

UNCLASSIFIED

AD NUMBER
AD835090
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to DoD only; Administrative/Operational Use; 08 MAY 1968. Other requests shall be referred to Naval Air Systems Command, Washington, DC 20360.
AUTHORITY
USNASC notice, 4 Dec 1970

THIS PAGE IS UNCLASSIFIED

AD835090

# VARIABLE GEOMETRY SHROUDED PROPELLER TEST PROGRAM FINAL REPORT

VOLUME II

TEST DATA

8 May 1968

Prepared under Contract N00019-67-C-0087 for the Naval Air Systems  
Command, Department of the Navy by Hamilton Standard, Division of United  
Aircraft, Windsor Locks, Connecticut.

~~Distribution of this document is unlimited.~~

EACH TRANSMITTAL OF THIS DOCUMENT  
OUTSIDE THE DEPARTMENT OF DEFENSE  
MUST HAVE PRIOR APPROVAL OF: THE  
COMMANDER, NAVAL AIR SYSTEMS COMMAND

AIR-5362

Wash. D.C. 20361

DDP  
RECEIVED  
JUL 15 1968  
RECEIVED

VARIABLE GEOMETRY SHROUDED  
PROPELLER TEST PROGRAM

FINAL REPORT

VOLUME II

TEST DATA

8 May 1968

Prepared by: United Aircraft Research Laboratories

Approved by Carl Rohrbach Head of Aerodynamics and Hydrodynamics  
Carl Rohrbach

W. E. Fortmann Chief of Technical Staff  
William E. Fortmann

Al D. Croxall Chief Project Engineer  
Al D. Croxall

Number of Pages 214

Report F331012-1

Wind Tunnel Tests of Variable  
Geometry Shrouded Propellers

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY . . . . .	1
INTRODUCTION . . . . .	2
TEST FACILITY, PROPELLER DYNAMOMETER AND TEST MODELS	
Wind Tunnel Facility . . . . .	2
Propeller Dynamometer and Shroud Balance . . . . .	3
Propeller Dynamometer and Shroud Installation . . . . .	4
Test Models . . . . .	4
TEST PROCEDURES	
Initial Testing . . . . .	6
Performance Testing . . . . .	6
Pressure Testing . . . . .	7
DATA REDUCTION AND STATEMENT OF ACCURACY . . . . .	7
PRESENTATION OF DATA . . . . .	9
REFERENCES . . . . .	11
LIST OF SYMBOLS . . . . .	12

TABLE OF CONTENTS  
(Contd.)

	<u>Page</u>
<b>APPENDICES - HS VG SHROUDED PROPELLER TEST</b>	
I - Model Component Identification and Dimensional Data . . . . .	19
II - Pressure Sensing Instrumentation and Traversing Probe Calibration . . . . .	29
III - Tunnel Blockage Corrections . . . . .	37
IV - Propeller Dynamometer Buoyancy Investigations . . . . .	41
V - Propeller Hub Skin Friction Tare . . . . .	48
VI - Shroud Support Tare and Interference Effects . . . . .	50
VII - Data Reduction Equations . . . . .	58
FIGURES 1 - 47 . . . . .	following page 61
<b>TABLES - HS VG SHROUDED PROPELLER TEST . . . . .</b>	
	following Fig. 47
I - Test Schedule . . . . .	I-1
II - Wind Tunnel Run Log . . . . .	II-1
III - Performance Data . . . . .	III-1
IV - Pressure Data (Shroud Inlet Velocities and Exit Pressures) . .	IV-1
V - Shroud Inlet Data . . . . .	V-1
VI - Traversing Probe Data . . . . .	VI-1
VII - Pressure Data (Shroud Surface Pressure Coefficients, Inlet Velocities and Exit Pressures) . . . . .	VII-1

Report F331012-1

Wind Tunnel Tests of Variable  
Geometry Shrouded Propellers

SUMMARY

Wind tunnel tests of variable geometry shrouded propeller models were conducted for the Hamilton Standard Division of the United Aircraft Corporation in the 18-ft and 8-ft test sections of the UARL Large Subsonic Wind Tunnel during the period from May 1 to May 18, 1967. The test model comprised a shroud propeller assembly which was attached to a propeller dynamometer through strain gage balances. The balances provided shroud chord force, propeller thrust and propeller torque data. Various pressure measurements were also obtained including shroud inlet pitot-static pressures, shroud exit total pressures, shroud surface pressure distributions, and velocity-angularity radial traverse probe data. These data were obtained for three shroud configurations and two sets of propellers. Shroud variables included lip contour, length and exit area; propeller variables included blade planform and blade-shroud tip clearance. Test data for these model configurations were obtained through ranges of blade rotational speed at various blade pitch angles and at tunnel Mach numbers from 0.02 to 0.60.

A complete transcript of preliminary performance test data and descriptive information pertinent to the test models, equipment and techniques was forwarded to Hamilton personnel by June 19, 1967. Post-test efforts were suspended on June 28, 1967 and resumed on November 1, 1967 at Hamilton's request. On November 19, 1967, the transmittal of all performance and pressure data in final reduced form was completed. This report presents an explanatory text, detailed tabulations of the performance and pressure data, and a complete graphical presentation of the performance data.

This project was undertaken for Hamilton Standard under Purchase Order WPI IFL BCO-104A dated March 7, 1966 and Purchase Order 46746 dated January 12, 1967.

## INTRODUCTION

Interest in shrouded propeller studies has been stimulated by the advantages of ducted propellers over free-air propellers. The former is capable of producing the same thrust-to-power ratio as a free-air propeller of approximately twice its diameter (Ref. 1). Past shrouded propeller studies have been directed toward an optimum shroud configuration for overall performance throughout the propeller's anticipated operational speed regime. However, configurations designed for high thrust at low subsonic speeds require large bellmouth inlets as well as high exit-to-propeller area ratios which are undesirable for high subsonic speed flight because of their inherently high drag. A shroud designed for good high subsonic speed performance requires a sharp inlet lip and low exit-to-propeller area ratio which conversely produces poor low subsonic speed performance. As a consequence, this program was initiated to obtain data for shroud geometries applicable to both ends of the flight spectrum. These data supplement Hamilton's previous results obtained under Bureau of Naval Weapons, Contract NOW 64-0707-d. The subject data are applicable to a shroud capable of altering its shape to optimize performance (i.e., variable geometry shroud).

The subject shrouded propeller tests comprise the experimental phase of a program contracted by Hamilton Standard with the Naval Air Systems Command to provide systematically varied performance curves which are sufficient to permit empirical performance estimates for the pertinent flight conditions of a variable geometry shrouded propeller. The data obtained are presented herein in detailed tabular and graphical formats; the test apparatus and techniques are also described.

## TEST FACILITY, PROPELLER DYNAMOMETER AND TEST MODELS

### Wind Tunnel Facility

The UARL Large Subsonic Wind Tunnel, shown in Fig. 1, is a single-return closed-throat facility with interchangeable 18-ft and 8-ft octagonal test sections. Maximum tunnel velocity is approximately 200 mph in the 18-ft section and near sonic Mach numbers can be obtained in the 8-ft section. Tunnel stagnation pressure equals atmospheric pressure, and the stagnation temperature of the airstream was held constant in the 64 to 98 F range by means of air exchanger valves. Electric power may be supplied to test models

by two motor generator sets each of which develop a maximum of 375 hp at frequencies of 0 to 400 cps. Auxiliary vacuum systems and a 400 psig air supply are also available. A small digital computer and a static data acquisition system (capable of recording 200 steady pressures or temperatures) located in the tunnel control room are employed to record and process test data. A detailed description of the wind tunnel and its auxiliary equipment is given in Ref. 2.

### Propeller Dynamometer and Shroud Balance

The model propellers were driven by the UARL propeller dynamometer, schematically illustrated in Fig. 2, which consists of two variable-speed motors, mounted in tandem and housed within a streamlined cast-steel pod with an integral support strut. The motors are mounted in hydrostatic bearings to restrain all motion except axial motion along or rotational motion about the longitudinal axis of the dynamometer. These motions were restrained by load cells which measure thrust and torque of the model propeller. Each motor is capable of delivering 375 hp at 12,000 rpm; together they provide a maximum torque of 330 lb-ft at any operational speed. Model speed was controlled by the variable frequency electrical power supplied by two motor-generator sets, and the model speed was measured with a Berkley EFUT meter and a 60-tooth gear signal generator. The dynamometer was faired to minimize the axial static pressure gradient in the plane of the propeller, Ref. 3. Additional data on airflow distortion and buoyancy effects produced by the dynamometer were obtained during the subject test program and are discussed in this report. The dynamometer is also designed so that the model propeller and hub are the only portion of the metric system exposed to the airstream. Pressure instrumentation was provided within the dynamometer in order to correct the measured thrust for any difference in pressure between the front face of the hub and an equal area in the rear fairing. Further details of the propeller dynamometer are presented in Ref. 3.

The shroud strain gage balance system, shown in Fig. 3, was used to support the shroud on the propeller dynamometer and to measure shroud-chord forces. The balance ground structure was provided by a new fairing of heavy gage rolled boiler plate machined to provide essentially the same shape as the metal fairing normally used. The shroud was supported on the ground structure by a three-point linkage schematically illustrated in Fig. 4. Support points  $P_1$  and  $P_2$ , shown in Figs. 3 and 4, were fixed in the y-z plane (Fig. 4) by two "A" frames which were free to pivot at both ends. Points  $P_1$  and  $P_2$  were restrained in the axial direction by flexured load cells ( $C_4$ ,  $C_5$ ) which attached to the non-metric structure and which permitted lateral as well as vertical rotation, thus only axial chord forces ( $C_4$ ,  $C_5$ ) were transmitted through these points. Forces

$N_1$  and  $N_2$  (not required for this test) could have been obtained directly from load cells which measure a bending moment in the lateral plane between points  $P_1$  and  $P_2$  and the shroud. Support point  $P_3$  was fixed in space by a rigid support arm projecting forward from the fairing of the extension shaft housing. A flexured load cell ( $N_3$ ) could have been inserted between the side arm and shroud and used to determine the side force on the latter, but the normal forces at zero degrees yaw were found to be negligibly small in Ref. 4 and the side force was therefore not determined during the subject test. The tare and interference effect of the "A" frames was obtained with the use of a dummy support system.

#### Propeller Dynamometer and Shroud Installation

The shroud-dynamometer was installed in each test section at a yaw angle of zero degrees and with the thrust axis coincident with the tunnel centerline elevation. Figures 5 and 6 illustrate the model installation in both the 8- and 18-ft sections, respectively. Dynamometer monitoring instrumentation consisted of an EPU' meter for rotational speed, a vibration meter with provision for selecting vertical or horizontal motion and a Speed-O-Max display for numerous thermocouple temperatures. Pressure leads from the dynamometer and electrical leads from the dynamometer and shroud balance were connected at the dynamometer strut bulkhead then led across the tunnel balance chamber to the appropriate facility in the control room. Pressure tubing leads from the shroud and exit rakes were led downstream across the shroud balance linkage, along and down the leading edge of the dynamometer, and into the balance chamber where they were connected to a patch panel. Pressure tubing leads from the inlet rakes and spinner ( $P_1$  in Fig. 2) were led upstream through the spinner and a sting, through the sting support struts, and into the balance chamber where they were connected to the patch panel. At the patch panel the leads were directed to the static data acquisition system and manometer boards in the tunnel control room. The electrical and pressure leads from the traversing probe were led into the balance chamber and then directed to the appropriate facility in the control room.

#### Test Models

The test models consisted of two high-speed, 20-in. chord shrouds, one low-speed, 23-in. chord shroud and two sets of propeller blades. Each shroud configuration was fabricated from a solid aluminum ring with circumferential grooves for the implacement of pressure instrumentation. These grooves were

then filled with plastic filler and blended to match the local contours. Figure 7 shows two shroud models and identifies some of the model components, all of which are specified in detail in Appendix I.

The test models included two sets of propeller blades, illustrated in Fig. 8, comprising wide and narrow tip planform three-way configurations previously used during Ref. 4 testing. The geometry of each blade is described in Appendix I, Figs. I-5 and I-6. The blades were aluminum although the wide tip set incorporated fiberglass tips which during a previous test (Ref. 4) provided for tip clearance variations between the blade tip and shroud. The blades installed in the 7.5-in. diameter steel hub provided a disc diameter of approximately 30 in. Both propellers had an activity factor of 168 and a design camber of 0.4. Changes in blade angle were accomplished by manually turning worm gears in the hub that mesh with integral gear sectors on the blade root.

Provisions for the mounting of inlet pitot-static rakes and an exit total pressure rake were provided in addition to the static pressure orifices incorporated in the model shroud components. The 15-orifice, pitot-static inlet rake and the 25-orifice total pressure exit rake were nonmetrically supported from the spinner and dynamometer cowl fairing, respectively. A probe which traversed the exit of each shroud was mounted from the tunnel floor. A complete description of this instrumentation is provided in Appendix II.

The configuration designation system used herein is a continuation of that used in Ref. 4 and is based on 16 symbols, each consisting of a letter with subscripts denoting variables. A typical sample would be  $L_4C_1E_7B_3P_{WT}T_1$ , which defines the complete shroud-propeller model with inlet lip four ( $L_4$ ), propeller at 40-percent shroud chord ( $C_1$ ), diffuser exit area ratio of 1.0 ( $E_7$ ), three-way hub ( $B_3$ ), wide-tip planform blade ( $P_{WT}$ ) and basic blade tip-shroud clearance ( $T_1$ ). The symbols are concisely defined in Appendix I and illustrated in Figs. 7 and 8. Special forms of these symbols used in computer tabulations are included in parenthesis after the symbol definition in Appendix I.

## TEST PROCEDURES

## Initial Testing

Initial testing consisted of traversing probe calibration, tunnel blockage calibration, dynamometer buoyancy investigation, hub tare, and "A"-frame tare and interference runs. The traversing probe calibration, as described in Appendix II, defined the parameters required for interpretation of velocity-angularity data. The blockage calibrations, as described in Appendix III, provided a technique for setting tunnel speed. The buoyancy investigation, as described in Appendix IV, defined the local airflow distortion that occurred at the shroud inlet and exit stations due to the dynamometer presence as well as the resultant buoyancy drag effects for shroud chord force corrections. The hub tare runs, as described in Appendix V, defined the hub skin friction effects for thrust measurement corrections.

The tare and interference runs, as described in Appendix VI, defined the effects of the "A" frame which were to be deleted from the shroud chord force data. Based on stress data observed during the previous shrouded propeller test (Ref. 4), a safe operating range (windmill rpm to 8000 rpm) was established for the blades used. Propeller dynamic balance calibrations were interspersed in the test program and were conducted following assembly and static balancing of each hub propeller configuration. These calibrations consisted of monitoring horizontal and vertical vibration as sensed by the vibration gages immediately downstream of the hub as shown in Fig. 2. A safe operating limit of  $\pm 0.005$  in. has been established for the subject test rig.

## Performance Testing

The performance test program consisted of recording and processing propeller thrust and torque, shroud chord force and shroud inlet and exit pressures for various model blade angles through a range of rotational speed at constant Mach number, shroud configuration and zero yaw angle. Each rotational speed setting constituted a test point and each range of rotational speed defined a data run.

The performance data instrumentation consisted of one EPUT meter for propeller rotational speed and seven strain gage unit potentiometers for torque, thrust, delta thrust, chord force (two load cells), and local Mach

number at the hub (two transducers). This instrumentation incorporated a locking circuit which provided a simultaneous visual sample of each signal which was manually recorded and at the same time punched into a digital computer in the tunnel control room for processing. The almost simultaneous reduction of the basic data permitted a manual on-line graphic presentation of the data in coefficient form. The inlet and exit pressure data were displayed on manometer boards in the control room and recorded both photographically and on paper tape with the static data acquisition system. The latter data were reduced upon completion of the test program at the UARL Computation Laboratory.

Performance data in the Mach number ranges from 0.02 to 0.20 and 0.2 to 0.6 were obtained in the 18-ft and 8-ft test sections, respectively. A functional sequence of shroud configurations with attendant run numbers and figure numbers is presented in Table I, and a detailed listing of each run obtained during the entire program is given in Table II.

#### Pressure Testing

The pressure program consisted of recording and processing pressures sensed by a probe traversed radially across the shroud exit area for various model blade angles, rotational speeds, Mach numbers, and shroud configurations. Each radial station setting constituted a test point and each complete traverse across the shroud exit area at constant (design) rotational speed, plus that data generated at a specified rotational speed above and below the design rpm for one radial position of the traversing probe, defined a pressure run. In addition to the traverse probe data, pressures sensed with the inlet pitot-static rake, the exit total pressure rake and the static orifices on the shroud were recorded on paper tape and processed at the Computation Laboratory.

#### DATA REDUCTION AND STATEMENT OF ACCURACY

The reduction of the performance and pressure data which were obtained during the runs listed in Table I is discussed herein. Additional calibration and tare data are described in Appendices II through VI. The data reduction equations for the performance data are presented in Appendix VII in the initial five sections. The first section (Eqs. 1 to 4) is preliminary in nature and includes standard calculations for determining tunnel air density and velocity based on the nominal test section Mach number and an equation for solid and wake blockage corrections to tunnel velocity. The symbols used in these equations and all subsequently discussed equations are defined in the List of

Symbols. The second group of equations (Eqs. 5 to 7) converts the force and moment gage readings to thrust, torque and chord force. The third and fourth groups of equations (Eqs. 8 to 12) indicate expressions for tare and interference corrections and balance interactions to the basic force and moment equations. The fifth group of equations (Eqs. 13 to 22) converts thrust, torque and chord force to aerodynamic coefficient form and also includes standard calculations for advance ratio, efficiency, shaft horsepower and propeller tip speed. These equations also indicate the "A"-frame tare and interference correction on chord force. The parameters defined by Eqs. 13 to 22 represent the required performance data in their final algebraic form.

The data reduction equations for the pressure data are presented in the remaining three sections. Section VI (Eqs. 23 to 29) presents the equations used to determine the actual free-stream values of dynamic pressure, Mach number, static pressure and velocity, and application of these to the pressure coefficient calculation. The propeller thrust effect correction used in performance parameter data reduction Eq. 4 was not applied to dynamic pressure (Eq. 25) nor the other flow parameters used in pressure coefficient data reduction for convenience and consistency with Ref. 4. Section VII (Eqs. 30 and 31) presents the equations used in calculating the inlet velocities. The final group of equations (Eqs. 32 to 37) includes expressions for converting traversing probe pressures to the inclined velocity and to a projected velocity component parallel to the thrust axis.

At the conclusion of the test program a statistical analysis based on methods outlined in Ref. 5 was made of approximately 75 static zero shifts noted for each of the three balance components. Estimates of static data accuracy (two standard deviations) based on these results are tabulated below.

<u>Component</u>	<u>System Capacity</u>	<u>Measured Force or Moment</u>		<u>Coefficient (5000 RPM)</u>	
		<u>Current Test</u>	<u>Ref. 4</u>	<u>Current Test</u>	<u>Ref. 4</u>
Thrust, lb	700	±0.34	±0.93	±0.0006	±0.002
Torque, ft-lb	500	±0.25	±0.54	±0.0011	±0.002
Chord Force, lb	±1000	±0.92	±1.26	±0.0016	±0.004

The above coefficients are based on air density equals 0.0022 slugs/cu ft and propeller diameter equals 2.495 ft.

Accuracy in setting propeller rotational speed and propeller blade angle is estimated as ±1 rpm and ±0.1 deg, respectively. Accuracy in setting tunnel Mach number is estimated as ±0.005 in the 18-ft tunnel and ±0.021 in the 8-ft section.

Overall data repeatability as influenced by all of these parameters and also by model configuration duplication is illustrated in Figs. 9 to 14 of the Data Repeatability tab section. Figures 9 and 10 present data repeatability in the speed regime of the 18-ft tunnel; Figs. 11 to 14 present data repeatability in the 8-ft test section. The plots presented are of the repeat runs conducted intermittently throughout the test program and are felt to be representative of the overall data repeatability.

An arithmetic mean estimate of the pressure data repeatability based on a small number of samples indicated values of  $\pm 0.06$  in surface pressure coefficient,  $\pm 1.0$  fps in inlet velocity,  $\pm 0.01$  psi in exit total pressure,  $\pm 0.5$  deg in traverse probe yaw angle (ZETA),  $\pm 1.0$  deg in traverse probe pitch angle (THETA), and  $\pm 5$  fps in traverse probe velocity ( $V'$ ). The accuracy in setting the traversing probe radial position was estimated as 0.012 in.

#### PRESENTATION OF DATA

The presentation of the performance data is in the form of aerodynamic coefficient plots and tabulations. The plots are divided into three tab-sectioned groups descriptively annotated as: Data Repeatability, Low Speed Shroud Effects and High Speed Shroud Effects. The first tab section presents a comparison of the data repeatability as discussed in the preceding section of this report (Data Reduction and Statement of Accuracy). All performance data are presented so that the effects of a specific change in model geometry is illustrated. Within each tab-sectioned group the salient aerodynamic parameters for low ( $M = 0.02$  to  $0.10$ ) and high ( $M = 0.20$  to  $0.60$ ) speed performance are presented in sets of two and three figures. The low-speed performance plots present power coefficient, thrust coefficient, net thrust coefficient and chord force versus advance ratio. The high-speed performance plots present efficiency, net efficiency and power coefficient with cross plots of constant efficiencies overlaid versus advance ratio. In addition to the graphic presentation of the performance data, a complete tabulation of these data is presented in Table III.

The efficiencies presented in the high-speed performance data are noted to be in excess of 100 percent and the efficiencies in the low-speed performance data are noted to be irregularly low, ranging from 10 to 50 percent. It is felt that this is an effect of the definition of efficiency as presented in Appendix VII and used in the data reduction. As presented herein, efficiency is based on free-stream velocity as an approximation of the velocity field felt by the shroud and propeller. This was done to be consistent with the previous results presented in Ref. 4 to aid in overall comparisons and because of the difficulty in defining the correct propeller velocity.

Concurrent with the acquisition of performance data and in addition to the pressure data obtained during the pressure data phase of the test program, the shroud inlet velocity and shroud exit total pressure data were obtained. Complete tabulations of these data have been transmitted to HS personnel and only selections (at a propeller speed of 6000 rpm) of these results are presented in Table IV in the form of data tabulations. The shroud inlet velocity data generated during the "A"-frame tare and interference phase of testing are presented in Table V.

The presentation of the remainder of pressure data obtained during the pressure data phase of the test program is also in the form of data tabulations. Table VI is a complete tabulation of the traversing probe data acquired and Table VII is a representative tabulation of shroud surface pressure coefficients, inlet velocities and exit total pressures simultaneously acquired with the traversing probe data at a single probe radial position for each propeller rotational speed. The identification system for identifying the tabulated pressure coefficients presented in Table VII is presented in Appendix I.

REFERENCES

1. Hamilton Standard letter from H. St. John to Bureau of Naval Weapons dated November 12, 1965.
2. R&D Source Capabilities. Laboratories Facilities. UARL Report SR-2000-184, January 1967.
3. Lanz, H.: Description of UARL 12,000 RPM Propeller Test Rig. UARL Report R-14493-1, November 1953.
4. Simmonds, A. W.: Wind Tunnel Test of Shrouded Propellers. UARL Report E330590-1, March 1967.
5. Ireson, W. and E. Grant: Handbook of Industrial Engineering and Management. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1955.
6. Pope, A. and W. J. Harper: Low Speed Wind Tunnel Testing. John Wiley & Sons, New York, 1966.
7. Grose, R. M.: Wind Tunnel Tests of Shrouded Propellers at Mach Numbers from 0 to 0.60. UARL, December 1958 (WADC Technical Report 58-604).
8. Black, D.: Tare and Interference (T&I) for the Shroud "A"-Frame Support System for the 8-Foot Tunnel Testing. Memorandum to A. Simmonds, June 24, 1966.

## LIST OF SYMBOLS

A	Ordinate intercept of hub skin friction tare equation, lb, Ref. Appendix V
$A_e$	Area of the shroud exit, station 100% chord, sq ft
$A_P$	Disc area of 2.494 ft diameter propeller ( $T_1$ ), sq ft
$A_T$	Cross-sectional area of test section; 49 sq ft for 8-ft test section, 268 sq ft for 18-ft test section
$A_X$	Shroud total included frontal area, $\pi(R + t_{\max})^2$ ; 5.768 cu ft for 8-ft test section, 7.426 cu ft for 18-ft test section
B	Slope of hub skin friction tare versus local Mach number, lb/ $M_\infty$ , Ref. Appendix V
b	Blade local chord, ft
C	Shroud chord force, lb
$C_c$	Shroud chord force coefficient, positive upstream (CC)
$C_{ct}$	"A"-frame chord force tare coefficient, Ref. Appendices VI, VII
$C_L$	Integrated design lift coefficient
$C_{LD}$	Blade design lift coefficient
$C_P$	Power or pressure coefficient, (CP)
$C_T$	Thrust coefficient, (CT)
$C_{TNET}$	Net thrust coefficient, (CT NET)
$C_4$	Shroud chord force measured at point $P_1$ , (Fig. 4)
$C_5$	Shroud chord force measured at point $P_2$ , (Fig. 4)
c	Shroud chord length, in.

LIST OF SYMBOLS  
(Contd.)

D	Traversing probe orifice distance from propeller axis, in.
$D_B$	Buoyancy drag due to pressure gradient along tunnel axis, lb, Ref. Appendices IV, VII
d	Traversing probe orifice height off tunnel floor during calibration
$d_p$	Actual model propeller diameter, ft, Ref. Appendix I
$d_s$	Shroud internal diameter at propeller plane, 30.0 in.
$\bar{d}$	Average diameter to shroud camber line
e	"A"-frame drag parameter, Ref. Appendices IV, VII, positive downstream
f	Correction term in "A"-frame tare equation, Ref. Appendices VI, VII, 2.71e
$f_{h_t}$	Hub skin friction tare on thrust, lb, Ref. Appendix V, positive downstream
g	Acceleration due to gravity, 32.16 ft/sec/sec
H	Barometric pressure, psf, (H)
HP	Horsepower, (HP)
h	Blade local thickness, ft
J	Advance ratio
K	Slope of $\Delta T_R$ , sgu/psf
$\bar{K}$	Constant for determining static pressure at traversing probe; obtained from probe calibration data, Ref. Appendix II
$K_1$	Slope of torque strain gage unit (sgu) readout instrument, 0.049843 ft-lb/sgu

LIST OF SYMBOLS  
(Contd.)

$K_2$	Slope of thrust (sgu) readout instrument, 0.073047 lb/sgu
$K_3$	Slope of $\Delta T$ (sgu) readout instrument, 0.008812 lb/sgu
$K_7$	Slope of chord force, $C_4$ (upper "A"-frame load cell), readout instrument, 0.043222 lb/sgu
$K_8$	Slope of chord force, $C_5$ (lower "A"-frame load cell), readout instrument, 0.044113 lb/sgu
$K_9$	Slope of local (hub), total pressure readout instrument, 0.035457 psf/sgu
$K_{10}$	Slope of local (hub), static pressure readout instrument, 0.071247 psf/sgu
LER	Leading edge radius, % chord
M	Nominal Mach number, uncorrected for blockage (performance data), (M)
$M_L$	Mach number at 20-deg azimuth approximately 1.5 in. above hub surface, Ref. Appendix V
$M_T$	Mach number pressure ratio at traversing probe, Ref. Appendix II
$M_{SB}$	Mach number at upstream speed orifice
$M_{TP}$	Mach number at traversing probe, Ref. Appendix VII
$M_u$	Clear test section Mach number
$M_{\infty}$	Mach number at propeller plane corrected for shroud total blockage only, (MINF)
N	Rotational speed, rpm, (N)
$N_1$	Shroud normal forces measured at point $P_1$ , (Fig. 4)

LIST OF SYMBOLS  
(Contd.)

