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Detailed Design of a Quiet High Flow Fan

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16. Abstract

A single stage fan has been designed to demonstrate the noise abatement properties of near-sonic inlet flow and long-chord stator vanes for the reduction of both upstream and downstream propagated fan source noise. It is designed to produce a pressure ratio of 1.653:1 with an adiabatic efficiency of 83.9%. The fan has a 508 mm (20 in.) inlet diameter with a hub/tip ratio of 0.426 and a design tip speed of 533.4 m/sec (1750 ft/sec). The design inlet specific flow rate is 219.71 kg/sec-m^2 (45 lbm/sec/ft^2) and there are 10 tandem stator vanes with a combined aspect ratio of 0.54. The rig has been designed to adapt to both the noise and performance test facilities at NASA-Lewis Research Center.

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SUMMARY

A single stage fan has been designed to demonstrate concepts for the reduction of fan generated noise. The concepts utilized in this Quiet High Flow (QHF) fan are near-sonic flow at the fan inlet to reduce upstream propagated noise and the use of long-chord vanes to reduce downstream noise. The near-sonic flow is obtained by operating at a higher-than-normal inlet specific flow, and is maintained by operating at or near design speed for all performance requirements. Thrust modulation at design speed is accomplished with a variable fan exhaust nozzle, and variable fan outlet stators. The long-chord vanes provide downstream noise reduction by their reduced response to the unsteady flow effects of the rotor wake field.

The fan stage incorporates an advanced high tip speed rotor which combines multiple circular arc and started contained shock (low shock loss) airfoils, and tandem stator rows which are double circular arc airfoils. Each tandem stator pair has a continuous mean camber line and will act as a single vane when at design setting angle. Axial spacing between the blade and vane rows was set to maximum rig limit in order to minimize blade pass tone radiated noise.

The important design parameters are:

Stage pressure ratio	1.653
Stage adiabatic efficiency - %	83.9
Tip speed - m/sec (ft/sec)	533.4 (1750)
Tip diameter - mm (in.)	508 (20)
Hub/tip ratio	.426
Specific flow - $kg/sec\text{-}m^2$ ($lbm/sec\text{-}ft^2$)	219.71 (45.0)

The fan size was fixed by requirements for testing at NASA-Lewis. Extensive mechanical design work was performed to accomodate the fan stage for both performance and noise test facilities at NASA. Mechanical design included structural and vibration analyses. Predicted stresses due to static and dynamic loads are well within the capabilities of the selected materials. The blades and vanes have acceptable frequency response characteristics and the rotor blades have acceptable flutter margin.

The preliminary analysis of the QHF concept indicated that a QHF powered aircraft would be substantially more quiet than the same aircraft powered by a conventional fan engine. Comparison of the 100 EPNdB contour areas for the two aircraft showed the QHF areas to be 82% smaller at takeoff and 97% smaller during approach. Current analysis indicates that noise reductions of this order can be expected from the QHF final design as well.

INTRODUCTION

Future turbofan engines will require extensive reduction in the noise generated during takeoff and approach by conventional aircraft in order to meet the environmental noise standards. Attempts to reduce the noise emanating from turbofan engines have resulted in sound absorbing systems being adapted to the engines which are costly and penalize performance. Since the fan component is the major contributor to the noise produced by an engine, any significant reduction in engine noise can only be accomplished by first reducing fan noise.

The report presents the final aerodynamic and mechanical design and an acoustic analysis of a fan stage which is designated the Quiet High Flow (QHF) fan. It is a high tip speed, high flow per unit frontal area, single stage fan without an inlet guide vane row. The design objective of this fan stage is to utilize advanced aerodynamic concepts to achieve low noise levels without the use of external sound absorbers.

The fan design completes the second phase of a program at Detroit Diesel Allison (DDA) sponsored by NASA-Lewis Research Center for the study of concepts to reduce fan source noise in turbofan engines for conventional takeoff and landing (CTOL) aircraft. The proposed program concepts were to reduce forward radiated noise by incorporating very high specific inlet flow and to reduce exit noise through the use of a low number of long-chord exit vanes. At the time of the inception of the program, it was theorized that a high specific design flow rate would result in a near-sonic condition at the fan face and reduce forward propagating fan noise much like a near-sonic inlet (Ref. 1). Since that time, the noise abatement properties of this method have been experimentally verified by tests at DDA of a compressor with a specific flow rate similar to the QHF fan. The low number of long-chord vanes should reduce both discrete frequency and broadband fan source exit noise by reducing the vane response to blade wakes and turbulent eddies (Ref. 2).

The first phase of the program, performed under Contract NAS3-18521, was a thorough acoustic analysis of four preliminary aerodynamic designs to determine the most appropriate configuration for a QHF fan stage (Ref. 3). The preliminary design work showed that the best configuration (#3) had a positive hub-to-tip total pressure gradient, tandem long-chord stators well aft of the rotor, and an increased diameter at stator inlet to reduce the levels of stator hub Mach number and loading for off-design operating conditions. These design characteristics were closely adhered to for the QHF fan final design.

The fan is designed to operate in the NASA-Lewis Research Center test facilities. The QHF test rig will fit the Engine Fan and Jet Noise Facility (W2) with either the fan inlet or exhaust facing the anechoic room. The rig will also fit the Single-Stage Aerodynamic Test Facility (W8) with the fan exhausting into the collector.

AERODYNAMIC DESIGN

FLOWPATH AND VECTOR DIAGRAMS

The design parameters for the QHF fan are:

Stage pressure ratio	1.653
Rotor corrected tip speed - m/sec (ft/sec)	533.40 (1750)
Corrected airflow per unit frontal area - kg/sec-m^2 ($lbm/sec-ft^2$)	219.71 (45.0)
Rotor inlet hub/tip ratio	.426
Efficiency - %	83.9
Tip diameter - mm (in.)	508 (20)
Corrected airflow-kg/sec (lbm/sec)	36.45 (80.4)
Corrected speed - RPM	20053.5

The velocity diagrams of the QHF fan were obtained using the DDA Axial Compressor Design calculation. A description of the design system is given in Appendix A.

The fan flowpath is shown in Figure 1. It is similar to the configuration 3 flowpath from the preliminary design study. The major differences are the reduction of the tip speed from 548.6 m/sec (1800 ft/sec) to 533.4 m/sec (1750 ft/sec) and the convergence through the rotor. The rotor exit area was decreased 6.9 percent by raising the rotor hub ramp angle from 16.38 to 18.8 degrees and the tip ramp angle was changed from 0 to -4.72 degrees. With the original flowpath and tip speed, the turning angles across the upper 50% of the blade were very small, on the order of 2 degrees. These small angles result in blade sections with zero or negative net camber. The throat tends to be at the rear of these blade sections, which results in airfoils with large positive front camber and negative rear camber in order to achieve the design throat critical area ratio. By reducing the rotor exit area, the static pressure rise is decreased for the same total pressure ratio and the air turning angles are increased. With higher turning angles, design blade sections will have positive net camber and a better front-to-rear camber ratio.

To ensure a near-sonic block to the forward radiated noise, a high specific flow rate is necessary. It is also important that the inlet velocity profile be essentially uniform to avoid a low Mach number "leakage" path for fan generated noise. The flowpath walls upstream of the rotor are contoured to give the rotor inlet Mach number distributions shown in Figure 2. The average value of the rotor inlet axial Mach number is .714. The high absolute Mach number combined with the rotational speed of the rotor yields supersonic inlet relative Mach numbers over the entire span with a tip value of 1.8. The rotor exit relative Mach numbers are supersonic over the upper 35% of the span (Figure 3).

The number of rotor airfoils is 22 while the stator consists of a double row of 10 vanes each. The number of rotor blades was fixed by performance and structural considerations while the number of vanes was determined by a detailed acoustic analysis in the preliminary design. Large spacing between rotor and stator blade rows reduces interaction noise caused by wake buffeting of the stator vanes (Ref. 4). The duct length between the rotor trailing edge and stator leading edge planes in the QHF fan was limited to two rotor chord lengths by the available axial space in the test rig.

Wall curvature between rotor exit and stator inlet and the rotor exit pressure profile are two design features which affect stator performance. It was discovered with the preliminary design work that an increasing hub radius between the rotor and the stator and a positive radial gradient in pressure were necessary to keep loading levels at design point and the stator inlet hub Mach number at the choke end of the design speed line within reasonable limits. The duct cross-sectional areas at both rotor and stator exit also had to be large enough that the duct would not choke at a pressure ratio higher than the value designated as the approach operating point (R_c = 1.15). The rotor has a design pressure ratio of 1.664 with a 3 percent positive hub-to-tip gradient. The stator exit tip radius is 298.07 mm (11.735 in.) and the exit area is 0.168m^2 (260.36 in^2).

Stator inlet and exit absolute Mach numbers at the design pressure ratio are shown in Figure 4. The average stator exit Mach number is 0.432. The inlet and exit Mach numbers for the stators at the approach point are also shown in Figure 4. The average inlet and exit Mach numbers for the approach point are 0.60 and 0.71. With these velocity levels, choking in the duct should not be a problem. The spanwise distribution of the design point loadings (diffusion factors) are shown in Figures 5 and 6. They are moderately high but the fan should have sufficient range for good stall margin.

The predicted rotor and stator total pressure loss coefficients for the design point are illustrated in Figure 7. Figure 8 shows the spanwise distribution of rotor and stage adiabatic efficiencies. The average efficiencies are 85.0 percent for the rotor and 83.9 percent for the stage.

Figure 9 shows the rotor inlet and exit relative air angles while Figure 10 is a plot of the absolute air angles for the stators. The exit air angle from the second stator is designed to be 0.0 degrees.

A concern in this design was the annulus wall boundary layer behavior between the rotor and stators due to an adverse static pressure gradient. Skin friction coefficients, obtained from a Herring-Mellor turbulent boundary layer calculation (Ref. 5) and a Head calculation (Ref. 6 and 7) modified for compressible flow, for both the inner and outer annulus walls are presented in Figure 11. Using the criterion that skin friction goes to

zero for separated flow, these results indicate no boundary layer separation. These distributions of skin friction coefficient are relatively insensitive to change over the normal range of input assumptions. The inner and outer wall displacement thickness distributions, as obtained from the H-M calculation, were included in the aerodynamic design calculation as endwall blockages to account for boundary layer growth.

The design point velocity vector diagrams calculated along streamlines are tabulated for the rotor and stator leading and trailing edges and several intrastage locations in Appendix B, Tables 5 (SI units) and 7 (English units).

NOZZLE AND DIFFUSER DESIGN

Acoustic testing of the fan rig on NASA-Lewis test stand W2 requires that the fan be mounted to exhaust into an anechoic chamber to measure the fan exit noise. Two flow devices were designed to control 100% speed performance with this rig configuration. These devices are a nozzle, for running at the design pressure ratio, and a diffuser, for running at the approach pressure ratio of 1.15. It was determined that the diffuser should have an area ratio of approximately 2.5 and a length/width ratio of 8 to 10. The entrance area to the diffuser is 0.1665 m^2 (258.12 in^2) and expands to 0.4215 m^2 (653.27 in^2) which is an area ratio of 2.53. The L/W ratio was set at 9.52 which yields a diffuser length of 1033.5 mm (40.69 in.). The wall divergence angle is 4.635 degrees. Figure 12 shows a drawing of both the diffuser and nozzle as they would be attached to the fan flowpath. The nozzle was designed with a flap angle of 15 degrees for a nozzle pressure ratio of 1.62. The estimated discharge coefficient (Aeff/Ageo) for these design criteria is 0.955. This would mean that a nozzle discharge area of .1084 m^2 (168 in^2) is required to exhaust to atmospheric pressure. The nozzle is adjustable fore and aft to areas of .1023 m^2 (158.6 in^2) and .1181 m^2 (183.1 in^2) at the extreme points. This should provide a range of pressure ratios from 1.74 to 1.55.

FAN APPLICATION

The QHF fan might be undesirable in an engine because of the increased frontal area due to the increased flowpath diameter at stator inlet. In the first phase of the fan development program, an engine flowpath with a bypass ratio of 6 was developed from the configuration #3 rig flowpath (Ref. 3). Detailed analyses were made to determine the engine configuration performance at various operating points. The rotor exit air near the hub has the highest whirl and absolute velocities. In the engine configuration, this air flows down the primary duct rather than across the bypass vane rows. This results in substantial reductions in stator hub loading at the design pressure ratio and stator hub Mach number at the approach pressure ratio for the bypass vane rows of the engine compared to the rig vanes. Redesigning the bypass vanes to the rig level of performance would allow for a diameter decrease of the bypass duct, thus reducing the fan frontal area.

AIRFOIL DESIGN

ROTOR BLADE

The rotor blade was designed to produce a total pressure ratio of 1.664 at a tip speed of 533.4 m/sec (1750 ft/sec). There are 22 rotor blades with an aspect ratio of 1.578 (based on average span and true mean chord). The rotor blade consists of multiple circular arc (MCA) airfoils over approximately 60% of the span. The outer 40% of the blade, which is wholly supersonic, is made up of started contained shock (SCS) airfoil sections. SCS airfoils were chosen to reduce the shock losses in the high Mach number region. A profile of the blade is shown in Figure 13.

An MCA airfoil is shown schematically in Figure 14. It is made up of two circular arcs which define three metal angles: inlet (β_1*), exit (β_2*), and inflection (β_i*). A metal angle is the angle between the axial direction and the mean camber line of an airfoil section at a specified location. The blade section is designed by adjusting the metal angles to satisfy incidence, deviation, and starting margin criteria.

The started contained shock airfoil was developed as a means to control shock strength, shock number, and shock location in wholly supersonic regions of the blade. As designed, the SCS section will eliminate shock reflections from blade surfaces and passage shock refractions which tend to multiply the number of shock waves and thus increase shock loss. Figure 15 is a schematic of an SCS airfoil. A general description of the SCS design system is presented in Appendix C.

The chord, solidity, and maximum thickness to chord ratio were the important geometric parameters in the design of the blade. A low aspect ratio, and therefore a long average chord, was selected based on torsional frequency required to meet the stall and high speed flutter criteria without the use of part-span shrouds. Part-span shrouds could cause a choking problem by adding blockage to an already high specific flow regime. The solidity (Figure 16) was selected to control hub loading and contain the shock wave system within the blade passages of the SCS airfoil sections. The number of blades was selected which would provide a chord taper to meet the solidity and aspect ratio requirements and also be viable from a weight and stress standpoint. The spanwise chord distribution for the rotor blade is shown in Figure 17. The radial distribution of maximum thickness/chord (Figure 18) was set to avoid responsive resonant conditions and to maintain radial uniformity of blade mechanical properties.

Since the entire rotor blade has supersonic relative inlet Mach numbers, incidence was set on the suction surface at a point halfway between the leading edge and the emanation point of the first captured Mach wave. The value was set at 1.5 degrees and is intended to account for leading edge blockage, suction surface

boundary layer, and the bow shock wave. The design passage minimum critical area ratio (A/A^*_{min}) distribution is illustrated in Figure 19. Minimum values range from 1.021 to 1.044 for a normal shock wave total pressure loss applied at the blade passage entrance and a linear distribution of profile loss from the leading to trailing edge of the airfoil section. The entrance region incidence together with channel area considerations and convergence determine the meanline incidence angles which are illustrated in Figure 20. Rotor deviation angles for the MCA sections were calculated using the NASA 2-D rule (Ref. 8) plus empirical adjustments. For the SCS sections, the effective pressure surface (boundary layer) is aligned with the exit flow direction which defines the deviation from the blade meanline (Figure 20). The metal angles were selected to satisfy the incidence and deviation angle requirements (Figure 21).

For manufacturing purposes, the airfoil sections were redefined on planes normal to the stacking line. The stack line is a radial line passing through the center of gravity of each conical section. The rotor blade manufacturing coordinates are listed in Appendix D with coordinate definitions given on Figure 54.

STATOR VANES

The vanes selected for the QHF fan stage have double circular arc sections which were designed on conical surfaces approximating streamlines of revolution. Due to the desirable acoustic characteristics of long-chord vanes, a low number of vanes (10) was selected which would satisfy the long chord requirement and still give a reasonable solidity distribution. In order to avoid choking the vanes at the approach condition, tandem vanes were incorporated in the stator row with both vanes resettable, the first vane to -30 degrees open and the second vane to -10 degrees open from design setting angle. At the design point, the double vane meanline is continuous and the two vanes act as a single unit. As incidence becomes increasingly negative near the low pressure end of the 100 percent speed operating line, the vanes can be reset to keep the incidence angle near zero and to open the vane throat. The vane row geometry is shown in Figure 22.

The chord and camber of the tandem vanes are the same so they should match well when run as a single vane. The chord for each vane tapers linearly from 101.6 mm (4.0 in.) at the hub to 114.3 mm (4.5 in.) at the tip. With 10 vanes for each row, this results in the solidity distributions shown in Figure 23. Aspect ratio of the first and second vanes are 1.11 and 1.05, respectively. Thickness-to-chord ratio is a constant 0.07 for both vanes.

Incidence angles for the first stator are shown in Figure 24. The incidence angle was set based on minimum loss data for double circular arc airfoils. The deviation angles for the second stator

were determined using the NASA 2-D rule (Ref. 8) with an empirical correction and are also illustrated in Figure 24. Stator inlet and exit metal angles for both vane rows are presented in Figure 25. Incidence and camber were used to control the throat area of the channels between the vanes. Figure 26 shows the radial distribution of minimum A/A* for each vane at the fan design speed and pressure ratio. The minimum A/A* for the first vane occurs at the channel entrance for all spanwise positions.

The approach point flow conditions (100% speed and R_c = 1.15) in the vane hub channels are illustrated in Figure 27 for varying first stator reset angle and for second stator reset angles at -25° reset for stator 1. Values of minimum A/A* less than 1.0 imply that the passage is choked. As shown in Figure 27, the hub of the second stator is choked for all reset angles while the first stator unchokes at -23 degrees. The best combination of incidence and A/A* suggests a -25° reset for the first vane and a -5° reset for the second vane. At these setting angles, the radial distributions of minimum A/A* for the vanes (Figure 28) indicate that the second vane is choked over 20 percent of the span. The flow through stator 2 should redistribute radially outward where the vane is not choked so that compressor operation at a pressure ratio of 1.15 should be possible.

The manufacturing coordinates for both vanes are given in Appendix D with airfoil section definitions on Figure 55. The section coordinates were defined on planes normal to a stacking line. The stack line for stator 1 is on a radial line passing through the vane hub trailing edge. For stator 2, the stack line is on a radial line passing through the vane hub leading edge. Both vanes were leaned counter clockwise 6.55° from the hub stacking line intersection viewed from upstream. This stacking arrangement was selected to ensure tandem vane meanline continuity at all radii with the vanes at design setting angle and to minimize the endwall vane gap at the extreme reset positions.

ACOUSTIC ANALYSIS

The Quiet High Flow (QHF) fan concept incorporates a near-sonic block at the face of the fan induced by high specific flow (219.71 kg/sec-m^2) to reduce forward radiated noise and very long chord exit vanes to reduce rearward radiated noise (Ref. 1 & 2). The long-chord vanes show low response to excitation at the high reduced frequency (increasing chord increases reduced frequency) wake fluctuations and thus radiate lower noise.

During Phase I of the QHF program, acoustic and aerodynamic trade studies were combined to arrive at a preliminary QHF design. The results of the Phase I studies (Ref. 3) were used during the current (Phase II) portion of the program to develop the QHF fan final design. The final QHF design was analyzed using the methods outlined in References 3 and 9 to estimate the noise to be expected at takeoff and approach conditions. The results of this analysis are presented in this report section.

During the Phase II time period a DDA research compressor whose first stage is designed to a similar specific flow rate to the QHF underwent test. As part of the DDA noise research program, compressor inlet noise was recorded during this testing. The data obtained confirms the QHF design concept of inlet noise reduction through high specific flow design and is also summarized in this section.

FINAL QHF DESIGN NOISE CHARACTERISTICS

The final QHF fan design has modest differences from the preliminary design in the number of blades, blade work distributions, stator configurations and rotor to stator spacing as discussed in the aerodynamic design section. The noise generation characteristics of the two fans are similar however, as shown in Figures 29 and 30. At the takeoff condition (Figure 29) the noise spectra expected from the two fans differ by only 1 PNdB. At the approach condition (Figure 30) the final design level varies ± 4 PNdB from the preliminary design because of increased broad band noise in the front arc and reduced blade pass tone level in the rear arc.

It should be noted that the levels shown in Figure 30b for the preliminary design do not coincide with those presented in the Phase I final report (Ref. 3). A review of the Phase I noise prediction revealed a computational error leading to an incorrect stator diffusion factor and resulting in a low estimate (about 20 db) for the rear radiated blade pass tone. Noise from other sources, notably fan broad band noise, combined with the high frequency of the tone make the overall effect of this error small however, less than one PNdB or 2 PNdBT (tone corrected PNdB) for the approach flyover condition.

EXPERIMENTAL CONFIRMATION OF THE QHF FAN CONCEPT

In-duct measurements of inlet noise are normally made during the performance mapping of DDA research fans and compressors. These measurements provide a base for improved prediction methods and for evaluating design changes. Data from two test units, one similar to the QHF fan in design concept and one of more conventional design, 207.5 kg/sec-m^2 (42.5 lbm/sec-ft^2) specific flow rate, is presented in this section.

Figure 31 shows a normalized map for the two compressors and indicates the map location of the data points presented in Figures 32 and 33 for noise comparison. Note that both compressors exhibit the multiple-pure-tone and blade-pass-tone roll off with increasing blade tip Mach number and that the high specific flow induces a sharper roll off. Figure 34 summarizes this trend by showing relative blade-pass-tone levels as a function of percent corrected rotor speed. The high specific flow compressor shows a definite noise reduction advantage as a result of the sharper roll off characteristic.

MECHANICAL DESIGN

GENERAL ARRANGEMENT

The QHF fan rig has been designed to operate in two different test facilities at NASA-Lewis Research Center. The first is the Single-Stage Aerodynamic Test Facility (W8) which is primarily a performance test stand. The second is the Engine Fan and Jet Noise Facility (W2) which is primarily for noise measurement. The rig can operate in the forward position on W8 mounted to the inlet adapter ring and exhausting through a discharge plenum (Figure 35).

Since it is necessary to measure both fore and aft radiated noise being produced by the fan, it has two mounting configurations for the W2 facility. In the forward position (Figure 36), the fan draws air from the noise measurement room through an inlet bell and exhausts through a discharge plenum. In the reverse position (Figure 12), the fan draws air from the discharge plenum and exhausts into the measurement room. A nozzle and diffuser have been designed to provide some throttling capability for the reverse configuration.

These three different configurations were made possible by designing common parts for the basic fan and adding adapter spools and fairings for attachment to existing LeRC stand hardware. (LeRC hardware is shown as broken lines in Figures 12, 35, and 36.)

MATERIAL SELECTION

SAE 51410 steel material has been selected for nearly all of the rig parts. AMS 5504 is specified for sheet and plate and AMS 5613 for bar stock and forgings. This steel has good weldability and machining characteristics. It has been widely used in aircraft engine hardware for parts requiring oxidation resistance up to 800°K with medium strength. Oxidation resistance was considered by DDA to be an important material requirement because nearly every rig part is dependent on a close fitting pilot for proper positioning and rig vibratory restraint.

AMS 4967 or AMS 4928 titanium 6Al4V is specified for the blades. High tip speed fan blades generally require titanium to meet stress and dynamic constraints. Titanium 6Al4V was selected because it has a good combination of high strength-to-weight ratio and fracture toughness.

AMS 6431 (D6AC) steel is specified for the wheel. This selection was based on the rig design philosophy of having large strength margins.

AMS 6512 steel was selected for the blade retainer pin. The primary requirement for this part is shear strength. Heat treatment of this material to a Rockwell C minimum hardness of 52 gives a shear strength near the ultimate strength.

Graphite filled epoxy is recommended as the blade tip case abradable coating. This material has the characteristic of cutting cleanly without balling up, with the removed material having the form of fine powder.

WHEEL DESIGN

The basic approach to the wheel design was to provide a low stress, rig type (non-flight weight), stable part. The wheel was shaped to conform to the flowpath and to provide good blade retention and blade force distribution characteristics and at the same time sized so that the wheel assembly (wheel, blades, bolts, pins, etc.) would meet the weight limitation requirements of 22.7 kg (50 lbs). The wheel can be mounted to the test facility drive shaft on both sides. Cutouts have been provided on both sides of the wheel for strain gage terminal blocks and covers. Holes and slots have been designed into the wheel and add-on parts for a clear path routing of blade strain gage wires to the terminal blocks. The blades are located in wheel dovetail slots and fixed in place with retention pins. Balancing of the wheel assembly is accomplished by altering the weight of balance rings mounted on the wheel.

CASE DESIGN

The case was designed to provide a stable, heavy wall, rig type structure. It has a vertical split line and hoist holes for ease of assembly. Mounting pads and holes which accept LeRC instrumentation have been designed into the case. A removable ring is inserted into the case over the blade tips to allow for future tip treatment studies. The blade tip rub strip is located on the inner surface of the ring.

STATOR ATTACHMENT

A set of tandem stators has been designed for the QHF fan rig. When the rig is mounted in the forward position on W2 and W8, the stators are cantilevered. Plugs are inserted into the inner flowpath stem holes. When the rig is mounted in the reverse position on W2, a pin is inserted through the hub fairing into a hole in the bottom of each vane so that the vanes are essentially trunnion mounted at both ends and act as the support structure for the hub fairing. The first vane is resettable 30° counter clockwise (open) from the design setting angle.

The second vane is resettable 10° open. The axis of rotation of the first vane lies on a radial line passing through the geometric center of the hub airfoil section. The axis of rotation of the second vane is leaned 9.62° to the left (viewed from upstream) from the intersection of a radial line with the geometric center of the hub section. The stacking and rotation axes are carefully positioned relative to the inner flowpath to minimize the vane reset gap at the approach position. With a radial stack axis, the first stator gap at the 30° reset position was 4.06 mm (0.16 in.) which was reduced to 0.86 mm (.034 in.) when the vane was leaned.

STRUCTURAL AND VIBRATION ANALYSIS

AIRFOIL STRESSES

A detailed stress analysis was performed on the final rotor blade design for sea level static, standard day condition at 20053.5 RPM. Results are summarized in Figure 37 which shows the iso-stress plots for each surface of the airfoil. The maximum principal stress on the pressure surface is 603.3 MPa (87.5 KSI) while the corresponding value on the suction surface is 559.6 MPa (81.2 KSI). These stress levels are low enough to provide adequate margin for rig operation in both high and low cycle fatigue. The modified Goodman diagram in Figure 38 indicates that a fillet hub stress of 603.3 MPa (87.5 KSI) gives a ±103.5 MPa (15 KSI) vibratory capability at 100% speed. Since this blade has been designed to avoid resonance at this speed and a ±34.5 MPa (5 KSI) vibratory stress has proven to be a satisfactory criterion on past designs, high cycle fatigue should not be a problem.

Low cycle capability at the airfoil hub fillet is indicated by the SN plot in Figure 39. The maximum hub stress gives a low cycle fatigue life in excess of 10,000 start-stop cycles which should well satisfy any rig requirements.

The design requirements to operate without any detrimental deformation to an overspeed of 115% of nominal rig speed and also provide a burst margin equal to 122% of nominal rig speed have been met.

An iteration was performed utilizing a finite element model to determine the shape of the blade at rest from the blade shape at design speed and loading level. This procedure provides the blade geometry for manufacturing by computing the changes in blade twist, camber, and growth between 0% and 100% speed. The amount of computed untwist is shown in Figure 40.

ATTACHMENT AND WHEEL STRESSES

The design criteria and allowable stresses used to ensure the structural integrity of the attachment and wheel followed those used successfully in other DDA compressor rigs. The percentages established in Table 1 are in conformity with the following basic requirements:

- Parts are designed for a minimum service life of 5000 major cycles of zero to maximum stress with a reliability of 0.999. Particular attention was given to locations susceptible to low cycle fatigue, especially features resulting in stress concentration.
- Parts are designed to a capability of operating without detrimental deformation to an overspeed equal to 115% of the nominal rig speed.

Table 1. Attachment and Wheel Stress Summary

	Low Cycle Fatigue 5000 Start-Stop Z = 3.0	Permanent Yield @115% N_D Z = 3.0	Burst @122% N_D Z = 3.0	Allowable @ N_D	Calculated @ N_D
BLADE DOVETAIL					
Tensile	-	$.95F_{ty}$/752MPa	$.90F_{tu}$/820MPa	552MPa	130MPa
Shear	-	$.60F_{ty}$/476MPa	$.52F_{tu}$/476MPa	317MPa	126MPa
Bearing	-	$.95F_{ty}$/752MPa	-	565MPa	461MPa
Fillet Peak (K_T=2.23)	Must conform/1151MPa	-	-	1151MPa	438MPa
WHEEL LUG					
Tensile	-	$.95F_{ty}$/1241MPa	$.90F_{tu}$/1365MPa	917MPa	341MPa
Shear	-	$.60F_{ty}$/786MPa	$.52F_{tu}$/786MPa	531MPa	147MPa
Bearing	-	$.95F_{ty}$/1241MPa	-	938MPa	461MPa
Fillet Peak (K_T=2.23)	Must conform/1427MPa	-	-	1427MPa	1036MPa
WHEEL					
Rim Tangential (K_T=1.71)	Must conform/827MPa	-	-	827MPa	227MPa
Web Tangential	-	$.95F_{ty}$/1241MPa	-	938MPa	328MPa
Web Radial	-	$.95F_{ty}$/1241MPa	$.90F_{tu}$/1365MPa	917MPa	328MPa
Bore Tangential (K_T=1.0)	Must conform/1793MPa	$1.0F_{ty}$/1310MPa	-	986MPa	850MPa
Average Tangential	-	-	$.90F_{tu}$/1365MPa	917MPa	332MPa

Z - Standard Deviations

N_D = 20053.5 rpm

K_t - Stress concentration factor

F_{ty} - 0.2% yield strength

Blade Mat'l: Ti 6Al4V(AMS4967)

F_{tu} - Ultimate tensile strength

Wheel Mat'l: D6AC Steel(AMS6431)

- Parts are designed for operating without burst to a speed of 122% of the nominal rig speed. The attachment geometry is shown in Figure 41. Stresses for this attachment are compared to the allowable values in Table 1. As can be seen by comparing the allowable stresses with the calculated values, very adequate margins exist in all categories for both the blade dovetail and wheel lug. Wheel stresses are also listed in Table 1 which likewise show that the operating stresses are all well below the allowable values.

VIBRATION ANALYSIS OF THE BLADES AND VANES

Frequency, stalled flutter, and high speed flutter parameters were examined in the vibration analyses of the QHF fan. A vibration criterion was formulated to define the characteristics required to avoid the typically responsive resonant conditions and to provide adequate flutter margins for the most severe inlet conditions of the operating regime. Vibration analyses were then conducted to optimize the frequencies and ensure flutter stability.

Vibration design criteria were formulated to identify the frequency and flutter properties required of an acceptable blade. The frequency criteria include the following restrictions:

- Coincidence of blade resonant frequency with second or third harmonic of rotation is not permitted at continuous duty operating speed, 95 to 105 percent.
- Coincidence of the lower three natural frequencies of blades and vanes with the passage frequency of adjacent blades, vanes or struts is not permitted at continuous duty operating speed.
- Coincidence of individual stator vane frequencies or stator assembly frequencies with first harmonic of rotation is also not permitted at continuous duty operating speed.

The flutter criteria include the following restrictions:

- The stalled flutter boundary must have a margin of two degrees incidence and 100 feet per second inlet relative velocity for the most destabilizing inlet conditions of the operating regime.
- The high speed flutter parameter, $\bar{\omega}$, must exceed .6 for the torsion modes and .2 for the bending modes with the maximum inlet relative velocity of the operating regime

$$\bar{\omega} = \Pi FC \div V$$

where: F = lowest torsional and bend frequencies
C = blade chord at seventy five percent of span
V = inlet relative velocity at seventy five percent of blade span.

Digital computer programs using finite element and beam analysis

techniques were used to calculate frequencies, mode shapes, vibratory stress distributions and flutter stability. Figure 42 shows the rotor blade-wheel frequencies vs rotor speed. The continuous duty speed range is free from low order intersections. The fan wheel is very stiff and provides an essentially inflexible mounting for the blades. The wheel-blade system frequencies are less than one percent lower than the rigidly mounted blade frequencies. Figure 43 shows flutter instability characteristics for the rotor blade. Operating line and surge line predictions are also shown to quantify margins. Adequate margins are indicated for both subsonic stall flutter and supersonic high speed flutter for sea level static inlet which is the most severe instability condition for the QHF test rig.

The case mounted end of the stators is designed with a disk and "O" ring clamping arrangement which has demonstrated excellent vibration damping properties in similar compressor vane design applications. Figures 44 and 45 show frequencies for the first and second stators with trunnion mounting at both ends and Figures 46 and 47 show frequencies for trunnion mounting at O.D. and free end at I.D. Both vanes have adequate margin for first order with trunnion mounting at one or both ends. However, each of the vane-mounting configurations shows coincidence of a chordwise bending mode with blade passage, 22 order, at or near design speed. Some responsiveness might be expected from these intersections, but dangerous response is not generally associated with vane chordwise bending modes.

The following conclusions can be made based on the above analysis:

- The QHF fan blade and wheel assembly is considered to have acceptable vibration characteristics and meets the vibration design criteria.
  - The continuous duty speed range is free from typically responsive order intersections.
  - The stall flutter instability region lies more than ten degrees above the estimated surge line with sea level static inlet which is the most severe stall flutter environment.
  - The high speed flutter parameters are .74 and .31 for the torsional and bending modes, respectively. The acceptability criteria are minima of .6 for torsion and .2 for bending.
- Both stators have acceptable frequencies with trunnion mounting at one or both ends. However, some resonant response is expected to occur where vane chordwise bending modes coincide with blade passage.
  - Coincidence of the lower three natural frequencies with either first order or blade passage order has been avoided at operating speeds.
  - Modes which exhibit chordwise bending have frequently displayed sensitivity to compressor blade passage excitations. Coincidence of a chordwise bending mode

with blade passage, 22 order, occurs at or near design speed with each of the stator-mounting configurations. Strain gage instrumentation is recommended for initial compressor rig testing to quantify the vibration responsiveness of these modes. A dangerous response is not expected from the chordwise bending modes.

INSTRUMENTATION PROVISIONS AND RECOMMENDATIONS

Provisions have been made in the design of the QHF fan case and fairing pieces for the mounting of instrumentation to measure aerodynamic performance and check mechanical integrity. The following is a description of recommended instrumentation type and placement applicable to NASA-Lewis test stands W8 (performance) and W2 (acoustic).

AERODYNAMIC INSTRUMENTATION

The aerodynamic instrumentation has been selected to accurately define the performance of the test rotor and vane rows of the QHF fan. In addition, the characteristics of the intrastage duct can be ascertained. Detailed compressor performance will be determined from a combination of fixed and traversing aerodynamic measurements. A complete list of the recommended steady state aerodynamic instrumentation for NASA test stand W8 is presented in Table 2 and is keyed to the flowpath rollout shown in Figure 48.

The rotor performance will be obtained from radial traverse surveys of two types of combination probes, total pressure-temperature and static pressure - yaw angle probes, fore and aft of the rotor. Overall performance will be measured with 7-element radial total pressure and temperature rakes downstream of vane exit. Intrastage duct and vane performance can be measured using combination probes at the inlet to the tandem vane row in conjunction with the rotor exit and vane exit instrumentation, respectively.

Static pressure taps are located on the inner and outer walls at the blade and vane leading and trailing edge instrumentation planes. In addition, the blade tip axial static pressure distribution will be documented by 10 taps located on the outer wall. Linear arrays of static pressure taps are also included on both walls of the intrastage duct.

A three-tier fixed wake rake, with 16 elements per tier, will map the vane wake characteristics. The wake rake will cover 1 1/4 vane passage widths.

Due to differences in fan rig installation between test stands W8 and W2, some instrumentation locations are not available with W2. There are no static pressure taps on the inner wall upstream of the rotor. At the stator exit instrumentation plane, there will be two each of the 7-element total pressure and total temperature rakes (versus 4 each for W8); there will be no hub static pressure taps; and there will be no tip static pressure taps with the rig mounted in the reverse position.

Table 2. Recommended QHF Aerodynamic Instrumentation List

1. Rotor inlet: plane at -23.9 mm (-0.94 in.) or 20.3 mm (0.80 in.) in front of rotor hub leading edge.
   a. Four (4) hub static taps at 40°, 130°, 220° and 310°
   b. Four (4) tip static taps at 40°, 130°, 220°, and 310°
   c. Two (2) P_T, T_T traverse probes at 60° and 285°
   d. Two (2) P_S, yaw traverse probes at 95° and 240°

2. Rotor exit: plane at 77.2 mm (+3.04 in.) or 20.3 mm (0.80 in.) in back of rotor hub trailing edge.
   a. Four (4) hub static taps at 60°, 150°, 240°, and 330°
   b. Four (4) tip static taps at 60°, 150°, 240°, and 330°
   c. Two (2) P_T, T_T traverse probes at 130° and 310°
   d. Two (2) P_S, yaw traverse probes at 20° and 200°

3. Over the rotor tip
   Ten (10) tip static taps equally spaced axially and 1.25° tangential spacing.

	Axial location, mm (inches)	Tangential location, degrees
1.	-8.00 (-.315)	350.00
2.	-0.79 (-.031)	348.75
3.	6.43 (.253)	347.50
4.	13.64 (.537)	346.25
5.	20.85 (.821)	345.00
6.	28.07 (1.105)	343.75
7.	35.28 (1.389)	342.50
8.	42.49 (1.673)	341.25
9.	49.71 (1.957)	340.00
10.	56.92 (2.241)	338.75

4. Intrastage duct
   a. Two (2) hub static taps at 220° and axial locations of 108.59 mm (4.275 in.) and 140.34 mm (5.525 in.)
   b. Five (5) tip static taps at 220° and axial locations of 92.71, 108.59, 124.46, 140.34, and 172.09 mm

Table 2 cont'd.

5. Stator inlet: plane at 156.21 mm (6.15 in.) or 25.4 mm (1.0 in.) in front of stator 1 tip.
   a. Four (4) hub static taps at 40°, 130°, 220°, and 320°
   b. Four (4) tip static taps at 40°, 130°, 220°, and 320°
   c. One (1) P_T, T_T traverse probe at 80°
   d. One (1) P_S, yaw traverse probe at 285°

6. Stator exit: plane at 500.38 mm (19.7 in.).
   a. Four (4) hub static taps at 271.20°, 134.40°, 33.60°, and 328.80° which are at 20, 40, 60, and 80% of vane mean spacing, respectively
   b. Four (4) tip static taps at 271.20°, 134.40°, 33.60°, and 328.80°
   c. Four (4) 7-element P_T fixed rakes at 19.20°, 314.40°, 105.60°, and 256.80° which are at 20, 40, 60, and 80% of vane mean spacing
   d. Four (4) 7-element T_T fixed rakes at 343.20°, 62.40°, 285.60°, and 148.80° which are at 20, 40, 60, and 80% of vane mean spacing (Note: Elements of the P_T and T_T rakes are to be at 5, 10, 25, 50, 75, 90, and 95% span.)
   e. One (1) three-tier P_T fixed wake rake centered at 196.50°. The tiers are to be located at 10, 50, and 90% span. Each tier will have 16 elements with a spacing of 3°. The elements will be placed at the following tangential locations: 174°, 177°, 180°, 183°, 186°, 189°, 192°, 195°, 198°, 201°, 204°, 207°, 210°, 213°, 216°, 219°.

STRESS INSTRUMENTATION

The risk of excessive blade vibration can be minimized by defining vibration limits and monitoring vibration response with strain gages while compressor testing. The strain gage placements must be carefully selected to provide useful sensitivity for each mode which is likely to respond. A knowledge of blade frequencies and stress distribution patterns is required to reliably select useful gage locations. Blade fatigue strength for each mode at the selected gage locations must also be known to define blade vibration limits.

A recommended strain gage instrumentation plan is presented for testing the QHF compressor. This plan was formulated from analytical data: calculated frequencies and vibratory stress patterns. The proposed instrumentation plan can be refined and substantiated by bench vibration testing. Bench tests should include blade fatigue and vibratory stress distribution measurements using strain gages mounted at the same locations as those recommended for the compressor testing.

A three step approach was used to select the strain gage placements:

- Possible resonant modes were identified from the calculated blade frequency-speed plots.
- The calculated vibratory stress pattern for each potentially responsive mode was examined to select gage locations with acceptable sensitivity. To be an acceptable location, a strain gage must measure at least fifty percent of the maximum vibratory stress in the blade. It is desirable to have one gage location to monitor all modes of interest. However, this is usually not feasible.
- A minimum number of strain gage locations were selected with acceptable sensitivity for the potentially responsive modes.

Table 3 lists each mode which is considered to have some potential for resonance and shows relative stress values (as a percent of maximum stress) for acceptable strain gage locations associated with these modes. The resonances which are listed as possibly responsive are: first mode coincidence with second order, second mode and third mode coincidences with fourth order, and seventh mode coincidence with tenth order. The eighth mode, chordwise bending, is indicated to have a seven percent frequency margin for tenth order at maximum speed. However, it has been included in the instrumentation plan since chordwise bending modes are sometimes very responsive to the passing frequency of adjacent vanes. Instrumentation for chordwise bending may be deleted if bench test frequencies show that resonance is not likely on any of the rotor blades.

The recommended blade instrumentation plan consists of three strain gage locations on the suction side of the airfoil. The three locations are identified as B, C and F. Table 3 lists the

Table 3. Relative Stress at Selected Locations on the Suction and Pressure Surface of the QHF Rotor Blade.

Potential Resonance[1]		Relative sensitivity of resonant response (percent)											
		Suction Surface Location[2]						Pressure Surface Location[3]					
Mode	Order of Rotation	A	B	C	D	E	F	G	H	I	J	K	L
1	2	53	100	7	13	82	3	47	78	0	14	91	0
2	4	78	99	11	3	100	0	62	92	26	49	35	0
3	4	33	35	68	100	36	47	34	2	73	74	14	4
7	10	35	13	100	56	27	69	38	1	78	14	27	49
8	10	1	1	51	8	0	100	8	0	11	7	4	79

1. Modes 1, 2, 3, 7 - radial stress, Mode 8 - chordwise stress
2. See Figure 49
3. See Figure 50

relative sensitivities and Figure 49 shows the gage locations on the blade. Gage locations B and C were chosen because they each respond to 100% of the maximum vibratory stress for one mode resonance and also exceed the 50% stress measurement criteria for a second mode. Gage location F has the maximum sensitivity to the chordwise bending mode. A minimum of three strain gages should be installed at each of the three locations, one gage per blade.

An alternate plan is to mount strain gages at three locations on the pressure side of the airfoil if there are objections to instrumentation located on the suction side. These are identified as H, I and L in Figure 50. The same minimum quantity, three strain gages at each location, is recommended. However, pressure side instrumentation is more susceptible to erosion if foreign matter is carried by the airstream.

For the stators, radially oriented strain gages located on the vane surface at the intersection of the button edge and the vane tip are recommended. These gages would have adequate sensitivity to vibratory stress for any potentially responsive mode.

