8500				
15	1.0149	0.0175	0.2423	3.3855	0.5048	0.8255				
	1.0083	0.0197	0.1195	3.4334	0.5361	0.7876				

STATION 10

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	V E L O C I T I E S		TEMPERATURES		PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURV. %	STATIC DENSITY	LOCA TION
		ABSOLUTE	MERIDNL.	TANGENTL.	TOTAL	STATIC	TOTAL						
1	7.5940	1231.323	769.697	961.746	734.7	608.3	6866.51	3546.75	1.0192	7.394	9.82	0.1093	1
2	7.6444	1228.155	767.424	958.868	735.7	610.1	6850.97	3562.91	1.0146	5.915	14.88	0.1095	2
3	7.7070	1224.911	765.866	955.959	736.8	611.9	6833.58	3576.41	1.0105	4.801	17.04	0.1096	3
4	7.7716	1222.523	764.946	953.776	738.1	613.7	6817.05	3587.07	1.0072	3.904	18.94	0.1096	4
5	7.8383	1221.290	764.178	952.670	739.7	615.6	6806.18	3597.80	1.0045	3.138	17.41	0.1096	5
6	7.9070	1221.126	763.207	953.238	741.8	617.7	6804.01	3609.70	1.0027	2.445	17.38	0.1096	6
7	7.9778	1222.784	762.852	955.645	744.3	619.9	6811.78	3620.94	1.0022	1.812	16.35	0.1096	7
8	8.0505	1225.093	761.515	959.667	747.3	622.4	6896.96	3634.85	1.0021	1.193	15.49	0.1095	8
9	8.1250	1227.493	758.497	965.102	750.7	625.3	6925.90	3651.80	1.0017	0.582	14.30	0.1095	9
10	8.2017	1229.559	753.246	971.822	754.5	628.7	6960.08	3674.24	1.0007	-0.015	13.04	0.1096	10
11	8.2804	1231.429	745.038	980.478	759.9	632.7	7000.37	3702.67	0.9990	-0.735	11.63	0.1098	11
12	8.3614	1234.781	735.082	992.138	764.1	637.3	7047.45	3731.36	0.9982	-1.495	10.23	0.1098	12
13	8.4453	1239.093	719.347	1008.905	770.8	643.0	7101.53	3764.49	0.9972	-2.445	8.32	0.1098	13
14	8.5333	1245.549	691.284	1037.309	780.5	651.2	7155.94	3800.39	0.9968	-3.779	5.81	0.1094	14
15	8.6273	1265.836	644.177	1099.068	796.8	663.5	7255.18	3826.15	1.0029	-5.785	3.27	0.1082	15

STATION 11

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITY		COINCIDENTIAL		TEMPERATURES		PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCA TION
		ABSOLUTE	TANGENTIAL	MERIDNL.	TANGENTL.	TOTAL	STATIC	TOTAL	STATIC						
1	7.6272	1228.508	771.417	956.240	736.7	609.0	6866.61	3560.42	1.0160	51.106	9.163	9.81	0.1096	1	
2	7.5365	1238.373	790.100	953.577	735.7	608.1	6363.87	3520.37	1.0248	50.356	8.107	7.05	0.1086	2	
3	7.7472	1247.872	807.917	951.027	736.8	607.2	6853.58	3481.08	1.0334	49.652	7.384	6.40	0.1075	3	
4	7.8092	1256.445	823.145	949.255	739.1	605.7	6847.05	3446.83	1.0409	49.070	6.764	6.35	0.1065	4	
5	7.8726	1264.499	836.165	948.571	739.7	606.7	6846.18	3418.59	1.0477	48.604	6.129	6.54	0.1057	5	
6	7.9375	1272.338	846.804	949.613	741.8	607.1	6856.01	3397.21	1.0538	48.276	5.457	7.02	0.1050	6	
7	8.0039	1280.017	855.050	952.541	744.3	608.0	6871.79	3383.15	1.0594	48.087	4.733	7.83	0.1044	7	
8	8.0718	1286.982	860.370	957.123	747.3	609.5	6896.96	3377.24	1.0638	48.047	3.932	9.14	0.1039	8	
9	8.1412	1292.500	861.907	963.157	750.5	611.7	6925.90	3380.59	1.0664	48.176	3.062	11.34	0.1036	9	
10	8.2124	1296.325	859.397	970.513	756.5	614.7	6950.08	3394.92	1.0670	48.475	2.123	15.53	0.1038	10	
11	8.2854	1298.142	851.515	979.845	758.9	618.7	7000.37	3422.64	1.0651	49.009	1.120	25.38	0.1042	11	
12	8.3505	1297.499	836.077	992.209	764.1	624.0	7047.45	3467.09	1.0599	49.881	0.059	74.85	0.1042	12	
13	8.4384	1293.826	809.012	1009.695	770.8	631.5	7101.53	3532.92	1.0507	51.297	-1.064	-76.01	0.1049	13	
14	8.5208	1287.267	760.203	1038.821	780.5	642.6	7152.94	3627.41	1.0363	53.804	-2.282	-24.28	0.1059	14	
15	8.6114	1280.046	668.263	1091.761	796.8	660.4	7265.18	3765.06	1.0165	58.530	-3.732	-13.28	0.1069	15	

STATION 12

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITY		COINCIDENTIAL		TEMPERATURES		PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCA TION
		ABSOLUTE	TANGENTIAL	MERIDNL.	TANGENTL.	TOTAL	STATIC	TOTAL	STATIC						
1	7.7326	1090.278	936.025	559.074	734.7	635.7	6655.12	4010.37	0.8124	30.849	6.173	-3.41	0.1183	1	
2	7.7920	1085.219	932.211	555.593	735.7	637.7	6660.47	4036.99	0.7770	30.795	5.921	-3.47	0.1187	2	
3	7.8331	1077.564	926.134	550.834	736.8	640.2	6652.30	4071.95	0.8691	30.743	5.643	-3.50	0.1193	3	
4	7.8858	1067.837	917.867	545.708	738.1	643.2	6652.11	4114.43	0.8592	30.733	5.336	-3.84	0.1200	4	
5	7.9403	1058.184	908.387	541.081	739.7	646.5	6668.10	4161.15	0.8493	30.753	4.993	-4.21	0.1207	5	
6	7.9964	1050.023	902.193	537.220	741.8	650.0	6682.56	4208.37	0.8405	30.772	4.610	-4.62	0.1214	6	
7	8.0541	1044.755	897.248	535.221	744.3	653.5	6708.12	4252.54	0.8340	30.817	4.171	-5.83	0.1220	7	
8	8.1132	1042.447	894.588	535.170	747.3	656.9	6740.30	4290.45	0.8300	30.889	3.669	-7.57	0.1225	8	
9	8.1736	1043.046	894.171	537.032	750.7	660.2	6775.51	4319.93	0.8284	30.989	3.097	-11.70	0.1227	9	
10	8.2354	1044.747	896.331	541.332	754.5	663.3	6815.90	4339.97	0.8297	31.130	2.450	-25.54	0.1227	10	
11	8.2984	1054.747	901.055	543.263	758.9	666.3	6852.35	4351.08	0.8338	31.319	1.732	133.62	0.1225	11	
12	8.3624	1065.572	907.473	548.704	764.1	669.6	6916.25	4355.78	0.8404	31.619	0.937	19.27	0.1220	12	
13	8.4278	1078.651	913.615	573.408	770.8	673.9	6975.77	4359.28	0.8479	32.114	0.059	10.75	0.1213	13	
14	8.4948	1092.590	914.873	597.477	780.5	681.2	7041.96	4371.14	0.8544	33.148	-0.942	7.59	0.1204	14	
15	8.5638	1109.151	917.627	623.039	796.8	694.4	7140.22	4411.04	0.8589	34.175	-2.190	5.79	0.1191	15	

STREAM -LINE	RELATIVE GAS ANGLES		RELATIVE VELOCITIES		LOSS DE HALL		DIFFUS		DELTA P		BLADE SPEEDS		STREAM -LINE
	OPT.IN.	OUTLET	INLET	OUTLET	COEFF	NJMREX	FACTOR	UPON Q	INLET	OUTLET	INLET	OUTLET	
1	51.106	30.849	1228.508	1090.278	0.0640	0.887	0.	0.1561	0.	0.	0.	0.	1
2	50.356	30.795	1238.373	1085.219	0.0600	0.876	0.	0.1547	0.	0.	0.	0.	2
3	49.652	30.743	1247.872	1077.554	0.0567	0.864	0.	0.1752	0.	0.	0.	0.	3
4	49.070	30.733	1256.445	1067.837	0.0544	0.850	0.	0.1963	0.	0.	0.	0.	4
5	48.504	30.753	1264.499	1058.184	0.0520	0.837	0.	0.2166	0.	0.	0.	0.	5
6	48.276	30.772	1272.338	1050.028	0.0496	0.825	0.	0.2346	0.	0.	0.	0.	6
7	48.087	30.817	1280.017	1044.756	0.0469	0.815	0.	0.2492	0.	0.	0.	0.	7
8	48.047	30.889	1286.982	1042.447	0.0445	0.810	0.	0.2595	0.	0.	0.	0.	8
9	48.176	30.989	1292.500	1043.046	0.0424	0.807	0.	0.2650	0.	0.	0.	0.	9
10	48.475	31.120	1296.325	1047.115	0.0404	0.808	0.	0.2651	0.	0.	0.	0.	10
11	49.009	31.319	1298.142	1054.747	0.0386	0.813	0.	0.2595	0.	0.	0.	0.	11
12	49.881	31.619	1297.499	1065.672	0.0366	0.821	0.	0.2482	0.	0.	0.	0.	12
13	51.297	32.114	1293.826	1078.651	0.0352	0.834	0.	0.2316	0.	0.	0.	0.	13
14	53.804	33.148	1287.257	1092.590	0.0350	0.849	0.	0.2102	0.	0.	0.	0.	14
15	58.530	34.175	1280.046	1109.151	0.0357	0.866	0.	0.1846	0.	0.	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS		INLET-TO-STATION-PARAMETERS		MEAN PARAMETERS		STATION-TO-STATION		INLET-TO-STATION	
	PRESSURE RATIO	DELTA T EFFICIENCY	PRESSURE RATIO	DELTA T EFFICIENCY	PRESSURE RATIO	DELTA T EFFICIENCY	PRESSURE RATIO	DELTA T EFFICIENCY	PRESSURE RATIO	DELTA T EFFICIENCY
1	0.9692	0.	3.1451	0.4163	0.4298	0.9260	0.9776	3.2173	0.4537	0.8731
2	0.9708	0.	3.1477	0.4184	0.9260	0.9260	0.	0.	0.	0.
3	0.9721	0.	3.1495	0.4205	0.9216	0.9216	0.	0.	0.	0.
4	0.9730	0.	3.1484	0.4230	0.9161	0.9161	0.	0.	0.	0.
5	0.9740	0.	3.1513	0.4261	0.9102	0.9102	0.	0.	0.	0.
6	0.9750	0.	3.1591	0.4301	0.9038	0.9038	0.	0.	0.	0.
7	0.9762	0.	3.1702	0.4350	0.8971	0.8971	0.	0.	0.	0.
8	0.9773	0.	3.1854	0.4408	0.8897	0.8897	0.	0.	0.	0.
9	0.9783	0.	3.2020	0.4474	0.8812	0.8812	0.	0.	0.	0.
10	0.9793	0.	3.2211	0.4547	0.8722	0.8722	0.	0.	0.	0.
11	0.9803	0.	3.2431	0.4631	0.8622	0.8622	0.	0.	0.	0.
12	0.9814	0.	3.2685	0.4732	0.8505	0.8505	0.	0.	0.	0.
13	0.9823	0.	3.2967	0.4860	0.8352	0.8352	0.	0.	0.	0.
14	0.9827	0.	3.3280	0.5048	0.8115	0.8115	0.	0.	0.	0.
15	0.9828	0.	3.3744	0.5361	0.7745	0.7745	0.	0.	0.	0.

STATION 13

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	ABSOLUTE VELOCITY	VELOCITY ANGLES	RELATIVE VELOCITIES	TEMPERATURES	PRESSURES	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RADIAL CURVATURE	STATIC DENSITY	LOCATION
TIEN		VERTICAL, TANGENTIAL	INLET, OUTLET	INLET, OUTLET	TOTAL, STATIC	TOTAL, STATIC						TIEN
1	7.7467	910.056	865.559	281.087	734.7	665.7	0.7198	17.991	-1.304	-5.77	0.1286	1
2	7.7959	896.739	853.333	275.615	735.7	668.8	0.7076	17.900	-1.003	-5.05	0.1297	2
3	7.8470	943.579	941.224	270.286	736.8	671.3	0.6957	17.812	-0.680	-5.47	0.1308	3
4	7.9000	871.251	829.776	265.013	738.1	674.9	0.6844	17.750	-0.336	-7.03	0.1316	4
5	7.9549	862.251	821.402	262.249	739.7	677.9	0.6758	17.707	0.021	-7.75	0.1322	5
6	8.0114	857.759	817.288	260.367	741.3	680.6	0.6710	17.671	0.371	-8.73	0.1327	6
7	8.0695	857.362	817.451	260.197	744.3	683.1	0.6698	17.656	0.690	-10.10	0.1330	7
8	8.1293	861.623	820.983	261.495	747.3	685.5	0.6715	17.667	0.961	-12.07	0.1331	8
9	8.1933	868.439	827.305	263.105	750.7	688.0	0.6757	17.705	1.171	-14.93	0.1330	9
10	8.2593	878.302	836.363	263.164	754.5	693.3	0.6822	17.778	1.314	-19.72	0.1328	10
11	8.3130	891.416	849.317	273.828	758.9	692.8	0.6911	17.890	1.381	-28.55	0.1323	11
12	8.3759	908.028	863.234	281.679	764.1	695.8	0.7026	18.072	1.368	-48.50	0.1316	12
13	8.4395	926.788	879.576	292.030	770.8	699.3	0.7152	18.367	1.275	-142.99	0.1307	13
14	8.5040	948.235	896.904	307.752	780.5	705.7	0.7284	18.939	1.095	179.20	0.1292	14
15	8.5592	978.542	922.397	326.993	796.8	717.1	0.7458	19.520	0.826	54.77	0.1268	15

STATION 13 IS AT THE EXIT OF A BLADE ROW ROTATING AT 0. RPM.

STREAM -LINE	RELATIVE GAS ANGLES	RELATIVE VELOCITIES	LOSS COEFF	DE HALL NUMBER	DIFFUSION FACTOR	DELTA P UPON Q	BLADE SPEEDS	STREAM -LINE
INLET, OUTLET	INLET, OUTLET	INLET, OUTLET	INLET, OUTLET	INLET, OUTLET	INLET, OUTLET	INLET, OUTLET	INLET, OUTLET	INLET, OUTLET
1	30.849	1090.279	910.056	0.3824	0.835	0.2092	0.	1
2	30.795	1085.219	896.739	0.8770	0.826	0.2247	0.	2
3	30.743	1077.554	883.579	0.8691	0.820	0.2362	0.	3
4	30.733	1067.837	871.251	0.8592	0.816	0.2436	0.	4
5	30.753	1058.184	862.251	0.8493	0.815	0.2466	0.	5
6	30.772	1050.028	857.759	0.8405	0.817	0.2457	0.	6
7	30.817	1044.756	857.862	0.8340	0.821	0.2413	0.	7
8	30.889	1042.447	861.623	0.8300	0.827	0.2351	0.	8
9	30.989	1043.046	868.438	0.8284	0.833	0.2281	0.	9
10	31.130	1047.115	878.302	0.8297	0.839	0.2208	0.	10
11	31.319	1054.747	891.416	0.8338	0.845	0.2132	0.	11
12	31.619	1065.572	908.028	0.8404	0.852	0.2049	0.	12
13	32.114	1078.551	926.788	0.8479	0.859	0.1958	0.	13
14	33.148	1092.090	948.235	0.8544	0.868	0.1853	0.	14
15	34.175	1109.151	978.542	0.8589	0.882	0.1608	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	STATION-TO-STATION-PARAMETERS DELTA T ON T	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	INLET-TO-STATION-PARAMETERS DELTA T ON T	MEAN PARAMETERS PRESSURE RATIO	MEAN PARAMETERS DELTA T ON T	MEAN PARAMETERS ISEN% EFFICY.	STATION-TO-STATION INLET-TO-STATION PRESSURE RATIO	STATION-TO-STATION DELTA T ON T	STATION-TO-STATION ISEN% EFFICY.
1	0.9683	0.	3.0453	0.4163	0.8992	0.8992	0.	0.9771	0.	0.
2	0.9700	0.	3.0534	0.4184	0.8973	0.8973	0.	0.	0.	0.
3	0.9714	0.	3.0584	0.4205	0.8944	0.8944	0.	0.	0.	0.
4	0.9723	0.	3.0612	0.4230	0.8899	0.8899	0.	0.	0.	0.
5	0.9733	0.	3.0670	0.4261	0.8851	0.8851	0.	0.	0.	0.
6	0.9745	0.	3.0776	0.4301	0.8801	0.8801	0.	0.	0.	0.
7	0.9757	0.	3.0931	0.4350	0.8747	0.8747	0.	0.	0.	0.
8	0.9767	0.	3.1112	0.4408	0.8685	0.8685	0.	0.	0.	0.
9	0.9779	0.	3.1311	0.4474	0.8614	0.8614	0.	0.	0.	0.
10	0.9789	0.	3.1532	0.4547	0.8536	0.8536	0.	0.	0.	0.
11	0.9799	0.	3.1780	0.4631	0.8448	0.8448	0.	0.	0.	0.
12	0.9811	0.	3.2067	0.4732	0.8343	0.8343	0.	0.	0.	0.
13	0.9820	0.	3.2373	0.4860	0.8202	0.8202	0.	0.	0.	0.
14	0.9825	0.	3.2697	0.5048	0.7975	0.7975	0.	0.	0.	0.
15	0.9825	0.	3.3153	0.5361	0.7612	0.7612	0.	0.	0.	0.

STATION 14

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITY ABSOLUTE	VELOCITY MERIDNL.	VELOCITY TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCATION
1	7.7077	685.758	681.424	76.977	734.7	695.5	6232.71	5145.36	0.5306	6.445	-3.359	25.42	0.1367	1
2	7.7637	690.513	686.404	76.130	735.7	696.0	6260.87	5155.62	0.5342	6.329	-2.857	23.34	0.1389	2
3	7.8212	693.750	689.671	75.124	736.8	696.7	6279.91	5163.45	0.5363	6.217	-2.354	21.74	0.1390	3
4	7.8802	696.180	692.217	74.172	738.1	697.6	6293.61	5169.27	0.5378	6.115	-1.843	20.55	0.1389	4
5	7.9407	700.599	696.726	73.562	739.7	698.9	6312.01	5173.35	0.5408	6.027	-1.332	19.55	0.1388	5
6	8.0024	708.543	704.925	73.463	741.9	700.0	6341.27	5175.81	0.5466	5.950	-0.836	18.41	0.1387	6
7	8.0651	720.260	716.454	73.940	744.3	701.2	6381.79	5176.81	0.5551	5.892	-0.377	17.25	0.1385	7
8	8.1292	733.583	729.754	74.859	747.3	702.5	6427.21	5176.44	0.5648	5.847	0.030	16.45	0.1382	8
9	8.1919	748.014	744.122	76.206	750.7	704.2	6475.92	5174.79	0.5752	5.817	0.378	15.50	0.1378	9
10	8.2551	763.572	759.671	78.066	754.5	705.0	6527.76	5171.84	0.5865	5.867	0.664	-11.66	0.1374	10
11	8.3205	781.633	777.466	80.603	758.9	708.1	6587.97	5167.50	0.5994	5.919	0.880	-24.84	0.1369	11
12	8.4426	801.757	797.350	83.547	764.1	710.6	6655.40	5161.60	0.6138	6.010	1.022	-175.22	0.1352	12
13	8.5145	823.260	818.520	86.219	770.8	714.4	6725.39	5153.87	0.6286	6.152	1.092	-155.39	0.1353	13
14	8.5797	845.549	841.303	94.087	780.5	720.9	6794.77	5143.76	0.6434	6.381	1.096	-165.19	0.1338	14
15	8.5797	878.733	872.842	101.581	796.8	732.5	6890.30	5132.68	0.6636	6.638	1.033	-260.27	0.1314	15

STATION 15

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITY		TEMPERATURES		TOTAL	PRESSURES		MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTR.	STATIC DENSITY	LOCA TION
		ABSOLUTE	TANGENTIAL	INLET	OUTLET		STATIC	STATIC						
1	7.5819	576.969	576.869	0.	736.7	707.0	6019.96	5261.97	0.4428	0.	-1.473	13.14	0.1396	1
2	7.7432	593.753	593.753	0.	735.7	706.4	6060.29	5255.28	0.4559	0.	-1.258	15.70	0.1395	2
3	7.8054	605.771	605.771	0.	736.8	706.3	6088.20	5249.33	0.4652	0.	-1.041	19.18	0.1394	3
4	7.8687	614.809	614.809	0.	738.1	706.7	6138.43	5244.29	0.4720	0.	-0.806	25.00	0.1392	4
5	7.9330	624.855	624.855	0.	739.7	707.2	6133.11	5240.32	0.4795	0.	-0.567	35.18	0.1390	5
6	7.9981	638.411	638.411	0.	741.8	707.9	6173.41	5237.53	0.4897	0.	-0.323	60.01	0.1388	6
7	8.0637	654.366	654.366	0.	744.3	708.7	6217.46	5235.95	0.5016	0.	-0.092	169.87	0.1386	7
8	8.1295	671.451	671.451	0.	747.3	709.8	6270.65	5235.62	0.5143	0.	0.109	-284.27	0.1383	8
9	8.1953	688.291	688.291	0.	750.7	711.3	6325.40	5236.47	0.5266	0.	0.284	-85.24	0.1381	9
10	8.2613	705.510	705.510	0.	754.5	713.1	6383.80	5238.43	0.5391	0.	0.422	-54.43	0.1378	10
11	8.3271	724.340	724.340	0.	758.9	715.3	6450.21	5241.40	0.5527	0.	0.524	-42.39	0.1374	11
12	8.3928	744.816	744.816	0.	764.1	718.0	6526.50	5245.18	0.5672	0.	0.583	-37.02	0.1370	12
13	8.4583	765.481	765.481	0.	770.8	722.0	6599.80	5249.57	0.5814	0.	0.602	-34.86	0.1364	13
14	8.5237	786.255	786.255	0.	780.5	729.1	6671.54	5254.34	0.5942	0.	0.584	-34.83	0.1352	14
15	8.5891	814.975	814.975	0.	796.8	741.5	6765.34	5259.44	0.6107	0.	0.537	-35.88	0.1330	15

STATION 15 IS AT THE EXIT OF A BLADE ROW ROTATING AT 0. RPM.

STREAM -LINE	OPT. IN.	RELATIVE GAS ANGLES		RELATIVE VELOCITIES		RELATIVE MACH NO.'S		LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	BLADE SPEEDS		STREAM -LINE
		INLET	OUTLET	INLET	OUTLET	INLET	OUTLET				INLET	OUTLET	
1	6.445	0.	685.758	576.869	0.5306	0.4428	0.2551	0.841	0.	0.	0.1072	0.	1
2	5.329	-0.	690.613	593.753	0.5342	0.4559	0.2397	0.860	0.	0.	0.0902	0.	2
3	6.217	0.	693.750	605.771	0.5363	0.4552	0.2269	0.873	0.	0.	0.0769	0.	3
4	6.116	-0.	696.180	614.809	0.5378	0.4720	0.2172	0.883	0.	0.	0.0667	0.	4
5	5.027	0.	700.599	624.855	0.5408	0.4795	0.2080	0.892	0.	0.	0.0588	0.	5
6	5.950	-0.	708.343	638.411	0.5465	0.4897	0.1977	0.901	0.	0.	0.0530	0.	6
7	5.892	0.	720.250	654.366	0.5551	0.5016	0.1876	0.909	0.	0.	0.0491	0.	7
8	5.857	-0.	723.583	671.451	0.5648	0.5143	0.1779	0.915	0.	0.	0.0473	0.	8
9	5.847	0.	748.014	688.291	0.5752	0.5266	0.1694	0.920	0.	0.	0.0474	0.	9
10	5.867	-0.	763.672	705.510	0.5885	0.5391	0.1616	0.924	0.	0.	0.0491	0.	10
11	5.919	0.	781.633	724.340	0.5994	0.5527	0.1538	0.927	0.	0.	0.0520	0.	11
12	6.010	-0.	801.757	744.816	0.6139	0.5572	0.1461	0.929	0.	0.	0.0560	0.	12
13	6.152	0.	823.250	765.481	0.6286	0.5814	0.1406	0.930	0.	0.	0.0609	0.	13
14	6.381	-0.	846.548	786.255	0.6434	0.5942	0.1397	0.929	0.	0.	0.0670	0.	14
15	5.638	0.	878.733	814.975	0.6626	0.6107	0.1428	0.927	0.	0.	0.0721	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS			INLET-TO-STATION-PARAMETERS			MEAN PARAMETERS			STATION-TO-STATION			INLET-TO-STATION		
	RADIUS	DELTA T EFFICIENCY	ISENTHROPIC EFFICIENCY	DELTA T EFFICIENCY	DELTA T EFFICIENCY	DELTA T EFFICIENCY	PRESSURE RATIO	DELTA T ON T	ISEN. EFFICCY.	DELTA T ON T	DELTA T ON T	DELTA T ON T	DELTA T ON T	DELTA T ON T	DELTA T ON T
1	0.9659	0.	0.	2.8450	0.4163	0.8357									
2	0.9680	0.	0.	2.9640	0.4184	0.8379									
3	0.9695	0.	0.	2.8772	0.4205	0.8378									
4	0.9706	0.	0.	2.8868	0.4230	0.8358									
5	0.9717	0.	0.	2.8934	0.4261	0.8334									
6	0.9731	0.	0.	2.9161	0.4301	0.8311									
7	0.9743	0.	0.	2.9383	0.4350	0.8285									
8	0.9756	0.	0.	2.9634	0.4408	0.8252									
9	0.9768	0.	0.	2.9893	0.4474	0.8206									
10	0.9779	0.	0.	3.0152	0.4547	0.8153									
11	0.9791	0.	0.	3.0483	0.4631	0.8092									
12	0.9803	0.	0.	3.0834	0.4732	0.8015									
13	0.9813	0.	0.	3.1190	0.4860	0.7897									
14	0.9819	0.	0.	3.1529	0.5044	0.7588									
15	0.9819	0.	0.	3.1972	0.5241	0.7342									

STATION 16

GENERAL FLOW PARAMETERS

LOCAL TION	RADIUS	VELOCITY			TEMPERATURES			PRESSURES TOTAL	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCAL TION
		ABSOLUTE	MERIDIAN	TANGENTIAL	TOTAL	STATIC	STATIC							
1	7.5819	574.238	574.238	0.	734.7	707.2	5019.96	5268.55	0.4407	0.	-0.001	37533.06	0.1397	1
2	7.7423	588.591	588.591	0.	735.7	706.9	5050.29	5268.54	0.4518	0.	-0.021	4345.37	0.1393	2
3	7.8050	598.433	598.433	0.	736.8	707.0	6088.20	5268.51	0.4593	0.	-0.029	2976.35	0.1398	3
4	7.8583	605.672	605.672	0.	739.1	707.6	5108.43	5268.47	0.4647	0.	-0.026	3271.94	0.1396	4
5	7.9328	614.377	614.377	0.	739.7	708.3	6133.11	5268.44	0.4711	0.	-0.015	5161.99	0.1395	5
6	7.9981	627.123	627.123	0.	741.8	709.1	6170.41	5268.41	0.4806	0.	-0.001	36329.54	0.1394	6
7	8.0640	642.772	642.772	0.	744.3	710.0	6217.46	5268.43	0.4923	0.	0.	-6036.31	0.1392	7
8	8.1299	660.017	660.017	0.	747.3	711.1	5270.65	5268.44	0.5051	0.	0.034	-2392.25	0.1390	8
9	8.1960	677.396	677.396	0.	750.7	712.6	6525.40	5268.48	0.5179	0.	0.045	-2112.98	0.1387	9
10	8.2521	695.499	695.499	0.	754.5	714.3	6385.80	5268.54	0.5311	0.	0.053	-1794.59	0.1383	10
11	8.3279	715.513	715.513	0.	758.9	716.9	6450.21	5268.62	0.5456	0.	0.055	-1715.31	0.1379	11
12	8.3935	737.386	737.386	0.	764.1	718.9	6524.50	5268.69	0.5612	0.	0.050	-1869.23	0.1375	12
13	8.4588	759.559	759.559	0.	770.8	722.8	6599.80	5268.76	0.5766	0.	0.039	-2353.48	0.1367	13
14	8.5241	781.874	781.874	0.	780.5	729.7	6671.54	5268.81	0.5907	0.	0.023	-3921.91	0.1354	14
15	8.5891	812.186	812.186	0.	796.8	741.9	6745.34	5268.85	0.6085	0.	-0.000	50983.57	0.1332	15

STATION 17

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	ABSOLUTE VELOCITY	VELOCITY MERIDIONAL	VELOCITY TANGENTIAL	TEMPERATURES TOTAL	TEMPERATURES STATIC	TEMPERATURES TOTAL	PRESSURES STATIC	PRESSURES TOTAL	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVATURE	STATIC DENSITY	LOCA TION
1	7.5920	574.448	574.448	0.	734.7	707.2	6019.96	5268.03	0.4408	0.	0.004	0.	0.	0.1397	1
2	7.7430	588.792	588.792	0.	735.7	706.9	6053.29	5268.02	0.4519	0.	0.003	0.	0.	0.1399	2
3	7.8051	598.621	598.621	0.	736.8	707.0	6088.20	5268.02	0.4594	0.	0.002	0.	0.	0.1397	3
4	7.9533	605.846	605.846	0.	738.1	707.6	6138.43	5268.01	0.4648	0.	0.002	0.	0.	0.1396	4
5	7.9228	614.539	614.539	0.	739.7	708.3	6193.11	5268.00	0.4712	0.	0.001	0.	0.	0.1395	5
6	7.9981	627.273	627.273	0.	741.8	709.0	6270.41	5267.99	0.4807	0.	0.000	0.	0.	0.1393	6
7	8.0640	642.933	642.933	0.	744.3	709.9	6217.46	5267.97	0.4924	0.	0.	0.	0.	0.1392	7
8	8.1299	660.181	660.181	0.	747.3	711.1	6270.65	5267.97	0.5052	0.	-0.001	0.	0.	0.1389	8
9	8.1959	677.575	677.575	0.	750.7	712.5	6325.40	5267.96	0.5180	0.	-0.001	0.	0.	0.1387	9
10	8.2620	695.697	695.697	0.	754.5	714.3	6383.80	5267.95	0.5312	0.	-0.001	0.	0.	0.1383	10
11	8.3279	715.733	715.733	0.	758.9	716.3	6450.21	5267.94	0.5457	0.	-0.002	0.	0.	0.1379	11
12	8.3935	737.527	737.527	0.	754.1	718.9	6524.50	5267.93	0.5614	0.	-0.002	0.	0.	0.1374	12
13	8.4588	759.818	759.818	0.	770.8	722.7	6599.90	5267.92	0.5768	0.	-0.003	0.	0.	0.1367	13
14	8.5240	782.143	782.143	0.	780.5	723.6	6671.54	5267.90	0.5909	0.	-0.003	0.	0.	0.1354	14
15	8.5890	812.468	812.468	0.	796.8	741.9	6755.34	5267.90	0.6087	0.	-0.004	0.	0.	0.1332	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION PRESSURE RATIO	STATION-TO-STATION ISENTROPIC EFFICIENCY	INLET-TO-STATION PRESSURE RATIO	INLET-TO-STATION ISENTROPIC EFFICIENCY	MEAN PRESSURE RATIO	STATION-TO-STATION DELTA T ON T	INLET-TO-STATION ISEN. EFFICIENCY
1	1.0000	0.	2.8450	0.4163	0.8357	0.	0.
2	1.0000	0.	2.3660	0.4184	0.8378	0.	0.
3	1.0000	0.	2.8772	0.4205	0.8378	0.	0.
4	1.0000	0.	2.8868	0.4230	0.8358	0.	0.
5	1.0000	0.	2.8984	0.4261	0.8334	0.	0.
6	1.0000	0.	2.9161	0.4301	0.8311	0.	0.
7	1.0000	0.	2.9393	0.4350	0.8285	0.	0.
8	1.0000	0.	2.9634	0.4408	0.8252	0.	0.
9	1.0000	0.	2.9993	0.4474	0.8205	0.	0.
10	1.0000	0.	3.0159	0.4547	0.8153	0.	0.
11	1.0000	0.	3.0483	0.4631	0.8092	0.	0.
12	1.0000	0.	3.0834	0.4732	0.8015	0.	0.
13	1.0000	0.	3.1190	0.4860	0.7897	0.	0.
14	1.0000	0.	3.1529	0.5048	0.7688	0.	0.
15	1.0000	0.	3.1972	0.5361	0.7342	0.	0.

SECTION V
FINAL STAGE CONFIGURATION

1. DESIGN POINT

The following figures are consistent with the data given in Section II:

Design speed (corrected to SLS)	20371.4 rpm
Design flow (corrected to SLS)	30.0 lbs/sec
Design total pressure ratio	3.0 : 1

2. ANNULUS GEOMETRY

Figure 20 shows the flowpath including inlet bell mouth, compressor proper, and exhaust that will be incorporated into the compressor test facility. Details of the inner wall (hub) of the compressor annulus are shown in Fig 21; Fig 22 shows details of the compressor outer wall (casing). In each of these figures the origin of the axial coordinates is the same as was used for the aerodynamic design calculations; that is, the rotor leading edge.

3. ROTOR GEOMETRY

a. Number of Blades

The rotor contains 30 blades.

b. Blade Form

The rotor blade design was produced by determining profiles on 15 streamsurfaces, and then stacking the sections to complete the blade definition. In order to create data convenient for the manufacturing process, coordinates of plane sections through the blade perpendicular to the stack axis were interpolated (and extrapolated) by a "spline-curve" method. A brief description of the (streamsurface) airfoil sections was given in Section II of this report; Ref 2 gives a full description of the section, the stacking procedure, and the method of interpolating (or extrapolating) the "manufacturing" section data. A computer program to perform the necessary calculations was also presented in Ref 2. For this design, it was convenient to use a slightly modified form of this program. The program was amended so that the entire blade construction was performed a specified number of times. Input data to each pass (after the first) was based on the results of the preceding pass so that the axially-projected chord of each section would equal the desired value of 2.0 (inches), and so that

the blade leading edge, at all radii, would lie at the desired location, that is $x = 0$. Changes in the original input data were made to the stacking point location, the meridionally-projected section chord lengths, and the x-direction stacking offsets of the sections. Thus the resulting blade exactly matched the allocated space in the aerodynamic calculations. These iterations could have been made "by hand" using the program as published in Ref 2; the modified program enabled the desired result to be obtained from one run. Five iterations were made; in fact an acceptable result for all practical purposes was achieved after two or three iterations.

Shown on following pages is computer program output for the rotor blade design. All dimensions are in inches. First appear sundry constants and a definition of the 15 streamsurfaces. The streamsurfaces are defined at eight axial locations which coincide with eight of the computing stations used for the aerodynamic design calculations. The origin for the axial locations of the stations is the same as was used for the aerodynamic analyses. The input data printout is completed with a table defining the geometry of each section. A detailed description of the significance of each input data item is given in Ref 2, but it should be noted that, in accord with the program modification described above, the stacking point location, the section meridionally-projected chord lengths, and the x-direction offsets are first-estimates only. Next are shown details of the 15 streamsurface sections. Only the "normalized" data has been reproduced; the equivalent dimensional data would be derived by scaling the non-dimensional quantities by the meridional chord of the section (or the appropriate power thereof). Finally, details are shown of 11 manufacturing sections through the blade. These plane sections perpendicular to the stack axis are spaced 1/4-inch apart, and extend slightly beyond the blade in both directions. The "Z" coordinate is measured along the stack axis from the machine axis. The origin for the section coordinates is the stack axis. The "X" direction is parallel to the machine axis, and the coordinate increases in the direction of flow. The "Y" direction is perpendicular to the "X" direction, and the "Y" coordinate decreases in the direction of rotation. "XS" and "YS" define the suction surface of the section, and "XP" and "YP" define the pressure surface. "XSEMI" and "YSEMI" define the leading edge radius. The trailing edge is a straight line joining the pressure and suction surfaces. The data reproduced shows 50 points per blade surface; for manufacturing purposes the program was run with 120 points per surface specified.

Figure 23 shows superimposed plots of developed streamsurface sections 1, 3, 5 . . . 15. Figure 24 shows similar views of manufacturing sections 1, 3, 5 . . . 11. Extrapolation of the blade to planes beyond the hub and casing causes the larger changes in section along the blade that are seen in Fig 24, relative to Fig 23.

c. Location of Stack Axis

The rotor stack axis is located at an axial coordinate of 0.9791 inches, measured from the same origin as was used to define the annulus geometry.

d. Root Fillet

Between points $3/4$ -inch in from the leading and trailing edges of the blade, the root fillet is a $1/4$ -inch radius, on both sides of the blade. The fillet is smoothly decreased to $1/16$ -inch radius at the blade edges.

USAF - ARLIARF) HIGH MACH NUMBER COMPRESSOR BLADE PROGRAM

= FINAL ROTOR BLADE PHYSICAL CHARACTERISTICS

TITLE
 NUMBER OF STREAMSURFACES = 15
 NUMBER OF STATIONS = 8
 NUMBER OF CONSTANT-Z PLANES = 11
 NUMBER OF BLADE DATA POINTS = 8
 NUMBER OF POINTS ON SURFACES = 50
 ISECN = 0
 IFCORD = 0
 IFPLOT = 0
 IPRINT = 0
 ZINER = 6.5000
 ZOUTER = 9.0000
 SCALE = 10.0000
 STACKX = 0.9800

STREAMSURFACE GEOMETRY SPECIFICATION

STATION NUMBER 1 XCL = -0.4000 ANGLN = -0.

STREAMLINE NUMBER	RADII
1	6.6016
2	6.7715
3	6.9415
4	7.1115
5	7.2818
6	7.4526
7	7.6242
8	7.7963
9	7.9693
10	8.1438
11	8.3196
12	8.4974
13	8.6777
14	8.8617
15	9.0500

ANGLN= -0.

XCL= 0.

STATION NUMBER 2

RADII

STREAMLINE
NUMBER

1	6.7586
2	6.9122
3	7.0673
4	7.2230
5	7.3793
6	7.5362
7	7.6938
8	7.8517
9	8.0102
10	8.1698
11	8.3303
12	8.4920
13	8.6555
14	8.8214
15	8.9900

ANGLN= -0.

XCL= 0.4000

STATION NUMBER 3

RADII

STREAMLINE
NUMBER

1	6.9066
2	7.0517
3	7.1961
4	7.3396
5	7.4826
6	7.6252
7	7.7681
8	7.9107
9	8.0537
10	8.1971
11	8.3407
12	8.4848
13	8.6296
14	8.7756
15	8.9231

STATION NUMBER 4 XCL= 0.8000 ANGLN= -0.

STREAMLINE NUMBER	RADII
1	7.0871
2	7.2216
3	7.3529
4	7.4816
5	7.6084
6	7.7339
7	7.8588
8	7.9828
9	8.1066
10	8.2306
11	8.3543
12	8.4784
13	8.6030
14	8.7288
15	8.8562

STATION NUMBER 5 XCL= 1.2000 ANGLN= -0.

STREAMLINE NUMBER	RADII
1	7.3207
2	7.4228
3	7.5241
4	7.6251
5	7.7262
6	7.8278
7	7.9302
8	8.0333
9	8.1374
10	8.2427
11	8.3488
12	8.4562
13	8.5649
14	8.6757
15	8.7894

STATION NUMBER 6 XCL= 1.6000 ANGL= -0.

STREAMLINE
NUMBER

RADII
1 7.4879
2 7.5628
3 7.6395
4 7.7181
5 7.7987
6 7.8813
7 7.9662
8 8.0530
9 8.1417
10 8.2325
11 8.3251
12 8.4197
13 8.5166
14 8.6169
15 8.7225

STATION NUMBER 7 XCL= 2.0000 ANGL= -0.

STREAMLINE
NUMBER

RADII
1 7.5585
2 7.6211
3 7.6864
4 7.7541
5 7.8243
6 7.8969
7 7.9720
8 8.0492
9 8.1285
10 8.2100
11 8.2934
12 8.3789
13 8.4667
14 8.5580
15 8.6556

STATION NUMBER 8 XCL= 2.3000 ANGLN= -0.

STREAMLINE RADIi
NUMBER

- 1 7.5840
- 2 7.6448
- 3 7.7078
- 4 7.7728
- 5 7.8398
- 6 7.9087
- 7 7.9797
- 8 8.0524
- 9 8.1271
- 10 8.2038
- 11 8.2824
- 12 8.3633
- 13 8.4469
- 14 8.5344
- 15 8.6279

SECTION GEOMETRY SPECIFICATION

STREAMLINE NUMBER	INLET ANGLE	OUTLET ANGLE	Y2 LE/ MAX VALUE	Y2 TE/ MAX VALUE	LE RADIUS /CHORD	MAX THICK /CHORD	TE THICK /2*CHORD	POINT OF MAX THICK	CHORD OR AXIAL CD	X STACK OFFSET	Y STACK OFFSET
1.00	61.549	12.455	0.	0.5000	0.00155	0.04857	0.00804	0.7000	2.1703	-0.	-0.
3.00	61.806	15.466	0.	0.5000	0.00159	0.04536	0.00756	0.7000	2.1048	-0.	-0.
5.00	62.162	18.238	0.	0.5000	0.00158	0.04238	0.00706	0.7000	2.0572	-0.	-0.
7.00	62.628	20.362	0.	0.5000	0.00157	0.03962	0.00660	0.7000	2.0253	-0.	-0.
9.00	63.179	21.875	0.	0.5000	0.00155	0.03722	0.00620	0.7000	2.0075	-0.	-0.
11.00	63.701	23.143	0.	0.5000	0.00152	0.03511	0.00585	0.7000	2.0025	-0.	-0.
13.00	64.180	24.053	0.	0.5000	0.00150	0.03317	0.00553	0.7000	2.0096	-0.	-0.
15.00	64.705	24.317	0.	0.5000	0.00146	0.03129	0.00521	0.7000	2.0295	-0.	-0.