$N_2$	Shroud normal forces measured at point $P_2$ , (Fig. 4)
$N_3$	Shroud normal forces measured at point $P_3$ , (Fig. 4)
$n$	Rotational speed, rps
$P$	Pressure, psf or power, ft-lb/sec
$P_{SB}$	Pressure at upstream speed orifice, psf
PTR	Propeller test rig
$P_{1-4}$	Dynamometer pressures, Ref. Fig. 2, psf or load points, Ref. Fig. 4
$\Delta P_t$	Hub pressure differential tare (buoyancy) on thrust, lb
$Q$	Torque, ft-lb
$Q_p$	Torque uncorrected for thrust interaction on torque, ft-lb
$q$	Dynamic pressure corrected for shroud total and propeller wake blockage (performance data); or, corrected for shroud blockage only (pressure data), psf, ( $Q$ )
$q_t$	Interaction slope of torque on thrust, 0 lb T/ft-lb $Q_p$
$q_u$	Dynamic pressure uncorrected for blockage, psf
$R$	Gas constant, $1722 \text{ ft}^2/\text{sec}^2 \text{ } ^\circ\text{R}$ ; nominal blade radius, 15 in.
$r$	Local propeller radius, in.
$S_i$	Shroud cross-sectional area for sector $i$
$T$	Thrust, lb
TER	Trailing edge radius, % chord
$T_{NET}$	Net thrust ( $T+C$ ); lb

LIST OF SYMBOLS  
(Contd.)

$T_P$	Thrust uncorrected for hub pressure differential tare, hub skin friction tare and balance interactions, lb
TS	Test section
$T_{SC}$	Settling chamber temperature, °R, (TSC)
$T_{TP}$	Temperature at traversing probe
$\Delta T$	Increment of thrust due to axial pressure differential across hub, lb
t	Shroud or blade thickness, in.
$t_q$	Interaction slope of thrust on torque, 0 ft-lb Q/lb $T_P$
V	Velocity
$V_O$	Velocity of airstream corrected for shroud solid and wake blockage and propeller wake blockage, fps, (VO)
$V_T$	Propeller tip speed, fps, (VT)
$V_{TP}$	Velocity measured at traversing probe, fps, (VTP)
$V_u$	Velocity of airstream uncorrected for blockage, fps
$V'$	Velocity component parallel to thrust axis at traversing probe, fps, (VPR)
$V_\infty$	Velocity corrected for shroud blockage, (VINP)
$\beta$	Blade twist, deg, Ref. Appendix I
$\gamma$	Ratio of specific heat of air, 1.4
$(\frac{\Delta p}{\Delta x})_i$	Axial pressure gradient in shroud sector i
$\epsilon_s$	Shroud solid and wake blockage correction, 0.0294 for the 8-ft test section; 0.00693 for the 18-ft test section, Ref. Appendix VII

LIST OF SYMBOLS  
(Contd.)

$Z$	Angle of yaw at traversing probe, deg, (ZETA)
$\eta$	Propeller efficiency, (ETA)
$\eta_{NET}$	Net propeller efficiency, (ETA NET)
$\theta$	Blade angle at 3/4 blade radius, (THETA 3/4); or pitch angle at traversing probe, (THETA), deg, Ref. Appendix II
$\theta_r$	Ratio of pressure differential across axial static orifices to traverse orifices on traversing probe, Ref. Appendix II
$\pi$	Constant, 3.1416
$\rho$	Mass density of free airstream, slugs/cu ft, (RHO)
$\psi$	Angle of yaw, deg, (PSI)

Subscripts

AVE	Average value across shroud inlet station, (AVE)
i	Conditions at inlet static orifices 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, (Fig. II-2) or axial division of shroud stations for evaluation of buoyancy drag
j	Inlet total orifices 2, 5, 8, 11, 14 used with static $i = j \pm 1$ (Fig. II-2)
$l$	Local condition, 1.5 in. above hub surface
m	Model surface
o	Initial or zero gage reading or ambient condition
P	Parameters uncorrected for interactions, buoyancy and tares
R	Strain gage reading, sgu

LIST OF SYMBOLS  
(Contd.)

Subscripts (Contd.)

- s        Static pressure
- t        Total pressure
- u        Uncorrected for blockage
- $\infty$       Free-stream conditions, corrected for solid blockage, (INF)
- 1-5      Orifices on traversing probe, (see Fig. II-4)

## APPENDIX I

## HS VG SHROUDED PROPELLER TEST

## Model Component Identification and Dimensional Data

This appendix presents a listing of the model component symbols, surface pressure orifice identification and associated dimensional data.

	<u>Fig.</u>
I - Model Component Designation Symbols	
$A_D$ Chord force "A"-frame dummy, (AD)	VI-1
$B_X$ Propeller hub configuration	7
where subscript X = 3, 3-way hub, (B3) X = 4, 4-way hub, (B4)	
$C_1$ Propeller plane located at 40% shroud chord, (C1)	I-1 - I-3
$E_X$ Diffuser section	7, I-1 - I-3
where subscript X = 6, shroud exit area divided by shroud internal area at propeller equal 0.9, (E6)	
X = 7, shroud exit area divided by shroud internal area at propeller equal 1.0, (E7)	
X = 8, shroud exit area divided by shroud internal area at propeller equal 1.4, (E8)	
$L_X$ Inlet lip	7, I-1 - I-3
where subscript X = 4, high speed lip, (L4) X = 5, low speed lip, (L5)	

APPENDIX I  
(Contd.)

Fig.

I - Model Component Designation Symbols - (Contd.)

$P_{XX}$	Planform of propeller blades  where subscript XX = WT, wide tip planform, (PWT) XX = NT, narrow tip planform, (PNT)	I-5 - I-6
PTR	Propeller dynamometer, (PTR)	2, 3
$R_1$	Inlet pitot-static velocity rake at 20-deg azimuth, (R1)	7, II-1 - II-2
$R_E$	Exit total pressure rake at 75-deg azimuth, (RE)	7, II-1 - II-3
$R_{E5}$	Exit pitot-static velocity rake at 130-deg azimuth, (RE5)	II-1 - II-2
$R_{GX}$	Buoyancy (pressure gradient) rake  where subscript X = 1, 20-deg azimuth, (RG1) X = 5, 130-deg azimuth, (RG5)	IV-1 - IV-2
$T_P$	Traversing probe at 166.5 deg azimuth and at trailing edge of shroud diffuser (tunnel station, 71.75 in. for the 18-ft section; 69.96 in. for the 8-ft section), (TP)	7, II-1 - II-4
$T_{P4}$	Traversing probe protruding from tunnel floor at tunnel station -32 in., (TP4)	
$T_X$	Blade tip-shroud clearance  where subscript X = 1, 29.925 in. diameter propeller, (T1) X = 2, 29.850 in. diameter propeller, (T2)	

NOTE: Minimum internal shroud diameter = 30.0 in. for all shrouds.

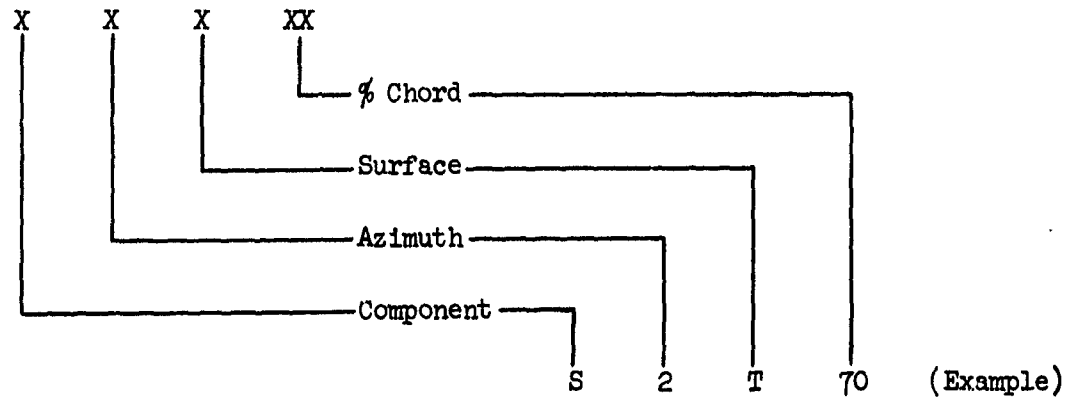
APPENDIX I  
(Contd.)

II - Surface Pressure Orifice Identification System for Table VII

A. Symbols

- |     |                  |   |                   |
|-----|------------------|---|-------------------|
| S   | - Shroud         | 1 | - 45 deg azimuth  |
| B   | - Inside Surface | 2 | - 135 deg azimuth |
| LEO | - Leading Edge   |   |                   |
| T   | - Outside        |   |                   |

B. Orifice Legend

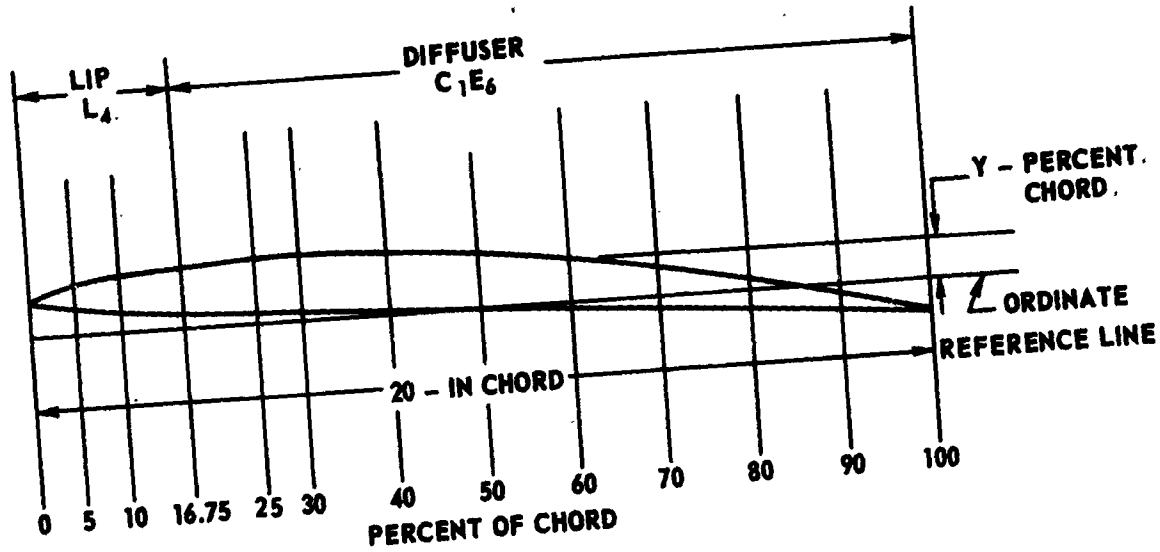


APPENDIX I  
(Contd.)

## III - Model Dimensional Data

<u>Title and Description</u>	<u>Fig.</u>
Shroud L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> Ordinates	I-1
Shroud L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> Ordinates	I-2
Shroud L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> Ordinates	I-3
Spinner Ordinates	I-4
3-Way Wide Tip Blade Geometry	I-5
3-Way Narrow Tip Blade Geometry	I-6

**HS VG SHROUDED PROPELLER TEST**  
**MODEL DIMENSIONAL DATA**  
**SHROUD L<sub>4</sub>C<sub>1</sub>E<sub>6</sub> ORDINATES**  
**AREA RATIO = 0.9**

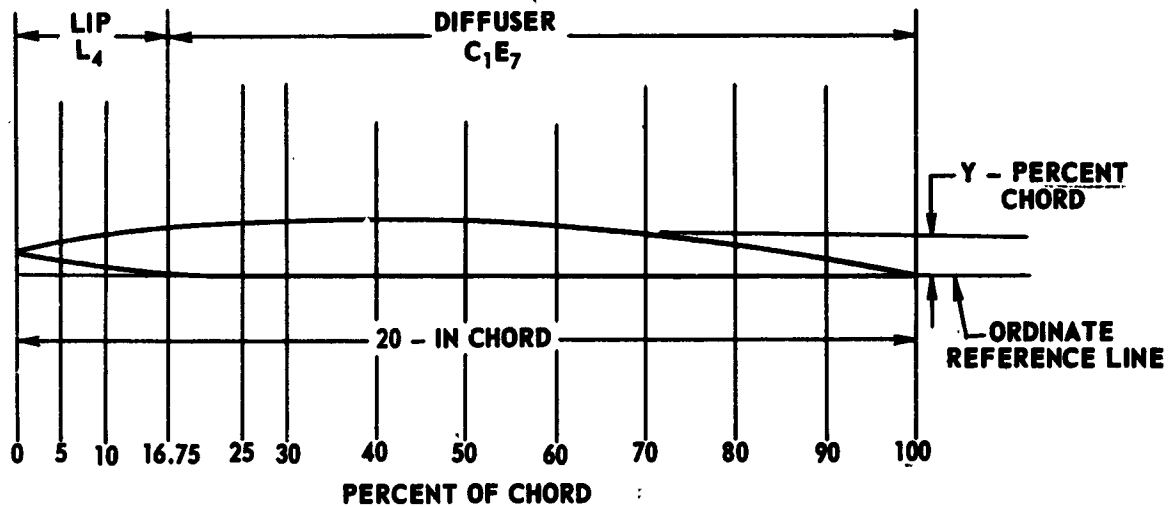


STATION PERCENT CHORD	ORDINATE Y	
	UPPER	LOWER
0.00	3.440	3.440
0.50	3.910	2.990
1.25	4.200	2.750
2.50	4.460	2.560
3.75	4.700	2.415
5.00	4.900	2.275
7.50	5.225	2.035
10.00	5.500	1.860
15.00	5.900	1.480
20.00	6.160	1.125
25.00	6.300	0.760
30.00	6.290	0.395
35.00	6.175	0.100
40.00	6.000	0.000
45.00	5.730	-0.100
50.00	5.370	-0.250
60.00	4.310	-0.740
70.00	2.760	-1.305
80.00	0.890	-1.925
90.00	-1.090	-2.565
100.00	-3.375	-3.375

\* L.E.R. = 0.24% t/c = 6%

\* L.E.R. = LEADING EDGE RADIUS

**HS VG SHROUDED PROPELLER TEST  
MODEL DIMENSIONAL DATA  
SHROUD L<sub>4</sub>C<sub>1</sub>E<sub>7</sub> ORDINATES  
AREA RATIO = 1.0**

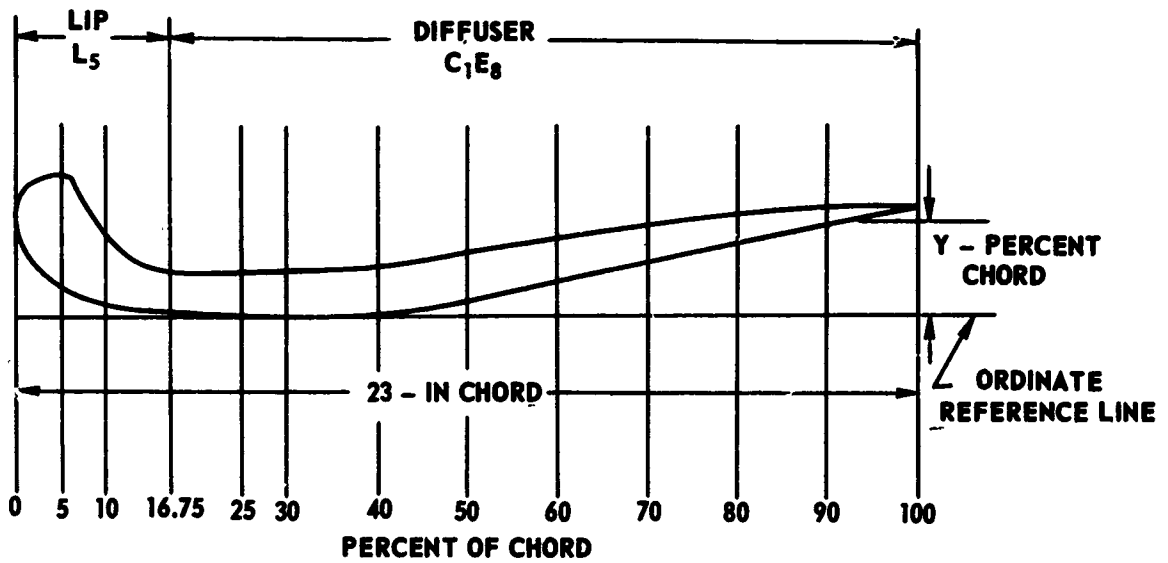


STATION PERCENT CHORD	ORDINATE Y	
	UPPER	LOWER
0.00	2.325	2.325
0.50	2.710	1.860
1.25	2.890	1.640
2.50	3.290	1.460
5.00	3.750	1.315
7.50	4.085	1.190
10.00	4.375	0.990
15.00	4.875	0.840
20.00	5.265	0.600
25.00	5.565	0.400
30.00	5.780	0.225
35.00	5.910	0.115
40.00	6.00	0.000
45.00	6.00	0.000
50.00	5.860	0.000
60.00	5.275	0.000
70.00	4.790	0.002
80.00	3.030	0.050
90.00	1.660	0.065
100.00	0.100	0.100

\* L.E.R. = 0.24%    t/c = 6%

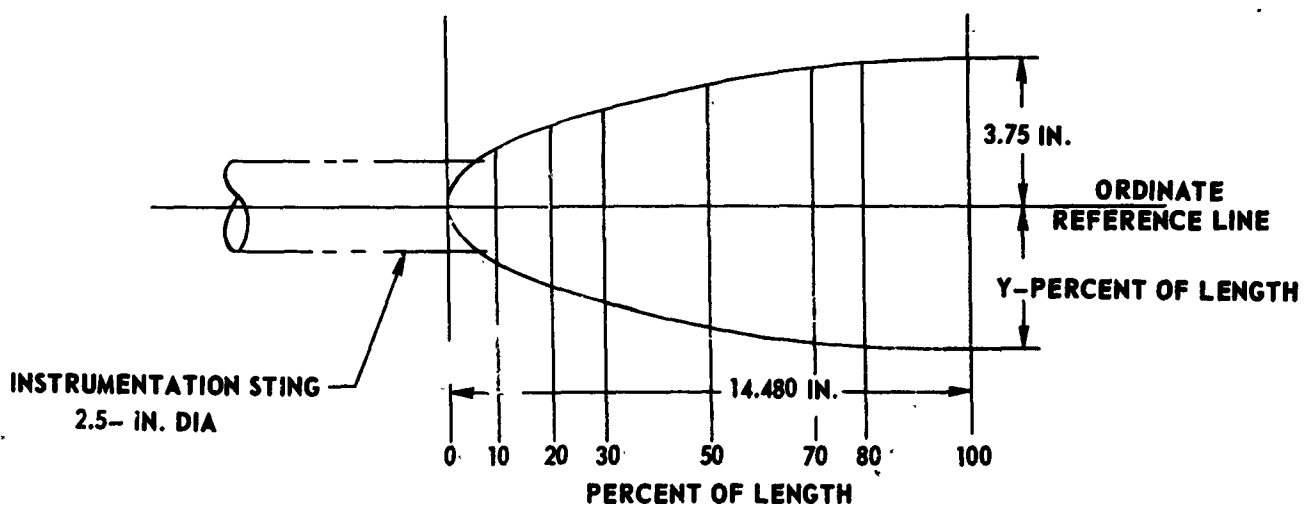
\* L.E.R. = LEADING EDGE RADIUS

**HS VG SHROUDED PROPELLER TEST  
MODEL DIMENSIONAL DATA  
SHROUD  $L_5C_1E_8$  ORDINATES  
AREA RATIO = 1.4**



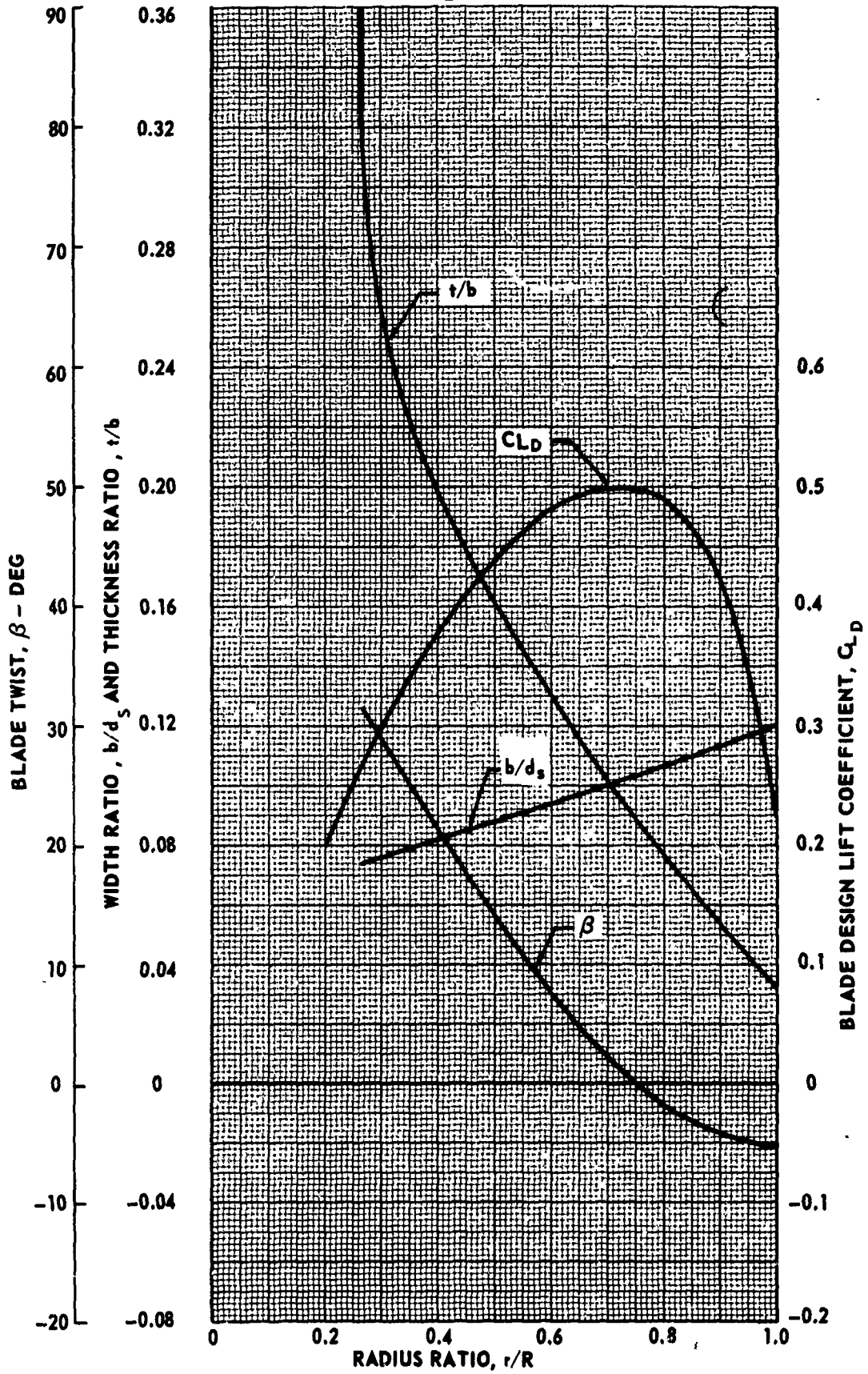
STATION PERCENT CHORD	ORDINATE Y		STATION PERCENT CHORD	ORDINATE Y	
	UPPER	LOWER		UPPER	LOWER
0.00	10.868	10.868			
0.22	12.172	9.303	30.40	5.151	0.052
0.44	12.606	8.564	34.80	5.216	0.000
0.65	12.954	8.020	39.30	5.216	0.000
0.87	13.215	7.607	40.30	5.303	0.078
1.30	13.650	6.868	41.40	5.434	0.183
1.74	13.976	6.260	42.60	5.651	0.313
2.17	14.215	5.738	43.60	5.825	0.469
2.61	14.476	5.216	47.80	6.521	1.269
3.48	14.867	4.347	52.10	7.216	2.108
4.36	14.997	3.630	56.50	7.912	2.965
5.21	14.932	3.021	60.80	8.520	3.825
6.08	14.454	2.521	65.20	9.129	4.677
6.95	12.954	2.087	69.50	9.694	5.521
8.70	9.998	1.413	73.90	10.172	6.381
11.30	7.173	0.782	78.20	10.433	7.229
13.90	5.564	0.543	82.60	10.781	8.085
15.65	4.990	0.435	87.00	11.085	8.933
17.40	4.716	0.356	91.30	11.346	9.781
21.70	4.869	0.226	95.60	11.520	10.641
26.10	5.043	0.122	100.00	11.520	11.520

**HS VG SHROUDED PROPELLER TEST  
MODEL DIMENSIONAL DATA  
SPINNER ORDINATES**

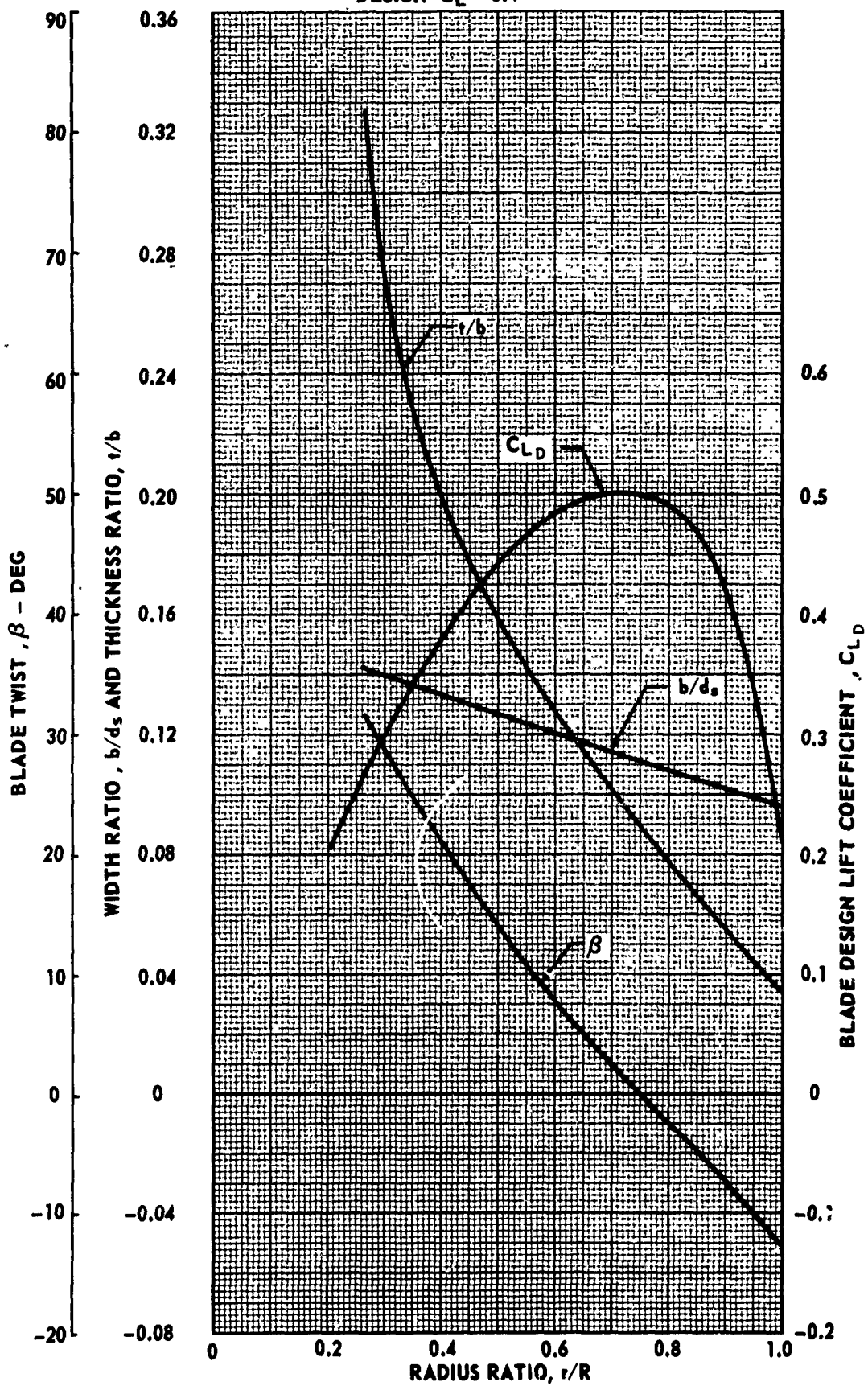


STATION PERCENT OF LENGTH	SPINNER ORDINATE, Y
	UPPER AND LOWER
0	0.0
1	2.69
2	3.81
3	4.74
4	5.56
5	6.31
10	9.36
15	11.73
20	13.65
25	15.32
30	16.81
35	18.15
40	19.36
45	20.45
50	21.42
60	23.08
70	24.33
80	25.21
90	25.74
100	25.90

HS VG SHROUDED PROPELLER TEST  
MODEL DIMENSIONAL DATA  
3-WAY WIDE TIP BLADE GEOMETRY  
SK 57144  
DESIGN  $C_L = 0.4$



HS VG SHROUDED PROPELLER TEST  
MODEL DIMENSIONAL DATA  
3 - WAY NARROW TIP BLADE GEOMETRY  
SK 57145  
DESIGN  $C_L = 0.4$



## APPENDIX II

## HS VG SHROUDED PROPELLER TEST

Pressure Sensing Instrumentation and  
Traversing Probe Calibration

This appendix describes the pressure sensing instrumentation used during the subject test. As shown in Fig. II-1, the instrumentation consisted of a pitot-static rake located at the shroud inlet station, an exit total pressure rake, shroud surface static pressure orifices at two azimuth angles, and a traversing probe. Pressures sensed by these devices were converted to electrical signals with transducers and recorded on paper tape with the static data acquisition system located in the tunnel control room. In addition to the paper tape record, a photographic record of the pressures as displayed on manometer boards was obtained. Sketches of the inlet pitot-static rake, the exit total pressure and pitot-static rakes and the traversing probe are presented in Figs. II-2, II-3, and II-4. Figures II-5 and II-6 present the results of the traversing probe calibration conducted immediately after the 8-ft section test and used in the final reduction of traversing probe data obtained in the 8- and 13-ft test sections.

