DISCLAIMER NOTICE

ARL 71-0061
MARCH 1971

AD 727001

Aerospace Research Laboratories

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

A. J. WENNERSTROM
RICHARD M. HEARSEY
FLUID DYNAMICS FACILITIES RESEARCH LABORATORY

PROJECT NO. 7065

Approved for public release; distribution unlimited.

AIR FORCE SYSTEMS COMMAND
United States Air Force

180

NOTICES

200 - June 1971 - CO305 - 42-71-723

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
March 1971	177	9

8a. CONTRACT OR GRANT NO. In-house research b. PROJECT NO. 7065-09	9a. ORIGINATOR'S REPORT NUMBER(S)
c. DoD Element 61102F d. DoD Subelement 681307	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) 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 1 NOV 65 1473

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

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

A. J. WENNERSTROM

R. M. HEARSEY

FLUID DYNAMICS FACILITIES RESEARCH LABORATORY

MARCH 1971

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. Kearsey, 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.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

FIGURE		PAGE

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 radio 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.

$$\bar{\omega} = \bar{\omega}_d + \bar{\omega}_s \tag{1}$$

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

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

and

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

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

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

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

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

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 streamsurface, referred to conditions at the leading edge of the respective blade row. Then the (absolute) total pressure at any station may be determined from

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

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

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

where

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

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 $P_{nr}/P_{nr}(ideal)$ 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.

Section	Solidity
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:

Section	Solidity
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

$$\delta = m\theta \sqrt{1/\sigma} \tag{8}$$

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 cylindric 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

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

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

$$W = \int_{hub}^{case} C_m \cos\phi \; w \; dA \tag{10}$$

where W is the flow-rate

w is the specific weight

A is flow area normal to the axis.

The energy equation is either

$$T = \text{constant along streamlines between blade rows} \qquad (11)$$

$$T = \text{specified value within or immediately following a rotor row} \qquad (12)$$

or

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

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

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

Algebraic manipulation yields the following result

$$gJC_p\frac{dT}{d\ell} = \left\{ C_m^2\left[\frac{\cos(\phi+\gamma)}{r_c} + \frac{\sin(\phi+\gamma)}{C_m}\frac{dC_m}{dm}\right] + \frac{U_1C_{\theta 1} + gJC_p(T-T_1)}{\omega r^2} \times \right.$$

$$\frac{d}{d\ell}\left[\frac{gJC_pT_1}{\omega} - r_1C_{\theta 1}\right] + gRt\frac{d}{d\ell}\ell n\left[\frac{P_1}{T_1^{\frac{\gamma}{\gamma-1}}}\frac{P_R/P_{1R}}{(P_R/P_{1R})_{ideal}}\right] - \tag{15}$$

$$\left. C_m\frac{dC_m}{d\ell}\right\} \Big/ \left[\frac{U_1C_{\theta 1} + gJC_p(T-T_1)}{U^2}\right]$$

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

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

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

The shape factor is obtained from

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

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

The displacement thickness is given by

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

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 ... in the iterative loss reestimation procedure for two ... If the increased tip loss is viewed as a radial redistribution ... within the gap between blades, it need not ... affect the rotor design and its omission would result ... radial redistribution of stator conditions. Second, ... anticipated that the stated design objectives of this ... achieved after appropriate boundary-layer control ... have been added, these modifications, if successful, should ... wake thickness and the associated radial migration. A ... consideration is that an attempt to compensate for ... 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 ... for the final computation of this phase of the design. The ... inlet and outlet areas were determined from the initially ... design objectives. The area at the rotor outlet was determined by maximizing the static pressure rise across the rotor while ... 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 ... feet per second in the space between rotor and stator.)

Figure 4 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.Q. 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)
NPLOT = 31 (FIRST PASS DURING WHICH CASCADE ANALYSIS IS PRINTED)
INCPO =  0 (INCREMENT FOR ABOVE)
NWRIT = 31 (FIRST PASS DURING WHICH VELOCITY TRIANGLE DATA IS PRINTED)
INCWRI =  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 IFMLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE FLOW ANGLE	LOSS COEFFICIENT	BLOCKAGE FRACTION
7.5000	-24.00	0.08000	0.02600
7.6000	-26.70	0.09000	0.02600
7.8000	-30.80	0.11000	0.02600
8.0000	-33.18	0.13000	0.02600
8.2000	-34.68	0.15000	0.02600
8.4000	-35.52	0.18000	0.02600
8.6000	-35.80	0.21000	0.02600
8.7000	-35.77	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 IFMLOS =0 IFLVSI =0 IFPROF =0 IFREYL =0

RADIUS	RELATIVE FLOW ANGLE	LOSS COEFFICIENT	BLOCKAGE FRACTION
7.6400	-0.	0.13000	-0.
7.7770	-0.	0.13000	-0.
7.9140	-0.	0.13000	-0.
8.0510	-0.	0.13000	-0.
8.1880	-0.	0.13000	-0.
8.3260	-0.	0.13000	-0.
8.4620	-0.	0.13000	-0.
8.6000	-0.	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	IMACHI (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	9.0000	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.	3-D SHOCK + OUR D.
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	0.10576
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	0.03586	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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CAMBER	52.521	53.097	53.776	54.524	55.222	55.855	56.453	56.975	57.471	58.005	58.568	59.236	60.247	62.251	66.584
BETA1	44.359	44.598	44.880	45.205	45.524	45.848	46.212	46.575	46.960	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	1.7661	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.	3-D SHOCK + OUR D.
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	0.20589
7	8.0315	1.4260	1.2840	0.7092	0.09840	0.03640	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

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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	4.7908	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.	-0.565	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	7.2462	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

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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	5.1868	239.578	239.578	0.	518.7	513.9	2116.00	2048.54	0.2157	0.	9.102	55.25	0.0748	2
3	5.5309	242.385	242.385	0.	518.7	513.8	2116.00	2046.97	0.2182	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

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	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	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	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	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	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	0.0849	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	1320.0	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	0.6255	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	1538.7	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	3.2017	0.4109	0.9593	3.2017	0.4109	0.9593
2	3.1838	0.4104	0.9551	3.1838	0.4104	0.9551
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	0.7881	3.4803	0.5428	0.7881

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	3.2608	3.2608
DELTA T ON T	0.4497	0.4497
ISEN. EFFICY.	0.8928	0.8928

STATION 7

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.6272	1305.073	900.757	944.379	731.8	590.1	6774.75	3187.81	1.0964	46.356	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	2.993	-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	1.0443	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

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.6819	589.206	589.206	0.	731.8	702.9	5939.65	5158.22	0.4535	0.	0.291	-56.22	0.1376	1
2	7.7290	589.071	589.071	0.	731.6	702.7	5941.37	5159.79	0.4535	0.	0.367	-50.38	0.1377	2
3	7.7813	590.003	590.003	0.	731.7	702.7	5946.07	5161.63	0.4542	0.	0.451	-44.72	0.1378	3
4	7.0382	592.250	592.250	0.	732.3	703.1	5954.35	5163.76	0.4558	0.	0.544	-39.42	0.1377	4
5	7.8994	597.791	597.791	0.	733.5	703.8	5972.10	5166.29	0.4598	0.	0.632	-35.23	0.1377	5
6	7.9641	609.724	609.724	0.	735.5	704.6	6008.95	5169.36	0.4688	0.	0.703	-32.36	0.1376	6
7	8.0314	627.904	527.904	0.	738.2	705.4	6065.82	5173.00	0.4824	0.	0.760	-30.18	0.1375	7
8	8.1003	649.433	649.433	0.	741.7	706.6	6135.22	5177.16	0.4986	0.	0.779	-29.31	0.1374	8
9	8.1702	672.543	672.543	0.	745.7	708.1	6212.23	5181.62	0.5158	0.	0.740	-30.39	0.1372	9
10	8.2408	697.307	697.307	0.	750.4	709.9	6297.35	5186.15	0.5341	0.	0.669	-32.81	0.1370	10
11	8.3115	724.558	724.558	0.	755.8	712.1	6393.97	5190.47	0.5541	0.	0.544	-38.63	0.1367	11
12	8.3818	754.837	754.837	0.	762.2	714.8	6504.49	5194.21	0.5762	0.	0.383	-50.54	0.1363	12
13	8.4515	786.153	786.153	0.	770.1	718.7	6620.16	5196.84	0.5984	0.	0.190	-81.38	0.1356	13
14	8.5206	817.354	817.354	0.	781.3	725.7	6731.24	5197.84	0.6192	0.	-0.027	-267.77	0.1343	14
15	8.5891	855.125	855.125	0.	800.3	739.4	6856.59	5197.76	0.6418	0.	-0.248	192.29	0.1318	15

STATION 8 IS AT THE EXIT OF A BLADE ROW ROTATING AT 0. RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN.	INLET	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		46.354	0.	1305.073	589.206	1.0964	0.4535	0.2328	0.451	0.6986	0.5493	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.	2
3		46.875	0.	1277.926	590.003	1.0684	0.4542	0.2210	0.462	0.7101	0.5510	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.	4
5		47.518	0.	1257.843	597.791	1.0463	0.4598	0.2122	0.475	0.7206	0.5464	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.	6
7		48.205	-0.	1251.097	627.904	1.0354	0.4824	0.1973	0.502	0.7092	0.5333	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.	8
9		48.953	0.	1256.191	672.543	1.0342	0.5158	0.1791	0.535	0.6808	0.5137	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.	10
11		49.923	-0.	1268.597	724.558	1.0381	0.5541	0.1610	0.571	0.6437	0.4890	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.	12
13		51.624	0.	1286.789	786.153	1.0443	0.5984	0.1423	0.611	0.5932	0.4570	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.	14
15		57.318	-0.	1312.300	855.125	1.0449	0.6418	0.1382	0.652	0.5438	0.4106	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

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

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	0.9108	2.9714
DELTA T ON T	0.	0.4497
ISEN. EFFICY.	0.	0.8112

STATION 9

****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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.	-0.036	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	724.8	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

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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

OVERALL PERFORMANCE PARAMETERS

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

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.0000	2.9714
DELTA T ON T	0.	0.4497
ISEN. EFFICY.	0.	0.8112

2. INTRA-BLADE FLOW ANALYSIS

The objective of the intr -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 ro‹or and stator are shown in Figs 18 and 19.