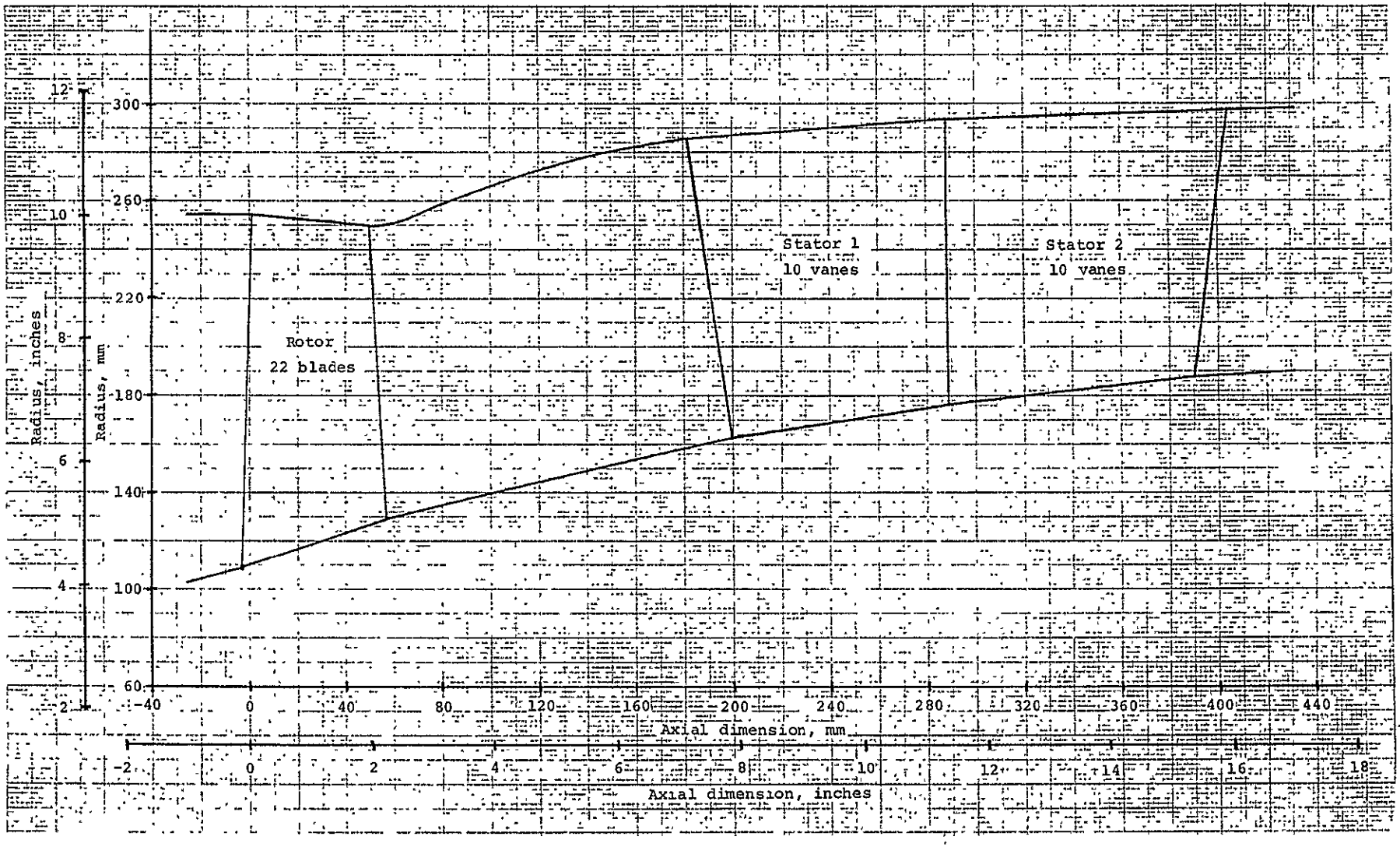


FIGURE 1. QHF FAN FLOWPATH SCHEMATIC

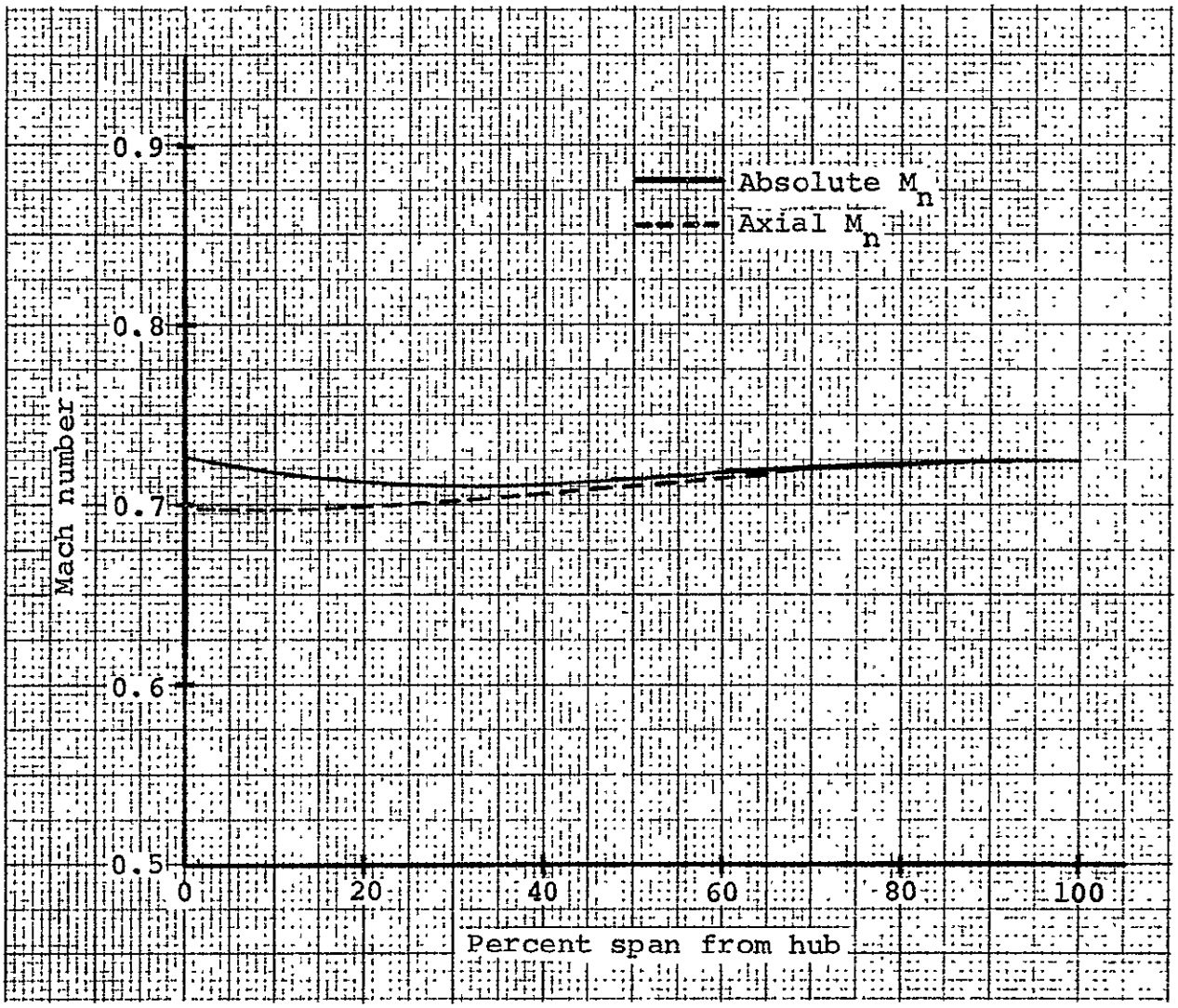


Figure 2. Duct Mach numbers at rotor inlet plane

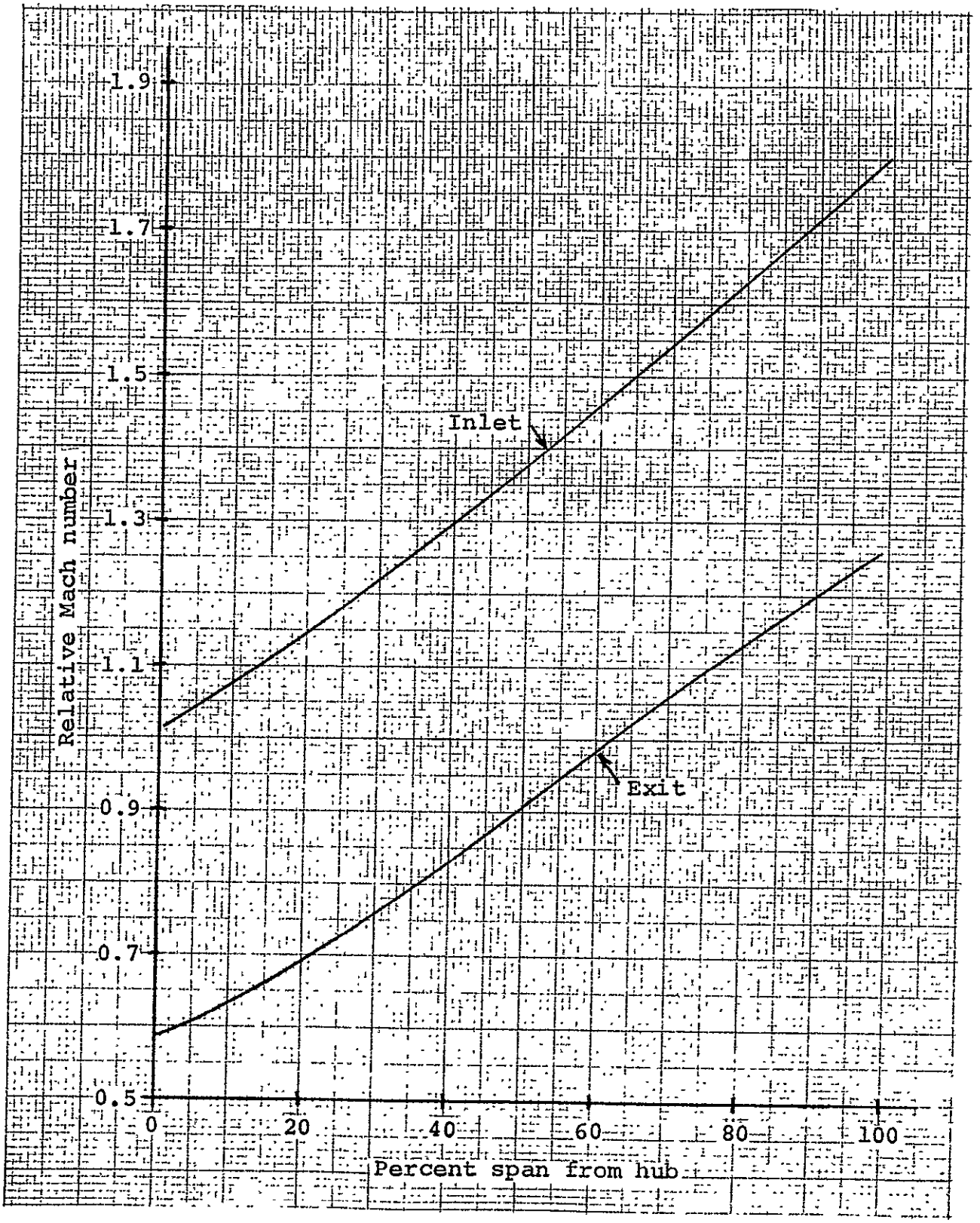


Figure 3. Rotor relative Mach number

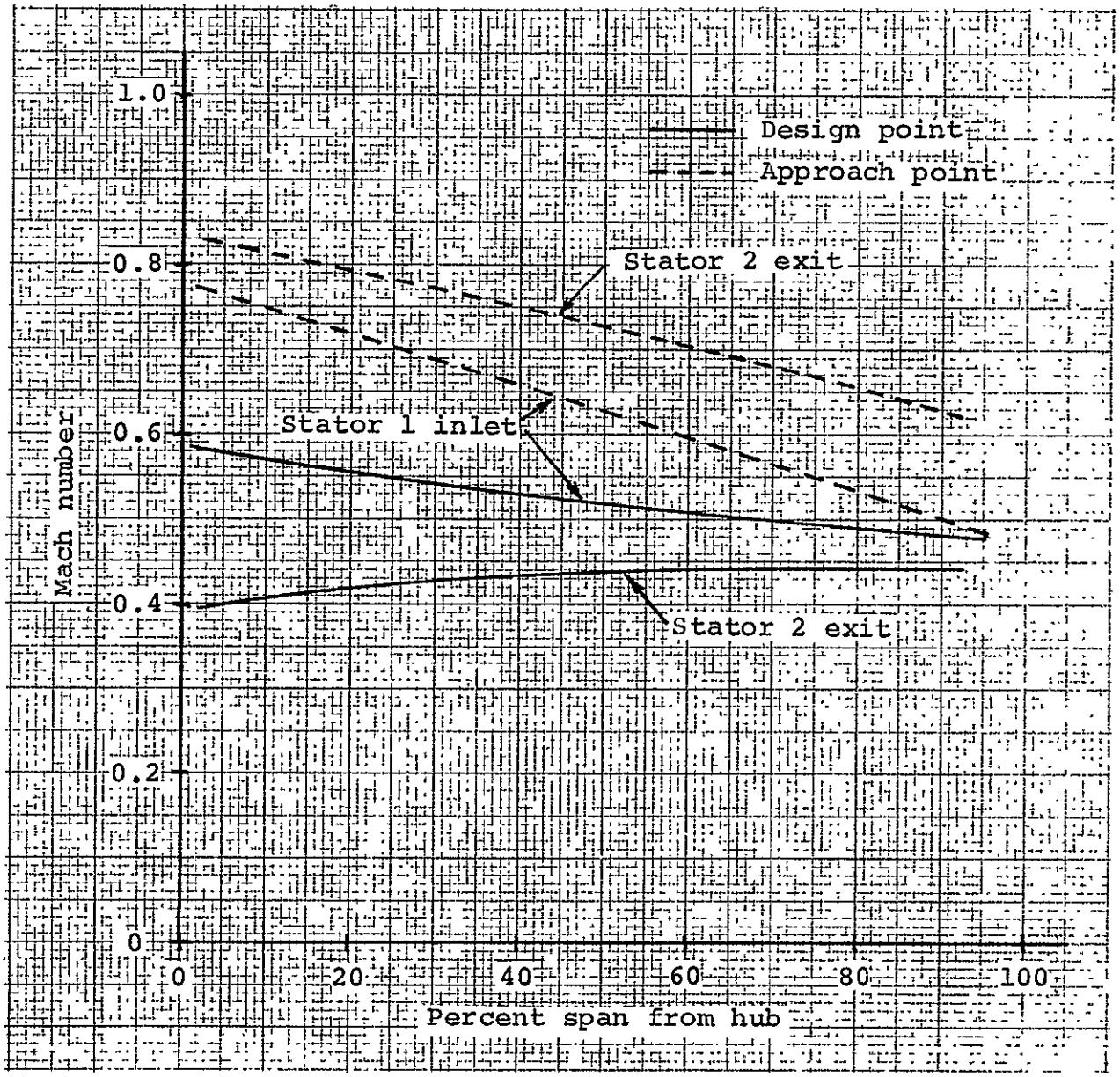


Figure 4. Stator Mach numbers at the design and approach points

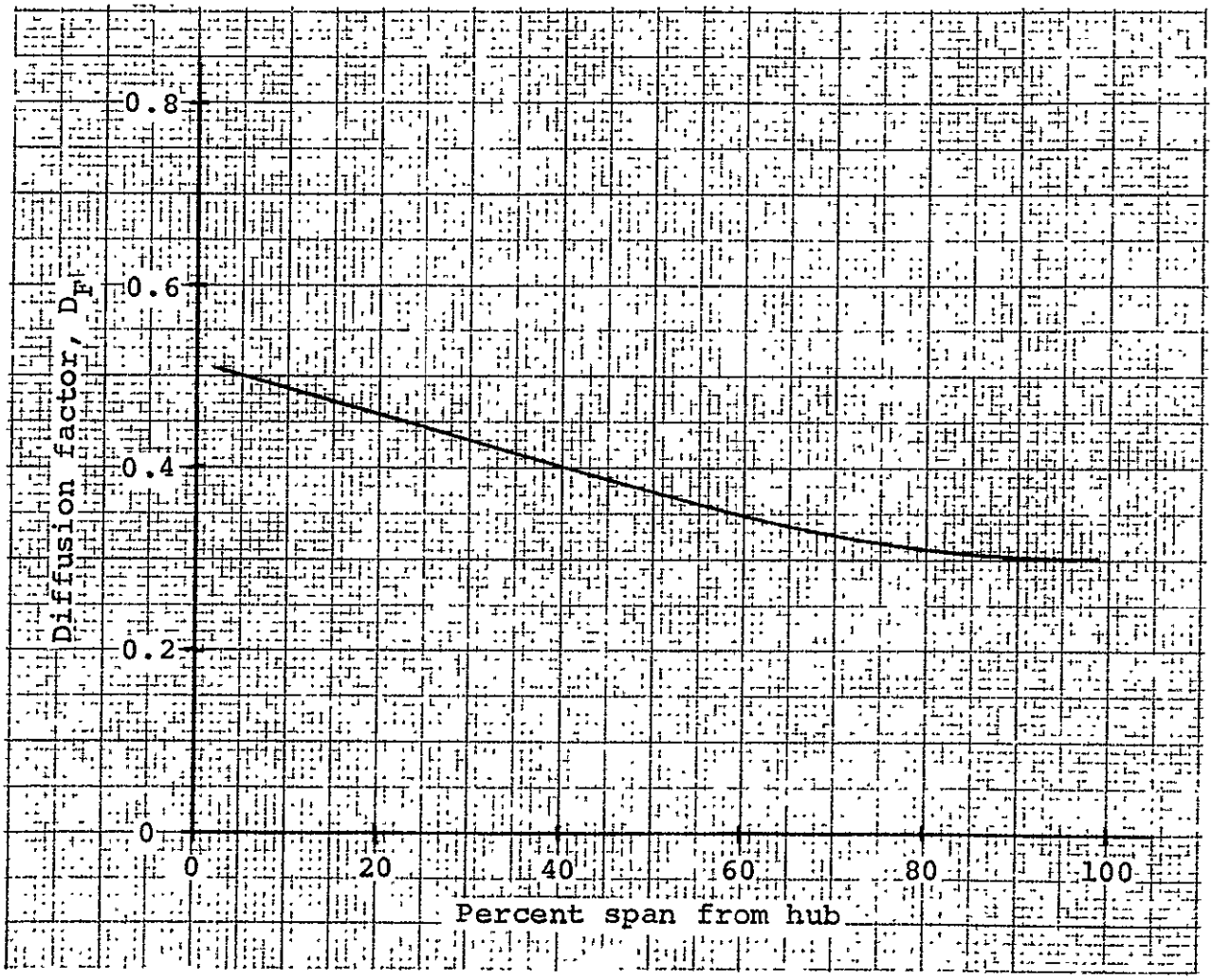


Figure 5. Rotor diffusion factor

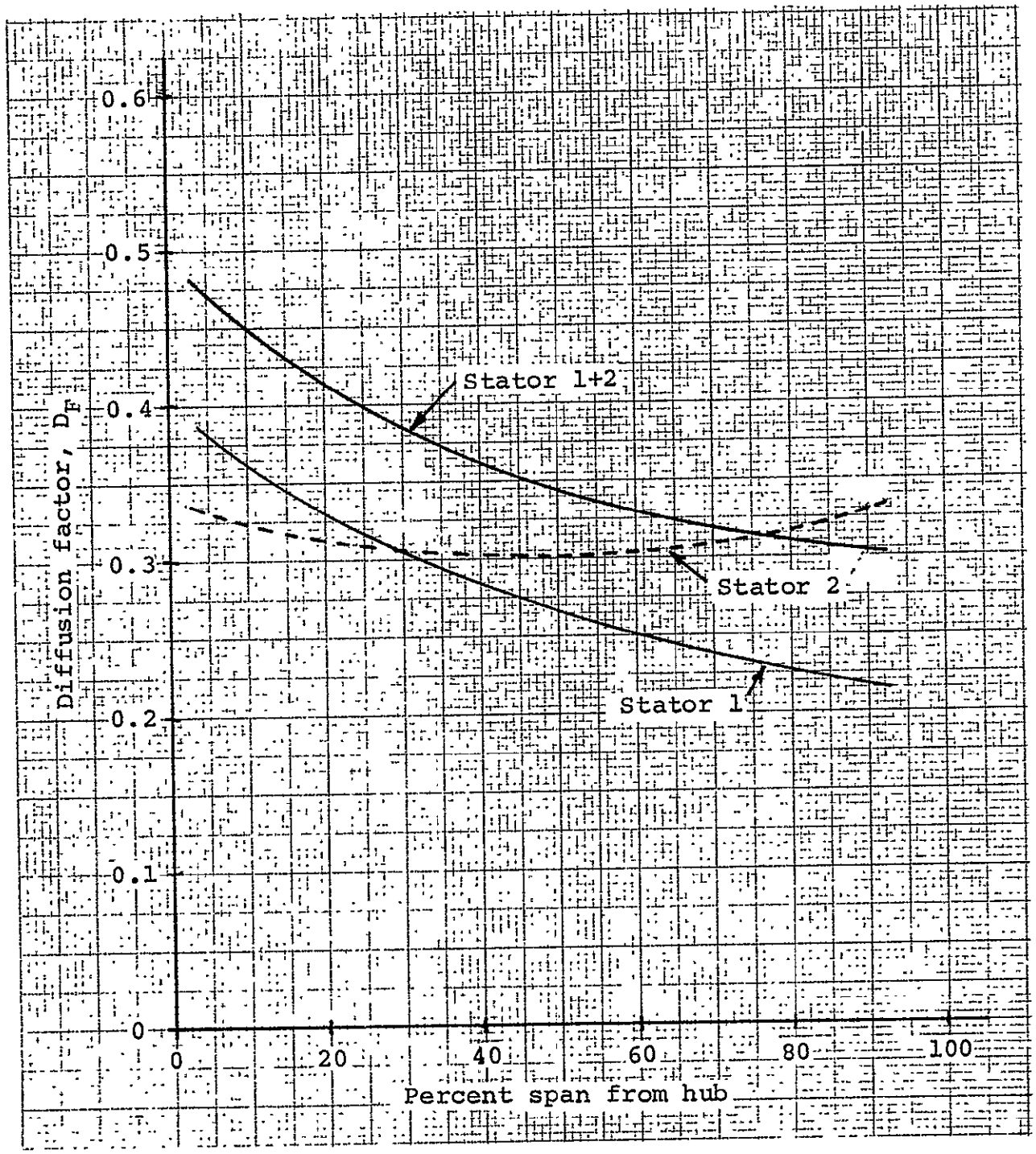


Figure 6. Stator diffusion factors

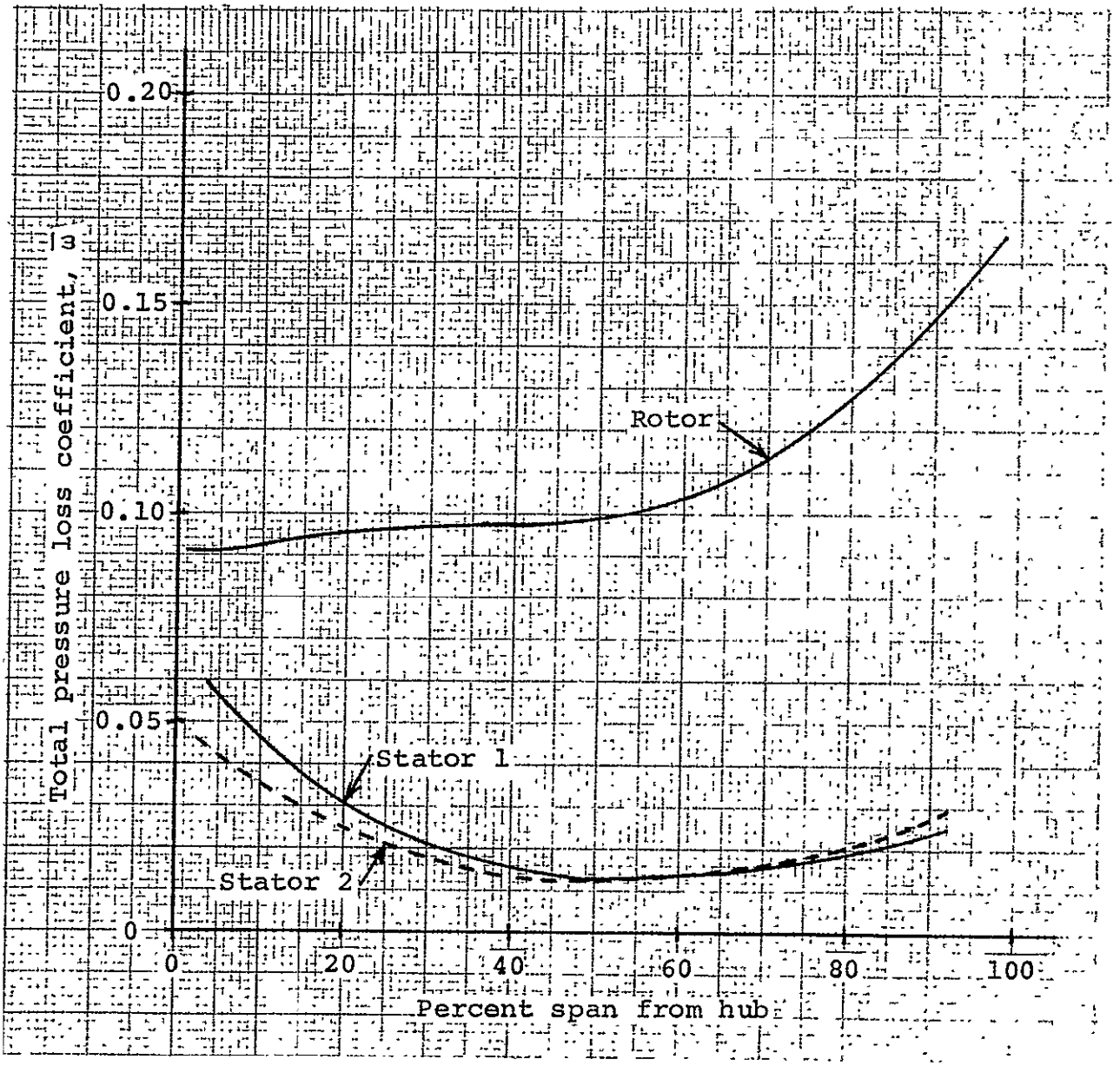


Figure 7. Rotor and stator pressure loss coefficients

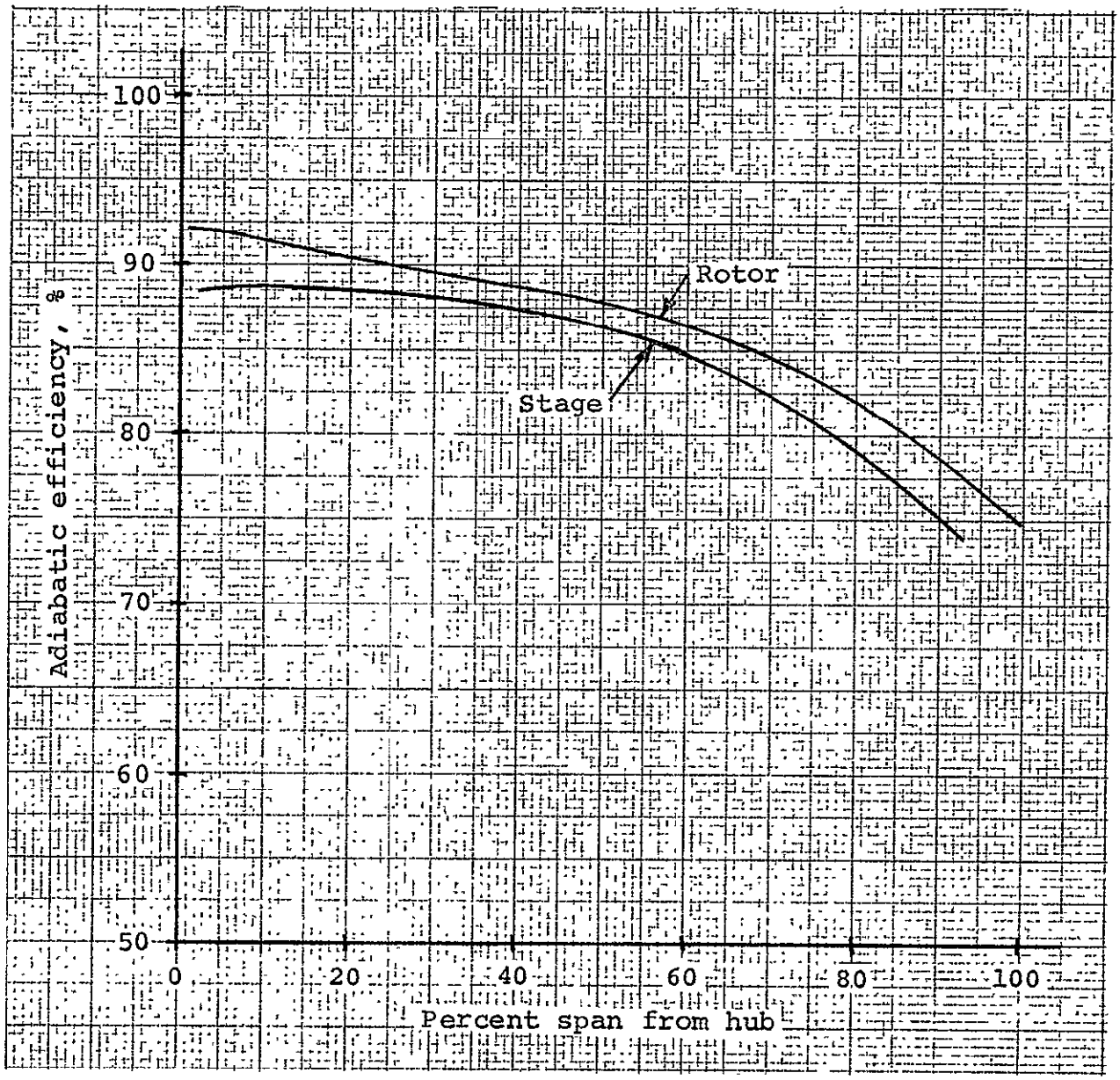


Figure 8. Radial efficiency distribution

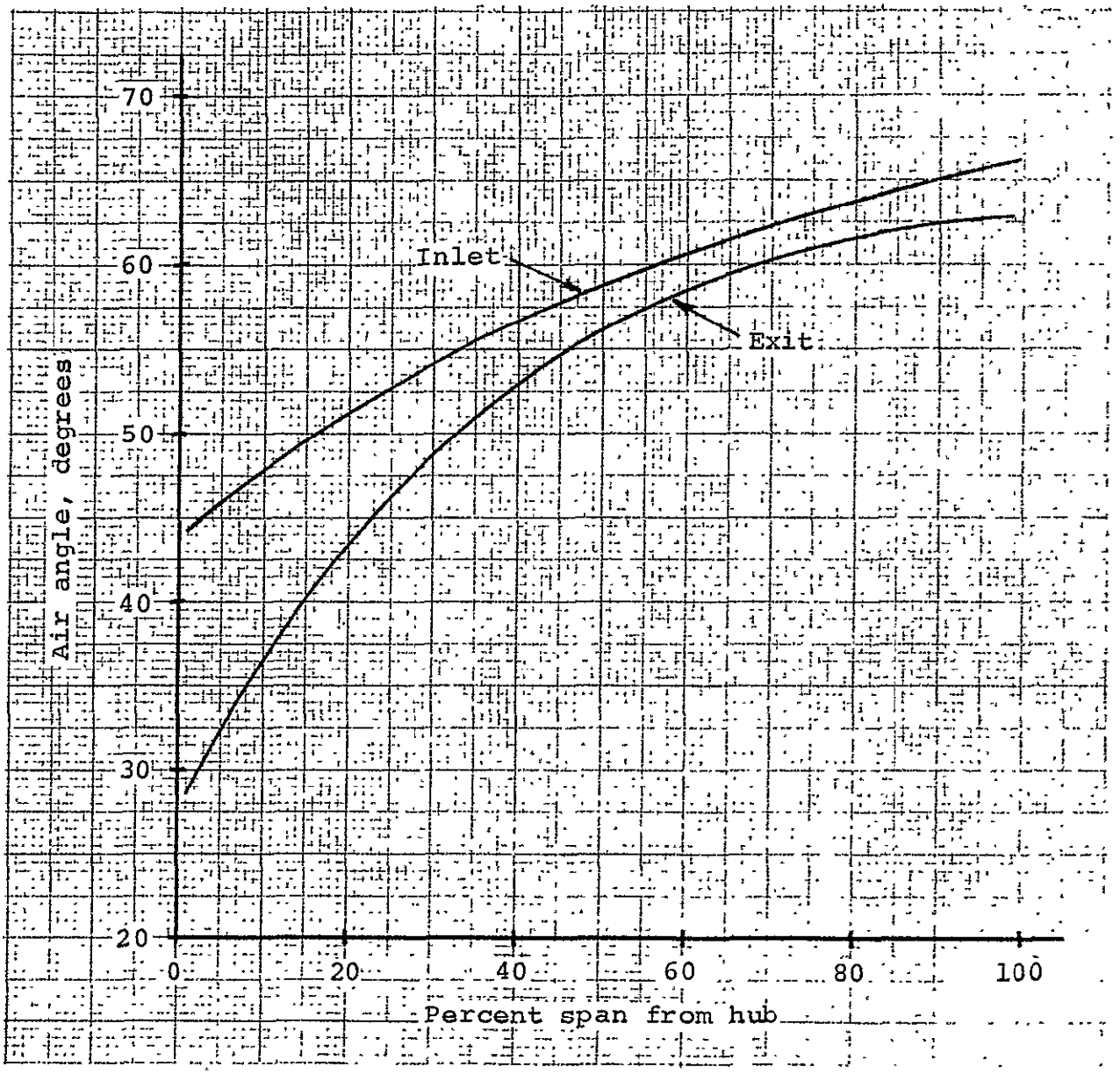


Figure 9. Rotor relative air angles

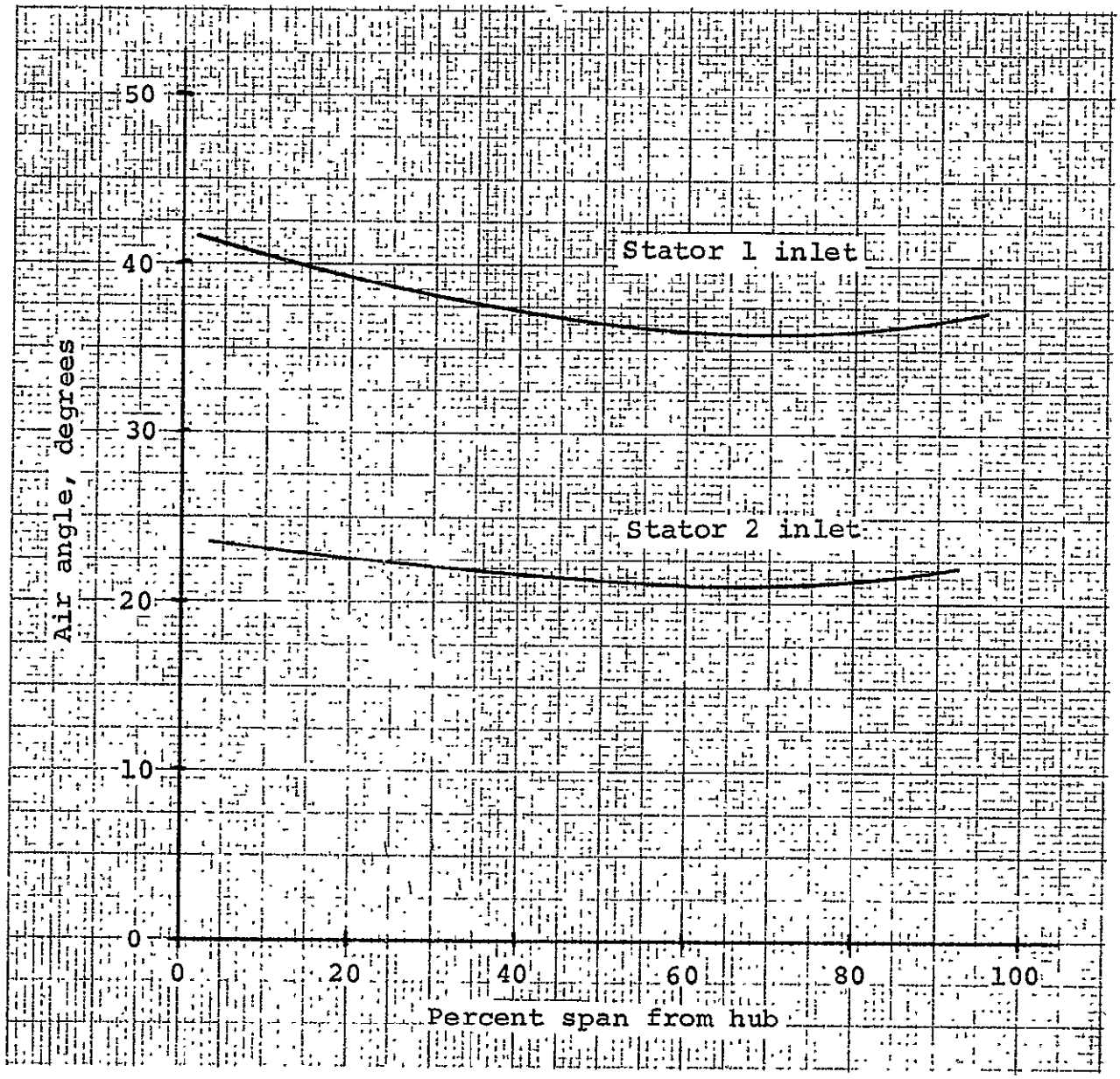


Figure 10. Stator absolute air angles

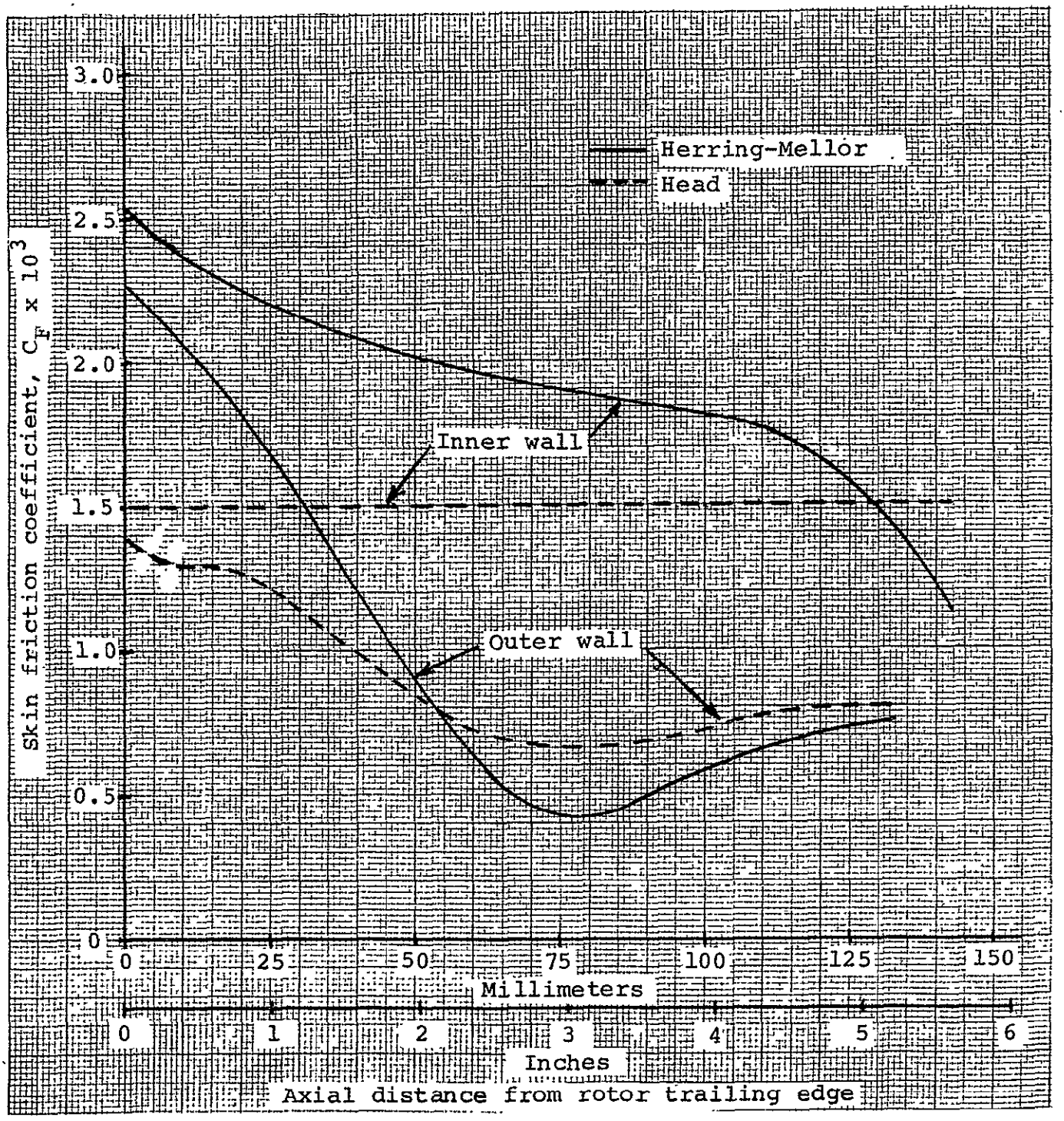


Figure 11. Skin friction coefficients for inner and outer annulus walls between rotor and stator