The traversing probe calibration was performed to extend the scope of the existing calibration into the region of more negative pitch angles. The calibration data generally conformed with the anticipated results based upon the previous UARL calibration as reported in Ref. 4. The repeatability of overlapping calibration points between the two UARL calibrations reaffirmed the mutual UARL-HS decision to employ the UARL generated calibration data, and renewed confidence in the probe's reliability. The calibration data were used in conjunction with Eqs. 30 through 37 of Appendix VII to define the velocity and angularity of the airflow at the probe station.

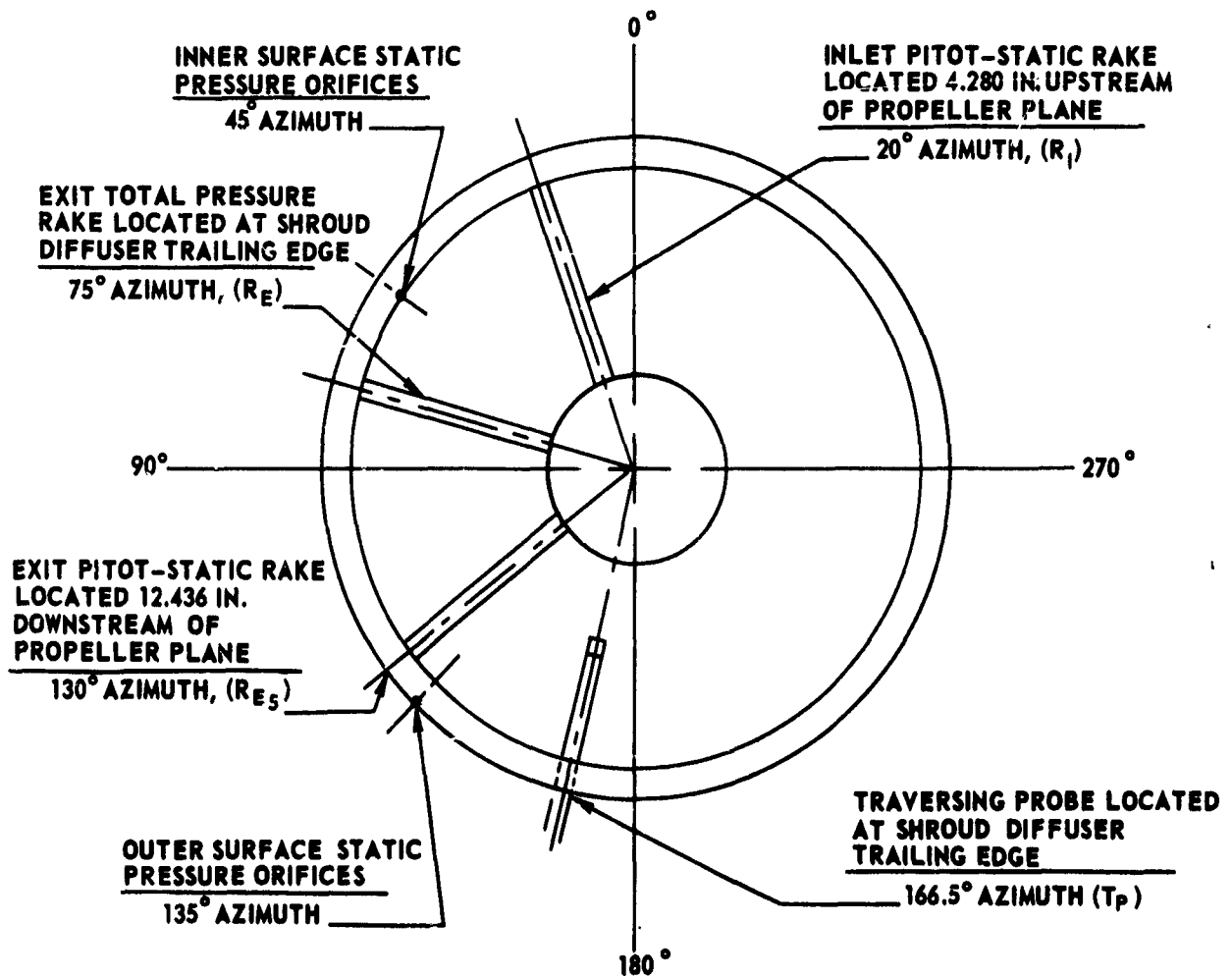
The test technique employed with the traversing probe consisted of recording pressures  $P_1$  through  $P_5$  at discrete radial stations at the shroud exit plane and a shroud azimuth of 166.5 deg. Radial positioning of the probe was remotely controlled at a console in the tunnel control room which also provided for rotating the probe to balance the pressures  $P_2$  and  $P_3$  shown in Fig. II-4. Nulling of these pressures provided a yaw angle (ZETA) in numerical display through an electro-mechanical system integral in the control console. With a discrete radial position and yaw angle the parameters  $M_T$  and  $\theta_T$  were determined by Eqs. 32 and 33 of Appendix VII, respectively. With values  $M_T$

APPENDIX II  
(Contd.)

and  $\theta_r$ , pitch angle (THETA) and subsequently parameter  $\bar{K}$  were determined from the calibration data presented in Figs. II-5 and II-6, respectively. Linear interpolation was used to determine pitch angle and  $\bar{K}$  for values of  $M_r$  and  $\theta_r$  parameter intermediate to the presented curves. The parameter  $\bar{K}$  was used to determine a corrected static pressure (Eq. 34) which in turn leads to the determination of Mach number, velocity and the axial component of velocity by Eqs. 35 through 37, respectively.

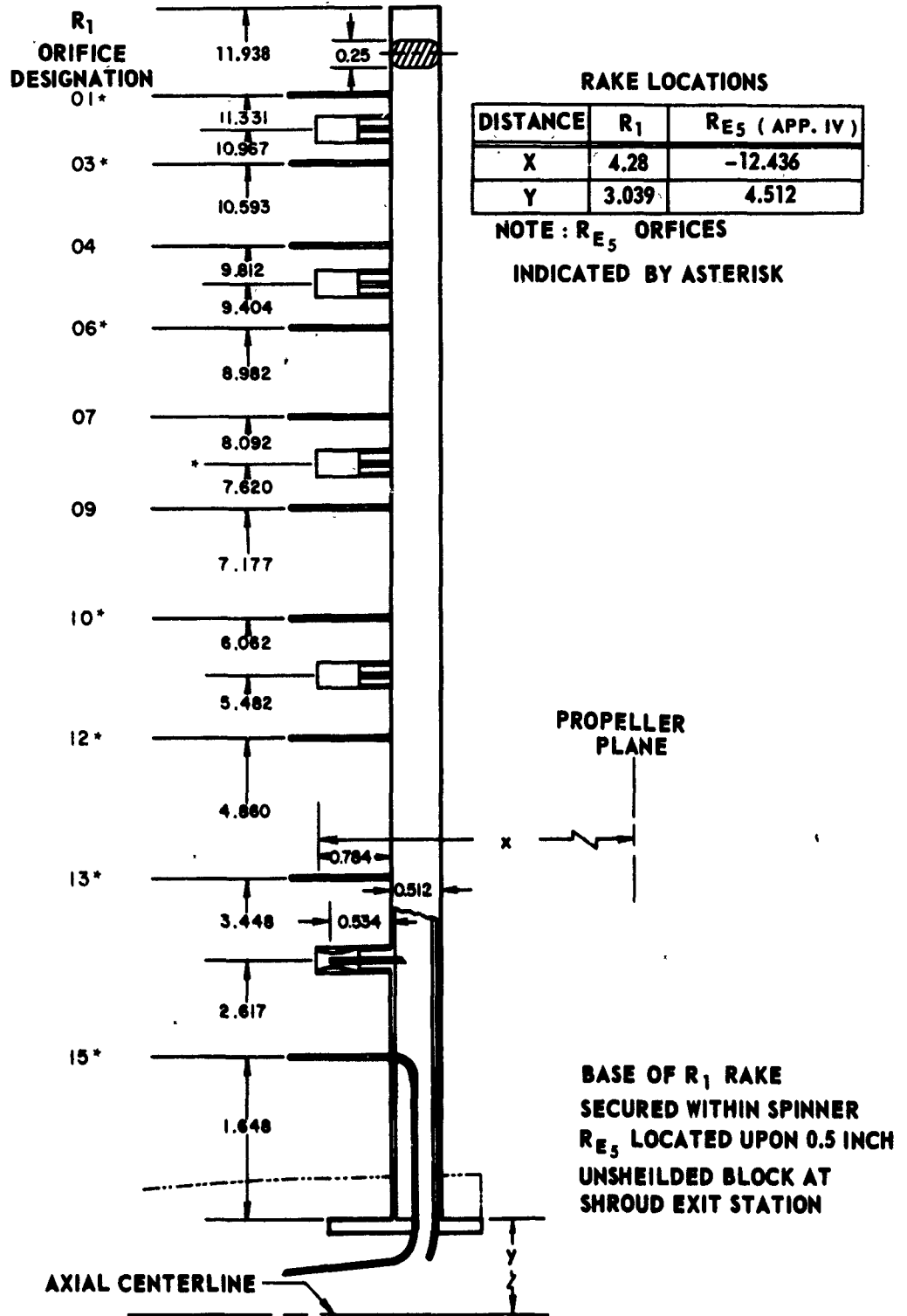
HS VG SHROUDED PROPELLER TEST

PRESSURE SENSING INSTRUMENTATION ARRANGEMENT  
VIEW LOOKING DOWNSTREAM

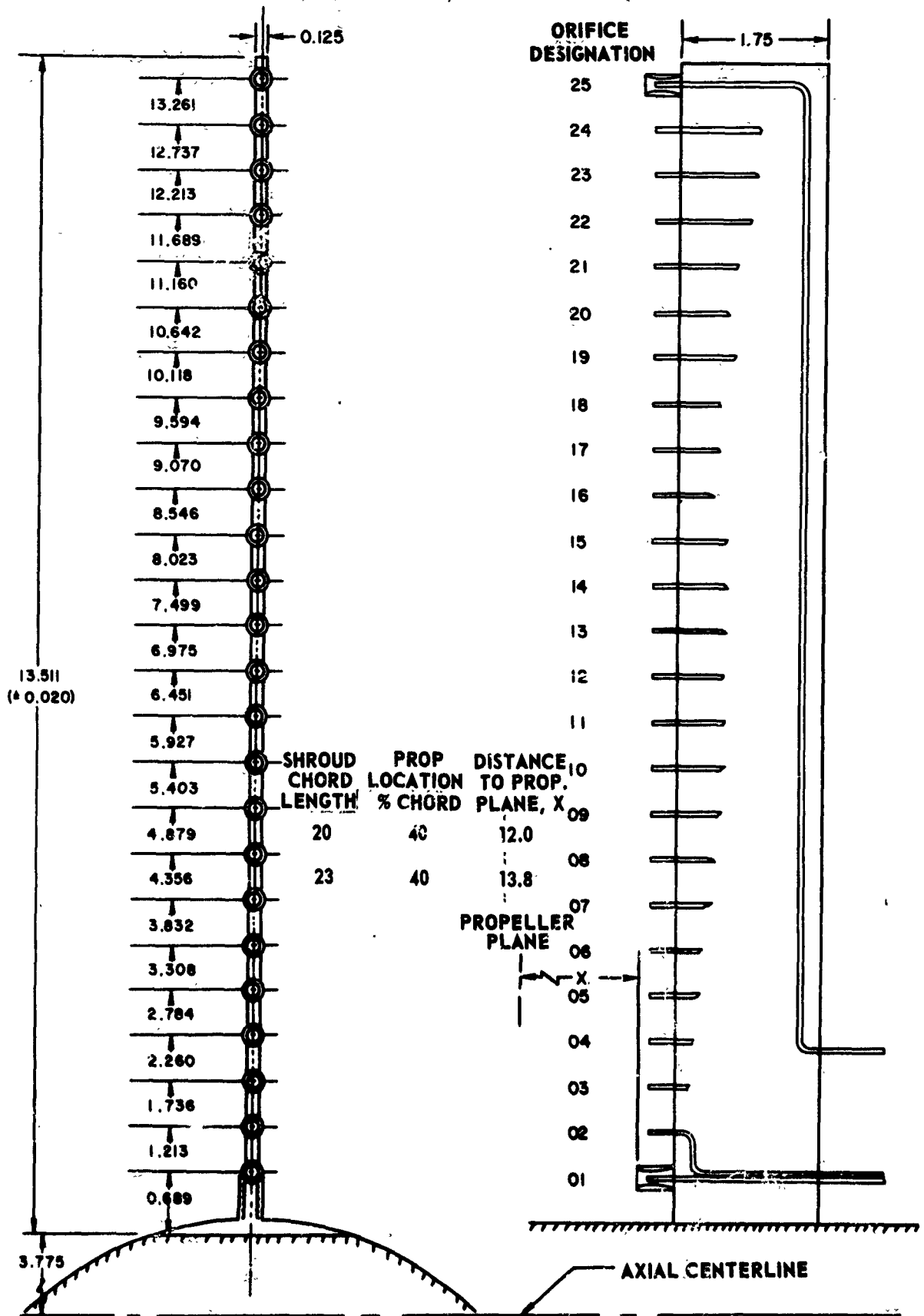


**HS VG SHROUDED PROPELLER TEST  
PITOT-STATIC RAKE ORIFICE LOCATIONS AND DESIGNATIONS**

**NOTE : DIMENSIONS SHOWN IN INCHES**



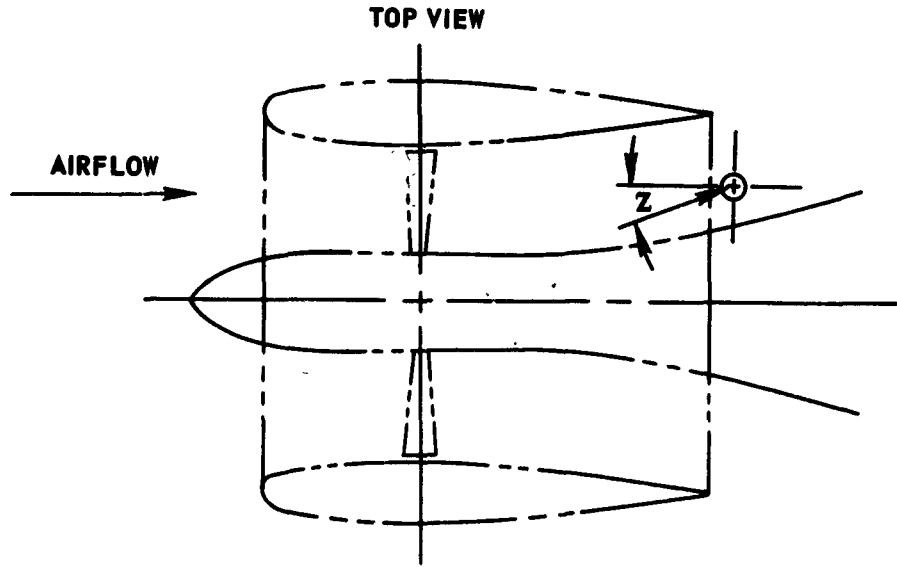
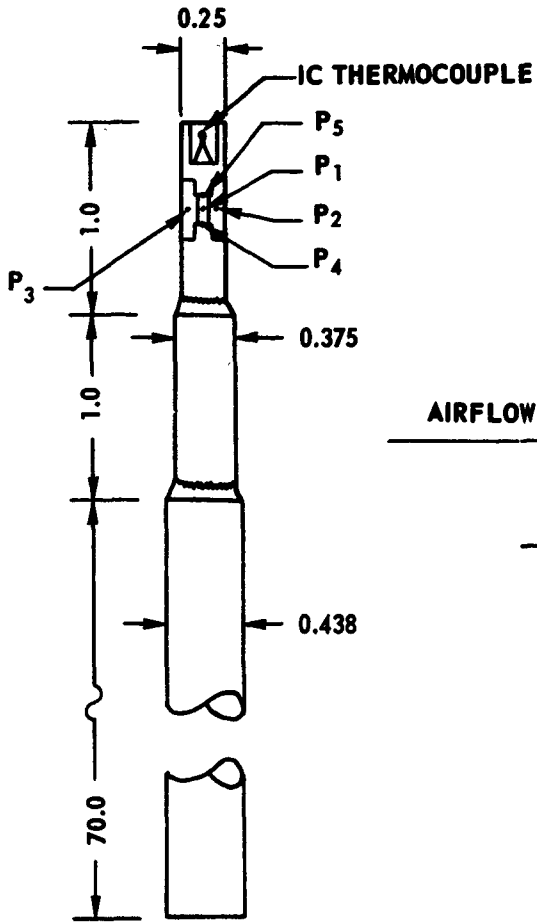
**HS VG SHROUDED PROPELLER TEST  
EXIT RAKE ORIFICE LOCATIONS AND DESIGNATIONS**  
NOTE : DIMENSIONS SHOWN IN INCHES



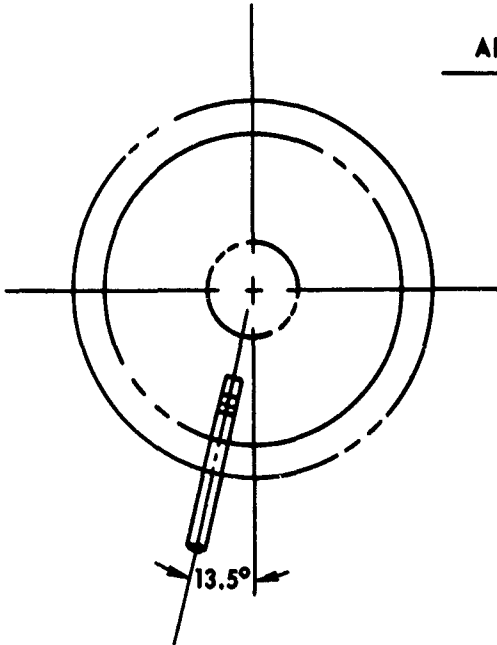
**HS VG SHROUDED PROPELLER TEST  
TRaversing PROBE INSTALLATION**

NOTE : DIMENSIONS SHOWN IN INCHES  
POSITIVE ANGLES SHOWN

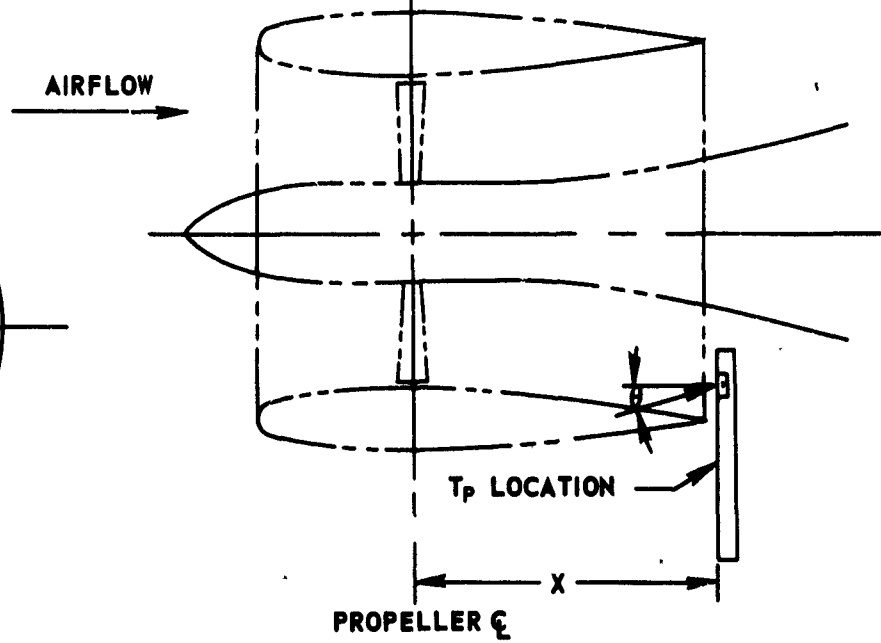
SHROUD CHORD LENGTH	PROP LOCATION % CHORD	DISTANCE TO PROP. PLANE, X
20	40	12.2
23	40	14.0