ARF AXIAL COMPRESSOR PROGRAM RMH3
```
ARF AXIAL COMPRESSOR PROGRAM RMH3
*********************************

JOB 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
IFSIMP =  1 (2 -S.P.C.  .NE.2 -L.S.C. 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)
NPLOT = 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)
INCWRI =  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 ON 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 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
6.9066	-60.902	0.9918	0.12899
7.0522	-61.119	0.9907	0.11789
7.1970	-61.318	0.9895	0.10982
7.3409	-61.520	0.9881	0.10356
7.4841	-61.745	0.9867	0.09844
7.6270	-61.996	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	-63.673	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(I) = 1

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 =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
7.2223	-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	-58.959	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(I) = 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

IANCHR(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
7.6394	-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	0.08231
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

IANCHR(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 ACTUAL/IDEAL BLOCKAGE

	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

IBEND(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

IBEND(I) = 15

RADIUS	'Z'
7.6272	2.5129
7.6865	2.6117
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	2.6591
8.6114	2.5153

STATION 12 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. 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
7.7326	30.849	0.9692	0.09244
7.7823	30.794	0.9708	0.08750
7.8336	30.743	0.9721	0.08307
7.8865	30.733	0.9730	0.07925
7.9410	30.753	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	0.07261
8.4287	32.124	0.9823	0.07580
8.4953	33.155	0.9827	0.08106
8.5638	34.175	0.9828	0.08811

IANCHR(I) = 1

IBEND(I) = 15

RADIUS	[illegible]
7.7326	3.0659
7.7823	3.1401
7.8336	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	3.3560
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 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
7.7447	17.995	0.9383	0.09800
7.7942	17.903	0.9416	0.09282
7.8456	17.814	0.9442	0.08819
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
8.3126	17.889	0.9606	0.07463
8.3758	18.071	0.9628	0.07647
8.4397	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	3.6189
7.7942	3.6684
7.8456	3.7124
7.8988	3.7506
7.9538	3.7826
8.0104	3.8077
8.0686	3.8256
8.1279	3.8355
8.1885	3.8370
8.2501	3.8295
8.3126	3.8123
8.3758	3.7846
8.4397	3.7453
8.5045	3.6921
8.5702	3.6202

STATION 14 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. 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
7.7057	6.449	0.9075	0.06947
7.7613	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	0.05611
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	4.2187
7.8787	4.2378
7.9392	4.2538
8.0008	4.2564
8.0633	4.2753
8.1264	4.2303
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	4.1726

STATION 15 FOLLOWS A BLADE DESCRIBED BY THE FOLLOWING AND ROTATING AT 0. 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
7.6819	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.	0.9002	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(I) = 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	6.3746	9.0900	-0.	-0.	0
3	-0.4000	6.6016	9.0500	-0.	-0.	0
4	0.	6.7586	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	8.6556	-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	7.6820	8.5890	-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.

OUTPUT FROM PASS 20
****

STATION 1
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	6.0686	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	20.932	0.	0.0709	1
2	6.2843	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	19.338	0.	0.0709	2
3	6.5004	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	17.707	0.	0.0709	3
4	6.7161	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	16.050	0.	0.0709	4
5	6.9318	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	14.371	0.	0.0709	5
6	7.1475	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	12.681	0.	0.0709	6
7	7.3636	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	10.990	0.	0.0709	7
8	7.5793	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	9.318	0.	0.0709	8
9	7.7950	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	7.680	0.	0.0709	9
10	8.0111	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	6.095	0.	0.0709	10
11	8.2268	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	4.592	0.	0.0709	11
12	8.4425	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	3.197	0.	0.0709	12
13	8.6582	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	1.943	0.	0.0709	13
14	8.8743	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	0.865	0.	0.0709	14
15	9.0900	431.080	431.080	0.	518.7	503.2	2116.00	1903.19	0.3921	0.	0.	0.	0.0709	15

STATION 2
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	6.3746	470.028	470.028	0.	518.7	500.3	2116.00	1864.78	0.4288	0.	20.813	-205.84	0.0699	1
2	6.5551	473.379	473.379	0.	518.7	500.1	2116.00	1861.35	0.4320	0.	19.173	-145.33	0.0698	2
3	6.7559	476.533	476.533	0.	518.7	499.8	2116.00	1858.10	0.4350	0.	17.486	-108.73	0.0697	3
4	6.9464	479.359	479.359	0.	518.7	499.6	2116.00	1855.17	0.4377	0.	15.772	-85.80	0.0696	4
5	7.1370	481.775	481.775	0.	518.7	499.4	2116.00	1852.66	0.4400	0.	14.036	-70.75	0.0696	5
6	7.3277	483.697	483.697	0.	518.7	499.2	2116.00	1850.66	0.4418	0.	12.286	-59.53	0.0695	6
7	7.5191	485.033	485.033	0.	518.7	499.1	2116.00	1849.26	0.4430	0.	10.526	-50.28	0.0695	7
8	7.7108	485.660	485.660	0.	518.7	499.1	2116.00	1848.60	0.4436	0.	8.766	-42.16	0.0695	8
9	7.9031	485.445	485.445	0.	518.7	499.1	2116.00	1848.83	0.4434	0.	7.020	-34.95	0.0695	9
10	8.0966	484.223	484.223	0.	518.7	499.2	2116.00	1850.11	0.4423	0.	5.292	-28.60	0.0695	10
11	8.2912	481.826	481.826	0.	518.7	499.4	2116.00	1852.61	0.4400	0.	3.605	-23.21	0.0696	11
12	8.4873	478.073	478.073	0.	518.7	499.7	2116.00	1856.51	0.4364	0.	1.978	-18.73	0.0697	12
13	8.6854	472.799	472.799	0.	518.7	500.1	2116.00	1861.94	0.4314	0.	0.441	-15.24	0.0698	13
14	8.8864	465.876	465.876	0.	518.7	500.6	2116.00	1869.00	0.4249	0.	-0.968	-12.50	0.0700	14
15	9.0900	457.525	457.525	0.	518.7	501.3	2116.00	1877.41	0.4170	0.	0.	-10.50	0.0702	15

STATION 3
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	6.5016	515.618	515.618	0.	518.7	496.6	2116.00	1816.42	0.4722	0.	21.148	43.50	0.0686	1
2	6.7723	522.734	522.734	0.	518.7	496.0	2116.00	1808.55	0.4790	0.	19.257	85.98	0.0684	2
3	6.9431	528.734	528.734	0.	518.7	495.4	2116.00	1801.86	0.4848	0.	17.422	174.20	0.0682	3
4	7.1136	534.023	534.023	0.	518.7	495.0	2116.00	1795.91	0.4898	0.	15.607	399.04	0.0680	4
5	7.2843	538.745	538.745	0.	518.7	494.5	2116.00	1790.56	0.4944	0.	13.781	-6190.53	0.0679	5
6	7.4553	542.857	542.857	0.	518.7	494.2	2116.00	1785.87	0.4985	0.	11.930	-299.52	0.0678	6
7	7.6270	546.214	546.214	0.	518.7	493.9	2116.00	1782.02	0.5016	0.	10.043	-130.98	0.0677	7
8	7.7990	548.592	548.592	0.	518.7	493.7	2116.00	1779.28	0.5039	0.	8.121	-74.52	0.0676	8
9	7.9718	549.738	549.738	0.	518.7	493.5	2116.00	1777.96	0.5050	0.	6.160	-47.54	0.0676	9
10	8.1459	549.348	549.348	0.	518.7	493.6	2116.00	1778.41	0.5046	0.	4.153	-32.21	0.0676	10
11	8.3212	547.056	547.056	0.	518.7	493.8	2116.00	1781.05	0.5024	0.	2.104	-22.64	0.0676	11
12	8.4985	542.405	542.405	0.	518.7	494.2	2116.00	1786.38	0.4979	0.	0.006	-15.24	0.0678	12
13	8.6733	534.806	534.806	0.	518.7	494.9	2116.00	1795.02	0.4906	0.	-2.148	-11.76	0.0680	13
14	8.8518	523.446	523.446	0.	518.7	495.9	2116.00	1807.76	0.4797	0.	-4.367	-8.52	0.0684	14
15	9.0500	507.233	507.233	0.	518.7	497.3	2116.00	1825.58	0.4642	0.	-6.654	-5.12	0.0688	15

STATION 4
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	6.7586	573.071	573.071	0.	518.7	491.4	2116.00	1750.61	0.5276	0.	20.869	-21.79	0.0668	1
2	6.9132	575.766	575.766	0.	518.7	491.1	2116.00	1747.40	0.5302	0.	19.327	-173.48	0.0667	2
3	7.0692	581.001	581.001	0.	518.7	490.6	2116.00	1741.13	0.5353	0.	17.694	59.39	0.0666	3
4	7.2256	587.593	587.593	0.	518.7	490.0	2116.00	1733.18	0.5417	0.	15.972	35.57	0.0663	4
5	7.3824	594.698	594.698	0.	518.7	489.3	2116.00	1724.53	0.5487	0.	14.157	31.22	0.0661	5
6	7.5396	601.688	601.688	0.	518.7	488.6	2116.00	1715.96	0.5555	0.	12.257	31.97	0.0659	6
7	7.6972	608.126	608.126	0.	518.7	487.9	2116.00	1708.00	0.5518	0.	10.277	35.97	0.0657	7
8	7.8550	613.676	613.676	0.	518.7	487.4	2116.00	1701.09	0.5673	0.	8.227	44.27	0.0655	8
9	8.0133	618.112	618.112	0.	518.7	486.9	2116.00	1695.54	0.5716	0.	6.105	61.45	0.0653	9
10	8.1726	621.222	621.222	0.	518.7	486.6	2116.00	1691.63	0.5747	0.	3.898	114.15	0.0652	10
11	8.3325	622.724	622.724	0.	518.7	486.4	2116.00	1689.74	0.5762	0.	1.594	-2145.02	0.0651	11
12	8.4936	622.279	622.279	0.	518.7	486.5	2116.00	1690.30	0.5757	0.	-0.826	-88.93	0.0652	12
13	8.6565	619.516	619.516	0.	518.7	486.8	2116.00	1693.78	0.5730	0.	-3.383	-43.57	0.0653	13
14	8.8219	614.082	614.082	0.	518.7	487.3	2116.00	1700.58	0.5677	0.	-6.103	-29.44	0.0654	14
15	8.9900	605.737	605.737	0.	518.7	488.2	2116.00	1710.96	0.5595	0.	-9.013	-24.07	0.0657	15

STATION 5
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	6.9066	614.448	592.279	163.563	552.1	520.7	2611.89	2127.37	0.5495	15.438	22.324	6.22	0.0766	1
2	7.0530	623.652	602.266	151.918	552.5	520.1	2614.89	2116.58	0.5580	15.048	21.187	5.45	0.0763	2
3	7.1984	633.002	612.380	160.255	552.8	519.5	2617.27	2104.89	0.5668	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	2081.23	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	0.5896	13.627	13.953	8.91	0.0750	6
7	7.7722	663.476	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.[illegible]	656.599	150.679	554.6	516.9	2619.86	2046.52	0.6047	12.925	6.934	17.85	0.0743	9
10	8.2006	678.579	661.667	150.552	555.2	516.9	2623.86	2042.55	0.6091	12.819	4.400	28.21	0.0741	10
11	8.3436	683.544	656.619	151.167	556.0	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	-130.69	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	46753.65	0.0735	15

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

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN.	INLET	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		-64.501	-60.902	1331.172	1217.926	1.2255	1.0892	0.0140	0.915	0.	0.1428	1201.5	1227.8	1
2		-64.898	-61.120	1357.159	1246.974	1.2497	1.1158	0.0156	0.919	0.	0.1329	1229.0	1253.8	2
3		-65.198	-61.319	1384.515	1275.966	1.2756	1.1424	0.0172	0.922	0.	0.1243	1256.7	1279.7	3
4		-65.419	-61.522	1412.537	1304.599	1.3023	1.1688	0.0191	0.924	0.	0.1167	1284.5	1305.3	4
5		-65.623	-61.748	1440.658	1332.914	1.3293	1.1949	0.0208	0.925	0.	0.1098	1312.4	1330.9	5
6		-65.825	-61.999	1469.198	1360.670	1.3564	1.2204	0.0228	0.926	0.	0.1036	1340.3	1355.3	6
7		-66.039	-62.279	1497.413	1387.830	1.3834	1.2452	0.0250	0.927	0.	0.0979	1368.4	1381.7	7
8		-66.277	-62.574	1525.315	1414.313	1.4100	1.2694	0.0273	0.927	0.	0.0928	1396.4	1407.0	8
9		-66.544	-62.874	1552.881	1440.061	1.4361	1.2926	0.0298	0.927	0.	0.0881	1424.6	1432.4	9
10		-65.849	-63.153	1580.106	1465.123	1.4618	1.3150	0.0325	0.927	0.	0.0839	1452.9	1457.9	10
11		-67.199	-63.414	1606.857	1489.496	1.4868	1.3366	0.0354	0.927	0.	0.0798	1481.3	1483.3	11
12		-67.603	-63.675	1633.149	1513.150	1.5110	1.3573	0.0391	0.927	0.	0.0758	1509.9	1508.8	12
13		-68.072	-63.949	1658.921	1536.266	1.5344	1.3772	0.0435	0.926	0.	0.0716	1538.9	1534.4	13
14		-68.617	-64.246	1684.237	1558.433	1.5570	1.3958	0.0505	0.925	0.	0.0671	1568.3	1560.2	14
15		-69.243	-64.552	1709.123	1579.230	1.5786	1.4125	0.0615	0.924	0.	0.0620	1598.2	1586.3	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	1.2344	0.0645	0.9612	1.2344	0.0645	0.9612
2	1.2353	0.0652	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	0.0674	0.9321	1.2378	0.0674	0.9321
7	1.2375	0.0679	0.9244	1.2375	0.0679	0.9244
8	1.2375	0.0535	0.9164	1.2375	0.0685	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

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.2418	1.2418
DELTA T ON T	0.0706	0.0706
ISEN. EFFICY.	0.9033	0.9033

STATION 6
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.0871	720.306	499.216	519.253	627.6	584.4	4056.03	3160.21	0.6080	46.127	27.367	4.30	0.1014	1
2	7.2233	726.533	513.806	513.808	628.5	584.6	4057.20	3155.70	0.6133	45.000	24.867	7.07	0.1012	2
3	7.3559	733.180	525.781	510.987	629.9	585.2	4088.37	3158.89	0.6185	44.183	22.248	15.96	0.1012	3
4	7.4854	739.555	535.326	510.407	631.7	585.2	4118.62	3169.63	0.6234	43.635	19.556	-268.41	0.1014	4
5	7.6127	745.851	542.036	511.703	633.9	587.6	4156.64	3187.31	0.6279	43.320	16.819	-17.25	0.1017	5
6	7.7384	751.705	548.144	514.391	636.5	589.4	4201.10	3210.93	0.6318	43.181	14.060	-10.01	0.1022	6
7	7.8633	757.172	552.143	518.120	639.2	591.5	4250.32	3239.23	0.6353	43.179	11.290	-7.73	0.1027	7
8	7.9872	762.421	555.155	522.580	642.2	593.8	4302.87	3270.57	0.6385	43.269	8.532	-6.83	0.1033	8
9	8.1107	767.567	557.573	527.514	645.3	596.3	4357.21	3303.72	0.6415	43.413	5.795	-6.58	0.1039	9
10	8.2342	773.042	560.103	532.302	648.6	598.8	4412.87	3336.94	0.6447	43.569	3.088	-5.31	0.1045	10
11	8.3574	778.737	562.876	538.146	651.8	601.3	4467.60	3368.77	0.6480	43.713	0.431	-7.58	0.1051	11
12	8.4807	784.425	565.665	543.458	655.1	603.9	4518.95	3397.89	0.6514	43.853	-2.172	-9.21	0.1055	12
13	8.6045	789.909	568.025	548.912	658.5	606.6	4564.48	3423.11	0.6545	44.020	-4.711	-12.77	0.1058	13
14	8.7295	795.594	569.801	556.269	662.5	609.8	4603.13	3443.37	0.6575	44.362	-7.170	-23.84	0.1059	14
15	8.8562	802.451	567.157	557.681	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 20371.4 RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN.	INLET	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S. INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		-60.903	-56.024	1217.959	893.301	1.0892	0.7541	0.0291	0.733	0.	0.4387	1227.0	1259.9	1
2		-61.120	-55.301	1246.997	926.048	1.1153	0.7816	0.0324	0.743	0.	0.4170	1253.8	1284.1	2
3		-61.319	-56.580	1275.979	954.628	1.1424	0.8053	0.0359	0.748	0.	0.4001	1279.7	1307.7	3
4		-61.523	-56.873	1304.608	979.559	1.1689	0.8256	0.0394	0.751	0.	0.3872	1305.3	1330.7	4
5		-61.749	-57.189	1332.924	1001.402	1.1949	0.8430	0.0433	0.751	0.	0.3773	1330.9	1353.3	5
6		-61.999	-57.526	1360.599	1020.894	1.2204	0.8581	0.0472	0.750	0.	0.3697	1356.3	1375.7	6
7		-62.280	-57.885	1387.353	1038.597	1.2453	0.8714	0.0514	0.748	0.	0.3635	1381.7	1397.9	7
8		-62.575	-58.252	1414.363	1055.065	1.2694	0.8835	0.0558	0.746	0.	0.3579	1407.0	1419.9	8
9		-62.875	-58.621	1440.129	1070.801	1.2927	0.8949	0.0607	0.744	0.	0.3524	1432.4	1441.9	9
10		-63.155	-58.963	1465.208	1086.336	1.3151	0.9059	0.0658	0.741	0.	0.3466	1457.9	1463.8	10
11		-63.416	-59.283	1489.502	1101.949	1.3367	0.9170	0.0715	0.740	0.	0.3402	1483.3	1485.7	11
12		-63.677	-59.595	1513.273	1117.657	1.3574	0.9281	0.0781	0.739	0.	0.3331	1508.8	1507.7	12
13		-63.952	-59.915	1536.400	1133.139	1.3773	0.9389	0.0867	0.738	0.	0.3253	1534.4	1529.7	13
14		-64.248	-60.254	1558.568	1146.404	1.3959	0.9474	0.1001	0.736	0.	0.3174	1560.2	1551.9	14
15		-64.554	-60.598	1579.354	1155.253	1.4126	0.9515	0.1212	0.731	0.	0.3098	1586.3	1574.4	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	1.5529	0.1366	0.9803	1.9168	0.2099	0.9728
2	1.5554	0.1375	0.9775	1.9221	0.2117	0.9692
3	1.5621	0.1394	0.9746	1.9321	0.2143	0.9654
4	1.5727	0.1420	0.9719	1.9464	0.2179	0.9615
5	1.5869	0.1455	0.9688	1.9644	0.2221	0.9572
6	1.6040	0.1495	0.9659	1.9854	0.2270	0.9529
7	1.6232	0.1541	0.9629	2.0087	0.2324	0.9484
8	1.6432	0.1588	0.9597	2.0335	0.2381	0.9436
9	1.6631	0.1635	0.9562	2.0592	0.2441	0.9384
10	1.6818	0.1680	0.9524	2.0855	0.2503	0.9329
11	1.6985	0.1723	0.9480	2.1113	0.2567	0.9268
12	1.7131	0.1762	0.9430	2.1355	0.2631	0.9197
13	1.7254	0.1800	0.9363	2.1571	0.2696	0.9106
14	1.7365	0.1844	0.9258	2.1754	0.2772	0.8964
15	1.7471	0.1899	0.9095	2.1907	0.2870	0.8745

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.6525	2.0525
DELTA T ON T	0.1618	0.2459
ISEN. EFFICY.	0.9534	0.9346

STATION 7
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	V E L O C I T I E S ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.3207	883.693	613.591	635.940	656.5	591.4	4708.59	3268.22	0.7415	46.025	26.611	-3.37	0.1036	1
2	7.4237	891.565	618.504	642.138	659.7	593.6	4775.37	3298.22	0.7468	46.074	23.001	-3.35	0.1042	2
3	7.5255	897.791	620.494	648.857	663.2	596.1	4843.71	3333.94	0.7504	46.280	19.530	-3.43	0.1049	3
4	7.5267	903.043	620.781	655.834	666.7	598.8	4913.87	3373.63	0.7531	46.573	16.223	-3.60	0.1057	4
5	7.7278	907.766	619.932	663.117	670.3	601.7	4985.39	3415.98	0.7552	46.928	13.087	-3.86	0.1065	5
6	7.8293	912.210	618.467	670.542	674.0	604.8	5057.47	3459.54	0.7570	47.314	10.121	-4.23	0.1073	6
7	7.9315	916.614	616.734	678.101	677.8	607.9	5129.69	3503.37	0.7587	47.714	7.320	-4.74	0.1081	7
8	8.0345	921.063	615.058	685.610	681.7	611.1	5201.29	3546.62	0.7604	48.105	4.682	-5.40	0.1088	8
9	8.1384	925.783	613.551	693.275	685.7	614.3	5272.48	3588.81	0.7622	48.491	2.197	-6.28	0.1096	9
10	8.2434	930.948	612.424	701.143	687.7	617.6	5343.59	3629.63	0.7644	48.864	-0.146	-7.49	0.1102	10
11	8.3494	936.545	611.729	709.157	693.9	620.9	5414.12	3668.70	0.7670	49.219	-2.342	-9.22	0.1108	11
12	8.4555	942.795	610.843	718.145	698.4	624.5	5484.30	3705.87	0.7699	49.616	-4.398	-11.83	0.1113	12
13	8.5650	949.558	608.717	728.913	703.5	628.4	5552.99	3740.94	0.7731	50.135	-6.310	-16.73	0.1116	13
14	8.6757	958.025	603.045	744.411	709.9	633.5	5621.51	3773.60	0.7768	50.989	-8.046	-29.93	0.1117	14
15	8.7894	970.047	590.527	769.590	718.9	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 OPT.IN.	INLET	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		-55.019	-47.320	893.134	905.131	0.7540	0.7595	0.0458	1.013	0.	0.0747	1259.9	1301.4	1
2		-55.297	-47.606	925.949	917.360	0.7815	0.7684	0.0504	0.991	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.	0.1041	1307.7	1337.8	3
4		-55.872	-48.426	979.520	935.489	0.8256	0.7801	0.0606	0.955	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.	0.1212	1353.3	1373.8	5
6		-57.527	-49.384	1020.932	950.042	0.8581	0.7884	0.0717	0.931	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.	0.1274	1397.9	1410.0	7
8		-58.256	-50.369	1055.179	964.274	0.8836	0.7960	0.0842	0.914	0.	0.1275	1419.9	1428.3	8
9		-58.625	-50.845	1070.949	971.705	0.8950	0.8000	0.0911	0.907	0.	0.1265	1441.9	1446.8	9
10		-58.969	-51.298	1086.512	979.443	0.9061	0.8043	0.0986	0.901	0.	0.1249	1463.8	1465.5	10
11		-59.289	-51.723	1102.149	987.516	0.9172	0.8087	0.1065	0.896	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.	0.1218	1507.7	1503.3	12
13		-59.922	-52.520	1133.359	1000.379	0.9391	0.8143	0.1286	0.883	0.	0.1213	1529.7	1522.6	13
14		-60.261	-52.924	1146.541	1000.278	0.9476	0.8110	0.1479	0.872	0.	0.1226	1551.9	1542.3	14
15		-60.605	-53.329	1155.488	988.799	0.9516	0.7972	0.1791	0.856	0.	0.1264	1574.4	1552.5	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	1.1609	0.0460	0.9457	2.2252	0.2656	0.9662
2	1.1741	0.0497	0.9433	2.2568	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	2.3560	0.2923	0.9486
6	1.2038	0.0590	0.9215	2.3901	0.2995	0.9434
7	1.2069	0.0604	0.9135	2.4242	0.3068	0.9378
8	1.2088	0.0615	0.9048	2.4581	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	0.3685	0.8733
15	1.2285	0.0769	0.7871	2.6914	0.3860	0.8465

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.2055	2.4754
DELTA T ON T	0.0619	0.3211
ISEN. EFFICY.	0.8853	0.9201

STATION 8
****

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTRE.	STATIC DENSITY	LOCATION
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	7.5528	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	50.693	8.990	-2.95	0.1104	4
5	7.7982	1104.329	688.285	863.600	718.0	615.5	6254.69	3667.41	0.9077	51.446	6.800	-3.56	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	948.901	757.8	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	1017.805	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	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		-47.324	-34.727	905.191	899.209	0.7596	0.7498	0.0630	0.993	0.	0.0772	1301.4	1331.2	1
2		-47.611	-35.119	917.439	887.681	0.7685	0.7374	0.0691	0.968	0.	0.1044	1319.7	1344.5	2
3		-47.994	-35.737	927.206	877.957	0.7750	0.7266	0.0755	0.947	0.	0.1241	1337.8	1358.1	3
4		-48.432	-36.459	935.602	870.090	0.7802	0.7175	0.0821	0.930	0.	0.1378	1355.8	1372.0	4
5		-48.902	-37.207	943.071	864.183	0.7846	0.7103	0.0890	0.916	0.	0.1468	1373.8	1386.3	5
6		-49.389	-37.942	950.144	860.010	0.7885	0.7046	0.0961	0.905	0.	0.1523	1391.8	1401.0	6
7		-49.882	-38.631	957.115	857.152	0.7922	0.7000	0.1039	0.896	0.	0.1552	1410.0	1416.1	7
8		-50.371	-39.282	964.321	855.391	0.7961	0.6964	0.1122	0.887	0.	0.1562	1428.3	1431.5	8
9		-50.846	-39.888	971.715	854.501	0.8000	0.6935	0.1211	0.879	0.	0.1561	1446.8	1447.2	9
10		-51.296	-40.464	979.415	854.150	0.8042	0.6910	0.1307	0.872	0.	0.1553	1465.5	1463.4	10
11		-51.720	-41.001	987.451	854.076	0.8087	0.6888	0.1408	0.865	0.	0.1542	1484.3	1479.8	11
12		-52.119	-41.477	994.318	852.138	0.8124	0.6849	0.1532	0.857	0.	0.1539	1503.5	1496.7	12
13		-52.515	-41.909	1000.262	846.137	0.8143	0.6773	0.1692	0.846	0.	0.1552	1522.6	1513.9	13
14		-52.918	-42.309	1000.148	828.218	0.8109	0.6594	0.1944	0.823	0.	0.1607	1542.3	1531.8	14
15		-53.324	-42.681	988.570	786.290	0.7971	0.6211	0.2352	0.795	0.	0.1746	1562.5	1550.6	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	1.2427	0.0665	0.9619	2.7653	0.3498	0.9635
2	1.2512	0.0690	0.9576	2.8237	0.3597	0.9593
3	1.2548	0.0703	0.9532	2.8724	0.3683	0.9547
4	1.2554	0.0709	0.9471	2.9154	0.3764	0.9495
5	1.2546	0.0711	0.9408	2.9559	0.3842	0.9441
6	1.2532	0.0713	0.9339	2.9952	0.3921	0.9383
7	1.2518	0.0715	0.9260	3.0347	0.4003	0.9319
8	1.2506	0.0719	0.9167	3.0741	0.4088	0.9249
9	1.2497	0.0724	0.9071	3.1139	0.4176	0.9174
10	1.2489	0.0731	0.8967	3.1538	0.4269	0.9093
11	1.2436	0.0739	0.8854	3.1946	0.4357	0.9006
12	1.2493	0.0752	0.8721	3.2379	0.4478	0.8902
13	1.2514	0.0772	0.8565	3.2842	0.4610	0.8771
14	1.2560	0.0807	0.8332	3.3367	0.4790	0.8575
15	1.2653	0.0869	0.7996	3.4053	0.5065	0.8272

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.2522	3.0997
DELTA T ON T	0.0737	0.4186
ISEN. EFFICY.	0.8998	0.9111

STATION 9

****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.5585	1246.730	787.262	965.091	734.7	605.2	6856.61	3483.90	1.0342	50.723	7.888	-5.43	0.1080	1
2	7.5207	1235.367	775.898	951.952	735.7	608.5	6850.37	3530.17	1.0224	51.111	6.508	-6.57	0.1089	2
3	7.6856	1225.545	763.417	958.726	736.9	611.8	6853.58	3573.44	1.0111	51.471	5.266	-8.52	0.1095	3
4	7.7529	1216.283	751.719	956.172	738.1	615.0	6847.05	3613.29	1.0009	51.827	4.102	-12.05	0.1102	4
5	7.8229	1209.803	741.531	954.640	739.7	610.1	6846.18	3649.61	0.9922	52.161	3.015	-21.05	0.1107	5
6	7.8953	1203.641	732.963	954.734	741.8	621.2	6854.01	3682.37	0.9855	52.486	1.962	-74.31	0.1112	6
7	7.9703	1200.945	726.047	956.622	744.3	624.3	6[illegible]1.78	3711.87	0.9809	52.803	0.913	56.07	0.1115	7
8	8.0474	1200.317	720.411	960.088	747.3	627.4	6896.96	3738.30	0.9779	53.117	-0.112	20.83	0.1117	8
9	8.1267	1201.216	715.409	964.941	750.7	630.7	6925.90	3761.77	0.9761	53.447	-1.130	13.09	0.1119	9
10	8.2082	1203.772	711.407	971.065	754.5	634.0	6960.08	3782.48	0.9756	53.774	-2.141	9.55	0.1119	10
11	8.2917	1208.205	707.853	979.134	758.9	637.4	7000.37	3800.49	0.9766	54.136	-3.135	7.58	0.1118	11
12	8.3773	1214.745	703.603	990.227	764.1	641.4	7047.45	3816.10	0.9788	54.605	-4.134	6.44	0.1116	12
13	8.4654	1223.589	695.869	1006.447	770.8	646.2	7101.53	3830.38	0.9823	55.340	-5.187	5.75	0.1112	13
14	8.5571	1235.675	676.106	1034.298	780.5	653.5	7165.94	3846.84	0.9864	55.828	-6.438	5.83	0.1104	14
15	8.6556	1254.613	628.236	1085.990	796.8	665.8	7255.18	3873.97	0.9922	59.951	-8.252	9.29	0.1091	15

STATION 9 IS AT THE EXIT OF A BLADE ROW ROTATING AT 20371.4 RPM.

STREAM -LINE	OPT. IN.	RELATIVE GAS ANGLES 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	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	BLADE SPEEDS OUTLET	STREAM -LINE
1		-34.739	-25.612	899.342	875.263	0.7500	0.7260	0.0800	0.973	0.	0.0642	1331.2	1343.7	1
2		-35.131	-26.838	887.813	869.561	0.7375	0.7193	0.0875	0.979	0.	0.0448	1344.5	1354.8	2
3		-35.748	-28.085	878.081	865.308	0.7267	0.7139	0.0950	0.985	0.	0.0254	1358.1	1366.3	3
4		-36.468	-29.306	870.198	862.044	0.7176	0.7094	0.1032	0.991	0.	0.0064	1372.0	1378.3	4
5		-37.215	-30.452	864.269	860.138	0.7103	0.7061	0.1117	0.995	0.	-0.0121	1386.3	1390.7	5
6		-37.947	-31.478	860.071	859.440	0.7046	0.7037	0.1206	0.999	0.	-0.0303	1401.0	1403.6	6
7		-38.634	-32.372	857.195	859.639	0.7000	0.7021	0.1300	1.003	0.	-0.0479	1416.1	1416.9	7
8		-39.283	-33.151	855.397	860.467	0.6964	0.7010	0.1400	1.006	0.	-0.0651	1431.5	1430.6	8
9		-39.886	-33.850	854.480	861.420	0.6935	0.7000	0.1509	1.008	0.	-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.	-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.	-0.1162	1479.8	1474.1	11
12		-41.469	-35.355	852.041	662.702	0.6848	0.6952	0.1896	1.013	0.	-0.1348	1496.7	1489.3	12
13		-41.900	-35.626	846.015	856.094	0.6772	0.6873	0.2090	1.012	0.	-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.	-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.	-0.2227	1550.6	1538.7	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
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	3.2391	0.4301	0.9273
7	1.0701	0.0248	0.7882	3.2475	0.4350	0.9192
8	1.0603	0.0227	0.7421	3.2594	0.4408	0.9104
9	1.0511	0.0210	0.6845	3.2731	0.4474	0.9008
10	1.0429	0.0195	0.6206	3.2893	0.4547	0.8906
11	1.0356	0.0184	0.5458	3.3083	0.4631	0.8794
12	1.0286	0.0175	0.4619	3.3306	0.4732	0.8664
13	1.0219	0.0171	0.3630	3.3561	0.4860	0.8500
14	1.0149	0.0175	0.2429	3.3865	0.5048	0.8255
15	1.0083	0.0197	0.1195	3.4334	0.5361	0.7876

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.0640	3.2939
DELTA T ON T	0.0250	0.4537
ISEN. EFFICY.	0.7158	0.8930

STATION 10
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.5840	1231.323	769.697	961.746	734.7	608.3	6866.51	3546.75	1.0192	51.329	7.394	9.82	0.1093	1
2	7.6444	1228.155	767.424	958.868	735.7	610.1	6860.37	3562.81	1.0146	51.323	5.915	14.88	0.1095	2
3	7.7070	1224.911	765.866	955.959	736.8	611.9	6853.58	3576.41	1.0105	51.300	4.801	17.04	0.1096	3
4	7.7716	1222.533	764.946	953.776	738.1	613.7	6847.05	3587.07	1.0072	51.270	3.904	16.94	0.1096	4
5	7.8383	1221.290	764.178	952.670	739.7	615.6	6846.18	3597.80	1.0045	51.266	3.138	17.41	0.1096	5
6	7.9070	1221.126	763.207	953.238	741.8	617.7	6854.01	3609.70	1.0027	51.318	2.445	17.38	0.1096	6
7	7.9778	1222.784	762.852	955.645	744.3	619.9	6871.78	3620.94	1.0022	51.401	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	51.567	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	51.836	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	52.221	-0.015	13.04	0.1096	10
11	8.2804	1231.429	745.038	980.478	758.9	632.7	7000.37	3702.67	0.9990	52.770	-0.735	11.69	0.1098	11
12	8.3514	1234.781	735.082	992.138	764.1	637.3	7047.45	3731.36	0.9982	53.465	-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	54.511	-2.445	8.32	0.1098	13
14	8.5333	1246.549	691.284	1037.309	780.5	651.2	7155.94	3800.39	0.9968	56.320	-3.779	5.81	0.1094	14
15	8.6279	1265.836	644.177	1089.068	796.8	663.5	7255.18	3826.15	1.0029	59.410	-5.785	3.27	0.1082	15

STATION 11
****

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCATION
1	7.6272	1228.508	771.417	956.240	734.7	609.0	6866.61	3560.42	1.0160	51.106	9.163	9.81	0.1096	1
2	7.6365	1238.373	790.100	953.577	735.7	608.1	6860.87	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	738.1	606.7	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	6854.01	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	6871.78	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	750.7	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	754.5	614.7	6950.08	3394.92	1.0670	48.475	2.123	15.53	0.1036	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	0.1038	11
12	8.3605	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	7135.94	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

LOCATION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCATION
1	7.7326	1090.278	936.025	559.074	734.7	635.7	6655.12	4010.37	0.8824	30.849	6.173	-3.41	0.1183	1
2	7.7820	1085.219	932.211	555.593	735.7	637.7	6660.47	4036.99	0.8770	30.795	5.921	-3.47	0.1187	2
3	7.8331	1077.564	926.134	550.834	736.8	640.2	6662.30	4071.95	0.8691	30.743	5.643	-3.60	0.1193	3
4	7.8858	1067.837	917.867	545.708	738.1	643.2	6662.11	4114.43	0.8592	30.733	5.336	-3.84	0.1200	4
5	7.9403	1058.184	909.387	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	-4.82	0.1214	6
7	8.0541	1044.756	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	-7.67	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	1047.115	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	6862.35	4351.08	0.8338	31.319	1.732	133.62	0.1225	11
12	8.3624	1065.672	907.473	558.704	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	8.5633	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

STATION 12 IS AT THE EXIT OF A BLADE ROW ROTATING AT 0. RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN.	INLET	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		51.106	30.849	1228.508	1090.278	1.0160	0.8824	0.0640	0.887	0.	0.1361	0.	0.	1
2		50.356	30.795	1238.373	1085.219	1.0248	0.8770	0.0600	0.876	0.	0.1547	0.	0.	2
3		49.652	30.743	1247.872	1077.554	1.0334	0.8691	0.0567	0.864	0.	0.1752	0.	0.	3
4		49.070	30.733	1256.445	1067.837	1.0409	0.8592	0.0544	0.850	0.	0.1963	0.	0.	4
5		48.504	30.753	1264.499	1058.184	1.0477	0.8493	0.0520	0.837	0.	0.2166	0.	0.	5
6		48.276	30.772	1272.338	1050.028	1.0538	0.8405	0.0496	0.825	0.	0.2346	0.	0.	6
7		48.087	30.817	1280.017	1044.756	1.0594	0.8340	0.0469	0.816	0.	0.2492	0.	0.	7
8		48.047	30.889	1286.982	1042.447	1.0638	0.8300	0.0445	0.810	0.	0.2595	0.	0.	8
9		48.176	30.989	1292.500	1043.046	1.0664	0.8284	0.0424	0.807	0.	0.2650	0.	0.	9
10		48.475	31.130	1296.325	1047.115	1.0670	0.8297	0.0404	0.808	0.	0.2651	0.	0.	10
11		49.009	31.319	1298.142	1054.747	1.0651	0.8338	0.0386	0.813	0.	0.2595	0.	0.	11
12		49.881	31.619	1297.499	1065.672	1.0599	0.8404	0.0366	0.821	0.	0.2482	0.	0.	12
13		51.297	32.114	1293.826	1078.651	1.0507	0.8479	0.0352	0.834	0.	0.2316	0.	0.	13
14		53.804	33.148	1287.257	1092.590	1.0363	0.8544	0.0350	0.849	0.	0.2102	0.	0.	14
15		58.530	34.175	1280.046	1109.151	1.0165	0.8589	0.0357	0.866	0.	0.1846	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	0.9692	0.	0.	3.1451	0.4163	0.9298
2	0.9708	0.	0.	3.1477	0.4184	0.9260
3	0.9721	0.	0.	3.1485	0.4205	0.9216
4	0.9730	0.	0.	3.1484	0.4230	0.9161
5	0.9740	0.	0.	3.1513	0.4261	0.9102
6	0.9750	0.	0.	3.1581	0.4301	0.9038
7	0.9762	0.	0.	3.1702	0.4350	0.8971
8	0.9773	0.	0.	3.1854	0.4408	0.8897
9	0.9783	0.	0.	3.2020	0.4474	0.8812
10	0.9793	0.	0.	3.2211	0.4547	0.8722
11	0.9803	0.	0.	3.2431	0.4631	0.8622
12	0.9814	0.	0.	3.2685	0.4732	0.8505
13	0.9823	0.	0.	3.2967	0.4860	0.8352
14	0.9827	0.	0.	3.3280	0.5048	0.8115
15	0.9828	0.	0.	3.3744	0.5361	0.7745

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	0.9776	3.2173
DELTA T ON T	0.	0.4537
ISEN. EFFICY.	0.	0.8731

STATION 13
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.7467	910.056	865.559	281.087	734.7	665.7	6443.90	4553.63	0.7198	17.991	-1.304	-5.77	0.1286	1
2	7.7959	896.739	853.333	275.615	735.7	668.8	6460.89	4626.37	0.7076	17.900	-1.003	-5.05	0.1297	2
3	7.8470	883.579	841.224	270.286	736.8	671.3	6471.54	4683.85	0.6957	17.812	-0.680	-5.47	0.1308	3
4	7.9000	871.251	829.776	265.613	738.1	674.9	6477.58	4735.13	0.6844	17.750	-0.336	-7.00	0.1316	4
5	7.9548	862.251	821.402	262.249	739.7	677.9	6489.77	4779.42	0.6758	17.707	0.021	-7.75	0.1322	5
6	8.0114	857.759	817.288	260.367	741.8	680.6	6512.29	4816.18	0.6710	17.671	0.371	-8.73	0.1327	6
7	8.0695	857.362	817.451	260.197	744.3	683.1	6544.95	4845.19	0.6698	17.656	0.690	-10.10	0.1330	7
8	8.1289	861.623	820.983	261.495	747.3	685.5	6583.39	4866.40	0.6715	17.667	0.961	-12.07	0.1331	8
9	8.1893	868.438	827.305	264.105	750.7	688.0	6625.51	4880.14	0.6757	17.705	1.171	-14.93	0.1330	9
10	8.2503	878.302	836.363	268.164	754.5	690.3	6672.09	4886.73	0.6822	17.778	1.314	-19.72	0.1328	10
11	8.3130	891.416	848.317	273.828	758.9	692.8	6724.66	4886.60	0.6911	17.890	1.381	-28.55	0.1323	11
12	8.3759	908.028	863.234	281.679	764.1	695.5	6785.31	4880.54	0.7026	18.072	1.368	-48.50	0.1316	12
13	8.4395	926.788	879.576	292.030	770.8	699.3	6850.11	4871.56	0.7152	18.367	1.275	-142.99	0.1307	13
14	8.5040	948.235	896.904	307.752	780.5	705.7	6918.69	4861.20	0.7284	18.939	1.095	179.20	0.1292	14
15	8.5592	978.542	922.397	326.993	796.8	717.1	7015.26	4850.02	0.7458	19.520	0.826	59.77	0.1268	15

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

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN.	INLET	OUTLET	RELATIVE VELOCITIES INLET	OUTLET	RELATIVE MACH NO.S INLET	OUTLET	LOSS COEFF	DE HALL NUMBER	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	OUTLET	STREAM -LINE
1		30.849	17.991	1090.278	910.056	0.9824	0.7198	0.1279	0.835	0.	0.2092	0.	0.	1
2		30.795	17.900	1085.219	896.739	0.8770	0.7076	0.1197	0.826	0.	0.2247	0.	0.	2
3		30.743	17.812	1077.564	883.579	0.8691	0.6957	0.1133	0.820	0.	0.2362	0.	0.	3
4		30.733	17.750	1067.837	871.251	0.8592	0.6844	0.1087	0.816	0.	0.2436	0.	0.	4
5		30.753	17.707	1058.184	862.251	0.8493	0.6758	0.1040	0.815	0.	0.2466	0.	0.	5
6		30.772	17.671	1050.028	857.759	0.8405	0.6710	0.0989	0.817	0.	0.2457	0.	0.	6
7		30.817	17.656	1044.756	857.862	0.8340	0.6698	0.0937	0.821	0.	0.2413	0.	0.	7
8		30.889	17.667	1042.447	861.623	0.8300	0.6715	0.0891	0.827	0.	0.2351	0.	0.	8
9		30.989	17.705	1043.046	868.438	0.8284	0.6757	0.0847	0.833	0.	0.2281	0.	0.	9
10		31.130	17.778	1047.115	878.302	0.8297	0.6822	0.0808	0.839	0.	0.2208	0.	0.	10
11		31.319	17.890	1054.747	891.416	0.8338	0.6911	0.0771	0.845	0.	0.2132	0.	0.	11
12		31.619	18.072	1065.672	908.028	0.8404	0.7026	0.0732	0.852	0.	0.2049	0.	0.	12
13		32.114	18.367	1078.551	926.788	0.8479	0.7152	0.0705	0.859	0.	0.1958	0.	0.	13
14		33.148	18.939	1092.690	948.235	0.8544	0.7284	0.0699	0.868	0.	0.1835	0.	0.	14
15		34.175	19.520	1109.151	978.542	0.8589	0.7458	0.0714	0.882	0.	0.1608	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

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

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	0.9771	3.1439
DELTA T ON T	0.	0.4537
ISEN. EFFICY.	0.	0.8529

STATION 14
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
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	0.1387	1
2	7.7637	690.513	686.404	76.130	735.7	696.0	6260.87	5155.62	0.5342	6.329	-2.857	23.94	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	25.74	0.1390	3
4	7.8802	696.180	692.217	74.172	738.1	697.8	6293.61	5169.27	0.5378	6.116	-1.843	29.55	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	34.55	0.1388	5
6	8.0024	708.543	704.825	73.463	741.8	700.0	6341.27	5175.81	0.5466	5.950	-0.836	45.41	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	62.25	0.1385	7
8	8.1282	733.583	729.754	74.859	747.3	702.5	6427.21	5176.44	0.5648	5.857	0.030	108.45	0.1382	8
9	8.1919	748.014	744.122	76.206	750.7	704.2	6475.62	5174.79	0.5752	5.847	0.378	236.50	0.1378	9
10	8.2551	763.572	759.671	78.066	754.5	706.0	6527.76	5171.84	0.5865	5.867	0.664	-1166.53	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	-248.45	0.1369	11
12	8.3850	801.757	797.350	83.947	764.1	710.6	6655.40	5161.60	0.6138	6.010	1.022	-175.22	0.1352	12
13	8.4495	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	8.5145	846.549	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	0.6626	6.638	1.033	-260.27	0.1314	15

STATION 14 IS AT THE EXIT OF A BLADE ROW ROTATING AT 0. RPM.

STREAM -LINE	RELATIVE GAS ANGLES OPT.IN.	RELATIVE GAS ANGLES 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	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	BLADE SPEEDS OUTLET	STREAM -LINE
1		17.991	6.445	910.056	685.758	0.7198	0.5306	0.1917	0.754	0.	0.3094	0.	0.	1
2		17.906	[illegible].329	896.739	690.513	0.7076	0.5342	0.1796	0.770	0.	0.2885	0.	0.	2
3		17.812	[illegible].217	883.579	693.750	0.6957	0.5363	0.1701	0.785	0.	0.2683	0.	0.	3
4		17.750	[illegible].115	871.251	696.180	0.6844	0.5378	0.1628	0.799	0.	0.2492	0.	0.	4
5		17.707	6.027	862.251	700.599	0.6758	0.5408	0.1558	0.813	0.	0.2303	0.	0.	5
6		17.671	5.950	857.759	708.643	0.6710	0.5466	0.1483	0.826	0.	0.2120	0.	0.	6
7		17.656	[illegible]	857.862	720.260	0.6698	0.5551	0.1405	0.840	0.	0.1951	0.	0.	7
8		17.667	5.857	861.623	733.583	0.6715	0.5648	0.1335	0.851	0.	0.1806	0.	0.	8
9		17.705	5.847	868.433	748.014	0.6757	0.5752	0.1270	0.861	0.	0.1688	0.	0.	9
10		17.778	5.867	878.302	763.672	0.6822	0.5865	0.1213	0.869	0.	0.1597	0.	0.	10
11		17.390	5.919	891.416	781.633	0.6911	0.5994	0.1153	0.877	0.	0.1528	0.	0.	11
12		13.072	6.010	908.028	801.757	0.7026	0.6138	0.1095	0.883	0.	0.1476	0.	0.	12
13		13.367	6.152	926.738	823.260	0.7152	0.6286	0.1054	0.888	0.	0.1427	0.	0.	13
14		18.939	6.381	948.235	846.548	0.7284	0.6434	0.1049	0.893	0.	0.1373	0.	0.	14
15		19.520	6.638	978.642	878.733	0.7458	0.6526	0.1071	0.898	0.	0.1305	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	STATION-TO-STATION-PARAMETERS DELTA T ON T	STATION-TO-STATION-PARAMETERS ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	INLET-TO-STATION-PARAMETERS DELTA T ON T	INLET-TO-STATION-PARAMETERS ISENTROPIC EFFICIENCY
1	0.9672	0.	0.	2.9455	0.4163	0.8680
2	0.9690	0.	0.	2.9538	0.4184	0.8680
3	0.9704	0.	0.	2.9678	0.4205	0.8664
4	0.9716	0.	0.	2.9743	0.4230	0.8632
5	0.9726	0.	0.	2.9830	0.4261	0.8596
6	0.9737	0.	0.	2.9963	0.4301	0.8559
7	0.9751	0.	0.	3.0160	0.4350	0.8519
8	0.9763	0.	0.	3.0374	0.4408	0.8470
9	0.9774	0.	0.	3.0603	0.4474	0.8412
10	0.9784	0.	0.	3.0850	0.4547	0.8346
11	0.9797	0.	0.	3.1134	0.4631	0.8272
12	0.9809	0.	0.	3.1453	0.4732	0.8181
13	0.9818	0.	0.	3.1783	0.4860	0.8051
14	0.9821	0.	0.	3.2111	0.5048	0.7832
15	0.9822	0.	0.	3.2553	0.5361	0.7478

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	0.9766	3.0706
DELTA T ON T	0.	0.4537
ISEN. EFFICY.	0.	0.8323

STATION 15
****

GENERAL FLOW PARAMETERS

LOCATION	RADIUS	VELOCITIES ABSOLUTE	VELOCITIES MERIDNL.	VELOCITIES TANGENTL.	TEMPERATURES TOTAL	TEMPERATURES STATIC	PRESSURES TOTAL	PRESSURES STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCATION
1	7.6819	576.869	576.869	0.	734.7	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	6108.43	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	6170.41	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	6524.50	5245.18	0.5572	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	RELATIVE GAS ANGLES OPT.IN.	RELATIVE GAS ANGLES 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	DIFFUS FACTOR	DELTA P UPON Q	BLADE SPEEDS INLET	BLADE SPEEDS OUTLET	STREAM-LINE
1		6.445	0.	685.758	576.869	0.5306	0.4428	0.2551	0.841	0.	0.1072	0.	0.	1
2		6.329	-0.	690.613	593.753	0.5342	0.4559	0.2397	0.860	0.	0.0902	0.	0.	2
3		6.217	0.	693.750	605.771	0.5363	0.4652	0.2269	0.873	0.	0.0769	0.	0.	3
4		6.116	-0.	696.180	614.809	0.5378	0.4720	0.2172	0.883	0.	0.0667	0.	0.	4
5		6.027	0.	700.599	624.855	0.5408	0.4795	0.2080	0.892	0.	0.0588	0.	0.	5
6		5.950	-0.	708.543	638.411	0.5465	0.4897	0.1977	0.901	0.	0.0530	0.	0.	6
7		5.892	0.	720.260	654.366	0.5551	0.5016	0.1876	0.909	0.	0.0491	0.	0.	7
8		5.857	-0.	733.583	671.451	0.5648	0.5143	0.1779	0.915	0.	0.0473	0.	0.	8
9		5.847	0.	748.014	688.291	0.5752	0.5266	0.1694	0.920	0.	0.0474	0.	0.	9
10		5.867	-0.	763.672	705.510	0.5865	0.5391	0.1616	0.924	0.	0.0491	0.	0.	10
11		5.919	0.	781.633	724.340	0.5994	0.5527	0.1538	0.927	0.	0.0520	0.	0.	11
12		6.010	-0.	801.757	744.816	0.6139	0.5572	0.1461	0.929	0.	0.0560	0.	0.	12
13		6.152	0.	823.250	765.481	0.6286	0.5814	0.1406	0.930	0.	0.0609	0.	0.	13
14		6.381	-0.	846.548	786.255	0.6434	0.5942	0.1397	0.929	0.	0.0670	0.	0.	14
15		6.638	0.	878.733	814.975	0.6626	0.6107	0.1428	0.927	0.	0.0721	0.	0.	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	0.9659	0.	0.	2.8450	0.4163	0.8357
2	0.9680	0.	0.	2.8640	0.4184	0.8378
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.	3.0157	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	0.5043	0.7688
15	0.9819	0.	0.	3.1972	0.5361	0.7342

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	0.9759	2.9970
DELTA T ON T	0.	0.4537
ISEN. EFFICY.	0.	0.8114

STATION 16
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD. OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.6819	574.238	574.238	0.	734.7	707.2	6019.96	5268.55	0.4407	0.	-0.001	37533.06	0.1397	1
2	7.7423	588.591	588.591	0.	735.7	706.9	6060.29	5268.54	0.4518	0.	-0.021	4045.37	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	7.8683	605.672	605.672	0.	738.1	707.6	6108.43	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	34929.54	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	6270.65	5268.44	0.5051	0.	0.034	-2892.25	0.1390	8
9	8.1960	677.396	677.396	0.	750.7	712.6	6325.40	5268.48	0.5179	0.	0.045	-2112.98	0.1387	9
10	8.2521	695.499	695.499	0.	754.5	714.3	6383.80	5268.54	0.5311	0.	0.053	-1794.59	0.1383	10
11	8.3279	715.513	715.513	0.	758.9	716.3	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	761.874	781.874	0.	780.5	729.7	6671.54	5268.31	0.5907	0.	0.023	-3921.91	0.1354	14
15	8.5891	812.186	812.186	0.	796.8	741.9	6765.34	5268.85	0.6085	0.	-0.000	50983.57	0.1332	15

STATION 17
****

GENERAL FLOW PARAMETERS

LOCA TION	RADIUS	VELOCITIES ABSOLUTE	MERIDNL.	TANGENTL.	TEMPERATURES TOTAL	STATIC	PRESSURES TOTAL	STATIC	MACH NUMBER	WHIRL ANGLE	SLOPE ANGLE	RAD.OF CURVTRE.	STATIC DENSITY	LOCA TION
1	7.5820	574.448	574.448	0.	734.7	707.2	6019.96	5268.03	0.4408	0.	0.004	0.	0.1397	1
2	7.7430	588.792	588.792	0.	735.7	706.9	6060.29	5268.02	0.4519	0.	0.003	0.	0.1398	2
3	7.8051	598.621	598.621	0.	736.8	707.0	6088.20	5268.02	0.4594	0.	0.002	0.	0.1397	3
4	7.8633	605.846	605.846	0.	738.1	707.6	6108.43	5268.01	0.4648	0.	0.002	0.	0.1396	4
5	7.9228	614.539	614.539	0.	739.7	708.3	6133.11	5268.00	0.4712	0.	0.001	0.	0.1395	5
6	7.9981	627.279	627.279	0.	741.8	709.0	6170.41	5267.99	0.4807	0.	0.000	0.	0.1393	6
7	8.0640	642.933	642.933	0.	744.3	709.9	6217.46	5267.98	0.4924	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.	0.1389	8
9	8.1959	677.575	677.575	0.	750.7	712.5	6325.40	5267.96	0.5180	0.	-0.001	0.	0.1387	9
10	8.2620	695.697	695.697	0.	754.5	714.3	6383.80	5267.95	0.5312	0.	-0.001	0.	0.1383	10
11	8.3279	715.733	715.723	0.	758.9	716.3	6450.21	5267.94	0.5457	0.	-0.002	0.	0.1379	11
12	8.3935	737.527	737.627	0.	764.1	718.9	6524.50	5267.93	0.5614	0.	-0.002	0.	0.1374	12
13	8.4588	759.818	759.818	0.	770.8	722.7	6599.80	5267.92	0.5768	0.	-0.003	0.	0.1367	13
14	8.5240	782.143	782.148	0.	780.5	729.6	6671.54	5267.90	0.5909	0.	-0.003	0.	0.1354	14
15	8.5890	812.468	812.469	0.	796.8	741.9	6765.34	5267.90	0.6087	0.	-0.004	0.	0.1332	15

OVERALL PERFORMANCE PARAMETERS

STREAM -LINE	STATION-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY	INLET-TO-STATION-PARAMETERS PRESSURE RATIO	DELTA T ON T	ISENTROPIC EFFICIENCY
1	1.0000	0.	0.	2.8450	0.4163	0.8357
2	1.0000	0.	0.	2.8640	0.4184	0.8379
3	1.0000	0.	0.	2.8772	0.4205	0.8378
4	1.0000	0.	0.	2.8868	0.4230	0.8358
5	1.0000	0.	0.	2.8984	0.4261	0.8334
6	1.0000	0.	0.	2.9161	0.4301	0.8311
7	1.0000	0.	0.	2.9393	0.4350	0.8285
8	1.0000	0.	0.	2.9634	0.4408	0.8252
9	1.0000	0.	0.	2.9893	0.4474	0.8205
10	1.0000	0.	0.	3.0159	0.4547	0.8153
11	1.0000	0.	0.	3.0483	0.4631	0.8092
12	1.0000	0.	0.	3.0834	0.4732	0.8015
13	1.0000	0.	0.	3.1130	0.4860	0.7897
14	1.0000	0.	0.	3.1529	0.5048	0.7688
15	1.0000	0.	0.	3.1972	0.5361	0.7342

MEAN PARAMETERS	STATION-TO-STATION	INLET-TO-STATION
PRESSURE RATIO	1.0000	2.9970
DELTA T ON T	0.	0.4537
ISEN. EFFICY.	0.	0.8114

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 - ARL(ARF)  HIGH MACH NUMBER COMPRESSOR BLADE PROGRAM
                           ************************************************************

TITLE                          = FINAL ROTOR BLADE PHYSICAL CHARACTERISTICS

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

ZINNER                         =  6.5000
ZOUTER                         =  9.0000
SCALE                          = 10.0000
STACKX                         =  0.9800

          STREAMSURFACE GEOMETRY SPECIFICATION

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

     STREAMLINE      RADII
      NUMBER

         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
```

