NASA TECHNICAL NOTE

NASA TN D-6538

C.1

NASA TN D-6538

EFFECT OF CASING TREATMENT ON OVERALL AND BLADE-ELEMENT PERFORMANCE OF A COMPRESSOR ROTOR

by Royce D. Moore, George Kovich, and Robert J. Blade

Lewis Research Center
Cleveland, Ohio 44135

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • NOVEMBER 1971

1. Report No. NASA TN D-6538	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle EFFECT OF CASING TREATMENT ON OVERALL AND BLADE-ELEMENT PERFORMANCE OF A COMPRESSOR ROTOR		5. Report Date November 1971
		6. Performing Organization Code
7. Author(s) Royce D. Moore, George Kovich, and Robert J. Blade		8. Performing Organization Report No. E-6119
		10. Work Unit No. 720-03
9. Performing Organization Name and Address Lewis Research Center National Aeronautics and Space Administration Cleveland, Ohio 44135		11. Contract or Grant No.
		13. Type of Report and Period Covered Technical Note
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

An axial-flow compressor rotor was tested at design speed with six different casing treatments across the rotor tip. Radial surveys of pressure, temperature, and flow angle were taken at the rotor inlet and outlet. Surveys were taken at several weight flows for each treatment. All the casings treatments decreased the weight flow at stall over that for the solid casing. Radial surveys indicate that the performance over the entire radial span of the blade is affected by the treatment across the rotor tip.

17. Key Words (Suggested by Author(s)) Compressor casing treatment; Stall margin improvement; Axial flow compressor rotor		18. Distribution Statement Unclassified - unlimited	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 65	22. Price* $3.00

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

EFFECT OF CASING TREATMENT ON OVERALL AND BLADE-ELEMENT PERFORMANCE OF A COMPRESSOR ROTOR

by Royce D. Moore, George Kovich, and Robert J. Blade

Lewis Research Center

SUMMARY

An axial-flow compressor rotor was tested at design speed with six different casings treatments across the rotor tip. Radial surveys of pressure, temperature, and flow angle were taken at several equivalent weight flows for each casing treatment. A solid casing, a skewed slot casing, a circumferentially grooved casing, and three different blade-angle slot casings were used across the tip of the rotor. All the casing treatments significantly decreased the weight flow at stall over that for the solid casing. A blade-angle slot configuration with slots over the middle portion of the rotor tip gave higher pressure ratio and efficiency over the entire blade span than the two blade-angle slot configurations with slots that extended past both leading and trailing edges of the blade. The rotor gave the highest overall pressure ratio with the skewed slot casing, but the efficiency was low. The rotor efficiency was the highest with the circumferentially grooved casing. The pressure ratio of the rotor was about the same for both the circumferentially grooved casing and the short blade-angle slot casing at the stall condition. However, the rotor stalled at a higher weight flow with the grooved casing than with the short blade-angle slot casing. Radial surveys indicate that the performance over the entire blade span is affected by the casing treatment applied across the tip of the rotor. The survey data showed that the losses associated with the casing treatments are higher than those for the solid casing. This would indicate that the phenomena associated with casing treatment is one of stabilizing the flow rather than one of reducing losses.

INTRODUCTION

The fan and compressor of modern aircraft must be capable of operating over widely diverse conditions. Improving the flow margin between the fan or compressor operating point and the stall-limit point will, in general, improve the useful operating range of the propulsion system. Under many conditions, unstable flow conditions are initiated in the tip region of a fan or compressor. Thus, if stall in the tip region can be delayed, the weight flow range of the fan or compressor may be increased.

One approach to delaying stall and thus improving the weight-flow range has been to use various casing-treatment configurations across the tip of the rotor blade (refs. 1 to 3). The results of reference 1 showed that several different casing-treatment designs improved the weight-flow range (delayed stall) over that for a solid casing. The overall performance results, which were based on fixed instrumentation, showed a significant decrease in efficiency for some of the casing-treatment configurations.

The objective of this report is to present data obtained from detailed surveys of the flow conditions at the inlet and outlet of the rotor blade for some of the casing-treatment configurations of reference 1. Radial surveys of pressure, temperature, and flow angle were taken at design speed for several weight flows. For the near-stall conditions, the radial distribution of several performance parameters are compared for the various configurations. The casing-treatment configurations tested were a solid casing, three different blade angle slot configurations, a circumferentially grooved configuration, and a skewed slot configuration. This investigation was conducted at the NASA Lewis Research Center. The data are presented in tabular form as well as in plots. All symbols and equations are defined in appendixes A and B. The definitions and U. S. Customary units used in the tables are listed in appendix C, and the conversions to SI units are given in appendix D.

APPARATUS

Test Facility

A schematic view of the test facility is shown in figure 1. The facility is the same as that described in reference 1. The drive system consists of an electric motor with a variable-frequency speed control. The drive motor was coupled to a 5.02-ratio speed-increaser gear box that drove the rotor. Atmospheric air was used as the working fluid. A plenum tank 6 feet (1.83 m) in diameter and approximately 12 feet (3.66 m) long was located just upstream of the test rotor. A bellmouth nozzle was fitted from the plenum tank to the inlet of the rotor. Airflow was controlled by the butterfly valve in the outlet line.

Instrumentation

The weight flow was determined from measurements on a thin-plate orifice that was

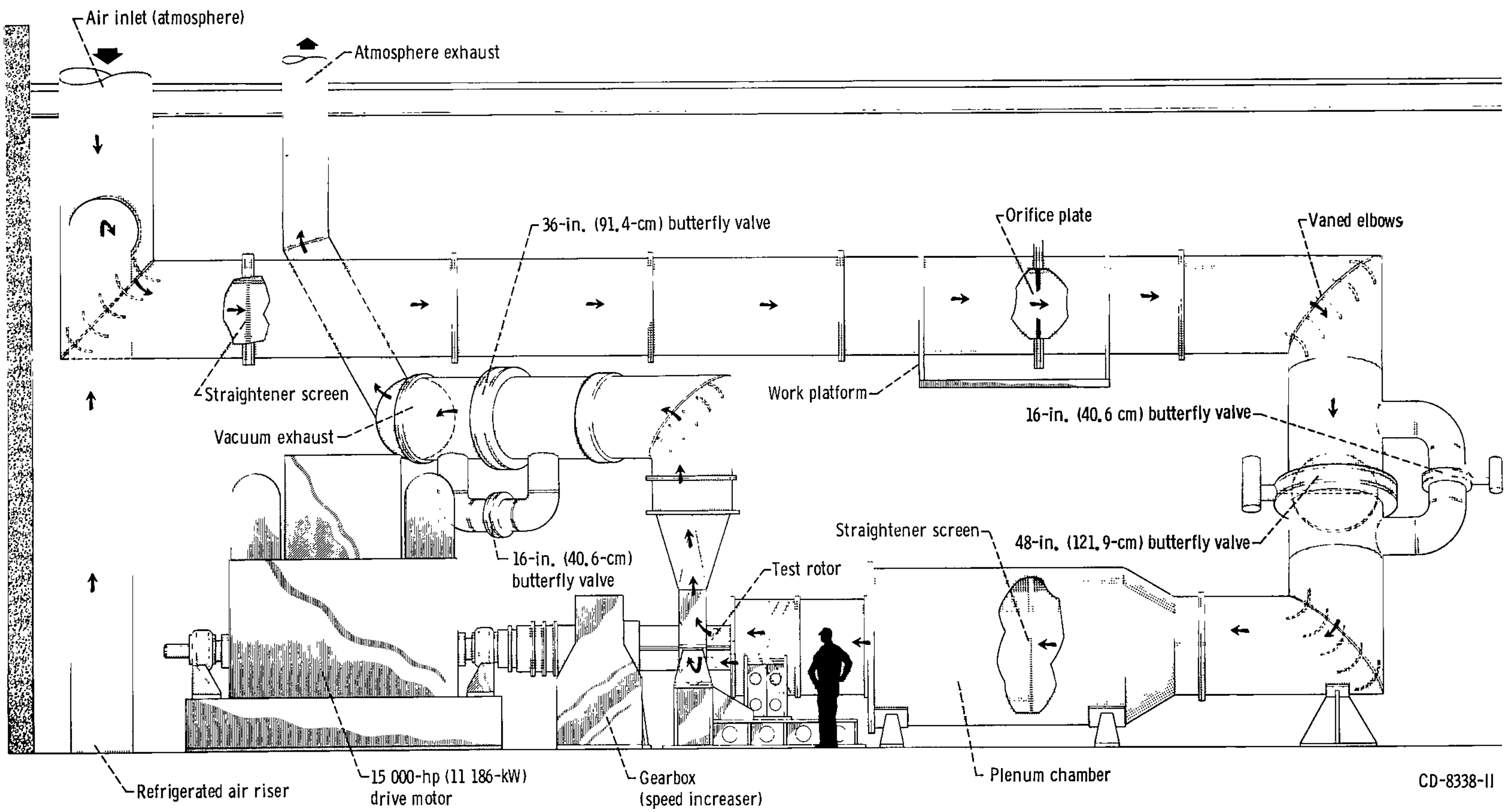


Figure 1. - Test facility.

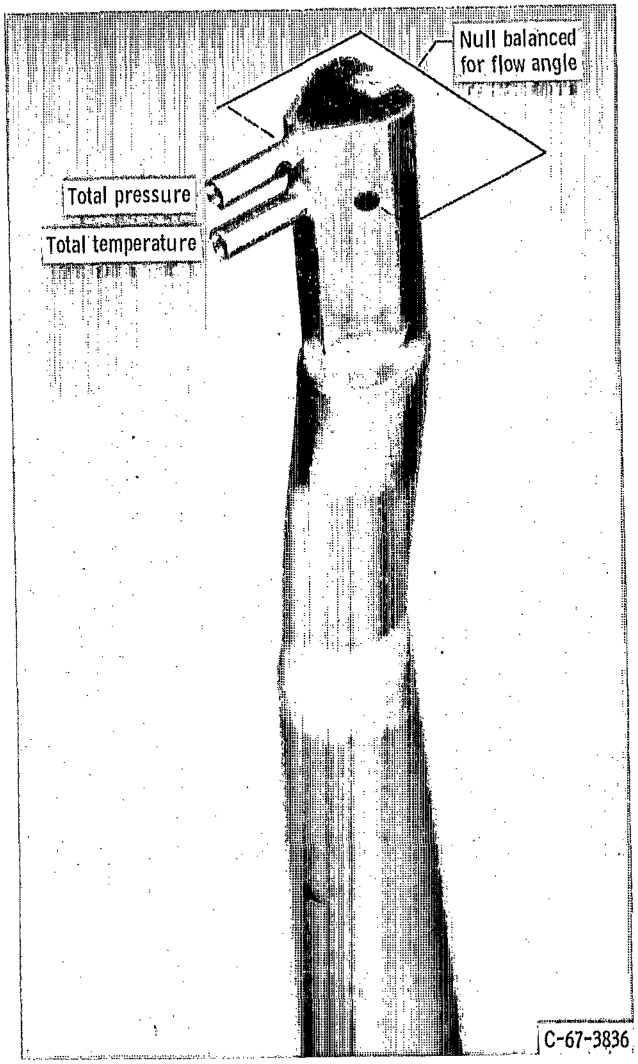


Figure 2. - Combination sensing probe.

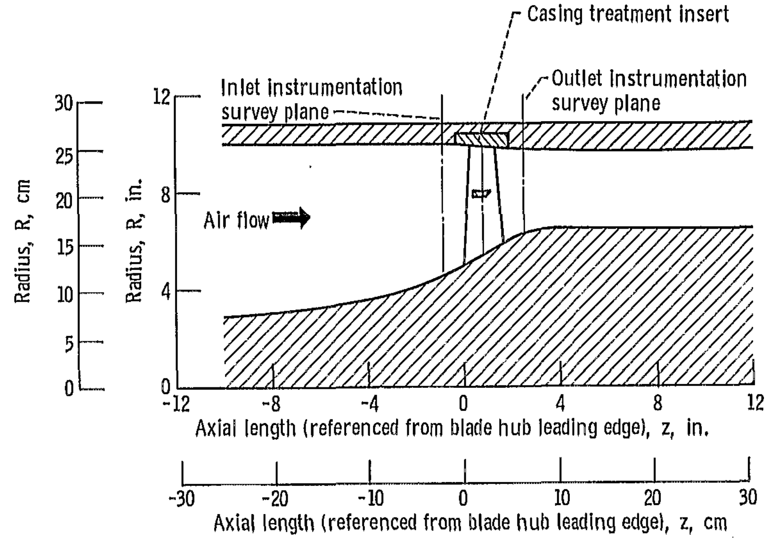


Figure 3. - Meridional view of axial-flow rotor showing location of casing insert.

27.2 inches (69.1 cm) in diameter. The orifice plate was located in the 48-inch (121.9-cm) inlet line (fig. 1).

Radial surveys of the flow were made using combination probes (fig. 2). Four probes located approximately 90° apart were used at both the rotor inlet and outlet. The axial location of these probes is shown in figure 3. Radial distributions of total pressure and total temperature were obtained from the combination probe for both inlet and outlet conditions. The flow angles were determined from the null-balanced combination probes. The static pressure at the rotor inlet was also determined from the combination probe. However, at the rotor outlet Mach numbers were too high for accurate static-pressure measurement from the combination probe. Thus, the static pressure was assumed to vary linearily between measured outer- and inner-wall static pressures.

A hot-wire anemometer probe located approximately 1 inch (2.54 cm) upstream of the rotor leading edge was used for detecting the onset of stall. Evidence of rotor stall was also correlated by a drop in rotor outlet pressure, which was monitored on an X-Y recorder during the tests. The noise level also increased when the rotor stalled. The estimated errors of the data based on the inherent accuracies of the instrumentation and recording system are as follows:

Weight flow, lbm/sec (kg/sec)	±0.5 (±0.23)
Temperature, ^{O}R (K)	±1.0 (±0.55)
Flow angle, deg	±1.0
Rotor speed, rpm	±50
Inlet total pressure, psi (N/cm^2)	±0.05 (±0.03)
Inlet static pressure, psi (N/cm^2)	±0.10 (±0.07)
Outlet total pressure, psi (N/cm^2)	±0.10 (±0.07)
Outlet wall static pressure, psi (N/cm^2)	±0.10 (±0.07)

Test Rotor

The rotor used in this investigation has a nominal radius of 10 inches (25.4 cm). The 47-blade rotor has an inlet hub-tip radius ratio of 0.5. The rotor (fig. 4) was equipped with blade vibration dampers, located at about 43-percent span from the tip. The rotor (herein referred to as rotor 5) was designed for the first stage of a high-pressure-ratio axial-flow compressor. The design for this rotor is given in detail in reference 4. The design parameters for this rotor are given in tables I to III. The values listed in tables I to III are in U. S. Customary units. Conversions for SI units are given in appendix D.

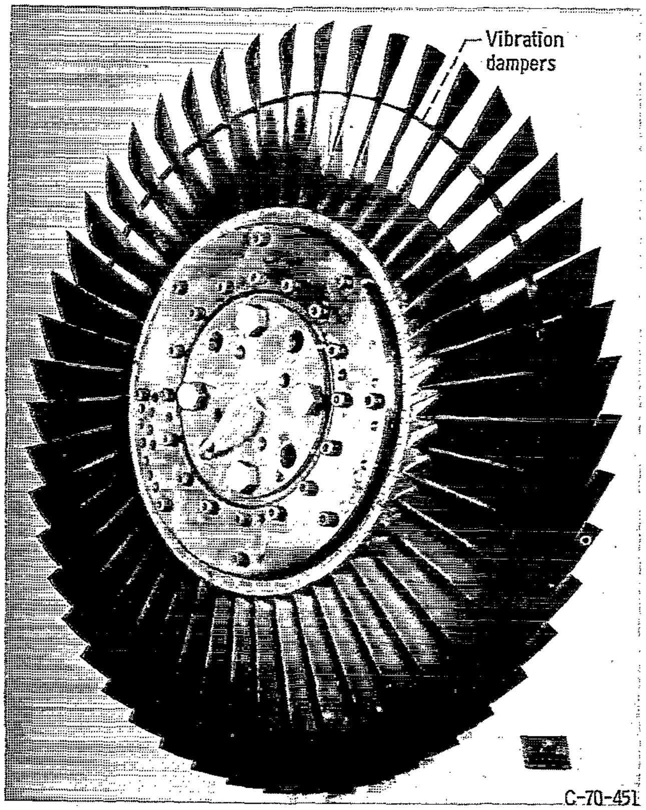


Figure 4. - Compressor rotor 5.

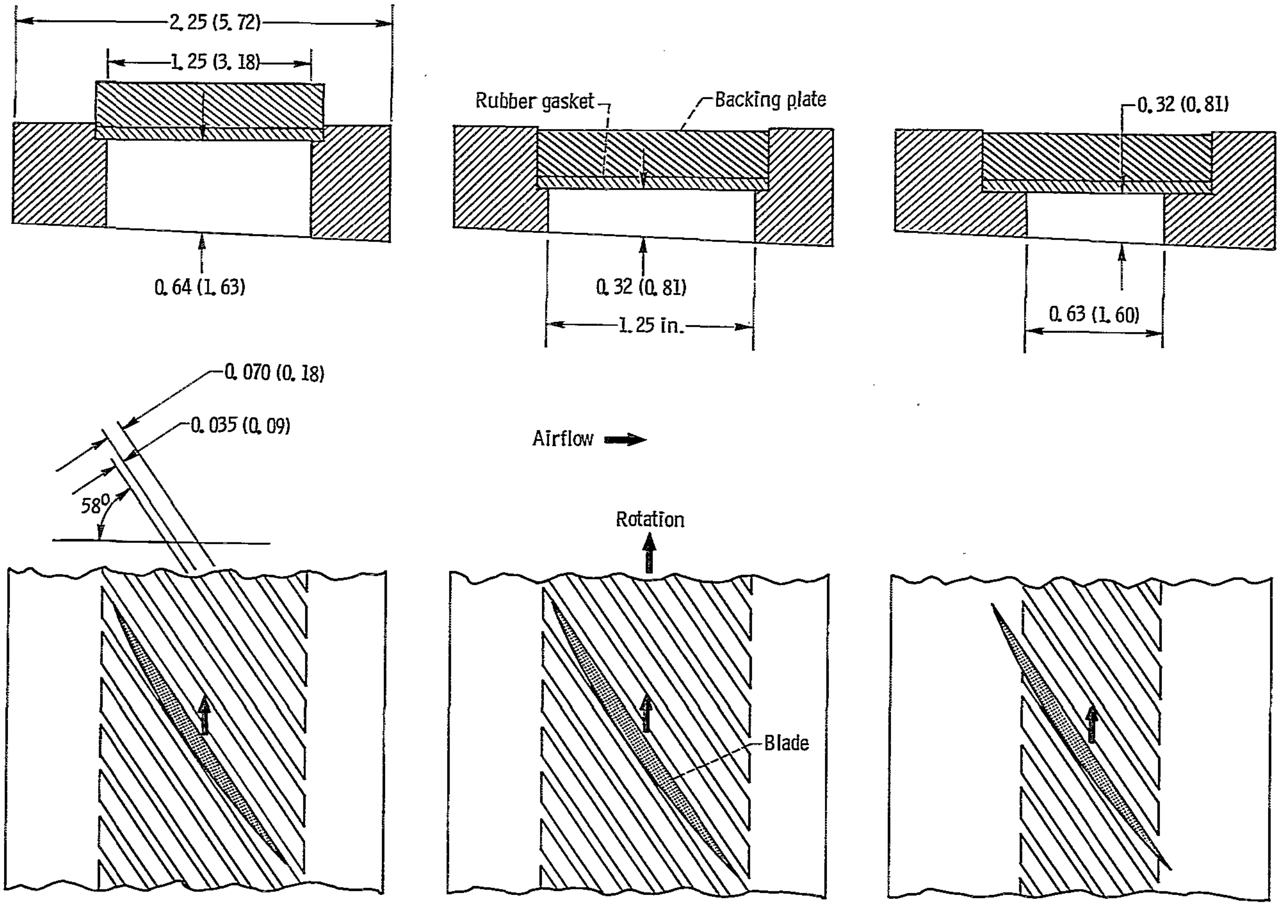
Casing Inserts

The casing treatments were fabricated as inserts to fit in a casing recess over the tip of the rotor blades (fig. 3). The inserts were designed to fit flush with the wall fairing. Six different casing inserts were designed. Each insert was machined so that the casing treatment surface was parallel to the rotor tip with a nominal clearance of 0.020 inch (0.05 cm). As a result of the rotor-tip taper, the inserts have about a 4° slope from the inlet to the outlet.

The casing inserts are described in detail in reference 1; thus only a brief description of each will be presented.

Solid insert. - The solid insert was used as the reference casing-treatment configuration to determine the rotor performance without casing treatment.

Blade-angle slot inserts. - Three different blade-angle slot inserts were tested. The slots, which were cut to the same angle as the blade-tip setting angle ($\sim 58^{\circ}$), extended radially into the casing. The radial depth and axial length of the slots varied as shown in figure 5. The insert shown in figure 5(a) will be referred to as the deep, long blade-angle slots; the insert shown in figure 5(b) will be referred to as the shallow, long



(a) Deep and long.

(b) Shallow and long.

(c) Shallow and short.

CD-11080-01

Figure 5. - Blade angle slot inserts. (Dimensions are in inches (cm).)

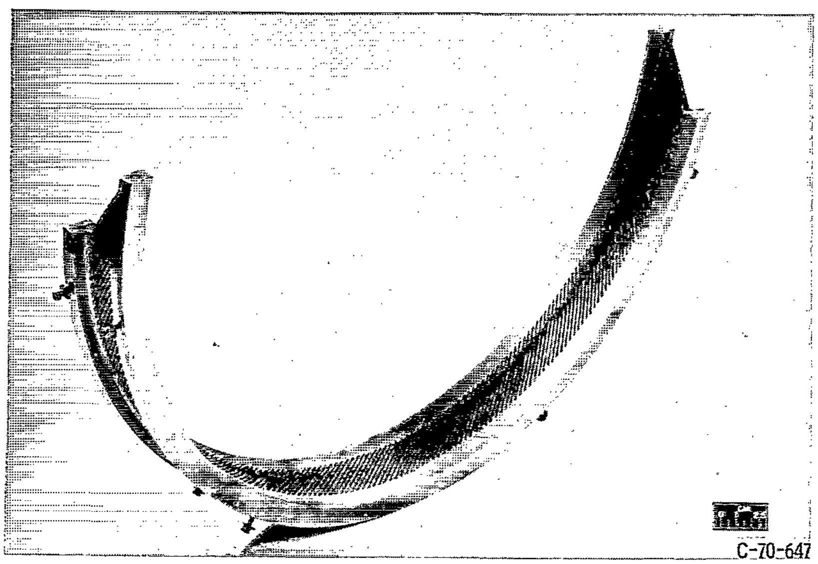


Figure 6. - Shallow, short blade-angle slot insert.

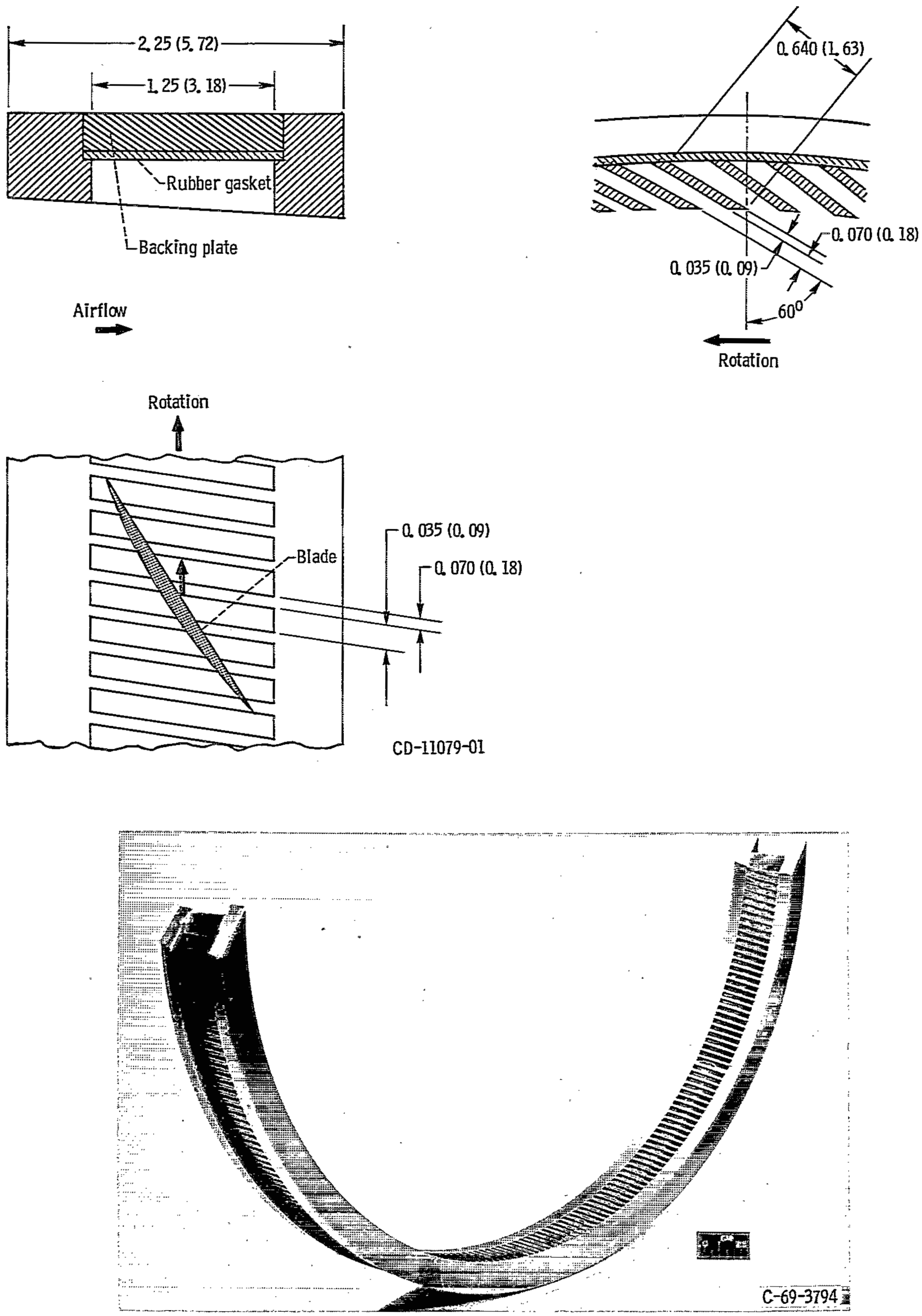


Figure 7. - Skewed slot insert. (Dimensions are in inches (cm).)