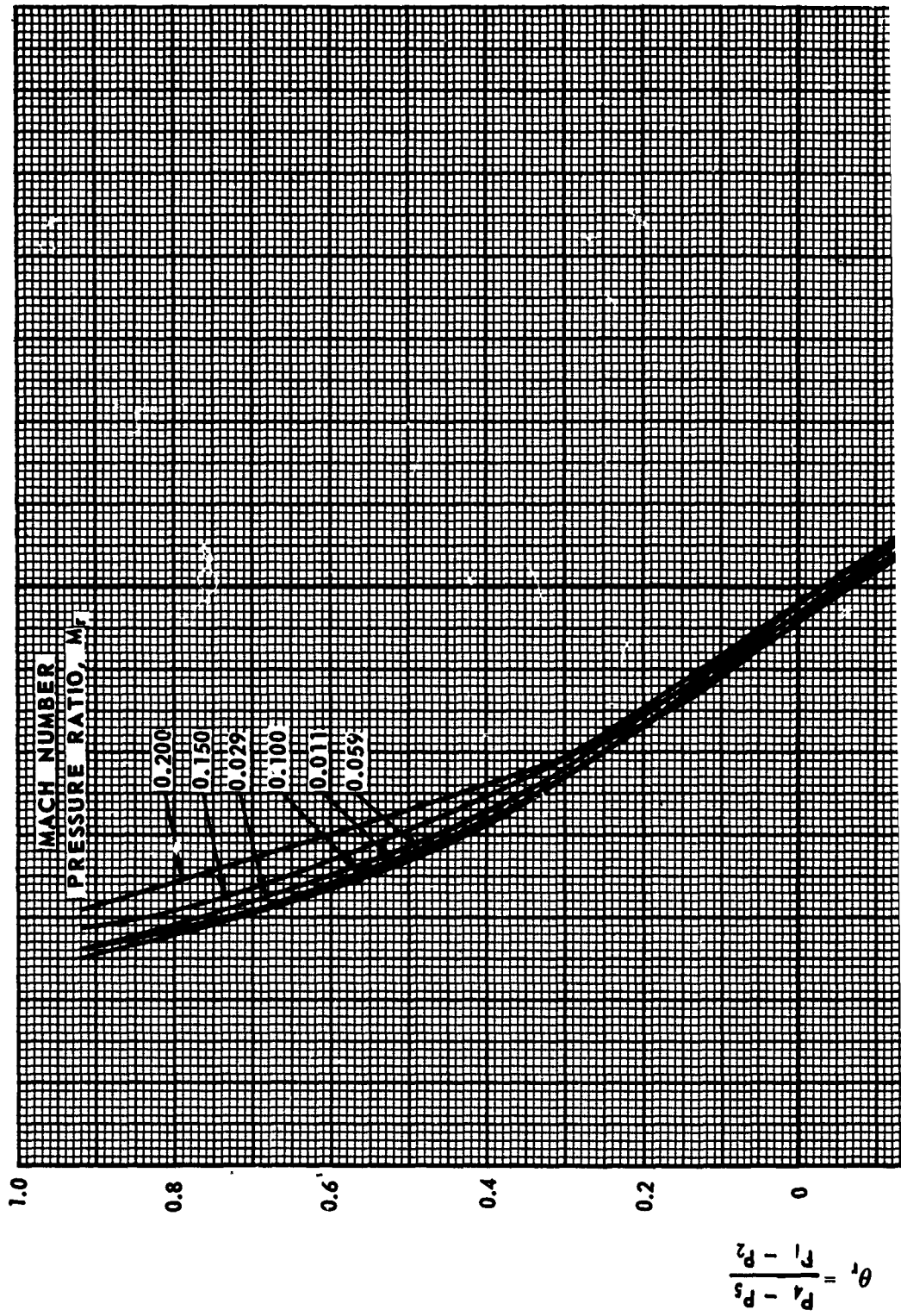
VIEW FROM UPSTREAM



SIDE VIEW

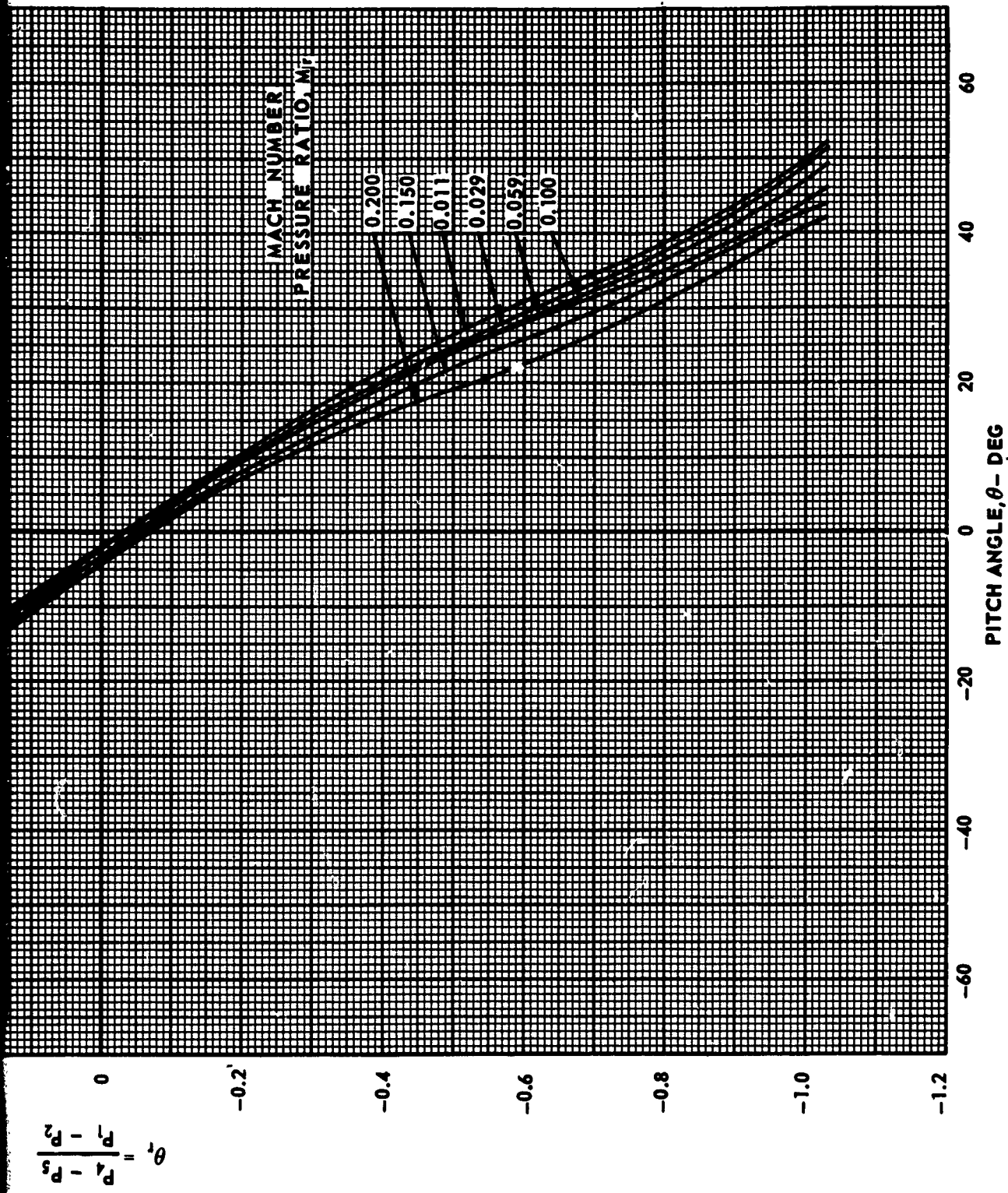


HS VG SHROUDED PROPELLER  
TRAVERSING PROBE CALIBRATION CURVES

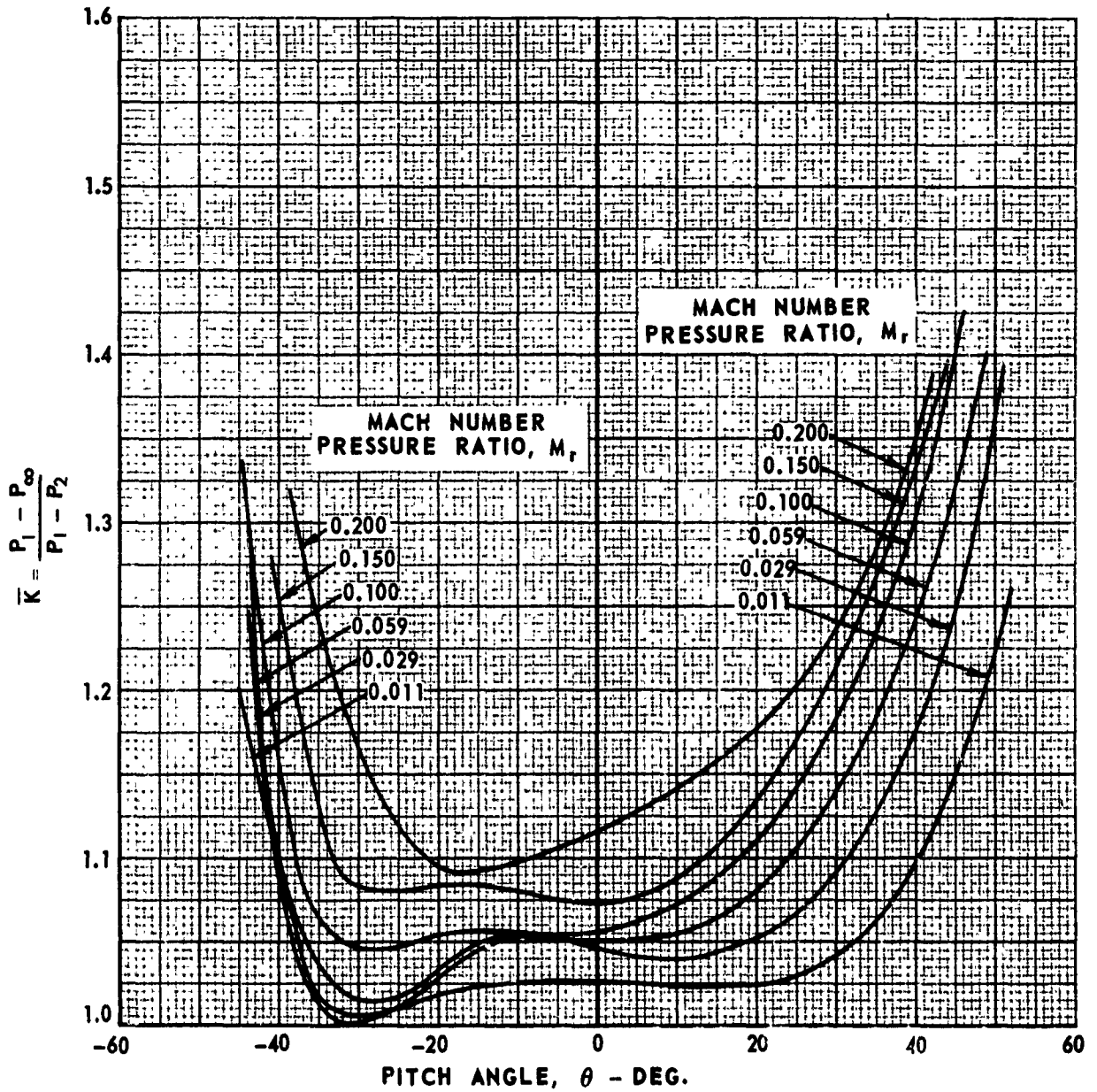


1

FIG. II-5



HS VG SHROUDED PROPELLER TEST  
 TRAVERSING PROBE CALIBRATION DATA



## APPENDIX III

## HS VG SHROUDED PROPELLER TEST

## Tunnel Blockage Corrections

In the 18-ft test section the average static pressure in the propeller plane at the two vertical walls of the test section was compared with an average of four static pressures on the 45-deg sides of the octagonal test section (speed ring) located 167.56 in. upstream of the propeller plane. This comparison was made with the dynamometer installed in the test section with and without the shroud present. As implied by Fig. III-1, the static pressure at the tunnel walls in the propeller plane does not differ significantly from the upstream value due to the addition of the dynamometer with or without the shroud. Therefore, the desired tunnel speed in the 18-ft test section was set according to the calibration curve, Fig. III-1, using the speed ring as reference and then the desired tunnel speed was analytically corrected for shroud solid and wake blockage and propeller thrust effect. The shroud solid and wake blockage correction was calculated (Appendix VII) to be approximately equal to 0.7 percent (equivalent to the Ref. 4 effect) and it is applied to the data in Fig. III-1 for comparison. This differed from the procedure followed by Ref. 4 where shroud blockage was considered negligible in the 18-ft test section and tunnel speed was set at the propeller plane.

In the 8-ft test section the propeller is farther upstream in the throat of the test section and thus it was not possible to establish an upstream pressure reference which was equal to the test section static pressure without being influenced by the model. The average of three pressures from the speed bump located in the test section bellmouth 81.4 in. upstream of the propeller was selected as the reference pressure. The speed bump data are plotted in Fig. III-2 against data from speed plate orifices in the propeller plane at the upper east inclined wall of the test section for the clear test section and for the dynamometer with and without the shroud. As indicated in Fig. III-2, an increase in speed of approximately three percent is caused by the presence of the dynamometer-shroud combination. Since the dynamometer itself does not significantly increase the propeller plane wall pressure, it appears that its blockage effects are negligible. As it is difficult to accurately determine the tunnel centerline correction from the measured wall data for a realistic model, a shroud blockage correction based on model geometry was employed. The model geometry term, which approximates the sum of the shroud

APPENDIX III  
(Contd.)

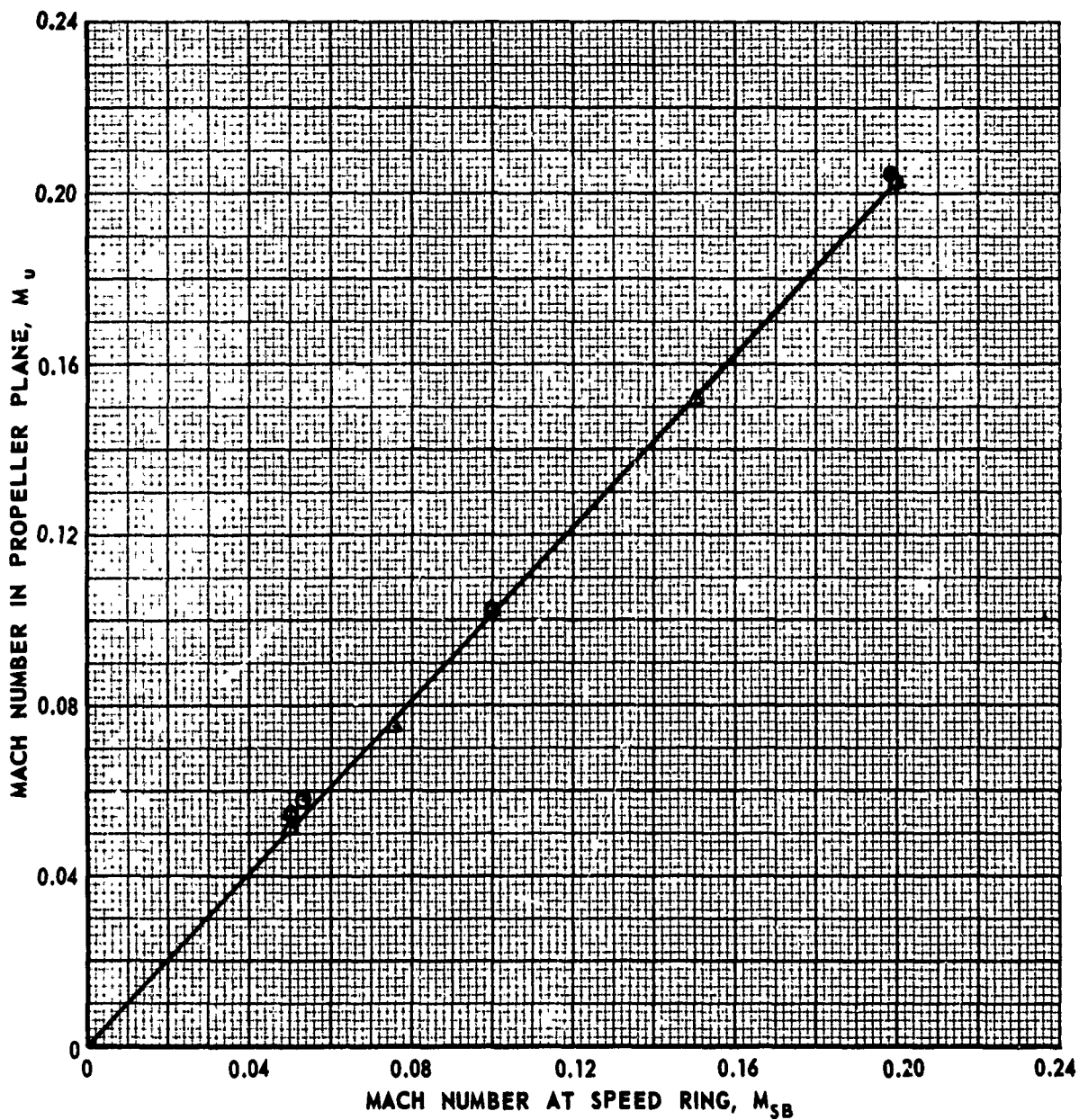
solid and wake blockage, is defined as one quarter of the ratio of the total included model frontal area to the test section cross-sectional area (Ref. 6,  $\epsilon_S = A_X/4A_T$ ). This term was selected to be approximately equal in magnitude to the Ref. 4 term. Therefore, the desired tunnel speed in the 8-ft test section was set according to the calibration curve presented in Fig. III-2 using the speed bump as reference and then the desired speed was analytically corrected for shroud solid and wake blockage and propeller thrust effects. The shroud blockage correction was calculated as defined in Appendix VII to be equal to 2.94 percent and it is applied to the data in Fig. III-2 for comparison.

HS VG SHROUDED PROPELLER TEST  
BLOCKAGE EFFECT OF THE SHROUD

18-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	1	VARY	PTR W/O SHROUD + BLADES	—
△	2	↓	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>	↓

NOTE: SOLID SYMBGLS DENOTE DATA WITH SHROUD BLOCKAGE CORRECTIONS APPLIED

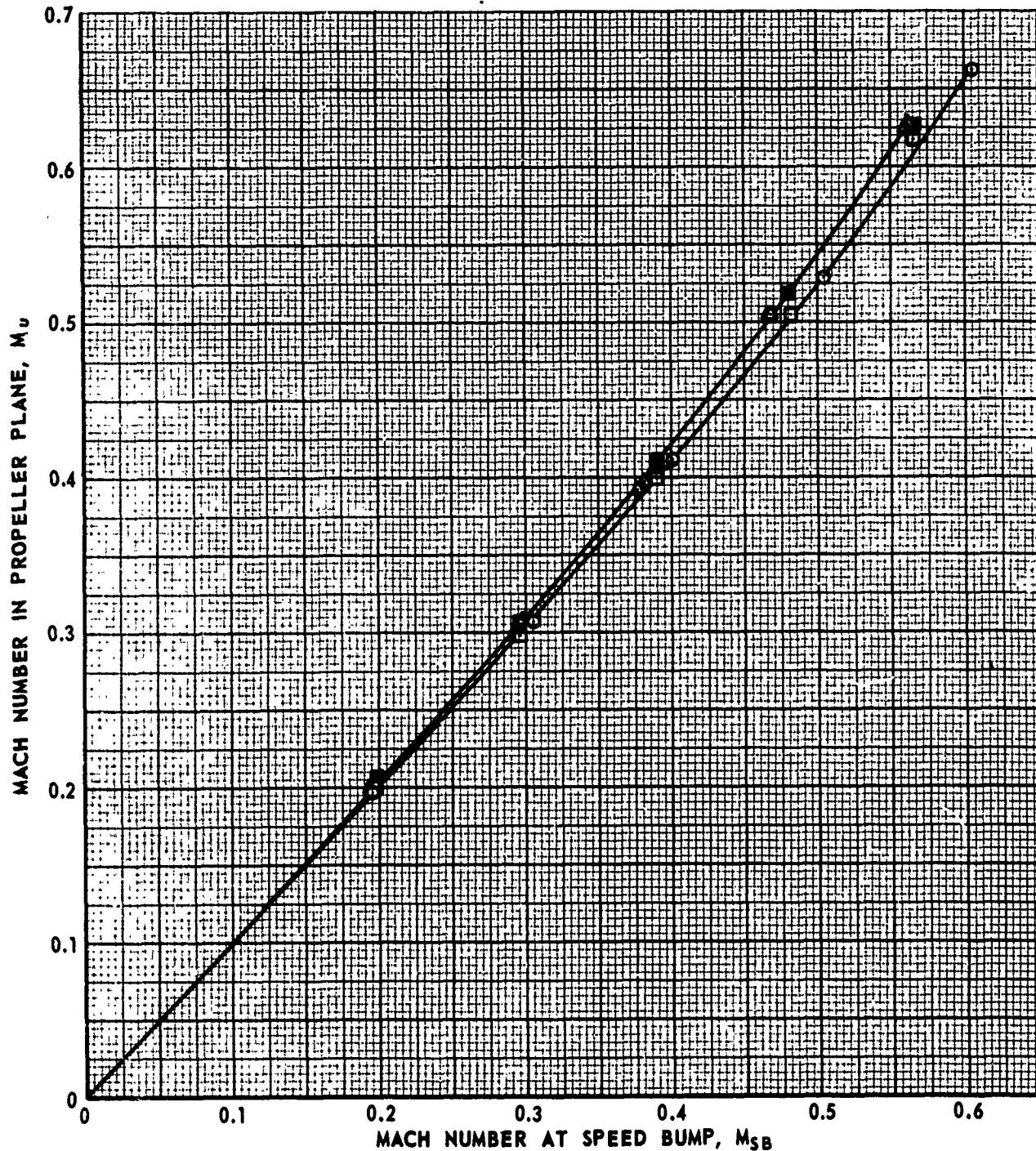


HS VG SHROUDED PROPELLER TEST  
BLOCKAGE EFFECT OF PROPELLER DYNAMOMETER  
WITH AND WITHOUT SHROUD

8-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	25	VARY	CLEAR TEST SECTION	—
△	27	↓	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>	↓
□	26	↓	PTR W/O SHROUD + BLADES	↓

NOTE: SOLID SYMBOLS DENOTE DATA WITH SHROUD BLOCKAGE CORRECTIONS APPLIED



## APPENDIX IV

## HS VG SHROUDED PROPELLER TEST

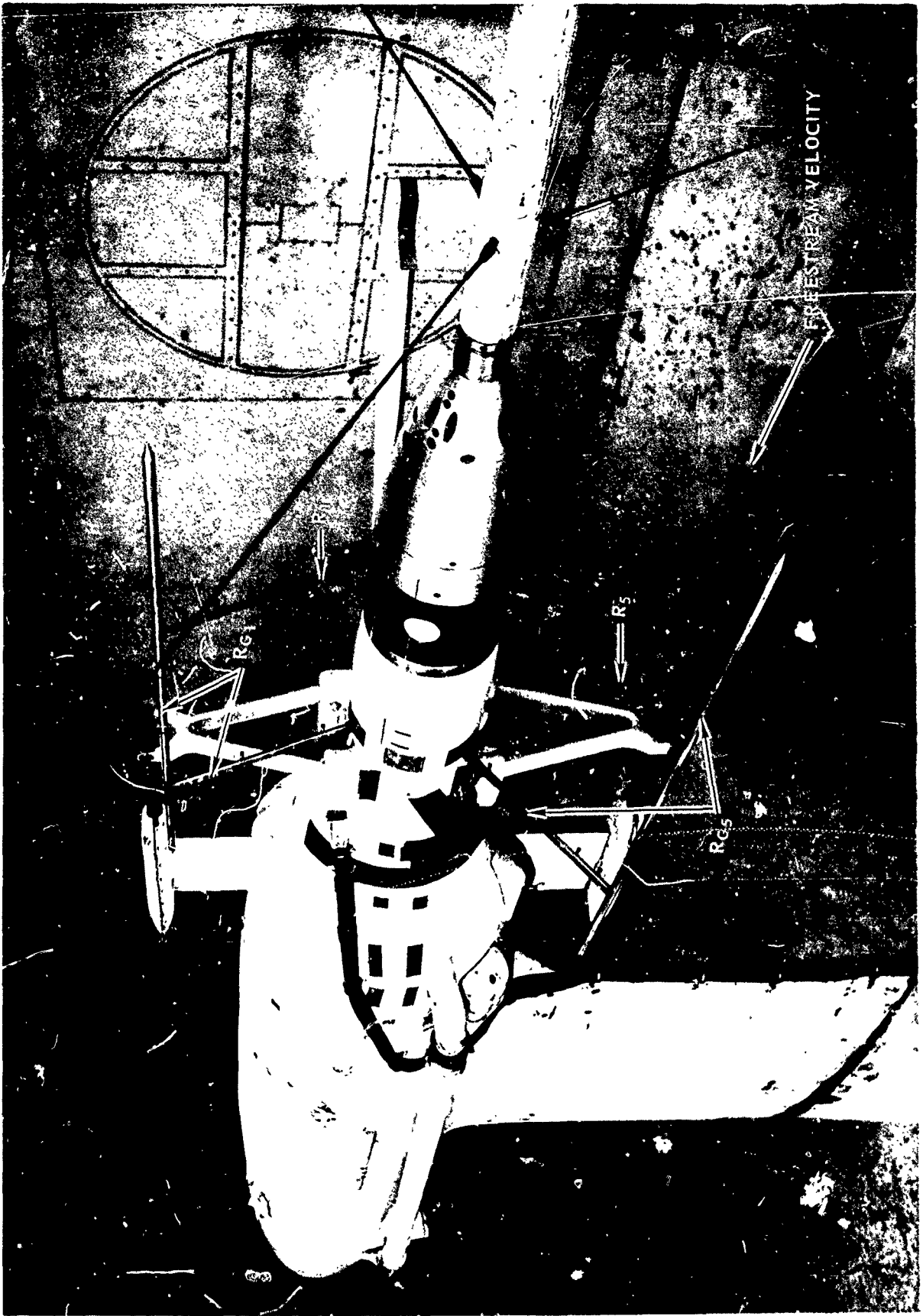
## Propeller Dynamometer Buoyancy Investigations

Tunnel calibrations were performed with the dynamometer installed without the shroud or blades in both test sections in order to determine whether an axial pressure gradient existed at the shroud location due to the dynamometer presence. The existence of such a gradient would require that the measured shroud chord force be corrected for a resultant buoyancy drag. It is stated in Ref. 7 that this gradient is very small throughout the test Mach number range and which resulted in a chord force correction coefficient of 0.0016. Subsequently, as this is the magnitude of chord force accuracy, the buoyancy correction was considered negligible in Ref. 4. However, due to the proximity of the trailing edge of the low-speed shroud to the dynamometer cowl and because of the  $E_6$  diffuser is a converging nozzle, further study was deemed necessary for this program.

The axial static pressures along two azimuth positions, 20 and 130 deg, were determined using the two buoyancy rakes shown in Figs. IV-1 and IV-2. The resultant pressure distribution at the shroud location (15.28 in. from the hub centerline) is illustrated in Fig. IV-3. The buoyancy drag force which resulted from the application of these data (Appendix VII and Ref. 6) is presented in Fig. IV-4. This buoyancy drag force represents approximately 0.5 percent of the overall drag felt by this shroud.

Radial velocity profile data at the shroud inlet and exit stations were measured simultaneously with the axial pressure distribution data by the buoyancy rakes. These data were generated to determine if and what type of buoyancy corrections would be necessary for propeller performance data in future test programs. The buoyancy rake data recorded at the shroud exit station were questionable as the downstream rake was situated in the wake of the inlet rake. Exit velocities measured with these rakes were determined assuming the exit plane total pressure equaled free-stream total pressure. The resulting velocity profiles were substantiated at the conclusion of the shroud data phases of the program by comparable data obtained using an inlet pitot-static rake ( $R_1$ ), an exit pitot-static rake ( $RE_5$ ), an exit total pressure rake and the traversing probe (Figs. II-2, II-3 and II-4). A composite velocity profile for both shroud stations and each test section Mach number is presented in Figs. IV-5 and IV-6, with typical data point distributions indicated for  $M = 0.3$  and  $0.6$ , respectively.

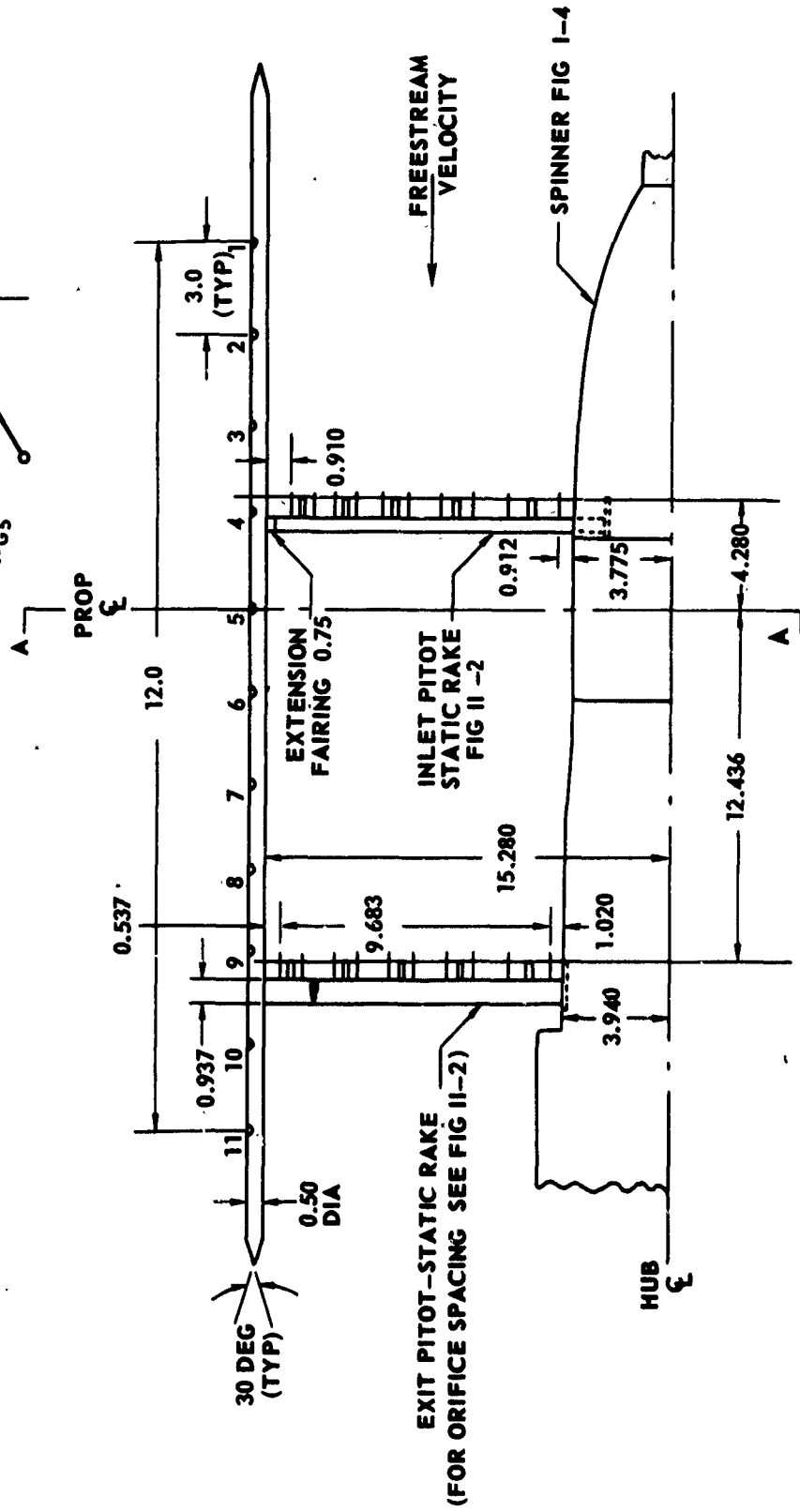
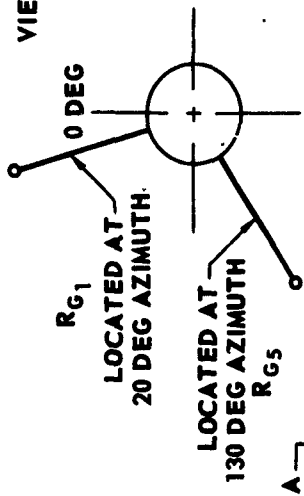
HS VG SHROUDED PROPELLER TEST  
PROPELLER DYNAMOMETER WITH BOUYANCY RAKES