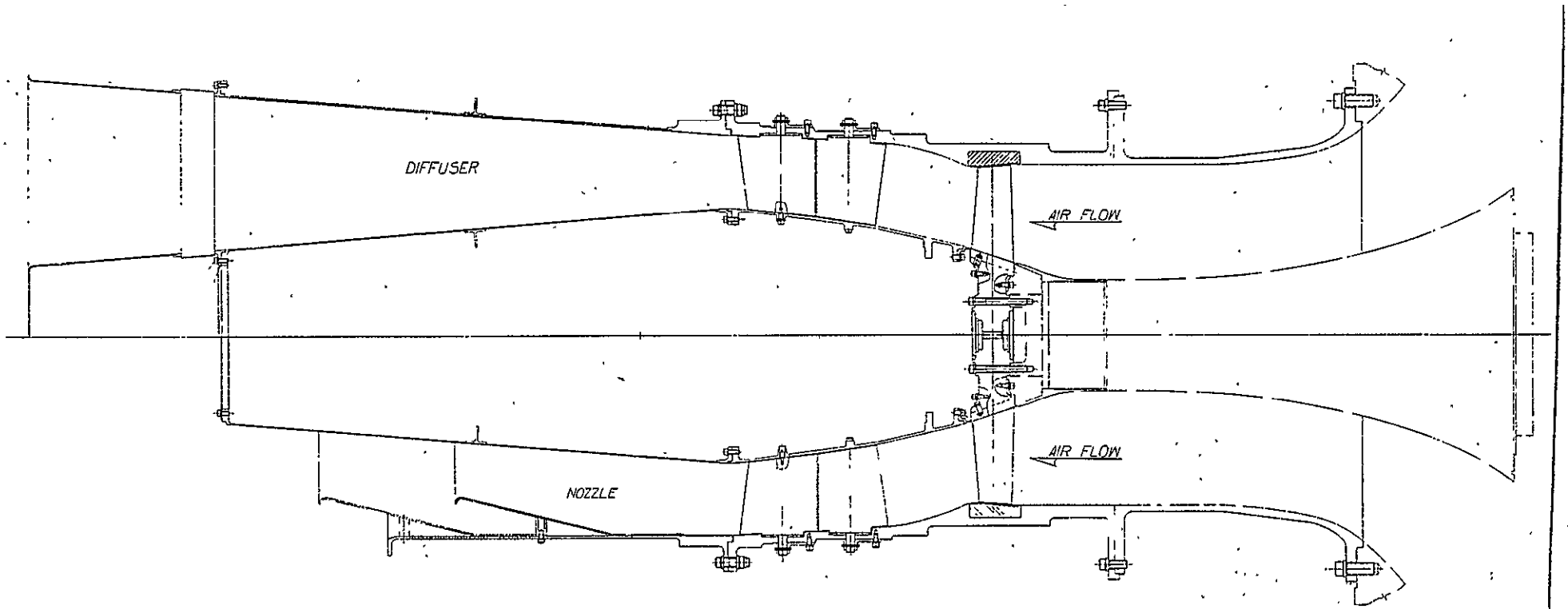


FIGURE 12. NOZZLE AND DIFFUSER, GEOMETRY

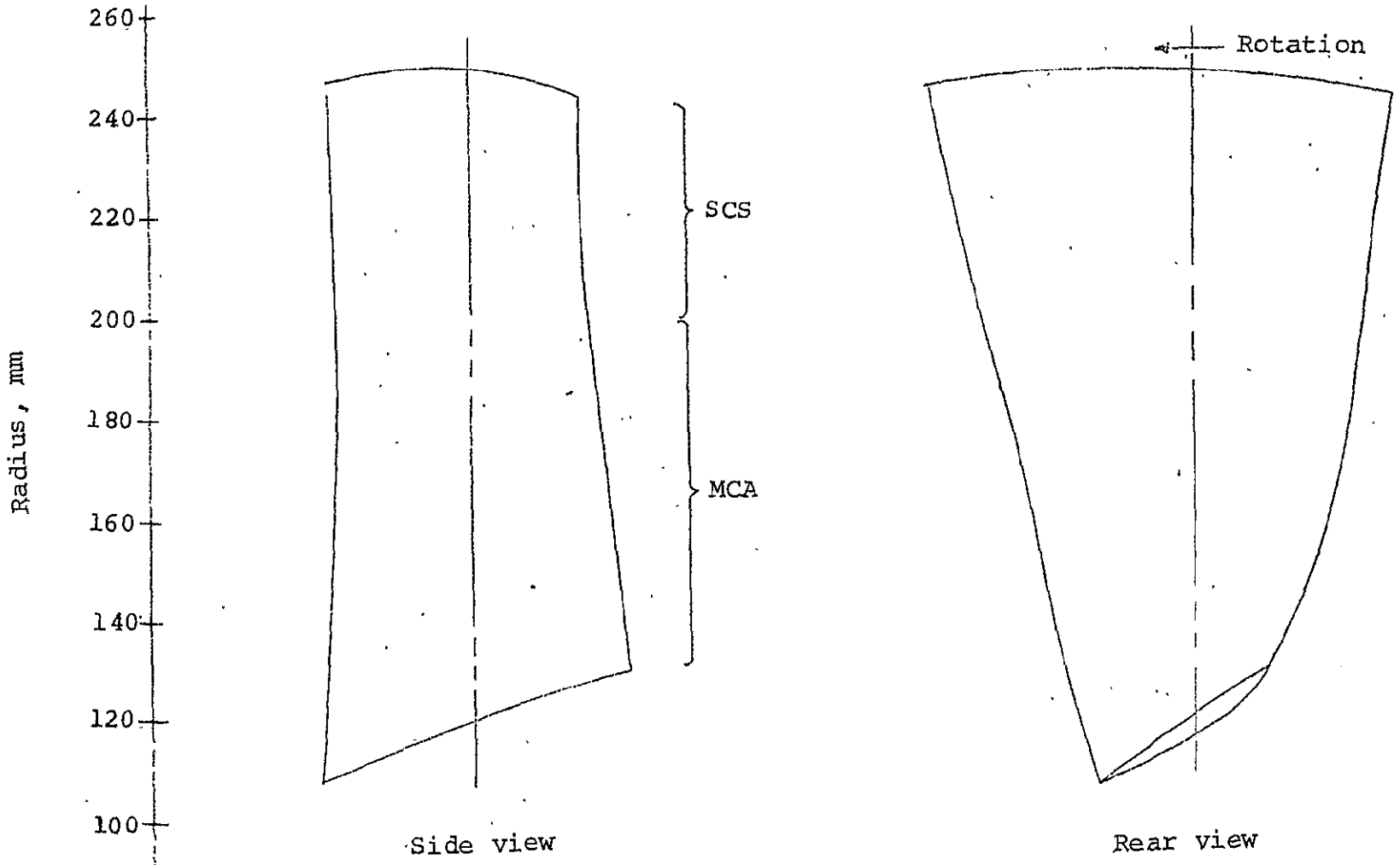


Figure 13. QHF rotor blade profile

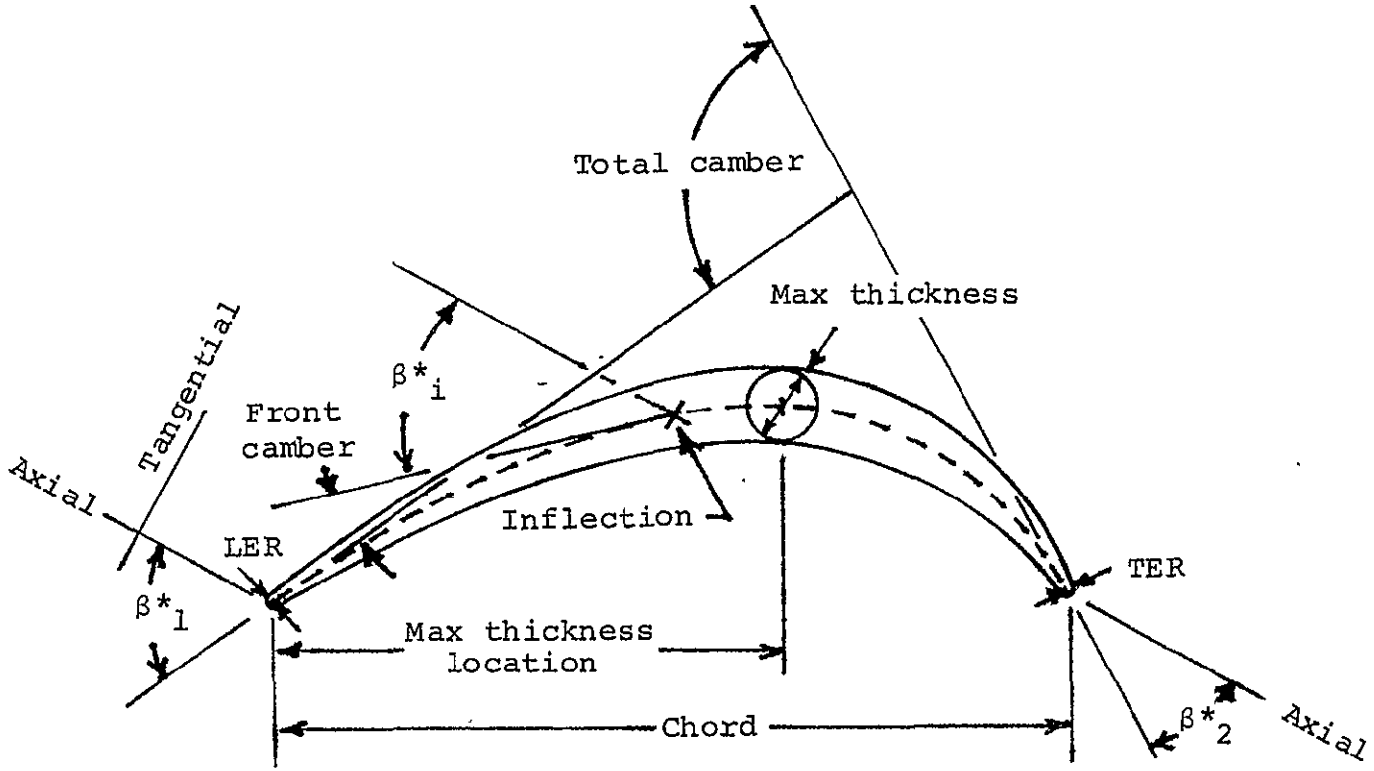


Figure 14. Multiple circular arc airfoil definitions

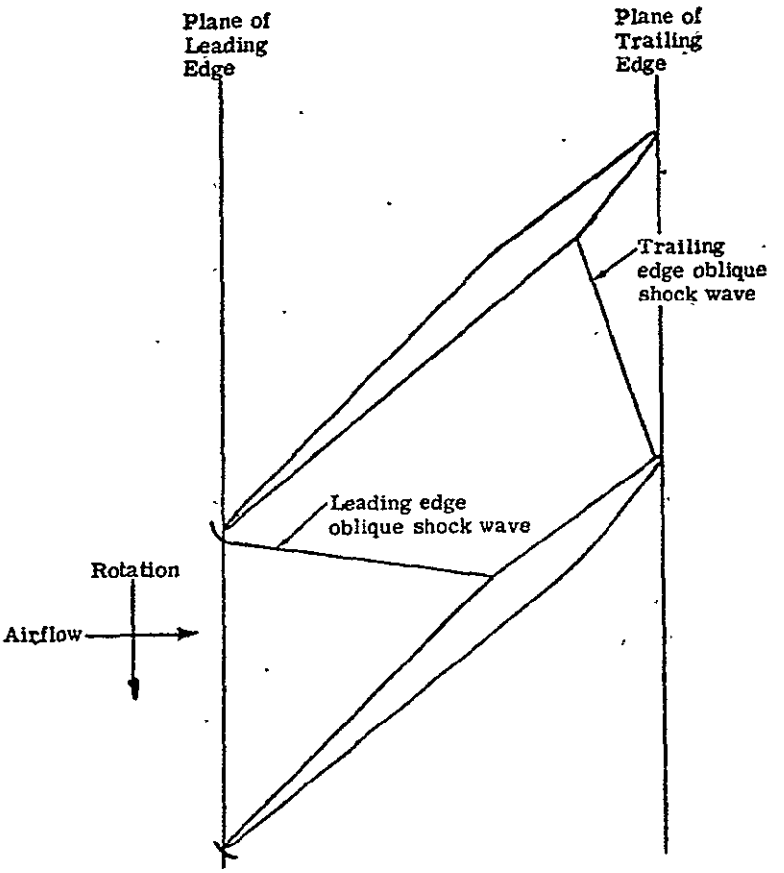


Figure 15. Schematic of started contained shock blade section

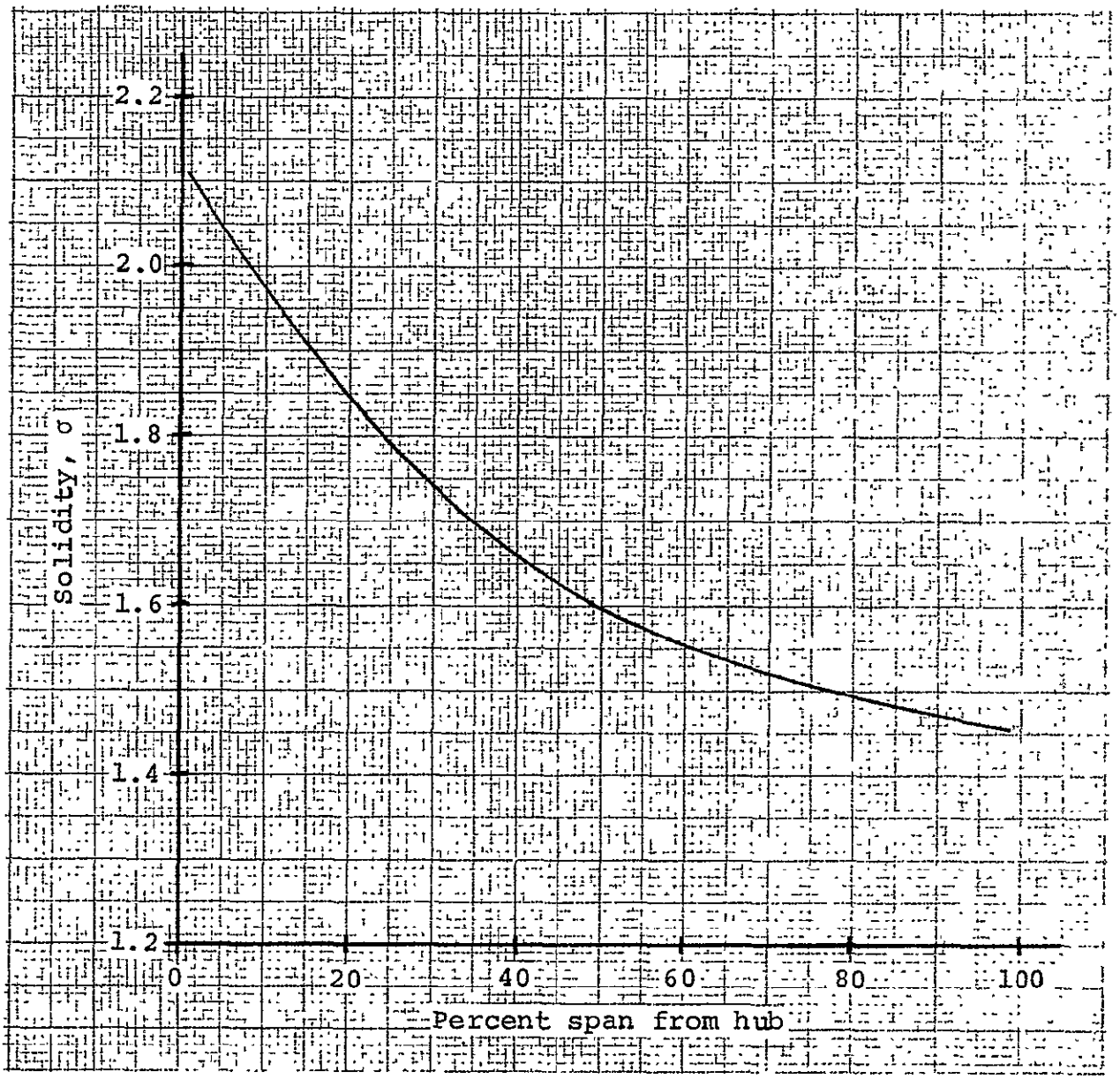


Figure 16. Rotor solidity

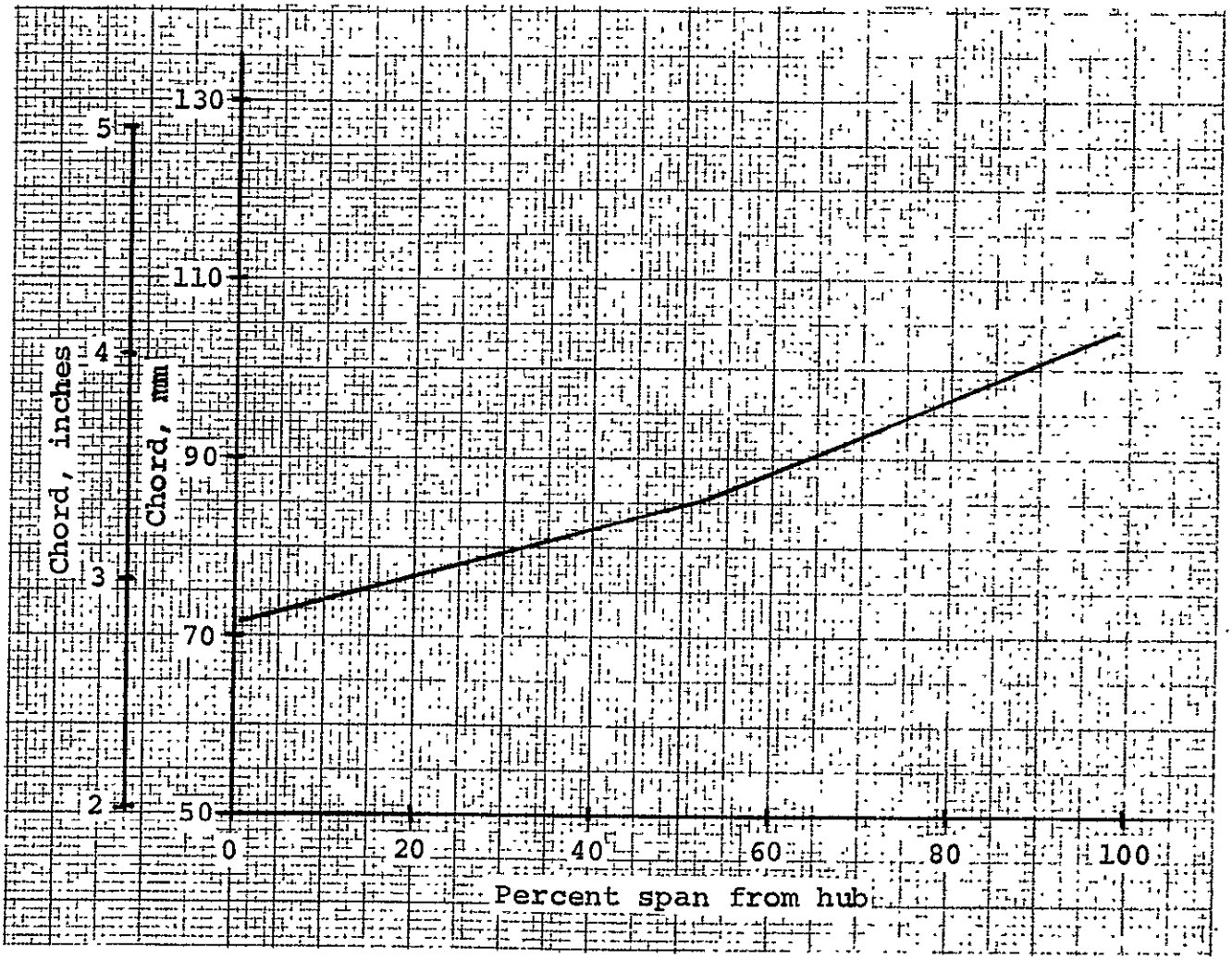


Figure 17. Rotor chord

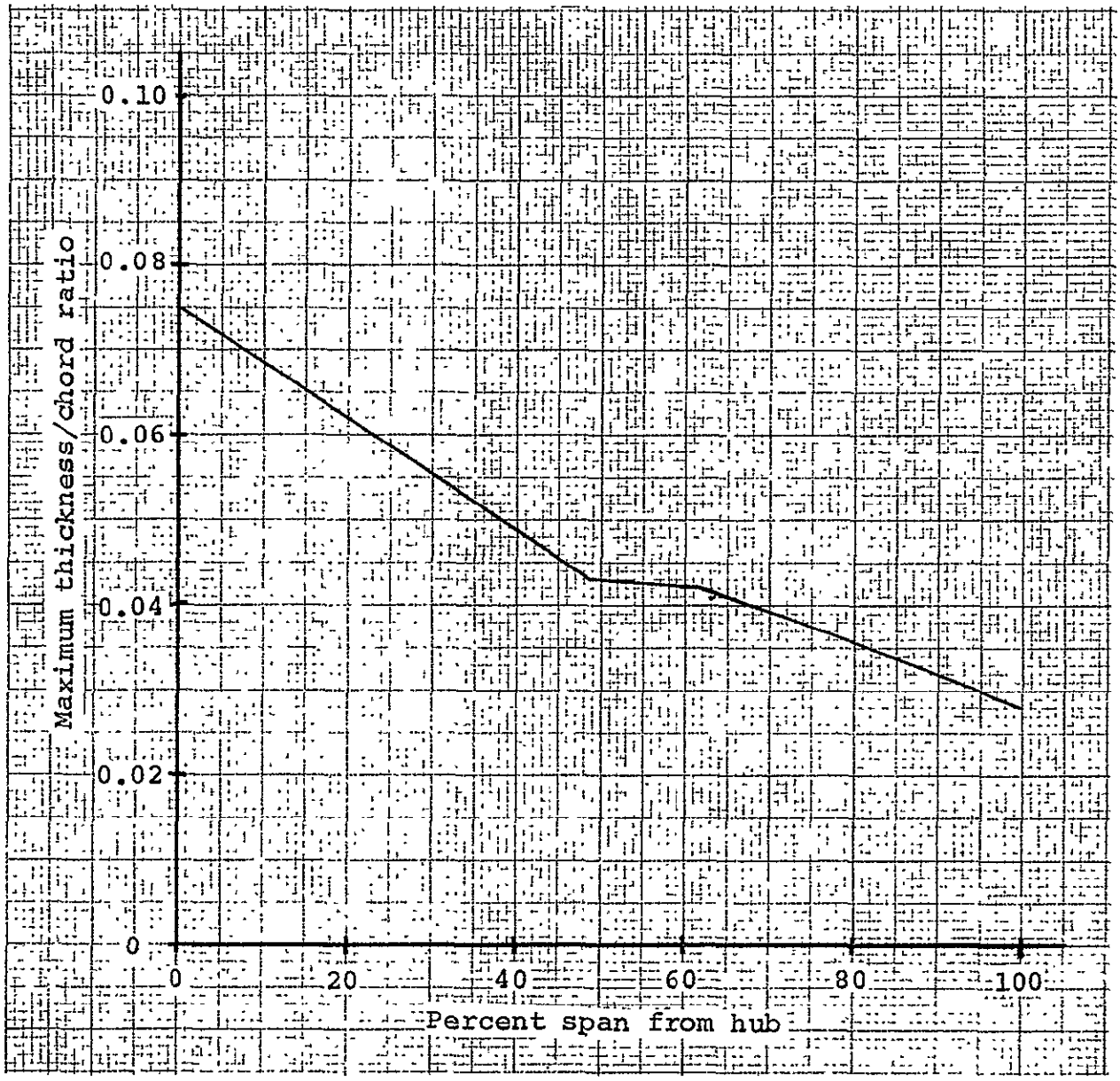


Figure 18. Rotor thickness/chord ratio

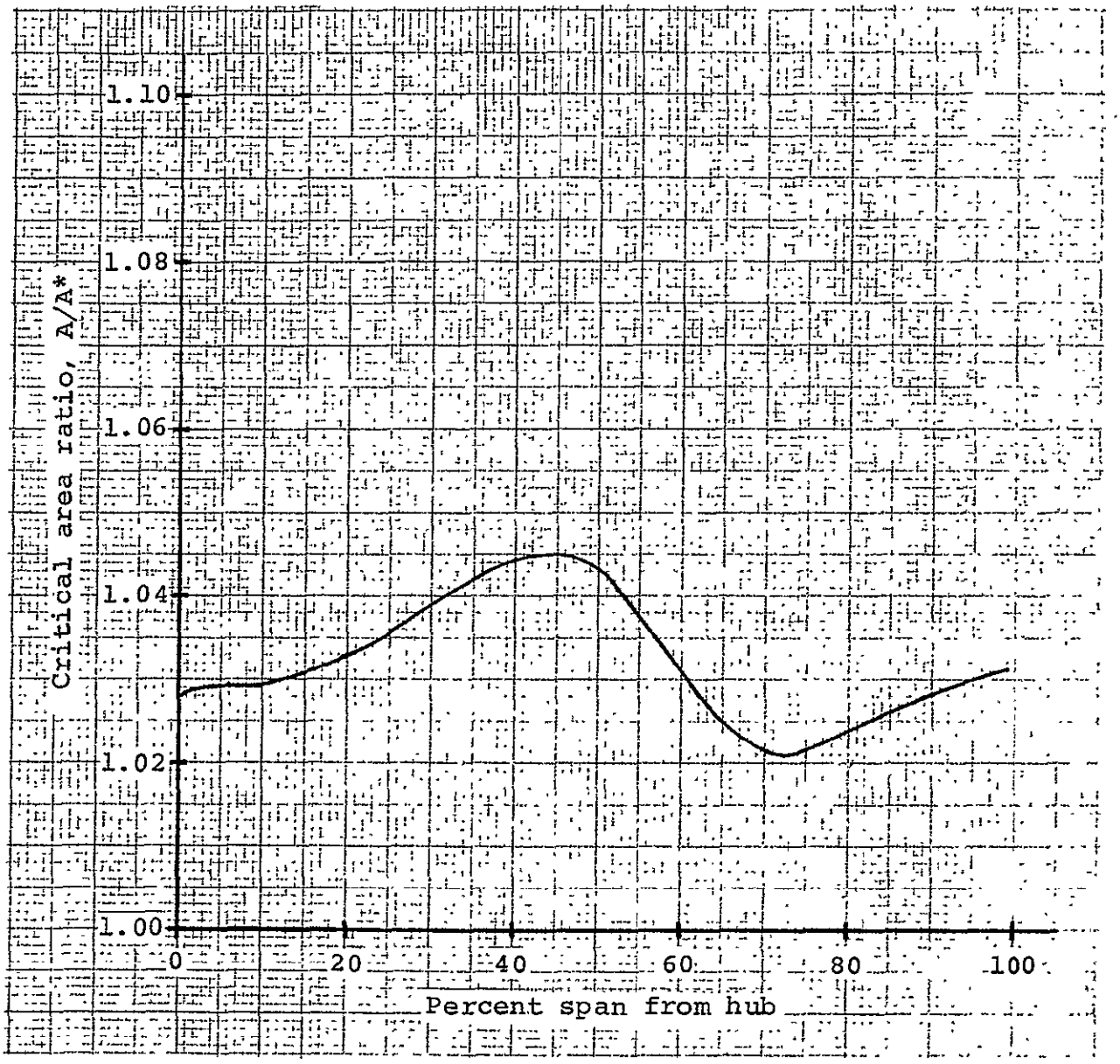


Figure 19. Radial distribution of blade passage minimum critical area ratio

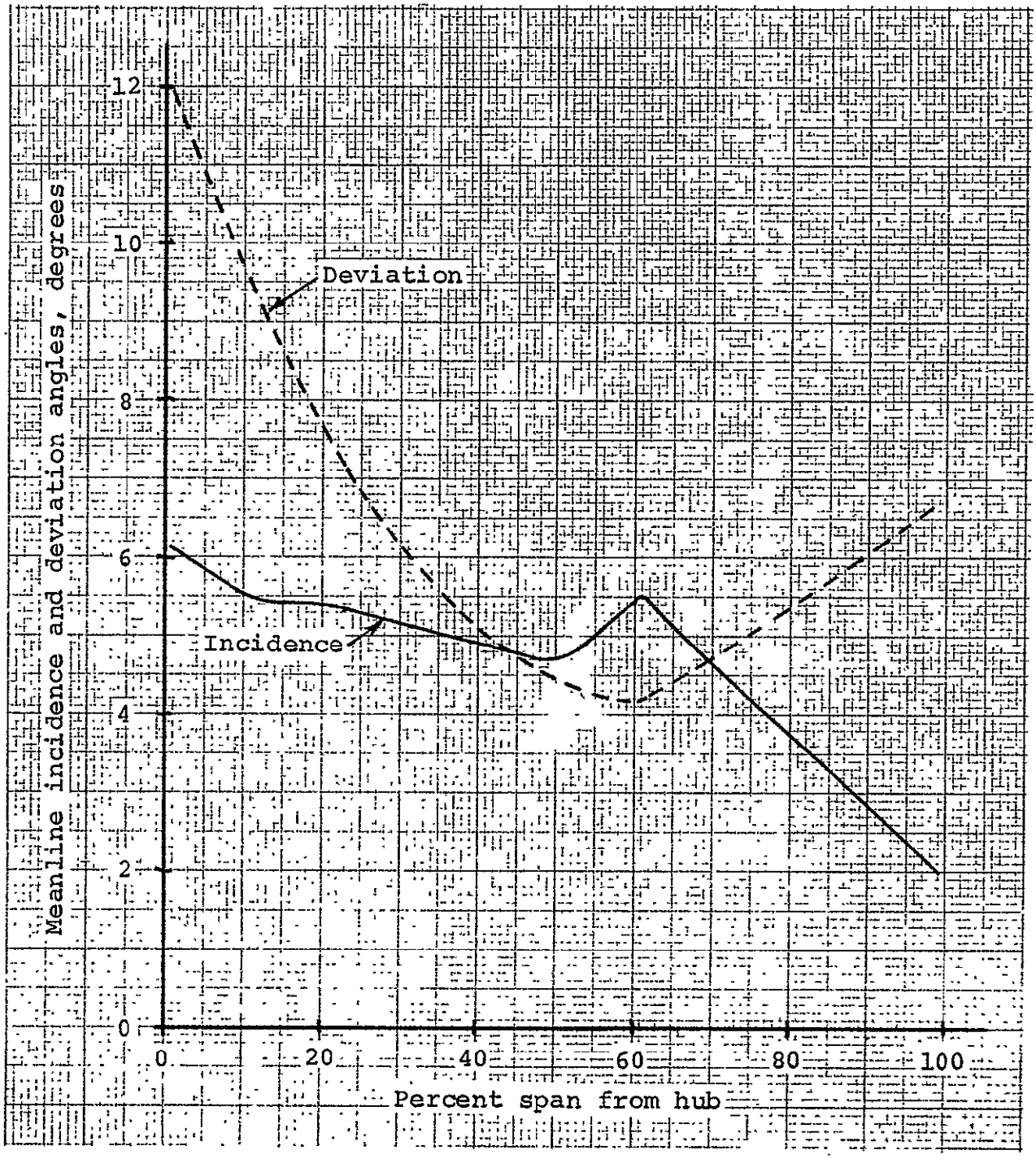


Figure 20. Rotor incidence and deviation

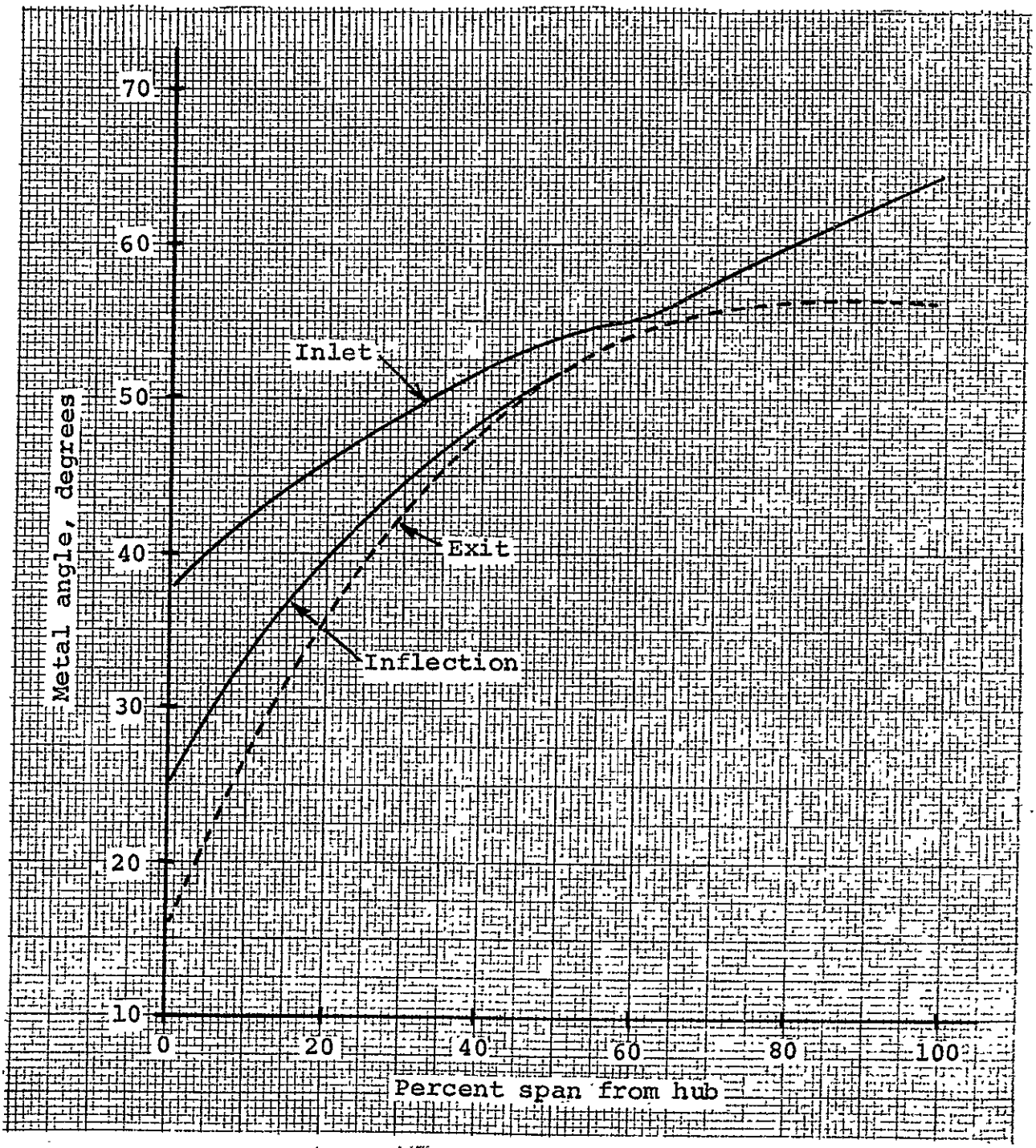


Figure 21. Rotor metal angles

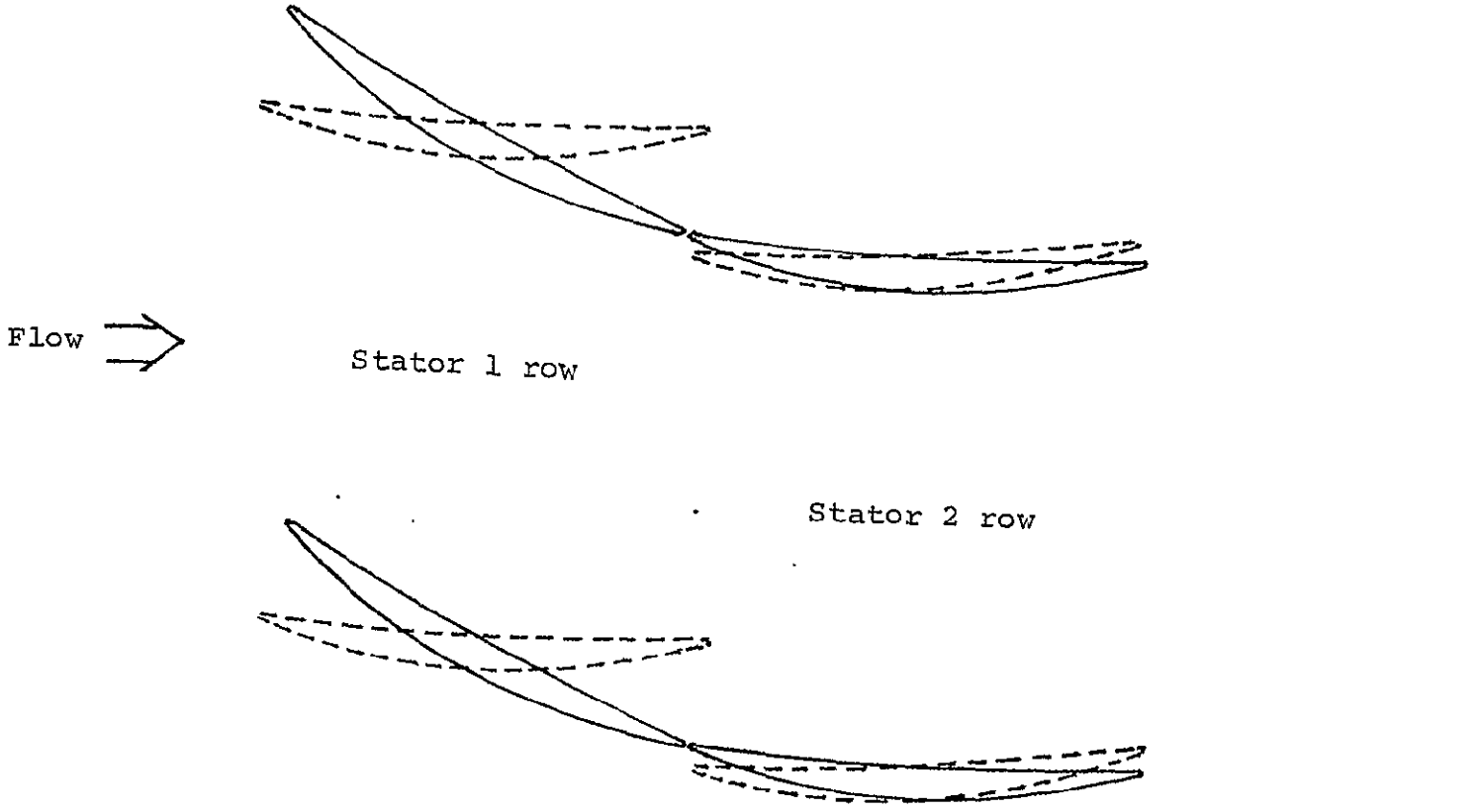


Figure 22. QHF tandem vane relationship

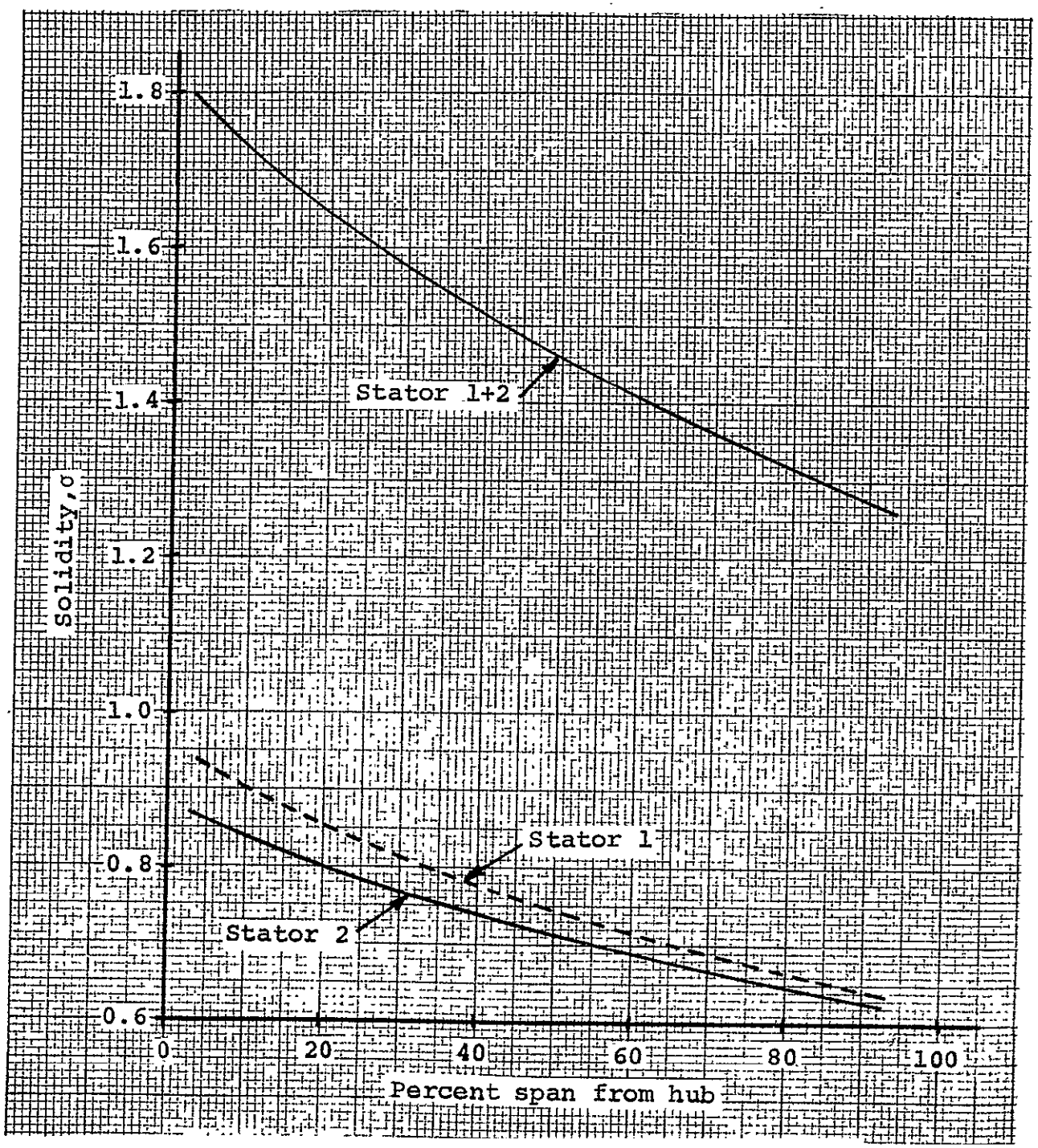


Figure 23. Stator solidity

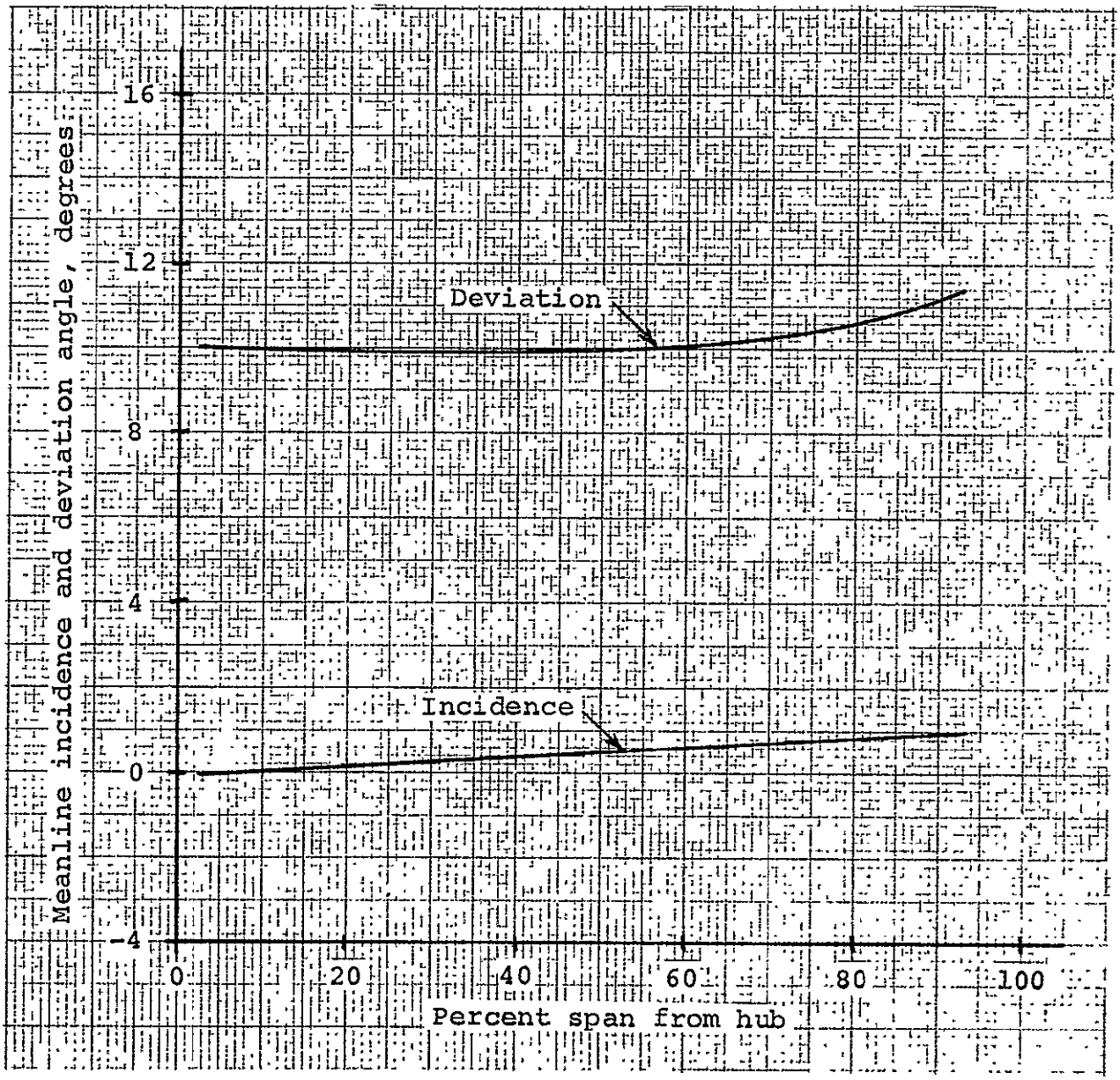


Figure 24. Stator 1 incidence and stator 2 deviation angles

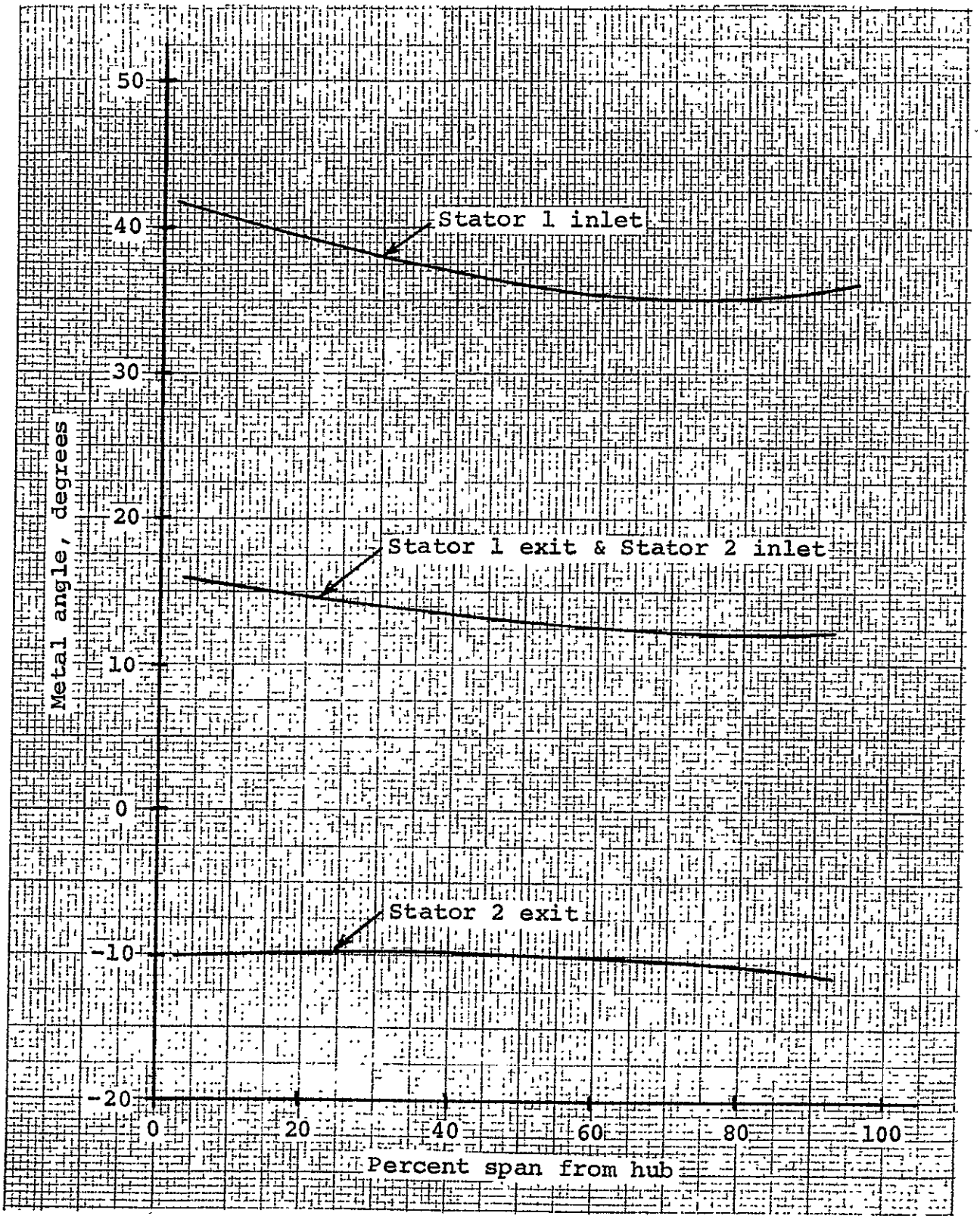


Figure 25. Radial metal angle distribution for the stators

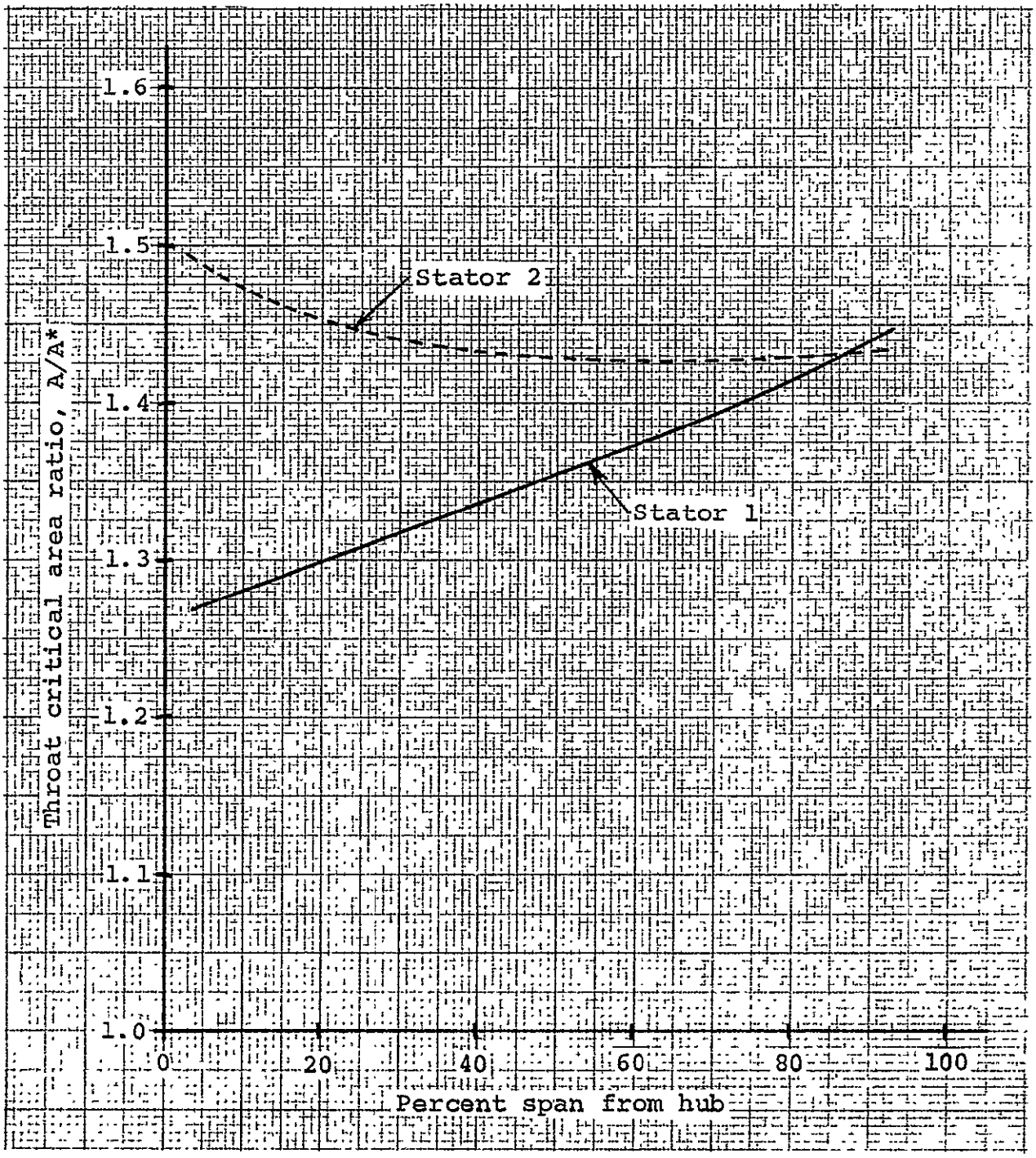


Figure 26. Stator passage design minimum critical area ratio

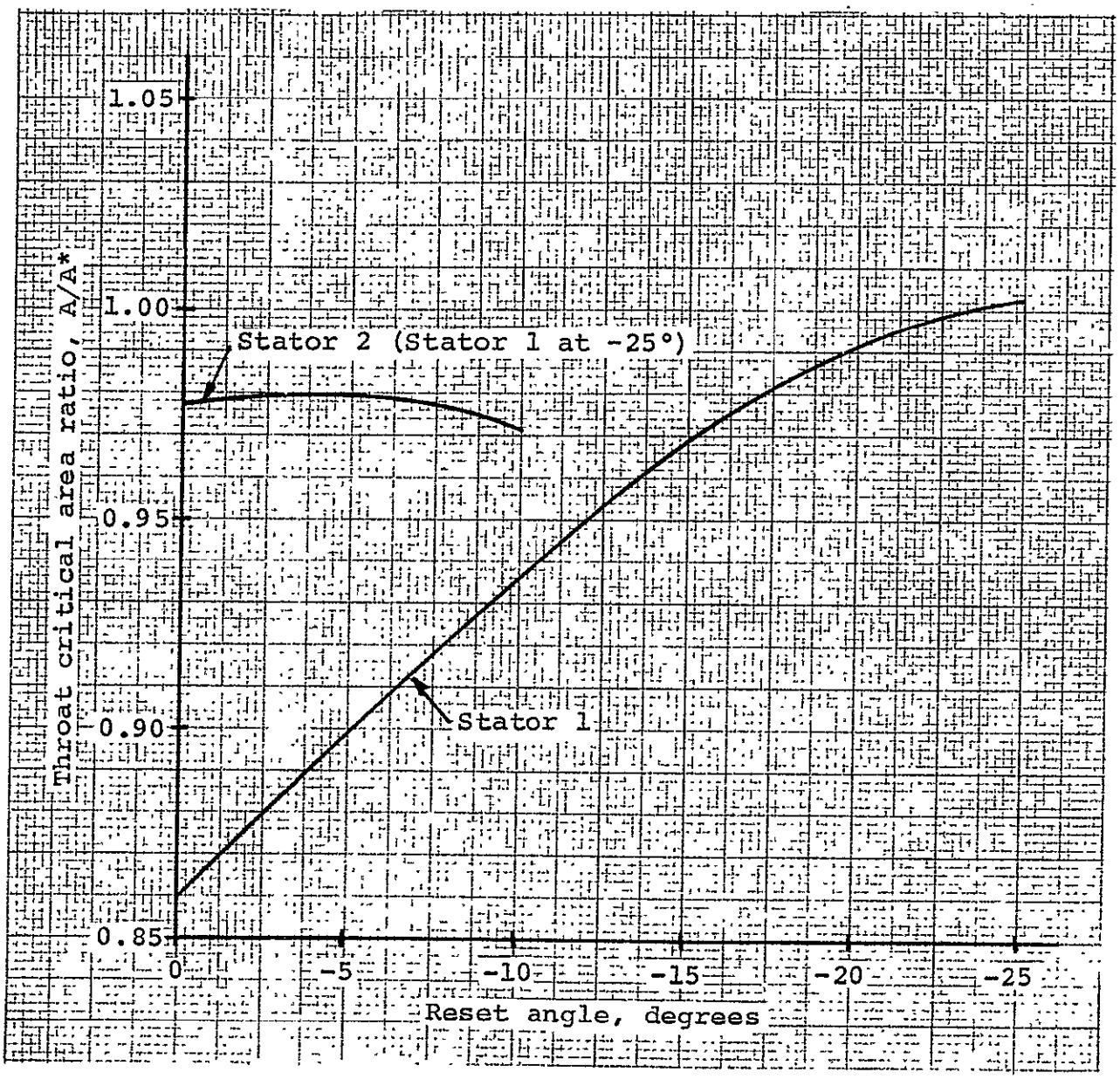


Figure 27. Stator hub passage critical area ratio for various vane reset angles

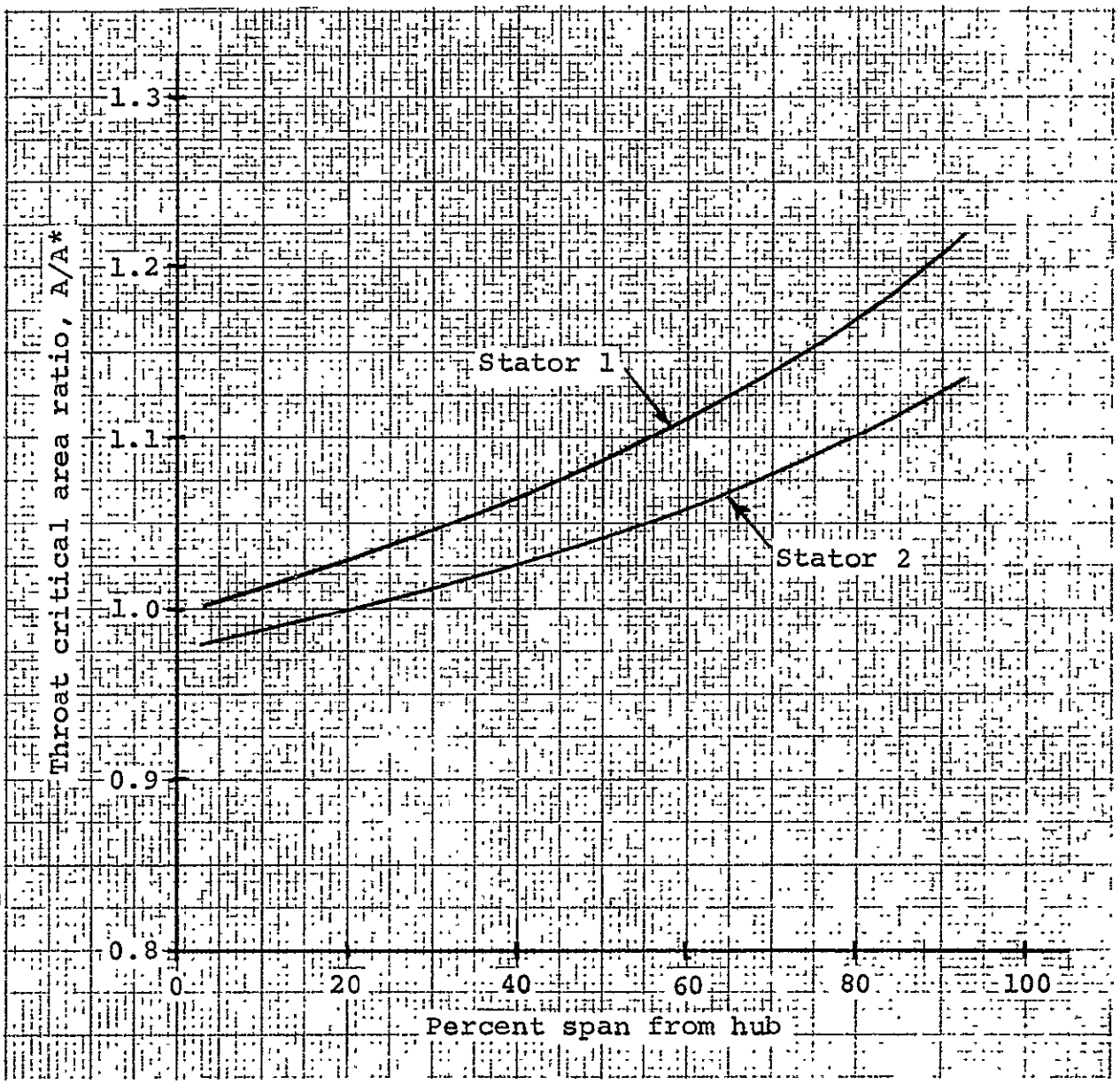
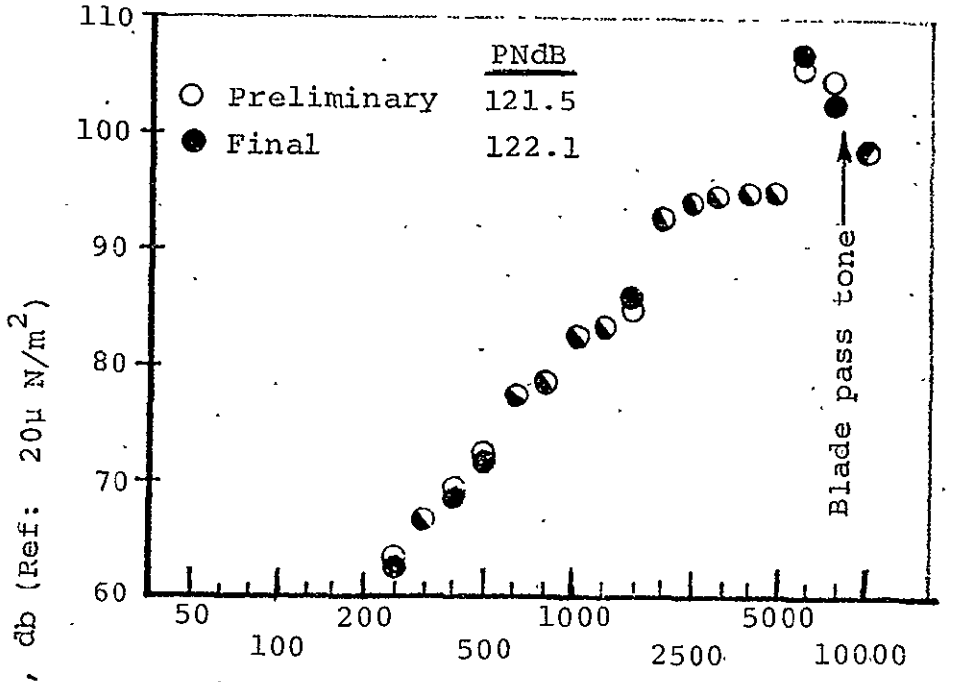
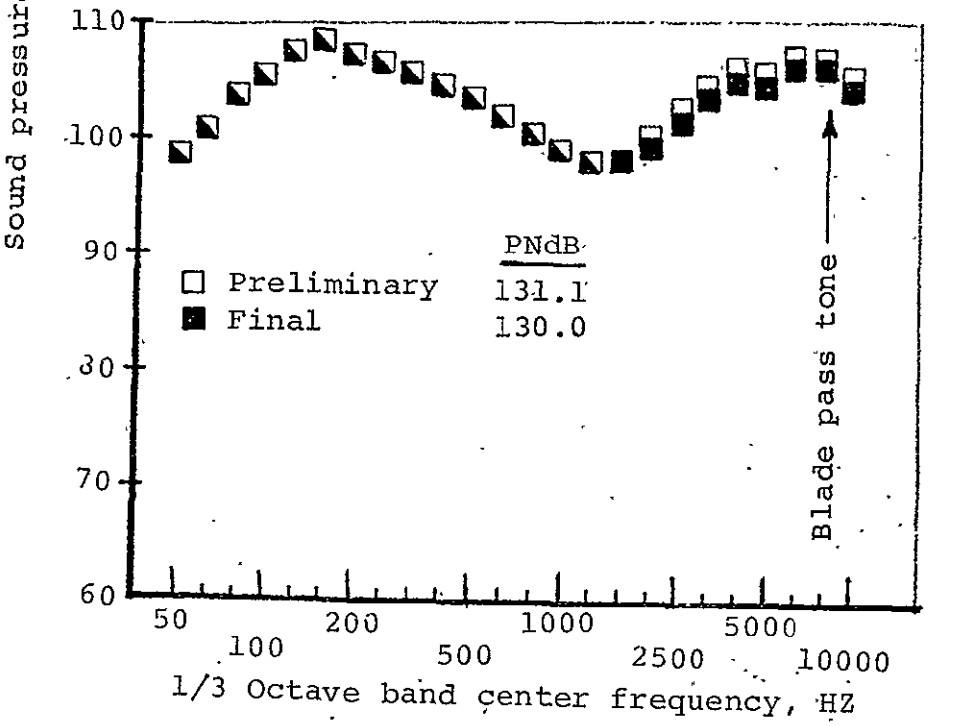


Figure 28. Stator approach point minimum critical area ratio

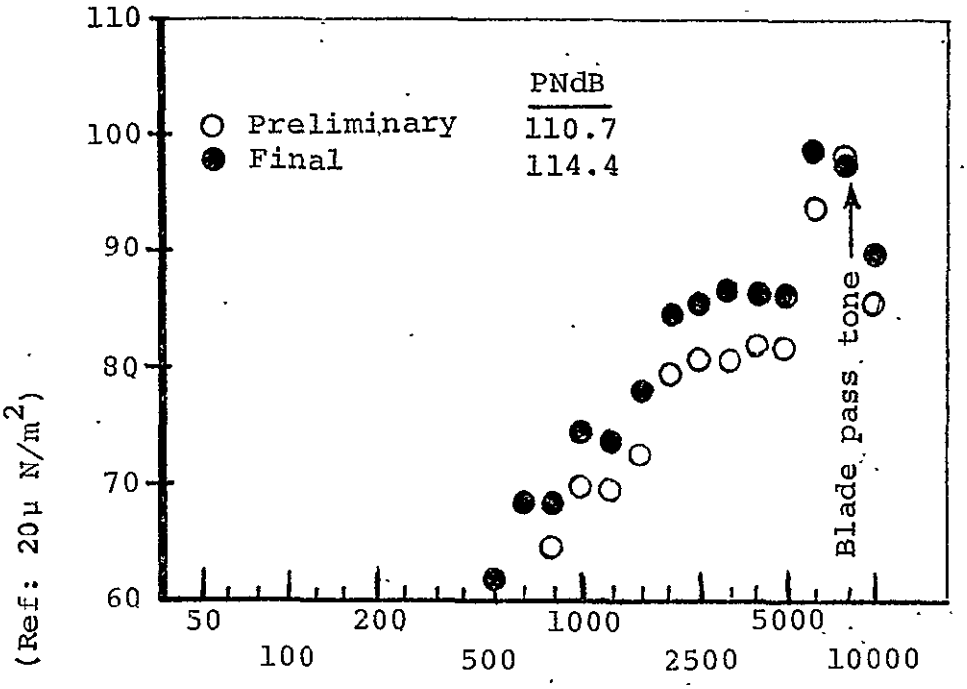


29a. Inlet noise at 50° from axis

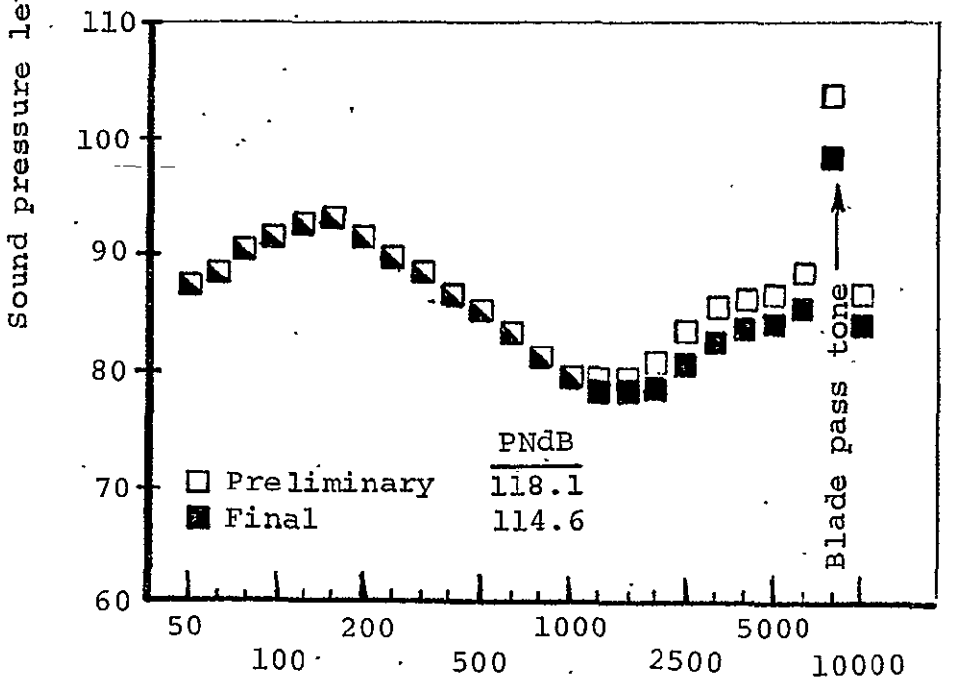


29b. Exhaust noise at 60° from axis

Figure 29. Comparison of rig test noise levels estimated for QHF fan preliminary and final designs - take-off condition at 5m (16.4 ft) radius



30a. Inlet noise at 50° from axis



30b. Exhaust noise at 60° from axis

Figure 30. Comparison of rig test noise levels estimated for QHF fan preliminary and final designs - approach condition at 5m (16.4 ft) radius

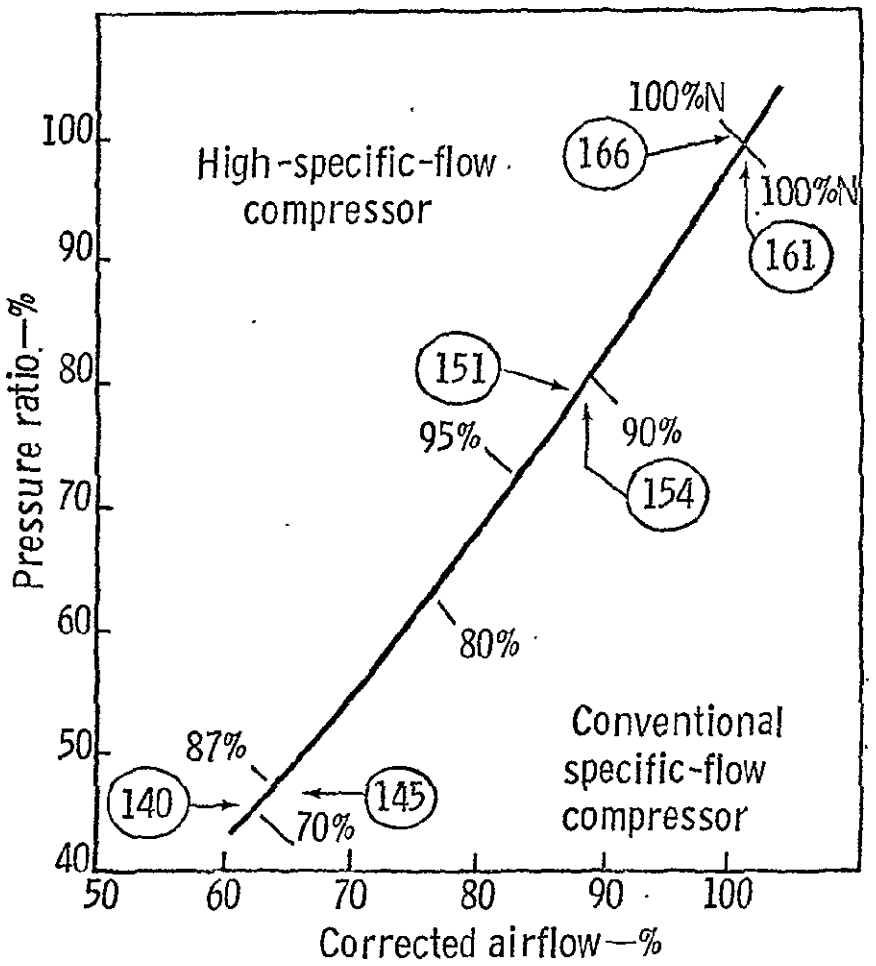


Figure 31. Normalized fan map for high specific flow and conventional specific flow compressors showing location of noise test data points

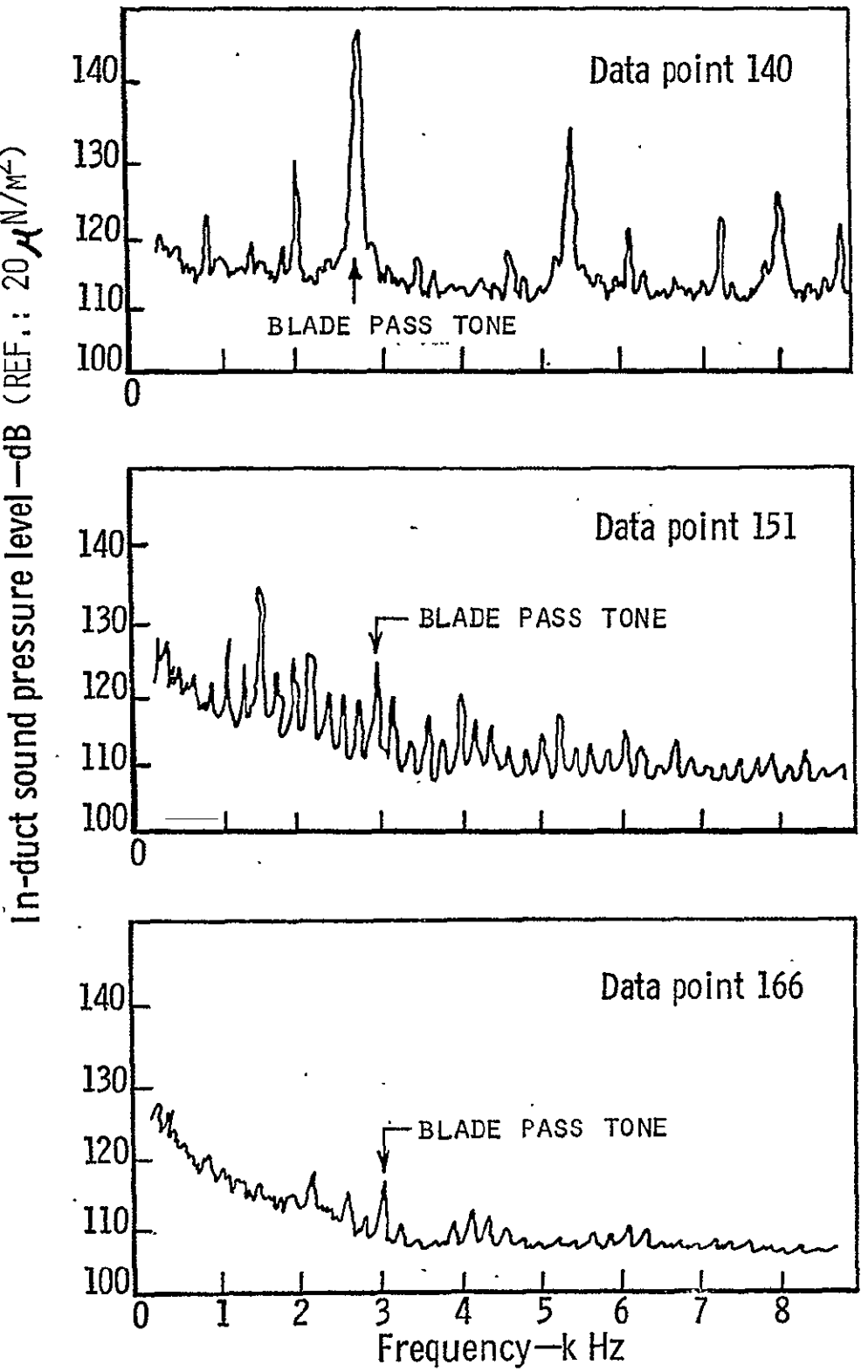


Figure 32. Narrow band analysis of high specific flow compressor inlet noise at 3 speed conditions

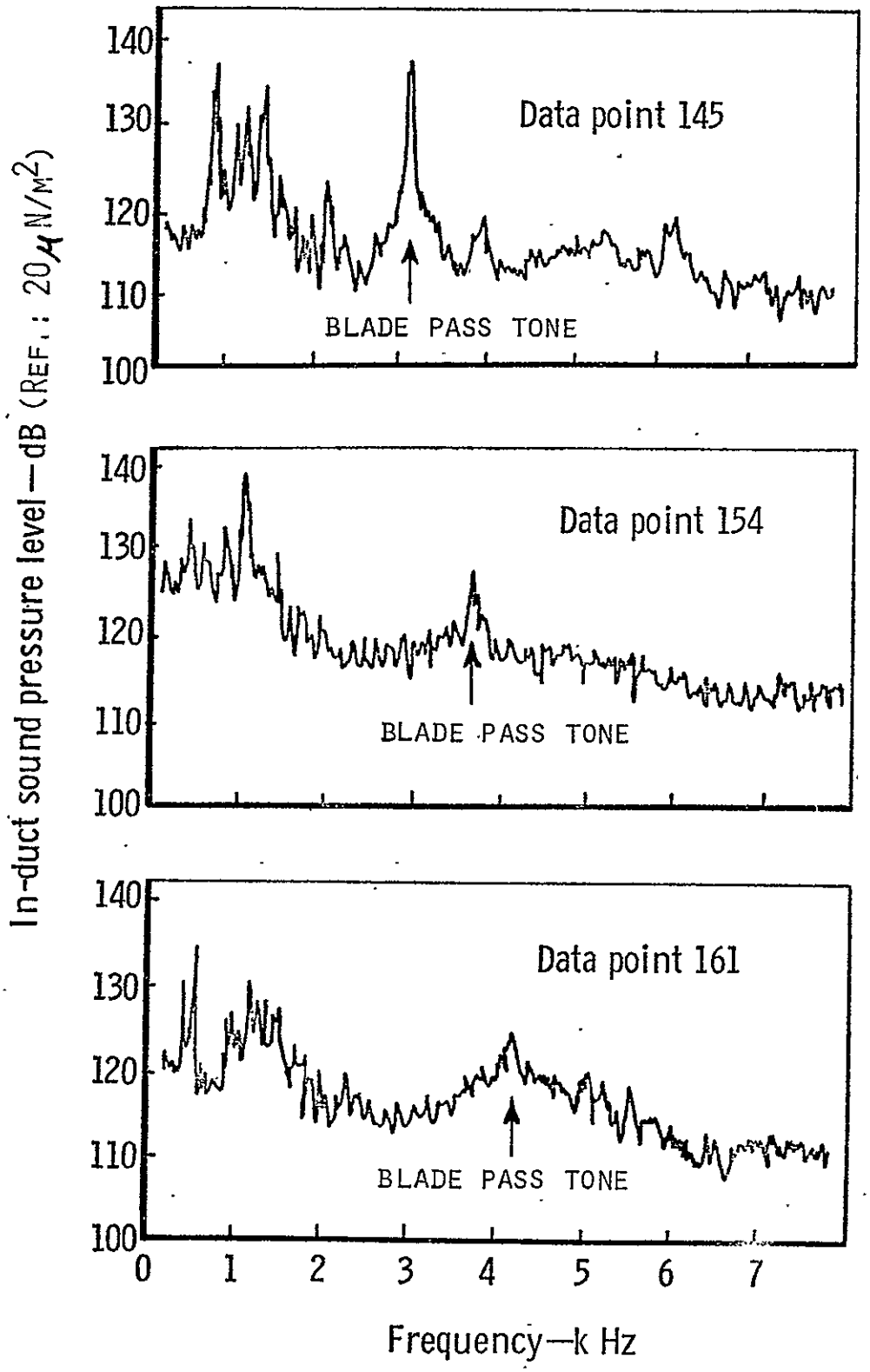


Figure 33. Narrow band analysis of conventional specific flow fan inlet noise at 3 speed conditions

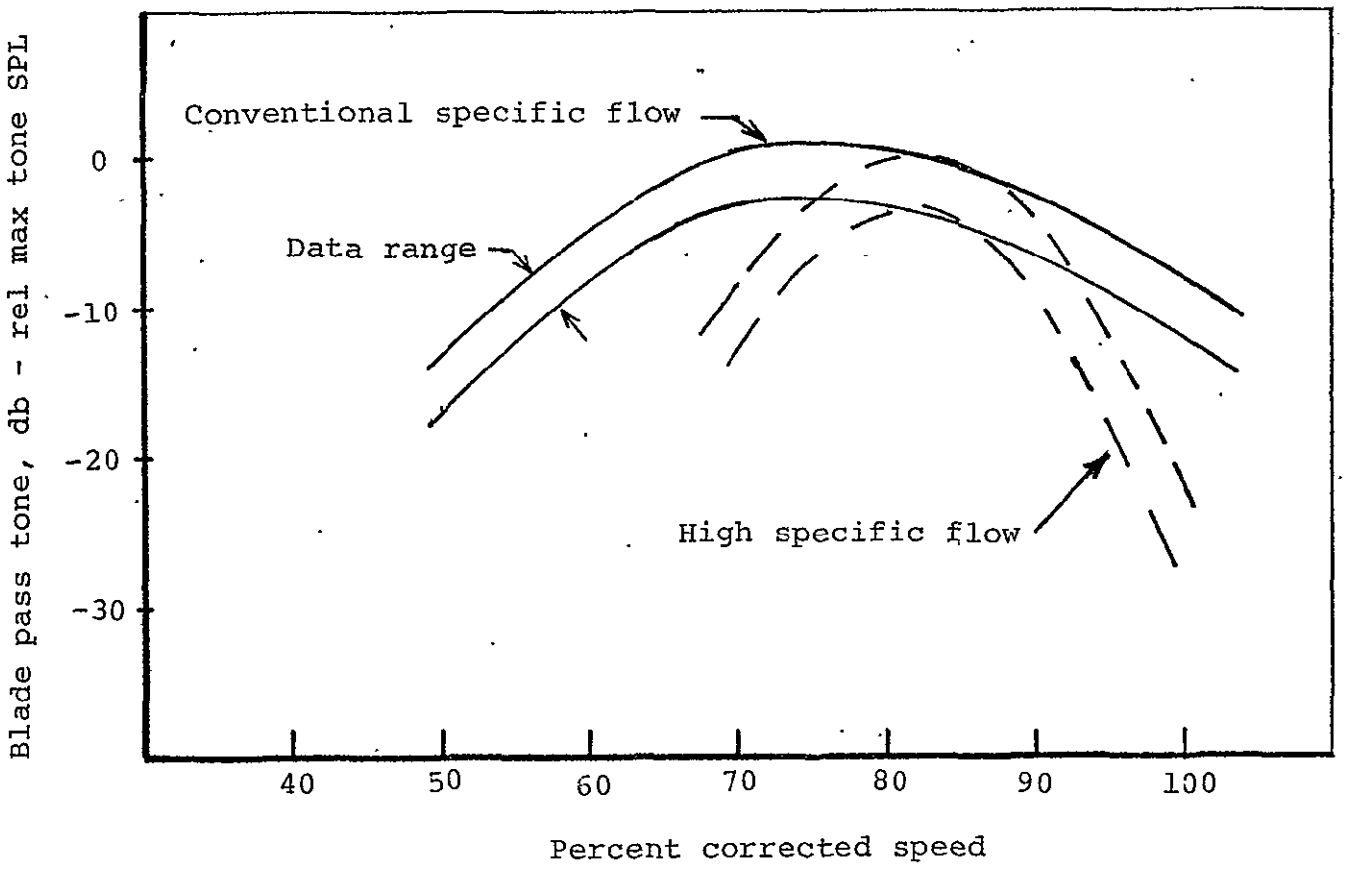


Figure 34. Comparison of blade pass tone trend with rotor speed for high and conventional specific flow compressors

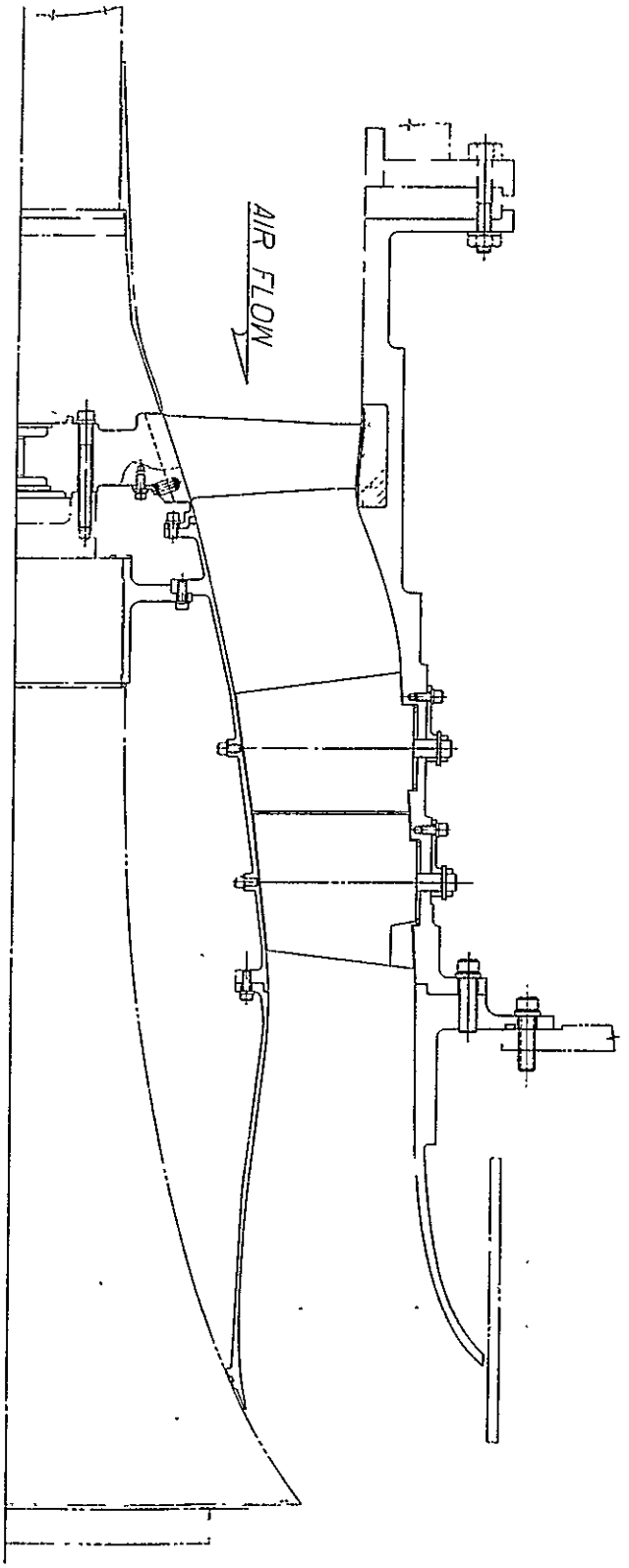


Figure 35. Test stand W8 general configuration

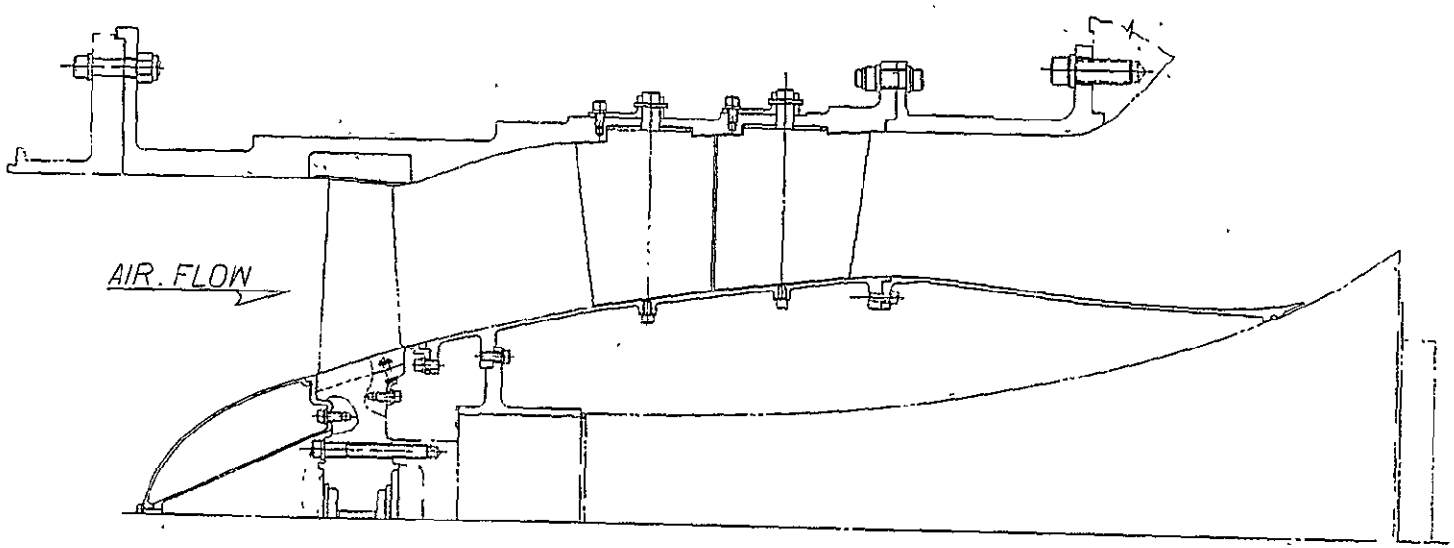
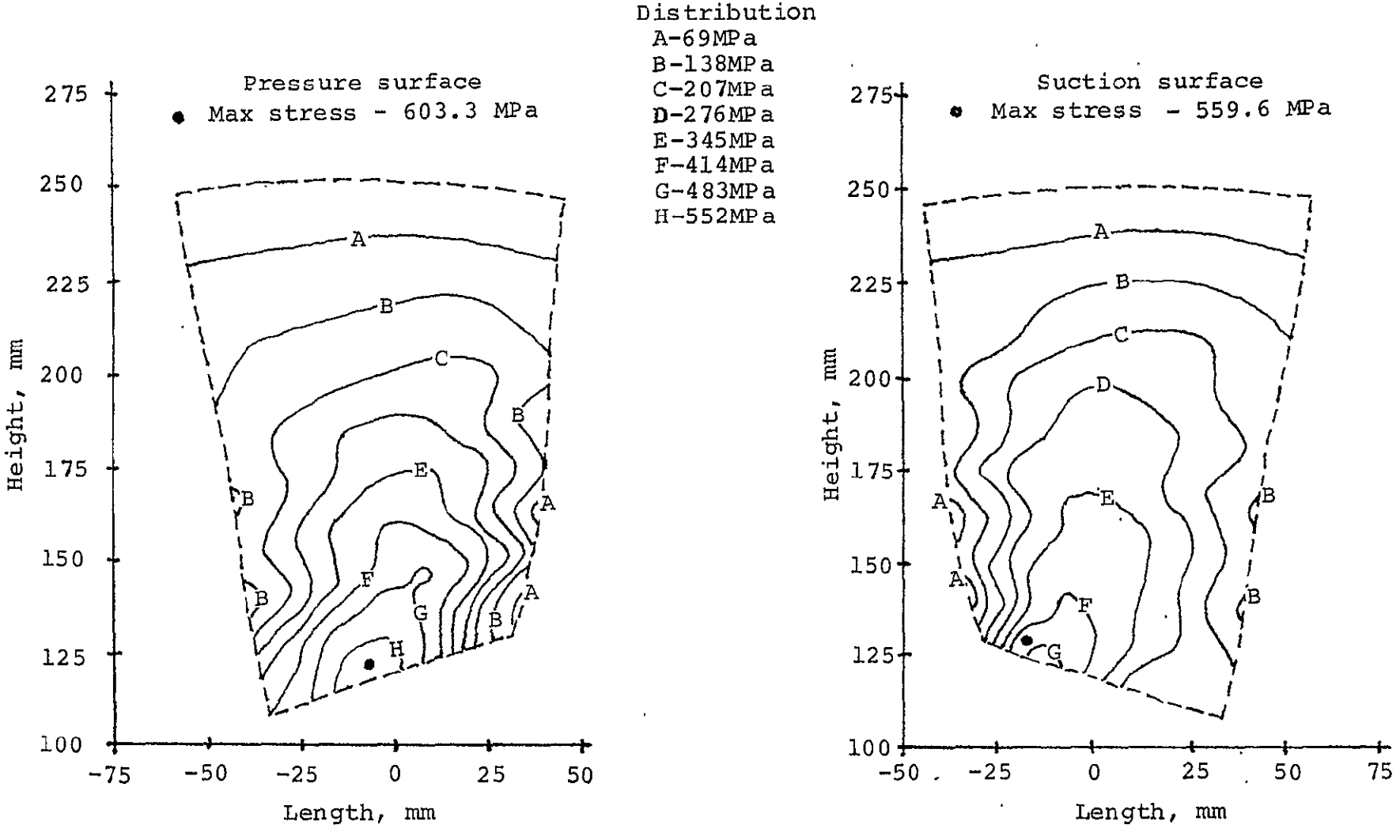


Figure 36. Test stand W2 general configuration in forward mounting position



Rectangular coordinate system rotated 50° from engine centerline around blade stacking axis