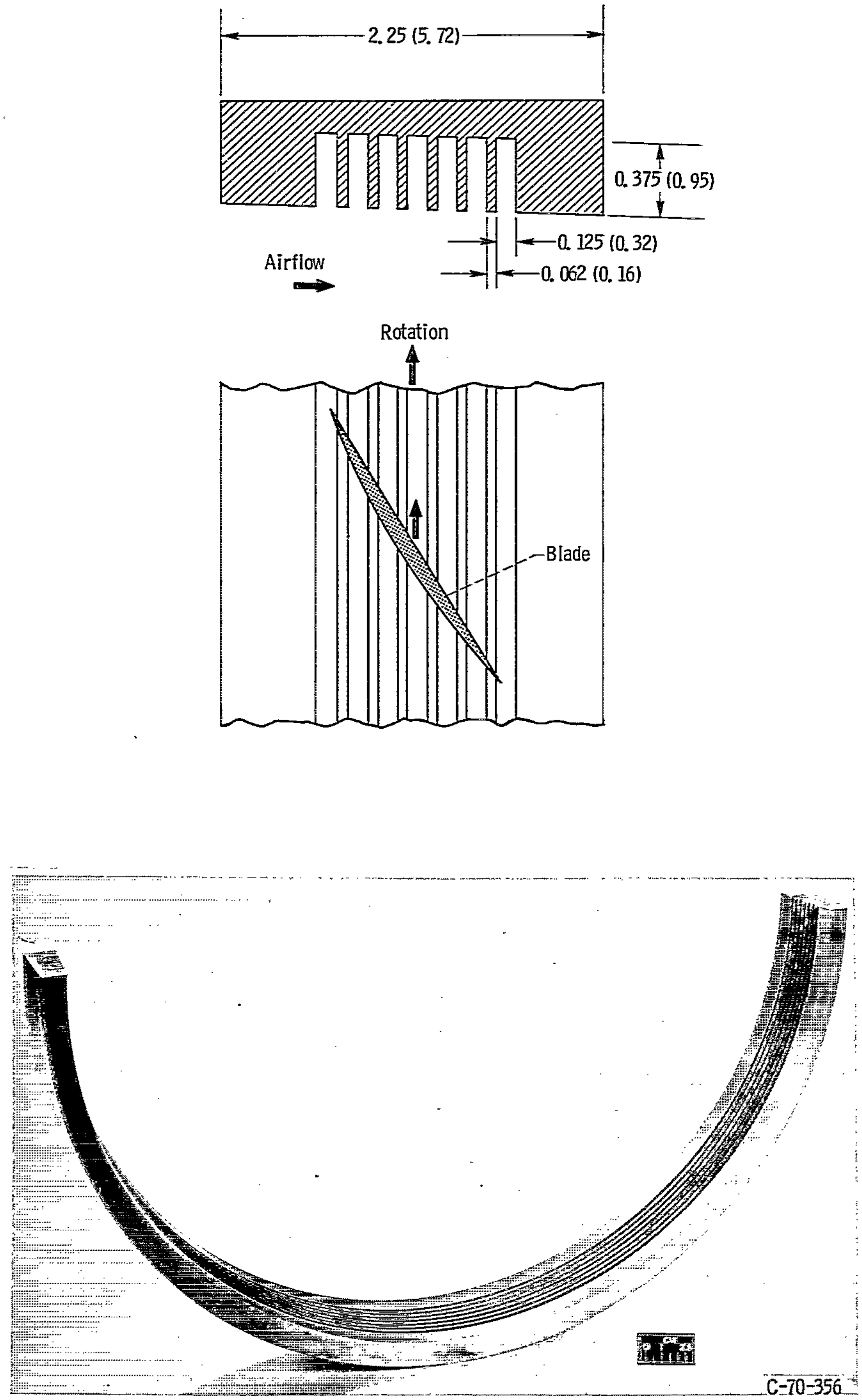


Figure 8. - Circumferentially groove insert. (Dimensions are in inches (cm).)

blade-angle slots. For both long slot inserts (figs. 5(a) and (b)), the slots extend past both the blade leading and trailing edges. The insert shown in figure 5(c) will be referred to as the shallow, short blade-angle slots. For this insert, the slots cover only the midportion of the blades. All three of these inserts have a backing plate and a rubber gasket over the back of the slots. The plate and gasket close the slots and should eliminate the slot to slot recirculation of air. However, recirculation along a slot from the trailing edge to the leading edge of the blade is possible for both of the long-slot inserts. A photograph of the shallow, short blade-angle slot insert is presented in figure 6. Wood plugs were used in the front and rear portions of the shallow, long blade-angle slot to make the shallow, short blade-angle slot.

Skewed slot insert. - The skewed slots were designed to be parallel to the axial direction and skewed in the direction of rotation. However, the slots were about 4° from the axial direction because of the changing radius of the inner diameter of the insert. A sketch of these skewed slots as well as a photograph is shown in figure 7. The slots extend past both the blade leading and trailing edges. This insert also had a plate and a gasket over the back of the slots. Recirculation along a slot from the blade trailing edge to blade leading edge is again possible, but slot to slot recirculation should be eliminated. The skewed slots have the same slot depth (fig. 7) as the deep-long blade-angle slots.

Circumferentially grooved insert. - The circumferentially grooved insert is shown in figure 8. The grooves extend past both the blade leading and trailing edges. The grooves were designed to give the same surface open-to-closed area ratio over the blades as the long blade-angle slots and skewed slots. The circumferential grooves should eliminate the blade-trailing-edge to blade-leading-edge recirculation, but recirculation from blade to blade along the grooves is possible.

PROCEDURE

These tests were conducted using atmospheric air as the working fluid. The inlet control valve was in the fully open position for all tests. Vacuum exhaust (26 torr vacuum) was used at the outlet of the throttle valve to help overcome system losses. The flow was controlled by manually operating the outlet throttle valve. For each casing insert, radial surveys were conducted at several weight flows for design speed only.

The overall rotor performance is based on mass-averaged values of temperature and energy-averaged values of pressure at the rotor inlet and outlet. These values were determined by the radial surveys of temperature and pressure. All parameters were based on correcting the measurements to standard day conditions at the rotor inlet. The blade-element data presented have been translated to the rotor leading and trailing edges.

The list of symbols and equations used are listed in appendixes A and B. The definitions and units for the tables is presented in appendix C.

RESULTS AND DISCUSSION

The results from this investigation will be presented in three main sections. The overall rotor performance with the various casing configurations will be presented first, followed by the radial distributions of several performance parameters for each configuration. Comparisons of parameters for various configurations are then made at the near-stall condition.

The plotted data and some additional performance parameters are also presented in tabular form. For identification, the reading numbers, which correspond to the various casing configurations, are listed in table IV. The overall performance data for each configuration are listed in table V. The blade element data for each reading are then presented in tables VI to XI. All values in the tables are in U. S. Customary units and the parameters are defined in appendix B.

Overall Performance

The overall performance for rotor 5 with the various casing configurations is presented in figure 9. Total pressure ratio, total temperature ratio, and temperature-rise efficiency are plotted as functions of equivalent weight flow for design speed. The solid data points represent the lowest flow that could be obtained just before stall. The solid line represents the rotor performance with the solid casing (no casing treatment). The dashed lines are faired through the two groups of casing-treatment data to indicate trends only. One group of treatment data seems to form a simple extension of the pressure-ratio curve for the solid-casing configuration. The second group of treatment data has about the same flow range as the first group, but the pressure ratio is considerably lower. All the casing configurations improved the weight-flow rate over that for the solid casing.

With both the deep, long and shallow, long blade-angle slot configurations, the pressure ratio and efficiency are significantly less than those values with the shallow, short blade-angle slot configuration. The efficiency with the shallow, short blade-angle slot configuration was just slightly less than that with the solid casing. The weight flow at the near-stall conditions is approximately the same for all three blade-angle slot configurations.

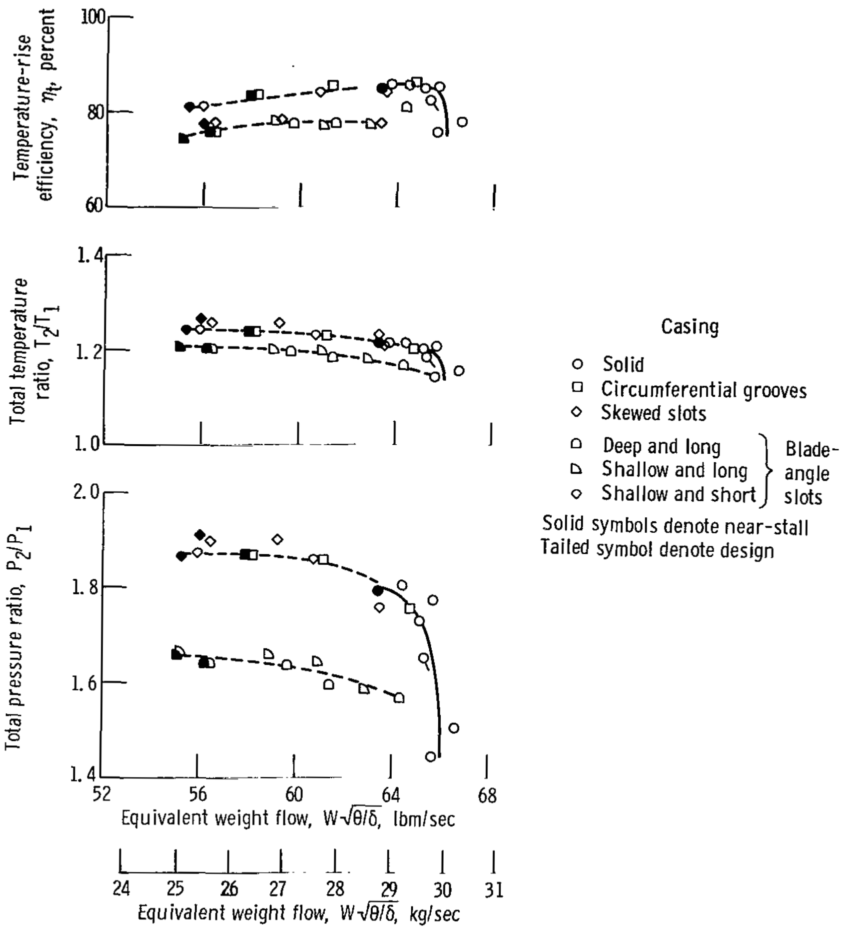


Figure 9. - Effect of casing treatment on overall performance of rotor 5. Design speed.

With the skewed slot configuration, the weight flow at the near-stall condition is about the same as it was with the three blade-angle slot configurations. At this near-stall condition, the rotor pressure ratio is the highest with the skewed slot configuration, but the efficiency with this configuration is about the same as that with both of the long blade-angle slot configurations. The skewed slot configuration has slots the same axial length as both the long blade-angle slot configurations.

The rotor operated with the circumferentially grooved configuration stalled at a slightly higher weight flow than with any of the slotted configurations. The weight flow at stall was, however, less than that for the solid casing. The maximum efficiency for this rotor with the grooved configuration is slightly greater than that obtained for the solid casing.

In general, the trends just discussed for this rotor with the various casing treatment configurations are the same as those observed in reference 1. The magnitude of weight flow, pressure tatio, temperature ratio, and efficiency are, however, different because of the calculation procedures. Herein, the values are based on mass-averaged radial survey data corrected to standard-day conditions at the rotor inlet. In reference 1 the values were based on arithmetically averaged fixed-rake instrumentation data corrected to standard-day conditions at the plenum.

Radial Distribution

The radial distribution of several performance parameters will be examined in their relation to the trends observed in the overall performance plots. The radial distributions are presented for the various casing configurations in figures 10 to 15. The following parameters are presented as functions of percent span from the rotor tip: total pressure ratio, total temperature ratio, temperature-rise efficiency, outlet flow angle, diffusion factor, total loss coefficient, outlet tangential velocity, and outlet axial velocity. For each configuration, the parameters are presenteu ior three weight flows: near-stall, midflow, and near-choke conditions.

Vibration dampers were located at approximately 43-percent span from the rotor tip. Data points were more closely spaced in the damper region in order to define the damper wake and to get more accurate mass-averaged values.

Solid casing. - The radial distributions for this rotor with the solid casing are presented in figure 10. The design distributions are also shown in this figure as dashed

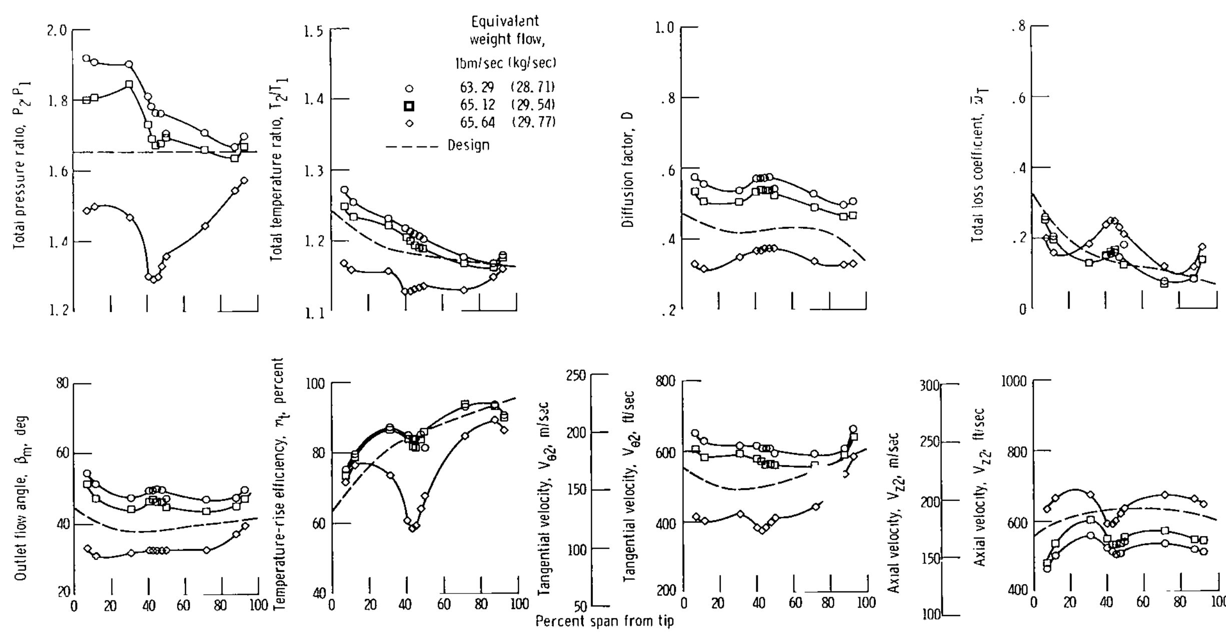


Figure 10. - Radial distribution of performance for rotor 5 operated with solid casing. Design speed.

lines. As the flow was decreased, the pressure ratio increased, particularly in the tip region. The diffusion factor and tangential velocity also increased fairly uniformly across the entire blade span. Except near the tip, the losses decrease with decreasing weight flow. Examination of the outlet axial velocity indicates that as the throttle valve was closed the flow decreased uniformly across the blade span.

The total pressure ratio shows a decay in the region of the dampers (~43 percent span). Except at the highest weight flow, the total temperature ratio did not show the decay in the damper region. The loss in efficiency is due to the loss in total pressure. Although the diffusion factor at the near-stall condition is higher than the design value, the losses are less than the design values except in the damper and hub regions.

Deep, long blade-angle slot casing. - The radial distributions for the deep, long blade-angle slot casing configurations are presented in figure 11. For all three weight flows, the total pressure shows a sharp decrease from about 30-percent span to the tip. The differences in efficiency for the three weight flows from the tip to about 30-percent span is attributed to the change in total temperature ratio. The flow in the tip region is low, as evidenced by the low axial velocity at the rotor outlet. The losses in the tip region increased rapidly with decreasing weight flow. At the near-stall condition, the blade shows an increase in loading (diffusion factor) from 30-percent span to the tip; at the other two weight flows, the loading decreases.

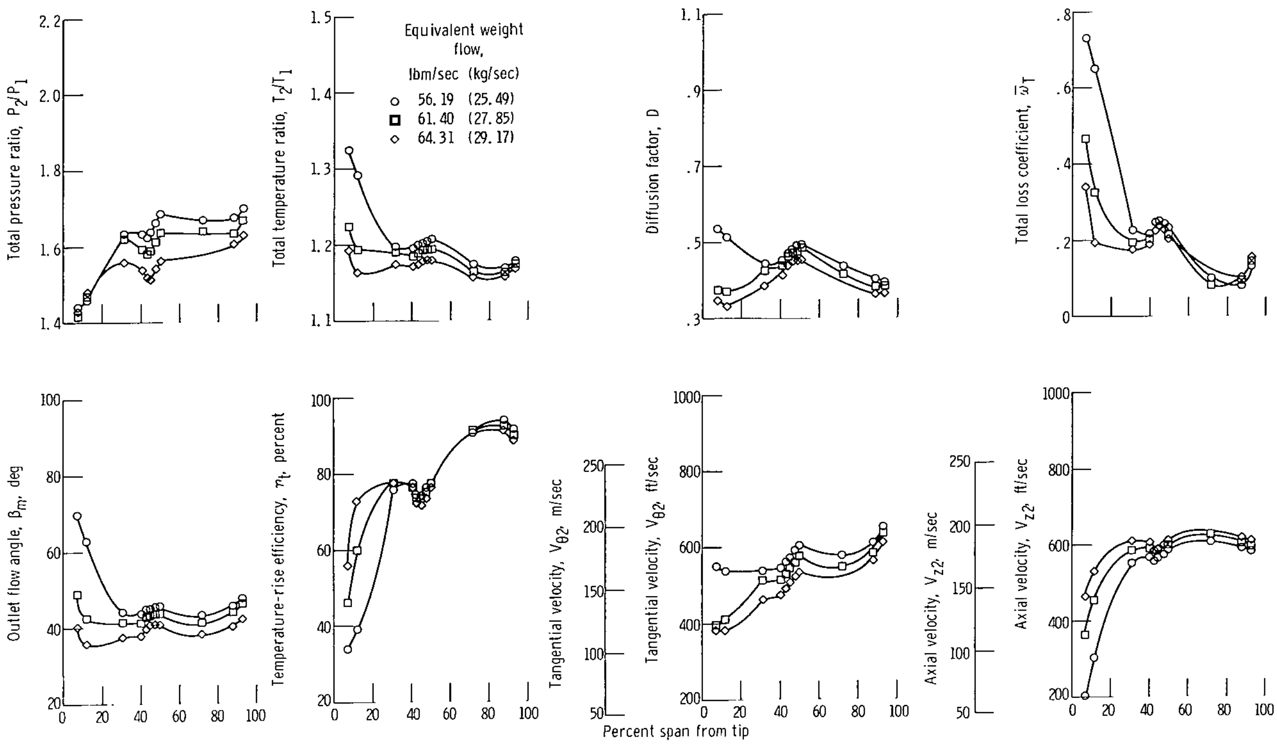


Figure 11. - Radial distribution of performance for rotor 5 operated with deep, long blade-angle slot casing. Design speed.

It is evident that the effect of this casing treatment is felt over the entire blade span when comparisons are made with the solid casing configuration. At a comparable weight flow with the solid casing, the pressure ratio over the entire blade span is much lower, and the losses are much higher with the deep, long blade-angle slot configuration. This is probably due to considerable recirculation at the rotor tip, which causes the streamlines to shift over the entire blade span.

Shallow, long blade-angle slot casing. - The radial distributions for the shallow, long blade-angle slot casing configuration are presented in figure 12. The rotor in this

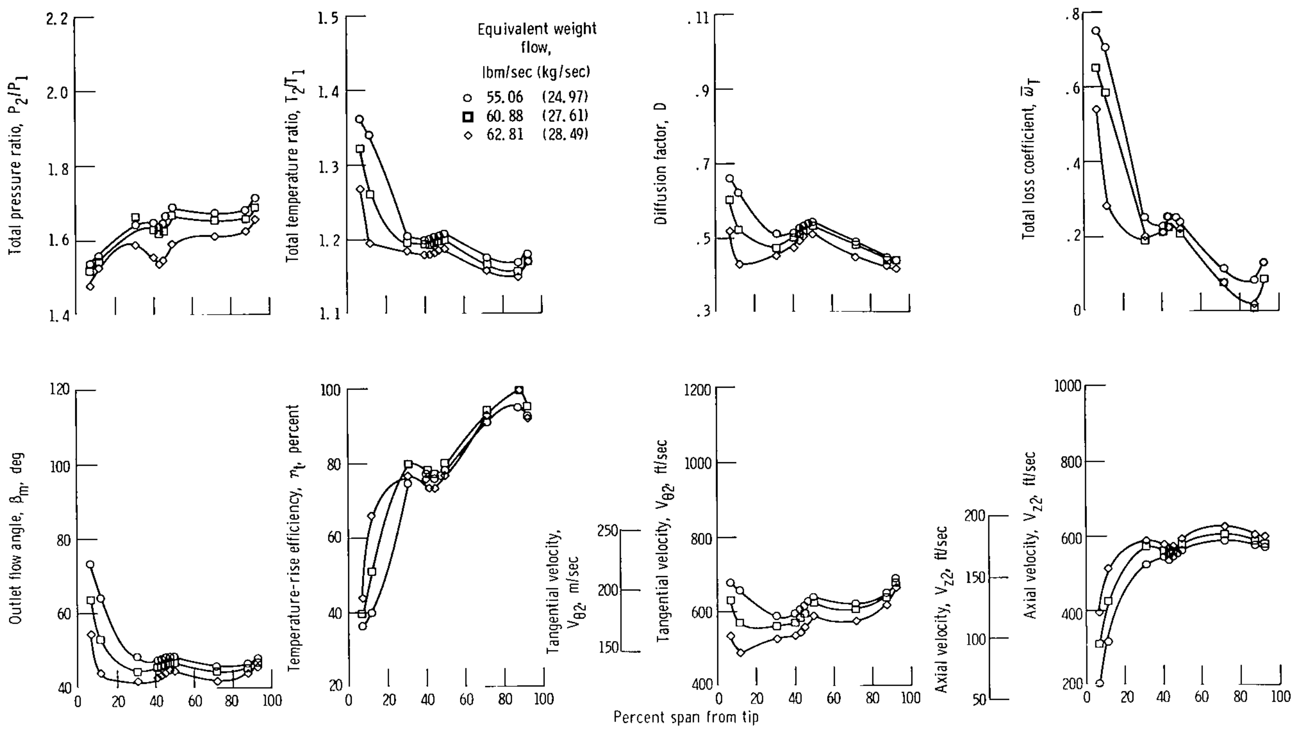


Figure 12. - Radial distribution of performance for rotor 5 operated with shallow, long blade-angle slot casing. Design speed.

configuration gave similar trends as it did with the deep, long blade-angle slot configuration. However, the diffusion factor for the two higher weight flows increased from 30-percent span to the tip. The losses in the tip region are high for all three weight flows. The axial velocity at the rotor outlet is low in the tip region, indicating a reduction in flow in this region.

Shallow, short blade-angle slot casing. - The radial distributions for the shallow, short blade-angle slot casing configuration are given in figure 13. At each radial location, the pressure ratio, temperature ratio, outlet flow angle, diffusion factor, outlet tangential velocity, and total loss coefficient increased with decreasing weight flow.

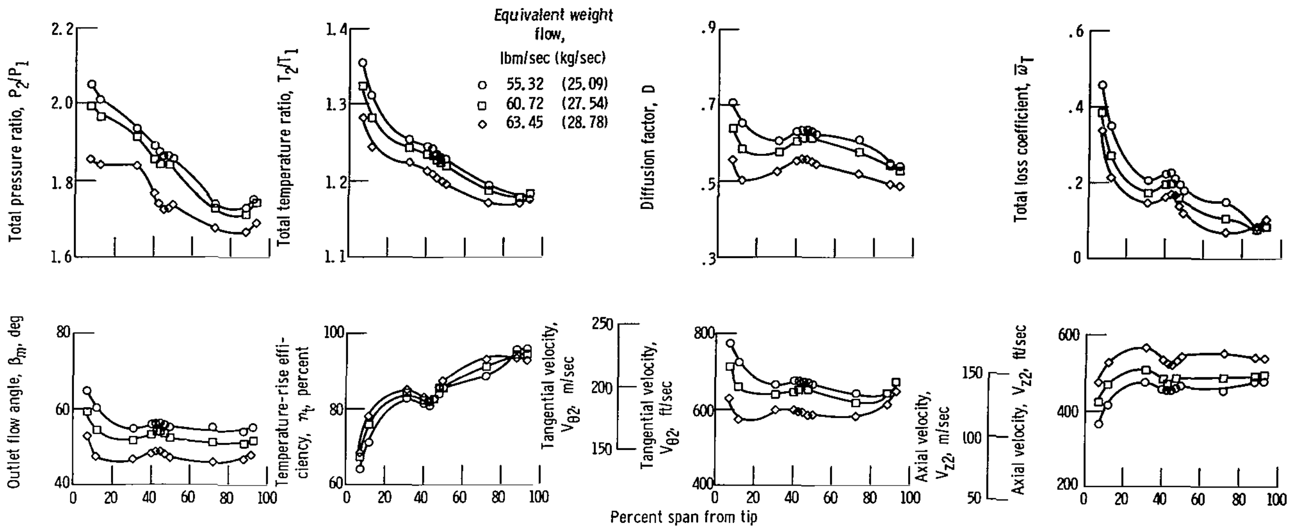


Figure 13. - Radial distribution of performance for rotor 5 operated with shallow, short blade-angle slot casing. Design speed.

For the highest weight flow, the pressure ratio remained essentially constant from 30-percent span to the tip. However, at the two other weight flows, the pressure ratio continued to increase to the tip. Except in the hub region, the efficiency over the blade span decreased as the weight flow decreased. With this configuration, the large decrease in axial velocity in the tip region experienced with the two long blade-angle slot configurations was not observed. There was a slight decrease in axial velocity in the tip region.

The rotor with the solid casing stalled at a weight flow of about 63.3 pounds per second (28.71 kg/sec). At a comparable weight flow of 63.45 pounds per second (28.78 kg/sec), the rotor with the shallow, short blade-angle slot casing has about the same radial distribution of parameters as it did with the solid casing. The absolute values are approximately the same for both casing configurations. The losses in the tip region are slightly greater for the shallow, short blade-angle casing. The shallow, short blade-angle slot casing configuration allowed the blade loading (diffusion factor) to continue to increase while the weight flow was decreased to values less than the stall weight flow for the solid casing. The flow decreased about 8 pounds per second (3.6 kg/sec) below that value for the solid casing configuration before stall occurred.

Skewed slot casing. - The radial distribution for the skewed slot casing configuration is presented in figure 14. Both the total temperature and total pressure show a decrease from 12-percent span to 7-percent span. The pressure ratio in the tip region remained essentially constant as the weight flow was reduced from 59.20 to 55.99 pounds per second (26.85 to 25.40 kg/sec). With this configuration, the midpassage of the blade is more highly loaded (higher diffusion factor) than the tip for all three weight flows.

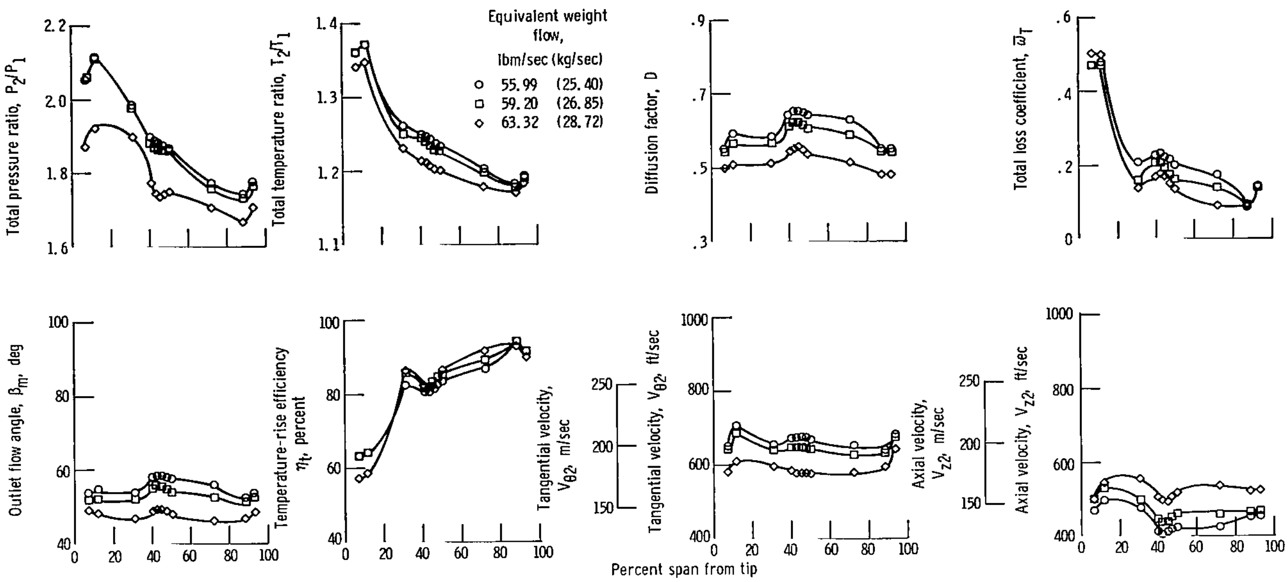


Figure 14. - Radial distribution of performance for rotor 5 operated with skewed slot casing. Design speed.

At the weight flow at which the solid casing configuration stalled (63.29 lbm/sec (28.71 kg/sec)), this casing treatment configuration showed about the same trends in radial distribution as the solid casing, except in the tip region. The apparent losses in the tip region are much greater for the skewed slot configuration although the diffusion factor is about the same for both the solid and skewed slot configurations. For this slot configuration, the momentum-rise efficiency is about 8 to 10 percentage points greater than the temperature-rise efficiency (table V(e)). This would indicate that there is considerable recirculation in the tip region. Perhaps if the slots were confined to only the midportion of the blade tips as they were for the shallow, short blade angle slot configuration, the recirculation would have been reduced. Then, the efficiency curve might have been an extension of the solid casing efficiency curve just as the pressure ratio curve seemed to be an extension of the solid casing pressure ratio curve in the overall performance maps of figure 9.