### HS VG SHROUDED PROPELLER TEST BOUYANCY RAKE ORIFICE LOCATIONS AND DESIGNATIONS

NOTE : DIMENSIONS SHOWN IN INCHES

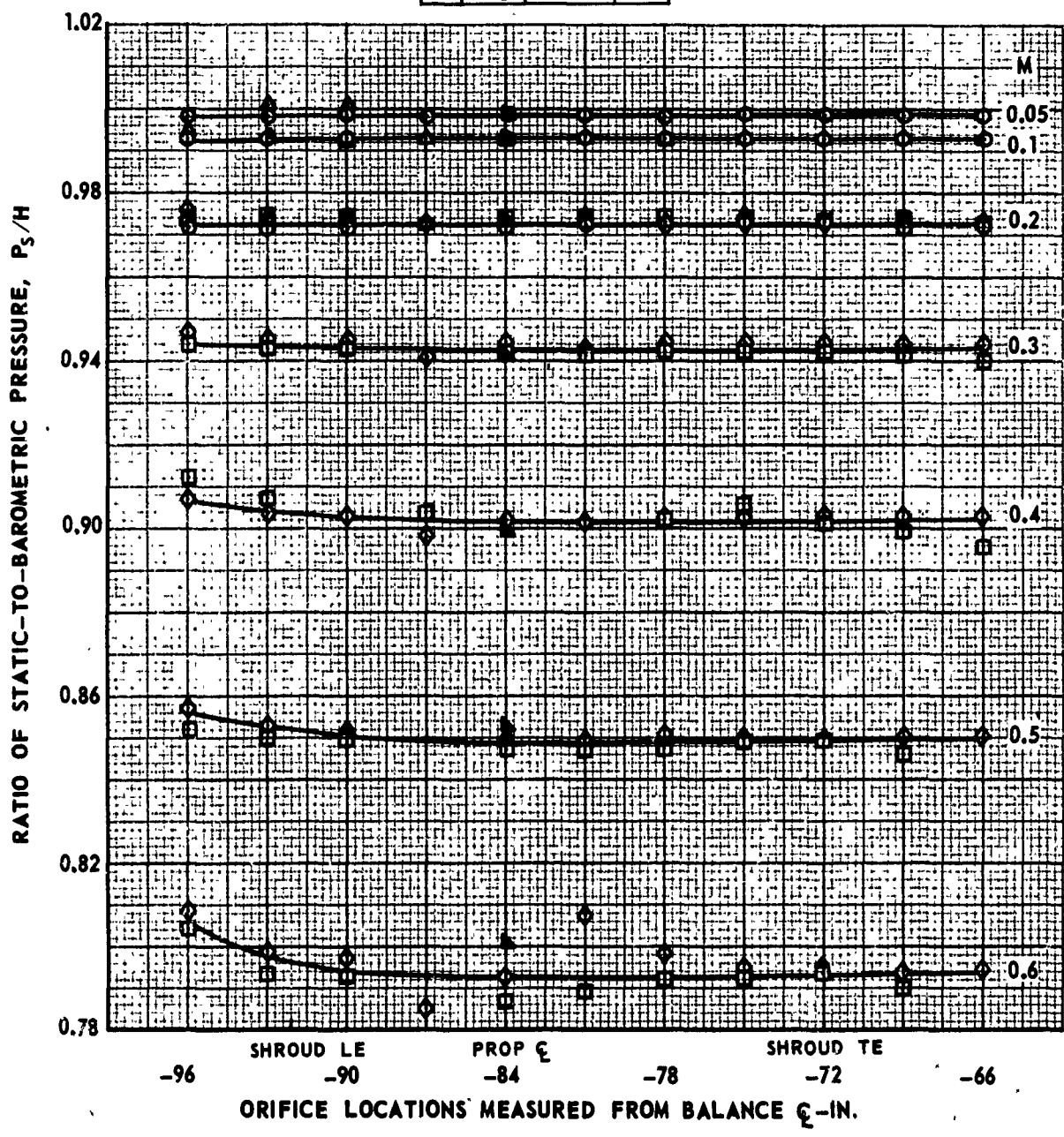
STATION AA  
VIEW FROM UPSTREAM



**HS VG SHROUDED PROPELLER TEST  
AXIAL STATIC PRESSURE DISTRIBUTION AT SHROUD STATION  
PROPELLER TEST RIG WITHOUT SHROUD**

SYM	RAKE	AZIMUTH	TS
⊙	R <sub>G1</sub>	20	18
△	R <sub>G5</sub>	130	
□	R <sub>G1</sub>	20	8
◇	R <sub>G5</sub>	130	8

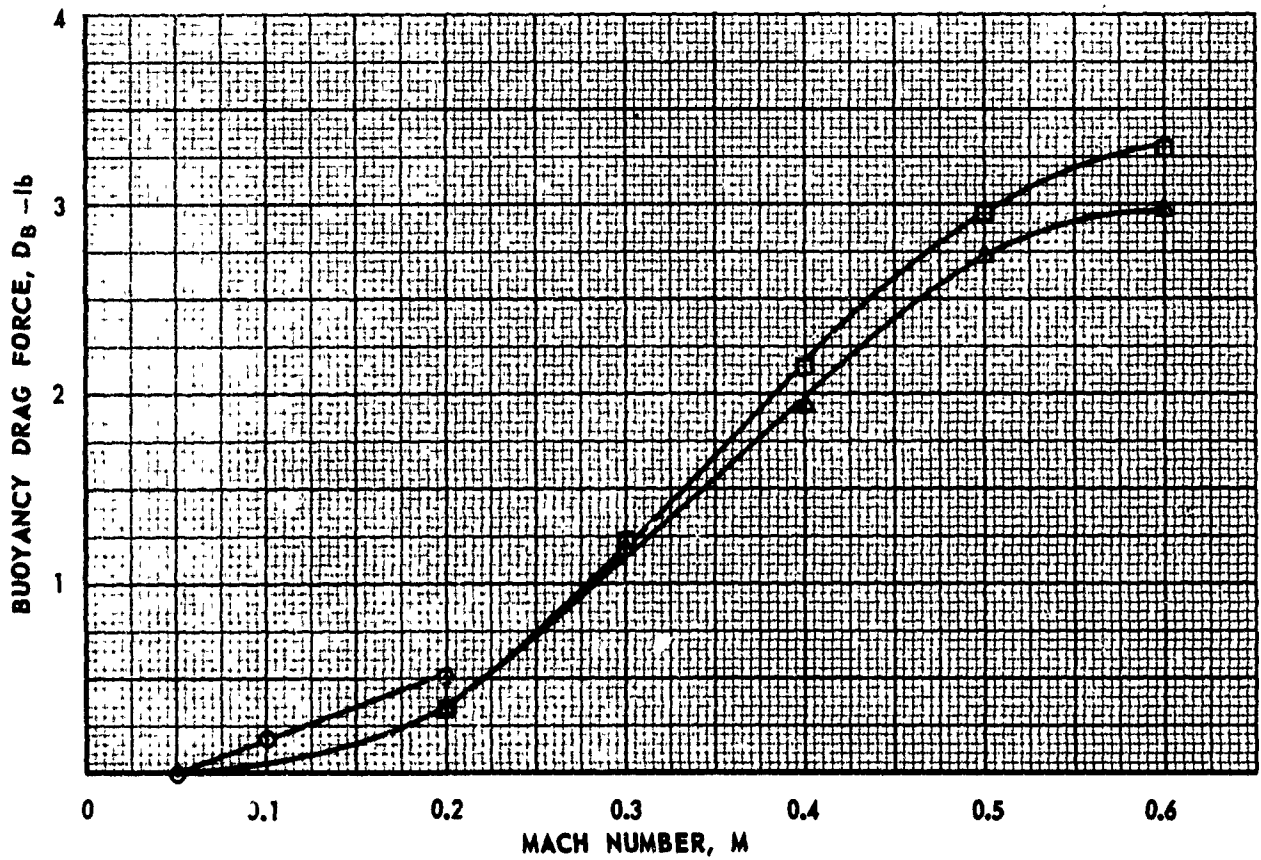
NOTE : CLOSED SYMBOLS (▲) DENOTE  $P_{\infty}/H$



HS VG SHROUDED PROPELLER TEST  
 BUOYANCY DATA  
 EVALUATED BY METHOD OF AREA SUMMATIONS

$$D_B = -\pi \bar{d} \sum_i s_i \left( \frac{\Delta P}{\Delta X} \right)_i \text{ REF. 6}$$

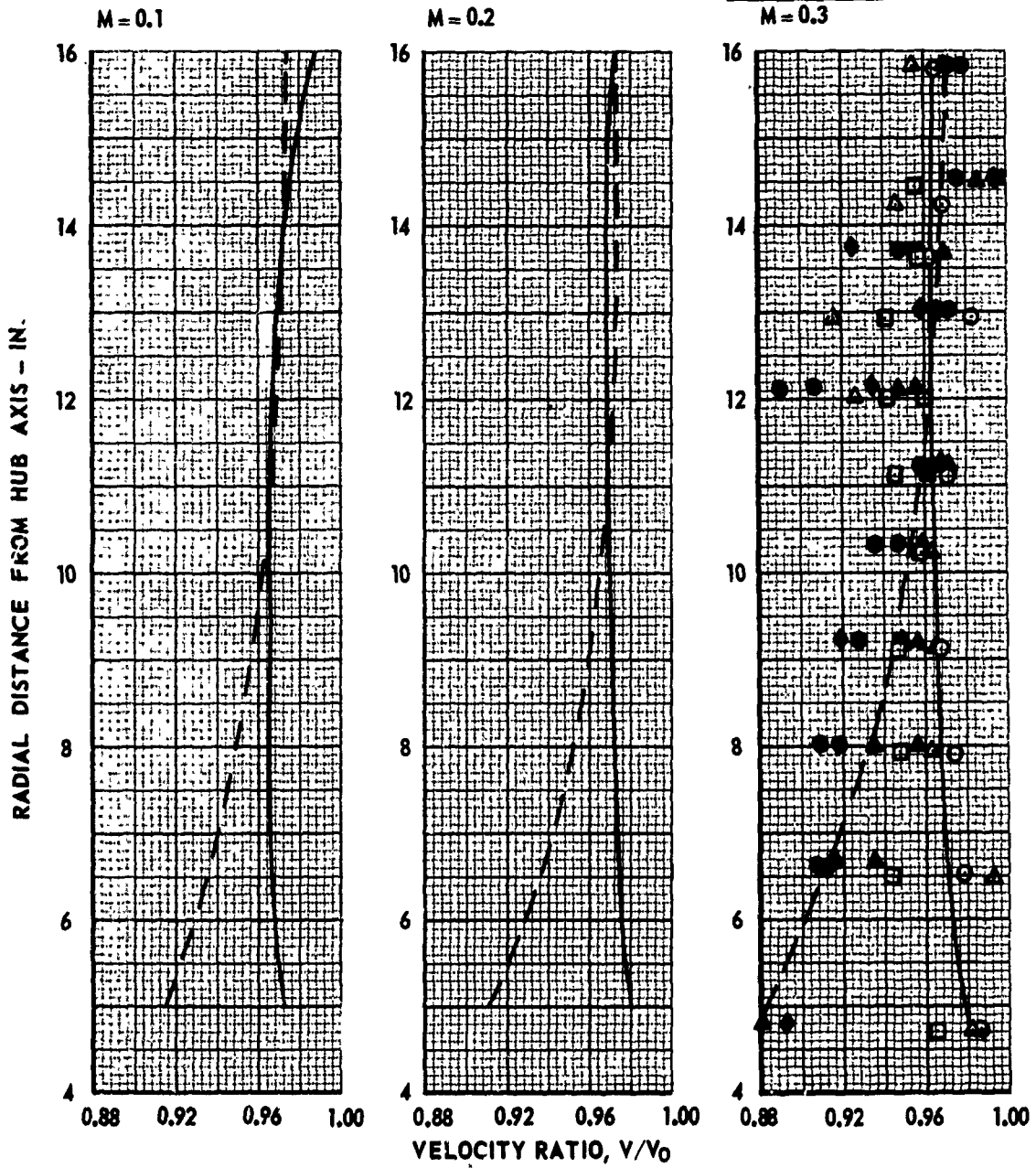
SYM	SHROUD	TS
○	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub>	18
△	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub>	8
□	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub>	8



**HS VG SHROUDED PROPELLER TEST  
VELOCITY PROFILES AT THE SHROUD INLET AND EXIT STATIONS  
PROPELLER TEST RIG WITHOUT SHROUD**

NOTE: SOLID LINES AND OPEN SYMBOLS  
DENOTE INLET VELOCITIES  
DASHED LINES AND SOLID SYMBOLS  
DENOTE EXIT VELOCITIES

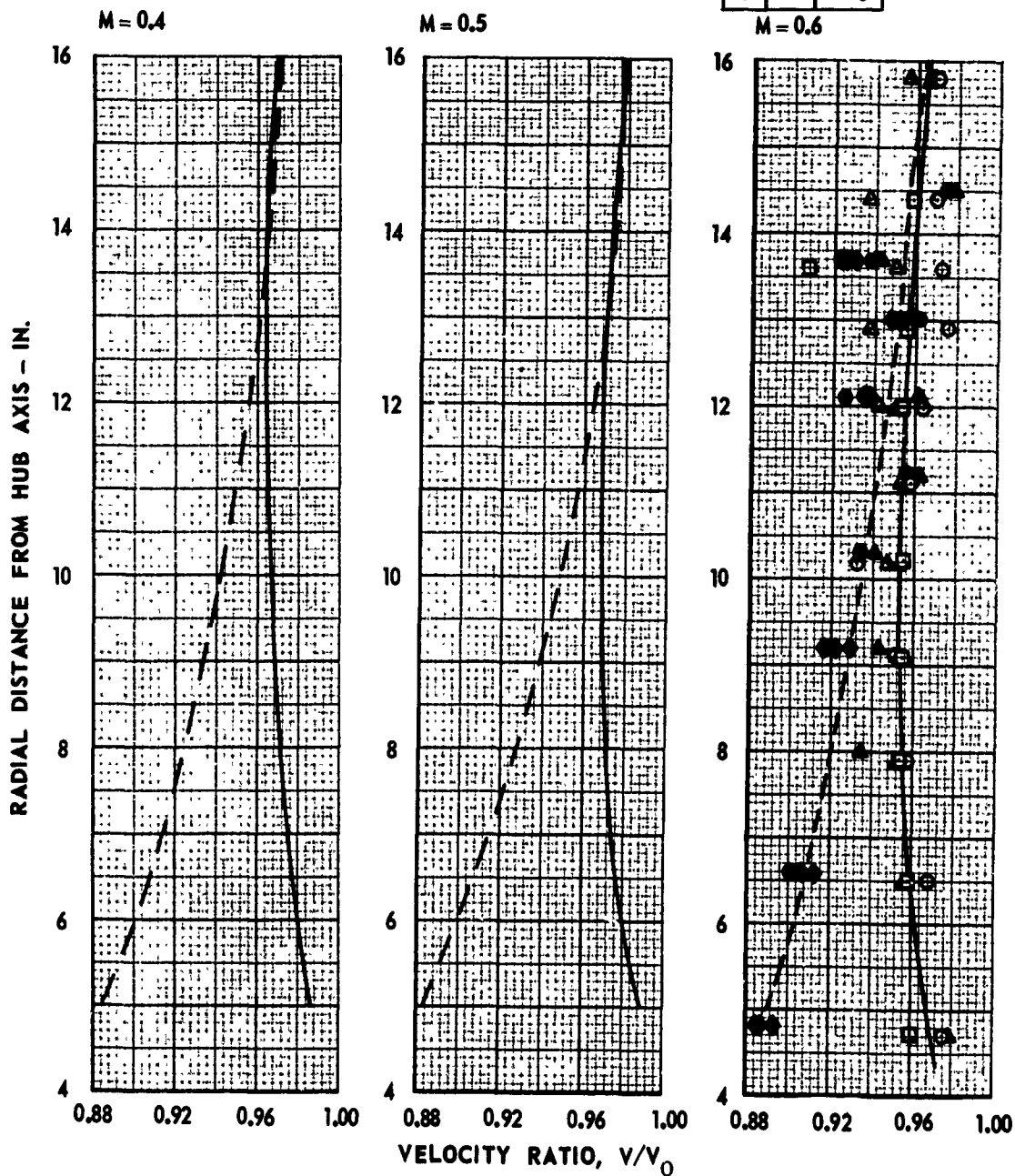
SYM	RUN	RAKE
○	26	RG <sub>1</sub>
△	26	RG <sub>5</sub>
□	85	RG <sub>1</sub>
◇	85	RE <sub>5</sub>



**HS VG SHROUDED PROPELLER TEST  
VELOCITY PROFILES AT THE SHROUD INLET AND EXIT STATIONS  
PROPELLER TEST RIG WITHOUT SHROUD**

NOTE: SOLID LINES AND OPEN SYMBOLS  
DENOTE INLET VELOCITIES  
DASHED LINES AND SOLID SYMBOLS  
DENOTE EXIT VELOCITIES

SYM	RUN	RAKE
○	26	RG <sub>1</sub>
△	26	RG <sub>5</sub>
□	87	RG <sub>1</sub>
◇	87	RE <sub>5</sub>



## APPENDIX V

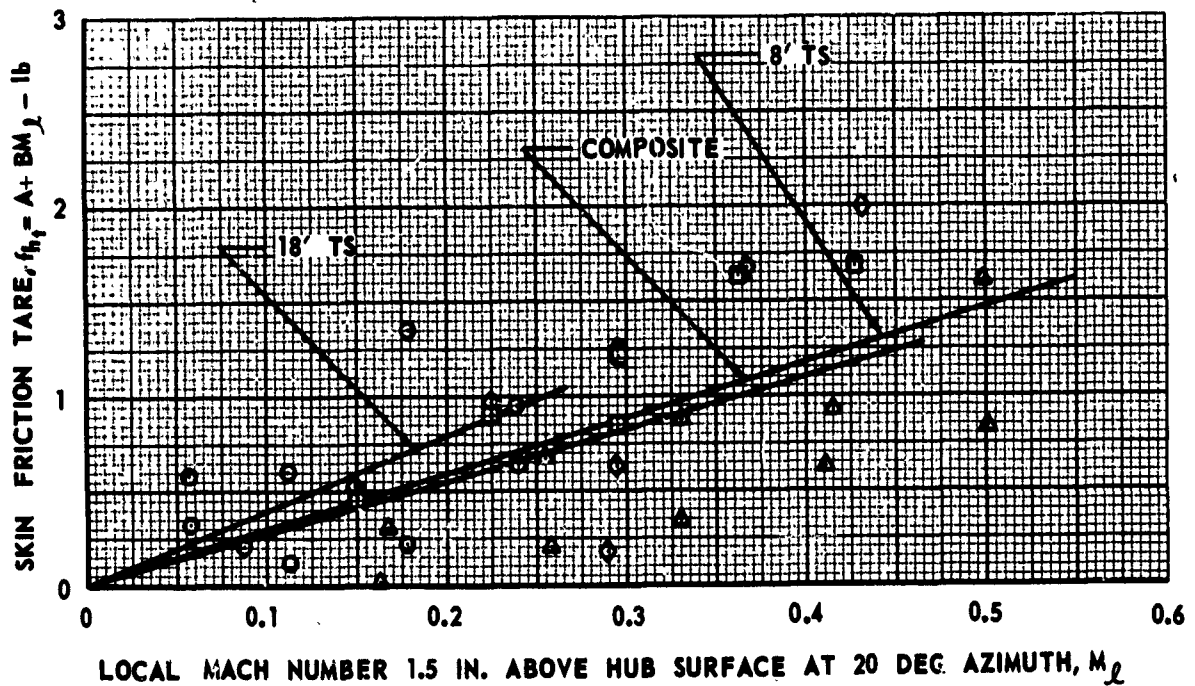
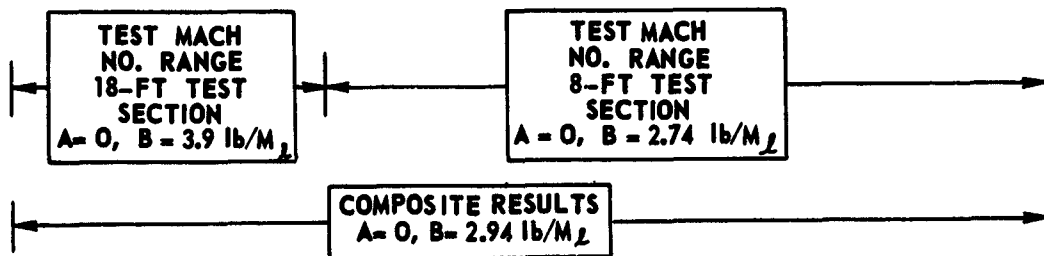
## HS VG SHROUDED PROPELLER TEST

## Propeller Hub Skin Friction Tare

The forces measured by the dynamometer's thrust balance represent a summation of the propeller thrust, a hub skin friction drag and a thrust force derived from the pressure differential across the hub. The pressure differential thrust is determined from direct measurement of the pressures across the hub at each data point. The hub skin friction drag tare was determined from a calibration made without blades through a Mach number range at zero hub rotational speed. The gross thrust measured during this calibration is equal to the independently measured pressure thrust and the skin friction drag since the propeller thrust is equal to zero. Hub skin friction tare values measured in this manner are shown in Fig. V-1. Due to scatter in the data generated in both test sections, a composite linear function of local Mach number was fitted to the overall data as shown in this plot. The individual test section values of the tare parameters are included for comparison. The values derived from the composite were used in the final data reduction equations, Appendix VII. Local Mach number was selected as the independent variable rather than tunnel speed in order to account for the effect due to the shroud presence. It should be noted that the intention in so defining the hub skin friction as a function of local Mach number was to simplify computer application of the data and, further, that the included results are applicable only with the finite spinner.

### HS VG SHROUDED PROPELLER TEST PROPELLER HUB SKIN FRICTION TARE

SYM	RUN NO.	CONFIGURATION	TS
⊙	2	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>	18
△	27	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>	8
□	81	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>	
◇	82	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub> <sup>R</sup> E <sub>5</sub>	↓



## APPENDIX VI

## HS VG SHROUDED PROPELLER TEST

## Shroud Support Tare and Interference Effects

The tare and interference effects of the shroud support system are presented in this appendix for the three shroud configurations tested. The support system consisted of a side arm and two "A"-frame attachment points as illustrated in Fig. 3. The interference effects (no tare effect applicable) of the side arm support were evaluated in a previous test (Ref. 4) and found to be negligible and corrections for these effects were not applied to the performance data presented in this report. Unlike the side arm interference, the "A"-frame tare and interference effects were found to be significant to chord force measurements. Derivation of the "A"-frame tare and interference effects were achieved from two methods: a) the tare produced from the air loads on the isolated "A"-frames and b) the tare and interference produced from the airloads on the "A"-frames, shown in Fig. VI-1, in proximity of the three shroud configurations.

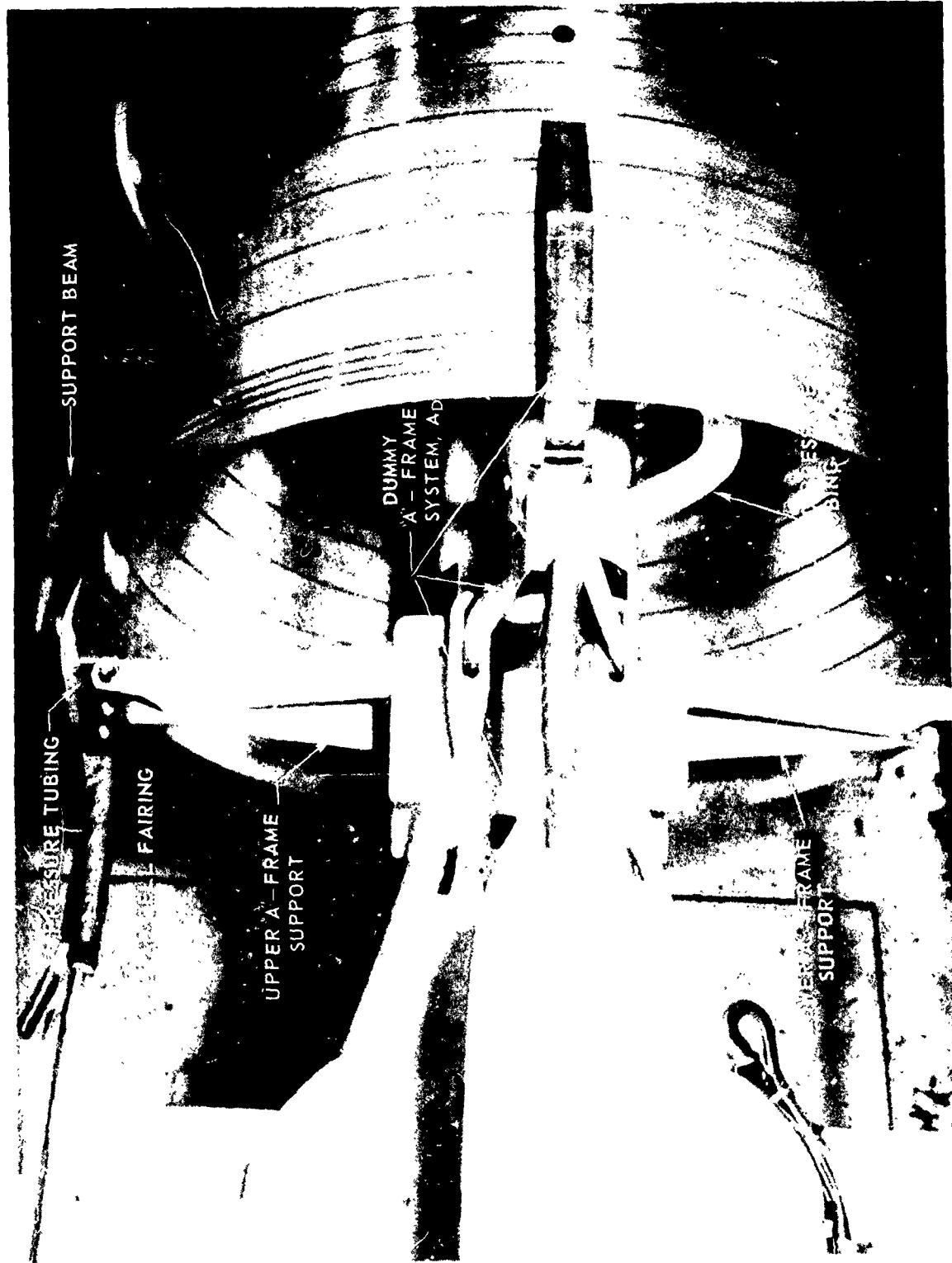
Concurrent with the dynamometer buoyancy investigations an "A"-frame correction to chord force was obtained based on chord force measurements of the two isolated (no shroud) "A"-frames rather than from the dummy "A"-frame image. This technique was developed in a previous test (Ref. 4) because of the inconsistencies in the data obtained with the image system, and the direct measurements were made of the isolated system to improve the correction.

With the measurements of "A"-frame chord force presented in Fig. VI-2 and the approach described in Ref. 8, a chord force correction as a function of propeller advance ratio and thrust coefficient was derived as given in Eq. 9 of Appendix VII. The correction does not include the "interference" of tare and interference (shroud not present), nor does it account for changes associated with variations in "A"-frame shroud attachment proximities. However, these effects were checked by measuring the effects of the airloads on the dummy "A"-frame system in proximity of each of the three shroud configurations. These effects were determined by obtaining the difference in shroud chord force coefficient without and with a single dummy "A"-frame installed (this configuration produces half of the effect of the two "A"-frames). These differences compared poorly with the results obtained from the isolated "A"-frames because the predetermined values of the drag parameter were based on the free-stream Mach number.