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 1

P = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 Q = 61.549 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETAI = 12.455 (BLADE INLET ANGLE.)
 BETAZ = 0.00155 (BLADE OUTLET ANGLE.)
 YZERO = 0.04857 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YONE = 0.00809 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CORD = 2.1700 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5002
 STAGGER ANGLE = 48.306
 CAMBER ANGLE = 49.094
 SECTION AREA = 0.07856

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49436
 YBAR = 0.73090

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00604
 IY = 0.00446
 IXY = 0.00504

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -40.548

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01035 (AT -40.548 WITH 'X' AXIS)
 IPY = 0.00014 (AT -40.548 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E		C A T A		SURFACE COORDINATE DATA			
	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP
1	0.00232	0.	61.549	0.00464	0.00028	0.00111	0.00436	-0.00111
2	0.02263	0.03747	61.529	0.00867	0.01882	0.03953	0.02644	0.03540
3	0.04294	0.07487	61.469	0.01269	0.03736	0.07790	0.04851	0.07184
4	0.06324	0.11215	61.371	0.01666	0.05593	0.11615	0.07056	0.10816
5	0.08355	0.14925	61.234	0.02059	0.07453	0.15421	0.09258	0.14430
6	0.10386	0.18612	61.061	0.02445	0.09316	0.19203	0.11456	0.18020
7	0.12417	0.22289	60.850	0.02822	0.11184	0.22956	0.13649	0.21582
8	0.14447	0.25892	60.602	0.03189	0.13058	0.26675	0.15837	0.25109
9	0.16478	0.29476	60.317	0.03546	0.14938	0.30354	0.18018	0.28598
10	0.18509	0.33016	59.994	0.03890	0.16825	0.33989	0.20193	0.32043
11	0.20540	0.36508	59.634	0.04220	0.18719	0.37574	0.22360	0.35441
12	0.22570	0.39947	59.235	0.04536	0.20621	0.41107	0.24519	0.38786
13	0.24601	0.43329	58.796	0.04837	0.22533	0.44582	0.26670	0.42076
14	0.26632	0.46651	58.317	0.05121	0.24453	0.47995	0.28811	0.45306
15	0.28662	0.49908	57.798	0.05388	0.26383	0.51344	0.30942	0.48472

POINT NUMBER	M E A N I N E C A T A			SURFACE COORDINATE DATA				
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP	
16	0.30693	0.53098	57.235	0.05638	0.28323	0.54624	0.33064	0.51573
17	0.32724	0.56218	56.629	0.05871	0.30272	0.57832	0.35175	0.54603
18	0.34755	0.59264	55.978	0.06085	0.32233	0.60966	0.37276	0.57561
19	0.36785	0.62233	55.281	0.06281	0.34204	0.64022	0.39367	0.60445
20	0.38816	0.65124	54.536	0.06459	0.36186	0.66998	0.41447	0.63251
21	0.40847	0.67934	53.741	0.06619	0.38178	0.69891	0.43515	0.65977
22	0.42878	0.70661	52.895	0.06760	0.40182	0.72700	0.45573	0.68622
23	0.44908	0.73303	51.996	0.06884	0.42196	0.75422	0.47621	0.71183
24	0.46939	0.75858	51.043	0.06991	0.44221	0.78056	0.49657	0.73660
25	0.48970	0.78326	50.035	0.07080	0.46257	0.80599	0.51683	0.76052
26	0.51001	0.80704	48.969	0.07152	0.48303	0.83052	0.53698	0.78356
27	0.53031	0.82992	47.846	0.07209	0.50359	0.85411	0.55703	0.80573
28	0.55062	0.85190	46.663	0.07250	0.52426	0.87678	0.57698	0.82702
29	0.57093	0.87297	45.422	0.07275	0.54502	0.89850	0.59684	0.84743
30	0.59123	0.89312	44.121	0.07286	0.56587	0.91927	0.61660	0.86696
31	0.61154	0.91235	42.761	0.07283	0.58682	0.93909	0.63627	0.88562
32	0.63185	0.93068	41.343	0.07264	0.60786	0.95794	0.65584	0.90341
33	0.65216	0.94809	39.869	0.07227	0.62899	0.97582	0.67532	0.92036
34	0.67246	0.96460	38.342	0.07169	0.65023	0.99271	0.69470	0.93649
35	0.69277	0.98022	36.765	0.07088	0.67156	1.00861	0.71398	0.95182
36	0.71308	0.99495	35.142	0.06984	0.69298	1.02351	0.73318	0.96639
37	0.73339	1.00881	33.480	0.06855	0.71448	1.03740	0.75229	0.98022
38	0.75369	1.02182	31.784	0.06700	0.73605	1.05029	0.77134	0.99334
39	0.77400	1.03398	30.063	0.06517	0.75768	1.06219	0.79032	1.00578
40	0.79431	1.04533	28.325	0.06306	0.77935	1.07309	0.80927	1.01758
41	0.81461	1.05588	26.579	0.06066	0.80104	1.08301	0.82819	1.02876
42	0.83492	1.06566	24.838	0.05796	0.82275	1.09196	0.84710	1.03936
43	0.85523	1.07469	23.111	0.05495	0.84445	1.09996	0.86601	1.04942
44	0.87554	1.08300	21.410	0.05162	0.86612	1.10703	0.88496	1.05897
45	0.89584	1.09063	19.749	0.04796	0.88774	1.11320	0.90395	1.06806
46	0.91615	1.09760	18.139	0.04396	0.90931	1.11848	0.92299	1.07671
47	0.93646	1.10394	16.593	0.03960	0.93080	1.12292	0.94211	1.08497
48	0.95677	1.10971	15.122	0.03488	0.95222	1.12655	0.96132	1.09287
49	0.97707	1.11493	13.739	0.02978	0.97354	1.12940	0.98061	1.10047
50	0.99738	1.11965	12.455	0.02429	0.99476	1.13151	1.00000	1.10780

STREAMSURFACE GEOMETRY OH STREAMLINE NUMBER 2

P = 0.
 Q = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETA1 = 61.670 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETA2 = 13.957 (BLADE INLET ANGLE.)
 YZERO = 0.00157 (BLADE OUTLET ANGLE.)
 T = 0.04695 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YONE = 0.00782 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CORD = 2.1352 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF PEAK LINE.)
 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5129
 STAGGER ANGLE = 48.742
 CAMBER ANGLE = 47.713
 SECTION AREA = 0.07717

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49449
 YBAR = 0.73749

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00610
 IY = 0.00438
 IXY = 0.00503

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -40.144

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01035 (AT -40.144 WITH 'X' AXIS)
 IPY = 0.00013 (AT -40.144 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A		A N G L E T H I C K N E S S			S U R F A C E C O O R D I N A T E D A T A			
	X	Y	X	Y	Z	XS	YS	XP	YP
1	0.00278	0.00000	61.670	0.00476		0.00028	0.00113	0.00447	-0.00113
2	0.02268	0.03765	61.650	0.00866		0.01887	0.03970	0.02649	0.03559
3	0.04298	0.07523	61.591	0.01255		0.03746	0.07821	0.04850	0.07225
4	0.06328	0.11269	61.495	0.01640		0.05608	0.11661	0.07049	0.10878
5	0.08358	0.14998	61.361	0.02020		0.07472	0.15482	0.09245	0.14514
6	0.10389	0.18703	61.191	0.02394		0.09340	0.19279	0.11437	0.18126
7	0.12419	0.22379	60.984	0.02759		0.11212	0.23048	0.13625	0.21710
8	0.14449	0.26021	60.741	0.03115		0.13090	0.26782	0.15808	0.25260
9	0.16479	0.29625	60.462	0.03461		0.14973	0.30476	0.17985	0.28771
10	0.18509	0.33185	60.146	0.03794		0.16864	0.34129	0.20155	0.32240
11	0.20539	0.36697	59.792	0.04115		0.18761	0.37732	0.22317	0.35662
12	0.22569	0.40158	59.402	0.04422		0.20666	0.41283	0.24472	0.39032
13	0.24600	0.43562	58.972	0.04713		0.22580	0.44777	0.26619	0.42347
14	0.26630	0.46906	58.504	0.04989		0.24503	0.48210	0.28757	0.45603
15	0.28660	0.50188	57.996	0.05249		0.26434	0.51579	0.30885	0.48797

POINT NUMBER	M E A N L I N E A N G L E T H I C K N E S S			S U R F A C E C O O R D I N A T E D A T A		
	X	Y	ANGLE	XS	YS	XP
16	0.30690	0.53402	57.446	0.54880	0.33005	0.51924
17	0.32720	0.56547	56.854	0.58110	0.35114	0.54983
18	0.34750	0.59619	56.218	0.61266	0.37213	0.57971
19	0.36780	0.62615	55.537	0.64346	0.39302	0.60884
20	0.38810	0.65554	54.810	0.67348	0.41391	0.63721
21	0.40841	0.68372	54.035	0.70265	0.43450	0.66479
22	0.42871	0.71129	53.210	0.73100	0.45508	0.69157
23	0.44901	0.73801	52.335	0.75850	0.47555	0.71752
24	0.46931	0.76388	51.407	0.78512	0.49592	0.74264
25	0.48961	0.78888	50.426	0.81085	0.51620	0.76691
26	0.50991	0.81300	49.390	0.83568	0.53637	0.79032
27	0.53021	0.83623	48.298	0.85960	0.55644	0.81287
28	0.55052	0.85857	47.150	0.88259	0.57641	0.83455
29	0.57082	0.88000	45.945	0.90465	0.59629	0.85535
30	0.59112	0.90053	44.683	0.92578	0.61609	0.87529
31	0.61142	0.92016	43.364	0.94596	0.63579	0.89435
32	0.63172	0.93888	41.990	0.96520	0.65541	0.91256
33	0.65202	0.95671	40.562	0.98347	0.67493	0.92994
34	0.67232	0.97364	39.082	1.00077	0.69436	0.94651
35	0.69262	0.98968	37.555	1.01708	0.71369	0.96229
36	0.71293	1.00486	35.984	1.03242	0.73294	0.97730
37	0.73323	1.01917	34.375	1.04676	0.75210	0.99158
38	0.75353	1.03264	32.733	1.06012	0.77120	1.00515
39	0.77383	1.04528	31.066	1.07250	0.79023	1.01805
40	0.79413	1.05711	29.382	1.08390	0.80922	1.03031
41	0.81443	1.06815	27.691	1.09434	0.82818	1.04195
42	0.83473	1.07842	26.002	1.10383	0.84713	1.05302
43	0.85504	1.08796	24.327	1.11238	0.86607	1.06355
44	0.87534	1.09679	22.676	1.12001	0.88504	1.07357
45	0.89564	1.10494	21.062	1.12676	0.90404	1.08312
46	0.91594	1.11244	19.497	1.13264	0.92309	1.09224
47	0.93624	1.11932	17.941	1.13768	0.94220	1.10096
48	0.95654	1.12563	16.559	1.14193	0.96139	1.10934
49	0.97684	1.13141	15.210	1.14542	0.98065	1.11740
50	0.99714	1.13669	13.957	1.14818	1.00000	1.12520

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 3

P = 0.
Q = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1 = 61.806 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA2 = 15.446 (BLADE INLET ANGLE.)
YZERO = 0.00159 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T = 0.04536 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE = 0.00756 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z = 0.7000 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD = 2.1049 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5262
STAGGER ANGLE = 49.189
CAMBER ANGLE = 46.360
SECTION AREA = 0.07585

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49465
YBAR = 0.74463

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00618
IY = 0.00430
IXY = 0.00503

ANGLE OF INCLINATION OF (CNE) PRINCIPAL AXIS TO 'X' AXIS = -39.728

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01035 (AT -39.728 WITH 'X' AXIS)
IPY = 0.00013 (AT -39.728 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A		A N G L E T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A			
	X	Y	X	Y	XS	YS	XP	YP
1	0.00242	0.00000	61.806	0.00485	0.00029	0.00115	0.00456	-0.00115
2	0.02272	0.03185	61.787	0.00863	0.01892	0.03989	0.02652	0.03581
3	0.04302	0.07564	61.729	0.01239	0.03756	0.07858	0.04847	0.07271
4	0.06331	0.11331	61.634	0.01612	0.05622	0.11714	0.07041	0.10948
5	0.08361	0.15080	61.503	0.01981	0.07490	0.15553	0.09231	0.14608
6	0.10390	0.18806	61.336	0.02343	0.09363	0.19368	0.11418	0.18245
7	0.12420	0.22504	61.134	0.02697	0.11239	0.23155	0.13601	0.21853
8	0.14450	0.26168	60.896	0.03043	0.13120	0.26908	0.15779	0.25428
9	0.16479	0.29794	60.622	0.03378	0.15008	0.30623	0.17951	0.28966
10	0.18509	0.33377	60.312	0.03701	0.16901	0.34294	0.20116	0.32461
11	0.20538	0.36913	59.967	0.04012	0.18802	0.37917	0.22275	0.35909
12	0.22568	0.40397	59.584	0.04310	0.20710	0.41488	0.24426	0.39306
13	0.24598	0.43826	59.164	0.04593	0.22626	0.45003	0.26569	0.42649
14	0.26627	0.47196	58.706	0.04861	0.24550	0.48458	0.28704	0.45933
15	0.28657	0.50503	58.209	0.05113	0.26484	0.51849	0.30830	0.49156

POINT NUMBER	M F A N L I : I E D A T A			SURFACE COORDINATE DATA				
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP	
16	0.30686	0.53744	57.671	0.05350	0.28426	0.55174	0.32947	0.52313
17	0.32716	0.56915	57.093	0.05570	0.30378	0.58428	0.35054	0.55403
18	0.34746	0.60015	56.472	0.05773	0.32339	0.61610	0.37152	0.58421
19	0.36775	0.63041	55.808	0.05959	0.34311	0.64715	0.39240	0.61367
20	0.38805	0.65989	55.098	0.06128	0.36292	0.67742	0.41317	0.64236
21	0.40834	0.68859	54.342	0.06280	0.38283	0.70689	0.43385	0.67028
22	0.42864	0.71647	53.539	0.06415	0.40284	0.73553	0.45443	0.69741
23	0.44894	0.74352	52.687	0.06533	0.42296	0.76332	0.47491	0.72371
24	0.46923	0.76972	51.784	0.06635	0.44317	0.79024	0.49530	0.74920
25	0.48953	0.79506	50.829	0.06721	0.46348	0.81629	0.51558	0.77384
26	0.50982	0.81954	49.822	0.06791	0.48388	0.84144	0.53576	0.79763
27	0.53012	0.84313	48.761	0.06845	0.50438	0.86569	0.55586	0.82057
28	0.55042	0.86584	47.646	0.06885	0.52498	0.88903	0.57586	0.84265
29	0.57071	0.88766	46.477	0.06910	0.54566	0.91145	0.59576	0.86386
30	0.59101	0.90858	45.252	0.06922	0.56643	0.93295	0.61559	0.88422
31	0.61130	0.92861	43.974	0.06920	0.58728	0.95351	0.63533	0.90371
32	0.63160	0.94774	42.642	0.06903	0.60822	0.97314	0.65498	0.92235
33	0.65190	0.96599	41.258	0.06869	0.62925	0.99181	0.67454	0.94017
34	0.67219	0.98336	39.826	0.06815	0.65037	1.00953	0.69402	0.95718
35	0.69249	0.99985	38.347	0.06740	0.67158	1.02628	0.71340	0.97341
36	0.71278	1.01547	36.826	0.06643	0.69288	1.04206	0.73269	0.98889
37	0.73308	1.03025	35.268	0.06521	0.71425	1.05686	0.75190	1.00363
38	0.75338	1.04418	33.678	0.06373	0.73570	1.07070	0.77105	1.01766
39	0.77367	1.05730	32.064	0.06200	0.75721	1.08357	0.79013	1.03103
40	0.79397	1.06962	30.434	0.05999	0.77877	1.09548	0.80916	1.04375
41	0.81426	1.08115	28.795	0.05771	0.80036	1.10644	0.82816	1.05587
42	0.83456	1.09194	27.158	0.05513	0.82198	1.11646	0.84714	1.06741
43	0.85486	1.10199	25.534	0.05226	0.84359	1.12557	0.86612	1.07841
44	0.87515	1.11134	23.932	0.04909	0.86519	1.13377	0.88511	1.08890
45	0.89545	1.12001	22.364	0.04560	0.88677	1.14110	0.90412	1.09893
46	0.91574	1.12805	20.842	0.04179	0.90831	1.14757	0.92318	1.10852
47	0.93604	1.13548	19.378	0.03764	0.92979	1.15323	0.94228	1.11773
48	0.95633	1.14234	17.983	0.03315	0.95122	1.15810	0.96145	1.12658
49	0.97663	1.14867	16.669	0.02830	0.97257	1.16222	0.98069	1.13511
50	0.99693	1.15451	15.446	0.02308	0.99385	1.16563	1.00000	1.14339

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 4

P = 0.
 Q = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BET1 = 61.970 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BET2 = 16.898 (BLADE INLET ANGLE.)
 YZERO = 0.00159 (BLADE CUTLET ANGLE.)
 T = 0.04384 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YONE = 0.00731 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CORD = 2.0790 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5405
 STAGGER ANGLE = 49.656
 CAMBER ANGLE = 45.071
 SECTION AREA = 0.07465

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49481
 YBAR = 0.75267

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00627
 IY = 0.00424
 IXY = 0.00503

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -39.292

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01039 (AT -39.292 WITH 'X' AXIS)
 IPY = 0.00012 (AT -39.292 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E D A T A		A N G L E T H I C K N E S S			S U R F A C E C O O R D I N A T E D A T A		
	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP
1	0.00245	0.00000	61.970	0.00490	0.00029	0.00115	0.00461	-0.00115
2	0.02274	0.03810	61.951	0.00856	0.01896	0.04012	0.02652	0.03609
3	0.04303	0.07615	61.894	0.01222	0.03764	0.07902	0.04842	0.07327
4	0.06332	0.11407	61.802	0.01584	0.05634	0.11781	0.07030	0.11033
5	0.08361	0.15182	61.673	0.01941	0.07507	0.15643	0.09216	0.14721
6	0.10390	0.18934	61.510	0.02293	0.09383	0.19481	0.11398	0.18387
7	0.12420	0.22658	61.311	0.02637	0.11263	0.23291	0.13576	0.22025
8	0.14449	0.26348	61.078	0.02972	0.13148	0.27067	0.15750	0.25630
9	0.16478	0.30001	60.810	0.03298	0.15038	0.30805	0.17917	0.29197
10	0.18507	0.33611	60.506	0.03612	0.16935	0.34500	0.20079	0.32722
11	0.20536	0.37175	60.168	0.03914	0.18838	0.38148	0.22234	0.36201
12	0.22565	0.40687	59.794	0.04203	0.20749	0.41744	0.24382	0.39629
13	0.24594	0.44144	59.383	0.04479	0.22667	0.45285	0.26522	0.43004
14	0.26624	0.47543	58.935	0.04740	0.24594	0.48766	0.28654	0.46320
15	0.28653	0.50880	58.449	0.04985	0.26529	0.52184	0.30777	0.49576

POINT NUMBER	M E A S U R E M E N T S			A N G L E T H I C K N E S S			S U R F A C E C O O R D I N A T E D A T A							
	X	Y	Z	ANGLE	THICKNESS	THICKNESS	XS	YS	XP	YP	XS	YS	XP	YP
16	0.30682	0.54151	57.924	0.05216			0.28472	0.55536	0.32892	0.52766				
17	0.32711	0.57354	57.359	0.05430			0.30425	0.58819	0.34997	0.55890				
18	0.34740	0.60486	56.752	0.05628			0.32387	0.62029	0.37093	0.58943				
19	0.36769	0.63544	56.104	0.05809			0.34358	0.65164	0.39180	0.61924				
20	0.38798	0.66526	55.412	0.05974			0.36339	0.68221	0.41258	0.64830				
21	0.40828	0.69429	54.675	0.06122			0.38330	0.71199	0.43325	0.67659				
22	0.42857	0.72251	53.892	0.06254			0.40330	0.74094	0.45383	0.70408				
23	0.44886	0.74992	53.061	0.06370			0.42340	0.76906	0.47432	0.73078				
24	0.46915	0.77648	52.182	0.06470			0.44360	0.79632	0.49471	0.75665				
25	0.48944	0.80220	51.254	0.06554			0.46388	0.82271	0.51500	0.78169				
26	0.50973	0.82705	50.274	0.06623			0.48427	0.84822	0.53520	0.80589				
27	0.53002	0.85103	49.243	0.06676			0.50474	0.87283	0.55531	0.82924				
28	0.55032	0.87414	48.160	0.06716			0.52530	0.89654	0.57533	0.85174				
29	0.57061	0.89636	47.024	0.06741			0.54595	0.91933	0.59527	0.87338				
30	0.59090	0.91769	45.835	0.06753			0.56668	0.94122	0.61512	0.89417				
31	0.61119	0.93814	44.595	0.06751			0.58749	0.96218	0.63489	0.91410				
32	0.63148	0.95771	43.303	0.06736			0.60838	0.98222	0.65458	0.93320				
33	0.65177	0.97639	41.962	0.06703			0.62937	1.00131	0.67418	0.95147				
34	0.67207	0.99420	40.573	0.06651			0.65044	1.01946	0.69369	0.96894				
35	0.69236	1.01114	39.140	0.06578			0.67160	1.03666	0.71312	0.98563				
36	0.71265	1.02723	37.666	0.06483			0.69284	1.05289	0.73246	1.00157				
37	0.73294	1.04248	36.156	0.06365			0.71416	1.06817	0.75171	1.01678				
38	0.75323	1.05689	34.616	0.06221			0.73556	1.08249	0.77090	1.03129				
39	0.77352	1.07050	33.052	0.06052			0.75702	1.09586	0.79003	1.04513				
40	0.79381	1.08331	31.471	0.05856			0.77853	1.10828	0.80910	1.05833				
41	0.81411	1.09534	29.882	0.05633			0.80007	1.11976	0.82814	1.07092				
42	0.83440	1.10663	28.294	0.05382			0.82164	1.13033	0.84715	1.08294				
43	0.85469	1.11720	26.717	0.05101			0.84322	1.13998	0.86615	1.09442				
44	0.87498	1.12707	25.167	0.04791			0.86479	1.14875	0.88516	1.10539				
45	0.89527	1.13627	23.638	0.04450			0.88635	1.15666	0.90419	1.11584				
46	0.91556	1.14484	22.158	0.04077			0.90787	1.16372	0.92325	1.12576				
47	0.93585	1.15281	20.733	0.03672			0.92935	1.16998	0.94235	1.13564				
48	0.95615	1.16022	19.373	0.03234			0.95078	1.17547	0.96151	1.14496				
49	0.97644	1.16709	18.092	0.02760			0.97215	1.18021	0.98072	1.15398				
50	0.99673	1.17349	16.898	0.02251			0.99346	1.18426	1.00000	1.16272				

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 5

P = 0.
 Q = 0.5000 (OZYDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETAL = 62.162 (OZYDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETA2 = 18.238 (BLADE INLET ANGLE.)
 YZERO = 0.00158 (BLADE CUTLET ANGLE.)
 T = 0.04238 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YDHE = 0.00706 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CURD = 2.0573 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5554
 STAGGER ANGLE = 50.128
 CAMBER ANGLE = 43.924
 SECTION AREA = 0.07352

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49487
 YBAR = 0.76136

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00637
 IY = 0.00417
 IXY = 0.00504

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -38.846

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01043 (AT -38.846 WITH 'X' AXIS)
 IPY = 0.00011 (AT -38.846 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A		SURFACE COORDINATE DATA			
	X	Y	XS	YS	XP	YP
1	0.00246	0.00000	62.162	0.00492	0.00028	0.00115
2	0.02275	0.03841	62.143	0.00849	0.01900	0.04039
3	0.04304	0.07675	62.088	0.01204	0.03772	0.07957
4	0.06332	0.11498	61.997	0.01555	0.05646	0.11863
5	0.08361	0.15304	61.871	0.01903	0.07522	0.15752
6	0.10390	0.19086	61.711	0.02245	0.09402	0.19618
7	0.12419	0.22841	61.516	0.02579	0.11285	0.23456
8	0.14448	0.26563	61.287	0.02905	0.13174	0.27261
9	0.16476	0.30247	61.025	0.03221	0.15067	0.31027
10	0.18505	0.33889	60.727	0.03527	0.16957	0.34751
11	0.20534	0.37484	60.396	0.03821	0.18873	0.38428
12	0.22563	0.41029	60.029	0.04102	0.20766	0.42054
13	0.24591	0.44519	59.627	0.04371	0.22706	0.45624
14	0.26620	0.47951	59.188	0.04624	0.24634	0.49135
15	0.28649	0.51321	58.713	0.04864	0.26571	0.52584
						0.30727
						0.50058

POINT NUMBER	M E A N L I N E D A T A			SURFACE COORDINATE DATA				
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP	
16	0.30678	0.54627	58.199	0.05088	0.28516	0.55967	0.32840	0.53286
17	0.32707	0.57864	57.646	0.05297	0.30469	0.59282	0.34944	0.56447
18	0.34735	0.61031	57.054	0.05490	0.32432	0.62524	0.37039	0.59538
19	0.36764	0.64124	56.420	0.05667	0.34404	0.65692	0.39125	0.62557
20	0.38793	0.67142	55.744	0.05828	0.36384	0.68782	0.41201	0.65502
21	0.40822	0.70082	55.024	0.05973	0.38375	0.71793	0.43269	0.68370
22	0.42850	0.72941	54.260	0.06102	0.40374	0.74723	0.45327	0.71159
23	0.44879	0.75719	53.449	0.06215	0.42383	0.77570	0.47375	0.73869
24	0.46908	0.78414	52.592	0.06312	0.44401	0.80332	0.49415	0.76497
25	0.48937	0.81024	51.687	0.06395	0.46428	0.83007	0.51446	0.79042
26	0.50966	0.83549	50.732	0.06462	0.48464	0.85594	0.53467	0.81504
27	0.52994	0.85987	49.728	0.06515	0.50509	0.88093	0.55480	0.83882
28	0.55023	0.88338	48.673	0.06554	0.52562	0.90502	0.57484	0.86174
29	0.57052	0.90601	47.567	0.06579	0.54624	0.92821	0.59480	0.88382
30	0.59081	0.92777	46.411	0.06591	0.56694	0.95049	0.61467	0.90505
31	0.61109	0.94864	45.204	0.06590	0.58771	0.97185	0.63447	0.92542
32	0.63138	0.96863	43.948	0.06575	0.60857	0.99230	0.65420	0.94497
33	0.65167	0.98775	42.644	0.06543	0.62951	1.01182	0.67383	0.96369
34	0.67196	1.00600	41.294	0.06493	0.65053	1.03040	0.69338	0.98161
35	0.69225	1.02340	39.901	0.06422	0.67165	1.04803	0.71284	0.99876
36	0.71253	1.03994	38.469	0.06330	0.69284	1.06471	0.73222	1.01516
37	0.73282	1.05564	37.002	0.06214	0.71412	1.08045	0.75152	1.03083
38	0.75311	1.07052	35.505	0.06074	0.73547	1.09524	0.77075	1.04580
39	0.77340	1.08459	33.985	0.05909	0.75688	1.10909	0.78991	1.06010
40	0.79368	1.09788	32.448	0.05718	0.77835	1.12200	0.80902	1.07375
41	0.81397	1.11040	30.902	0.05500	0.79985	1.13399	0.82809	1.08680
42	0.83426	1.12217	29.357	0.05254	0.82138	1.14507	0.84714	1.09928
43	0.85455	1.13323	27.822	0.04980	0.84293	1.15525	0.86617	1.11121
44	0.87484	1.14360	26.306	0.04677	0.86447	1.16456	0.88520	1.12263
45	0.89512	1.15330	24.821	0.04343	0.88601	1.17301	0.90424	1.13359
46	0.91541	1.16237	23.377	0.03980	0.90752	1.18064	0.92331	1.14411
47	0.93570	1.17085	21.986	0.03584	0.92899	1.18747	0.94241	1.15423
48	0.95599	1.17877	20.659	0.03156	0.95042	1.19353	0.96155	1.16400
49	0.97627	1.18616	19.406	0.02694	0.97180	1.19887	0.98075	1.17346
50	0.99656	1.19307	18.238	0.02197	0.99312	1.20351	1.00000	1.18264

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 6

P = 0.
Q = 0.5000
BETA1 = 62.381
BETA2 = 19.393
YZFRD = 0.00158
T = 0.04096
YONE = 0.00683
Z = 0.7000
CORD = 2.0394

(D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
(D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
(BLADE INLET ANGLE.)
(BLADE CUTLET ANGLE.)
(BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
(BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
(BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
(LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
(CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5704
STAGGER ANGLE = 50.589
CAMBER ANGLE = 42.988
SECTION AREA = 0.07243

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49475
YBAR = 0.77037

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00648
IY = 0.00411
IXY = 0.00505

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -38.402

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01048 (AT -38.402 WITH 'X' AXIS)
IPY = 0.00011 (AT -38.402 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E G A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
1	0.00247	0.00000	62.381	0.00495	0.0028	0.00115	0.00467
2	0.02276	0.03876	62.363	0.00841	0.01903	0.04071	0.02649
3	0.04304	0.07746	62.309	0.01186	0.03779	0.08022	0.04830
4	0.06333	0.11604	62.219	0.01529	0.05657	0.11961	0.07009
5	0.08361	0.15445	62.095	0.01866	0.07537	0.15882	0.09186
6	0.10390	0.19264	61.938	0.02199	0.09420	0.19781	0.11360
7	0.12418	0.23054	61.747	0.02524	0.11307	0.23651	0.13530
8	0.14447	0.26811	61.522	0.02841	0.13198	0.27489	0.15695
9	0.16475	0.30531	61.264	0.03149	0.15095	0.31288	0.17856
10	0.18504	0.34209	60.972	0.03446	0.16947	0.35045	0.20010
11	0.20532	0.37841	60.647	0.03732	0.18906	0.38755	0.22159
12	0.22561	0.41422	60.287	0.04006	0.20821	0.42414	0.24301
13	0.24589	0.44948	59.892	0.04267	0.22744	0.46018	0.26435
14	0.26618	0.48417	59.462	0.04514	0.24674	0.49564	0.28562
15	0.28646	0.51824	58.995	0.04747	0.26612	0.53047	0.30681

POINT NUMBER	M E A N L I N E C A T A			S U R F A C E C O O R D I N A T E D A T A				
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP	
16	0.30675	0.55166	58.491	0.04965	0.28558	0.56464	0.32792	0.53859
17	0.32703	0.58441	57.950	0.05169	0.30513	0.59013	0.34894	0.57070
18	0.34732	0.61645	57.369	0.05357	0.32476	0.63090	0.36988	0.60201
19	0.36760	0.64777	56.748	0.05529	0.34448	0.66292	0.39072	0.63261
20	0.38789	0.67832	56.085	0.05686	0.36429	0.69418	0.41148	0.66246
21	0.40817	0.70810	55.381	0.05828	0.38420	0.72465	0.43215	0.69155
22	0.42846	0.73708	54.632	0.05954	0.40419	0.75431	0.45273	0.71985
23	0.44874	0.76525	53.839	0.06064	0.42427	0.78314	0.47322	0.74736
24	0.46903	0.79259	53.000	0.06159	0.44443	0.81112	0.49363	0.77405
25	0.48931	0.81908	52.115	0.06240	0.46469	0.83824	0.51394	0.79993
26	0.50960	0.84473	51.181	0.06306	0.48503	0.86449	0.53416	0.82496
27	0.52988	0.86951	50.199	0.06357	0.50546	0.88985	0.55431	0.84916
28	0.55017	0.89342	49.168	0.06395	0.52597	0.91432	0.57436	0.87251
29	0.57045	0.91645	48.088	0.06420	0.54657	0.93790	0.59434	0.89501
30	0.59074	0.93861	46.958	0.06432	0.56724	0.96056	0.61424	0.91666
31	0.61102	0.95989	45.779	0.06431	0.58798	0.98232	0.63407	0.93747
32	0.63131	0.98030	44.552	0.06416	0.60860	1.00316	0.65382	0.95744
33	0.65159	0.99984	43.279	0.06386	0.62971	1.02308	0.67348	0.97659
34	0.67188	1.01851	41.960	0.06337	0.65070	1.04201	0.69306	0.99495
35	0.69216	1.03632	40.600	0.06268	0.67177	1.06011	0.71256	1.01252
36	0.71245	1.05328	39.202	0.06178	0.69293	1.07722	0.73197	1.02935
37	0.73273	1.06941	37.769	0.06065	0.71416	1.09338	0.75131	1.04544
38	0.75302	1.08472	36.306	0.05928	0.73547	1.10861	0.77057	1.06084
39	0.77330	1.09923	34.821	0.05767	0.75684	1.12290	0.78977	1.07556
40	0.79359	1.11295	33.319	0.05580	0.77826	1.13626	0.80892	1.08963
41	0.81387	1.12590	31.808	0.05367	0.79973	1.14871	0.82802	1.10310
42	0.83416	1.13812	30.297	0.05127	0.82123	1.16025	0.84709	1.11598
43	0.85444	1.14962	28.794	0.04859	0.84274	1.17091	0.86615	1.12832
44	0.87473	1.16043	27.310	0.04563	0.86426	1.18070	0.88520	1.14015
45	0.89501	1.17058	25.855	0.04238	0.88577	1.18964	0.90426	1.15151
46	0.91530	1.18010	24.440	0.03883	0.90727	1.19777	0.92333	1.16242
47	0.93558	1.18902	23.075	0.03497	0.92873	1.20511	0.94244	1.17294
48	0.95587	1.19739	21.772	0.03079	0.95016	1.21169	0.96158	1.18310
49	0.97615	1.20524	20.541	0.02628	0.97154	1.21755	0.98077	1.19293
50	0.99644	1.21261	19.393	0.02144	0.99288	1.22272	1.00000	1.20250

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 7

P = 0.
Q = 0.5000
BETA1 = 62.628
BETA2 = 20.362
YZERO = 0.00157
T = 0.03962
YOME = 0.00660
Z = 0.7000
CORD = 2.0253

(D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
(D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
(BLADE INLET ANGLE.)
(BLADE OUTLET ANGLE.)
(BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
(BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
(BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
(LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF PEAK LINE.)
(CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.5855
STAGGER ANGLE = 51.039
CAMBER ANGLE = 42.266
SECTION AREA = 0.07141

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49440
YBAR = 0.77972

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00659
IY = 0.00405
IXY = 0.00506

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -37.958

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01054 (AT-37.958 WITH 'X' AXIS)
IPY = 0.00010 (AT-37.958 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A		A N G L E T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A			
	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP
1	0.00249	0.00000	62.628	0.00498	0.00028	0.00114	0.00470	-0.00114
2	0.02277	0.03917	62.610	0.00835	0.01906	0.04109	0.02648	0.03725
3	0.04305	0.07827	62.556	0.01171	0.03786	0.08097	0.04825	0.07558
4	0.06334	0.11726	62.468	0.01504	0.05667	0.12074	0.07000	0.11379
5	0.08362	0.15608	62.347	0.01833	0.07550	0.16033	0.09174	0.15182
6	0.10390	0.19467	62.192	0.02156	0.09437	0.19969	0.11344	0.18964
7	0.12419	0.23297	62.003	0.02473	0.11327	0.23878	0.13510	0.22717
8	0.14447	0.27095	61.782	0.02782	0.13221	0.27753	0.15672	0.26438
9	0.16475	0.30856	61.529	0.03081	0.15121	0.31590	0.17830	0.30121
10	0.18504	0.34574	61.242	0.03371	0.17026	0.35385	0.19981	0.33763
11	0.20532	0.38246	60.921	0.03650	0.18937	0.39133	0.22127	0.37359
12	0.22560	0.41868	60.567	0.03916	0.20855	0.42830	0.24266	0.40905
13	0.24588	0.45435	60.179	0.04170	0.22779	0.46472	0.26398	0.44398
14	0.26617	0.48944	59.756	0.04411	0.24711	0.50055	0.28522	0.47833
15	0.28645	0.52391	59.297	0.04638	0.26651	0.53575	0.30639	0.51207

POINT NUMBER	M E A N I N E D A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
16	0.30673	0.55774	58.802	0.57030	0.32748	0.54517	
17	0.32702	0.59089	58.269	0.34849	0.57761		
18	0.34730	0.62333	57.698	0.36941	0.60935		
19	0.36758	0.65505	57.088	0.39025	0.64037		
20	0.38787	0.68600	56.437	0.41100	0.67065		
21	0.40815	0.71618	55.745	0.43167	0.70016		
22	0.42843	0.74556	55.010	0.45225	0.72889		
23	0.44871	0.77413	54.231	0.47274	0.75682		
24	0.46900	0.80187	53.407	0.49314	0.78394		
25	0.48928	0.82876	52.538	0.51346	0.81023		
26	0.50956	0.85480	51.621	0.53370	0.83569		
27	0.52985	0.87998	50.657	0.55365	0.86030		
28	0.55013	0.90429	49.645	0.57393	0.88407		
29	0.57041	0.92772	48.585	0.59392	0.90699		
30	0.59070	0.95028	47.476	0.61384	0.92905		
31	0.61098	0.97196	46.320	0.63369	0.95027		
32	0.63126	0.99276	45.116	0.65346	0.97065		
33	0.65155	1.01269	43.866	0.67315	0.99021		
34	0.67183	1.03175	42.572	0.69276	1.00897		
35	0.69211	1.04996	41.237	0.71228	1.02695		
36	0.71239	1.06732	39.864	0.73173	1.04417		
37	0.73268	1.08384	38.457	0.75109	1.06065		
38	0.75296	1.09954	37.021	0.77038	1.07643		
39	0.77324	1.11444	35.562	0.78961	1.09154		
40	0.79353	1.12855	34.085	0.80879	1.10599		
41	0.81381	1.14189	32.600	0.82792	1.11983		
42	0.83409	1.15450	31.113	0.84702	1.13308		
43	0.85438	1.16639	29.635	0.86610	1.14578		
44	0.87466	1.17758	28.173	0.88517	1.15796		
45	0.89494	1.18812	26.740	0.90425	1.16966		
46	0.91523	1.19803	25.345	0.92333	1.18091		
47	0.93551	1.20735	23.998	0.94245	1.19176		
48	0.95579	1.21611	22.712	0.96159	1.20225		
49	0.97607	1.22434	21.496	0.98077	1.21241		
50	0.99636	1.23210	20.362	1.00000	1.22228		

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 8

P = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 Q = 0.9000 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETA1 = 62.900 (BLADE INLET ANGLE.)
 BETA2 = 21.169 (BLADE OUTLET ANGLE.)
 YZERO = 0.00156 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 T = 0.03838 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 YONE = 0.00640 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 CORD = 2.0147 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6007
 STAGGER ANGLE = 51.480
 CAMBER ANGLE = 41.731
 SECTION AREA = 0.07051

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49388
 YBAR = 0.78944

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00672
 IY = 0.00400
 IXY = 0.00508

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -37.514

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01062 (AT -37.514 WITH 'X' AXIS)
 IPY = 0.00010 (AT -37.514 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E		D E T A		A N G L E		T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A			
	X	Y	X	Y	X5	YS	XP	YP	X5	YS	XP	YP
1	0.00250	0.00000	62.900	0.00500	0.00027	0.00114	0.00472	0.00114	0.00027	0.00114	0.00472	0.00114
2	0.02278	0.03962	62.802	0.00829	0.01909	0.04151	0.02647	0.03773	0.01909	0.04151	0.02647	0.03773
3	0.04306	0.07919	62.829	0.01157	0.03792	0.08183	0.04821	0.07655	0.03792	0.08183	0.04821	0.07655
4	0.06334	0.11863	62.742	0.01482	0.05676	0.12202	0.06993	0.11524	0.05676	0.12202	0.06993	0.11524
5	0.08362	0.15790	62.622	0.01803	0.07562	0.16205	0.09163	0.15376	0.07562	0.16205	0.09163	0.15376
6	0.10391	0.19694	62.470	0.02118	0.09451	0.20184	0.11330	0.19205	0.09451	0.20184	0.11330	0.19205
7	0.12419	0.23571	62.284	0.02427	0.11344	0.24135	0.13493	0.23006	0.11344	0.24135	0.13493	0.23006
8	0.14447	0.27414	62.066	0.02729	0.13242	0.28053	0.15652	0.26775	0.13242	0.28053	0.15652	0.26775
9	0.16475	0.31219	61.816	0.03021	0.15144	0.31933	0.17807	0.30506	0.15144	0.31933	0.17807	0.30506
10	0.18503	0.34982	61.533	0.03304	0.17051	0.35770	0.19955	0.34195	0.17051	0.35770	0.19955	0.34195
11	0.20532	0.38699	61.217	0.03576	0.18965	0.39560	0.22093	0.37838	0.18965	0.39560	0.22093	0.37838
12	0.22560	0.42365	60.869	0.03836	0.20884	0.43298	0.24235	0.41431	0.20884	0.43298	0.24235	0.41431
13	0.24588	0.45976	60.486	0.04084	0.22811	0.46982	0.26365	0.44970	0.22811	0.46982	0.26365	0.44970
14	0.26616	0.49529	60.069	0.04319	0.24745	0.50607	0.28487	0.48452	0.24745	0.50607	0.28487	0.48452
15	0.28644	0.53020	59.617	0.04540	0.26686	0.54169	0.30603	0.51872	0.26686	0.54169	0.30603	0.51872

POINT NUMBER	M E A N L I N E D A T A			S U R F A C E C O O R D I N A T E D A T A		
	X	Y	ANGLE THICKNESS	XS	YS	XP
16	0.30672	0.56447	59.129	0.04748	0.28635	0.57665
17	0.32701	0.59805	58.604	0.04941	0.30592	0.61092
18	0.34729	0.63092	58.042	0.05120	0.32557	0.64447
19	0.36757	0.66306	57.440	0.05284	0.34530	0.67728
20	0.38785	0.69444	56.799	0.05434	0.36512	0.70931
21	0.40813	0.72504	56.117	0.05568	0.38502	0.74056
22	0.42841	0.75484	55.393	0.05688	0.40501	0.77059
23	0.44870	0.78382	54.626	0.05793	0.42508	0.80058
24	0.46898	0.81196	53.815	0.05883	0.44523	0.82933
25	0.48926	0.83926	52.958	0.05966	0.46547	0.85722
26	0.50954	0.86571	52.055	0.06022	0.48579	0.88422
27	0.52982	0.89128	51.106	0.06072	0.50620	0.91035
28	0.55010	0.91599	50.109	0.06108	0.52667	0.93557
29	0.57039	0.93981	49.064	0.06131	0.54723	0.95990
30	0.59067	0.96276	47.972	0.06142	0.56786	0.98332
31	0.61095	0.98482	46.832	0.06141	0.58856	1.00582
32	0.63123	1.00600	45.646	0.06126	0.60933	1.02742
33	0.65151	1.02631	44.414	0.06097	0.63018	1.04808
34	0.67180	1.04575	43.139	0.06050	0.65111	1.06782
35	0.69208	1.06432	41.823	0.05983	0.67213	1.08662
36	0.71236	1.08205	40.468	0.05897	0.69322	1.10448
37	0.73264	1.09893	39.080	0.05788	0.71440	1.12140
38	0.75292	1.11499	37.663	0.05657	0.73564	1.13739
39	0.77320	1.13025	36.222	0.05502	0.75695	1.15244
40	0.79349	1.14471	34.763	0.05323	0.77831	1.16658
41	0.81377	1.15841	33.295	0.05119	0.79972	1.17980
42	0.83405	1.17136	31.825	0.04889	0.82116	1.19213
43	0.85433	1.18359	30.363	0.04633	0.84262	1.20358
44	0.87461	1.19513	28.916	0.04350	0.86409	1.21417
45	0.89489	1.20601	27.496	0.04040	0.88557	1.22393
46	0.91518	1.21626	26.114	0.03701	0.90703	1.23287
47	0.93546	1.22591	24.779	0.03333	0.92847	1.24104
48	0.95574	1.23499	23.502	0.02936	0.94989	1.24845
49	0.97602	1.24356	22.296	0.02507	0.97126	1.25516
50	0.99630	1.25164	21.169	0.02047	0.99261	1.26119