Circumferentially grooved casing. - The radial distributions for the circumferentially grooved casing configuration are presented in figure 15. The total pressure ratio increased from 30-percent span to the tip for the two lower weight flows but remained essentially constant for the highest weight flow. Except in the hub region, the efficiency along the blade span decreased with decreasing weight flow.

At a comparable weight flow, the radial distributions were about the same for the grooved configuration as the solid casing configuration. The losses, however, were just slightly greater in the tip region for the grooved configuration. With the circumferentially grooved casing configuration, the rotor could continue to load up (increase

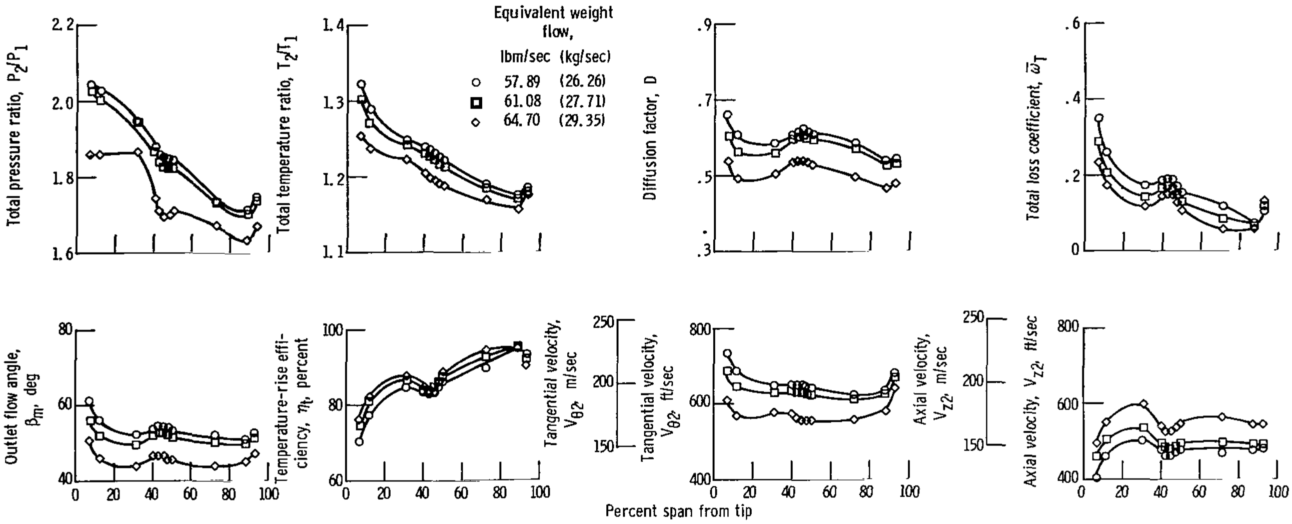


Figure 15. - Radial distribution of performance for rotor 5 operated with circumferential groove casing. Design speed.

diffusion factor) as the weight flow was reduced to a value less than the stall weight flow with the solid casing. This accounts for the overall pressure ratio and efficiency curve for the grooved configuration being a continuation of the curves for the solid casing configuration.

CASING TREATMENT COMPARISONS

One objective of the casing treatment was to decrease the weight flow at which stall occurs as compared with a solid casing, thereby increasing the useful operating range of the rotor. Thus, comparisons of the various casing configurations are made at the near-stall condition. The various performance parameters are again presented as a function of percent span.

In figure 16, the rotor performance with the three different blade-angle slot configurations are compared. With both long slot configurations, all the plotted parameters exhibit the same trends with percent span. The efficiency and losses are essentially the same for the two configurations. For the shallow, short blade-angle slot configuration, the pressure ratio and temperature ratio continually decreased with increasing percent span except near the hub. For both long blade-angle slot configurations, the pressure ratio increased from the tip to midspan and then remained relatively constant to the hub. The short slot configuration gave higher pressure ratio and efficiency over the entire blade span than did the two long slot configurations. The blade loading with the short slot configuration was uniformly higher across the entire span than with either of the long slot configurations. With the long slot configurations, the rotor with shallow slots

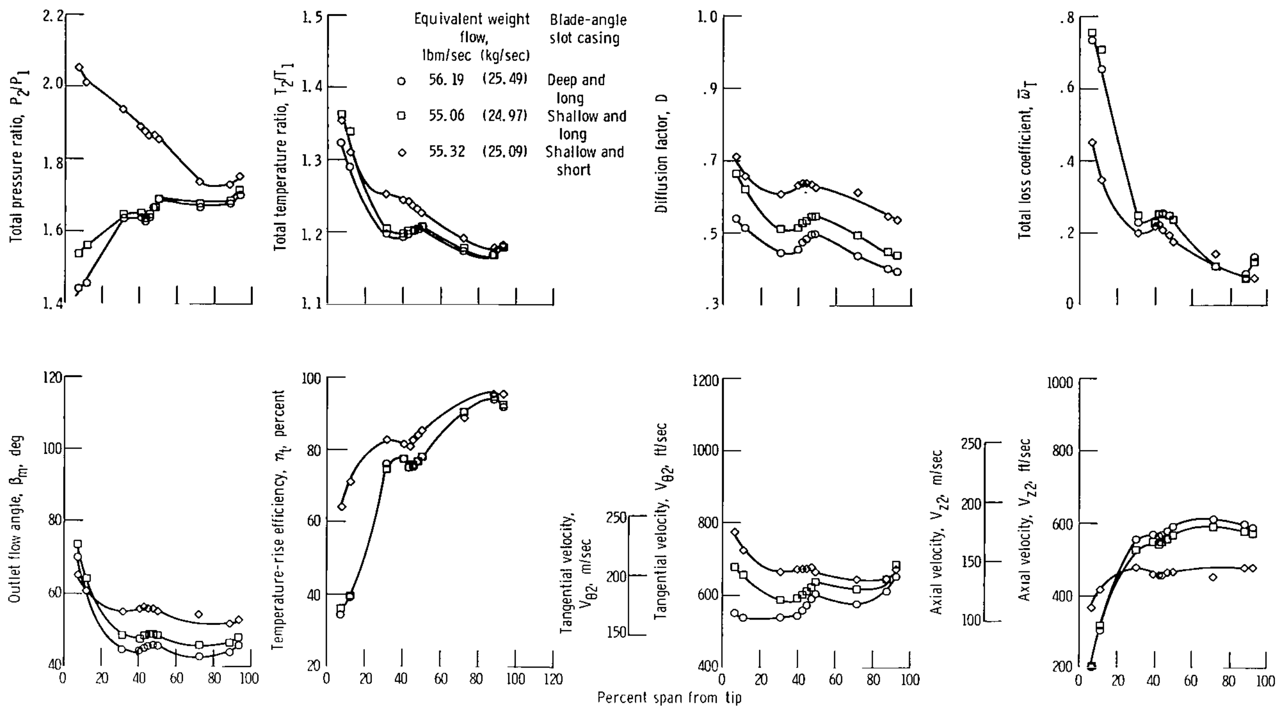


Figure 16. - Comparison of radial distribution of performance for rotor 5 for the three different blade-angle slot casings. Design speed; near-stall conditions.

was more highly loaded than it was with deep slots. Examination of all the parameters presented show that the performance of this rotor is appreciably improved with the shallow, short blade-angle slot configuration over that for either the deep, long or shallow, long blade-angle slot configurations.

In figure 17, the parameters at the near-stall condition are compared for the shallow, short blade-angle slot, skewed slot, and circumferentially grooved configurations. The radial distributions are similar with the three different configurations except in the tip region with the skewed slot configuration. The pressure ratio of the rotor with the grooved configuration is almost identical to that with the shallow, short blade-angle slot configuration, even though the weight flow is different. The temperature ratio is less with the grooved configuration thereby giving a higher efficiency than with the blade-angle slot configuration. The pressure ratio and temperature ratio are the highest with the skewed slot configuration except in the tip region. At 7-percent span, the pressure ratio is about the same as that for the shorter blade-angle slot and grooved configurations. The efficiency, however, is the lowest with the skewed slot configuration. Both pressure ratio and temperature ratio showed a decrease from 12-percent span to the tip with the skewed slot configuration.

At the near-stall condition, the rotor blades with the shallow, short blade-angle slot configuration are more highly loaded over the entire blade span than with the grooved configuration. This is due at least in part to the lower weight flow at which the rotor

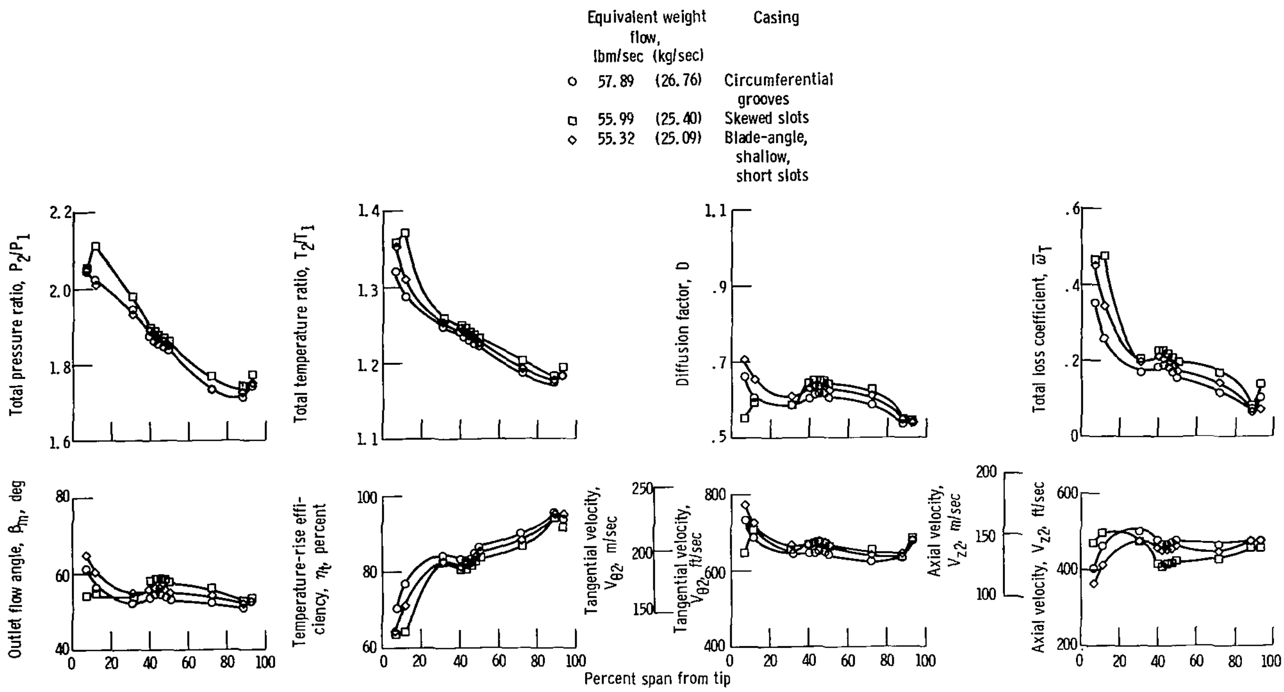


Figure 17. - Comparison of radial distribution of performance for rotor 5 for several different casings. Design speed; near-stall conditions.

stalled with the blade angle slot configuration. With the skewed slot configuration, the blade loading was lower in the tip region and higher from midspan to the hub region than either the blade-angle slot or grooved configuration. The losses at the near-stall condition are the lowest with the grooved configuration and highest with the skewed slot configuration.

Shortening the slots in the blade-angle slot configuration improved the pressure ratio in the tip region (fig. 16). The pressure ratio in the tip region with the skewed slot configuration might not show the decrease from 12-percent span to the tip had the slots been shorter.

CONCLUDING REMARKS

The results from this investigation indicate that the casing-treatment slots probably should not extend past the blade leading and trailing edges if both high efficiency and pressure ratio are to be achieved. The shorter blade-angle slot configuration gave higher efficiency and pressure ratio than both blade-angle slot configurations with slots that extended past the blade edges. The skewed slot configuration, which also had slots extending past the blade edges, had high pressure ratio, but the efficiency was low because of recirculation.

The overall performances for the shallow, short blade-angle slot and for the circumferentially grooved casing configurations fall close to an extension of the overall performance for the solid casing (fig. 9). However, the survey data indicate that the losses associated with the casing treatments are higher than those for the solid casing at comparable weight flow. This would indicate that the phenomena associated with casing treatment is one of flow stabilization rather than one of loss reduction. The stabilization of the flow delays stall, thereby allowing the weight flow to be reduced over that of the solid casing. More detailed measurements near the tip leading and trailing edges and dynamic measurements over the rotor tips may be necessary in order to further define the phenomena.

SUMMARY OF RESULTS

An axial-flow compressor rotor was tested at design speed with six different casing-treatment configurations. A solid, three different blade-angle slots, a skewed slot, and a circumferentially grooved casing treatment configurations were used. Radial surveys of the flow conditions (pressure, temperature, and flow angle) into and out of the rotor were taken at several weight flows for each configuration. This investigation yielded the following principal results:

1. The weight flow at which the rotor stalled decreased significantly with all the casing-treatment configurations below that with the solid casing.

2. A blade-angle slot configuration with slots over the middle portion of the rotor blade tips gave higher pressure ratio and efficiency over the entire blade span than two blade-angle slot configurations with slots that extended beyond both blade leading and trailing edges. Radial surveys indicated that the losses were lower for the shorter blade angle slot configuration.

3. At the near-stall condition, the total pressure ratio of the rotor with the skewed slot configuration was higher than with any other configuration from 7-percent span to the hub. At 7-percent span from the tip, the pressure ratio was about the same as that for the shorter blade-angle slot and circumferentially grooved configurations. However, the efficiency was lower than that with the shorter blade-angle slot and circumferentially grooved configuration.

4. The rotor with the circumferentially grooved configuration had the highest efficiency; and its pressure ratio was about the same as with the shorter blade angle slot

configurations. However, the rotor stalled at a higher weight flow with the grooved configuration than with the blade-angle slot or skewed-slot configurations.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, August 3, 1971,
720-03.

APPENDIX A

SYMBOLS

A_{an} annulus area at rotor leading edge, 1.59 ft^2 (0.0148 m^2)

A_f frontal area at rotor leading edge, 2.13 ft^2 (0.0198 m^2)

C_p specific heat at constant pressure, 0.24 Btu/(lb)(^{o}R) (1004 J/(kg)(K))

D diffusion factor

g acceleration of gravity, 32.17 ft/sec^2 (9.8 m/sec^2)

i_{mc} mean incidence angle, angle between inlet air direction and line tangent to blade mean camber line at leading edge, deg

i_{ss} suction surface incidence angle, angle between inlet-air direction and line tangent to blade suction surface at leading edge, deg

J mechanical equivalent of heat, 778.16 ft-lb/Btu

N rotative speed, rpm

P total pressure, psia (N/cm^2)

p static pressure, psia (N/cm^2)

r radius, in. (cm)

T total temperature, ^{o}R (K)

U wheel speed, ft/sec (m/sec)

V air velocity, ft/sec (m/sec)

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

z axial distance referenced from rotor blade hub leading edge, in. (cm)

β air angle, angle between air velocity and axial direction, deg

γ ratio of specific heats (1.40)

δ ratio of rotor inlet total pressure to standard pressure of 14.69 psia (10.13 N/cm^2)

δ^{o} deviation angle, angle between exit air direction and tangent to blade mean chamber line at trailing edge, deg

θ ratio of rotor inlet total temperature to standard temperature of 518.7^{o} R (288.1 K)

η efficiency

κ_{mc} angle between the blade mean camber line and the axial direction, deg

κ_{ss} angle between the blade suction surface camber line at the leading edge and the axial direction, deg

σ solidity, ratio of chord to spacing, c/s

$\overline{\omega}$ total loss coefficient

$\overline{\omega}_p$ profile loss coefficient

$\overline{\omega}_s$ shock loss coefficient

Subscripts:

id ideal

LE blade leading edge

m meridional direction

mom momentum

TE blade trailing edge

t temperature-rise (adiabatic)

θ tangential direction

1 instrument plane upstream of rotor

2 instrument plane downstream of rotor

Superscripts:

relative to rotor

APPENDIX B

PERFORMANCE PARAMETERS

Suction surface incidence angle:

$$i_{ss} = \left(\beta'_m\right)_{LE} - (\kappa_{ss}) \tag{B1}$$

Mean incidence angle:

$$i_{mc} = \left(\beta'_m\right)_{LE} - \left(\kappa_{mc}\right)_{LE} \tag{B2}$$

Deviation:

$$\delta^o = \left(\beta'_m\right)_{TE} - \left(\kappa_{mc}\right)_{TE} \tag{B3}$$

Diffusion factor:

$$D = 1 - \frac{(V')_{TE}}{(V')_{LE}} + \frac{\left(rV_\theta\right)_{TE} - \left(rV_\theta\right)_{LE}}{\left[(r)_{LE} + (r)_{TE}\right]\sigma(V')_{LE}} \tag{B4}$$

Total loss coefficient:

$$\overline{\omega} = \frac{\left(P'_{id}\right)_{TE} - (P')_{TE}}{(P')_{LE} - (p)_{LE}} \tag{B5}$$

Profile loss coefficient:

$$\overline{\omega}_p = \overline{\omega} - \overline{\omega}_s \tag{B6}$$

Total loss parameter:

$$\frac{\overline{\omega}\cos\left(\beta'_{mc}\right)_{TE}}{2\sigma} \tag{B7}$$

Profile loss parameter:

$$\frac{(\bar{\omega} - \bar{\omega}_s)\cos\left(\beta'_{mc}\right)_{TE}}{2\sigma} \tag{B8}$$

Temperature-rise efficiency:

$$\eta_t = \frac{\frac{(P)_{TE}}{(P)_{LE}}^{(\gamma-1)/\gamma} - 1}{\frac{(T)_{TE}}{(T)_{LE}} - 1} \tag{B9}$$

Momentum rise efficiency:

$$\eta_{mom} = \frac{\left[\frac{(P)_{TE}}{(P)_{LE}}\right]^{(\gamma-1)/\gamma} - 1}{\frac{(UV\sigma)_{TE} - (UV\sigma)_{LE}}{(T)_{LE} gJC_p}} \tag{B10}$$

Equivalent weight flow:

$$\frac{w\sqrt{\theta}}{\delta} \tag{B11}$$

Equivalent rotative speed:

$$\frac{N}{\sqrt{\theta}} \tag{B12}$$

Weight flow per unit frontal area:

$$\frac{\frac{w\sqrt{\theta}}{\delta}}{A_f} \tag{B13}$$

Weight flow per unit annulus area:

$$\frac{\frac{w\sqrt{\theta}}{\delta}}{A_{an}} \tag{B14}$$

Head rise coefficient:

$$\frac{gJC_pT_{LE}}{(U_{tip})^2}\left[\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma} - 1\right] \tag{B15}$$

Flow coefficient:

$$\left(\frac{V_Z}{U_{tip}}\right)_{LE} \tag{B16}$$

APPENDIX C

DEFINITIONS AND UNITS USED IN TABLES

ABS	absolute
AREA RATIO	ratio of actual flow area to critical area (where local Mach number is one)
BETAM	meridional air angle, deg
CONE ANGLE	angle between axial direction and conical surface representing blade element, deg
DELTA INC	difference between mean camber blade angle and suction surface blade angle, deg
DEV	deviation angle (defined by eq. (B3)), deg
D-FACT	diffusion factor (defined by eq. (B4))
EFF	temperature-rise efficiency (defined by eq. (B9))
IN	inlet (leading edge of blade)
INCIDENCE	incidence angle (suction surface defined by eq. (B1) and mean defined by eq. (B2))
KIC	angle between blade mean camber line and axial direction at leading edge, deg
KOC	angle between blade mean camber line and axial direction at trailing edge, deg
KTC	angle between blade mean camber line and axial direction at transition point, deg
LOSS COEFF	loss coefficient (total defined by eq. (B5) and profile defined by eq. (B6))
LOSS PARAM	loss parameter (total defined by eq. (B7) and profile defined by eq. (B8))
MERID	meridional
MERID VEL R	meridional velocity ratio
OUT	outlet (trailing edge of blade)
PHISS	suction surface camber ahead of assumed shock location, deg
PRESS	pressure, psia

PROF	profile
RADII	radius, in.
REL	relative to the blade
RI	inlet radius (leading edge of blade), in.
RO	outlet radius (trailing edge of blade), in.
RP	radial position
RPM	rotative speed, rpm
SPEED	speed, ft/sec
SS	suction surface
STREAMLINE SLOPE	slope of streamline, deg
TANG	tangential
TEMP	temperature, ^{o}R
TI	thickness of blade at leading edge, in.
TM	thickness of blade at maximum thickness, in.
TO	thickness of blade at trailing edge, in.
TOT	total
VEL	velocity, ft/sec
X FACTOR	ratio of suction surface camber ahead of assumed shock location of multiple circular arc blade section to that of double circular arc blade section
ZMC	axial distance to blade maximum thickness point from inlet, in.
ZOC	axial distance to blade trailing edge from inlet, in.
ZTC	axial distance to transition point from inlet, in.

APPENDIX D

CONVERSION FACTORS FOR SI UNITS

Length:

1 inch = 2.54 centimeter

1 foot = 0.3048 meter

Temperature:

1° R = 0.55555 K

Pressure:

1 psia = 0.68947572 N/cm^2

Velocity and speed:

1 ft/sec = 0.3048 m/sec

Weight flow:

1 lbm/sec = 0.45359237 kg/sec

Weight flow per area:

1 lbm/sec ft^2 = 0.042140 kg/sec m^2

REFERENCES

1. Osborn, Walter M.; Lewis, George W.; and Heidelberg, Laurence J.: Effect of Several Porous Casing Treatments on Stall Limit and Overall Performance of an Axial-Flow Compressor Rotor. NASA TN D-6537, 1971.
2. Bailey, Everett E.; and Voit, Charles H.: Some Observations of Effects of Porous Casings on Operating Range of a Single Axial-Flow Compressor Rotor. NASA TM X-2120, 1970.
3. Koch, C. C.: Experimental Evaluation of Outer Case Blowing or Bleeding of Single-Stage Axial-Flow Compressor, Part VI. Rep. R69AEG256, General Electric Co. (NASA CR-54592), Jan. 30, 1970.
4. Ball, Calvin L.; Janetske, David C.; and Reid, Lonnie: Performance of a 1380-Foot-Per-Second-Tip-Speed Axial-Flow Compressor Rotor with Blade Tip Solidity of 1.5. NASA TM X-2379, 1971.

TABLE I. - DESIGN OVERALL PARAMETERS FOR ROTOR 5

TOTAL PRESSURE RATIO	1.652
TOTAL TEMPERATURE RATIO	1.187
EFFICIENCY	0.824
WT FLOW PER UNIT FRONTAL AREA	30.824
WT FLOW PER UNIT ANNULUS AREA	41.549
WT FLOW	65.284
RPM	16000.000
TIP SPEED	1375.738

TABLE II. - DESIGN BLADE-ELEMENT PARAMETERS FOR ROTOR 5

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
TIP	9.853	9.802	-0.	44.7	64.6	55.5	518.7	1.243	14.69	1.652
1	9.622	9.531	-0.	42.3	63.8	53.9	518.7	1.227	14.69	1.652
2	9.426	9.349	0.	41.0	63.1	52.9	518.7	1.217	14.69	1.652
3	8.587	8.607	0.	38.0	60.1	48.6	518.7	1.189	14.69	1.652
4	8.152	8.239	0.	38.0	58.6	46.0	518.7	1.182	14.69	1.652
5	8.040	8.146	0.	38.1	58.2	45.3	518.7	1.182	14.69	1.652
6	7.927	8.054	0.	38.3	57.8	44.5	518.7	1.181	14.69	1.652
7	7.800	7.949	0.	38.5	57.3	43.6	518.7	1.180	14.69	1.652
8	7.700	7.868	0.	38.6	57.0	42.9	518.7	1.179	14.69	1.652
9	6.611	7.025	0.	39.8	53.5	33.9	518.7	1.171	14.69	1.652
10	5.681	6.387	0.	40.9	51.3	25.2	518.7	1.166	14.69	1.652
11	5.377	6.201	0.	41.3	50.7	22.3	518.7	1.164	14.69	1.652
HUB	5.006	5.934	-0.	41.6	49.9	18.0	518.7	1.161	14.69	1.652

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
TIP	654.5	787.6	1523.5	988.2	654.5	559.7	-0.	554.1	1375.7	1368.6
1	661.3	788.6	1497.4	989.7	661.3	583.0	-0.	531.0	1343.5	1330.8
2	667.0	789.8	1475.5	987.9	667.0	596.4	0.	517.8	1316.1	1305.4
3	689.1	796.1	1382.9	948.6	689.1	627.3	0.	490.2	1199.0	1201.8
4	695.8	803.3	1334.0	911.7	695.8	633.2	0.	494.4	1138.2	1150.4
5	696.9	805.9	1321.3	900.7	696.9	633.9	0.	497.5	1122.6	1137.4
6	697.7	808.6	1308.4	889.3	697.7	634.5	0.	501.4	1106.8	1124.6
7	698.3	811.7	1293.7	877.5	698.3	635.6	0.	504.9	1089.1	1109.9
8	698.4	814.3	1282.1	868.5	698.4	636.6	0.	507.8	1075.1	1098.6
9	681.8	848.1	1147.6	784.8	681.8	651.4	0.	543.2	923.1	980.9
10	635.8	882.7	1016.6	736.8	635.8	666.8	0.	578.4	793.2	891.8
11	615.0	894.0	970.5	726.4	615.0	671.8	0.	589.7	750.8	865.8
HUB	589.1	913.6	914.1	718.4	589.1	683.2	-0.	606.5	699.0	828.5

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	STREAMLINE SLOPE IN	STREAMLINE SLOPE OUT	MERID VEL R	PEAK SS MACH NO
TIP	0.608	0.660	1.414	0.828	0.608	0.469	-4.00	-4.80	0.855	1.612
1	0.614	0.665	1.391	0.835	0.614	0.492	-3.40	-3.53	0.882	1.619
2	0.620	0.670	1.372	0.837	0.620	0.506	-2.87	-2.60	0.894	1.622
3	0.642	0.684	1.289	0.815	0.642	0.539	0.50	1.65	0.910	1.604
4	0.649	0.693	1.244	0.786	0.649	0.546	2.78	4.05	0.910	1.562
5	0.650	0.696	1.233	0.777	0.650	0.547	3.42	4.69	0.910	1.554
6	0.651	0.698	1.221	0.768	0.651	0.548	4.08	5.35	0.909	1.545
7	0.652	0.702	1.207	0.758	0.652	0.549	4.85	6.11	0.910	1.536
8	0.652	0.704	1.196	0.751	0.652	0.551	5.48	6.71	0.911	1.528
9	0.635	0.739	1.069	0.684	0.635	0.568	13.70	14.03	0.955	1.453
10	0.589	0.775	0.942	0.647	0.589	0.586	22.91	21.48	1.049	1.272
11	0.568	0.787	0.897	0.639	0.568	0.591	26.32	24.11	1.092	1.211
HUB	0.543	0.807	0.843	0.635	0.543	0.604	30.90	28.40	1.160	1.135

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
TIP	0.	2.0	0.0	6.0	0.472	0.634	0.328	0.221	0.062	0.042
1	7.00	2.3	0.0	5.1	0.454	0.680	0.278	0.173	0.054	0.033
2	11.70	2.6	0.0	4.6	0.442	0.711	0.248	0.145	0.048	0.028
3	30.90	3.8	0.0	3.6	0.418	0.815	0.158	0.072	0.031	0.014
4	40.40	4.3	0.0	3.7	0.421	0.845	0.135	0.065	0.026	0.013
5	42.80	4.4	0.0	3.8	0.423	0.849	0.132	0.066	0.026	0.013
6	45.20	4.5	-0.0	3.8	0.425	0.852	0.131	0.068	0.026	0.013
7	47.90	4.7	0.0	3.9	0.427	0.857	0.128	0.069	0.025	0.013
8	50.00	4.8	0.0	3.9	0.429	0.861	0.126	0.070	0.024	0.014
9	71.80	5.9	0.0	4.8	0.427	0.902	0.101	0.073	0.019	0.014
10	88.30	6.5	0.0	6.1	0.392	0.931	0.084	0.081	0.015	0.014
11	93.10	6.7	0.0	6.8	0.370	0.941	0.078	0.077	0.013	0.013
HUB	100.00	6.8	0.0	7.7	0.335	0.955	0.065	0.065	0.010	0.010