F331012-1

FIG. VI-1

HS VG SHROUDED PROPELLER TEST  
"A" - FRAME IMAGE SYSTEM

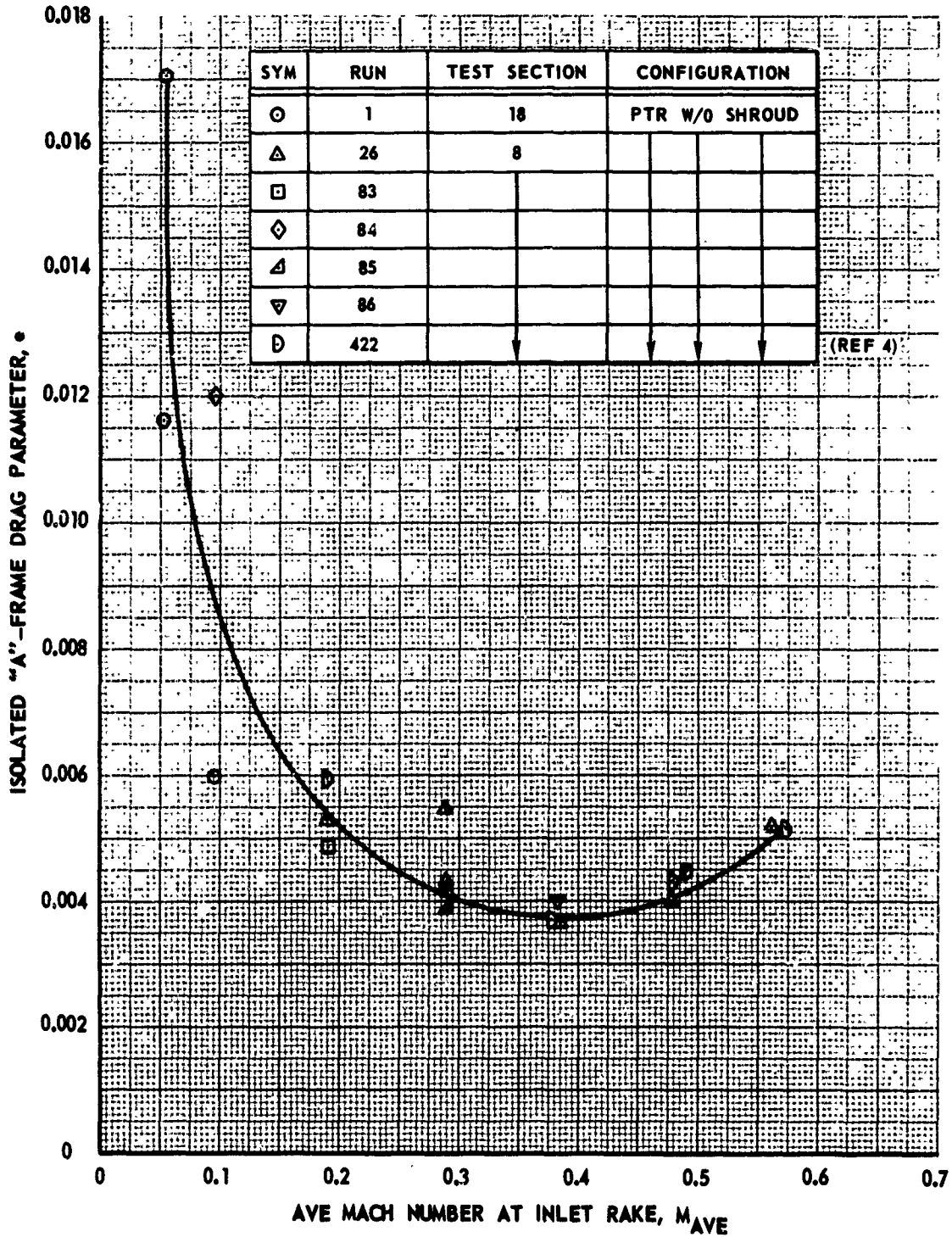


HS VG SHROUDED PROPELLER TEST

"A" - FRAME DRAG TARE

$$C_{c_1} = \left[ e + f \left( \frac{C_T}{J^2} \right) \right] J^2 \quad (\text{APP VII EQ. 9})$$

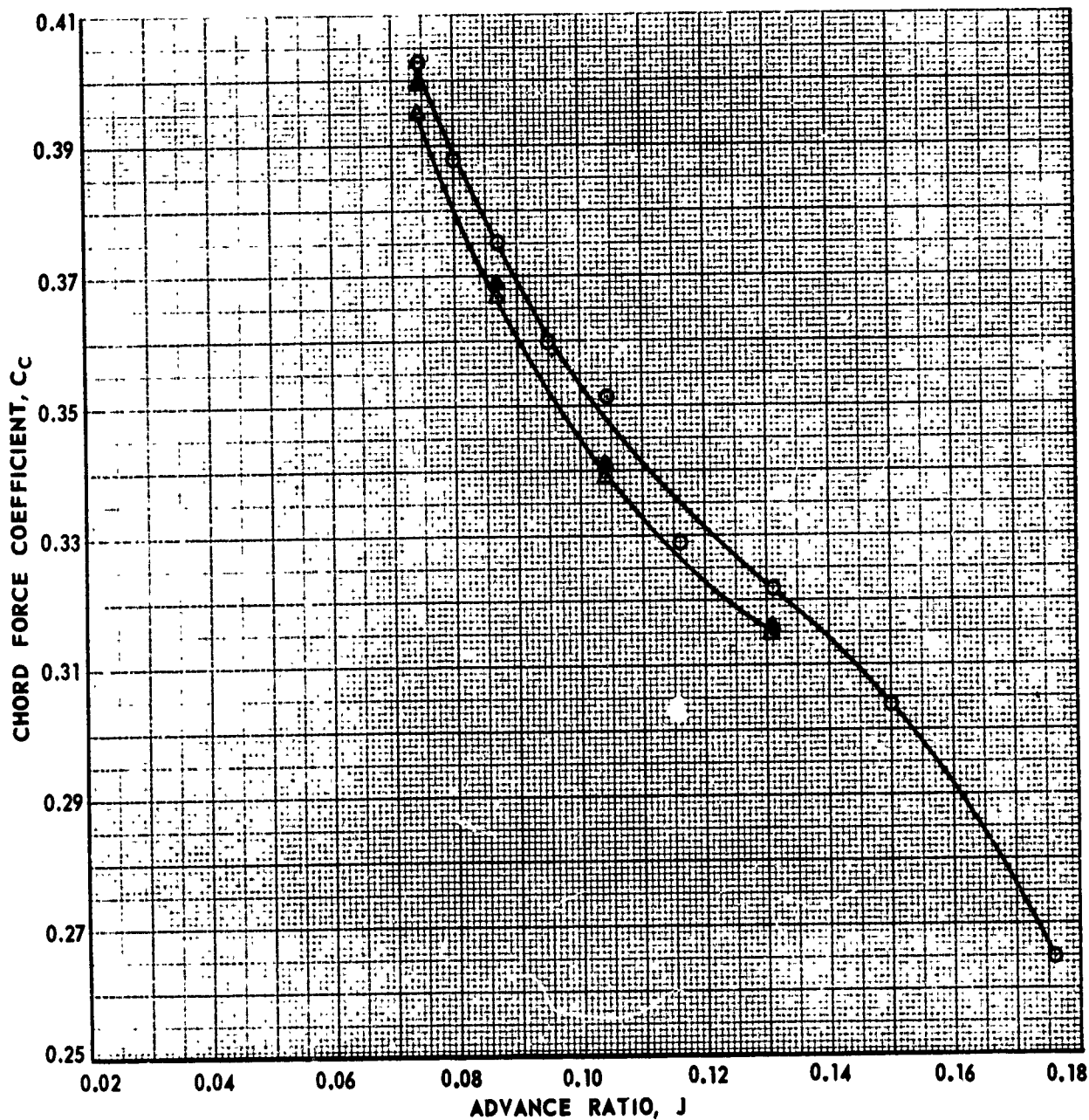
WHERE  $f = 2.71e$



HS VG SHROUDED PROPELLER TEST  
COMPARISON OF "A" - FRAME TARE CORRECTION WITH TEST DATA

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\xi$ 3/4
○	13	0.02	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	36.0
△	16	↓	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> AD	↓

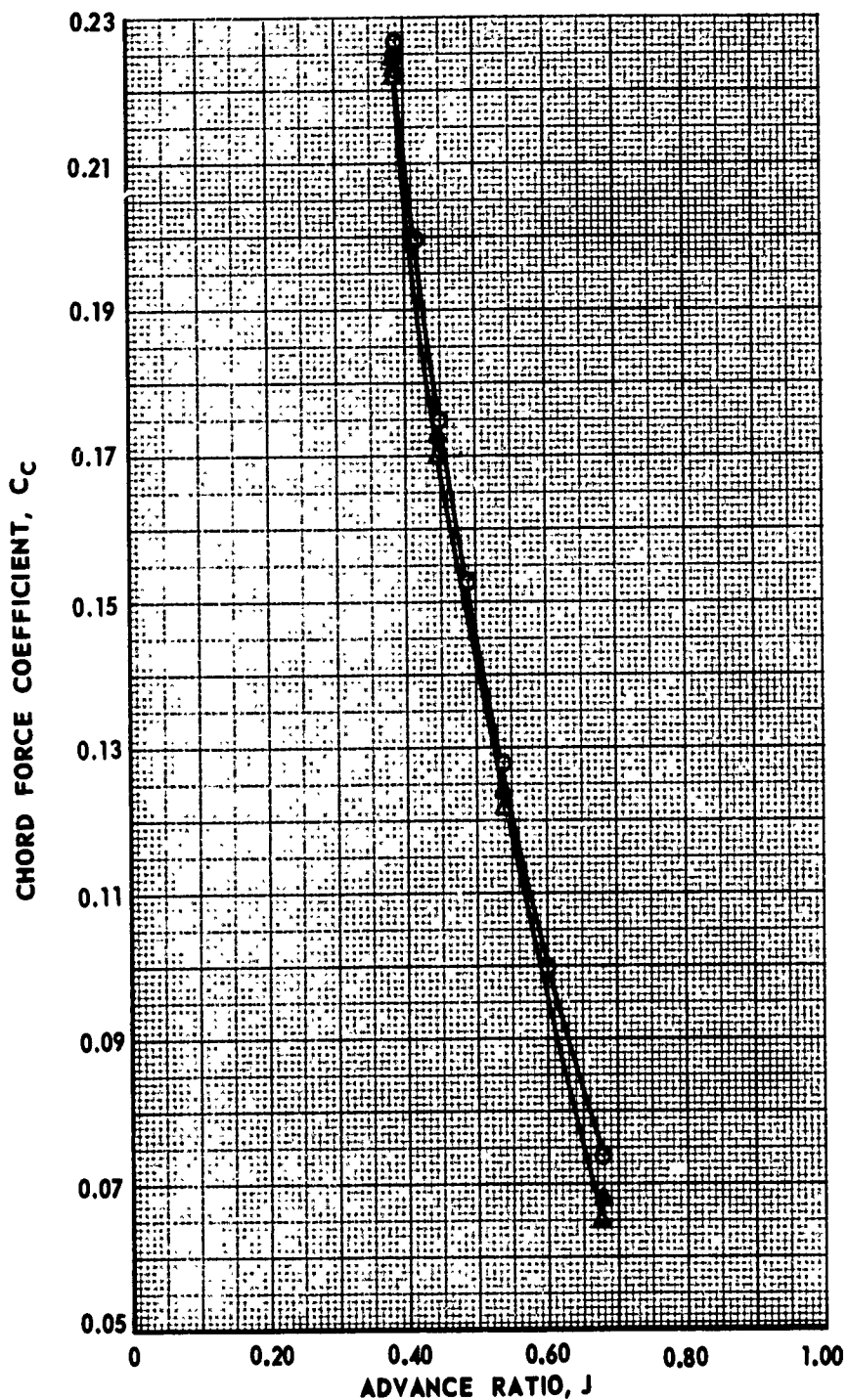
NOTES: OPEN CIRCLE SYMBOLS - UNCORRECTED DATA, STANDARD SUPPORT SYSTEM.  
OPEN TRIANGLE SYMBOLS - UNCORRECTED DATA, DUMMY "A"-FRAME ADDED.  
SOLID SYMBOLS - DATA WITH DUMMY "A"-FRAME CORRECTED FOR ONE ISOLATED "A"-FRAME.



### HS VG SHROUDED PROPELLER TEST COMPARISON OF "A" - FRAME TARE CORRECTION WITH TEST DATA

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	11	0.10	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	36.0
△	15	↓	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> A <sub>D</sub>	↓

NOTES: OPEN CIRCLE SYMBOLS - UNCORRECTED DATA, STANDARD SUPPORT SYSTEM.  
 OPEN TRIANGLE SYMBOLS - UNCORRECTED DATA, DUMMY "A"-FRAME ADDED.  
 SOLID SYMBOLS - DATA WITH DUMMY "A"-FRAME CORRECTED FOR ONE ISOLATED "A"-FRAME.



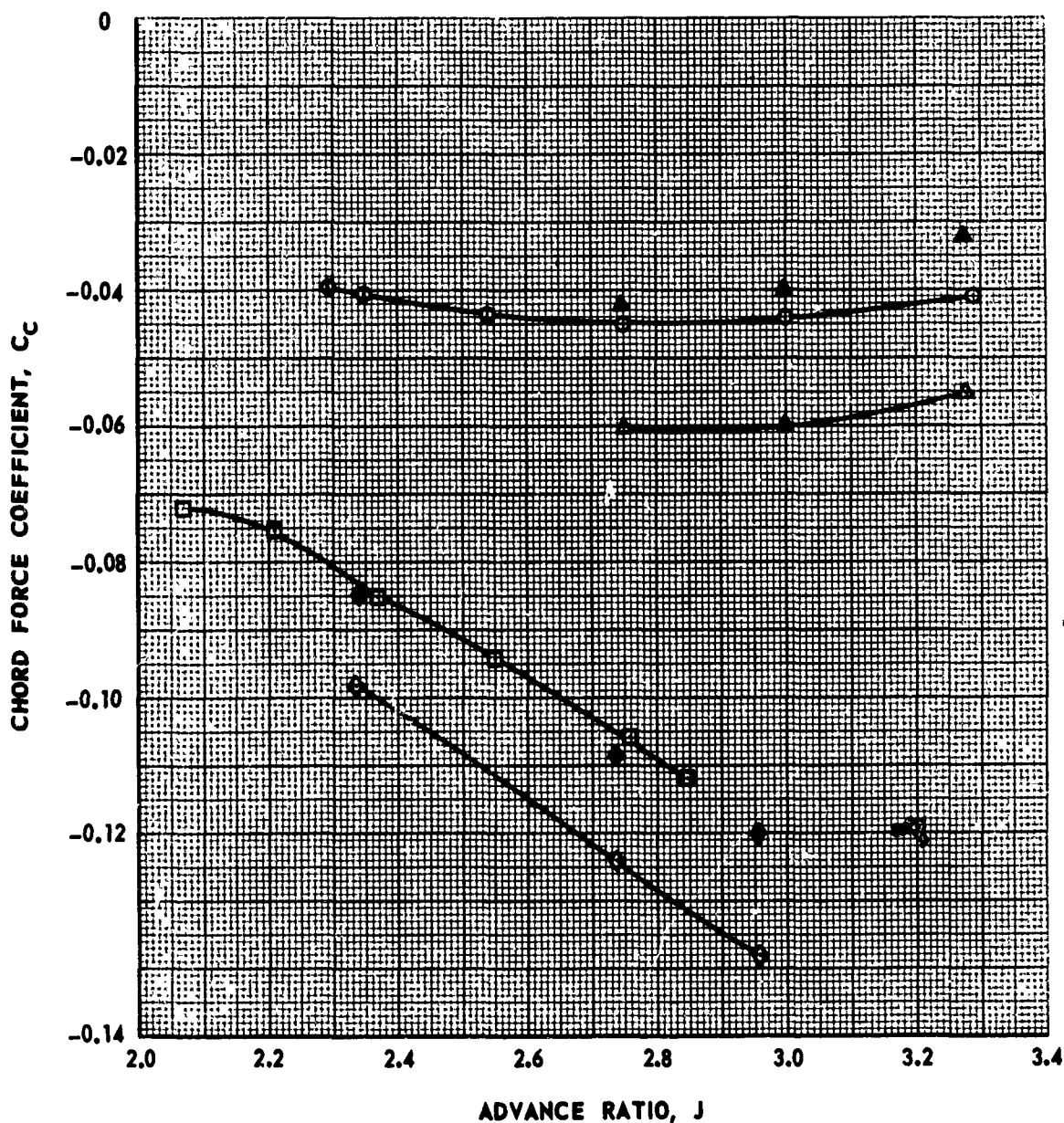
F331012-1

FIG. VI-6

HS VG SHROUDED PROPELLER TEST  
COMPARISON OF "A" - FRAME TARE CORRECTION WITH TEST DATA

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	46	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	49.0
△	50		L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> A <sub>D</sub>	↓
□	65		L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	41.0
◇	74	↓	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> A <sub>D</sub>	↓

NOTES: OPEN CIRCLE AND SQUARE SYMBOLS - UNCORRECTED DATA, STANDARD SUPPORT SYSTEM.  
OPEN TRIANGLE AND DIAMOND SYMBOLS - UNCORRECTED DATA, DUMMY "A"-FRAME ADDED.  
SOLID SYMBOLS - DATA WITH DUMMY "A"-FRAME CORRECTED FOR ONE ISOLATED "A"-FRAME.



**APPENDIX V11**  
**HS VG SHROUDED PROPELLER TEST**  
**DATA REDUCTION EQUATIONS**

**I - PRELIMINARY CALCULATIONS**

$$\rho_0 = \frac{H}{RT_{sc}} \quad (1)$$

$$\rho = \rho_0 \left[ \frac{\gamma g R T_{sc}}{1 + \frac{\gamma-1}{2} M^2} \right]^{-\frac{1}{\gamma-1}} \quad (2)$$

$$V_u = M \left[ \frac{\gamma g R T_{sc}}{1 + \frac{\gamma-1}{2} M^2} \right]^{0.5} \quad (3)$$

$$V_o = V_u \left[ 1 + \frac{A_x}{4A_T} - \frac{T_{NET}}{4A_T q_u \left[ 1 + \frac{T_{NET}}{q_u A_p} \right]^{0.5}} \right] \quad (4)$$

WHERE  $T_{NET} = T + C$ , (T AND C DEFINED IN EQS. 10 AND 12)

AND  $q_u = \frac{\rho V_u^2}{2}$

**II CONVERSION OF STRAIN GAGE READINGS**

$$T_P = K_2(T_R - T_0) \quad (5)$$

$$Q_P = K_1(Q_R - Q_0) \quad (6)$$

$$C_u = K_7(C_{4R} - C_{40}) + K_8(C_{5R} - C_{50}) \quad (7)$$

**III HUB SKIN FRICTION AND "A" - FRAME TARE AND INTERFERENCE**

$$f_{ht} = A + BM_L \quad (8)$$

WHERE  $\frac{P_{sL}}{P_{tL}} = \frac{H - K_{10}(P_{sLR} - P_{sL0})}{H - K_9(P_{tLR} - P_{tL0})}$

AND  $M_L = \left[ \frac{(P_{sL}/P_{tL})^{-\frac{\gamma-1}{\gamma}} - 1}{\frac{\gamma-1}{2}} \right]^{0.5}$

## APPENDIX V11

(CONTD)

$$C_{Ct} = \left[ e + f \left( \frac{C_T}{J^2} \right) \right] J^2 \quad (9)$$

## IV HUB SKIN FRICTION, BALANCE INTERACTIONS AND HUB AND PTR BUOYANCY CORRECTIONS

$$T = T_P + f_{ht} - K_3 (\Delta T_R - \Delta T_O) - Q_P q_t \quad (10)$$

$$\text{WHERE } \Delta T_R = K(P_1 - P_4)$$

$$Q = Q_P - T_P t_q \quad (11)$$

$$C = C_u + D_B \quad (12)$$

$$\text{WHERE } D_B = -\pi \bar{d} \sum_i S_i \left( \frac{\Delta P}{\Delta X} \right)_i$$

## V CONVERSION OF FORCE COMPONENTS TO PERFORMANCE PARAMETERS

$$n = \frac{\bar{N}}{60} \quad (13)$$

$$C_T = \frac{T}{\rho n^2 d_p^4} \quad (14)$$

$$C_P = \frac{2\pi Q}{\rho n^2 d_p^5} \quad (15)$$

$$C_C = \frac{C}{\rho n^2 d_p^4} + C_{Ct} \quad (16)$$

$$C_{TNET} = C_T + C_C \quad (17)$$

$$J = \frac{V_0}{n d_p} \quad (18)$$

$$\eta = \frac{C_T}{C_P} J \quad (19)$$

$$\eta_{NET} = \frac{C_{TNET}}{C_P} J$$

$$HP = \frac{\bar{N}Q}{5252} \quad (21)$$

**APPENDIX V11**  
**(CONTD)**

$$V_T = \pi n d_p \quad (22)$$

**VI CALCULATION OF FREESTREAM VALUES (PRESSURE DATA) AND PRESSURE COEFFICIENT**

$$\rho_u = \rho_o \left( \frac{P_{SB}}{H} \right)^{\frac{1}{\gamma}} \quad (23)$$

WHERE  $\rho_o = \frac{H}{RT_{SC}}$

$$V_u = M_u \left[ \frac{\gamma g R T_{SC}}{1 + \frac{\gamma-1}{2} M_u^2} \right]^{0.5} \quad (24)$$

WHERE  $M_u = f(M_{SB})$  FROM APP III, FIG III-1 AND FIG III-2

AND  $M_{SB} = \left[ \frac{(P_{SB}/H)^{-\frac{\gamma-1}{\gamma}} - 1}{\frac{\gamma-1}{2}} \right]^{0.5}$

$$q_\infty = q_u \left( 1 + \frac{A_x}{2A_T} \right) \quad (25)$$

WHERE  $q_u = \frac{\rho_u V_u^2}{2}$

$$q_\infty = \frac{\gamma}{2} H M_\infty^2 \left( 1 + \frac{\gamma-1}{2} M_\infty^2 \right)^{-\frac{\gamma}{\gamma-1}} \quad (\text{SOLVED FOR } M_\infty) \quad (26)$$

$$P_\infty = H \left( 1 + \frac{\gamma-1}{2} M_\infty^2 \right)^{-\frac{\gamma}{\gamma-1}} \quad (27)$$

$$V_\infty = \left( \frac{2q_\infty}{\rho} \right)^{0.5} \quad (28)$$

WHERE  $\rho = \rho_o \left( \frac{P_\infty}{H} \right)^{\frac{1}{\gamma}}$

$$C_p = \frac{P_m - P_\infty}{q_\infty} \quad (29)$$

**VII CALCULATION OF INLET VELOCITIES**

$$V_i = M_i \left[ \frac{\gamma g R T_{SC}}{1 + \frac{\gamma-1}{2} M_i^2} \right]^{0.5} \quad (30)$$

## APPENDIX V11

(CONTD)

$$\text{WHERE } M_i = \left[ \frac{(P_{s_i}/P_{t_i})^{-\frac{\gamma-1}{\gamma}} - 1}{\frac{\gamma-1}{2}} \right]^{0.5}$$

$$V_{AVE} = \sum_i \frac{V_i}{iC} \quad (31)$$

## VIII REDUCTION OF TRAVERSING PROBE DATA

$$M_r = \frac{P_1 - P_2}{P_1} \quad (32)$$

$$\theta_r = \frac{P_4 - P_5}{P_1 - P_2} \quad (33)$$

$$P_5 = P_1 - \bar{K}(P_1 - P_2) \quad (34)$$

WHERE  $\theta = f(M_r, \theta_r)$  FROM APP. II, FIG. II-6

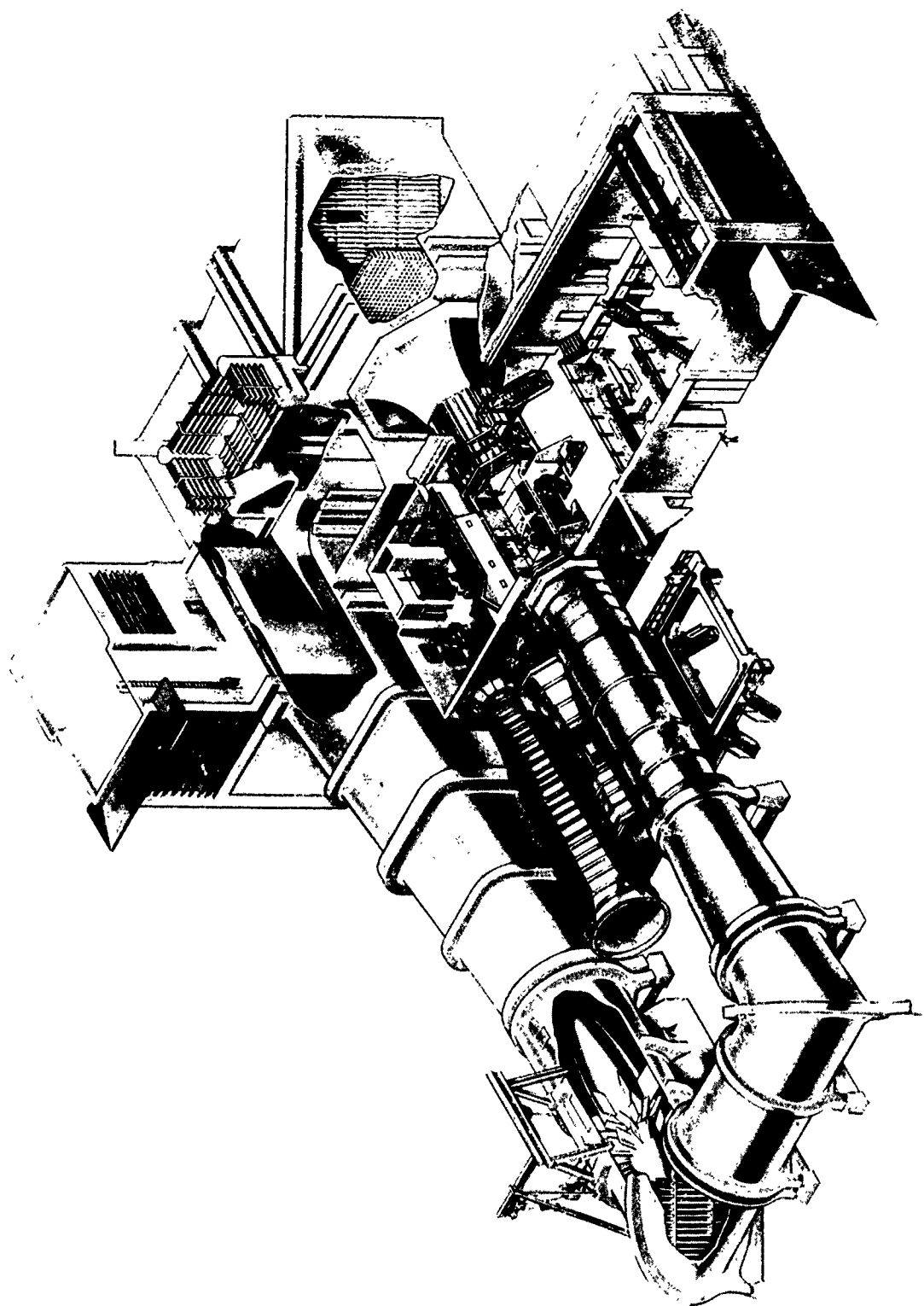
AND  $\bar{K} = f(M_r, \theta)$  FROM APP. II, FIG. II-7

$$M_{TP} = \left[ \frac{(P_s/P_1)^{-\frac{\gamma-1}{\gamma}} - 1}{\frac{\gamma-1}{2}} \right]^{0.5} \quad (35)$$

$$V_{TP} = M_{TP} \left[ \frac{\gamma g R T_{sc}}{1 + \frac{\gamma-1}{2} M_{TP}^2} \right]^{0.5} \quad (36)$$