Figure 37. Principal airfoil stresses at 20053.5 rpm

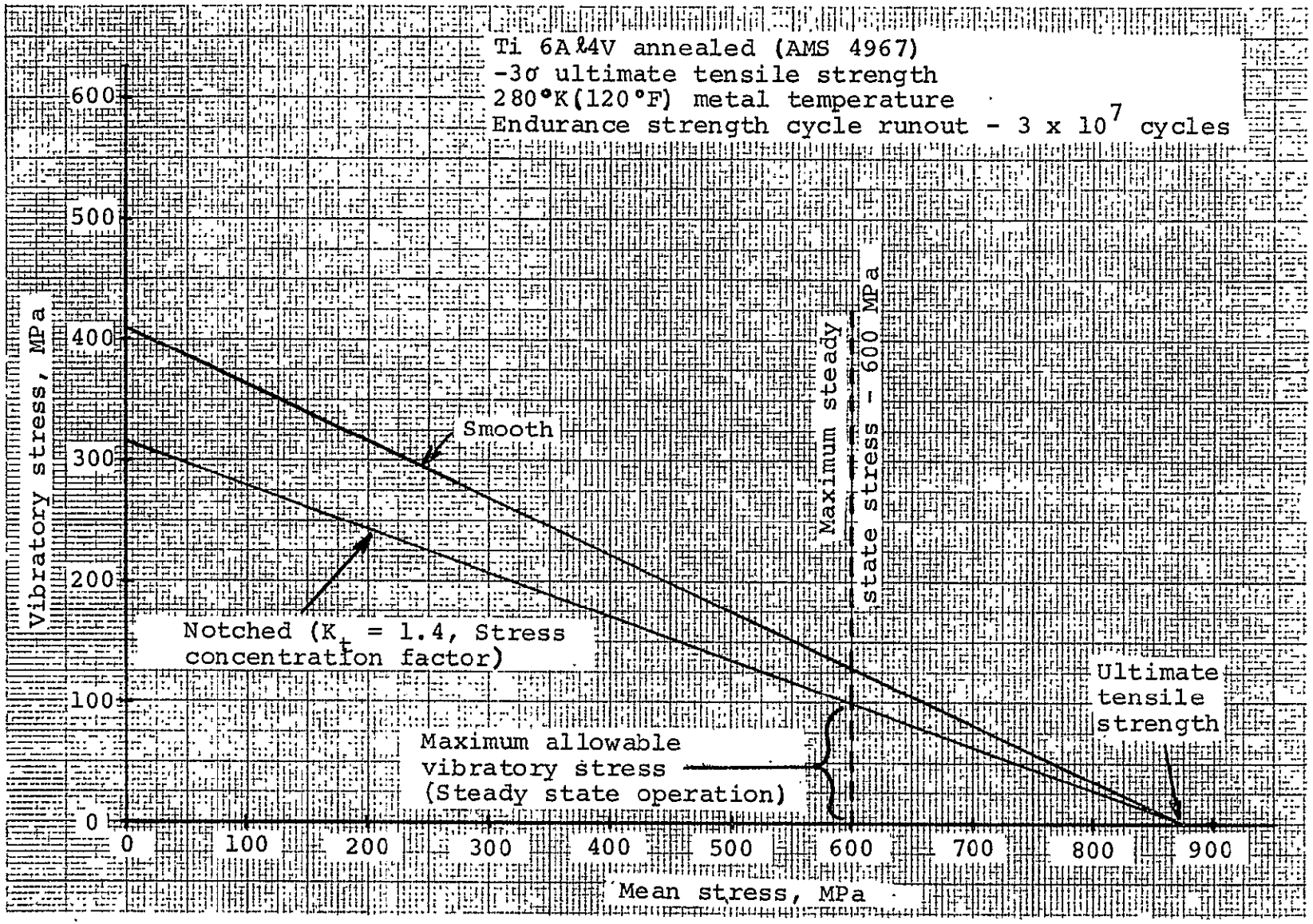


Figure 38. Modified Goodman diagram - blade fillet region

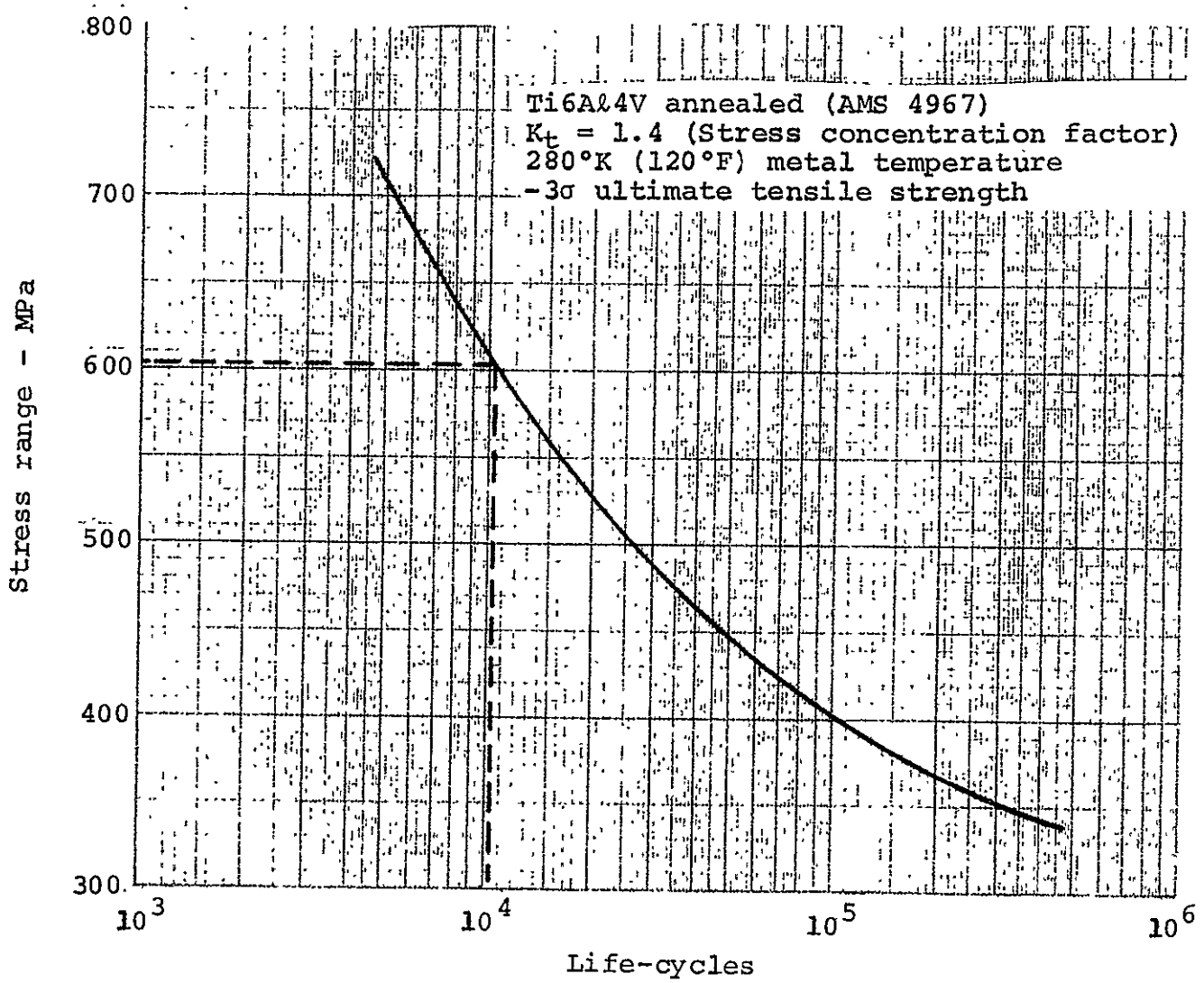


Figure 39. Rotor hub low cycle fatigue

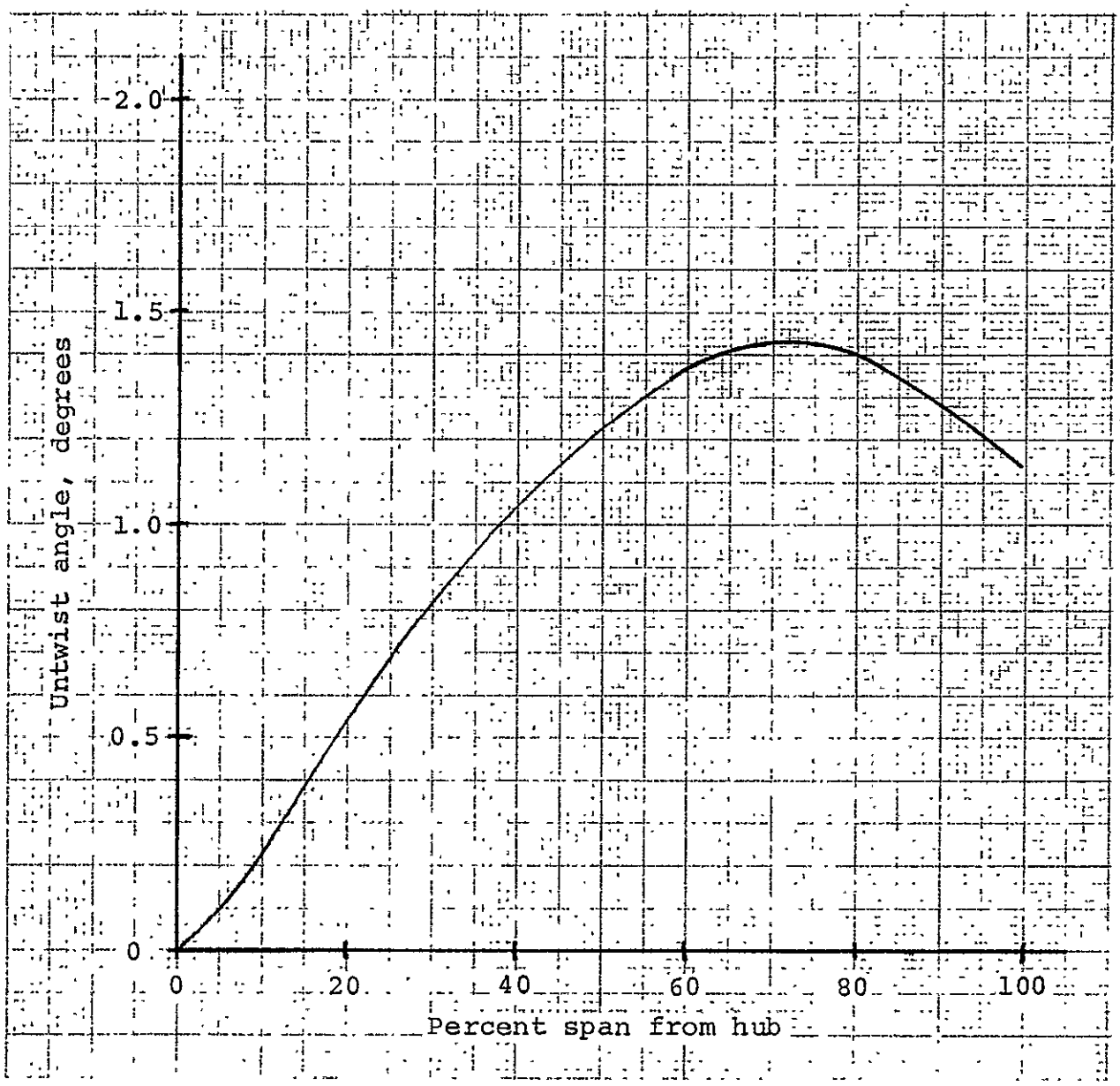


Figure 40. Rotor blade untwist at design speed

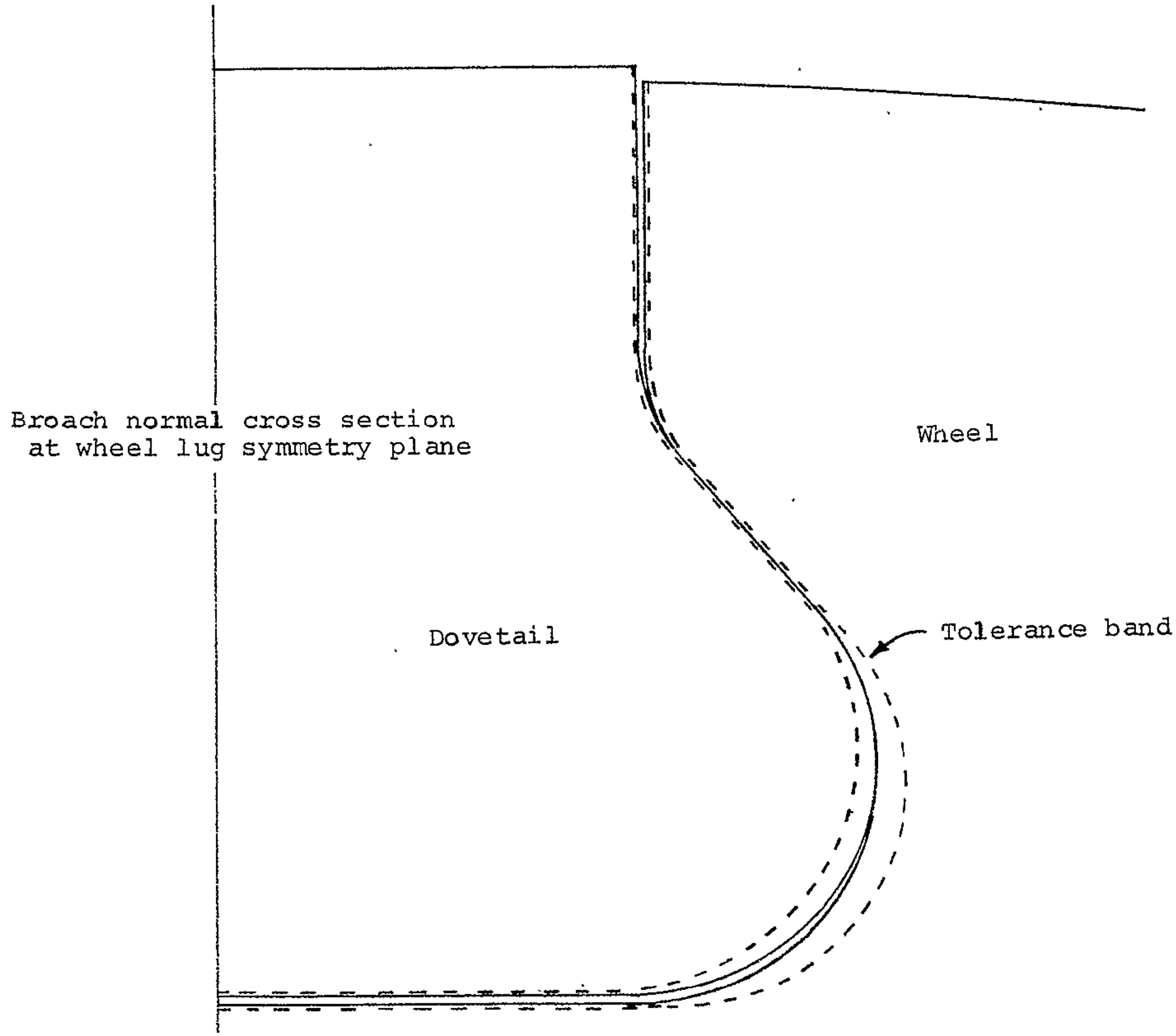


Figure 41. Dovetail attachment

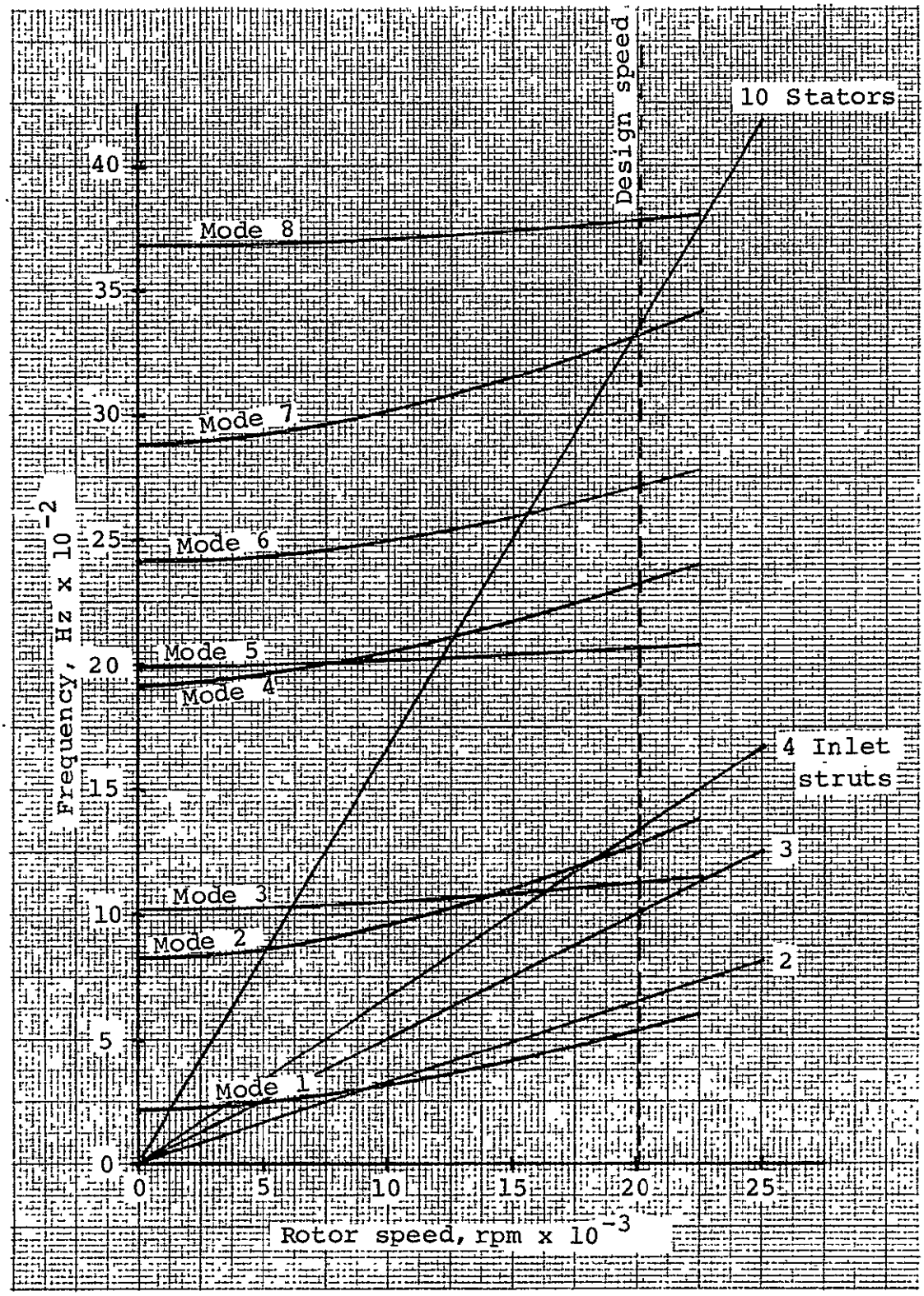


Figure 42. Blade-wheel frequencies

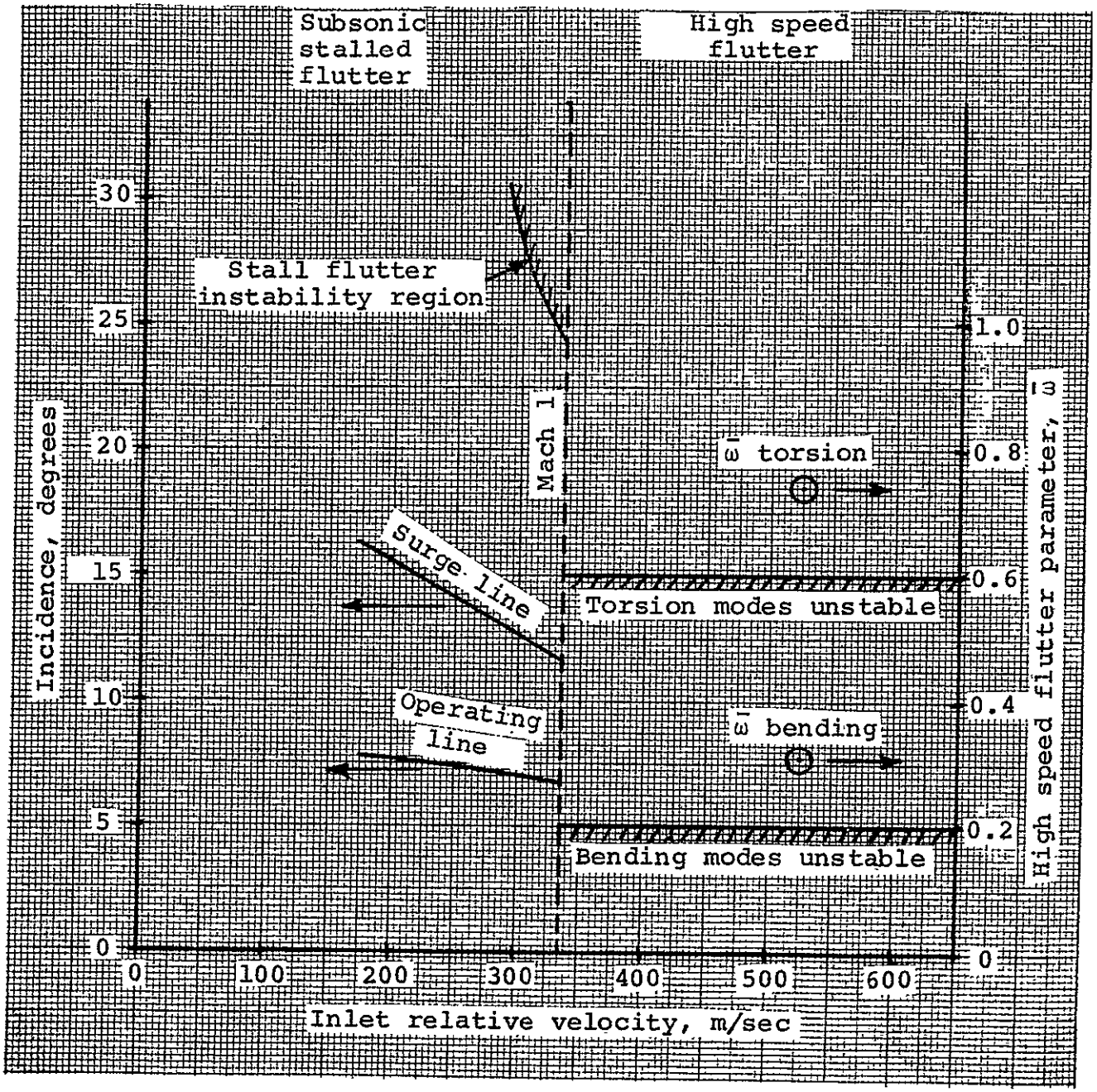


Figure 43. Rotor blade stability

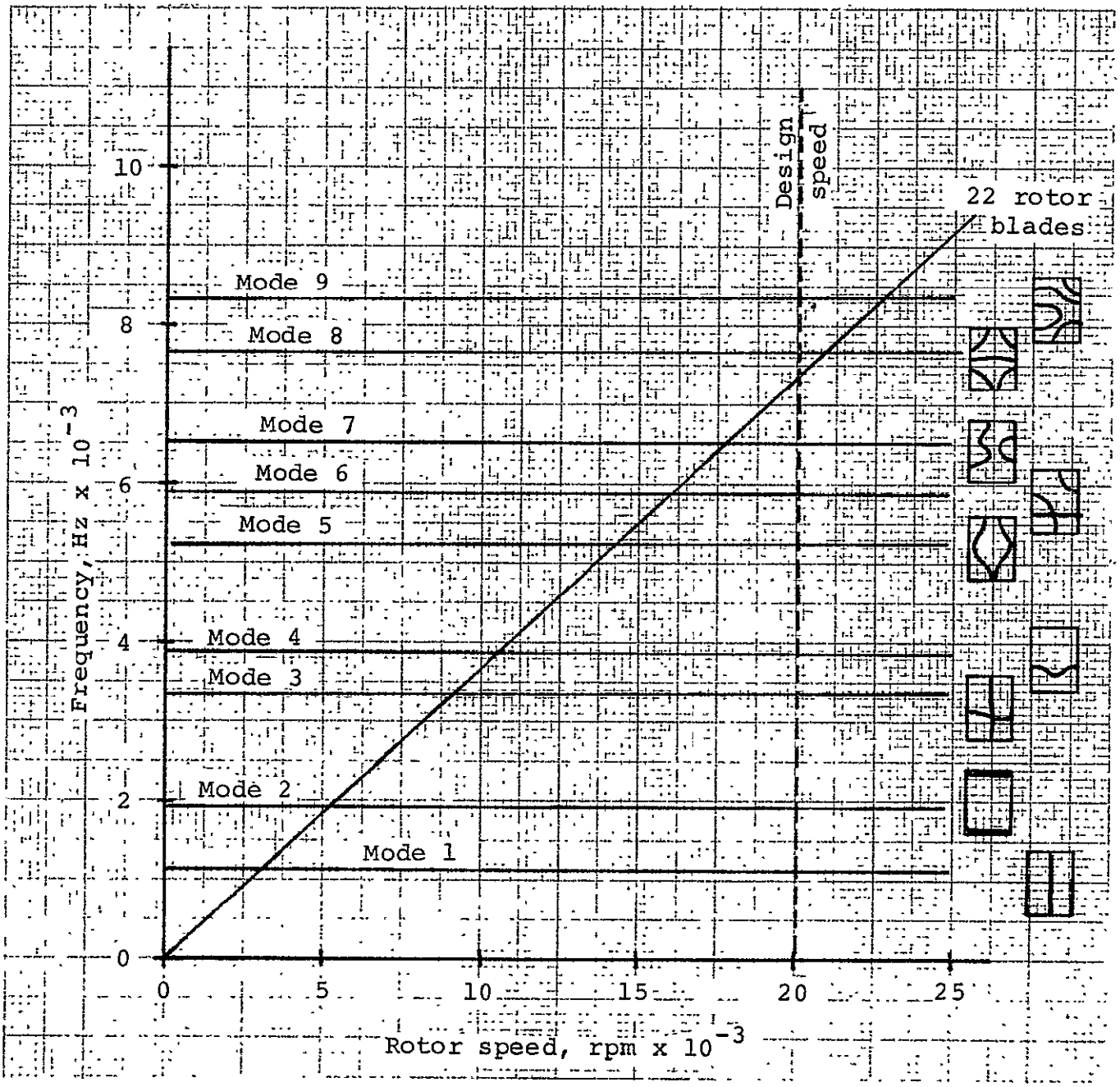


Figure 44. Stator 1 frequencies with trunnion mounting at both ends

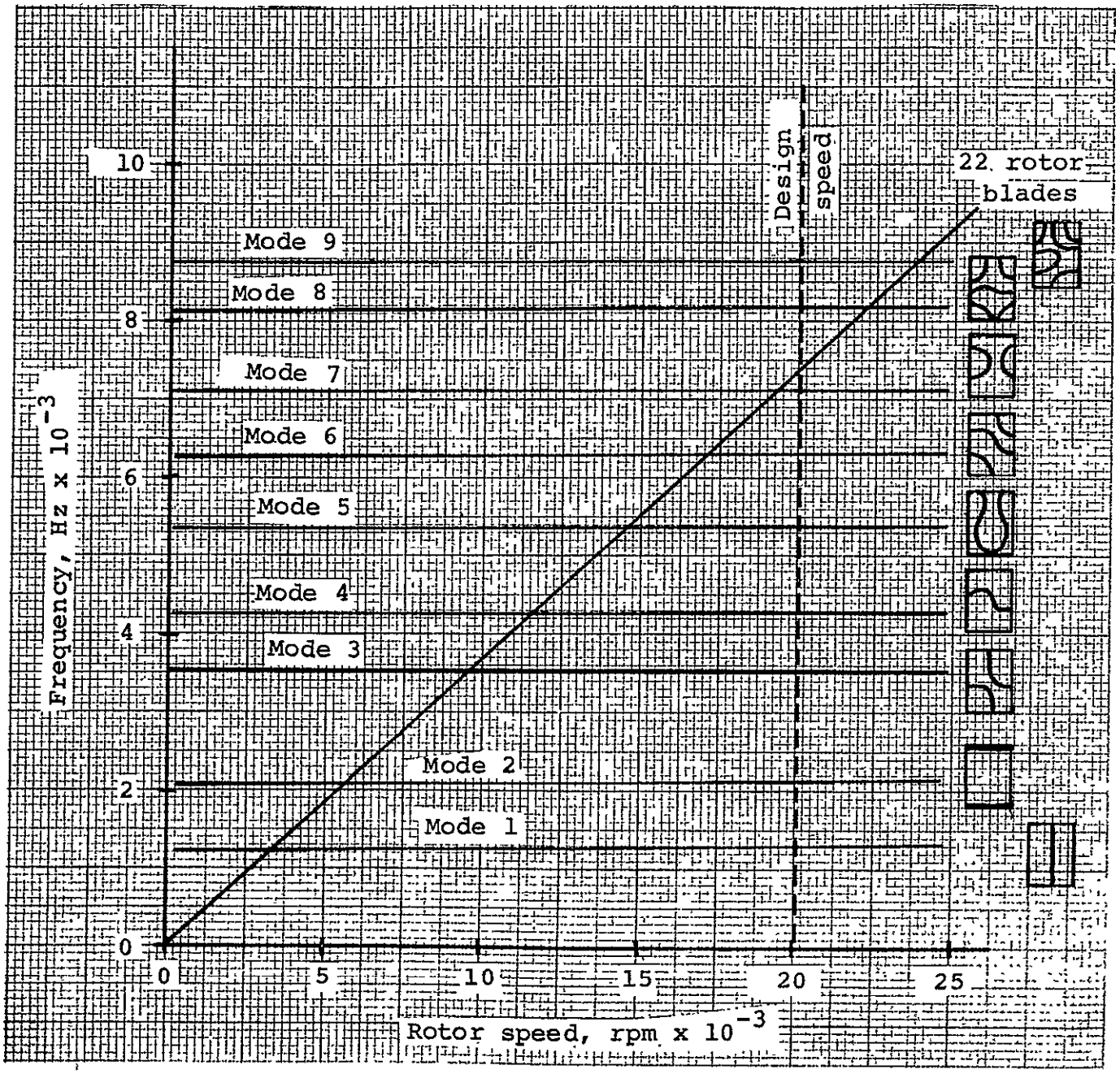


Figure 45. Stator 2 frequencies with trunnion mounting at both ends

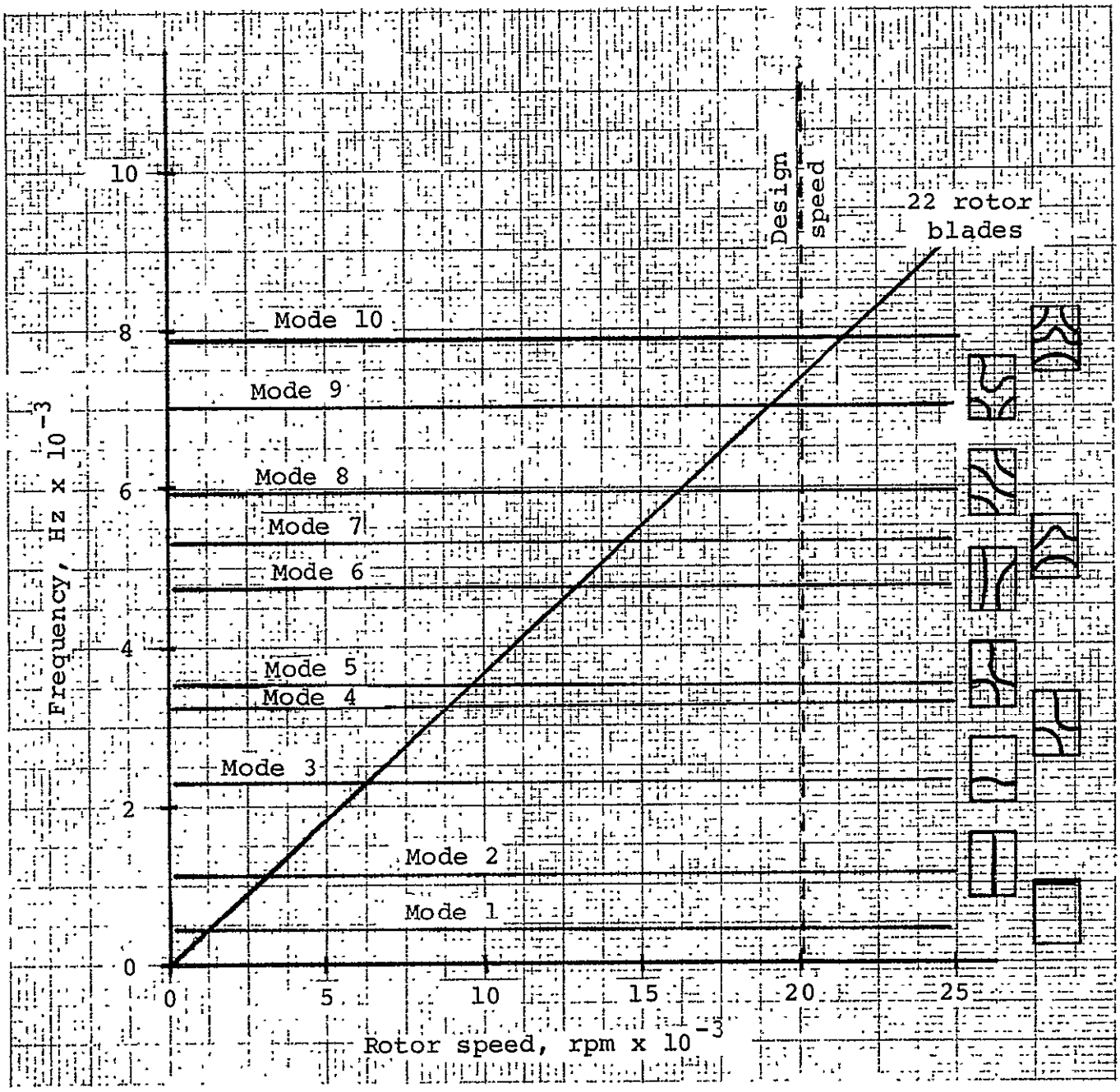


Figure 46. Stator 1 frequencies with trunnion mounting at one end

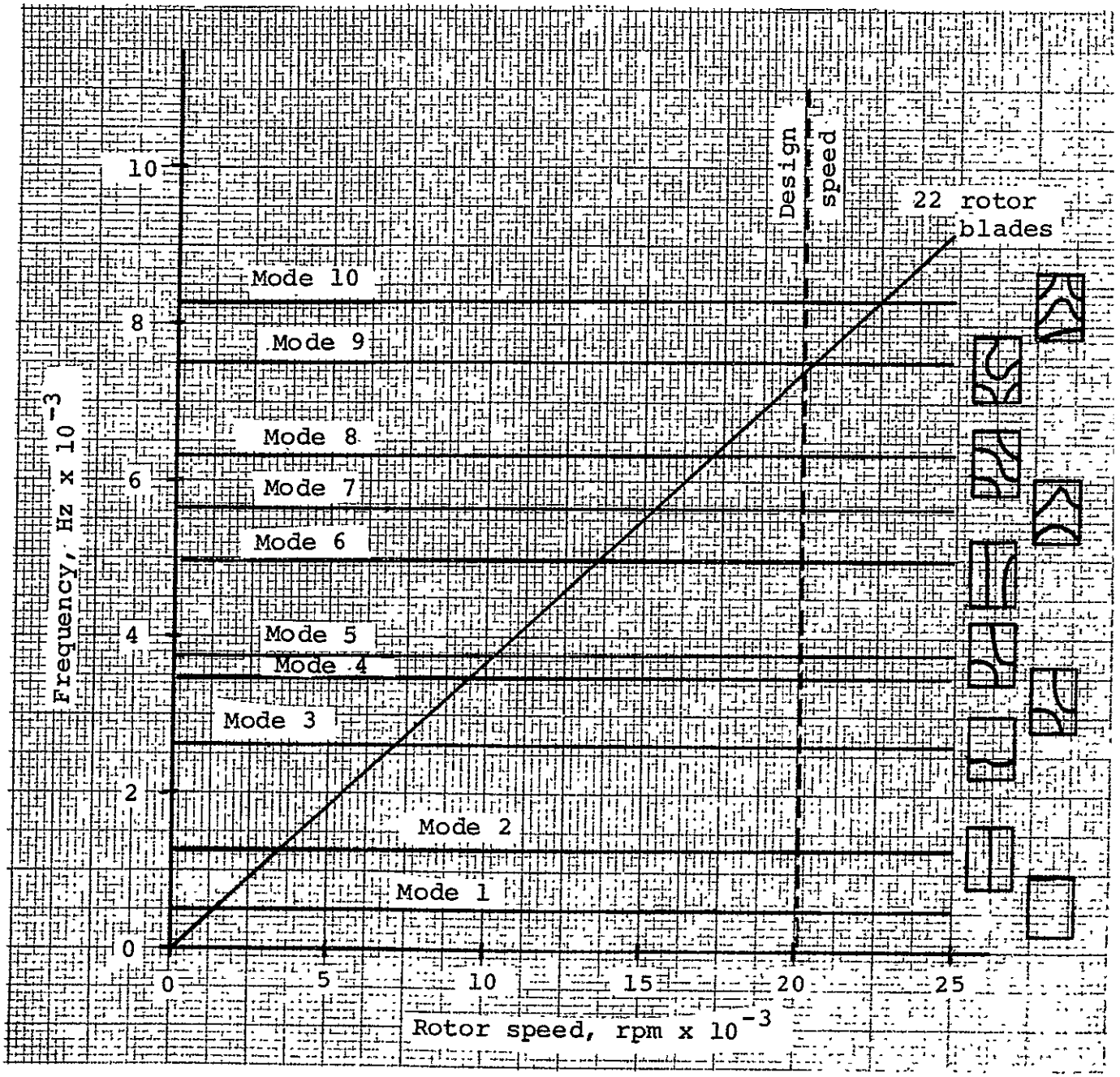


Figure 47. Stator 2 frequencies with trunnion mounting at one end

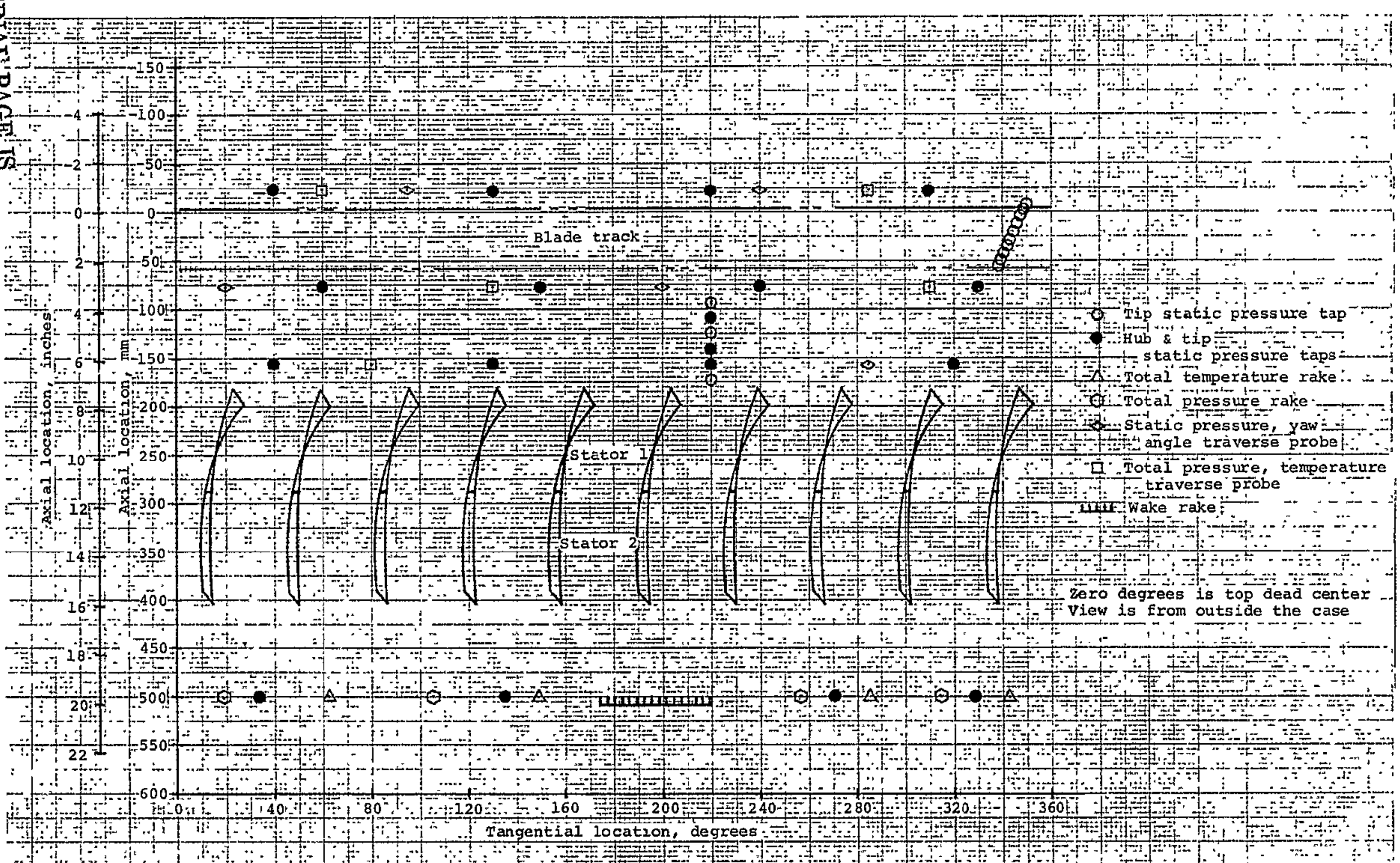


FIGURE 48. INSTRUMENTATION LOCATIONS FOR QHF FAN RIG

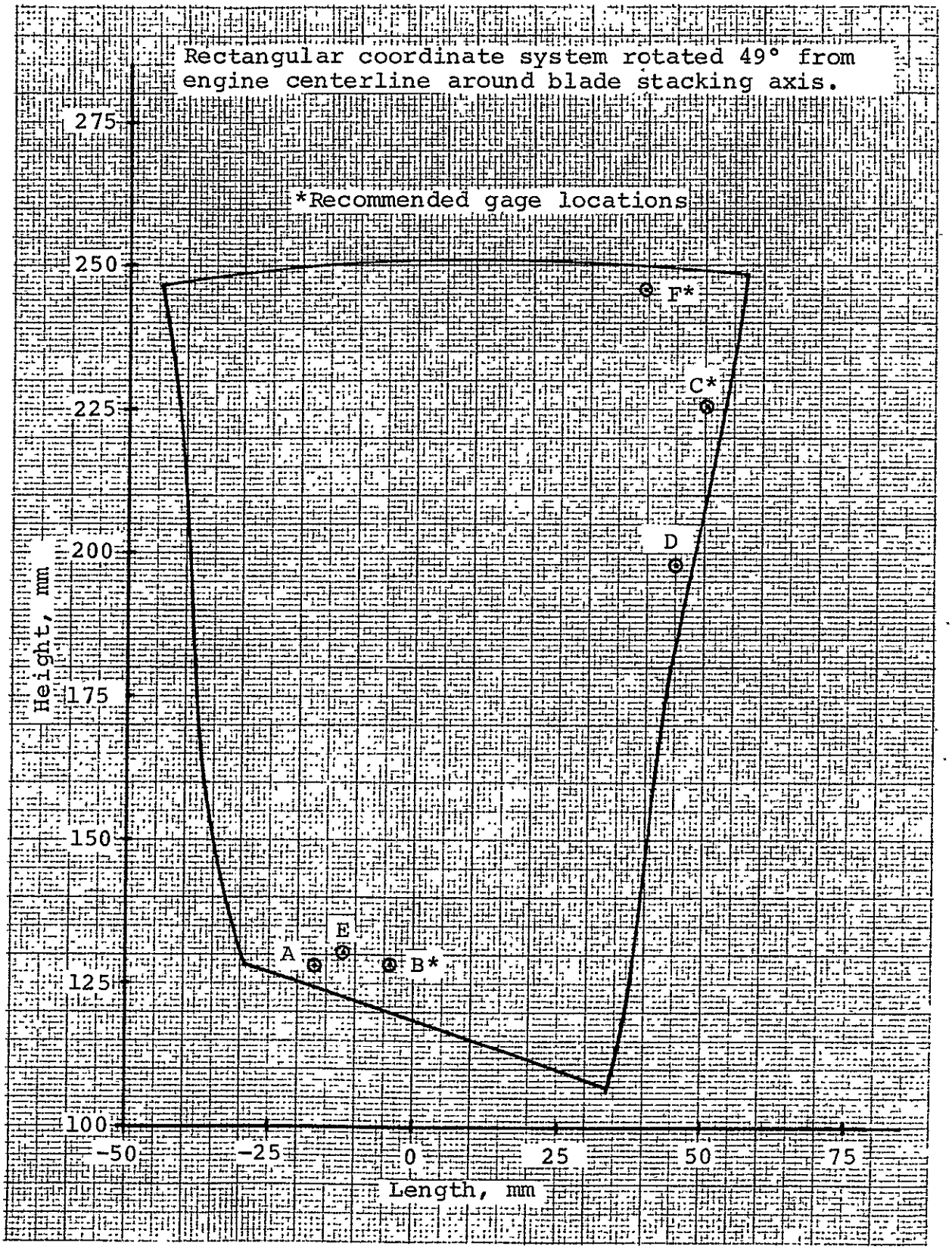


Figure 49. Locations on rotor blade suction surface of maximum stress response

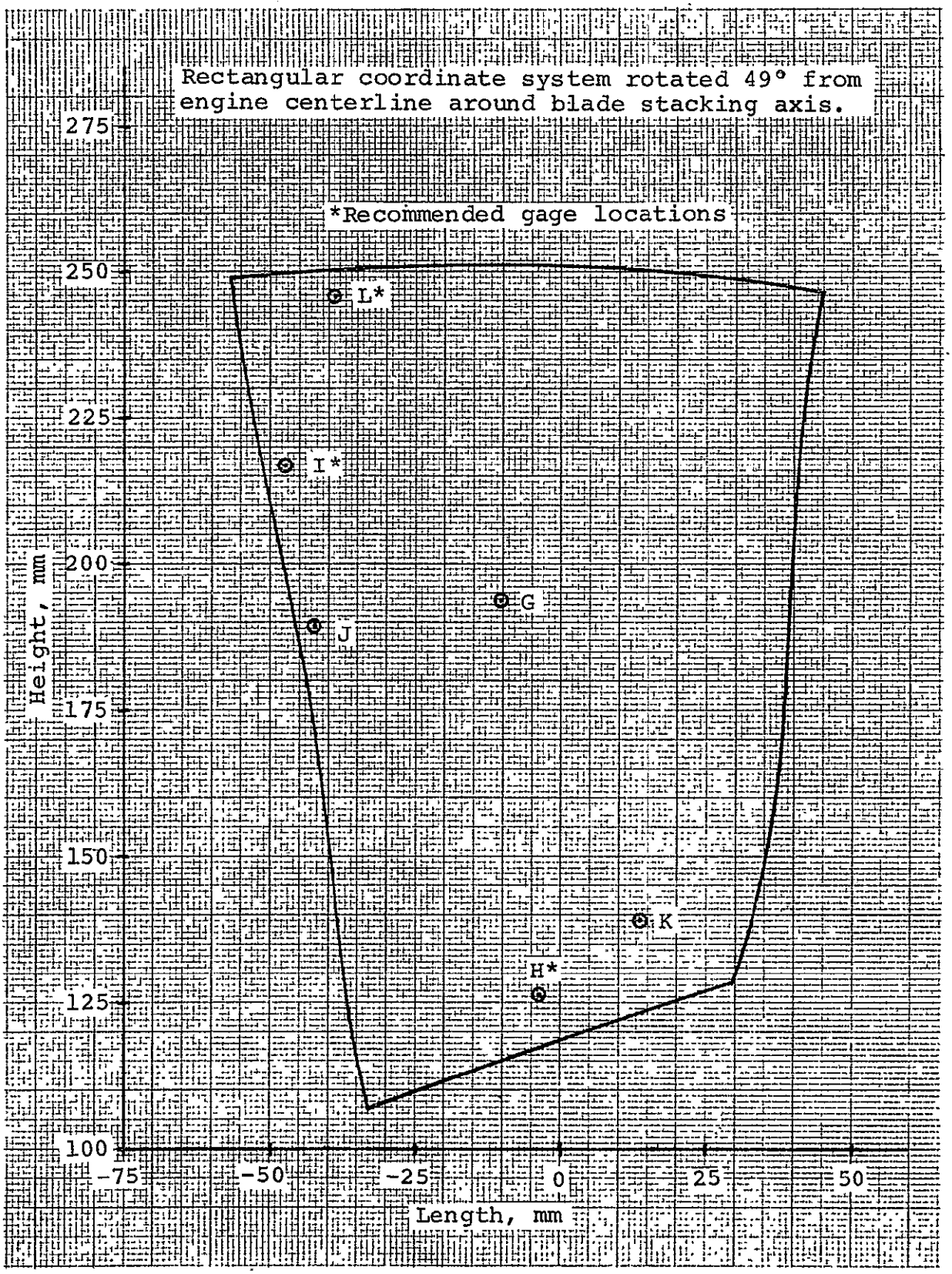


Figure 50. Locations on rotor blade pressure surface of maximum stress response

APPENDIX A

AXIAL COMPRESSOR DESIGN SYSTEM

The vector diagram calculation used for axial compressor design assumes an axisymmetric flow field and obtains a solution of the continuity, energy, and radial equilibrium equations. The design analysis is identified as the Axial Compressor Design System (ACDS) Program BD76. Viscous terms are omitted; however, the equations do account for streamline curvature, radial gradients of total enthalpy and entropy, and blade force terms arising from non-radial blade surfaces. Calculations may be performed at the leading or trailing edges of the airfoils by slanting the calculation stations.

Enthalpy rise across a rotor is given by Euler's turbine equation, and the continuity equation is adjusted for local as well as endwall blockage.

Used as a design tool, the calculation provides detailed examination of the aerothermodynamic solution of the flow process through the compressor. The solution is iterative and must rely on profile loss estimates which are correlated as a function of aerodynamic loading (diffusion factor). This data has been obtained from test data for a wide range of compressor designs and is continually updated.

The equilibrium equation is in the form of:

$$\left.\frac{dV_z^2}{dr}\right|_c = -\left.\frac{d(V_\theta^2)}{dr}\right|_c - \left.\frac{d(V_r^2)}{dr}\right|_c + 2\left[\left.\frac{(dH_o)}{dr}\right|_c - T\left.\frac{ds}{dr}\right|_c\right]$$

$$+ 2V_z \left.\frac{dV_r}{dz}\right|_\psi - \frac{V_\theta^2}{r} + 2V_z \left.\frac{dV_z}{dz}\right|_\psi \left.\frac{dz}{dr}\right|_c +$$

$$2V_z \left.\frac{d(rV_\theta)}{dz}\right|_\psi \left.\frac{d\theta}{dr}\right|_c$$

Where:

- r radial distance
- z axial distance
- θ tangential distance
- V_r radial velocity
- V_z axial velocity
- V_θ tangential velocity
- T total temperature
- s entropy
- H_θ total enthalpy
- c projection of the calculating station on relative stress surface
- ψ relative to stream surface

The continuity equation is:

$$W_a = 2\pi \int_{y_h}^{y_t} K_\gamma \rho V_m \sin(\lambda - \epsilon) \, r \, dy$$

Where:

- W_a airflow
- V_m meridional velocity
- $K\gamma$ blockage factor
- ρ density
- Y length along the calculating station
- ϵ angle between tangent to the streamline projected on the meridional plane and axial direction
- λ angle between calculation station and axial

APPENDIX B
QHF FAN STAGE VELOCITY DIAGRAMS

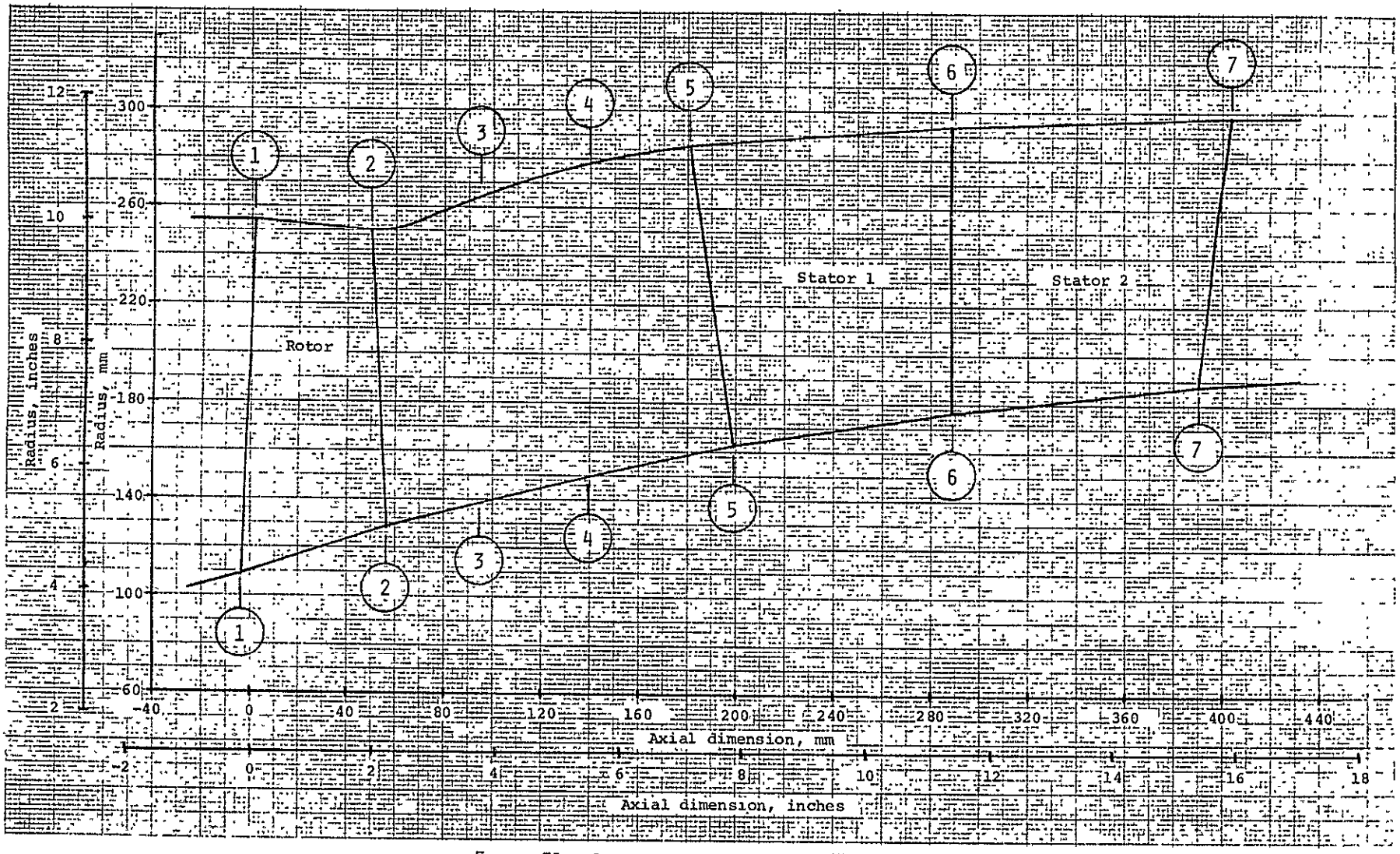


FIGURE 51. COMPUTING STATIONS FOR QHF FAN FLOWPATH

Table 4. Units Definition For Table 5

Metric output

Quantity	Dimensions
Length	Centimeters
Velocity	Meters/second
Pressure	Kilopascals
Temperature	Degrees Kelvin
Flow angle	Degrees

Table 5. Blade Element Performance
Design Point (SI Units)

Station 1-1*

ROTOR INLET

MASS FLOW RATE 36.47 FLOW RATE/SQ. M. 219.80 (CORRECTED) MASS AVE. TOTAL PRESSURE 101.33
CORRECTED FLOW RATE 36.47 ANNULUS AREA 0.17 SQ. M =1659.2 SQ.CM MASS AVE. TOTAL TEMPERATURE 288.2

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
10.851	227.0	0.0	65.54	101.33	71.05	288.2	260.3	236.3	0.730	236.	0.2	1
11.353	226.7	0.0	61.34	101.33	71.37	288.2	260.6	234.9	0.725	235.	3.7	3
12.227	226.5	0.0	54.94	101.33	71.77	288.2	261.0	233.1	0.719	233.	9.6	5
13.396	226.7	0.0	47.66	101.33	72.08	288.2	261.4	231.7	0.714	232.	17.7	7
14.788	227.5	0.0	40.25	101.33	72.22	288.2	261.5	231.0	0.712	231.	27.2	9
16.341	228.8	0.0	32.94	101.33	72.20	288.2	261.5	231.2	0.713	231.	37.9	11
18.010	230.4	0.0	25.67	101.33	72.05	288.2	261.3	231.8	0.715	232.	49.3	13
19.764	232.1	0.0	18.22	101.33	71.82	288.2	261.1	232.8	0.718	233.	61.3	15
21.580	233.6	0.0	10.33	101.33	71.60	288.2	260.9	233.8	0.722	234.	73.8	17
23.444	234.6	0.0	1.71	101.33	71.43	288.2	260.7	234.6	0.724	235.	86.6	19
25.349	234.6	0.0	-7.92	101.33	71.40	288.2	260.7	234.7	0.725	235.	99.6	21

*Location keyed to Figure 51.

Table 5. (Continued)

Station 2-2

ROTOR EXIT

MASS FLOW RATE	36.47	FLOW RATE/SQ. M. 165.44 (CORRECTED)		MASS AVE. TOTAL PRESSURE	168.58
CORRECTED FLOW RATE	23.86	ANNULUS AREA 0.14 SQ. M =1442.2 SQ.CM		MASS AVE. TOTAL TEMPERATURE	341.4
CORRECTED TIP SPEED	533. M/SEC			ROTOR ADIABATIC EFFICIENCY	85.0
PRESSURE RATIO	1.664	CUMULATIVE ADIABATIC EFFICIENCY	85.0		

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
12.977	174.8	174.4	47.88	165.82	117.45	335.6	304.0	251.5	0.719	181.	0.8	1
13.357	174.3	170.2	46.27	165.97	118.80	335.8	305.1	247.9	0.708	180.	4.0	3
14.031	173.5	163.4	43.65	166.25	120.94	336.2	306.9	242.3	0.689	179.	9.5	5
14.953	172.7	155.4	40.51	166.63	123.41	336.9	309.1	235.9	0.669	177.	17.1	7
16.076	172.9	146.7	37.35	167.09	125.82	337.6	311.3	229.8	0.649	177.	26.4	9
17.349	174.1	138.3	34.35	167.62	127.86	338.4	313.2	225.0	0.634	177.	36.9	11
18.732	176.7	130.4	31.64	168.19	129.37	339.4	314.8	221.9	0.624	180.	48.4	13
20.189	180.7	124.2	29.26	168.79	130.20	340.7	316.3	221.2	0.620	183.	60.4	15
21.696	186.3	119.8	27.22	169.41	130.26	342.6	317.8	223.2	0.624	188.	72.9	17
23.233	193.7	118.0	26.04	170.05	129.39	345.6	319.6	228.3	0.637	195.	85.6	19
24.784	203.9	118.7	25.93	170.69	127.41	349.8	321.7	237.3	0.660	205.	98.4	21

RELATIVE MACH NOS. INLET	EXIT	TOTAL TEMP RISE	TOTAL TEMP RATIO	WHEEL SPEED IN	OUT	ROTOR PRESSURE RATIO	ROTOR ADIABATIC EFFICIENCY	ROTOR POLYTROPIC EFFICIENCY	
1.014	0.589	47.44	1.165	227.9	272.5	1.636	92.0	92.6	1
1.034	0.603	47.64	1.165	238.4	280.5	1.638	91.8	92.4	3
1.070	0.631	48.05	1.167	256.8	294.6	1.641	91.4	92.0	5
1.124	0.675	48.72	1.169	281.3	314.0	1.644	90.6	91.3	7
1.193	0.735	49.45	1.172	310.5	337.6	1.649	89.8	90.5	9
1.276	0.810	50.28	1.174	343.2	364.3	1.654	88.9	89.7	11
1.368	0.895	51.20	1.178	378.2	393.4	1.660	87.9	88.8	13
1.468	0.985	52.54	1.182	415.0	424.0	1.666	86.3	87.3	15
1.574	1.077	54.48	1.189	453.2	455.6	1.672	83.9	85.1	17
1.684	1.167	57.45	1.199	492.3	487.9	1.678	80.2	81.6	19
1.797	1.254	61.68	1.214	532.3	520.5	1.684	75.3	77.3	21

S.L. NO.	DIFFUSION FACTOR	OMEGA BAR	DELTA P5/0	SOLIDITY	TOTAL TURNING	ABSOLUTE FLOW ANGLE INLET	ABSOLUTE FLOW ANGLE EXIT	EQUIVALENT DIFFUSION FACTOR	RELATIVE FLOW ANGLE INLET	RELATIVE FLOW ANGLE EXIT	RELATIVE VELOCITY INLET	RELATIVE VELOCITY EXIT	RELATIVE TEMPERATURE INLET	RELATIVE TEMPERATURE EXIT
1	0.510	0.091	0.705	2.102	15.53	0.0	43.90	1.548	43.96	28.43	328.	206.	314.	325.
3	0.502	0.091	0.685	2.051	13.96	0.0	43.34	1.526	45.43	31.47	335.	211.	317.	327.
5	0.488	0.092	0.647	1.971	11.50	0.0	42.41	1.485	47.77	36.27	347.	222.	321.	331.
7	0.467	0.095	0.593	1.877	8.73	0.0	41.23	1.430	50.53	41.79	364.	238.	328.	337.
9	0.439	0.096	0.528	1.780	6.17	0.0	39.69	1.368	53.35	47.18	387.	260.	336.	345.
11	0.407	0.097	0.458	1.689	4.17	0.0	37.93	1.310	56.04	51.87	414.	287.	347.	354.
13	0.376	0.098	0.389	1.606	2.82	0.0	35.99	1.266	58.49	55.67	444.	318.	360.	365.
15	0.347	0.104	0.324	1.554	2.11	0.0	34.15	1.238	60.71	58.59	476.	351.	374.	378.
17	0.323	0.116	0.265	1.517	1.98	0.0	32.47	1.232	62.71	60.72	510.	385.	391.	392.
19	0.305	0.137	0.212	1.484	2.38	0.0	31.11	1.249	64.52	62.14	545.	418.	409.	407.
21	0.294	0.166	0.166	1.455	3.30	0.0	30.02	1.295	66.21	62.91	582.	451.	430.	423.

Table 5. (Continued)

Station 3-3

MASS FLOW RATE 36.47 FLOW RATE/SQ. M. 150.06 (CORRECTED) MASS AVE. TOTAL PRESSURE 168.57
CORRECTED FLOW RATE 23.85 ANNULUS AREA 0.16 SQ. M =1590.0 SQ.CM MASS AVE. TOTAL TEMPERATURE 341.4

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
13.935	166.0	162.4	41.47	165.82	122.65	335.6	307.8	235.9	0.670	171.	0.9	1
14.303	165.9	158.9	40.84	165.97	123.62	335.8	308.6	233.4	0.662	171.	3.8	3
14.957	165.8	153.3	39.80	166.25	125.21	336.2	310.0	229.2	0.649	170.	9.0	5
15.856	165.5	146.6	38.57	166.63	127.11	336.9	311.7	224.4	0.634	170.	16.2	7
16.957	165.6	139.1	37.50	167.09	129.09	337.6	313.6	219.5	0.618	170.	24.9	9
18.216	166.0	131.7	36.85	167.62	130.98	338.4	315.4	215.1	0.604	170.	34.9	11
19.598	166.6	124.6	36.89	168.19	132.69	339.4	317.1	211.3	0.592	171.	45.9	13
21.079	166.6	118.9	37.83	168.79	134.25	340.7	319.1	208.2	0.581	171.	57.7	15
22.647	165.5	114.8	39.98	169.41	135.78	342.6	321.6	205.4	0.571	170.	70.1	17
24.303	162.2	112.8	43.59	170.05	137.47	345.6	325.2	202.3	0.559	168.	83.3	19
26.071	154.9	112.9	48.81	170.69	139.68	349.8	330.3	197.8	0.543	162.	97.4	21

Station 4-4

MASS FLOW RATE 36.47 FLOW RATE/SQ. M. 137.81 (CORRECTED) MASS AVE. TOTAL PRESSURE 168.57
CORRECTED FLOW RATE 23.86 ANNULUS AREA 0.17 SQ. M =1731.4 SQ.CM MASS AVE. TOTAL TEMPERATURE 341.4

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
15.060	157.2	150.3	40.41	165.82	127.38	335.6	311.2	221.2	0.625	162.	1.1	1
15.410	157.1	147.5	39.64	165.97	128.17	335.8	311.8	219.1	0.619	162.	3.8	3
16.037	156.9	143.0	38.39	166.25	129.49	336.2	313.0	215.7	0.608	162.	8.7	5
16.905	156.5	137.5	36.88	166.63	131.16	336.9	314.6	211.5	0.595	161.	15.4	7
17.979	156.0	131.2	35.44	167.09	133.01	337.6	316.3	206.9	0.580	160.	23.8	9
19.221	155.3	124.8	34.22	167.62	134.93	338.4	318.1	202.1	0.565	159.	33.4	11
20.601	154.3	118.6	33.28	168.19	136.87	339.4	319.9	197.4	0.550	158.	44.1	13
22.099	152.5	113.4	32.53	168.79	138.82	340.7	322.1	192.8	0.536	156.	55.7	15
23.704	149.6	109.7	31.79	169.41	140.82	342.6	325.0	188.2	0.520	153.	68.1	17
25.420	145.0	107.8	30.72	170.05	142.94	345.6	328.8	183.3	0.504	148.	81.4	19
27.259	138.6	108.0	28.75	170.69	145.23	349.8	334.0	178.0	0.486	142.	95.7	21

Station 5-5

STATOR 1 INLET

MASS FLOW RATE 36.47 FLOW RATE/SQ. M. 136.26 (CORRECTED) MASS AVE. TOTAL PRESSURE 168.58
CORRECTED FLOW RATE 23.86 ANNULUS AREA 0.18 SQ. M =1751.0 SQ.CM MASS AVE. TOTAL TEMPERATURE 341.4

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
16.457	152.0	137.5	31.26	165.82	131.67	335.6	314.2	207.3	0.583	155.	1.4	1
16.773	151.8	135.5	30.73	165.97	132.28	335.8	314.7	205.8	0.578	155.	4.0	3
17.342	151.3	132.2	29.83	166.25	133.33	336.2	315.6	203.2	0.570	154.	8.6	5
18.140	150.6	128.1	28.67	166.63	134.68	336.9	317.0	199.8	0.560	153.	15.1	7
19.138	150.0	123.3	27.44	167.09	136.23	337.6	318.4	196.1	0.548	152.	23.2	9
20.307	149.3	118.1	26.24	167.62	137.86	338.4	320.0	192.2	0.536	152.	32.7	11
21.617	148.5	113.0	25.12	168.19	139.51	339.4	321.7	188.3	0.524	151.	43.4	13
23.049	147.2	108.8	24.05	168.79	141.16	340.7	323.7	184.6	0.512	149.	55.0	15
24.589	145.3	105.7	22.98	169.41	142.80	342.6	326.3	181.1	0.500	147.	67.6	17
26.236	142.3	104.5	21.86	170.05	144.44	345.6	329.8	177.9	0.488	144.	81.0	19
27.993	138.2	105.1	20.65	170.69	146.08	349.8	334.6	174.9	0.477	140.	95.3	21

Table 5. (Continued)

Station 6-6

STATOR 1 EXIT

MASS FLOW RATE 36.47 FLOW RATE/SQ. M. 138.101 (CORRECTED) MASS AVE. TOTAL PRESSURE 167.95
CORRECTED FLOW RATE 23.95 ANNULUS AREA 0.17 SQ. M =1734.2 SQ.CM MASS AVE. TOTAL TEMPERATURE 341.4
PRESSURE RATIO 1.657 CUMULATIVE ADIABATIC EFFICIENCY 84.4 STAGE ADIABATIC EFFICIENCY 84.4

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
18.060	147.5	64.7	21.01	163.81	142.45	335.6	322.4	162.4	0.451	149.	3.5	1
18.350	148.3	64.6	20.72	164.18	142.63	335.8	322.5	163.1	0.453	150.	5.9	3
18.870	149.5	64.4	20.13	164.78	142.93	336.2	322.8	164.0	0.455	151.	10.4	5
19.598	150.9	64.0	19.24	165.51	143.34	336.9	323.3	165.1	0.458	152.	16.6	7
20.506	152.4	63.3	18.06	166.29	143.82	337.6	323.9	166.0	0.460	153.	24.3	9
21.567	153.7	62.3	16.63	167.06	144.35	338.4	324.6	166.7	0.461	155.	33.4	11
22.758	154.9	61.2	15.03	167.78	144.91	339.4	325.4	167.2	0.462	156.	43.5	13
24.059	155.7	60.4	13.29	168.43	145.48	340.7	326.7	167.5	0.462	156.	54.6	15
25.457	156.1	60.2	11.42	169.03	146.07	342.6	328.6	167.7	0.461	157.	66.5	17
26.942	156.1	61.1	9.41	169.57	146.66	345.6	331.5	167.9	0.460	156.	79.2	19
28.511	155.6	63.5	7.18	170.06	147.27	349.8	335.7	168.2	0.458	156.	92.5	21

ABSOLUTE INLET	MACH NOS. EXIT	TOTAL TEMP RISE	TOTAL TEMP RATIO	WHEEL SPEED IN	WHEEL SPEED OUT	STAGE PRESSURE RATIO	STAGE ADIABATIC EFFICIENCY	STAGE POLYTROPIC EFFICIENCY	
0.583	0.451	47.44	1.165	0.0	0.0	1.617	89.6	90.3	1
0.578	0.453	47.64	1.165	0.0	0.0	1.620	89.7	90.4	3
0.570	0.455	48.05	1.167	0.0	0.0	1.626	89.6	90.3	5
0.560	0.458	48.72	1.169	0.0	0.0	1.633	89.3	90.0	7
0.548	0.460	49.45	1.172	0.0	0.0	1.641	88.9	89.6	9
0.536	0.461	50.28	1.174	0.0	0.0	1.649	88.3	89.0	11
0.524	0.462	51.20	1.178	0.0	0.0	1.656	87.5	88.3	13
0.512	0.462	52.54	1.182	0.0	0.0	1.662	85.9	86.9	15
0.500	0.461	54.48	1.189	0.0	0.0	1.668	83.5	84.6	17
0.488	0.460	57.45	1.199	0.0	0.0	1.673	79.7	81.1	19
0.477	0.458	61.68	1.214	0.0	0.0	1.678	74.7	76.5	21

S.L. NO.	DIFFUSION FACTOR	OMEGA BAR	DELTA PS/Q	SOLIDITY	TOTAL TURNING	ABSOLUTE FLOW ANGLE INLET	ABSOLUTE FLOW ANGLE EXIT	EQUIVALENT DIFFUSION FACTOR
1	0.379	0.059	0.316	0.939	18.07	41.56	23.49	1.576
3	0.370	0.053	0.307	0.926	17.84	41.19	23.35	1.569
5	0.355	0.045	0.292	0.903	17.48	40.60	23.12	1.558
7	0.336	0.035	0.271	0.873	17.06	39.88	22.83	1.545
9	0.316	0.026	0.246	0.839	16.53	38.95	22.43	1.530
11	0.295	0.019	0.218	0.804	15.97	37.93	21.96	1.515
13	0.276	0.014	0.188	0.768	15.41	36.88	21.47	1.501
15	0.258	0.013	0.157	0.733	14.97	36.09	21.13	1.492
17	0.242	0.014	0.123	0.700	14.66	35.71	21.04	1.488
19	0.229	0.019	0.087	0.669	14.62	35.97	21.35	1.494
21	0.217	0.026	0.048	0.640	14.79	36.96	22.16	1.509

Table 5. (Continued)

Station 7-7

STATOR 2 EXIT

MASS FLOW RATE	36.47	FLOW RATE/SQ. M. 141.88 (CORRECTED)		MASS AVE. TOTAL PRESSURE	167.49
CORRECTED FLOW RATE	24.01	ANNULUS AREA 0.17 SQ. M =1692.3 SQ.CM		MASS AVE. TOTAL TEMPERATURE	341.4
PRESSURE RATIO	1.653	CUMULATIVE ADIABATIC EFFICIENCY	83.9	STAGE ADIABATIC EFFICIENCY	83.9

RADIUS CENT.	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
19.088	143.9	0.0	9.85	162.84	145.91	335.6	325.2	144.3	0.399	144.	2.5	1
19.367	145.3	0.0	9.82	163.28	146.00	335.8	325.2	145.7	0.403	146.	5.1	3
19.865	147.6	0.0	9.72	163.99	146.14	336.2	325.3	147.9	0.409	148.	9.6	5
20.559	150.2	0.0	9.53	164.87	146.34	336.9	325.6	150.5	0.416	151.	15.9	7
21.422	152.8	0.0	9.21	165.79	146.58	337.6	325.9	153.1	0.423	153.	23.8	9
22.429	155.2	0.0	8.78	166.68	146.85	338.4	326.4	155.4	0.429	155.	32.9	11
23.558	157.2	0.0	8.22	167.47	147.12	339.4	327.0	157.4	0.434	157.	43.2	13
24.792	158.8	0.0	7.57	168.14	147.40	340.7	328.1	158.9	0.438	159.	54.4	15
26.118	160.1	0.0	6.85	168.69	147.67	342.6	329.8	160.3	0.440	160.	66.5	17
27.525	161.3	0.0	6.08	169.12	147.93	345.6	332.6	161.4	0.441	161.	79.3	19
29.007	162.4	0.0	5.30	169.40	148.15	349.8	336.7	162.5	0.442	162.	92.7	21

ABSOLUTE INLET	MACH NOS. EXIT	TOTAL TEMP RISE	TOTAL TEMP RATIO	WHEEL SPEED IN	WHEEL SPEED OUT	STAGE PRESSURE RATIO	STAGE ADIABATIC EFFICIENCY	STAGE POLYTROPIC EFFICIENCY	
0.451	0.399	47.44	1.165	0.0	0.0	1.607	88.4	89.2	1
0.453	0.403	47.64	1.165	0.0	0.0	1.611	88.6	89.3	3
0.455	0.409	48.05	1.167	0.0	0.0	1.618	88.7	89.4	5
0.458	0.416	48.72	1.169	0.0	0.0	1.627	88.5	89.3	7
0.460	0.423	49.45	1.172	0.0	0.0	1.636	88.3	89.1	9
0.461	0.429	50.28	1.174	0.0	0.0	1.645	87.8	88.6	11
0.462	0.434	51.20	1.178	0.0	0.0	1.653	87.1	88.0	13
0.462	0.438	52.54	1.182	0.0	0.0	1.659	85.6	86.6	15
0.461	0.440	54.48	1.189	0.0	0.0	1.665	83.2	84.3	17
0.460	0.441	57.45	1.199	0.0	0.0	1.669	79.3	80.7	19
0.458	0.442	61.68	1.214	0.0	0.0	1.672	74.1	75.9	21

S.L. NO.	DIFFUSION FACTOR	OMEGA BAR	DELTA PS/Q	SOLIDITY	TOTAL TURNING	ABSOLUTE FLOW ANGLE INLET	ABSOLUTE FLOW ANGLE EXIT	EQUIVALENT DIFFUSION FACTOR
1	0.334	0.046	0.162	0.874	23.49	23.49	0.0	1.504
3	0.330	0.042	0.156	0.863	23.35	23.35	0.0	1.504
5	0.324	0.036	0.147	0.845	23.12	23.12	0.0	1.505
7	0.319	0.029	0.136	0.822	22.83	22.83	0.0	1.507
9	0.312	0.022	0.123	0.794	22.43	22.43	0.0	1.508
11	0.307	0.017	0.110	0.766	21.96	21.96	0.0	1.508
13	0.303	0.013	0.097	0.736	21.47	21.47	0.0	1.509
15	0.302	0.013	0.084	0.707	21.13	21.13	0.0	1.513
17	0.305	0.015	0.070	0.679	21.04	21.04	0.0	1.524
19	0.315	0.020	0.055	0.653	21.35	21.35	0.0	1.544
21	0.332	0.029	0.039	0.627	22.16	22.16	0.0	1.577

Table 6. Units Definition For Table 7

English output

Quantity	Dimensions
Length	Inches
Velocity	Feet/second
Pressure	Pounds force/inch^2
Temperature	Degrees Rankine
Flow angle	Degrees

Table 7. Blade Element Performance
Design Point (English Units)

Station 1-1*

ROTOR INLET

MASS FLOW RATE 80.40 FLOW RATE/SQ. FT. 45.00 (CORRECTED) MASS AVE. TOTAL PRESSURE 14.70
CORRECTED FLOW RATE 80.35 ANNULUS AREA 1.79 SQ. FT = 257.2 SQ.IN MASS AVE. TOTAL TEMPERATURE 518.7

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
4.272	745.0	0.0	215.09	14.70	10.30	518.7	468.6	775.4	0.731	775.	0.2	1
4.470	744.0	0.0	201.31	14.70	10.35	518.7	469.2	770.8	0.726	771.	3.7	3
4.814	743.3	0.0	180.29	14.70	10.41	518.7	469.9	764.9	0.720	765.	9.6	5
5.274	744.0	0.0	156.39	14.70	10.45	518.7	470.5	760.3	0.715	760.	17.7	7
5.822	746.6	0.0	132.08	14.70	10.47	518.7	470.8	758.2	0.713	758.	27.2	9
6.433	750.8	0.0	108.10	14.70	10.47	518.7	470.7	758.6	0.713	759.	37.9	11
7.091	756.1	0.0	84.23	14.70	10.45	518.7	470.4	760.8	0.715	761.	49.3	13
7.781	761.7	0.0	59.77	14.70	10.42	518.7	470.0	764.1	0.719	764.	61.3	15
8.496	766.6	0.0	33.88	14.70	10.38	518.7	469.6	767.4	0.722	767.	73.8	17
9.230	769.8	0.0	5.62	14.70	10.36	518.7	469.3	769.8	0.725	770.	86.6	19
9.980	769.8	0.0	-26.00	14.70	10.35	518.7	469.2	770.3	0.725	770.	99.6	21

*Location keyed to Figure 51.

Table 7. (Continued)

Station 2-2

ROTOR EXIT

MASS FLOW RATE	80.40	FLOW RATE/SQ. FT. 33.86 (CORRECTED)		MASS AVE. TOTAL PRESSURE	24.45
CORRECTED FLOW RATE	52.56	ANNULUS AREA 1.55 SQ. FT = 223.5 SQ.IN		MASS AVE. TOTAL TEMPERATURE	614.2
CORRECTED TIP SPEED	1750. FT/SEC			ROTOR ADIABATIC EFFICIENCY	85.0
PRESSURE RATIO	1.664	CUMULATIVE ADIABATIC EFFICIENCY	85.0		

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PPESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
5.109	573.4	572.1	157.06	24.05	17.03	603.8	547.2	825.1	0.719	594.	0.8	1
5.259	571.6	558.2	151.76	24.07	17.23	604.2	549.2	813.2	0.708	591.	4.0	3
5.524	569.0	536.0	143.20	24.11	17.54	604.9	552.4	794.7	0.690	587.	9.5	5
5.887	566.5	509.9	132.90	24.17	17.90	606.1	556.3	773.7	0.669	582.	17.1	7
6.329	567.0	481.4	122.51	24.24	18.25	607.4	560.2	753.8	0.650	580.	26.4	9
6.831	571.1	453.5	112.67	24.31	18.55	608.9	563.6	737.9	0.634	582.	36.9	11
7.375	579.8	427.8	103.81	24.39	18.76	610.6	566.5	727.9	0.624	589.	48.4	13
7.949	592.7	407.3	95.97	24.48	18.88	613.0	569.2	725.5	0.620	600.	60.4	15
8.542	611.0	393.0	89.60	24.57	18.89	616.4	571.9	732.0	0.624	618.	72.9	17
9.147	635.5	387.0	85.40	24.66	18.77	621.8	575.1	749.0	0.637	641.	85.6	19
9.758	668.6	389.5	85.03	24.76	18.48	629.3	579.0	778.4	0.660	674.	98.4	21

RELATIVE MACH NOS. INLET	EXIT	TOTAL TEMP RISE	TOTAL TEMP RATIO	WHEEL SPEED IN	OUT	ROTOR PRESSURE RATIO	ROTOR ADIABATIC EFFICIENCY	ROTOR POLYTROPIC EFFICIENCY	
1.015	0.590	85.14	1.164	747.6	894.1	1.636	92.0	92.8	1
1.034	0.604	85.50	1.165	782.2	920.3	1.638	91.8	92.6	3
1.070	0.632	86.24	1.166	842.4	966.7	1.641	91.4	92.2	5
1.124	0.675	87.43	1.169	923.0	1030.3	1.644	90.6	91.4	7
1.194	0.736	88.73	1.171	1018.8	1107.6	1.649	89.8	90.7	9
1.276	0.810	90.23	1.174	1125.8	1195.3	1.654	88.9	89.8	11
1.368	0.895	91.88	1.177	1240.8	1290.6	1.660	87.9	89.0	13
1.469	0.986	94.28	1.182	1361.7	1391.0	1.666	86.3	87.5	15
1.574	1.078	97.75	1.188	1486.8	1494.8	1.672	83.9	85.2	17
1.684	1.168	103.07	1.199	1615.2	1600.7	1.678	80.2	81.8	19
1.797	1.255	110.65	1.213	1746.5	1707.6	1.684	75.3	77.2	21

S.L. NO.	DIFFUSION FACTOR	OMEGA BAR	DELTA PS/Q	SOLIDITY	TOTAL TURNING	ABSOLUTE FLOW ANGLE INLET	ABSOLUTE FLOW ANGLE EXIT	EQUIVALENT DIFFUSION FACTOR	RELATIVE FLOW ANGLE INLET	RELATIVE FLOW ANGLE EXIT	RELATIVE VELOCITY INLET	RELATIVE VELOCITY EXIT	RELATIVE TEMPERATURE INLET	RELATIVE TEMPERATURE EXIT
1	0.510	0.091	0.705	2.102	15.52	0.0	43.90	1.548	43.95	28.44	1077.	676.	565.	585.
3	0.502	0.091	0.685	2.051	13.95	0.0	43.35	1.526	45.42	31.48	1098.	693.	570.	589.
5	0.488	0.092	0.647	1.971	11.48	0.0	42.41	1.485	47.76	36.28	1138.	728.	578.	596.
7	0.467	0.095	0.593	1.877	8.72	0.0	41.23	1.429	50.52	41.80	1196.	781.	590.	607.
9	0.439	0.096	0.528	1.780	6.15	0.0	39.69	1.367	53.34	47.19	1270.	854.	605.	621.
11	0.407	0.097	0.458	1.689	4.15	0.0	37.93	1.310	56.03	51.88	1358.	943.	624.	638.
13	0.376	0.098	0.389	1.606	2.80	0.0	35.99	1.265	58.49	55.68	1456.	1045.	647.	657.
15	0.347	0.104	0.324	1.554	2.10	0.0	34.15	1.238	60.70	58.60	1561.	1153.	673.	679.
17	0.323	0.116	0.265	1.517	1.97	0.0	32.47	1.231	62.70	60.73	1673.	1263.	702.	704.
19	0.305	0.137	0.212	1.484	2.37	0.0	31.11	1.249	64.52	62.15	1789.	1373.	735.	731.
21	0.294	0.166	0.166	1.455	3.28	0.0	30.02	1.294	66.20	62.92	1909.	1480.	771.	760.

Table 7. (Continued)

Station 3-3

MASS FLOW RATE 80.40 FLOW RATE/SQ. FT. 30.71 (CORRECTED) MASS AVE. TOTAL PRESSURE 24.45
CORRECTED FLOW RATE 52.56 ANNULUS AREA 1.71 SQ. FT = 246.4 SQ.IN MASS AVE. TOTAL TEMPERATURE 614.1

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
5.486	544.5	532.8	136.02	24.05	17.79	603.8	554.0	773.9	0.671	561.	0.9	1
5.631	544.2	521.3	133.95	24.07	17.93	604.2	555.5	765.4	0.663	560.	3.8	3
5.888	543.7	502.8	130.55	24.11	18.16	604.9	557.9	752.0	0.649	559.	9.0	5
6.243	542.9	480.9	126.50	24.17	18.44	606.1	561.1	736.2	0.634	557.	16.2	7
6.676	543.3	456.3	123.02	24.24	18.72	607.4	564.3	720.1	0.618	557.	24.9	9
7.172	544.6	432.0	120.87	24.31	19.00	608.9	567.5	705.6	0.604	558.	34.9	11
7.715	546.4	408.9	121.00	24.39	19.25	610.6	570.6	693.1	0.592	560.	45.9	13
8.299	546.5	390.1	124.09	24.48	19.47	613.0	574.2	682.8	0.581	560.	57.7	15
8.916	543.0	376.5	131.14	24.57	19.69	616.4	578.7	673.6	0.571	559.	70.1	17
9.568	532.0	369.9	142.99	24.66	19.94	621.8	585.2	663.5	0.560	551.	83.3	19
10.264	508.0	370.3	160.06	24.76	20.26	629.3	594.4	648.7	0.543	533.	97.4	21

Station 4-4

MASS FLOW RATE 80.40 FLOW RATE/SQ. FT. 28.21 (CORRECTED) MASS AVE. TOTAL PRESSURE 24.45
CORRECTED FLOW RATE 52.56 ANNULUS AREA 1.86 SQ. FT = 268.4 SQ.IN MASS AVE. TOTAL TEMPERATURE 614.1

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
5.929	515.5	493.0	132.54	24.05	18.48	603.8	560.1	725.5	0.625	532.	1.1	1
6.067	515.4	483.8	130.03	24.07	18.59	604.2	561.2	718.8	0.619	532.	3.8	3
6.314	514.8	468.9	125.92	24.11	18.78	604.9	563.3	707.7	0.608	530.	8.7	5
6.656	513.2	451.0	120.97	24.17	19.02	606.1	566.1	693.8	0.595	527.	15.4	7
7.078	511.6	430.4	116.26	24.24	19.29	607.4	569.1	678.6	0.580	525.	23.8	9
7.567	509.3	409.4	112.24	24.31	19.57	608.9	572.4	663.0	0.565	522.	33.4	11
8.111	506.1	389.0	109.17	24.39	19.85	610.6	575.7	647.6	0.551	518.	44.1	13
8.700	500.2	372.1	106.68	24.48	20.13	613.0	579.7	632.5	0.536	511.	55.7	15
9.332	490.6	359.7	104.27	24.57	20.42	616.4	584.8	617.2	0.521	502.	68.1	17
10.008	475.7	353.7	100.76	24.65	20.73	621.8	591.7	601.3	0.504	486.	81.4	19
10.732	454.6	354.1	94.29	24.76	21.06	629.3	601.0	583.9	0.486	464.	95.7	21

Station 5-5

STATOR 1 INLET

MASS FLOW RATE 80.40 FLOW RATE/SQ. FT. 27.89 (CORRECTED) MASS AVE. TOTAL PRESSURE 24.45
CORRECTED FLOW RATE 52.56 ANNULUS AREA 1.88 SQ. FT = 271.4 SQ.IN MASS AVE. TOTAL TEMPERATURE 614.2

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
6.479	498.4	451.2	102.54	24.05	19.10	603.8	565.4	680.1	0.584	509.	1.4	1
6.603	497.8	444.5	100.81	24.07	19.19	604.2	566.3	675.0	0.579	508.	4.0	3
6.827	496.4	433.6	97.84	24.11	19.34	604.9	568.0	666.4	0.570	506.	8.6	5
7.142	494.1	420.3	94.03	24.17	19.53	606.1	570.4	655.5	0.560	503.	15.1	7
7.535	492.0	404.3	90.01	24.24	19.76	607.4	573.0	643.1	0.548	500.	23.2	9
7.995	489.7	387.5	86.06	24.31	20.00	608.9	575.9	630.4	0.536	497.	32.7	11
8.511	487.1	370.7	82.40	24.39	20.23	610.6	578.9	617.7	0.524	494.	43.4	13
9.074	482.9	356.7	78.87	24.48	20.47	613.0	582.5	605.5	0.512	489.	55.0	15
9.681	476.4	346.7	75.38	24.57	20.71	616.4	587.1	594.1	0.500	482.	67.6	17
10.329	466.6	342.7	71.70	24.65	20.95	621.8	593.5	583.4	0.489	472.	81.0	19
11.021	453.2	344.8	67.72	24.76	21.19	629.3	602.0	573.5	0.477	458.	95.3	21

Table 7. (Continued)

Station 6-6

STATOR 1 EXIT

MASS FLOW RATE 80.40 FLOW RATE/SQ. FT. 28.26 (CORRECTED) MASS AVE. TOTAL PRESSURE 24.36
CORRECTED FLOW RATE 52.76 ANNULUS AREA 1.87 SQ. FT = 268.8 SQ.IN MASS AVE. TOTAL TEMPERATURE 614.1
PRESSURE RATIO 1.657 CUMULATIVE ADIABATIC EFFICIENCY 84.4 STAGE ADIABATIC EFFICIENCY 84.4

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
7.110	483.7	212.3	68.91	23.76	20.66	603.8	580.2	532.8	0.451	489.	3.5	1
7.224	486.3	212.0	67.94	23.81	20.69	604.2	580.4	534.8	0.453	491.	5.9	3
7.429	490.3	211.2	66.03	23.90	20.73	604.9	580.9	537.9	0.455	495.	10.4	5
7.716	495.0	210.0	63.11	24.01	20.79	606.1	581.8	541.4	0.458	499.	16.6	7
8.073	499.7	207.7	59.23	24.12	20.86	607.4	582.8	544.4	0.460	503.	24.3	9
8.491	504.2	204.5	54.55	24.23	20.94	608.9	584.1	546.8	0.462	507.	33.4	11
8.960	507.9	200.7	49.29	24.33	21.02	610.6	585.6	548.3	0.462	510.	43.5	13
9.472	510.5	198.0	43.58	24.43	21.10	613.0	587.9	549.3	0.462	512.	54.6	15
10.022	512.0	197.5	37.46	24.52	21.19	616.4	591.3	550.0	0.462	513.	66.5	17
10.607	512.1	200.6	30.85	24.59	21.27	621.6	596.6	550.8	0.460	513.	79.2	19
11.225	510.4	208.2	23.54	24.65	21.36	629.3	604.1	551.8	0.458	511.	92.5	21

ABSOLUTE MACH NOS. INLET	EXIT	TOTAL TEMP RISE	TOTAL TEMP RATIO	WHEEL SPEED IN	OUT	STAGE PRESSURE RATIO	STAGE ADIABATIC EFFICIENCY	STAGE POLYTROPIC EFFICIENCY	
0.584	0.451	85.14	1.164	0.0	0.0	1.617	89.6	90.3	1
0.579	0.453	85.50	1.165	0.0	0.0	1.620	89.7	90.3	3
0.570	0.455	86.24	1.166	0.0	0.0	1.626	89.6	90.3	5
0.560	0.458	87.43	1.169	0.0	0.0	1.633	89.3	90.0	7
0.548	0.460	88.73	1.171	0.0	0.0	1.641	88.9	89.6	9
0.536	0.462	90.23	1.174	0.0	0.0	1.649	88.3	89.0	11
0.524	0.462	91.88	1.177	0.0	0.0	1.656	87.5	88.3	13
0.512	0.462	94.28	1.182	0.0	0.0	1.662	85.9	86.9	15
0.500	0.462	97.75	1.188	0.0	0.0	1.668	83.5	84.6	17
0.489	0.460	103.07	1.199	0.0	0.0	1.673	79.7	81.1	19
0.477	0.458	110.65	1.213	0.0	0.0	1.678	74.7	76.4	21

S.L. NO.	DIFFUSION FACTOR	OMEGA BAR	DELTA PS/Q	SOLIDITY	TOTAL TURNING	ABSOLUTE FLOW ANGLE INLET	ABSOLUTE FLOW ANGLE EXIT	EQUIVALENT DIFFUSION FACTOR
1	0.379	0.059	0.316	0.939	18.07	41.56	23.49	1.576
3	0.370	0.053	0.307	0.926	17.84	41.19	23.35	1.569
5	0.355	0.045	0.292	0.903	17.48	40.60	23.12	1.558
7	0.336	0.035	0.271	0.873	17.06	39.89	22.83	1.545
9	0.316	0.026	0.246	0.839	16.53	38.95	22.43	1.530
11	0.296	0.019	0.218	0.804	15.97	37.93	21.96	1.515
13	0.276	0.014	0.188	0.768	15.41	36.88	21.47	1.501
15	0.258	0.013	0.157	0.733	14.97	36.10	21.13	1.492
17	0.242	0.014	0.123	0.700	14.67	35.71	21.04	1.489
19	0.229	0.019	0.087	0.669	14.62	35.98	21.35	1.494
21	0.217	0.026	0.048	0.640	14.80	36.96	22.16	1.509

Table 7. (Continued)

Station 7-7

STATOR 2 EXIT

MASS FLOW RATE 80.40
CORRECTED FLOW RATE 52.90
PRESSURE RATIO 1.653

FLOW RATE/SQ. FT. 29.04 (CORRECTED)
ANNULUS AREA 1.82 SQ. FT = 262.3 SQ.IN
CUMULATIVE ADIABATIC EFFICIENCY 83.9

MASS AVE. TOTAL PRESSURE 24.29
MASS AVE. TOTAL TEMPERATURE 614.1
STAGE ADIABATIC EFFICIENCY 83.9

RADIUS INCHES	AXIAL VELOCITY	WHIRL VELOCITY	RADIAL VELOCITY	TOTAL PRESSURE	STATIC PRESSURE	TEMPERATURES TOTAL	TEMPERATURES STATIC	ABSOLUTE VELOCITY	ABSOLUTE MACH NO.	MER. VELOCITY	PERCENT SPAN	S.L. NO.
7.515	472.0	0.0	32.31	23.62	21.16	603.8	585.2	473.1	0.399	473.	2.5	1
7.625	476.7	0.0	32.19	23.68	21.18	604.2	585.2	477.7	0.403	478.	5.1	3
7.821	484.0	0.0	31.87	23.79	21.20	604.9	585.4	485.1	0.409	485.	9.6	5
8.094	492.7	0.0	31.24	23.91	21.23	606.1	585.9	493.7	0.416	494.	15.9	7
8.434	501.3	0.0	30.22	24.05	21.26	607.4	586.5	502.2	0.423	502.	23.8	9
8.830	509.0	0.0	28.78	24.17	21.30	608.9	587.3	509.8	0.429	510.	32.9	11
9.275	515.4	0.0	26.97	24.29	21.34	610.6	588.4	516.1	0.434	516.	43.2	13
9.761	520.7	0.0	24.84	24.39	21.38	613.0	590.4	521.3	0.438	521.	54.4	15
10.283	525.1	0.0	22.46	24.47	21.42	616.4	593.5	525.6	0.440	526.	66.5	17
10.837	529.0	0.0	19.93	24.53	21.46	621.8	598.5	529.4	0.442	529.	79.3	19
11.420	532.6	0.0	17.38	24.57	21.49	629.3	605.8	532.9	0.442	533.	92.7	21

ABSOLUTE INLET	MACH NOS. EXIT	TOTAL TEMP RISE	TOTAL TEMP RATIO	WHEEL SPEED IN	WHEEL SPEED OUT	STAGE PRESSURE RATIO	STAGE ADIABATIC EFFICIENCY	STAGE POLYTROPIC EFFICIENCY	
0.451	0.399	85.14	1.164	0.0	0.0	1.607	88.4	89.1	1
0.453	0.403	85.50	1.165	0.0	0.0	1.611	88.6	89.3	3
0.455	0.409	86.24	1.166	0.0	0.0	1.618	88.7	89.4	5
0.458	0.416	87.43	1.169	0.0	0.0	1.627	88.5	89.2	7
0.460	0.423	88.73	1.171	0.0	0.0	1.636	88.3	89.0	9
0.462	0.429	90.23	1.174	0.0	0.0	1.645	87.8	88.6	11
0.462	0.434	91.88	1.177	0.0	0.0	1.653	87.1	87.9	13
0.462	0.438	94.28	1.182	0.0	0.0	1.659	85.6	86.6	15
0.462	0.440	97.75	1.188	0.0	0.0	1.665	83.2	84.2	17
0.460	0.442	103.07	1.199	0.0	0.0	1.669	79.3	80.6	19
0.458	0.442	110.65	1.213	0.0	0.0	1.672	74.1	75.8	21

S.L. NO.	DIFFUSION FACTOR	OMEGA BAR	DELTA PS/Q	SOLIDITY	TOTAL TURNING	ABSOLUTE FLOW ANGLE INLET	ABSOLUTE FLOW ANGLE EXIT	EQUIVALENT DIFFUSION FACTOR
1	0.334	0.046	0.162	0.874	23.49	23.49	0.0	1.504
3	0.330	0.042	0.156	0.863	23.35	23.35	0.0	1.504
5	0.325	0.036	0.147	0.845	23.12	23.12	0.0	1.505
7	0.319	0.029	0.136	0.822	22.83	22.83	0.0	1.507
9	0.312	0.022	0.123	0.794	22.43	22.43	0.0	1.508
11	0.307	0.017	0.110	0.766	21.96	21.96	0.0	1.508
13	0.303	0.013	0.097	0.736	21.47	21.47	0.0	1.509
15	0.302	0.013	0.084	0.707	21.13	21.13	0.0	1.513
17	0.305	0.015	0.070	0.679	21.04	21.04	0.0	1.524
19	0.315	0.020	0.055	0.653	21.35	21.35	0.0	1.544
21	0.332	0.029	0.039	0.627	22.16	22.16	0.0	1.577

APPENDIX C

STARTED CONTAINED SHOCK AIRFOIL DESIGN SYSTEM

SCS blade section design is accomplished on a conical surface which approximates the stream surface. Blade section inlet design conditions are taken directly from a full radial equilibrium solution of the velocity diagrams. Blade section exit design conditions are axially-symmetric and are modified to include blade wake displacement thickness effects before being applied to the blade section design. The SCS design system is made up of two major sections, the wake-mixing analysis and the blade airfoil design.