TABLE III. - BLADE GEOMETRY FOR ROTOR 5

RP	PERCENT SPAN	RADII RI	RO	BLADE ANGLES KIC	KTC	KOC	DELTA INC
TIP	0.	9.853	9.802	62.55	58.39	49.50	1.95
1	7.	9.622	9.531	61.46	56.87	48.77	2.29
2	12.	9.426	9.349	60.53	55.62	48.18	2.57
3	31.	8.587	8.607	56.30	50.60	45.02	3.81
4	40.	8.152	8.239	54.24	48.35	42.31	4.30
5	43.	8.040	8.146	53.70	47.70	41.52	4.42
6	45.	7.927	8.054	53.17	47.02	40.68	4.55
7	48.	7.800	7.949	52.57	46.25	39.70	4.69
8	50.	7.700	7.868	52.11	45.64	38.92	4.80
9	72.	6.611	7.025	47.47	38.40	28.98	5.88
10	88.	5.681	6.387	44.59	31.77	18.71	6.55
11	93.	5.377	6.201	43.93	29.63	15.18	6.68
HUB	100.	5.006	5.934	43.25	27.05	10.00	6.80

RP	BLADE THICKNESSES TI	TM	TO	AXIAL DIMENSIONS ZMC	ZTC	ZOC	CONE ANGLE
TIP	0.020	0.060	0.020	0.554	0.554	1.001	-5.700
1	0.020	0.064	0.020	0.558	0.558	1.056	-4.831
2	0.020	0.068	0.020	0.560	0.560	1.092	-3.964
3	0.020	0.085	0.020	0.575	0.575	1.230	0.902
4	0.020	0.093	0.020	0.604	0.604	1.288	3.857
5	0.020	0.095	0.020	0.611	0.611	1.303	4.653
6	0.020	0.097	0.020	0.619	0.619	1.319	5.470
7	0.020	0.100	0.020	0.626	0.626	1.336	6.377
8	0.020	0.101	0.020	0.632	0.632	1.350	7.081
9	0.020	0.123	0.020	0.694	0.694	1.488	15.350
10	0.020	0.140	0.020	0.740	0.740	1.595	23.606
11	0.020	0.146	0.020	0.754	0.754	1.627	26.582
HUB	0.020	0.153	0.020	0.771	0.771	1.674	30.300

RP	AERO CHORD	SETTING ANGLE	TOTAL CAMBER	SOLIDITY	X FACTOR	PHISS	AREA RATIO
TIP	1.903	57.84	13.05	1.500	0.649	5.82	1.085
1	1.936	56.44	12.68	1.530	0.735	6.71	1.081
2	1.943	55.31	12.35	1.561	0.802	7.35	1.077
3	1.959	50.61	11.27	1.703	1.000	9.14	1.062
4	1.960	48.30	11.93	1.788	1.000	9.07	1.052
5	1.961	47.64	12.19	1.812	1.000	9.12	1.050
6	1.961	46.96	12.49	1.836	1.000	9.17	1.048
7	1.962	46.18	12.87	1.864	1.000	9.22	1.046
8	1.962	45.56	13.19	1.888	1.000	9.26	1.045
9	1.988	38.29	18.49	2.196	1.000	9.76	1.032
10	2.070	31.70	25.88	2.584	1.000	10.05	1.035
11	2.117	29.58	28.75	2.753	1.000	10.04	1.043
HUB	2.165	26.80	33.25	2.980	1.000	9.95	1.057

TABLE IV. - IDENTIFICATION OF READING NUMBERS

Casing	Reading numbers
Solid	443- 684 444- 695 445- 706 477- 830 478- 847 479- 858 482- 869
Deep, long blade-angle slot	551-1061 552-1073 553-1084 554-1095 555-1106
Shallow, long blade-angle slot	707-1503 708-1514 709-1525 710-1536 711-1547
Shallow, short blade-angle slot	761-1629 762-1640 763-1651 764-1662
Skewed slot	508- 924 510- 940 511- 951 512- 962
Circumferentially grooved	602-1227 603-1238 604-1249 605-1260

TABLE V. - OVERALL PERFORMANCE FOR ROTOR 5 WITH DIFFERENT ROTOR CASINGS

(a) With solid casing

	Reading number						
	443-684	444-695	445-706	477-830	478-847	479-858	482-869
ROTOR TOTAL PRESSURE RATIO	1.805	1.505	1.776	1.792	1.447	1.731	1.797
ROTOR TOTAL TEMPERATURE RATIO	1.214	1.158	1.209	1.213	1.147	1.200	1.213
ROTOR TEMP. RISE EFFICIENCY	0.860	0.782	0.855	0.851	0.760	0.851	0.857
ROTOR MOMENTUM RISE EFFICIENCY	0.857	0.772	0.858	0.841	0.746	0.836	0.848
ROTOR HEAD RISE COEFFICIENT	0.300	0.202	0.290	0.299	0.183	0.279	0.299
FLOW COEFFICIENT	0.431	0.441	0.431	0.429	0.451	0.445	0.429
WT FLOW PER UNIT FRONTAL AREA	30.405	31.452	31.032	29.883	30.992	30.745	30.062
WT FLOW PER UNIT ANNULUS AREA	40.983	42.395	41.829	40.280	41.775	41.442	40.521
WT FLOW AT ORIFICE	64.397	66.616	65.725	63.293	65.642	65.117	63.671
WT FLOW AT ROTOR INLET	64.897	66.054	65.000	64.491	66.783	66.141	64.553
WT FLOW AT ROTOR OUTLET	61.023	64.188	62.441	60.458	64.000	62.382	60.554
RPM	16083.417	16083.709	16099.760	15998.963	16009.100	16027.687	16022.704
PERCENT OF DESIGN SPEED	100.521	100.523	100.623	99.994	100.057	100.173	100.142

(b) With deep, long blade-angle slot casing

	Reading number				
	551-1061	552-1073	553-1084	554-1095	555-1106
ROTOR TOTAL PRESSURE RATIO	1.638	1.568	1.595	1.635	1.640
ROTOR TOTAL TEMPERATURE RATIO	1.200	1.169	1.184	1.195	1.201
ROTOR TEMP. RISE EFFICIENCY	0.756	0.812	0.777	0.774	0.756
ROTOR MOMENTUM RISE EFFICIENCY	0.791	0.824	0.807	0.808	0.789
ROTOR HEAD RISE COEFFICIENT	0.248	0.225	0.234	0.246	0.248
FLOW COEFFICIENT	0.352	0.428	0.395	0.376	0.349
WT FLOW PER UNIT FRONTAL AREA	26.530	30.364	28.989	28.159	26.629
WT FLOW PER UNIT ANNULUS AREA	35.761	40.929	39.075	37.956	35.894
WT FLOW AT ORIFICE	56.192	64.312	61.399	59.640	56.400
WT FLOW AT ROTOR INLET	55.714	64.314	60.930	58.604	55.368
WT FLOW AT ROTOR OUTLET	53.974	62.688	59.197	57.141	53.959
RPM	16043.216	16042.574	16049.264	16061.969	16067.241
PERCENT OF DESIGN SPEED	100.270	100.266	100.308	100.387	100.420

(c) With shallow, long blade-angle slot casing

	Reading number				
	707-1503	708-1514	709-1525	710-1536	711-1547
ROTOR TOTAL PRESSURE RATIO	1.657	1.585	1.642	1.659	1.665
ROTOR TOTAL TEMPERATURE RATIO	1.209	1.181	1.197	1.199	1.208
ROTOR TEMP. RISE EFFICIENCY	0.744	0.777	0.771	0.783	0.756
ROTOR MOMENTUM RISE EFFICIENCY	0.722	0.722	0.733	0.738	0.731
ROTOR HEAD RISE COEFFICIENT	0.254	0.231	0.250	0.256	0.258
FLOW COEFFICIENT	0.351	0.414	0.393	0.380	0.345
WT FLOW PER UNIT FRONTAL AREA	25.995	29.656	28.744	27.825	26.046
WT FLOW PER UNIT ANNULUS AREA	35.040	39.974	38.745	37.506	35.108
WT FLOW AT ORIFICE	55.058	62.811	60.880	58.933	55.165
WT FLOW AT ROTOR INLET	55.542	62.895	60.670	59.083	54.671
WT FLOW AT ROTOR OUTLET	52.016	59.062	56.477	55.227	52.425
RPM	16035.067	16030.468	16026.682	16010.855	15999.836
PERCENT OF DESIGN SPEED	100.219	100.190	100.167	100.068	99.999

TABLE V. - Concluded. OVERALL PERFORMANCE FOR ROTOR 5 WITH DIFFERENT ROTOR CASINGS

(d) With shallow, short blade-angle slot casing

	Reading number			
	761-1629	762-1640	763-1651	764-1662
ROTOR TOTAL PRESSURE RATIO	1.866	1.758	1.859	1.872
ROTOR TOTAL TEMPERATURE RATIO	1.240	1.208	1.230	1.241
ROTOR TEMP. RISE EFFICIENCY	0.812	0.841	0.842	0.813
ROTOR MOMENTUM RISE EFFICIENCY	0.807	0.823	0.831	0.806
ROTOR HEAD RISE COEFFICIENT	0.322	0.287	0.318	0.322
FLOW COEFFICIENT	0.354	0.426	0.394	0.353
WT FLOW PER UNIT FRONTAL AREA	26.117	29.958	28.666	26.400
WT FLOW PER UNIT ANNULUS AREA	35.204	40.381	38.640	35.586
WT FLOW AT ORIFICE	55.317	63.451	60.716	55.916
WT FLOW AT ROTOR INLET	55.994	64.390	60.791	55.952
WT FLOW AT ROTOR OUTLET	52.776	61.015	57.181	52.902
RPM	15987.962	16015.620	16025.916	16023.144
PERCENT OF DESIGN SPEED	99.925	100.098	100.162	100.145

(e) With skewed slot casing

	Reading number			
	508-924	510-940	511-951	512-962
ROTOR TOTAL PRESSURE RATIO	1.896	1.792	1.901	1.909
ROTOR TOTAL TEMPERATURE RATIO	1.257	1.233	1.257	1.262
ROTOR TEMP. RISE EFFICIENCY	0.780	0.778	0.786	0.774
ROTOR MOMENTUM RISE EFFICIENCY	0.864	0.872	0.876	0.857
ROTOR HEAD RISE COEFFICIENT	0.328	0.294	0.327	0.329
FLOW COEFFICIENT	0.353	0.410	0.374	0.348
WT FLOW PER UNIT FRONTAL AREA	26.630	29.894	27.951	26.436
WT FLOW PER UNIT ANNULUS AREA	35.896	40.295	37.675	35.634
WT FLOW AT ORIFICE	56.403	63.316	59.199	55.992
WT FLOW AT ROTOR INLET	55.966	62.677	58.509	55.325
WT FLOW AT ROTOR OUTLET	53.913	60.761	57.338	54.107
RPM	16049.437	16124.841	16121.884	16121.531
PERCENT OF DESIGN SPEED	100.309	100.780	100.762	100.760

(f) With circumferentially grooved casing

	Reading number			
	602-1227	603-1238	604-1249	605-1260
ROTOR TOTAL PRESSURE RATIO	1.867	1.755	1.857	1.864
ROTOR TOTAL TEMPERATURE RATIO	1.233	1.201	1.225	1.232
ROTOR TEMP. RISE EFFICIENCY	0.839	0.869	0.860	0.840
ROTOR MOMENTUM RISE EFFICIENCY	0.835	0.852	0.855	0.838
ROTOR HEAD RISE COEFFICIENT	0.322	0.287	0.319	0.322
FLOW COEFFICIENT	0.377	0.439	0.404	0.378
WT FLOW PER UNIT FRONTAL AREA	27.331	30.547	28.838	27.493
WT FLOW PER UNIT ANNULUS AREA	36.840	41.175	38.871	37.058
WT FLOW AT ORIFICE	57.886	64.698	61.079	58.230
WT FLOW AT ROTOR INLET	58.765	65.470	61.748	58.685
WT FLOW AT ROTOR OUTLET	55.861	63.080	59.072	56.053
RPM	15996.219	15997.943	15989.649	15973.580
PERCENT OF DESIGN SPEED	99.976	99.987	99.935	99.835

TABLE VI. - BLADE-ELEMENT DATA AT BLADE EDGES FOR SOLID CASING

(a) Reading number, 443-684

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.4	55.0	65.5	56.4	520.7	1.276	14.52	1.914
2	9.426	9.349	1.4	50.6	64.1	53.6	520.0	1.257	14.66	1.908
3	8.587	8.607	1.6	47.0	58.3	46.5	519.4	1.232	14.72	1.902
4	8.152	8.239	1.6	48.8	56.0	45.8	518.9	1.219	14.71	1.822
5	8.040	8.146	1.6	48.9	55.4	46.4	518.9	1.214	14.71	1.782
6	7.927	8.054	1.6	49.3	55.0	46.2	518.9	1.210	14.71	1.766
7	7.800	7.949	1.7	48.9	54.4	44.7	518.4	1.207	14.72	1.765
8	7.700	7.868	1.5	48.2	54.1	43.5	518.2	1.203	14.71	1.774
9	6.611	7.025	1.5	47.0	52.3	35.1	517.7	1.177	14.72	1.716
10	5.681	6.387	1.4	47.6	51.1	27.0	517.3	1.162	14.73	1.673
11	5.377	6.201	1.3	49.1	50.5	20.7	517.4	1.177	14.73	1.698

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	608.8	796.1	1469.0	825.5	608.6	456.8	15.4	652.0	1352.4	1339.6
2	634.5	804.7	1454.0	859.5	634.3	510.6	15.8	621.9	1324.2	1313.4
3	733.4	833.6	1393.4	825.6	733.1	568.6	20.5	609.6	1205.4	1208.2
4	758.8	809.7	1356.3	765.4	758.5	533.4	21.5	609.1	1145.9	1158.1
5	765.1	791.4	1345.9	754.5	764.8	520.0	21.0	596.6	1128.5	1143.4
6	766.5	787.7	1334.5	742.0	766.2	514.0	21.4	596.8	1114.1	1131.9
7	768.0	795.0	1319.0	734.7	767.6	522.5	22.2	599.2	1094.8	1115.7
8	766.3	800.2	1307.1	734.7	766.0	533.0	19.8	596.9	1079.0	1102.5
9	700.9	813.6	1146.9	678.0	700.7	554.9	18.8	595.1	926.8	984.8
10	630.7	827.8	1004.0	626.6	630.5	558.4	15.1	611.1	796.4	895.4
11	610.8	866.9	959.3	606.6	610.6	567.6	13.8	655.2	753.7	869.2

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.561	0.657	1.354	0.681	0.561	0.377	0.751	1.642
2	0.587	0.670	1.345	0.716	0.587	0.425	0.805	1.630
3	0.687	0.705	1.305	0.698	0.687	0.481	0.776	1.557
4	0.713	0.687	1.275	0.650	0.713	0.453	0.703	1.503
5	0.720	0.672	1.266	0.640	0.720	0.441	0.680	1.489
6	0.721	0.669	1.256	0.631	0.721	0.437	0.671	1.481
7	0.723	0.678	1.242	0.626	0.723	0.445	0.681	1.467
8	0.722	0.684	1.231	0.628	0.721	0.455	0.696	1.460
9	0.655	0.705	1.072	0.588	0.655	0.481	0.792	1.413
10	0.585	0.724	0.931	0.548	0.585	0.488	0.886	1.251
11	0.565	0.757	0.887	0.529	0.565	0.495	0.930	1.192

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	4.0	1.7	7.6	0.579	0.737	0.275	0.170	0.050	0.031
2	11.70	3.6	1.0	5.3	0.542	0.788	0.214	0.114	0.041	0.022
3	30.90	2.0	-1.9	1.5	0.532	0.869	0.131	0.053	0.026	0.011
4	40.40	1.7	-2.6	3.5	0.558	0.855	0.143	0.080	0.028	0.016
5	42.80	1.6	-2.8	4.9	0.558	0.839	0.156	0.098	0.030	0.019
6	45.20	1.7	-2.8	5.5	0.562	0.840	0.155	0.099	0.029	0.019
7	47.90	1.8	-2.9	4.9	0.561	0.852	0.145	0.093	0.028	0.018
8	50.00	1.9	-2.9	4.6	0.556	0.875	0.122	0.074	0.023	0.014
9	71.80	4.7	-1.2	5.9	0.527	0.942	0.061	0.038	0.011	0.007
10	88.30	6.4	-0.2	7.9	0.498	0.976	0.030	0.028	0.005	0.005
11	93.10	6.5	-0.2	5.1	0.498	0.922	0.112	0.111	0.019	0.019

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SOLID CASING

(b) Reading number, 444-695

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.3	37.2	64.1	55.0	520.8	1.191	14.62	1.537
2	9.426	9.349	1.4	33.3	63.3	53.7	520.0	1.173	14.64	1.564
3	8.587	8.607	1.7	34.8	57.8	48.2	519.1	1.174	14.66	1.554
4	8.152	8.239	1.7	35.3	55.3	52.0	518.8	1.144	14.68	1.370
5	8.040	8.146	1.5	35.5	54.8	51.8	519.0	1.144	14.69	1.355
6	7.927	8.054	1.5	35.7	54.2	50.5	518.5	1.145	14.70	1.363
7	7.800	7.949	1.6	35.8	53.8	48.4	518.3	1.146	14.70	1.390
8	7.700	7.868	1.5	35.5	53.6	46.6	518.3	1.148	14.72	1.417
9	6.611	7.025	1.7	34.9	51.4	37.4	517.4	1.136	14.73	1.481
10	5.681	6.387	1.5	38.4	50.0	26.4	517.8	1.147	14.75	1.574
11	5.377	6.201	1.4	40.5	49.3	21.6	518.2	1.159	14.75	1.595

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	648.3	769.3	1485.7	1067.0	648.1	612.5	15.1	465.5	1351.9	1339.1
2	656.3	778.3	1462.5	1098.0	656.1	650.5	15.7	427.3	1322.8	1312.0
3	744.7	811.4	1397.8	998.9	744.4	666.2	21.6	463.2	1204.6	1207.4
4	774.5	711.9	1360.6	942.6	774.2	580.8	23.0	411.6	1141.8	1154.0
5	782.7	707.3	1356.2	931.8	782.5	575.8	20.6	410.7	1128.4	1143.3
6	786.5	721.0	1345.4	919.8	786.2	585.4	20.8	420.8	1112.5	1130.4
7	784.1	743.8	1328.5	908.8	783.8	603.1	21.8	435.4	1094.4	1115.3
8	783.2	765.9	1318.4	908.3	782.9	623.8	20.3	444.4	1081.0	1104.6
9	724.7	822.8	1160.8	849.6	724.4	675.1	20.9	470.2	927.9	986.0
10	655.4	888.8	1019.6	777.4	655.2	696.4	17.2	552.3	798.4	897.7
11	635.8	916.5	975.1	749.7	635.6	697.1	15.7	595.0	755.2	870.9

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.600	0.657	1.375	0.911	0.600	0.523	0.945	1.616
2	0.608	0.671	1.356	0.947	0.608	0.561	0.991	1.615
3	0.699	0.703	1.311	0.865	0.698	0.577	0.895	1.548
4	0.730	0.619	1.282	0.819	0.729	0.505	0.750	1.486
5	0.738	0.614	1.279	0.809	0.738	0.500	0.736	1.480
6	0.743	0.627	1.270	0.800	0.742	0.509	0.745	1.469
7	0.740	0.648	1.254	0.792	0.740	0.525	0.769	1.458
8	0.739	0.669	1.244	0.793	0.739	0.545	0.797	1.453
9	0.679	0.728	1.088	0.752	0.679	0.597	0.932	1.390
10	0.609	0.789	0.947	0.690	0.609	0.618	1.063	1.238
11	0.589	0.812	0.904	0.664	0.589	0.617	1.097	1.178

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	2.6	0.3	6.1	0.380	0.683	0.244	0.142	0.046	0.027
2	11.70	2.8	0.2	5.5	0.339	0.785	0.158	0.060	0.030	0.011
3	30.90	1.5	-2.3	3.1	0.378	0.771	0.177	0.100	0.035	0.020
4	40.40	1.1	-3.2	9.7	0.388	0.655	0.231	0.171	0.040	0.029
5	42.80	1.0	-3.4	10.3	0.393	0.630	0.248	0.189	0.042	0.032
6	45.20	1.0	-3.5	9.8	0.398	0.638	0.247	0.191	0.043	0.033
7	47.90	1.2	-3.5	8.7	0.400	0.673	0.230	0.179	0.041	0.032
8	50.00	1.4	-3.4	7.7	0.397	0.709	0.210	0.161	0.038	0.029
9	71.80	3.7	-2.2	8.2	0.359	0.871	0.107	0.085	0.019	0.015
10	88.30	5.3	-1.3	7.3	0.345	0.939	0.067	0.065	0.012	0.011
11	93.10	5.3	-1.4	6.0	0.347	0.897	0.131	0.130	0.022	0.022

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SOLID CASING

(c) Reading number, 445-706

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.4	53.6	64.7	56.8	520.4	1.263	14.65	1.832
2	9.426	9.349	1.4	48.0	64.0	53.3	519.6	1.245	14.65	1.867
3	8.587	8.607	1.7	45.1	58.5	46.1	518.6	1.230	14.66	1.890
4	8.152	8.239	1.8	47.3	56.2	45.7	518.4	1.215	14.67	1.794
5	8.040	8.146	1.6	47.4	55.7	46.7	518.3	1.208	14.68	1.747
6	7.927	8.054	1.6	47.3	55.2	46.4	518.3	1.205	14.69	1.727
7	7.800	7.949	1.6	46.9	54.7	45.0	518.4	1.200	14.70	1.728
8	7.700	7.868	1.5	46.3	54.3	43.7	518.2	1.198	14.72	1.739
9	6.611	7.025	1.6	45.1	52.2	35.2	518.1	1.175	14.73	1.694
10	5.681	6.387	1.6	45.8	50.9	27.4	518.3	1.162	14.73	1.659
11	5.377	6.201	1.3	47.8	50.4	20.9	518.9	1.177	14.76	1.687

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	630.5	782.2	1476.8	846.6	630.3	463.6	15.6	630.0	1351.1	1338.4
2	637.2	799.8	1454.5	894.9	637.0	534.7	15.7	594.8	1323.2	1312.4
3	728.7	840.7	1392.7	855.0	728.3	593.4	21.3	595.6	1208.4	1211.3
4	754.4	811.2	1353.7	787.4	754.0	550.0	23.3	596.3	1147.5	1159.8
5	757.2	788.0	1343.7	777.8	756.9	533.4	20.9	580.0	1131.1	1146.1
6	760.0	782.6	1330.9	769.6	759.7	530.8	21.8	575.1	1114.6	1132.4
7	760.5	789.3	1316.0	762.6	760.2	538.9	21.1	576.7	1095.2	1116.2
8	761.3	797.8	1305.1	763.0	761.1	551.4	20.4	576.7	1080.5	1104.1
9	704.7	816.9	1149.6	706.4	704.5	576.9	19.4	578.3	927.9	986.0
10	633.1	830.9	1004.0	653.1	632.8	579.6	17.8	595.4	797.3	896.4
11	613.7	873.4	962.4	627.2	613.6	586.1	13.6	647.5	755.1	870.8

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.583	0.648	1.365	0.701	0.582	0.384	0.736	1.626
2	0.590	0.670	1.346	0.749	0.590	0.448	0.839	1.628
3	0.683	0.713	1.305	0.725	0.682	0.503	0.815	1.564
4	0.709	0.690	1.273	0.670	0.709	0.468	0.729	1.506
5	0.712	0.671	1.264	0.662	0.712	0.454	0.705	1.498
6	0.715	0.667	1.252	0.656	0.715	0.452	0.699	1.486
7	0.715	0.674	1.238	0.651	0.715	0.460	0.709	1.473
8	0.716	0.683	1.228	0.653	0.716	0.472	0.724	1.465
9	0.658	0.709	1.074	0.613	0.658	0.500	0.819	1.410
10	0.586	0.726	0.930	0.571	0.586	0.507	0.916	1.245
11	0.567	0.762	0.889	0.547	0.567	0.511	0.955	1.192

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	3.2	0.9	8.0	0.562	0.718	0.281	0.178	0.050	0.032
2	11.70	3.5	0.9	5.1	0.512	0.799	0.197	0.097	0.038	0.019
3	30.90	2.2	-1.6	1.0	0.507	0.868	0.131	0.052	0.027	0.011
4	40.40	1.9	-2.4	3.4	0.537	0.846	0.149	0.086	0.029	0.017
5	42.80	2.0	-2.5	5.2	0.537	0.832	0.160	0.100	0.030	0.019
6	45.20	2.0	-2.6	5.7	0.536	0.823	0.168	0.112	0.032	0.021
7	47.90	2.1	-2.6	5.3	0.535	0.844	0.148	0.096	0.028	0.018
8	50.00	2.1	-2.7	4.8	0.530	0.864	0.130	0.081	0.025	0.016
9	71.80	4.5	-1.3	6.1	0.500	0.931	0.072	0.049	0.013	0.009
10	88.30	6.2	-0.4	8.4	0.468	0.962	0.046	0.044	0.008	0.008
11	93.10	6.4	-0.3	5.3	0.477	0.910	0.127	0.127	0.022	0.022

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SOLID CASING

(d) Reading number, 477-830

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.6	54.4	65.5	55.4	519.7	1.272	14.53	1.918
2	9.426	9.349	0.9	51.4	64.2	53.2	519.5	1.253	14.66	1.907
3	8.587	8.607	1.8	47.7	58.5	46.2	518.6	1.231	14.71	1.901
4	8.152	8.239	1.0	49.5	56.3	45.6	518.6	1.217	14.72	1.809
5	8.040	8.146	1.2	49.8	55.8	45.9	518.7	1.213	14.72	1.781
6	7.927	8.054	1.6	50.0	55.3	45.6	518.5	1.210	14.72	1.763
7	7.800	7.949	1.2	49.8	54.9	44.4	518.4	1.206	14.72	1.762
8	7.700	7.868	1.1	47.1	54.6	42.7	518.5	1.202	14.72	1.702
9	6.611	7.025	1.3	46.9	52.5	35.1	518.3	1.177	14.72	1.704
10	5.681	6.387	0.7	47.3	51.4	27.0	518.4	1.168	14.72	1.665
11	5.377	6.201	1.5	49.7	50.7	20.1	518.6	1.180	14.71	1.695

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	605.3	802.2	1457.4	822.5	605.1	466.4	16.8	652.6	1342.7	1330.0
2	629.7	806.8	1448.8	841.7	629.6	503.8	10.4	630.2	1315.2	1304.4
3	720.3	834.3	1379.5	810.2	720.0	561.1	22.4	617.4	1199.1	1201.9
4	748.5	807.9	1350.3	749.3	748.4	524.6	13.4	614.4	1137.3	1149.4
5	752.4	795.9	1338.8	738.2	752.3	513.9	15.4	607.7	1122.8	1137.6
6	753.2	790.6	1321.5	726.5	752.9	508.2	21.0	605.6	1107.1	1124.8
7	754.9	795.0	1312.3	717.9	754.8	513.0	15.2	607.3	1088.8	1109.6
8	754.1	807.2	1301.6	748.6	754.0	549.7	14.6	591.0	1075.6	1099.1
9	696.4	810.5	1143.8	676.9	696.2	554.0	15.3	591.6	922.8	980.6
10	627.3	825.3	1005.1	628.0	627.3	559.6	7.8	606.6	793.1	891.6
11	602.8	867.2	951.1	597.1	602.6	560.7	15.8	661.5	751.7	866.9

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.558	0.664	1.344	0.681	0.558	0.386	0.771	1.631
2	0.582	0.674	1.340	0.703	0.582	0.421	0.800	1.629
3	0.674	0.706	1.291	0.686	0.674	0.475	0.779	1.553
4	0.703	0.686	1.268	0.636	0.703	0.446	0.701	1.509
5	0.707	0.676	1.258	0.627	0.707	0.437	0.683	1.496
6	0.708	0.672	1.242	0.618	0.708	0.432	0.675	1.479
7	0.710	0.678	1.234	0.612	0.710	0.437	0.680	1.476
8	0.709	0.690	1.223	0.640	0.709	0.470	0.729	1.470
9	0.650	0.702	1.067	0.586	0.650	0.480	0.796	1.417
10	0.581	0.719	0.930	0.547	0.581	0.487	0.892	1.260
11	0.556	0.755	0.878	0.520	0.556	0.488	0.931	1.186