STREAMSURFACE GEOMETRY OH STREAMLINE NUMBER 9

P = 0.
 O = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BET41 = 63.179 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BET42 = 21.875 (BLADE INLET ANGLE.)
 YZERO = 0.00155 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 T = 0.03722 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 YU1E = 0.00620 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 CORD = 2.0074 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6159
 STAGGER ANGLE = 51.909
 CAMBER ANGLE = 41.304
 SECTION AREA = 0.06970

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49329
 YBAR = 0.79928

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00685
 IY = 0.00396
 IXY = 0.00510

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -37.080

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01071 (AT -37.080 WITH 'X' AXIS)
 IPY = 0.00010 (AT -37.080 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
1	0.00250	0.00000	63.179	0.00500	0.00027	0.00113	0.00473
2	0.02278	0.04010	63.161	0.00822	0.01911	0.04196	0.02645
3	0.04306	0.08014	63.109	0.01143	0.03797	0.08273	0.04816
4	0.06334	0.12007	63.024	0.01461	0.05684	0.12338	0.06985
5	0.08362	0.15982	62.905	0.01774	0.07573	0.16386	0.09152
6	0.10391	0.19933	62.754	0.02083	0.09465	0.20410	0.11316
7	0.12419	0.23857	62.571	0.02385	0.11360	0.24406	0.13477
8	0.14447	0.27747	62.356	0.02680	0.13260	0.28369	0.15634
9	0.16475	0.31600	62.109	0.02965	0.15164	0.32293	0.17785
10	0.18503	0.35410	61.830	0.03242	0.17074	0.36175	0.19932
11	0.20531	0.39173	61.519	0.03508	0.18990	0.40009	0.22073
12	0.22559	0.42885	61.174	0.03762	0.20911	0.43792	0.24207
13	0.24587	0.46542	60.797	0.04004	0.22839	0.47519	0.26335
14	0.26615	0.50140	60.385	0.04234	0.24775	0.51186	0.28456
15	0.28643	0.53677	59.939	0.04451	0.26717	0.54791	0.30569

POINT NUMBER	MEAN LINE ANGLE THICKNESS			SURFACE COORDINATE DATA			
	X	Y	ANGLE	XS	YS	XP	YP
16	0.30671	0.57147	59.458	0.04654	0.28667	0.58330	0.32675
17	0.32700	0.60550	58.940	0.04843	0.30625	0.61799	0.34774
18	0.34728	0.63881	58.385	0.05017	0.32591	0.65196	0.36864
19	0.36756	0.67138	57.791	0.05178	0.34565	0.68518	0.38946
20	0.38784	0.70319	57.159	0.05323	0.36548	0.71763	0.41020
21	0.40812	0.73422	56.486	0.05455	0.38538	0.74928	0.43086
22	0.42840	0.76444	55.771	0.05571	0.40517	0.78011	0.45143
23	0.44868	0.79383	55.014	0.05674	0.42544	0.81010	0.47192
24	0.46896	0.82239	54.213	0.05762	0.44554	0.83924	0.49233
25	0.48924	0.85010	53.368	0.05837	0.46582	0.86751	0.51266
26	0.50952	0.87694	52.477	0.05898	0.48614	0.89490	0.53291
27	0.52980	0.90291	51.540	0.05946	0.50653	0.92140	0.55308
28	0.55009	0.92800	50.556	0.05981	0.52699	0.94700	0.57318
29	0.57037	0.95221	49.524	0.06003	0.54753	0.97170	0.59320
30	0.59065	0.97554	48.446	0.06013	0.56815	0.99548	0.61315
31	0.61093	0.99797	47.320	0.06012	0.58883	1.01835	0.63303
32	0.63121	1.01952	46.148	0.05998	0.60958	1.04030	0.65284
33	0.65149	1.04019	44.931	0.05968	0.63041	1.06132	0.67257
34	0.67177	1.05999	43.670	0.05922	0.65133	1.08141	0.69222
35	0.69205	1.07892	42.369	0.05856	0.67232	1.10055	0.71179
36	0.71233	1.09699	41.029	0.05771	0.69339	1.11876	0.73127
37	0.73261	1.11422	39.656	0.05664	0.71454	1.13602	0.75069
38	0.75289	1.13062	38.253	0.05535	0.73576	1.15235	0.77003
39	0.77318	1.14620	36.826	0.05383	0.75704	1.16775	0.78931
40	0.79346	1.16100	35.381	0.05208	0.77838	1.18223	0.80853
41	0.81374	1.17502	33.926	0.05007	0.79976	1.19579	0.82771
42	0.83402	1.18829	32.468	0.04782	0.82118	1.20846	0.84685
43	0.85430	1.20083	31.017	0.04531	0.84262	1.22025	0.86597
44	0.87458	1.21269	29.581	0.04254	0.86408	1.23118	0.88508
45	0.89486	1.22387	28.170	0.03951	0.88554	1.24128	0.90419
46	0.91514	1.23442	26.796	0.03619	0.90698	1.25057	0.92330
47	0.93542	1.24437	25.468	0.03260	0.92841	1.25908	0.94243
48	0.95570	1.25375	24.198	0.02871	0.94982	1.26685	0.96159
49	0.97598	1.26261	22.997	0.02453	0.97119	1.27390	0.98078
50	0.99627	1.27098	21.875	0.02005	0.99253	1.28028	1.00000

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 10

P = 0.
Q = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1 = 63.448 (BLADE INLET ANGLE.)
BETA2 = 22.534 (BLADE OUTLET ANGLE.)
T = 0.00153 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
YMAX = 0.03614 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YOME = 0.00602 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z = 0.7000 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD = 2.0034 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6307
STAGGER ANGLE = 52.316
CAMBER ANGLE = 40.913
SECTION AREA = 0.06893

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49274
YBAR = 0.80890

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00698
IY = 0.00391
IXY = 0.00512

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -36.668

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01079 (AT -36.668 WITH 'X' AXIS)
IPY = 0.00010 (AT -36.668 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E		A N G L E		T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A			
	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP		
1	0.00250	0.00000	63.448	0.00499	0.00026	0.00112	0.00473	0.00112		
2	0.02278	0.04057	63.431	0.00815	0.01914	0.04240	0.02642	0.03875		
3	0.04306	0.08109	63.379	0.01128	0.03802	0.08361	0.04810	0.07856		
4	0.06334	0.12148	63.295	0.01439	0.05691	0.12471	0.06977	0.11824		
5	0.08362	0.16169	63.178	0.01746	0.07583	0.16564	0.09141	0.15775		
6	0.10390	0.20168	63.029	0.02048	0.09477	0.20633	0.11303	0.19703		
7	0.12418	0.24138	62.848	0.02344	0.11375	0.24673	0.13461	0.23603		
8	0.14446	0.28075	62.635	0.02632	0.13277	0.28680	0.15615	0.27470		
9	0.16474	0.31973	62.392	0.02912	0.15184	0.32648	0.17764	0.31299		
10	0.18502	0.35829	62.116	0.03183	0.17096	0.36573	0.19909	0.35085		
11	0.20530	0.39638	61.808	0.03443	0.19013	0.40451	0.22047	0.38825		
12	0.22558	0.43395	61.468	0.03692	0.20936	0.44277	0.24180	0.42513		
13	0.24586	0.47097	61.099	0.03929	0.22866	0.48046	0.26306	0.46147		
14	0.26614	0.50740	60.689	0.04154	0.24803	0.51757	0.28425	0.49723		
15	0.28642	0.54320	60.248	0.04366	0.26747	0.55404	0.30537	0.53237		

POINT NUMBER	M E A S U R E M E N T			C O O R D I N A T E			D A T A		
	X	Y	Z	XP	YP	ZP	THICKNESS	ANGLE	THICKNESS
16	0.30670	0.57835	59.773	0.04564					
17	0.32698	0.61281	59.261	0.04749					
18	0.34726	0.64655	58.713	0.04920					
19	0.36754	0.67955	58.127	0.05076					
20	0.38782	0.71177	57.503	0.05219					
21	0.40811	0.74321	56.838	0.05347					
22	0.42839	0.77384	56.132	0.05461					
23	0.44867	0.80364	55.384	0.05561					
24	0.46895	0.83260	54.594	0.05648					
25	0.48923	0.86070	53.758	0.05720					
26	0.50951	0.88793	52.878	0.05780					
27	0.52979	0.91428	51.952	0.05826					
28	0.55007	0.93975	50.980	0.05860					
29	0.57035	0.96434	49.961	0.05882					
30	0.59063	0.98802	48.894	0.05892					
31	0.61091	1.01082	47.782	0.05890					
32	0.63119	1.03273	46.623	0.05876					
33	0.65147	1.05375	45.419	0.05847					
34	0.67175	1.07389	44.172	0.05801					
35	0.69203	1.09316	42.884	0.05736					
36	0.71231	1.11156	41.558	0.05652					
37	0.73259	1.12912	40.198	0.05547					
38	0.75287	1.14584	38.808	0.05420					
39	0.77315	1.16175	37.394	0.05271					
40	0.79343	1.17685	35.962	0.05098					
41	0.81371	1.19118	34.518	0.04902					
42	0.83399	1.20476	33.071	0.04681					
43	0.85427	1.21760	31.630	0.04435					
44	0.87455	1.22975	30.204	0.04163					
45	0.89483	1.24122	28.802	0.03866					
46	0.91511	1.25206	27.435	0.03542					
47	0.93540	1.26229	26.114	0.03190					
48	0.95568	1.27196	24.849	0.02811					
49	0.97596	1.28109	23.653	0.02402					
50	0.99624	1.28973	22.534	0.01964					

SURFACE COORDINATE DATA								
XS	YS	XP	YS	XP	YP	XS	YS	XP
0.28699	0.58984	0.32642	0.56686					
0.30658	0.62494	0.34739	0.60067					
0.32624	0.65932	0.36829	0.63377					
0.34599	0.69295	0.38910	0.66614					
0.36582	0.72579	0.40983	0.69775					
0.38572	0.75784	0.43049	0.72859					
0.40571	0.78906	0.45106	0.75862					
0.42578	0.81944	0.47155	0.78784					
0.44593	0.84896	0.49196	0.81624					
0.46616	0.87761	0.51230	0.84379					
0.48646	0.90537	0.53255	0.87049					
0.50685	0.93224	0.55273	0.89633					
0.52730	0.95820	0.57283	0.92131					
0.54783	0.98325	0.59286	0.94542					
0.56843	1.00739	0.61283	0.96866					
0.58910	1.03061	0.63272	0.99103					
0.60983	1.05291	0.65254	1.01255					
0.63065	1.07427	0.67229	1.03323					
0.65154	1.09469	0.69196	1.05309					
0.67251	1.11417	0.71155	1.07214					
0.69356	1.13271	0.73106	1.09042					
0.71469	1.15030	0.75049	1.10794					
0.73589	1.16696	0.76986	1.12472					
0.75715	1.18269	0.78916	1.14081					
0.77846	1.19749	0.80840	1.15622					
0.79982	1.21138	0.82760	1.17099					
0.82122	1.22437	0.84676	1.18515					
0.84264	1.23648	0.86590	1.19872					
0.86408	1.24774	0.88503	1.21176					
0.88552	1.25816	0.90415	1.22429					
0.90696	1.26778	0.92327	1.23634					
0.92837	1.27662	0.94242	1.24797					
0.94977	1.28471	0.96158	1.25920					
0.97114	1.29209	0.98077	1.27009					
0.99247	1.29881	1.00000	1.28066					

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 11

P = 0.
 Q = 0.5000 (DZYDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETAL = 63.701 (DZYDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETAZ = 23.143 (BLADE INLET ANGLE.)
 YZERO = 0.00152 (BLADE OUTLET ANGLE.)
 T = 0.03511 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YONE = 0.00585 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CORD = 2.0025 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6448
 STAGGER ANGLE = 52.697
 CAMBER ANGLE = 40.558
 SECTION AREA = 0.06815

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49219
 YBAR = 0.81803

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00709
 IY = 0.00387
 IXY = 0.00514

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO X' AXIS = -36.282

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01086 (AT -36.282 WITH X' AXIS)
 IPY = 0.00009 (AT -36.282 WITH Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
1	0.00250	0.00000	63.701	0.00499	0.00026	0.00111	0.00474-0.00111
2	0.02278	0.04102	63.684	0.00808	0.01916	0.04282	0.02640 0.03923
3	0.04306	0.08199	63.633	0.01115	0.03806	0.08446	0.04805 0.07951
4	0.06334	0.12283	63.550	0.01419	0.05698	0.12599	0.06969 0.11967
5	0.08362	0.16350	63.434	0.01720	0.07593	0.16734	0.09131 0.15965
6	0.10390	0.20393	63.287	0.02016	0.09489	0.20846	0.11290 0.19940
7	0.12418	0.24408	63.108	0.02305	0.11390	0.24929	0.13446 0.23886
8	0.14446	0.28389	62.898	0.02587	0.13294	0.28978	0.15597 0.27800
9	0.16474	0.32332	62.657	0.02861	0.15203	0.32989	0.17744 0.31675
10	0.18502	0.36231	62.384	0.03126	0.17117	0.36956	0.19886 0.35507
11	0.20530	0.40083	62.080	0.03380	0.19036	0.40875	0.22023 0.39292
12	0.22558	0.43884	61.744	0.03624	0.20982	0.44742	0.24154 0.43026
13	0.24586	0.47629	61.376	0.03856	0.22893	0.48553	0.26278 0.46705
14	0.26614	0.51314	60.974	0.04076	0.24832	0.52303	0.28396 0.50326
15	0.28642	0.54937	60.539	0.04283	0.26777	0.55990	0.30506 0.53884

POINT NUMBER	M E A N L I N E C A T A		A N G L E T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A				
	X	Y	X	Y	XS	YS	XP	YP	
16	0.30670	0.58494	60.069	0.04477	0.28730	0.59611	0.32610	0.57377	
17	0.32698	0.61981	59.563	0.04658	0.30690	0.63161	0.34706	0.60801	
18	0.34726	0.65396	59.021	0.04825	0.32657	0.66638	0.36794	0.64154	
19	0.36754	0.68736	58.442	0.04978	0.34633	0.70039	0.38875	0.67433	
20	0.38782	0.71999	57.825	0.05118	0.36616	0.73361	0.40948	0.70636	
21	0.40810	0.75182	57.167	0.05243	0.38607	0.76604	0.43013	0.73761	
22	0.42838	0.78284	56.470	0.05355	0.40606	0.79763	0.45070	0.76805	
23	0.44866	0.81303	55.731	0.05453	0.42613	0.82838	0.47119	0.79767	
24	0.46894	0.84236	54.949	0.05537	0.44627	0.85826	0.49160	0.82646	
25	0.48922	0.87084	54.123	0.05608	0.46650	0.88727	0.51194	0.85441	
26	0.50950	0.89844	53.253	0.05666	0.48680	0.91539	0.53220	0.88149	
27	0.52978	0.92516	52.337	0.05711	0.50717	0.94260	0.55238	0.90771	
28	0.55006	0.95099	51.375	0.05744	0.52762	0.96891	0.57249	0.93306	
29	0.57034	0.97592	50.367	0.05765	0.54814	0.99430	0.59254	0.95753	
30	0.59062	0.99996	49.312	0.05774	0.56872	1.01878	0.61251	0.98113	
31	0.61090	1.02310	48.211	0.05772	0.58938	1.04233	0.63242	1.00386	
32	0.63118	1.04534	47.064	0.05758	0.61010	1.06495	0.65226	1.02573	
33	0.65146	1.06669	45.873	0.05729	0.63090	1.08664	0.67202	1.04675	
34	0.67174	1.08716	44.638	0.05684	0.65177	1.10738	0.69170	1.06694	
35	0.69202	1.10674	43.363	0.05620	0.67272	1.12717	0.71131	1.08632	
36	0.71230	1.12547	42.049	0.05537	0.69375	1.14602	0.73084	1.10491	
37	0.73258	1.14333	40.701	0.05434	0.71486	1.16393	0.75029	1.12274	
38	0.75286	1.16036	39.323	0.05309	0.73604	1.18089	0.76968	1.13983	
39	0.77314	1.17656	37.920	0.05162	0.75728	1.19692	0.78900	1.15620	
40	0.79342	1.19196	36.499	0.04992	0.77857	1.21203	0.80826	1.17190	
41	0.81370	1.20658	35.066	0.04799	0.79991	1.22622	0.82748	1.18694	
42	0.83398	1.22044	33.630	0.04583	0.82129	1.23952	0.84667	1.20136	
43	0.85426	1.23357	32.198	0.04342	0.84269	1.25194	0.86582	1.21520	
44	0.87454	1.24599	30.780	0.04076	0.86411	1.26350	0.88497	1.22848	
45	0.89482	1.25774	29.385	0.03784	0.88553	1.27423	0.90410	1.24125	
46	0.91510	1.26884	28.025	0.03467	0.90695	1.28415	0.92324	1.25354	
47	0.93538	1.27934	26.710	0.03123	0.92836	1.29329	0.94240	1.26559	
48	0.95566	1.28927	25.451	0.02752	0.94974	1.30169	0.96157	1.27684	
49	0.97594	1.29866	24.258	0.02353	0.97110	1.30938	0.98077	1.28793	
50	0.99622	1.30756	23.143	0.01925	0.99243	1.31641	1.00000	1.29871	

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 12

P = 0.
Q = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1 = 63.940 (BLADE INLET ANGLE.)
BETA2 = 23.672 (BLADE OUTLET ANGLE.)
YZERO = 0.00151 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T = 0.03413 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE = 0.00569 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z = 0.7000 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
ZORD = 2.0045 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6581
STAGGER ANGLE = 53.045
CAMBER ANGLE = 40.268
SECTION AREA = 0.06735

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49157
YBAR = 0.82650

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00720
IY = 0.00382
IXY = 0.00515

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -35.924

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01092 (AT -35.924 WITH 'X' AXIS)
IPY = 0.00009 (AT -35.924 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E D A T A		SURFACE COORDINATE DATA			
	X	Y	XS	YS	XP	YP
1	0.00251	0.00000	63.940	0.00502	0.00025	0.00110
2	0.02279	0.04146	63.923	0.00803	0.01918	0.04322
3	0.04307	0.08285	63.872	0.01104	0.03811	0.08528
4	0.06335	0.12413	63.790	0.01401	0.05706	0.12722
5	0.08363	0.16523	63.675	0.01696	0.07603	0.16899
6	0.10391	0.20609	63.529	0.01985	0.09502	0.21051
7	0.12419	0.24666	63.353	0.02268	0.11405	0.25175
8	0.14447	0.28690	63.145	0.02544	0.13312	0.29265
9	0.16475	0.32675	62.906	0.02812	0.15223	0.33315
10	0.18503	0.36617	62.637	0.03071	0.17139	0.37322
11	0.20530	0.40510	62.336	0.03319	0.19061	0.41281
12	0.22558	0.44352	62.003	0.03558	0.20988	0.45187
13	0.24586	0.48138	61.638	0.03785	0.22921	0.49037
14	0.26614	0.51864	61.241	0.04000	0.24861	0.52827
15	0.28642	0.55527	60.810	0.04202	0.26808	0.56552

POINT NUMBER	M E A N L I N E D A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
16	0.30670	0.59124	60.345	0.04392	0.28762	0.60210	0.32579
17	0.32698	0.62650	59.844	0.04569	0.30723	0.63798	0.34674
18	0.34726	0.66104	59.308	0.04732	0.32692	0.67312	0.36761
19	0.36754	0.69482	58.735	0.04882	0.34668	0.70749	0.38841
20	0.38782	0.72783	58.124	0.05018	0.36652	0.74108	0.40913
21	0.40810	0.76004	57.473	0.05141	0.38643	0.77386	0.42977
22	0.42838	0.79142	56.783	0.05250	0.40642	0.80580	0.45034
23	0.44866	0.82197	56.051	0.05345	0.42649	0.83690	0.47083
24	0.46894	0.85167	55.276	0.05427	0.44664	0.86712	0.49124
25	0.48922	0.88049	54.459	0.05496	0.46686	0.89647	0.51158
26	0.50950	0.90844	53.597	0.05553	0.48715	0.92492	0.53185
27	0.52978	0.93550	52.690	0.05597	0.50752	0.95246	0.55204
28	0.55006	0.96166	51.737	0.05629	0.52796	0.97909	0.57216
29	0.57034	0.98692	50.739	0.05649	0.54947	1.00480	0.59221
30	0.59062	1.01128	49.693	0.05658	0.56905	1.02958	0.61219
31	0.61090	1.03474	48.602	0.05656	0.58969	1.05344	0.63211
32	0.63118	1.05729	47.465	0.05642	0.61039	1.07636	0.65196
33	0.65146	1.07895	46.284	0.05613	0.63118	1.09834	0.67174
34	0.67174	1.09971	45.059	0.05568	0.65203	1.11938	0.69144
35	0.69202	1.11959	43.794	0.05505	0.67297	1.13946	0.71107
36	0.71230	1.13860	42.490	0.05423	0.69398	1.15860	0.73061
37	0.73258	1.15675	41.152	0.05321	0.71507	1.17679	0.75009
38	0.75286	1.17406	39.784	0.05199	0.73622	1.19403	0.76949
39	0.77314	1.19053	38.390	0.05054	0.75744	1.21034	0.78883
40	0.79342	1.20620	36.978	0.04888	0.77872	1.22572	0.80812
41	0.81370	1.22108	35.553	0.04699	0.80004	1.24019	0.82736
42	0.83398	1.23519	34.124	0.04486	0.82139	1.25376	0.84656
43	0.85426	1.24857	32.699	0.04250	0.84278	1.26645	0.86573
44	0.87454	1.26124	31.287	0.03989	0.86418	1.27829	0.88489
45	0.89482	1.27323	29.898	0.03704	0.88558	1.28928	0.90405
46	0.91509	1.28457	28.542	0.03393	0.90699	1.29948	0.92320
47	0.93537	1.29530	27.231	0.03057	0.92838	1.30889	0.94237
48	0.95565	1.30546	25.975	0.02694	0.94975	1.31757	0.96155
49	0.97593	1.31508	24.785	0.02304	0.97110	1.32554	0.98076
50	0.99621	1.32420	23.672	0.01886	0.99243	1.33284	1.00000

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 13

P = 0.
 Q = 0.5000 (O2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETAL = 64.180 (D2YUX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETAZ = 24.053 (BLADE INLET ANGLE.)
 YZERO = 0.00150 (BLADE OUTLET ANGLE.)
 T = 0.03317 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YONE = 0.00553 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CORD = 2.0096 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 (CHORD CR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS -- ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6707
 STAGGFP ANGLE = 53.368
 CAMBER ANGLE = 40.127
 SECTION AREA = 0.06650

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.49083
 YBAR = 0.83467

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00728
 IY = 0.00377
 IXY = 0.00515

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -35.586

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01096 (AT -35.586 WITH 'X' AXIS)
 IPY = 0.00009 (AT -35.586 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E D A T A		SURFACE COORDINATE DATA				
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
1	0.00251	0.00000	64.180	0.00503	0.0025	0.00110	0.00478
2	0.02279	0.04190	64.163	0.00798	0.01920	0.04364	0.02639
3	0.04307	0.08374	64.113	0.01092	0.03816	0.08613	0.04799
4	0.06335	0.12546	64.031	0.01383	0.05714	0.12849	0.06957
5	0.08363	0.16700	63.918	0.01671	0.07613	0.17068	0.09114
6	0.10391	0.20830	63.773	0.01954	0.09515	0.21262	0.11268
7	0.12419	0.24932	63.598	0.02231	0.11420	0.25428	0.13419
8	0.14447	0.28999	63.392	0.02501	0.13330	0.29559	0.15565
9	0.16475	0.33027	63.155	0.02763	0.15243	0.33651	0.17708
10	0.18503	0.37011	62.888	0.03016	0.17161	0.37698	0.19846
11	0.20531	0.40947	62.590	0.03259	0.19085	0.41698	0.21978
12	0.22559	0.44831	62.260	0.03492	0.21014	0.45644	0.24105
13	0.24587	0.48659	61.898	0.03714	0.22949	0.49533	0.26226
14	0.26615	0.52426	61.504	0.03924	0.24891	0.53362	0.28340
15	0.28643	0.56129	61.076	0.04122	0.26839	0.57126	0.30448

POINT NUMBER	M E A N L I N E C A T A		A N G L E T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A							
	X	Y	X	Y	XS	YS	XP	YP	XS	YS	XP	YP
16	0.30671	0.59765	60.615	0.04308	0.28795	0.60822	0.32548	0.58708				
17	0.32699	0.63330	60.118	0.04481	0.30757	0.64447	0.34642	0.62214				
18	0.34727	0.66823	59.586	0.04640	0.32727	0.67997	0.36728	0.65648				
19	0.36755	0.70239	59.018	0.04786	0.34704	0.71471	0.38807	0.69007				
20	0.38783	0.73577	58.411	0.04919	0.36688	0.74865	0.40879	0.72289				
21	0.40811	0.76834	57.765	0.05039	0.38681	0.78178	0.42942	0.75490				
22	0.42839	0.80008	57.080	0.05145	0.40680	0.81406	0.44999	0.78610				
23	0.44867	0.83098	56.353	0.05238	0.42687	0.84549	0.47048	0.81647				
24	0.46896	0.86102	55.584	0.05318	0.44702	0.87605	0.49089	0.84599				
25	0.48924	0.89108	54.772	0.05385	0.46724	0.90571	0.51123	0.87465				
26	0.50952	0.91845	53.916	0.05440	0.48753	0.93447	0.53150	0.90244				
27	0.52980	0.94583	53.015	0.05482	0.50790	0.96232	0.55169	0.92934				
28	0.55008	0.97231	52.068	0.05513	0.52833	0.98925	0.57182	0.95536				
29	0.57036	0.99787	51.075	0.05533	0.54883	1.01525	0.59188	0.98049				
30	0.59064	1.02253	50.036	0.05541	0.56940	1.04032	0.61187	1.00473				
31	0.61092	1.04627	48.951	0.05539	0.59003	1.06446	0.63180	1.02809				
32	0.63120	1.06911	47.820	0.05524	0.61073	1.08766	0.65166	1.05056				
33	0.65148	1.09104	46.644	0.05496	0.63150	1.10990	0.67145	1.07217				
34	0.67176	1.11207	45.424	0.05451	0.65234	1.13120	0.69117	1.09294				
35	0.69204	1.13221	44.164	0.05389	0.67326	1.15153	0.71081	1.11288				
36	0.71232	1.15146	42.865	0.05308	0.69426	1.17092	0.73037	1.13201				
37	0.73260	1.16986	41.531	0.05208	0.71533	1.18935	0.74986	1.15036				
38	0.75288	1.18739	40.167	0.05087	0.73647	1.20683	0.76928	1.16796				
39	0.77316	1.20410	38.776	0.04945	0.75767	1.22337	0.78864	1.18482				
40	0.79344	1.21998	37.367	0.04782	0.77892	1.23899	0.80795	1.20098				
41	0.81372	1.23508	35.944	0.04596	0.80023	1.25368	0.82721	1.21647				
42	0.83400	1.24940	34.516	0.04388	0.82156	1.26748	0.84643	1.23132				
43	0.85428	1.26298	33.092	0.04156	0.84293	1.28039	0.86562	1.24557				
44	0.87456	1.27584	31.680	0.03901	0.86431	1.29244	0.88480	1.25924				
45	0.89484	1.28802	30.290	0.03622	0.88570	1.30366	0.90397	1.27238				
46	0.91512	1.29955	28.933	0.03319	0.90709	1.31407	0.92314	1.28502				
47	0.93540	1.31045	27.620	0.02990	0.92846	1.32370	0.94233	1.29721				
48	0.95568	1.32078	26.362	0.02636	0.94982	1.33259	0.96153	1.30897				
49	0.97596	1.33057	25.169	0.02255	0.97116	1.34077	0.98075	1.32036				
50	0.99624	1.33986	24.053	0.01847	0.99247	1.34829	1.00000	1.33142				

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 14

P = 0.
 U = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETA1 = 64.437 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
 BETA2 = 24.241 (BLADE INLET ANGLE.)
 YZFR0 = 0.00149 (BLADE CUTLET ANGLE.)
 T = 0.03223 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
 YDMF = 0.00537 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
 Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
 CARN = 2.0175 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
 (CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6828
 STAGGER ANGLE = 53.672
 CAMBER ANGLE = 40.196
 SECTION AREA = 0.06559

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.48992
 YBAR = 0.84295

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00735
 IY = 0.00372
 IXY = 0.00513

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO 'X' AXIS = -35.259

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01098 (AT -35.259 WITH 'X' AXIS)
 IPY = 0.00009 (AT -35.259 WITH 'Y' AXIS)

POINT NUMBER	M E A N L I N E C A T A		A N G L E T H I C K N E S S		S U R F A C E C O O R D I N A T E D A T A			
	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP
1	0.00250	0.00000	64.437	0.00500	0.00024	0.00108	0.00475	-0.00108
2	0.02278	0.04239	64.420	0.00789	0.01922	0.04409	0.02634	0.04069
3	0.04306	0.08472	64.371	0.01077	0.03821	0.08705	0.04792	0.08239
4	0.06334	0.12692	64.289	0.01362	0.05721	0.12988	0.06948	0.12397
5	0.08363	0.16894	64.177	0.01644	0.07623	0.17252	0.09102	0.16536
6	0.10391	0.21072	64.033	0.01921	0.09527	0.21493	0.11254	0.20652
7	0.12419	0.25221	63.859	0.02192	0.11435	0.25704	0.13403	0.24720
8	0.14447	0.29335	63.654	0.02456	0.13347	0.29880	0.15547	0.28790
9	0.16475	0.33410	63.419	0.02712	0.15262	0.34017	0.17688	0.32803
10	0.18503	0.37441	63.153	0.02960	0.17183	0.38109	0.19824	0.36772
11	0.20531	0.41423	62.856	0.03198	0.19108	0.42152	0.21954	0.40693
12	0.22560	0.45351	62.528	0.03426	0.21040	0.46141	0.24079	0.44561
13	0.24588	0.49223	62.169	0.03643	0.22977	0.50073	0.26198	0.48372
14	0.26616	0.53033	61.777	0.03849	0.24920	0.53943	0.28311	0.52123
15	0.28644	0.56779	61.351	0.04042	0.26870	0.57748	0.30418	0.55810

POINT NUMBER	M E A N L I N E D A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
16	0.30672	0.60457	60.892	0.04223	0.28927	0.61484	0.32517
17	0.32700	0.64063	60.398	0.04392	0.30791	0.65148	0.34610
18	0.34728	0.67596	59.869	0.04548	0.32762	0.68737	0.36695
19	0.36757	0.71051	59.303	0.04690	0.34740	0.72248	0.38773
20	0.38785	0.74427	58.699	0.04820	0.36726	0.75679	0.40844
21	0.40813	0.77722	58.056	0.04936	0.38718	0.79027	0.42907
22	0.42841	0.80932	57.373	0.05040	0.40719	0.82291	0.44963
23	0.44869	0.84057	56.649	0.05130	0.42727	0.85467	0.47012
24	0.46897	0.87095	55.882	0.05208	0.44742	0.88555	0.49053
25	0.48925	0.90044	55.073	0.05276	0.46764	0.91460	0.51087
26	0.50954	0.92903	54.219	0.05326	0.48793	0.94453	0.53114
27	0.52982	0.95672	53.320	0.05367	0.50829	0.97275	0.55134
28	0.55010	0.98349	52.374	0.05397	0.52873	0.99996	0.57147
29	0.57038	1.00934	51.383	0.05415	0.54922	1.02624	0.59153
30	0.59066	1.03427	50.345	0.05423	0.56979	1.05157	0.61154
31	0.61094	1.05827	49.260	0.05420	0.59041	1.07596	0.63147
32	0.63122	1.08136	48.128	0.05405	0.61110	1.09940	0.65135
33	0.65150	1.10353	46.952	0.05376	0.63186	1.12188	0.67115
34	0.67179	1.12479	45.731	0.05332	0.65270	1.14339	0.69088
35	0.69207	1.14514	44.469	0.05270	0.67361	1.16395	0.71053
36	0.71235	1.16461	43.167	0.05190	0.69459	1.18354	0.73010
37	0.73263	1.18320	41.830	0.05092	0.71565	1.20216	0.74961
38	0.75291	1.20092	40.461	0.04973	0.73678	1.21984	0.76905
39	0.77319	1.21780	39.066	0.04833	0.75796	1.23656	0.78842
40	0.79347	1.23385	37.650	0.04673	0.77920	1.25235	0.80775
41	0.81376	1.24910	36.220	0.04491	0.80049	1.26721	0.82702
42	0.83404	1.26357	34.784	0.04287	0.82181	1.28117	0.84626
43	0.85432	1.27728	33.351	0.04060	0.84316	1.29424	0.86548
44	0.87460	1.29027	31.930	0.03811	0.86452	1.30644	0.88468
45	0.89488	1.30257	30.530	0.03538	0.88590	1.31781	0.90387
46	0.91516	1.31421	29.163	0.03242	0.90727	1.32836	0.92306
47	0.93544	1.32522	27.840	0.02921	0.92862	1.33813	0.94227
48	0.95573	1.33564	26.571	0.02576	0.94997	1.34716	0.96149
49	0.97601	1.34552	25.367	0.02205	0.97128	1.35548	0.98073
50	0.99629	1.35489	24.241	0.01808	0.99258	1.36313	1.00000

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 15

P = 0.
Q = 0.5000 (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1 = 64.705 (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA2 = 24.317 (BLADE INLET ANGLE.)
YZERO = 0.00146 (BLADE OUTLET ANGLE.)
T = 0.03129 (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
YONE = 0.00521 (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
Z = 0.7000 (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
CORD = 2.0278 (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
(CHORD OR MERIDIONAL CHORD OF SECTION.)

NORMALISED RESULTS - ALL THE FOLLOWING REFER TO ABLADE HAVING A MERIDIONAL CHORD PROJECTION OF UNITY

BLADE CHORD = 1.6948
STAGGER ANGLE = 53.968
CAMBER ANGLE = 40.388
SECTION AREA = 0.06462

LOCATION OF CENTROID RELATIVE TO LEADING EDGE

XBAR = 0.48891
YBAR = 0.85143

SECOND MOMENTS OF AREA ABOUT CENTROID

IX = 0.00741
IY = 0.00366
IXY = 0.00512

ANGLE OF INCLINATION OF (ONE) PRINCIPAL AXIS TO *X* AXIS = -34.936

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID

IPX = 0.01099 (AT -34.936 WITH *X* AXIS)
IPY = 0.00009 (AT -34.936 WITH *Y* AXIS)

POINT NUMBER	M E A N L I N E C A T A		SURFACE COORDINATE DATA				
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
1	0.00247	0.00000	64.705	0.00494	0.00024	0.00106	0.00471-0.00106
2	0.02275	0.04291	64.688	0.00777	0.01924	0.04457	0.02627 0.04125
3	0.04304	0.08575	64.639	0.01059	0.03825	0.08802	0.04782 0.08349
4	0.06332	0.12847	64.558	0.01339	0.05728	0.13135	0.05937 0.12560
5	0.08360	0.17101	64.446	0.01614	0.07632	0.17449	0.09089 0.16753
6	0.10389	0.21330	64.303	0.01886	0.09539	0.21739	0.11238 0.20921
7	0.12417	0.25529	64.130	0.02151	0.11449	0.25998	0.13385 0.25060
8	0.14446	0.29694	63.926	0.02410	0.13363	0.30223	0.15528 0.29164
9	0.16474	0.33818	63.692	0.02661	0.15281	0.34407	0.17666 0.33228
10	0.18502	0.37897	63.427	0.02903	0.17204	0.38546	0.19800 0.37248
11	0.20531	0.41927	63.132	0.03136	0.19132	0.42636	0.21929 0.41218
12	0.22559	0.45903	62.806	0.03359	0.21065	0.46671	0.24053 0.45136
13	0.24587	0.49821	62.447	0.03571	0.23004	0.50647	0.26170 0.48995
14	0.26616	0.53677	62.057	0.03772	0.24950	0.54561	0.28282 0.52793
15	0.28644	0.57468	61.633	0.03961	0.26901	0.58409	0.30387 0.56527

POINT NUMBER	M E A N L I N E D A T A			SURFACE COORDINATE DATA			
	X	Y	ANGLE THICKNESS	XS	YS	XP	YP
16	0.30672	0.61189	61.176	0.04138	0.28860	0.62187	0.32485
17	0.32701	0.64838	60.684	0.04302	0.30825	0.65892	0.34576
18	0.34729	0.68412	60.156	0.04454	0.32797	0.69521	0.36661
19	0.36757	0.71908	59.591	0.04593	0.34777	0.73071	0.38738
20	0.38786	0.75323	58.988	0.04720	0.36763	0.76539	0.40808
21	0.40814	0.78656	58.347	0.04833	0.38757	0.79924	0.42871
22	0.42842	0.81903	57.665	0.04933	0.40758	0.83223	0.44927
23	0.44871	0.85064	56.942	0.05021	0.42767	0.86433	0.46975
24	0.46899	0.88136	56.177	0.05097	0.44782	0.89554	0.49016
25	0.48927	0.91118	55.368	0.05160	0.46805	0.92584	0.51050
26	0.50956	0.94009	54.514	0.05211	0.48834	0.95521	0.53077
27	0.52984	0.96808	53.614	0.05250	0.50871	0.98365	0.55098
28	0.55012	0.99514	52.669	0.05279	0.52914	1.01114	0.57111
29	0.57041	1.02127	51.676	0.05296	0.54963	1.03769	0.59118
30	0.59069	1.04646	50.636	0.05303	0.57019	1.06328	0.61119
31	0.61097	1.07072	49.548	0.05299	0.59081	1.08791	0.63114
32	0.63126	1.09404	48.414	0.05284	0.61150	1.11158	0.65102
33	0.65154	1.11643	47.233	0.05255	0.63225	1.13427	0.67083
34	0.67183	1.13790	46.007	0.05211	0.65308	1.15600	0.69057
35	0.69211	1.15845	44.739	0.05149	0.67399	1.17674	0.71023
36	0.71239	1.17810	43.430	0.05070	0.69496	1.19651	0.72982
37	0.73268	1.19686	42.085	0.04973	0.71601	1.21531	0.74934
38	0.75296	1.21474	40.706	0.04856	0.73712	1.23315	0.76879
39	0.77324	1.23177	39.301	0.04719	0.75830	1.25003	0.78819
40	0.79353	1.24795	37.873	0.04561	0.77952	1.26596	0.80753
41	0.81381	1.26333	36.431	0.04383	0.80080	1.28096	0.82682
42	0.83409	1.27791	34.982	0.04183	0.82210	1.29504	0.84608
43	0.85438	1.29172	33.535	0.03961	0.84343	1.30823	0.86532
44	0.87466	1.30480	32.039	0.03718	0.86478	1.32055	0.88454
45	0.89494	1.31718	30.684	0.03452	0.88614	1.33202	0.90375
46	0.91523	1.32889	29.301	0.03163	0.90749	1.34268	0.92297
47	0.93551	1.33996	27.962	0.02851	0.92883	1.35255	0.94219
48	0.95579	1.35043	26.677	0.02514	0.95015	1.36167	0.96144
49	0.97608	1.36035	25.458	0.02154	0.97145	1.37008	0.98071
50	0.99636	1.36976	24.317	0.01768	0.99272	1.37781	1.00000

BLADE SURFACE GEOMETRY IN CARTESIAN COORDINATES AT SPECIFIED VALUES OF 'Z'

SECTION NUMBER 1 'Z' = 6.5000

SECTION PROPERTIES

SECTION AREA = 4.1529E-01

LOCATION OF CENTROID
RELATIVE TO STACK AXIS XBAR = 6.2908E-02
YBAR = 6.1354E-02

SECOND MOMENTS OF AREA
ABOUT CENTROID IX = 1.5144E-01
IY = 9.4772E-02
IXY = 1.1512E-01

PRINCIPAL SECOND MOMENTS
OF AREA ABOUT CENTROID IPX = 2.4167E-01 (AT -38.09 DEGREES TO 'X' AXIS)
IPY = 4.5472E-03 (AT -38.09 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78470E-01	-1.5742E 00	-9.70253E-01	-1.57924E 00
2	-9.40674E-01	-1.49504E 00	-9.25064E-01	-1.50422E 00
3	-9.02704E-01	-1.41512E 00	-8.79598E-01	-1.42875E 00
4	-8.64548E-01	-1.33479E 00	-8.33877E-01	-1.35297E 00
5	-8.26179E-01	-1.25421E 00	-7.87925E-01	-1.27703E 00
6	-7.87582E-01	-1.17353E 00	-7.41786E-01	-1.20106E 00
7	-7.48746E-01	-1.09290E 00	-6.95491E-01	-1.12520E 00
8	-7.09659E-01	-1.01247E 00	-6.49097E-01	-1.04961E 00
9	-6.70313E-01	-9.32394E-01	-6.02648E-01	-9.74426E-01
10	-6.30716E-01	-8.52824E-01	-5.56181E-01	-8.99782E-01
11	-5.90854E-01	-7.73906E-01	-5.09798E-01	-8.25821E-01
12	-5.50743E-01	-6.95783E-01	-4.63531E-01	-7.52679E-01
13	-5.10416E-01	-6.18590E-01	-4.17595E-01	-6.80486E-01
14	-4.69883E-01	-5.42460E-01	-3.71988E-01	-6.09365E-01
15	-4.29275E-01	-4.67513E-01	-3.26958E-01	-5.39434E-01
16	-3.88572E-01	-3.93864E-01	-2.82568E-01	-4.70802E-01
17	-3.47940E-01	-3.21616E-01	-2.38997E-01	-4.03570E-01
18	-3.07422E-01	-2.50862E-01	-1.96425E-01	-3.37835E-01
19	-2.67080E-01	-1.81686E-01	-1.55032E-01	-2.73685E-01
20	-2.27281E-01	-1.14167E-01	-1.14903E-01	-2.11204E-01
21	-1.87861E-01	-4.83668E-02	-7.62446E-02	-1.50475E-01
22	-1.49275E-01	1.56509E-02	-3.87084E-02	-9.15765E-02
23	-1.11398E-01	7.78323E-02	-2.49570E-03	-3.45906E-02
24	-7.42615E-02	1.38111E-01	3.26766E-02	2.04050E-02
25	-3.80288E-02	1.96415E-01	6.68524E-02	7.33348E-02
26	-2.37353E-03	2.52689E-01	1.00103E-01	1.24123E-01
27	3.26637E-02	3.06855E-01	1.32584E-01	1.72700E-01
28	6.71797E-02	3.58858E-01	1.64526E-01	2.18996E-01
29	1.01319E-01	4.08624E-01	1.96028E-01	2.62944E-01
30	1.35225E-01	4.56083E-01	2.27320E-01	3.04482E-01
31	1.69057E-01	5.01152E-01	2.58702E-01	3.43558E-01
32	2.03142E-01	5.43718E-01	2.90202E-01	3.80154E-01
33	2.37739E-01	5.83647E-01	3.21808E-01	4.14265E-01
34	2.73019E-01	6.20814E-01	3.53908E-01	4.45895E-01
35	3.09263E-01	6.55089E-01	3.86300E-01	4.75049E-01
36	3.46382E-01	6.86338E-01	4.19344E-01	5.01748E-01
37	3.84618E-01	7.14418E-01	4.53179E-01	5.26016E-01