The wake-mixing analysis calculates the required flow conditions at the blade inviscid core exit for the specified inlet and exit conditions. The inlet and exit flow conditions from the velocity diagram calculation are considered to be fully mixed or uniform. The flow conditions at the core exit, as illustrated in Figure 52 (Station a), are represented by the uniform core exit flow and the boundary layer characteristics which describe the viscous flow. The wake-mixing problem is calculated in reverse, i.e., the fully mixed conditions (Station b in Figure 52) are known and the core flow that would produce these conditions is computed.

The wake-mixing analysis solves the conservation equations of mass, momentum, and energy expressed in terms of the boundary layer characteristics. The solution is iterative since the inviscid core discharge flow angle and the total displacement thickness (sum of the suction and pressure surface boundary layers and trailing edge blockage) at the blade trailing edge are not known. A boundary layer shape factor is specified at the blade trailing edge for turbulent flow. The displacement thickness is determined by the iterative procedure such that the relative total pressure at the core exit agrees with a value which is calculated using an estimated shock wave total pressure loss through the blade passage. Continuity of the flow between the inlet and core exit is satisfied.

The SCS airfoil design system requires inputs of inlet flow conditions from the velocity diagram program, core exit flow conditions from the wake-mixing analysis, predetermined values of chord, blade element cross-sectional area, and leading and trailing edge radii for each streamline airfoil section. The SCS airfoil design philosophy is based on the concept of streamline tracing with blade surfaces. The compression which is required in the passage in order to arrive at the core exit conditions is achieved by oblique shock waves. The reflections which would result from the impingement of the shock waves on a blade surface are cancelled with a surface

slope change. This slope change is equal to the shock wave turning angle and is rounded to reduce the chance of boundary layer separation. The working surfaces used in this analysis are the effective suction and pressure surfaces which represent the blade metal surfaces plus boundary layer displacement thickness. The actual blade shape is then computed by subtracting the boundary layer displacement thickness from the effective blade.

The last step of the SCS design system is a check of calculated cross-sectional area against area required for structural integrity. If they do not agree, an expansion turn which increases cross-sectional area, or a precompression turn (which decreases area) is applied to the suction surface at the first covered Mach wave. This involves a regeneration of the effective suction surface after the first covered Mach wave and a recycle of the analytical process beginning with the definition of the shock wave structure since the flow conditions into the passage shock and the required surface velocity distribution are altered. A completed SCS design is shown schematically in Figure 53.

An essentially complete description of an all-supersonic SCS design system of similar philosophy, including theory and equation development, is given in Reference 10. There are two major differences between the SCS design systems of DDA and Reference 10. In Reference 10, the effective suction surface segments in the blade passage are designed to have a constant rate of change of relative flow angle with respect to meridional distance. These surface segments are designed to have constant relative velocity in the DDA system. The other difference is the ability to alter the airfoil cross-sectional area in the DDA system. This degree of freedom is not available in the SCS design system of Reference 10.

In review, the primary features of the SCS design system are as follows.

- The effective blade surfaces are designed as constant velocity surfaces.
- The required diffusion and compression are achieved by oblique shock waves.
- At the points of shock intersection with the suction and pressure surfaces, a blade surface slope change is provided to eliminate shock wave reflection.

These features result in the following aerodynamic conditions

- Regions of accelerating flow adjacent to the blade are eliminated.
- Blade row trailing wave systems are eliminated.
- Shock-boundary layer interaction strengths are reduced from those occurring with MCA blading.

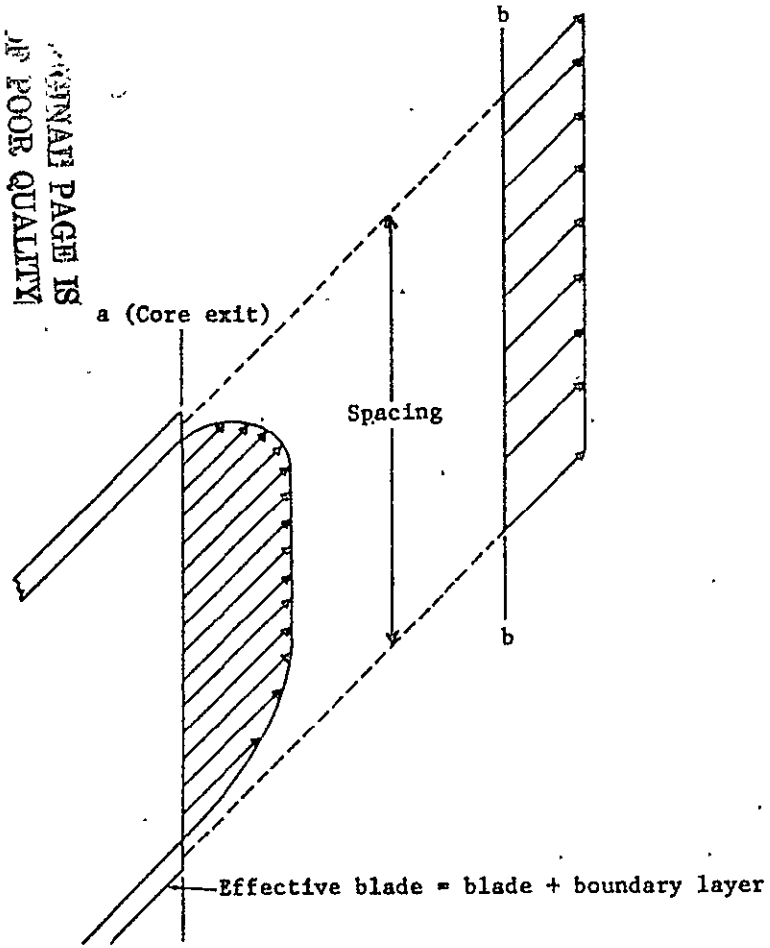


Figure 52. Wake mixing

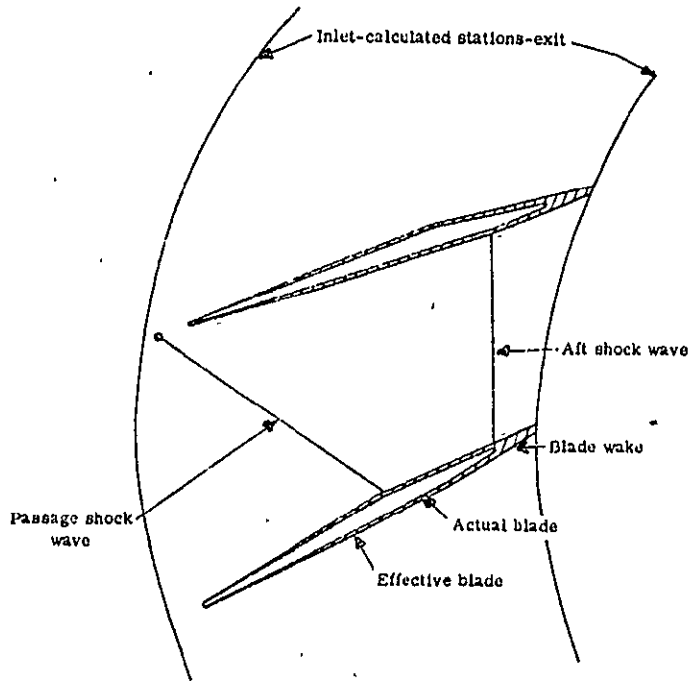


Figure 53. SCS rotor blade design

APPENDIX D
AIRFOIL COORDINATES ON MANUFACTURING SURFACES

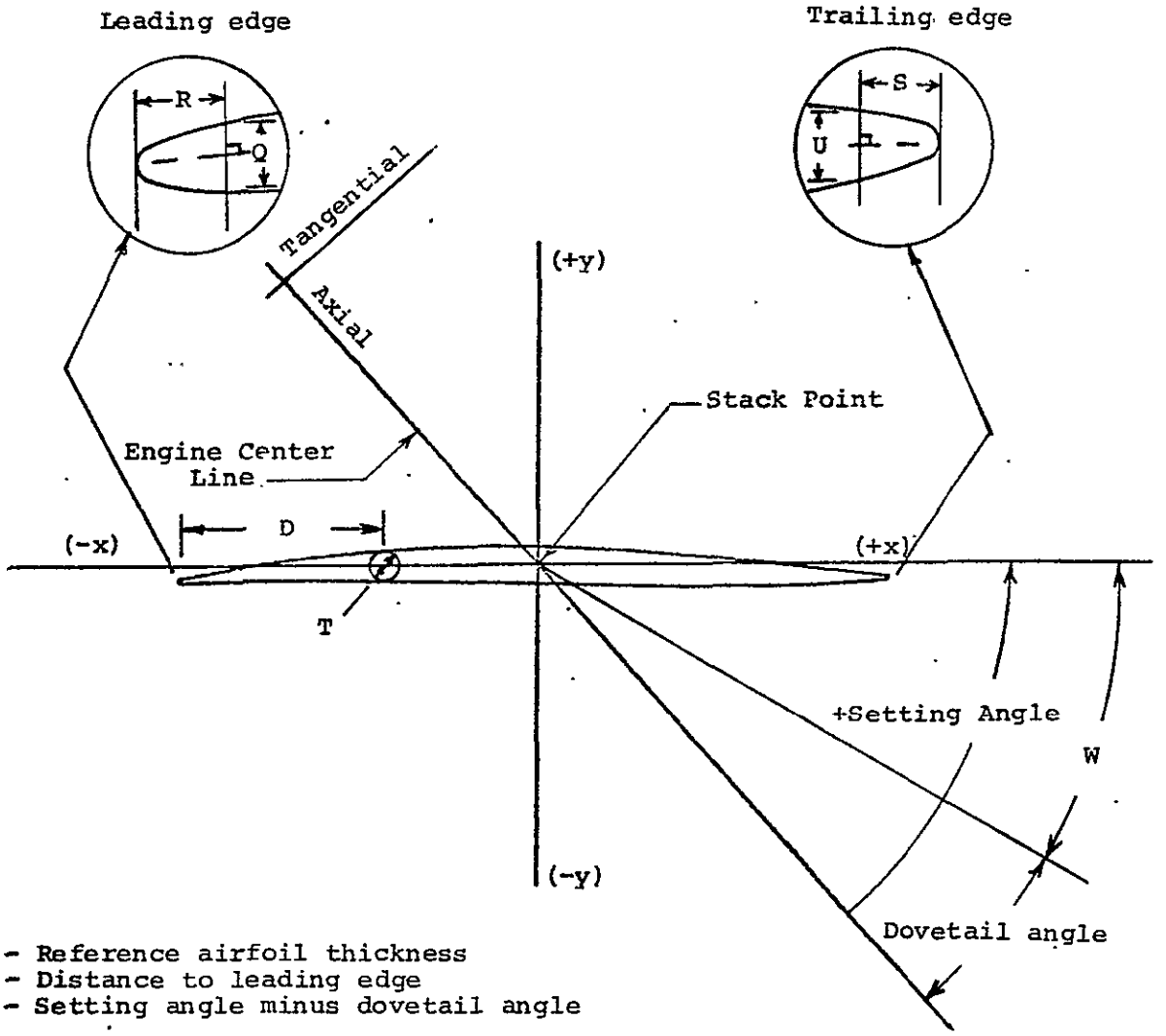


Figure 54. Orientation of airfoil manufacturing coordinates for the rotor blade

Table 8. Airfoil Manufacturing Coordinates - Rotor

(SI Units)[1]

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.5250	6.823 6D 49M 23S	0.5410	5.0800	0.029	0.031

LEADING EDGE AXIAL TANGENT POINT -3.1416

Q DIMENSION 0.0911 U DIMENSION 0.1197
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.1489, -0.1413
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.2807*	-0.9766	21	1.0725	0.3122	41	1.0271	-0.2976
2	-3.2667	-0.9505	22	1.3290	0.2475	42	0.8658	-0.2731
3	-3.1276	-0.8402	23	1.5844	0.1623	43	0.6244	-0.2429
4	-2.9147	-0.6820	24	1.8379	0.0557	44	0.3832	-0.2205
5	-2.6967	-0.5333	25	2.0892	-0.0738	45	0.1423	-0.2073
6	-2.4739	-0.3941	26	2.3377	-0.2273	46	-0.0984	-0.2033
7	-2.2467	-0.2648	27	2.5841	-0.4072	47	-0.3375	-0.2083
8	-2.0150	-0.1458	28	2.8273	-0.6148	48	-0.5759	-0.2234
9	-1.7793	-0.0374	29	3.0646	-0.8514	49	-0.8140	-0.2482
10	-1.5399	0.0601	30	3.1422	-0.9369	50	-1.0516	-0.2824
11	-1.2968	0.1461	31	3.1628*	-0.9781	51	-1.2099	-0.3101
12	-1.1329	0.1970	32	3.1200	-1.0032	52	-1.4468	-0.3590
13	-0.8846	0.2630	33	3.0317	-0.9559	53	-1.6833	-0.4163
14	-0.6336	0.3164	34	2.7691	-0.8259	54	-1.9192	-0.4819
15	-0.3801	0.3564	35	2.5100	-0.7125	55	-2.1547	-0.5554
16	-0.1247	0.3823	36	2.2556	-0.6141	56	-2.3893	-0.6369
17	0.1305	0.3945	37	2.0057	-0.5295	57	-2.6235	-0.7259
18	0.3868	0.3932	38	1.7585	-0.4564	58	-2.8569	-0.8223
19	0.6437	0.3776	39	1.5134	-0.3940	59	-3.0895	-0.9261
20	0.9010	0.3445	40	1.2697	-0.3413	60	-3.2441	-0.9992

* INDICATES EXTREME POINTS

1. Dimensions in centimeters, angles in degrees
   All listed values pertain to the manufacturing sections

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.1600	12.113 12D 6M 48S	0.5269	5.0800	0.028	0.030

LEADING EDGE AXIAL TANGENT POINT -3.0921

Q DIMENSION 0.0888 U DIMENSION 0.1206
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0990, -0.1329
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.3559*	-0.9056	21	1.0798	0.2913	41	1.0200	-0.2904
2	-3.3404	-0.8769	22	1.3317	0.2304	42	0.8604	-0.2679
3	-3.1927	-0.7731	23	1.5812	0.1508	43	0.6207	-0.2400
4	-2.9677	-0.6245	24	1.8277	0.0514	44	0.3807	-0.2189
5	-2.7386	-0.4850	25	2.0708	-0.0689	45	0.1401	-0.2063
6	-2.5058	-0.3548	26	2.3097	-0.2110	46	-0.1010	-0.2022
7	-2.2694	-0.2342	27	2.5447	-0.3773	47	-0.3413	-0.2064
8	-2.0296	-0.1234	28	2.7748	-0.5687	48	-0.5819	-0.2199
9	-1.7867	-0.0228	29	2.9976	-0.7864	49	-0.8227	-0.2421
10	-1.5411	0.0673	30	3.0700	-0.8650	50	-1.0639	-0.2729
11	-1.2928	0.1466	31	3.0882*	-0.8991	51	-1.2249	-0.2980
12	-1.1259	0.1933	32	3.0476	-0.9279	52	-1.4665	-0.3423
13	-0.8740	0.2538	33	2.9641	-0.8855	53	-1.7083	-0.3945
14	-0.6203	0.3022	34	2.7148	-0.7687	54	-1.9503	-0.4541
15	-0.3651	0.3383	35	2.4670	-0.6664	55	-2.1923	-0.5211
16	-0.1091	0.3613	36	2.2221	-0.5777	56	-2.4342	-0.5953
17	0.1461	0.3715	37	1.9799	-0.5012	57	-2.6762	-0.6765
18	0.4014	0.3693	38	1.7390	-0.4351	58	-2.9181	-0.7645
19	0.6565	0.3537	39	1.4990	-0.3784	59	-3.1598	-0.8593
20	0.9109	0.3220	40	1.2594	-0.3304	60	-3.3208	-0.9260

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.7950	17.357 17D 21M 25S	0.5165	5.0800	0.028	0.030

LEADING EDGE AXIAL TANGENT POINT -3.0426

Q DIMENSION 0.0867 U DIMENSION 0.1213
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0560, -0.1240
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.4446*	-0.8260	21	1.0924	0.2720	41	1.0230	-0.2845
2	-3.4278	-0.7986	22	1.3425	0.2152	42	0.8632	-0.2640
3	-3.2715	-0.7019	23	1.5894	0.1413	43	0.6229	-0.2384
4	-3.0345	-0.5636	24	1.8325	0.0495	44	0.3817	-0.2188
5	-2.7942	-0.4341	25	2.0712	-0.0612	45	0.1393	-0.2068
6	-2.5511	-0.3135	26	2.3047	-0.1917	46	-0.1042	-0.2024
7	-2.3054	-0.2020	27	2.5331	-0.3438	47	-0.3477	-0.2056
8	-2.0571	-0.0999	28	2.7552	-0.5185	48	-0.5920	-0.2171
9	-1.8065	-0.0074	29	2.9691	-0.7168	49	-0.8372	-0.2366
10	-1.5540	0.0752	30	3.0383	-0.7883	50	-1.0833	-0.2638
11	-1.2996	0.1476	31	3.0548*	-0.8201	51	-1.2479	-0.2860
12	-1.1293	0.1901	32	3.0162	-0.8485	52	-1.4953	-0.3253
13	-0.8726	0.2448	33	2.9358	-0.8113	53	-1.7434	-0.3718
14	-0.6151	0.2885	34	2.6948	-0.7088	54	-1.9922	-0.4250
15	-0.3568	0.3206	35	2.4542	-0.6189	55	-2.2416	-0.4849
16	-0.0985	0.3407	36	2.2147	-0.5406	56	-2.4914	-0.5514
17	0.1584	0.3492	37	1.9765	-0.4729	57	-2.7417	-0.6242
18	0.4148	0.3462	38	1.7385	-0.4141	58	-2.9924	-0.7030
19	0.6703	0.3309	39	1.5004	-0.3636	59	-3.2434	-0.7881
20	0.9242	0.3008	40	1.2620	-0.3206	60	-3.4110	-0.8479

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
11.4300	22.415 22D 24M 54S	0.5085	5.0800	0.027	0.029

LEADING EDGE AXIAL TANGENT POINT -2.9922

Q DIMENSION 0.0850 U DIMENSION 0.1218
P DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0219, -0.1146
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.5407*	-0.7410	21	1.1098	0.2557	41	1.0362	-0.2790
2	-3.5229	-0.7153	22	1.3611	0.2034	42	0.8746	-0.2607
3	-3.3593	-0.6275	23	1.6087	0.1356	43	0.6312	-0.2376
4	-3.1119	-0.5020	24	1.8520	0.0518	44	0.3864	-0.2197
5	-2.8620	-0.3847	25	2.0904	-0.0490	45	0.1401	-0.2084
6	-2.6089	-0.2737	26	2.3230	-0.1676	46	-0.1077	-0.2039
7	-2.3537	-0.1713	27	2.5496	-0.3053	47	-0.3561	-0.2063
8	-2.0968	-0.0778	28	2.7692	-0.4631	48	-0.6058	-0.2159
9	-1.8383	0.0067	29	2.9799	-0.6418	49	-0.8568	-0.2326
10	-1.5784	0.0820	30	3.0480	-0.7061	50	-1.1091	-0.2562
11	-1.3175	0.1477	31	3.0635*	-0.7357	51	-1.2780	-0.2755
12	-1.1430	0.1862	32	3.0267	-0.7642	52	-1.5322	-0.3099
13	-0.8808	0.2356	33	2.9477	-0.7327	53	-1.7875	-0.3506
14	-0.6182	0.2748	34	2.7101	-0.6456	54	-2.0438	-0.3974
15	-0.3556	0.3035	35	2.4720	-0.5688	55	-2.3011	-0.4501
16	-0.0935	0.3213	36	2.2339	-0.5017	56	-2.5591	-0.5088
17	0.1670	0.3284	37	1.9958	-0.4434	57	-2.8180	-0.5730
18	0.4265	0.3251	38	1.7572	-0.3925	58	-3.0768	-0.6408
19	0.6845	0.3105	39	1.5179	-0.3485	59	-3.3358	-0.7135
20	0.9405	0.2824	40	1.2776	-0.3108	60	-3.5088	-0.7646

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.0650	27.184 27D 11M 3S	0.5018	5.0800	0.026	0.028

LEADING EDGE AXIAL TANGENT POINT -2.9405

Q DIMENSION 0.0826 U DIMENSION 0.1218
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0026, -0.1033
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.6381*	-0.6549	21	1.1316	0.2436	41	1.0594	-0.2734
2	-3.6195	-0.6275	22	1.3870	0.1962	42	0.8943	-0.2576
3	-3.4487	-0.5481	23	1.6386	0.1349	43	0.6454	-0.2374
4	-3.1904	-0.4334	24	1.8858	0.0592	44	0.3949	-0.2214
5	-2.9305	-0.3264	25	2.1278	-0.0315	45	0.1426	-0.2112
6	-2.6691	-0.2271	26	2.3639	-0.1380	46	-0.1114	-0.2069
7	-2.4062	-0.1357	27	2.5935	-0.2613	47	-0.3664	-0.2086
8	-2.1421	-0.0524	28	2.8158	-0.4023	48	-0.6230	-0.2167
9	-1.8769	0.0227	29	3.0294	-0.5616	49	-0.8811	-0.2309
10	-1.6108	0.0896	30	3.0984	-0.6189	50	-1.1406	-0.2508
11	-1.3439	0.1479	31	3.1134*	-0.6462	51	-1.3140	-0.2666
12	-1.1658	0.1821	32	3.0782	-0.6756	52	-1.5750	-0.2948
13	-0.8982	0.2260	33	2.9988	-0.6500	53	-1.8371	-0.3282
14	-0.6297	0.2614	34	2.7599	-0.5789	54	-2.1001	-0.3668
15	-0.3615	0.2873	35	2.5198	-0.5161	55	-2.3642	-0.4103
16	-0.0940	0.3033	36	2.2789	-0.4608	56	-2.6292	-0.4589
17	0.1718	0.3097	37	2.0373	-0.4123	57	-2.8950	-0.5122
18	0.4362	0.3066	38	1.7947	-0.3698	58	-3.1618	-0.5702
19	0.6989	0.2934	39	1.5510	-0.3327	59	-3.4294	-0.6329
20	0.9594	0.2678	40	1.3059	-0.3007	60	-3.6080	-0.6762

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.7000	31.495 310 29M 43S	0.4963	5.0800	0.026	0.028

LEADING EDGE AXIAL TANGENT POINT -2.8932

Q DIMENSION 0.0806 U DIMENSION 0.1206
P DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0018, -0.0895
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.7289*	-0.5554	21	1.1567	0.2372	41	1.0925	-0.2655
2	-3.7095	-0.5295	22	1.4195	0.1967	42	0.9219	-0.2529
3	-3.5323	-0.4593	23	1.6783	0.1427	43	0.6646	-0.2366
4	-3.2656	-0.3593	24	1.9328	0.0758	44	0.4060	-0.2232
5	-2.9978	-0.2661	25	2.1823	-0.0044	45	0.1461	-0.2143
6	-2.7291	-0.1796	26	2.4262	-0.0986	46	-0.1153	-0.2101
7	-2.4594	-0.0999	27	2.6636	-0.2073	47	-0.3776	-0.2106
8	-2.1889	-0.0273	28	2.8939	-0.3313	48	-0.6412	-0.2164
9	-1.9177	0.0384	29	3.1159	-0.4714	49	-0.9061	-0.2271
10	-1.6460	0.0969	30	3.1878	-0.5218	50	-1.1723	-0.2427
11	-1.3729	0.1489	31	3.2032*	-0.5509	51	-1.3504	-0.2559
12	-1.1903	0.1795	32	3.1693	-0.5779	52	-1.6187	-0.2794
13	-0.9165	0.2187	33	3.0879	-0.5584	53	-1.8873	-0.3059
14	-0.6428	0.2497	34	2.8428	-0.5044	54	-2.1567	-0.3360
15	-0.3695	0.2724	35	2.5964	-0.4563	55	-2.4270	-0.3699
16	-0.0969	0.2865	36	2.3490	-0.4136	56	-2.6981	-0.4076
17	0.1743	0.2924	37	2.1003	-0.3758	57	-2.9702	-0.4491
18	0.4444	0.2902	38	1.8504	-0.3424	58	-3.2433	-0.4942
19	0.7131	0.2793	39	1.5992	-0.3130	59	-3.5172	-0.5431
20	0.9800	0.2578	40	1.3466	-0.2875	60	-3.7004	-0.5776

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
13.3350	35.504 35D 30M 12S	0.4880	5.0800	0.025	0.027

LEADING EDGE AXIAL TANGENT POINT -2.8469

Q DIMENSION 0.0786 U DIMENSION 0.1164
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0091, -0.0767
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.8199*	-0.4595	21	1.1818	0.2257	41	1.1240	-0.2631
2	-3.8000	-0.4353	22	1.4514	0.1893	42	0.9481	-0.2526
3	-3.6174	-0.3744	23	1.7182	0.1424	43	0.6832	-0.2384
4	-3.3429	-0.2878	24	1.9817	0.0845	44	0.4166	-0.2265
5	-3.0664	-0.2052	25	2.2413	0.0152	45	0.1489	-0.2179
6	-2.7892	-0.1286	26	2.4967	-0.0659	46	-0.1199	-0.2127
7	-2.5115	-0.0583	27	2.7469	-0.1593	47	-0.3893	-0.2111
8	-2.2334	0.0054	28	2.9914	-0.2657	48	-0.6596	-0.2134
9	-1.9550	0.0626	29	3.2293	-0.3855	49	-0.9309	-0.2196
10	-1.6764	0.1132	30	3.3071	-0.4286	50	-1.2032	-0.2294
11	-1.3976	0.1570	31	3.3238*	-0.4551	51	-1.3853	-0.2380
12	-1.2118	0.1825	32	3.2911	-0.4841	52	-1.6594	-0.2538
13	-0.9332	0.2150	33	3.2052	-0.4712	53	-1.9345	-0.2732
14	-0.6548	0.2405	34	2.9475	-0.4351	54	-2.2107	-0.2960
15	-0.3767	0.2591	35	2.6892	-0.4024	55	-2.4879	-0.3221
16	-0.0992	0.2703	36	2.4302	-0.3728	56	-2.7662	-0.3517
17	0.1772	0.2746	37	2.1706	-0.3459	57	-3.0456	-0.3845
18	0.4528	0.2722	38	1.9102	-0.3217	58	-3.3259	-0.4205
19	0.7274	0.2627	39	1.6491	-0.2999	59	-3.6059	-0.4568
20	1.0007	0.2441	40	1.3870	-0.2804	60	-3.7930	-0.4826

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CRC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
13.9700	38.978 38D 58M 39S	0.4760	5.0800	0.024	0.026

LEADING EDGE AXIAL TANGENT POINT -2.8035

Q DIMENSION 0.0757 U DIMENSION 0.1097
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0126, -0.0674
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.9033*	-0.3767	21	1.2052	0.2097	41	1.1533	-0.2625
2	-3.8830	-0.3509	22	1.4813	0.1778	42	0.9719	-0.2539
3	-3.6947	-0.2966	23	1.7555	0.1372	43	0.6992	-0.2418
4	-3.4119	-0.2197	24	2.0273	0.0874	44	0.4257	-0.2305
5	-3.1288	-0.1485	25	2.2965	0.0284	45	0.1513	-0.2216
6	-2.8455	-0.0828	26	2.5626	-0.0404	46	-0.1241	-0.2155
7	-2.5619	-0.0228	27	2.8253	-0.1193	47	-0.4001	-0.2123
8	-2.2781	0.0313	28	3.0841	-0.2089	48	-0.6771	-0.2123
9	-1.9942	0.0798	29	3.3384	-0.3096	49	-0.9551	-0.2155
10	-1.7103	0.1225	30	3.4222	-0.3457	50	-1.2341	-0.2212
11	-1.4263	0.1592	31	3.4401*	-0.3729	51	-1.4203	-0.2261
12	-1.2370	0.1805	32	3.4093	-0.3991	52	-1.7005	-0.2356
13	-0.9533	0.2076	33	3.3190	-0.3922	53	-1.9814	-0.2479
14	-0.6692	0.2291	34	3.0484	-0.3725	54	-2.2632	-0.2628
15	-0.3853	0.2445	35	2.7780	-0.3540	55	-2.5459	-0.2803
16	-0.1021	0.2535	36	2.5077	-0.3365	56	-2.8295	-0.3005
17	0.1799	0.2563	37	2.2373	-0.3201	57	-3.1141	-0.3233
18	0.4611	0.2532	38	1.9668	-0.3045	58	-3.3997	-0.3487
19	0.7412	0.2437	39	1.6960	-0.2898	59	-3.6862	-0.3768
20	1.0201	0.2262	40	1.4249	-0.2758	60	-3.8779	-0.3968

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
14.6050	41.997 41D 59M 48S	0.4636	5.0800	0.023	0.025

LEADING EDGE AXIAL TANGENT POINT -2.7606

Q DIMENSION 0.0732 U DIMENSION 0.1047
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0183, -0.0598
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.9865*	-0.3115	21	1.2282	0.1958	41	1.1836	-0.2605
2	-3.9664	-0.2873	22	1.5111	0.1681	42	0.9967	-0.2539
3	-3.7737	-0.2400	23	1.7926	0.1333	43	0.7162	-0.2438
4	-3.4836	-0.1715	24	2.0727	0.0909	44	0.4352	-0.2335
5	-3.1932	-0.1079	25	2.3511	0.0409	45	0.1537	-0.2245
6	-2.9029	-0.0495	26	2.6269	-0.0180	46	-0.1284	-0.2171
7	-2.6126	0.0036	27	2.8993	-0.0866	47	-0.4108	-0.2116
8	-2.3224	0.0513	28	3.1684	-0.1643	48	-0.6938	-0.2084
9	-2.0322	0.0937	29	3.4339	-0.2514	49	-0.9776	-0.2075
10	-1.7422	0.1307	30	3.5215	-0.2826	50	-1.2622	-0.2089
11	-1.4524	0.1621	31	3.5400*	-0.3078	51	-1.4524	-0.2111
12	-1.2594	0.1801	32	3.5107	-0.3346	52	-1.7385	-0.2164
13	-0.9700	0.2026	33	3.4176	-0.3319	53	-2.0254	-0.2240
14	-0.6811	0.2196	34	3.1385	-0.3233	54	-2.3133	-0.2339
15	-0.3925	0.2311	35	2.8597	-0.3146	55	-2.6021	-0.2462
16	-0.1046	0.2372	36	2.5810	-0.3057	56	-2.8919	-0.2608
17	0.1823	0.2383	37	2.3024	-0.2966	57	-3.1827	-0.2776
18	0.4686	0.2346	38	2.0237	-0.2874	58	-3.4745	-0.2967
19	0.7542	0.2258	39	1.7438	-0.2788	59	-3.7674	-0.3178
20	1.0390	0.2102	40	1.4638	-0.2699	60	-3.9625	-0.3318

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
15.2400	44.562 44D 33M 41S	0.4504	5.0800	0.022	0.024

LEADING EDGE AXIAL TANGENT POINT -2.7209

Q DIMENSION 0.0701 U DIMENSION 0.0974
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0161, -0.0564
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.0630*	-0.2572	21	1.2495	0.1813	41	1.2098	-0.2592
2	-4.0431	-0.2344	22	1.5382	0.1563	42	1.0186	-0.2538
3	-3.8458	-0.1918	23	1.8258	0.1249	43	0.7316	-0.2449
4	-3.5500	-0.1316	24	2.1122	0.0871	44	0.4442	-0.2352
5	-3.2543	-0.0762	25	2.3971	0.0426	45	0.1564	-0.2263
6	-2.9587	-0.0254	26	2.6805	-0.0087	46	-0.1321	-0.2185
7	-2.6632	0.0208	27	2.9621	-0.0669	47	-0.4208	-0.2121
8	-2.3677	0.0621	28	3.2418	-0.1323	48	-0.7100	-0.2076
9	-2.0725	0.0987	29	3.5193	-0.2050	49	-1.0001	-0.2049
10	-1.7774	0.1306	30	3.6114	-0.2309	50	-1.2909	-0.2043
11	-1.4825	0.1577	31	3.6305*	-0.2537	51	-1.4851	-0.2043
12	-1.2860	0.1730	32	3.6031	-0.2802	52	-1.7770	-0.2058
13	-0.9914	0.1922	33	3.5068	-0.2814	53	-2.0695	-0.2091
14	-0.6968	0.2068	34	3.2185	-0.2836	54	-2.3627	-0.2142
15	-0.4027	0.2164	35	2.9307	-0.2841	55	-2.6568	-0.2211
16	-0.1092	0.2211	36	2.6434	-0.2832	56	-2.9516	-0.2298
17	0.1832	0.2213	37	2.3564	-0.2809	57	-3.2473	-0.2403
18	0.4750	0.2173	38	2.0697	-0.2773	58	-3.5439	-0.2527
19	0.7662	0.2089	39	1.7830	-0.2724	59	-3.8414	-0.2669
20	1.0565	0.1944	40	1.4964	-0.2664	60	-4.0403	-0.2773

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
15.8750	46.927 46D 55M 38S	0.4358	5.0800	0.021	0.023

LEADING EDGE AXIAL TANGENT POINT -2.6811

Q DIMENSION 0.0672 U DIMENSION 0.0912
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0177, -0.0525
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.1418*	-0.2108	21	1.2701	0.1659	41	1.2360	-0.2581
2	-4.1222	-0.1892	22	1.5650	0.1436	42	1.0400	-0.2537
3	-3.9206	-0.1510	23	1.8591	0.1159	43	0.7460	-0.2458
4	-3.6184	-0.0971	24	2.1525	0.0829	44	0.4518	-0.2363
5	-3.3165	-0.0476	25	2.4451	0.0444	45	0.1574	-0.2269
6	-3.0148	-0.0025	26	2.7368	0.0004	46	-0.1374	-0.2179
7	-2.7133	0.0383	27	3.0275	-0.0491	47	-0.4320	-0.2097
8	-2.4121	0.0746	28	3.3172	-0.1042	48	-0.7271	-0.2028
9	-2.1112	0.1065	29	3.6058	-0.1651	49	-1.0227	-0.1973
10	-1.8106	0.1339	30	3.7017	-0.1866	50	-1.3189	-0.1933
11	-1.5103	0.1569	31	3.7209*	-0.2074	51	-1.5168	-0.1914
12	-1.3103	0.1697	32	3.6953	-0.2338	52	-1.8140	-0.1898
13	-1.0105	0.1853	33	3.5964	-0.2379	53	-2.1121	-0.1899
14	-0.7112	0.1964	34	3.3000	-0.2483	54	-2.4108	-0.1914
15	-0.4122	0.2032	35	3.0040	-0.2565	55	-2.7104	-0.1946
16	-0.1138	0.2057	36	2.7084	-0.2623	56	-3.0108	-0.1993
17	0.1837	0.2044	37	2.4134	-0.2657	57	-3.3122	-0.2057
18	0.4807	0.1997	38	2.1187	-0.2669	58	-3.6144	-0.2137
19	0.7772	0.1913	39	1.8243	-0.2659	59	-3.9176	-0.2233
20	1.0731	0.1779	40	1.5301	-0.2630	60	-4.1203	-0.2306

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
16.5100	48.902 48D 54M 8S	0.4200	5.0800	0.020	0.022

LEADING EDGE AXIAL TANGENT POINT -2.6491

Q DIMENSION 0.0639 U DIMENSION 0.0861
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0129, -0.0522
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.2277*	-0.1812	21	1.2885	0.1532	41	1.2585	-0.2541
2	-4.2085	-0.1609	22	1.5890	0.1330	42	1.0585	-0.2506
3	-4.0023	-0.1267	23	1.8888	0.1082	43	0.7586	-0.2436
4	-3.6934	-0.0787	24	2.1881	0.0786	44	0.4586	-0.2349
5	-3.3847	-0.0345	25	2.4868	0.0443	45	0.1583	-0.2258
6	-3.0764	0.0058	26	2.7847	0.0053	46	-0.1423	-0.2168
7	-2.7684	0.0422	27	3.0820	-0.0384	47	-0.4428	-0.2083
8	-2.4608	0.0746	28	3.3786	-0.0869	48	-0.7436	-0.2008
9	-2.1535	0.1030	29	3.6745	-0.1402	49	-1.0450	-0.1945
10	-1.8474	0.1277	30	3.7729	-0.1589	50	-1.3469	-0.1894
11	-1.5417	0.1483	31	3.7919*	-0.1811	51	-1.5486	-0.1867
12	-1.3380	0.1597	32	3.7681	-0.2033	52	-1.8516	-0.1837
13	-1.0330	0.1734	33	3.6670	-0.2093	53	-2.1553	-0.1820
14	-0.7283	0.1830	34	3.3643	-0.2248	54	-2.4606	-0.1812
15	-0.4240	0.1886	35	3.0622	-0.2371	55	-2.7670	-0.1814
16	-0.1203	0.1903	36	2.7607	-0.2465	56	-3.0741	-0.1830
17	0.1824	0.1887	37	2.4596	-0.2531	57	-3.3820	-0.1859
18	0.4847	0.1841	38	2.1590	-0.2570	58	-3.6907	-0.1902
19	0.7866	0.1763	39	1.8586	-0.2584	59	-4.0003	-0.1959
20	1.0879	0.1640	40	1.5585	-0.2574	60	-4.2072	-0.2006

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
17.1450	50.775 50D 46M 29S	0.4031	5.0800	0.019	0.021

LEADING EDGE AXIAL TANGENT POINT -2.6200

Q DIMENSION 0.0606 U DIMENSION 0.0809
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0127, -0.0508
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.3180*	-0.1513	21	1.3023	0.1405	41	1.2790	-0.2503
2	-4.2994	-0.1321	22	1.6092	0.1225	42	1.0743	-0.2476
3	-4.0893	-0.1015	23	1.9157	0.1004	43	0.7672	-0.2413
4	-3.7746	-0.0586	24	2.2219	0.0743	44	0.4601	-0.2329
5	-3.4604	-0.0192	25	2.5276	0.0443	45	0.1528	-0.2239
6	-3.1466	0.0166	26	2.8331	0.0103	46	-0.1547	-0.2144
7	-2.8332	0.0488	27	3.1382	-0.0276	47	-0.4620	-0.2050
8	-2.5203	0.0773	28	3.4430	-0.0693	48	-0.7696	-0.1964
9	-2.2078	0.1022	29	3.7475	-0.1148	49	-1.0777	-0.1886
10	-1.8957	0.1234	30	3.8490	-0.1308	50	-1.3862	-0.1817
11	-1.5841	0.1410	31	3.8679*	-0.1512	51	-1.5922	-0.1775
12	-1.3766	0.1506	32	3.8459	-0.1727	52	-1.9017	-0.1723
13	-1.0656	0.1621	33	3.7427	-0.1803	53	-2.2118	-0.1680
14	-0.7550	0.1700	34	3.4336	-0.2004	54	-2.5226	-0.1648
15	-0.4449	0.1742	35	3.1249	-0.2170	55	-2.8341	-0.1629
16	-0.1352	0.1750	36	2.8165	-0.2303	56	-3.1463	-0.1621
17	0.1735	0.1729	37	2.5086	-0.2403	57	-3.4594	-0.1625
18	0.4819	0.1683	38	2.2009	-0.2472	58	-3.7734	-0.1642
19	0.7899	0.1612	39	1.8934	-0.2511	59	-4.0882	-0.1673
20	1.0975	0.1502	40	1.5861	-0.2521	60	-4.2986	-0.1701

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
17.7800	52.394 52D 23M 38S	0.3840	5.0800	0.019	0.020

LEADING EDGE AXIAL TANGENT PCINT -2.5984

Q DIMENSION 0.0570 U DIMENSION 0.0776
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0063, -0.0514
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.4202*	-0.1332	21	1.3024	0.1299	41	1.2812	-0.2449
2	-4.4018	-0.1148	22	1.6144	0.1140	42	1.0730	-0.2423
3	-4.1836	-0.0881	23	1.9262	0.0942	43	0.7607	-0.2361
4	-3.8582	-0.0502	24	2.2376	0.0708	44	0.4483	-0.2280
5	-3.5386	-0.0145	25	2.5487	0.0437	45	0.1358	-0.2191
6	-3.2194	0.0178	26	2.8596	0.0130	46	-0.1770	-0.2098
7	-2.9007	0.0469	27	3.1704	-0.0212	47	-0.4895	-0.2004
8	-2.5826	0.0727	28	3.4809	-0.0587	48	-0.8024	-0.1915
9	-2.2649	0.0951	29	3.7913	-0.0997	49	-1.1158	-0.1834
10	-1.9477	0.1141	30	3.8948	-0.1140	50	-1.4296	-0.1759
11	-1.6310	0.1299	31	3.9129*	-0.1331	51	-1.6391	-0.1714
12	-1.4200	0.1385	32	3.8922	-0.1538	52	-1.9539	-0.1654
13	-1.1041	0.1487	33	3.7872	-0.1624	53	-2.2693	-0.1602
14	-0.7885	0.1557	34	3.4728	-0.1854	54	-2.5854	-0.1560
15	-0.4734	0.1594	35	3.1587	-0.2045	55	-2.9022	-0.1529
16	-0.1587	0.1600	36	2.8451	-0.2197	56	-3.2198	-0.1508
17	0.1550	0.1580	37	2.5319	-0.2314	57	-3.5383	-0.1498
18	0.4684	0.1539	38	2.2189	-0.2396	58	-3.8575	-0.1501
19	0.7815	0.1477	39	1.9061	-0.2446	59	-4.1827	-0.1506
20	1.0942	0.1383	40	1.5936	-0.2463	60	-4.4011	-0.1514

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
18.4150	53.890 53D 53M 23S	0.3639	5.0800	0.019	0.019

LEADING EDGE AXIAL TANGENT POINT -2.6130

Q DIMENSION 0.0548 U DIMENSION 0.0735
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0123, -0.0500
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.5709*	-0.1093	21	1.3027	0.1221	41	1.2853	-0.2371
2	-4.5527	-0.0904	22	1.6203	0.1087	42	1.0734	-0.2350
3	-4.3298	-0.0670	23	1.9376	0.0917	43	0.7556	-0.2291
4	-3.9965	-0.0336	24	2.2547	0.0712	44	0.4377	-0.2216
5	-3.6645	-0.0027	25	2.5717	0.0474	45	0.1197	-0.2133
6	-3.3336	0.0243	26	2.8886	0.0204	46	-0.2001	-0.2048
7	-3.0038	0.0475	27	3.2054	-0.0097	47	-0.5205	-0.1959
8	-2.6751	0.0682	28	3.5222	-0.0429	48	-0.8416	-0.1872
9	-2.3475	0.0867	29	3.8391	-0.0789	49	-1.1634	-0.1787
10	-2.0209	0.1028	30	3.9448	-0.0915	50	-1.4860	-0.1705
11	-1.6953	0.1165	31	3.9623*	-0.1093	51	-1.7017	-0.1652
12	-1.4787	0.1242	32	3.9428	-0.1292	52	-2.0259	-0.1578
13	-1.1546	0.1336	33	3.8360	-0.1389	53	-2.3512	-0.1509
14	-0.8313	0.1402	34	3.5159	-0.1653	54	-2.6775	-0.1446
15	-0.5088	0.1441	35	3.1962	-0.1871	55	-3.0051	-0.1391
16	-0.1870	0.1453	36	2.8769	-0.2049	56	-3.3338	-0.1345
17	0.1336	0.1442	37	2.5581	-0.2186	57	-3.6639	-0.1308
18	0.4537	0.1413	38	2.2395	-0.2286	58	-3.9953	-0.1283
19	0.7727	0.1364	39	1.9212	-0.2349	59	-4.3281	-0.1270
20	1.0908	0.1291	40	1.6032	-0.2377	60	-4.5508	-0.1269

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
19.0500	55.227 55D 13M 37S	0.3529	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6275

Q DIMENSION 0.0523 U DIMENSION 0.0699
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0215, -0.0513
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.7230*	-0.0905	21	1.2722	0.1142	41	1.2577	-0.2419
2	-4.7050	-0.0712	22	1.5971	0.1062	42	1.0410	-0.2421
3	-4.4775	-0.0506	23	1.9216	0.0958	43	0.7158	-0.2379
4	-4.1374	-0.0209	24	2.2457	0.0812	44	0.3901	-0.2292
5	-3.7986	0.0069	25	2.5677	0.0614	45	0.0639	-0.2184
6	-3.4609	0.0299	26	2.8912	0.0365	46	-0.2628	-0.2073
7	-3.1244	0.0477	27	3.2146	0.0064	47	-0.5899	-0.1960
8	-2.7890	0.0630	28	3.5379	-0.0265	48	-0.9175	-0.1850
9	-2.4547	0.0769	29	3.8613	-0.0611	49	-1.2460	-0.1744
10	-2.1215	0.0893	30	3.9691	-0.0731	50	-1.5753	-0.1642
11	-1.7893	0.1000	31	3.9860*	-0.0906	51	-1.7953	-0.1577
12	-1.5683	0.1061	32	3.9674	-0.1102	52	-2.1261	-0.1484
13	-1.2377	0.1138	33	3.8586	-0.1189	53	-2.4580	-0.1398
14	-0.9079	0.1196	34	3.5326	-0.1435	54	-2.7910	-0.1321
15	-0.5788	0.1235	35	3.2070	-0.1655	55	-3.1252	-0.1251
16	-0.2505	0.1253	36	2.8818	-0.1849	56	-3.4605	-0.1191
17	0.0768	0.1256	37	2.5568	-0.2016	57	-3.7972	-0.1142
18	0.4036	0.1245	38	2.2319	-0.2158	58	-4.1352	-0.1105
19	0.7298	0.1222	39	1.9072	-0.2276	59	-4.4746	-0.1082
20	1.0554	0.1182	40	1.5825	-0.2371	60	-4.7018	-0.1075

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
19.6850	56.513 56D 30M 46S	0.3400	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6358

Q DIMENSION 0.0508 U DIMENSION 0.0666
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0214, -0.0503
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.8685*	-0.0709	21	1.2402	0.1086	41	1.2255	-0.2468
2	-4.8507	-0.0514	22	1.5722	0.1061	42	1.0045	-0.2492
3	-4.6196	-0.0328	23	1.9039	0.1027	43	0.6727	-0.2461
4	-4.2741	-0.0060	24	2.2352	0.0942	44	0.3404	-0.2352
5	-3.9300	0.0190	25	2.5621	0.0785	45	0.0077	-0.2211
6	-3.5871	0.0384	26	2.8926	0.0553	46	-0.3255	-0.2072
7	-3.2453	0.0511	27	3.2226	0.0248	47	-0.6593	-0.1935
8	-2.9046	0.0606	28	3.5527	-0.0085	48	-0.9937	-0.1802
9	-2.5637	0.0699	29	3.8831	-0.0422	49	-1.3288	-0.1675
10	-2.2238	0.0785	30	3.9933	-0.0535	50	-1.6648	-0.1553
11	-1.8850	0.0863	31	4.0096*	-0.0710	51	-1.8893	-0.1475
12	-1.6596	0.0909	32	3.9913	-0.0905	52	-2.2269	-0.1364
13	-1.3223	0.0969	33	3.8803	-0.0980	53	-2.5655	-0.1262
14	-0.9858	0.1018	34	3.5474	-0.1204	54	-2.9052	-0.1169
15	-0.6501	0.1055	35	3.2149	-0.1420	55	-3.2450	-0.1084
16	-0.3151	0.1082	36	2.8829	-0.1628	56	-3.5859	-0.1013
17	0.0192	0.1098	37	2.5511	-0.1826	57	-3.9280	-0.0954
18	0.3529	0.1105	38	2.2196	-0.2014	58	-4.2715	-0.0911
19	0.6869	0.1106	39	1.8882	-0.2194	59	-4.6163	-0.0885
20	1.0187	0.1098	40	1.5569	-0.2364	60	-4.8471	-0.0878

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE C8C 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
20.3200	57.615 57D 36M 52S	0.3256	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6389

Q DIMENSION 0.0496 U DIMENSION 0.0649
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0331, -0.0482
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.0087*	-0.0625	21	1.2176	0.1043	41	1.2025	-0.2475
2	-4.9907	-0.0431	22	1.5569	0.1043	42	0.9769	-0.2507
3	-4.7548	-0.0256	23	1.8961	0.1039	43	0.6384	-0.2473
4	-4.4022	-0.0005	24	2.2351	0.0988	44	0.2996	-0.2344
5	-4.0509	0.0227	25	2.5698	0.0865	45	-0.0395	-0.2185
6	-3.7009	0.0409	26	2.9080	0.0654	46	-0.3791	-0.2030
7	-3.3521	0.0531	27	3.2458	0.0359	47	-0.7193	-0.1880
8	-3.0045	0.0624	28	3.5838	0.0022	48	-1.0599	-0.1736
9	-2.6579	0.0705	29	3.9223	-0.0333	49	-1.4013	-0.1598
10	-2.3123	0.0774	30	4.0353	-0.0452	50	-1.7434	-0.1468
11	-1.9677	0.0833	31	4.0512*	-0.0626	51	-1.9720	-0.1385
12	-1.7385	0.0867	32	4.0330	-0.0818	52	-2.3155	-0.1269
13	-1.3953	0.0911	33	3.9190	-0.0884	53	-2.6601	-0.1162
14	-1.0528	0.0947	34	3.5776	-0.1084	54	-3.0057	-0.1066
15	-0.7109	0.0976	35	3.2370	-0.1288	55	-3.3524	-0.0981
16	-0.3696	0.0998	36	2.8970	-0.1495	56	-3.7003	-0.0911
17	-0.0288	0.1015	37	2.5575	-0.1705	57	-4.0495	-0.0855
18	0.3116	0.1027	38	2.2184	-0.1917	58	-4.4000	-0.0817
19	0.6516	0.1036	39	1.8796	-0.2133	59	-4.7520	-0.0798
20	0.9913	0.1041	40	1.5410	-0.2345	60	-4.9875	-0.0796

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
20.9550	58.589 58D 35M 20S	0.3108	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6419

Q DIMENSION 0.0471 U DIMENSION 0.0654
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0355, -0.0474
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.1502*	-0.0602	21	1.2043	0.0992	41	1.1906	-0.2462
2	-5.1321	-0.0409	22	1.5509	0.0983	42	0.9601	-0.2481
3	-4.8913	-0.0240	23	1.8975	0.0970	43	0.6142	-0.2425
4	-4.5315	-0.0000	24	2.2440	0.0932	44	0.2681	-0.2279
5	-4.1731	0.0219	25	2.5884	0.0842	45	-0.0783	-0.2116
6	-3.8160	0.0393	26	2.9343	0.0664	46	-0.4252	-0.1957
7	-3.4601	0.0516	27	3.2800	0.0401	47	-0.7725	-0.1805
8	-3.1054	0.0613	28	3.6258	0.0071	48	-1.1203	-0.1659
9	-2.7517	0.0695	29	3.9719	-0.0302	49	-1.4689	-0.1520
10	-2.3991	0.0765	30	4.0874	-0.0428	50	-1.8181	-0.1389
11	-2.0475	0.0824	31	4.1033*	-0.0602	51	-2.0514	-0.1307
12	-1.8135	0.0857	32	4.0850	-0.0794	52	-2.4021	-0.1192
13	-1.4633	0.0899	33	3.9684	-0.0861	53	-2.7538	-0.1087
14	-1.1137	0.0933	34	3.6190	-0.1066	54	-3.1065	-0.0994
15	-0.7648	0.0958	35	3.2705	-0.1274	55	-3.4604	-0.0914
16	-0.4164	0.0976	36	2.9228	-0.1485	56	-3.8155	-0.0850
17	-0.0684	0.0988	37	2.5756	-0.1699	57	-4.1719	-0.0803
18	0.2791	0.0995	38	2.2290	-0.1917	58	-4.5296	-0.0775
19	0.6263	0.0997	39	1.8826	-0.2140	59	-4.8888	-0.0768
20	0.9732	0.0996	40	1.5365	-0.2348	60	-5.1292	-0.0774

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE C3C 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
21.5900	59.414 59D 24M 52S	0.2970	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6487

Q DIMENSION 0.0473 U DIMENSION 0.0662
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0341, -0.0449
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.2796*	-0.0545	21	1.1910	0.0976	41	1.1798	-0.2415
2	-5.2615	-0.0355	22	1.5450	0.0966	42	0.9443	-0.2426
3	-5.0173	-0.0201	23	1.8990	0.0949	43	0.5909	-0.2355
4	-4.6521	0.0017	24	2.2535	0.0927	44	0.2374	-0.2197
5	-4.2881	0.0214	25	2.6081	0.0868	45	-0.1164	-0.2037
6	-3.9253	0.0373	26	2.9624	0.0721	46	-0.4706	-0.1882
7	-3.5636	0.0490	27	3.3165	0.0486	47	-0.8252	-0.1733
8	-3.2029	0.0584	28	3.6706	0.0160	48	-1.1802	-0.1592
9	-2.8432	0.0665	29	4.0249	-0.0235	49	-1.5355	-0.1456
10	-2.4843	0.0725	30	4.1432	-0.0371	50	-1.8916	-0.1329
11	-2.1263	0.0795	31	4.1591*	-0.0546	51	-2.1293	-0.1249
12	-1.8880	0.0829	32	4.1407	-0.0736	52	-2.4865	-0.1136
13	-1.5312	0.0873	33	4.0211	-0.0801	53	-2.8446	-0.1034
14	-1.1750	0.0909	34	3.6633	-0.0999	54	-3.2036	-0.0942
15	-0.8192	0.0938	35	3.3064	-0.1205	55	-3.5636	-0.0864
16	-0.4636	0.0959	36	2.9505	-0.1418	56	-3.9247	-0.0801
17	-0.1084	0.0973	37	2.5953	-0.1638	57	-4.2869	-0.0753
18	0.2463	0.0980	38	2.2407	-0.1864	58	-4.6502	-0.0725
19	0.6008	0.0983	39	1.8868	-0.2100	59	-5.0149	-0.0716
20	0.9550	0.0981	40	1.5331	-0.2310	60	-5.2588	-0.0720

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
22.2250	60.102 60D 6M 8S	0.2808	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6564

Q DIMENSION 0.0460 U DIMENSION 0.0660
P DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0383, -0.0431
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.4064*	-0.0552	21	1.1895	0.0936	41	1.1782	-0.2359
2	-5.3883	-0.0361	22	1.5510	0.0913	42	0.9377	-0.2351
3	-5.1395	-0.0208	23	1.9126	0.0883	43	0.5770	-0.2251
4	-4.7673	0.0007	24	2.2745	0.0846	44	0.2164	-0.2090
5	-4.3965	0.0201	25	2.6366	0.0784	45	-0.1445	-0.1930
6	-4.0268	0.0359	26	2.9988	0.0669	46	-0.5056	-0.1776
7	-3.6582	0.0480	27	3.3609	0.0472	47	-0.8671	-0.1629
8	-3.2906	0.0579	28	3.7229	0.0169	48	-1.2289	-0.1490
9	-2.9240	0.0663	29	4.0850	-0.0229	49	-1.5913	-0.1358
10	-2.5583	0.0735	30	4.2057	-0.0377	50	-1.9542	-0.1236
11	-2.1934	0.0796	31	4.2215*	-0.0553	51	-2.1966	-0.1160
12	-1.9505	0.0830	32	4.2030	-0.0742	52	-2.5607	-0.1054
13	-1.5867	0.0874	33	4.0808	-0.0804	53	-2.9257	-0.0959
14	-1.2235	0.0908	34	3.7151	-0.0996	54	-3.2916	-0.0876
15	-0.8608	0.0934	35	3.3505	-0.1198	55	-3.6585	-0.0808
16	-0.4985	0.0951	36	2.9869	-0.1409	56	-4.0264	-0.0756
17	-0.1364	0.0960	37	2.6241	-0.1629	57	-4.3954	-0.0721
18	0.2254	0.0963	38	2.2620	-0.1858	58	-4.7657	-0.0706
19	0.5870	0.0959	39	1.9003	-0.2094	59	-5.1372	-0.0712
20	0.9485	0.0948	40	1.5390	-0.2280	60	-5.3857	-0.0727

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TC LEADING EDGE	RADII L.E.	RADII T.E.
22.8600	60.764 60D 45M 49S	0.2649	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6641

Q DIMENSION 0.0451 U DIMENSION 0.0667
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0401, -0.0409
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.5339*	-0.0553	21	1.1884	0.0900	41	1.1775	-0.2298
2	-5.5158	-0.0363	22	1.5572	0.0865	42	0.9321	-0.2271
3	-5.2624	-0.0211	23	1.9263	0.0822	43	0.5642	-0.2141
4	-4.8833	0.0002	24	2.2956	0.0770	44	0.1963	-0.1976
5	-4.5055	0.0193	25	2.6653	0.0706	45	-0.1718	-0.1816
6	-4.1289	0.0351	26	3.0355	0.0622	46	-0.5400	-0.1663
7	-3.7534	0.0476	27	3.4057	0.0464	47	-0.9086	-0.1518
8	-3.3789	0.0579	28	3.7758	0.0184	48	-1.2775	-0.1382
9	-3.0053	0.0667	29	4.1456	-0.0219	49	-1.6469	-0.1255
10	-2.6327	0.0741	30	4.2689	-0.0377	50	-2.0169	-0.1138
11	-2.2608	0.0803	31	4.2845*	-0.0554	51	-2.2639	-0.1066
12	-2.0133	0.0837	32	4.2659	-0.0742	52	-2.6350	-0.0966
13	-1.6425	0.0880	33	4.1411	-0.0802	53	-3.0070	-0.0879
14	-1.2723	0.0913	34	3.7675	-0.0988	54	-3.3798	-0.0806
15	-0.9025	0.0936	35	3.3951	-0.1187	55	-3.7536	-0.0747
16	-0.5331	0.0949	36	3.0238	-0.1395	56	-4.1285	-0.0706
17	-0.1640	0.0954	37	2.6533	-0.1615	57	-4.5045	-0.0683
18	0.2050	0.0950	38	2.2836	-0.1846	58	-4.8817	-0.0682
19	0.5738	0.0938	39	1.9144	-0.2085	59	-5.2602	-0.0703
20	0.9425	0.0919	40	1.5457	-0.2246	60	-5.5133	-0.0729

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
23.4950	61.241 61D 14M 27S	0.2497	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6683

Q DIMENSION 0.0445 U DIMENSION 0.0660
P DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0385, -0.0386
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.6310*	-0.0578	21	1.1986	0.0888	41	1.1896	-0.2193
2	-5.6133	-0.0390	22	1.5759	0.0845	42	0.9387	-0.2148
3	-5.3574	-0.0240	23	1.9536	0.0789	43	0.5627	-0.2002
4	-4.9745	-0.0031	24	2.3319	0.0721	44	0.1870	-0.1842
5	-4.5925	0.0156	25	2.7109	0.0641	45	-0.1886	-0.1690
6	-4.2115	0.0313	26	3.0909	0.0549	46	-0.5641	-0.1547
7	-3.8312	0.0439	27	3.4713	0.0391	47	-0.9397	-0.1412
8	-3.4518	0.0544	28	3.8520	0.0140	48	-1.3154	-0.1287
9	-3.0729	0.0635	29	4.2328	-0.0229	49	-1.6914	-0.1171
10	-2.6947	0.0714	30	4.3594	-0.0401	50	-2.0677	-0.1066
11	-2.3171	0.0780	31	4.3749*	-0.0579	51	-2.3187	-0.1002
12	-2.0655	0.0818	32	4.3561	-0.0765	52	-2.6957	-0.0915
13	-1.6885	0.0865	33	4.2277	-0.0816	53	-3.0733	-0.0840
14	-1.3118	0.0902	34	3.8435	-0.0979	54	-3.4515	-0.0778
15	-0.9354	0.0929	35	3.4608	-0.1162	55	-3.8305	-0.0731
16	-0.5590	0.0945	36	3.0796	-0.1361	56	-4.2102	-0.0700
17	-0.1826	0.0951	37	2.6995	-0.1576	57	-4.5907	-0.0688
18	0.1938	0.0947	38	2.3205	-0.1810	58	-4.9723	-0.0695
19	0.5704	0.0934	39	1.9424	-0.2036	59	-5.3548	-0.0724
20	0.9472	0.0910	40	1.5662	-0.2169	60	-5.6105	-0.0754

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
24.1300	61.687 61D 41M 13S	0.2330	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6723

Q DIMENSION 0.0432 U DIMENSION 0.0656
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0422, -0.0357
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.7271*	-0.0612	21	1.2269	0.0856	41	1.2203	-0.2075
2	-5.7094	-0.0423	22	1.6116	0.0798	42	0.9644	-0.2000
3	-5.4491	-0.0267	23	1.9968	0.0725	43	0.5810	-0.1845
4	-5.0595	-0.0050	24	2.3827	0.0637	44	0.1979	-0.1688
5	-4.6708	0.0146	25	2.7693	0.0534	45	-0.1850	-0.1540
6	-4.2831	0.0311	26	3.1568	0.0416	46	-0.5678	-0.1402
7	-3.8961	0.0445	27	3.5452	0.0259	47	-0.9505	-0.1275
8	-3.5098	0.0555	28	3.9346	0.0057	48	-1.3334	-0.1158
9	-3.1242	0.0650	29	4.3241	-0.0252	49	-1.7164	-0.1052
10	-2.7392	0.0732	30	4.4533	-0.0433	50	-2.0997	-0.0957
11	-2.3547	0.0800	31	4.4687*	-0.0613	51	-2.3554	-0.0901
12	-2.0986	0.0838	32	4.4497	-0.0797	52	-2.7394	-0.0826
13	-1.7147	0.0885	33	4.3186	-0.0844	53	-3.1239	-0.0764
14	-1.3311	0.0921	34	3.9262	-0.0994	54	-3.5090	-0.0716
15	-0.9476	0.0944	35	3.5355	-0.1167	55	-3.8947	-0.0684
16	-0.5642	0.0956	36	3.1462	-0.1361	56	-4.2813	-0.0669
17	-0.1808	0.0957	37	2.7583	-0.1574	57	-4.6687	-0.0673
18	0.2028	0.0945	38	2.3714	-0.1812	58	-5.0570	-0.0698
19	0.5866	0.0922	39	1.9855	-0.2004	59	-5.4463	-0.0744
20	0.9707	0.0887	40	1.6046	-0.2095	60	-5.7065	-0.0787

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
24.7650	62.117 62D 7M 2S	0.2170	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6763

Q DIMENSION 0.0433 U DIMENSION 0.0650
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0477, -0.0329
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.8235*	-0.0647	21	1.2553	0.0823	41	1.2513	-0.1958
2	-5.8059	-0.0458	22	1.6474	0.0750	42	0.9904	-0.1853
3	-5.5411	-0.0296	23	2.0401	0.0659	43	0.5996	-0.1689
4	-5.1448	-0.0070	24	2.4334	0.0551	44	0.2091	-0.1534
5	-4.7494	0.0134	25	2.8276	0.0425	45	-0.1811	-0.1391
6	-4.3549	0.0308	26	3.2227	0.0282	46	-0.5712	-0.1259
7	-3.9612	0.0449	27	3.6192	0.0125	47	-0.9611	-0.1139
8	-3.5681	0.0565	28	4.0173	-0.0027	48	-1.3511	-0.1030
9	-3.1757	0.0665	29	4.4158	-0.0278	49	-1.7413	-0.0934
10	-2.7839	0.0749	30	4.5475	-0.0468	50	-2.1316	-0.0849
11	-2.3925	0.0818	31	4.5627*	-0.0648	51	-2.3921	-0.0800
12	-2.1318	0.0858	32	4.5436	-0.0831	52	-2.7830	-0.0738
13	-1.7410	0.0905	33	4.4097	-0.0873	53	-3.1745	-0.0689
14	-1.3504	0.0939	34	4.0092	-0.1010	54	-3.5665	-0.0656
15	-0.9599	0.0960	35	3.6104	-0.1174	55	-3.9592	-0.0638
16	-0.5695	0.0967	36	3.2131	-0.1362	56	-4.3526	-0.0640
17	-0.1789	0.0962	37	2.8172	-0.1573	57	-4.7468	-0.0660
18	0.2118	0.0943	38	2.4225	-0.1815	58	-5.1420	-0.0702
19	0.6028	0.0910	39	2.0289	-0.1973	59	-5.5381	-0.0767
20	0.9941	0.0863	40	1.6432	-0.2021	60	-5.8028	-0.0821

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
25.0825	62.326 62D 19M 34S	0.2092	5.0800	0.019	0.018

LEADING EDGE AXIAL TANGENT POINT -2.6783

Q DIMENSION 0.0432 U DIMENSION 0.0648
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0513, -0.0316
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.8719*	-0.0665	21	1.2694	0.0806	41	1.2669	-0.1900
2	-5.8543	-0.0476	22	1.6653	0.0726	42	1.0036	-0.1781
3	-5.5872	-0.0311	23	2.0617	0.0626	43	0.6090	-0.1611
4	-5.1875	-0.0081	24	2.4588	0.0508	44	0.2148	-0.1458
5	-4.7888	0.0128	25	2.8567	0.0371	45	-0.1791	-0.1317
6	-4.3909	0.0306	26	3.2557	0.0214	46	-0.5728	-0.1188
7	-3.9938	0.0451	27	3.6562	0.0058	47	-0.9664	-0.1071
8	-3.5974	0.0569	28	4.0587	-0.0070	48	-1.3600	-0.0967
9	-3.2016	0.0671	29	4.4617	-0.0291	49	-1.7537	-0.0875
10	-2.8063	0.0757	30	4.5946	-0.0486	50	-2.1476	-0.0796
11	-2.4115	0.0828	31	4.6098*	-0.0666	51	-2.4104	-0.0751
12	-2.1484	0.0867	32	4.5907	-0.0849	52	-2.8048	-0.0694
13	-1.7542	0.0914	33	4.4554	-0.0888	53	-3.1998	-0.0652
14	-1.3601	0.0947	34	4.0508	-0.1019	54	-3.5953	-0.0626
15	-0.9661	0.0967	35	3.6480	-0.1177	55	-3.9914	-0.0616
16	-0.5721	0.0972	36	3.2467	-0.1363	56	-4.3883	-0.0626
17	-0.1780	0.0964	37	2.8468	-0.1573	57	-4.7860	-0.0655
18	0.2162	0.0941	38	2.4481	-0.1816	58	-5.1846	-0.0705
19	0.6108	0.0903	39	2.0507	-0.1958	59	-5.5842	-0.0778
20	1.0058	0.0850	40	1.6626	-0.1985	60	-5.8512	-0.0839

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
25.4000	62.532 62D 31M 54S	0.2016	5.0800	0.019	0.019

LEADING EDGE AXIAL TANGENT POINT -2.6803

Q DIMENSION 0.0429 U DIMENSION 0.0646
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0555, -0.0303
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-5.9203*	-0.0684	21	1.2836	0.0789	41	1.2826	-0.1842
2	-5.9027	-0.0495	22	1.6831	0.0701	42	1.0168	-0.1708
3	-5.6334	-0.0327	23	2.0833	0.0593	43	0.6185	-0.1534
4	-5.2304	-0.0092	24	2.4841	0.0465	44	0.2205	-0.1382
5	-4.8283	0.0121	25	2.8859	0.0316	45	-0.1770	-0.1243
6	-4.4270	0.0303	26	3.2886	0.0146	46	-0.5744	-0.1117
7	-4.0265	0.0453	27	3.6931	-0.0010	47	-0.9716	-0.1004
8	-3.6266	0.0574	28	4.1001	-0.0112	48	-1.3688	-0.0904
9	-3.2274	0.0678	29	4.5076	-0.0304	49	-1.7661	-0.0817
10	-2.8287	0.0765	30	4.6418	-0.0504	50	-2.1635	-0.0743
11	-2.4304	0.0837	31	4.6570*	-0.0685	51	-2.4287	-0.0702
12	-2.1651	0.0877	32	4.6377	-0.0867	52	-2.8266	-0.0651
13	-1.7674	0.0923	33	4.5011	-0.0904	53	-3.2251	-0.0616
14	-1.3698	0.0956	34	4.0925	-0.1028	54	-3.6241	-0.0596
15	-0.9723	0.0974	35	3.6856	-0.1182	55	-4.0237	-0.0594
16	-0.5748	0.0977	36	3.2803	-0.1364	56	-4.4241	-0.0612
17	-0.1772	0.0966	37	2.8764	-0.1573	57	-4.8252	-0.0649
18	0.2207	0.0939	38	2.4737	-0.1818	58	-5.2272	-0.0708
19	0.6189	0.0897	39	2.0725	-0.1944	59	-5.6303	-0.0790
20	1.0176	0.0838	40	1.6821	-0.1949	60	-5.8996	-0.0857

* INDICATES EXTREME POINTS

Table 8. (Continued)

FAN COMPRESSOR BLADE CBC 11863(METRIC).