$$V' = V_{TP} \cos \theta \cos Z \quad (37)$$

HS VG SHROUDED PROPELLER TEST  
UARL LARGE SUBSONIC WIND TUNNEL



HS VG SHROUDED PROPELLER TEST  
SCHEMATIC DRAWING OF PROPELLER DYNAMOMETER

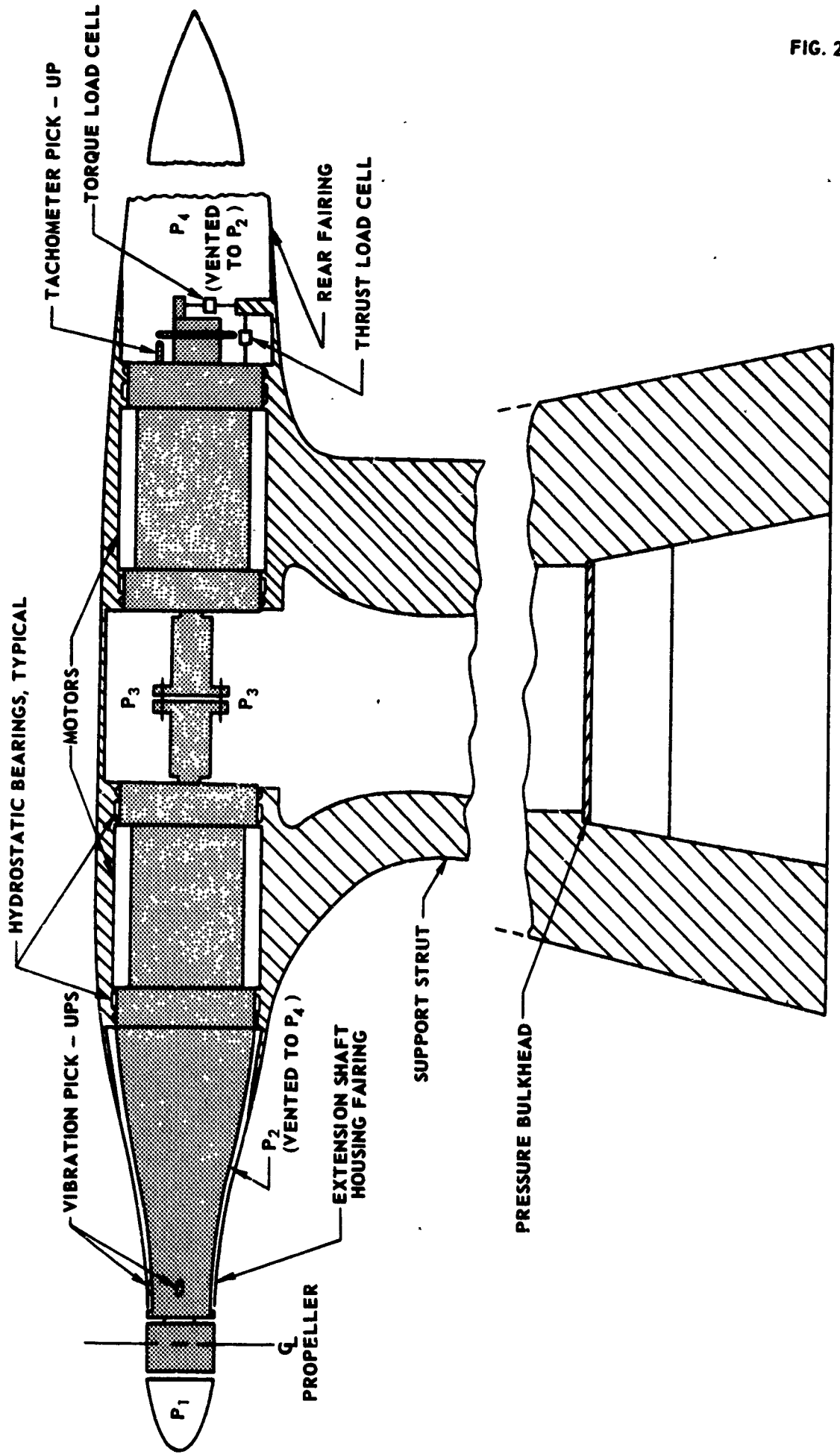
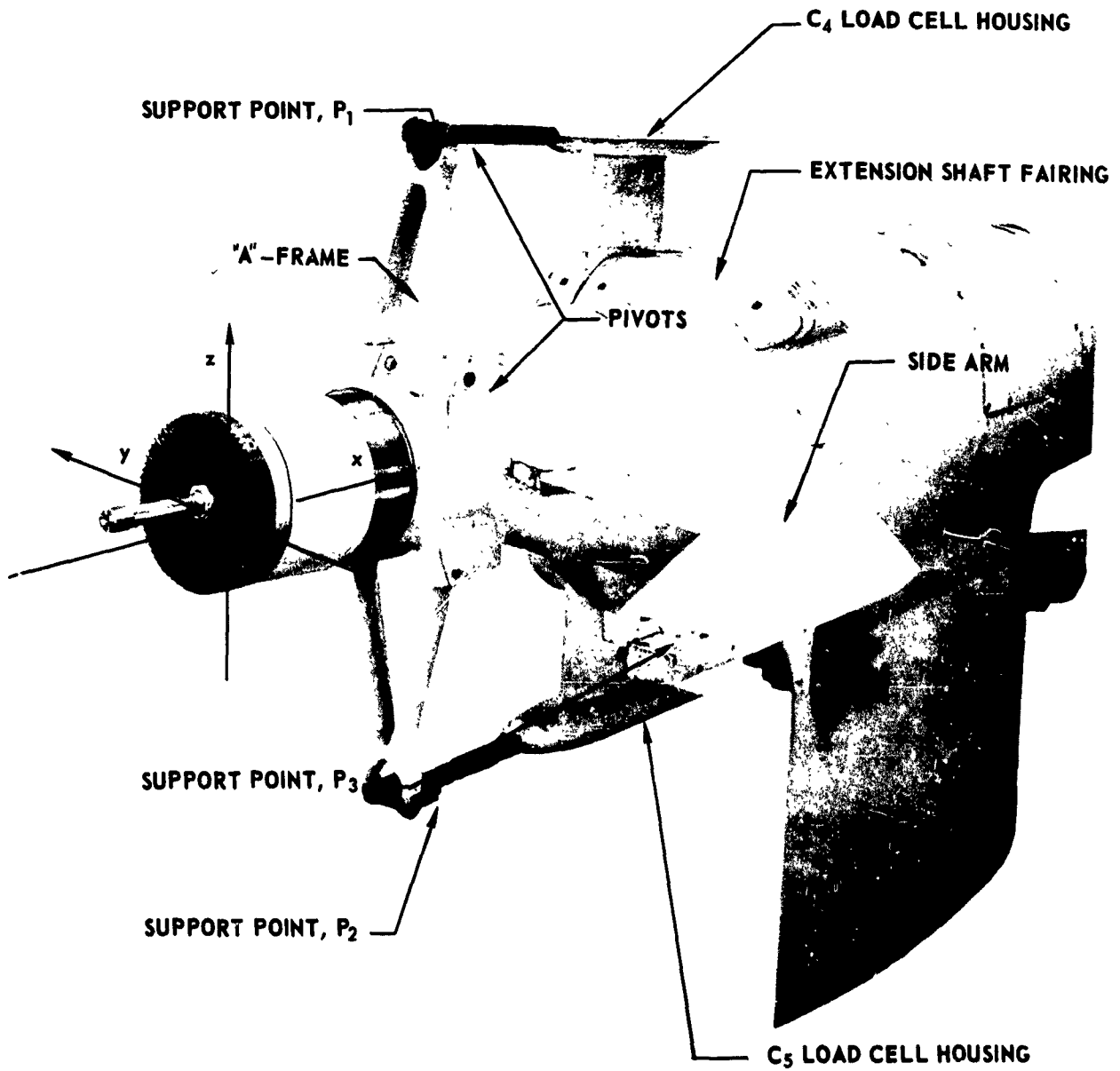


FIG. 2

# HS VG SHROUDED PROPELLER TEST

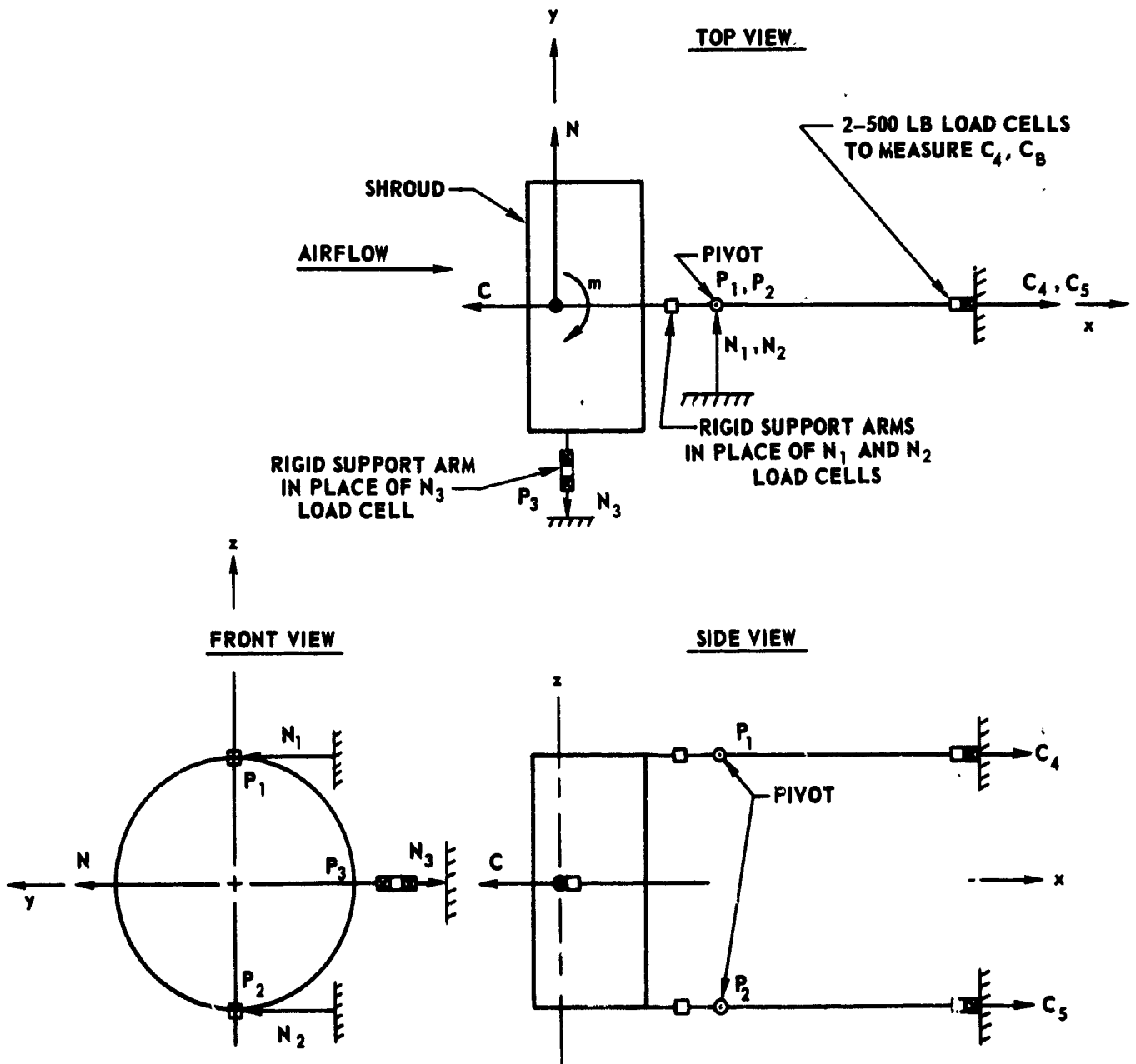
## SHROUD BALANCE SYSTEM



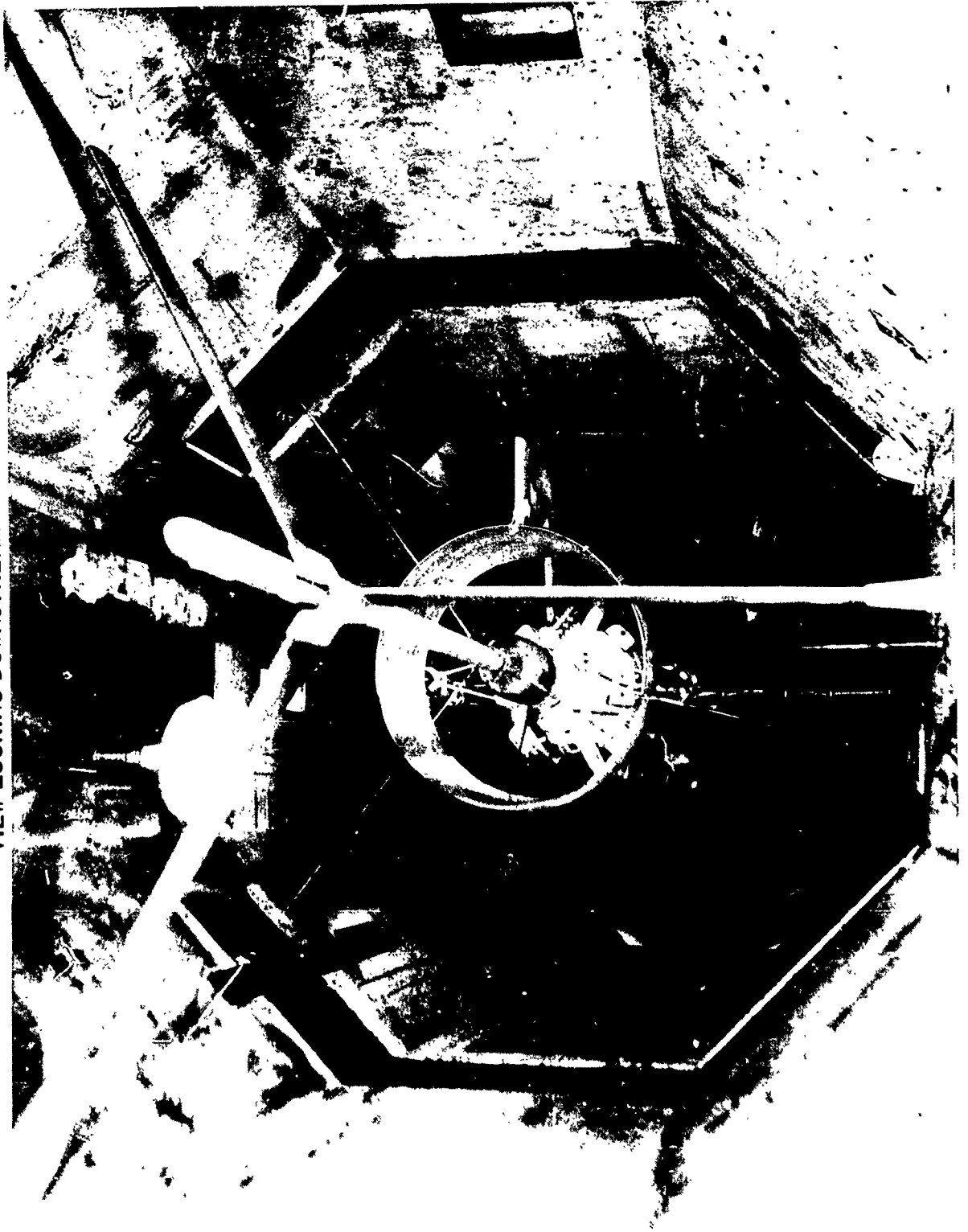
HS VG SHROUDED PROPELLER TEST  
SCHEMATIC DIAGRAM OF SHROUD BALANCE

$$N = N_3 - N_1 - N_2$$

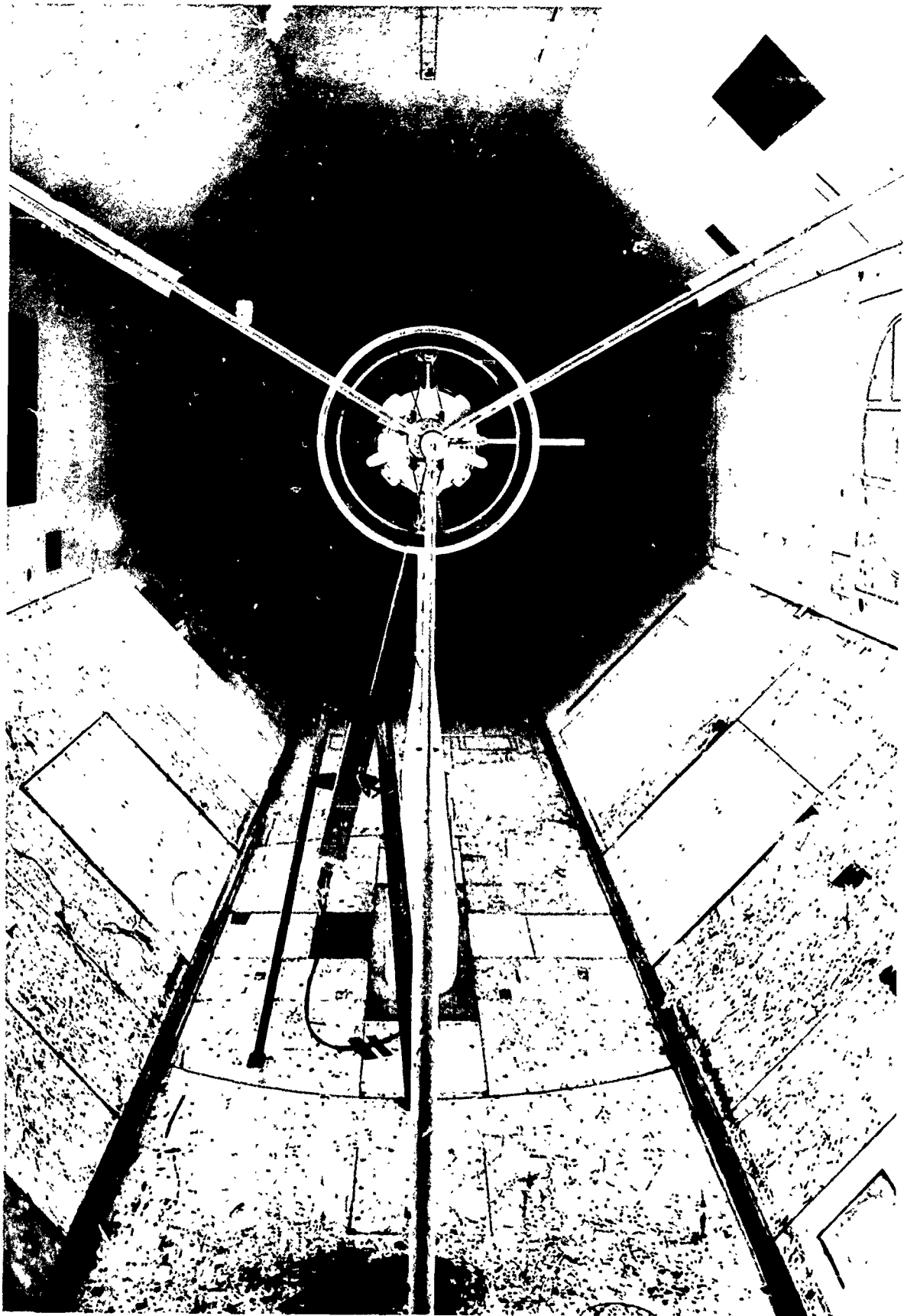
$$C = C_4 + C_5$$



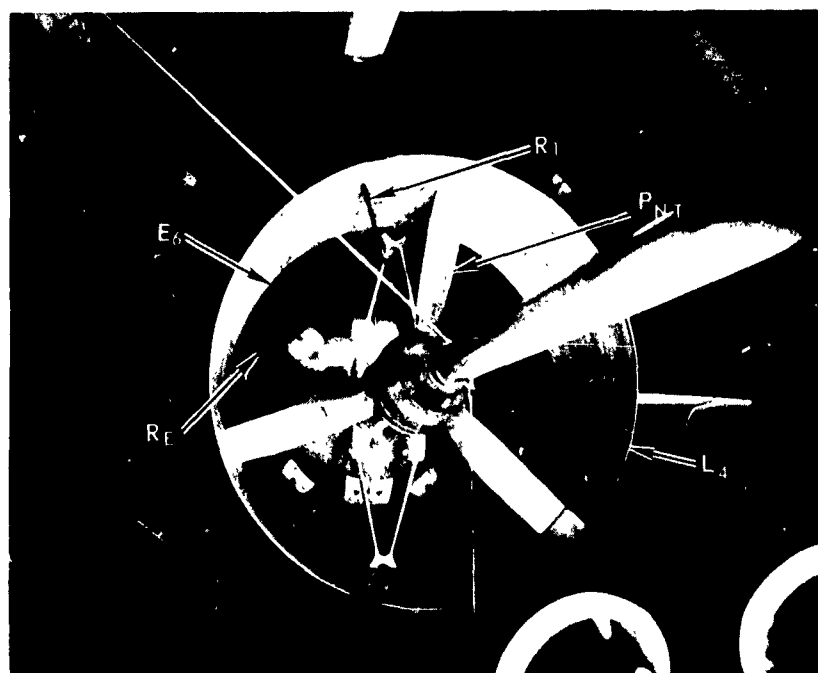
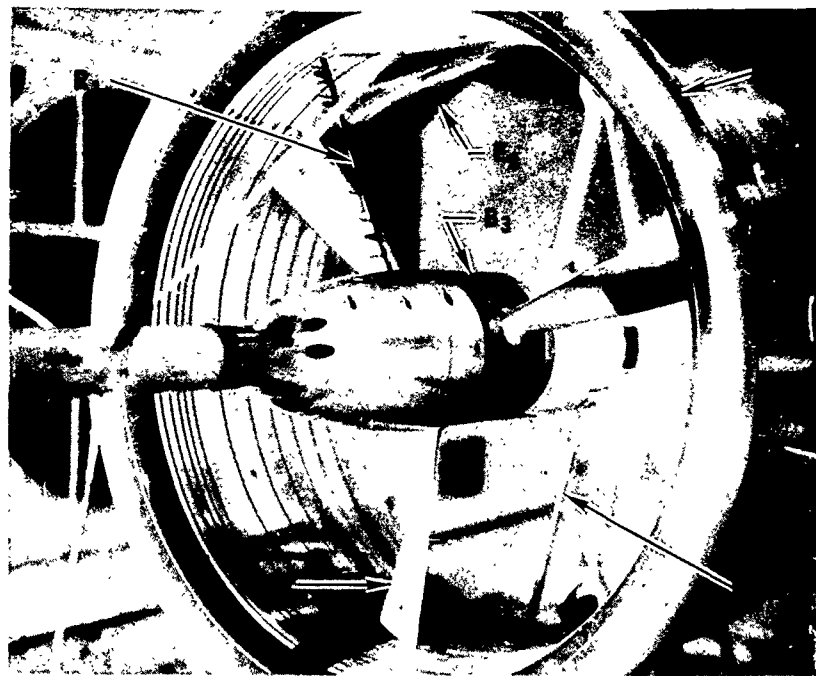
HS VG SHROUDED PROPELLER TEST  
MODEL PROPELLER TEST DYNAMOMETER INSTALLED IN 8-FT TEST SECTION  
VIEW LOOKING DOWNSTREAM



HS VG SHROUDED PROPELLER TEST  
MODEL PROPELLER TEST DYNAMOMETER INSTALLED IN 18-FT TEST SECTION  
VIEW LOOKING DOWNSTREAM



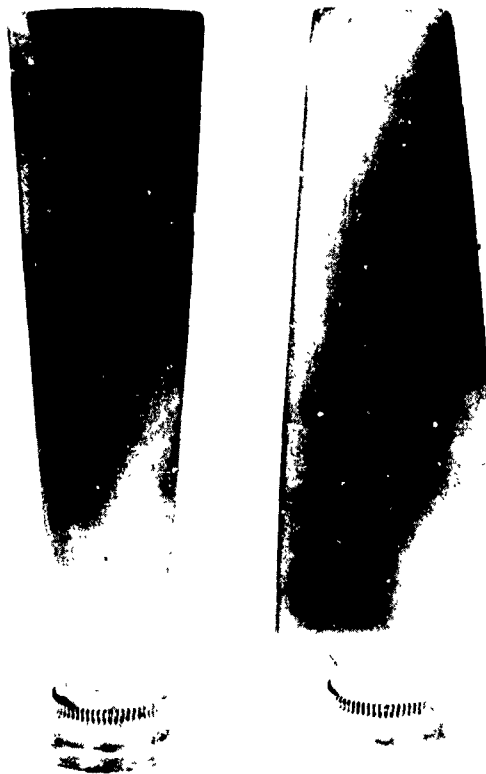
### HS VG SHROUDED PROPELLER TEST MODEL COMPONENT DESIGNATION SYMBOLS



HS VG SHROUDED PROPELLER TEST  
PROPELLER TEST BLADES

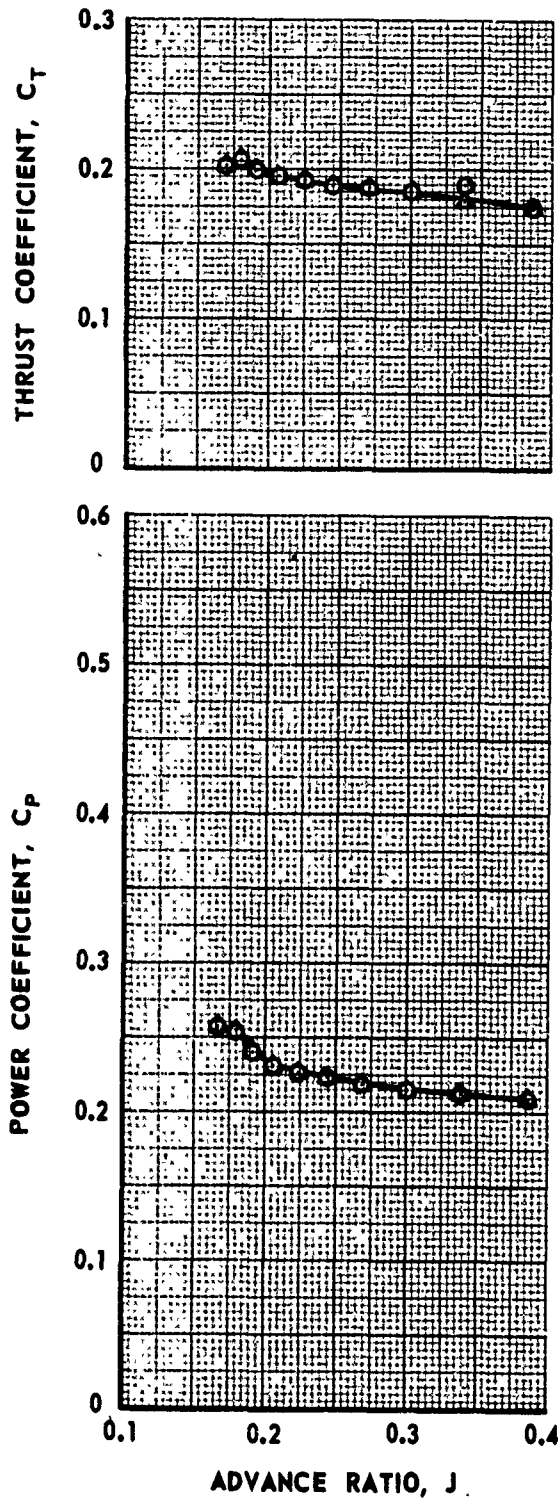
3-WAY  
WIDE TIP, P<sub>WT</sub>

3-WAY  
NARROW TIP, P<sub>NT</sub>



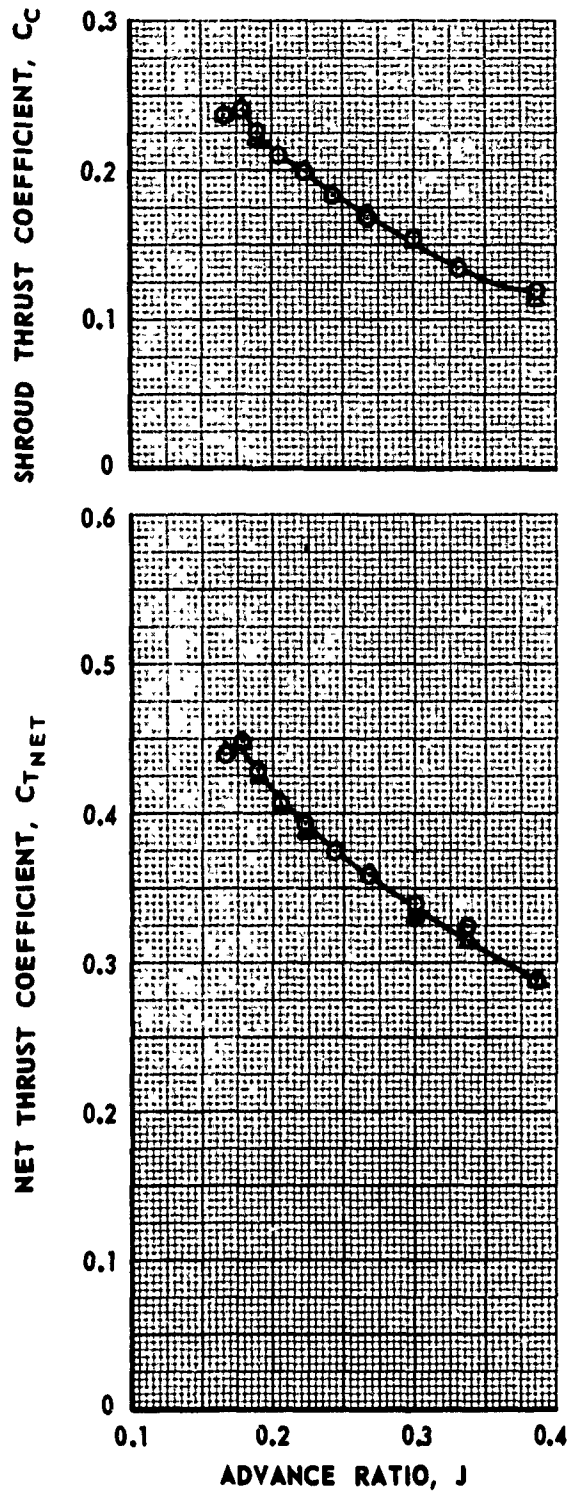
HS VG SHROUDED PROPELLER TEST  
 COMPARISON OF DATA REPEATABILITY IN THE 18-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
G	8	0.05	$L_5 C_1 E_8 B_3 P_{WT} T_1 R_1 R_E$	29.0
$\Delta$	21	↓	↓	↓