POINT NO	XS	YS	XP	YP
38	4.24428E-01	7.39196E-01	4.87686E-01	5.47892E-01
39	4.65472E-01	7.60517E-01	5.23539E-01	5.67421E-01
40	5.08428E-01	7.78252E-01	5.60381E-01	5.84670E-01
41	5.52961E-01	7.92269E-01	5.99015E-01	5.99710E-01
42	5.99367E-01	8.02471E-01	6.38964E-01	6.12647E-01
43	6.47908E-01	8.08797E-01	6.80852E-01	6.23581E-01
44	6.98103E-01	8.11232E-01	7.24304E-01	6.32642E-01
45	7.49853E-01	8.09811E-01	7.69536E-01	6.39967E-01
46	8.03016E-01	8.04616E-01	8.16521E-01	6.45711E-01
47	8.57218E-01	7.95776E-01	8.65202E-01	6.50045E-01
48	9.12194E-01	7.83465E-01	9.15536E-01	6.53157E-01
49	9.67705E-01	7.67879E-01	9.67478E-01	6.55243E-01
50	1.02353E 00	7.49251E-01	1.02088E 00	6.56516E-01

POINT NO	XSEMI	YSEMI
1	-9.70253E-01	-1.57924E 00
2	-9.70508E-01	-1.57966E 00
3	-9.70806E-01	-1.58005E 00
4	-9.71143E-01	-1.58040E 00
5	-9.71515E-01	-1.58072E 00
6	-9.71918E-01	-1.58099E 00
7	-9.72348E-01	-1.58122E 00
8	-9.72800E-01	-1.58140E 00
9	-9.73269E-01	-1.58152E 00
10	-9.73750E-01	-1.58160E 00
11	-9.74238E-01	-1.58163E 00
12	-9.74727E-01	-1.58160E 00
13	-9.75212E-01	-1.58152E 00
14	-9.75688E-01	-1.58139E 00
15	-9.76150E-01	-1.58121E 00
16	-9.76592E-01	-1.58098E 00
17	-9.77009E-01	-1.58070E 00
18	-9.77397E-01	-1.58038E 00
19	-9.77752E-01	-1.58003E 00
20	-9.78070E-01	-1.57964E 00
21	-9.78348E-01	-1.57922E 00
22	-9.78581E-01	-1.57877E 00
23	-9.78768E-01	-1.57830E 00
24	-9.78907E-01	-1.57781E 00
25	-9.78997E-01	-1.57732E 00
26	-9.79035E-01	-1.57681E 00
27	-9.79022E-01	-1.57631E 00
28	-9.78958E-01	-1.57582E 00
29	-9.78844E-01	-1.57533E 00
30	-9.78680E-01	-1.57486E 00
31	-9.78470E-01	-1.57442E 00

SECTION NUMBER 2 'Z' = 6.7500

SECTION PROPERTIES

SECTION AREA = 3.8705E-01

LOCATION OF CENTROID
 RELATIVE TO STACK AXIS XBAR = 5.4763E-02
 YBAR = 5.8043E-02

SECOND MOMENTS OF AREA
 ABOUT CENTROID IX = 1.3940E-01
 IY = 8.8351E-02
 IXY = 1.0716E-01

PRINCIPAL SECOND MOMENTS
 OF AREA ABOUT CENTROID IPX = 2.2403E-01 (AT -38.30 DEGREES TO 'X' AXIS)
 IPY = 3.7156E-03 (AT -38.30 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78457E-01	-1.55794E 00	-9.69987E-01	-1.56275E 00
2	-9.40902E-01	-1.47930E 00	-9.25483E-01	-1.48811E 00
3	-9.03249E-01	-1.40037E 00	-8.80806E-01	-1.41328E 00
4	-8.65471E-01	-1.32123E 00	-8.35960E-01	-1.33835E 00
5	-8.27540E-01	-1.24199E 00	-7.90960E-01	-1.26338E 00
6	-7.89434E-01	-1.16272E 00	-7.45827E-01	-1.18847E 00
7	-7.51137E-01	-1.08356E 00	-7.00591E-01	-1.11372E 00
8	-7.12641E-01	-1.00462E 00	-6.55292E-01	-1.03924E 00
9	-6.73931E-01	-9.26044E-01	-6.09962E-01	-9.65168E-01
10	-6.35009E-01	-8.47970E-01	-5.64645E-01	-8.91637E-01
11	-5.95867E-01	-7.70536E-01	-5.19396E-01	-8.18772E-01
12	-5.56504E-01	-6.93873E-01	-4.74256E-01	-7.46702E-01
13	-5.16946E-01	-6.18111E-01	-4.29353E-01	-6.75547E-01
14	-4.77192E-01	-5.43372E-01	-3.84708E-01	-6.05425E-01
15	-4.37320E-01	-4.69773E-01	-3.40488E-01	-5.36446E-01
16	-3.97327E-01	-3.97422E-01	-2.96748E-01	-4.68716E-01
17	-3.57310E-01	-3.26420E-01	-2.53632E-01	-4.02333E-01
18	-3.17321E-01	-2.56857E-01	-2.11266E-01	-3.37388E-01
19	-2.77395E-01	-1.88818E-01	-1.69806E-01	-2.73969E-01
20	-2.37782E-01	-1.22381E-01	-1.29321E-01	-2.12156E-01
21	-1.98401E-01	-5.76085E-02	-8.99743E-02	-1.52026E-01
22	-1.59555E-01	5.43542E-03	-5.15394E-02	-9.36559E-02
23	-1.21199E-01	6.66961E-02	-1.41514E-02	-3.71193E-02
24	-8.33475E-02	1.26111E-01	2.23786E-02	1.75120E-02
25	-4.61194E-02	1.83616E-01	5.80868E-02	7.01697E-02
26	-9.29698E-03	2.39154E-01	9.30327E-02	1.20787E-01
27	2.70958E-02	2.92665E-01	1.27329E-01	1.69301E-01
28	6.31291E-02	3.44089E-01	1.61155E-01	2.15653E-01
29	9.89067E-02	3.93367E-01	1.94599E-01	2.59784E-01
30	1.34547E-01	4.40437E-01	2.27833E-01	3.01644E-01
31	1.70166E-01	4.85227E-01	2.61106E-01	3.41190E-01
32	2.06026E-01	5.27644E-01	2.94431E-01	3.78409E-01
33	2.42325E-01	5.67574E-01	3.27813E-01	4.13304E-01
34	2.79214E-01	6.04910E-01	3.61541E-01	4.45886E-01
35	3.16896E-01	6.39547E-01	3.95471E-01	4.76167E-01
36	3.55329E-01	6.71374E-01	4.29888E-01	5.04174E-01
37	3.94683E-01	7.00276E-01	4.64901E-01	5.29936E-01
38	4.35316E-01	7.26146E-01	5.00436E-01	5.53497E-01

POINT NO	XS	YS	XP	YP
39	4.76972E-01	7.48863E-01	5.37006E-01	5.74905E-01
40	5.20160E-01	7.68327E-01	5.74360E-01	5.94228E-01
41	5.64638E-01	7.84437E-01	6.13114E-01	6.11539E-01
42	6.10616E-01	7.97123E-01	6.52912E-01	6.26936E-01
43	6.58298E-01	8.06345E-01	6.94239E-01	6.40515E-01
44	7.07277E-01	8.12102E-01	7.36810E-01	6.52395E-01
45	7.57491E-01	8.14433E-01	7.80814E-01	6.62700E-01
46	8.08807E-01	8.13414E-01	8.26183E-01	6.71569E-01
47	8.60929E-01	8.09159E-01	8.72927E-01	6.79154E-01
48	9.13641E-01	8.01819E-01	9.20946E-01	6.85621E-01
49	9.66753E-01	7.91560E-01	9.70360E-01	6.91139E-01
50	1.02009E 00	7.78580E-01	1.02090E 00	6.95894E-01

POINT NO	XSEMI	YSEMI
1	-9.69987E-01	-1.56275E 00
2	-9.70248E-01	-1.56318E 00
3	-9.70553E-01	-1.56358E 00
4	-9.70899E-01	-1.56395E 00
5	-9.71280E-01	-1.56428E 00
6	-9.71694E-01	-1.56456E 00
7	-9.72136E-01	-1.56480E 00
8	-9.72601E-01	-1.56498E 00
9	-9.73083E-01	-1.56512E 00
10	-9.73578E-01	-1.56521E 00
11	-9.74079E-01	-1.56524E 00
12	-9.74583E-01	-1.56522E 00
13	-9.75082E-01	-1.56514E 00
14	-9.75572E-01	-1.56501E 00
15	-9.76048E-01	-1.56484E 00
16	-9.76503E-01	-1.56461E 00
17	-9.76933E-01	-1.56433E 00
18	-9.77334E-01	-1.56401E 00
19	-9.77700E-01	-1.56366E 00
20	-9.78029E-01	-1.56326E 00
21	-9.78315E-01	-1.56284E 00
22	-9.78557E-01	-1.56238E 00
23	-9.78751E-01	-1.56190E 00
24	-9.78896E-01	-1.56141E 00
25	-9.78989E-01	-1.56091E 00
26	-9.79031E-01	-1.56040E 00
27	-9.79019E-01	-1.55988E 00
28	-9.78955E-01	-1.55938E 00
29	-9.78839E-01	-1.55888E 00
30	-9.78672E-01	-1.55840E 00
31	-9.78457E-01	-1.55794E 00

SECTION NUMBER 3 'Z' = 7.0000

SECTION PROPERTIES SECTION AREA = 3.6004E-01
 LOCATION OF CENTROID XBAR = 4.6070E-02
 RELATIVE TO STACK AXIS YBAR = 5.3141E-02
 SECOND MOMENTS OF AREA IX = 1.2838E-01
 ABOUT CENTROID IY = 8.2252E-02
 IXY = 9.9619E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID IPX = 2.0715E-01 (AT -38.48 DEGREES TO 'X' AXIS)
 IPY = 3.0621E-03 (AT -38.48 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78458E-01	-1.55046E 00	-9.69820E-01	-1.55516E 00
2	-9.41031E-01	-1.47136E 00	-9.25810E-01	-1.47970E 00
3	-9.03570E-01	-1.39214E 00	-8.81729E-01	-1.40422E 00
4	-8.66056E-01	-1.31293E 00	-8.37597E-01	-1.32883E 00
5	-8.28475E-01	-1.23383E 00	-7.93437E-01	-1.25362E 00
6	-7.90812E-01	-1.15495E 00	-7.49265E-01	-1.17870E 00
7	-7.53045E-01	-1.07640E 00	-7.05104E-01	-1.10418E 00
8	-7.15165E-01	-9.98271E-01	-6.60965E-01	-1.03015E 00
9	-6.77147E-01	-9.20682E-01	-6.16857E-01	-9.56704E-01
10	-6.38973E-01	-8.43732E-01	-5.72804E-01	-8.83943E-01
11	-6.00632E-01	-7.67525E-01	-5.28797E-01	-8.11958E-01
12	-5.62094E-01	-6.92158E-01	-4.84871E-01	-7.40831E-01
13	-5.23371E-01	-6.17727E-01	-4.41062E-01	-6.70647E-01
14	-4.84445E-01	-5.44325E-01	-3.97413E-01	-6.01494E-01
15	-4.45341E-01	-4.72046E-01	-3.54016E-01	-5.33459E-01
16	-4.06076E-01	-4.00983E-01	-3.10928E-01	-4.66631E-01
17	-3.66680E-01	-3.31223E-01	-2.68268E-01	-4.01095E-01
18	-3.27219E-01	-2.62853E-01	-2.26108E-01	-3.36942E-01
19	-2.87710E-01	-1.95951E-01	-1.84580E-01	-2.74253E-01
20	-2.48282E-01	-1.30594E-01	-1.43740E-01	-2.13107E-01
21	-2.08942E-01	-6.68502E-02	-1.03704E-01	-1.53578E-01
22	-1.69834E-01	-4.78006E-03	-6.43705E-02	-9.57353E-02
23	-1.31000E-01	5.55598E-02	-2.58072E-02	-3.96481E-02
24	-9.24335E-02	1.14112E-01	1.20805E-02	1.46190E-02
25	-5.42101E-02	1.70816E-01	4.93212E-02	6.70047E-02
26	-1.62204E-02	2.25622E-01	8.59621E-02	1.17451E-01
27	2.15278E-02	2.78474E-01	1.25075E-01	1.65902E-01
28	5.90785E-02	3.29321E-01	1.57784E-01	2.12309E-01
29	9.64946E-02	3.78110E-01	1.93169E-01	2.56625E-01
30	1.33869E-01	4.24790E-01	2.28345E-01	2.98806E-01
31	1.71274E-01	4.69303E-01	2.63509E-01	3.38821E-01
32	2.08909E-01	5.11570E-01	2.98660E-01	3.76664E-01
33	2.46911E-01	5.51500E-01	3.33817E-01	4.12344E-01
34	2.85410E-01	5.89007E-01	3.69174E-01	4.45877E-01
35	3.24528E-01	6.24005E-01	4.04642E-01	4.77285E-01
36	3.64277E-01	6.56410E-01	4.40435E-01	5.06599E-01
37	4.04749E-01	6.86134E-01	4.76622E-01	5.33856E-01
38	4.46204E-01	7.13096E-01	5.13186E-01	5.59101E-01

POINT NO	XS	YS	XP	YP
39	4.88472E-01	7.37209E-01	5.50474E-01	5.82389E-01
40	5.31892E-01	7.58401E-01	5.88338E-01	6.03787E-01
41	5.76315E-01	7.76605E-01	6.27212E-01	6.23369E-01
42	6.21866E-01	7.91775E-01	6.66860E-01	6.41226E-01
43	6.68668E-01	8.03894E-01	7.07626E-01	6.57449E-01
44	7.16452E-01	8.12973E-01	7.49316E-01	6.72147E-01
45	7.65129E-01	8.19055E-01	7.92071E-01	6.85432E-01
46	8.14598E-01	8.22212E-01	8.35845E-01	6.97427E-01
47	8.64640E-01	8.22542E-01	8.80652E-01	7.08263E-01
48	9.15089E-01	8.20173E-01	9.26457E-01	7.18084E-01
49	9.65801E-01	8.15241E-01	9.73241E-01	7.27035E-01
50	1.01665E 00	8.07908E-01	1.02092E 00	7.35273E-01

POINT NO	XSEMI	YSEMI
1	-9.69820E-01	-1.55516E 00
2	-9.70085E-01	-1.55561E 00
3	-9.70393E-01	-1.55602E 00
4	-9.70744E-01	-1.55640E 00
5	-9.71131E-01	-1.55674E 00
6	-9.71551E-01	-1.55703E 00
7	-9.71999E-01	-1.55728E 00
8	-9.72471E-01	-1.55748E 00
9	-9.72962E-01	-1.55763E 00
10	-9.73465E-01	-1.55773E 00
11	-9.73975E-01	-1.55777E 00
12	-9.74488E-01	-1.55776E 00
13	-9.74996E-01	-1.55769E 00
14	-9.75495E-01	-1.55758E 00
15	-9.75979E-01	-1.55740E 00
16	-9.76444E-01	-1.55718E 00
17	-9.76882E-01	-1.55691E 00
18	-9.77291E-01	-1.55660E 00
19	-9.77665E-01	-1.55624E 00
20	-9.78001E-01	-1.55585E 00
21	-9.78294E-01	-1.55542E 00
22	-9.78542E-01	-1.55496E 00
23	-9.78742E-01	-1.55440E 00
24	-9.78891E-01	-1.55399E 00
25	-9.78988E-01	-1.55348E 00
26	-9.79032E-01	-1.55296E 00
27	-9.79022E-01	-1.55244E 00
28	-9.78959E-01	-1.55192E 00
29	-9.78842E-01	-1.55142E 00
30	-9.78675E-01	-1.55093E 00
31	-9.78458E-01	-1.55046E 00

SECTION NUMBER 4 'Z' = 7.2500

SECTION PROPERTIES SECTION AREA = 3.3470E-01
 LOCATION OF CENTROID XBAR = 3.6358E-02
 RELATIVE TO STACK AXIS YBAR = 4.3823E-02
 SECOND MOMENTS OF AREA IX = 1.1947E-01
 ABOUT CENTROID IY = 7.6494E-02
 IXY = 9.2937E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID IPX = 1.9337E-01 (AT -38.49 DEGREES TO 'X' AXIS)
 IPY = 2.5919E-03 (AT -38.49 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78468E-01	-1.55317E 00	-9.69759E-01	-1.55577E 00
2	-9.41064E-01	-1.47352E 00	-9.26076E-01	-1.48146E 00
3	-9.03653E-01	-1.39387E 00	-8.82368E-01	-1.40523E 00
4	-8.66221E-01	-1.31431E 00	-8.38660E-01	-1.32916E 00
5	-8.28757E-01	-1.23498E 00	-7.94976E-01	-1.25336E 00
6	-7.91251E-01	-1.15596E 00	-7.51339E-01	-1.17794E 00
7	-7.53689E-01	-1.07737E 00	-7.07782E-01	-1.10300E 00
8	-7.16067E-01	-9.99316E-01	-6.64322E-01	-1.02864E 00
9	-6.78372E-01	-9.21899E-01	-6.20988E-01	-9.54953E-01
10	-6.40598E-01	-8.45220E-01	-5.77807E-01	-8.82040E-01
11	-6.02747E-01	-7.69376E-01	-5.34788E-01	-8.09992E-01
12	-5.64801E-01	-6.94462E-01	-4.91957E-01	-7.36898E-01
13	-5.26764E-01	-6.20371E-01	-4.49299E-01	-6.68845E-01
14	-4.88616E-01	-5.47793E-01	-4.06843E-01	-5.99918E-01
15	-4.50343E-01	-4.76213E-01	-3.64591E-01	-5.32199E-01
16	-4.11938E-01	-4.05913E-01	-3.22570E-01	-4.65762E-01
17	-3.73426E-01	-3.36972E-01	-2.80801E-01	-4.00681E-01
18	-3.34779E-01	-2.69462E-01	-2.39310E-01	-3.37023E-01
19	-2.96012E-01	-2.03450E-01	-1.98144E-01	-2.74853E-01
20	-2.57135E-01	-1.38997E-01	-1.57338E-01	-2.14229E-01
21	-2.18184E-01	-7.61617E-02	-1.16930E-01	-1.55210E-01
22	-1.79166E-01	-1.49936E-02	-7.69235E-02	-9.78454E-02
23	-1.40150E-01	4.44606E-02	-3.73331E-02	-4.21849E-02
24	-1.01111E-01	1.02158E-01	1.82961E-03	1.17256E-02
25	-6.20730E-02	1.58056E-01	4.05659E-02	6.38402E-02
26	-2.30349E-02	2.12116E-01	7.88919E-02	1.14114E-01
27	1.60000E-02	2.64296E-01	1.16820E-01	1.62504E-01
28	5.50368E-02	3.14556E-01	1.54413E-01	2.08966E-01
29	9.40829E-02	3.62853E-01	1.91739E-01	2.53465E-01
30	1.33192E-01	4.09144E-01	2.28858E-01	2.95969E-01
31	1.72383E-01	4.53378E-01	2.65913E-01	3.36453E-01
32	2.11793E-01	4.95497E-01	3.02890E-01	3.74919E-01
33	2.51497E-01	5.35426E-01	3.39821E-01	4.11383E-01
34	2.91605E-01	5.73103E-01	3.76307E-01	4.45868E-01
35	3.32161E-01	6.08463E-01	4.13813E-01	4.78403E-01
36	3.73224E-01	6.41446E-01	4.50982E-01	5.09025E-01
37	4.14814E-01	6.71992E-01	4.88344E-01	5.37776E-01
38	4.57091E-01	7.00046E-01	5.25936E-01	5.64706E-01

POINT NO	XS	YS	XP	YP
39	4.99972E-01	7.25555E-01	5.63941E-01	5.89874E-01
40	5.43624E-01	7.48476E-01	6.02316E-01	6.13346E-01
41	5.87992E-01	7.68772E-01	6.42310E-01	6.35198E-01
42	6.33115E-01	7.86427E-01	6.80809E-01	6.55515E-01
43	6.79049E-01	8.01442E-01	7.21013E-01	6.74383E-01
44	7.25627E-01	8.13843E-01	7.61822E-01	6.91900E-01
45	7.72766E-01	8.23677E-01	8.03328E-01	7.08164E-01
46	8.20389E-01	8.31010E-01	8.45507E-01	7.23284E-01
47	8.68351E-01	8.35926E-01	8.88377E-01	7.37372E-01
48	9.16536E-01	8.38527E-01	9.31918E-01	7.50547E-01
49	9.64849E-01	8.38923E-01	9.76123E-01	7.62931E-01
50	1.01321E 00	8.37236E-01	1.02094E 00	7.74652E-01

POINT :ID	XSE4I	YSE4I
1	-9.69759E-01	-1.55776E 00
2	-9.70023E-01	-1.55820E 00
3	-9.70331E-01	-1.55862E 00
4	-9.70681E-01	-1.55901E 00
5	-9.71069E-01	-1.55925E 00
6	-9.71490E-01	-1.55965E 00
7	-9.71939E-01	-1.55991E 00
8	-9.72413E-01	-1.56012E 00
9	-9.72905E-01	-1.56028E 00
10	-9.73410E-01	-1.56038E 00
11	-9.73924E-01	-1.56043E 00
12	-9.74439E-01	-1.56043E 00
13	-9.74950E-01	-1.56037E 00
14	-9.75453E-01	-1.56025E 00
15	-9.75941E-01	-1.56009E 00
16	-9.76408E-01	-1.55987E 00
17	-9.76851E-01	-1.55961E 00
18	-9.77264E-01	-1.55930E 00
19	-9.77642E-01	-1.55895E 00
20	-9.77981E-01	-1.55856E 00
21	-9.78278E-01	-1.55814E 00
22	-9.78530E-01	-1.55768E 00
23	-9.78733E-01	-1.55721E 00
24	-9.78885E-01	-1.55671E 00
25	-9.78985E-01	-1.55620E 00
26	-9.79032E-01	-1.55568E 00
27	-9.79025E-01	-1.55516E 00
28	-9.78964E-01	-1.55464E 00
29	-9.78850E-01	-1.55414E 00
30	-9.78684E-01	-1.55364E 00
31	-9.78468E-01	-1.55317E 00

SECTION NUMBER 5 '2' = 7.5000

SECTION PROPERTIES SECTION AREA = 3.1217E-01
 LOCATION OF CENTROID XBAR = 2.5367E-02
 RELATIVE TO STACK AXIS YBAR = 2.7334E-02
 SECOND MOMENTS OF AREA IX = 1.1275E-01
 ABOUT CENTROID IY = 7.1154E-02
 IXY = 8.7298E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID IPX = 1.8169E-01 (AT -38.30 DEGREES TO 'X' AXIS)
 IPY = 2.2088E-03 (AT -38.30 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78480E-01	-1.56382E 00	-9.69677E-01	-1.56833E 00
2	-9.61012E-01	-1.48334E 00	-9.26192E-01	-1.49097E 00
3	-9.03547E-01	-1.40298E 00	-8.82705E-01	-1.41378E 00
4	-8.66074E-01	-1.32285E 00	-8.39238E-01	-1.33687E 00
5	-8.28582E-01	-1.24303E 00	-7.95816E-01	-1.26032E 00
6	-7.91063E-01	-1.16364E 00	-7.52464E-01	-1.18424E 00
7	-7.53507E-01	-1.08478E 00	-7.09214E-01	-1.10872E 00
8	-7.15914E-01	-1.00654E 00	-6.66085E-01	-1.03385E 00
9	-6.78274E-01	-9.29018E-01	-6.23112E-01	-9.59736E-01
10	-6.40581E-01	-8.52307E-01	-5.80316E-01	-8.86454E-01
11	-6.02842E-01	-7.76497E-01	-5.37719E-01	-8.14093E-01
12	-5.65044E-01	-7.01676E-01	-4.95332E-01	-7.42738E-01
13	-5.27187E-01	-6.27930E-01	-4.53145E-01	-6.72470E-01
14	-4.89254E-01	-5.55342E-01	-4.11168E-01	-6.03366E-01
15	-4.51224E-01	-4.83992E-01	-3.69392E-01	-5.35502E-01
16	-4.13094E-01	-4.13955E-01	-3.27828E-01	-4.68951E-01
17	-3.74840E-01	-3.45306E-01	-2.86470E-01	-4.03780E-01
18	-3.36458E-01	-2.78113E-01	-2.45332E-01	-3.40056E-01
19	-2.97940E-01	-2.12441E-01	-2.04416E-01	-2.77839E-01
20	-2.59279E-01	-1.48331E-01	-1.63737E-01	-2.17185E-01
21	-2.20478E-01	-8.58983E-02	-1.23302E-01	-1.58148E-01
22	-1.81534E-01	-2.51348E-02	-8.31150E-02	-1.00778E-01
23	-1.42456E-01	3.38926E-02	-4.31771E-02	-4.51177E-02
24	-1.03244E-01	9.11404E-02	-3.47677E-03	8.79115E-03
25	-6.38938E-02	1.46569E-01	3.59856E-02	6.09125E-02
26	-2.64024E-02	2.00141E-01	7.52337E-02	1.11215E-01
27	1.82360E-02	2.51825E-01	1.14284E-01	1.59671E-01
28	5.50384E-02	3.01591E-01	1.53160E-01	2.06258E-01
29	9.50076E-02	3.49412E-01	1.91904E-01	2.50960E-01
30	1.35185E-01	3.95264E-01	2.30534E-01	2.93766E-01
31	1.75567E-01	4.39125E-01	2.69130E-01	3.34671E-01
32	2.16243E-01	4.80962E-01	3.07660E-01	3.73693E-01
33	2.57220E-01	5.20732E-01	3.46160E-01	4.10862E-01
34	2.98586E-01	5.58401E-01	3.84631E-01	4.46217E-01
35	3.40317E-01	5.93935E-01	4.23080E-01	4.79798E-01
36	3.82478E-01	6.27309E-01	4.61564E-01	5.11655E-01
37	4.25044E-01	6.58498E-01	5.00072E-01	5.41839E-01
38	4.68052E-01	6.87481E-01	5.38677E-01	5.70405E-01

POINT NO	XS	YS	XP	YP
39	5.11492E-01	7.14245E-01	5.77398E-01	5.97416E-01
40	5.55354E-01	7.38781E-01	6.16286E-01	6.22939E-01
41	5.99658E-01	7.61086E-01	6.55403E-01	6.47045E-01
42	6.44354E-01	7.81164E-01	6.94754E-01	6.69812E-01
43	6.89422E-01	7.99037E-01	7.34399E-01	6.91320E-01
44	7.34798E-01	8.14736E-01	7.74327E-01	7.11653E-01
45	7.80403E-01	8.28309E-01	8.14586E-01	7.30896E-01
46	8.26179E-01	8.39811E-01	8.55168E-01	7.49142E-01
47	8.72062E-01	8.49310E-01	8.96102E-01	7.66481E-01
48	9.17984E-01	8.56881E-01	9.37378E-01	7.83011E-01
49	9.63897E-01	8.62604E-01	9.79005E-01	7.98827E-01
50	1.00976E 00	8.66564E-01	1.02097E 00	8.14031E-01

POINT NO	XSEMI	YSEMI
1	-9.69677E-01	-1.56833E 00
2	-9.69939E-01	-1.56878E 00
3	-9.70248E-01	-1.56921E 00
4	-9.70598E-01	-1.56960E 00
5	-9.70986E-01	-1.56995E 00
6	-9.71408E-01	-1.57026E 00
7	-9.71860E-01	-1.57052E 00
8	-9.72335E-01	-1.57073E 00
9	-9.72830E-01	-1.57090E 00
10	-9.73339E-01	-1.57101E 00
11	-9.73855E-01	-1.57106E 00
12	-9.74374E-01	-1.57106E 00
13	-9.74890E-01	-1.57101E 00
14	-9.75397E-01	-1.57090E 00
15	-9.75889E-01	-1.57074E 00
16	-9.76362E-01	-1.57053E 00
17	-9.76810E-01	-1.57027E 00
18	-9.77227E-01	-1.56996E 00
19	-9.77610E-01	-1.56962E 00
20	-9.77955E-01	-1.56923E 00
21	-9.78257E-01	-1.56881E 00
22	-9.78513E-01	-1.56835E 00
23	-9.78721E-01	-1.56788E 00
24	-9.78878E-01	-1.56738E 00
25	-9.78982E-01	-1.56687E 00
26	-9.79032E-01	-1.56635E 00
27	-9.79028E-01	-1.56583E 00
28	-9.78970E-01	-1.56531E 00
29	-9.78858E-01	-1.56480E 00
30	-9.78694E-01	-1.56430E 00
31	-9.78480E-01	-1.56382E 00

SECTION NUMBER 6 'Z' = 7.7500

SECTION PROPERTIES SECTION AREA = 2.9574E-01

LOCATION OF CENTROID
 RELATIVE TO STACK AXIS

XBAR = 1.7569E-02
 YBAR = 1.3610E-02

SECOND MOMENTS OF AREA
 ABOUT CENTROID

IX = 1.0979E-01
 IY = 6.7269E-02
 IXY = 8.3997E-02

PRINCIPAL SECOND MOMENTS
 OF AREA ABOUT CENTROID

IPX = 1.7517E-01 (AT -37.90 DEGREES TO 'X' AXIS)
 IPY = 1.8832E-03 (AT -37.90 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78494E-01	-1.58232E 00	-9.69600E-01	-1.58678E 00
2	-9.40916E-01	-1.50062E 00	-9.26208E-01	-1.50802E 00
3	-9.03342E-01	-1.41911E 00	-8.82826E-01	-1.42949E 00
4	-8.65762E-01	-1.33791E 00	-8.39474E-01	-1.35129E 00
5	-8.28163E-01	-1.25711E 00	-7.96175E-01	-1.27353E 00
6	-7.90536E-01	-1.17682E 00	-7.52948E-01	-1.19631E 00
7	-7.52872E-01	-1.09714E 00	-7.09820E-01	-1.11973E 00
8	-7.15166E-01	-1.01818E 00	-6.66809E-01	-1.04388E 00
9	-6.77409E-01	-9.40013E-01	-6.23944E-01	-9.68846E-01
10	-6.39598E-01	-8.62739E-01	-5.81245E-01	-8.94723E-01
11	-6.01734E-01	-7.86443E-01	-5.38735E-01	-8.21593E-01
12	-5.63809E-01	-7.11208E-01	-4.96422E-01	-7.49537E-01
13	-5.25825E-01	-6.37113E-01	-4.54302E-01	-6.78633E-01
14	-4.87764E-01	-5.64238E-01	-4.12379E-01	-6.08956E-01
15	-4.49611E-01	-4.92656E-01	-3.70644E-01	-5.40573E-01
16	-4.11355E-01	-4.22437E-01	-3.29096E-01	-4.73548E-01
17	-3.72976E-01	-3.53647E-01	-2.87728E-01	-4.07942E-01
18	-3.34463E-01	-2.86348E-01	-2.46530E-01	-3.43810E-01
19	-2.95800E-01	-2.20596E-01	-2.05502E-01	-2.81205E-01
20	-2.56973E-01	-1.56447E-01	-1.64629E-01	-2.20174E-01
21	-2.17967E-01	-9.39489E-02	-1.23916E-01	-1.60761E-01
22	-1.78776E-01	-3.31477E-02	-8.33529E-02	-1.03005E-01
23	-1.39380E-01	2.59155E-02	-4.29495E-02	-4.69410E-02
24	-9.97861E-02	8.32039E-02	-2.68814E-03	7.39982E-03
25	-5.99819E-02	1.38685E-01	3.74223E-02	5.99909E-02
26	-1.99722E-02	1.92329E-01	7.74035E-02	1.10810E-01
27	2.02529E-02	2.44112E-01	1.17233E-01	1.59841E-01
28	6.06926E-02	2.94012E-01	1.56993E-01	2.07071E-01
29	1.01355E-01	3.42012E-01	1.96631E-01	2.52494E-01
30	1.42244E-01	3.88098E-01	2.36185E-01	2.96108E-01
31	1.83367E-01	4.32260E-01	2.75670E-01	3.37918E-01
32	2.24740E-01	4.74479E-01	3.15082E-01	3.77948E-01
33	2.66391E-01	5.14732E-01	3.54424E-01	4.16235E-01
34	3.08327E-01	5.53000E-01	3.93680E-01	4.52824E-01
35	3.50564E-01	5.89268E-01	4.32873E-01	4.87763E-01
36	3.93091E-01	6.23529E-01	4.71990E-01	5.21106E-01
37	4.35920E-01	6.55780E-01	5.11057E-01	5.52912E-01
38	4.79022E-01	6.86025E-01	5.50061E-01	5.83247E-01

POINT NO	XS	YS	XP	YP
39	5.22393E-01	7.14277E-01	5.89080E-01	6.12178E-01
40	5.66005E-01	7.40554E-01	6.28079E-01	6.39781E-01
41	6.09827E-01	7.64885E-01	6.67085E-01	6.66132E-01
42	6.53832E-01	7.87308E-01	7.06122E-01	6.91307E-01
43	6.97965E-01	8.07865E-01	7.45194E-01	7.15381E-01
44	7.42182E-01	8.26602E-01	7.84321E-01	7.38431E-01
45	7.86433E-01	8.43570E-01	8.23516E-01	7.60534E-01
46	8.30675E-01	8.58824E-01	8.62794E-01	7.81766E-01
47	8.74877E-01	8.72422E-01	9.02169E-01	8.02205E-01
48	9.19007E-01	8.84420E-01	9.41651E-01	8.21929E-01
49	9.63047E-01	8.94880E-01	9.81250E-01	8.41005E-01
50	1.00698E 00	9.03858E-01	1.02097E 00	8.59520E-01

POINT NO XSEMI YSEMI

1	-9.69600E-01	-1.58678E 00
2	-9.69861E-01	-1.58724E 00
3	-9.70168E-01	-1.58767E 00
4	-9.70517E-01	-1.58806E 00
5	-9.70906E-01	-1.58842E 00
6	-9.71328E-01	-1.58873E 00
7	-9.71781E-01	-1.58900E 00
8	-9.72258E-01	-1.58922E 00
9	-9.72755E-01	-1.58938E 00
10	-9.73266E-01	-1.58950E 00
11	-9.73785E-01	-1.58956E 00
12	-9.74308E-01	-1.58957E 00
13	-9.74827E-01	-1.58952E 00
14	-9.75338E-01	-1.58941E 00
15	-9.75835E-01	-1.58926E 00
16	-9.76313E-01	-1.58905E 00
17	-9.76765E-01	-1.58879E 00
18	-9.77188E-01	-1.58849E 00
19	-9.77576E-01	-1.58814E 00
20	-9.77926E-01	-1.58775E 00
21	-9.78233E-01	-1.58733E 00
22	-9.78494E-01	-1.58688E 00
23	-9.78707E-01	-1.58640E 00
24	-9.78868E-01	-1.58590E 00
25	-9.78977E-01	-1.58539E 00
26	-9.79031E-01	-1.58487E 00
27	-9.79031E-01	-1.58435E 00
28	-9.78977E-01	-1.58382E 00
29	-9.78868E-01	-1.58331E 00
30	-9.78707E-01	-1.58281E 00
31	-9.78494E-01	-1.58232E 00

SECTION NUMBER 7 'Z' = 8.0000

SECTION PROPERTIES SECTION AREA = 2.8395E-01
 LOCATION OF CENTROID XBAR = 1.1433E-02
 RELATIVE TO STACK AXIS YBAR = 5.0212E-03
 SECOND MOMENTS OF AREA IX = 1.1046E-01
 ABOUT CENTROID IY = 6.4531E-02
 IXY = 8.2743E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID IPX = 1.7337E-01 (AT -37.24 DEGREES TO 'X' AXIS)
 IPY = 1.6262E-03 (AT -37.24 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78509E-01	-1.60670E 00	-9.69577E-01	-1.61112E 00
2	-9.40791E-01	-1.52373E 00	-9.26210E-01	-1.53097E 00
3	-9.03079E-01	-1.44098E 00	-8.82858E-01	-1.45104E 00
4	-8.65359E-01	-1.35855E 00	-8.39538E-01	-1.37146E 00
5	-8.27618E-01	-1.27655E 00	-7.96268E-01	-1.29234E 00
6	-7.89843E-01	-1.19509E 00	-7.53063E-01	-1.21377E 00
7	-7.52023E-01	-1.11428E 00	-7.09944E-01	-1.13585E 00
8	-7.14149E-01	-1.03421E 00	-6.66926E-01	-1.05869E 00
9	-6.76211E-01	-9.54973E-01	-6.24030E-01	-9.82374E-01
10	-6.38203E-01	-8.76669E-01	-5.81272E-01	-9.06991E-01
11	-6.00119E-01	-7.99380E-01	-5.38672E-01	-8.32628E-01
12	-5.61954E-01	-7.23190E-01	-4.96238E-01	-7.59367E-01
13	-5.23706E-01	-6.48178E-01	-4.53973E-01	-6.87290E-01
14	-4.85360E-01	-5.74424E-01	-4.11880E-01	-6.16471E-01
15	-4.46905E-01	-5.01999E-01	-3.69956E-01	-5.46976E-01
16	-4.08330E-01	-4.30972E-01	-3.28195E-01	-4.78871E-01
17	-3.69619E-01	-3.61406E-01	-2.86595E-01	-4.12212E-01
18	-3.30760E-01	-2.93359E-01	-2.45144E-01	-3.47050E-01
19	-2.91740E-01	-2.26886E-01	-2.03839E-01	-2.83434E-01
20	-2.52543E-01	-1.62034E-01	-1.62664E-01	-2.21403E-01
21	-2.13158E-01	-9.88473E-02	-1.21621E-01	-1.60993E-01
22	-1.73570E-01	-3.73653E-02	-8.07025E-02	-1.02236E-01
23	-1.33770E-01	2.23786E-02	-3.99156E-02	-4.51581E-02
24	-9.37576E-02	8.03553E-02	7.47136E-04	1.02185E-02
25	-5.35299E-02	1.36540E-01	4.12810E-02	6.38757E-02
26	-1.30932E-02	1.90912E-01	8.16947E-02	1.15800E-01
27	2.75562E-02	2.43455E-01	1.21984E-01	1.65983E-01
28	6.84086E-02	3.94156E-01	1.62160E-01	2.14420E-01
29	1.09466E-01	3.43007E-01	2.02219E-01	2.61113E-01
30	1.50717E-01	3.90004E-01	2.42173E-01	3.06066E-01
31	1.92161E-01	4.35145E-01	2.82019E-01	3.49291E-01
32	2.33797E-01	4.78422E-01	3.21757E-01	3.90816E-01
33	2.75640E-01	5.19824E-01	3.61369E-01	4.30683E-01
34	3.17690E-01	5.59342E-01	4.00851E-01	4.68937E-01
35	3.59948E-01	5.96974E-01	4.40197E-01	5.05629E-01
36	4.02406E-01	6.32724E-01	4.79409E-01	5.40811E-01
37	4.45054E-01	6.66599E-01	5.18490E-01	5.74543E-01
38	4.87876E-01	6.98614E-01	5.57449E-01	6.06883E-01

POINT NO	XS	YS	XP	YP
39	5.30849E-01	7.28789E-01	5.96296E-01	6.37898E-01
40	5.73952E-01	7.57151E-01	6.35045E-01	6.67654E-01
41	6.17156E-01	7.83730E-01	6.73711E-01	6.96219E-01
42	6.60433E-01	8.08566E-01	7.12310E-01	7.23656E-01
43	7.03749E-01	8.31694E-01	7.50860E-01	7.50031E-01
44	7.47077E-01	8.53155E-01	7.89381E-01	7.75410E-01
45	7.90388E-01	8.72991E-01	8.27895E-01	7.99857E-01
46	8.33661E-01	8.91247E-01	8.66421E-01	8.23441E-01
47	8.76876E-01	9.07974E-01	9.04978E-01	8.46228E-01
48	9.20020E-01	9.23223E-01	9.43581E-01	8.68288E-01
49	9.63084E-01	9.37047E-01	9.82242E-01	8.89689E-01
50	1.00606E 00	9.49506E-01	1.02097E 00	9.10504E-01