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
26.0350	62.931 62D 55M 53S	0.1869	5.0800	0.019	0.019

LEADING EDGE AXIAL TANGENT POINT -2.6843

Q DIMENSION 0.0424 U DIMENSION 0.0644
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0657, -0.0277
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-6.0174*	-0.0722	21	1.3120	0.0755	41	1.3142	-0.1728
2	-5.9999	-0.0533	22	1.7189	0.0652	42	1.0435	-0.1564
3	-5.7261	-0.0358	23	2.1265	0.0526	43	0.6377	-0.1381
4	-5.3163	-0.0115	24	2.5349	0.0278	44	0.2323	-0.1231
5	-4.9074	0.0107	25	2.9441	0.0206	45	-0.1727	-0.1096
6	-4.4993	0.0298	26	3.3545	0.0011	46	-0.5774	-0.0976
7	-4.0920	0.0455	27	3.7671	-0.0145	47	-0.9819	-0.0870
8	-3.6853	0.0581	28	4.1830	-0.0199	48	-1.3863	-0.0778
9	-3.2792	0.0690	29	4.5996	-0.0333	49	-1.7907	-0.0700
10	-2.8737	0.0780	30	4.7364	-0.0541	50	-2.1953	-0.0637
11	-2.4685	0.0854	31	4.7514*	-0.0723	51	-2.4652	-0.0604
12	-2.1985	0.0895	32	4.7321	-0.0904	52	-2.8703	-0.0565
13	-1.7939	0.0941	33	4.5927	-0.0937	53	-3.2758	-0.0543
14	-1.3892	0.0972	34	4.1759	-0.1047	54	-3.6818	-0.0538
15	-0.9847	0.0988	35	3.7609	-0.1191	55	-4.0884	-0.0551
16	-0.5801	0.0987	36	3.3476	-0.1368	56	-4.4957	-0.0585
17	-0.1754	0.0969	37	2.9357	-0.1574	57	-4.9038	-0.0639
18	0.2296	0.0935	38	2.5252	-0.1823	58	-5.3128	-0.0715
19	0.6351	0.0883	39	2.1163	-0.1915	59	-5.7227	-0.0815
20	1.0410	0.0812	40	1.7212	-0.1879	60	-5.9966	-0.0895

* INDICATES EXTREME POINTS

Table 9. Airfoil Manufacturing Coordinates - Rotor

(English Units)[1]

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
3.7500	6.823 6D 49M 22S	0.2130	2.0000	0.011	0.012

LEADING EDGE AXIAL TANGENT POINT -1.2369

Q DIMENSION 0.0359 U DIMENSION 0.0471
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0586, -0.0556
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.2916*	-0.3845	21	0.4222	0.1229	41	0.4044	-0.1172
2	-1.2861	-0.3742	22	0.5232	0.0974	42	0.3409	-0.1075
3	-1.2313	-0.3308	23	0.6238	0.0639	43	0.2458	-0.0956
4	-1.1475	-0.2685	24	0.7236	0.0219	44	0.1509	-0.0868
5	-1.0617	-0.2100	25	0.8225	-0.0291	45	0.0560	-0.0816
6	-0.9740	-0.1552	26	0.9203	-0.0895	46	-0.0387	-0.0800
7	-0.8845	-0.1042	27	1.0174	-0.1603	47	-0.1329	-0.0820
8	-0.7933	-0.0574	28	1.1131	-0.2420	48	-0.2267	-0.0880
9	-0.7005	-0.0147	29	1.2066	-0.3352	49	-0.3205	-0.0977
10	-0.6062	0.0237	30	1.2371	-0.3689	50	-0.4140	-0.1112
11	-0.5106	0.0575	31	1.2452*	-0.3851	51	-0.4763	-0.1221
12	-0.4460	0.0775	32	1.2283	-0.3950	52	-0.5696	-0.1413
13	-0.3483	0.1036	33	1.1936	-0.3763	53	-0.6627	-0.1639
14	-0.2494	0.1246	34	1.0902	-0.3252	54	-0.7556	-0.1897
15	-0.1496	0.1403	35	0.9882	-0.2805	55	-0.8483	-0.2187
16	-0.0491	0.1505	36	0.8880	-0.2418	56	-0.9407	-0.2507
17	0.0514	0.1553	37	0.7897	-0.2085	57	-1.0329	-0.2858
18	0.1523	0.1548	38	0.6923	-0.1797	58	-1.1248	-0.3237
19	0.2534	0.1486	39	0.5958	-0.1551	59	-1.2163	-0.3646
20	0.3547	0.1356	40	0.4999	-0.1344	60	-1.2772	-0.3934

* INDICATES EXTREME POINTS

1. Dimensions in inches, angles in degrees
   All listed values pertain to the manufacturing sections.

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
4.0000	12.113 12D 6M 47S	0.2074	2.0000	0.011	0.012

LEADING EDGE AXIAL TANGENT POINT -1.2174

Q DIMENSION 0.0350 U DIMENSION 0.0475
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0390, -0.0523
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.3212*	-0.3565	21	0.4251	0.1147	41	0.4016	-0.1143
2	-1.3151	-0.3453	22	0.5243	0.0907	42	0.3387	-0.1055
3	-1.2570	-0.3044	23	0.6225	0.0593	43	0.2444	-0.0945
4	-1.1684	-0.2459	24	0.7196	0.0202	44	0.1499	-0.0862
5	-1.0782	-0.1910	25	0.8153	-0.0271	45	0.0552	-0.0812
6	-0.9865	-0.1397	26	0.9093	-0.0831	46	-0.0398	-0.0796
7	-0.8935	-0.0922	27	1.0019	-0.1485	47	-0.1344	-0.0813
8	-0.7991	-0.0486	28	1.0925	-0.2239	48	-0.2291	-0.0866
9	-0.7034	+0.0090	29	1.1802	-0.3096	49	-0.3239	-0.0953
10	-0.6067	0.0265	30	1.2087	-0.3405	50	-0.4189	-0.1075
11	-0.5090	0.0577	31	1.2158*	-0.3540	51	-0.4822	-0.1173
12	-0.4433	0.0761	32	1.1999	-0.3653	52	-0.5774	-0.1348
13	-0.3441	0.0999	33	1.1670	-0.3486	53	-0.6726	-0.1553
14	-0.2442	0.1190	34	1.0688	-0.3026	54	-0.7678	-0.1788
15	-0.1437	0.1332	35	0.9713	-0.2624	55	-0.8631	-0.2052
16	-0.0429	0.1422	36	0.8749	-0.2274	56	-0.9584	-0.2344
17	0.0575	0.1463	37	0.7795	-0.1973	57	-1.0536	-0.2663
18	0.1580	0.1454	38	0.6847	-0.1713	58	-1.1489	-0.3010
19	0.2585	0.1392	39	0.5902	-0.1490	59	-1.2440	-0.3383
20	0.3586	0.1268	40	0.4958	-0.1301	60	-1.3074	-0.3646

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
4.2500	17.357 17D 21M 25S	0.2034	2.0000	0.011	0.012

LEADING EDGE AXIAL TANGENT POINT -1.1979

Q DIMENSION 0.0341 U DIMENSION 0.0478
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0220, -0.0488
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.3561*	-0.3252	21	0.4301	0.1071	41	0.4027	-0.1120
2	-1.3495	-0.3144	22	0.5285	0.0847	42	0.3399	-0.1039
3	-1.2880	-0.2763	23	0.6258	0.0556	43	0.2452	-0.0938
4	-1.1947	-0.2219	24	0.7215	0.0195	44	0.1503	-0.0861
5	-1.1001	-0.1709	25	0.8154	-0.0241	45	0.0548	-0.0814
6	-1.0044	-0.1234	26	0.9074	-0.0755	46	-0.0410	-0.0797
7	-0.9076	-0.0795	27	0.9973	-0.1354	47	-0.1369	-0.0809
8	-0.8099	-0.0393	28	1.0847	-0.2042	48	-0.2331	-0.0855
9	-0.7112	-0.0029	29	1.1689	-0.2822	49	-0.3296	-0.0931
10	-0.6118	0.0296	30	1.1962	-0.3104	50	-0.4265	-0.1038
11	-0.5117	0.0581	31	1.2027*	-0.3229	51	-0.4913	-0.1126
12	-0.4446	0.0748	32	1.1875	-0.3341	52	-0.5887	-0.1281
13	-0.3436	0.0964	33	1.1558	-0.3194	53	-0.6864	-0.1464
14	-0.2422	0.1136	34	1.0610	-0.2791	54	-0.7843	-0.1673
15	-0.1405	0.1262	35	0.9662	-0.2437	55	-0.8825	-0.1909
16	-0.0388	0.1341	36	0.8719	-0.2128	56	-0.9809	-0.2171
17	0.0624	0.1375	37	0.7781	-0.1862	57	-1.0794	-0.2457
18	0.1633	0.1363	38	0.6844	-0.1630	58	-1.1781	-0.2768
19	0.2639	0.1303	39	0.5907	-0.1431	59	-1.2769	-0.3103
20	0.3639	0.1184	40	0.4968	-0.1262	60	-1.3429	-0.3338

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
4.5000	22.415 22D 24M 54S	0.2002	2.0000	0.011	0.011

LEADING EDGE AXIAL TANGENT POINT -1.1780

Q DIMENSION 0.0335 U DIMENSION 0.0479
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0086, -0.0451
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.3940*	-0.2918	21	0.4369	0.1007	41	0.4079	-0.1098
2	-1.3870	-0.2816	22	0.5359	0.0801	42	0.3443	-0.1026
3	-1.3226	-0.2470	23	0.6334	0.0534	43	0.2485	-0.0936
4	-1.2252	-0.1977	24	0.7291	0.0204	44	0.1521	-0.0865
5	-1.1268	-0.1515	25	0.8230	-0.0193	45	0.0551	-0.0821
6	-1.0271	-0.1078	26	0.9146	-0.0660	46	-0.0424	-0.0803
7	-0.9267	-0.0674	27	1.0038	-0.1202	47	-0.1402	-0.0812
8	-0.8255	-0.0306	28	1.0902	-0.1823	48	-0.2385	-0.0850
9	-0.7237	0.0026	29	1.1732	-0.2527	49	-0.3373	-0.0916
10	-0.6214	0.0323	30	1.2000	-0.2780	50	-0.4367	-0.1008
11	-0.5187	0.0582	31	1.2061*	-0.2896	51	-0.5031	-0.1085
12	-0.4500	0.0733	32	1.1916	-0.3009	52	-0.6032	-0.1220
13	-0.3468	0.0928	33	1.1605	-0.2885	53	-0.7038	-0.1380
14	-0.2434	0.1082	34	1.0670	-0.2542	54	-0.8047	-0.1565
15	-0.1400	0.1195	35	0.9732	-0.2240	55	-0.9059	-0.1772
16	-0.0368	0.1265	36	0.8795	-0.1975	56	-1.0075	-0.2003
17	0.0658	0.1293	37	0.7858	-0.1746	57	-1.1095	-0.2256
18	0.1679	0.1280	38	0.6918	-0.1545	58	-1.2113	-0.2523
19	0.2695	0.1222	39	0.5976	-0.1372	59	-1.3133	-0.2809
20	0.3703	0.1112	40	0.5030	-0.1224	60	-1.3814	-0.3010

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
4.7500	27.184 27D 11M 3S	0.1976	2.0000	0.010	0.011

LEADING EDGE AXIAL TANGENT POINT -1.1577

Q DIMENSION 0.0325 U DIMENSION 0.0480
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0010, -0.0407
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.4323*	-0.2578	21	0.4455	0.0959	41	0.4171	-0.1076
2	-1.4250	-0.2470	22	0.5461	0.0772	42	0.3521	-0.1014
3	-1.3577	-0.2158	23	0.6451	0.0531	43	0.2541	-0.0935
4	-1.2561	-0.1706	24	0.7424	0.0233	44	0.1555	-0.0872
5	-1.1537	-0.1285	25	0.8377	-0.0124	45	0.0561	-0.0831
6	-1.0508	-0.0894	26	0.9307	-0.0543	46	-0.0439	-0.0814
7	-0.9473	-0.0534	27	1.0211	-0.1029	47	-0.1443	-0.0821
8	-0.8433	-0.0206	28	1.1086	-0.1584	48	-0.2453	-0.0853
9	-0.7389	0.0089	29	1.1927	-0.2211	49	-0.3469	-0.0909
10	-0.6342	0.0353	30	1.2198	-0.2437	50	-0.4490	-0.0987
11	-0.5291	0.0582	31	1.2258*	-0.2544	51	-0.5173	-0.1050
12	-0.4590	0.0717	32	1.2119	-0.2660	52	-0.6201	-0.1161
13	-0.3536	0.0890	33	1.1806	-0.2559	53	-0.7233	-0.1292
14	-0.2479	0.1029	34	1.0866	-0.2279	54	-0.8268	-0.1444
15	-0.1423	0.1131	35	0.9920	-0.2032	55	-0.9308	-0.1615
16	-0.0370	0.1194	36	0.8972	-0.1814	56	-1.0351	-0.1807
17	0.0676	0.1219	37	0.8021	-0.1623	57	-1.1398	-0.2017
18	0.1717	0.1207	38	0.7066	-0.1456	58	-1.2448	-0.2245
19	0.2752	0.1155	39	0.6106	-0.1310	59	-1.3502	-0.2492
20	0.3777	0.1054	40	0.5141	-0.1184	60	-1.4205	-0.2662

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
5.0000	31.496 31D 29M 43S	0.1954	2.0000	0.010	0.011

LEADING EDGE AXIAL TANGENT POINT -1.1390

Q DIMENSION 0.0317 U DIMENSION 0.0475
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0007, -0.0352
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.4681*	-0.2186	21	0.4554	0.0934	41	0.4301	-0.1045
2	-1.4604	-0.2085	22	0.5589	0.0774	42	0.3630	-0.0996
3	-1.3907	-0.1808	23	0.6608	0.0562	43	0.2616	-0.0932
4	-1.2857	-0.1415	24	0.7609	0.0298	44	0.1599	-0.0879
5	-1.1803	-0.1048	25	0.8592	-0.0017	45	0.0575	-0.0844
6	-1.0744	-0.0707	26	0.9552	-0.0388	46	-0.0454	-0.0827
7	-0.9683	-0.0394	27	1.0487	-0.0816	47	-0.1487	-0.0829
8	-0.8618	-0.0107	28	1.1393	-0.1304	48	-0.2524	-0.0852
9	-0.7550	0.0151	29	1.2267	-0.1856	49	-0.3567	-0.0894
10	-0.6480	0.0382	30	1.2551	-0.2054	50	-0.4615	-0.0956
11	-0.5405	0.0586	31	1.2611*	-0.2169	51	-0.5317	-0.1007
12	-0.4686	0.0707	32	1.2478	-0.2275	52	-0.6373	-0.1100
13	-0.3608	0.0861	33	1.2157	-0.2199	53	-0.7431	-0.1204
14	-0.2531	0.0983	34	1.1192	-0.1986	54	-0.8491	-0.1323
15	-0.1455	0.1073	35	1.0222	-0.1796	55	-0.9555	-0.1456
16	-0.0382	0.1128	36	0.9248	-0.1628	56	-1.0623	-0.1605
17	0.0686	0.1151	37	0.8269	-0.1479	57	-1.1694	-0.1768
18	0.1749	0.1142	38	0.7285	-0.1348	58	-1.2769	-0.1946
19	0.2807	0.1100	39	0.6296	-0.1232	59	-1.3847	-0.2138
20	0.3858	0.1015	40	0.5302	-0.1132	60	-1.4568	-0.2274

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
5.2500	35.504 35D 30M 13S	0.1921	2.0000	0.010	0.011

LEADING EDGE AXIAL TANGENT POINT -1.1208

Q DIMENSION 0.0310 U DIMENSION 0.0458
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0036, -0.0302
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.5039*	-0.1809	21	0.4653	0.0889	41	0.4425	-0.1036
2	-1.4961	-0.1714	22	0.5714	0.0745	42	0.3733	-0.0994
3	-1.4242	-0.1474	23	0.6765	0.0561	43	0.2690	-0.0939
4	-1.3161	-0.1133	24	0.7802	0.0333	44	0.1640	-0.0892
5	-1.2073	-0.0808	25	0.8824	0.0060	45	0.0586	-0.0858
6	-1.0981	-0.0506	26	0.9829	-0.0259	46	-0.0472	-0.0837
7	-0.9888	-0.0229	27	1.0815	-0.0627	47	-0.1533	-0.0831
8	-0.8793	0.0021	28	1.1777	-0.1046	48	-0.2597	-0.0840
9	-0.7697	0.0247	29	1.2714	-0.1518	49	-0.3665	-0.0864
10	-0.6600	0.0446	30	1.3020	-0.1687	50	-0.4737	-0.0903
11	-0.5503	0.0618	31	1.3086*	-0.1792	51	-0.5454	-0.0937
12	-0.4771	0.0719	32	1.2957	-0.1906	52	-0.6533	-0.0999
13	-0.3674	0.0847	33	1.2619	-0.1855	53	-0.7616	-0.1076
14	-0.2578	0.0947	34	1.1604	-0.1713	54	-0.8703	-0.1165
15	-0.1483	0.1020	35	1.0587	-0.1584	55	-0.9795	-0.1268
16	-0.0391	0.1064	36	0.9568	-0.1468	56	-1.0891	-0.1385
17	0.0698	0.1081	37	0.8546	-0.1362	57	-1.1990	-0.1514
18	0.1783	0.1072	38	0.7521	-0.1266	58	-1.3094	-0.1655
19	0.2864	0.1034	39	0.6492	-0.1181	59	-1.4196	-0.1799
20	0.3940	0.0961	40	0.5461	-0.1104	60	-1.4933	-0.1900

* INDICATES EXTREME POINTS.

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
5.5000	38.978 38D 58M 39S	0.1874	2.0000	0.009	0.010

LEADING EDGE AXIAL TANGENT POINT -1.1037

Q DIMENSION 0.0298 U DIMENSION 0.0432
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0050, -0.0265
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.5367*	-0.1483	21	0.4745	0.0826	41	0.4540	-0.1033
2	-1.5288	-0.1381	22	0.5832	0.0700	42	0.3826	-0.1000
3	-1.4546	-0.1168	23	0.6911	0.0540	43	0.2753	-0.0952
4	-1.3433	-0.0865	24	0.7981	0.0344	44	0.1676	-0.0907
5	-1.2318	-0.0584	25	0.9041	0.0112	45	0.0596	-0.0872
6	-1.1203	-0.0326	26	1.0089	-0.0159	46	-0.0489	-0.0848
7	-1.0086	-0.0090	27	1.1123	-0.0470	47	-0.1575	-0.0836
8	-0.8969	0.0123	28	1.2142	-0.0822	48	-0.2666	-0.0836
9	-0.7851	0.0314	29	1.3144	-0.1219	49	-0.3760	-0.0848
10	-0.6733	0.0482	30	1.3473	-0.1361	50	-0.4858	-0.0871
11	-0.5615	0.0627	31	1.3544*	-0.1468	51	-0.5592	-0.0890
12	-0.4870	0.0711	32	1.3423	-0.1571	52	-0.6695	-0.0928
13	-0.3753	0.0817	33	1.3067	-0.1544	53	-0.7801	-0.0976
14	-0.2635	0.0902	34	1.2002	-0.1466	54	-0.8910	-0.1034
15	-0.1517	0.0963	35	1.0937	-0.1394	55	-1.0023	-0.1103
16	-0.0402	0.0998	36	0.9873	-0.1325	56	-1.1140	-0.1183
17	0.0708	0.1009	37	0.8808	-0.1260	57	-1.2260	-0.1273
18	0.1815	0.0997	38	0.7743	-0.1199	58	-1.3385	-0.1373
19	0.2918	0.0959	39	0.6677	-0.1141	59	-1.4513	-0.1483
20	0.4016	0.0890	40	0.5610	-0.1086	60	-1.5267	-0.1562

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
5.7500	41.997 41D 59M 48S	0.1825	2.0000	0.009	0.010

LEADING EDGE AXIAL TANGENT POINT -1.0869

Q DIMENSION 0.0288 U DIMENSION 0.0412
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0072, -0.0235
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.5695*	-0.1226	21	0.4835	0.0771	41	0.4660	-0.1026
2	-1.5616	-0.1131	22	0.5949	0.0662	42	0.3924	-0.1000
3	-1.4857	-0.0945	23	0.7058	0.0525	43	0.2819	-0.0960
4	-1.3715	-0.0675	24	0.8160	0.0358	44	0.1713	-0.0919
5	-1.2572	-0.0425	25	0.9256	0.0161	45	0.0605	-0.0884
6	-1.1429	-0.0195	26	1.0342	-0.0071	46	-0.0506	-0.0855
7	-1.0286	0.0014	27	1.1414	-0.0341	47	-0.1617	-0.0833
8	-0.9143	0.0202	28	1.2474	-0.0647	48	-0.2732	-0.0821
9	-0.8001	0.0369	29	1.3519	-0.0990	49	-0.3849	-0.0817
10	-0.6859	0.0514	30	1.3864	-0.1112	50	-0.4969	-0.0822
11	-0.5718	0.0638	31	1.3937*	-0.1212	51	-0.5718	-0.0831
12	-0.4958	0.0709	32	1.3822	-0.1317	52	-0.6844	-0.0852
13	-0.3819	0.0798	33	1.3455	-0.1306	53	-0.7974	-0.0882
14	-0.2681	0.0864	34	1.2356	-0.1273	54	-0.9107	-0.0921
15	-0.1545	0.0910	35	1.1259	-0.1239	55	-1.0244	-0.0969
16	-0.0412	0.0934	36	1.0161	-0.1204	56	-1.1385	-0.1027
17	0.0718	0.0938	37	0.9065	-0.1168	57	-1.2530	-0.1093
18	0.1845	0.0924	38	0.7967	-0.1131	58	-1.3679	-0.1168
19	0.2969	0.0889	39	0.6866	-0.1098	59	-1.4832	-0.1251
20	0.4090	0.0827	40	0.5763	-0.1063	60	-1.5601	-0.1306

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.0000	44.562 44D 33M 41S	0.1773	2.0000	0.009	0.010

LEADING EDGE AXIAL TANGENT POINT -1.0712

Q DIMENSION 0.0276 U DIMENSION 0.0384
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0063, -0.0222
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.5996*	-0.1013	21	0.4919	0.0714	41	0.4763	-0.1021
2	-1.5918	-0.0923	22	0.6056	0.0615	42	0.4010	-0.0999
3	-1.5141	-0.0755	23	0.7188	0.0492	43	0.2880	-0.0964
4	-1.3977	-0.0518	24	0.8316	0.0343	44	0.1749	-0.0926
5	-1.2812	-0.0300	25	0.9437	0.0168	45	0.0616	-0.0891
6	-1.1648	-0.0100	26	1.0553	-0.0034	46	-0.0520	-0.0860
7	-1.0485	0.0082	27	1.1662	-0.0263	47	-0.1657	-0.0835
8	-0.9322	0.0245	28	1.2763	-0.0521	48	-0.2795	-0.0817
9	-0.8159	0.0389	29	1.3856	-0.0807	49	-0.3937	-0.0807
10	-0.6998	0.0514	30	1.4218	-0.0909	50	-0.5082	-0.0804
11	-0.5837	0.0621	31	1.4293*	-0.0999	51	-0.5847	-0.0804
12	-0.5063	0.0681	32	1.4185	-0.1103	52	-0.6996	-0.0810
13	-0.3903	0.0757	33	1.3806	-0.1108	53	-0.8148	-0.0823
14	-0.2743	0.0814	34	1.2671	-0.1116	54	-0.9302	-0.0843
15	-0.1585	0.0852	35	1.1538	-0.1119	55	-1.0460	-0.0870
16	-0.0430	0.0870	36	1.0407	-0.1115	56	-1.1620	-0.0905
17	0.0721	0.0871	37	0.9277	-0.1106	57	-1.2785	-0.0946
18	0.1870	0.0855	38	0.8148	-0.1092	58	-1.3952	-0.0995
19	0.3016	0.0822	39	0.7020	-0.1073	59	-1.5124	-0.1051
20	0.4159	0.0766	40	0.5892	-0.1049	60	-1.5907	-0.1092

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.2500	46.927 46D 55M 38S	0.1716	2.0000	0.008	0.009

LEADING EDGE AXIAL TANGENT POINT -1.0556

Q DIMENSION 0.0264 U DIMENSION 0.0359
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0070, -0.0207
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.6306*	-0.0830	21	0.5000	0.0653	41	0.4866	-0.1016
2	-1.6229	-0.0745	22	0.6161	0.0565	42	0.4094	-0.0999
3	-1.5435	-0.0594	23	0.7319	0.0456	43	0.2937	-0.0968
4	-1.4246	-0.0382	24	0.8475	0.0326	44	0.1779	-0.0930
5	-1.3057	-0.0187	25	0.9626	0.0175	45	0.0620	-0.0893
6	-1.1869	-0.0010	26	1.0775	0.0002	46	-0.0541	-0.0858
7	-1.0682	0.0151	27	1.1919	-0.0193	47	-0.1701	-0.0826
8	-0.9497	0.0294	28	1.3060	-0.0410	48	-0.2863	-0.0798
9	-0.8312	0.0419	29	1.4196	-0.0650	49	-0.4026	-0.0777
10	-0.7128	0.0527	30	1.4574	-0.0735	50	-0.5193	-0.0761
11	-0.5946	0.0618	31	1.4649*	-0.0817	51	-0.5971	-0.0753
12	-0.5159	0.0668	32	1.4548	-0.0921	52	-0.7142	-0.0747
13	-0.3978	0.0730	33	1.4159	-0.0937	53	-0.8315	-0.0747
14	-0.2800	0.0773	34	1.2992	-0.0978	54	-0.9492	-0.0754
15	-0.1623	0.0800	35	1.1827	-0.1010	55	-1.0671	-0.0766
16	-0.0448	0.0810	36	1.0663	-0.1033	56	-1.1854	-0.0785
17	0.0723	0.0805	37	0.9501	-0.1046	57	-1.3040	-0.0810
18	0.1892	0.0786	38	0.8341	-0.1051	58	-1.4230	-0.0841
19	0.3060	0.0753	39	0.7182	-0.1047	59	-1.5423	-0.0879
20	0.4225	0.0700	40	0.6024	-0.1035	60	-1.6222	-0.0908

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.5000	48.902 48D 54M 8S	0.1654	2.0000	0.008	0.009

LEADING EDGE AXIAL TANGENT POINT -1.0430

Q DIMENSION 0.0252 U DIMENSION 0.0339
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0051, -0.0206
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.6645*	-0.0713	21	0.5073	0.0603	41	0.4955	-0.1000
2	-1.6569	-0.0633	22	0.6256	0.0524	42	0.4167	-0.0987
3	-1.5757	-0.0499	23	0.7436	0.0426	43	0.2987	-0.0959
4	-1.4541	-0.0310	24	0.8615	0.0309	44	0.1805	-0.0925
5	-1.3326	-0.0136	25	0.9790	0.0174	45	0.0623	-0.0889
6	-1.2112	0.0023	26	1.0964	0.0021	46	-0.0560	-0.0854
7	-1.0899	0.0166	27	1.2134	-0.0151	47	-0.1743	-0.0820
8	-0.9688	0.0294	28	1.3302	-0.0342	48	-0.2928	-0.0791
9	-0.8478	0.0406	29	1.4466	-0.0552	49	-0.4114	-0.0766
10	-0.7273	0.0503	30	1.4854	-0.0626	50	-0.5303	-0.0746
11	-0.6070	0.0584	31	1.4929*	-0.0713	51	-0.6097	-0.0735
12	-0.5268	0.0629	32	1.4835	-0.0801	52	-0.7290	-0.0723
13	-0.4067	0.0683	33	1.4437	-0.0824	53	-0.8486	-0.0717
14	-0.2867	0.0721	34	1.3245	-0.0885	54	-0.9687	-0.0713
15	-0.1669	0.0743	35	1.2056	-0.0934	55	-1.0894	-0.0714
16	-0.0474	0.0749	36	1.0869	-0.0971	56	-1.2103	-0.0720
17	0.0718	0.0743	37	0.9684	-0.0996	57	-1.3315	-0.0732
18	0.1908	0.0725	38	0.8500	-0.1012	58	-1.4530	-0.0749
19	0.3097	0.0694	39	0.7317	-0.1017	59	-1.5749	-0.0771
20	0.4283	0.0646	40	0.6136	-0.1013	60	-1.6564	-0.0790

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.7500	50.775 50D 46M 29S	0.1587	2.0000	0.008	0.008

LEADING EDGE AXIAL TANGENT POINT -1.0315

Q DIMENSION 0.0238 U DIMENSION 0.0317
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0050, -0.0200
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.7000*	-0.0596	21	0.5127	0.0553	41	0.5035	-0.0985
2	-1.6927	-0.0520	22	0.6335	0.0482	42	0.4229	-0.0975
3	-1.6100	-0.0400	23	0.7542	0.0395	43	0.3020	-0.0950
4	-1.4861	-0.0231	24	0.8747	0.0293	44	0.1811	-0.0917
5	-1.3624	-0.0076	25	0.9951	0.0174	45	0.0601	-0.0881
6	-1.2388	0.0065	26	1.1154	0.0040	46	-0.0609	-0.0844
7	-1.1154	0.0192	27	1.2355	-0.0109	47	-0.1819	-0.0807
8	-0.9923	0.0304	28	1.3555	-0.0273	48	-0.3030	-0.0773
9	-0.8692	0.0402	29	1.4754	-0.0452	49	-0.4243	-0.0742
10	-0.7464	0.0486	30	1.5153	-0.0515	50	-0.5458	-0.0715
11	-0.6237	0.0555	31	1.5228*	-0.0595	51	-0.6269	-0.0699
12	-0.5420	0.0593	32	1.5141	-0.0680	52	-0.7487	-0.0678
13	-0.4195	0.0638	33	1.4735	-0.0710	53	-0.8708	-0.0661
14	-0.2973	0.0669	34	1.3518	-0.0789	54	-0.9931	-0.0649
15	-0.1751	0.0686	35	1.2303	-0.0854	55	-1.1158	-0.0641
16	-0.0532	0.0689	36	1.1089	-0.0907	56	-1.2387	-0.0638
17	0.0683	0.0681	37	0.9876	-0.0946	57	-1.3620	-0.0640
18	0.1897	0.0663	38	0.8665	-0.0973	58	-1.4856	-0.0647
19	0.3110	0.0634	39	0.7454	-0.0989	59	-1.6095	-0.0659
20	0.4321	0.0591	40	0.6245	-0.0992	60	-1.6924	-0.0670

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.0000	52.394 52D 23M 38S	0.1512	2.0000	0.007	0.008

LEADING EDGE AXIAL TANGENT POINT -1.0230

Q DIMENSION 0.0224 U DIMENSION 0.0302
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 0.0025, -0.0202
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.7402*	-0.0524	21	0.5128	0.0511	41	0.5044	-0.0964
2	-1.7330	-0.0452	22	0.6356	0.0449	42	0.4224	-0.0954
3	-1.6471	-0.0347	23	0.7583	0.0371	43	0.2995	-0.0930
4	-1.5190	-0.0197	24	0.8809	0.0279	44	0.1765	-0.0897
5	-1.3931	-0.0057	25	1.0034	0.0172	45	0.0535	-0.0863
6	-1.2675	0.0070	26	1.1258	0.0051	46	-0.0697	-0.0826
7	-1.1420	0.0185	27	1.2482	-0.0083	47	-0.1927	-0.0789
8	-1.0168	0.0286	28	1.3704	-0.0231	48	-0.3159	-0.0754
9	-0.8917	0.0374	29	1.4926	-0.0392	49	-0.4393	-0.0722
10	-0.7668	0.0449	30	1.5334	-0.0449	50	-0.5628	-0.0693
11	-0.6421	0.0511	31	1.5405*	-0.0524	51	-0.6453	-0.0675
12	-0.5591	0.0545	32	1.5323	-0.0605	52	-0.7692	-0.0651
13	-0.4347	0.0585	33	1.4910	-0.0639	53	-0.8934	-0.0631
14	-0.3104	0.0613	34	1.3672	-0.0730	54	-1.0179	-0.0614
15	-0.1864	0.0628	35	1.2436	-0.0805	55	-1.1426	-0.0602
16	-0.0625	0.0630	36	1.1201	-0.0865	56	-1.2676	-0.0594
17	0.0610	0.0622	37	0.9968	-0.0911	57	-1.3930	-0.0590
18	0.1844	0.0606	38	0.8736	-0.0943	58	-1.5187	-0.0591
19	0.3077	0.0581	39	0.7505	-0.0963	59	-1.6467	-0.0593
20	0.4308	0.0545	40	0.6274	-0.0970	60	-1.7327	-0.0596

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.2500	53.890 530 53M 22S	0.1433	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0287

Q DIMENSION 0.0216 U DIMENSION 0.0290
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0048, -0.0197
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.7996*	-0.0430	21	0.5129	0.0481	41	0.5060	-0.0934
2	-1.7924	-0.0356	22	0.6379	0.0428	42	0.4226	-0.0925
3	-1.7046	-0.0264	23	0.7628	0.0361	43	0.2975	-0.0902
4	-1.5734	-0.0132	24	0.8877	0.0280	44	0.1723	-0.0872
5	-1.4427	-0.0011	25	1.0125	0.0187	45	0.0471	-0.0840
6	-1.3124	0.0096	26	1.1372	0.0080	46	-0.0788	-0.0806
7	-1.1826	0.0187	27	1.2620	-0.0038	47	-0.2049	-0.0771
8	-1.0532	0.0268	28	1.3867	-0.0169	48	-0.3313	-0.0737
9	-0.9242	0.0341	29	1.5115	-0.0311	49	-0.4580	-0.0703
10	-0.7956	0.0405	30	1.5531	-0.0360	50	-0.5851	-0.0671
11	-0.6674	0.0459	31	1.5599*	-0.0430	51	-0.6699	-0.0651
12	-0.5822	0.0489	32	1.5523	-0.0509	52	-0.7976	-0.0621
13	-0.4546	0.0526	33	1.5102	-0.0547	53	-0.9257	-0.0594
14	-0.3273	0.0552	34	1.3842	-0.0651	54	-1.0542	-0.0569
15	-0.2003	0.0568	35	1.2583	-0.0737	55	-1.1831	-0.0548
16	-0.0736	0.0572	36	1.1327	-0.0807	56	-1.3125	-0.0530
17	0.0526	0.0568	37	1.0071	-0.0861	57	-1.4425	-0.0515
18	0.1786	0.0556	38	0.8817	-0.0900	58	-1.5729	-0.0505
19	0.3042	0.0537	39	0.7564	-0.0925	59	-1.7040	-0.0500
20	0.4294	0.0508	40	0.6312	-0.0936	60	-1.7916	-0.0499

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.5000	55.227 55D 13M 37S	0.1389	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0344

Q DIMENSION 0.0207 U DIMENSION 0.0275
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0085, -0.0202
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.8594*	-0.0356	21	0.5009	0.0450	41	0.4952	-0.0952
2	-1.8524	-0.0280	22	0.6288	0.0418	42	0.4099	-0.0953
3	-1.7628	-0.0199	23	0.7565	0.0377	43	0.2818	-0.0937
4	-1.6289	-0.0082	24	0.8841	0.0320	44	0.1536	-0.0902
5	-1.4955	0.0027	25	1.0109	0.0242	45	0.0251	-0.0860
6	-1.3626	0.0118	26	1.1383	0.0144	46	-0.1035	-0.0816
7	-1.2301	0.0188	27	1.2656	0.0025	47	-0.2322	-0.0772
8	-1.0980	0.0248	28	1.3929	-0.0104	48	-0.3612	-0.0728
9	-0.9664	0.0303	29	1.5202	-0.0241	49	-0.4905	-0.0686
10	-0.8352	0.0352	30	1.5626	-0.0288	50	-0.6202	-0.0646
11	-0.7044	0.0394	31	1.5693*	-0.0357	51	-0.7068	-0.0621
12	-0.6175	0.0418	32	1.5620	-0.0434	52	-0.8371	-0.0584
13	-0.4873	0.0448	33	1.5191	-0.0468	53	-0.9677	-0.0551
14	-0.3574	0.0471	34	1.3908	-0.0565	54	-1.0988	-0.0520
15	-0.2279	0.0486	35	1.2626	-0.0652	55	-1.2304	-0.0492
16	-0.0986	0.0493	36	1.1346	-0.0728	56	-1.3624	-0.0469
17	0.0302	0.0495	37	1.0066	-0.0794	57	-1.4950	-0.0450
18	0.1589	0.0490	38	0.8787	-0.0850	58	-1.6280	-0.0435
19	0.2873	0.0481	39	0.7509	-0.0896	59	-1.7617	-0.0426
20	0.4155	0.0465	40	0.6230	-0.0934	60	-1.8511	-0.0423

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.7500	56.513 56D 30M 46S	0.1339	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0377

Q DIMENSION 0.0200 U DIMENSION 0.0262
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0084, -0.0198
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.9167*	-0.0279	21	0.4883	0.0428	41	0.4825	-0.0972
2	-1.9097	-0.0202	22	0.6190	0.0418	42	0.3955	-0.0981
3	-1.8187	-0.0129	23	0.7496	0.0404	43	0.2648	-0.0969
4	-1.6827	-0.0024	24	0.8800	0.0371	44	0.1340	-0.0926
5	-1.5473	0.0075	25	1.0087	0.0309	45	0.0030	-0.0871
6	-1.4122	0.0151	26	1.1388	0.0218	46	-0.1282	-0.0816
7	-1.2777	0.0201	27	1.2688	0.0098	47	-0.2596	-0.0762
8	-1.1435	0.0238	28	1.3987	-0.0033	48	-0.3912	-0.0710
9	-1.0093	0.0275	29	1.5288	-0.0166	49	-0.5232	-0.0659
10	-0.8755	0.0309	30	1.5722	-0.0211	50	-0.6554	-0.0611
11	-0.7421	0.0340	31	1.5786*	-0.0280	51	-0.7438	-0.0581
12	-0.6534	0.0358	32	1.5714	-0.0356	52	-0.8767	-0.0537
13	-0.5206	0.0381	33	1.5277	-0.0386	53	-1.0100	-0.0497
14	-0.3881	0.0401	34	1.3966	-0.0474	54	-1.1438	-0.0460
15	-0.2560	0.0416	35	1.2657	-0.0559	55	-1.2775	-0.0427
16	-0.1241	0.0426	36	1.1350	-0.0641	56	-1.4118	-0.0399
17	0.0075	0.0432	37	1.0044	-0.0719	57	-1.5465	-0.0376
18	0.1389	0.0435	38	0.8739	-0.0793	58	-1.6817	-0.0359
19	0.2701	0.0435	39	0.7434	-0.0864	59	-1.8174	-0.0348
20	0.4011	0.0432	40	0.6129	-0.0931	60	-1.9083	-0.0346

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.0000	57.615 57D 36M 52S	0.1282	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0389

Q DIMENSION 0.0195 U DIMENSION 0.0255
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0130, -0.0190
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-1.9719*	-0.0246	21	0.4794	0.0411	41	0.4734	-0.0974
2	-1.9648	-0.0170	22	0.6129	0.0411	42	0.3846	-0.0987
3	-1.8720	-0.0101	23	0.7465	0.0409	43	0.2513	-0.0974
4	-1.7331	-0.0002	24	0.8800	0.0389	44	0.1179	-0.0923
5	-1.5948	0.0090	25	1.0117	0.0341	45	-0.0156	-0.0860
6	-1.4570	0.0161	26	1.1449	0.0258	46	-0.1493	-0.0799
7	-1.3197	0.0209	27	1.2779	0.0141	47	-0.2832	-0.0740
8	-1.1829	0.0246	28	1.4110	0.0008	48	-0.4173	-0.0683
9	-1.0464	0.0278	29	1.5442	-0.0131	49	-0.5517	-0.0629
10	-0.9104	0.0305	30	1.5887	-0.0178	50	-0.6864	-0.0578
11	-0.7747	0.0328	31	1.5950*	-0.0247	51	-0.7764	-0.0545
12	-0.6844	0.0341	32	1.5878	-0.0322	52	-0.9116	-0.0499
13	-0.5493	0.0359	33	1.5429	-0.0348	53	-1.0473	-0.0457
14	-0.4145	0.0373	34	1.4085	-0.0427	54	-1.1833	-0.0420
15	-0.2799	0.0384	35	1.2744	-0.0507	55	-1.3198	-0.0386
16	-0.1455	0.0393	36	1.1405	-0.0589	56	-1.4568	-0.0359
17	-0.0113	0.0400	37	1.0069	-0.0671	57	-1.5943	-0.0337
18	0.1227	0.0404	38	0.8734	-0.0755	58	-1.7323	-0.0322
19	0.2565	0.0408	39	0.7400	-0.0840	59	-1.8709	-0.0314
20	0.3903	0.0410	40	0.6067	-0.0923	60	-1.9636	-0.0313

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.2500	58.589 58D 35M 20S	0.1224	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0401

Q DIMENSION 0.0191 U DIMENSION 0.0258
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0140, -0.0186
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.0276*	-0.0237	21	0.4741	0.0390	41	0.4688	-0.0969
2	-2.0205	-0.0161	22	0.6106	0.0387	42	0.3780	-0.0977
3	-1.9257	-0.0094	23	0.7471	0.0382	43	0.2418	-0.0955
4	-1.7841	-0.0000	24	0.8835	0.0367	44	0.1055	-0.0897
5	-1.6430	0.0086	25	1.0190	0.0332	45	-0.0308	-0.0833
6	-1.5023	0.0155	26	1.1552	0.0262	46	-0.1674	-0.0771
7	-1.3622	0.0203	27	1.2913	0.0158	47	-0.3041	-0.0711
8	-1.2226	0.0241	28	1.4275	0.0028	48	-0.4411	-0.0653
9	-1.0834	0.0274	29	1.5637	-0.0119	49	-0.5783	-0.0598
10	-0.9445	0.0301	30	1.6092	-0.0168	50	-0.7158	-0.0547
11	-0.8061	0.0324	31	1.6155*	-0.0237	51	-0.8076	-0.0515
12	-0.7140	0.0337	32	1.6083	-0.0313	52	-0.9457	-0.0469
13	-0.5761	0.0354	33	1.5623	-0.0339	53	-1.0842	-0.0428
14	-0.4385	0.0367	34	1.4248	-0.0420	54	-1.2230	-0.0391
15	-0.3011	0.0377	35	1.2876	-0.0502	55	-1.3624	-0.0360
16	-0.1639	0.0384	36	1.1507	-0.0585	56	-1.5022	-0.0335
17	-0.0269	0.0389	37	1.0140	-0.0669	57	-1.6425	-0.0316
18	0.1099	0.0392	38	0.8775	-0.0755	58	-1.7833	-0.0305
19	0.2466	0.0393	39	0.7412	-0.0843	59	-1.9247	-0.0302
20	0.3831	0.0392	40	0.6049	-0.0924	60	-2.0194	-0.0305

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.5000	59.414 59D 24M 51S	0.1169	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0428

Q DIMENSION 0.0187 U DIMENSION 0.0260
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0134, -0.0177
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y	X	Y	X	Y
1	-2.0786*	-0.0215	0.4689	0.0384	0.4645	-0.0951
2	-2.0715	-0.0140	0.6083	0.0380	0.3718	-0.0955
3	-1.9753	-0.0079	0.7477	0.0374	0.2327	-0.0927
4	-1.8315	0.0007	0.8872	0.0365	0.0935	-0.0865
5	-1.6882	0.0084	1.0268	0.0342	-0.0458	-0.0802
6	-1.5454	0.0147	1.1663	0.0284	-0.1853	-0.0741
7	-1.4030	0.0193	1.3057	0.0191	-0.3249	-0.0682
8	-1.2610	0.0230	1.4451	0.0063	-0.4646	-0.0627
9	-1.1194	0.0262	1.5846	-0.0092	-0.6045	-0.0573
10	-0.9781	0.0289	1.6312	-0.0146	-0.7447	-0.0523
11	-0.8371	0.0313	1.6374*	-0.0215	-0.8383	-0.0492
12	-0.7433	0.0326	1.6302	-0.0290	-0.9789	-0.0447
13	-0.6028	0.0344	1.5831	-0.0315	-1.1199	-0.0407
14	-0.4626	0.0358	1.4422	-0.0393	-1.2613	-0.0371
15	-0.3225	0.0369	1.3017	-0.0475	-1.4030	-0.0340
16	-0.1825	0.0378	1.1616	-0.0558	-1.5451	-0.0315
17	-0.0427	0.0383	1.0218	-0.0645	-1.6877	-0.0297
18	0.0970	0.0386	0.8822	-0.0734	-1.8308	-0.0285
19	0.2365	0.0387	0.7428	-0.0827	-1.9744	-0.0282
20	0.3760	0.0386	0.6036	-0.0909	-2.0704	-0.0283

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.7500	60.102 60D 6M 8S	0.1105	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0458

Q DIMENSION 0.0180 U DIMENSION 0.0258
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0151, -0.0170
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.1285*	-0.0217	21	0.4683	0.0369	41	0.4638	-0.0929
2	-2.1214	-0.0142	22	0.6106	0.0360	42	0.3692	-0.0926
3	-2.0234	-0.0082	23	0.7530	0.0348	43	0.2272	-0.0886
4	-1.8769	0.0003	24	0.8955	0.0333	44	0.0852	-0.0823
5	-1.7309	0.0079	25	1.0380	0.0309	45	-0.0569	-0.0760
6	-1.5853	0.0141	26	1.1806	0.0263	46	-0.1991	-0.0699
7	-1.4402	0.0189	27	1.3232	0.0186	47	-0.3414	-0.0641
8	-1.2955	0.0228	28	1.4657	0.0067	48	-0.4838	-0.0586
9	-1.1512	0.0261	29	1.6083	-0.0090	49	-0.6265	-0.0535
10	-1.0072	0.0289	30	1.6558	-0.0148	50	-0.7694	-0.0487
11	-0.8635	0.0313	31	1.6620*	-0.0218	51	-0.8648	-0.0457
12	-0.7679	0.0327	32	1.6547	-0.0292	52	-1.0082	-0.0415
13	-0.6247	0.0344	33	1.6066	-0.0316	53	-1.1519	-0.0378
14	-0.4817	0.0358	34	1.4626	-0.0392	54	-1.2959	-0.0345
15	-0.3389	0.0368	35	1.3191	-0.0472	55	-1.4403	-0.0318
16	-0.1962	0.0374	36	1.1759	-0.0555	56	-1.5852	-0.0298
17	-0.0537	0.0378	37	1.0331	-0.0641	57	-1.7305	-0.0284
18	0.0887	0.0379	38	0.8905	-0.0731	58	-1.8762	-0.0278
19	0.2311	0.0377	39	0.7481	-0.0824	59	-2.0225	-0.0280
20	0.3734	0.0373	40	0.6059	-0.0898	60	-2.1203	-0.0286

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.0000	60.764 60D 45M 49S	0.1043	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0489

Q DIMENSION 0.0178 U DIMENSION 0.0263
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0158, -0.0161
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.1787*	-0.0218	21	0.4679	0.0354	41	0.4636	-0.0905
2	-2.1716	-0.0143	22	0.6131	0.0341	42	0.3670	-0.0894
3	-2.0718	-0.0083	23	0.7584	0.0324	43	0.2221	-0.0843
4	-1.9226	0.0001	24	0.9038	0.0303	44	0.0773	-0.0778
5	-1.7738	0.0076	25	1.0493	0.0278	45	-0.0676	-0.0715
6	-1.6255	0.0138	26	1.1951	0.0245	46	-0.2126	-0.0655
7	-1.4777	0.0187	27	1.3408	0.0183	47	-0.3577	-0.0598
8	-1.3303	0.0228	28	1.4865	0.0072	48	-0.5030	-0.0544
9	-1.1832	0.0262	29	1.6321	-0.0086	49	-0.6484	-0.0494
10	-1.0365	0.0292	30	1.6807	-0.0149	50	-0.7941	-0.0448
11	-0.8901	0.0316	31	1.6868*	-0.0218	51	-0.8913	-0.0419
12	-0.7926	0.0330	32	1.6795	-0.0292	52	-1.0374	-0.0380
13	-0.6467	0.0347	33	1.6304	-0.0316	53	-1.1838	-0.0346
14	-0.5009	0.0359	34	1.4833	-0.0389	54	-1.3306	-0.0317
15	-0.3553	0.0369	35	1.3367	-0.0467	55	-1.4778	-0.0294
16	-0.2099	0.0374	36	1.1905	-0.0549	56	-1.6254	-0.0278
17	-0.0646	0.0376	37	1.0446	-0.0636	57	-1.7734	-0.0269
18	0.0807	0.0374	38	0.8991	-0.0727	58	-1.9219	-0.0268
19	0.2259	0.0369	39	0.7537	-0.0821	59	-2.0709	-0.0277
20	0.3711	0.0362	40	0.6086	-0.0884	60	-2.1706	-0.0287

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.2500	61.241 61D 14M 26S	0.0983	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0505

Q DIMENSION 0.0176 U DIMENSION 0.0260
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0151, -0.0152
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.2169*	-0.0228	21	0.4719	0.0349	41	0.4683	-0.0864
2	-2.2099	-0.0153	22	0.6204	0.0333	42	0.3696	-0.0846
3	-2.1092	-0.0095	23	0.7691	0.0311	43	0.2215	-0.0788
4	-1.9585	-0.0012	24	0.9181	0.0284	44	0.0736	-0.0725
5	-1.8081	0.0061	25	1.0673	0.0253	45	-0.0742	-0.0665
6	-1.6581	0.0123	26	1.2169	0.0216	46	-0.2221	-0.0609
7	-1.5084	0.0173	27	1.3666	0.0154	47	-0.3700	-0.0556
8	-1.3590	0.0214	28	1.5165	0.0055	48	-0.5179	-0.0507
9	-1.2098	0.0250	29	1.6664	-0.0090	49	-0.6659	-0.0461
10	-1.0609	0.0281	30	1.7163	-0.0158	50	-0.8140	-0.0420
11	-0.9122	0.0307	31	1.7224*	-0.0228	51	-0.9129	-0.0394
12	-0.8132	0.0322	32	1.7150	-0.0301	52	-1.0613	-0.0360
13	-0.6648	0.0341	33	1.6644	-0.0321	53	-1.2100	-0.0331
14	-0.5165	0.0355	34	1.5132	-0.0386	54	-1.3589	-0.0306
15	-0.3682	0.0366	35	1.3625	-0.0457	55	-1.5080	-0.0288
16	-0.2201	0.0372	36	1.2124	-0.0536	56	-1.6575	-0.0276
17	-0.0719	0.0374	37	1.0628	-0.0621	57	-1.8074	-0.0271
18	0.0763	0.0373	38	0.9136	-0.0713	58	-1.9576	-0.0274
19	0.2246	0.0368	39	0.7647	-0.0801	59	-2.1082	-0.0285
20	0.3729	0.0358	40	0.6166	-0.0854	60	-2.2088	-0.0297

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.5000	61.687 61D 41M 13S	0.0917	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0521

Q DIMENSION 0.0166 U DIMENSION 0.0258
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0166, -0.0141
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.2548*	-0.0241	21	0.4830	0.0337	41	0.4804	-0.0817
2	-2.2478	-0.0167	22	0.6345	0.0314	42	0.3797	-0.0787
3	-2.1453	-0.0105	23	0.7862	0.0285	43	0.2287	-0.0726
4	-1.9919	-0.0020	24	0.9381	0.0251	44	0.0779	-0.0664
5	-1.8389	0.0057	25	1.0903	0.0210	45	-0.0728	-0.0606
6	-1.6862	0.0122	26	1.2428	0.0164	46	-0.2235	-0.0552
7	-1.5339	0.0175	27	1.3958	0.0102	47	-0.3742	-0.0502
8	-1.3818	0.0219	28	1.5490	0.0022	48	-0.5249	-0.0456
9	-1.2300	0.0256	29	1.7024	-0.0099	49	-0.6757	-0.0414
10	-1.0784	0.0288	30	1.7533	-0.0171	50	-0.8266	-0.0377
11	-0.9271	0.0315	31	1.7593*	-0.0241	51	-0.9273	-0.0355
12	-0.8262	0.0330	32	1.7519	-0.0314	52	-1.0785	-0.0325
13	-0.6751	0.0349	33	1.7002	-0.0332	53	-1.2299	-0.0301
14	-0.5241	0.0362	34	1.5458	-0.0391	54	-1.3815	-0.0282
15	-0.3731	0.0372	35	1.3919	-0.0459	55	-1.5334	-0.0269
16	-0.2221	0.0377	36	1.2387	-0.0536	56	-1.6855	-0.0264
17	-0.0712	0.0377	37	1.0859	-0.0620	57	-1.8381	-0.0265
18	0.0798	0.0372	38	0.9336	-0.0713	58	-1.9909	-0.0275
19	0.2309	0.0363	39	0.7817	-0.0789	59	-2.1442	-0.0293
20	0.3821	0.0349	40	0.6317	-0.0825	60	-2.2466	-0.0310

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.7500	62.117 62D 7M 2S	0.0854	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0536

Q DIMENSION 0.0172 U DIMENSION 0.0256
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0188, -0.0130
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y	X	Y	X	Y
1	-2.2927*	-0.0255	0.4942	0.0324	0.4926	-0.0771
2	-2.2858	-0.0180	0.6486	0.0295	0.3899	-0.0730
3	-2.1815	-0.0117	0.8032	0.0260	0.2361	-0.0665
4	-2.0255	-0.0028	0.9580	0.0217	0.0823	-0.0604
5	-1.8698	0.0053	1.1132	0.0168	-0.0713	-0.0548
6	-1.7145	0.0121	1.2688	0.0111	-0.2249	-0.0496
7	-1.5595	0.0177	1.4249	0.0049	-0.3784	-0.0448
8	-1.4048	0.0222	1.5816	-0.0011	-0.5319	-0.0406
9	-1.2503	0.0262	1.7385	-0.0109	-0.6855	-0.0368
10	-1.0960	0.0295	1.7903	-0.0184	-0.8392	-0.0334
11	-0.9419	0.0322	1.7964*	-0.0255	-0.9418	-0.0315
12	-0.8393	0.0338	1.7888	-0.0327	-1.0957	-0.0290
13	-0.6854	0.0356	1.7361	-0.0344	-1.2498	-0.0271
14	-0.5317	0.0370	1.5784	-0.0398	-1.4041	-0.0258
15	-0.3779	0.0378	1.4214	-0.0462	-1.5587	-0.0251
16	-0.2242	0.0381	1.2650	-0.0536	-1.7136	-0.0252
17	-0.0704	0.0379	1.1091	-0.0619	-1.8688	-0.0260
18	0.0834	0.0371	0.9537	-0.0714	-2.0244	-0.0276
19	0.2373	0.0358	0.7988	-0.0777	-2.1804	-0.0302
20	0.3914	0.0340	0.6469	-0.0796	-2.2846	-0.0323

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.8750	62.326 62D 19M 34S	0.0824	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0544

Q DIMENSION 0.0169 U DIMENSION 0.0255
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0202, -0.0124
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.3118*	-0.0262	21	0.4998	0.0317	41	0.4988	-0.0748
2	-2.3048	-0.0188	22	0.6556	0.0286	42	0.3951	-0.0701
3	-2.1997	-0.0123	23	0.8117	0.0247	43	0.2398	-0.0634
4	-2.0423	-0.0032	24	0.9680	0.0200	44	0.0846	-0.0574
5	-1.8854	0.0050	25	1.1247	0.0146	45	-0.0705	-0.0518
6	-1.7287	0.0120	26	1.2818	0.0084	46	-0.2255	-0.0468
7	-1.5724	0.0178	27	1.4394	0.0023	47	-0.3805	-0.0422
8	-1.4163	0.0224	28	1.5979	-0.0027	48	-0.5354	-0.0381
9	-1.2605	0.0264	29	1.7566	-0.0114	49	-0.6904	-0.0344
10	-1.1048	0.0298	30	1.8089	-0.0191	50	-0.8455	-0.0313
11	-0.9494	0.0326	31	1.8149*	-0.0262	51	-0.9490	-0.0296
12	-0.8458	0.0341	32	1.8073	-0.0334	52	-1.1043	-0.0273
13	-0.6906	0.0360	33	1.7541	-0.0350	53	-1.2597	-0.0257
14	-0.5355	0.0373	34	1.5948	-0.0401	54	-1.4155	-0.0246
15	-0.3804	0.0381	35	1.4362	-0.0464	55	-1.5714	-0.0243
16	-0.2252	0.0383	36	1.2782	-0.0537	56	-1.7277	-0.0246
17	-0.0701	0.0379	37	1.1208	-0.0619	57	-1.8842	-0.0258
18	0.0851	0.0370	38	0.9638	-0.0715	58	-2.0412	-0.0278
19	0.2405	0.0356	39	0.8074	-0.0771	59	-2.1985	-0.0306
20	0.3960	0.0335	40	0.6546	-0.0782	60	-2.3036	-0.0330

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.0000	62.532 62D 31M 54S	0.0794	2.0000	0.007	0.007

LEADING EDGE AXIAL TANGENT POINT -1.0552

Q DIMENSION 0.0169 U DIMENSION 0.0254
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0218, -0.0119
COMPRESSOR ROTATION IS COUNTER-CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.3308*	-0.0269	21	0.5054	0.0311	41	0.5050	-0.0725
2	-2.3239	-0.0195	22	0.6627	0.0276	42	0.4003	-0.0672
3	-2.2179	-0.0129	23	0.8202	0.0234	43	0.2435	-0.0604
4	-2.0592	-0.0036	24	0.9780	0.0183	44	0.0868	-0.0544
5	-1.9009	0.0048	25	1.1362	0.0124	45	-0.0697	-0.0489
6	-1.7429	0.0119	26	1.2947	0.0058	46	-0.2261	-0.0440
7	-1.5852	0.0178	27	1.4540	-0.0004	47	-0.3825	-0.0395
8	-1.4278	0.0226	28	1.6142	-0.0044	48	-0.5389	-0.0356
9	-1.2706	0.0267	29	1.7746	-0.0120	49	-0.6953	-0.0321
10	-1.1137	0.0301	30	1.8275	-0.0198	50	-0.8518	-0.0292
11	-0.9569	0.0329	31	1.8335*	-0.0270	51	-0.9562	-0.0276
12	-0.8524	0.0345	32	1.8259	-0.0341	52	-1.1129	-0.0256
13	-0.6958	0.0364	33	1.7721	-0.0356	53	-1.2697	-0.0242
14	-0.5393	0.0376	34	1.6112	-0.0405	54	-1.4268	-0.0235
15	-0.3828	0.0383	35	1.4510	-0.0465	55	-1.5841	-0.0234
16	-0.2263	0.0385	36	1.2914	-0.0537	56	-1.7418	-0.0241
17	-0.0697	0.0380	37	1.1324	-0.0619	57	-1.8997	-0.0255
18	0.0869	0.0370	38	0.9739	-0.0716	58	-2.0580	-0.0279
19	0.2437	0.0353	39	0.8159	-0.0765	59	-2.2166	-0.0311
20	0.4006	0.0330	40	0.6622	-0.0767	60	-2.3227	-0.0338

* INDICATES EXTREME POINTS

Table 9. (Continued)

FAN COMPRESSOR BLADE CBC 11863

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.2500	62.931 62D 55M 53S	0.0736	2.0000	0.007	0.001

LEADING EDGE AXIAL TANGENT POINT -1.0568

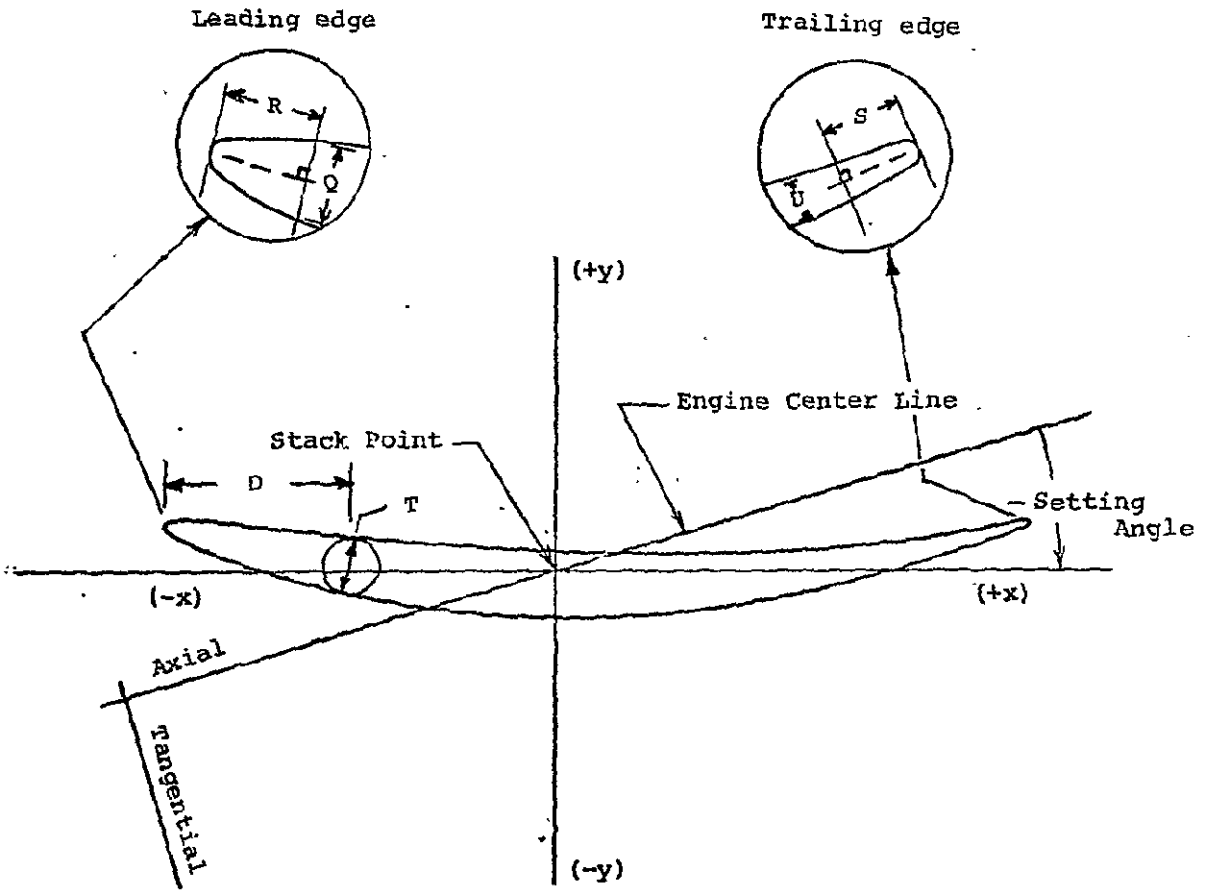
Q DIMENSION 0.0167 U DIMENSION 0.0254
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -0.0259, -0.0109
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-2.3691*	-0.0284	21	0.5165	0.0297	41	0.5174	-0.0680
2	-2.3622	-0.0210	22	0.6767	0.0257	42	0.4108	-0.0616
3	-2.2544	-0.0141	23	0.8372	0.0207	43	0.2510	-0.0544
4	-2.0930	-0.0045	24	0.9980	0.0149	44	0.0914	-0.0485
5	-1.9320	0.0042	25	1.1591	0.0081	45	-0.0680	-0.0432
6	-1.7714	0.0117	26	1.3207	0.0004	46	-0.2273	-0.0384
7	-1.6110	0.0179	27	1.4831	-0.0057	47	-0.3866	-0.0342
8	-1.4509	0.0229	28	1.6468	-0.0078	48	-0.5458	-0.0306
9	-1.2910	0.0272	29	1.8109	-0.0131	49	-0.7050	-0.0276
10	-1.1314	0.0307	30	1.8647	-0.0213	50	-0.8643	-0.0251
11	-0.9718	0.0336	31	1.8706*	-0.0285	51	-0.9706	-0.0238
12	-0.8656	0.0352	32	1.8630	-0.0356	52	-1.1300	-0.0223
13	-0.7062	0.0371	33	1.8082	-0.0369	53	-1.2897	-0.0214
14	-0.5469	0.0383	34	1.6441	-0.0412	54	-1.4495	-0.0212
15	-0.3877	0.0389	35	1.4807	-0.0469	55	-1.6096	-0.0217
16	-0.2284	0.0388	36	1.3179	-0.0539	56	-1.7700	-0.0230
17	-0.0691	0.0382	37	1.1558	-0.0620	57	-1.9306	-0.0251
18	0.0904	0.0368	38	0.9942	-0.0718	58	-2.0916	-0.0282
19	0.2500	0.0348	39	0.8332	-0.0754	59	-2.2530	-0.0321
20	0.4098	0.0320	40	0.6776	-0.0740	60	-2.3609	-0.0352