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	4.0	1.7	6.6	0.578	0.753	0.258	0.157	0.048	0.029
2	11.70	3.7	1.1	5.0	0.555	0.799	0.202	0.103	0.039	0.020
3	30.90	2.2	-1.6	1.2	0.539	0.871	0.130	0.055	0.026	0.011
4	40.40	2.1	-2.2	3.3	0.570	0.850	0.148	0.085	0.029	0.017
5	42.80	2.1	-2.4	4.4	0.572	0.840	0.156	0.098	0.030	0.019
6	45.20	2.0	-2.5	4.9	0.572	0.837	0.160	0.106	0.030	0.020
7	47.90	2.2	-2.4	4.7	0.575	0.852	0.145	0.093	0.028	0.018
8	50.00	2.4	-2.4	3.8	0.543	0.813	0.181	0.131	0.035	0.026
9	71.80	4.8	-1.0	5.9	0.527	0.929	0.076	0.053	0.014	0.010
10	88.30	6.6	0.1	7.9	0.497	0.935	0.082	0.080	0.014	0.014
11	93.10	6.7	0.0	4.6	0.505	0.905	0.139	0.139	0.024	0.024

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SOLID CASING

(e) Reading number, 478-847

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	9.622	9.531	1.6	33.2	64.3	55.2	519.7	1.167	14.48	1.486
2	9.426	9.349	1.0	31.0	62.9	53.5	519.6	1.159	14.65	1.497
3	8.587	8.607	1.5	31.9	56.9	49.0	518.6	1.157	14.72	1.467
4	8.152	8.239	1.5	32.7	54.3	52.2	518.7	1.129	14.72	1.300
5	8.040	8.146	1.1	32.2	53.8	52.1	518.5	1.129	14.72	1.290
6	7.927	8.054	1.0	32.6	53.3	50.8	518.5	1.131	14.72	1.299
7	7.800	7.949	1.0	32.5	53.0	48.6	518.4	1.133	14.72	1.330
8	7.700	7.868	1.1	32.6	52.6	47.0	518.4	1.135	14.73	1.357
9	6.611	7.025	1.2	32.5	50.6	37.7	518.4	1.130	14.72	1.441
10	5.681	6.387	1.0	37.0	49.8	26.7	518.2	1.148	14.72	1.542
11	5.377	6.201	1.0	39.4	49.3	21.6	518.5	1.160	14.71	1.570

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	637.8	760.8	1471.3	1114.6	637.6	636.7	18.2	416.5	1344.2	1331.4
2	668.5	779.1	1465.1	1123.3	668.4	667.7	11.8	401.5	1315.6	1304.8
3	769.5	798.8	1408.1	1034.0	769.3	678.5	19.7	421.6	1199.0	1201.8
4	802.4	709.0	1375.4	972.9	802.1	596.8	21.7	382.7	1139.0	1151.1
5	811.7	703.6	1374.5	969.5	811.6	595.6	15.4	374.6	1124.7	1139.6
6	814.0	716.6	1362.6	954.5	813.9	603.8	14.5	385.8	1107.3	1125.1
7	809.0	743.1	1345.5	947.5	808.9	626.4	14.6	399.8	1089.9	1110.7
8	810.0	762.7	1334.4	941.6	809.8	642.4	15.5	411.1	1076.1	1099.5
9	744.3	824.8	1173.0	879.5	744.2	695.9	16.1	442.8	922.8	980.6
10	662.5	889.7	1025.6	795.4	662.4	710.6	11.1	535.4	794.1	892.7
11	635.5	920.6	975.2	765.4	635.4	711.5	11.5	584.2	751.3	866.5

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS
RP	IN	OUT	IN	OUT	IN	OUT	VEL R MACH NO
1	0.590	0.657	1.362	0.962	0.590	0.550	0.999 1.609
2	0.621	0.677	1.361	0.976	0.621	0.580	0.999 1.603
3	0.725	0.697	1.326	0.902	0.724	0.592	0.882 1.530
4	0.759	0.620	1.301	0.851	0.759	0.522	0.744 1.470
5	0.769	0.615	1.302	0.848	0.769	0.521	0.734 1.469
6	0.771	0.627	1.291	0.835	0.771	0.528	0.742 1.458
7	0.766	0.652	1.274	0.831	0.766	0.549	0.774 1.449
8	0.767	0.670	1.264	0.827	0.767	0.564	0.793 1.439
9	0.699	0.732	1.101	0.780	0.699	0.617	0.935 1.372
10	0.616	0.789	0.953	0.706	0.616	0.630	1.073 1.237
11	0.589	0.815	0.904	0.678	0.589	0.630	1.120 1.178

	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
RP	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	7.00	2.8	0.5	6.3	0.330	0.716	0.200	0.102	0.037	0.019
2	11.70	2.3	-0.3	5.3	0.318	0.767	0.159	0.062	0.030	0.012
3	30.90	0.6	-3.2	4.0	0.350	0.736	0.184	0.109	0.036	0.021
4	40.40	0.1	-4.2	9.9	0.366	0.604	0.237	0.177	0.041	0.030
5	42.80	0.1	-4.4	10.6	0.367	0.583	0.250	0.190	0.042	0.032
6	45.20	0.1	-4.5	10.1	0.374	0.594	0.248	0.192	0.043	0.033
7	47.90	0.4	-4.3	8.9	0.373	0.640	0.228	0.176	0.040	0.031
8	50.00	0.4	-4.4	8.0	0.374	0.678	0.210	0.161	0.038	0.029
9	71.80	2.9	-2.9	8.6	0.336	0.847	0.119	0.098	0.021	0.018
10	88.30	5.0	-1.5	7.6	0.329	0.891	0.119	0.116	0.020	0.020
11	93.10	5.3	-1.3	6.1	0.330	0.861	0.175	0.175	0.030	0.029

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SOLID CASING

(f) Reading number, 479-858

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.6	51.5	64.8	56.5	519.9	1.248	14.50	1.798
2	9.426	9.349	1.4	47.3	63.2	53.4	519.3	1.232	14.66	1.804
3	8.587	8.607	1.5	44.3	57.4	45.4	518.4	1.221	14.72	1.844
4	8.152	8.239	1.6	46.3	54.8	46.0	518.6	1.203	14.72	1.728
5	8.040	8.146	1.4	46.9	54.3	46.6	518.5	1.198	14.72	1.689
6	7.927	8.054	1.1	46.4	53.9	46.5	518.5	1.194	14.72	1.670
7	7.800	7.949	1.3	46.2	53.4	45.2	518.4	1.190	14.72	1.676
8	7.700	7.868	1.2	44.9	53.0	43.9	518.4	1.188	14.72	1.693
9	6.611	7.025	1.2	43.6	51.2	35.6	518.6	1.167	14.72	1.656
10	5.681	6.387	1.2	44.9	50.3	27.3	518.3	1.162	14.72	1.632
11	5.377	6.201	1.1	47.0	49.9	20.8	518.6	1.175	14.70	1.667

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	626.6	773.1	1468.6	872.5	626.4	481.2	17.3	605.1	1345.6	1332.9
2	656.7	792.2	1457.3	902.2	656.5	537.6	16.1	581.9	1317.1	1306.4
3	755.9	845.8	1403.0	861.6	755.7	605.2	19.3	590.9	1201.4	1204.2
4	789.8	800.9	1369.4	796.8	789.5	553.0	21.8	579.3	1140.7	1152.9
5	796.3	784.3	1363.1	780.9	796.1	536.1	18.9	572.5	1125.4	1140.3
6	797.3	776.2	1353.4	777.9	797.1	535.4	14.8	562.0	1108.5	1126.3
7	797.0	783.5	1336.6	770.0	796.8	542.7	17.5	565.1	1090.6	1111.4
8	798.1	793.6	1327.1	779.9	797.9	561.9	17.2	560.3	1077.7	1101.2
9	730.5	813.6	1166.3	724.7	730.3	589.5	15.1	560.7	924.4	982.3
10	648.5	833.8	1015.3	664.4	648.4	590.5	13.0	588.6	794.3	893.0
11	622.6	875.5	966.8	638.8	622.5	597.1	12.3	640.3	752.0	867.3

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.579	0.644	1.357	0.727	0.579	0.401	0.768	1.619
2	0.609	0.667	1.352	0.759	0.609	0.452	0.819	1.607
3	0.711	0.721	1.319	0.734	0.710	0.516	0.801	1.542
4	0.746	0.684	1.293	0.681	0.746	0.472	0.701	1.479
5	0.753	0.670	1.289	0.667	0.753	0.458	0.673	1.472
6	0.754	0.664	1.280	0.665	0.754	0.458	0.672	1.467
7	0.754	0.672	1.264	0.660	0.753	0.465	0.681	1.452
8	0.755	0.682	1.255	0.670	0.755	0.483	0.704	1.445
9	0.684	0.708	1.093	0.631	0.684	0.513	0.807	1.388
10	0.602	0.729	0.942	0.581	0.602	0.516	0.911	1.241
11	0.576	0.765	0.894	0.558	0.576	0.523	0.959	1.184

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	3.3	1.0	7.7	0.536	0.737	0.253	0.153	0.046	0.028
2	11.70	2.7	0.1	5.2	0.505	0.790	0.196	0.100	0.037	0.019
3	30.90	1.1	-2.7	0.4	0.506	0.865	0.128	0.051	0.026	0.011
4	40.40	0.5	-3.8	3.7	0.533	0.834	0.151	0.090	0.029	0.018
5	42.80	0.5	-3.9	5.1	0.540	0.817	0.163	0.104	0.031	0.020
6	45.20	0.7	-3.9	5.8	0.536	0.812	0.167	0.111	0.031	0.021
7	47.90	0.8	-3.9	5.5	0.535	0.837	0.145	0.094	0.027	0.018
8	50.00	0.8	-4.0	5.0	0.522	0.864	0.121	0.072	0.023	0.014
9	71.80	3.6	-2.3	6.4	0.489	0.931	0.068	0.046	0.013	0.009
10	88.30	5.6	-1.0	8.2	0.462	0.929	0.085	0.083	0.015	0.014
11	93.10	5.9	-0.8	5.3	0.466	0.899	0.140	0.140	0.024	0.024

TABLE VI. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SOLID CASING

(g) Reading number, 482-869

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.5	54.7	65.6	56.1	520.1	1.271	14.49	1.905
2	9.426	9.349	1.9	51.2	64.1	53.4	519.3	1.253	14.65	1.900
3	8.587	8.607	1.6	47.2	58.4	46.1	518.8	1.230	14.72	1.895
4	8.152	8.239	1.4	49.2	56.1	45.5	518.4	1.217	14.72	1.807
5	8.040	8.146	1.4	49.8	55.6	46.1	518.5	1.211	14.72	1.773
6	7.927	8.054	1.5	49.7	55.2	45.7	518.3	1.208	14.72	1.756
7	7.800	7.949	1.4	49.4	54.7	44.5	518.3	1.204	14.73	1.755
8	7.700	7.868	1.4	48.6	54.4	43.3	518.3	1.202	14.72	1.764
9	6.611	7.025	0.9	46.7	52.6	35.1	518.4	1.177	14.73	1.706
10	5.681	6.387	1.0	47.5	51.5	27.0	518.4	1.168	14.72	1.665
11	5.377	6.201	1.2	49.4	51.0	20.3	518.4	1.180	14.71	1.697

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	602.7	794.6	1459.8	823.6	602.5	459.0	15.6	648.7	1345.3	1332.6
2	630.9	805.5	1441.6	846.0	630.5	504.5	21.4	627.9	1317.8	1307.0
3	726.1	836.1	1385.1	818.8	725.8	568.2	20.4	613.4	1200.1	1202.9
4	752.6	809.6	1349.8	754.8	752.4	528.8	18.8	613.0	1139.5	1151.6
5	757.8	795.1	1341.6	740.3	757.6	513.7	17.9	606.9	1125.1	1139.9
6	757.2	789.2	1325.2	731.3	756.9	510.4	20.1	601.9	1107.9	1125.6
7	760.0	795.1	1314.0	725.3	759.8	517.5	18.7	603.6	1090.8	1111.6
8	758.7	801.6	1302.1	728.0	758.5	529.8	18.9	601.5	1077.2	1100.7
9	697.4	811.6	1149.1	680.1	697.3	556.2	11.3	591.1	924.6	982.5
10	623.3	825.2	1000.6	625.5	623.2	557.2	11.3	608.6	794.1	892.8
11	598.7	867.1	951.0	601.3	598.6	564.1	12.9	658.6	751.8	867.0

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.556	0.657	1.346	0.681	0.555	0.380	0.762	1.637
2	0.584	0.673	1.334	0.707	0.583	0.421	0.800	1.618
3	0.680	0.708	1.297	0.694	0.679	0.481	0.783	1.554
4	0.707	0.688	1.269	0.642	0.707	0.450	0.703	1.502
5	0.713	0.676	1.261	0.630	0.712	0.437	0.678	1.493
6	0.712	0.672	1.246	0.623	0.712	0.435	0.674	1.479
7	0.715	0.678	1.236	0.619	0.715	0.442	0.681	1.471
8	0.714	0.685	1.225	0.622	0.713	0.453	0.699	1.463
9	0.651	0.703	1.072	0.589	0.651	0.481	0.798	1.424
10	0.577	0.719	0.926	0.545	0.577	0.485	0.894	1.257
11	0.553	0.755	0.878	0.523	0.552	0.491	0.942	1.195

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	4.1	1.8	7.3	0.577	0.747	0.262	0.160	0.048	0.029
2	11.70	3.5	0.9	5.2	0.547	0.795	0.207	0.111	0.040	0.021
3	30.90	2.1	-1.7	1.0	0.535	0.871	0.129	0.053	0.026	0.011
4	40.40	1.9	-2.4	3.2	0.565	0.851	0.146	0.085	0.029	0.017
5	42.80	1.9	-2.5	4.5	0.570	0.841	0.154	0.095	0.029	0.018
6	45.20	1.9	-2.6	5.1	0.569	0.839	0.155	0.101	0.030	0.019
7	47.90	2.0	-2.7	4.8	0.569	0.853	0.143	0.092	0.027	0.018
8	50.00	2.2	-2.6	4.4	0.561	0.873	0.124	0.075	0.024	0.015
9	71.80	5.0	-0.9	6.0	0.527	0.931	0.073	0.049	0.014	0.009
10	88.30	6.7	0.2	8.0	0.497	0.934	0.084	0.082	0.015	0.014
11	93.10	7.0	0.3	4.7	0.500	0.903	0.141	0.141	0.024	0.024

TABLE VII. - BLADE-ELEMENT DATA AT BLADE EDGES FOR DEEP, LONG BLADE-ANGLE SLOT CASING

(a) Reading number, 551-1061

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	4.1	69.9	71.7	75.6	521.5	1.322	14.53	1.444
2	9.426	9.349	3.8	60.8	70.4	68.6	520.7	1.290	14.63	1.458
3	8.587	8.607	3.4	44.3	64.9	50.4	520.3	1.198	14.68	1.633
4	8.152	8.239	2.6	43.7	62.0	46.8	518.8	1.195	14.71	1.634
5	8.040	8.146	2.5	45.0	61.3	45.8	518.1	1.199	14.72	1.625
6	7.927	8.054	2.0	45.1	60.9	44.2	517.6	1.202	14.73	1.638
7	7.800	7.949	1.8	45.6	60.4	41.8	517.7	1.205	14.72	1.663
8	7.700	7.868	1.5	45.5	60.1	39.9	517.4	1.207	14.72	1.685
9	6.611	7.025	1.4	42.5	56.2	32.8	517.5	1.174	14.73	1.669
10	5.681	6.387	1.3	43.8	54.6	24.0	517.5	1.169	14.73	1.674
11	5.377	6.201	1.7	45.5	54.0	18.7	517.2	1.179	14.73	1.699

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	436.0	586.3	1385.8	809.3	434.8	201.6	31.3	550.6	1347.1	1334.4
2	460.9	617.2	1369.2	827.7	459.9	301.4	30.6	538.6	1320.2	1309.5
3	548.2	771.3	1291.3	865.9	547.3	552.4	32.6	538.3	1202.2	1205.0
4	592.3	789.2	1261.6	834.4	591.7	571.0	26.8	544.8	1141.0	1153.2
5	601.7	794.5	1252.8	806.5	601.1	562.0	26.0	561.6	1125.2	1140.0
6	607.1	807.9	1246.2	795.7	606.7	570.2	21.1	572.4	1109.7	1127.5
7	610.2	830.0	1233.5	778.2	609.9	580.4	18.9	593.4	1091.0	1111.9
8	609.8	846.9	1224.2	773.7	609.6	593.2	16.1	604.5	1077.8	1101.3
9	608.4	854.5	1094.6	749.0	608.2	629.7	15.2	577.6	925.3	983.2
10	556.8	883.8	960.9	698.1	556.6	637.9	13.1	611.8	796.4	895.4
11	536.7	913.9	911.7	676.4	536.5	640.7	15.9	651.7	753.1	868.5

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.396	0.465	1.257	0.642	0.395	0.160	0.464	1.762
2	0.419	0.498	1.245	0.668	0.418	0.243	0.655	1.750
3	0.503	0.657	1.184	0.737	0.502	0.470	1.009	1.676
4	0.546	0.676	1.163	0.714	0.546	0.489	0.965	1.612
5	0.556	0.680	1.157	0.690	0.555	0.481	0.935	1.598
6	0.561	0.692	1.152	0.681	0.561	0.488	0.940	1.594
7	0.564	0.712	1.141	0.667	0.564	0.498	0.952	1.585
8	0.564	0.727	1.132	0.664	0.564	0.509	0.973	1.585
9	0.563	0.746	1.012	0.654	0.562	0.550	1.035	1.521
10	0.512	0.776	0.884	0.613	0.512	0.560	1.146	1.297
11	0.493	0.802	0.838	0.594	0.493	0.562	1.194	1.227

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	10.2	7.9	26.8	0.538	0.344	0.727	0.609	0.059	0.050
2	11.70	9.8	7.3	20.4	0.514	0.393	0.648	0.534	0.076	0.062
3	30.90	8.6	4.8	5.3	0.445	0.760	0.229	0.144	0.043	0.027
4	40.40	7.8	3.5	4.5	0.454	0.773	0.221	0.153	0.042	0.029
5	42.80	7.6	3.2	4.3	0.475	0.748	0.250	0.186	0.048	0.036
6	45.20	7.6	3.1	3.5	0.483	0.750	0.253	0.190	0.049	0.037
7	47.90	7.7	3.0	2.1	0.495	0.764	0.246	0.186	0.049	0.037
8	50.00	7.9	3.1	1.0	0.497	0.777	0.238	0.179	0.048	0.036
9	71.80	8.6	2.7	3.7	0.436	0.908	0.103	0.071	0.020	0.014
10	88.30	9.9	3.3	4.9	0.401	0.938	0.085	0.083	0.015	0.015
11	93.10	10.0	3.3	3.2	0.394	0.914	0.135	0.135	0.023	0.023

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR DEEP, LONG BLADE-ANGLE SLOT CASING

(b) Reading number, 552-1073

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.1	39.4	67.4	63.9	520.4	1.192	14.50	1.431
2	9.426	9.349	1.6	35.7	65.7	60.1	519.2	1.163	14.65	1.480
3	8.587	8.607	2.2	37.1	59.6	50.5	519.0	1.174	14.70	1.559
4	8.152	8.239	1.5	37.9	56.8	48.0	518.2	1.172	14.72	1.539
5	8.040	8.146	1.5	39.7	56.1	47.7	518.4	1.174	14.72	1.512
6	7.927	8.054	1.7	40.7	55.7	46.2	518.6	1.177	14.72	1.519
7	7.800	7.949	1.4	40.8	55.5	44.1	518.3	1.180	14.72	1.543
8	7.700	7.868	1.7	40.7	54.9	42.4	518.3	1.179	14.72	1.564
9	6.611	7.025	1.5	38.3	48.3	32.3	518.7	1.156	14.73	1.674
10	5.681	6.387	1.7	40.2	51.2	26.2	517.7	1.158	14.73	1.602
11	5.377	6.201	1.8	42.3	50.3	20.8	518.0	1.169	14.73	1.629

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	557.6	602.9	1448.9	1061.1	557.5	466.0	11.1	382.4	1348.5	1335.7
2	589.8	656.6	1430.2	1068.9	589.5	533.4	16.9	382.9	1320.0	1309.2
3	688.4	766.1	1361.4	961.2	687.9	610.8	26.9	462.4	1201.8	1204.6
4	734.2	774.0	1341.6	912.6	733.9	610.5	18.8	475.8	1141.9	1154.0
5	744.4	768.6	1333.6	878.3	744.2	591.1	19.5	491.3	1126.1	1141.0
6	742.5	781.7	1317.3	856.5	742.1	592.8	21.7	509.6	1110.0	1127.8
7	739.1	802.2	1303.2	845.1	738.9	607.2	17.7	524.2	1091.2	1112.0
8	740.0	818.5	1287.2	839.6	739.6	620.4	22.5	533.8	1076.0	1099.4
9	804.5	880.6	1209.9	818.0	804.2	691.3	20.9	545.4	924.8	982.7
10	627.2	876.6	999.6	746.0	626.9	669.2	18.2	566.2	796.7	895.8
11	608.1	908.7	952.1	718.6	607.8	671.6	19.5	612.1	752.3	867.6

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.512	0.506	1.329	0.891	0.511	0.391	0.836	1.681
2	0.543	0.562	1.318	0.915	0.543	0.457	0.905	1.656
3	0.641	0.660	1.268	0.828	0.641	0.526	0.888	1.570
4	0.688	0.669	1.258	0.789	0.688	0.528	0.832	1.516
5	0.699	0.663	1.252	0.758	0.699	0.510	0.794	1.500
6	0.697	0.674	1.236	0.739	0.696	0.511	0.799	1.489
7	0.694	0.693	1.223	0.730	0.693	0.524	0.822	1.485
8	0.694	0.709	1.208	0.727	0.694	0.537	0.839	1.468
9	0.761	0.776	1.145	0.721	0.761	0.610	0.860	1.323
10	0.581	0.773	0.926	0.658	0.581	0.590	1.067	1.247
11	0.562	0.800	0.880	0.633	0.562	0.591	1.105	1.178

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	5.9	3.6	15.1	0.351	0.561	0.342	0.232	0.049	0.033
2	11.70	5.1	2.5	11.9	0.334	0.727	0.195	0.093	0.031	0.015
3	30.90	3.4	-0.5	5.5	0.388	0.777	0.179	0.104	0.033	0.019
4	40.40	2.6	-1.7	5.7	0.416	0.762	0.191	0.129	0.036	0.024
5	42.80	2.3	-2.1	6.2	0.440	0.721	0.227	0.169	0.042	0.031
6	45.20	2.5	-2.1	5.5	0.452	0.716	0.239	0.184	0.045	0.035
7	47.90	2.8	-1.9	4.4	0.457	0.733	0.230	0.179	0.044	0.034
8	50.00	2.7	-2.1	3.4	0.454	0.764	0.208	0.161	0.041	0.031
9	71.80	0.7	-5.2	3.2	0.426	1.013	-0.012	-0.032	-0.002	-0.006
10	88.30	6.4	-0.1	7.2	0.366	0.913	0.104	0.103	0.018	0.018
11	93.10	6.3	-0.4	5.3	0.367	0.884	0.160	0.160	0.027	0.027

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR DEEP, LONG BLADE-ANGLE SLOT CASING

(c) Reading number, 553-1084

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	2.5	47.4	68.8	68.8	520.4	1.224	14.49	1.413
2	9.426	9.349	2.2	42.0	67.3	63.1	519.5	1.193	14.64	1.468
3	8.587	8.607	2.5	41.3	61.5	49.7	519.4	1.190	14.69	1.620
4	8.152	8.239	1.8	41.0	58.8	47.3	518.3	1.185	14.73	1.592
5	8.040	8.146	1.6	42.7	58.0	46.7	517.8	1.188	14.73	1.578
6	7.927	8.054	1.7	43.1	57.5	45.0	518.1	1.191	14.73	1.588
7	7.800	7.949	1.6	43.3	57.1	42.9	518.1	1.193	14.72	1.612
8	7.700	7.868	1.5	43.6	56.9	40.9	518.1	1.194	14.72	1.635
9	6.611	7.025	1.7	40.2	53.5	33.7	518.2	1.165	14.73	1.638
10	5.681	6.387	1.9	41.9	52.2	25.6	518.2	1.163	14.74	1.631
11	5.377	6.201	1.7	44.2	51.7	19.8	518.1	1.175	14.73	1.667

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	514.3	537.8	1422.3	1008.1	513.8	364.3	22.2	395.7	1348.4	1335.7
2	544.2	614.4	1408.3	1007.3	543.7	456.2	21.2	411.5	1320.3	1309.5
3	638.3	779.6	1337.1	907.0	637.7	586.1	28.3	514.1	1203.5	1206.3
4	679.8	782.5	1309.8	870.5	679.4	590.5	20.9	513.3	1140.7	1152.8
5	691.0	782.9	1304.5	838.9	690.7	575.5	19.6	530.8	1126.3	1141.1
6	694.8	797.3	1292.0	823.6	694.5	582.2	20.3	544.8	1109.7	1127.4
7	693.0	816.7	1276.7	811.5	692.8	594.5	19.1	560.0	1091.5	1112.3
8	692.1	835.8	1265.3	801.2	691.8	605.2	18.6	576.4	1078.0	1101.5
9	670.7	851.2	1127.4	781.5	670.4	649.9	19.3	549.7	925.7	983.7
10	602.4	872.8	981.9	719.7	602.1	649.2	19.6	583.4	795.2	894.0
11	582.9	911.0	939.3	693.5	582.6	652.7	17.6	635.6	754.5	870.1

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.470	0.443	1.300	0.831	0.470	0.300	0.709	1.702
2	0.499	0.517	1.292	0.847	0.499	0.384	0.839	1.687
3	0.591	0.668	1.238	0.777	0.590	0.502	0.919	1.606
4	0.633	0.673	1.220	0.748	0.633	0.508	0.869	1.548
5	0.645	0.672	1.217	0.720	0.645	0.494	0.833	1.536
6	0.648	0.685	1.206	0.708	0.648	0.500	0.838	1.523
7	0.647	0.702	1.191	0.698	0.646	0.511	0.858	1.516
8	0.646	0.720	1.180	0.690	0.645	0.521	0.875	1.510
9	0.624	0.745	1.049	0.684	0.624	0.569	0.969	1.442
10	0.556	0.767	0.907	0.632	0.556	0.570	1.078	1.253
11	0.537	0.800	0.866	0.609	0.537	0.573	1.120	1.199

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	7.3	5.0	20.0	0.377	0.463	0.469	0.358	0.055	0.042
2	11.70	6.7	4.2	14.9	0.373	0.600	0.325	0.220	0.047	0.032
3	30.90	5.2	1.4	4.7	0.428	0.777	0.197	0.119	0.037	0.023
4	40.40	4.5	0.2	5.0	0.441	0.768	0.205	0.142	0.039	0.027
5	42.80	4.3	-0.1	5.2	0.466	0.739	0.234	0.173	0.044	0.033
6	45.20	4.3	-0.3	4.3	0.474	0.742	0.237	0.181	0.046	0.035
7	47.90	4.5	-0.2	3.2	0.479	0.756	0.231	0.178	0.045	0.035
8	50.00	4.7	-0.1	2.0	0.485	0.777	0.215	0.165	0.043	0.033
9	71.80	5.8	-0.0	4.6	0.417	0.916	0.086	0.062	0.016	0.012
10	88.30	7.4	0.9	6.5	0.385	0.922	0.100	0.098	0.017	0.017
11	93.10	7.7	1.0	4.2	0.390	0.900	0.145	0.145	0.025	0.025

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR DEEP, LONG BLADE-ANGLE SLOT CASING