STATION NUMBER 2 XCL= 0. ANGLN= -0.

STREAMLINE NUMBER	RADII
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

STATION NUMBER 3 XCL= 0.4000 ANGLN= -0.

STREAMLINE NUMBER	RADII
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 ANGLN= -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 ANGLN= -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 NUMBER	RADII
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	0.00809	0.7000	2.1703	-0.	-0.
3.00	61.806	15.446	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.         (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
  Q          = 0.5000     (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
  BETA1      = 61.549     (BLADE INLET ANGLE.)
  BETA2      = 12.455     (BLADE OUTLET ANGLE.)
  YZERO      = 0.00155    (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
  T          = 0.04857    (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
  YONE       = 0.00809    (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
  Z          = 0.7000     (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
  CORD       = 2.1700     (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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	0.22269	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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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 ON STREAMLINE NUMBER  2
                    ******************************************

P          = 0.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q          = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1      = 61.670    (BLADE INLET ANGLE.)
BETA2      = 13.957    (BLADE OUTLET ANGLE.)
YZERO      = 0.00157   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T          = 0.04695   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE       = 0.00782   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z          = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD       = 2.1352    (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         M E A N L I N E  D A T A             SURFACE COORDINATE DATA
           NUMBER      X         Y     ANGLE THICKNESS        XS        YS        XP        YP

             1     0.00238 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 0.30478 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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30690	0.53402	57.446	0.05492	0.28375	0.54880	0.33005	0.51924
17	0.32720	0.56547	56.854	0.05718	0.30326	0.58110	0.35114	0.54983
18	0.34750	0.59619	56.218	0.05927	0.32287	0.61266	0.37213	0.57971
19	0.36780	0.62615	55.537	0.06118	0.34258	0.64346	0.39302	0.60884
20	0.38810	0.65534	54.810	0.06291	0.36240	0.67348	0.41381	0.63721
21	0.40841	0.68372	54.035	0.06447	0.38232	0.70265	0.43450	0.66479
22	0.42871	0.71129	53.210	0.06585	0.40234	0.73100	0.45508	0.69157
23	0.44901	0.73801	52.335	0.06706	0.42247	0.75850	0.47555	0.71752
24	0.46931	0.76388	51.407	0.06810	0.44270	0.78512	0.49592	0.74264
25	0.48961	0.78888	50.426	0.06898	0.46303	0.81085	0.51620	0.76691
26	0.50991	0.81300	49.390	0.06969	0.48346	0.83568	0.53637	0.79032
27	0.53021	0.83623	48.298	0.07025	0.50399	0.85960	0.55644	0.81287
28	0.55052	0.85857	47.150	0.07065	0.52462	0.88259	0.57641	0.83455
29	0.57082	0.88000	45.945	0.07090	0.54534	0.90465	0.59629	0.85535
30	0.59112	0.90053	44.683	0.07102	0.56615	0.92578	0.61609	0.87529
31	0.61142	0.92016	43.364	0.07099	0.58705	0.94596	0.63579	0.89435
32	0.63172	0.93888	41.990	0.07081	0.60803	0.96520	0.65541	0.91256
33	0.65202	0.95671	40.562	0.07045	0.62911	0.98347	0.67493	0.92994
34	0.67232	0.97364	39.082	0.06990	0.65029	1.00077	0.69436	0.94651
35	0.69262	0.98968	37.555	0.06912	0.67156	1.01708	0.71369	0.96229
36	0.71293	1.00486	35.984	0.06811	0.69292	1.03242	0.73294	0.97730
37	0.73323	1.01917	34.375	0.06686	0.71435	1.04676	0.75210	0.99158
38	0.75353	1.03264	32.733	0.06535	0.73586	1.06012	0.77120	1.00515
39	0.77383	1.04528	31.066	0.06357	0.75743	1.07250	0.79023	1.01805
40	0.79413	1.05711	29.382	0.06151	0.77904	1.08390	0.80922	1.03031
41	0.81443	1.06815	27.691	0.05917	0.80069	1.09434	0.82818	1.04195
42	0.83473	1.07842	26.002	0.05653	0.82234	1.10383	0.84713	1.05302
43	0.85504	1.08796	24.327	0.05359	0.84400	1.11238	0.86607	1.06355
44	0.87534	1.09679	22.676	0.05034	0.86563	1.12001	0.88504	1.07357
45	0.89564	1.10494	21.062	0.04676	0.88724	1.12676	0.90404	1.08312
46	0.91594	1.11244	19.497	0.04286	0.90879	1.13264	0.92309	1.09224
47	0.93624	1.11932	17.991	0.03861	0.93028	1.13768	0.94220	1.10096
48	0.95654	1.12563	16.559	0.03400	0.95170	1.14193	0.96139	1.10934
49	0.97684	1.13141	15.210	0.02903	0.97304	1.14542	0.98065	1.11740
50	0.99714	1.13669	13.957	0.02367	0.99429	1.14818	1.00000	1.12520

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 3
****

```
P        = 0.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q        = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1    = 61.806    (BLADE INLET ANGLE.)
BETA2    = 15.446    (BLADE OUTLET 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 (ONE) 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	M E A N L I N E	D A T A			SURFACE COORDINATE DATA			
NUMBER	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP
1	0.00242	0.00000	61.806	0.00485	0.00029	0.00115	0.00456	-0.00115
2	0.02272	0.03785	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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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..5451	15.446	0.02308	0.99385	1.16563	1.00000	1.14339

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 4
****

```
P        = 0.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q        = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1    = 61.970    (BLADE INLET ANGLE.)
BETA2    = 16.898    (BLADE OUTLET ANGLE.)
YZERO    = 0.00159   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T        = 0.04384   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE     = 0.00731   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z        = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD     = 2.0790    (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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	1.11589
46	0.91556	1.14484	22.158	0.04077	0.90787	1.16372	0.92325	1.12596
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.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q        = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTICN OF ITS MAXIMUM VALUE.)
BETA1    = 62.162    (BLADE INLET ANGLE.)
BETA2    = 18.238    (BLADE CUTLET ANGLE.)
YZERO    = 0.00158   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T        = 0.04238   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE     = 0.00706   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z        = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CURD     = 2.0573    (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 CF 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	M E A N L I N E	D A T A			SURFACE COORDINATE DATA			
NUMBER	X	Y	ANGLE	THICKNESS	XS	YS	XP	YP
1	0.00246	0.00000	62.162	0.00492	0.00028	0.00115	0.00464	-0.00115
2	0.02275	0.03841	62.143	0.00849	0.01900	0.04039	0.02650	0.03642
3	0.04304	0.07675	62.088	0.01204	0.03772	0.07957	0.04835	0.07394
4	0.06332	0.11498	61.997	0.01555	0.05646	0.11863	0.07019	0.11133
5	0.08361	0.15304	61.871	0.01903	0.07522	0.15752	0.09200	0.14855
6	0.10390	0.19086	61.711	0.02245	0.09402	0.19618	0.11378	0.18555
7	0.12419	0.22841	61.516	0.02579	0.11285	0.23456	0.13552	0.22226
8	0.14448	0.26563	61.287	0.02905	0.13174	0.27261	0.15721	0.25865
9	0.16476	0.30247	61.025	0.03221	0.15067	0.31027	0.17885	0.29467
10	0.18505	0.33889	60.727	0.03527	0.16967	0.34751	0.20043	0.33027
11	0.20534	0.37484	60.396	0.03821	0.18873	0.38428	0.22195	0.36540
12	0.22563	0.41029	60.029	0.04102	0.20786	0.42054	0.24340	0.40004
13	0.24591	0.44519	59.627	0.04371	0.22706	0.45624	0.26477	0.43414
14	0.26620	0.47951	59.188	0.04624	0.24634	0.49135	0.28606	0.46767
15	0.28649	0.51321	58.713	0.04864	0.26571	0.52584	0.30727	0.50058

POINT NUMBER	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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.          (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q          = 0.5000      (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1      = 62.381      (BLADE INLET ANGLE.)
BETA2      = 19.393      (BLADE OUTLET ANGLE.)
YZERO      = 0.00158     (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T          = 0.04096     (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE       = 0.00683     (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z          = 0.7000      (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD       = 2.0394      (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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
1	0.00247	0.00000	62.381	0.00495	0.00028	0.00115	0.00467	-0.00115
2	0.02276	0.03876	62.363	0.00841	0.01903	0.04071	0.02649	0.03681
3	0.04304	0.07746	62.309	0.01186	0.03779	0.08022	0.04830	0.07470
4	0.06333	0.11604	62.219	0.01529	0.05657	0.11961	0.07009	0.11248
5	0.08361	0.15445	62.095	0.01866	0.07537	0.15882	0.09186	0.15009
6	0.10390	0.19264	61.938	0.02199	0.09420	0.19781	0.11360	0.18746
7	0.12418	0.23054	61.747	0.02524	0.11307	0.23651	0.13530	0.22456
8	0.14447	0.26811	61.522	0.02841	0.13198	0.27489	0.15695	0.26134
9	0.16475	0.30531	61.264	0.03149	0.15095	0.31288	0.17856	0.29774
10	0.18504	0.34209	60.972	0.03446	0.16997	0.35045	0.20010	0.33373
11	0.20532	0.37841	60.647	0.03732	0.18906	0.38755	0.22159	0.36926
12	0.22561	0.41422	60.287	0.04006	0.20821	0.42414	0.24301	0.40429
13	0.24589	0.44948	59.892	0.04267	0.22744	0.46018	0.26435	0.43878
14	0.26618	0.48417	59.462	0.04514	0.24674	0.49564	0.28562	0.47270
15	0.28646	0.51824	58.995	0.04747	0.26612	0.53047	0.30681	0.50601

POINT NUMBER	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30675	0.55166	58.491	0.04965	0.28558	0.56464	0.32792	0.53869
17	0.32703	0.58441	57.950	0.05169	0.30513	0.59013	0.34894	0.57070
18	0.34732	0.61645	57.369	0.05367	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	0.60680	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	1.04207	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.	(D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q	= 0.5000	(D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1	= 62.628	(BLADE INLET ANGLE.)
BETA2	= 20.362	(BLADE OUTLET ANGLE.)
YZERO	= 0.00157	(BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T	= 0.03962	(BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE	= 0.00660	(BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z	= 0.7000	(LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD	= 2.0253	(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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30673	0.55774	58.802	0.04851	0.28599	0.57030	0.32748	0.54517
17	0.32702	0.59089	58.269	0.05049	0.30554	0.60417	0.34849	0.57761
18	0.34730	0.62333	57.698	0.05233	0.32519	0.63731	0.36941	0.60935
19	0.36758	0.65505	57.088	0.05401	0.34491	0.66972	0.39025	0.64037
20	0.38787	0.68600	56.437	0.05554	0.36473	0.70135	0.41100	0.67065
21	0.40815	0.71618	55.745	0.05691	0.38463	0.73220	0.43167	0.70016
22	0.42843	0.74556	55.010	0.05814	0.40462	0.76223	0.45225	0.72889
23	0.44871	0.77413	54.231	0.05922	0.42469	0.79144	0.47274	0.75682
24	0.46900	0.80187	53.407	0.06015	0.44485	0.81980	0.49314	0.78394
25	0.48928	0.82876	52.538	0.06093	0.46510	0.84730	0.51346	0.81023
26	0.50956	0.85480	51.621	0.06158	0.48543	0.87392	0.53370	0.83569
27	0.52985	0.87998	50.657	0.06208	0.50584	0.89966	0.55385	0.86030
28	0.55013	0.90429	49.645	0.06245	0.52633	0.92451	0.57393	0.88407
29	0.57041	0.92772	48.585	0.06269	0.54691	0.94846	0.59392	0.90699
30	0.59070	0.95028	47.476	0.06280	0.56755	0.97150	0.61384	0.92905
31	0.61098	0.97196	46.320	0.06280	0.58827	0.99364	0.63369	0.95027
32	0.63126	0.99276	45.116	0.06265	0.60907	1.01487	0.65346	0.97065
33	0.65155	1.01269	43.866	0.06235	0.62994	1.03517	0.67315	0.99021
34	0.67183	1.03175	42.572	0.06187	0.65090	1.05454	0.69276	1.00897
35	0.69211	1.04996	41.237	0.06120	0.67194	1.07297	0.71228	1.02695
36	0.71239	1.06732	39.864	0.06032	0.69306	1.09046	0.73173	1.04417
37	0.73268	1.08384	38.457	0.05921	0.71426	1.10702	0.75109	1.06065
38	0.75296	1.09954	37.021	0.05788	0.73554	1.12264	0.77038	1.07643
39	0.77324	1.11444	35.562	0.05630	0.75687	1.13734	0.78961	1.09154
40	0.79353	1.12855	34.085	0.05447	0.77826	1.15110	0.80879	1.10599
41	0.81381	1.14189	32.600	0.05239	0.79970	1.16396	0.82792	1.11983
42	0.83409	1.15450	31.113	0.05004	0.82116	1.17592	0.84702	1.13308
43	0.85438	1.16639	29.635	0.04742	0.84265	1.18700	0.86610	1.14578
44	0.87466	1.17758	28.173	0.04453	0.86415	1.19721	0.88517	1.15796
45	0.89494	1.18812	26.740	0.04135	0.88564	1.20659	0.90425	1.16966
46	0.91523	1.19803	25.345	0.03789	0.90712	1.21515	0.92333	1.18091
47	0.93551	1.20735	23.998	0.03412	0.92857	1.22293	0.94245	1.19176
48	0.95579	1.21611	22.712	0.03005	0.94999	1.22996	0.96159	1.20225
49	0.97607	1.22434	21.496	0.02566	0.97137	1.23628	0.98077	1.21241
50	0.99636	1.23210	20.362	0.02094	0.99271	1.24191	1.00000	1.22228

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 8

P	= 0.	(D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q	= 0.5000	(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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
1	0.00250	0.C0000	62.900	0.00500	0.00027	0.00114	C.00472	-0.00114
2	0.02278	0.03962	62.882	C.00829	0.01909	0.04151	0.02647	C.03773
3	0.04306	0.07919	62.829	0.01157	C.03792	0.08183	C.04821	0.07655
4	0.06334	0.11863	62.742	0.01482	C.05676	0.12202	0.06993	0.11524
5	0.08362	0.15790	62.622	0.01803	0.07562	0.16205	0.09163	0.15376
6	0.10391	0.19694	62.47C	0.02118	0.09451	0.20184	0.1133C	0.19205
7	0.12419	0.23571	62.284	0.02427	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
9	0.16475	0.31219	61.816	0.03021	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
11	0.20532	0.38699	61.217	0.03576	0.18965	0.39560	0.22098	0.37838
12	0.22560	0.42365	60.869	0.03836	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
14	0.26616	0.49529	60.069	0.04319	C.24745	0.50607	0.28487	0.48452
15	0.28644	0.53020	59.617	0.04540	0.26686	0.54169	0.30603	0.51872

POINT NUMBER	M E A N L I N E D A T A X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30672	0.56447	59.129	0.04748	0.28635	0.57665	0.32710	0.55228
17	0.32701	0.59805	58.604	0.04941	0.30592	0.61092	0.34810	0.58518
18	0.34729	0.63092	58.042	0.05120	0.32557	0.64447	0.36901	0.61737
19	0.36757	0.66306	57.440	0.05284	0.34530	0.67728	0.38984	0.64884
20	0.38785	0.69444	56.799	0.05434	0.36512	0.70931	0.41058	0.67956
21	0.40813	0.72504	56.117	0.05568	0.38502	0.74056	0.43125	0.70952
22	0.42841	0.75484	55.393	0.05688	0.40501	0.77099	0.45182	0.73868
23	0.44870	0.78382	54.626	0.05793	0.42508	0.80058	0.47231	0.76705
24	0.46898	0.81196	53.815	0.05883	0.44523	0.82933	0.49272	0.79460
25	0.48926	0.83926	52.958	0.05960	0.46547	0.85722	0.51305	0.82131
26	0.50954	0.86571	52.055	0.06022	0.48579	0.88422	0.53329	0.84719
27	0.52982	0.89128	51.106	0.06072	0.50620	0.91035	0.55345	0.87222
28	0.55010	0.91599	50.109	0.06108	0.52667	0.93557	0.57354	0.89640
29	0.57039	0.93981	49.064	0.06131	0.54723	0.95990	0.59354	0.91973
30	0.59067	0.96276	47.972	0.06142	0.56786	0.98332	0.61348	0.94220
31	0.61095	0.98482	46.832	0.06141	0.58856	1.00582	0.63334	0.96381
32	0.63123	1.00600	45.646	0.06126	0.60933	1.02742	0.65313	0.98459
33	0.65151	1.02631	44.414	0.06097	0.63018	1.04808	0.67285	1.00453
34	0.67180	1.04575	43.139	0.06050	0.65111	1.06782	0.69248	1.02367
35	0.69208	1.06432	41.823	0.05983	0.67213	1.08662	0.71203	1.04203
36	0.71236	1.08205	40.468	0.05897	0.69322	1.10448	0.73149	1.05962
37	0.73264	1.09893	39.080	0.05788	0.71440	1.12140	0.75089	1.07647
38	0.75292	1.11499	37.663	0.05657	0.73564	1.13739	0.77020	1.09260
39	0.77320	1.13025	36.222	0.05502	0.75695	1.15244	0.78946	1.10805
40	0.79349	1.14471	34.763	0.05323	0.77831	1.16658	0.80866	1.12285
41	0.81377	1.15841	33.295	0.05119	0.79972	1.17980	0.82782	1.13701
42	0.83405	1.17136	31.825	0.04889	0.82116	1.19213	0.84694	1.15059
43	0.85433	1.18359	30.363	0.04633	0.84262	1.20358	0.86604	1.16360
44	0.87461	1.19513	28.916	0.04350	0.86409	1.21417	0.88513	1.17609
45	0.89489	1.20601	27.496	0.04040	0.88557	1.22393	0.90422	1.18809
46	0.91518	1.21626	26.114	0.03701	0.90703	1.23287	0.92332	1.19964
47	0.93546	1.22591	24.779	0.03333	0.92847	1.24104	0.94244	1.21077
48	0.95574	1.23499	23.502	0.02936	0.94989	1.24845	0.96159	1.22153
49	0.97602	1.24356	22.296	0.02507	0.97126	1.25516	0.98078	1.23196
50	0.99630	1.25164	21.169	0.02047	0.99261	1.26119	1.00000	1.24209