POINT NO	XSEMI	YSEMI
1	-9.69577E-01	-1.61112E 00
2	-9.69834E-01	-1.61158E 00
3	-9.70139E-01	-1.61201E 00
4	-9.70485E-01	-1.61240E 00
5	-9.70871E-01	-1.61276E 00
6	-9.71292E-01	-1.61307E 00
7	-9.71742E-01	-1.61334E 00
8	-9.72218E-01	-1.61356E 00
9	-9.72714E-01	-1.61373E 00
10	-9.73224E-01	-1.61385E 00
11	-9.73744E-01	-1.61391E 00
12	-9.74267E-01	-1.61392E 00
13	-9.74787E-01	-1.61387E 00
14	-9.75299E-01	-1.61377E 00
15	-9.75797E-01	-1.61361E 00
16	-9.76276E-01	-1.61341E 00
17	-9.76731E-01	-1.61315E 00
18	-9.77156E-01	-1.61285E 00
19	-9.77547E-01	-1.61250E 00
20	-9.77900E-01	-1.61212E 00
21	-9.78210E-01	-1.61170E 00
22	-9.78475E-01	-1.61125E 00
23	-9.78691E-01	-1.61077E 00
24	-9.78856E-01	-1.61028E 00
25	-9.78969E-01	-1.60976E 00
26	-9.79028E-01	-1.60924E 00
27	-9.79031E-01	-1.60872E 00
28	-9.78981E-01	-1.60820E 00
29	-9.78876E-01	-1.60768E 00
30	-9.78718E-01	-1.60718E 00
31	-9.78509E-01	-1.60670E 00

SECTION NUMBER 8 'Z' = 8.2500

SECTION AREA = 2.7573E-01
 LOCATION OF CENTROID
 RELATIVE TO STACK AXIS XBAR = 7.0488E-03
 YBAR = 1.3486E-03
 SECOND MOMENTS OF AREA
 ABOUT CENTROID IX = 1.1363E-01
 IY = 6.2585E-02
 IXY = 8.2829E-02
 PRINCIPAL SECOND MOMENTS
 OF AREA ABOUT CENTROID IPX = 1.7478E-01 (AT -36.44 DEGREES TO 'X' AXIS)
 IPY = 1.4354E-03 (AT -36.44 DEGREES TO 'Y' AXIS)

SECTION PROPERTIES

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78521E-01	-1.63449E 00	-9.69527E-01	-1.63892E 00
2	-9.40648E-01	-1.55027E 00	-9.26170E-01	-1.55741E 00
3	-9.02779E-01	-1.46627E 00	-8.82826E-01	-1.47613E 00
4	-8.64899E-01	-1.38260E 00	-8.39510E-01	-1.39520F 00
5	-8.26993E-01	-1.29937E 00	-7.96237E-01	-1.31471E 00
6	-7.89048E-01	-1.21669E 00	-7.53019E-01	-1.23478E 00
7	-7.51051E-01	-1.13466E 00	-7.09873E-01	-1.15551E 00
8	-7.12990E-01	-1.05338E 00	-6.66810E-01	-1.07698E 00
9	-6.74854E-01	-9.72944E-01	-6.23846E-01	-9.99294E-01
10	-6.36633E-01	-8.93444E-01	-5.80994E-01	-9.22539E-01
11	-5.98318E-01	-8.14966E-01	-5.38267E-01	-8.46798E-01
12	-5.59901E-01	-7.37592E-01	-4.95674E-01	-7.72155E-01
13	-5.21377E-01	-6.61402E-01	-4.53222E-01	-6.98688E-01
14	-4.82734E-01	-5.86472E-01	-4.10916E-01	-6.26471E-01
15	-4.43963E-01	-5.12874E-01	-3.68757E-01	-5.55572E-01
16	-4.05054E-01	-4.40675E-01	-3.26747E-01	-4.86052E-01
17	-3.65999E-01	-3.69936E-01	-2.84886E-01	-4.17968E-01
18	-3.26787E-01	-3.00714E-01	-2.43170E-01	-3.51371E-01
19	-2.87412E-01	-2.33060E-01	-2.01599E-01	-2.86304E-01
20	-2.47862E-01	-1.67020E-01	-1.60170E-01	-2.22808E-01
21	-2.08134E-01	-1.02634E-01	-1.18883E-01	-1.60914E-01
22	-1.68219E-01	-3.99381E-02	-7.77385E-02	-1.00651E-01
23	-1.28117E-01	2.10379E-02	-3.67382E-02	-4.20425E-02
24	-8.78289E-02	8.02696E-02	4.11785E-03	1.48925E-02
25	-4.73578E-02	1.37736E-01	4.48293E-02	7.01387E-02
26	-6.70765E-03	1.93421E-01	8.53968E-02	1.23685E-01
27	3.41156E-02	2.47312E-01	1.25821E-01	1.75526E-01
28	7.51060E-02	2.99401E-01	1.66105E-01	2.25657E-01
29	1.16256E-01	3.49681E-01	2.06250E-01	2.74081E-01
30	1.57557E-01	3.98153E-01	2.46259E-01	3.20805E-01
31	1.99001E-01	4.44819E-01	2.86135E-01	3.65838E-01
32	2.40591E-01	4.89671E-01	3.25869E-01	4.09208E-01
33	2.82334E-01	5.32702E-01	3.65450E-01	4.50953E-01
34	3.24233E-01	5.73906E-01	4.04867E-01	4.91116E-01
35	3.66286E-01	6.13284E-01	4.44119E-01	5.29743E-01
36	4.08487E-01	6.50841E-01	4.83206E-01	5.66881E-01
37	4.50824E-01	6.86586E-01	5.22131E-01	6.02584E-01
38	4.93285E-01	7.20535E-01	5.60905E-01	6.36905E-01

POINT NO	XS	YS	XP	YP
39	5.35852E-01	7.52706E-01	5.99539E-01	6.69903E-01
40	5.78506E-01	7.83124E-01	6.38047E-01	7.01640E-01
41	6.21226E-01	8.11820E-01	6.76447E-01	7.32174E-01
42	6.63990E-01	8.38826E-01	7.14761E-01	7.61566E-01
43	7.06778E-01	8.64177E-01	7.53014E-01	7.89874E-01
44	7.49574E-01	8.87908E-01	7.91229E-01	8.17161E-01
45	7.92362E-01	9.10057E-01	8.29430E-01	8.43489E-01
46	8.35130E-01	9.30669E-01	8.67643E-01	8.68920E-01
47	8.77867E-01	9.49790E-01	9.05888E-01	8.93521E-01
48	9.20567E-01	9.67469E-01	9.44180E-01	9.17357E-01
49	9.63224E-01	9.83762E-01	9.82538E-01	9.40496E-01
50	1.00584E 00	9.98724E-01	1.02097E 00	9.63007E-01

POINT NO	XSEMI	YSEMI
1	-9.69527E-01	-1.63892E 00
2	-9.69783E-01	-1.63938E 00
3	-9.70085E-01	-1.63981E 00
4	-9.70430E-01	-1.64021E 00
5	-9.70815E-01	-1.64057E 00
6	-9.71235E-01	-1.64088E 00
7	-9.71685E-01	-1.64115E 00
8	-9.72161E-01	-1.64137E 00
9	-9.72658E-01	-1.64154E 00
10	-9.73169E-01	-1.64166E 00
11	-9.73690E-01	-1.64172E 00
12	-9.74214E-01	-1.64173E 00
13	-9.74737E-01	-1.64168E 00
14	-9.75251E-01	-1.64158E 00
15	-9.75752E-01	-1.64142E 00
16	-9.76235E-01	-1.64122E 00
17	-9.76693E-01	-1.64096E 00
18	-9.77121E-01	-1.64066E 00
19	-9.77516E-01	-1.64031E 00
20	-9.77873E-01	-1.63993E 00
21	-9.78187E-01	-1.63950E 00
22	-9.78456E-01	-1.63905E 00
23	-9.78676E-01	-1.63858E 00
24	-9.78845E-01	-1.63808E 00
25	-9.78961E-01	-1.63756E 00
26	-9.79024E-01	-1.63704E 00
27	-9.79031E-01	-1.63652E 00
28	-9.78984E-01	-1.63599E 00
29	-9.78882E-01	-1.63547E 00
30	-9.78727E-01	-1.63497E 00
31	-9.78521E-01	-1.63449E 00

SECTION NUMBER 9 'Z' = 8.5000

SECTION PROPERTIES SECTION AREA = 2.6922E-01

LOCATION OF CENTROID XBAR = 2.9914E-03
 RELATIVE TO STACK AXIS YBAR = 4.7234E-04

SECOND MOMENTS OF AREA IX = 1.1816E-01
 ABOUT CENTROID IY = 6.1033E-02
 IXY = 8.3547E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID IPX = 1.7789E-01 (AT -35.56 DEGREES TO 'X' AXIS)
 IPY = 1.3008E-03 (AT -35.56 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78531E-01	-1.66553E 00	-9.69450E-01	-1.67004E 00
2	-9.40520E-01	-1.57976E 00	-9.26111E-01	-1.58690E 00
3	-9.02508E-01	-1.49424E 00	-8.82785E-01	-1.50403E 00
4	-8.64482E-01	-1.40909E 00	-8.39486E-01	-1.42152E 00
5	-8.26426E-01	-1.32441E 00	-7.96227E-01	-1.33949E 00
6	-7.88325E-01	-1.24030E 00	-7.53017E-01	-1.25802E 00
7	-7.50168E-01	-1.15687E 00	-7.09871E-01	-1.17723E 00
8	-7.11939E-01	-1.07421E 00	-6.66798E-01	-1.09719E 00
9	-6.73628E-01	-9.92414E-01	-6.23809E-01	-1.01801E 00
10	-6.35224E-01	-9.11562E-01	-5.80916E-01	-9.39755E-01
11	-5.96714E-01	-8.31741E-01	-5.38126E-01	-8.62517E-01
12	-5.58091E-01	-7.53030E-01	-4.95451E-01	-7.86373E-01
13	-5.19346E-01	-6.75505E-01	-4.52900E-01	-7.11397E-01
14	-4.80471E-01	-5.99239E-01	-4.10480E-01	-6.37658E-01
15	-4.41461E-01	-5.24300E-01	-3.68199E-01	-5.65221E-01
16	-4.02309E-01	-4.50750E-01	-3.26062E-01	-4.94144E-01
17	-3.63010E-01	-3.78648E-01	-2.84074E-01	-4.24480E-01
18	-3.23560E-01	-3.08047E-01	-2.42240E-01	-3.56278E-01
19	-2.83956E-01	-2.38994E-01	-2.00563E-01	-2.89580E-01
20	-2.44197E-01	-1.71533E-01	-1.59048E-01	-2.24423E-01
21	-2.04281E-01	-1.05701E-01	-1.17696E-01	-1.60839E-01
22	-1.64211E-01	-4.15316E-02	-7.65032E-02	-9.88555E-02
23	-1.23986E-01	2.09488E-02	-3.54874E-02	-3.84955E-02
24	-8.36119E-02	8.17166E-02	5.36959E-03	2.02215E-02
25	-4.30895E-02	1.40753E-01	4.60629E-02	7.72800E-02
26	-2.42546E-03	1.98041E-01	8.65946E-02	1.32669E-01
27	3.8377E-02	2.53571E-01	1.26967E-01	1.86379E-01
28	7.93123E-02	3.07334E-01	1.67185E-01	2.38408E-01
29	1.20375E-01	3.59324E-01	2.07251E-01	2.88755E-01
30	1.61556E-01	4.09541E-01	2.47172E-01	3.37422E-01
31	2.02853E-01	4.57984E-01	2.86951E-01	3.84419E-01
32	2.44270E-01	5.04647E-01	3.26581E-01	4.29768E-01
33	2.85819E-01	5.49518E-01	3.66053E-01	4.73503E-01
34	3.27502E-01	5.92542E-01	4.05358E-01	5.15661E-01
35	3.69323E-01	6.33867E-01	4.44497E-01	5.56279E-01
36	4.11275E-01	6.73346E-01	4.83470E-01	5.95402E-01
37	4.53354E-01	7.11033E-01	5.22286E-01	6.33073E-01
38	4.95549E-01	7.46940E-01	5.60953E-01	6.69340E-01

POINT NO	XS	YS	XP	YP
39	5.37847E-01	7.81081E-01	5.99483E-01	7.04256E-01
40	5.80233E-01	8.13476E-01	6.37894E-01	7.37872E-01
41	6.22686E-01	8.44149E-01	6.76203E-01	7.70243E-01
42	6.65192E-01	8.73127E-01	7.14437E-01	8.01418E-01
43	7.07737E-01	9.00436E-01	7.52625E-01	8.31449E-01
44	7.50311E-01	9.26103E-01	7.90796E-01	8.60389E-01
45	7.92909E-01	9.50161E-01	8.28978E-01	8.88292E-01
46	8.35523E-01	9.72643E-01	8.67202E-01	9.15214E-01
47	8.78150E-01	9.93591E-01	9.05492E-01	9.41211E-01
48	9.20788E-01	1.01305E 00	9.43871E-01	9.66345E-01
49	9.63437E-01	1.03107E 00	9.82361E-01	9.90676E-01
50	1.00610E 00	1.04770E 00	1.02097E 00	1.01427E 00

POINT NO	XSEMI	YSEMI
1	-9.69450E-01	-1.67004E 00
2	-9.69705E-01	-1.67050E 00
3	-9.70006E-01	-1.67093E 00
4	-9.70351E-01	-1.67133E 00
5	-9.70736E-01	-1.67170E 00
6	-9.71156E-01	-1.67201E 00
7	-9.71608E-01	-1.67229E 00
8	-9.72086E-01	-1.67251E 00
9	-9.72584E-01	-1.67268E 00
10	-9.73098E-01	-1.67280E 00
11	-9.73622E-01	-1.67286E 00
12	-9.74150E-01	-1.67287E 00
13	-9.74676E-01	-1.67282E 00
14	-9.75194E-01	-1.67271E 00
15	-9.75700E-01	-1.67255E 00
16	-9.76186E-01	-1.67234E 00
17	-9.76649E-01	-1.67208E 00
18	-9.77082E-01	-1.67178E 00
19	-9.77482E-01	-1.67142E 00
20	-9.77843E-01	-1.67103E 00
21	-9.78162E-01	-1.67061E 00
22	-9.78436E-01	-1.67015E 00
23	-9.78660E-01	-1.66966E 00
24	-9.78834E-01	-1.66916E 00
25	-9.78954E-01	-1.66864E 00
26	-9.79020E-01	-1.66811E 00
27	-9.79031E-01	-1.66758E 00
28	-9.78987E-01	-1.66705E 00
29	-9.78888E-01	-1.66652E 00
30	-9.78735E-01	-1.66602E 00
31	-9.78531E-01	-1.66553E 00

SECTION NUMBER 10 'Z' # 8.7500

SECTION PROPERTIES SECTION AREA # 2.6329E-01
 LOCATION OF CENTROID XBAR # -2.4630E-03
 RELATIVE TO STACK AXIS YBAR # 2.3435E-03
 SECOND MOMENTS OF AREA IX # 1.2334E-01
 ABOUT CENTROID IY # 5.9553E-02
 IXY # 8.4442E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID IPX # 1.8185E-01 (AT -34.62 DEGREES TO 'X' AXIS)
 IPY # 1.2480E-03 (AT -34.62 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78551E-01	-1.70206E 00	-9.69556E-01	-1.70662E 00
2	-9.40488E-01	-1.61437E 00	-9.26317E-01	-1.62154E 00
3	-9.02419E-01	-1.52896E 00	-8.83092E-01	-1.53672E 00
4	-8.64330E-01	-1.43992E 00	-8.39893E-01	-1.45228E 00
5	-8.26206E-01	-1.35338E 00	-7.96732E-01	-1.36831E 00
6	-7.88034E-01	-1.2674E 00	-7.53619E-01	-1.28493E 00
7	-7.49801E-01	-1.18219E 00	-7.10546E-01	-1.20222E 00
8	-7.11495E-01	-1.09773E 00	-6.67507E-01	-1.12028E 00
9	-6.73105E-01	-1.01415E 00	-6.24487E-01	-1.03920E 00
10	-6.34619E-01	-9.71537E-01	-5.81879E-01	-9.59051E-01
11	-5.96027E-01	-8.4984E-01	-5.39171E-01	-8.78919E-01
12	-5.57322E-01	-7.6951E-01	-4.96573E-01	-8.01878E-01
13	-5.18494E-01	-6.90249E-01	-4.54098E-01	-7.24998E-01
14	-4.79540E-01	-6.12246E-01	-4.11755E-01	-6.49344E-01
15	-4.40456E-01	-5.35566E-01	-3.69552E-01	-5.74974E-01
16	-4.01238E-01	-4.60268E-01	-3.27498E-01	-5.01951E-01
17	-3.61884E-01	-3.86409E-01	-2.85601E-01	-4.30319E-01
18	-3.22394E-01	-3.14027E-01	-2.43866E-01	-3.60125E-01
19	-2.82747E-01	-2.43179E-01	-2.02298E-01	-2.91411E-01
20	-2.43004E-01	-1.73900E-01	-1.60903E-01	-2.24215E-01
21	-2.03107E-01	-1.06226E-01	-1.19681E-01	-1.58568E-01
22	-1.63079E-01	3.41816E-02	-7.86329E-02	-9.44994E-02
23	-1.22920E-01	8.68032E-02	2.95374E-03	2.87974E-02
24	-8.26327E-02	1.47834E-01	4.34995E-02	8.77832E-02
25	-1.07171E-03	2.07074E-01	8.38873E-02	1.45503E-01
26	3.89889E-02	3.44567E-01	1.24124E-01	2.61343E-01
27	7.97784E-02	5.20500E-01	1.64218E-01	2.55490E-01
28	1.20691E-01	3.74261E-01	2.04178E-01	3.07936E-01
29	1.61727E-01	4.26440E-01	2.44014E-01	3.58674E-01
30	2.02866E-01	4.7820E-01	2.82732E-01	4.07704E-01
31	2.44182E-01	5.25407E-01	3.2327E-01	4.55041E-01
32	2.85629E-01	5.72157E-01	3.6278E-01	5.00709E-01
33	3.27231E-01	6.17066E-01	4.0111E-01	5.44737E-01
34	3.68997E-01	6.60124E-01	4.41294E-01	5.87155E-01
35	4.10916E-01	7.01329E-01	4.80337E-01	6.28000E-01
36	4.52981E-01	7.40681E-01	5.19244E-01	6.67314E-01
37	4.95184E-01	7.78190E-01	5.58029E-01	7.05140E-01
38				

POINT NO	XS	YS	XP	YP
39	5.37502E-01	8.11869E-01	5.96682E-01	7.41530E-01
40	5.79919E-01	8.47740E-01	6.35233E-01	7.76537E-01
41	6.22408E-01	8.79830E-01	6.71693E-01	8.10214E-01
42	6.64950E-01	9.10212E-01	7.12093E-01	8.42810E-01
43	7.07535E-01	9.39791E-01	7.50464E-01	8.73775E-01
44	7.50154E-01	9.68716E-01	7.88842E-01	9.03741E-01
45	7.92819E-01	9.96980E-01	8.27257E-01	9.32621E-01
46	8.35517E-01	1.01462E 00	8.65747E-01	9.60412E-01
47	8.78233E-01	1.03068E 00	9.04337E-01	9.87192E-01
48	9.21033E-01	1.04721E 00	9.43057E-01	1.01302E 00
49	9.63857E-01	1.07624E 00	9.81932E-01	1.03796E 00
50	1.00674E 00	1.09388E 00	1.02097E 00	1.06207E 00

POINT NO YSEMI

1	-9.69556E-01	-1.70662E 00
2	-9.69804E-01	-1.70708E 00
3	-9.70099E-01	-1.70751E 00
4	-9.70436E-01	-1.70791E 00
5	-9.70814E-01	-1.70827E 00
6	-9.71227E-01	-1.70858E 00
7	-9.71671E-01	-1.70885E 00
8	-9.72141E-01	-1.70907E 00
9	-9.72632E-01	-1.70924E 00
10	-9.73139E-01	-1.70935E 00
11	-9.73659E-01	-1.70941E 00
12	-9.74176E-01	-1.70942E 00
13	-9.74696E-01	-1.70936E 00
14	-9.75209E-01	-1.70926E 00
15	-9.75709E-01	-1.70910E 00
16	-9.76190E-01	-1.70888E 00
17	-9.76649E-01	-1.70862E 00
18	-9.77079E-01	-1.70831E 00
19	-9.77476E-01	-1.70796E 00
20	-9.77835E-01	-1.70756E 00
21	-9.78153E-01	-1.70714E 00
22	-9.78426E-01	-1.70668E 00
23	-9.78651E-01	-1.70619E 00
24	-9.78826E-01	-1.70569E 00
25	-9.78948E-01	-1.70517E 00
26	-9.79017E-01	-1.70464E 00
27	-9.79032E-01	-1.70411E 00
28	-9.78991E-01	-1.70358E 00
29	-9.78897E-01	-1.70306E 00
30	-9.78750E-01	-1.70255E 00
31	-9.78551E-01	-1.70206E 00

SECTION NUMBER 11 '2' " 9.0000

SECTION PROPERTIES SECTION AREA 2.5753E-01
 LOCATION OF CENTROID XBAR -9.1868E-03
 RELATIVE TO STACK AXIS YUAR 5.3695E-03
 SECOND MOMENTS OF AREA IX 1.2901E-01
 ABOUT CENTROID IY 5.8087E-02
 IXY 8.5221E-02

PRINCIPAL SECOND MOMENTS OF AREA ABOUT CENTROID
 IPX 1.8585E-01 (AT -33.70 DEGREES TO 'X' AXIS)
 IPY 1.2442E-03 (AT -33.70 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78576E-01	-1.76140E 00	-9.69744E-01	-1.74596E 00
2	-9.40551E-01	-1.65189E 00	-9.26712E-01	-1.65901E 00
3	-9.02532E-01	-1.56261E 00	-8.89708E-01	-1.57229E 00
4	-8.64499E-01	-1.47369E 00	-8.40744E-01	-1.48590E 00
5	-8.26441E-01	-1.30223E 00	-7.97829E-01	-1.39996E 00
6	-7.88342E-01	-1.2735E 00	-7.54973E-01	-1.31457E 00
7	-7.50187E-01	-1.21014E 00	-7.12186E-01	-1.22982E 00
8	-7.11966E-01	-1.12370E 00	-6.69477E-01	-1.14581E 00
9	-6.73668E-01	-1.03812E 00	-6.26854E-01	-1.06263E 00
10	-6.35276E-01	-9.53494E-01	-5.84323E-01	-9.80353E-01
11	-5.96785E-01	-8.69895E-01	-5.41808E-01	-8.99070E-01
12	-5.58185E-01	-7.87402E-01	-4.99582E-01	-8.18891E-01
13	-5.19467E-01	-7.06087E-01	-4.57387E-01	-7.39769E-01
14	-4.80628E-01	-6.26020E-01	-4.15321E-01	-6.61889E-01
15	-4.41663E-01	-5.47263E-01	-3.73392E-01	-5.85273E-01
16	-4.02568E-01	-4.69875E-01	-3.31604E-01	-5.09978E-01
17	-3.63341E-01	-3.93912E-01	-2.89964E-01	-4.36059E-01
18	-3.23979E-01	-3.19424E-01	-2.48474E-01	-3.63564E-01
19	-2.84482E-01	-2.46458E-01	-2.07137E-01	-2.92539E-01
20	-2.44847E-01	-1.75057E-01	-1.65951E-01	-2.23027E-01
21	-2.05073E-01	-1.05260E-01	-1.24917E-01	-1.55066E-01
22	-1.65159E-01	-3.71033E-02	-8.40293E-02	-8.86936E-02
23	-1.25105E-01	2.97798E-02	-4.32849E-02	-2.39419E-02
24	-8.49080E-02	9.41592E-02	-2.07603E-03	3.91588E-02
25	-4.45876E-02	1.57207E-01	3.78004E-02	1.00581E-01
26	-4.08003E-03	2.18498E-01	7.01543E-02	1.60299E-01
27	3.65526E-02	2.78011E-01	1.10391E-01	2.18293E-01
28	7.73355E-02	3.33724E-01	1.58535E-01	2.74542E-01
29	1.18265E-01	3.91620E-01	1.98575E-01	3.29031E-01
30	1.59347E-01	4.45684E-01	2.30534E-01	3.81748E-01
31	2.00580E-01	4.97901E-01	2.78408E-01	4.32688E-01
32	2.41904E-01	5.48246E-01	3.18190E-01	4.81065E-01
33	2.83564E-01	5.96699E-01	3.57862E-01	5.28300E-01
34	3.25326E-01	6.43247E-01	3.97418E-01	5.75020E-01
35	3.67263E-01	6.87880E-01	4.36848E-01	6.19056E-01
36	4.09366E-01	7.30597E-01	4.76152E-01	6.61443E-01
37	4.51623E-01	7.71405E-01	5.15326E-01	7.02225E-01
38	4.94014E-01	8.10313E-01	5.54378E-01	7.41448E-01

POINT ID	X5	Y5	X4	Y4
39	5.36519E-01	8.47342E-01	5.92304E-01	7.79165E-01
40	5.79110E-01	8.82518E-01	6.32118E-01	8.15433E-01
41	6.21758E-01	9.15075E-01	6.70833E-01	8.50307E-01
42	6.64437E-01	9.47433E-01	7.09495E-01	8.83835E-01
43	7.07141E-01	9.77276E-01	7.48110E-01	9.16065E-01
44	7.49877E-01	1.00538E 00	7.86752E-01	9.47047E-01
45	7.92649E-01	1.03179E 00	8.25444E-01	9.76831E-01
46	8.35463E-01	1.05655E 00	8.64232E-01	1.00547E 00
47	8.78333E-01	1.07969E 00	9.03144E-01	1.03303E 00
48	9.21269E-01	1.10138E 00	9.42224E-01	1.05995E 00
49	9.64277E-01	1.12135E 00	9.81498E-01	1.08511E 00
50	1.00739E 00	1.13996E 00	1.02097E 00	1.10974E 00

POINT ID	XSEMI	YSEMI
1	-9.69744E-01	-1.74596E 00
2	-9.69984E-01	-1.74641E 00
3	-9.70269E-01	-1.74684E 00
4	-9.70597E-01	-1.74723E 00
5	-9.70964E-01	-1.74759E 00
6	-9.71368E-01	-1.74790E 00
7	-9.71798E-01	-1.74816E 00
8	-9.72256E-01	-1.74838E 00
9	-9.72736E-01	-1.74856E 00
10	-9.73238E-01	-1.74871E 00
11	-9.73758E-01	-1.74871E 00
12	-9.74294E-01	-1.74865E 00
13	-9.74854E-01	-1.74854E 00
14	-9.75436E-01	-1.74838E 00
15	-9.76038E-01	-1.74816E 00
16	-9.76670E-01	-1.74791E 00
17	-9.77338E-01	-1.74760E 00
18	-9.78038E-01	-1.74725E 00
19	-9.78768E-01	-1.74689E 00
20	-9.79528E-01	-1.74663E 00
21	-9.80318E-01	-1.74643E 00
22	-9.81138E-01	-1.74629E 00
23	-9.81988E-01	-1.74621E 00
24	-9.82868E-01	-1.74619E 00
25	-9.83778E-01	-1.74629E 00
26	-9.84718E-01	-1.74649E 00
27	-9.85688E-01	-1.74679E 00
28	-9.86688E-01	-1.74719E 00
29	-9.87718E-01	-1.74769E 00
30	-9.88768E-01	-1.74829E 00
31	-9.89838E-01	-1.74899E 00

 FINAL VALUES OF QUANTITIES MODIFIED IN STACKING ITERATION

LOCATION OF STACK AXIS X = 0.979

SECTION NUMBER	MERIDIONAL CHORD LENGTH	X STACK OFFSET
1	2.1700	0.
2	2.1352	0.0035
3	2.1049	0.0044
4	2.0790	0.0037
5	2.0573	0.0021
6	2.0394	0.0002
7	2.0253	-0.0017
8	2.0147	-0.0032
9	2.0074	-0.0045
10	2.0034	-0.0056
11	2.0025	-0.0062
12	2.0045	-0.0061
13	2.0096	-0.0049
14	2.0175	-0.0026
15	2.0276	0.0012

4. STATOR GEOMETRY

a. Number of Blades

The stator contains 49 blades.

b. Blade Form

The stator blade design was produced by the same process as was used for the rotor design, but with two differences. First (as described in Section II of this report), the double circular arc profile was selected for the streamsurface sections. Second, the sections were stacked at the trailing edge to complete the blade definition.

The 15 streamsurfaces on which the double circular arc profiles were designed are defined by the results of the aerodynamic analysis given in Section IV.2 of this report. The stator occupies stations 11 through 15. Details of each section are given in the following table. For each section, the ratio of maximum thickness to chord is .04, and the edge radii are .005 inch.

Section No.	Camber Angle (degrees)	Stagger Angle (degrees)	Chord (inches)
1 (Hub)	54.39	18.70	2.349
2	54.59	18.54	2.240
3	54.77	18.38	2.143
4	55.03	18.26	2.060
5	55.33	18.16	1.990
6	55.59	18.08	1.934
7	55.85	18.03	1.895
8	56.13	18.02	1.873
9	56.39	18.05	1.869
10	56.68	18.13	1.885
11	56.99	18.28	1.923
12	57.49	18.54	1.984
13	58.35	18.96	2.072
14	60.38	19.81	2.197
15 (Casing)	62.35	20.73	2.365

The generation of the blade geometry including interpolation (and extrapolation) of "manufacturing plane" data was accomplished using a computer program similar to that used for the rotor blade, and output from the program is shown on following pages. The coordinates of 10 "manufacturing" plane sections through the blade perpendicular to the stack axis are given. The sections are spaced $1/8$ inch apart, and extend slightly beyond the actual blade in both directions. The coordinate definitions are the same as given for the rotor blade above. 'XP' and 'YP' define the pressure surface of the section, and 'XS' and 'YS' define the suction surface. 'XSEM1' and 'YSEM1' define the trailing edge radius, and 'XSEM2' and 'YSEM2' define the leading edge radius.

Figure 25 shows superimposed plots of alternate developed stream-surface sections. Figure 26 is a similar plot of all of the manufacturing sections.

c. Location of Stack Axis

The stator stack axis is located at an axial coordinate of 4.7250 inches, measured from the same origin as was used to define the annulus geometry.

d. Root Fillet

Between points $3/4$ inch in from the leading edge and $1/2$ inch in from the trailing edge, the fillet is $1/4$ inch radius on both sides of the blade at both hub and casing. The fillet is smoothly decreased to $1/16$ inch radius at the blade edges.

e. Stator Blade Coordinates

CARTESIAN COORDINATES FOR MANUFACTURING SECTIONS

SECTION NO. 1 'Z' = 7.500

POINT NO	XP	YP	XS	YS
1	-2.33265	0.73382	-2.33696	0.75911
2	-2.30979	0.75157	-2.31571	0.71564
3	-2.28605	0.72012	-2.29323	0.67388
4	-2.26130	0.68941	-2.26942	0.63367
5	-2.23537	0.65933	-2.24419	0.59483
6	-2.20811	0.62996	-2.21740	0.55740
7	-2.17936	0.60110	-2.18891	0.52114
8	-2.14894	0.57275	-2.15857	0.48601
9	-2.11667	0.54487	-2.12624	0.45195
10	-2.08240	0.51742	-2.09177	0.41890
11	-2.04595	0.49037	-2.05500	0.38683
12	-2.00716	0.46369	-2.01580	0.35570
13	-1.96593	0.43733	-1.97408	0.32550
14	-1.92229	0.41144	-1.92983	0.29624
15	-1.87637	0.38594	-1.88335	0.26795
16	-1.82831	0.36092	-1.83467	0.24067
17	-1.77827	0.33643	-1.78400	0.21444
18	-1.72642	0.31253	-1.73153	0.18929
19	-1.67296	0.28927	-1.67745	0.16527
20	-1.61803	0.26670	-1.62198	0.14240
21	-1.56196	0.24487	-1.56531	0.12071
22	-1.50481	0.22384	-1.50764	0.10023
23	-1.44632	0.20363	-1.44913	0.08093
24	-1.38818	0.18430	-1.39011	0.06293
25	-1.32906	0.16586	-1.33061	0.04623
26	-1.26904	0.14837	-1.27095	0.03076
27	-1.21011	0.13183	-1.21105	0.01655
28	-1.15054	0.11627	-1.15133	0.00361
29	-1.09135	0.10171	-1.09185	-0.00803
30	-1.03237	0.08815	-1.03270	-0.01851
31	-0.97379	0.07553	-0.97399	-0.02772
32	-0.91568	0.06401	-0.91573	-0.03573
33	-0.85809	0.05343	-0.85812	-0.04254
34	-0.80107	0.04381	-0.80104	-0.04819
35	-0.74462	0.03516	-0.74456	-0.05271
36	-0.68876	0.02744	-0.68868	-0.05610
37	-0.63348	0.02064	-0.63339	-0.05840
38	-0.57875	0.01474	-0.57805	-0.05963
39	-0.52450	0.00972	-0.52442	-0.05980
40	-0.47070	0.00555	-0.47062	-0.05892
41	-0.41728	0.00223	-0.41722	-0.05701
42	-0.36420	-0.00027	-0.36415	-0.05407
43	-0.31144	-0.00195	-0.31141	-0.05011

POINT NO	XP	YP	XS	YS
44	-0.25896	-0.00282	-0.25894	-0.04512
45	-0.20673	-0.00290	-0.20672	-0.03910
46	-0.15474	-0.00219	-0.15473	-0.03207
47	-0.10296	-0.00069	-0.10296	-0.02400
48	-0.05138	0.00160	-0.05133	-0.01490

POINT NO.	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00527	0.00432	-2.35719	0.80480
2	-0.00448	0.00431	-2.35735	0.80532
3	-0.00370	0.00417	-2.35744	0.80592
4	-0.00295	0.00392	-2.35745	0.80658
5	-0.00226	0.00355	-2.35739	0.80728
6	-0.00153	0.00307	-2.35725	0.80802
7	-0.00108	0.00250	-2.35704	0.80876
8	-0.00063	0.00185	-2.35676	0.80949
9	-0.00029	0.00114	-2.35642	0.81019
10	-0.00007	0.00038	-2.35604	0.81085
11	0.00004	-0.00040	-2.35561	0.81145
12	0.00002	-0.00119	-2.35515	0.81197
13	-0.00013	-0.00197	-2.35467	0.81240
14	-0.00039	-0.00271	-2.35418	0.81273
15	-0.00077	-0.00340	-2.35370	0.81295
16	-0.00125	-0.00403	-2.35323	0.81306
17	-0.00183	-0.00457	-2.35280	0.81305
18	-0.00248	-0.00501	-2.35240	0.81293
19	-0.00319	-0.00535	-2.35206	0.81269
20	-0.00395	-0.00557	-2.35177	0.81234

SECTION NO. 2 "Z" = 7.625

POINT NO	XP	YP	XS	YS
1	-2.13299	0.70408	-2.13661	0.68047
2	-2.10932	0.67395	-2.11473	0.64027
3	-2.08602	0.64467	-2.09193	0.60175
4	-2.06138	0.61614	-2.06805	0.55475
5	-2.03578	0.58830	-2.04301	0.52912
6	-2.00909	0.55110	-2.01668	0.49477
7	-1.98116	0.53449	-1.98896	0.46159
8	-1.95186	0.50841	-1.95372	0.42953
9	-1.92104	0.48284	-1.92883	0.39850
10	-1.89855	0.45772	-1.89617	0.36845
11	-1.85426	0.43304	-1.86162	0.33936
12	-1.81804	0.40876	-1.82506	0.31117
13	-1.77980	0.38488	-1.78640	0.28388
14	-1.73955	0.36141	-1.74570	0.25749

POINT NO	XP	YP	XS	YS
15	-1.09742	0.33840	-1.70308	0.23203
16	-1.05353	0.31587	-1.65967	0.20753
17	-1.60800	0.29388	-1.61262	0.18400
18	-1.56098	0.27246	-1.56509	0.16149
19	-1.51264	0.25166	-1.51625	0.14001
20	-1.46313	0.23152	-1.46625	0.11960
21	-1.41260	0.21208	-1.41529	0.10026
22	-1.36124	0.19338	-1.36349	0.08204
23	-1.30918	0.17545	-1.31105	0.06493
24	-1.25659	0.15833	-1.25811	0.04875
25	-1.20351	0.14202	-1.20483	0.03410
26	-1.15039	0.12657	-1.15134	0.02040
27	-1.09707	0.11139	-1.09779	0.00784
28	-1.04378	0.09829	-1.04430	-0.00359
29	-0.99063	0.08549	-0.99100	-0.01388
30	-0.93772	0.07358	-0.93795	-0.02306
31	-0.88511	0.06257	-0.88524	-0.03113
32	-0.83285	0.05245	-0.83291	-0.03812
33	-0.78101	0.04321	-0.78101	-0.04404
34	-0.72960	0.03484	-0.72955	-0.04891
35	-0.67864	0.02732	-0.67857	-0.05275
36	-0.62813	0.02067	-0.62804	-0.05558
37	-0.57807	0.01483	-0.57798	-0.05742
38	-0.52843	0.00981	-0.52834	-0.05827
39	-0.47917	0.00558	-0.47909	-0.05816
40	-0.43024	0.00214	-0.43017	-0.05709
41	-0.38160	-0.00054	-0.38155	-0.05507
42	-0.33323	-0.00247	-0.33318	-0.05210
43	-0.28509	-0.00365	-0.28506	-0.04819
44	-0.23715	-0.00478	-0.23713	-0.04334
45	-0.18941	-0.00379	-0.18939	-0.03753
46	-0.14183	-0.00276	-0.14182	-0.03078
47	-0.09441	-0.00101	-0.09441	-0.02307
48	-0.04714	0.00147	-0.04713	-0.01441

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00531	0.00427	-2.15793	0.72292
2	-0.00452	0.00427	-2.15813	0.72345
3	-0.00374	0.00414	-2.15826	0.72406
4	-0.00299	0.00389	-2.15830	0.72473
5	-0.00229	0.00353	-2.15826	0.72545
6	-0.00166	0.00305	-2.15814	0.72619
7	-0.00111	0.00249	-2.15794	0.72693
8	-0.00065	0.00184	-2.15767	0.72767
9	-0.00030	0.00114	-2.15733	0.72837
10	-0.00007	0.00038	-2.15694	0.72903

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
11	0.00004	-0.00040	-2.15549	0.72963
12	0.00063	-0.00119	-2.15501	0.73014
13	-0.00011	-0.00197	-2.15551	0.73057
14	-0.00037	-0.00272	-2.15499	0.73039
15	-0.00074	-0.00341	-2.15449	0.73110
16	-0.00122	-0.00404	-2.15398	0.73120
17	-0.00179	-0.00459	-2.15350	0.73113
18	-0.00244	-0.00504	-2.15307	0.73104
19	-0.00315	-0.00538	-2.15268	0.73079
20	-0.00390	-0.00550	-2.15235	0.73043

SECTION NO. 3 'Z' = 7.750

POINT NO	XP	YP	XS	YS
1	-1.95751	0.53409	-1.95993	0.61116
2	-1.92994	0.50413	-1.93307	0.57213
3	-1.90219	0.57529	-1.90599	0.53508
4	-1.87420	0.54747	-1.87853	0.49982
5	-1.84588	0.52061	-1.85065	0.46619
6	-1.81715	0.49465	-1.82226	0.43406
7	-1.78791	0.46950	-1.79327	0.40330
8	-1.75805	0.44512	-1.76357	0.37330
9	-1.72743	0.42143	-1.73304	0.34543
10	-1.69589	0.39839	-1.70149	0.31824
11	-1.66323	0.37590	-1.66871	0.29200
12	-1.62925	0.35393	-1.63454	0.25669
13	-1.59281	0.33243	-1.59882	0.22229
14	-1.55638	0.31141	-1.56155	0.21875
15	-1.51950	0.29086	-1.52231	0.19612
16	-1.47875	0.27082	-1.48297	0.17433
17	-1.43773	0.25132	-1.44125	0.15357
18	-1.39554	0.23239	-1.39855	0.13368
19	-1.35232	0.21405	-1.35504	0.11475
20	-1.30819	0.19634	-1.31053	0.09679
21	-1.26325	0.17929	-1.26525	0.07982
22	-1.21756	0.16293	-1.21934	0.06384
23	-1.17154	0.14727	-1.17292	0.04887
24	-1.12501	0.13235	-1.12612	0.03491
25	-1.07817	0.11818	-1.07904	0.02197
26	-1.03114	0.10478	-1.03181	0.01004
27	-0.98404	0.09215	-0.98453	-0.00087
28	-0.93695	0.08032	-0.93730	-0.01078
29	-0.88995	0.06927	-0.89013	-0.01968
30	-0.84312	0.05903	-0.84325	-0.02760
31	-0.79651	0.04957	-0.79655	-0.03453
32	-0.75015	0.04090	-0.75015	-0.04051

POINT NO	XP	YP	XS	YS
33	-0.70409	0.03301	-0.70405	-0.04553
34	-0.65833	0.02590	-0.65827	-0.04962
35	-0.61233	0.01954	-0.61282	-0.05289
35	-0.56777	0.01393	-0.56769	-0.05505
37	-0.52295	0.00906	-0.52288	-0.05543
38	-0.47844	0.00492	-0.47835	-0.05692
39	-0.43417	0.00148	-0.43410	-0.05653
40	-0.39012	-0.00125	-0.39006	-0.05527
41	-0.34527	-0.00329	-0.34522	-0.05314
42	-0.30258	-0.00465	-0.30254	-0.05015
42	-0.25903	-0.00552	-0.25900	-0.04630
44	-0.21551	-0.00533	-0.21550	-0.04159
45	-0.17231	-0.00466	-0.17230	-0.03598
45	-0.12910	-0.00333	-0.12910	-0.02951
47	-0.08599	-0.00132	-0.08598	-0.02216
48	-0.04295	0.00134	-0.04295	-0.01392

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00536	0.00422	-1.98551	0.65269
2	-0.00457	0.00423	-1.98550	0.65326
3	-0.00378	0.00411	-1.98700	0.65390
4	-0.00303	0.00386	-1.98711	0.65430
5	-0.00233	0.00351	-1.98712	0.65534
6	-0.00169	0.00304	-1.98704	0.65610
7	-0.00113	0.00248	-1.98587	0.65585
8	-0.00057	0.00184	-1.98551	0.65759
9	-0.00031	0.00113	-1.98626	0.65830
10	-0.00007	0.00038	-1.98524	0.65895
11	0.00005	-0.00040	-1.98536	0.65953
12	0.00004	-0.00119	-1.98483	0.66003
13	-0.00009	-0.00197	-1.98426	0.66042
14	-0.00034	-0.00272	-1.98366	0.66072
15	-0.00071	-0.00342	-1.98306	0.66089
16	-0.00118	-0.00405	-1.98247	0.66095
17	-0.00175	-0.00461	-1.98190	0.66089
18	-0.00239	-0.00506	-1.98136	0.66071
19	-0.00310	-0.00541	-1.98087	0.66042
20	-0.00385	-0.00564	-1.98044	0.66002