* INDICATES EXTREME POINTS



T - Reference airfoil thickness
D - Distance to leading edge

Rotation is counterclockwise from the rear

Figure 55. Orientation of airfoil manufacturing coordinates for the stator vanes

Table 10. Airfoil Manufacturing Coordinates - Stator 1
(SI Units)[1]

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.7000	-31.280 -31D 16M 49S	0.6842	5.0800	0.035	0.034

LEADING EDGE AXIAL TANGENT POINT -8.4571

Q DIMENSION 0.1038 U DIMENSION 0.1063
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -4.6455, -0.8623
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-9.6019*	-0.4754	21	-2.7312	-0.6154	41	-2.6909	-1.2026
2	-9.5592	-0.4411	22	-2.4027	-0.6057	42	-3.1107	-1.2491
3	-9.2266	-0.4396	23	-2.0738	-0.5938	43	-3.4475	-1.2774
4	-8.8947	-0.4777	24	-1.6622	-0.5755	44	-3.8695	-1.3017
5	-8.4808	-0.4996	25	-1.3326	-0.5582	45	-4.2076	-1.3123
6	-8.1502	-0.5165	26	-1.0024	-0.5384	46	-4.5459	-1.3152
7	-7.8202	-0.5325	27	-0.5889	-0.5101	47	-4.9686	-1.3078
8	-7.4083	-0.5514	28	-0.2576	-0.4846	48	-5.3063	-1.2934
9	-7.0792	-0.5654	29	0.1575	-0.4490	49	-5.6435	-1.2716
10	-6.7504	-0.5784	30	0.2406	-0.4414	50	-6.0637	-1.2342
11	-6.3398	-0.5930	31	0.2821*	-0.4733	51	-6.3988	-1.1964
12	-6.0116	-0.6032	32	0.2547	-0.5082	52	-6.8159	-1.1396
13	-5.6015	-0.6140	33	0.1754	-0.5358	53	-7.1480	-1.0867
14	-5.2735	-0.6209	34	-0.2236	-0.6669	54	-7.4784	-1.0275
15	-4.9456	-0.6264	35	-0.5458	-0.7633	55	-7.8890	-0.9450
16	-4.5356	-0.6309	36	-0.9520	-0.8732	56	-8.2151	-0.8724
17	-4.2077	-0.6325	37	-1.2794	-0.9525	57	-8.5391	-0.7943
18	-3.8797	-0.6323	38	-1.6088	-1.0241	58	-8.9409	-0.6894
19	-3.4697	-0.6292	39	-2.0231	-1.1026	59	-9.2594	-0.5998
20	-3.1416	-0.6244	40	-2.3563	-1.1565	60	-9.5754	-0.5056

* INDICATES EXTREME POINTS

1. Dimensions in centimeters, angles in degrees
   All listed values pertain to the manufacturing sections

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
13.9700	-29.938 -29D 56M 16S	0.6917	5.0800	0.036	0.034

LEADING EDGE AXIAL TANGENT POINT -8.6341

Q DIMENSION 0.1059 U DIMENSION 0.1072
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -4.7703, -0.7213
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-9.7549*	-0.3547	21	-2.8370	-0.4641	41	-2.7950	-1.0570
2	-9.7122	-0.3192	22	-2.5062	-0.4559	42	-3.2167	-1.1026
3	-9.3767	-0.3357	23	-2.1750	-0.4460	43	-3.5550	-1.1307
4	-9.0420	-0.3518	24	-1.7605	-0.4308	44	-3.9787	-1.1554
5	-8.6247	-0.3711	25	-1.4285	-0.4165	45	-4.3182	-1.1669
6	-8.2916	-0.3859	26	-1.0959	-0.4001	46	-4.6579	-1.1711
7	-7.9590	-0.3998	27	-0.6794	-0.3767	47	-5.0827	-1.1660
8	-7.5442	-0.4161	28	-0.3456	-0.3555	48	-5.4225	-1.1536
9	-7.2128	-0.4280	29	0.0726	-0.3259	49	-5.7617	-1.1339
10	-6.8818	-0.4389	30	0.1564	-0.3196	50	-6.1847	-1.0991
11	-6.4686	-0.4510	31	0.1980*	-0.3525	51	-6.5222	-1.0634
12	-6.1383	-0.4593	32	0.1701	-0.3872	52	-6.9424	-1.0091
13	-5.7258	-0.4678	33	0.0901	-0.4138	53	-7.2771	-0.9582
14	-5.3959	-0.4731	34	-0.3124	-0.5400	54	-7.6104	-0.9009
15	-5.0661	-0.4768	35	-0.6371	-0.6328	55	-8.0245	-0.8205
16	-4.6537	-0.4795	36	-1.0462	-0.7385	56	-8.3537	-0.7494
17	-4.3236	-0.4800	37	-1.3758	-0.8149	57	-8.6808	-0.6725
18	-3.9934	-0.4792	38	-1.7072	-0.8840	58	-9.0866	-0.5687
19	-3.5806	-0.4761	39	-2.1239	-0.9598	59	-9.4085	-0.4796
20	-3.2503	-0.4718	40	-2.4588	-1.0121	60	-9.7279	-0.3855

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
15.2400	-28.615 -28D 36M 52S	0.6999	5.0800	0.036	0.035

LEADING EDGE AXIAL TANGENT POINT -8.8112

Q DIMENSION 0.1080 U DIMENSION 0.1081
K DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -4.8919, -0.5769
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-9.9074*	-0.2304	21	-2.9371	-0.3091	41	-2.8934	-0.9082
2	-9.8645	-0.1937	22	-2.6039	-0.3026	42	-3.3172	-0.9529
3	-9.5258	-0.2083	23	-2.2703	-0.2946	43	-3.6571	-0.9809
4	-9.1881	-0.2223	24	-1.8528	-0.2826	44	-4.0829	-1.0060
5	-8.7671	-0.2391	25	-1.5183	-0.2712	45	-4.4239	-1.0185
6	-8.4311	-0.2517	26	-1.1834	-0.2583	46	-4.7652	-1.0241
7	-8.0958	-0.2635	27	-0.7639	-0.2397	47	-5.1926	-1.0214
8	-7.6776	-0.2772	28	-0.4276	-0.2228	48	-5.5346	-1.0110
9	-7.3437	-0.2870	29	-0.0063	-0.1992	49	-5.8762	-0.9933
10	-7.0102	-0.2959	30	0.0781	-0.1941	50	-6.3024	-0.9611
11	-6.5940	-0.3055	31	0.1197*	-0.2280	51	-6.6425	-0.9275
12	-6.2614	-0.3119	32	0.0914	-0.2626	52	-7.0662	-0.8757
13	-5.8461	-0.3181	33	0.0107	-0.2882	53	-7.4039	-0.8267
14	-5.5140	-0.3216	34	-0.3951	-0.4094	54	-7.7401	-0.7712
15	-5.1821	-0.3238	35	-0.7224	-0.4987	55	-8.1582	-0.6928
16	-4.7670	-0.3245	36	-1.1344	-0.6004	56	-8.4907	-0.6231
17	-4.4345	-0.3239	37	-1.4662	-0.6740	57	-8.8212	-0.5474
18	-4.1019	-0.3225	38	-1.7997	-0.7405	58	-9.2314	-0.4445
19	-3.6861	-0.3193	39	-2.2188	-0.8138	59	-9.5569	-0.3559
20	-3.3533	-0.3156	40	-2.5555	-0.8645	60	-9.8799	-0.2618

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
16.5100	-27.413 -27D 24M 46S	0.7088	5.0800	0.037	0.035

LEADING EDGE AXIAL TANGENT POINT -8.9945

Q DIMENSION 0.1095 U DIMENSION 0.1089
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.0134, -0.4380
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-10.0754*	-0.1001	21	-3.0312	-0.1563	41	-2.9848	-0.7618
2	-10.0319	-0.0652	22	-2.6954	-0.1507	42	-3.4108	-0.8065
3	-9.6848	-0.0830	23	-2.3594	-0.1441	43	-3.7524	-0.8350
4	-9.3391	-0.0995	24	-1.9389	-0.1344	44	-4.1804	-0.8614
5	-8.9088	-0.1183	25	-1.6020	-0.1255	45	-4.5232	-0.8754
6	-8.5685	-0.1294	26	-1.2646	-0.1153	46	-4.8663	-0.8831
7	-8.2302	-0.1386	27	-0.8421	-0.1008	47	-5.2965	-0.8836
8	-7.8083	-0.1489	28	-0.5034	-0.0877	48	-5.6411	-0.8758
9	-7.4715	-0.1561	29	-0.0792	-0.0692	49	-5.9854	-0.8608
10	-7.1353	-0.1623	30	0.0058	-0.0653	50	-6.4151	-0.8319
11	-6.7157	-0.1687	31	0.0476*	-0.1000	51	-6.7582	-0.8009
12	-6.3806	-0.1726	32	0.0189	-0.1346	52	-7.1859	-0.7524
13	-5.9621	-0.1758	33	-0.0625	-0.1593	53	-7.5268	-0.7059
14	-5.6276	-0.1770	34	-0.4714	-0.2764	54	-7.8665	-0.6527
15	-5.2934	-0.1769	35	-0.8010	-0.3627	55	-8.2890	-0.5770
16	-4.8753	-0.1749	36	-1.2158	-0.4612	56	-8.6252	-0.5092
17	-4.5401	-0.1727	37	-1.5497	-0.5326	57	-8.9597	-0.4349
18	-4.2049	-0.1701	38	-1.8851	-0.5973	58	-9.3803	-0.3279
19	-3.7859	-0.1661	39	-2.3066	-0.6689	59	-9.7145	-0.2349
20	-3.4505	-0.1622	40	-2.6451	-0.7186	60	-10.0467	-0.1353

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE. CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
17.7800	-26.541 -26D 32M 27S	0.7182	5.0800	0.037	0.036

LEADING EDGE AXIAL TANGENT POINT -9.1925

Q DIMENSION 0.1102 U DIMENSION 0.1099
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.1498, -0.3129
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-10.2861*	0.0306	21	-3.1200	-0.0176	41	-3.0677	-0.6297
2	-10.2422	0.0660	22	-2.7817	-0.0111	42	-3.4968	-0.6770
3	-9.8898	0.0482	23	-2.4432	-0.0041	43	-3.8418	-0.7080
4	-9.5389	0.0317	24	-2.0195	0.0055	44	-4.2745	-0.7380
5	-9.1020	0.0125	25	-1.6802	0.0139	45	-4.6217	-0.7549
6	-8.7540	-0.0012	26	-1.3404	0.0232	46	-4.9695	-0.7655
7	-8.4071	-0.0134	27	-0.9150	0.0359	47	-5.4064	-0.7694
8	-7.9750	-0.0266	28	-0.5740	0.0472	48	-5.7567	-0.7638
9	-7.6305	-0.0355	29	-0.1469	0.0628	49	-6.1073	-0.7505
10	-7.2869	-0.0427	30	-0.0614	0.0661	50	-6.5455	-0.7229
11	-6.8586	-0.0496	31	-0.0193*	0.0307	51	-6.8958	-0.6920
12	-6.5169	-0.0532	32	-0.0481	-0.0040	52	-7.3330	-0.6426
13	-6.0908	-0.0554	33	-0.1300	-0.0282	53	-7.6819	-0.5946
14	-5.7507	-0.0550	34	-0.5415	-0.1436	54	-8.0299	-0.5391
15	-5.4111	-0.0529	35	-0.8729	-0.2288	55	-8.4633	-0.4595
16	-4.9868	-0.0480	36	-1.2900	-0.3264	56	-8.8085	-0.3876
17	-4.6468	-0.0433	37	-1.6255	-0.3974	57	-9.1522	-0.3085
18	-4.3070	-0.0382	38	-1.9627	-0.4622	58	-9.5795	-0.1999
19	-3.8826	-0.0314	39	-2.3862	-0.5344	59	-9.9192	-0.1057
20	-3.5434	-0.0255	40	-2.7264	-0.5851	60	-10.2568	-0.0051

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
19.0500	-25.675 -25D 40M 30S	0.7273	5.0800	0.038	0.036

LEADING EDGE AXIAL TANGENT POINT -9.3915

Q DIMENSION 0.1109 U DIMENSION 0.1108
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.2830, -0.1808
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-10.4947*	0.1633	21	-3.2248	0.1176	41	-3.1730	-0.5031
2	-10.4503	0.1992	22	-2.8810	0.1243	42	-3.6089	-0.5508
3	-10.0930	0.1816	23	-2.5371	0.1316	43	-3.9588	-0.5818
4	-9.7371	0.1653	24	-2.1071	0.1415	44	-4.3977	-0.6117
5	-9.2941	0.1468	25	-1.7630	0.1500	45	-4.7498	-0.6285
6	-8.9411	0.1336	26	-1.4186	0.1592	46	-5.1025	-0.6388
7	-8.5892	0.1219	27	-0.9879	0.1715	47	-5.5456	-0.6422
8	-8.1508	0.1093	28	-0.6429	0.1822	48	-5.9008	-0.6362
9	-7.8013	0.1009	29	-0.2110	0.1965	49	-6.2563	-0.6224
10	-7.4527	0.0940	30	-0.1246	0.1995	50	-6.7005	-0.5943
11	-7.0182	0.0875	31	-0.0821*	0.1634	51	-7.0555	-0.5631
12	-6.6715	0.0840	32	-0.1114	0.1284	52	-7.4987	-0.5135
13	-6.2392	0.0819	33	-0.1941	0.1042	53	-7.8524	-0.4653
14	-5.8940	0.0820	34	-0.6102	-0.0112	54	-8.2056	-0.4097
15	-5.5495	0.0838	35	-0.9456	-0.0968	55	-8.6448	-0.3298
16	-5.1189	0.0883	36	-1.3679	-0.1953	56	-8.9950	-0.2577
17	-4.7739	0.0927	37	-1.7081	-0.2671	57	-9.3437	-0.1783
18	-4.4293	0.0976	38	-2.0501	-0.3328	58	-9.7772	-0.0693
19	-3.9989	0.1042	39	-2.4801	-0.4061	59	-10.1220	0.0256
20	-3.6548	0.1098	40	-2.8258	-0.4577	60	-10.4647	0.1272

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
20.3200	-24.857 -24D 51M 23S	0.7362	5.0800	0.038	0.037

LEADING EDGE AXIAL TANGENT POINT -9.5864

Q DIMENSION 0.1117 U DIMENSION 0.1119
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.4134, -0.0500
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-10.6992*	0.2979	21	-3.3283	0.2517	41	-3.2769	-0.3777
2	-10.6545	0.3344	22	-2.9795	0.2585	42	-3.7189	-0.4259
3	-10.2924	0.3167	23	-2.6308	0.2659	43	-4.0738	-0.4572
4	-9.9318	0.3004	24	-2.1947	0.2760	44	-4.5189	-0.4872
5	-9.4827	0.2819	25	-1.8457	0.2846	45	-4.8758	-0.5039
6	-9.1249	0.2687	26	-1.4965	0.2939	46	-5.2335	-0.5140
7	-8.7683	0.2569	27	-1.0596	0.3064	47	-5.6825	-0.5169
8	-8.3239	0.2442	28	-0.7097	0.3172	48	-6.0425	-0.5106
9	-7.9695	0.2360	29	-0.2718	0.3316	49	-6.4027	-0.4964
10	-7.6160	0.2291	30	-0.1841	0.3347	50	-6.8528	-0.4678
11	-7.1754	0.2226	31	-0.1412*	0.2980	51	-7.2126	-0.4363
12	-6.8238	0.2192	32	-0.1709	0.2625	52	-7.6616	-0.3861
13	-6.3853	0.2170	33	-0.2549	0.2379	53	-8.0201	-0.3374
14	-6.0352	0.2169	34	-0.6771	0.1208	54	-8.3778	-0.2813
15	-5.6857	0.2185	35	-1.0174	0.0340	55	-8.8233	-0.2006
16	-5.2490	0.2227	36	-1.4459	-0.0658	56	-9.1782	-0.1277
17	-4.8992	0.2270	37	-1.7910	-0.1386	57	-9.5317	-0.0475
18	-4.5498	0.2316	38	-2.1379	-0.2052	58	-9.9713	0.0627
19	-4.1133	0.2381	39	-2.5741	-0.2795	59	-10.3210	0.1586
20	-3.7643	0.2438	40	-2.9248	-0.3318	60	-10.6687	0.2614

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
21.5900	-24.149 -24D 8M 57S	0.7450	5.0800	0.038	0.037

LEADING EDGE AXIAL TANGENT POINT -9.7718

Q DIMENSION 0.1127 U DIMENSION 0.1128
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.5413, 0.0766
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-10.8999*	0.4339	21	-3.4294	0.3826	41	-3.3777	-0.2554
2	-10.8547	0.4708	22	-3.0757	0.3899	42	-3.8258	-0.3045
3	-10.4881	0.4512	23	-2.7221	0.3977	43	-4.1856	-0.3364
4	-10.1227	0.4332	24	-2.2799	0.4084	44	-4.6368	-0.3668
5	-9.6679	0.4129	25	-1.9259	0.4177	45	-4.9986	-0.3837
6	-9.3053	0.3985	26	-1.5718	0.4276	46	-5.3611	-0.3939
7	-8.9439	0.3856	27	-1.1287	0.4410	47	-5.8161	-0.3967
8	-8.4936	0.3725	28	-0.7738	0.4525	48	-6.1807	-0.3903
9	-8.1344	0.3645	29	-0.3297	0.4679	49	-6.5456	-0.3760
10	-7.7762	0.3580	30	-0.2407	0.4712	50	-7.0015	-0.3472
11	-7.3296	0.3518	31	-0.1972*	0.4340	51	-7.3660	-0.3155
12	-6.9732	0.3485	32	-0.2274	0.3979	52	-7.8209	-0.2651
13	-6.5286	0.3465	33	-0.3126	0.3728	53	-8.1841	-0.2162
14	-6.1737	0.3466	34	-0.7409	0.2532	54	-8.5465	-0.1597
15	-5.8193	0.3483	35	-1.0861	0.1646	55	-8.9979	-0.0785
16	-5.3766	0.3525	36	-1.5208	0.0627	56	-9.3577	-0.0037
17	-5.0220	0.3568	37	-1.8708	-0.0117	57	-9.7161	0.0787
18	-4.6678	0.3616	38	-2.2227	-0.0796	58	-10.1618	0.1919
19	-4.2253	0.3683	39	-2.6650	-0.1554	59	-10.5163	0.2907
20	-3.8715	0.3743	40	-3.0206	-0.2087	60	-10.8688	0.3966

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSUR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
22.8600	-23.645 -23D 38M 40S	0.7538	5.0800	0.039	0.038

LEADING EDGE AXIAL TANGENT POINT -9.9410

Q DIMENSION 0.1139 U DIMENSION 0.1138
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.6679, 0.1986
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-11.0982*	0.5705	21	-3.5293	0.5073	41	-3.4759	-0.1394
2	-11.0526	0.6077	22	-3.1708	0.5154	42	-3.9302	-0.1898
3	-10.6814	0.5855	23	-2.8122	0.5242	43	-4.2950	-0.2225
4	-10.3115	0.5652	24	-2.3639	0.5363	44	-4.7523	-0.2536
5	-9.8508	0.5424	25	-2.0050	0.5469	45	-5.1191	-0.2707
6	-9.4837	0.5268	26	-1.6459	0.5582	46	-5.4865	-0.2808
7	-9.1175	0.5142	27	-1.1966	0.5735	47	-5.9475	-0.2834
8	-8.6614	0.5008	28	-0.8368	0.5867	48	-6.3170	-0.2765
9	-8.2975	0.4917	29	-0.3863	0.6044	49	-6.6866	-0.2616
10	-7.9346	0.4843	30	-0.2962	0.6081	50	-7.1485	-0.2319
11	-7.4821	0.4771	31	-0.2519*	0.5706	51	-7.5178	-0.1992
12	-7.1210	0.4732	32	-0.2825	0.5338	52	-7.9787	-0.1473
13	-6.6705	0.4706	33	-0.3688	0.5079	53	-8.3466	-0.0970
14	-6.3107	0.4703	34	-0.8030	0.3846	54	-8.7137	-0.0389
15	-5.9515	0.4716	35	-1.1530	0.2932	55	-9.1710	0.0445
16	-5.5028	0.4755	36	-1.5935	0.1881	56	-9.5355	0.1197
17	-5.1435	0.4797	37	-1.9484	0.1115	57	-9.8986	0.2029
18	-4.7845	0.4846	38	-2.3051	0.0416	58	-10.3502	0.3201
19	-4.3360	0.4917	39	-2.7534	-0.0365	59	-10.7094	0.4224
20	-3.9774	0.4982	40	-3.1140	-0.0913	60	-11.0666	0.5323

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
24.1300	-23.360 -23D 21M 34S	0.7629	5.0800	0.039	0.038

LEADING EDGE AXIAL TANGENT POINT-10.0930

Q DIMENSION 0.1146 U DIMENSION 0.1148
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.7946, 0.3190
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-11.2958*	0.7068	21	-3.6295	0.6289	41	-3.5742	-0.0264
2	-11.2498	0.7443	22	-3.2662	0.6379	42	-4.0347	-0.0783
3	-10.8740	0.7208	23	-2.9028	0.6479	43	-4.4044	-0.1118
4	-10.4995	0.7002	24	-2.4484	0.6617	44	-4.8680	-0.1436
5	-10.0332	0.6770	25	-2.0846	0.6738	45	-5.2398	-0.1609
6	-9.6614	0.6605	26	-1.7205	0.6869	46	-5.6122	-0.1709
7	-9.2908	0.6457	27	-1.2650	0.7046	47	-6.0793	-0.1729
8	-8.8289	0.6298	28	-0.9002	0.7199	48	-6.4537	-0.1654
9	-8.4604	0.6191	29	-0.4435	0.7404	49	-6.8281	-0.1496
10	-8.0929	0.6101	30	-0.3520	0.7447	50	-7.2961	-0.1185
11	-7.6346	0.6014	31	-0.3070*	0.7069	51	-7.6701	-0.0844
12	-7.2687	0.5964	32	-0.3379	0.6694	52	-8.1369	-0.0303
13	-6.8123	0.5926	33	-0.4254	0.6426	53	-8.5096	0.0220
14	-6.4478	0.5915	34	-0.8652	0.5150	54	-8.8814	0.0824
15	-6.0839	0.5923	35	-1.2199	0.4205	55	-9.3446	0.1691
16	-5.6292	0.5956	36	-1.6664	0.3118	56	-9.7137	0.2474
17	-5.2652	0.5996	37	-2.0259	0.2326	57	-10.0813	0.3335
18	-4.9014	0.6045	38	-2.3875	0.1603	58	-10.5385	0.4522
19	-4.4470	0.6119	39	-2.8419	0.0797	59	-10.9022	0.5558
20	-4.0837	0.6189	40	-3.2073	0.0231	60	-11.2638	0.6676

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
25.4000	-23.409 -23D 24M 32S	0.7722	5.0800	0.039	0.039

LEADING EDGE AXIAL TANGENT PCINT-10.2187

Q DIMENSION 0.1159 U DIMENSION 0.1157
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK PCINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -5.9262, 0.4277
CCMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE PCINTS

STATION NO.	X	Y		X	Y		X	Y
1	-11.4959*	0.8415	21	-3.7332	0.7401	41	-3.6745	0.0761
2	-11.4492	0.8793	22	-3.3651	0.7508	42	-4.1411	0.0218
3	-11.0690	0.8527	23	-2.9969	0.7627	43	-4.5158	-0.0132
4	-10.6901	0.8282	24	-2.5364	0.7793	44	-4.9857	-0.0464
5	-10.2182	0.8008	25	-2.1677	0.7939	45	-5.3625	-0.0644
6	-9.8419	0.7813	26	-1.7988	0.8097	46	-5.7400	-0.0748
7	-9.4668	0.7639	27	-1.3371	0.8312	47	-6.2133	-0.0767
8	-8.9992	0.7451	28	-0.9673	0.8497	48	-6.5926	-0.0687
9	-8.6262	0.7324	29	-0.5044	0.8744	49	-6.9720	-0.0523
10	-8.2540	0.7217	30	-0.4117	0.8795	50	-7.4460	-0.0199
11	-7.7899	0.7113	31	-0.3658*	0.8416	51	-7.8250	0.0156
12	-7.4194	0.7052	32	-0.3968	0.8032	52	-8.2979	0.0718
13	-6.9572	0.7004	33	-0.4854	0.7753	53	-8.6754	0.1263
14	-6.5880	0.6988	34	-0.9307	0.6422	54	-9.0520	0.1893
15	-6.2193	0.6991	35	-1.2897	0.5434	55	-9.5210	0.2798
16	-5.7587	0.7023	36	-1.7418	0.4298	56	-9.8948	0.3616
17	-5.3900	0.7065	37	-2.1059	0.3469	57	-10.2670	0.4518
18	-5.0216	0.7118	38	-2.4721	0.2713	58	-10.7297	0.5761
19	-4.5614	0.7202	39	-2.9325	0.1871	59	-11.0978	0.6849
20	-4.1933	0.7283	40	-3.3027	0.1279	60	-11.4636	0.8018

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE GSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
26.6700	-23.690 -23D 41M 22S	0.7814	5.0800	0.040	0.039

LEADING EDGE AXIAL TANGENT POINT-10.3235

Q DIMENSION 0.1172 U DIMENSION 0.1166
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -6.0609, 0.5324
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-11.6969*	0.9741	21	-3.8409	0.8473	41	-3.7790	0.1748
2	-11.6495	1.0122	22	-3.4681	0.8601	42	-4.2517	0.1177
3	-11.2648	0.9808	23	-3.0952	0.8743	43	-4.6313	0.0812
4	-10.8815	0.9522	24	-2.6287	0.8939	44	-5.1072	0.0468
5	-10.4040	0.9202	25	-2.2552	0.9112	45	-5.4889	0.0281
6	-10.0233	0.8976	26	-1.8814	0.9298	46	-5.8713	0.0174
7	-9.6438	0.8774	27	-1.4136	0.9551	47	-6.3506	0.0155
8	-9.1707	0.8558	28	-1.0388	0.9769	48	-6.7346	0.0238
9	-8.7933	0.8412	29	-0.5696	1.0062	49	-7.1187	0.0408
10	-8.4167	0.8289	30	-0.4757	1.0123	50	-7.5987	0.0744
11	-7.9470	0.8169	31	-0.4288*	0.9743	51	-7.9824	0.1112
12	-7.5721	0.8098	32	-0.4600	0.9351	52	-8.4612	0.1695
13	-7.1043	0.8041	33	-0.5496	0.9059	53	-8.8434	0.2261
14	-6.7307	0.8020	34	-1.0002	0.7668	54	-9.2246	0.2916
15	-6.3575	0.8021	35	-1.3636	0.6637	55	-9.6994	0.3859
16	-5.8913	0.8051	36	-1.8214	0.5451	56	-10.0777	0.4713
17	-5.5182	0.8095	37	-2.1901	0.4586	57	-10.4543	0.5656
18	-5.1453	0.8153	38	-2.5610	0.3795	58	-10.9225	0.6960
19	-4.6794	0.8246	39	-3.0273	0.2913	59	-11.2946	0.8102
20	-4.3068	0.8337	40	-3.4024	0.2292	60	-11.6644	0.9333

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
27.9400	-24.036 -24D 2M 9S	0.7892	5.0800	0.040	0.039

LEADING EDGE AXIAL TANGENT POINT-10.4215

G DIMENSION 0.1181 U DIMENSION 0.1175
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -6.1943, 0.6468
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-11.8998*	1.1057	21	-3.9473	0.9651	41	-3.8831	0.2842
2	-11.8516	1.1439	22	-3.5701	0.9785	42	-4.3617	0.2260
3	-11.4621	1.1101	23	-3.1927	0.9935	43	-4.7460	0.1884
4	-11.0740	1.0793	24	-2.7208	1.0145	44	-5.2280	0.1529
5	-10.5906	1.0448	25	-2.3428	1.0332	45	-5.6145	0.1337
6	-10.2053	1.0203	26	-1.9646	1.0534	46	-6.0018	0.1226
7	-9.8210	0.9986	27	-1.4911	1.0810	47	-6.4873	0.1206
8	-9.3420	0.9752	28	-1.1119	1.1050	48	-6.8763	0.1291
9	-8.9600	0.9594	29	-0.6370	1.1373	49	-7.2654	0.1465
10	-8.5788	0.9461	30	-0.5419	1.1441	50	-7.7516	0.1810
11	-8.1034	0.9330	31	-0.4942*	1.1058	51	-8.1402	0.2188
12	-7.7238	0.9253	32	-0.5256	1.0659	52	-8.6252	0.2788
13	-7.2503	0.9191	33	-0.6162	1.0358	53	-9.0122	0.3370
14	-6.8721	0.9167	34	-1.0717	0.8924	54	-9.3982	0.4044
15	-6.4944	0.9167	35	-1.4392	0.7861	55	-9.8790	0.5013
16	-6.0225	0.9199	36	-1.9021	0.6641	56	-10.2619	0.5892
17	-5.6449	0.9245	37	-2.2752	0.5751	57	-10.6430	0.6861
18	-5.2674	0.9308	38	-2.6504	0.4938	58	-11.1167	0.8202
19	-4.7959	0.9408	39	-3.1223	0.4033	59	-11.4932	0.9376
20	-4.4188	0.9506	40	-3.5019	0.3398	60	-11.8671	1.0642

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
29.2100	-24.374 -24D 22M 26S	0.7970	5.0800	0.041	0.040

LEADING EDGE AXIAL TANGENT POINT-10.5194

Q DIMENSION 0.1189 U DIMENSION 0.1184
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -6.3297, 0.7607
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-12.1046*	1.2366	21	-4.0551	1.0824	41	-3.9886	0.3934
2	-12.0555	1.2750	22	-3.6734	1.0968	42	-4.4731	0.3336
3	-11.6613	1.2388	23	-3.2915	1.1129	43	-4.8622	0.2950
4	-11.2683	1.2057	24	-2.8139	1.1356	44	-5.3502	0.2584
5	-10.7790	1.1687	25	-2.4315	1.1556	45	-5.7416	0.2386
6	-10.3888	1.1425	26	-2.0488	1.1774	46	-6.1339	0.2272
7	-9.9998	1.1191	27	-1.5698	1.2072	47	-6.6256	0.2251
8	-9.5150	1.0939	28	-1.1860	1.2331	48	-7.0195	0.2337
9	-9.1283	1.0769	29	-0.7056	1.2679	49	-7.4136	0.2516
10	-8.7424	1.0626	30	-0.6094	1.2752	50	-7.9061	0.2870
11	-8.2612	1.0485	31	-0.5610*	1.2367	51	-8.2997	0.3258
12	-7.8771	1.0402	32	-0.5925	1.1962	52	-8.7908	0.3874
13	-7.3978	1.0334	33	-0.6840	1.1653	53	-9.1827	0.4472
14	-7.0151	1.0308	34	-1.1444	1.0181	54	-9.5735	0.5164
15	-6.6328	1.0307	35	-1.5160	0.9090	55	-10.0602	0.6160
16	-6.1552	1.0341	36	-1.9841	0.7836	56	-10.4477	0.7063
17	-5.7730	1.0389	37	-2.3615	0.6923	57	-10.8335	0.8060
18	-5.3910	1.0456	38	-2.7411	0.6088	58	-11.3127	0.9437
19	-4.9138	1.0563	39	-3.2186	0.5158	59	-11.6935	1.0644
20	-4.5322	1.0668	40	-3.6027	0.4505	60	-12.0717	1.1944

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
30.4800	-24.704 -24D 42M 14S	0.8045	5.0800	0.041	0.040

LEADING EDGE AXIAL TANGENT POINT-10.6174

Q DIMENSION 0.1198 U DIMENSION 0.1192
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -6.4666; 0.8740
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-12.3111*	1.3668	21	-4.1642	1.1990	41	-4.0954	0.5020
2	-12.2612	1.4055	22	-3.7780	1.2144	42	-4.5858	0.4405
3	-11.8621	1.3668	23	-3.3916	1.2317	43	-4.9797	0.4008
4	-11.4643	1.3315	24	-2.9084	1.2559	44	-5.4738	0.3633
5	-10.9690	1.2920	25	-2.5216	1.2774	45	-5.8701	0.3428
6	-10.5740	1.2639	26	-2.1343	1.3008	46	-6.2673	0.3311
7	-10.1803	1.2390	27	-1.6498	1.3327	47	-6.7652	0.3288
8	-9.6896	1.2120	28	-1.2616	1.3605	48	-7.1642	0.3376
9	-9.2981	1.1938	29	-0.7755	1.3978	49	-7.5633	0.3559
10	-8.9076	1.1785	30	-0.6782	1.4057	50	-8.0620	0.3922
11	-8.4206	1.1633	31	-0.6291*	1.3641	51	-8.4606	0.4320
12	-8.0318	1.1544	32	-0.6608	1.3258	52	-8.9578	0.4953
13	-7.5468	1.1470	33	-0.7533	1.2941	53	-9.3547	0.5567
14	-7.1594	1.1442	34	-1.2185	1.1431	54	-9.7504	0.6277
15	-6.7726	1.1440	35	-1.5941	1.0312	55	-10.2430	0.7301
16	-6.2893	1.1475	36	-2.0675	0.9026	56	-10.6352	0.8228
17	-5.9025	1.1527	37	-2.4491	0.8088	57	-11.0256	0.9251
18	-5.5160	1.1597	38	-2.8331	0.7231	58	-11.5104	1.0665
19	-5.0331	1.1711	39	-3.3162	0.6277	59	-11.8956	1.1905
20	-4.6469	1.1824	40	-3.7049	0.5606	60	-12.2780	1.3240

* INDICATES EXTREME POINTS

Table 10. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
31.7500	-25.02o -25D 1M 35S	0.8119	5.0800	0.042	0.041

LEADING EDGE AXIAL TANGENT POINT-10.7154

Q DIMENSION 0.1206 U DIMENSION 0.1201
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -6.6051, 0.9866
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-12.5193*	1.4964	21	-4.2746	1.3150	41	-4.2036	0.6099
2	-12.4686	1.5353	22	-3.8839	1.3314	42	-4.6999	0.5468
3	-12.0646	1.4942	23	-3.4931	1.3498	43	-5.0986	0.5060
4	-11.6619	1.4567	24	-3.0042	1.3757	44	-5.5987	0.4674
5	-11.1605	1.4146	25	-2.6129	1.3986	45	-5.9999	0.4464
6	-10.7608	1.3847	26	-2.2212	1.4236	46	-6.4020	0.4342
7	-10.3622	1.3582	27	-1.7310	1.4576	47	-6.9062	0.4318
8	-9.8656	1.3295	28	-1.3384	1.4872	48	-7.3102	0.4408
9	-9.4694	1.3100	29	-0.8468	1.5271	49	-7.7143	0.4596
10	-9.0742	1.2937	30	-0.7484	1.5355	50	-8.2193	0.4968
11	-8.5813	1.2775	31	-0.6985*	1.4937	51	-8.6229	0.5376
12	-8.1879	1.2679	32	-0.7304	1.4548	52	-9.1264	0.6025
13	-7.6971	1.2600	33	-0.8238	1.4223	53	-9.5281	0.6655
14	-7.3051	1.2569	34	-1.2939	1.2674	54	-9.9287	0.7384
15	-6.9137	1.2567	35	-1.6736	1.1527	55	-10.4273	0.8434
16	-6.4247	1.2603	36	-2.1521	1.0208	56	-10.8243	0.9385
17	-6.0334	1.2658	37	-2.5380	0.9246	57	-11.2192	1.0435
18	-5.6423	1.2732	38	-2.9264	0.8368	58	-11.7098	1.1887
19	-5.1537	1.2853	39	-3.4151	0.7389	59	-12.0993	1.3159
20	-4.7630	1.2973	40	-3.8084	0.6701	60	-12.4860	1.4529

* INDICATES EXTREME POINTS

Table 11. Airfoil Manufacturing Coordinates - Stator 1
(English Units)[1]

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
5.0000	-31.280 -31D 16M 49S	0.2694	2.0000	0.014	0.013

LEADING EDGE AXIAL TANGENT POINT -3.3296

Q DIMENSION 0.0408 U DIMENSION 0.0419
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -1.8290, -0.3395
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.7803*	-0.1872	21	-1.0753	-0.2423	41	-1.0594	-0.4735
2	-3.7635	-0.1737	22	-0.9459	-0.2385	42	-1.2247	-0.4918
3	-3.6325	-0.1809	23	-0.8165	-0.2338	43	-1.3573	-0.5029
4	-3.5019	-0.1881	24	-0.6544	-0.2266	44	-1.5234	-0.5125
5	-3.3389	-0.1967	25	-0.5246	-0.2197	45	-1.6565	-0.5166
6	-3.2087	-0.2033	26	-0.3946	-0.2120	46	-1.7897	-0.5178
7	-3.0788	-0.2097	27	-0.2319	-0.2008	47	-1.9561	-0.5149
8	-2.9166	-0.2171	28	-0.1014	-0.1908	48	-2.0891	-0.5092
9	-2.7871	-0.2226	29	0.0620	-0.1768	49	-2.2218	-0.5006
10	-2.6576	-0.2277	30	0.0947	-0.1738	50	-2.3873	-0.4859
11	-2.4960	-0.2334	31	0.1111*	-0.1863	51	-2.5192	-0.4710
12	-2.3668	-0.2375	32	0.1003	-0.2001	52	-2.6834	-0.4487
13	-2.2053	-0.2417	33	0.0691	-0.2109	53	-2.8142	-0.4278
14	-2.0762	-0.2445	34	-0.0880	-0.2626	54	-2.9443	-0.4045
15	-1.9471	-0.2466	35	-0.2149	-0.3005	55	-3.1059	-0.3720
16	-1.7857	-0.2484	36	-0.3748	-0.3438	56	-3.2343	-0.3435
17	-1.6566	-0.2490	37	-0.5037	-0.3750	57	-3.3619	-0.3127
18	-1.5274	-0.2489	38	-0.6334	-0.4032	58	-3.5200	-0.2714
19	-1.3660	-0.2477	39	-0.7965	-0.4341	59	-3.6455	-0.2362
20	-1.2369	-0.2458	40	-0.9277	-0.4553	60	-3.7698	-0.1991

* INDICATES EXTREME POINTS

1. Dimensions in inches, angles in degrees
   All listed values pertain to the manufacturing sections

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
5.5000	-29.938 -29D 56M 16S	0.2723	2.0000	0.014	0.013

LEADING EDGE AXIAL TANGENT POINT -3.3993

Q DIMENSION 0.0417 U DIMENSION 0.0422
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -1.8781, -0.2840
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.8405*	-0.1396	21	-1.1169	-0.1827	41	-1.1004	-0.4161
2	-3.8237	-0.1257	22	-0.9867	-0.1795	42	-1.2604	-0.4341
3	-3.6916	-0.1322	23	-0.8563	-0.1756	43	-1.3996	-0.4451
4	-3.5598	-0.1385	24	-0.6931	-0.1696	44	-1.5664	-0.4549
5	-3.3955	-0.1461	25	-0.5624	-0.1640	45	-1.7001	-0.4594
6	-3.2644	-0.1519	26	-0.4315	-0.1575	46	-1.8338	-0.4611
7	-3.1335	-0.1574	27	-0.2675	-0.1483	47	-2.0011	-0.4591
8	-2.9701	-0.1638	28	-0.1361	-0.1400	48	-2.1348	-0.4542
9	-2.8397	-0.1685	29	0.0286	-0.1283	49	-2.2684	-0.4464
10	-2.7094	-0.1728	30	0.0616	-0.1258	50	-2.4349	-0.4327
11	-2.5467	-0.1775	31	0.0779*	-0.1388	51	-2.5676	-0.4187
12	-2.4167	-0.1808	32	0.0670	-0.1525	52	-2.7332	-0.3973
13	-2.2542	-0.1842	33	0.0355	-0.1629	53	-2.8650	-0.3773
14	-2.1244	-0.1862	34	-0.1230	-0.2126	54	-2.9962	-0.3547
15	-1.9945	-0.1877	35	-0.2508	-0.2491	55	-3.1592	-0.3230
16	-1.8322	-0.1888	36	-0.4119	-0.2908	56	-3.2888	-0.2950
17	-1.7022	-0.1890	37	-0.5417	-0.3208	57	-3.4176	-0.2648
18	-1.5722	-0.1887	38	-0.6721	-0.3480	58	-3.5774	-0.2239
19	-1.4097	-0.1874	39	-0.8362	-0.3779	59	-3.7042	-0.1888
20	-1.2796	-0.1857	40	-0.9681	-0.3985	60	-3.8299	-0.1518

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.0000	-28.615 -28D 36M 52S	0.2755	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT -3.4690

Q DIMENSION 0.0425 U DIMENSION 0.0425
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -1.9260, -0.2271
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.9006*	-0.0907	21	-1.1563	-0.1217	41	-1.1391	-0.3576
2	-3.8837	-0.0762	22	-1.0252	-0.1191	42	-1.3060	-0.3752
3	-3.7503	-0.0820	23	-0.8938	-0.1160	43	-1.4398	-0.3862
4	-3.6174	-0.0875	24	-0.7295	-0.1112	44	-1.6074	-0.3961
5	-3.4516	-0.0941	25	-0.5978	-0.1068	45	-1.7417	-0.4010
6	-3.3193	-0.0991	26	-0.4659	-0.1017	46	-1.8761	-0.4032
7	-3.1873	-0.1038	27	-0.3007	-0.0944	47	-2.0445	-0.4021
8	-3.0227	-0.1091	28	-0.1684	-0.0877	48	-2.1790	-0.3980
9	-2.8912	-0.1130	29	-0.0025	-0.0784	49	-2.3135	-0.3911
10	-2.7599	-0.1165	30	0.0307	-0.0764	50	-2.4813	-0.3784
11	-2.5961	-0.1203	31	0.0471*	-0.0898	51	-2.6152	-0.3651
12	-2.4651	-0.1228	32	0.0360	-0.1034	52	-2.7820	-0.3448
13	-2.3016	-0.1252	33	0.0042	-0.1134	53	-2.9149	-0.3255
14	-2.1709	-0.1266	34	-0.1556	-0.1612	54	-3.0473	-0.3036
15	-2.0402	-0.1275	35	-0.2844	-0.1963	55	-3.2119	-0.2728
16	-1.8768	-0.1277	36	-0.4466	-0.2364	56	-3.3428	-0.2453
17	-1.7459	-0.1275	37	-0.5773	-0.2653	57	-3.4729	-0.2155
18	-1.6149	-0.1270	38	-0.7085	-0.2915	58	-3.6344	-0.1750
19	-1.4512	-0.1257	39	-0.8735	-0.3204	59	-3.7626	-0.1401
20	-1.3202	-0.1242	40	-1.0061	-0.3404	60	-3.8897	-0.1031

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.5000	-27.413 -27D 24M 46S	0.2790	2.0000	0.015	0.014

LEADING EDGE AXIAL TANGENT POINT -3.5411

Q DIMENSION 0.0431 U DIMENSION 0.0429
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -1.9738, -0.1724
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-3.9667*	-0.0394	21	-1.1934	-0.0615	41	-1.1751	-0.2999
2	-3.9496	-0.0257	22	-1.0612	-0.0593	42	-1.3428	-0.3175
3	-3.8129	-0.0327	23	-0.9289	-0.0567	43	-1.4773	-0.3287
4	-3.6768	-0.0392	24	-0.7633	-0.0529	44	-1.6458	-0.3391
5	-3.5074	-0.0466	25	-0.6307	-0.0494	45	-1.7808	-0.3447
6	-3.3734	-0.0510	26	-0.4979	-0.0454	46	-1.9159	-0.3477
7	-3.2402	-0.0546	27	-0.3315	-0.0397	47	-2.0853	-0.3479
8	-3.0741	-0.0586	28	-0.1982	-0.0345	48	-2.2209	-0.3448
9	-2.9415	-0.0615	29	-0.0312	-0.0273	49	-2.3564	-0.3389
10	-2.8092	-0.0639	30	0.0023	-0.0257	50	-2.5256	-0.3275
11	-2.6440	-0.0664	31	0.0187*	-0.0394	51	-2.6607	-0.3153
12	-2.5120	-0.0679	32	0.0074	-0.0530	52	-2.8291	-0.2962
13	-2.3473	-0.0692	33	-0.0246	-0.0627	53	-2.9633	-0.2779
14	-2.2156	-0.0697	34	-0.1856	-0.1088	54	-3.0970	-0.2570
15	-2.0840	-0.0696	35	-0.3154	-0.1428	55	-3.2634	-0.2272
16	-1.9194	-0.0689	36	-0.4787	-0.1816	56	-3.3958	-0.2005
17	-1.7874	-0.0680	37	-0.6101	-0.2097	57	-3.5274	-0.1712
18	-1.6555	-0.0669	38	-0.7422	-0.2352	58	-3.6930	-0.1291
19	-1.4905	-0.0654	39	-0.9081	-0.2633	59	-3.8246	-0.0925
20	-1.3585	-0.0639	40	-1.0414	-0.2829	60	-3.9554	-0.0533

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.0000	-26.541 -26D 32M 27S	0.2827	2.0000	0.015	0.014

LEADING EDGE AXIAL TANGENT POINT -3.6191

Q DIMENSION 0.0434 U DIMENSION 0.0433
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.0275, -0.1232
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.0497*	0.0120	21	-1.2284	-0.0069	41	-1.2078	-0.2479
2	-4.0324	0.0260	22	-1.0952	-0.0044	42	-1.3767	-0.2665
3	-3.8936	0.0190	23	-0.9619	-0.0016	43	-1.5125	-0.2787
4	-3.7555	0.0125	24	-0.7951	0.0022	44	-1.6829	-0.2905
5	-3.5835	0.0049	25	-0.6615	0.0055	45	-1.8196	-0.2972
6	-3.4464	-0.0005	26	-0.5277	0.0091	46	-1.9565	-0.3014
7	-3.3099	-0.0053	27	-0.3602	0.0141	47	-2.1285	-0.3029
8	-3.1398	-0.0105	28	-0.2260	0.0186	48	-2.2604	-0.3007
9	-3.0041	-0.0140	29	-0.0578	0.0247	49	-2.4044	-0.2955
10	-2.8689	-0.0168	30	-0.0242	0.0260	50	-2.5770	-0.2846
11	-2.7002	-0.0195	31	-0.0076*	0.0121	51	-2.7149	-0.2724
12	-2.5657	-0.0209	32	-0.0190	-0.0016	52	-2.8870	-0.2530
13	-2.3979	-0.0218	33	-0.0512	-0.0111	53	-3.0244	-0.2341
14	-2.2640	-0.0217	34	-0.2132	-0.0565	54	-3.1614	-0.2123
15	-2.1304	-0.0208	35	-0.3437	-0.0901	55	-3.3320	-0.1809
16	-1.9633	-0.0189	36	-0.5079	-0.1285	56	-3.4679	-0.1526
17	-1.8294	-0.0170	37	-0.6400	-0.1565	57	-3.6032	-0.1215
18	-1.6957	-0.0151	38	-0.7727	-0.1820	58	-3.7714	-0.0787
19	-1.5286	-0.0124	39	-0.9394	-0.2104	59	-3.9052	-0.0416
20	-1.3950	-0.0100	40	-1.0734	-0.2304	60	-4.0381	-0.0020

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.5000	-25.675 -25D 40M 30S	0.2863	2.0000	0.015	0.014

LEADING EDGE AXIAL TANGENT POINT -3.6974

Q DIMENSION	0.0437	U DIMENSION	0.0436
R DIMENSION	0.0750	S DIMENSION	0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.0800, -0.0712
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.1318*	0.0643	21	-1.2696	0.0463	41	-1.2492	-0.1981
2	-4.1143	0.0784	22	-1.1342	0.0489	42	-1.4208	-0.2168
3	-3.9736	0.0715	23	-0.9989	0.0518	43	-1.5586	-0.2291
4	-3.8335	0.0651	24	-0.8296	0.0557	44	-1.7314	-0.2408
5	-3.6591	0.0578	25	-0.6941	0.0591	45	-1.8700	-0.2474
6	-3.5201	0.0526	26	-0.5585	0.0627	46	-2.0089	-0.2515
7	-3.3816	0.0480	27	-0.3889	0.0675	47	-2.1833	-0.2528
8	-3.2090	0.0430	28	-0.2531	0.0717	48	-2.3232	-0.2505
9	-3.0714	0.0397	29	-0.0831	0.0774	49	-2.4631	-0.2450
10	-2.9341	0.0370	30	-0.0491	0.0785	50	-2.6380	-0.2340
11	-2.7631	0.0344	31	-0.0323*	0.0643	51	-2.7778	-0.2217
12	-2.6266	0.0331	32	-0.0438	0.0506	52	-2.9522	-0.2022
13	-2.4564	0.0322	33	-0.0764	0.0410	53	-3.0915	-0.1832
14	-2.3205	0.0323	34	-0.2402	-0.0044	54	-3.2304	-0.1613
15	-2.1848	0.0330	35	-0.3723	-0.0381	55	-3.4035	-0.1298
16	-2.0153	0.0348	36	-0.5386	-0.0769	56	-3.5413	-0.1015
17	-1.8795	0.0365	37	-0.6725	-0.1052	57	-3.6786	-0.0702
18	-1.7438	0.0384	38	-0.8071	-0.1310	58	-3.8493	-0.0273
19	-1.5744	0.0410	39	-0.9764	-0.1599	59	-3.9850	0.0101
20	-1.4389	0.0432	40	-1.1125	-0.1802	60	-4.1200	0.0501

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.0000	-24.857 -24D 51M 23S	0.2898	2.0000	0.015	0.014

LEADING EDGE AXIAL TANGENT POINT -3.7742

Q DIMENSION 0.0440 U DIMENSION 0.0440
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.1313, -0.0197
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.2123*	0.1173	21	-1.3104	0.0991	41	-1.2901	-0.1487
2	-4.1947	0.1316	22	-1.1730	0.1018	42	-1.4641	-0.1677
3	-4.0521	0.1247	23	-1.0357	0.1047	43	-1.6039	-0.1800
4	-3.9101	0.1183	24	-0.8640	0.1086	44	-1.7791	-0.1918
5	-3.7334	0.1110	25	-0.7266	0.1121	45	-1.9196	-0.1984
6	-3.5925	0.1058	26	-0.5892	0.1157	46	-2.0604	-0.2023
7	-3.4521	0.1011	27	-0.4172	0.1206	47	-2.2372	-0.2035
8	-3.2771	0.0962	28	-0.2794	0.1249	48	-2.3769	-0.2010
9	-3.1376	0.0929	29	-0.1070	0.1306	49	-2.5207	-0.1954
10	-2.9984	0.0902	30	-0.0725	0.1318	50	-2.6979	-0.1842
11	-2.8250	0.0877	31	-0.0556*	0.1173	51	-2.8396	-0.1718
12	-2.6865	0.0863	32	-0.0673	0.1033	52	-3.0164	-0.1520
13	-2.5139	0.0854	33	-0.1003	0.0937	53	-3.1575	-0.1328
14	-2.3761	0.0854	34	-0.2666	0.0476	54	-3.2983	-0.1108
15	-2.2385	0.0860	35	-0.4006	0.0134	55	-3.4737	-0.0790
16	-2.0666	0.0877	36	-0.5693	-0.0259	56	-3.6135	-0.0503
17	-1.9288	0.0894	37	-0.7051	-0.0546	57	-3.7526	-0.0187
18	-1.7912	0.0912	38	-0.8417	-0.0808	58	-3.9257	0.0247
19	-1.6194	0.0938	39	-1.0134	-0.1101	59	-4.0634	0.0625
20	-1.4820	0.0960	40	-1.1515	-0.1306	60	-4.2003	0.1029

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.5000	-24.149 -24D 8M 57S	0.2933	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT -3.8472

Q DIMENSION 0.0444 U DIMENSION 0.0444
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.1817, 0.0302
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.2913*	0.1708	21	-1.3501	0.1506	41	-1.3298	-0.1005
2	-4.2735	0.1853	22	-1.2109	0.1535	42	-1.5062	-0.1199
3	-4.1292	0.1776	23	-1.0717	0.1566	43	-1.6479	-0.1324
4	-3.9853	0.1706	24	-0.8976	0.1608	44	-1.8255	-0.1444
5	-3.8062	0.1626	25	-0.7582	0.1645	45	-1.9679	-0.1511
6	-3.6635	0.1569	26	-0.6188	0.1684	46	-2.1107	-0.1551
7	-3.5212	0.1518	27	-0.4444	0.1736	47	-2.2898	-0.1562
8	-3.3439	0.1467	28	-0.3046	0.1782	48	-2.4334	-0.1536
9	-3.2025	0.1435	29	-0.1298	0.1842	49	-2.5770	-0.1480
10	-3.0615	0.1409	30	-0.0948	0.1855	50	-2.7565	-0.1367
11	-2.8857	0.1385	31	-0.0776*	0.1709	51	-2.9000	-0.1242
12	-2.7453	0.1372	32	-0.0895	0.1566	52	-3.0791	-0.1044
13	-2.5703	0.1364	33	-0.1231	0.1468	53	-3.2221	-0.0851
14	-2.4306	0.1365	34	-0.2917	0.0997	54	-3.3647	-0.0629
15	-2.2911	0.1371	35	-0.4276	0.0648	55	-3.5465	-0.0309
16	-2.1168	0.1388	36	-0.5987	0.0247	56	-3.6841	-0.0014
17	-1.9772	0.1405	37	-0.7365	-0.0046	57	-3.8252	0.0310
18	-1.8377	0.1424	38	-0.8751	-0.0313	58	-4.0007	0.0756
19	-1.6635	0.1450	39	-1.0492	-0.0612	59	-4.1403	0.1145
20	-1.5242	0.1474	40	-1.1892	-0.0821	60	-4.2791	0.1562

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.0000	-23.645 -23D 38M 40S	0.2968	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT -3.9138

Q DIMENSION 0.0448 U DIMENSION 0.0448
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.2315, 0.0782
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.3694*	0.2246	21	-1.3895	0.1997	41	-1.3685	-0.0549
2	-4.3514	0.2392	22	-1.2483	0.2029	42	-1.5473	-0.0747
3	-4.2053	0.2305	23	-1.1072	0.2064	43	-1.6909	-0.0876
4	-4.0596	0.2225	24	-0.9307	0.2111	44	-1.8710	-0.0998
5	-3.8783	0.2135	25	-0.7894	0.2153	45	-2.0154	-0.1066
6	-3.7337	0.2074	26	-0.6480	0.2198	46	-2.1600	-0.1106
7	-3.5896	0.2025	27	-0.4711	0.2258	47	-2.3415	-0.1116
8	-3.4100	0.1972	28	-0.3294	0.2310	48	-2.4870	-0.1088
9	-3.2667	0.1936	29	-0.1521	0.2379	49	-2.6325	-0.1030
10	-3.1239	0.1907	30	-0.1166	0.2394	50	-2.8144	-0.0913
11	-2.9457	0.1878	31	-0.0992*	0.2246	51	-2.9598	-0.0784
12	-2.8035	0.1863	32	-0.1112	0.2101	52	-3.1412	-0.0580
13	-2.6262	0.1853	33	-0.1452	0.2000	53	-3.2861	-0.0382
14	-2.4845	0.1851	34	-0.3161	0.1514	54	-3.4306	-0.0153
15	-2.3431	0.1857	35	-0.4539	0.1154	55	-3.6106	0.0175
16	-2.1665	0.1872	36	-0.6274	0.0741	56	-3.7541	0.0471
17	-2.0250	0.1889	37	-0.7671	0.0439	57	-3.8971	0.0799
18	-1.8836	0.1908	38	-0.9075	0.0164	58	-4.0749	0.1260
19	-1.7071	0.1936	39	-1.0840	-0.0144	59	-4.2163	0.1663
20	-1.5659	0.1961	40	-1.2260	-0.0359	60	-4.3569	0.2096

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.5000	-23.360 -23D 21M 34S	0.3003	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT -3.9736

Q DIMENSION 0.0451 U DIMENSION 0.0452
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.2814 , 0.1256
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.4472*	0.2783	21	-1.4289	0.2476	41	-1.4072	-0.0104
2	-4.4290	0.2930	22	-1.2859	0.2512	42	-1.5885	-0.0308
3	-4.2811	0.2838	23	-1.1428	0.2551	43	-1.7340	-0.0440
4	-4.1337	0.2757	24	-0.9639	0.2605	44	-1.9165	-0.0565
5	-3.9501	0.2665	25	-0.8207	0.2653	45	-2.0629	-0.0633
6	-3.8037	0.2600	26	-0.6774	0.2704	46	-2.2095	-0.0673
7	-3.6578	0.2542	27	-0.4980	0.2774	47	-2.3934	-0.0681
8	-3.4759	0.2480	28	-0.3544	0.2834	48	-2.5408	-0.0651
9	-3.3309	0.2437	29	-0.1746	0.2915	49	-2.6882	-0.0589
10	-3.1862	0.2402	30	-0.1386	0.2932	50	-2.8725	-0.0466
11	-3.0057	0.2368	31	-0.1209*	0.2783	51	-3.0197	-0.0332
12	-2.8617	0.2348	32	-0.1330	0.2635	52	-3.2035	-0.0119
13	-2.6820	0.2333	33	-0.1675	0.2530	53	-3.3502	0.0087
14	-2.5385	0.2329	34	-0.3406	0.2028	54	-3.4966	0.0324
15	-2.3952	0.2332	35	-0.4803	0.1655	55	-3.6790	0.0666
16	-2.2162	0.2345	36	-0.6560	0.1228	56	-3.8243	0.0974
17	-2.0729	0.2361	37	-0.7976	0.0916	57	-3.9690	0.1313
18	-1.9297	0.2380	38	-0.9399	0.0631	58	-4.1490	0.1780
19	-1.7508	0.2409	39	-1.1189	0.0314	59	-4.2922	0.2188
20	-1.6077	0.2437	40	-1.2627	0.0091	60	-4.4346	0.2628

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.0000	-23.409 -23D 24M 32S	0.3040	2.0000	0.016	0.015

LEADING EDGE AXIAL TANGENT POINT -4.0231

Q DIMENSION 0.0456 U DIMENSION 0.0456
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.3332, 0.1684
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.5260*	0.3313	21	-1.4698	0.2914	41	-1.4466	0.0300
2	-4.5076	0.3462	22	-1.3248	0.2956	42	-1.6304	0.0086
3	-4.3579	0.3357	23	-1.1799	0.3003	43	-1.7779	-0.0052
4	-4.2087	0.3261	24	-0.9986	0.3068	44	-1.9629	-0.0183
5	-4.0229	0.3153	25	-0.8534	0.3126	45	-2.1112	-0.0254
6	-3.8748	0.3076	26	-0.7082	0.3188	46	-2.2598	-0.0294
7	-3.7271	0.3007	27	-0.5264	0.3273	47	-2.4462	-0.0302
8	-3.5430	0.2933	28	-0.3808	0.3345	48	-2.5955	-0.0271
9	-3.3961	0.2883	29	-0.1986	0.3442	49	-2.7449	-0.0206
10	-3.2496	0.2841	30	-0.1621	0.3463	50	-2.9315	-0.0078
11	-3.0669	0.2800	31	-0.1440*	0.3313	51	-3.0807	0.0061
12	-2.9210	0.2776	32	-0.1562	0.3162	52	-3.2669	0.0283
13	-2.7390	0.2757	33	-0.1911	0.3052	53	-3.4155	0.0497
14	-2.5937	0.2751	34	-0.3664	0.2528	54	-3.5638	0.0745
15	-2.4485	0.2752	35	-0.5077	0.2139	55	-3.7484	0.1102
16	-2.2672	0.2765	36	-0.6857	0.1692	56	-3.8956	0.1424
17	-2.1221	0.2781	37	-0.8291	0.1366	57	-4.0421	0.1779
18	-1.9770	0.2802	38	-0.9733	0.1068	58	-4.2243	0.2268
19	-1.7958	0.2836	39	-1.1545	0.0736	59	-4.3692	0.2696
20	-1.6509	0.2867	40	-1.3003	0.0503	60	-4.5132	0.3157

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.5000	-23.689 -23D 41M 22S	0.3076	2.0000	0.016	0.015

LEADING EDGE AXIAL TANGENT POINT -4.0644

Q DIMENSION 0.0462 U DIMENSION 0.0459
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.3862, 0.2096
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.6051*	0.3835	21	-1.5122	0.3336	41	-1.4878	0.0688
2	-4.5864	0.3985	22	-1.3654	0.3386	42	-1.6739	0.0463
3	-4.4350	0.3861	23	-1.2186	0.3442	43	-1.8253	0.0320
4	-4.2840	0.3749	24	-1.0349	0.3519	44	-2.0107	0.0184
5	-4.0961	0.3623	25	-0.8879	0.3587	45	-2.1610	0.0111
6	-3.9462	0.3534	26	-0.7407	0.3661	46	-2.3115	0.0069
7	-3.7968	0.3455	27	-0.5565	0.3760	47	-2.5002	0.0061
8	-3.6105	0.3369	28	-0.4090	0.3846	48	-2.6514	0.0094
9	-3.4619	0.3312	29	-0.2243	0.3961	49	-2.8026	0.0161
10	-3.3137	0.3264	30	-0.1873	0.3986	50	-2.9916	0.0293
11	-3.1288	0.3216	31	-0.1688*	0.3836	51	-3.1427	0.0438
12	-2.9811	0.3188	32	-0.1811	0.3681	52	-3.3312	0.0667
13	-2.7970	0.3166	33	-0.2164	0.3567	53	-3.4816	0.0890
14	-2.6499	0.3158	34	-0.3938	0.3019	54	-3.6317	0.1148
15	-2.5029	0.3158	35	-0.5369	0.2613	55	-3.8187	0.1519
16	-2.3194	0.3170	36	-0.7171	0.2146	56	-3.9676	0.1856
17	-2.1725	0.3187	37	-0.8623	0.1805	57	-4.1159	0.2227
18	-2.0257	0.3210	38	-1.0083	0.1494	58	-4.3002	0.2740
19	-1.8423	0.3246	39	-1.1919	0.1147	59	-4.4467	0.3190
20	-1.6956	0.3282	40	-1.3395	0.0902	60	-4.5923	0.3675

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
11.0000	-24.036 -24D 2M 9S	0.3107	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT -4.1029

Q DIMENSION 0.0465 U DIMENSION 0.0463
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.4388 , 0.2547
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.6850*	0.4353	21	-1.5541	0.3800	41	-1.5288	0.1119
2	-4.6660	0.4504	22	-1.4056	0.3852	42	-1.7172	0.0890
3	-4.5127	0.4371	23	-1.2570	0.3912	43	-1.8685	0.0742
4	-4.3598	0.4249	24	-1.0712	0.3994	44	-2.0583	0.0602
5	-4.1695	0.4113	25	-0.9224	0.4068	45	-2.2104	0.0526
6	-4.0178	0.4017	26	-0.7735	0.4147	46	-2.3629	0.0483
7	-3.8665	0.3932	27	-0.5871	0.4256	47	-2.5541	0.0475
8	-3.6780	0.3839	28	-0.4377	0.4350	48	-2.7072	0.0508
9	-3.5275	0.3777	29	-0.2508	0.4478	49	-2.8604	0.0577
10	-3.3775	0.3725	30	-0.2133	0.4504	50	-3.0518	0.0713
11	-3.1903	0.3673	31	-0.1946*	0.4354	51	-3.2048	0.0861
12	-3.0409	0.3643	32	-0.2069	0.4197	52	-3.3957	0.1098
13	-2.8545	0.3618	33	-0.2426	0.4078	53	-3.5481	0.1327
14	-2.7056	0.3609	34	-0.4219	0.3513	54	-3.7001	0.1592
15	-2.5568	0.3609	35	-0.5666	0.3095	55	-3.8894	0.1974
16	-2.3711	0.3622	36	-0.7489	0.2614	56	-4.0401	0.2320
17	-2.2224	0.3640	37	-0.8957	0.2264	57	-4.1902	0.2701
18	-2.0738	0.3664	38	-1.0435	0.1944	58	-4.3767	0.3229
19	-1.8881	0.3704	39	-1.2293	0.1588	59	-4.5249	0.3692
20	-1.7397	0.3742	40	-1.3787	0.1338	60	-4.6721	0.4190

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
11.5000	-24.374 -24D 22M 26S	0.3138	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT -4.1415

Q DIMENSION 0.0468 U DIMENSION 0.0466
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.4921, 0.2995
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.7656*	0.4868	21	-1.5965	0.4261	41	-1.5703	0.1549
2	-4.7463	0.5020	22	-1.4462	0.4318	42	-1.7611	0.1313
3	-4.5910	0.4877	23	-1.2959	0.4382	43	-1.9143	0.1161
4	-4.4363	0.4747	24	-1.1078	0.4471	44	-2.1064	0.1017
5	-4.2437	0.4601	25	-0.9573	0.4550	45	-2.2635	0.0939
6	-4.0901	0.4498	26	-0.8066	0.4636	46	-2.4149	0.0894
7	-3.9369	0.4406	27	-0.6180	0.4753	47	-2.6085	0.0886
8	-3.7461	0.4307	28	-0.4669	0.4855	48	-2.7636	0.0920
9	-3.5938	0.4240	29	-0.2778	0.4992	49	-2.9187	0.0990
10	-3.4419	0.4184	30	-0.2399	0.5021	50	-3.1126	0.1130
11	-3.2524	0.4128	31	-0.2209*	0.4869	51	-3.2676	0.1283
12	-3.1012	0.4095	32	-0.2333	0.4709	52	-3.4609	0.1525
13	-2.9125	0.4068	33	-0.2693	0.4588	53	-3.6152	0.1761
14	-2.7618	0.4058	34	-0.4506	0.4008	54	-3.7691	0.2033
15	-2.6113	0.4058	35	-0.5968	0.3579	55	-3.9607	0.2425
16	-2.4233	0.4071	36	-0.7812	0.3085	56	-4.1133	0.2781
17	-2.2728	0.4090	37	-0.9297	0.2725	57	-4.2651	0.3173
18	-2.1225	0.4116	38	-1.0792	0.2397	58	-4.4538	0.3715
19	-1.9346	0.4159	39	-1.2672	0.2031	59	-4.6037	0.4191
20	-1.7843	0.4200	40	-1.4184	0.1774	60	-4.7526	0.4703

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.0000	-24.704 -24D 42M 14S	0.3167	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT -4.1801

Q DIMENSION 0.0472 U DIMENSION 0.0469
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.5460, 0.3441
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.8469*	0.5381	21	-1.6394	0.4721	41	-1.6124	0.1976
2	-4.8272	0.5533	22	-1.4874	0.4781	42	-1.8054	0.1734
3	-4.6701	0.5381	23	-1.3353	0.4849	43	-1.9605	0.1578
4	-4.5135	0.5242	24	-1.1451	0.4945	44	-2.1550	0.1430
5	-4.3185	0.5087	25	-0.9927	0.5029	45	-2.311.	0.1350
6	-4.1630	0.4976	26	-0.8403	0.5121	46	-2.4674	0.1303
7	-4.0080	0.4878	27	-0.6495	0.5247,	47	-2.6635	0.1294
8	-3.8148	0.4772	28	-0.4967	0.5356	48	-2.8205	0.1329
9	-3.6607	0.4700	29	-0.3053	0.5503	49	-2.9777	0.1401
10	-3.5069	0.4640	30	-0.2670	0.5534	50	-3.1740	0.1544
11	-3.3152	0.4580	31	-0.2477*	0.5371	51	-3.3309	0.1701
12	-3.1621	0.4545	32	-0.2601	0.5220	52	-3.5267	0.1950
13	-2.9712	0.4516	33	-0.2966	0.5095	53	-3.6829	0.2192
14	-2.8187	0.4505	34	-0.4797	0.4500	54	-3.8387	0.2471
15	-2.6664	0.4504	35	-0.6276	0.4060	55	-4.0327	0.2874
16	-2.4761	0.4518	36	-0.8140	0.3553	56	-4.1871	0.3239
17	-2.3238	0.4538	37	-0.9642	0.3184	57	-4.3408	0.3642
18	-2.1716	0.4566	38	-1.1154	0.2847	58	-4.5317	0.4199
19	-1.9815	0.4611	39	-1.3056	0.2471	59	-4.6833	0.4687
20	-1.8295	0.4655	40	-1.4586	0.2207	60	-4.8339	0.5213

* INDICATES EXTREME POINTS

Table 11. (Continued)

FAN COMPRESSOR VANE ONE CSC 11864

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.5000	-25.026 -25D 1M 35S	0.3196	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT -4.2187