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 9
****

```
P       = 0.         (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q       = 0.5000     (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1   = 63.179     (BLADE INLET ANGLE.)
BETA2   = 21.875     (BLADE OUTLET ANGLE.)
YZERO   = 0.00155    (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T       = 0.03722    (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE    = 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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
1	0.00250	0.00000	63.179	0.00500	0.00027	0.00113	0.00473	-0.00113
2	0.02278	0.04010	63.161	0.00822	0.01911	0.04196	0.02645	0.03825
3	0.04306	0.08014	63.109	0.01143	0.03797	0.08273	0.04816	0.07756
4	0.06334	0.12007	63.024	0.01461	0.05684	0.12338	0.06985	0.11676
5	0.08362	0.15982	62.905	0.01774	0.07573	0.16386	0.09152	0.15577
6	0.10391	0.19933	62.754	0.02083	0.09465	0.20410	0.11316	0.19456
7	0.12419	0.23857	62.571	0.02385	0.11360	0.24406	0.13477	0.23308
8	0.14447	0.27747	62.356	0.02680	0.13260	0.28369	0.15634	0.27126
9	0.16475	0.31600	62.109	0.02965	0.15164	0.32293	0.17785	0.30906
10	0.18503	0.35410	61.830	0.03242	0.17074	0.36175	0.19932	0.34644
11	0.20531	0.39173	61.519	0.03508	0.18990	0.40009	0.22073	0.38336
12	0.22559	0.42885	61.174	0.03762	0.20911	0.43792	0.24207	0.41978
13	0.24587	0.46542	60.797	0.04004	0.22839	0.47519	0.26335	0.45565
14	0.26615	0.50140	60.385	0.04234	0.24775	0.51186	0.28456	0.49094
15	0.28643	0.53677	59.939	0.04451	0.26717	0.54791	0.30569	0.52562

POINT NUMBER	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30671	0.57147	59.458	0.04654	0.28667	0.58330	0.32675	0.55965
17	0.32700	0.60550	58.940	0.04843	0.30625	0.61799	0.34774	0.59301
18	0.34728	0.63881	58.385	0.05017	0.32591	0.65196	0.36864	0.62566
19	0.36756	0.67138	57.791	0.05178	0.34565	0.68518	0.38946	0.65759
20	0.38784	0.70319	57.159	0.05323	0.36548	0.71763	0.41020	0.68876
21	0.40812	0.73422	56.486	0.05455	0.38538	0.74928	0.43086	0.71916
22	0.42840	0.76444	55.771	0.05571	0.40537	0.78011	0.45143	0.74877
23	0.44868	0.79383	55.014	0.05674	0.42544	0.81010	0.47192	0.77757
24	0.46896	0.82239	54.213	0.05762	0.44559	0.83924	0.49233	0.80554
25	0.48924	0.85010	53.368	0.05837	0.46582	0.86751	0.51266	0.83268
26	0.50952	0.87694	52.477	0.05898	0.48614	0.89490	0.53291	0.85898
27	0.52980	0.90291	51.540	0.05946	0.50653	0.92140	0.55308	0.88442
28	0.55009	0.92800	50.556	0.05981	0.52699	0.94700	0.57318	0.90901
29	0.57037	0.95221	49.524	0.06003	0.54753	0.97170	0.59320	0.93273
30	0.59065	0.97554	48.446	0.06013	0.56815	0.99548	0.61315	0.95559
31	0.61093	0.99797	47.320	0.06012	0.58883	1.01835	0.63303	0.97759
32	0.63121	1.01952	46.148	0.05998	0.60958	1.04030	0.65284	0.99875
33	0.65149	1.04019	44.931	0.05968	0.63041	1.06132	0.67257	1.01907
34	0.67177	1.05999	43.670	0.05922	0.65133	1.08141	0.69222	1.03857
35	0.69205	1.07892	42.369	0.05856	0.67232	1.10055	0.71179	1.05728
36	0.71233	1.09699	41.029	0.05771	0.69339	1.11876	0.73127	1.07522
37	0.73261	1.11422	39.656	0.05664	0.71454	1.13602	0.75069	1.09241
38	0.75289	1.13062	38.253	0.05535	0.73576	1.15235	0.77003	1.10888
39	0.77318	1.14620	36.826	0.05383	0.75704	1.16775	0.78931	1.12466
40	0.79346	1.16100	35.381	0.05208	0.77838	1.18223	0.80853	1.13977
41	0.81374	1.17502	33.926	0.05007	0.79976	1.19579	0.82771	1.15424
42	0.83402	1.18829	32.468	0.04782	0.82118	1.20846	0.84685	1.16811
43	0.85430	1.20083	31.017	0.04531	0.84262	1.22025	0.86597	1.18142
44	0.87458	1.21269	29.581	0.04254	0.86408	1.23118	0.88508	1.19419
45	0.89486	1.22387	28.170	0.03951	0.88554	1.24128	0.90419	1.20646
46	0.91514	1.23442	26.796	0.03619	0.90698	1.25057	0.92330	1.21827
47	0.93542	1.24437	25.468	0.03260	0.92841	1.25908	0.94243	1.22965
48	0.95570	1.25375	24.198	0.02871	0.94982	1.26685	0.96159	1.24065
49	0.97598	1.26261	22.997	0.02453	0.97119	1.27390	0.98078	1.25132
50	0.99627	1.27098	21.875	0.02005	0.99253	1.28028	1.00000	1.26168

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 10
****

```
P          = 0.         (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q          = 0.5000     (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1      = 63.448     (BLADE INLET ANGLE.)
BETA2      = 22.534     (BLADE OUTLET ANGLE.)
YZERO      = 0.00153    (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T          = 0.03614    (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE       = 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	MEANLINE DATA				SURFACE COORDINATE DATA			
NUMBER	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	61.095	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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30670	0.57835	59.773	0.04564	0.28699	0.58984	0.32642	0.56686
17	0.32698	0.61281	59.261	0.04749	0.30658	0.62494	0.34739	0.60067
18	0.34726	0.64655	58.713	0.04920	0.32624	0.65932	0.36829	0.63377
19	0.36754	0.67955	58.127	0.05076	0.34599	0.69295	0.38910	0.66614
20	0.38782	0.71177	57.503	0.05219	0.36582	0.72579	0.40983	0.69775
21	0.40811	0.74321	56.838	0.05347	0.38572	0.75784	0.43049	0.72859
22	0.42839	0.77384	56.132	0.05461	0.40571	0.78906	0.45106	0.75862
23	0.44867	0.80364	55.384	0.05561	0.42578	0.81944	0.47155	0.78784
24	0.46895	0.83260	54.594	0.05648	0.44593	0.84896	0.49196	0.81624
25	0.48923	0.86070	53.758	0.05720	0.46616	0.87761	0.51230	0.84379
26	0.50951	0.88793	52.878	0.05780	0.48646	0.90537	0.53255	0.87049
27	0.52979	0.91428	51.952	0.05826	0.50685	0.93224	0.55273	0.89633
28	0.55007	0.93975	50.980	0.05860	0.52730	0.95820	0.57283	0.92131
29	0.57035	0.96434	49.961	0.05882	0.54783	0.98325	0.59286	0.94542
30	0.59063	0.98802	48.894	0.05892	0.56843	1.00739	0.61283	0.96866
31	0.61091	1.01082	47.782	0.05890	0.58910	1.03061	0.63272	0.99103
32	0.63119	1.03273	46.623	0.05876	0.60983	1.05291	0.65254	1.01255
33	0.65147	1.05375	45.419	0.05847	0.63065	1.07427	0.67229	1.03323
34	0.67175	1.07389	44.172	0.05801	0.65154	1.09469	0.69196	1.05309
35	0.69203	1.09316	42.884	0.05736	0.67251	1.11417	0.71155	1.07214
36	0.71231	1.11156	41.558	0.05652	0.69356	1.13271	0.73106	1.09042
37	0.73259	1.12912	40.198	0.05547	0.71469	1.15030	0.75049	1.10794
38	0.75287	1.14584	38.808	0.05420	0.73589	1.16696	0.76986	1.12472
39	0.77315	1.16175	37.394	0.05271	0.75715	1.18269	0.78916	1.14081
40	0.79343	1.17685	35.962	0.05098	0.77846	1.19749	0.80840	1.15622
41	0.81371	1.19118	34.518	0.04902	0.79982	1.21138	0.82760	1.17099
42	0.83399	1.20476	33.071	0.04681	0.82122	1.22437	0.84676	1.18515
43	0.85427	1.21760	31.630	0.04435	0.84264	1.23648	0.86590	1.19872
44	0.87455	1.22975	30.204	0.04163	0.86408	1.24774	0.88503	1.21176
45	0.89483	1.24122	28.802	0.03866	0.88552	1.25816	0.90415	1.22429
46	0.91511	1.25206	27.435	0.03542	0.90696	1.26778	0.92327	1.23634
47	0.93540	1.26229	26.114	0.03190	0.92837	1.27662	0.94242	1.24797
48	0.95568	1.27196	24.849	0.02811	0.94977	1.28471	0.96158	1.25920
49	0.97596	1.28109	23.653	0.02402	0.97114	1.29209	0.98077	1.27009
50	0.99624	1.28973	22.534	0.01964	0.99247	1.29881	1.00000	1.28066

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 11
****

```
P       = 0.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q       = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1   = 63.701    (BLADE INLET ANGLE.)
BETA2   = 23.143    (BLADE OUTLET ANGLE.)
YZERO   = 0.00152   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T       = 0.03511   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE    = 0.00585   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z       = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD    = 2.0025    (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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	C.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	0.20962	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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	0.60802
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	1.26539
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.          (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q         = 0.5000      (D2YDX2 OF MEANLINE AT TRAILING 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.)
CORD      = 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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
1	0.00251	0.00000	63.940	0.00502	0.00025	0.00110	0.00476	-0.00110
2	0.02279	0.04146	63.923	0.00803	0.01918	0.04322	0.02639	0.03969
3	0.04307	0.08285	63.872	0.01104	0.03811	0.08528	0.04802	0.08042
4	0.06335	0.12413	63.790	0.01401	0.05706	0.12722	0.06963	0.12103
5	0.08363	0.16523	63.675	0.01696	0.07603	0.16899	0.09123	0.16147
6	0.10391	0.20609	63.529	0.01985	0.09502	0.21051	0.11279	0.20166
7	0.12419	0.24666	63.353	0.02268	0.11405	0.25175	0.13432	0.24158
8	0.14447	0.28690	63.145	0.02544	0.13312	0.29265	0.15581	0.28115
9	0.16475	0.32675	62.906	0.02812	0.15223	0.33315	0.17726	0.32035
10	0.18503	0.36617	62.637	0.03071	0.17139	0.37322	0.19866	0.35911
11	0.20530	0.40510	62.336	0.03319	0.19061	0.41281	0.22000	0.39740
12	0.22558	0.44352	62.003	0.03558	0.20988	0.45187	0.24129	0.43517
13	0.24586	0.48138	61.638	0.03785	0.22921	0.49037	0.26252	0.47239
14	0.26614	0.51864	61.241	0.04000	0.24861	0.52827	0.28368	0.50902
15	0.28642	0.55527	60.810	0.04202	0.26808	0.56552	0.30477	0.54503

POINT NUMBER	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30670	0.59124	60.345	0.04392	0.28762	0.60210	0.32579	0.58037
17	0.32698	0.62650	59.844	0.04569	0.30723	0.63798	0.34674	0.61502
18	0.34726	0.66104	59.308	0.04732	0.32692	0.67312	0.36761	0.64896
19	0.36754	0.69482	58.735	0.04882	0.34668	0.70749	0.38841	0.68216
20	0.38782	0.72783	58.124	0.05018	0.36652	0.74108	0.40913	0.71458
21	0.40810	0.76004	57.473	0.05141	0.38643	0.77386	0.42977	0.74622
22	0.42838	0.79142	56.783	0.05250	0.40642	0.80580	0.45034	0.77705
23	0.44866	0.82197	56.051	0.05345	0.42649	0.83690	0.47083	0.80705
24	0.46894	0.85167	55.276	0.05427	0.44664	0.86712	0.49124	0.83621
25	0.48922	0.88049	54.459	0.05496	0.46686	0.89647	0.51158	0.86452
26	0.50950	0.90844	53.597	0.05553	0.48715	0.92492	0.53185	0.89196
27	0.52978	0.93550	52.690	0.05597	0.50752	0.95246	0.55204	0.91854
28	0.55006	0.96166	51.737	0.05629	0.52796	0.97909	0.57216	0.94423
29	0.57034	0.98692	50.739	0.05649	0.54847	1.00480	0.59221	0.96905
30	0.59062	1.01128	49.693	0.05658	0.56905	1.02958	0.61219	0.99298
31	0.61090	1.03474	48.602	0.05656	0.58969	1.05344	0.63211	1.01604
32	0.63118	1.05729	47.465	0.05642	0.61039	1.07636	0.65196	1.03822
33	0.65146	1.07895	46.284	0.05613	0.63118	1.09834	0.67174	1.05955
34	0.67174	1.09971	45.059	0.05568	0.65203	1.11938	0.69144	1.08005
35	0.69202	1.11959	43.794	0.05505	0.67297	1.13946	0.71107	1.09973
36	0.71230	1.13860	42.490	0.05423	0.69398	1.15860	0.73061	1.11861
37	0.73258	1.15675	41.152	0.05321	0.71507	1.17679	0.75009	1.13672
38	0.75286	1.17406	39.784	0.05199	0.73622	1.19403	0.76949	1.15408
39	0.77314	1.19053	38.390	0.05054	0.75744	1.21034	0.78883	1.17072
40	0.79342	1.20620	36.978	0.04888	0.77872	1.22572	0.80812	1.18667
41	0.81370	1.22108	35.553	0.04699	0.80004	1.24019	0.82736	1.20196
42	0.83398	1.23519	34.124	0.04486	0.82139	1.25376	0.84656	1.21662
43	0.85426	1.24857	32.699	0.04250	0.84278	1.26645	0.86573	1.23069
44	0.87454	1.26124	31.287	0.03989	0.86418	1.27829	0.88489	1.24419
45	0.89482	1.27323	29.898	0.03704	0.88558	1.28928	0.90405	1.25717
46	0.91509	1.28457	28.542	0.03393	0.90699	1.29948	0.92320	1.26967
47	0.93537	1.29530	27.231	0.03057	0.92838	1.30889	0.94237	1.28171
48	0.95565	1.30546	25.975	0.02694	0.94975	1.31757	0.96155	1.29335
49	0.97593	1.31508	24.785	0.02304	0.97110	1.32554	0.98076	1.30462
50	0.99621	1.32420	23.672	0.01886	0.99243	1.33284	1.00000	1.31556

```
                    STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 13
                    ******************************************

P          = 0.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q          = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1      = 64.180    (BLADE INLET ANGLE.)
BETA2      = 24.053    (BLADE OUTLET ANGLE.)
YZERO      = 0.00150   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T          = 0.03317   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE       = 0.00553   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z          = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD       = 2.0096    (CHORD OR MERIDIONAL CHORD OF SECTION.)

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

BLADE CHORD     = 1.6707

STAGGER 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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
1	0.00251	0.00000	64.180	0.00503	0.00025	0.00110	0.00478	-0.00110
2	0.02279	0.04190	64.163	0.00798	0.01920	0.04364	0.02639	0.04016
3	0.04307	0.08374	64.113	0.01092	0.03816	0.08613	0.04799	0.08136
4	0.06335	0.12546	64.031	0.01383	0.05714	0.12849	0.06957	0.12243
5	0.08363	0.16700	63.918	0.01671	0.07613	0.17068	0.09114	0.16333
6	0.10391	0.20830	63.773	0.01954	0.09515	0.21262	0.11268	0.20399
7	0.12419	0.24932	63.598	0.02231	0.11420	0.25428	0.13419	0.24436
8	0.14447	0.28999	63.392	0.02501	0.13330	0.29559	0.15565	0.28439
9	0.16475	0.33027	63.155	0.02763	0.15243	0.33651	0.17708	0.32403
10	0.18503	0.37011	62.888	0.03016	0.17161	0.37698	0.19846	0.36324
11	0.20531	0.40947	62.590	0.03259	0.19085	0.41698	0.21978	0.40197
12	0.22559	0.44831	62.260	0.03492	0.21014	0.45644	0.24105	0.44019
13	0.24587	0.48659	61.898	0.03714	0.22949	0.49533	0.26226	0.47784
14	0.26615	0.52426	61.504	0.03924	0.24891	0.53362	0.28340	0.51489
15	0.28643	0.56129	61.076	0.04122	0.26839	0.57126	0.30448	0.55132

POINT NUMBER	M E A N L I N E D A T A X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA 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	0.89018	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.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q          = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1      = 64.437    (BLADE INLET ANGLE.)
BETA2      = 24.241    (BLADE OUTLET ANGLE.)
YZERO      = 0.00149   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T          = 0.03223   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE       = 0.00537   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z          = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD       = 2.0175    (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         M E A N L I N E  D A T A              SURFACE COORDINATE DATA
       NUMBER      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 0.24738
         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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30672	0.60457	60.892	0.04223	0.28827	0.61484	0.32517	0.59430
17	0.32700	0.64063	60.398	0.04392	0.30791	0.65148	0.34610	0.62979
18	0.34728	0.67596	59.869	0.04548	0.32762	0.68737	0.36695	0.66454
19	0.36757	0.71051	59.303	0.04690	0.34740	0.72248	0.38773	0.69854
20	0.38785	0.74427	58.699	0.04820	0.36726	0.75679	0.40844	0.73175
21	0.40813	0.77722	58.056	0.04936	0.38718	0.79027	0.42907	0.76416
22	0.42841	0.80932	57.373	0.05040	0.40719	0.82291	0.44963	0.79574
23	0.44869	0.84057	56.649	0.05130	0.42727	0.85467	0.47012	0.82647
24	0.46897	0.87095	55.882	0.05208	0.44742	0.88555	0.49053	0.85634
25	0.48925	0.90044	55.073	0.05273	0.46764	0.91553	0.51087	0.88534
26	0.50954	0.92903	54.219	0.05326	0.48793	0.94460	0.53114	0.91346
27	0.52982	0.95672	53.320	0.05367	0.50829	0.97275	0.55134	0.94068
28	0.55010	0.98349	52.374	0.05397	0.52873	0.99996	0.57147	0.96701
29	0.57038	1.00934	51.383	0.05415	0.54922	1.02624	0.59153	0.99244
30	0.59066	1.03427	50.345	0.05423	0.56979	1.05157	0.61154	1.01696
31	0.61094	1.05827	49.260	0.05420	0.59041	1.07596	0.63147	1.04059
32	0.63122	1.08136	48.128	0.05405	0.61110	1.09940	0.65135	1.06332
33	0.65150	1.10353	46.952	0.05376	0.63186	1.12188	0.67115	1.08518
34	0.67179	1.12479	45.731	0.05332	0.65270	1.14339	0.69088	1.10618
35	0.69207	1.14514	44.469	0.05270	0.67361	1.16395	0.71053	1.12634
36	0.71235	1.16461	43.167	0.05190	0.69459	1.18354	0.73010	1.14568
37	0.73263	1.18320	41.830	0.05092	0.71565	1.20216	0.74961	1.16423
38	0.75291	1.20092	40.461	0.04973	0.73678	1.21984	0.76905	1.18200
39	0.77319	1.21780	39.066	0.04833	0.75796	1.23656	0.78842	1.19903
40	0.79347	1.23385	37.650	0.04673	0.77920	1.25235	0.80775	1.21535
41	0.81376	1.24910	36.220	0.04491	0.80049	1.26721	0.82702	1.23098
42	0.83404	1.26357	34.784	0.04287	0.82181	1.28117	0.84626	1.24596
43	0.85432	1.27728	33.351	0.04060	0.84316	1.29424	0.86548	1.26033
44	0.87460	1.29027	31.930	0.03811	0.86452	1.30644	0.88468	1.27410
45	0.89488	1.30257	30.530	0.03538	0.88590	1.31781	0.90387	1.28733
46	0.91516	1.31421	29.163	0.03242	0.90727	1.32836	0.92306	1.30005
47	0.93544	1.32522	27.840	0.02921	0.92862	1.33813	0.94227	1.31230
48	0.95573	1.33564	26.571	0.02576	0.94997	1.34716	0.96149	1.32413
49	0.97601	1.34552	25.367	0.02205	0.97128	1.35548	0.98073	1.33556
50	0.99629	1.35489	24.241	0.01808	0.99258	1.36313	1.00000	1.34665