SECTION NO. 4 'Z' = 7.875

POINT NO	XP	YP	XS	YS
1	-1.83152	0.55584	-1.83287	0.55332
2	-1.80937	0.55578	-1.80217	0.52488
3	-1.76917	0.52388	-1.77133	0.43840
4	-1.73785	0.43906	-1.74031	0.45394
5	-1.70537	0.47230	-1.70905	0.42113
5	-1.67457	0.44552	-1.67750	0.33992
7	-1.64268	0.42168	-1.64501	0.35019
8	-1.61033	0.39771	-1.61331	0.33183
9	-1.57755	0.37453	-1.58053	0.30477
10	-1.54425	0.35223	-1.54719	0.27892
11	-1.51035	0.33062	-1.51321	0.25421
12	-1.47579	0.30972	-1.47853	0.23059
13	-1.44049	0.28949	-1.44303	0.20801
14	-1.40443	0.26992	-1.40685	0.18643
15	-1.36755	0.25099	-1.36987	0.16583
15	-1.33017	0.23270	-1.33219	0.14620
17	-1.29204	0.21506	-1.29385	0.12752
18	-1.25331	0.19800	-1.25491	0.10978
19	-1.21404	0.18172	-1.21544	0.09298
20	-1.17430	0.16504	-1.17550	0.07711
21	-1.12414	0.15103	-1.13515	0.06217
22	-1.09364	0.13679	-1.09443	0.04815
23	-1.05296	0.12305	-1.05354	0.03506
24	-1.01185	0.11008	-1.01240	0.02288
25	-0.97059	0.09781	-0.97111	0.01161
25	-0.92943	0.08624	-0.92974	0.00124
27	-0.88811	0.07536	-0.88833	-0.00824
28	-0.84678	0.06516	-0.84692	-0.01683
29	-0.80547	0.05569	-0.80556	-0.02454
30	-0.76423	0.04690	-0.76427	-0.03138
31	-0.72307	0.03980	-0.72309	-0.03736
32	-0.68202	0.03139	-0.68200	-0.04249
33	-0.64109	0.02465	-0.64105	-0.04678
34	-0.60028	0.01859	-0.60023	-0.05024
35	-0.55951	0.01319	-0.55955	-0.05287
35	-0.51907	0.00846	-0.51901	-0.05469
37	-0.47857	0.00438	-0.47861	-0.05569
38	-0.43839	0.00094	-0.43833	-0.05589
39	-0.39821	-0.00185	-0.39817	-0.05529
40	-0.35814	-0.00401	-0.35810	-0.05388
41	-0.31814	-0.00554	-0.31811	-0.05168
42	-0.27821	-0.00544	-0.27813	-0.04867
43	-0.23834	-0.00571	-0.23832	-0.04486
44	-0.19852	-0.00636	-0.19851	-0.04023

POINT NO	XP	YP	XS	YS
45	-0.15875	-0.00540	-0.15874	-0.03480
46	-0.11901	-0.00381	-0.11901	-0.02855
47	-0.07931	-0.00160	-0.07931	-0.02147
48	-0.03954	0.00123	-0.03954	-0.01355

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00540	0.00413	-1.86368	0.60438
2	-0.00461	0.00419	-1.86405	0.60493
3	-0.00382	0.00407	-1.86431	0.60565
4	-0.00307	0.00384	-1.86448	0.60637
5	-0.00236	0.00349	-1.86453	0.60712
6	-0.00172	0.00303	-1.86449	0.60789
7	-0.00115	0.00247	-1.86433	0.60865
8	-0.00059	0.00183	-1.86406	0.60940
9	-0.00032	0.00113	-1.86371	0.61010
10	-0.00008	0.00038	-1.86326	0.61074
11	0.00005	-0.00040	-1.86274	0.61131
12	0.00005	-0.00119	-1.86216	0.61179
13	-0.00007	-0.00197	-1.86153	0.61216
14	-0.00032	-0.00272	-1.86085	0.61242
15	-0.00058	-0.00343	-1.86018	0.61257
16	-0.00115	-0.00407	-1.85950	0.61260
17	-0.00171	-0.00462	-1.85884	0.61250
18	-0.00235	-0.00508	-1.85821	0.61228
19	-0.00306	-0.00544	-1.85763	0.61195
20	-0.00382	-0.00557	-1.85712	0.61152

SECTION NO. 5 *Z* = 3.000

POINT NO	XP	YP	XS	YS
1	-1.75813	0.55306	-1.75870	0.53567
2	-1.72407	0.52758	-1.72484	0.49722
3	-1.69003	0.49837	-1.69097	0.46095
4	-1.65599	0.47036	-1.65708	0.42667
5	-1.62194	0.44349	-1.62313	0.39422
6	-1.58784	0.41769	-1.58910	0.36346
7	-1.55366	0.39292	-1.55498	0.33427
8	-1.51937	0.36913	-1.52072	0.30655
9	-1.48495	0.34527	-1.48630	0.28022
10	-1.45035	0.32430	-1.45168	0.25518
11	-1.41554	0.30318	-1.41683	0.23137
12	-1.38048	0.28288	-1.38172	0.20874
13	-1.34515	0.26337	-1.34632	0.18722
14	-1.30954	0.24462	-1.31063	0.16677
15	-1.27364	0.22661	-1.27464	0.14737

POINT NO	XP	YP	XS	YS
15	-1.23747	0.20933	-1.23833	0.12896
17	-1.20105	0.19275	-1.20186	0.11153
18	-1.16433	0.17589	-1.16509	0.09505
19	-1.12749	0.16171	-1.12811	0.07951
20	-1.09041	0.14722	-1.09093	0.06488
21	-1.05315	0.13341	-1.05359	0.05116
22	-1.01574	0.12027	-1.01610	0.03631
23	-0.97820	0.10781	-0.97850	0.02633
24	-0.94057	0.09601	-0.94080	0.01522
25	-0.90265	0.08460	-0.90303	0.00495
26	-0.86508	0.07438	-0.86521	-0.00448
27	-0.82726	0.06454	-0.82735	-0.01309
28	-0.78942	0.05536	-0.78948	-0.02088
29	-0.75158	0.04681	-0.75161	-0.02785
30	-0.71374	0.03890	-0.71374	-0.03405
31	-0.67591	0.03163	-0.67590	-0.03944
32	-0.63811	0.02473	-0.63809	-0.04404
33	-0.60034	0.01876	-0.60031	-0.04787
34	-0.56250	0.01355	-0.56257	-0.05092
35	-0.52491	0.00878	-0.52487	-0.05320
36	-0.48725	0.00469	-0.48721	-0.05472
37	-0.44963	0.00103	-0.44960	-0.05548
38	-0.41205	-0.00193	-0.41202	-0.05548
39	-0.37451	-0.00430	-0.37448	-0.05472
40	-0.33699	-0.00607	-0.33697	-0.05320
41	-0.29950	-0.00724	-0.29948	-0.05092
42	-0.26202	-0.00782	-0.26201	-0.04788
43	-0.22455	-0.00781	-0.22455	-0.04407
44	-0.18711	-0.00721	-0.18711	-0.03949
45	-0.14958	-0.00601	-0.14967	-0.03414
46	-0.11225	-0.00423	-0.11225	-0.02800
47	-0.07483	-0.00185	-0.07483	-0.02107
48	-0.03741	0.00112	-0.03741	-0.01334

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00543	0.00414	-1.79287	0.57689
2	-0.00464	0.00415	-1.79330	0.57752
3	-0.00386	0.00405	-1.79362	0.57821
4	-0.00310	0.00382	-1.79383	0.57895
5	-0.00239	0.00347	-1.79392	0.57972
6	-0.00174	0.00301	-1.79389	0.58050
7	-0.00117	0.00246	-1.79375	0.58128
8	-0.00070	0.00183	-1.79349	0.58202
9	-0.00033	0.00113	-1.79313	0.58272
10	-0.00008	0.00038	-1.79266	0.58335
11	0.00005	-0.00040	-1.79211	0.58391

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
12	0.00006	-0.00119	-1.79143	0.58437
13	-0.00005	-0.00197	-1.79080	0.58472
14	-0.00030	-0.00273	-1.79007	0.58490
15	-0.00066	-0.00344	-1.78933	0.58508
16	-0.00112	-0.00403	-1.78858	0.58503
17	-0.00158	-0.00464	-1.78764	0.58495
18	-0.00232	-0.00510	-1.78714	0.58471
19	-0.00302	-0.00546	-1.78649	0.58434
20	-0.00373	-0.00570	-1.78591	0.58389

SECTION NO. 6 'Z' = 3.125

POINT NO	XP	YP	XS	YS
1	-1.73959	0.55239	-1.73943	0.52975
2	-1.70301	0.52093	-1.70291	0.49044
3	-1.66654	0.49095	-1.66645	0.45347
4	-1.63017	0.46220	-1.63013	0.41852
5	-1.59388	0.43458	-1.59388	0.38571
6	-1.55757	0.40832	-1.55771	0.35460
7	-1.52153	0.38308	-1.52161	0.32517
8	-1.48544	0.35877	-1.48555	0.29730
9	-1.44940	0.33574	-1.44954	0.27069
10	-1.41333	0.31355	-1.41355	0.24587
11	-1.37739	0.29230	-1.37753	0.22217
12	-1.34141	0.27196	-1.34150	0.19970
13	-1.30542	0.25248	-1.30552	0.17843
14	-1.26942	0.23385	-1.26962	0.15829
15	-1.23341	0.21504	-1.23360	0.13924
16	-1.19737	0.19901	-1.19755	0.12124
17	-1.16130	0.18276	-1.16147	0.10424
18	-1.12521	0.16725	-1.12536	0.08823
19	-1.08903	0.15248	-1.08921	0.07316
20	-1.05292	0.13842	-1.05304	0.05901
21	-1.01673	0.12507	-1.01683	0.04577
22	-0.98052	0.11240	-0.98060	0.03340
23	-0.94429	0.10041	-0.94434	0.02139
24	-0.90801	0.08903	-0.90807	0.01123
25	-0.87173	0.07841	-0.87177	0.00139
26	-0.83543	0.06839	-0.83540	-0.00754
27	-0.79912	0.05900	-0.79914	-0.01535
28	-0.76279	0.05025	-0.76281	-0.02329
29	-0.72646	0.04213	-0.72647	-0.02995
30	-0.69013	0.03462	-0.69013	-0.03582
31	-0.65379	0.02772	-0.65379	-0.04094
32	-0.61745	0.02144	-0.61745	-0.04529
33	-0.58112	0.01575	-0.58111	-0.04889

POINT NO	XP	YP	XS	YS
34	-0.54473	0.01057	-0.54477	-0.05174
35	-0.50845	0.00513	-0.50844	-0.05385
36	-0.47212	0.00229	-0.47211	-0.05521
37	-0.43579	-0.00102	-0.43579	-0.05583
38	-0.39947	-0.00374	-0.39946	-0.05571
39	-0.36315	-0.00538	-0.36315	-0.05485
40	-0.32684	-0.00744	-0.32683	-0.05324
41	-0.29052	-0.00841	-0.29052	-0.05090
42	-0.25421	-0.00380	-0.25421	-0.04781
43	-0.21790	-0.00862	-0.21789	-0.04395
44	-0.18158	-0.00785	-0.18158	-0.03937
45	-0.14527	-0.00551	-0.14527	-0.03401
46	-0.10895	-0.00458	-0.10895	-0.02788
47	-0.07264	-0.00208	-0.07264	-0.02038
48	-0.03632	0.00102	-0.03632	-0.01329

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00545	0.00411	-1.77655	0.57207
2	-0.00457	0.00413	-1.77703	0.57271
3	-0.00368	0.00402	-1.77739	0.57342
4	-0.00312	0.00380	-1.77703	0.57418
5	-0.00241	0.00346	-1.77776	0.57497
6	-0.00176	0.00300	-1.77775	0.57576
7	-0.00119	0.00246	-1.77752	0.57654
8	-0.00071	0.00183	-1.77737	0.57723
9	-0.00034	0.00113	-1.77700	0.57799
10	-0.00008	0.00038	-1.77653	0.57862
11	0.00005	-0.00040	-1.77595	0.57917
12	0.00006	-0.00119	-1.77531	0.57962
13	-0.00005	-0.00198	-1.77460	0.57996
14	-0.00029	-0.00273	-1.77364	0.58013
15	-0.00064	-0.00344	-1.77305	0.58028
16	-0.00110	-0.00408	-1.77226	0.58026
17	-0.00165	-0.00465	-1.77147	0.58011
18	-0.00229	-0.00512	-1.77072	0.57984
19	-0.00300	-0.00548	-1.77002	0.57946
20	-0.00375	-0.00572	-1.76939	0.57897

SECTION NO. 7 'Z' = 8.250

POINT NO	XP	YP	XS	YS
1	-1.77823	0.57043	-1.77733	0.54703
2	-1.73937	0.53740	-1.73834	0.50579
3	-1.70069	0.50582	-1.69955	0.46705
4	-1.66218	0.47554	-1.66099	0.43052
5	-1.62382	0.44579	-1.62261	0.39629
6	-1.58553	0.41920	-1.58441	0.35389
7	-1.54749	0.39280	-1.54635	0.33329
8	-1.50951	0.36754	-1.50842	0.30435
9	-1.47164	0.34338	-1.47062	0.27699
10	-1.43387	0.32026	-1.43293	0.25110
11	-1.39620	0.29816	-1.39534	0.22660
12	-1.35863	0.27702	-1.35785	0.20342
13	-1.32115	0.25882	-1.32045	0.18150
14	-1.28375	0.23752	-1.28314	0.16078
15	-1.24644	0.21911	-1.24590	0.14121
16	-1.20921	0.20154	-1.20874	0.12274
17	-1.17206	0.18480	-1.17156	0.10534
18	-1.13498	0.16886	-1.13464	0.08897
19	-1.09797	0.15371	-1.09763	0.07359
20	-1.06102	0.13931	-1.06073	0.05913
21	-1.02412	0.12567	-1.02393	0.04570
22	-0.98728	0.11274	-0.98713	0.03313
23	-0.95049	0.10053	-0.95037	0.02145
24	-0.91375	0.08902	-0.91355	0.01064
25	-0.87704	0.07819	-0.87697	0.00063
26	-0.84037	0.06804	-0.84032	-0.00844
27	-0.80373	0.05854	-0.80370	-0.01675
28	-0.76712	0.04969	-0.76710	-0.02425
29	-0.73052	0.04149	-0.73051	-0.03096
30	-0.69394	0.03392	-0.69394	-0.03688
31	-0.65737	0.02698	-0.65738	-0.04203
32	-0.62082	0.02065	-0.62083	-0.04640
33	-0.58427	0.01494	-0.58428	-0.05001
34	-0.54772	0.00984	-0.54774	-0.05287
35	-0.51118	0.00534	-0.51120	-0.05496
36	-0.47465	0.00145	-0.47467	-0.05631
37	-0.43811	-0.00185	-0.43813	-0.05690
38	-0.40158	-0.00455	-0.40160	-0.05674
39	-0.36505	-0.00566	-0.36506	-0.05584
40	-0.32853	-0.00818	-0.32854	-0.05418
41	-0.29200	-0.00910	-0.29201	-0.05177
42	-0.25548	-0.00944	-0.25549	-0.04860
43	-0.21897	-0.00919	-0.21897	-0.04457
44	-0.18246	-0.00835	-0.18246	-0.03993

POINT NO	XP	YP	XS	YS
45	-0.14596	-0.00593	-0.14596	-0.03452
46	-0.10946	-0.00491	-0.10946	-0.02823
47	-0.07297	-0.00230	-0.07297	-0.02126
48	-0.03648	0.00090	-0.03648	-0.01344

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00547	0.00409	-1.81717	0.59174
2	-0.00468	0.00411	-1.81765	0.59240
3	-0.00389	0.00401	-1.81804	0.59312
4	-0.00313	0.00379	-1.81851	0.59389
5	-0.00242	0.00345	-1.81845	0.59469
6	-0.00177	0.00300	-1.81847	0.59550
7	-0.00119	0.00245	-1.81835	0.59629
8	-0.00072	0.00182	-1.81812	0.59704
9	-0.00034	0.00113	-1.81777	0.59775
10	-0.00008	0.00038	-1.81730	0.59838
11	0.00005	-0.00040	-1.81674	0.59893
12	0.00007	-0.00119	-1.81609	0.59938
13	-0.00004	-0.00196	-1.81538	0.59972
14	-0.00028	-0.00273	-1.81461	0.59994
15	-0.00063	-0.00344	-1.81382	0.60003
16	-0.00109	-0.00409	-1.81301	0.60000
17	-0.00164	-0.00465	-1.81222	0.59984
18	-0.00228	-0.00512	-1.81145	0.59955
19	-0.00298	-0.00549	-1.81073	0.59916
20	-0.00373	-0.00574	-1.81008	0.59865

SECTION NO. 8 'Z' = 8.375

POINT NO	XP	YP	XS	YS
1	-1.87652	0.61766	-1.87472	0.59263
2	-1.83559	0.58172	-1.83333	0.54763
3	-1.79491	0.54748	-1.79235	0.50552
4	-1.75445	0.51482	-1.75172	0.46619
5	-1.71417	0.48362	-1.71134	0.42911
6	-1.67401	0.45381	-1.67118	0.39417
7	-1.63397	0.42529	-1.63119	0.36120
8	-1.59400	0.39801	-1.59131	0.33004
9	-1.55409	0.37190	-1.55152	0.30058
10	-1.51421	0.34690	-1.51179	0.27269
11	-1.47435	0.32298	-1.47210	0.24630
12	-1.43449	0.30008	-1.43242	0.22132
13	-1.39462	0.27317	-1.39274	0.19768
14	-1.35476	0.25722	-1.35306	0.17533
15	-1.31492	0.23722	-1.31341	0.15421

POINT NO	XP	YP	XS	YS
16	-1.27512	0.21814	-1.27379	0.13429
17	-1.23538	0.17995	-1.23422	0.11552
18	-1.19570	0.18265	-1.19471	0.09785
19	-1.15611	0.16620	-1.15527	0.08129
20	-1.11661	0.15059	-1.11591	0.05575
21	-1.07722	0.13580	-1.07663	0.05125
22	-1.03792	0.12182	-1.03745	0.03774
23	-0.99874	0.10862	-0.99850	0.02519
24	-0.95966	0.09619	-0.95937	0.01358
25	-0.92070	0.08451	-0.92048	0.00290
26	-0.88184	0.07357	-0.88168	-0.00683
27	-0.84306	0.06335	-0.84295	-0.01579
28	-0.80437	0.05334	-0.80431	-0.02382
29	-0.76574	0.04303	-0.76572	-0.03101
30	-0.72718	0.03390	-0.72718	-0.03735
31	-0.68866	0.02945	-0.68858	-0.04287
32	-0.65018	0.02266	-0.65022	-0.04757
33	-0.61175	0.01653	-0.61179	-0.05146
34	-0.57334	0.01105	-0.57339	-0.05454
35	-0.53496	0.00621	-0.53502	-0.05681
36	-0.49661	0.00202	-0.49666	-0.05830
37	-0.45828	-0.00153	-0.45833	-0.05898
38	-0.41996	-0.00445	-0.42001	-0.05883
39	-0.38157	-0.00675	-0.38171	-0.05793
40	-0.34340	-0.00841	-0.34344	-0.05529
41	-0.30516	-0.00945	-0.30513	-0.05380
42	-0.26693	-0.00986	-0.26695	-0.05052
43	-0.22873	-0.00955	-0.22874	-0.04543
44	-0.19055	-0.00882	-0.19055	-0.04153
45	-0.15239	-0.00736	-0.15240	-0.03585
46	-0.11426	-0.00529	-0.11426	-0.02934
47	-0.07615	-0.00259	-0.07615	-0.02200
48	-0.03806	0.00074	-0.03806	-0.01383

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00547	0.00409	-1.91720	0.64160
2	-0.00468	0.00411	-1.91769	0.64228
3	-0.00389	0.00401	-1.91808	0.64302
4	-0.00313	0.00379	-1.91835	0.64381
5	-0.00242	0.00345	-1.91851	0.64462
6	-0.00177	0.00300	-1.91855	0.64544
7	-0.00119	0.00245	-1.91846	0.64625
8	-0.00072	0.00182	-1.91825	0.64703
9	-0.00034	0.00113	-1.91793	0.64775
10	-0.00008	0.00038	-1.91750	0.64840
11	0.00006	-0.00040	-1.91697	0.64876

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
12	0.00007	-0.00119	-1.91536	0.64942
13	-0.00004	-0.00138	-1.91568	0.64977
14	-0.00028	-0.00273	-1.91495	0.65000
15	-0.00053	-0.00344	-1.91419	0.65010
16	-0.00108	-0.00409	-1.91341	0.65005
17	-0.00164	-0.00465	-1.91264	0.64993
18	-0.00227	-0.00512	-1.91189	0.64962
19	-0.00298	-0.00549	-1.91119	0.64921
20	-0.00373	-0.00574	-1.91055	0.64870

SECTION NO. 9 *Z* = 8.500

POINT NO	XP	YP	XS	YS
1	-2.04139	0.71864	-2.03774	0.68940
2	-1.99841	0.67669	-1.99372	0.63645
3	-1.95599	0.63696	-1.95051	0.58745
4	-1.91373	0.59922	-1.90790	0.54182
5	-1.87180	0.56329	-1.86573	0.49915
6	-1.83001	0.52902	-1.82385	0.45909
7	-1.78827	0.49625	-1.78214	0.42136
8	-1.74650	0.46489	-1.74050	0.38575
9	-1.70459	0.43483	-1.69381	0.35207
10	-1.66249	0.40599	-1.65698	0.32016
11	-1.62011	0.37829	-1.61492	0.28991
12	-1.57739	0.35169	-1.57257	0.26120
13	-1.53428	0.32613	-1.52987	0.23396
14	-1.49083	0.30150	-1.48683	0.20813
15	-1.44708	0.27910	-1.44351	0.18367
16	-1.40313	0.25563	-1.39998	0.16057
17	-1.35904	0.23419	-1.35629	0.13878
18	-1.31438	0.21378	-1.31251	0.11827
19	-1.27071	0.19438	-1.26870	0.09902
20	-1.22659	0.17598	-1.22490	0.08100
21	-1.18257	0.15858	-1.18117	0.06418
22	-1.13868	0.14215	-1.13755	0.04853
23	-1.09497	0.12568	-1.09407	0.03401
24	-1.05146	0.11214	-1.05076	0.02060
25	-1.00816	0.09852	-1.00763	0.00823
26	-0.96507	0.083579	-0.96468	-0.00300
27	-0.92215	0.07393	-0.92190	-0.01325
28	-0.87941	0.05290	-0.87925	-0.02250
29	-0.83681	0.05270	-0.83673	-0.03073
30	-0.79433	0.04329	-0.79431	-0.03810
31	-0.75195	0.03468	-0.75198	-0.04447
32	-0.70967	0.02684	-0.70974	-0.04991
33	-0.66748	0.01976	-0.66757	-0.05443

POINT NO	XP	YP	XS	YS
34	-0.62535	0.01343	-0.62546	-0.05904
35	-0.58330	0.00784	-0.58341	-0.05074
36	-0.54130	0.00299	-0.54141	-0.05255
37	-0.49935	-0.00113	-0.49946	-0.06347
38	-0.45746	-0.00453	-0.45755	-0.06349
39	-0.41562	-0.00722	-0.41570	-0.06262
40	-0.37382	-0.00919	-0.37389	-0.05087
41	-0.33208	-0.01045	-0.33214	-0.05823
42	-0.29039	-0.01101	-0.29043	-0.05471
43	-0.24875	-0.01097	-0.24878	-0.05029
44	-0.20716	-0.01002	-0.20718	-0.04493
45	-0.16563	-0.00847	-0.16564	-0.03877
46	-0.12414	-0.00623	-0.12415	-0.03166
47	-0.08271	-0.00329	-0.08271	-0.02364
48	-0.04133	0.00035	-0.04133	-0.01469

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00547	0.00408	-2.08372	0.74820
2	-0.00468	0.00410	-2.08418	0.74890
3	-0.00390	0.00400	-2.08455	0.74967
4	-0.00314	0.00373	-2.08482	0.75050
5	-0.00242	0.00344	-2.08499	0.75135
6	-0.00177	0.00300	-2.08504	0.75222
7	-0.00120	0.00245	-2.08499	0.75307
8	-0.00072	0.00182	-2.08483	0.75389
9	-0.00034	0.00112	-2.08455	0.75466
10	-0.00009	0.00038	-2.08419	0.75535
11	0.00006	-0.00040	-2.08374	0.75595
12	0.00007	-0.00119	-2.08320	0.75645
13	-0.00004	-0.00197	-2.08261	0.75683
14	-0.00027	-0.00273	-2.08195	0.75709
15	-0.00062	-0.00344	-2.08127	0.75720
16	-0.00108	-0.00409	-2.08058	0.75719
17	-0.00163	-0.00465	-2.07983	0.75703
18	-0.00226	-0.00513	-2.07920	0.75674
19	-0.00296	-0.00549	-2.07856	0.75633
20	-0.00371	-0.00574	-2.07796	0.75580

SECTION NO. 10 *Z* = 9.525

POINT NO	XP	YP	XS	YS
1	-2.26554	0.85424	-2.26010	0.82007
2	-2.22134	0.80525	-2.21421	0.75739
3	-2.17794	0.75703	-2.16957	0.69981
4	-2.13433	0.71524	-2.12593	0.64549
5	-2.09211	0.67362	-2.08270	0.59679
6	-2.04950	0.63335	-2.03992	0.55025
7	-2.00632	0.59398	-1.99727	0.50545
8	-1.96390	0.55359	-1.95454	0.4 512
9	-1.92055	0.51265	-1.91152	0.42598
10	-1.87765	0.47097	-1.86802	0.38882
11	-1.83201	0.42851	-1.82398	0.35343
12	-1.78650	0.42718	-1.77893	0.31982
13	-1.74002	0.37592	-1.73305	0.28775
14	-1.69259	0.32772	-1.68526	0.25723
15	-1.64437	0.33901	-1.63867	0.22822
16	-1.59548	0.31201	-1.59041	0.20071
17	-1.54605	0.28576	-1.54161	0.17459
18	-1.49623	0.25205	-1.49237	0.15014
19	-1.44515	0.22853	-1.44284	0.12705
20	-1.39535	0.21518	-1.39312	0.10540
21	-1.34557	0.17449	-1.34333	0.08515
22	-1.29548	0.17498	-1.29355	0.06630
23	-1.24545	0.15615	-1.24390	0.04280
24	-1.19555	0.13841	-1.19442	0.03263
25	-1.14513	0.12181	-1.14519	0.01775
26	-1.09691	0.10530	-1.09621	0.00413
27	-1.04795	0.09135	-1.04745	-0.00823
28	-0.99921	0.07842	-0.99888	-0.01949
29	-0.95056	0.06593	-0.95047	-0.02955
30	-0.90228	0.05451	-0.90221	-0.03845
31	-0.85405	0.04400	-0.85405	-0.04626
32	-0.80595	0.03441	-0.80603	-0.05295
33	-0.75795	0.02575	-0.75808	-0.05853
34	-0.71005	0.01738	-0.71020	-0.06311
35	-0.66223	0.01111	-0.66240	-0.06653
36	-0.61449	0.00511	-0.61466	-0.06900
37	-0.56591	-0.00001	-0.56597	-0.07035
38	-0.51919	-0.00425	-0.51934	-0.07067
39	-0.47154	-0.00756	-0.47177	-0.06993
40	-0.42415	-0.01021	-0.42426	-0.06815
41	-0.37673	-0.01191	-0.37582	-0.06534
42	-0.32938	-0.01276	-0.32945	-0.06147
43	-0.28210	-0.01277	-0.28215	-0.05657
44	-0.23490	-0.01195	-0.23493	-0.05061

POINT NO	XP	YP	XS	YS
45	-0.18773	-0.01029	-0.18773	-0.04359
46	-0.14071	-0.00733	-0.14072	-0.03552
47	-0.09373	-0.00447	-0.09373	-0.02837
48	-0.04633	-0.00131	-0.04633	-0.01614

POINT NO	XSEW1	YSEW1	XSEW2	YSEW2
1	-0.00543	0.00005	-2.30984	0.89074
2	-0.00459	0.00004	-2.30957	0.89145
3	-0.00391	0.00004	-2.30953	0.89224
4	-0.00315	0.00007	-2.30959	0.89303
5	-0.00243	0.00044	-2.30995	0.89395
6	-0.00175	0.00299	-2.31012	0.89485
7	-0.00121	0.00745	-2.31013	0.89573
8	-0.00072	0.01182	-2.30998	0.89653
9	-0.00035	0.01612	-2.30977	0.89737
10	-0.00009	0.02033	-2.30947	0.89810
11	0.00006	-0.00740	-2.30910	0.89873
12	0.00007	-0.00119	-2.30965	0.89925
13	-0.00003	-0.00197	-2.30915	0.89965
14	-0.00025	-0.00273	-2.30751	0.89992
15	-0.00051	-0.00344	-2.30703	0.90003
16	-0.00106	-0.00409	-2.30643	0.90003
17	-0.00161	-0.00465	-2.30583	0.89994
18	-0.00225	-0.00513	-2.30525	0.89965
19	-0.00295	-0.00550	-2.30467	0.89925
20	-0.00370	-0.00575	-2.30417	0.89872

SECTION VI

PREDICTED STAGE PERFORMANCE

1. PREDICTED PERFORMANCE USING THE ITERATIVE LOSS ESTIMATION PROCEDURE

The iterative loss reestimation procedure was employed with the design diffusion loss model but with less optimistic assumptions for shock losses in order to estimate the probable performance of the predicted stage when first tested. The coefficient of the Mach number term in Eq. (9) was increased from 0.6887 to 1.0, which is equivalent to assuming that a normal shock occurs in the rotor at the relative inlet Mach number and in the stator at the expanded suction surface Mach number. These calculations may still be somewhat optimistic to the extent that an elevated rotor tip diffusion loss was not introduced. The calculations were made using the program option of specified rotor relative exit flow angles. Rotor deviation angles were assumed equal to their design values.

The results calculated at the design flow rate of 30.0 lb/sec with the above described change are:

Rotor total pressure ratio	3.042
Rotor isentropic efficiency	0.869
Stage total pressure ratio	2.730
Stage isentropic efficiency	0.772

Meridional velocity at the rotor exit on the tip streamline dropped from 618.1 ft/sec to 519.4 ft/sec and boundary layer blockage in the rotor exit plane rose from 0.0208 to 0.0268 of the cross-sectional area. The relative total pressure loss coefficients resulting from this analysis are shown for the rotor and stator in Fig 27.

2. PREDICTED INTRA-BLADE-ROW PERFORMANCE

The distributions of loss obtained as described above and presented in Fig 27 were used for an intra-blade-row analysis in the identical manner previously described in Section IV.2 for the original design. There were two objectives to this calculation. The first objective was to determine the choking flow for the stage at loss levels more likely to occur in an initial test. The second objective was to determine to what extent the internal flow distribution might change under these circumstances.

With respect to the first objective, it was determined that the stage would not pass the design flow of 30.0 lb/sec but that it would pass slightly more than 29.0 lb/sec. Thus, a reduction of flow on the

order of three percent below design can be anticipated. Choking is predicted to occur at the first calculation station downstream of the stator leading edge. This is in contrast to the Mach number distribution at design loss levels for which the rotor, rather than the stator, controls choking. Rotor incidence angles corresponding to the reduced flow are approximately one degree higher than design. Stator incidence angles are predicted to be within one degree of design values on every streamsurface except the outer casing, where the predicted value sweeps up to ten degrees above design.

Concerning the second objective, since the axial distribution of static pressure was chosen as the parameter for which the design should be optimized, the static pressure distribution corresponding to the higher loss levels should give an indication of the departure from ideal conditions. This is presented in Fig 28. Comparing this with Fig 17 which presents the design distribution, the choked condition of the stator appears not to significantly affect the stator axial pressure gradient but it can be expected to cause the rotor to operate at a more throttled condition than its peak efficiency operating point. This would typically result in a steeper axial pressure gradient in the entrance region of the rotor followed by a plateau as shown in Fig 28. Until steps are taken to reduce rotor losses or to increase stator flow area, it is unlikely that the rotor will be able to operate at its point of peak efficiency at design speed. This conclusion is predicated upon the assumption that maximum rotor efficiency is likely to occur at or very near the throttle point at which the rotor just becomes unchoked. This operating condition corresponds to the minimum axial pressure gradient which can be obtained at a throttle point near the maximum rotor pressure ratio.

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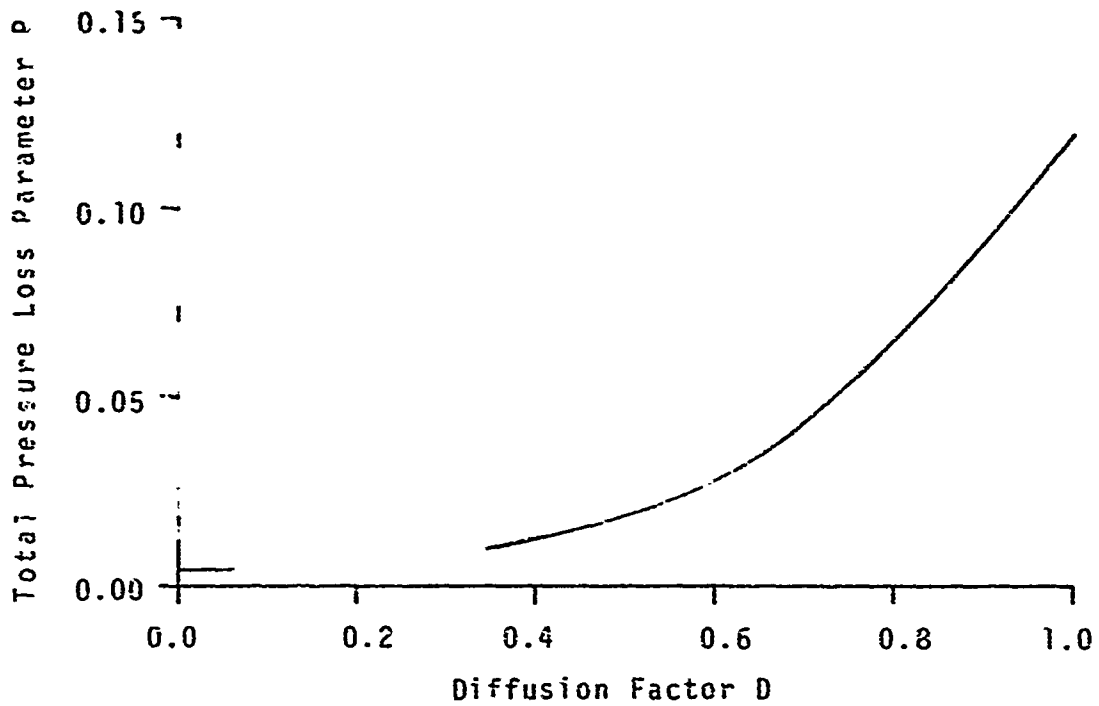


Fig 1. Assumed Relationship Between Total Pressure Loss Parameter and Diffusion Factor

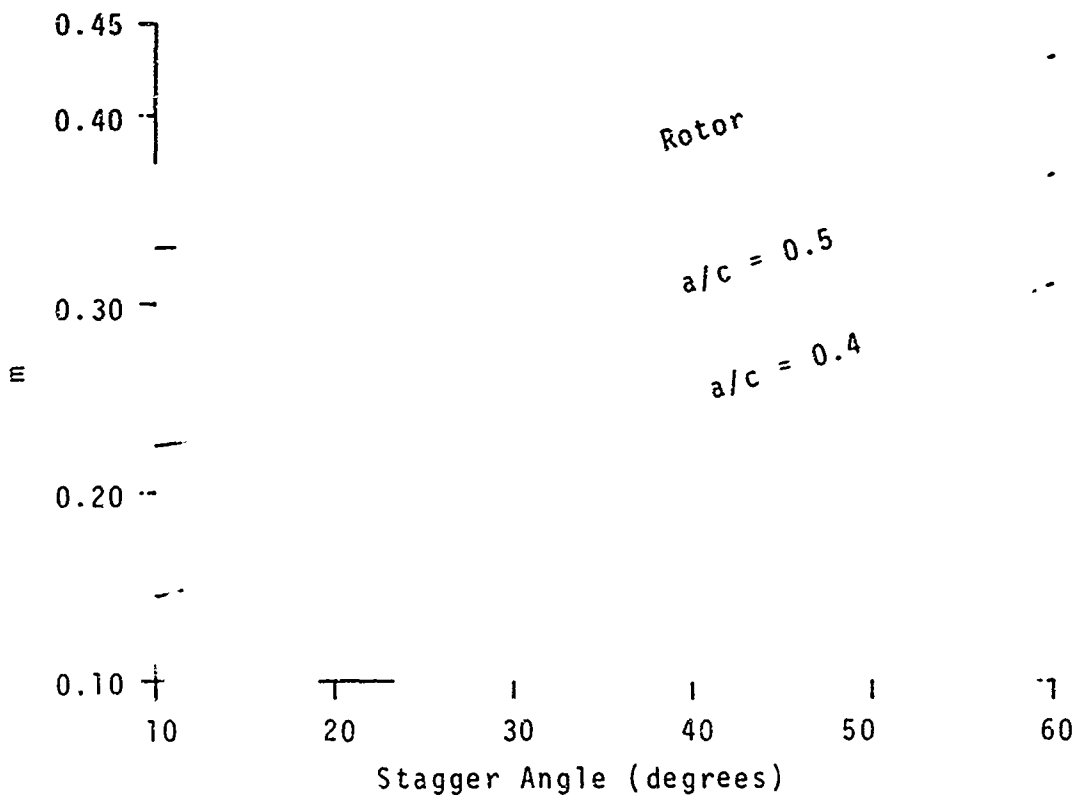


Fig 2. Relationship Between "m" and Stagger Angle in Carter's Rule for Rotor and Conventional Sections

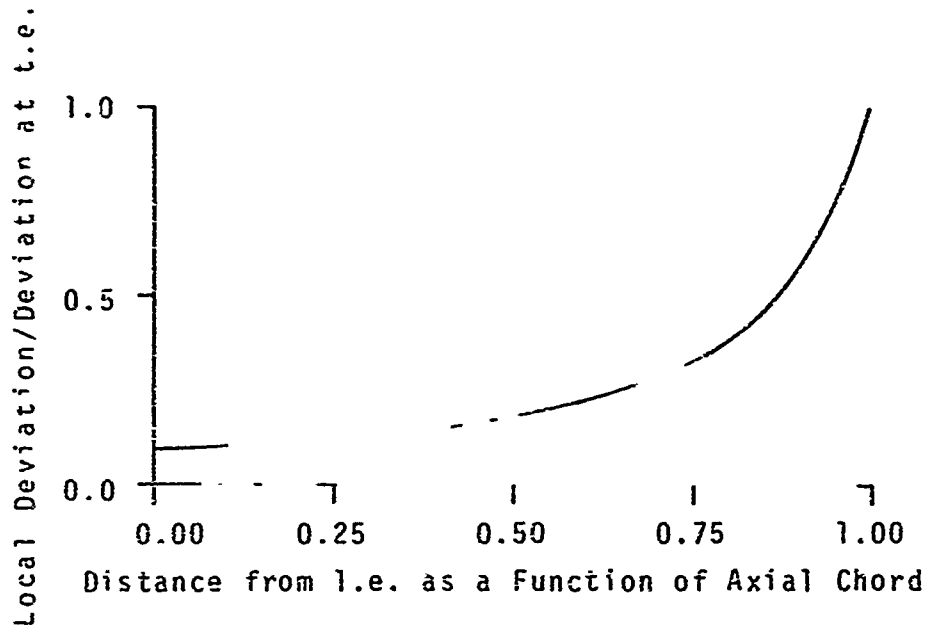


Fig 3. Assumed Generalized Variation of Deviation Within Blade

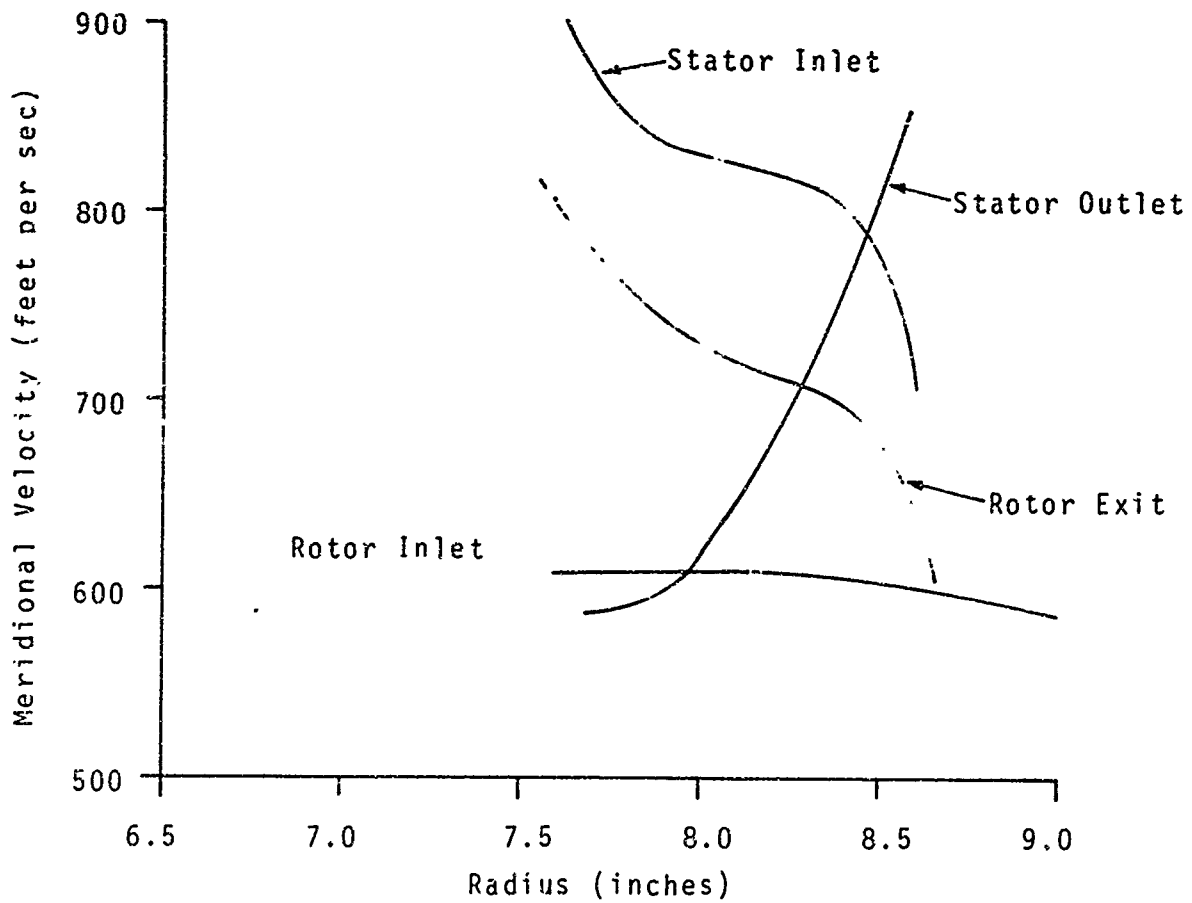


Fig 4. Meridional Velocity Distributions from Iterative Loss Reestimation Procedure