(d) Reading number, 554-1095

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	3.0	58.8	70.3	71.4	520.9	1.274	14.50	1.441
2	9.426	9.349	3.2	49.6	68.7	65.7	519.8	1.227	14.64	1.466
3	8.587	8.607	3.0	42.9	63.3	50.0	519.8	1.195	14.68	1.646
4	8.152	8.239	2.1	43.2	58.5	45.1	518.6	1.194	14.72	1.702
5	8.040	8.146	1.9	44.3	59.8	46.2	518.0	1.197	14.73	1.621
6	7.927	8.054	1.6	44.5	59.3	44.5	517.9	1.199	14.73	1.634
7	7.800	7.949	1.7	45.0	58.7	42.1	518.1	1.202	14.73	1.658
8	7.700	7.868	1.4	45.0	58.4	40.3	518.1	1.204	14.73	1.681
9	6.611	7.025	1.6	42.0	54.9	33.0	517.6	1.174	14.73	1.672
10	5.681	6.387	1.7	43.2	53.5	24.9	517.9	1.168	14.74	1.658
11	5.377	6.201	1.6	45.0	52.9	19.8	518.0	1.176	14.73	1.679

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	473.7	556.7	1403.1	903.8	473.0	288.4	24.6	476.2	1345.5	1332.8
2	504.2	596.0	1385.8	937.8	503.4	386.5	27.8	453.7	1319.0	1308.2
3	591.0	775.0	1311.6	883.2	590.2	567.4	30.6	527.9	1201.9	1204.7
4	685.4	815.4	1310.7	841.8	684.9	594.2	25.1	558.5	1142.6	1154.8
5	644.3	791.4	1280.5	817.8	644.0	566.4	21.0	552.7	1127.7	1142.6
6	649.2	805.2	1270.8	804.4	648.9	574.0	17.9	564.7	1110.5	1128.3
7	652.4	827.7	1256.5	789.3	652.2	585.7	19.1	584.8	1093.1	1113.9
8	654.9	845.6	1250.2	783.3	654.7	597.8	15.5	598.0	1080.6	1104.2
9	639.0	856.3	1112.1	758.2	638.8	635.9	18.1	573.6	928.4	986.5
10	578.0	875.7	970.7	703.8	577.8	638.3	17.0	599.6	797.0	896.1
11	558.8	904.4	926.4	679.3	558.6	639.0	15.8	640.0	754.8	870.5

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.431	0.450	1.277	0.730	0.431	0.233	0.610	1.731
2	0.461	0.493	1.266	0.776	0.460	0.320	0.768	1.711
3	0.544	0.661	1.208	0.754	0.544	0.484	0.961	1.639
4	0.639	0.701	1.221	0.723	0.638	0.511	0.868	1.540
5	0.598	0.677	1.188	0.700	0.598	0.485	0.880	1.571
6	0.603	0.690	1.180	0.689	0.602	0.492	0.885	1.563
7	0.606	0.710	1.167	0.677	0.606	0.502	0.898	1.550
8	0.608	0.726	1.161	0.673	0.608	0.513	0.913	1.548
9	0.593	0.747	1.032	0.662	0.593	0.555	0.995	1.483
10	0.533	0.768	0.895	0.617	0.532	0.560	1.105	1.277
11	0.514	0.793	0.852	0.596	0.514	0.560	1.144	1.217

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	8.8	6.5	22.6	0.460	0.402	0.599	0.485	0.062	0.051
2	11.70	8.2	5.6	17.5	0.421	0.509	0.450	0.343	0.059	0.045
3	30.90	7.0	3.1	5.0	0.438	0.783	0.201	0.120	0.038	0.023
4	40.40	4.2	-0.1	2.8	0.472	0.848	0.142	0.080	0.028	0.016
5	42.80	6.1	1.6	4.6	0.477	0.751	0.238	0.175	0.046	0.033
6	45.20	6.1	1.5	3.8	0.485	0.757	0.237	0.177	0.046	0.034
7	47.90	6.1	1.4	2.4	0.494	0.770	0.231	0.174	0.046	0.035
8	50.00	6.2	1.4	1.3	0.498	0.783	0.223	0.168	0.045	0.034
9	71.80	7.3	1.4	3.9	0.436	0.908	0.101	0.072	0.019	0.014
10	88.30	8.7	2.2	5.9	0.398	0.925	0.100	0.098	0.017	0.017
11	93.10	8.9	2.2	4.3	0.398	0.908	0.137	0.137	0.023	0.023

TABLE VII. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES FOR DEEP, LONG BLADE-ANGLE SLOT CASING

(e) Reading number, 555-1106

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	3.3	70.2	72.2	75.6	521.5	1.325	14.51	1.453
2	9.426	9.349	3.6	60.8	70.5	68.8	520.4	1.291	14.65	1.460
3	8.587	8.607	2.9	44.5	65.2	50.3	520.0	1.200	14.68	1.641
4	8.152	8.239	2.5	43.8	62.3	46.8	518.6	1.196	14.71	1.639
5	8.040	8.146	2.3	44.9	61.6	46.1	518.0	1.200	14.72	1.628
6	7.927	8.054	2.0	45.1	61.2	44.4	517.6	1.203	14.72	1.642
7	7.800	7.949	1.6	45.5	60.7	42.0	517.4	1.206	14.72	1.666
8	7.700	7.868	1.6	45.6	60.4	40.2	517.6	1.207	14.72	1.686
9	6.611	7.025	1.5	42.6	56.5	32.9	517.9	1.173	14.73	1.670
10	5.681	6.387	1.8	43.5	54.8	24.2	517.4	1.170	14.73	1.675
11	5.377	6.201	1.7	45.6	54.2	18.9	517.5	1.178	14.73	1.696

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	427.2	589.9	1392.2	807.0	426.6	200.1	24.2	554.9	1349.5	1336.7
2	459.4	615.8	1372.1	830.0	458.5	300.1	29.1	537.7	1322.3	1311.5
3	545.1	774.0	1298.0	864.8	544.4	552.0	27.3	542.6	1205.5	1208.3
4	587.1	791.1	1262.7	834.5	586.5	571.2	25.2	547.3	1143.4	1155.6
5	598.0	792.9	1255.7	809.8	597.5	561.8	23.5	559.5	1127.9	1142.8
6	602.0	807.8	1247.2	798.2	601.6	570.2	20.6	572.2	1113.0	1130.9
7	604.4	829.9	1236.2	782.3	604.1	581.3	16.4	592.3	1094.9	1115.8
8	605.1	845.2	1222.9	774.4	604.9	591.6	16.9	603.6	1079.7	1103.3
9	603.3	853.3	1091.3	748.0	603.1	628.2	16.0	577.5	925.5	983.5
10	548.8	880.7	951.8	700.6	548.6	638.9	16.9	606.1	794.8	893.5
11	532.2	910.3	908.6	673.6	531.9	637.4	16.0	650.0	752.6	867.9

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.387	0.468	1.262	0.640	0.387	0.159	0.469	1.781
2	0.418	0.496	1.248	0.669	0.417	0.242	0.655	1.756
3	0.500	0.659	1.190	0.736	0.499	0.470	1.014	1.690
4	0.541	0.677	1.164	0.714	0.541	0.489	0.974	1.622
5	0.552	0.678	1.159	0.693	0.552	0.480	0.940	1.609
6	0.556	0.691	1.152	0.683	0.556	0.488	0.948	1.604
7	0.559	0.711	1.143	0.671	0.559	0.498	0.962	1.600
8	0.559	0.725	1.130	0.665	0.559	0.508	0.978	1.591
9	0.557	0.744	1.008	0.652	0.557	0.548	1.042	1.527
10	0.505	0.772	0.875	0.614	0.504	0.560	1.165	1.290
11	0.489	0.799	0.834	0.591	0.488	0.559	1.198	1.228

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	10.7	8.4	26.8	0.544	0.347	0.727	0.602	0.059	0.049
2	11.70	9.9	7.4	20.6	0.513	0.392	0.650	0.534	0.075	0.062
3	30.90	8.9	5.1	5.3	0.450	0.760	0.229	0.139	0.043	0.026
4	40.40	8.1	3.8	4.5	0.455	0.773	0.221	0.151	0.042	0.029
5	42.80	7.8	3.4	4.6	0.474	0.748	0.250	0.183	0.048	0.035
6	45.20	7.9	3.4	3.7	0.481	0.750	0.253	0.188	0.049	0.037
7	47.90	8.1	3.4	2.3	0.493	0.763	0.248	0.185	0.049	0.037
8	50.00	8.2	3.4	1.2	0.495	0.779	0.236	0.177	0.048	0.036
9	71.80	8.8	2.9	3.7	0.435	0.910	0.101	0.069	0.019	0.013
10	88.30	10.1	3.5	5.2	0.391	0.931	0.096	0.095	0.017	0.017
11	93.10	10.2	3.5	3.3	0.395	0.913	0.136	0.136	0.023	0.023

TABLE VIII. - BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, LONG BLADE-ANGLE SLOT CASING

(a) Reading number, 707-1503

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.5	73.3	72.0	72.9	521.1	1.360	14.53	1.539
2	9.426	9.349	2.3	64.1	70.5	64.1	521.1	1.339	14.63	1.560
3	8.587	8.607	1.2	48.3	65.5	49.8	519.9	1.205	14.69	1.644
4	8.152	8.239	1.0	47.4	62.7	45.8	519.0	1.199	14.72	1.649
5	8.040	8.146	0.9	48.1	62.0	45.2	518.9	1.202	14.72	1.637
6	7.927	8.054	0.8	48.3	61.4	43.5	518.2	1.203	14.72	1.647
7	7.800	7.949	0.1	48.5	61.1	41.2	516.8	1.206	14.72	1.667
8	7.700	7.868	0.3	48.3	60.6	39.4	517.9	1.207	14.72	1.690
9	6.611	7.025	-0.0	45.5	56.7	31.2	517.1	1.176	14.72	1.678
10	5.681	6.387	0.1	46.3	54.9	21.8	517.8	1.169	14.74	1.682
11	5.377	6.201	-0.2	47.7	55.0	16.3	517.2	1.180	14.73	1.714

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	434.6	704.6	1403.3	689.0	434.4	203.0	11.6	674.7	1345.9	1333.2
2	460.2	728.2	1380.0	727.0	459.8	318.0	18.5	655.0	1319.6	1308.8
3	543.9	786.3	1309.7	809.4	543.8	522.7	11.1	587.4	1202.5	1205.3
4	584.0	804.6	1271.3	781.3	584.0	545.0	10.3	591.9	1139.5	1151.7
5	594.7	806.2	1266.0	762.8	594.7	537.9	8.9	600.6	1126.5	1141.4
6	600.4	817.7	1254.3	749.7	600.3	543.6	8.0	610.9	1109.3	1127.1
7	600.2	835.7	1242.7	736.3	600.2	554.1	1.5	625.6	1089.6	1110.4
8	605.8	852.2	1234.7	734.3	605.8	567.3	2.7	635.9	1078.6	1102.1
9	609.1	865.2	1108.5	708.1	609.1	606.0	-0.3	617.5	925.9	983.9
10	556.4	893.8	968.8	665.5	556.4	618.0	1.1	645.8	794.2	892.9
11	529.0	926.7	921.2	650.2	529.0	624.1	-2.1	685.0	752.1	867.4

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.394	0.556	1.273	0.544	0.394	0.160	0.467	1.785
2	0.418	0.581	1.255	0.580	0.418	0.254	0.692	1.764
3	0.499	0.669	1.201	0.689	0.498	0.445	0.961	1.708
4	0.538	0.688	1.171	0.669	0.538	0.466	0.933	1.639
5	0.548	0.689	1.167	0.652	0.548	0.460	0.905	1.628
6	0.554	0.700	1.158	0.642	0.554	0.465	0.906	1.617
7	0.555	0.717	1.149	0.632	0.555	0.476	0.923	1.617
8	0.560	0.732	1.141	0.630	0.560	0.487	0.936	1.607
9	0.564	0.755	1.026	0.618	0.564	0.529	0.995	1.539
10	0.512	0.786	0.891	0.585	0.512	0.543	1.111	1.318
11	0.486	0.814	0.846	0.571	0.486	0.548	1.180	1.268

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	10.5	8.2	24.1	0.663	0.364	0.749	0.621	0.072	0.060
2	11.70	10.0	7.4	15.8	0.620	0.400	0.703	0.584	0.098	0.082
3	30.90	9.2	5.4	4.8	0.511	0.744	0.246	0.150	0.047	0.028
4	40.40	8.4	4.1	3.5	0.514	0.771	0.225	0.150	0.044	0.029
5	42.80	8.2	3.8	3.6	0.527	0.749	0.250	0.177	0.049	0.034
6	45.20	8.2	3.6	2.8	0.534	0.755	0.248	0.179	0.049	0.035
7	47.90	8.5	3.8	1.5	0.543	0.764	0.244	0.177	0.049	0.036
8	50.00	8.4	3.6	0.5	0.543	0.780	0.233	0.169	0.048	0.035
9	71.80	9.0	3.1	2.0	0.492	0.905	0.106	0.069	0.021	0.014
10	88.30	10.2	3.7	2.8	0.449	0.947	0.072	0.069	0.013	0.012
11	93.10	11.0	4.3	0.8	0.439	0.923	0.120	0.120	0.021	0.021

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW,

LONG BLADE-ANGLE SLOT CASING

(b) Reading number, 708-1514

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	0.4	54.5	67.7	63.2	520.7	1.269	14.51	1.477
2	9.426	9.349	0.9	43.6	66.2	58.0	519.8	1.195	14.62	1.527
3	8.587	8.607	1.0	41.8	60.6	49.1	519.3	1.185	14.71	1.590
4	8.152	8.239	0.7	42.6	57.8	46.8	518.5	1.179	14.72	1.555
5	8.040	8.146	0.5	43.6	57.0	46.4	518.6	1.180	14.71	1.538
6	7.927	8.054	0.6	44.2	56.5	44.7	518.6	1.182	14.73	1.548
7	7.800	7.949	0.4	44.8	52.3	39.9	518.9	1.186	14.75	1.640
8	7.700	7.868	0.4	44.4	55.8	40.6	518.4	1.186	14.72	1.594
9	6.611	7.025	0.4	41.4	53.0	32.5	517.7	1.158	14.73	1.614
10	5.681	6.387	0.0	43.5	51.9	23.3	517.7	1.150	14.73	1.627
11	5.377	6.201	0.4	45.2	51.2	17.5	518.1	1.170	14.74	1.658

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	550.0	679.8	1451.4	875.1	550.0	394.8	4.0	553.4	1347.2	1334.4
2	577.1	707.8	1431.5	967.0	577.1	512.3	9.4	488.4	1319.4	1308.6
3	670.9	788.9	1366.0	897.7	670.8	587.8	11.9	526.1	1201.8	1204.6
4	712.5	788.1	1336.5	848.3	712.5	580.5	8.7	533.1	1139.5	1151.6
5	727.3	786.1	1334.7	824.7	727.3	568.9	5.7	542.5	1124.9	1139.7
6	727.2	800.5	1319.0	806.7	727.2	573.7	7.3	558.3	1107.7	1125.4
7	838.7	856.7	1371.9	792.2	838.7	607.7	5.5	603.9	1091.2	1112.1
8	727.3	838.9	1294.9	788.7	727.3	599.2	5.2	587.2	1076.6	1100.1
9	692.2	861.8	1150.9	766.7	692.2	646.4	4.9	570.0	924.4	982.3
10	621.8	892.9	1008.7	704.5	621.8	647.2	0.4	615.2	794.7	893.5
11	602.0	931.1	960.3	688.1	602.0	656.1	4.6	660.7	752.8	868.2

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.504	0.556	1.330	0.716	0.504	0.323	0.718	1.694
2	0.531	0.600	1.317	0.820	0.531	0.434	0.888	1.674
3	0.624	0.678	1.270	0.772	0.623	0.505	0.876	1.603
4	0.666	0.680	1.249	0.732	0.666	0.501	0.815	1.541
5	0.681	0.677	1.250	0.711	0.681	0.490	0.782	1.529
6	0.681	0.690	1.235	0.696	0.681	0.495	0.789	1.516
7	0.797	0.742	1.304	0.687	0.797	0.527	0.725	1.452
8	0.681	0.726	1.213	0.682	0.681	0.518	0.824	1.503
9	0.646	0.758	1.074	0.675	0.646	0.569	0.934	1.439
10	0.576	0.792	0.934	0.625	0.576	0.574	1.041	1.283
11	0.556	0.822	0.887	0.608	0.556	0.579	1.090	1.213

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	6.2	3.9	14.4	0.520	0.438	0.540	0.427	0.080	0.063
2	11.70	5.7	3.1	9.8	0.431	0.658	0.278	0.172	0.047	0.029
3	30.90	4.3	0.5	4.1	0.453	0.766	0.196	0.114	0.038	0.022
4	40.40	3.5	-0.8	4.5	0.476	0.752	0.207	0.141	0.040	0.027
5	42.80	3.2	-1.2	4.9	0.494	0.726	0.230	0.166	0.044	0.032
6	45.20	3.3	-1.2	4.0	0.503	0.730	0.232	0.172	0.045	0.033
7	47.90	-0.3	-5.0	0.2	0.541	0.817	0.154	0.097	0.032	0.020
8	50.00	3.6	-1.2	1.6	0.511	0.764	0.213	0.160	0.043	0.032
9	71.80	5.4	-0.5	3.4	0.449	0.927	0.070	0.043	0.013	0.008
10	88.30	7.2	0.7	4.2	0.426	0.994	0.007	0.003	0.001	0.001
11	93.10	7.2	0.5	2.0	0.417	0.915	0.117	0.116	0.020	0.020

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, LONG BLADE-ANGLE SLOT CASING

(c) Reading number, 709-1525

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.3	63.7	68.1	66.3	520.5	1.321	14.63	1.520
2	9.426	9.349	1.3	53.2	67.4	60.0	519.5	1.261	14.64	1.547
3	8.587	8.607	1.6	44.3	62.1	48.4	519.2	1.197	14.67	1.665
4	8.152	8.239	0.5	45.3	59.7	46.0	517.7	1.194	14.67	1.631
5	8.040	8.146	0.6	46.3	58.9	45.2	518.6	1.193	14.69	1.620
6	7.927	8.054	0.4	46.6	58.4	43.5	518.7	1.195	14.71	1.629
7	7.800	7.949	0.5	46.9	55.0	39.1	518.5	1.199	14.71	1.724
8	7.700	7.868	0.4	46.8	57.4	39.3	518.4	1.198	14.72	1.669
9	6.611	7.025	0.1	44.2	54.5	31.4	518.2	1.166	14.73	1.657
10	5.681	6.387	0.4	45.4	53.1	22.7	517.8	1.156	14.73	1.660
11	5.377	6.201	0.2	47.1	52.5	16.6	518.4	1.171	14.73	1.690

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	536.9	701.9	1440.2	771.9	536.8	310.8	12.3	629.4	1348.7	1335.9
2	544.1	711.8	1415.8	852.9	544.0	426.3	12.4	570.0	1319.5	1308.7
3	626.1	800.0	1338.7	862.3	625.8	572.5	17.4	558.8	1200.8	1203.6
4	661.9	799.8	1312.7	811.1	661.9	563.0	6.1	568.0	1139.7	1151.9
5	673.5	803.1	1305.3	788.2	673.5	555.2	6.8	580.3	1124.9	1139.7
6	680.5	816.8	1296.9	774.2	680.5	561.5	4.4	593.2	1108.4	1126.2
7	760.0	865.8	1325.6	763.1	760.0	592.0	6.2	631.7	1092.4	1113.2
8	685.0	851.7	1270.7	753.7	685.0	583.0	4.8	620.9	1075.1	1098.6
9	658.4	864.4	1133.4	726.7	658.4	620.2	0.8	602.2	923.2	981.0
10	593.3	888.7	988.2	676.3	593.2	624.0	4.3	632.7	794.7	893.5
11	574.2	926.9	944.0	658.7	574.1	631.4	1.8	678.5	751.1	866.3

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.492	0.563	1.319	0.619	0.491	0.249	0.579	1.696
2	0.499	0.587	1.298	0.703	0.499	0.351	0.784	1.697
3	0.579	0.685	1.238	0.738	0.579	0.490	0.915	1.627
4	0.616	0.687	1.221	0.696	0.616	0.483	0.851	1.581
5	0.627	0.689	1.214	0.676	0.627	0.477	0.824	1.564
6	0.634	0.702	1.208	0.665	0.634	0.482	0.825	1.554
7	0.715	0.747	1.247	0.658	0.715	0.511	0.779	1.492
8	0.638	0.734	1.184	0.649	0.638	0.502	0.851	1.531
9	0.612	0.757	1.053	0.637	0.612	0.543	0.942	1.477
10	0.548	0.786	0.912	0.598	0.548	0.552	1.052	1.290
11	0.529	0.817	0.869	0.581	0.529	0.557	1.100	1.230

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	6.6	4.3	17.4	0.603	0.395	0.649	0.537	0.085	0.071
2	11.70	6.9	4.3	11.8	0.523	0.509	0.484	0.376	0.078	0.060
3	30.90	5.8	2.0	3.4	0.475	0.797	0.185	0.102	0.036	0.020
4	40.40	5.5	1.2	3.7	0.502	0.774	0.207	0.137	0.040	0.027
5	42.80	5.2	0.8	3.7	0.518	0.764	0.217	0.151	0.042	0.029
6	45.20	5.1	0.6	2.8	0.528	0.768	0.218	0.155	0.043	0.031
7	47.90	2.4	-2.3	-0.6	0.552	0.847	0.144	0.088	0.030	0.018
8	50.00	5.2	0.4	0.4	0.537	0.797	0.199	0.144	0.041	0.030
9	71.80	6.8	0.9	2.3	0.483	0.934	0.068	0.038	0.013	0.007
10	88.30	8.4	1.8	3.7	0.446	1.001	-0.002	-0.004	-0.000	-0.001
11	93.10	8.5	1.9	1.1	0.442	0.947	0.075	0.075	0.013	0.013

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW,

LONG BLADE-ANGLE SLOT CASING

(d) Reading number, 710-1536

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.4	67.0	68.8	68.7	520.9	1.332	14.66	1.525
2	9.426	9.349	1.1	56.7	68.1	61.5	520.3	1.284	14.66	1.550
3	8.587	8.607	1.2	45.6	63.2	48.5	519.5	1.201	14.67	1.678
4	8.152	8.239	0.7	46.5	60.7	45.7	518.5	1.196	14.69	1.654
5	8.040	8.146	0.6	47.2	59.8	44.8	518.2	1.198	14.70	1.642
6	7.927	8.054	0.5	47.4	59.3	43.0	518.0	1.200	14.71	1.656
7	7.800	7.949	0.4	47.5	58.8	40.8	518.3	1.202	14.71	1.674
8	7.700	7.868	0.2	47.4	58.6	38.9	517.7	1.204	14.70	1.701
9	6.611	7.025	0.3	45.2	55.4	31.1	517.6	1.163	14.71	1.682
10	5.681	6.387	0.2	45.9	53.9	23.1	517.8	1.145	14.73	1.670
11	5.377	6.201	0.1	47.9	53.4	16.3	518.3	1.169	14.73	1.699

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	518.0	693.4	1429.8	745.6	517.9	271.1	12.9	638.2	1345.6	1332.8
2	524.9	706.6	1407.8	813.7	524.8	388.4	9.7	590.4	1316.1	1305.4
3	600.3	799.3	1329.6	842.6	600.2	558.8	13.0	571.6	1199.4	1202.2
4	635.9	805.1	1298.1	793.1	635.9	554.2	7.4	584.0	1139.1	1151.3
5	648.5	807.1	1289.8	772.6	648.5	548.1	7.2	592.4	1122.2	1137.0
6	654.6	822.1	1281.2	761.8	654.6	556.9	5.4	604.7	1106.8	1124.5
7	657.1	841.1	1269.4	750.5	657.1	567.9	4.3	620.5	1090.3	1111.2
8	657.1	857.8	1259.8	746.5	657.1	580.6	2.3	631.4	1077.1	1100.6
9	636.3	865.9	1119.7	712.7	636.3	610.2	3.4	614.4	924.7	982.7
10	576.9	880.1	979.3	666.1	576.9	612.9	2.4	631.6	793.8	892.5
11	555.6	922.6	932.7	645.0	555.6	619.0	1.4	684.2	750.6	865.6

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.473	0.553	1.306	0.595	0.473	0.216	0.523	1.706
2	0.480	0.576	1.288	0.663	0.480	0.317	0.740	1.711
3	0.554	0.683	1.226	0.720	0.553	0.477	0.931	1.651
4	0.589	0.690	1.203	0.680	0.589	0.475	0.872	1.598
5	0.602	0.692	1.197	0.662	0.602	0.470	0.845	1.579
6	0.608	0.705	1.190	0.654	0.608	0.478	0.851	1.570
7	0.610	0.722	1.179	0.645	0.610	0.488	0.864	1.563
8	0.611	0.738	1.171	0.642	0.611	0.500	0.884	1.560
9	0.590	0.760	1.038	0.626	0.590	0.536	0.959	1.500
10	0.532	0.781	0.902	0.591	0.532	0.544	1.062	1.302
11	0.511	0.814	0.857	0.569	0.511	0.546	1.114	1.241

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	7.3	5.0	19.9	0.621	0.386	0.676	0.563	0.080	0.067
2	11.70	7.6	5.0	13.3	0.554	0.470	0.551	0.441	0.084	0.067
3	30.90	6.9	3.1	3.4	0.490	0.794	0.192	0.106	0.037	0.021
4	40.40	6.4	2.1	3.4	0.514	0.788	0.201	0.130	0.039	0.025
5	42.80	6.1	1.6	3.3	0.527	0.768	0.222	0.156	0.043	0.030
6	45.20	6.1	1.5	2.3	0.534	0.776	0.218	0.154	0.043	0.031
7	47.90	6.2	1.5	1.1	0.540	0.785	0.214	0.154	0.044	0.031
8	50.00	6.4	1.6	-0.0	0.541	0.803	0.201	0.142	0.041	0.029
9	71.80	7.7	1.8	2.0	0.492	0.980	0.020	-0.011	0.004	-0.002
10	88.30	9.2	2.6	4.0	0.451	1.088	-0.105	-0.108	-0.019	-0.019
11	93.10	9.4	2.8	0.8	0.451	0.970	0.043	0.043	0.007	0.007

TABLE VIII. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, LONG BLADE-ANGLE SLOT CASING

(e) Reading number, 711-1547

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.6	72.2	71.4	72.0	521.7	1.356	14.64	1.547
2	9.426	9.349	1.5	63.2	70.8	63.6	521.1	1.333	14.64	1.575
3	8.587	8.607	1.1	48.2	66.0	49.8	520.0	1.206	14.66	1.657
4	8.152	8.239	0.7	47.8	63.3	45.8	518.7	1.201	14.68	1.664
5	8.040	8.146	0.5	48.4	62.6	45.0	517.9	1.203	14.69	1.652
6	7.927	8.054	0.6	48.8	62.1	43.4	517.6	1.204	14.70	1.658
7	7.800	7.949	0.5	48.6	61.6	41.5	517.2	1.206	14.72	1.673
8	7.700	7.868	0.4	48.5	61.2	39.2	517.5	1.207	14.71	1.701
9	6.611	7.025	0.0	45.6	57.4	31.5	517.2	1.172	14.73	1.679
10	5.681	6.387	-0.1	46.5	55.8	21.7	517.5	1.165	14.73	1.695
11	5.377	6.201	0.1	47.9	55.3	16.3	518.1	1.179	14.75	1.712

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	446.8	703.3	1402.3	693.5	446.7	214.8	12.5	669.7	1341.8	1329.1
2	454.8	725.0	1381.2	734.8	454.6	327.1	11.5	647.0	1315.7	1305.0
3	530.3	783.6	1303.1	810.2	530.2	522.7	9.8	583.9	1200.1	1202.9
4	568.6	804.4	1266.9	775.0	568.5	540.5	6.8	595.7	1138.9	1151.1
5	579.3	806.2	1259.0	757.2	579.2	535.5	5.4	602.7	1123.2	1138.0
6	582.6	816.8	1244.7	741.0	582.6	538.1	6.1	614.4	1106.1	1123.8
7	587.4	831.9	1233.5	733.9	587.4	549.9	4.7	624.2	1089.3	1110.2
8	588.0	851.9	1221.6	729.1	588.0	565.0	4.0	637.5	1074.9	1098.3
9	589.9	858.8	1095.3	705.1	589.9	601.4	0.5	613.1	923.4	981.2
10	539.4	892.2	960.1	661.5	539.4	614.4	-0.9	647.0	793.4	892.0
11	518.7	923.0	911.5	645.1	518.7	619.2	0.7	684.4	750.3	865.3