STREAMSURFACE GEOMETRY ON STREAMLINE NUMBER 15

```
P        = 0.        (D2YDX2 OF MEANLINE AT LEADING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
Q        = 0.5000    (D2YDX2 OF MEANLINE AT TRAILING EDGE AS A FRACTION OF ITS MAXIMUM VALUE.)
BETA1    = 64.705    (BLADE INLET ANGLE.)
BETA2    = 24.317    (BLADE OUTLET ANGLE.)
YZERO    = 0.00146   (BLADE LEADING EDGE RADIUS AS A FRACTION OF CHORD.)
T        = 0.03129   (BLADE MAXIMUM THICKNESS AS A FRACTION OF CHORD.)
YONE     = 0.00521   (BLADE TRAILING EDGE HALF-THICKNESS AS A FRACTION OF CHORD.)
Z        = 0.7000    (LOCATION OF MAXIMUM THICKNESS AS A FRACTION OF MEAN LINE.)
CORD     = 2.0278    (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	MEANLINE DATA				SURFACE COORDINATE DATA			
NUMBER	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	0.06937	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	MEANLINE DATA X	Y	ANGLE	THICKNESS	SURFACE COORDINATE DATA XS	YS	XP	YP
16	0.30672	0.61189	61.176	0.04138	0.28860	0.62187	0.32485	0.60192
17	0.32701	0.64838	60.684	0.04302	0.30825	0.65892	0.34576	0.63785
18	0.34729	0.68412	60.156	0.04454	0.32797	0.69521	0.36661	0.67304
19	0.36757	0.71908	59.591	0.04593	0.34777	0.73071	0.38738	0.70746
20	0.38786	0.75323	58.988	0.04720	0.36763	0.76539	0.40808	0.74108
21	0.40814	0.78656	58.347	0.04833	0.38757	0.79924	0.42871	0.77388
22	0.42842	0.81903	57.665	0.04933	0.40758	0.83223	0.44927	0.80584
23	0.44871	0.85064	56.942	0.05021	0.42767	0.86433	0.46975	0.83694
24	0.46899	0.88136	56.177	0.05097	0.44782	0.89554	0.49016	0.86717
25	0.48927	0.91118	55.368	0.05160	0.46805	0.92584	0.51050	0.89652
26	0.50956	0.94009	54.514	0.05211	0.48834	0.95521	0.53077	0.92496
27	0.52984	0.96808	53.614	0.05250	0.50871	0.98365	0.55098	0.95250
28	0.55012	0.99514	52.669	0.05279	0.52914	1.01114	0.57111	0.97913
29	0.57041	1.02127	51.676	0.05296	0.54963	1.03769	0.59118	1.00485
30	0.59069	1.04646	50.636	0.05303	0.57019	1.06328	0.61119	1.02964
31	0.61097	1.07072	49.548	0.05299	0.59081	1.08791	0.63114	1.05352
32	0.63126	1.09404	48.414	0.05284	0.61150	1.11158	0.65102	1.07650
33	0.65154	1.11643	47.233	0.05255	0.63225	1.13427	0.67083	1.09859
34	0.67183	1.13790	46.007	0.05211	0.65308	1.15600	0.69057	1.11980
35	0.69211	1.15845	44.739	0.05149	0.67399	1.17674	0.71023	1.14016
36	0.71239	1.17810	43.430	0.05070	0.69496	1.19651	0.72982	1.15969
37	0.73268	1.19686	42.085	0.04973	0.71601	1.21531	0.74934	1.17841
38	0.75296	1.21474	40.706	0.04856	0.73712	1.23315	0.76879	1.19634
39	0.77324	1.23177	39.301	0.04719	0.75830	1.25003	0.78819	1.21351
40	0.79353	1.24795	37.873	0.04561	0.77952	1.26596	0.80753	1.22995
41	0.81381	1.26333	36.431	0.04383	0.80080	1.28096	0.82682	1.24570
42	0.83409	1.27791	34.982	0.04183	0.82210	1.29504	0.84608	1.26077
43	0.85438	1.29172	33.535	0.03961	0.84343	1.30823	0.86532	1.27521
44	0.87466	1.30480	32.099	0.03718	0.86478	1.32055	0.88454	1.28905
45	0.89494	1.31718	30.684	0.03452	0.88614	1.33202	0.90375	1.30234
46	0.91523	1.32889	29.301	0.03163	0.90749	1.34268	0.92297	1.31509
47	0.93551	1.33996	27.962	0.02851	0.92883	1.35255	0.94219	1.32737
48	0.95579	1.35043	26.677	0.02514	0.95015	1.36167	0.96144	1.33920
49	0.97608	1.36035	25.458	0.02154	0.97145	1.37008	0.98071	1.35063
50	0.99636	1.36976	24.317	0.01768	0.99272	1.37781	1.00000	1.36171

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	-1.57442E 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	2.52685E-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	4.19341E-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	7.69556E-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	XBAR	=	5.4763E-02
RELATIVE TO STACK AXIS	YBAR	=	5.8043E-02
SECOND MOMENTS OF AREA	IX	=	1.3940E-01
ABOUT CENTROID	IY	=	8.8351E-02
	IXY	=	1.0716E-01
PRINCIPAL SECOND MOMENTS	IPX	=	2.2403E-01 (AT -38.30 DEGREES TO 'X' AXIS)
OF AREA ABOUT CENTROID	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	9.20996E-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	IPX	=	2.0757E-01 (AT -38.48 DEGREES TO 'X' AXIS)
	OF AREA ABOUT CENTROID	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	-1.55516F 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	1.22075E-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	2.56625F-01
30	1.33869E-01	4.24790E-01	2.28345E-01	2.98806F-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 C0
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 C0
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 C0
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	IPX	=	1.9337E-01 (AT -38.49 DEGREES TO 'X' AXIS)
	OF AREA ABOUT CENTROID	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	-1.55776E 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	-7.38898E-01
13	-5.26764E-01	-6.20571E-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	-4.11953E-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	3.76807E-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	6.41310E-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 NO	XSEMI	YSEMI
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	-1.55935E 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 'Z' = 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	IPX	=	1.8169E-01 (AT -38.30 DEGREES TO 'X' AXIS)
OF AREA ABOUT CENTROID	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	-9.41012E-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	-1.48351E-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	-2.44024E-02	2.00141E-01	7.52357E-02	1.11215E-01
27	1.52360E-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	7.66481F-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	XBAR	=	1.7569E-02	
RELATIVE TO STACK AXIS	YBAR	=	1.3610E-02	
SECOND MOMENTS OF AREA	IX	=	1.0979E-01	
ABOUT CENTROID	IY	=	6.7269E-02	
	IXY	=	8.3997E-02	
PRINCIPAL SECOND MOMENTS	IPX	=	1.7517E-01	(AT -37.90 DEGREES TO 'X' AXIS)
OF AREA ABOUT CENTROID	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	1.17253E-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	5.50081E-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	8.21925E-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	IPX	=	1.7337E-01 (AT -37.24 DEGREES TO 'X' AXIS)
OF AREA ABOUT CENTROID	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 CC
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	2.94156E-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	4.70422E-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	9.23222E-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 PROPERTIES

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 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	-1.39520E 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	9.05886E-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 RELATIVE TO STACK AXIS	XBAR	=	2.9914E-03	
	YBAR	=	4.7234E-04	
SECOND MOMENTS OF AREA ABOUT CENTROID	IX	=	1.1816E-01	
	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	-7.65092E-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	3.83777E-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	5.92592E-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 RELATIVE TO STACK AXIS	XBAR	=	-2.4630E-03
	YBAR	=	2.3435E-03
SECOND MOMENTS OF AREA ABOUT CENTROID	IX	=	1.2354E-01
	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	-1.52696E 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	-1.26744E 00	-7.53619E-01	-1.28493E 00
7	-7.49801E-01	-1.18219E 00	-7.10568E-01	-1.20222E 00
8	-7.11495E-01	-1.09773E 00	-6.67587E-01	-1.12028E 00
9	-6.73105E-01	-1.01415E 00	-6.24687E-01	-1.03920E 00
10	-6.34619E-01	-9.31537E-01	-5.81879E-01	-9.59051E-01
11	-5.96027E-01	-8.49964E-01	-5.39171E-01	-8.79919E-01