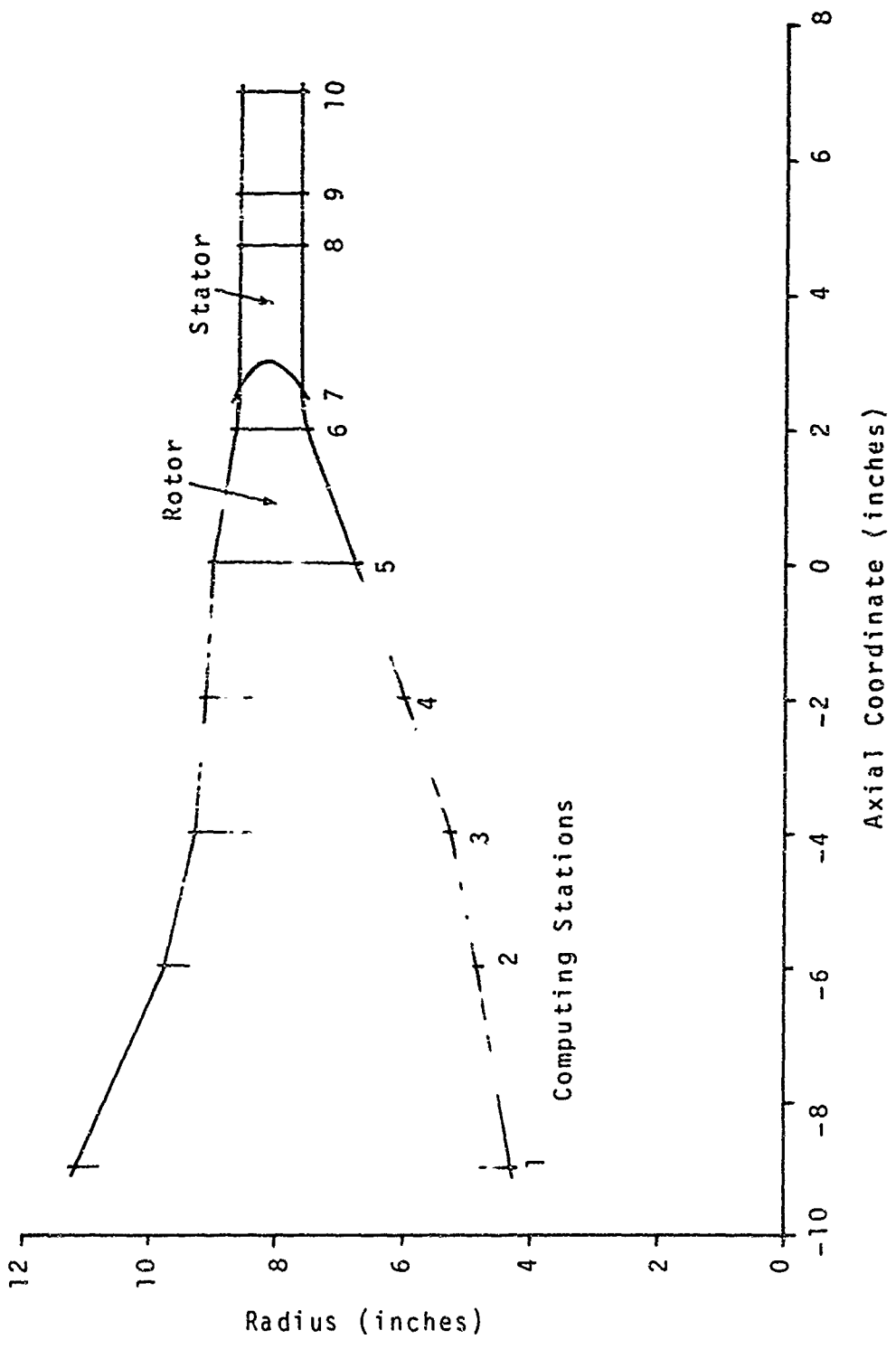


Fig 5. Annulus Geometry and Computing Stations Derived From Iterative Loss Reestimation Procedure

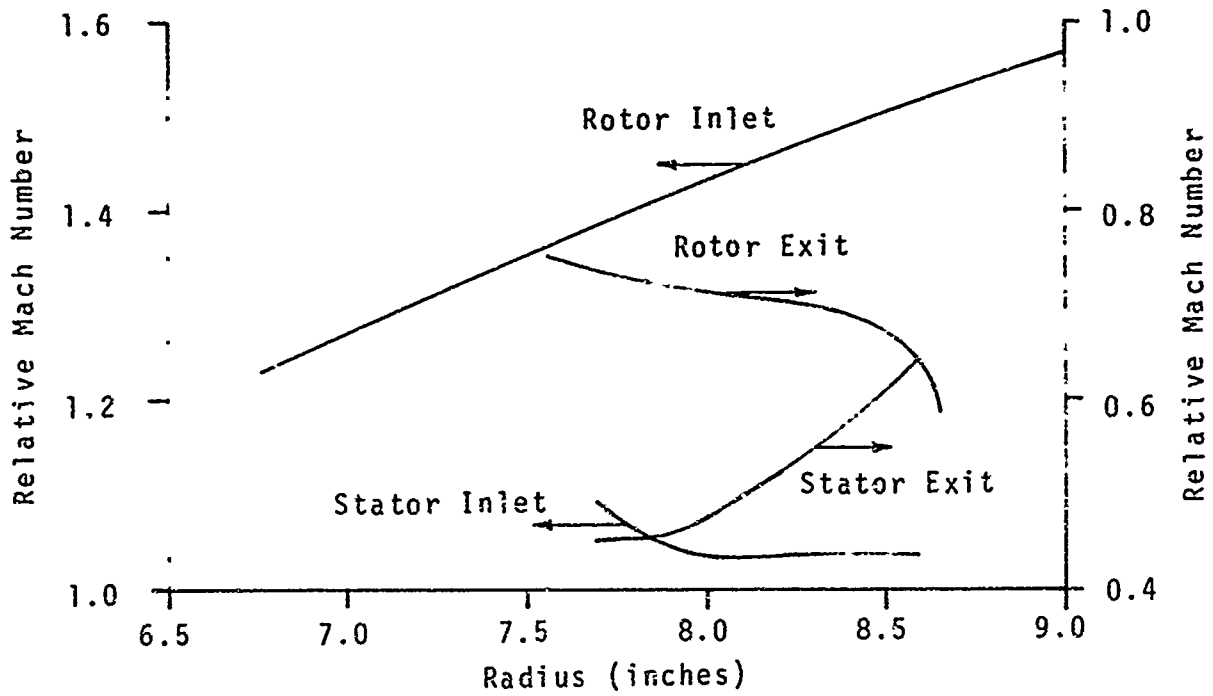


Fig 6. Rotor and Stator Relative Mach Numbers from Iterative Loss Reestimation Procedure

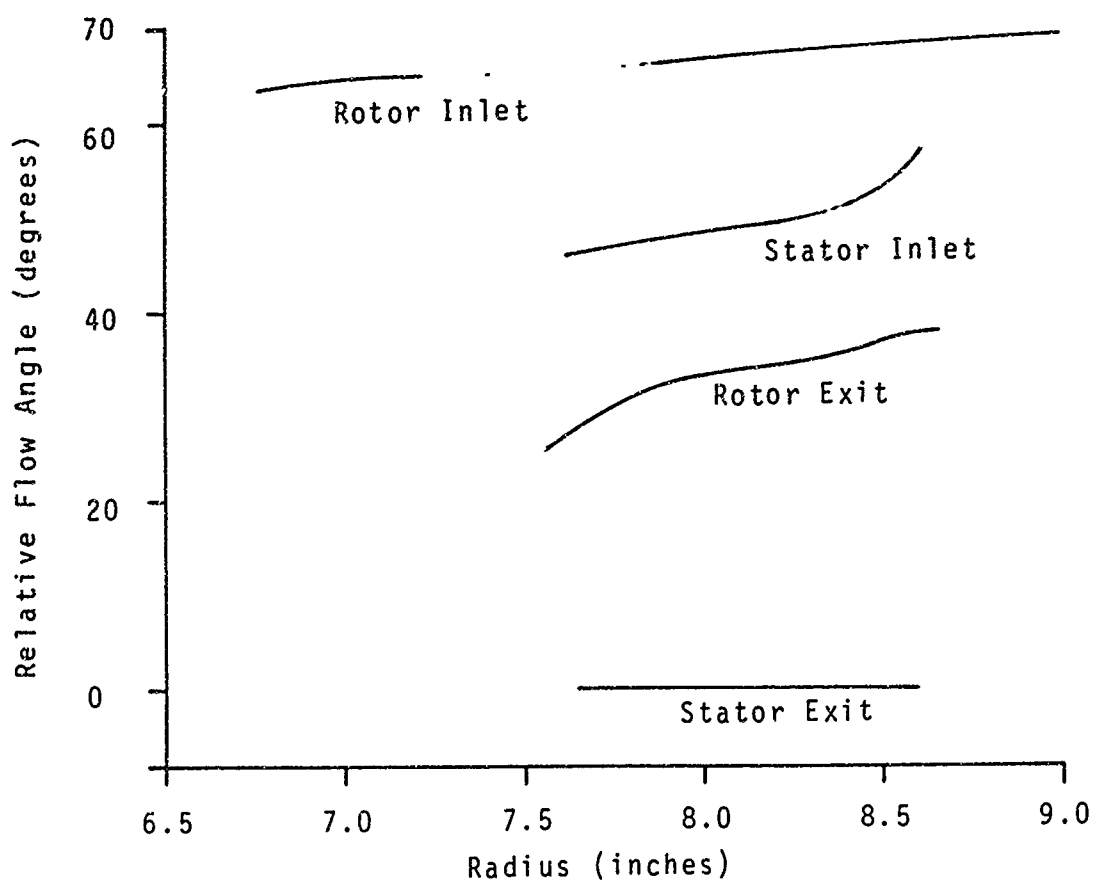


Fig 7. Rotor and Stator Relative Flow Angles from Iterative Loss Reestimation Procedure

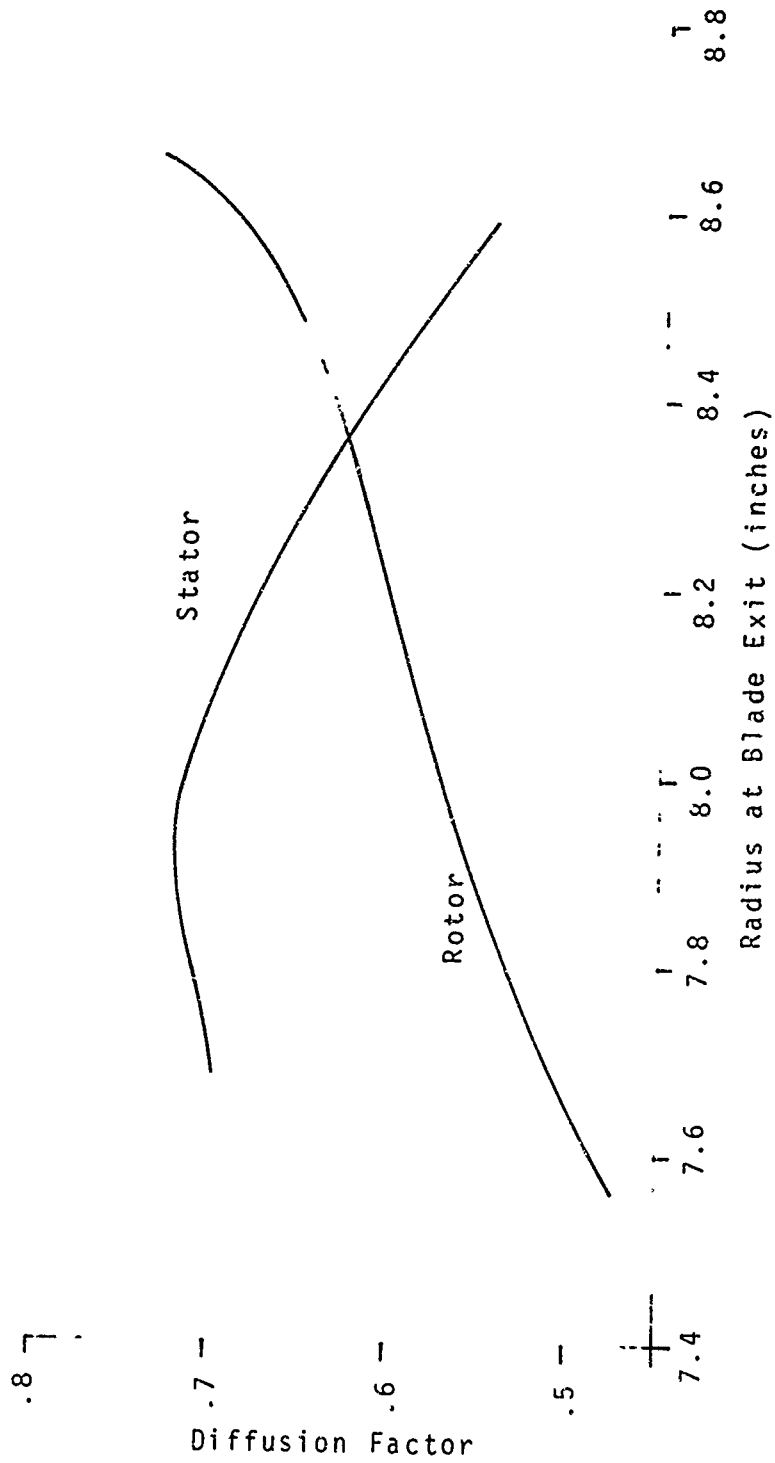


Fig 8. Diffusion Factors for Rotor and Stator from Iterative Loss Reestimation Procedure

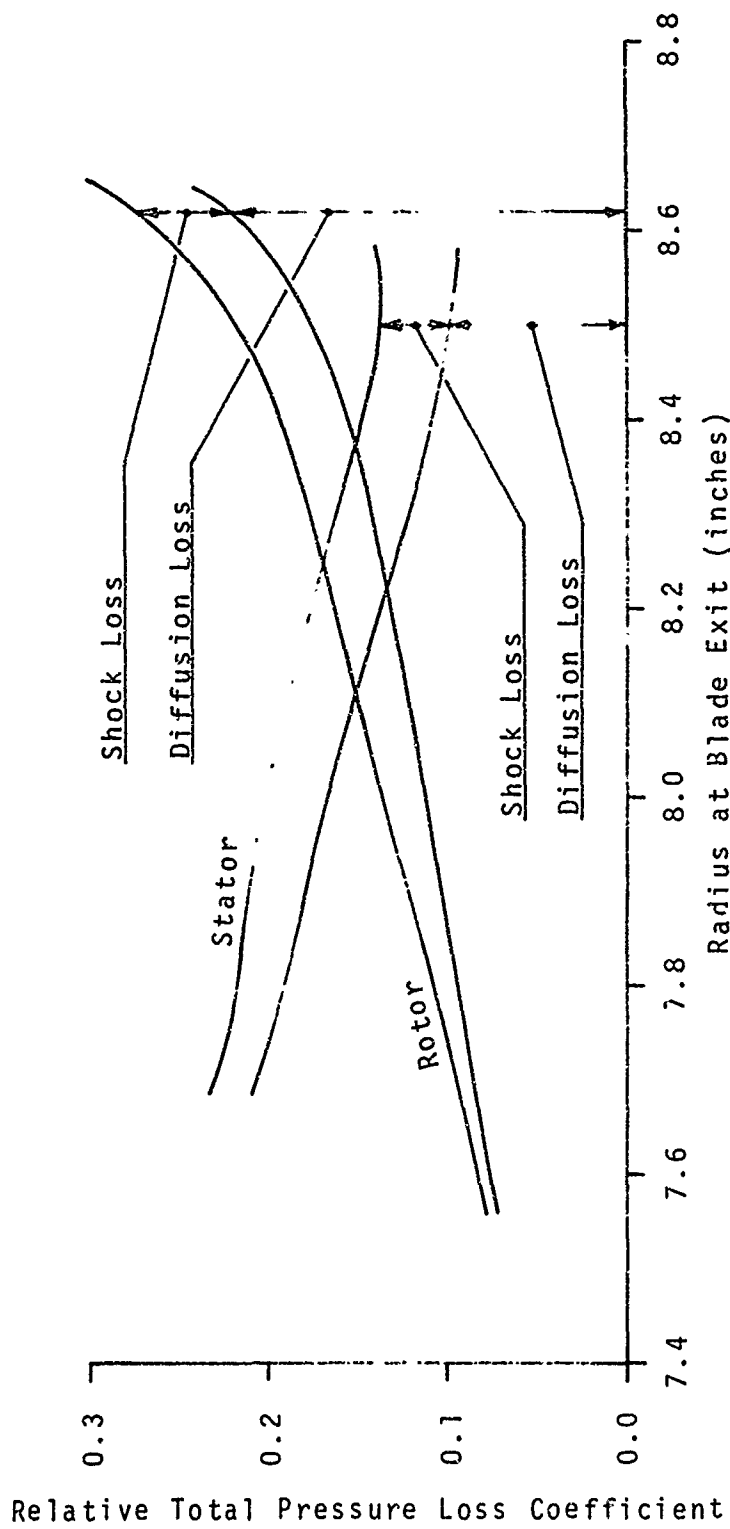


Fig 9. Relative Total Pressure Loss Coefficients for Rotor and Stator from Iterative Loss Reestimation Procedure

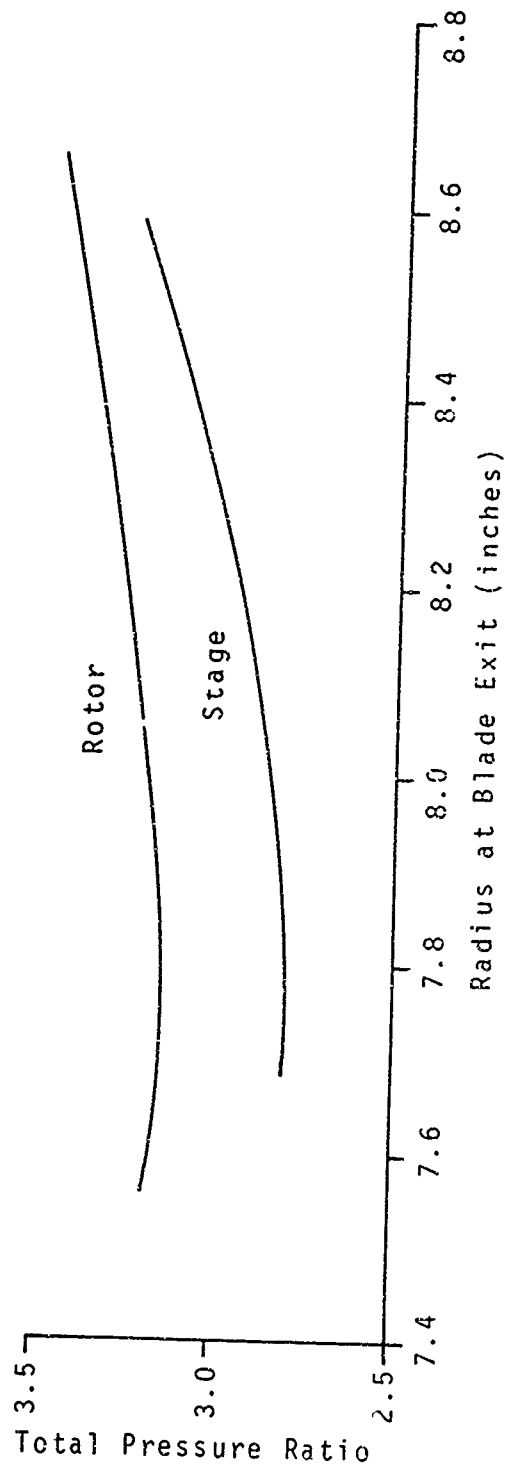


Fig 10. Total Pressure Ratios for Rotor and Stage from Iterative Loss Reestimation Procedure

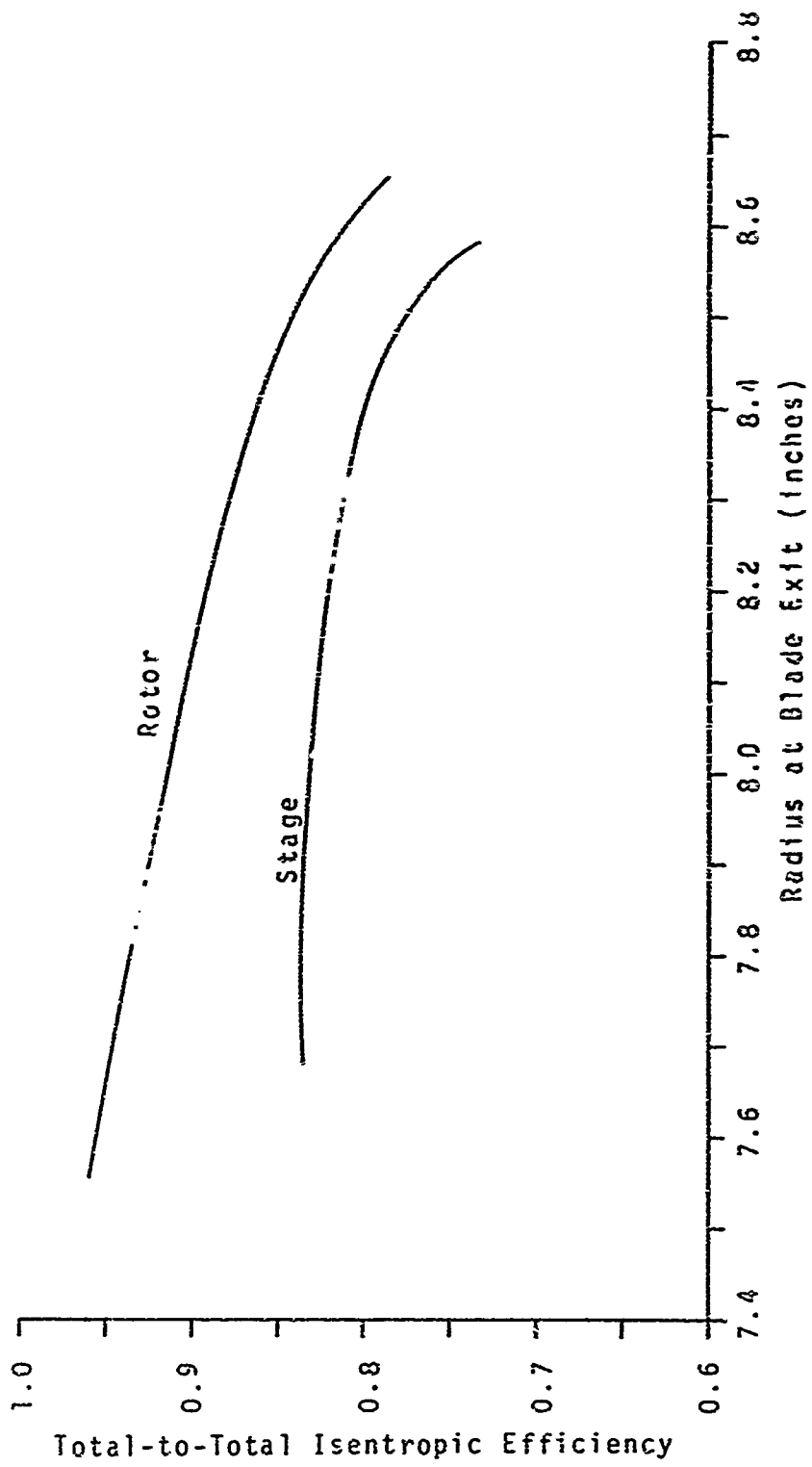


FIG 11. Isentropic Efficiency for Rotor and Stage from Iterative Loss Reestimation Procedure

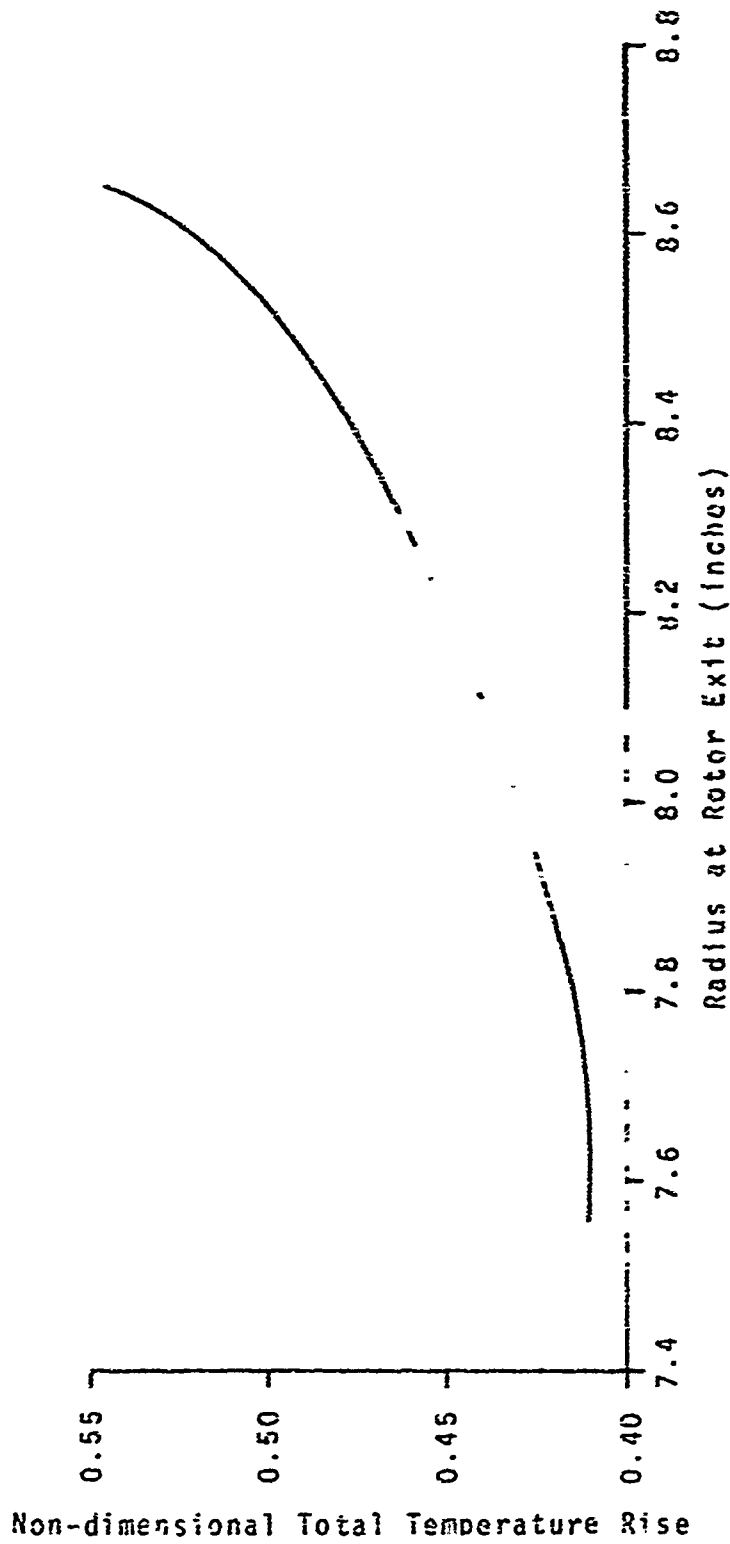


FIG 12. Nondimensional Total Temperature Rise
from Iterative Loss Recalculation Procedure

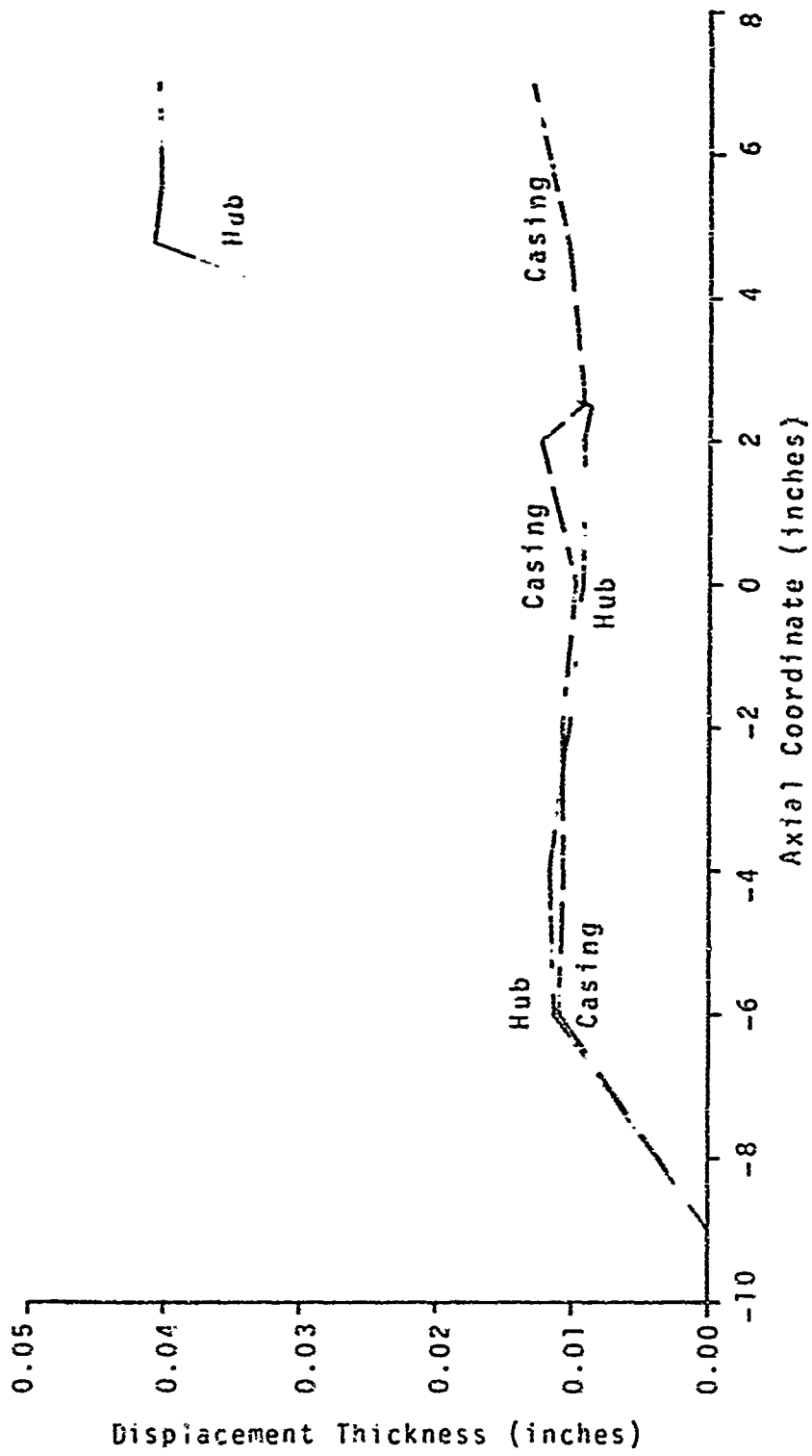


Fig 13. Annulus Wall Boundary Layer Displacement Thicknesses from Iterative Loss Reestimation Procedure

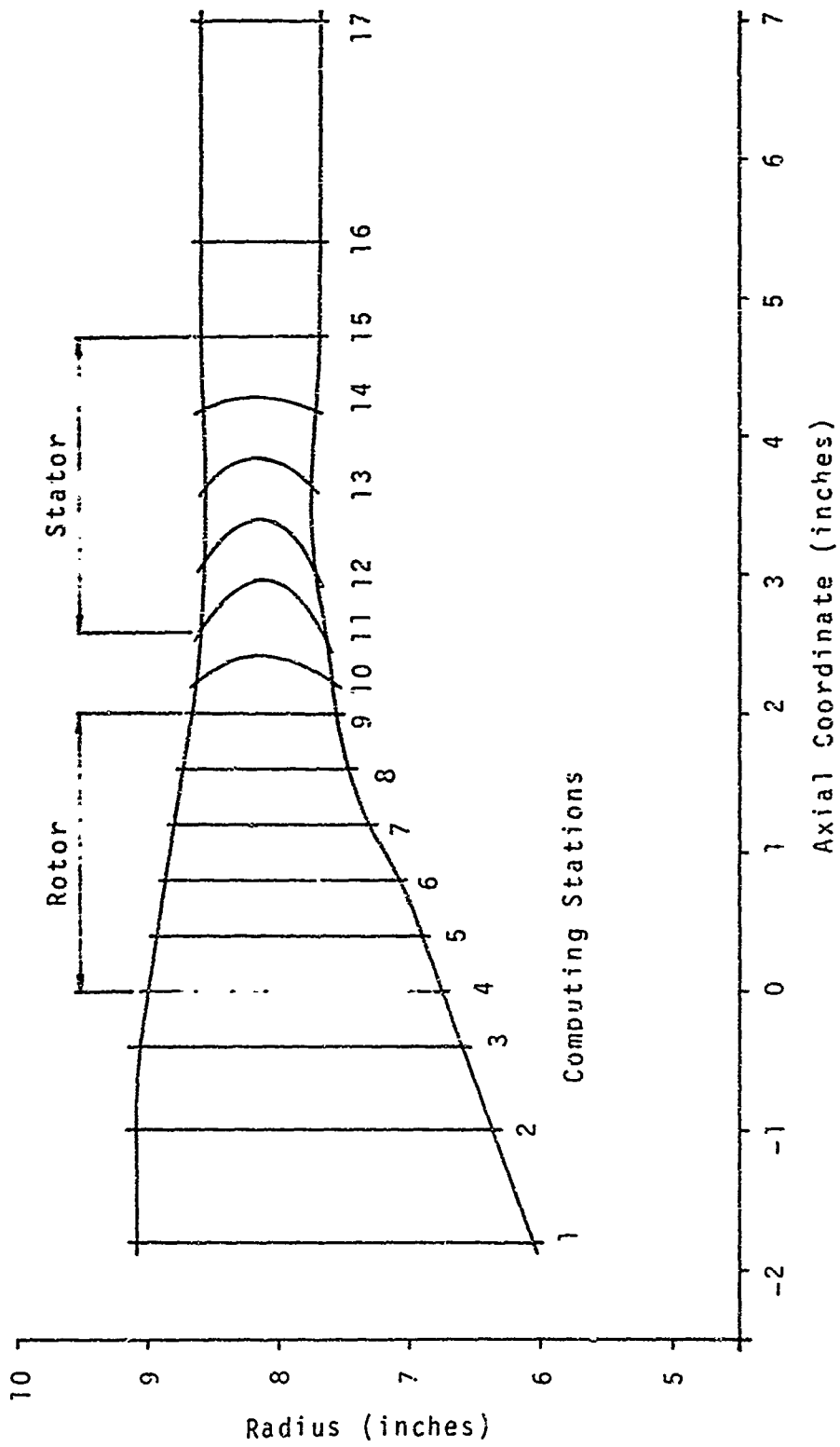


Fig 14. Annulus Geometry and Computing Stations for Final Blading Analysis

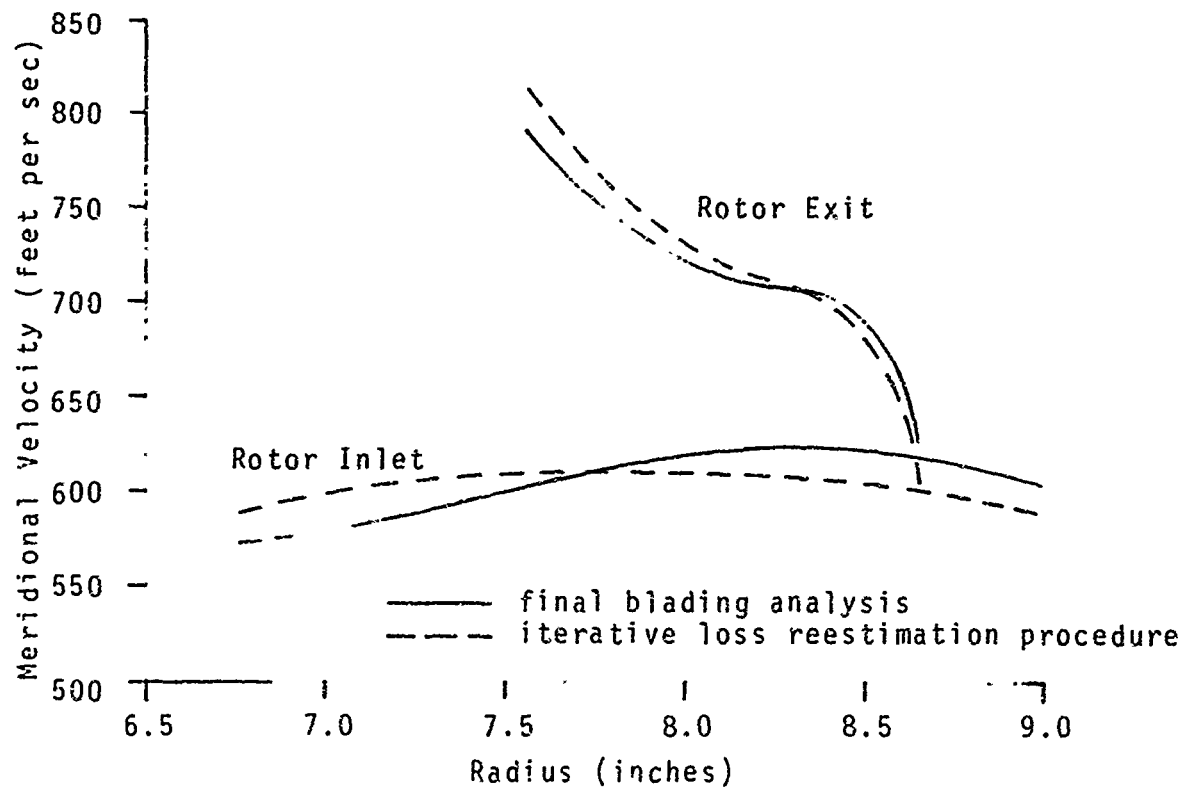


Fig 15. Meridional Velocity Distributions for Rotor from Final Blading Analysis and Iterative Loss Reestimation Procedure

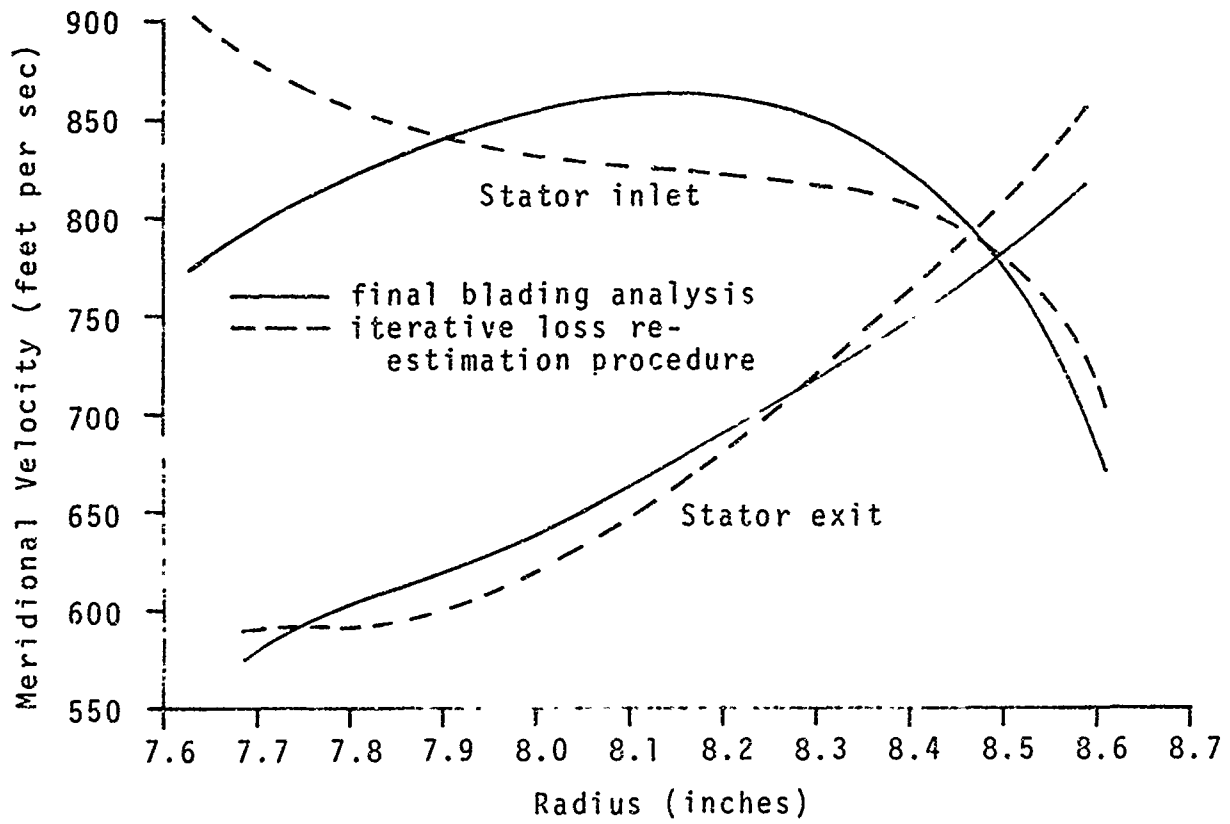


Fig 16. Meridional Velocity Distributions for Stator from Final Blading Analysis and Iterative Loss Reestimation Procedure