Q DIMENSION 0.0475 U DIMENSION 0.0473
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES -2.6005; 0.3884
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-4.9289*	0.5891	21	-1.6829	0.5177	41	-1.6549	0.2401
2	-4.9089	0.6044	22	-1.5291	0.5242	42	-1.8503	0.2153
3	-4.7498	0.5883	23	-1.3752	0.5314	43	-2.0073	0.1992
4	-4.5913	0.5735	24	-1.1828	0.5416	44	-2.2042	0.1840
5	-4.3939	0.5569	25	-1.0287	0.5506	45	-2.3622	0.1758
6	-4.2365	0.5452	26	-0.8745	0.5605	46	-2.5205	0.1710
7	-4.0796	0.5347	27	-0.6815	0.5739	47	-2.7190	0.1700
8	-3.8841	0.5234	28	-0.5269	0.5855	48	-2.8780	0.1735
9	-3.7281	0.5158	29	-0.3334	0.6012	49	-3.0371	0.1809
10	-3.5725	0.5093	30	-0.2946	0.6045	50	-3.2359	0.1956
11	-3.3785	0.5030	31	-0.2750*	0.5881	51	-3.3948	0.2117
12	-3.2236	0.4992	32	-0.2875	0.5727	52	-3.5931	0.2372
13	-3.0303	0.4961	33	-0.3243	0.5600	53	-3.7512	0.2620
14	-2.8760	0.4949	34	-0.5094	0.4990	54	-3.9089	0.2907
15	-2.7219	0.4948	35	-0.6589	0.4538	55	-4.1052	0.3321
16	-2.5294	0.4962	36	-0.8473	0.4019	56	-4.2615	0.3695
17	-2.3753	0.4983	37	-0.9992	0.3640	57	-4.4170	0.4108
18	-2.2214	0.5013	38	-1.1521	0.3294	58	-4.6101	0.4680
19	-2.0290	0.5060	39	-1.3445	0.2909	59	-4.7635	0.5181
20	-1.8752	0.5107	40	-1.4994	0.2638	60	-4.9157	0.5720

* INDICATES EXTREME POINTS

Table 12. Airfoil Manufacturing Coordinates - Stator 2
(SI Units)[1]

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
15.2400	-6.870 -6D 52M 11S	0.6711	5.0800	0.035	0.035

LEADING EDGE AXIAL TANGENT POINT -0.0001

Q DIMENSION 0.1077 U DIMENSION 0.1087
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 4.8515, -0.7208
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0377*	-0.3110	21	6.7689	-0.4787	41	6.8539	-1.0494
2	0.0783	-0.2778	22	7.0832	-0.4671	42	6.4520	-1.0978
3	0.4102	-0.3037	23	7.3971	-0.4531	43	6.1280	-1.1277
4	0.7408	-0.3276	24	7.7889	-0.4319	44	5.7204	-1.1540
5	1.1525	-0.3556	25	8.1017	-0.4121	45	5.3926	-1.1662
6	1.4806	-0.3759	26	8.4142	-0.3895	46	5.0634	-1.1705
7	1.8077	-0.3946	27	8.8042	-0.3575	47	4.6515	-1.1651
8	2.2152	-0.4158	28	9.1158	-0.3287	48	4.3215	-1.1528
9	2.5401	-0.4309	29	9.5046	-0.2887	49	3.9910	-1.1336
10	2.8641	-0.4446	30	9.5823	-0.2802	50	3.5775	-1.0996
11	3.2679	-0.4595	31	9.6251*	-0.3153	51	3.2467	-1.0644
12	3.5900	-0.4698	32	9.6027	-0.3449	52	2.8335	-1.0105
13	3.9916	-0.4807	33	9.5306	-0.3728	53	2.5035	-0.9593
14	4.3121	-0.4877	34	9.1662	-0.5052	54	2.1742	-0.9009
15	4.6320	-0.4934	35	8.8698	-0.6027	55	1.7639	-0.8178
16	5.0305	-0.4985	36	8.4936	-0.7138	56	1.4370	-0.7432
17	5.3479	-0.5003	37	8.1883	-0.7940	57	1.1115	-0.6614
18	5.6646	-0.4997	38	7.8794	-0.8667	58	0.7069	-0.5491
19	6.0598	-0.4956	39	7.4886	-0.9466	59	0.3853	-0.4511
20	6.3753	-0.4896	40	7.1726	-1.0019	60	0.0658	-0.3460

* INDICATES EXTREME POINTS

1. Dimensions in centimeters, angles in degrees
   All listed values pertain to the manufacturing sections

Table 12. (Continued)

FAN COMPRESSOR VANE TWO GSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
16.5100	-5.863 -5D 51M 47S	0.6848	5.0800	0.035	0.035

LEADING EDGE AXIAL TANGENT POINT -0.0000

Q DIMENSION 0.1087 U DIMENSION 0.1096
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 4.9190, -0.5766
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0171*	-0.1650	21	6.8636	-0.3260	41	6.9426	-0.9088
2	0.0586	-0.1314	22	7.1847	-0.3144	42	6.5324	-0.9579
3	0.3951	-0.1576	23	7.5056	-0.3006	43	6.2021	-0.9884
4	0.7306	-0.1819	24	7.9062	-0.2798	44	5.7869	-1.0154
5	1.1484	-0.2098	25	8.2264	-0.2605	45	5.4532	-1.0282
6	1.4815	-0.2302	26	8.5463	-0.2386	46	5.1183	-1.0331
7	1.8136	-0.2488	27	8.9460	-0.2076	47	4.6993	-1.0284
8	2.2274	-0.2698	28	9.2654	-0.1799	48	4.3636	-1.0165
9	2.5574	-0.2848	29	9.6645	-0.1415	49	4.0276	-0.9975
10	2.8866	-0.2982	30	9.7443	-0.1333	50	3.6074	-0.9635
11	3.2970	-0.3126	31	9.7874*	-0.1695	51	3.2714	-0.9281
12	3.6246	-0.3225	32	9.7636	-0.1996	52	2.8519	-0.8737
13	4.0330	-0.3327	33	9.6892	-0.2277	53	2.5169	-0.8220
14	4.3590	-0.3391	34	9.3133	-0.3608	54	2.1828	-0.7629
15	4.6845	-0.3441	35	9.0081	-0.4588	55	1.7666	-0.6787
16	5.0902	-0.3482	36	8.6214	-0.5705	56	1.4351	-0.6032
17	5.4137	-0.3492	37	8.3080	-0.6513	57	1.1051	-0.5203
18	5.7366	-0.3480	38	7.9913	-0.7245	58	0.6950	-0.4064
19	6.1397	-0.3433	39	7.5913	-0.8051	59	0.3692	-0.3071
20	6.4617	-0.3371	40	7.2682	-0.8608	60	0.0455	-0.2006

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
17.7800	-4.894 -4D 53M 37S	0.6983	5.0800	0.036	0.035

LEADING EDGE AXIAL TANGENT POINT 0.0000

Q DIMENSION 0.1097 U DIMENSION 0.1104
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 4.9930, -0.4315
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0017*	-0.0185	21	6.9658	-0.1722	41	7.0388	-0.7672
2	0.0439	0.0156	22	7.2938	-0.1608	42	6.6203	-0.8170
3	0.3854	-0.0107	23	7.6217	-0.1471	43	6.2836	-0.8480
4	0.7258	-0.0352	24	8.0313	-0.1268	44	5.8606	-0.8757
5	1.1498	-0.0632	25	8.3589	-0.1080	45	5.5209	-0.8891
6	1.4879	-0.0836	26	8.6864	-0.0869	46	5.1802	-0.8946
7	1.8252	-0.1022	27	9.0957	-0.0571	47	4.7539	-0.8907
8	2.2454	-0.1230	28	9.4232	-0.0304	48	4.4125	-0.8793
9	2.5867	-0.1378	29	9.8325	0.0064	49	4.0708	-0.8604
10	2.9153	-0.1508	30	9.9143	0.0142	50	3.6438	-0.8265
11	3.3325	-0.1648	31	9.9577*	-0.0207	51	3.3025	-0.7910
12	3.6655	-0.1742	32	9.9327	-0.0538	52	2.8764	-0.7361
13	4.0809	-0.1837	33	9.8559	-0.0820	53	2.5364	-0.6839
14	4.4126	-0.1895	34	9.4685	-0.2157	54	2.1974	-0.6241
15	4.7438	-0.1937	35	9.1544	-0.3141	55	1.7751	-0.5390
16	5.1569	-0.1968	36	8.7570	-0.4264	56	1.4389	-0.4624
17	5.4886	-0.1971	37	8.4355	-0.5077	57	1.1043	-0.3785
18	5.8158	-0.1953	38	8.1111	-0.5813	58	0.6886	-0.2631
19	6.2269	-0.1901	39	7.7017	-0.6625	59	0.3584	-0.1625
20	6.5555	-0.1835	40	7.3713	-0.7187	60	0.0304	-0.0546

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
18.4150	-4.422 -4D 25M 20S	0.7049	5.0800	0.036	0.036

LEADING EDGE AXIAL TANGENT POINT 0.0000

Q DIMENSION 0.1103 U DIMENSION 0.1108
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.0324, -0.3586
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0041*	0.0550	21	7.0196	-0.0951	41	7.0896	-0.6961
2	0.0385	0.0893	22	7.3511	-0.0836	42	6.6669	-0.7461
3	0.3824	0.0629	23	7.6825	-0.0701	43	6.3269	-0.7774
4	0.7253	0.0383	24	8.0967	-0.0501	44	5.9000	-0.8055
5	1.1525	0.0103	25	8.4279	-0.0315	45	5.5572	-0.8192
6	1.4932	-0.0101	26	8.7593	-0.0108	46	5.2136	-0.8251
7	1.8330	-0.0286	27	9.1734	0.0185	47	4.7836	-0.8216
8	2.2566	-0.0494	28	9.5049	0.0445	48	4.4393	-0.8103
9	2.5946	-0.0640	29	9.9193	0.0805	49	4.0948	-0.7916
10	2.9318	-0.0769	30	10.0022	0.0881	50	3.6643	-0.7577
11	3.3524	-0.0907	31	10.0457*	0.0527	51	3.3202	-0.7221
12	3.6882	-0.0998	32	10.0200	0.0193	52	2.8909	-0.6671
13	4.1072	-0.1089	33	9.9421	-0.0089	53	2.5483	-0.6145
14	4.4417	-0.1144	34	9.5489	-0.1428	54	2.2067	-0.5545
15	4.7758	-0.1182	35	9.2304	-0.2415	55	1.7815	-0.4688
16	5.1927	-0.1208	36	8.8277	-0.3541	56	1.4429	-0.3919
17	5.5255	-0.1207	37	8.5021	-0.4355	57	1.1059	-0.3074
18	5.8580	-0.1186	38	8.1737	-0.5094	58	0.6874	-0.1913
19	6.2732	-0.1131	39	7.7596	-0.5908	59	0.3549	-0.0900
20	6.6050	-0.1064	40	7.4257	-0.6473	60	0.0247	0.0186

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
19.0500	-3.960 -3D 57M 36S	0.7119	5.0800	0.036	0.036

LEADING EDGE AXIAL TANGENT POINT 0.0000

Q DIMENSION 0.1108 U DIMENSION 0.1112
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.0730, -0.2878
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0087*	0.1285	21	7.0752	-0.0177	41	7.1420	-0.6251
2	0.0342	0.1631	22	7.4102	-0.0063	42	6.7145	-0.6766
3	0.3805	0.1360	23	7.7451	0.0071	43	6.3709	-0.7089
4	0.7258	0.1110	24	8.1638	0.0269	44	5.9397	-0.7382
5	1.1560	0.0824	25	8.4988	0.0451	45	5.5937	-0.7527
6	1.4991	0.0616	26	8.8339	0.0655	46	5.2469	-0.7592
7	1.8414	0.0427	27	9.2530	0.0941	47	4.8131	-0.7563
8	2.2681	0.0216	28	9.5885	0.1196	48	4.4658	-0.7453
9	2.6087	0.0068	29	10.0080	0.1547	49	4.1185	-0.7267
10	2.9485	-0.0062	30	10.0920	0.1622	50	3.6846	-0.6927
11	3.3725	-0.0199	31	10.1356*	0.1262	51	3.3379	-0.6569
12	3.7110	-0.0289	32	10.1093	0.0925	52	2.9054	-0.6013
13	4.1335	-0.0377	33	10.0301	0.0643	53	2.5603	-0.5483
14	4.4710	-0.0428	34	9.6312	-0.0699	54	2.2164	-0.4876
15	4.8081	-0.0461	35	9.3082	-0.1687	55	1.7882	-0.4010
16	5.2289	-0.0479	36	8.9002	-0.2815	56	1.4474	-0.3231
17	5.5650	-0.0470	37	8.5705	-0.3632	57	1.1082	-0.2377
18	5.9008	-0.0441	38	8.2382	-0.4373	58	0.6870	-0.1203
19	6.3204	-0.0375	39	7.8193	-0.5190	59	0.3524	-0.0179
20	6.6560	-0.0299	40	7.4817	-0.5757	60	0.0202	0.0919

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO- CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
20.3200	-3.312 -3D 18M 42S	0.7236	5.0800	0.037	0.036

LEADING EDGE AXIAL TANGENT POINT 0.0002

Q DIMENSION 0.1118 U DIMENSION 0.1120
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.1460, -0.1436
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0157*	0.2759	21	7.1727	0.1299	41	7.2357	-0.4886
2	0.0278	0.3110	22	7.5136	0.1415	42	6.8016	-0.5398
3	0.3789	0.2843	23	7.8546	0.1550	43	6.4528	-0.5719
4	0.7290	0.2596	24	8.2810	0.1749	44	6.0153	-0.6009
5	1.1652	0.2312	25	8.6224	0.1933	45	5.6643	-0.6152
6	1.5132	0.2107	26	8.9640	0.2137	46	5.3126	-0.6215
7	1.8603	0.1920	27	9.3915	0.2423	47	4.8725	-0.6184
8	2.2931	0.1711	28	9.7339	0.2678	48	4.5203	-0.6072
9	2.6386	0.1564	29	10.1625	0.3028	49	4.1681	-0.5882
10	2.9833	0.1435	30	10.2483	0.3102	50	3.7281	-0.5537
11	3.4134	0.1298	31	10.2923*	0.2734	51	3.3766	-0.5174
12	3.7569	0.1208	32	10.2649	0.2392	52	2.9382	-0.4611
13	4.1856	0.1120	33	10.1837	0.2105	53	2.5885	-0.4074
14	4.5281	0.1069	34	9.7749	0.0744	54	2.2398	-0.3461
15	4.8702	0.1036	35	9.4444	-0.0258	55	1.8058	-0.2585
16	5.2973	0.1018	36	9.0273	-0.1403	56	1.4603	-0.1799
17	5.6386	0.1025	37	8.6908	-0.2232	57	1.1166	-0.0937
18	5.9797	0.1051	38	8.3518	-0.2983	58	0.6896	0.0248
19	6.4058	0.1112	39	7.9249	-0.3813	59	0.3505	0.1280
20	6.7467	0.1183	40	7.5812	-0.4389	60	0.0136	0.2387

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
21.5900	-2.799 -2D 47M 57S	0.7347	5.0800	0.037	0.037

LEADING EDGE AXIAL TANGENT POINT 0.0003

Q DIMENSION 0.1128 U DIMENSION 0.1130
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.2180, 0.0081
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0203*	0.4234	21	7.2727	0.2879	41	7.3329	-0.3411
2	0.0237	0.4592	22	7.6190	0.2989	42	6.8923	-0.3923
3	0.3797	0.4336	23	7.9653	0.3118	43	6.5384	-0.4244
4	0.7346	0.4099	24	8.3986	0.3307	44	6.0946	-0.4535
5	1.1769	0.3828	25	8.7455	0.3480	45	5.7386	-0.4679
6	1.5297	0.3631	26	9.0927	0.3674	46	5.3820	-0.4744
7	1.8818	0.3452	27	9.5272	0.3945	47	4.9358	-0.4716
8	2.3207	0.3253	28	9.8752	0.4185	48	4.5787	-0.4605
9	2.6710	0.3114	29	10.3110	0.4516	49	4.2216	-0.4417
10	3.0207	0.2991	30	10.3982	0.4586	50	3.7756	-0.4073
11	3.4570	0.2862	31	10.4425*	0.4209	51	3.4193	-0.3711
12	3.8055	0.2777	32	10.4143	0.3862	52	2.9748	-0.3148
13	4.2404	0.2695	33	10.3315	0.3576	53	2.6203	-0.2611
14	4.5878	0.2649	34	9.9148	0.2217	54	2.2669	-0.1997
15	4.9350	0.2619	35	9.5782	0.1215	55	1.8269	-0.1121
16	5.3684	0.2605	36	9.1537	0.0071	56	1.4767	-0.0334
17	5.7149	0.2613	37	8.8113	-0.0757	57	1.1281	0.0529
18	6.0612	0.2640	38	8.4667	-0.1508	58	0.6952	0.1716
19	6.4939	0.2699	39	8.0329	-0.2337	59	0.3512	0.2750
20	6.8400	0.2767	40	7.6838	-0.2913	60	0.0095	0.3859

* INDICATES EXTREME POINTS

Table 12. (Continued

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
22.8600	-2.332 -2D 19M 53S	0.7454	5.0800	0.038	0.037

LEADING EDGE AXIAL TANGENT POINT 0.0005

Q DIMENSION 0.1138 U DIMENSION 0.1140
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.2918, 0.1603
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0227*	0.5711	21	7.3747	0.4463	41	7.4325	-0.1927
2	0.0218	0.6076	22	7.7262	0.4568	42	6.9854	-0.2440
3	0.3826	0.5831	23	8.0780	0.4690	43	6.6264	-0.2762
4	0.7424	0.5605	24	8.5179	0.4869	44	6.1763	-0.3054
5	1.1908	0.5346	25	8.8703	0.5032	45	5.8154	-0.3200
6	1.5485	0.5159	26	9.2229	0.5215	46	5.4538	-0.3267
7	1.9054	0.4989	27	9.6643	0.5469	47	5.0015	-0.3241
8	2.3505	0.4800	28	10.0180	0.5695	48	4.6395	-0.3132
9	2.7057	0.4668	29	10.4608	0.6005	49	4.2775	-0.2946
10	3.0603	0.4552	30	10.5494	0.6071	50	3.8254	-0.2603
11	3.5028	0.4430	31	10.5940*	0.5711	51	3.4643	-0.2241
12	3.8562	0.4351	32	10.5650	0.5335	52	3.0139	-0.1679
13	4.2973	0.4275	33	10.4807	0.5049	53	2.6545	-0.1142
14	4.6498	0.4233	34	10.0564	0.3693	54	2.2963	-0.0528
15	5.0020	0.4206	35	9.7138	0.2693	55	1.8504	0.0348
16	5.4418	0.4196	36	9.2820	0.1552	56	1.4953	0.1135
17	5.7934	0.4206	37	8.9340	0.0725	57	1.1420	0.1999
18	6.1448	0.4233	38	8.5837	-0.0025	58	0.7030	0.3187
19	6.5840	0.4291	39	8.1431	-0.0854	59	0.3542	0.4221
20	6.9354	0.4357	40	7.7886	-0.1429	60	0.0077	0.5332

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
24.1300	-1.910 -1D 54M 36S	0.7556	5.0800	0.038	0.038

LEADING EDGE AXIAL TANGENT POINT 0.0006

Q DIMENSION 0.1148 U DIMENSION 0.1150
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES -- 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.2670, 0.3095
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0233*	0.7189	21	7.4782	0.6016	41	7.5341	-0.0473
2	0.0218	0.7560	22	7.8350	0.6118	42	7.0806	-0.0988
3	0.3874	0.7321	23	8.1920	0.6236	43	6.7165	-0.1313
4	0.7521	0.7100	24	8.6386	0.6408	44	6.2600	-0.1609
5	1.2065	0.6848	25	8.9963	0.6566	45	5.8941	-0.1757
6	1.5691	0.6666	26	9.3544	0.6740	46	5.5276	-0.1827
7	1.9309	0.6501	27	9.8026	0.6984	47	5.0690	-0.1803
8	2.3821	0.6318	28	10.1617	0.7199	48	4.7020	-0.1696
9	2.7422	0.6190	29	10.6115	0.7494	49	4.3351	-0.1511
10	3.1018	0.6079	30	10.7015	0.7557	50	3.8769	-0.1168
11	3.5504	0.5963	31	10.7465*	0.7190	51	3.5109	-0.0836
12	3.9088	0.5888	32	10.7168	0.6806	52	3.0544	-0.0243
13	4.3561	0.5816	33	10.6309	0.6523	53	2.6902	0.0296
14	4.7136	0.5777	34	10.1992	0.5164	54	2.3272	0.0913
15	5.0708	0.5754	35	9.8509	0.4163	55	1.8752	0.1793
16	5.5169	0.5748	36	9.4120	0.3019	56	1.5154	0.2584
17	5.8736	0.5760	37	9.0584	0.2190	57	1.1573	0.3453
18	6.2302	0.5789	38	8.7026	0.1437	58	0.7124	0.4647
19	6.6758	0.5847	39	8.2553	0.0606	59	0.3588	0.5688
20	7.0324	0.5912	40	7.8955	0.0028	60	0.0075	0.6806

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
25.4000	-1.536 -1D 32M 9S	0.7653	5.0800	0.039	0.038

LEADING EDGE AXIAL TANGENT POINT 0.0008

Q DIMENSION 0.1157 U DIMENSION 0.1159
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.4433, 0.4541
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0224*	0.8669	21	7.5828	0.7517	41	7.6377	0.0933
2	0.0233	0.9045	22	7.9448	0.7619	42	7.1777	0.0410
3	0.3938	0.8804	23	8.3070	0.7738	43	6.8084	0.0081
4	0.7633	0.8580	24	8.7603	0.7909	44	6.3455	-0.0220
5	1.2238	0.8327	25	9.1232	0.8065	45	5.9745	-0.0372
6	1.5913	0.8144	26	9.4866	0.8239	46	5.6029	-0.0444
7	1.9579	0.7978	27	9.9416	0.8479	47	5.1380	-0.0423
8	2.4152	0.7795	28	10.3061	0.8691	48	4.7660	-0.0317
9	2.7803	0.7668	29	10.7626	0.8982	49	4.3941	-0.0130
10	3.1447	0.7558	30	10.8541	0.9044	50	3.9296	0.0214
11	3.5995	0.7443	31	10.8996*	0.8670	51	3.5587	0.0579
12	3.9628	0.7370	32	10.8692	0.8283	52	3.0960	0.1148
13	4.4163	0.7301	33	10.7819	0.7995	53	2.7269	0.1692
14	4.7788	0.7264	34	10.3432	0.6626	54	2.3590	0.2315
15	5.1409	0.7243	35	9.9893	0.5616	55	1.9011	0.3206
16	5.5933	0.7239	36	9.5436	0.4461	56	1.5365	0.4006
17	5.9551	0.7254	37	9.1845	0.3624	57	1.1736	0.4886
18	6.3168	0.7285	38	8.8234	0.2864	58	0.7228	0.6094
19	6.7688	0.7345	39	8.3694	0.2024	59	0.3646	0.7149
20	7.1305	0.7411	40	8.0043	0.1439	60	0.0088	0.8281

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
26.6700	-1.186 -1D 11M 8S	0.7745	5.0800	0.039	0.039

LEADING EDGE AXIAL TANGENT POINT 0.0009

Q DIMENSION 0.1167 U DIMENSION 0.1168
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.5208, 0.5926
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COCRDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0201*	1.0151	21	7.6885	0.8950	41	7.7434	0.2273
2	0.0264	1.0531	22	8.0557	0.9057	42	7.2768	0.1739
3	0.4017	1.0276	23	8.4231	0.9181	43	6.9023	0.1402
4	0.7760	1.0041	24	8.8828	0.9360	44	6.4329	0.1094
5	1.2426	0.9775	25	9.2510	0.9522	45	6.0566	0.0937
6	1.6150	0.9583	26	9.6197	0.9701	46	5.6799	0.0861
7	1.9865	0.9410	27	10.0812	0.9950	47	5.2085	0.0881
8	2.4499	0.9219	28	10.4511	1.0168	48	4.8313	0.0987
9	2.8198	0.9087	29	10.9144	1.0467	49	4.4543	0.1176
10	3.1892	0.8972	30	11.0071	1.0530	50	3.9834	0.1526
11	3.6501	0.8854	31	11.0533*	1.0151	51	3.6074	0.1897
12	4.0183	0.8779	32	11.0223	0.9759	52	3.1385	0.2476
13	4.4780	0.8709	33	10.9338	0.9466	53	2.7645	0.3030
14	4.8454	0.8672	34	10.4885	0.8073	54	2.3917	0.3666
15	5.2125	0.8652	35	10.1293	0.7046	55	1.9277	0.4574
16	5.6712	0.8651	36	9.6770	0.5870	56	1.5583	0.5391
17	6.0380	0.8669	37	9.3126	0.5018	57	1.1908	0.6289
18	6.4047	0.8703	38	8.9462	0.4243	58	0.7343	0.7523
19	6.8631	0.8768	39	8.4856	0.3387	59	0.3717	0.8600
20	7.2299	0.8839	40	8.1153	0.2790	60	0.0114	0.9756

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
27.9400	-0.844 0D 50M 39S	0.7834	5.0800	0.040	0.039

LEADING EDGE AXIAL TANGENT POINT 0.0010

Q DIMENSION 0.1176 U DIMENSION 0.1178
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.6000, 0.7236
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0161*	1.1634	21	7.7960	1.0299	41	7.8519	0.3532
2	0.0312	1.2016	22	8.1683	1.0417	42	7.3785	0.2981
3	0.4113	1.1736	23	8.5409	1.0553	43	6.9986	0.2633
4	0.7905	1.1479	24	9.0071	1.0748	44	6.5225	0.2314
5	1.2631	1.1186	25	9.3805	1.0924	45	6.1408	0.2152
6	1.6403	1.0976	26	9.7544	1.1119	46	5.7586	0.2072
7	2.0167	1.0787	27	10.2226	1.1389	47	5.2805	0.2091
8	2.4861	1.0579	28	10.5978	1.1626	48	4.8980	0.2200
9	2.8610	1.0435	29	11.0677	1.1949	49	4.5156	0.2392
10	3.2352	1.0310	30	11.1618	1.2017	50	4.0382	0.2752
11	3.7023	1.0182	31	11.2087*	1.1635	51	3.6570	0.3134
12	4.0755	1.0101	32	11.1774	1.1236	52	3.1816	0.3730
13	4.5414	1.0026	33	11.0876	1.0934	53	2.8026	0.4300
14	4.9137	0.9987	34	10.6361	0.9502	54	2.4249	0.4955
15	5.2858	0.9967	35	10.2718	0.8446	55	1.9549	0.5891
16	5.7507	0.9967	36	9.8131	0.7237	56	1.5808	0.6733
17	6.1225	0.9988	37	9.4436	0.6359	57	1.2087	0.7658
18	6.4943	1.0026	38	9.0719	0.5562	58	0.7467	0.8930
19	6.9590	1.0099	39	8.6047	0.4680	59	0.3798	1.0041
20	7.3309	1.0177	40	8.2290	0.4065	60	0.0155	1.1233

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSCR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
29.2100	-0.508 0D 30M 29S	0.7922	5.0800	0.040	0.040

LEADING EDGE AXIAL TANGENT POINT 0.0011

Q DIMENSION 0.1185 U DIMENSION 0.1187
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COCRDINATES 5.6812, 0.8512
COMPRESSOR ROTATION IS CCUNTER CLOCKWISE FROM THE REAR

REFERENCE COCRDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0106*	1.3118	21	7.9053	1.1602	41	7.9626	0.4745
2	0.0376	1.3502	22	8.2828	1.1732	42	7.4824	0.4176
3	0.4225	1.3194	23	8.6606	1.1882	43	7.0969	0.3816
4	0.8065	1.2910	24	9.1334	1.2097	44	6.6139	0.3487
5	1.2852	1.2589	25	9.5121	1.2293	45	6.2267	0.3320
6	1.6672	1.2358	26	9.8913	1.2508	46	5.8390	0.3239
7	2.0484	1.2149	27	10.3661	1.2807	47	5.3540	0.3258
8	2.5240	1.1919	28	10.7467	1.3069	48	4.9660	0.3372
9	2.9037	1.1760	29	11.2234	1.3427	49	4.5783	0.3572
10	3.2829	1.1622	30	11.3189	1.3502	50	4.0942	0.3945
11	3.7561	1.1480	31	11.3666*	1.3118	51	3.7078	0.4340
12	4.1342	1.1389	32	11.3351	1.2711	52	3.2260	0.4957
13	4.6063	1.1306	33	11.2441	1.2400	53	2.8420	0.5548
14	4.9836	1.1262	34	10.7864	1.0918	54	2.4593	0.6224
15	5.3607	1.1239	35	10.4172	0.9825	55	1.9833	0.7192
16	5.8319	1.1239	36	9.9520	0.8575	56	1.6046	0.8062
17	6.2088	1.1261	37	9.5773	0.7667	57	1.2280	0.9018
18	6.5857	1.1302	38	9.2003	0.6843	58	0.7606	1.0332
19	7.0568	1.1382	39	8.7264	0.5931	59	0.3895	1.1478
20	7.4338	1.1468	40	8.3453	0.5295	60	0.0212	1.2709

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
29.8450	-0.343 0D 20M 36S	0.7965	5.0800	0.040	0.040

LEADING EDGE AXIAL TANGENT POINT 0.0011

Q DIMENSION 0.1189 U DIMENSION 0.1191
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.7224, 0.9150
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0072*	1.3860	21	7.9606	1.2254	41	8.0186	0.5351
2	0.0414	1.4244	22	8.3407	1.2390	42	7.5349	0.4773
3	0.4287	1.3923	23	8.7211	1.2547	43	7.1467	0.4408
4	0.8151	1.3626	24	9.1972	1.2772	44	6.6602	0.4073
5	1.2968	1.3290	25	9.5785	1.2976	45	6.2702	0.3904
6	1.6812	1.3048	26	9.9604	1.3202	46	5.8798	0.3822
7	2.0648	1.2830	27	10.4386	1.3515	47	5.3914	0.3842
8	2.5435	1.2589	28	10.8219	1.3790	48	5.0006	0.3958
9	2.9256	1.2422	29	11.3020	1.4166	49	4.6102	0.4162
10	3.3072	1.2278	30	11.3981	1.4245	50	4.1228	0.4541
11	3.7835	1.2128	31	11.4463*	1.3860	51	3.7337	0.4943
12	4.1641	1.2034	32	11.4147	1.3449	52	3.2488	0.5571
13	4.6393	1.1946	33	11.3231	1.3132	53	2.8622	0.6171
14	5.0191	1.1900	34	10.8623	1.1626	54	2.4771	0.6859
15	5.3988	1.1875	35	10.4905	1.0515	55	1.9981	0.7842
16	5.8731	1.1875	36	10.0222	0.9243	56	1.6171	0.8727
17	6.2525	1.1897	37	9.6448	0.8321	57	1.2382	0.9698
18	6.6319	1.1941	38	9.2652	0.7483	58	0.7681	1.1033
19	7.1062	1.2024	39	8.7879	0.6556	59	0.3949	1.2197
20	7.4858	1.2113	40	8.4040	0.5910	60	0.0246	1.3447

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
30.4800	-0.181 0D 10M 51S	0.8007	5.0800	0.041	0.041

LEADING EDGE AXIAL TANGENT POINT 0.0011

Q DIMENSION 0.1194 U DIMENSION 0.1196
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.7641, 0.9788
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0035*	1.4572	21	8.0162	1.2905	41	8.0750	0.5957
2	0.0456	1.4987	22	8.3989	1.3047	42	7.5878	0.5370
3	0.4352	1.4651	23	8.7820	1.3211	43	7.1968	0.4999
4	0.8240	1.4342	24	9.2614	1.3447	44	6.7068	0.4660
5	1.3087	1.3991	25	9.6454	1.3660	45	6.3141	0.4488
6	1.6955	1.3739	26	10.0299	1.3897	46	5.9209	0.4405
7	2.0816	1.3510	27	10.5115	1.4224	47	5.4290	0.4426
8	2.5633	1.3259	28	10.8975	1.4512	48	5.0356	0.4544
9	2.9479	1.3084	29	11.3810	1.4905	49	4.6424	0.4752
10	3.3320	1.2933	30	11.4779	1.4988	50	4.1517	0.5137
11	3.8113	1.2777	31	11.5265*	1.4601	51	3.7600	0.5547
12	4.1944	1.2678	32	11.4947	1.4187	52	3.2719	0.6184
13	4.6727	1.2586	33	11.4025	1.3865	53	2.8828	0.6795
14	5.0550	1.2538	34	10.9386	1.2334	54	2.4952	0.7494
15	5.4371	1.2512	35	10.5643	1.1204	55	2.0132	0.8493
16	5.9146	1.2510	36	10.0927	0.9912	56	1.6299	0.9391
17	6.2966	1.2534	37	9.7127	0.8975	57	1.2488	1.0378
18	6.6785	1.2579	38	9.3304	0.8123	58	0.7759	1.1734
19	7.1561	1.2665	39	8.8497	0.7181	59	0.4007	1.2916
20	7.5382	1.2758	40	8.4632	0.6525	60	0.0284	1.4185

* INDICATES EXTREME POINTS

Table 12. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865(METRIC)

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
31.7500	0.138 0D 8M 15S	0.8092	5.0800	0.041	0.041

LEADING EDGE AXIAL TANGENT POINT 0.0011

Q DIMENSION 0.1203 U DIMENSION 0.1204
R DIMENSION 0.1905 S DIMENSION 0.1905

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 5.8486, 1.1064
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0050*	1.6055	21	8.1287	1.4208	41	8.1889	0.7168
2	0.0550	1.6471	22	8.5166	1.4362	42	7.6948	0.6563
3	0.4494	1.6108	23	8.9049	1.4540	43	7.2982	0.6181
4	0.8429	1.5773	24	9.3909	1.4796	44	6.8012	0.5832
5	1.3336	1.5393	25	9.7803	1.5028	45	6.4029	0.5655
6	1.7253	1.5119	26	10.1703	1.5285	46	6.0042	0.5570
7	2.1162	1.4872	27	10.6586	1.5641	47	5.5055	0.5593
8	2.6040	1.4599	28	11.0500	1.5954	48	5.1065	0.5716
9	2.9935	1.4409	29	11.5404	1.6382	49	4.7080	0.5931
10	3.3824	1.4245	30	11.6386	1.6473	50	4.2106	0.6330
11	3.8680	1.4075	31	11.6881*	1.6084	51	3.8137	0.6753
12	4.2560	1.3966	32	11.6561	1.5661	52	3.3191	0.7411
13	4.7405	1.3866	33	11.5626	1.5329	53	2.9249	0.8041
14	5.1278	1.3813	34	11.0926	1.3749	54	2.5325	0.8763
15	5.5150	1.3784	35	10.7132	1.2583	55	2.0445	0.9794
16	5.9988	1.3782	36	10.2351	1.1249	56	1.6565	1.0720
17	6.3858	1.3807	37	9.8498	1.0282	57	1.2709	1.1737
18	6.7729	1.3855	38	9.4621	0.9403	58	0.7927	1.3135
19	7.2568	1.3948	39	8.9747	0.8431	59	0.4133	1.4354
20	7.6442	1.4049	40	8.5826	0.7755	60	0.0370	1.5661

* INDICATES EXTREME POINTS

Table 13. Airfoil Manufacturing Coordinates - Stator 2
(English Units)[1]

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.0000	-6.870 -6D 52M 11S	0.2642	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT -0.0000

Q DIMENSION 0.0424 U DIMENSION 0.0428
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 1.9101, -0.2838
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0148*	-0.1224	21	2.6649	-0.1885	41	2.6984	-0.4131
2	0.0308	-0.1094	22	2.7887	-0.1839	42	2.5402	-0.4322
3	0.1615	-0.1196	23	2.9123	-0.1784	43	2.4125	-0.4440
4	0.2917	-0.1291	24	3.0665	-0.1701	44	2.2521	-0.4543
5	0.4537	-0.1400	25	3.1897	-0.1622	45	2.1231	-0.4591
6	0.5829	-0.1480	26	3.3127	-0.1534	46	1.9935	-0.4608
7	0.7117	-0.1554	27	3.4662	-0.1407	47	1.8315	-0.4587
8	0.8721	-0.1637	28	3.5889	-0.1294	48	1.7014	-0.4539
9	1.0000	-0.1697	29	3.7420	-0.1137	49	1.5712	-0.4463
10	1.1276	-0.1750	30	3.7726	-0.1103	50	1.4084	-0.4329
11	1.2866	-0.1809	31	3.7894*	-0.1241	51	1.2782	-0.4191
12	1.4134	-0.1850	32	3.7806	-0.1358	52	1.1155	-0.3978
13	1.5715	-0.1892	33	3.7522	-0.1468	53	0.9856	-0.3777
14	1.6977	-0.1920	34	3.6087	-0.1989	54	0.8560	-0.3547
15	1.8236	-0.1943	35	3.4921	-0.2373	55	0.6944	-0.3220
16	1.9805	-0.1963	36	3.3439	-0.2810	56	0.5657	-0.2926
17	2.1055	-0.1970	37	3.2237	-0.3126	57	0.4376	-0.2604
18	2.2302	-0.1967	38	3.1021	-0.3412	58	0.2783	-0.2162
19	2.3857	-0.1951	39	2.9483	-0.3727	59	0.1517	-0.1776
20	2.5099	-0.1928	40	2.8239	-0.3944	60	0.0259	-0.1362

* INDICATES EXTREME POINTS

1. Dimensions in inches, angles in degrees
   All listed values pertain to the manufacturing sections

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
6.5000	-5.863 -5D 51M 47S	0.2696	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT -0.0000

Q DIMENSION 0.0428 U DIMENSION 0.0431
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 1.9367, -0.2270
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0067*	-0.0650	21	2.7022	-0.1283	41	2.7333	-0.3578
2	0.0231	-0.0517	22	2.8286	-0.1238	42	2.5718	-0.3771
3	0.1556	-0.0620	23	2.9549	-0.1183	43	2.4418	-0.3891
4	0.2876	-0.0716	24	3.1127	-0.1102	44	2.2783	-0.3998
5	0.4521	-0.0826	25	3.2387	-0.1025	45	2.1469	-0.4048
6	0.5833	-0.0906	26	3.3647	-0.0939	46	2.0151	-0.4067
7	0.7140	-0.0980	27	3.5220	-0.0817	47	1.8501	-0.4049
8	0.8769	-0.1062	28	3.6478	-0.0708	48	1.7180	-0.4002
9	1.0069	-0.1121	29	3.8049	-0.0557	49	1.5857	-0.3927
10	1.1365	-0.1174	30	3.8363	-0.0525	50	1.4202	-0.3793
11	1.2980	-0.1231	31	3.8533*	-0.0667	51	1.2880	-0.3654
12	1.4270	-0.1270	32	3.8439	-0.0786	52	1.1228	-0.3440
13	1.5878	-0.1310	33	3.8147	-0.0896	53	0.9909	-0.3236
14	1.7162	-0.1335	34	3.6667	-0.1421	54	0.8594	-0.3004
15	1.8443	-0.1355	35	3.5465	-0.1806	55	0.6955	-0.2672
16	2.0040	-0.1371	36	3.3942	-0.2246	56	0.5650	-0.2375
17	2.1314	-0.1375	37	3.2709	-0.2564	57	0.4351	-0.2048
18	2.2585	-0.1370	38	3.1462	-0.2852	58	0.2736	-0.1600
19	2.4172	-0.1352	39	2.9887	-0.3170	59	0.1453	-0.1209
20	2.5440	-0.1327	40	2.8615	-0.3389	60	0.0179	-0.0790

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.0000	-4.894 -4D 53M 37S	0.2749	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT 0.0000

Q DIMENSION 0.0432 U DIMENSION 0.0435
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 1.9658, -0.1699
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y	X	Y	X	Y
1	0.0007*	-0.0073	2.7424	-0.0678	41	2.7712	-0.3021
2	0.0173	0.0061	2.8716	-0.0633	42	2.6064	-0.3216
3	0.1517	-0.0042	3.0007	-0.0579	43	2.4738	-0.3338
4	0.2857	-0.0139	3.1619	-0.0499	44	2.3073	-0.3448
5	0.4527	-0.0249	3.2909	-0.0425	45	2.1736	-0.3500
6	0.5858	-0.0329	3.4198	-0.0342	46	2.0394	-0.3522
7	0.7186	-0.0402	3.5810	-0.0225	47	1.8710	-0.3507
8	0.8840	-0.0484	3.7099	-0.0120	48	1.7372	-0.3462
9	1.0160	-0.0542	3.8711	0.0025	49	1.6027	-0.3388
10	1.1478	-0.0594	3.9033	0.0056	50	1.4346	-0.3254
11	1.3120	-0.0649	3.9203*	-0.0082	51	1.3002	-0.3114
12	1.4431	-0.0686	3.9105	-0.0212	52	1.1325	-0.2898
13	1.6066	-0.0723	3.8803	-0.0323	53	0.9986	-0.2692
14	1.7372	-0.0746	3.7277	-0.0849	54	0.8651	-0.2457
15	1.8676	-0.0763	3.6041	-0.1237	55	0.6989	-0.2122
16	2.0303	-0.0775	3.4477	-0.1679	56	0.5665	-0.1821
17	2.1601	-0.0776	3.3211	-0.1999	57	0.4348	-0.1490
18	2.2897	-0.0769	3.1933	-0.2289	58	0.2711	-0.1036
19	2.4515	-0.0748	3.0321	-0.2608	59	0.1411	-0.0640
20	2.5809	-0.0722	2.9021	-0.2830	60	0.0120	-0.0215

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.2500	-4.422 -4D 25M 20S	0.2775	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT 0.0000

Q DIMENSION 0.0434 U DIMENSION 0.0436
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 1.9813, -0.1412
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0016*	0.0216	21	2.7636	-0.0374	41	2.7912	-0.2741
2	0.0152	0.0352	22	2.8941	-0.0329	42	2.6248	-0.2938
3	0.1506	0.0247	23	3.0246	-0.0276	43	2.4909	-0.3061
4	0.2856	0.0151	24	3.1877	-0.0197	44	2.3228	-0.3171
5	0.4537	0.0040	25	3.3181	-0.0124	45	2.1879	-0.3225
6	0.5879	-0.0040	26	3.4485	-0.0042	46	2.0526	-0.3248
7	0.7217	-0.0113	27	3.6116	0.0073	47	1.8833	-0.3235
8	0.8884	-0.0194	28	3.7421	0.0175	48	1.7477	-0.3190
9	1.0215	-0.0252	29	3.9052	0.0317	49	1.6124	-0.3117
10	1.1543	-0.0303	30	3.9379	0.0347	50	1.4426	-0.2983
11	1.3199	-0.0357	31	3.9550*	0.0207	51	1.3072	-0.2843
12	1.4521	-0.0393	32	3.9449	0.0076	52	1.1382	-0.2626
13	1.6170	-0.0429	33	3.9142	-0.0035	53	1.0033	-0.2419
14	1.7487	-0.0450	34	3.7594	-0.0562	54	0.8688	-0.2183
15	1.8803	-0.0466	35	3.6340	-0.0951	55	0.7014	-0.1846
16	2.0444	-0.0476	36	3.4755	-0.1394	56	0.5681	-0.1543
17	2.1754	-0.0475	37	3.3473	-0.1715	57	0.4354	-0.1210
18	2.3063	-0.0467	38	3.2180	-0.2005	58	0.2706	-0.0753
19	2.4697	-0.0445	39	3.0550	-0.2326	59	0.1397	-0.0354
20	2.6004	-0.0419	40	2.9235	-0.2549	60	0.0097	0.0073

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
7.5000	-3.960 -3D 57M 36S	0.2803	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT 0.0000

Q DIMENSION 0.0436 U DIMENSION 0.0438
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 1.9973, -0.1133
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0034*	0.0506	21	2.7855	-0.0070	41	2.8118	-0.2461
2	0.0135	0.0642	22	2.9174	-0.0025	42	2.6435	-0.2664
3	0.1498	0.0536	23	3.0493	0.0028	43	2.5082	-0.2791
4	0.2857	0.0437	24	3.2141	0.0106	44	2.3385	-0.2906
5	0.4551	0.0324	25	3.3460	0.0178	45	2.2022	-0.2963
6	0.5902	0.0242	26	3.4779	0.0258	46	2.0657	-0.2989
7	0.7250	0.0168	27	3.6429	0.0371	47	1.8949	-0.2977
8	0.8930	0.0085	28	3.7750	0.0471	48	1.7582	-0.2934
9	1.0270	0.0027	29	3.9402	0.0609	49	1.6214	-0.2861
10	1.1608	-0.0024	30	3.9732	0.0638	50	1.4506	-0.2727
11	1.3278	-0.0078	31	3.9904*	0.0497	51	1.3141	-0.2586
12	1.4610	-0.0114	32	3.9800	0.0364	52	1.1438	-0.2367
13	1.6274	-0.0149	33	3.9489	0.0253	53	1.0080	-0.2159
14	1.7602	-0.0169	34	3.7918	-0.0275	54	0.8726	-0.1920
15	1.8929	-0.0182	35	3.6647	-0.0664	55	0.7040	-0.1579
16	2.0586	-0.0188	36	3.5040	-0.1108	56	0.5698	-0.1272
17	2.1909	-0.0185	37	3.3742	-0.1430	57	0.4353	-0.0936
18	2.3232	-0.0174	38	3.2434	-0.1721	58	0.2705	-0.0474
19	2.4883	-0.0148	39	3.0785	-0.2043	59	0.1388	-0.0071
20	2.6205	-0.0118	40	2.9456	-0.2267	60	0.0080	0.0362

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.0000	-3.312 -3D 18M 42S	0.2849	2.0000	0.014	0.014

LEADING EDGE AXIAL TANGENT POINT 0.0001

Q DIMENSION 0.0440 U DIMENSION 0.0441
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.0260, -0.0565
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0062*	0.1086	21	2.8239	0.0511	41	2.8487	-0.1924
2	0.0110	0.1224	22	2.9581	0.0557	42	2.6778	-0.2125
3	0.1492	0.1119	23	3.0924	0.0610	43	2.5405	-0.2252
4	0.2870	0.1022	24	3.2602	0.0689	44	2.3682	-0.2366
5	0.4587	0.0910	25	3.3946	0.0761	45	2.2300	-0.2422
6	0.5957	0.0829	26	3.5291	0.0841	46	2.0916	-0.2447
7	0.7324	0.0756	27	3.6974	0.0954	47	1.9183	-0.2435
8	0.9028	0.0674	28	3.8322	0.1054	48	1.7796	-0.2390
9	1.0388	0.0616	29	4.0010	0.1192	49	1.6410	-0.2316
10	1.1745	0.0565	30	4.0348	0.1221	50	1.4678	-0.2180
11	1.3439	0.0511	31	4.0521*	0.1076	51	1.3294	-0.2037
12	1.4791	0.0476	32	4.0413	0.0942	52	1.1568	-0.1815
13	1.6479	0.0441	33	4.0093	0.0829	53	1.0191	-0.1604
14	1.7827	0.0421	34	3.8484	0.0293	54	0.8818	-0.1362
15	1.9174	0.0408	35	3.7183	-0.0102	55	0.7110	-0.1018
16	2.0856	0.0401	36	3.5541	-0.0552	56	0.5749	-0.0708
17	2.2199	0.0403	37	3.4216	-0.0879	57	0.4396	-0.0369
18	2.3542	0.0414	38	3.2881	-0.1175	58	0.2715	0.0098
19	2.5220	0.0438	39	3.1201	-0.1501	59	0.1380	0.0504
20	2.6562	0.0466	40	2.9847	-0.1728	60	0.0054	0.0940

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
8.5000	-2.799 -2D 47M 57S	0.2893	2.0000	0.015	0.014

LEADING EDGE AXIAL TANGENT POINT 0.0001

C DIMENSION 0.0444 U DIMENSION 0.0445
P DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.0544, 0.0032
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0080*	0.1667	21	2.8633	0.1133	41	2.8870	-0.1343
2	0.0093	0.1808	22	2.9996	0.1177	42	2.7135	-0.1544
3	0.1495	0.1707	23	3.1360	0.1228	43	2.5742	-0.1671
4	0.2892	0.1614	24	3.3065	0.1302	44	2.3994	-0.1785
5	0.4633	0.1507	25	3.4431	0.1370	45	2.2593	-0.1842
6	0.6023	0.1430	26	3.5798	0.1446	46	2.1189	-0.1868
7	0.7408	0.1359	27	3.7508	0.1553	47	1.9432	-0.1857
8	0.9137	0.1281	28	3.8879	0.1648	48	1.8026	-0.1813
9	1.0516	0.1226	29	4.0594	0.1778	49	1.6620	-0.1739
10	1.1893	0.1178	30	4.0938	0.1805	50	1.4804	-0.1604
11	1.3610	0.1127	31	4.1112*	0.1657	51	1.3462	-0.1461
12	1.4982	0.1093	32	4.1001	0.1521	52	1.1712	-0.1239
13	1.6694	0.1061	33	4.0675	0.1408	53	1.0316	-0.1028
14	1.8062	0.1043	34	3.9035	0.0873	54	0.8925	-0.0786
15	1.9429	0.1031	35	3.7710	0.0478	55	0.7193	-0.0441
16	2.1136	0.1025	36	3.6038	0.0028	56	0.5814	-0.0131
17	2.2500	0.1029	37	3.4690	-0.0298	57	0.4441	0.0208
18	2.3863	0.1039	38	3.3333	-0.0594	58	0.2737	0.0675
19	2.5566	0.1063	39	3.1626	-0.0920	59	0.1383	0.1083
20	2.6929	0.1090	40	3.0251	-0.1147	60	0.0038	0.1519

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.0000	-2.332 -2D 19M 53S	0.2935	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT 0.0002

Q DIMENSION 0.0448 U DIMENSION 0.0449
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.0835, 0.0631
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0089*	0.2248	21	2.9034	0.1757	41	2.9262	-0.0759
2	0.0086	0.2392	22	3.0418	0.1798	42	2.7502	-0.0960
3	0.1506	0.2296	23	3.1803	0.1847	43	2.6088	-0.1087
4	0.2923	0.2207	24	3.3535	0.1917	44	2.4316	-0.1202
5	0.4688	0.2105	25	3.4922	0.1981	45	2.2895	-0.1260
6	0.6096	0.2031	26	3.6311	0.2053	46	2.1472	-0.1286
7	0.7502	0.1964	27	3.8049	0.2153	47	1.9691	-0.1276
8	0.9254	0.1890	28	3.9441	0.2242	48	1.8266	-0.1233
9	1.0652	0.1838	29	4.1184	0.2364	49	1.6841	-0.1160
10	1.2049	0.1792	30	4.1533	0.2390	50	1.5061	-0.1025
11	1.3791	0.1744	31	4.1709*	0.2238	51	1.3639	-0.0882
12	1.5182	0.1713	32	4.1595	0.2100	52	1.1866	-0.0661
13	1.6919	0.1683	33	4.1263	0.1988	53	1.0451	-0.0450
14	1.8306	0.1666	34	3.9592	0.1454	54	0.9041	-0.0208
15	1.9693	0.1656	35	3.8243	0.1060	55	0.7285	0.0137
16	2.1424	0.1652	36	3.6543	0.0611	56	0.5887	0.0447
17	2.2809	0.1656	37	3.5173	0.0285	57	0.4496	0.0787
18	2.4192	0.1667	38	3.3794	-0.0010	58	0.2768	0.1255
19	2.5921	0.1690	39	3.2059	-0.0336	59	0.1394	0.1662
20	2.7305	0.1715	40	3.0664	-0.0563	60	0.0030	0.2099

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
9.5000	-1.910 -1D 54M 37S	0.2975	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT 0.0003

Q DIMENSION 0.0452 U DIMENSION 0.0453
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.1131, 0.1218
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0092*	0.2830	21	2.9442	0.2368	41	2.9662	-0.0186
2	0.0086	0.2976	22	3.0846	0.2409	42	2.7876	-0.0389
3	0.1525	0.2882	23	3.2252	0.2455	43	2.6443	-0.0517
4	0.2961	0.2795	24	3.4010	0.2523	44	2.4646	-0.0633
5	0.4750	0.2696	25	3.5419	0.2585	45	2.3205	-0.0692
6	0.6178	0.2624	26	3.6828	0.2654	46	2.1762	-0.0719
7	0.7602	0.2559	27	3.8593	0.2750	47	1.9957	-0.0710
8	0.9378	0.2487	28	4.0007	0.2834	48	1.8512	-0.0668
9	1.0796	0.2437	29	4.1777	0.2951	49	1.7007	-0.0595
10	1.2212	0.2393	30	4.2132	0.2975	50	1.5263	-0.0460
11	1.3978	0.2347	31	4.2309*	0.2831	51	1.3822	-0.0317
12	1.5389	0.2318	32	4.2192	0.2681	52	1.2025	-0.0096
13	1.7150	0.2290	33	4.1854	0.2568	53	1.0591	0.0117
14	1.8557	0.2275	34	4.0154	0.2033	54	0.9162	0.0359
15	1.9964	0.2265	35	3.8783	0.1639	55	0.7383	0.0706
16	2.1720	0.2263	36	3.7055	0.1189	56	0.5966	0.1017
17	2.3124	0.2268	37	3.5663	0.0862	57	0.4556	0.1360
18	2.4528	0.2279	38	3.4262	0.0566	58	0.2805	0.1830
19	2.6283	0.2302	39	3.2501	0.0238	59	0.1413	0.2240
20	2.7687	0.2327	40	3.1084	0.0011	60	0.0030	0.2679

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.0000	-1.536 -1D 32M 9S	0.3013	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT 0.0003

Q DIMENSION 0.0456 U DIMENSION 0.0456
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.1431, 0.1788
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0088*	0.3413	21	2.9853	0.2959	41	3.0070	0.0367
2	0.0092	0.3561	22	3.1279	0.3000	42	2.8259	0.0162
3	0.1550	0.3466	23	3.2705	0.3046	43	2.6805	0.0032
4	0.3005	0.3378	24	3.4489	0.3114	44	2.4982	-0.0087
5	0.4818	0.3278	25	3.5918	0.3175	45	2.3522	-0.0146
6	0.6265	0.3206	26	3.7349	0.3244	46	2.2059	-0.0175
7	0.7708	0.3141	27	3.9140	0.3338	47	2.0228	-0.0167
8	0.9509	0.3069	28	4.0575	0.3422	48	1.8764	-0.0125
9	1.0946	0.3019	29	4.2373	0.3536	49	1.7300	-0.0051
10	1.2381	0.2975	30	4.2732	0.3560	50	1.5471	0.0084
11	1.4171	0.2930	31	4.2912*	0.3413	51	1.4010	0.0228
12	1.5602	0.2901	32	4.2792	0.3261	52	1.2189	0.0452
13	1.7387	0.2874	33	4.2449	0.3148	53	1.0736	0.0666
14	1.8814	0.2860	34	4.0721	0.2609	54	0.9288	0.0912
15	2.0240	0.2851	35	3.9328	0.2211	55	0.7485	0.1262
16	2.2021	0.2850	36	3.7573	0.1756	56	0.6049	0.1577
17	2.3445	0.2856	37	3.6159	0.1427	57	0.4621	0.1923
18	2.4869	0.2868	38	3.4738	0.1128	58	0.2846	0.2399
19	2.6649	0.2892	39	3.2950	0.0797	59	0.1436	0.2815
20	2.8073	0.2918	40	3.1513	0.0567	60	0.0035	0.3260

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
10.5000	-1.186 -1D 11M 9S	0.3049	2.0000	0.015	0.015

LEADING EDGE AXIAL TANGENT POINT 0.0004

Q DIMENSION 0.0459 U DIMENSION 0.0460
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.1736, 0.2333
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0079*	0.3996	21	3.0270	0.3523	41	3.0486	0.0895
2	0.0104	0.4146	22	3.1715	0.3566	42	2.8649	0.0685
3	0.1582	0.4046	23	3.3162	0.3615	43	2.7174	0.0552
4	0.3055	0.3953	24	3.4972	0.3685	44	2.5326	0.0431
5	0.4892	0.3848	25	3.6421	0.3749	45	2.3845	0.0369
6	0.6358	0.3773	26	3.7873	0.3819	46	2.2362	0.0339
7	0.7821	0.3705	27	3.9690	0.3917	47	2.0506	0.0347
8	0.9645	0.3630	28	4.1146	0.4003	48	1.9021	0.0389
9	1.1102	0.3577	29	4.2970	0.4121	49	1.7536	0.0463
10	1.2556	0.3532	30	4.3335	0.4146	50	1.5683	0.0601
11	1.4370	0.3486	31	4.3517*	0.3997	51	1.4202	0.0747
12	1.5820	0.3456	32	4.3395	0.3842	52	1.2356	0.0975
13	1.7630	0.3429	33	4.3046	0.3727	53	1.0884	0.1193
14	1.9076	0.3414	34	4.1293	0.3178	54	0.9416	0.1443
15	2.0522	0.3406	35	3.9879	0.2774	55	0.7589	0.1801
16	2.2327	0.3406	36	3.8098	0.2311	56	0.6135	0.2123
17	2.3771	0.3413	37	3.6664	0.1975	57	0.4688	0.2476
18	2.5215	0.3426	38	3.5221	0.1671	58	0.2891	0.2962
19	2.7020	0.3452	39	3.3408	0.1333	59	0.1463	0.3386
20	2.8464	0.3480	40	3.1950	0.1098	60	0.0045	0.3841

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
11.0000	-0.844 OD 50M 39S	0.3084	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT 0.0004

Q DIMENSION 0.0463 U DIMENSION 0.0464
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.2048, 0.2849
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0064*	0.4580	21	3.0693	0.4055	41	3.0913	0.1391
2	0.0123	0.4731	22	3.2159	0.4101	42	2.9049	0.1174
3	0.1619	0.4621	23	3.3625	0.4155	43	2.7554	0.1037
4	0.3112	0.4519	24	3.5461	0.4231	44	2.5679	0.0911
5	0.4973	0.4404	25	3.6931	0.4301	45	2.4176	0.0847
6	0.6458	0.4321	26	3.8403	0.4378	46	2.2672	0.0816
7	0.7940	0.4247	27	4.0246	0.4484	47	2.0789	0.0823
8	0.9788	0.4165	28	4.1723	0.4577	48	1.9283	0.0866
9	1.1264	0.4108	29	4.3574	0.4704	49	1.7778	0.0942
10	1.2737	0.4059	30	4.3944	0.4731	50	1.5898	0.1083
11	1.4576	0.4009	31	4.4129*	0.4581	51	1.4397	0.1234
12	1.6045	0.3977	32	4.4006	0.4423	52	1.2526	0.1468
13	1.7879	0.3947	33	4.3652	0.4305	53	1.1034	0.1693
14	1.9345	0.3932	34	4.1874	0.3741	54	0.9547	0.1951
15	2.0810	0.3924	35	4.0440	0.3325	55	0.7696	0.2319
16	2.2641	0.3924	36	3.8634	0.2849	56	0.6224	0.2651
17	2.4104	0.3932	37	3.7179	0.2504	57	0.4759	0.3015
18	2.5568	0.3947	38	3.5716	0.2190	58	0.2940	0.3516
19	2.7398	0.3976	39	3.3877	0.1842	59	0.1495	0.3953
20	2.8862	0.4007	40	3.2398	0.1600	60	0.0061	0.4422

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
11.5000	-0.508 OD 30M 29S	0.3119	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT 0.0004

Q DIMENSION 0.0466 U DIMENSION 0.0467
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.2367, 0.3351
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0042*	0.5165	21	3.1123	0.4568	41	3.1349	0.1868
2	0.0148	0.5316	22	3.2609	0.4619	42	2.9458	0.1644
3	0.1664	0.5195	23	3.4097	0.4678	43	2.7941	0.1502
4	0.3175	0.5083	24	3.5958	0.4763	44	2.6039	0.1373
5	0.5060	0.4956	25	3.7449	0.4840	45	2.4514	0.1307
6	0.6564	0.4865	26	3.8942	0.4924	46	2.2988	0.1275
7	0.8065	0.4783	27	4.0812	0.5042	47	2.1079	0.1283
8	0.9937	0.4692	28	4.2310	0.5145	48	1.9551	0.1327
9	1.1432	0.4630	29	4.4187	0.5286	49	1.8025	0.1406
10	1.2925	0.4576	30	4.4563	0.5316	50	1.6119	0.1553
11	1.4788	0.4520	31	4.4750*	0.5165	51	1.4597	0.1709
12	1.6276	0.4484	32	4.4626	0.5004	52	1.2701	0.1952
13	1.8135	0.4451	33	4.4268	0.4882	53	1.1189	0.2184
14	1.9621	0.4434	34	4.2466	0.4299	54	0.9682	0.2451
15	2.1105	0.4425	35	4.1013	0.3868	55	0.7808	0.2831
16	2.2960	0.4425	36	3.9181	0.3376	56	0.6317	0.3174
17	2.4444	0.4433	37	3.7706	0.3019	57	0.4835	0.3550
18	2.5928	0.4450	38	3.6222	0.2694	58	0.2994	0.4068
19	2.7783	0.4481	39	3.4356	0.2335	59	0.1535	0.4519
20	2.9267	0.4515	40	3.2855	0.2085	60	0.0083	0.5004

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
11.7500	-0.343 OD 20M 36S	0.3136	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT 0.0004

Q DIMENSION 0.0468 U DIMENSION 0.0469
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.2530, 0.3603
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0028*	0.5457	21	3.1341	0.4824	41	3.1569	0.2107
2	0.0163	0.5608	22	3.2837	0.4878	42	2.9665	0.1879
3	0.1688	0.5481	23	3.4335	0.4940	43	2.8137	0.1735
4	0.3209	0.5365	24	3.6209	0.5028	44	2.6221	0.1604
5	0.5105	0.5232	25	3.7711	0.5109	45	2.4686	0.1537
6	0.6619	0.5137	26	3.9214	0.5198	46	2.3149	0.1505
7	0.8129	0.5051	27	4.1097	0.5321	47	2.1226	0.1513
8	1.0014	0.4956	28	4.2606	0.5429	48	1.9688	0.1558
9	1.1518	0.4891	29	4.4496	0.5577	49	1.8150	0.1639
10	1.3021	0.4834	30	4.4875	0.5608	50	1.6231	0.1788
11	1.4896	0.4775	31	4.5064*	0.5457	51	1.4700	0.1946
12	1.6394	0.4738	32	4.4940	0.5295	52	1.2791	0.2193
13	1.8265	0.4703	33	4.4579	0.5170	53	1.1268	0.2430
14	1.9760	0.4685	34	4.2765	0.4577	54	0.9752	0.2700
15	2.1255	0.4675	35	4.1301	0.4140	55	0.7866	0.3088
16	2.3122	0.4675	36	3.9457	0.3639	56	0.6366	0.3436
17	2.4616	0.4684	37	3.7972	0.3276	57	0.4875	0.3818
18	2.6110	0.4701	38	3.6477	0.2946	58	0.3024	0.4344
19	2.7977	0.4734	39	3.4598	0.2581	59	0.1555	0.4802
20	2.9472	0.4769	40	3.3087	0.2327	60	0.0097	0.5294

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.0000	-0.181 OD 10M 51S	0.3153	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT 0.0004

Q DIMENSION 0.0470 U DIMENSION 0.0471
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.2694, 0.3854
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	-0.0014*	0.5737	21	3.1560	0.5081	41	3.1791	0.2345
2	0.0179	0.5900	22	3.3067	0.5137	42	2.9873	0.2114
3	0.1714	0.5768	23	3.4575	0.5201	43	2.8334	0.1968
4	0.3244	0.5647	24	3.6462	0.5294	44	2.6405	0.1834
5	0.5152	0.5508	25	3.7974	0.5378	45	2.4859	0.1767
6	0.6675	0.5409	26	3.9488	0.5471	46	2.3311	0.1734
7	0.8195	0.5319	27	4.1384	0.5600	47	2.1374	0.1743
8	1.0092	0.5220	28	4.2904	0.5713	48	1.9825	0.1789
9	1.1606	0.5151	29	4.4807	0.5868	49	1.8277	0.1871
10	1.3118	0.5092	30	4.5188	0.5901	50	1.6345	0.2023
11	1.5005	0.5030	31	4.5380*	0.5748	51	1.4803	0.2184
12	1.6513	0.4991	32	4.5255	0.5585	52	1.2881	0.2435
13	1.8396	0.4955	33	4.4892	0.5459	53	1.1349	0.2675
14	1.9902	0.4936	34	4.3065	0.4856	54	0.9824	0.2950
15	2.1406	0.4926	35	4.1592	0.4411	55	0.7926	0.3344
16	2.3286	0.4925	36	3.9735	0.3902	56	0.6417	0.3697
17	2.4790	0.4935	37	3.8239	0.3533	57	0.4916	0.4086
18	2.6293	0.4952	38	3.6734	0.3198	58	0.3055	0.4620
19	2.8173	0.4986	39	3.4841	0.2827	59	0.1577	0.5085
20	2.9678	0.5023	40	3.3319	0.2569	60	0.0112	0.5585

* INDICATES EXTREME POINTS

Table 13. (Continued)

FAN COMPRESSOR VANE TWO CSC 11865

RADIAL DISTANCE	SETTING ANGLE	REFERENCE AIRFOIL THICKNESS	DISTANCE TO LEADING EDGE	RADII L.E.	RADII T.E.
12.5000	C.138 OD 8M 15S	0.3186	2.0000	0.016	0.016

LEADING EDGE AXIAL TANGENT POINT 0.0005

Q DIMENSION 0.0474 U DIMENSION 0.0474
R DIMENSION 0.0750 S DIMENSION 0.0750

STACK POINT COORDINATES 0.0 , 0.0
CENTER OF GRAVITY COORDINATES 2.3027, 0.4356
COMPRESSOR ROTATION IS COUNTER CLOCKWISE FROM THE REAR

REFERENCE COORDINATE POINTS

STATION NO.	X	Y		X	Y		X	Y
1	0.0020*	0.6321	21	3.2003	0.5594	41	3.2240	0.2822
2	0.0216	0.6485	22	3.3530	0.5654	42	3.0294	0.2584
3	0.1769	0.6342	23	3.5059	0.5724	43	2.8733	0.2433
4	0.3319	0.6210	24	3.6972	0.5825	44	2.6777	0.2296
5	0.5251	0.6060	25	3.8505	0.5917	45	2.5208	0.2227
6	0.6793	0.5952	26	4.0040	0.6018	46	2.3639	0.2193
7	0.8332	0.5855	27	4.1963	0.6158	47	2.1675	0.2202
8	1.0252	0.5747	28	4.3504	0.6281	48	2.0105	0.2250
9	1.1785	0.5673	29	4.5435	0.6450	49	1.8535	0.2335
10	1.3317	0.5608	30	4.5821	0.6485	50	1.6577	0.2492
11	1.5228	0.5541	31	4.6016*	0.6321	51	1.5014	0.2659
12	1.6756	0.5499	32	4.5890	0.6166	52	1.3067	0.2918
13	1.8663	0.5459	33	4.5522	0.6035	53	1.1516	0.3166
14	2.0188	0.5438	34	4.3672	0.5413	54	0.9970	0.3450
15	2.1712	0.5427	35	4.2178	0.4954	55	0.8049	0.3856
16	2.3617	0.5426	36	4.0296	0.4429	56	0.6522	0.4221
17	2.5141	0.5436	37	3.8779	0.4048	57	0.5004	0.4621
18	2.6665	0.5455	38	3.7252	0.3702	58	0.3121	0.5171
19	2.8570	0.5491	39	3.5333	0.3319	59	0.1627	0.5651
20	3.0095	0.5531	40	3.3790	0.3053	60	0.0146	0.6166

* INDICATES EXTREME POINTS

APPENDIX E

LIST OF SYMBOLS

A	-	area
A*	-	critical area
C_f	-	skin friction coefficient
D_f	-	diffusion factor
I.D.	-	inner diameter of casing
K_t	-	stress concentration factor for normal stress (theoretical notch factor)
L/W	-	length to width ratio
LER	-	airfoil leading edge radius
Mn	-	Mach number
N_D	-	design speed
O.D.	-	outer diameter of casing
PNdB	-	preceived noise decibel
R_c	-	pressure ratio
SPL	-	sound pressure level
TER	-	airfoil trailing edge radius
2-D	-	two-dimensional

Greek

β^*	-	metal angle, between mean camber line and axial location
σ	-	solidity, standard deviation
$\bar{\omega}$	-	total pressure loss coefficient, high speed flutter parameter

Subscripts

eff	-	effective
geo	-	geometric
i	-	inflection
1	-	inlet station
2	-	exit station

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