12	-5.57322E-01	-7.69511E-01	-4.96573E-01	-8.01978E-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	-5.74976E-01
16	-4.01238E-01	-4.60268E-01	-3.27498E-01	-5.01951E-01
17	-3.61884E-01	-3.86405E-01	-2.85601E-01	-4.30319E-01
18	-3.22394E-01	-3.14027E-01	-2.43866E-01	-3.60125E-01
19	-2.82767E-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	-4.01897E-02	-7.86329E-02	-9.44996E-02
23	-1.22920E-01	2.41816E-02	-3.77555E-02	-3.20369E-02
24	-8.26327E-02	8.68632E-02	2.95374E-03	2.87974E-02
25	-4.22177E-02	1.47834E-01	4.34995E-02	8.79832E-02
26	-1.67717E-03	2.07074E-01	8.38873E-02	1.45503E-01
27	3.89889E-02	2.64567E-01	1.24124E-01	2.01343E-01
28	7.97784E-02	3.20300E-01	1.64218E-01	2.55490E-01
29	1.20691E-01	3.74261E-01	2.04178E-01	3.07936E-01
30	1.61727E-01	4.26440E-01	2.44014E-01	3.58674E-01
31	2.02886E-01	4.76820E-01	2.83732E-01	4.07704E-01
32	2.44182E-01	5.25407E-01	3.23327E-01	4.55041E-01
33	2.85629E-01	5.72157E-01	3.62788E-01	5.00709E-01
34	3.27233E-01	6.17066E-01	4.02111E-01	5.44737E-01
35	3.68997E-01	6.60124E-01	4.41294E-01	5.87155E-01
36	4.10916E-01	7.01329E-01	4.80337E-01	6.28000E-01
37	4.52983E-01	7.40681E-01	5.19244E-01	6.67314E-01
38	4.95184E-01	7.78190E-01	5.58029E-01	7.05140E-01

POINT NO	XS	YS	XP	YP
39	5.37502E-01	8.13869E-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	6.73693E-01	8.10214E-01
42	6.64950E-01	9.10172E-01	7.12093E-01	8.42610E-01
43	7.07535E-01	9.30791E-01	7.50464E-01	8.73775E-01
44	7.50158E-01	9.65716E-01	7.88842E-01	9.03761E-01
45	7.92819E-01	9.90980E-01	8.27257E-01	9.32621E-01
46	8.35517E-01	1.01462E 00	8.65747E-01	9.60412E-01
47	8.78253E-01	1.03668E 00	9.04337E-01	9.87192E-01
48	9.21033E-01	1.05721E 00	9.43057E-01	1.01302E 00
49	9.63857E-01	1.07626E 00	9.81932E-01	1.03796E 00
50	1.00674E 00	1.09388E 00	1.02097E 00	1.06207E 00

POINT NO	XSEMI	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	-9.73655E-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	-9.78940E-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 'Z' = 9.0000

SECTION PROPERTIES

SECTION AREA		=	2.5753E-01
LOCATION OF CENTROID	XBAR	=	-9.1868E-03
RELATIVE TO STACK AXIS	YBAR	=	5.3695E-03
SECOND MOMENTS OF AREA	IX	=	1.2901E-01
ABOUT CENTROID	IY	=	5.8087E-02
	IXY	=	8.5221E-02
PRINCIPAL SECOND MOMENTS	IPX	=	1.8585E-01 (AT -33.70 DEGREES TO 'X' AXIS)
OF AREA ABOUT CENTROID	IPY	=	1.2442E-03 (AT -33.70 DEGREES TO 'Y' AXIS)

SECTION COORDINATES

POINT NO	XS	YS	XP	YP
1	-9.78576E-01	-1.74140E 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	-8.83708E-01	-1.57229E 00
4	-8.64499E-01	-1.47369E 00	-8.40744E-01	-1.48590E 00
5	-8.26441E-01	-1.38523E 00	-7.97829E-01	-1.39996E 00
6	-7.88342E-01	-1.29735E 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	-6.73666E-01	-1.03812E 00	-6.26854E-01	-1.06263E 00
10	-6.35276E-01	-9.53494E-01	-5.84325E-01	-9.80353E-01
11	-5.96785E-01	-8.69895E-01	-5.41898E-01	-8.99070E-01
12	-5.58185E-01	-7.87402E-01	-4.99582E-01	-8.18851E-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	2.93798E-02	-4.32849E-02	-2.39419E-02
24	-8.49080E-02	9.41592E-02	-2.67605E-03	3.91588E-02
25	-4.45876E-02	1.57207E-01	3.78004E-02	1.00581E-01
26	-4.08003E-03	2.18498E-01	7.81563E-02	1.60299E-01
27	3.65526E-02	2.78011E-01	1.18397E-01	2.18293E-01
28	7.73355E-02	3.35724E-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	2.38534E-01	3.81748E-01
31	2.00580E-01	4.97901E-01	2.78408E-01	4.32688E-01
32	2.41984E-01	5.48246E-01	3.18190E-01	4.81865E-01
33	2.83564E-01	5.96699E-01	3.57862E-01	5.29300E-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 NO	XS	YS	XP	YP
39	5.36519E-01	8.47342E-01	5.93304E-01	7.79165E-01
40	5.79110E-01	8.82518E-01	6.32118E-01	8.15433E-01
41	6.21756E-01	9.15875E-01	6.70833E-01	8.50307E-01
42	6.64437E-01	9.47453E-01	7.09495E-01	8.83835E-01
43	7.07141E-01	9.77278E-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	9.03148E-01	1.03303E 00
48	9.21269E-01	1.10138E 00	9.42224E-01	1.05955E 00
49	9.64277E-01	1.12135E 00	9.81495E-01	1.08511E 00
50	1.00739E 00	1.13994E 00	1.02097E 00	1.10976E 00

POINT NO	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	-9.71366E-01	-1.74790E 00
7	-9.71798E-01	-1.74816E 00
8	-9.72256E-01	-1.74838E 00
9	-9.72736E-01	-1.74854E 00
10	-9.73230E-01	-1.74865E 00
11	-9.73735E-01	-1.74871E 00
12	-9.74245E-01	-1.74871E 00
13	-9.74754E-01	-1.74865E 00
14	-9.75256E-01	-1.74854E 00
15	-9.75746E-01	-1.74838E 00
16	-9.76219E-01	-1.74817E 00
17	-9.76670E-01	-1.74791E 00
18	-9.77093E-01	-1.74760E 00
19	-9.77483E-01	-1.74725E 00
20	-9.77838E-01	-1.74685E 00
21	-9.78152E-01	-1.74643E 00
22	-9.78422E-01	-1.74597E 00
23	-9.78645E-01	-1.74549E 00
24	-9.78820E-01	-1.74499E 00
25	-9.78943E-01	-1.74448E 00
26	-9.79014E-01	-1.74395E 00
27	-9.79032E-01	-1.74343E 00
28	-9.78996E-01	-1.74290E 00
29	-9.78908E-01	-1.74239E 00
30	-9.78767E-01	-1.74188E 00
31	-9.78576E-01	-1.74140E 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 streamsurface 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	0.78382	-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	0.65938	-2.24419	0.59488
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	0.43738	-1.97408	0.32550
14	-1.92229	0.41144	-1.92988	0.29624
15	-1.87637	0.38594	-1.88335	0.26795
16	-1.82831	0.36092	-1.83467	0.24067
17	-1.77827	0.33645	-1.78400	0.21444
18	-1.72642	0.31253	-1.73153	0.18929
19	-1.67296	0.28927	-1.67745	0.16527
20	-1.61808	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	-1.44682	0.20363	-1.44913	0.08098
24	-1.38818	0.18430	-1.39011	0.06298
25	-1.32906	0.16586	-1.33061	0.04623
26	-1.26964	0.14837	-1.27085	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	-0.00808
30	-1.03237	0.08815	-1.03270	-0.01851
31	-0.97379	0.07558	-0.97399	-0.02772
32	-0.91568	0.06401	-0.91578	-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	-0.10295	-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	-0.00163	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	0.56475
5	-2.03578	0.58830	-2.04301	0.52912
6	-2.00909	0.56110	-2.01668	0.49477
7	-1.98116	0.53449	-1.98896	0.46159
8	-1.95186	0.50841	-1.95972	0.42953
9	-1.92104	0.48284	-1.92883	0.39850
10	-1.88855	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	-1.69742	0.33840	-1.70308	0.23203
16	-1.65353	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	-1.41528	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	0.04895
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	0.00764
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	-0.83286	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	0.02733	-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	-0.00408	-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	-2.15649	0.72963
12	0.00003	-0.00119	-2.15601	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	-2.15445	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	-0.00560	-2.15235	0.73043

SECTION NO. 3 'Z'= 7.750

POINT NO	XP	YP	XS	YS
1	-1.95751	0.63409	-1.95983	0.61116
2	-1.92994	0.60413	-1.93307	0.57213
3	-1.90219	0.57528	-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	0.37380
9	-1.72743	0.42143	-1.73304	0.34543
10	-1.69589	0.39838	-1.70149	0.31824
11	-1.66323	0.37590	-1.66871	0.29200
12	-1.62925	0.35393	-1.63454	0.26669
13	-1.59381	0.33243	-1.59882	0.24229
14	-1.55688	0.31141	-1.56155	0.21876
15	-1.51850	0.29086	-1.52281	0.19612
16	-1.47875	0.27082	-1.48267	0.17438
17	-1.43773	0.25132	-1.44125	0.15357
18	-1.39554	0.23239	-1.39865	0.13368
19	-1.35232	0.21405	-1.35504	0.11475
20	-1.30818	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	-0.79656	-0.03453