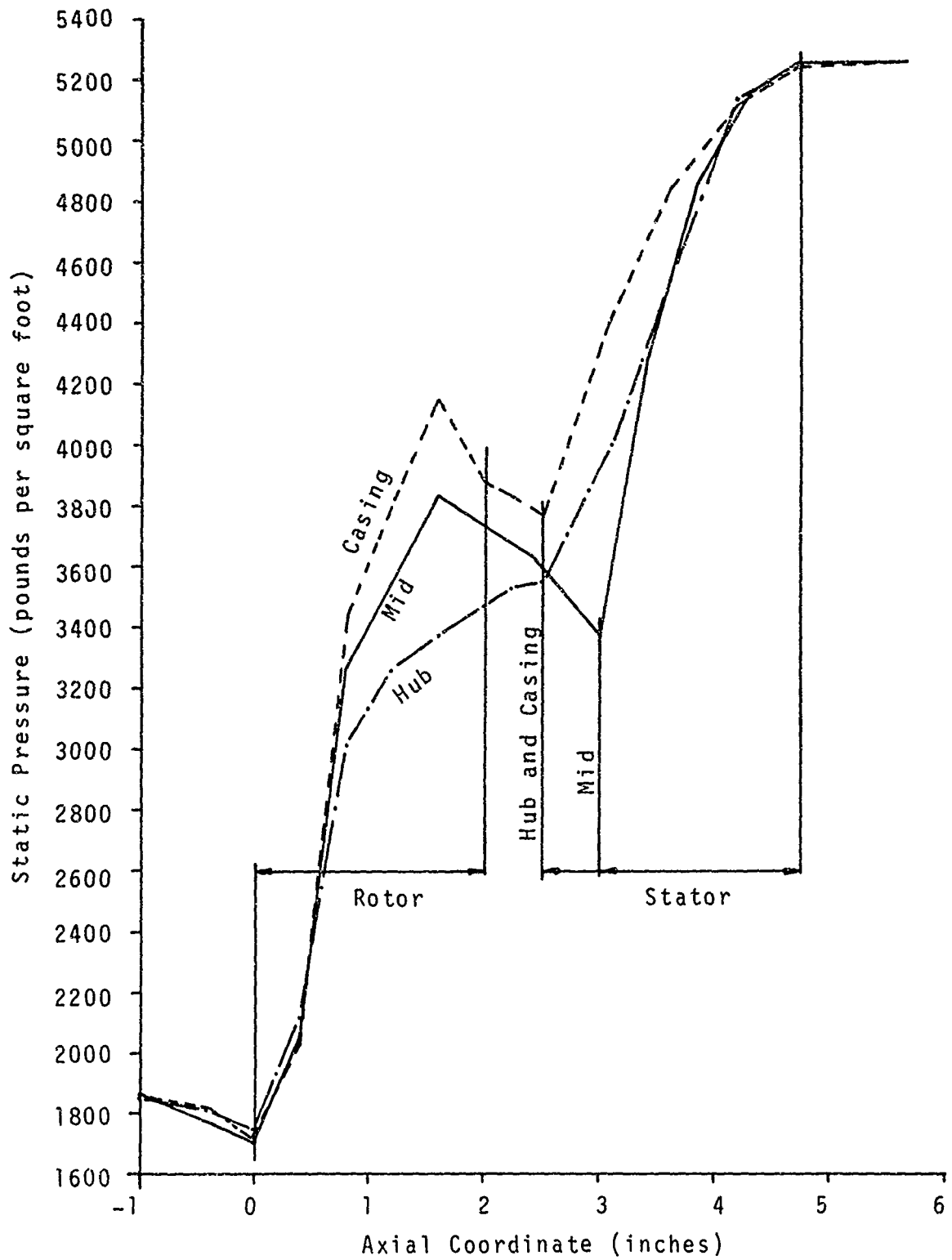


Fig 17. Static Pressure Distribution Through Stage from Final Blading Analysis

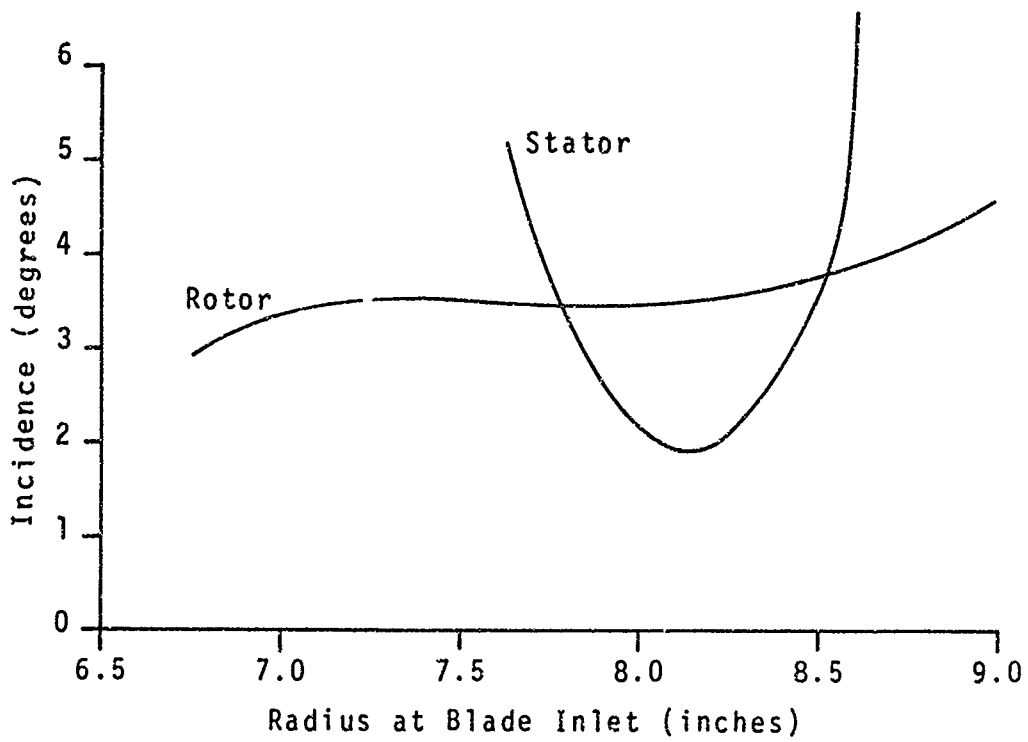


Fig 18. Incidence Angle Distributions for Rotor and Stator from Final Blading Analysis

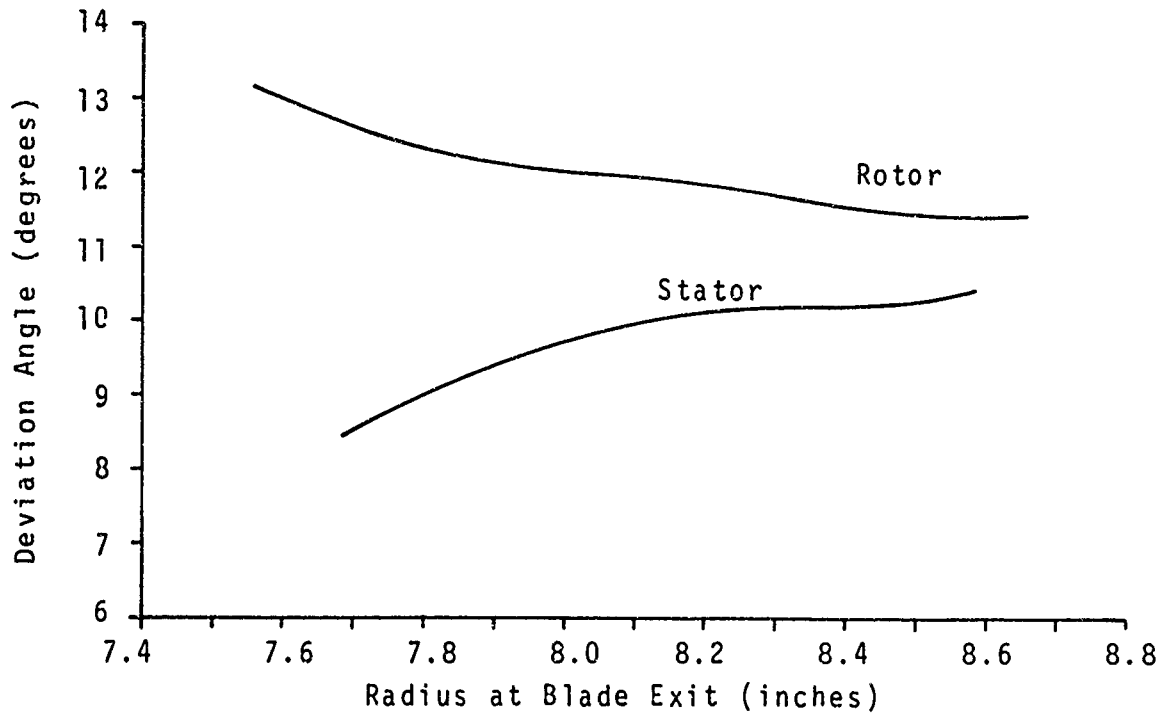


Fig 19. Deviation Angle Distributions for Rotor and Stator from Final Blading Analysis

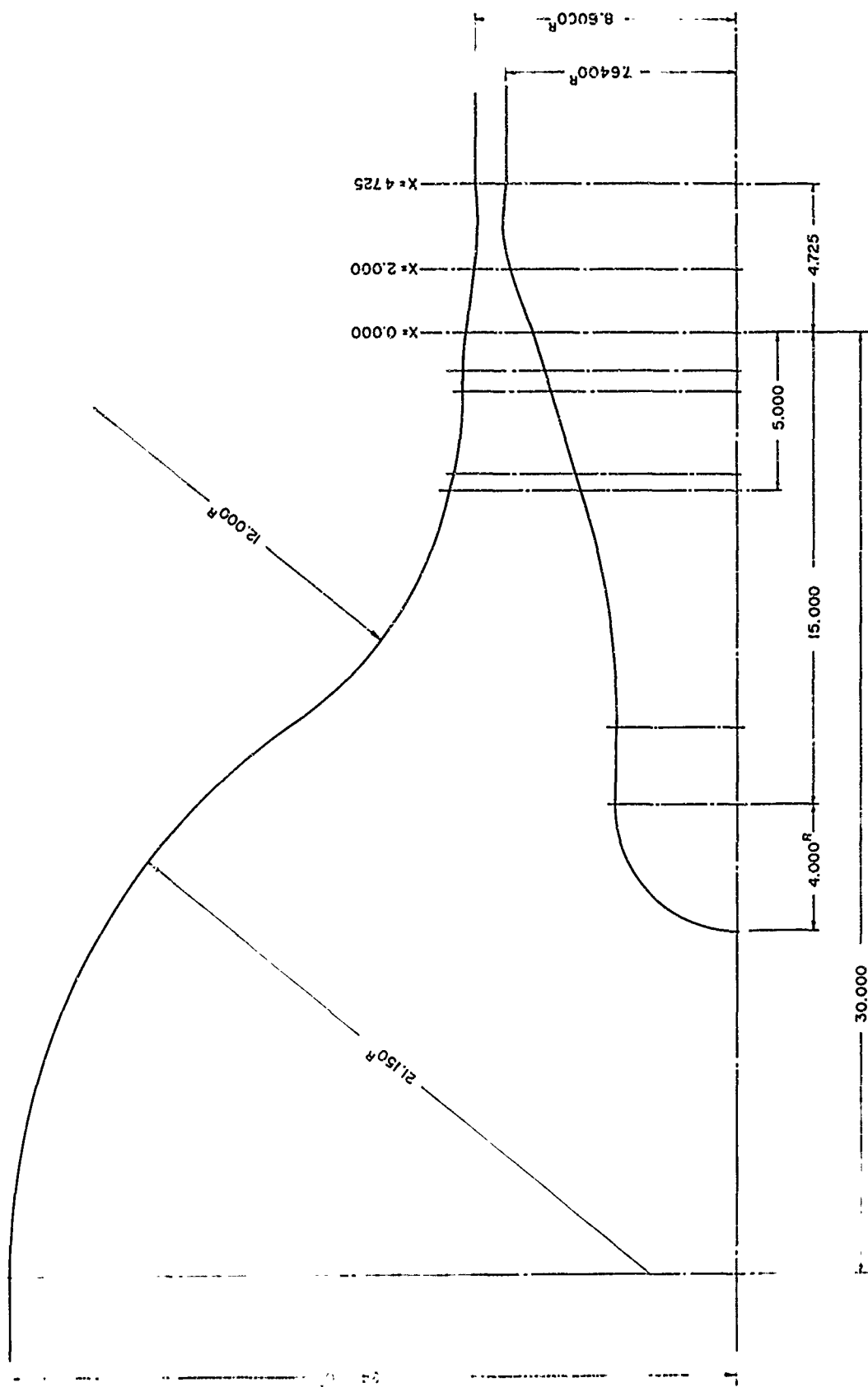
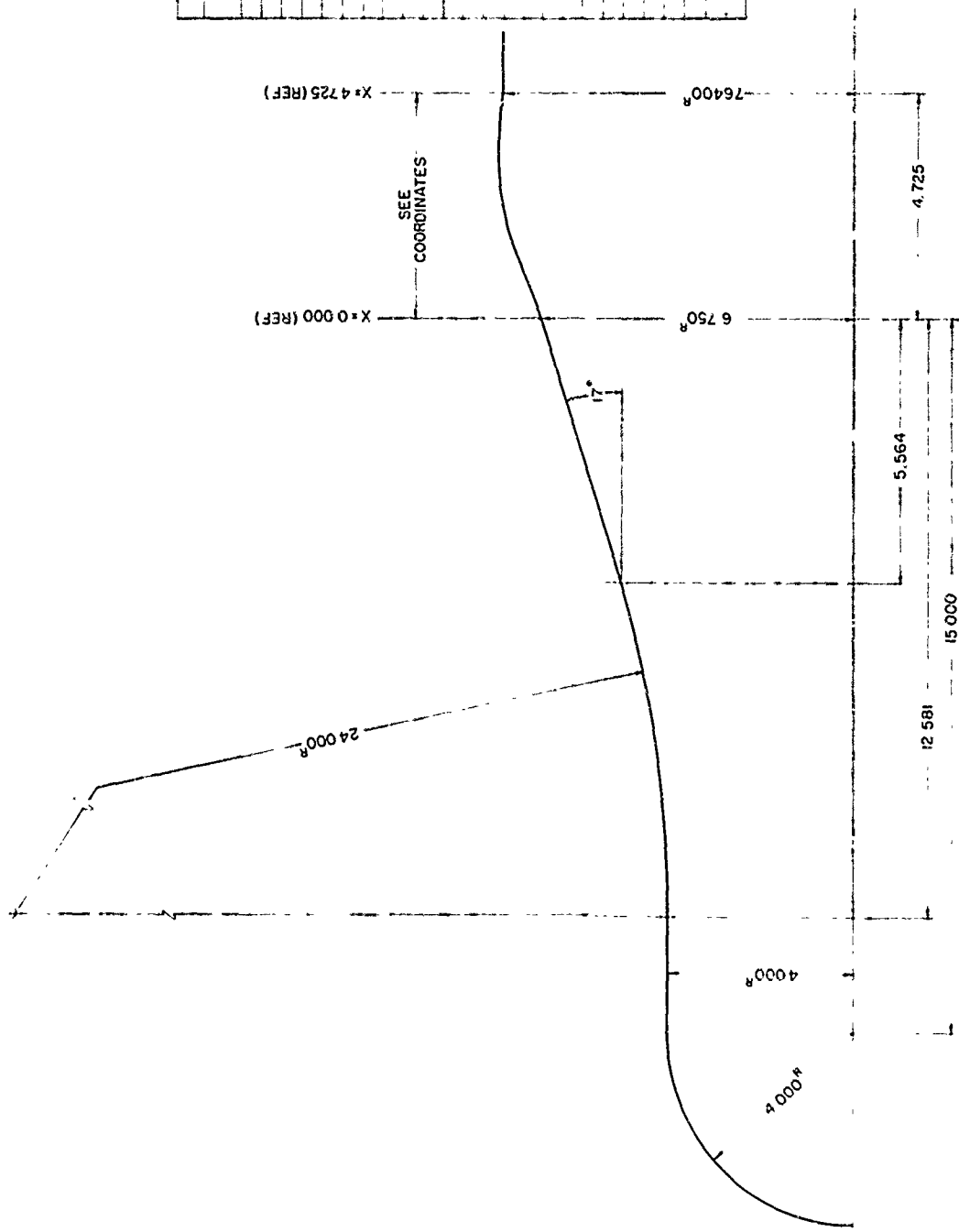


Fig 20. Definition of Overall Flowpath



COORDINATES			
DIM X	RADIUS	DIM X	RADIUS
0.0	6.7499	2.5	7.6199
0.1	6.7827	2.6	7.6384
0.2	6.8190	2.7	7.6577
0.3	6.8578	2.8	7.6768
0.4	6.8979	2.9	7.6945
0.5	6.9388	3.0	7.7097
0.6	6.9815	3.1	7.7212
0.7	7.0275	3.2	7.7288
0.8	7.0764	3.3	7.7327
0.9	7.1350	3.4	7.7334
1.0	7.1928	3.5	7.7311
1.1	7.2549	3.6	7.7262
1.2	7.3120	3.7	7.7192
1.3	7.3637	3.8	7.7105
1.4	7.4091	3.9	7.7007
1.5	7.4477	4.0	7.6903
1.6	7.4792	4.1	7.6798
1.7	7.5037	4.2	7.6697
1.8	7.5224	4.3	7.6605
1.9	7.5373	4.4	7.6526
2.0	7.5489	4.5	7.6463
2.1	7.5621	4.6	7.6420
2.2	7.5746	4.7	7.6400
2.3	7.5882	4.725	7.6400
2.4	7.6032		

Fig 21. Detail Definition of Inner Wall of Flowpath Through Compressor

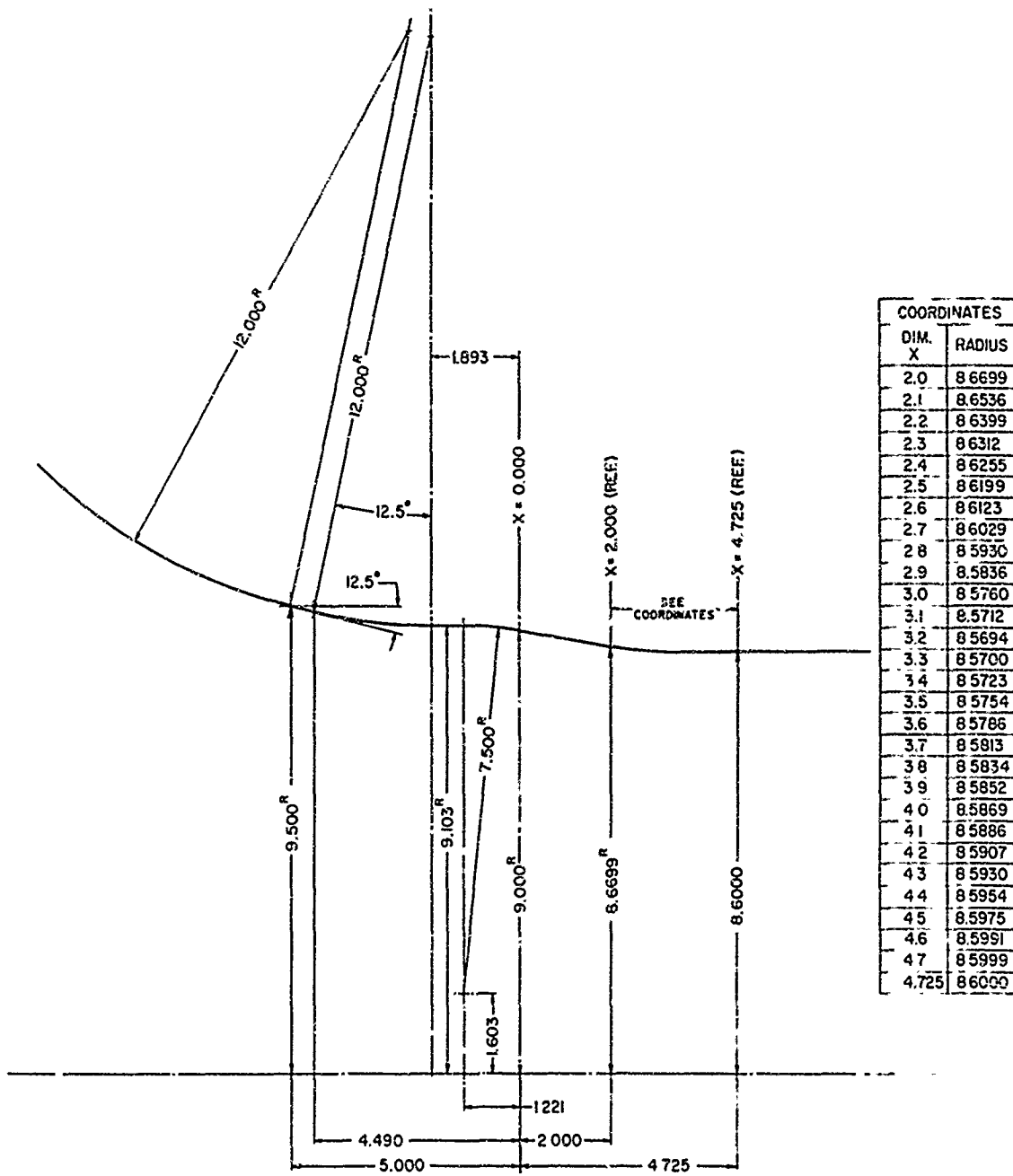


Fig 22. Detail Definition of Outer Wall of Flowpath Through Compressor

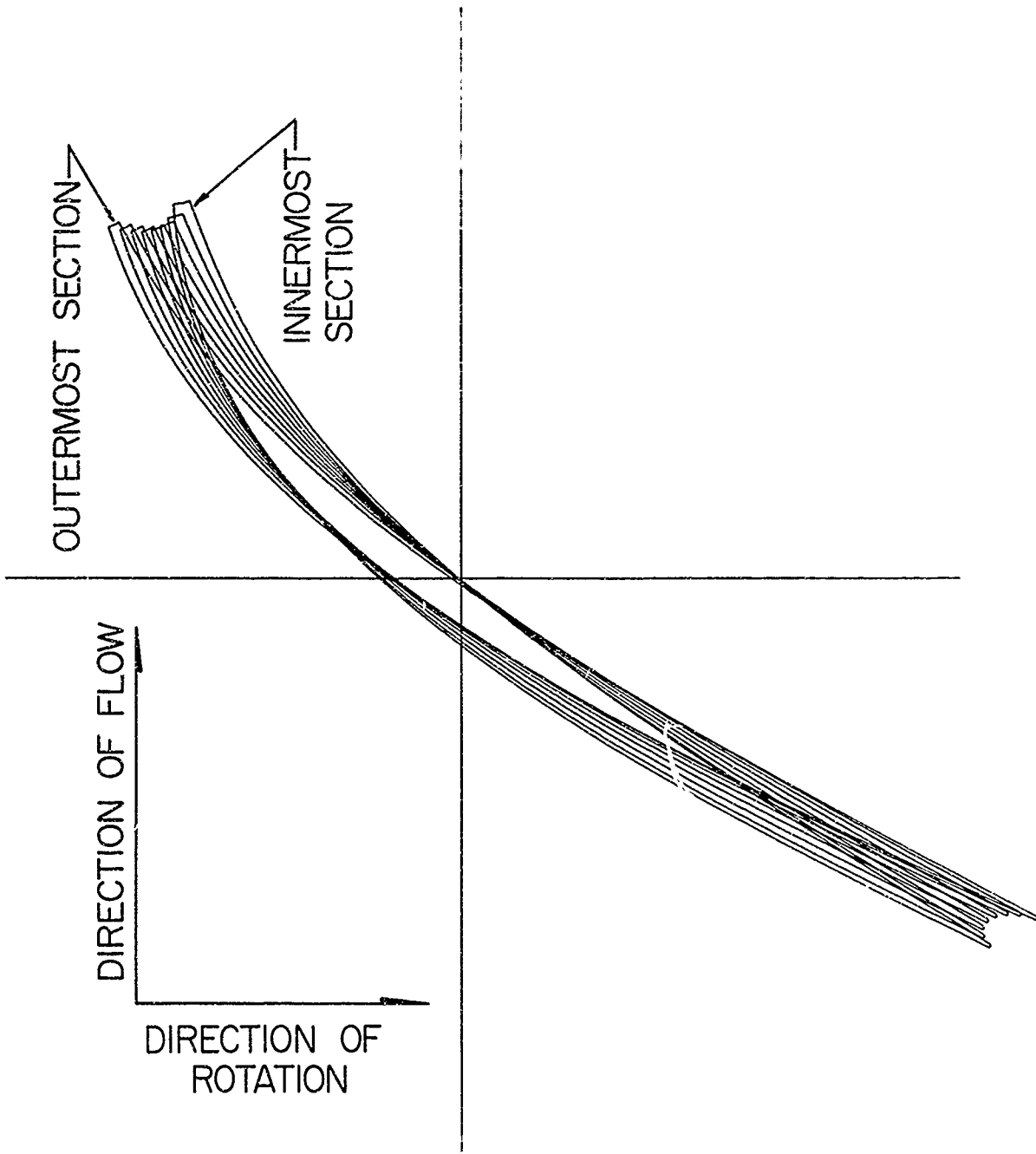


Fig 23. Superimposed Plots of Rotor Blade Streamsurface Sections

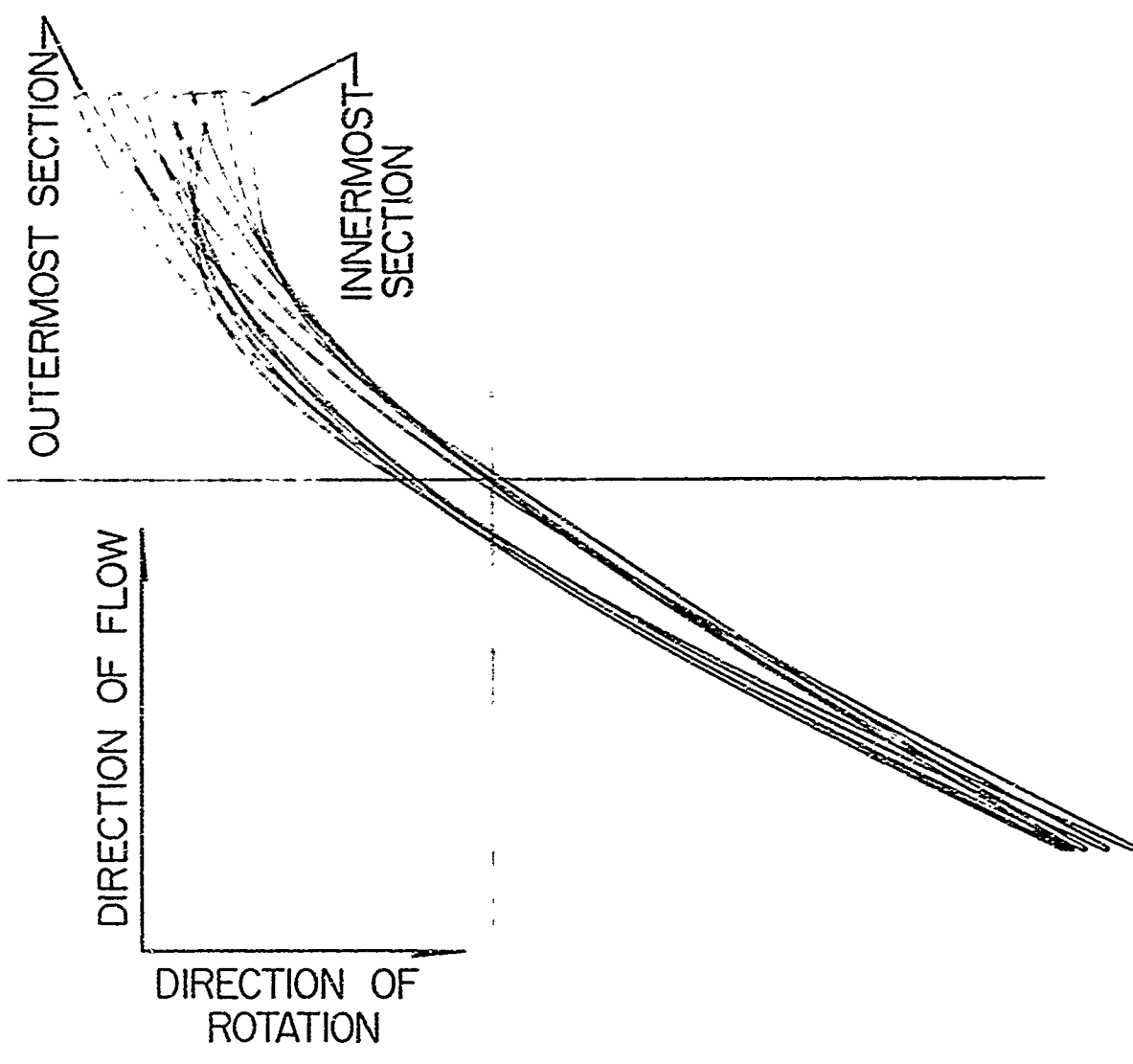


Fig 24. Superimposed Plots of Rotor Blade Cartesian (Manufacturing) Sections

DIRECTION OF FLOW

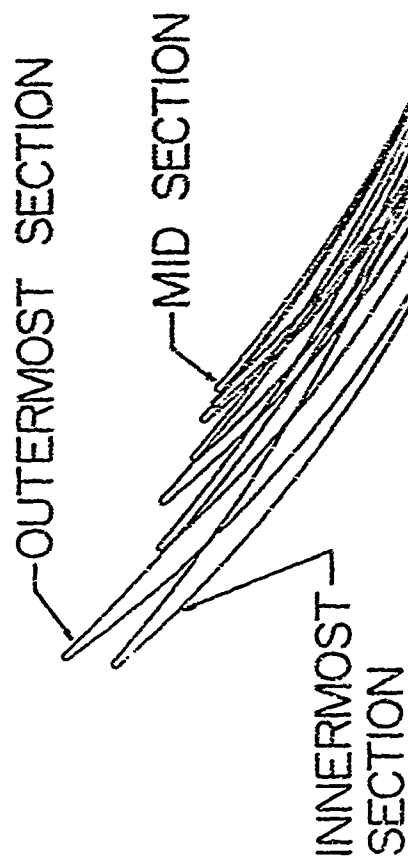


FIG 25. Superimposed Plates of Station Blade of Propellerless Aircraft

DIRECTION OF FLOW

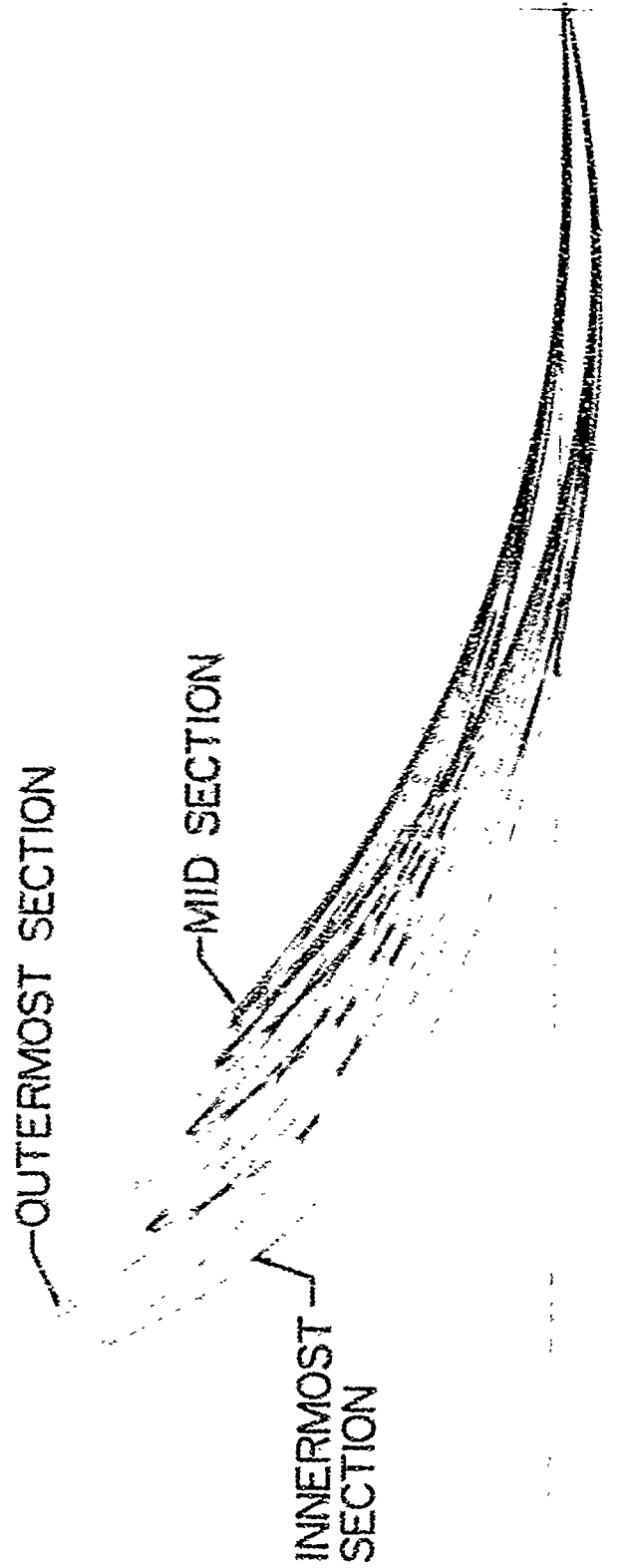


FIG. 26. Superimposed Plans of Stator Blade Cartesian (Manufacturing) Sections

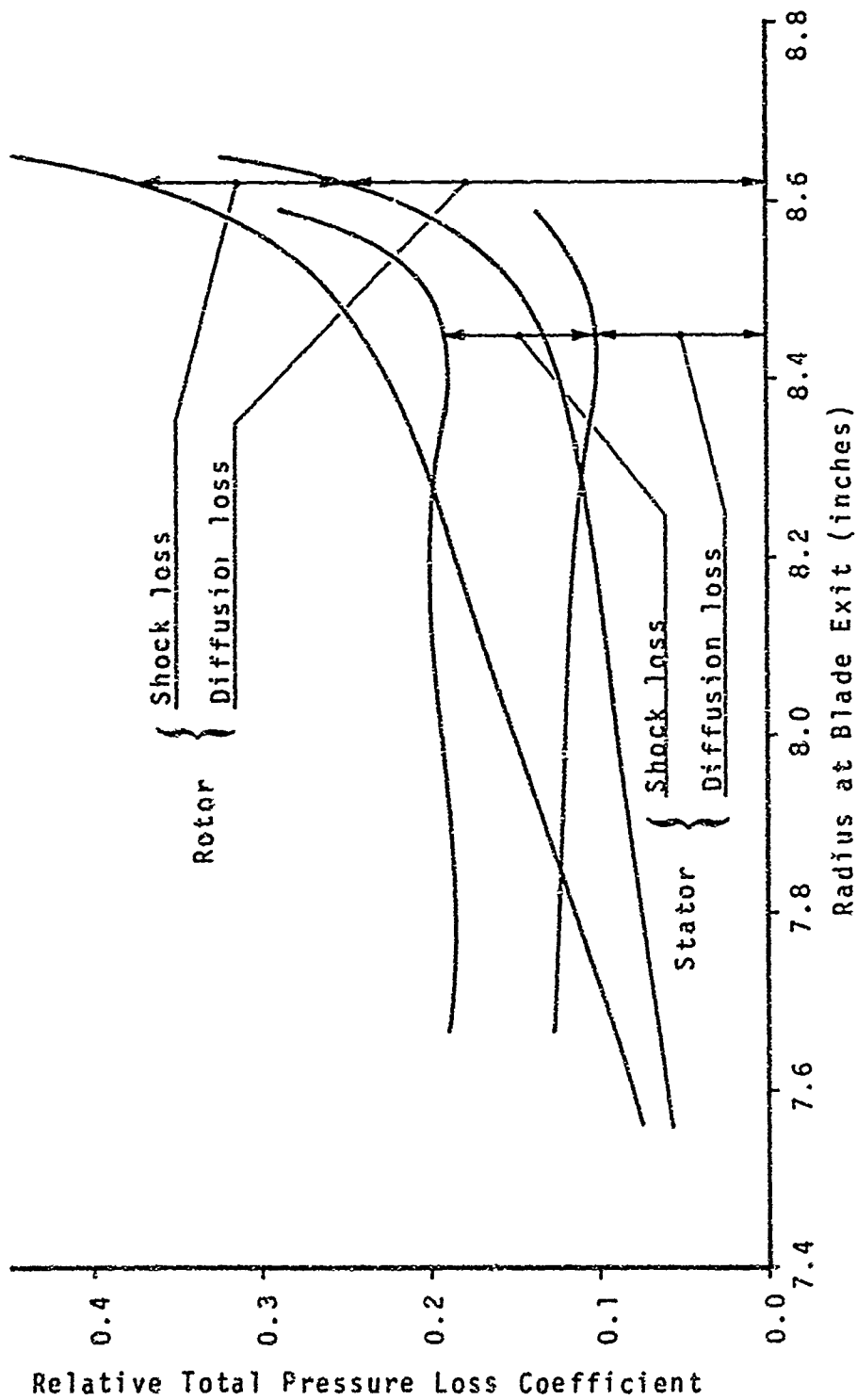


Fig 27. Relative Total Pressure Loss Coefficients for Rotor and Stator from Iterative Loss Reestimation Procedure with Higher Shock Loss

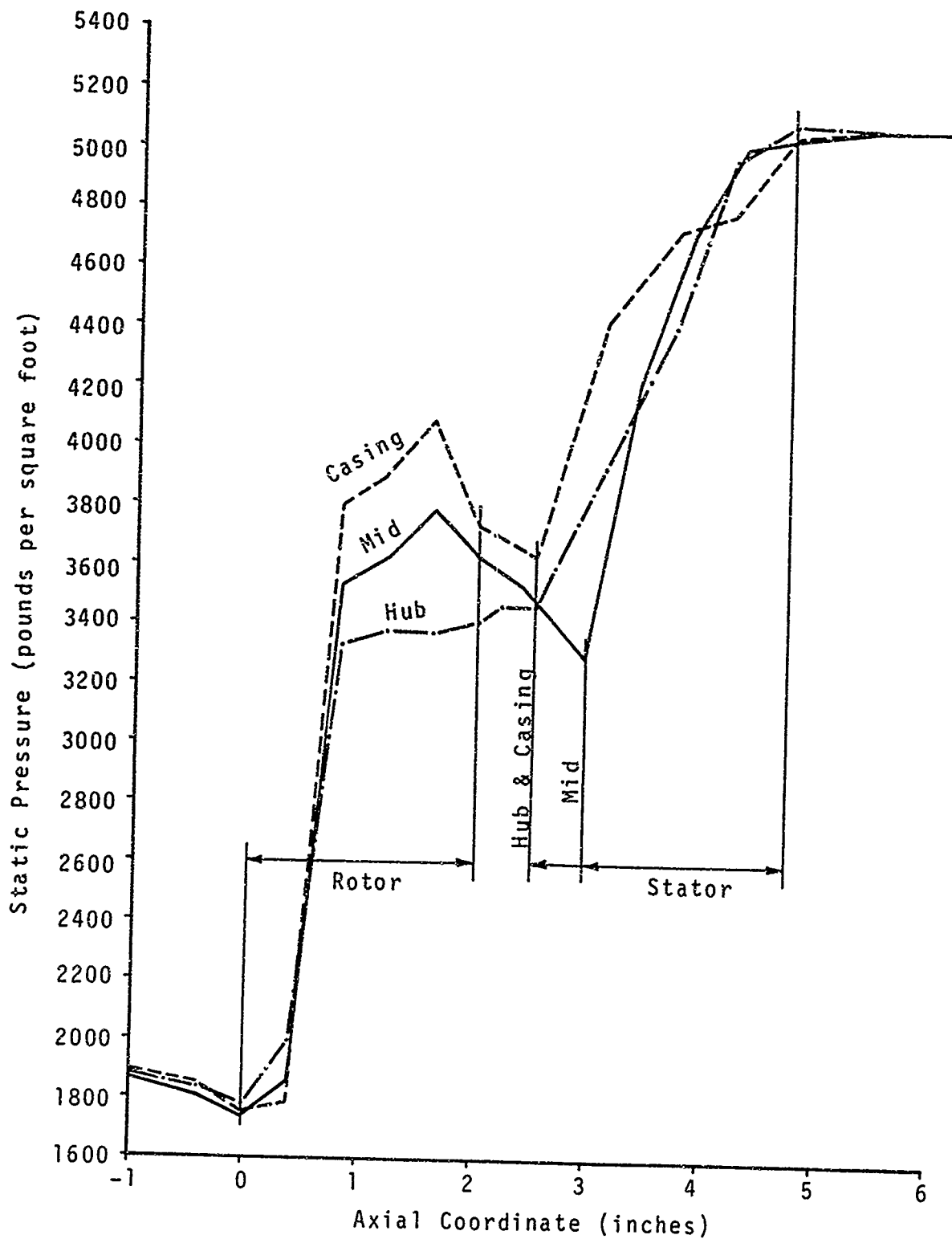


Fig 28. Static Pressure Distribution through Stage from Analysis with Increased Loss Coefficients

REFERENCES

1. Novak, R.A., "Streamline Curvature Computing Procedures for Fluid-Flow Problems". Transactions of the ASME, Series A, Paper No. 66-WA/GT-3, October 1967.
2. Hearsey, R.M. & Wennerstrom, A.J., "Axial Compressor Airfoils for Supersonic Mach Numbers". Aerospace Research Laboratories, WPAFB, Ohio, ARL TR 70-0046, March 1970.
3. Johnson, I.A., Bullock, R.O., et al, "Aerodynamic Design of Axial-Flow Compressors". National Aeronautics and Space Administration, NASA SP-36, 1965.
4. Miller, G.R., Lewis, G.W., Jr. & Hartmann, M.J., "Shock Losses in Transonic Compressor Blade Rows". Transactions of the ASME, Series A, Paper No. 60-WA-77, July 1961.
5. Moses, J.J. & Serovy, G.K., "Some Effects of Blade Trailing Edge Thickness on Performance of a Single-Stage Axial-Flow Compressor". National Advisory Committee for Aeronautics, NACA RM E51C09, 1951.
6. Kenny, D.P., "A Novel Low-Cost Diffuser for High-Performance Centrifugal Compressors". Transactions of the ASME, Series A, Paper No. 68-GT-38, January 1969.
7. Hearsey, R.M., "Axial Compressor Rotor Design Through Specification of the Meridional Velocity Profile". Aerospace Research Laboratories, Air Force Systems Command, WPAFB, Ohio, ARL TR 71-0024, February 1971.
8. Jansen, W., "The Application of End-Wall Boundary Layer Effects in the Performance Analysis of Axial Compressors". ASME Paper No. 67-WA/GT-11, presented at the Annual Winter Meeting, November 1967.
9. Novak, R.A., Hearsey, R.M., et al, "Model for Predicting Compressor Performance with Combined Circumferential and Radial Distortion-Computer Program". Propulsion system flow stability program (dynamic), Phase I, final technical report, Air Force Aero Propulsion Laboratory, AFAPL TR 68-142, Part VIII, December 1968.