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.406	0.556	1.273	0.548	0.405	0.170	0.481	1.766
2	0.413	0.580	1.255	0.587	0.413	0.262	0.719	1.772
3	0.485	0.666	1.193	0.689	0.485	0.444	0.986	1.719
4	0.523	0.688	1.165	0.663	0.523	0.462	0.951	1.658
5	0.534	0.689	1.160	0.648	0.534	0.458	0.924	1.644
6	0.537	0.699	1.148	0.634	0.537	0.461	0.924	1.632
7	0.542	0.713	1.139	0.629	0.542	0.471	0.936	1.624
8	0.543	0.732	1.127	0.626	0.543	0.485	0.961	1.618
9	0.545	0.751	1.011	0.616	0.545	0.526	1.019	1.560
10	0.495	0.786	0.882	0.583	0.495	0.541	1.139	1.331
11	0.475	0.810	0.835	0.566	0.475	0.544	1.194	1.263

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	9.9	7.6	23.2	0.658	0.373	0.735	0.613	0.074	0.062
2	11.70	10.2	7.7	15.4	0.615	0.416	0.680	0.559	0.097	0.080
3	30.90	9.7	5.9	4.8	0.508	0.755	0.238	0.141	0.045	0.027
4	40.40	9.1	4.8	3.5	0.519	0.779	0.219	0.141	0.043	0.027
5	42.80	8.9	4.4	3.5	0.530	0.759	0.243	0.168	0.047	0.033
6	45.20	8.9	4.3	2.7	0.539	0.762	0.244	0.174	0.048	0.034
7	47.90	8.9	4.2	1.8	0.541	0.769	0.242	0.175	0.049	0.035
8	50.00	9.0	4.2	0.3	0.542	0.793	0.222	0.157	0.046	0.032
9	71.80	9.8	3.9	2.3	0.487	0.929	0.079	0.041	0.015	0.008
10	88.30	11.1	4.5	2.7	0.449	0.988	0.016	0.013	0.003	0.002
11	93.10	11.3	4.6	0.8	0.438	0.926	0.116	0.115	0.020	0.020

TABLE IX. - BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, SHORT

BLADE-ANGLE SLOT CASING

(a) Reading number, 761-1629

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	9.622	9.531	0.7	64.7	70.3	56.7	520.0	1.353	14.52	2.050
2	9.426	9.349	1.1	60.2	68.9	54.5	519.8	1.309	14.64	2.011
3	8.587	8.607	0.6	54.7	64.6	48.3	519.1	1.251	14.72	1.934
4	8.152	8.239	0.3	55.8	62.6	46.1	518.3	1.245	14.72	1.889
5	8.040	8.146	0.3	56.1	62.0	45.5	518.2	1.243	14.73	1.874
6	7.927	8.054	0.3	56.0	61.7	44.6	519.0	1.236	14.73	1.862
7	7.800	7.949	0.2	55.4	61.3	43.3	518.0	1.232	14.72	1.863
8	7.700	7.868	0.1	54.8	61.0	42.7	518.1	1.227	14.73	1.855
9	6.611	7.025	-0.1	54.1	57.9	36.0	518.1	1.193	14.72	1.736
10	5.681	6.387	0.2	51.7	55.7	25.6	518.4	1.178	14.72	1.729
11	5.377	6.201	0.1	52.5	55.4	19.8	518.3	1.182	14.70	1.751

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	479.9	856.2	1421.0	665.8	479.9	365.9	5.5	774.1	1343.0	1330.3
2	505.1	834.4	1400.5	714.3	505.0	415.0	9.7	723.9	1316.0	1305.3
3	564.4	819.1	1317.8	711.8	564.3	473.7	5.9	668.2	1196.7	1199.5
4	587.3	815.2	1278.3	660.7	587.3	458.2	2.8	674.2	1138.2	1150.3
5	593.7	813.5	1266.2	647.9	593.7	454.3	3.6	674.9	1122.0	1136.8
6	593.9	812.6	1251.1	638.2	593.9	454.3	3.2	673.7	1104.3	1122.0
7	594.5	816.6	1237.5	636.2	594.5	463.3	2.4	672.5	1087.8	1108.5
8	594.4	813.8	1227.3	639.0	594.4	469.3	1.3	664.8	1075.0	1098.4
9	579.8	793.2	1090.5	575.1	579.8	465.5	-1.4	642.3	922.2	980.0
10	539.1	824.1	957.6	566.7	539.1	511.1	1.4	646.5	792.8	891.4
11	517.3	854.2	910.5	552.2	517.3	519.5	1.2	678.1	750.5	865.5

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	0.437	0.689	1.295	0.536	0.437	0.295	0.763	1.747
2	0.462	0.682	1.280	0.584	0.461	0.339	0.822	1.729
3	0.519	0.686	1.211	0.596	0.519	0.397	0.839	1.689
4	0.541	0.685	1.179	0.555	0.541	0.385	0.780	1.645
5	0.548	0.684	1.168	0.545	0.548	0.382	0.765	1.631
6	0.548	0.685	1.154	0.538	0.548	0.383	0.765	1.622
7	0.549	0.690	1.142	0.538	0.549	0.391	0.779	1.618
8	0.549	0.689	1.133	0.541	0.549	0.397	0.790	1.615
9	0.534	0.680	1.005	0.493	0.534	0.399	0.803	1.575
10	0.495	0.714	0.879	0.491	0.495	0.443	0.948	1.324
11	0.474	0.742	0.834	0.480	0.474	0.451	1.004	1.263

	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
RP	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	7.00	8.8	6.5	7.8	0.707	0.646	0.445	0.324	0.080	0.058
2	11.70	8.3	5.7	6.3	0.653	0.714	0.340	0.227	0.063	0.042
3	30.90	8.3	4.5	3.3	0.608	0.826	0.197	0.104	0.039	0.020
4	40.40	8.4	4.1	3.8	0.631	0.813	0.216	0.138	0.042	0.027
5	42.80	8.3	3.9	4.0	0.636	0.809	0.222	0.149	0.043	0.029
6	45.20	8.4	3.9	3.9	0.637	0.824	0.205	0.136	0.040	0.026
7	47.90	8.7	4.0	3.5	0.633	0.837	0.190	0.124	0.037	0.024
8	50.00	8.8	4.0	3.8	0.624	0.852	0.173	0.108	0.034	0.021
9	71.80	10.2	4.3	6.8	0.611	0.883	0.144	0.104	0.027	0.019
10	88.30	11.0	4.5	6.5	0.546	0.952	0.070	0.067	0.012	0.012
11	93.10	11.4	4.7	4.3	0.538	0.953	0.076	0.076	0.013	0.013

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, SHORT BLADE-ANGLE SLOT CASING

(b) Reading number, 762-1640

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.0	53.0	66.2	55.8	520.1	1.282	14.46	1.854
2	9.426	9.349	0.7	47.4	64.4	54.1	519.1	1.244	14.66	1.840
3	8.587	8.607	0.4	46.7	59.5	46.9	518.5	1.224	14.72	1.839
4	8.152	8.239	0.5	48.2	57.0	46.1	519.0	1.212	14.72	1.764
5	8.040	8.146	0.2	48.7	56.4	46.1	518.4	1.209	14.73	1.738
6	7.927	8.054	0.4	48.7	56.0	45.8	518.4	1.203	14.72	1.722
7	7.800	7.949	0.3	47.9	55.3	44.4	519.0	1.198	14.73	1.726
8	7.700	7.868	0.2	47.1	55.2	43.2	518.8	1.195	14.72	1.733
9	6.611	7.025	0.1	45.8	52.7	35.2	518.1	1.170	14.72	1.673
10	5.681	6.387	0.2	46.7	50.8	25.7	518.3	1.169	14.72	1.666
11	5.377	6.201	0.2	47.9	50.3	20.4	518.6	1.175	14.71	1.689

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	587.6	789.3	1456.1	845.2	587.5	475.0	9.8	630.3	1342.1	1329.4
2	627.7	781.9	1453.6	903.8	627.7	529.4	7.7	575.5	1318.7	1308.0
3	703.7	823.5	1388.2	828.0	703.7	565.2	4.5	598.8	1201.1	1203.9
4	738.2	802.4	1354.0	770.1	738.2	534.4	5.8	598.5	1140.9	1153.0
5	745.0	793.7	1347.6	755.1	745.0	524.0	2.0	596.1	1124.9	1139.8
6	745.6	787.4	1331.8	745.8	745.6	520.0	4.6	591.3	1108.1	1125.8
7	751.4	794.2	1321.0	745.5	751.4	532.3	4.1	589.4	1090.5	1111.3
8	745.9	800.4	1306.5	747.4	745.9	544.5	2.5	586.6	1075.2	1098.6
9	702.5	811.2	1158.4	692.1	702.5	565.8	0.9	581.2	921.9	979.7
10	644.6	844.0	1020.7	642.6	644.6	579.0	2.6	614.1	794.1	892.7
11	622.0	874.5	973.8	625.5	622.0	586.3	2.5	648.9	751.8	867.0

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.541	0.649	1.340	0.695	0.541	0.391	0.809	1.652
2	0.581	0.654	1.345	0.756	0.581	0.443	0.843	1.640
3	0.657	0.699	1.296	0.702	0.657	0.480	0.803	1.592
4	0.692	0.682	1.269	0.655	0.692	0.454	0.724	1.531
5	0.699	0.676	1.265	0.643	0.699	0.446	0.703	1.524
6	0.700	0.672	1.250	0.636	0.700	0.444	0.697	1.510
7	0.706	0.679	1.240	0.638	0.706	0.455	0.708	1.497
8	0.700	0.686	1.226	0.641	0.700	0.467	0.730	1.492
9	0.656	0.705	1.082	0.601	0.656	0.492	0.805	1.431
10	0.598	0.737	0.947	0.561	0.598	0.505	0.898	1.264
11	0.575	0.764	0.901	0.546	0.575	0.512	0.943	1.205

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	4.7	2.4	7.0	0.558	0.683	0.334	0.230	0.061	0.042
2	11.70	3.9	1.3	5.9	0.503	0.781	0.213	0.110	0.040	0.021
3	30.90	3.2	-0.6	1.9	0.529	0.848	0.148	0.064	0.030	0.013
4	40.40	2.7	-1.6	3.8	0.554	0.830	0.163	0.096	0.032	0.019
5	42.80	2.7	-1.7	4.5	0.562	0.820	0.171	0.106	0.033	0.020
6	45.20	2.7	-1.8	5.1	0.561	0.827	0.164	0.103	0.031	0.020
7	47.90	2.7	-2.0	4.7	0.556	0.855	0.137	0.080	0.026	0.015
8	50.00	3.0	-1.8	4.3	0.548	0.874	0.119	0.066	0.023	0.013
9	71.80	5.0	-0.9	6.0	0.520	0.930	0.071	0.045	0.013	0.008
10	88.30	6.1	-0.4	6.6	0.493	0.931	0.085	0.082	0.015	0.014
11	93.10	6.3	-0.4	4.8	0.487	0.924	0.104	0.104	0.018	0.018

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, SHORT BLADE-ANGLE SLOT CASING

(c) Reading number, 763-1651

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	0.7	59.3	68.1	55.8	520.2	1.322	14.51	1.996
2	9.426	9.349	0.8	54.5	66.6	54.0	519.3	1.282	14.66	1.966
3	8.587	8.607	0.5	51.7	62.3	48.1	519.2	1.242	14.71	1.913
4	8.152	8.239	0.3	53.2	59.9	46.2	518.4	1.235	14.72	1.853
5	8.040	8.146	0.3	54.1	59.5	46.0	518.4	1.233	14.72	1.841
6	7.927	8.054	0.1	54.0	56.8	42.6	519.1	1.228	14.72	1.930
7	7.800	7.949	0.2	53.3	58.7	43.4	518.4	1.223	14.72	1.840
8	7.700	7.868	-0.0	52.3	56.0	40.3	518.5	1.219	14.72	1.932
9	6.611	7.025	0.1	51.0	55.4	35.9	517.9	1.186	14.72	1.725
10	5.681	6.387	0.2	50.6	53.5	25.5	518.2	1.176	14.72	1.713
11	5.377	6.201	-0.1	51.2	53.2	20.0	518.4	1.182	14.71	1.742

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	538.9	826.4	1442.0	750.3	538.8	421.9	6.3	710.6	1343.8	1331.1
2	566.8	810.4	1427.1	799.5	566.7	470.2	7.7	660.1	1317.4	1306.7
3	627.8	815.3	1349.3	756.8	627.8	505.5	5.5	639.6	1199.9	1202.7
4	657.9	806.9	1312.0	699.5	657.9	483.8	3.7	645.7	1138.8	1150.9
5	661.3	805.1	1302.7	679.9	661.3	472.4	3.7	651.9	1126.1	1140.9
6	726.1	834.9	1324.7	666.2	726.1	490.3	1.2	675.8	1109.1	1126.9
7	663.1	814.2	1275.7	670.0	663.1	486.8	2.2	652.6	1092.0	1112.9
8	728.4	841.2	1301.2	673.7	728.4	514.0	-0.3	665.9	1078.0	1101.5
9	636.1	796.5	1120.8	619.3	636.1	501.6	1.3	618.7	924.1	982.0
10	586.1	829.9	985.5	583.3	586.1	526.4	1.9	641.7	794.2	892.9
11	564.0	862.0	941.0	574.5	564.0	540.0	-0.6	671.9	752.6	867.9

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.494	0.671	1.321	0.609	0.494	0.343	0.783	1.696
2	0.521	0.669	1.312	0.660	0.521	0.388	0.830	1.682
3	0.581	0.685	1.248	0.636	0.581	0.425	0.805	1.641
4	0.611	0.680	1.219	0.589	0.611	0.408	0.735	1.585
5	0.615	0.679	1.211	0.573	0.615	0.398	0.714	1.579
6	0.680	0.708	1.240	0.565	0.680	0.415	0.675	1.528
7	0.616	0.690	1.186	0.568	0.616	0.413	0.734	1.563
8	0.682	0.717	1.219	0.574	0.682	0.438	0.706	1.512
9	0.590	0.686	1.039	0.533	0.590	0.432	0.789	1.502
10	0.540	0.720	0.909	0.506	0.540	0.457	0.898	1.298
11	0.519	0.749	0.866	0.499	0.519	0.469	0.957	1.244

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	6.6	4.3	7.0	0.638	0.677	0.378	0.266	0.070	0.049
2	11.70	6.1	3.5	5.8	0.586	0.757	0.268	0.160	0.050	0.030
3	30.90	6.0	2.2	3.1	0.577	0.841	0.171	0.083	0.033	0.016
4	40.40	5.6	1.3	3.9	0.604	0.819	0.196	0.125	0.038	0.024
5	42.80	5.8	1.3	4.5	0.616	0.817	0.198	0.130	0.038	0.025
6	45.20	3.5	-1.0	1.9	0.637	0.905	0.101	0.039	0.020	0.008
7	47.90	6.0	1.4	3.7	0.613	0.854	0.158	0.097	0.031	0.019
8	50.00	3.8	-1.0	1.3	0.619	0.944	0.059	0.003	0.012	0.001
9	71.80	7.8	1.9	6.8	0.577	0.908	0.105	0.073	0.019	0.014
10	88.30	8.8	2.2	6.5	0.541	0.942	0.079	0.076	0.014	0.013
11	93.10	9.2	2.5	4.4	0.529	0.943	0.086	0.086	0.015	0.015

TABLE IX. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES FOR SHALLOW, SHORT BLADE-ANGLE SLOT CASING

(d) Reading number, 764-1662

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	9.622	9.531	0.9	65.0	70.4	56.8	520.1	1.357	14.51	2.054
2	9.426	9.349	0.9	60.2	68.9	54.5	519.8	1.310	14.65	2.013
3	8.587	8.607	0.7	54.9	64.8	48.4	519.4	1.252	14.72	1.940
4	8.152	8.239	0.2	55.8	62.7	46.2	518.7	1.246	14.72	1.888
5	8.040	8.146	0.1	56.2	60.7	43.6	519.0	1.241	14.72	1.958
6	7.927	8.054	0.1	56.2	61.8	44.6	518.6	1.238	14.72	1.868
7	7.800	7.949	0.1	55.6	61.5	43.3	517.9	1.234	14.72	1.869
8	7.700	7.868	-0.2	54.9	61.3	42.6	518.0	1.227	14.72	1.861
9	6.611	7.025	-0.0	53.8	58.0	35.9	517.8	1.194	14.72	1.741
10	5.681	6.387	0.1	51.8	55.9	25.6	518.0	1.180	14.72	1.733
11	5.377	6.201	0.2	52.5	55.3	19.8	518.4	1.184	14.71	1.753

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	477.7	858.6	1420.7	663.5	477.7	363.5	7.7	777.9	1345.6	1332.9
2	505.5	836.6	1404.1	714.7	505.4	415.5	8.4	726.1	1318.3	1307.6
3	561.6	820.6	1318.9	710.8	561.5	471.7	7.1	671.5	1200.5	1203.3
4	587.0	815.1	1280.5	662.4	587.0	458.1	2.5	674.2	1140.5	1152.7
5	629.5	835.3	1285.4	642.5	629.5	465.2	1.4	693.8	1122.1	1136.9
6	592.9	816.1	1255.5	637.2	592.9	453.8	1.1	678.3	1107.8	1125.6
7	592.4	819.6	1241.1	635.7	592.4	462.6	1.1	676.5	1091.7	1112.6
8	591.0	816.8	1230.2	638.3	591.0	469.5	-1.7	668.4	1077.2	1100.7
9	578.8	795.4	1090.8	579.6	578.8	469.4	-0.2	642.1	924.3	982.2
10	537.0	826.3	958.7	567.0	537.0	511.4	1.1	649.1	795.3	894.1
11	518.8	855.9	911.7	553.5	518.8	520.9	1.4	679.2	751.2	866.3

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID VEL R	PEAK SS MACH NO
RP	IN	OUT	IN	OUT	IN	OUT		
1	0.435	0.690	1.295	0.533	0.435	0.292	0.761	1.749
2	0.462	0.684	1.283	0.584	0.462	0.340	0.822	1.733
3	0.516	0.687	1.212	0.595	0.516	0.395	0.840	1.694
4	0.541	0.684	1.180	0.556	0.541	0.384	0.780	1.648
5	0.583	0.704	1.190	0.541	0.583	0.392	0.739	1.602
6	0.547	0.687	1.158	0.537	0.547	0.382	0.765	1.631
7	0.547	0.692	1.145	0.537	0.547	0.391	0.781	1.627
8	0.545	0.692	1.135	0.541	0.545	0.398	0.794	1.625
9	0.533	0.682	1.005	0.497	0.533	0.403	0.811	1.577
10	0.493	0.716	0.880	0.491	0.493	0.443	0.952	1.332
11	0.475	0.743	0.835	0.480	0.475	0.452	1.004	1.263

	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
RP	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	7.00	8.9	6.6	8.0	0.709	0.640	0.455	0.333	0.081	0.060
2	11.70	8.4	5.8	6.2	0.654	0.714	0.340	0.225	0.063	0.042
3	30.90	8.5	4.7	3.4	0.609	0.826	0.199	0.104	0.039	0.020
4	40.40	8.4	4.2	3.9	0.630	0.810	0.220	0.141	0.043	0.027
5	42.80	6.9	2.5	2.1	0.650	0.876	0.143	0.073	0.028	0.014
6	45.20	8.6	4.1	3.9	0.641	0.821	0.209	0.137	0.040	0.027
7	47.90	8.9	4.2	3.6	0.635	0.836	0.192	0.123	0.037	0.024
8	50.00	9.1	4.3	3.7	0.627	0.854	0.170	0.103	0.033	0.020
9	71.80	10.3	4.4	6.8	0.607	0.884	0.143	0.103	0.026	0.019
10	88.30	11.2	4.7	6.5	0.547	0.948	0.076	0.073	0.013	0.013
11	93.10	11.3	4.6	4.2	0.538	0.946	0.088	0.087	0.015	0.015

TABLE X. - BLADE-ELEMENT DATA AT BLADE EDGES FOR SKEWED SLOT CASING

(a) Reading number, 508-924

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	2.3	53.5	69.9	55.5	519.9	1.357	14.55	2.040
2	9.426	9.349	2.9	54.5	68.7	50.4	519.0	1.369	14.64	2.101
3	8.587	8.607	3.0	53.4	64.6	51.7	524.8	1.241	14.67	1.912
4	8.152	8.239	1.6	58.0	61.8	49.1	517.4	1.247	14.73	1.890
5	8.040	8.146	1.7	58.6	61.3	48.7	517.5	1.243	14.73	1.871
6	7.927	8.054	1.5	58.4	61.1	47.8	517.0	1.241	14.73	1.866
7	7.800	7.949	1.6	58.0	60.7	46.5	517.4	1.236	14.73	1.861
8	7.700	7.868	1.6	57.3	60.4	45.8	517.0	1.231	14.73	1.850
9	6.611	7.025	1.1	55.9	58.2	37.0	516.6	1.203	14.73	1.762
10	5.681	6.387	1.3	52.6	54.9	25.1	517.2	1.180	14.73	1.805
11	5.377	6.201	1.5	53.6	56.0	20.6	516.9	1.191	14.72	1.768

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	485.7	800.0	1414.8	839.7	485.3	475.4	19.5	643.5	1348.4	1335.6
2	505.1	862.2	1387.2	785.3	504.5	500.5	25.7	702.0	1318.0	1307.2
3	558.2	775.5	1300.6	745.8	557.4	462.5	29.5	622.4	1204.6	1207.4
4	603.0	790.5	1276.4	640.3	602.7	419.2	16.9	670.2	1142.0	1154.2
5	606.0	787.4	1262.0	623.0	605.8	410.8	18.3	671.7	1125.3	1140.2
6	605.0	789.4	1249.9	615.0	604.8	413.3	16.3	672.5	1110.1	1127.9
7	603.6	791.9	1233.3	608.4	603.4	419.1	16.4	671.9	1092.1	1112.9
8	602.6	788.7	1219.8	611.1	602.3	426.3	17.2	663.6	1077.9	1101.5
9	568.8	787.6	1078.3	553.4	568.7	442.1	10.4	651.8	926.6	984.6
10	549.6	828.7	956.6	556.2	549.5	503.5	12.6	658.1	795.6	894.5
11	499.8	844.6	893.3	535.0	499.7	500.7	12.7	680.2	753.2	868.7

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.443	0.639	1.290	0.671	0.443	0.380	0.979	1.731
2	0.462	0.691	1.269	0.629	0.461	0.401	0.992	1.713
3	0.510	0.645	1.188	0.621	0.509	0.385	0.830	1.669
4	0.557	0.662	1.180	0.536	0.557	0.351	0.696	1.618
5	0.560	0.660	1.167	0.523	0.560	0.345	0.678	1.605
6	0.560	0.663	1.156	0.517	0.559	0.347	0.683	1.604
7	0.558	0.667	1.140	0.512	0.558	0.353	0.695	1.597
8	0.557	0.665	1.128	0.515	0.557	0.360	0.708	1.591
9	0.524	0.673	0.994	0.473	0.524	0.378	0.777	1.494
10	0.505	0.719	0.880	0.482	0.505	0.437	0.916	1.301
11	0.458	0.730	0.818	0.463	0.458	0.433	1.002	1.257

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	8.4	6.2	6.7	0.550	0.632	0.466	0.349	0.086	0.065
2	11.70	8.1	5.6	2.2	0.589	0.640	0.476	0.369	0.097	0.075
3	30.90	8.3	4.5	6.7	0.561	0.845	0.175	0.090	0.032	0.016
4	40.40	7.6	3.3	6.8	0.642	0.806	0.225	0.153	0.041	0.028
5	42.80	7.6	3.1	7.2	0.650	0.806	0.226	0.159	0.041	0.029
6	45.20	7.8	3.3	7.1	0.652	0.810	0.223	0.157	0.041	0.029
7	47.90	8.1	3.4	6.7	0.651	0.824	0.207	0.146	0.038	0.027
8	50.00	8.2	3.4	6.8	0.641	0.831	0.200	0.141	0.037	0.026
9	71.80	10.5	4.6	7.8	0.626	0.866	0.173	0.147	0.031	0.027
10	88.30	10.2	3.7	6.1	0.557	1.018	-0.027	-0.029	-0.005	-0.005
11	93.10	12.0	5.3	5.1	0.547	0.924	0.130	0.130	0.022	0.022

TABLE X. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SKEWED

SLOT CASING

(b) Reading number, 510-940

	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
RP	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	9.622	9.531	1.3	49.2	67.5	56.5	520.8	1.340	14.51	1.872
2	9.426	9.349	1.5	48.2	66.3	52.2	519.7	1.347	14.60	1.921
3	8.587	8.607	2.2	47.0	60.5	47.8	519.1	1.231	14.68	1.896
4	8.152	8.239	1.4	49.0	57.6	48.7	517.9	1.215	14.71	1.772
5	8.040	8.146	1.3	49.4	56.8	48.9	518.3	1.211	14.73	1.743
6	7.927	8.054	1.3	49.4	56.4	48.1	518.0	1.208	14.74	1.737
7	7.800	7.949	1.3	48.5	56.0	46.5	518.6	1.202	14.74	1.741
8	7.700	7.868	1.4	47.8	55.6	45.4	518.1	1.200	14.74	1.748
9	6.611	7.025	'.3	46.2	53.2	36.4	518.2	1.179	14.74	1.704
10	5.681	6.387	1.5	46.7	51.8	28.4	518.0	1.170	14.75	1.669
11	5.377	6.201	1.6	48.4	51.2	21.9	518.2	1.183	14.74	1.706

	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
RP	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	554.5	767.7	1450.9	909.9	554.4	501.6	12.4	581.2	1353.2	1340.4
2	576.0	818.7	1430.6	890.6	575.8	545.8	15.1	610.2	1324.7	1313.9
3	670.4	817.3	1360.2	830.0	669.9	557.8	25.4	597.4	1209.2	1212.0
4	718.3	772.3	1338.4	767.1	718.1	506.4	17.5	583.0	1147.0	1159.2
5	728.7	761.3	1331.6	753.8	728.5	495.4	16.6	578.0	1131.2	1146.1
6	729.9	763.2	1319.8	745.0	729.7	497.1	16.3	579.1	1116.1	1133.9
7	729.9	772.7	1304.7	744.8	729.7	512.5	16.3	578.3	1097.8	1118.8
8	730.2	778.8	1291.8	745.0	730.0	523.5	17.3	576.6	1083.0	1106.7
9	684.5	802.6	1142.3	690.0	684.3	555.6	15.5	579.1	930.1	988.3
10	616.4	818.6	996.7	638.3	616.2	561.6	16.0	595.5	799.4	898.8
11	595.0	861.5	950.2	616.9	594.8	572.5	16.6	643.8	757.6	873.6

	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
RP	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	0.508	0.615	1.330	0.729	0.508	0.402	0.905	1.687
2	0.530	0.658	1.316	0.716	0.530	0.439	0.948	1.675
3	0.623	0.690	1.264	0.701	0.623	0.471	0.833	1.595
4	0.672	0.654	1.253	0.650	0.672	0.429	0.705	1.536
5	0.683	0.645	1.248	0.639	0.683	0.420	0.680	1.522
6	0.684	0.648	1.237	0.633	0.684	0.422	0.681	1.514
7	0.684	0.658	1.222	0.634	0.684	0.436	0.702	1.503
8	0.684	0.665	1.211	0.636	0.684	0.447	0.717	1.493
9	0.638	0.694	1.065	0.596	0.638	0.480	0.812	1.439
10	0.570	0.712	0.922	0.555	0.570	0.488	0.911	1.263
11	0.549	0.748	0.877	0.536	0.549	0.497	0.962	1.202

	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
RP	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	7.00	6.0	3.7	7.7	0.500	0.577	0.494	0.383	0.089	0.069
2	11.70	5.7	3.1	4.0	0.510	0.591	0.493	0.387	0.097	0.076
3	30.90	4.2	0.4	2.8	0.513	0.867	0.137	0.058	0.027	0.011
4	40.40	3.3	-1.0	6.4	0.546	0.827	0.169	0.104	0.031	0.019
5	42.80	3.1	-1.3	7.4	0.551	0.817	0.178	0.116	0.032	0.021
6	45.20	3.2	-1.3	7.5	0.553	0.824	0.171	0.112	0.031	0.020
7	47.90	3.3	-1.3	6.8	0.546	0.849	0.147	0.092	0.027	0.017
8	50.00	3.4	-1.4	6.4	0.539	0.866	0.131	0.079	0.024	0.015
9	71.80	5.5	-0.4	7.2	0.512	0.918	0.089	0.063	0.016	0.012
10	88.30	7.1	0.5	9.3	0.479	0.926	0.096	0.094	0.016	0.016
11	93.10	7.3	0.6	6.3	0.480	0.899	0.150	0.150	0.025	0.025