32	-0.75015	0.04090	-0.75016	-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	-0.61289	0.01954	-0.61282	-0.05280
36	-0.56777	0.01393	-0.56769	-0.05506
37	-0.52295	0.00906	-0.52288	-0.05643
38	-0.47844	0.00492	-0.47836	-0.05692
39	-0.43417	0.00148	-0.43410	-0.05653
40	-0.39012	-0.00125	-0.39006	-0.05527
41	-0.34627	-0.00329	-0.34622	-0.05314
42	-0.30258	-0.00465	-0.30254	-0.05015
43	-0.25903	-0.00532	-0.25900	-0.04630
44	-0.21561	-0.00533	-0.21560	-0.04159
45	-0.17231	-0.00466	-0.17230	-0.03598
46	-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	-1.98651	0.65269
2	-0.00457	0.00423	-1.98680	0.65326
3	-0.00378	0.00411	-1.98700	0.65390
4	-0.00303	0.00386	-1.98711	0.65460
5	-0.00233	0.00351	-1.98712	0.65534
6	-0.00169	0.00304	-1.98704	0.65610
7	-0.00113	0.00248	-1.98687	0.65685
8	-0.00067	0.00184	-1.98661	0.65759
9	-0.00031	0.00113	-1.98626	0.65830
10	-0.00007	0.00038	-1.98584	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	0.58584	-1.83287	0.56332
2	-1.80037	0.55576	-1.80217	0.52486
3	-1.76917	0.52686	-1.77133	0.48846
4	-1.73785	0.49906	-1.74031	0.45394
5	-1.70637	0.47230	-1.70905	0.42113
6	-1.67457	0.44652	-1.67750	0.38992
7	-1.64258	0.42168	-1.64561	0.36019
8	-1.61033	0.39771	-1.61331	0.33183
9	-1.57755	0.37458	-1.58055	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	-1.44308	0.20801
14	-1.40443	0.26992	-1.40685	0.18643
15	-1.36755	0.25099	-1.36987	0.16583
16	-1.33017	0.23270	-1.33219	0.14620
17	-1.29204	0.21506	-1.29385	0.12752
18	-1.25331	0.19806	-1.25491	0.10978
19	-1.21404	0.18172	-1.21544	0.09298
20	-1.17430	0.16604	-1.17550	0.07711
21	-1.12414	0.15103	-1.13515	0.06217
22	-1.09364	0.13670	-1.09448	0.04815
23	-1.05286	0.12305	-1.05354	0.03506
24	-1.01186	0.11008	-1.01240	0.02288
25	-0.97069	0.09761	-0.97111	0.01161
26	-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	0.04590	-0.76427	-0.03138
31	-0.72307	0.03880	-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	0.01659	-0.60023	-0.05024
35	-0.55961	0.01319	-0.55955	-0.05287
36	-0.51907	0.00846	-0.51901	-0.05469
37	-0.47867	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	-0.00644	-0.27818	-0.04867
43	-0.23834	-0.00671	-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	0.00418	-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	-0.00069	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	-1.86086	0.61242
15	-0.00068	-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	-0.00567	-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	-1.58764	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	0.34627	-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
16	-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	0.03831
23	-0.97820	0.10781	-0.97850	0.02633
24	-0.94057	0.09601	-0.94080	0.01522
25	-0.90285	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	-0.02786
30	-0.71374	0.03390	-0.71374	-0.03405
31	-0.67591	0.03163	-0.67590	-0.03944
32	-0.63811	0.02478	-0.63809	-0.04404
33	-0.60034	0.01846	-0.60031	-0.04787
34	-0.56260	0.01355	-0.56257	-0.05092
35	-0.52491	0.00878	-0.52487	-0.05320
36	-0.48725	0.00460	-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	-0.22456	-0.00781	-0.22455	-0.04407
44	-0.18711	-0.00721	-0.18711	-0.03949
45	-0.14968	-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	0.57683
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	0.58508
17	-0.00158	-0.00464	-1.78784	0.58495
18	-0.00232	-0.00510	-1.78714	0.58471
19	-0.00302	-0.00546	-1.78649	0.58434
20	-0.00378	-0.00570	-1.78591	0.58389

SECTION NO. 6 'Z'= 8.125

POINT NO	XP	YP	XS	YS
1	-1.73959	0.55239	-1.73948	0.52975
2	-1.70301	0.52093	-1.70291	0.49044
3	-1.66654	0.49095	-1.66546	0.45347
4	-1.63017	0.46220	-1.63013	0.41852
5	-1.59388	0.43458	-1.59388	0.38571
6	-1.55767	0.40352	-1.55771	0.35460
7	-1.52153	0.38308	-1.52161	0.32517
8	-1.48544	0.35839	-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	-1.30562	0.17843
14	-1.26942	0.23385	-1.26962	0.15829
15	-1.23341	0.21604	-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	0.08908	-0.90807	0.01123
25	-0.87173	0.07841	-0.87177	0.00139
26	-0.83543	0.06839	-0.83546	-0.00764
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	-0.54478	0.01057	-0.54477	-0.05174
35	-0.50845	0.00618	-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	-0.00588	-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	-0.00880	-0.25421	-0.04781
43	-0.21790	-0.00862	-0.21789	-0.04396
44	-0.18158	-0.00785	-0.18158	-0.03937
45	-0.14527	-0.00651	-0.14527	-0.03401
46	-0.10895	-0.00458	-0.10895	-0.02788
47	-0.07264	-0.00208	-0.07264	-0.02098
48	-0.03632	0.00102	-0.03632	-0.01329

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00545	0.00411	-1.77656	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	-1.77763	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	-1.77762	0.57654
8	-0.00071	0.00183	-1.77737	0.57729
9	-0.00034	0.00113	-1.77700	0.57799
10	-0.00008	0.00038	-1.77653	0.57862
11	0.00005	-0.00040	-1.77596	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	-1.77384	0.58018
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	0.57048	-1.77738	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	0.43062
5	-1.62382	0.44679	-1.62261	0.39629
6	-1.58559	0.41920	-1.58441	0.36389
7	-1.54749	0.39280	-1.54635	0.33329
8	-1.50951	0.36754	-1.50842	0.30436
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	0.25682	-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	-1.17166	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	-1.06078	0.05918
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	-0.91365	0.01064
25	-0.87704	0.07819	-0.87697	0.00068
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	-0.00666	-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	-0.04467
44	-0.18246	-0.00835	-0.18246	-0.03998

POINT NO	XP	YP	XS	YS
45	-0.14596	-0.00693	-0.14596	-0.03452
46	-0.10946	-0.00491	-0.10946	-0.02828
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	-1.81831	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	-1.81836	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	-0.00198	-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	0.54765
3	-1.79491	0.54748	-1.79235	0.50562
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	0.27817	-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	0.19995	-1.23422	0.11552
18	-1.19570	0.18265	-1.19471	0.09786
19	-1.15611	0.16620	-1.15527	0.08129
20	-1.11661	0.15059	-1.11591	0.06576
21	-1.07722	0.13580	-1.07663	0.05125
22	-1.03792	0.12182	-1.03745	0.03774
23	-0.99874	0.10862	-0.99836	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	-0.84296	-0.01579
28	-0.80437	0.05384	-0.80431	-0.02382
29	-0.76574	0.04503	-0.76572	-0.03101
30	-0.72718	0.03690	-0.72718	-0.03735
31	-0.68866	0.02945	-0.68868	-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	-0.38167	-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	-0.00965	-0.22874	-0.04643
44	-0.19055	-0.00882	-0.19056	-0.04155
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	0.64896

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
12	0.00007	-0.00119	-1.91636	0.64942
13	-0.00004	-0.00198	-1.91568	0.64977
14	-0.00028	-0.00273	-1.91495	0.65000
15	-0.00063	-0.00344	-1.91419	0.65010
16	-0.00108	-0.00409	-1.91341	0.65005
17	-0.00164	-0.00465	-1.91264	0.64990
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	-1.95589	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	-1.69881	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	0.30160	-1.48683	0.20813
15	-1.44708	0.27810	-1.44351	0.18367
16	-1.40313	0.25563	-1.39998	0.16057
17	-1.35904	0.23419	-1.35629	0.13878
18	-1.31488	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	0.12668	-1.09407	0.03401