TABLE X. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR SKEWED SLOT CASING

(c) Reading number, 511-951

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.4	52.0	69.2	54.4	521.0	1.363	14.52	2.059
2	9.426	9.349	1.5	52.0	68.0	49.8	519.5	1.369	14.60	2.109
3	8.587	8.607	2.3	52.0	63.0	48.7	519.4	1.250	14.68	1.978
4	8.152	8.239	1.5	55.2	60.3	48.8	518.4	1.242	14.72	1.880
5	8.040	8.146	1.5	55.9	59.8	48.3	517.9	1.238	14.72	1.865
6	7.927	8.054	1.4	55.5	59.3	47.4	518.4	1.233	14.74	1.860
7	7.800	7.949	1.6	54.7	59.1	46.0	518.5	1.228	14.73	1.857
8	7.700	7.868	1.4	54.1	58.8	45.1	518.2	1.225	14.74	1.854
9	6.611	7.025	1.4	52.7	56.2	37.3	517.7	1.196	14.74	1.756
10	5.681	6.387	1.4	51.5	54.8	27.9	518.3	1.181	14.73	1.727
11	5.377	6.201	1.5	52.6	54.3	20.9	518.3	1.192	14.74	1.762

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	509.1	813.9	1435.2	861.4	509.0	501.4	12.5	641.2	1354.5	1341.7
2	529.6	866.2	1413.4	825.2	529.4	532.7	13.5	683.0	1324.1	1313.2
3	603.0	812.4	1327.9	757.9	602.5	499.7	24.2	640.6	1207.5	1210.4
4	645.0	786.3	1301.0	682.5	644.8	449.2	17.0	645.4	1147.0	1159.2
5	648.7	785.0	1287.8	662.8	648.5	440.6	17.4	649.7	1130.0	1144.9
6	653.0	787.0	1277.9	657.4	652.8	445.2	16.3	649.0	1114.8	1132.7
7	647.9	791.8	1259.9	658.1	647.7	457.5	17.7	646.3	1098.4	1119.4
8	648.0	792.4	1249.5	658.4	647.8	464.6	16.3	641.9	1084.8	1108.5
9	613.8	785.8	1101.7	598.2	613.6	475.8	14.9	625.5	929.9	988.1
10	554.5	808.0	961.4	569.2	554.3	503.0	13.8	632.3	799.4	898.7
11	534.7	850.2	915.0	552.7	534.5	516.2	14.2	675.5	756.9	872.9

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.465	0.649	1.310	0.687	0.465	0.400	0.985	1.726
2	0.485	0.694	1.295	0.661	0.485	0.427	1.006	1.714
3	0.556	0.680	1.225	0.634	0.556	0.418	0.829	1.645
4	0.598	0.659	1.207	0.572	0.598	0.377	0.697	1.588
5	0.602	0.659	1.196	0.557	0.602	0.370	0.679	1.576
6	0.606	0.662	1.186	0.553	0.606	0.375	0.682	1.567
7	0.601	0.668	1.169	0.555	0.601	0.386	0.706	1.563
8	0.601	0.670	1.160	0.557	0.601	0.393	0.717	1.559
9	0.568	0.673	1.019	0.512	0.568	0.407	0.775	1.520
10	0.510	0.698	0.884	0.492	0.509	0.435	0.907	1.302
11	0.491	0.734	0.839	0.477	0.490	0.446	0.966	1.239

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	7.7	5.4	5.6	0.542	0.632	0.463	0.345	0.088	0.066
2	11.70	7.5	4.9	1.6	0.567	0.644	0.462	0.349	0.095	0.072
3	30.90	6.7	2.9	3.7	0.566	0.860	0.158	0.073	0.031	0.014
4	40.40	6.0	1.7	6.5	0.611	0.818	0.203	0.133	0.037	0.024
5	42.80	6.0	1.6	6.8	0.622	0.821	0.200	0.135	0.037	0.025
6	45.20	6.1	1.5	6.7	0.621	0.831	0.189	0.127	0.035	0.023
7	47.90	6.4	1.7	6.2	0.613	0.848	0.171	0.112	0.032	0.021
8	50.00	6.6	1.8	6.2	0.607	0.859	0.159	0.102	0.030	0.019
9	71.80	8.5	2.6	8.2	0.587	0.890	0.134	0.102	0.024	0.018
10	88.30	10.1	3.5	8.8	0.540	0.935	0.095	0.092	0.016	0.016
11	93.10	10.3	3.6	5.4	0.537	0.913	0.144	0.144	0.024	0.024

TABLE X. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES FOR SKEWED SLOT CASING

(d) Reading number, 512-962

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	2.4	53.9	70.6	55.6	521.3	1.359	14.53	2.051
2	9.426	9.349	2.5	54.7	69.5	50.7	520.7	1.370	14.59	2.113
3	8.587	8.607	2.3	53.9	64.4	49.1	519.4	1.261	14.72	1.981
4	8.152	8.239	1.6	58.1	62.3	49.3	518.2	1.249	14.72	1.896
5	8.040	8.146	1.6	58.7	61.8	48.8	518.2	1.247	14.73	1.885
6	7.927	8.054	1.6	58.4	61.5	47.7	518.0	1.243	14.73	1.881
7	7.800	7.949	1.6	57.9	61.2	46.4	517.7	1.238	14.73	1.870
8	7.700	7.868	1.4	57.3	60.9	45.7	517.9	1.233	14.73	1.863
9	6.611	7.025	1.1	56.0	58.4	37.1	517.7	1.204	14.73	1.770
10	5.681	6.387	1.2	52.5	56.8	27.8	517.8	1.182	14.73	1.740
11	5.377	6.201	1.3	53.6	56.3	20.9	517.5	1.194	14.73	1.774

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	469.9	802.7	1413.9	837.6	469.5	472.6	19.4	648.8	1353.1	1340.3
2	488.8	864.5	1392.9	787.4	488.3	499.1	21.2	705.9	1325.7	1314.9
3	566.7	812.7	1312.7	731.0	566.3	478.6	22.4	656.9	1206.6	1209.4
4	592.7	791.4	1275.8	641.8	592.5	418.4	16.3	671.8	1146.1	1158.4
5	598.5	791.9	1265.3	625.4	598.2	412.0	17.0	676.3	1131.9	1146.8
6	597.0	794.8	1251.8	618.6	596.8	416.4	16.2	677.0	1116.6	1134.5
7	594.8	795.1	1232.9	613.3	594.6	422.9	16.4	673.3	1096.5	1117.4
8	595.6	793.7	1223.7	613.9	595.4	428.6	14.8	668.0	1083.9	1107.5
9	565.6	789.6	1079.8	554.3	565.5	441.9	10.6	654.3	930.5	988.8
10	515.4	805.5	941.6	554.3	515.3	490.2	10.5	639.1	798.6	897.9
11	498.8	847.0	897.7	537.8	498.7	502.5	10.9	681.8	757.4	873.4

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.428	0.640	1.286	0.668	0.427	0.377	1.007	1.750
2	0.446	0.691	1.270	0.629	0.445	0.399	1.022	1.741
3	0.521	0.677	1.207	0.609	0.521	0.399	0.845	1.678
4	0.547	0.662	1.177	0.537	0.547	0.350	0.706	1.633
5	0.552	0.663	1.168	0.524	0.552	0.345	0.689	1.622
6	0.551	0.667	1.156	0.519	0.551	0.349	0.698	1.619
7	0.549	0.669	1.138	0.516	0.549	0.356	0.711	1.611
8	0.550	0.669	1.130	0.517	0.550	0.361	0.720	1.608
9	0.521	0.674	0.994	0.473	0.521	0.377	0.782	1.502
10	0.472	0.696	0.863	0.479	0.472	0.423	0.951	1.333
11	0.457	0.731	0.822	0.464	0.456	0.434	1.008	1.270

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	9.1	6.8	6.8	0.552	0.635	0.466	0.345	0.086	0.064
2	11.70	8.9	6.4	2.4	0.591	0.643	0.473	0.357	0.096	0.073
3	30.90	8.1	4.3	4.1	0.585	0.825	0.206	0.116	0.040	0.022
4	40.40	8.1	3.8	7.0	0.641	0.805	0.229	0.154	0.042	0.028
5	42.80	8.0	3.6	7.3	0.651	0.806	0.229	0.157	0.042	0.029
6	45.20	8.3	3.8	7.0	0.651	0.815	0.219	0.150	0.040	0.027
7	47.90	8.5	3.8	6.7	0.647	0.822	0.212	0.148	0.039	0.027
8	50.00	8.7	3.9	6.8	0.641	0.834	0.197	0.134	0.036	0.025
9	71.80	10.8	4.9	8.0	0.627	0.868	0.172	0.145	0.031	0.026
10	88.30	12.1	5.5	8.8	0.548	0.943	0.086	0.084	0.015	0.014
11	93.10	12.3	5.6	5.3	0.547	0.917	0.143	0.142	0.024	0.024

TABLE XI. - BLADE-ELEMENT DATA AT BLADE EDGES FOR CIRCUMFERENTIALLY GROOVED CASING

(a) Reading number, 602-1227

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.0	61.1	68.5	55.9	519.8	1.318	14.54	2.042
2	9.426	9.349	1.5	56.0	67.1	53.2	519.6	1.287	14.65	2.025
3	8.587	8.607	0.9	52.2	62.5	47.9	518.7	1.247	14.71	1.947
4	8.152	8.239	0.6	53.5	60.6	46.4	518.5	1.236	14.72	1.878
5	8.040	8.146	0.4	54.4	60.2	46.4	518.5	1.233	14.71	1.856
6	7.927	8.054	0.3	54.6	59.8	45.5	518.4	1.231	14.72	1.850
7	7.800	7.949	0.3	53.9	59.4	44.2	518.2	1.225	14.72	1.846
8	7.700	7.868	0.2	53.0	59.1	43.4	518.4	1.220	14.72	1.840
9	6.611	7.025	0.1	52.2	56.7	36.5	518.3	1.189	14.72	1.735
10	5.681	6.387	0.1	51.0	55.2	26.7	518.4	1.175	14.73	1.711
11	5.377	6.201	0.5	52.6	54.5	19.4	518.6	1.185	14.71	1.747

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	525.7	837.3	1434.3	721.8	525.7	404.6	9.0	733.0	1343.5	1330.8
2	550.5	828.2	1414.1	773.6	550.3	463.4	14.0	686.5	1316.6	1305.9
3	618.1	818.6	1340.5	748.2	618.0	501.4	9.9	647.0	1199.4	1202.2
4	638.7	805.2	1299.7	694.7	638.6	478.9	6.4	647.3	1138.4	1150.5
5	640.9	797.6	1287.7	673.1	640.9	464.1	4.5	648.7	1121.4	1136.2
6	641.1	799.9	1276.0	662.2	641.1	463.8	3.3	651.6	1106.5	1124.3
7	640.6	803.2	1259.8	659.5	640.6	473.1	3.0	649.2	1087.8	1108.6
8	640.7	801.8	1248.3	663.9	640.7	482.2	2.1	640.6	1073.5	1096.9
9	605.9	789.5	1103.8	601.1	605.9	483.4	1.0	624.2	923.7	981.5
10	550.3	815.3	964.2	574.6	550.3	513.3	1.3	633.4	793.1	891.7
11	533.3	858.5	917.3	553.2	533.2	521.7	4.4	681.8	750.8	865.8

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.481	0.682	1.313	0.588	0.481	0.330	0.770	1.703
2	0.505	0.683	1.298	0.638	0.505	0.382	0.842	1.686
3	0.572	0.687	1.239	0.628	0.571	0.421	0.811	1.642
4	0.592	0.678	1.205	0.585	0.592	0.403	0.750	1.596
5	0.594	0.672	1.194	0.567	0.594	0.391	0.724	1.588
6	0.594	0.675	1.183	0.559	0.594	0.391	0.723	1.584
7	0.594	0.680	1.168	0.558	0.594	0.400	0.738	1.575
8	0.594	0.680	1.157	0.563	0.594	0.409	0.753	1.569
9	0.560	0.678	1.020	0.516	0.560	0.415	0.798	1.539
10	0.506	0.707	0.886	0.498	0.506	0.445	0.933	1.318
11	0.489	0.745	0.841	0.480	0.489	0.453	0.978	1.247

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	7.0	4.7	7.1	0.661	0.711	0.342	0.229	0.063	0.042
2	11.70	6.5	4.0	5.0	0.605	0.777	0.254	0.148	0.049	0.028
3	30.90	6.2	2.4	2.9	0.582	0.848	0.167	0.081	0.033	0.016
4	40.40	6.3	2.0	4.1	0.604	0.835	0.182	0.111	0.035	0.021
5	42.80	6.4	2.0	4.9	0.616	0.829	0.190	0.122	0.036	0.023
6	45.20	6.6	2.1	4.9	0.621	0.833	0.185	0.120	0.035	0.023
7	47.90	6.8	2.1	4.4	0.615	0.849	0.168	0.106	0.032	0.020
8	50.00	6.9	2.1	4.5	0.605	0.864	0.151	0.093	0.029	0.018
9	71.80	9.0	3.2	7.3	0.588	0.900	0.119	0.084	0.022	0.015
10	88.30	10.5	3.9	7.6	0.538	0.950	0.071	0.068	0.012	0.012
11	93.10	10.5	3.8	3.9	0.541	0.934	0.106	0.106	0.018	0.018

TABLE XI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR

CIRCUMFERENTIALLY GROOVED CASING

(b) Reading number, 603-1238

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	0.6	50.8	65.4	55.4	519.8	1.253	14.49	1.858
2	9.426	9.349	0.9	45.9	63.7	53.2	519.1	1.235	14.65	1.857
3	8.587	8.607	0.6	44.0	58.2	46.2	518.6	1.221	14.72	1.864
4	8.152	8.239	0.8	46.6	55.6	46.9	518.5	1.203	14.72	1.741
5	8.040	8.146	0.4	46.7	55.2	47.6	518.4	1.198	14.72	1.705
6	7.927	8.054	0.2	46.6	54.8	47.3	518.4	1.194	14.73	1.691
7	7.800	7.949	0.3	45.9	54.2	45.9	518.4	1.190	14.72	1.698
8	7.700	7.868	0.4	45.2	53.8	44.6	518.6	1.187	14.71	1.707
9	6.611	7.025	-0.0	43.9	52.2	36.1	518.4	1.167	14.72	1.670
10	5.681	6.387	0.4	45.1	50.9	28.0	518.6	1.158	14.73	1.633
11	5.377	6.201	0.3	47.3	50.4	21.1	518.7	1.175	14.72	1.669

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	611.1	786.7	1469.1	875.6	611.1	497.6	6.4	609.3	1342.4	1329.7
2	643.6	791.8	1454.8	918.6	643.5	550.5	10.4	569.1	1315.1	1304.4
3	738.1	831.4	1400.5	863.6	738.1	597.8	7.9	577.8	1198.2	1201.0
4	770.5	787.3	1365.2	791.4	770.5	541.0	10.5	572.1	1137.5	1149.7
5	778.2	769.9	1362.2	781.8	778.2	527.5	5.0	560.7	1123.0	1137.8
6	779.6	765.2	1351.4	775.2	779.6	526.2	3.2	555.5	1107.0	1124.8
7	782.3	773.2	1337.6	772.9	782.3	538.2	4.1	555.1	1089.0	1109.8
8	783.3	782.3	1325.8	773.7	783.3	551.0	5.3	555.4	1075.0	1098.5
9	717.5	805.5	1170.6	718.4	717.5	580.2	-0.4	558.7	924.5	982.4
10	641.4	823.4	1016.8	658.2	641.3	581.3	4.1	583.1	793.2	891.7
11	618.6	868.5	970.3	631.5	618.6	589.2	2.9	638.1	750.5	865.5

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.564	0.655	1.356	0.729	0.564	0.415	0.814	1.640
2	0.596	0.666	1.348	0.772	0.596	0.463	0.856	1.620
3	0.692	0.707	1.313	0.734	0.692	0.508	0.810	1.563
4	0.726	0.671	1.286	0.675	0.726	0.461	0.702	1.501
5	0.734	0.657	1.285	0.667	0.734	0.450	0.678	1.498
6	0.735	0.654	1.275	0.662	0.735	0.450	0.675	1.491
7	0.738	0.662	1.262	0.662	0.738	0.461	0.688	1.478
8	0.739	0.672	1.251	0.664	0.739	0.473	0.703	1.466
9	0.671	0.700	1.095	0.624	0.671	0.504	0.809	1.423
10	0.595	0.720	0.943	0.575	0.595	0.508	0.906	1.260
11	0.572	0.758	0.897	0.551	0.572	0.514	0.952	1.203

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	3.9	1.6	6.5	0.537	0.765	0.232	0.127	0.043	0.024
2	11.70	3.2	0.6	5.0	0.491	0.824	0.168	0.069	0.032	0.013
3	30.90	1.9	-1.9	1.2	0.503	0.879	0.116	0.035	0.024	0.007
4	40.40	1.4	-2.9	4.6	0.536	0.844	0.144	0.080	0.027	0.015
5	42.80	1.4	-3.0	6.1	0.539	0.833	0.150	0.087	0.028	0.016
6	45.20	1.5	-3.0	6.6	0.539	0.834	0.148	0.088	0.027	0.016
7	47.90	1.6	-3.1	6.1	0.534	0.860	0.125	0.069	0.023	0.013
8	50.00	1.6	-3.2	5.6	0.528	0.885	0.104	0.051	0.020	0.010
9	71.80	4.5	-1.4	7.0	0.498	0.944	0.056	0.029	0.010	0.005
10	88.30	6.2	-0.4	8.9	0.469	0.949	0.060	0.057	0.010	0.010
11	93.10	6.4	-0.3	5.5	0.477	0.902	0.135	0.134	0.023	0.023

TABLE XI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES FOR

CIRCUMFERENTIALLY GROOVED CASING

(c) Reading number, 604-1249

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.4	56.1	66.9	54.4	519.7	1.298	14.52	2.026
2	9.426	9.349	1.2	52.0	65.5	52.6	519.3	1.269	14.64	2.000
3	8.587	8.607	0.9	49.7	60.5	47.2	518.6	1.240	14.72	1.943
4	8.152	8.239	0.4	52.0	58.5	46.2	518.6	1.230	14.72	1.863
5	8.040	8.146	0.4	52.7	58.2	46.4	518.5	1.225	14.73	1.831
6	7.927	8.054	0.3	52.5	57.7	45.9	518.8	1.221	14.72	1.822
7	7.800	7.949	0.4	52.2	57.3	44.6	518.6	1.216	14.72	1.820
8	7.700	7.868	0.2	51.4	57.0	43.7	518.5	1.212	14.72	1.820
9	6.611	7.025	0.1	50.1	55.0	35.8	518.4	1.184	14.72	1.734
10	5.681	6.387	0.2	49.8	53.6	26.9	518.4	1.172	14.72	1.700
11	5.377	6.201	0.5	51.4	52.9	19.8	518.4	1.184	14.72	1.733

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	568.0	827.0	1445.3	792.3	567.8	461.5	14.0	686.3	1343.0	1330.3
2	594.2	818.3	1430.6	828.6	594.0	503.3	12.6	645.2	1314.1	1303.4
3	673.2	822.9	1365.9	783.3	673.1	532.5	10.5	627.4	1199.0	1201.8
4	693.4	804.7	1328.3	715.4	693.4	495.5	4.9	634.0	1137.9	1150.0
5	692.0	793.6	1312.9	697.4	692.0	481.3	5.2	631.0	1120.8	1135.6
6	697.0	791.2	1304.1	691.0	697.0	481.2	3.9	628.0	1106.1	1123.9
7	695.1	795.5	1287.1	685.0	695.1	487.7	5.4	628.4	1088.7	1109.5
8	696.0	797.8	1279.3	687.9	696.0	497.5	1.8	623.6	1075.2	1098.7
9	645.4	797.2	1124.2	630.6	645.4	511.7	1.5	611.3	922.0	979.7
10	583.5	816.8	982.5	591.7	583.5	527.7	2.3	623.5	792.8	891.3
11	563.1	860.2	933.8	570.2	563.0	536.6	5.2	672.4	750.2	865.1

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.522	0.679	1.328	0.651	0.522	0.379	0.813	1.663
2	0.548	0.680	1.319	0.688	0.548	0.418	0.847	1.650
3	0.626	0.693	1.271	0.660	0.626	0.448	0.791	1.600
4	0.647	0.679	1.239	0.604	0.647	0.418	0.715	1.556
5	0.645	0.671	1.224	0.589	0.645	0.407	0.696	1.547
6	0.650	0.669	1.216	0.585	0.650	0.407	0.690	1.539
7	0.648	0.675	1.201	0.581	0.648	0.414	0.702	1.530
8	0.649	0.678	1.193	0.585	0.649	0.423	0.715	1.527
9	0.599	0.687	1.043	0.543	0.599	0.441	0.793	1.488
10	0.538	0.709	0.905	0.514	0.538	0.458	0.904	1.295
11	0.518	0.747	0.859	0.495	0.518	0.466	0.953	1.227

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	5.4	3.1	5.6	0.603	0.751	0.281	0.176	0.053	0.033
2	11.70	4.9	2.3	4.4	0.562	0.815	0.199	0.098	0.039	0.019
3	30.90	4.2	0.4	2.2	0.559	0.870	0.138	0.056	0.027	0.011
4	40.40	4.3	-0.0	3.9	0.595	0.846	0.161	0.094	0.031	0.018
5	42.80	4.4	0.0	4.8	0.601	0.837	0.171	0.107	0.033	0.020
6	45.20	4.5	-0.1	5.2	0.602	0.846	0.161	0.100	0.030	0.019
7	47.90	4.7	-0.0	4.9	0.599	0.865	0.141	0.084	0.027	0.016
8	50.00	4.8	0.0	4.7	0.592	0.879	0.127	0.071	0.024	0.014
9	71.80	7.3	1.4	6.6	0.566	0.925	0.085	0.054	0.016	0.010
10	88.30	8.8	2.3	7.8	0.527	0.951	0.065	0.063	0.011	0.011
11	93.10	8.9	2.2	4.2	0.529	0.923	0.118	0.118	0.020	0.020

TABLE XI. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES FOR

CIRCUMFERENTIALLY GROOVED CASING

(d) Reading number, 605-1260

RP	RADII IN	RADII OUT	ABS BETAM IN	ABS BETAM OUT	REL BETAM IN	REL BETAM OUT	TOTAL TEMP IN	TOTAL TEMP RATIO	TOTAL PRESS IN	TOTAL PRESS RATIO
1	9.622	9.531	1.3	61.0	68.3	55.9	520.0	1.319	14.56	2.031
2	9.426	9.349	1.4	55.2	67.2	53.0	519.4	1.287	14.65	2.014
3	8.587	8.607	0.9	51.8	62.5	47.9	518.6	1.245	14.71	1.943
4	8.152	8.239	0.6	53.6	60.4	46.2	518.5	1.235	14.71	1.877
5	8.040	8.146	0.5	54.3	60.1	46.5	518.7	1.232	14.72	1.849
6	7.927	8.054	0.3	54.4	59.8	45.5	518.4	1.229	14.71	1.844
7	7.800	7.949	0.4	54.0	59.3	44.1	518.4	1.224	14.73	1.842
8	7.700	7.868	0.4	53.3	59.0	43.5	518.4	1.219	14.72	1.838
9	6.611	7.025	0.1	52.1	56.7	36.3	518.4	1.188	14.71	1.735
10	5.681	6.387	0.3	50.8	55.2	26.7	518.4	1.174	14.72	1.711
11	5.377	6.201	0.3	52.4	54.8	19.4	518.4	1.185	14.72	1.745

RP	ABS VEL IN	ABS VEL OUT	REL VEL IN	REL VEL OUT	MERID VEL IN	MERID VEL OUT	TANG VEL IN	TANG VEL OUT	WHEEL SPEED IN	WHEEL SPEED OUT
1	528.5	835.5	1431.0	722.9	528.4	405.6	11.6	730.4	1341.5	1328.8
2	548.2	825.5	1412.1	784.2	548.0	471.6	13.4	677.5	1314.8	1304.0
3	617.2	816.4	1338.4	751.8	617.2	504.4	9.2	642.0	1196.7	1199.5
4	640.0	805.5	1296.9	690.8	639.9	478.0	6.9	648.3	1134.9	1147.0
5	641.7	795.7	1287.2	674.4	641.7	464.1	5.1	646.3	1120.9	1135.7
6	642.2	798.0	1275.1	663.6	642.2	464.8	3.1	648.7	1104.7	1122.4
7	641.2	803.0	1257.5	657.6	641.1	472.0	5.0	649.7	1086.8	1107.6
8	640.7	801.4	1245.8	660.6	640.7	479.4	4.9	642.1	1073.3	1096.7
9	603.7	789.4	1101.0	601.7	603.7	484.9	0.8	622.9	921.5	979.2
10	548.3	815.4	961.5	576.8	548.3	515.2	3.0	632.0	792.8	891.4
11	526.9	857.8	913.9	554.9	526.9	523.2	3.0	679.8	749.7	864.6

RP	ABS MACH NO IN	ABS MACH NO OUT	REL MACH NO IN	REL MACH NO OUT	MERID MACH NO IN	MERID MACH NO OUT	MERID VEL R	PEAK SS MACH NO
1	0.484	0.680	1.310	0.589	0.484	0.330	0.768	1.695
2	0.503	0.681	1.296	0.647	0.503	0.389	0.861	1.686
3	0.571	0.686	1.237	0.631	0.571	0.424	0.817	1.640
4	0.593	0.679	1.202	0.582	0.593	0.403	0.747	1.589
5	0.595	0.670	1.193	0.568	0.595	0.391	0.723	1.585
6	0.595	0.674	1.182	0.560	0.595	0.392	0.724	1.580
7	0.594	0.680	1.166	0.557	0.594	0.400	0.736	1.570
8	0.594	0.680	1.155	0.560	0.594	0.407	0.748	1.565
9	0.558	0.678	1.017	0.517	0.558	0.417	0.803	1.539
10	0.504	0.707	0.883	0.500	0.504	0.447	0.940	1.315
11	0.483	0.744	0.838	0.481	0.483	0.454	0.993	1.252

RP	PERCENT SPAN	INCIDENCE MEAN	INCIDENCE SS	DEV	D-FACT	EFF	LOSS COEFF TOT	LOSS COEFF PROF	LOSS PARAM TOT	LOSS PARAM PROF
1	7.00	6.8	4.5	7.0	0.658	0.702	0.352	0.242	0.065	0.044
2	11.70	6.6	4.0	4.8	0.595	0.771	0.260	0.154	0.050	0.030
3	30.90	6.2	2.4	2.8	0.577	0.854	0.160	0.074	0.031	0.015
4	40.40	6.2	1.9	3.9	0.606	0.840	0.176	0.107	0.034	0.021
5	42.80	6.4	1.9	5.0	0.614	0.827	0.190	0.123	0.036	0.023
6	45.20	6.5	2.0	4.9	0.619	0.836	0.182	0.117	0.035	0.022
7	47.90	6.7	2.0	4.4	0.616	0.853	0.164	0.104	0.032	0.020
8	50.00	6.9	2.1	4.5	0.607	0.869	0.145	0.088	0.028	0.017
9	71.80	9.1	3.2	7.2	0.586	0.907	0.111	0.076	0.020	0.014
10	88.30	10.5	4.0	7.7	0.534	0.953	0.067	0.064	0.012	0.011
11	93.10	10.8	4.1	3.9	0.537	0.930	0.113	0.113	0.019	0.019

NASA-Langley, 1971 —— 1 E-6119

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

FIRST CLASS MAIL

POSTAGE AND FEES PAID
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

U.S.MAIL

015 001 C1 U 01 711029 S00903DS
DEPT OF THE AIR FORCE
AF WEAPONS LAB (AFSC)
TECH LIBRARY/WLOL/
ATTN: E LOU BOWMAN, CHIEF
KIRTLAND AFB NM 87117

POSTMASTER: If Undeliverable (Section 158 Postal Manual) Do Not Return

---

"The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

— NATIONAL AERONAUTICS AND SPACE ACT OF 1958

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDUMS: Information receiving limited distribution because of preliminary data, security classification, or other reasons.

CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit NASA distribution in English.

SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Technology Surveys.

Details on the availability of these publications may be obtained from:

SCIENTIFIC AND TECHNICAL INFORMATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546