24	-1.05146	0.11214	-1.05076	0.02060
25	-1.00816	0.09852	-1.00763	0.00828
26	-0.96507	0.08579	-0.96468	-0.00300
27	-0.92216	0.07393	-0.92190	-0.01325
28	-0.87941	0.06290	-0.87925	-0.02250
29	-0.83681	0.05270	-0.83673	-0.03078
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	-0.05804
35	-0.58330	0.00784	-0.58341	-0.06074
36	-0.54130	0.00299	-0.54141	-0.06255
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	-0.06087
41	-0.33208	-0.01045	-0.33214	-0.05823
42	-0.29039	-0.01101	-0.29043	-0.05471
43	-0.24875	-0.01087	-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	0.00378	-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	-2.08456	0.75466
10	-0.00008	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	-2.08196	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	-2.07988	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'= 9.625

POINT NO	XP	YP	XS	YS
1	-2.26554	0.85424	-2.26019	0.82007
2	-2.22134	0.80525	-2.21421	0.75739
3	-2.17794	0.75903	-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	0.63395	-2.03992	0.55025
7	-2.00682	0.59598	-1.99727	0.50645
8	-1.96390	0.55959	-1.95454	0.4 512
9	-1.92055	0.52465	-1.91152	0.42598
10	-1.87655	0.49097	-1.86302	0.38882
11	-1.83201	0.45851	-1.82388	0.35348
12	-1.78650	0.42718	-1.77893	0.31982
13	-1.74002	0.39592	-1.73305	0.28775
14	-1.69259	0.36772	-1.68526	0.25723
15	-1.64437	0.33961	-1.63867	0.22822
16	-1.59548	0.31261	-1.59041	0.20071
17	-1.54665	0.28676	-1.54161	0.17469
18	-1.49623	0.26205	-1.49237	0.15014
19	-1.44515	0.23853	-1.44284	0.12705
20	-1.39593	0.21518	-1.39312	0.10540
21	-1.34557	0.19449	-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	0.10630	-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	-0.05296
33	-0.75795	0.02575	-0.75808	-0.05853
34	-0.71005	0.0.798	-0.71020	-0.06311
35	-0.66223	0.01111	-0.66240	-0.06653
36	-0.61449	0.00511	-0.61466	-0.06900
37	-0.56681	-0.00001	-0.56697	-0.07036
38	-0.51919	-0.00426	-0.51934	-0.07067
39	-0.47164	-0.00756	-0.47177	-0.06993
40	-0.42415	-0.01021	-0.42426	-0.06816
41	-0.37673	-0.01191	-0.37682	-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	-0.18776	-0.01029	-0.18778	-0.04259
46	-0.14071	-0.00733	-0.14072	-0.03552
47	-0.09373	-0.00447	-0.09375	-0.02637
48	-0.04635	-0.00331	-0.04563	-0.01614

POINT NO	XSEM1	YSEM1	XSEM2	YSEM2
1	-0.00548	0.00435	-2.30984	0.89074
2	-0.00459	0.00437	-2.30951	0.89145
3	-0.00391	0.00399	-2.30963	0.89224
4	-0.00315	0.00377	-2.30989	0.89308
5	-0.00243	0.00344	-2.31005	0.89395
6	-0.00175	0.00299	-2.31012	0.89485
7	-0.00121	0.00245	-2.31013	0.89573
8	-0.00072	0.00182	-2.30998	0.89653
9	-0.00035	0.00112	-2.30977	0.89737
10	-0.00008	0.00038	-2.30947	0.89813
11	0.00006	-0.00040	-2.30910	0.89873
12	0.00007	-0.00117	-2.30865	0.89925
13	-0.00003	-0.00197	-2.30815	0.89965
14	-0.00026	-0.00273	-2.30761	0.89994
15	-0.00057	-0.00344	-2.30703	0.90008
16	-0.00106	-0.00409	-2.30643	0.90008
17	-0.00161	-0.00465	-2.30583	0.89994
18	-0.00225	-0.00513	-2.30525	0.89966
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 REESTIMATION 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 [illegible] stage when first tested. The coefficient of the Mach number term in Eq (3) was increased from 0.6667 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 613.1 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.

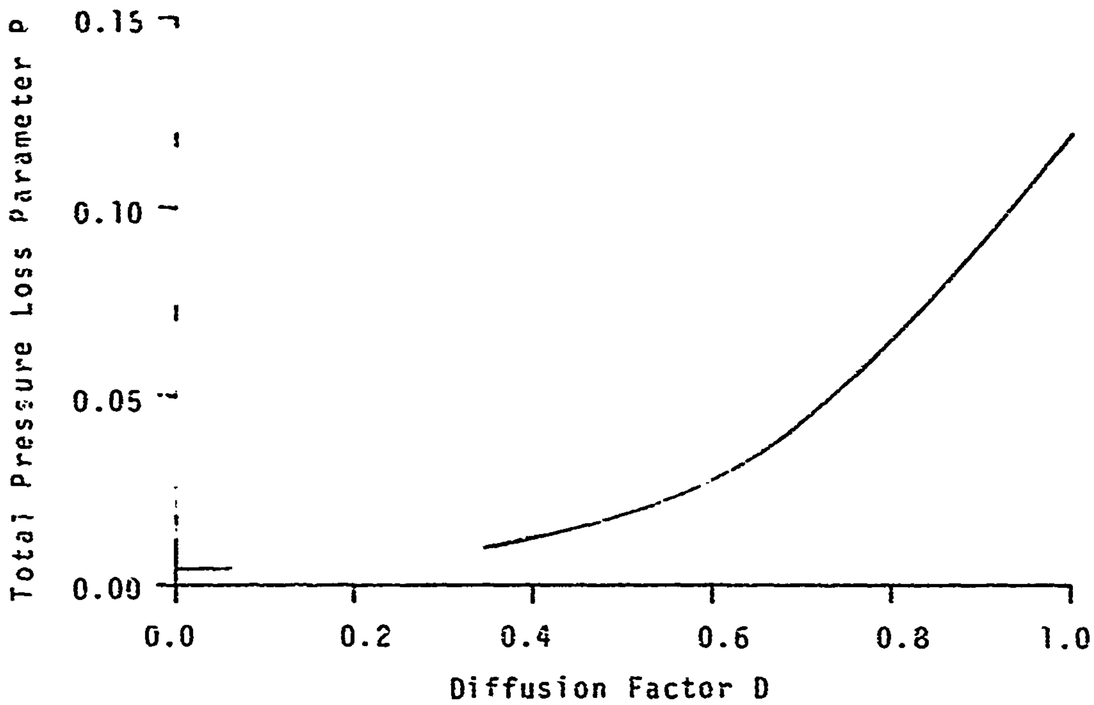


Fig 1. Assumed Relationship Between Total Pressure Loss Parameter and Diffusion Factor

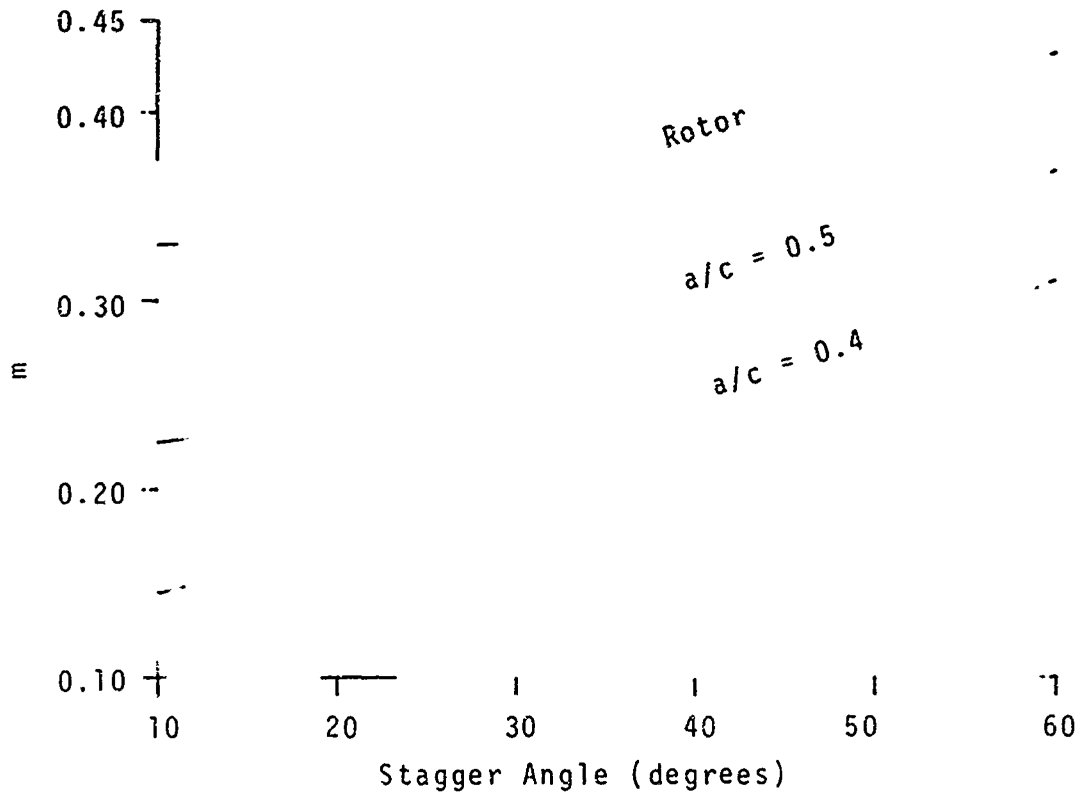


Fig 2. Relationship Between "m" and Stagger Angle in Carter's Rule for Rotor and Conventional Sections

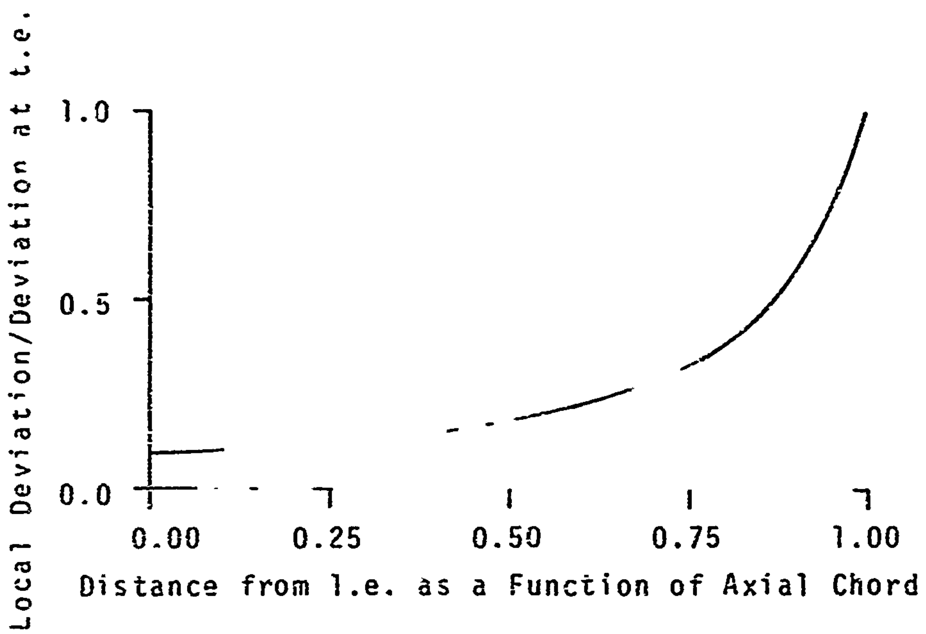


Fig 3. Assumed Generalized Variation of Deviation Within Blade

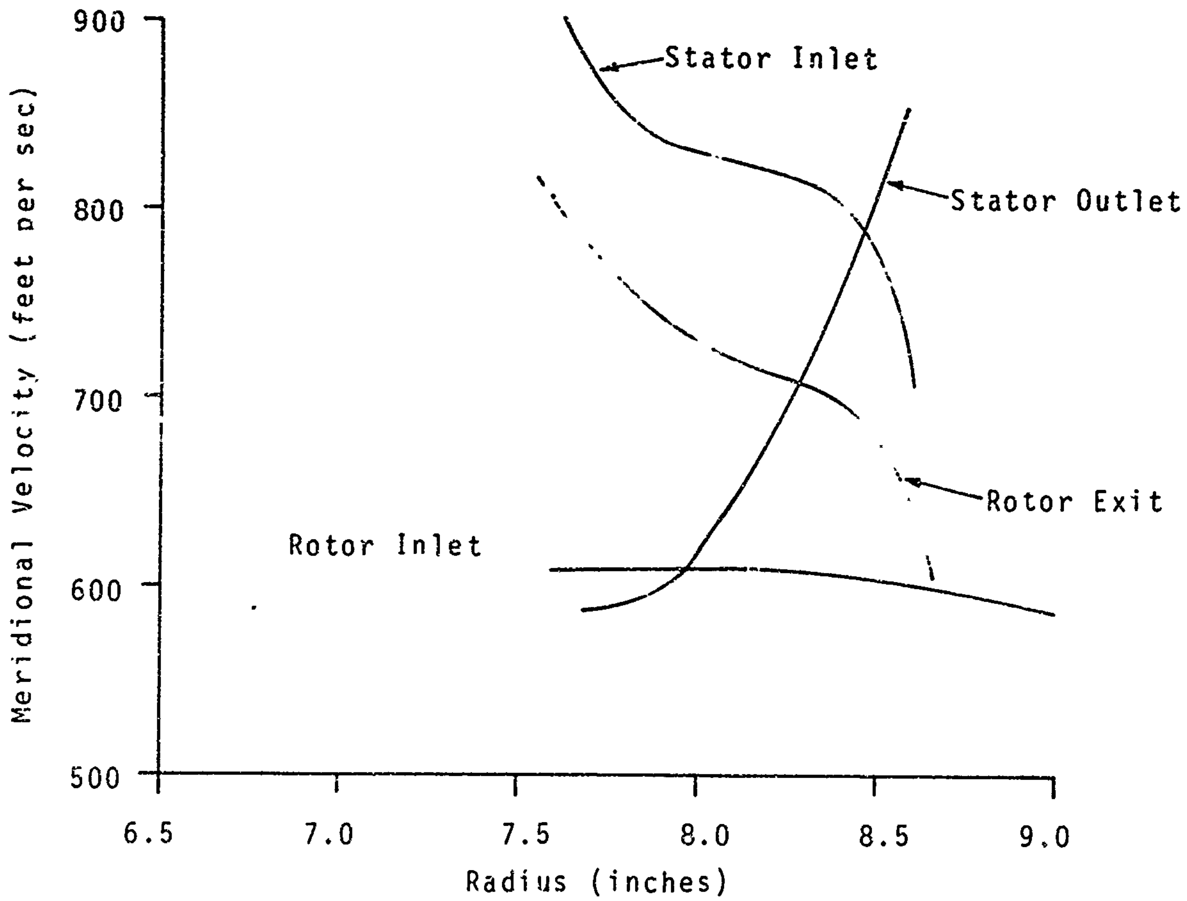


Fig 4. Meridional Velocity Distributions from Iterative Loss Reestimation Procedure

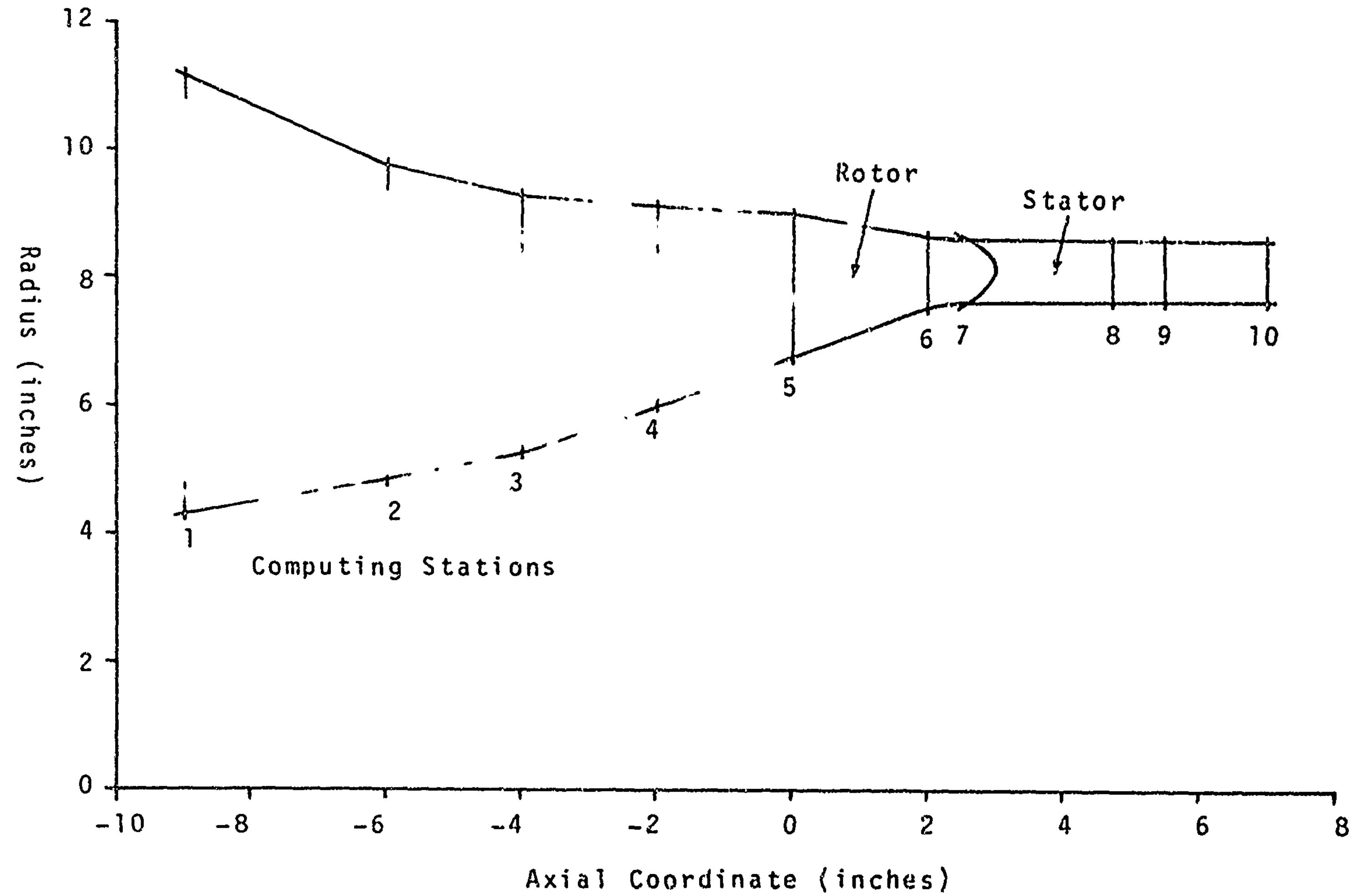


Fig 5. Annulus Geometry and Computing Stations Derived From Iterative Loss Reestimation Procedure

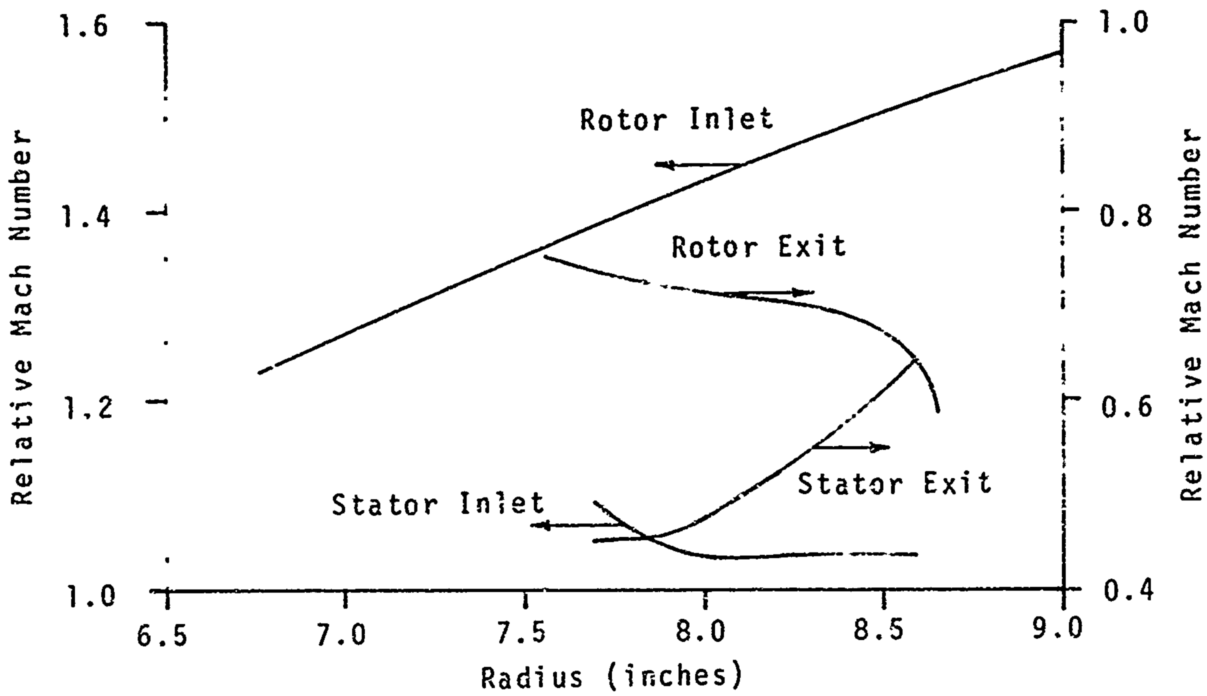


Fig 6. Rotor and Stator Relative Mach Numbers from Iterative Loss Reestimation Procedure

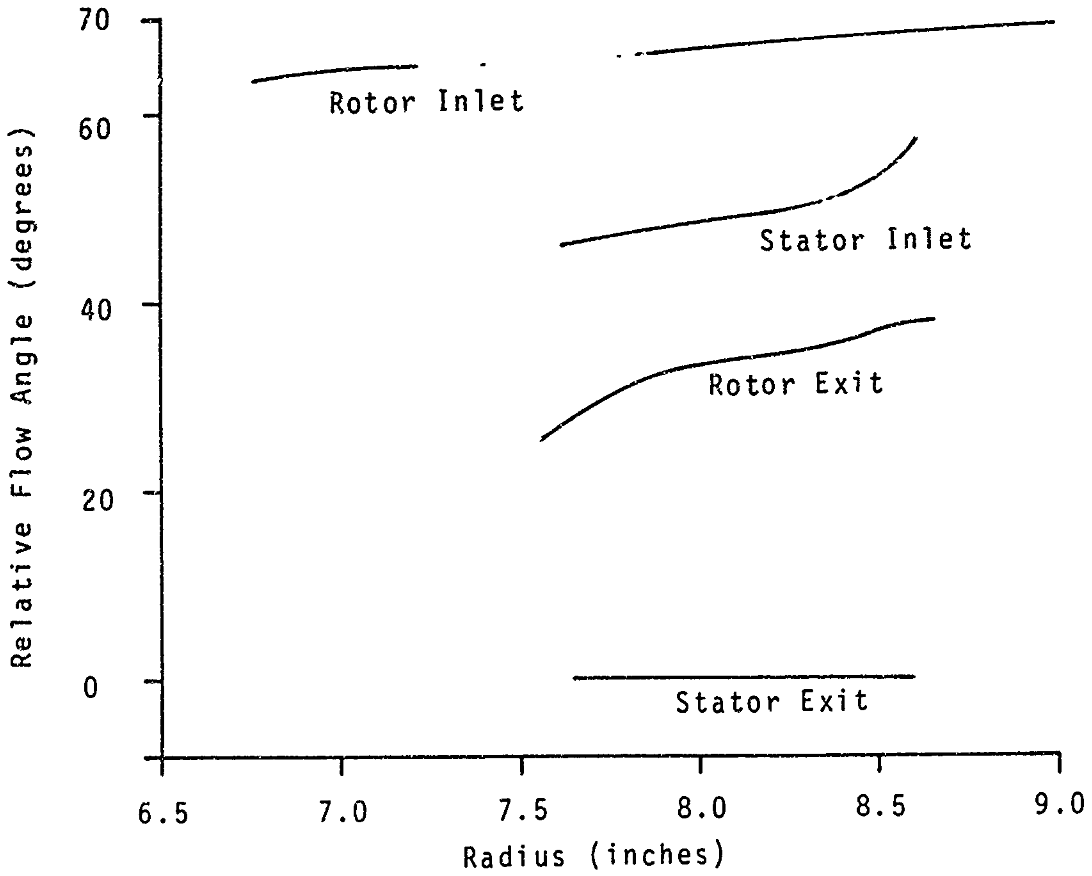


Fig 7. Rotor and Stator Relative Flow Angles from Iterative Loss Reestimation Procedure

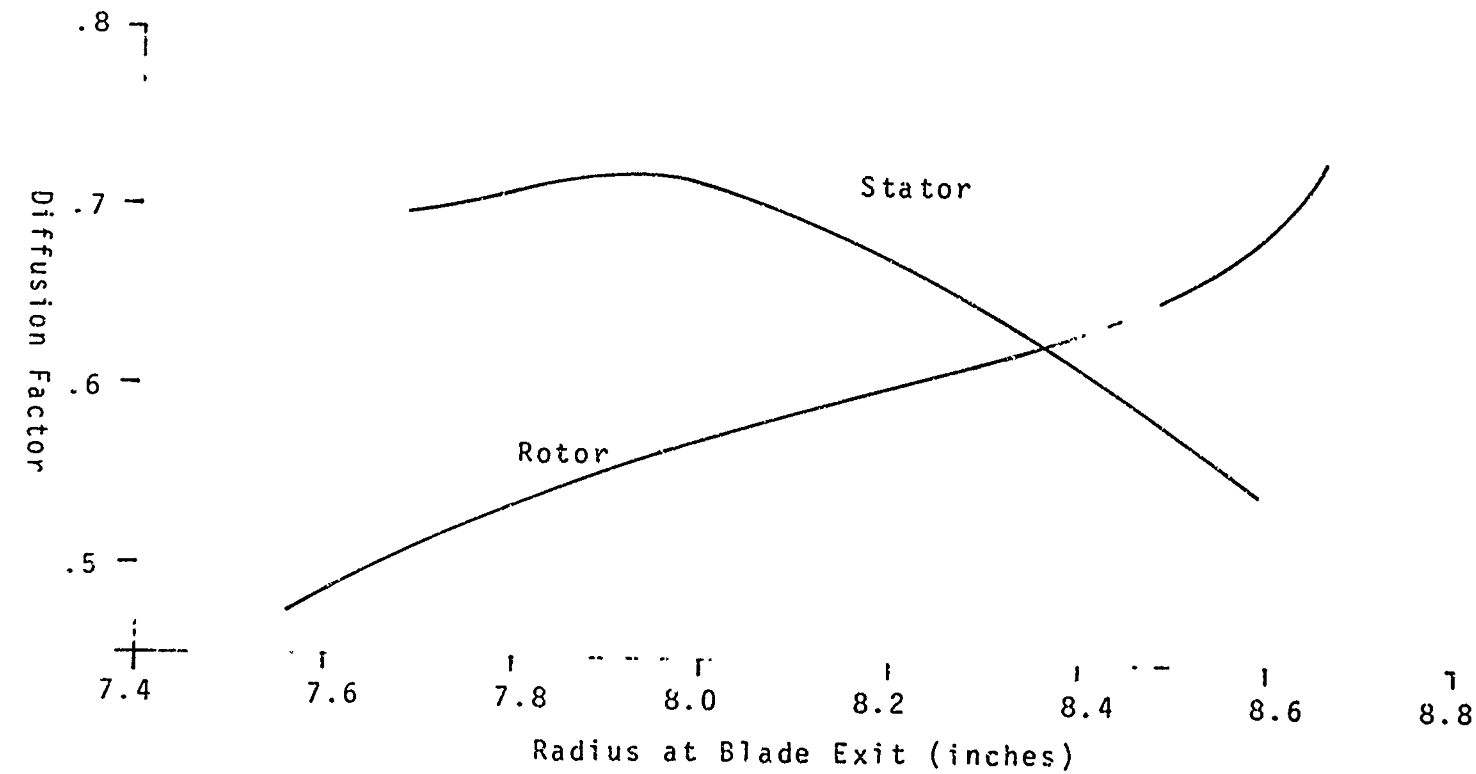


Fig 8. Diffusion Factors for Rotor and Stator from Iterative Loss Reestimation Procedure

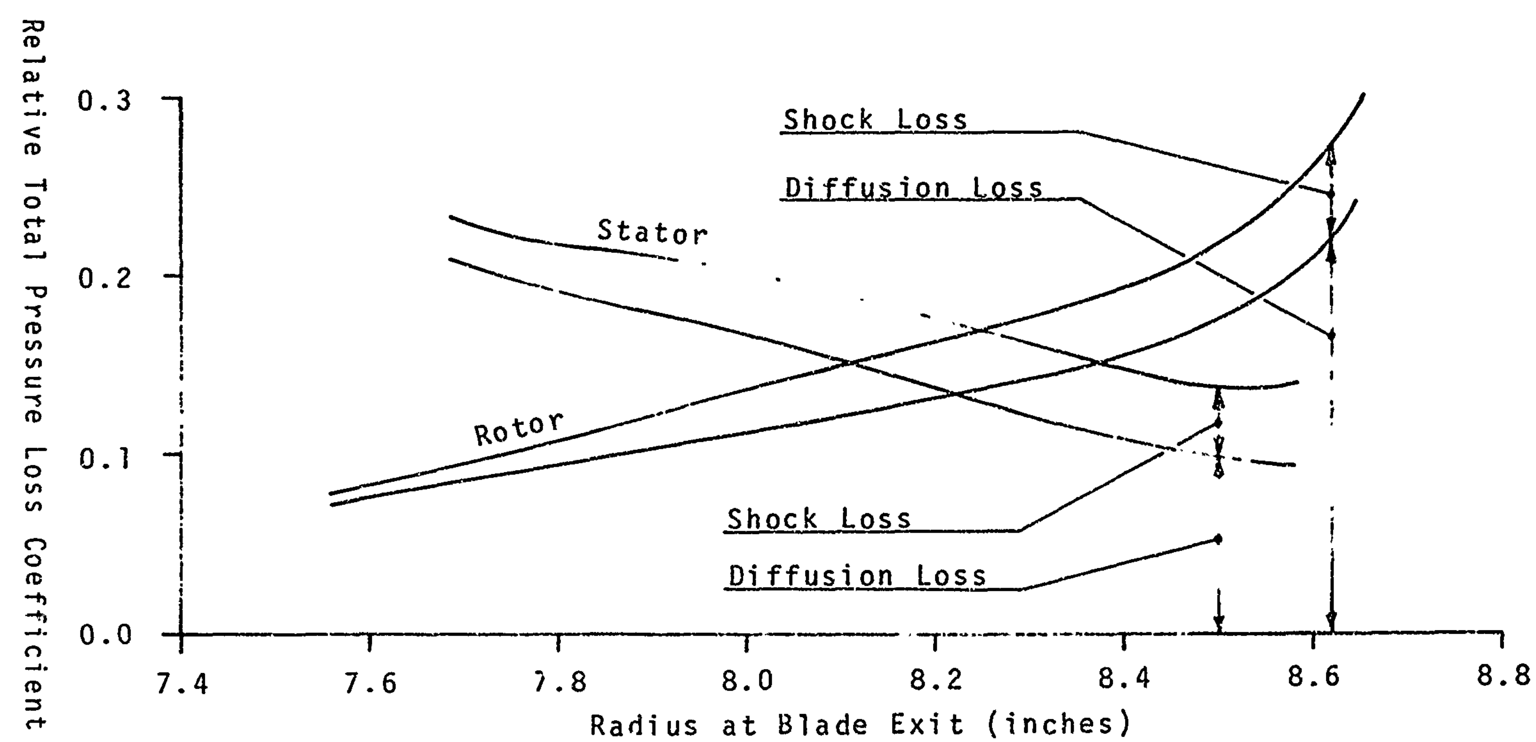


Fig 9. Relative Total Pressure Loss Coefficients for Rotor and Stator from Iterative Loss Reestimation Procedure

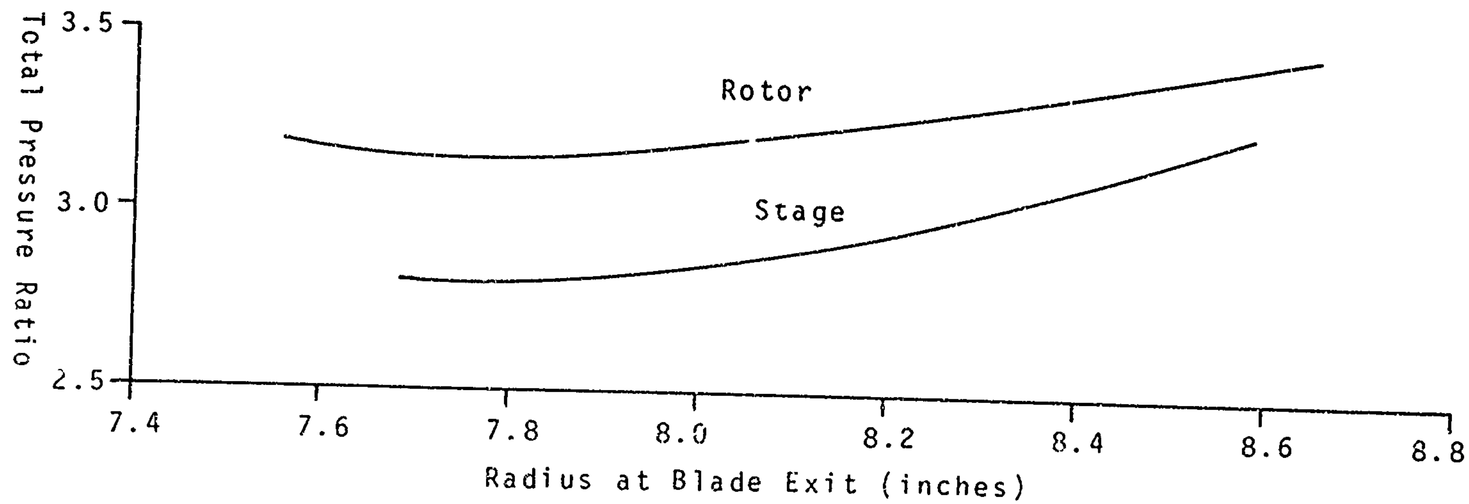


Fig 10. Total Pressure Ratios for Rotor and Stage from Iterative Loss Reestimation Procedure

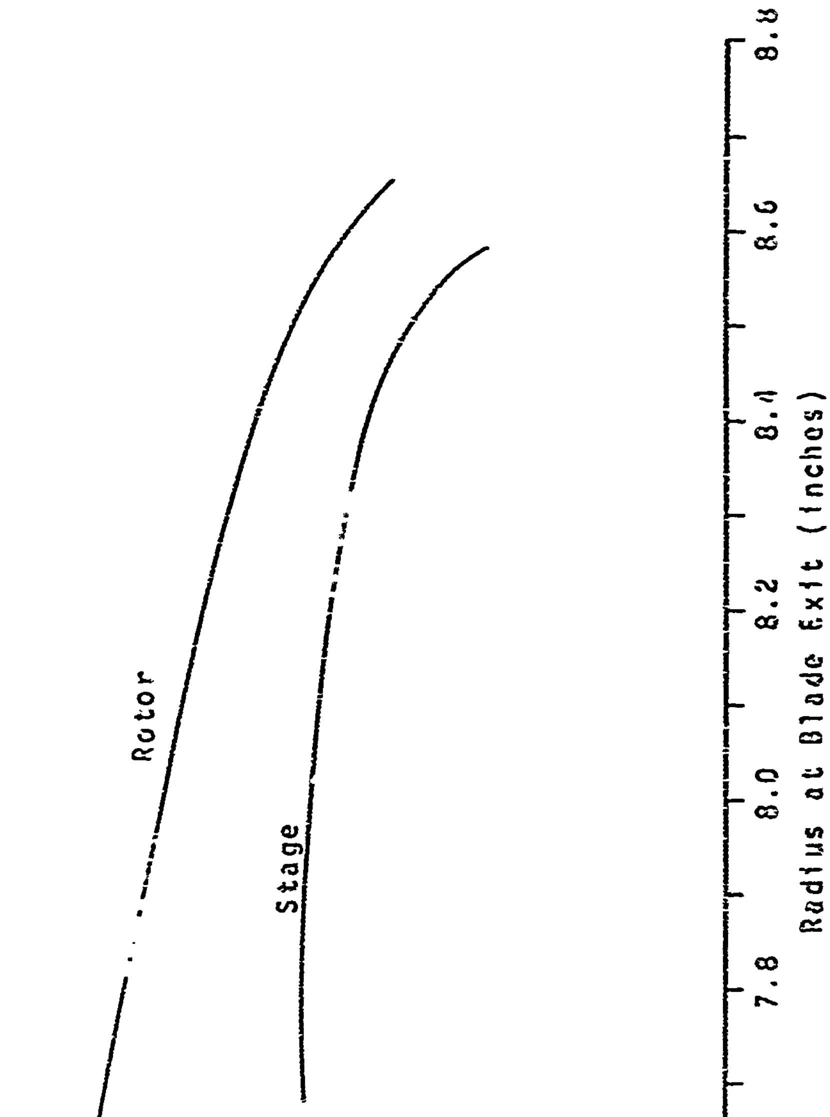


Fig 11. Isentropic Efficiencies for Rotor and Stage from Iterative Loss Reestimation Procedure

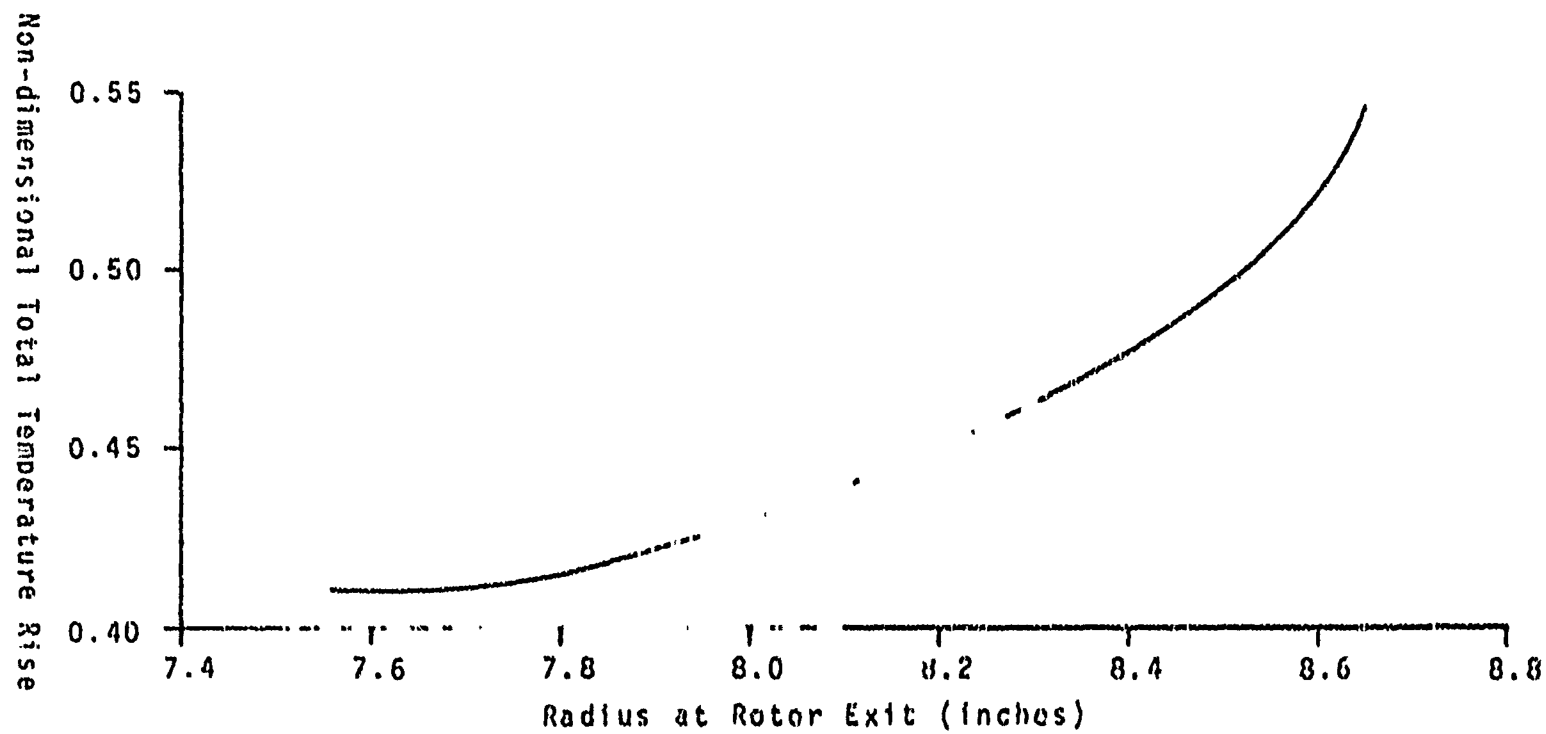


Fig 12. Nondimensional Total Temperature Rise from Iterative Loss Reestimation Procedure

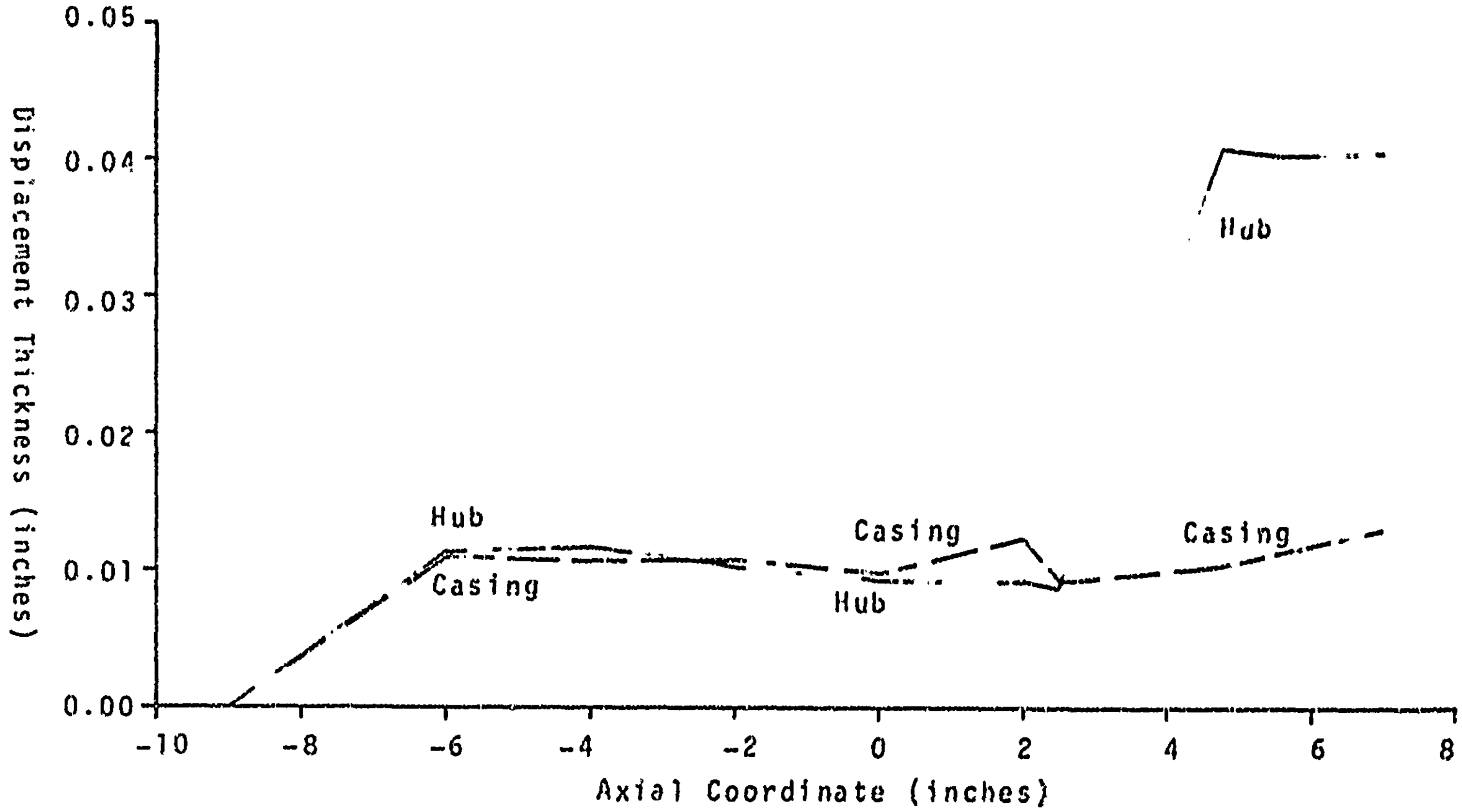


Fig 13. Annulus Wall Boundary Layer Displacement Thicknesses from Iterative Loss Reestimation Procedure

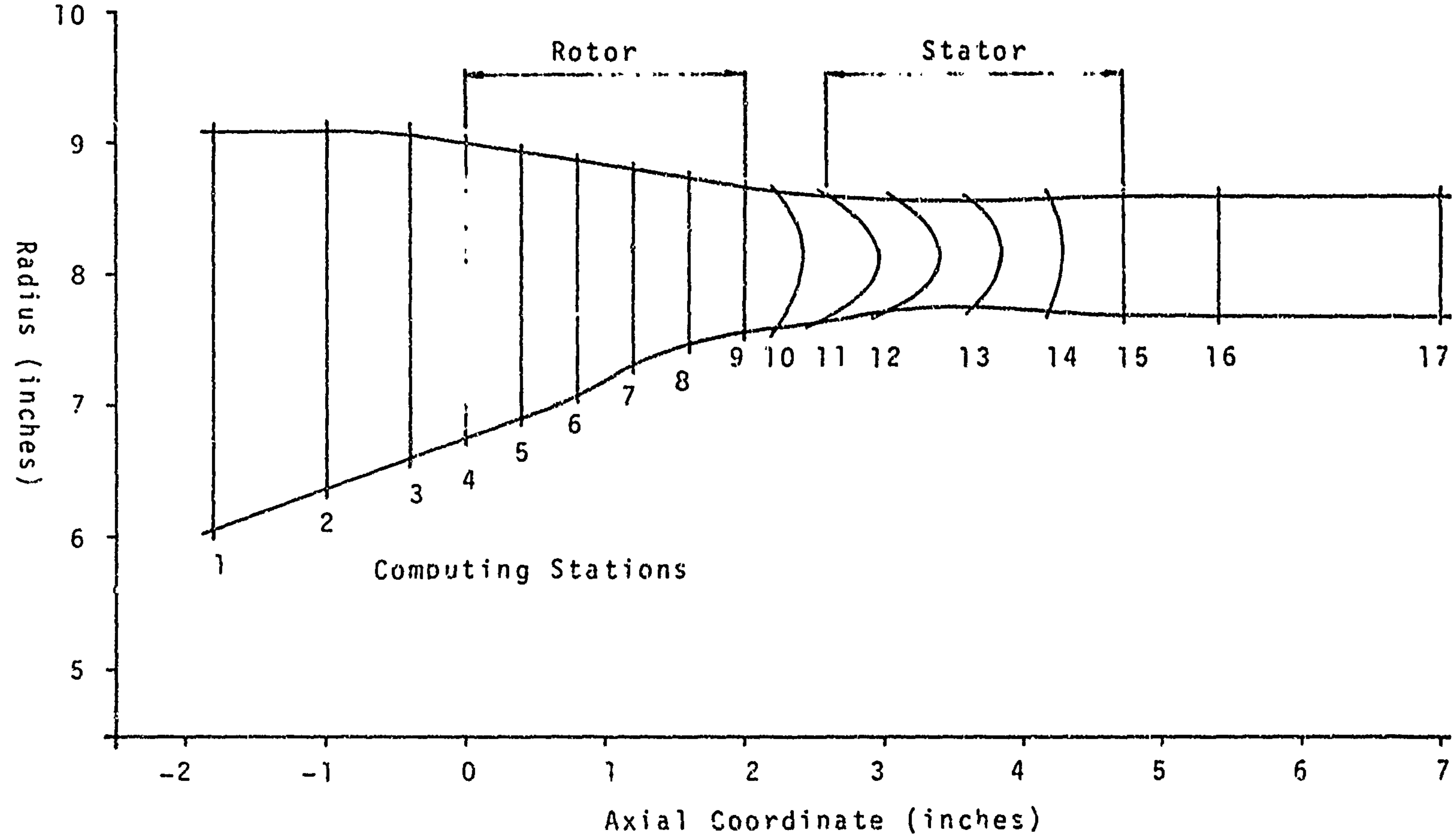


Fig 14. Annulus Geometry and Computing Stations for Final Blading Analysis

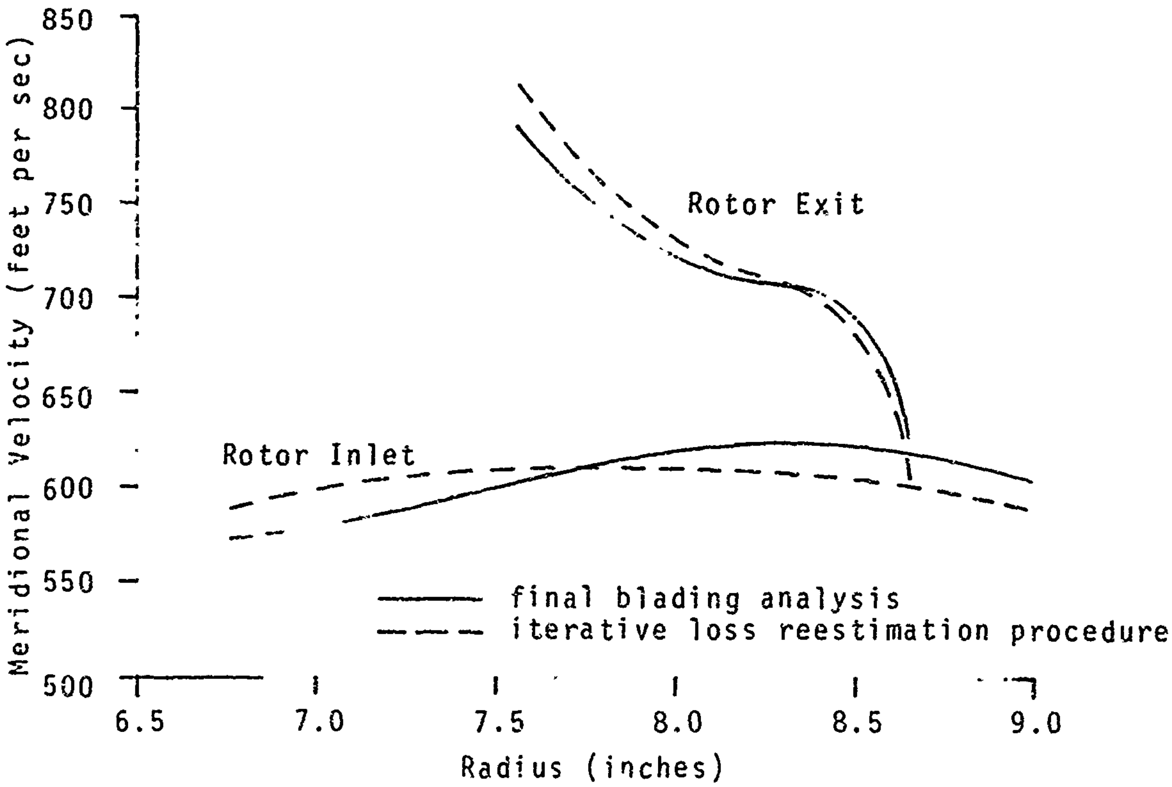


Fig 15. Meridional Velocity Distributions for Rotor from Final Blading Analysis and Iterative Loss Reestimation Procedure

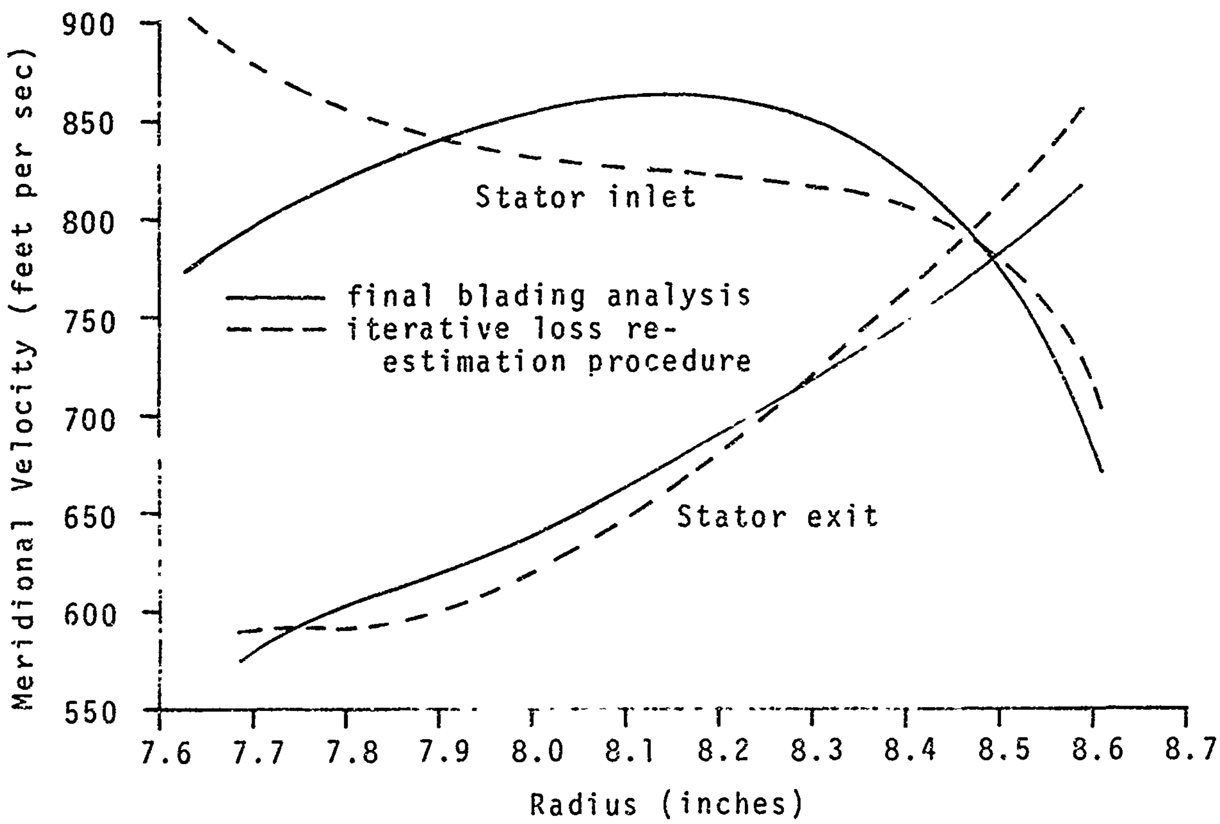


Fig 16. Meridional Velocity Distributions for Stator from Final Blading Analysis and Iterative Loss Reestimation Procedure

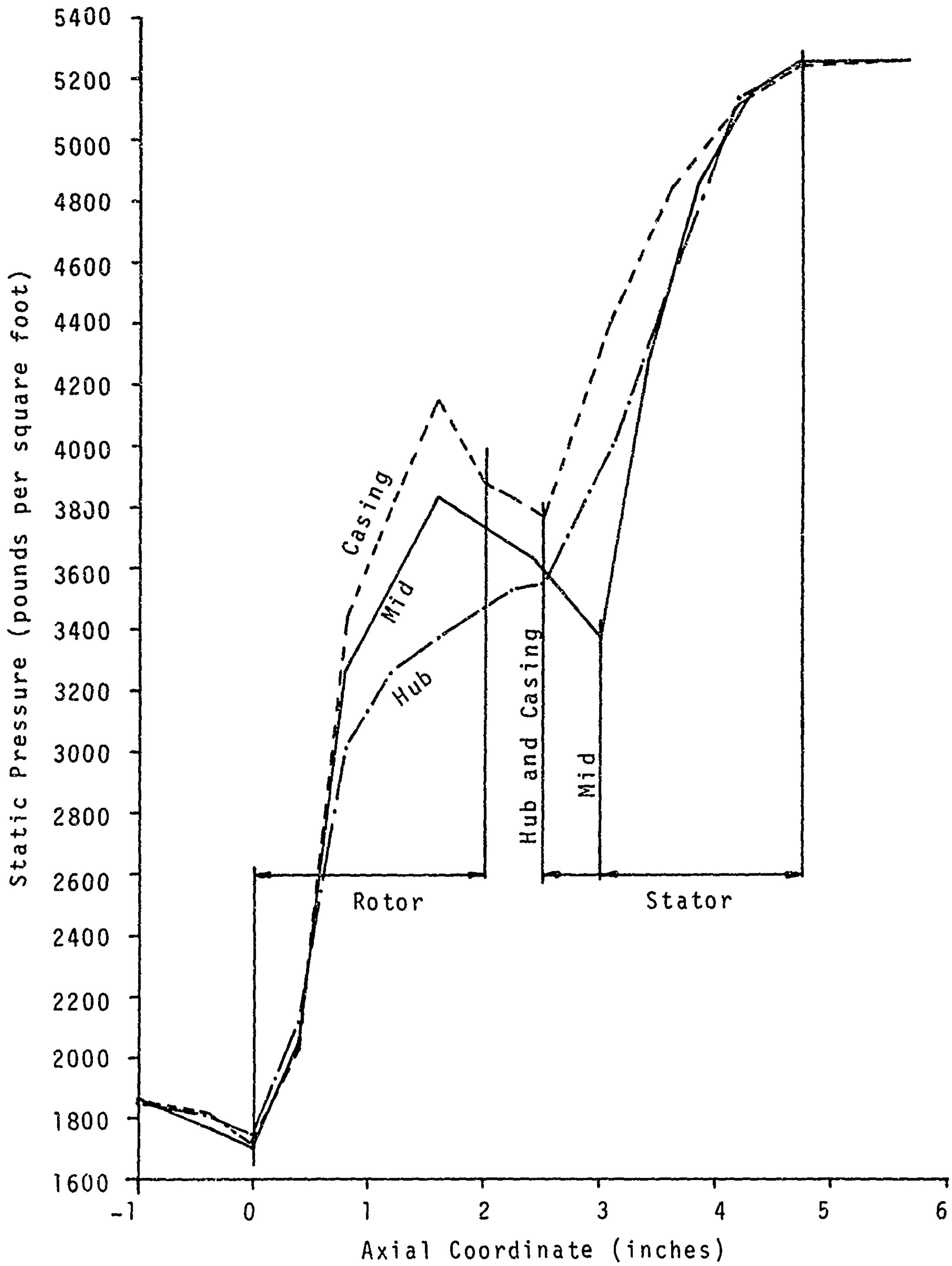


Fig 17. Static Pressure Distribution Through Stage from Final Blading Analysis

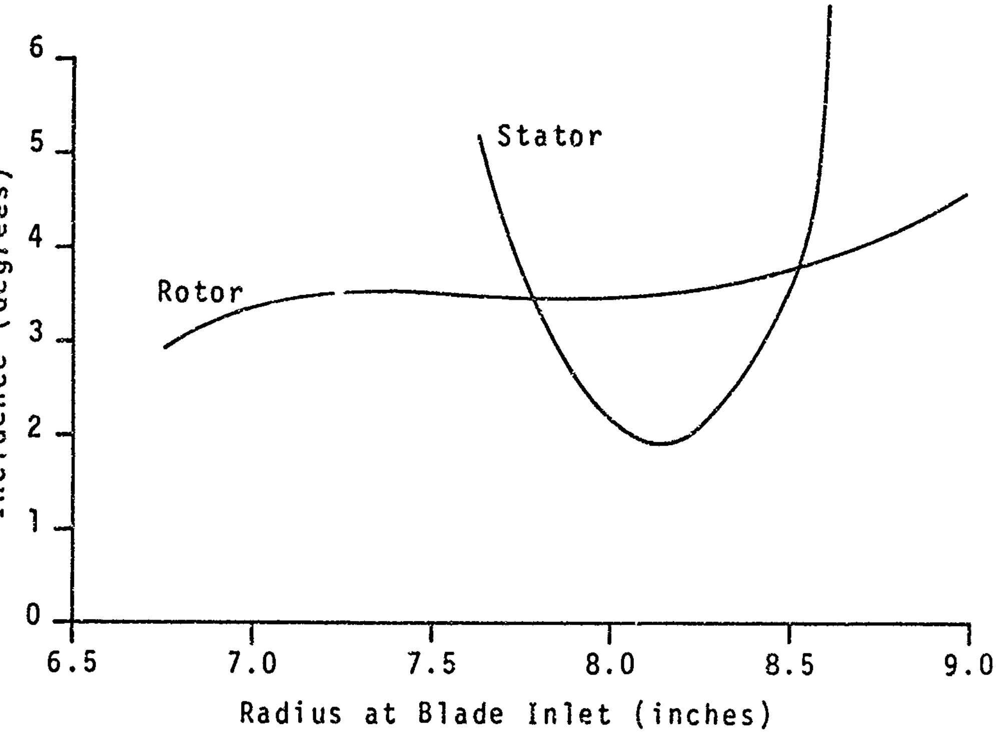


Fig 18. Incidence Angle Distributions for Rotor and Stator from Final Blading Analysis

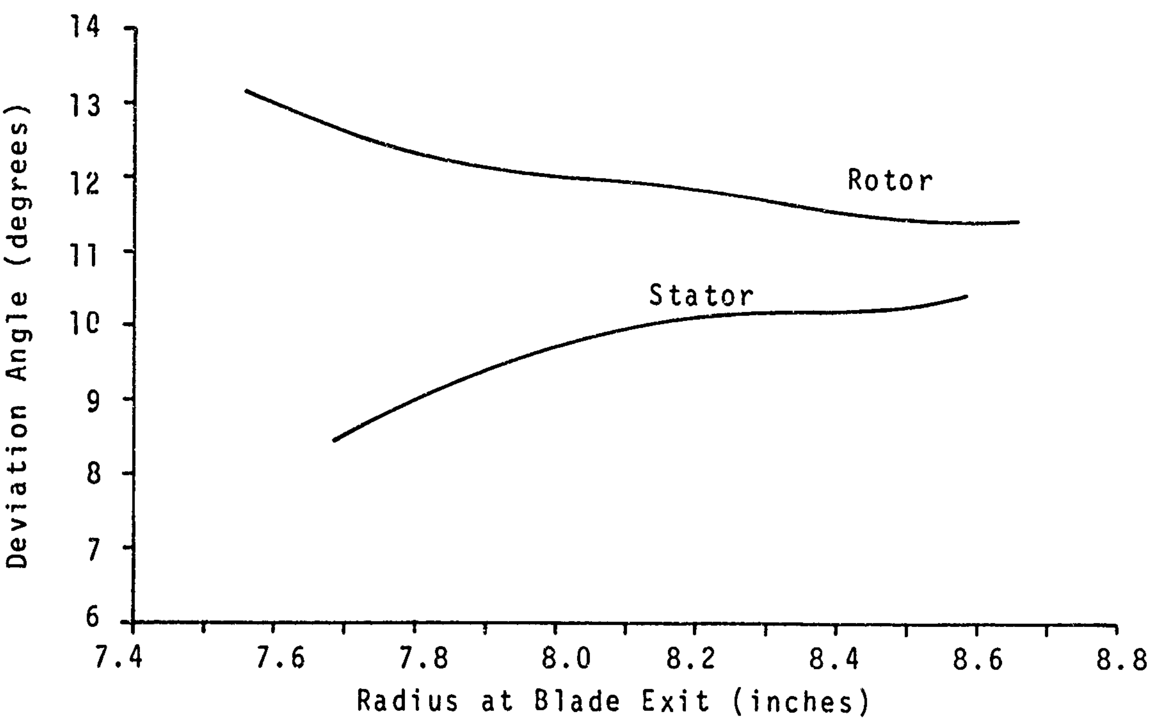


Fig 19. Deviation Angle Distributions for Rotor and Stator from Final Blading Analysis

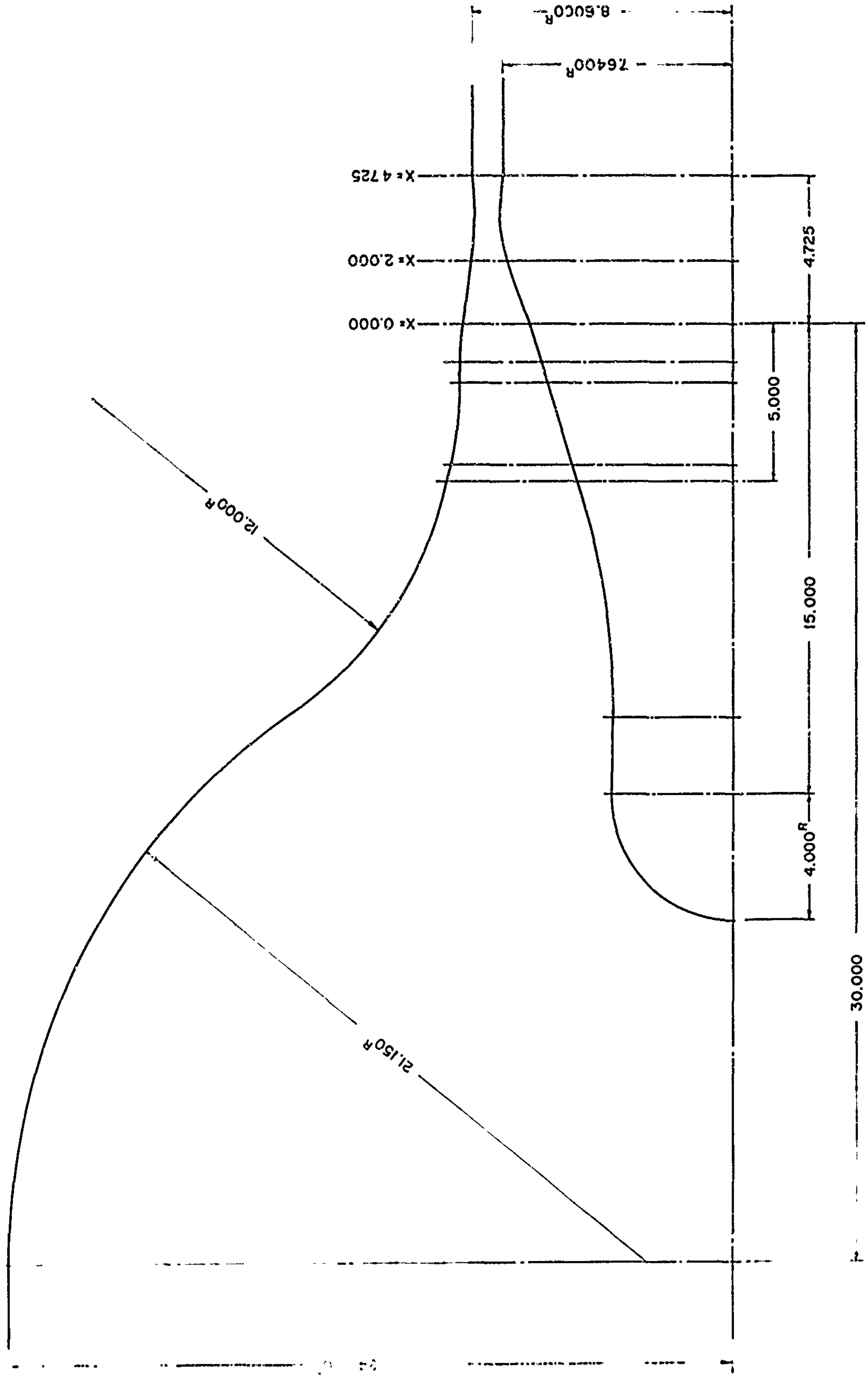
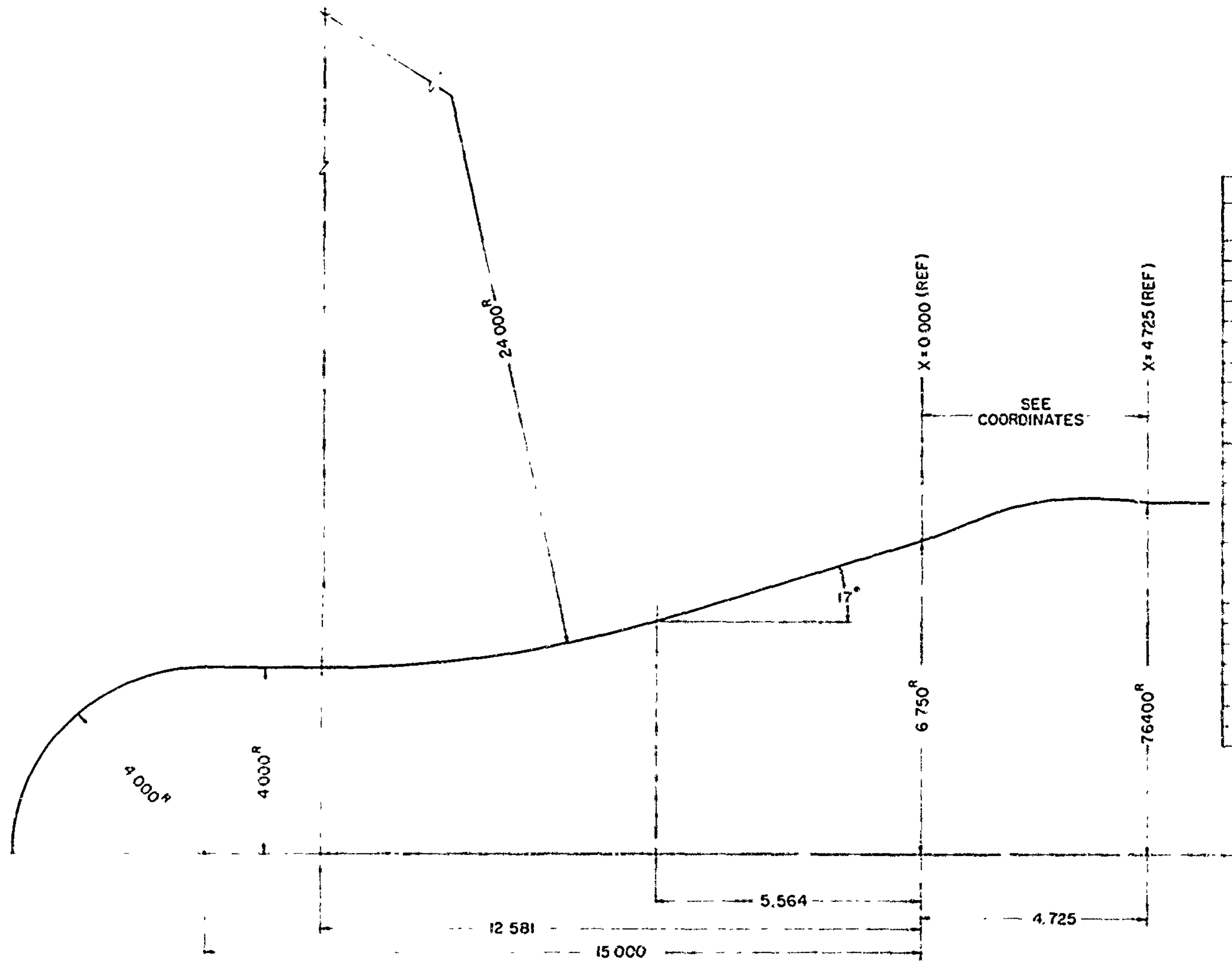
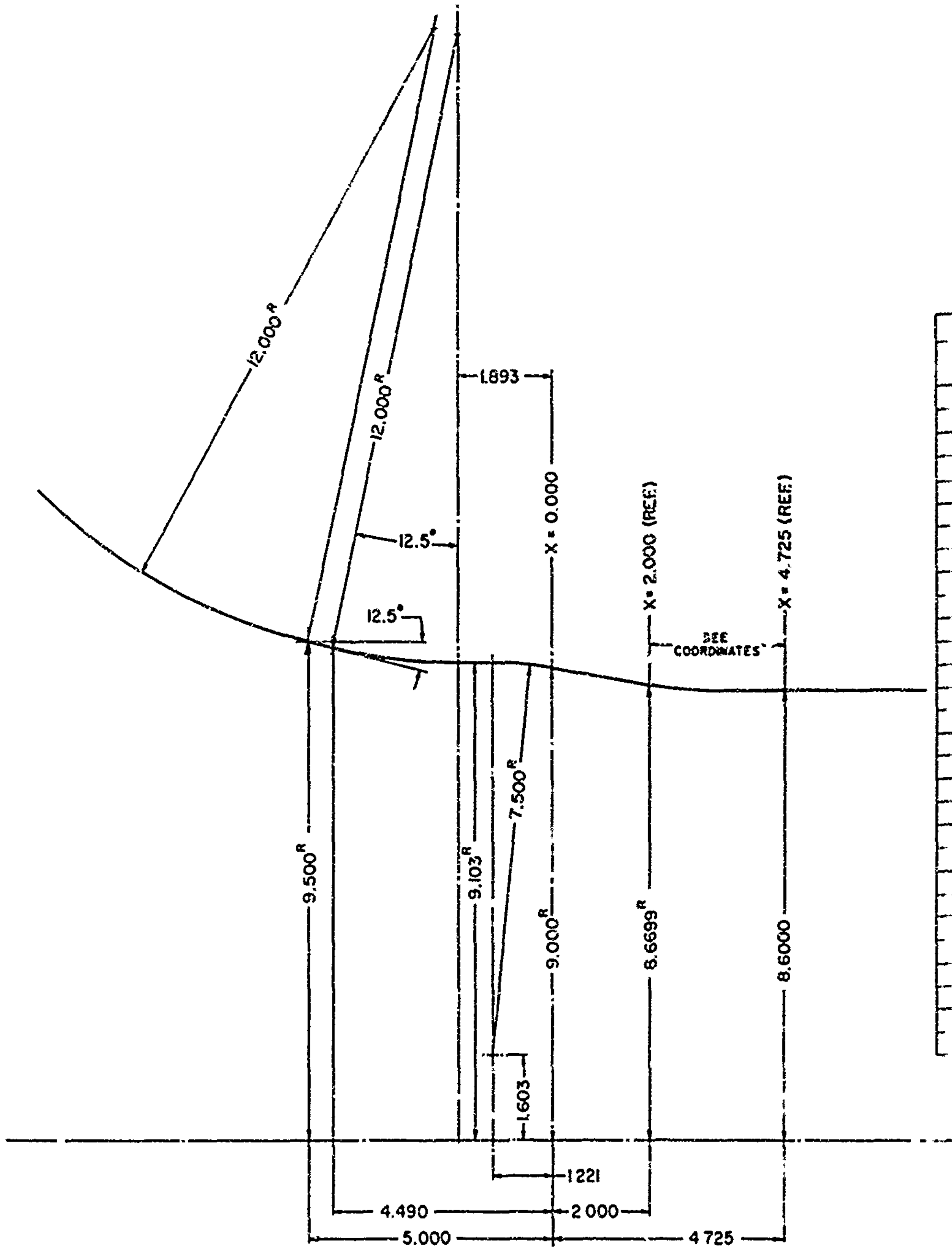


Fig 20. Definition of Overall Flowpath



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 0784	3 3	7 7327
0 9	7 1350	3 4	7 7334
1 0	7 1948	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 5499	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



COORDINATES	
DIM. X	RADIUS
2.0	8.6699
2.1	8.6536
2.2	8.6399
2.3	8.6312
2.4	8.6255
2.5	8.6199
2.6	8.6123
2.7	8.6029
2.8	8.5930
2.9	8.5836
3.0	8.5760
3.1	8.5712
3.2	8.5694
3.3	8.5700
3.4	8.5723
3.5	8.5754
3.6	8.5786
3.7	8.5813
3.8	8.5834
3.9	8.5852
4.0	8.5869
4.1	8.5886
4.2	8.5907
4.3	8.5930
4.4	8.5954
4.5	8.5975
4.6	8.5991
4.7	8.5999
4.725	8.6000

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

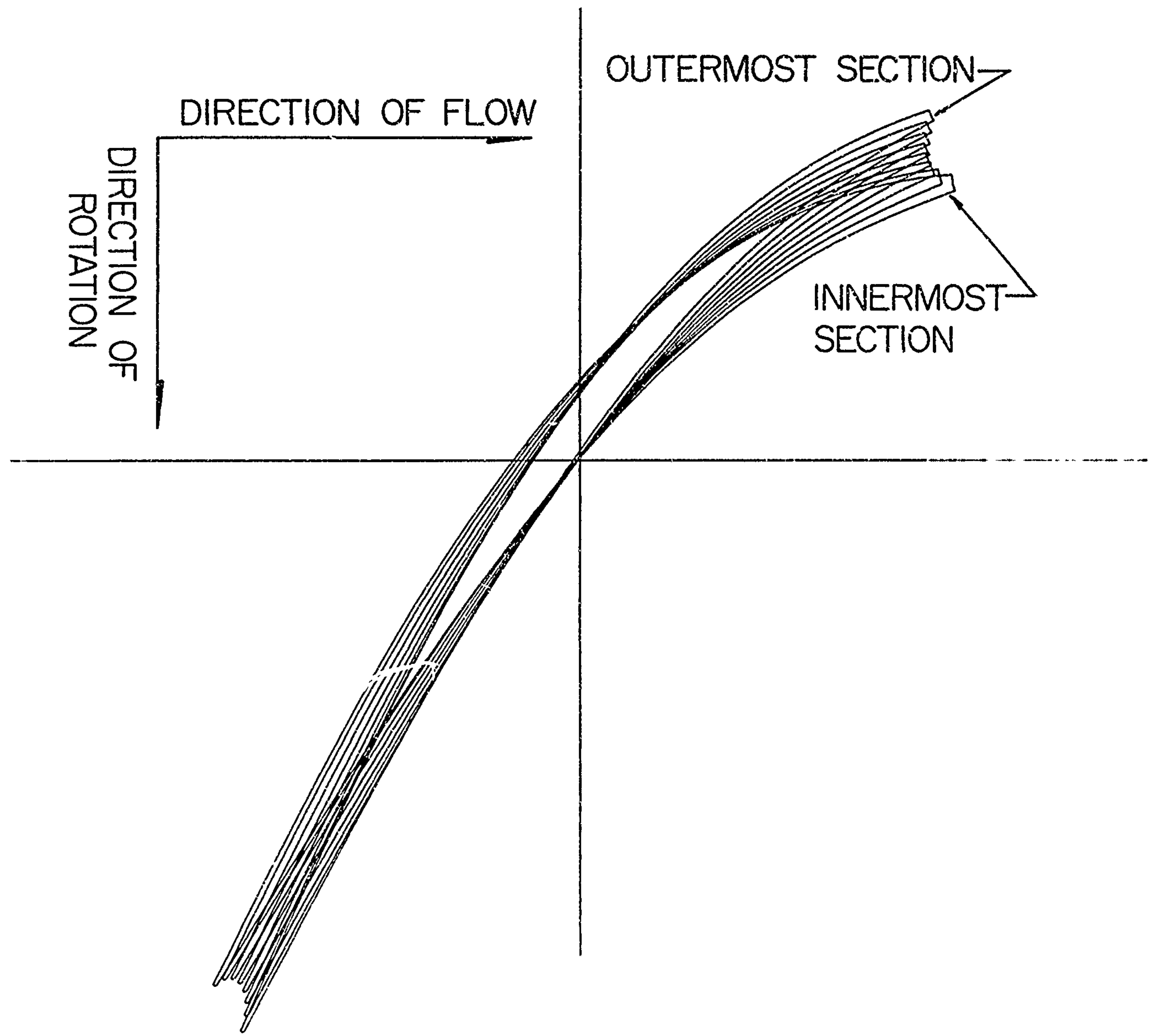


Fig 23. Superimposed Plots of Rotor Blade Streamsurface Sections

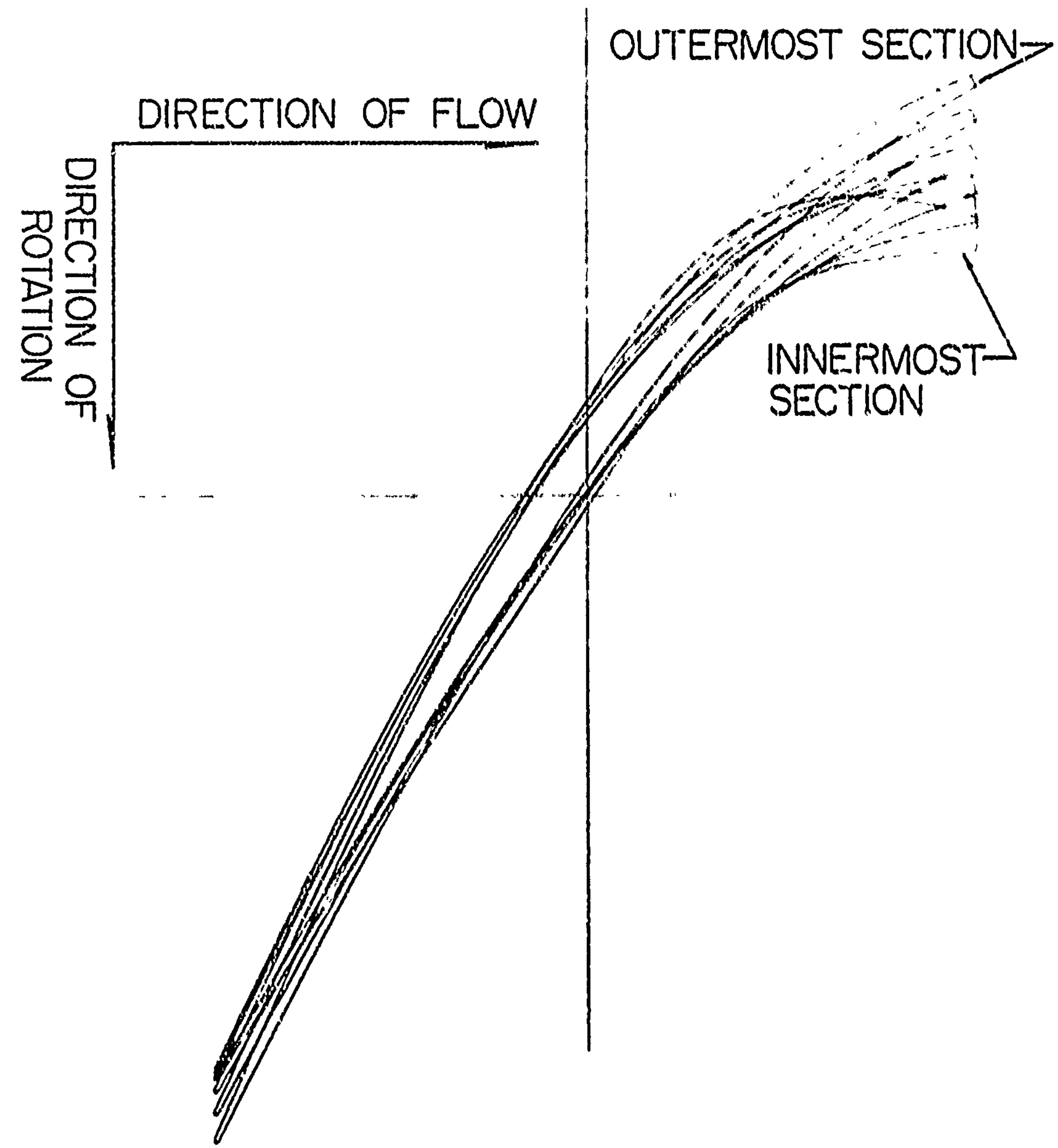


Fig 24. Superimposed Plots of Rotor Blade Cartesian (Manufacturing) Sections

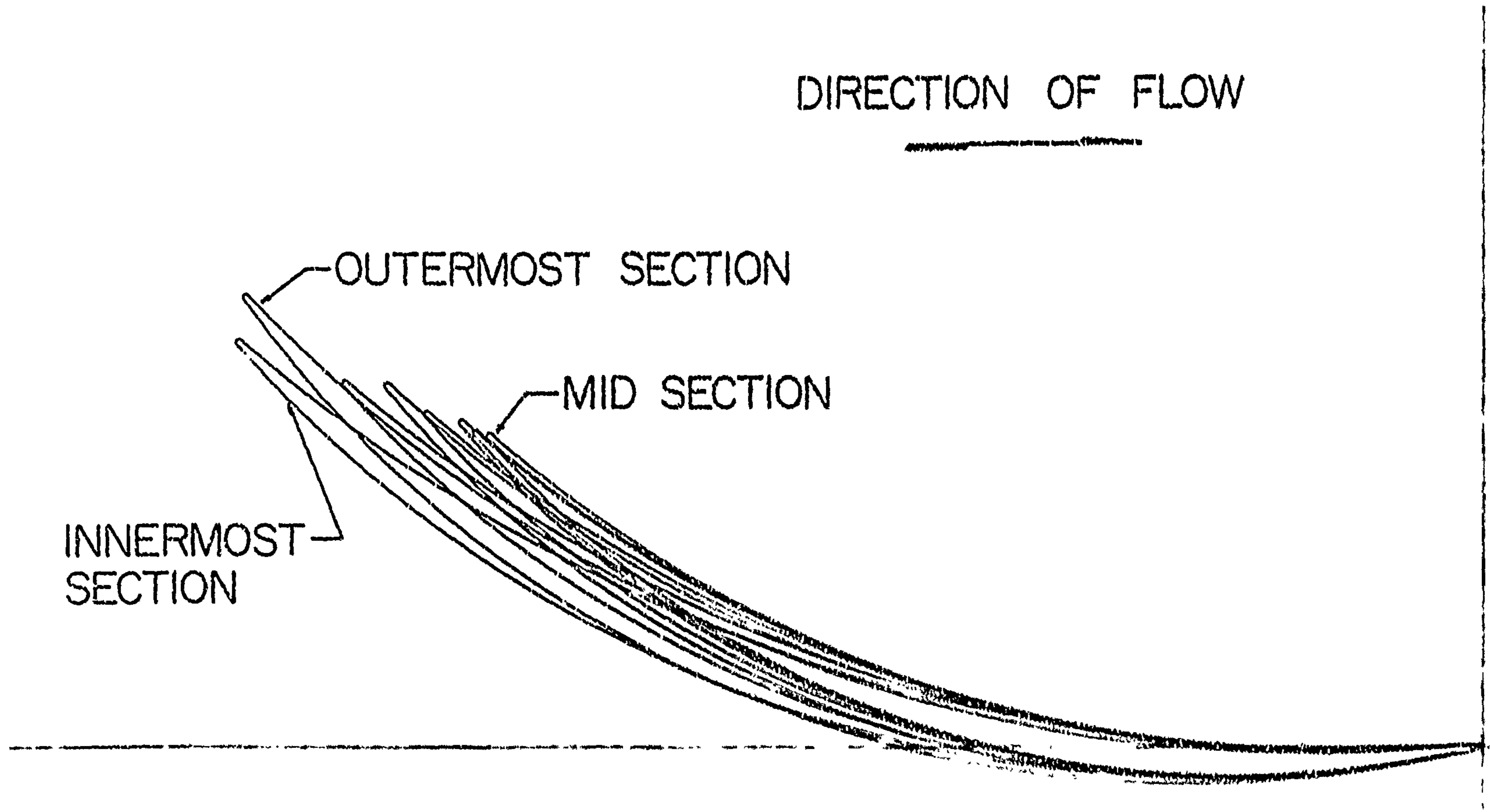


Fig 25. Superimposed Plots of Stator Blade Streamsurface Sections

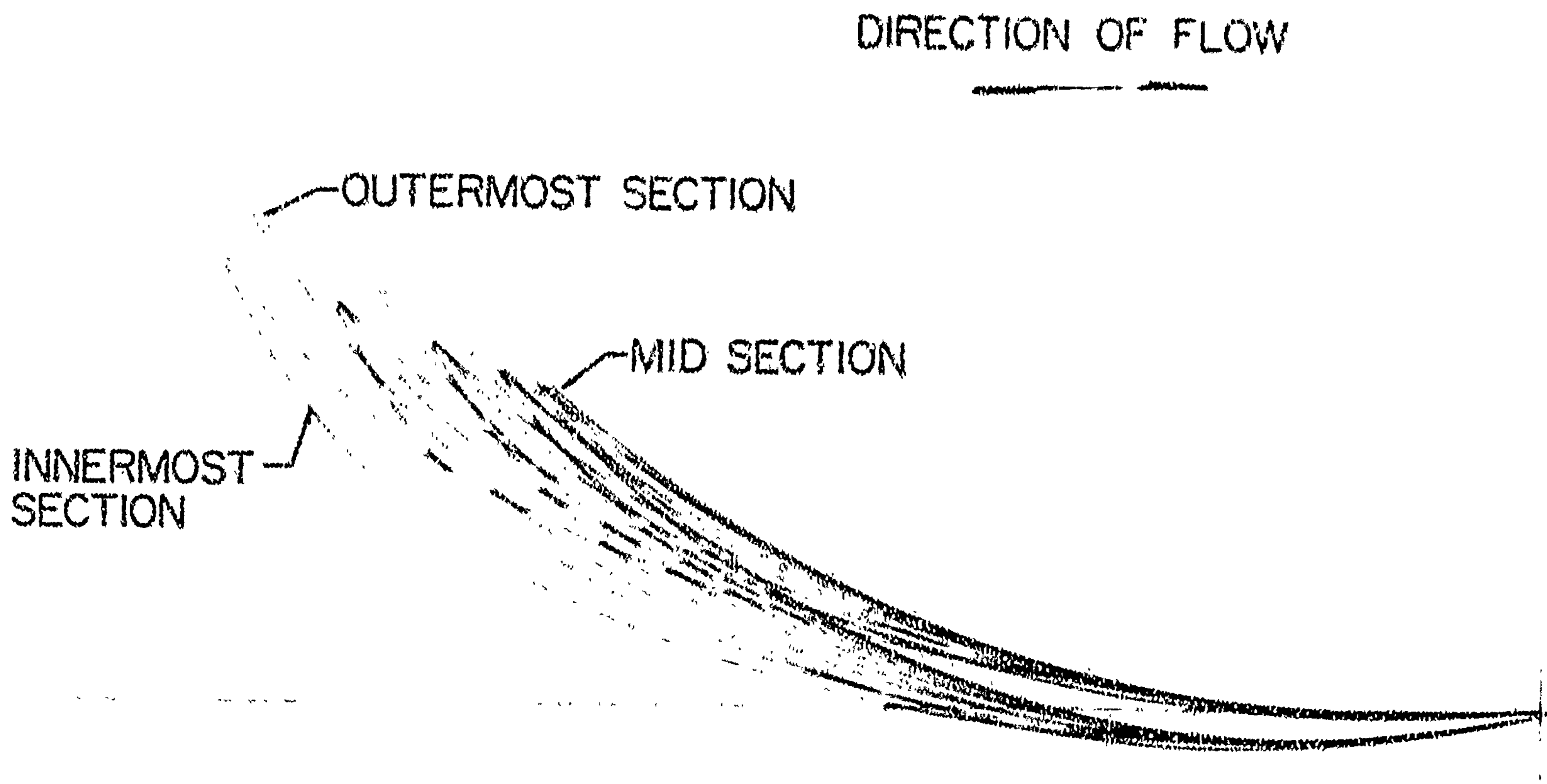


Fig 2[illegible]. Superimposed Plots of Stator Blade Cartesian (Manufacturing) Sections

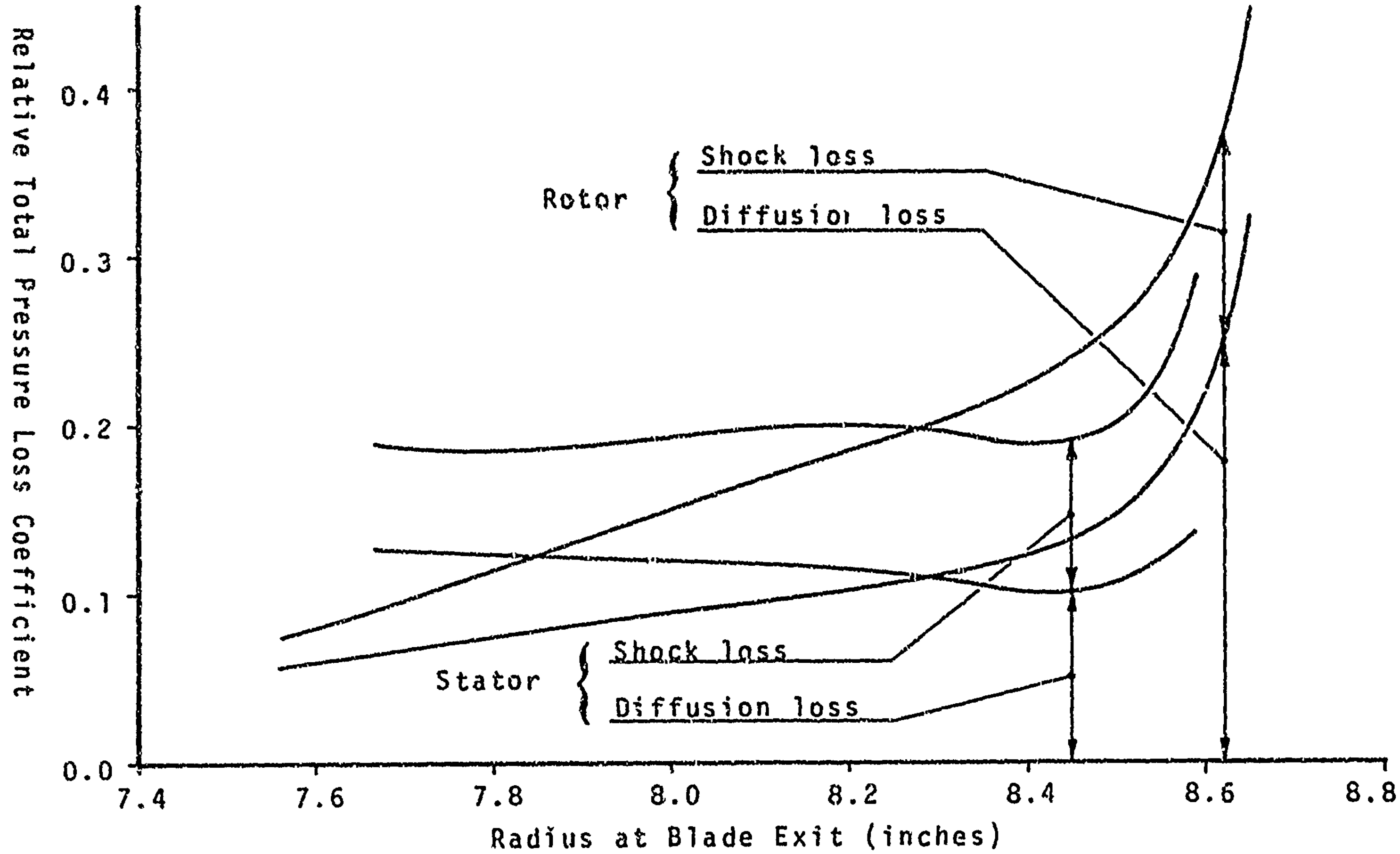


Fig 27. Relative Total Pressure Loss Coefficients for Rotor and Stator from Iterative Loss Reestimation Procedure with Higher Shock Loss

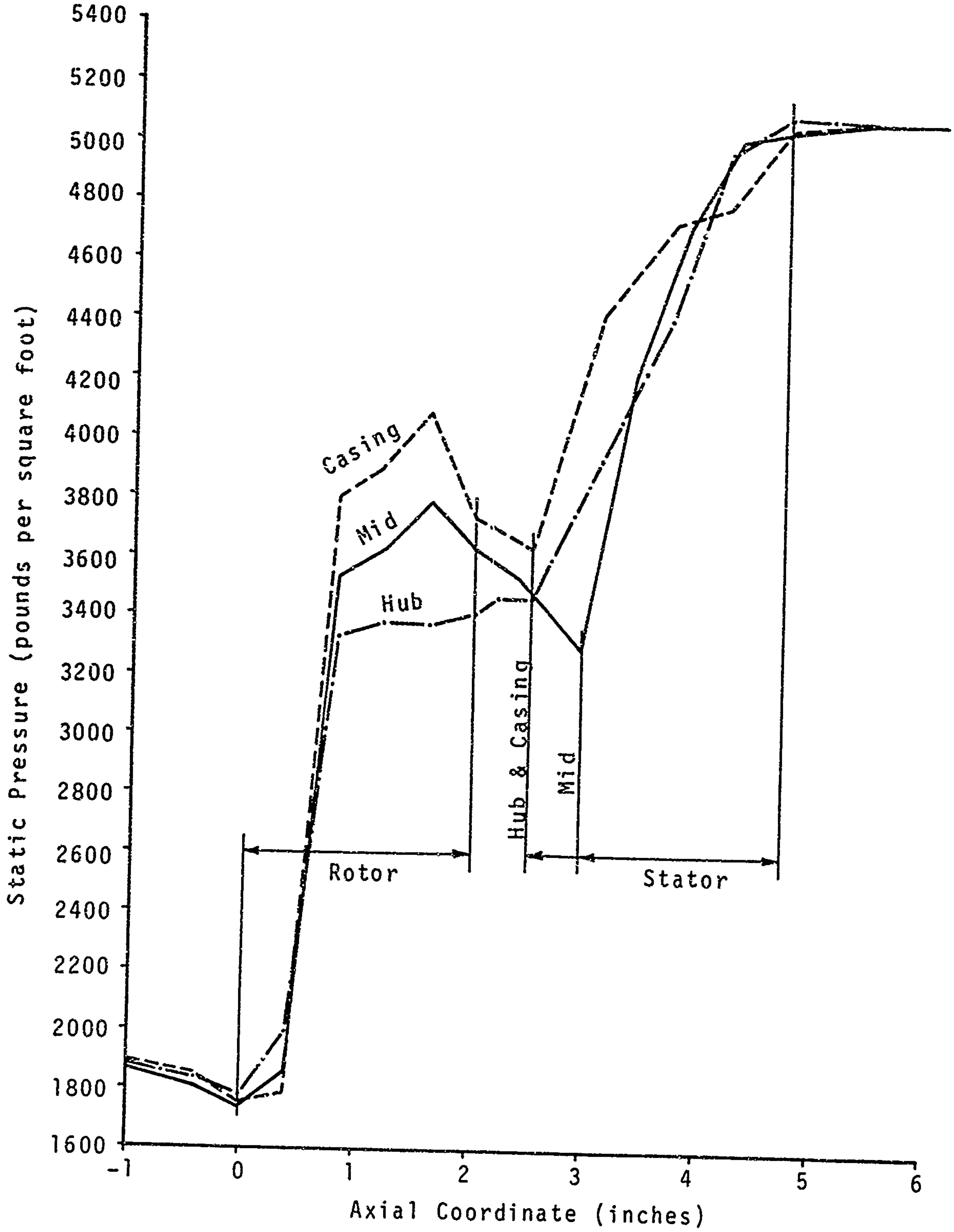


Fig 28. Static Pressure Distribution through Stage from Analysis with Increased Loss Coefficients

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.