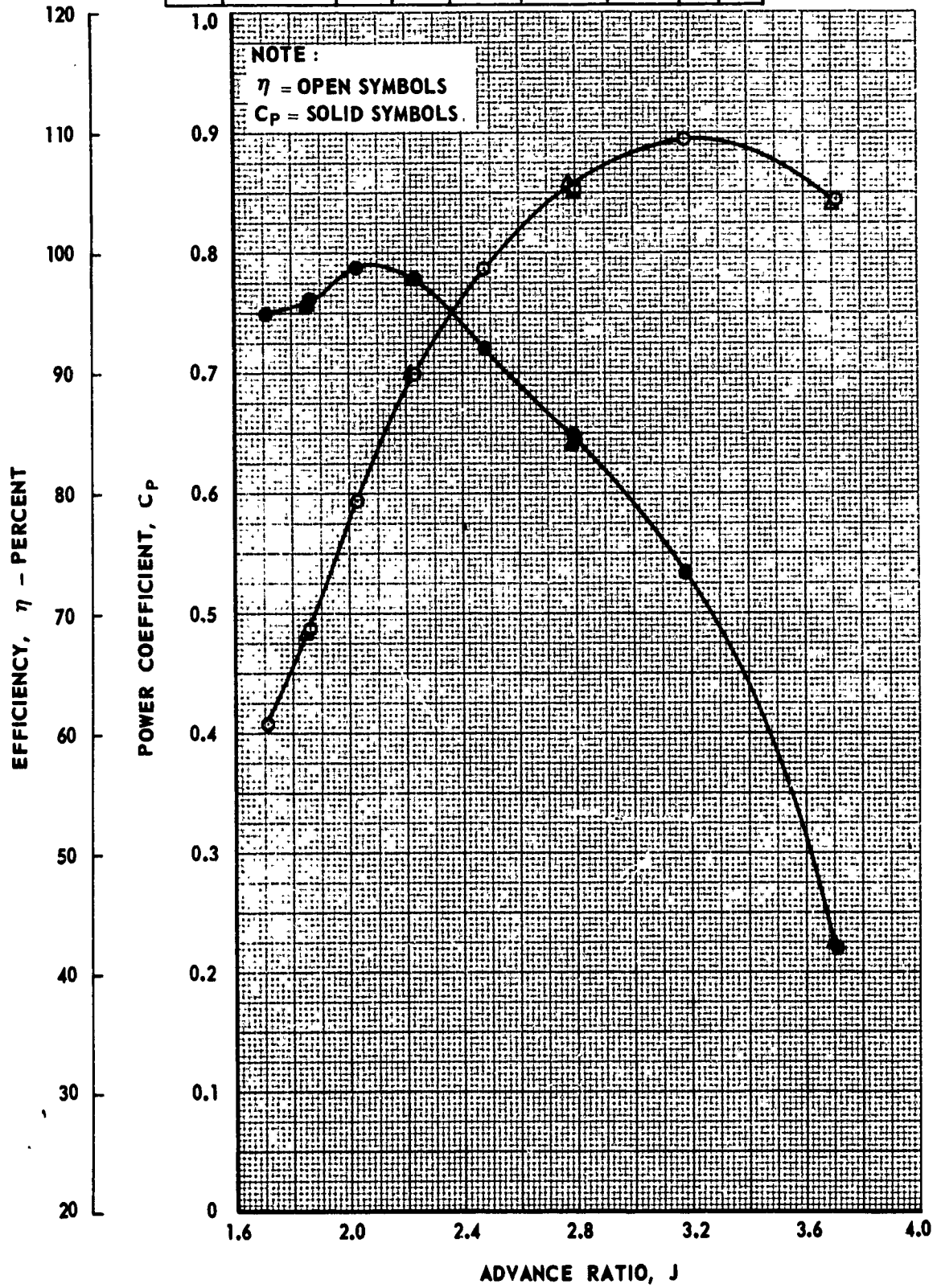
HS VG SHROUDED PROPELLER TEST  
COMPARISON OF DATA REPEATABILITY IN THE 18-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	8	0.05	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>i</sub> R <sub>1</sub> R <sub>E</sub>	29.0
△	21	↓	↓	↓



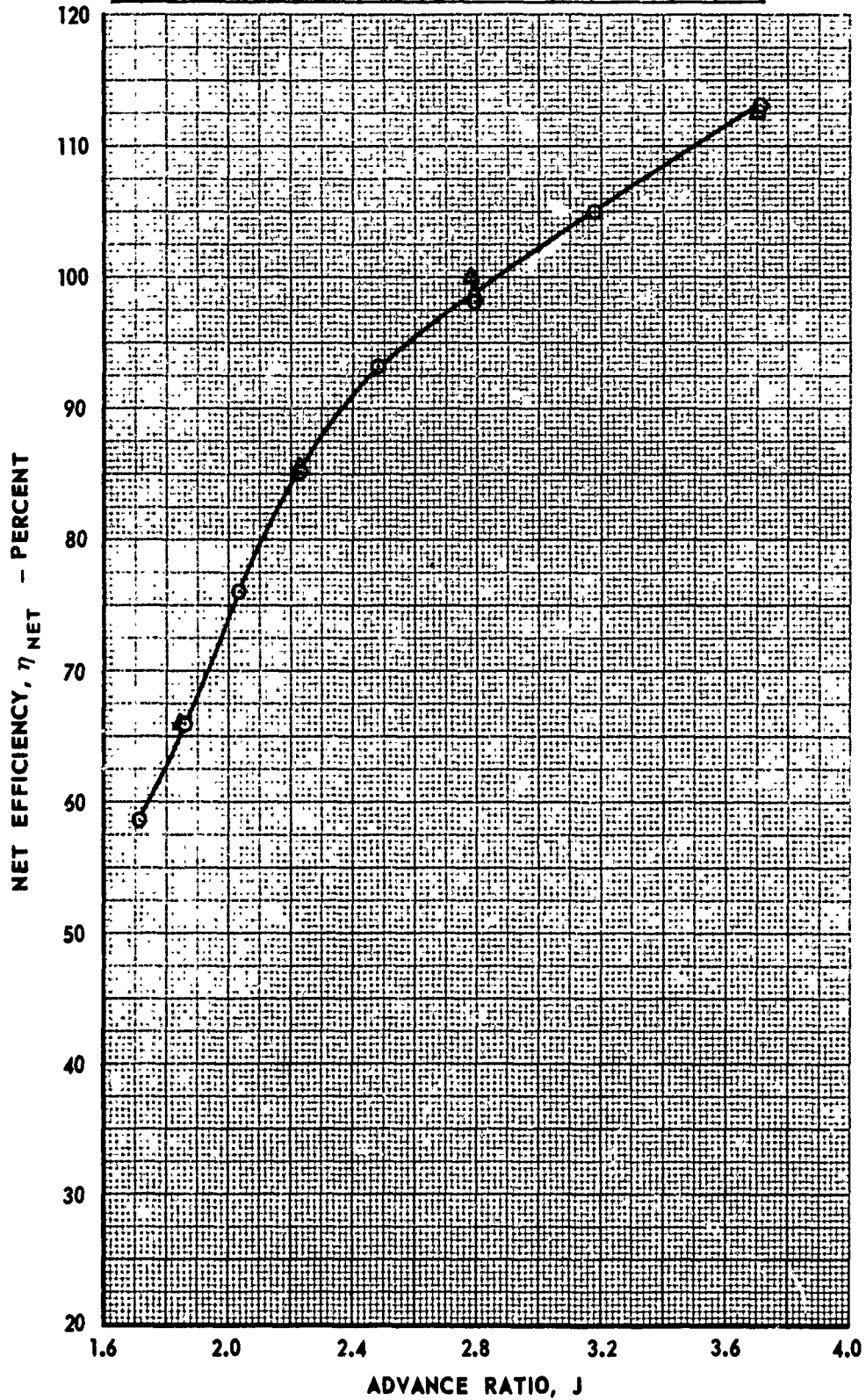
HS VG SHROUDED PROPELLER TEST  
COMPARISON OF DATA REPEATABILITY IN THE 8-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	35	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	50.0
Δ	36	↓	↓	↓



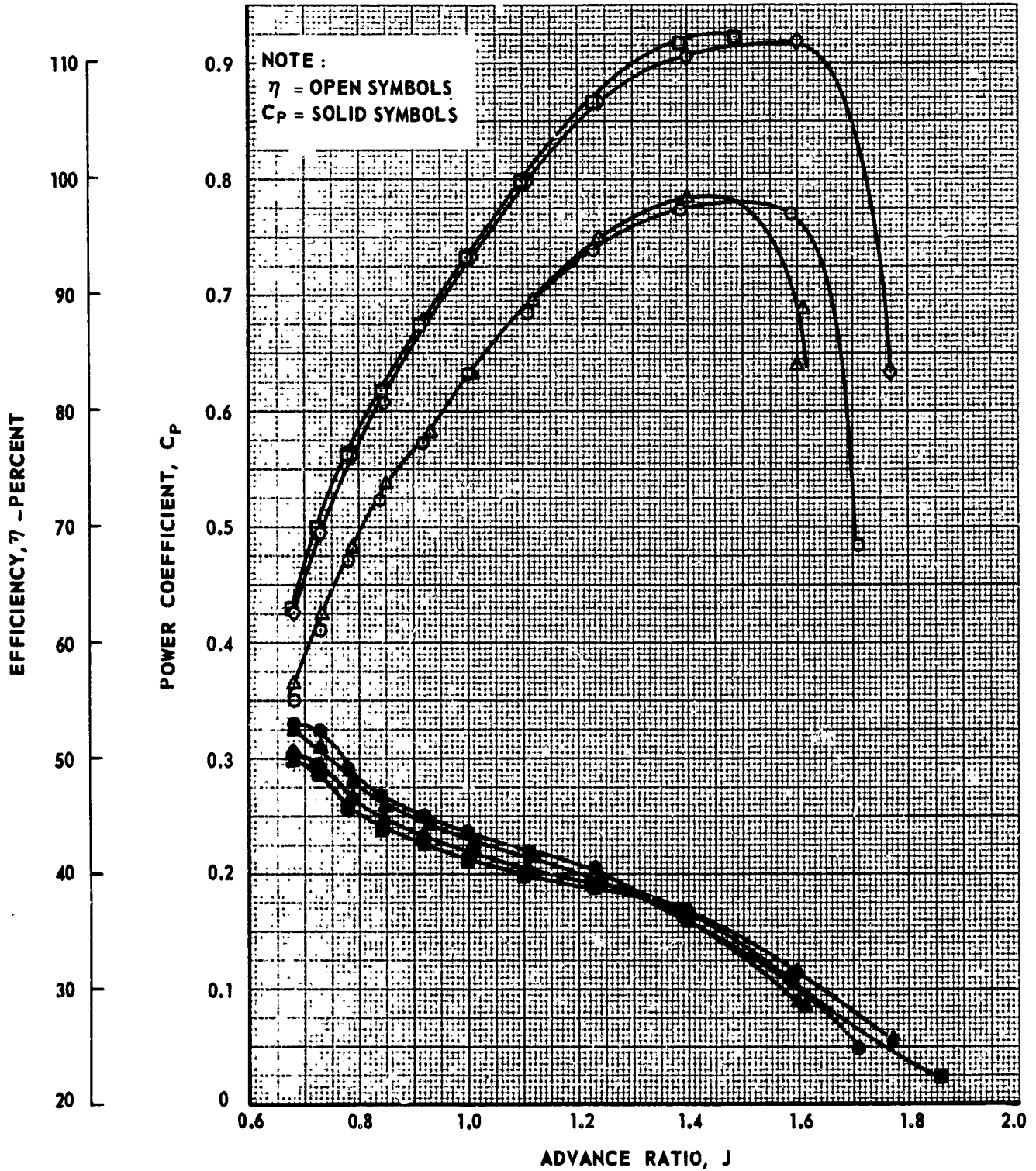
HS VG SHROUDED PROPELLER TEST  
 COMPARISON OF DATA REPEATABILITY IN THE 8-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	35	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> PWT <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	50.0
△	36			



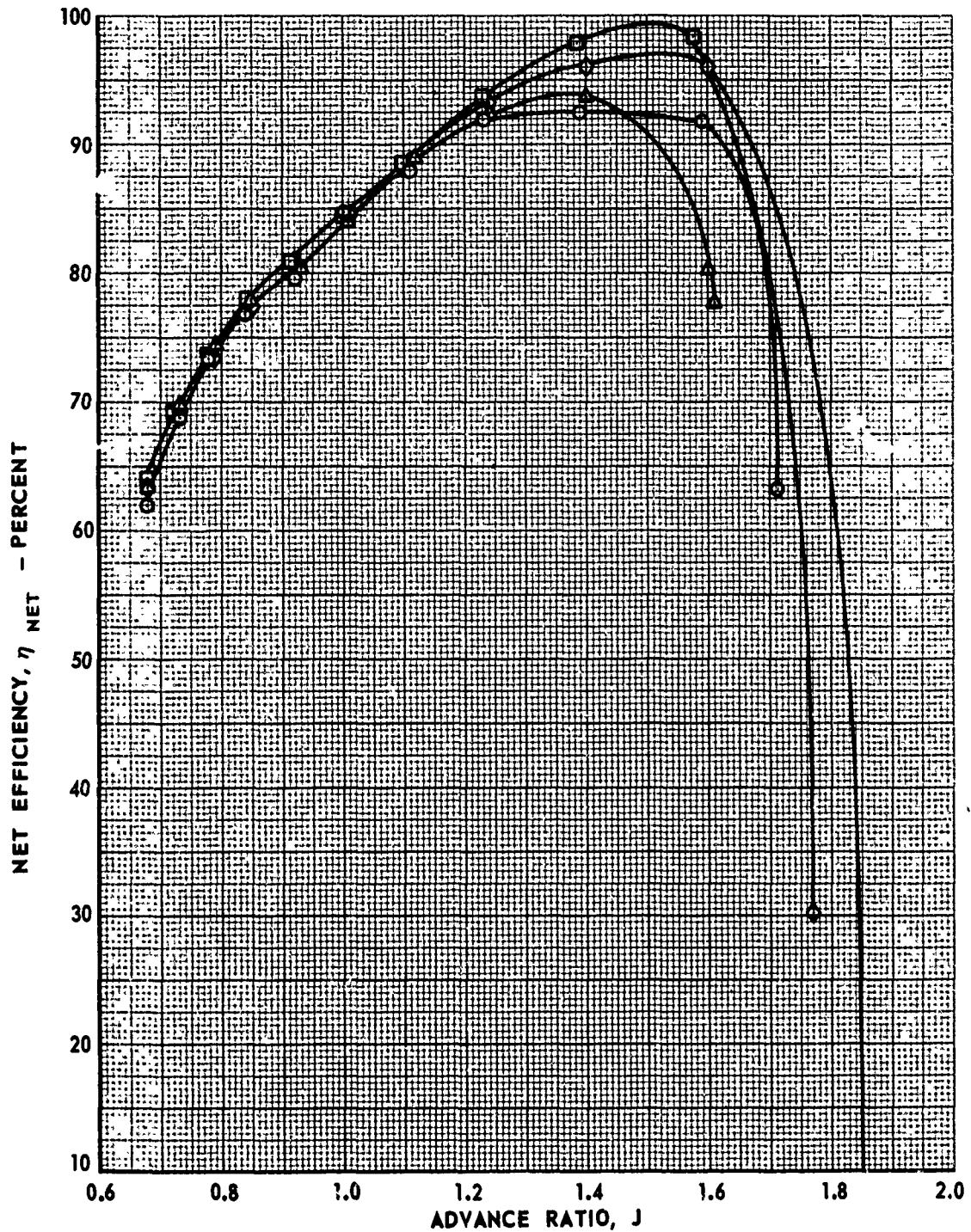
HS VG SHRQUDED PROPELLER TEST  
COMPARISON OF DATA REPEATABILITY IN THE 8-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	40	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	30.0
△	48		↓	↓
□	62		L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	28.0
◇	71		↓	↓



HS VG SHROUDED PROPELLER TEST  
COMPARISON OF DATA REPEATABILITY IN THE 8-FT TEST SECTION

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	40	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	30.0
△	48		↓	
□	62		L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	28.0
◇	71		↓	↓

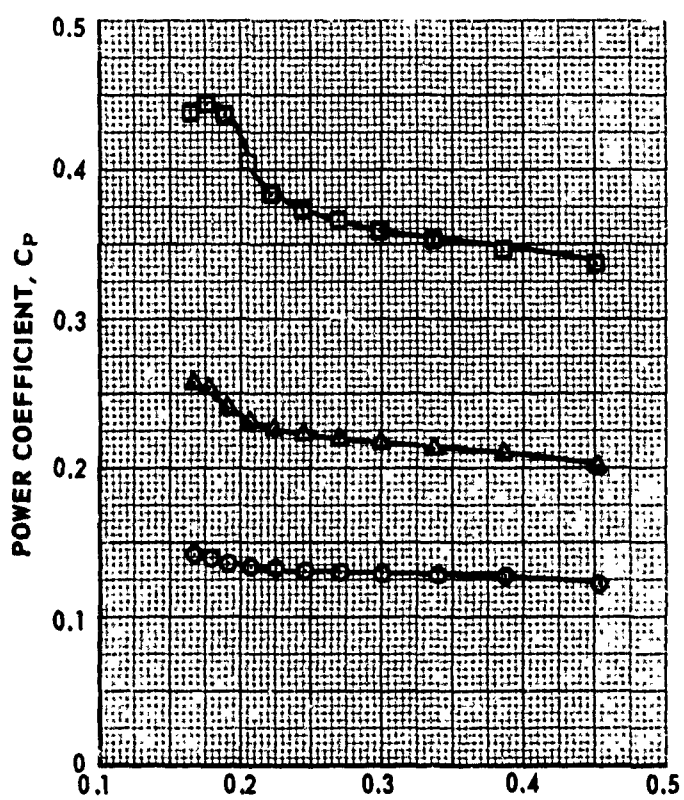
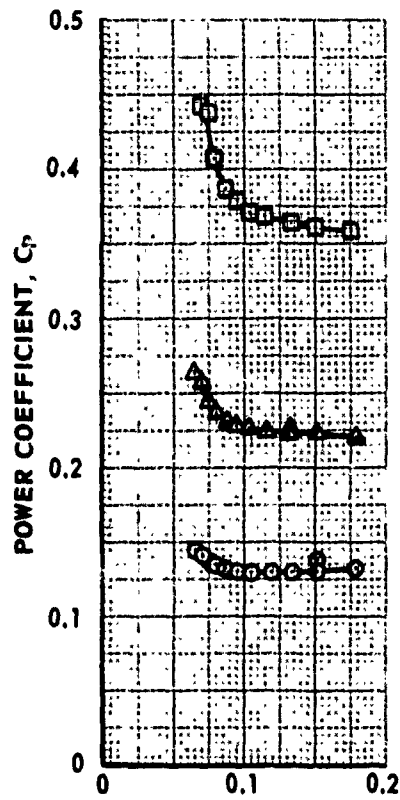
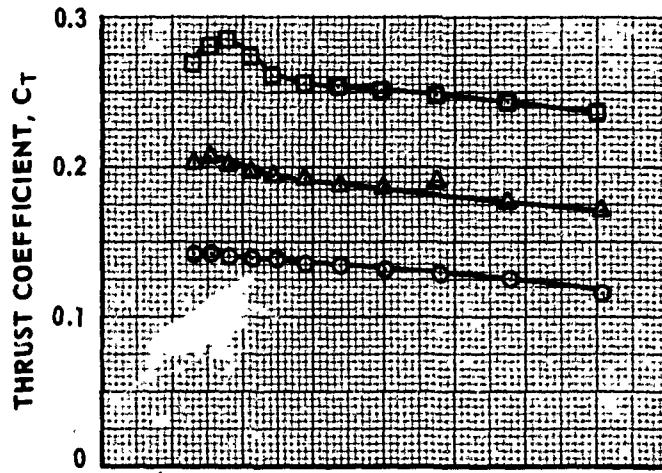
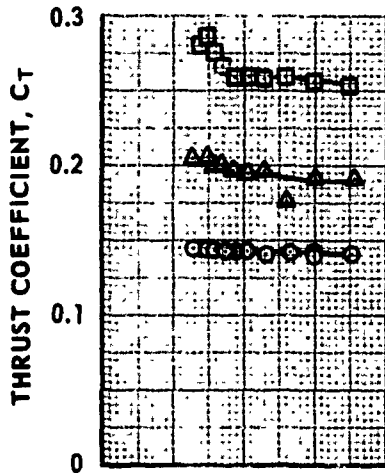


HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON LOW SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	4, 5	0.02, 0.05	$L_5 C_1 E_8 B_3 P_{WT} T_1 R_1 R_E$	22, 22
△	7, 8			29, 29
□	13, 12			36, 36

M = 0.02

M = 0.05

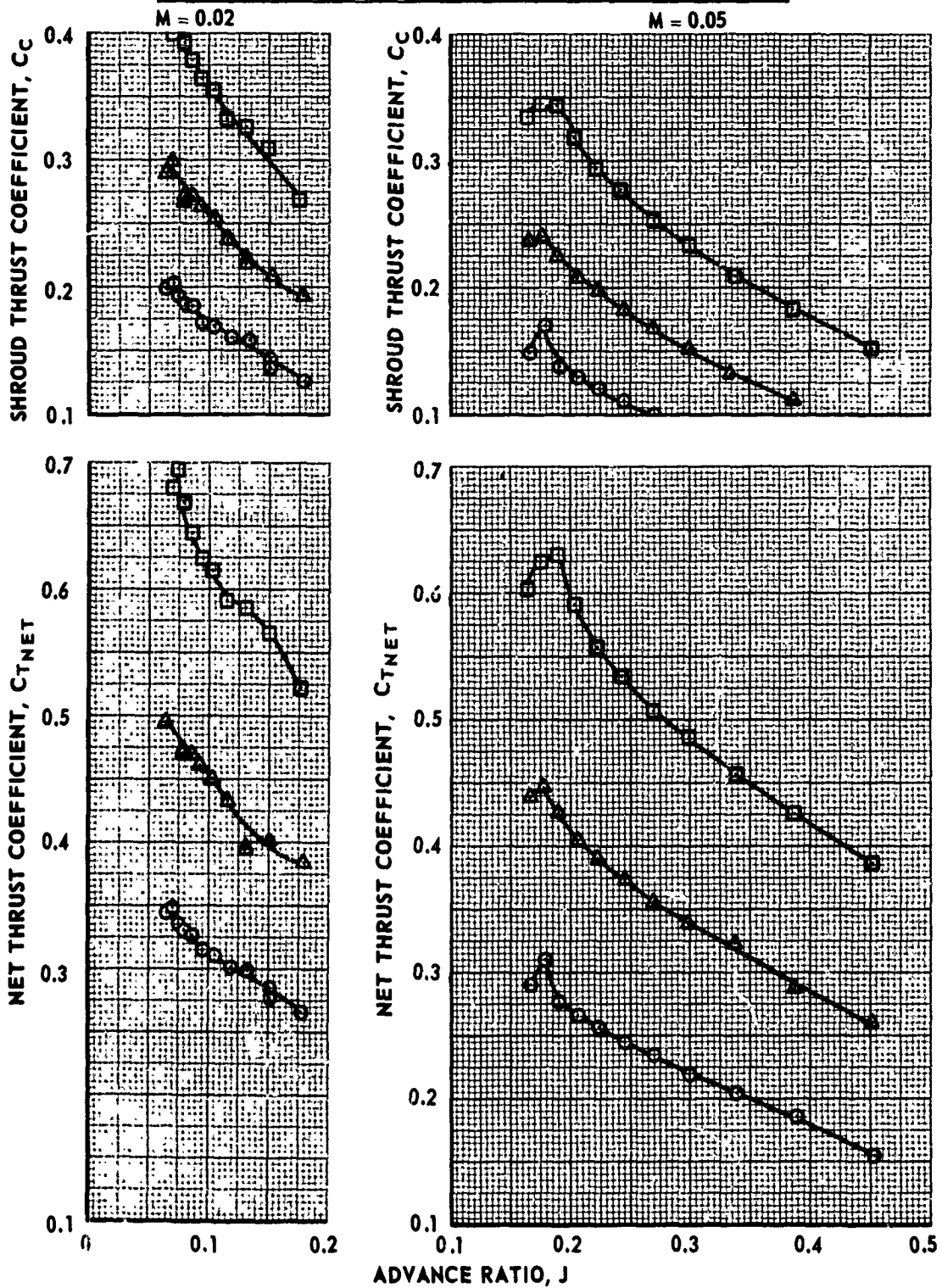


ADVANCE RATIO, J

### HS VG SHROUDED PROPELLER TEST

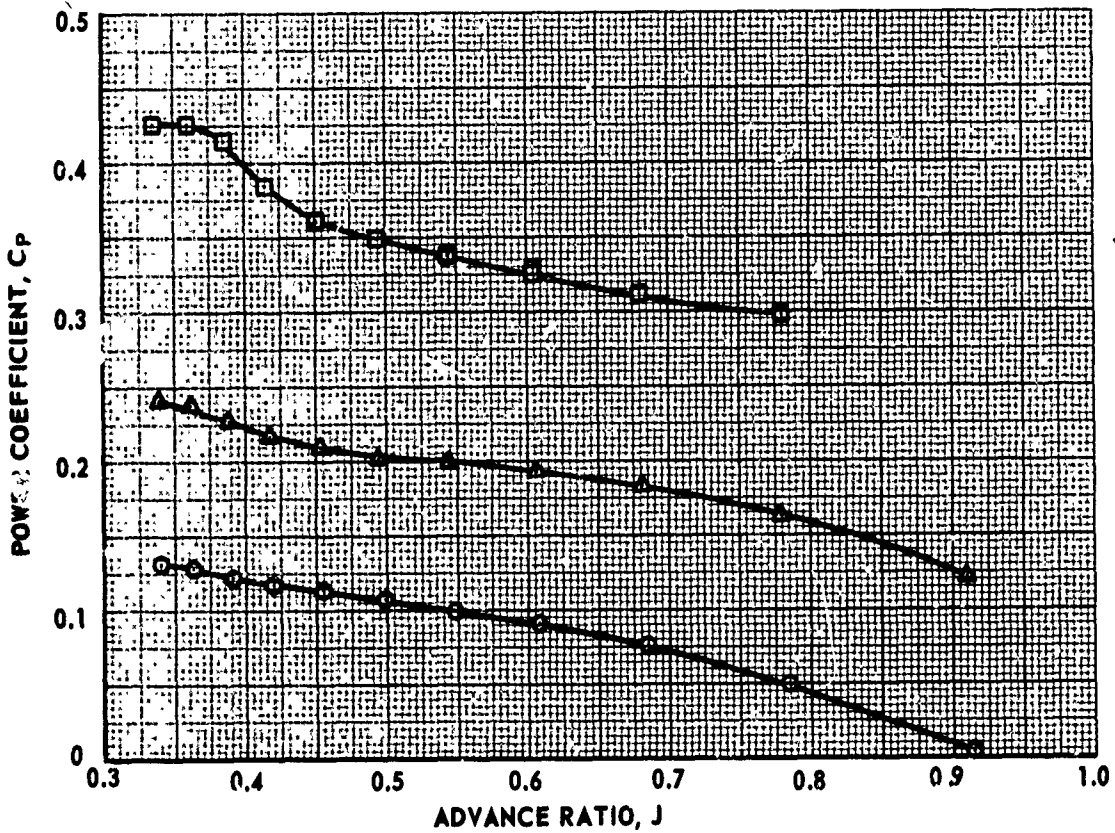
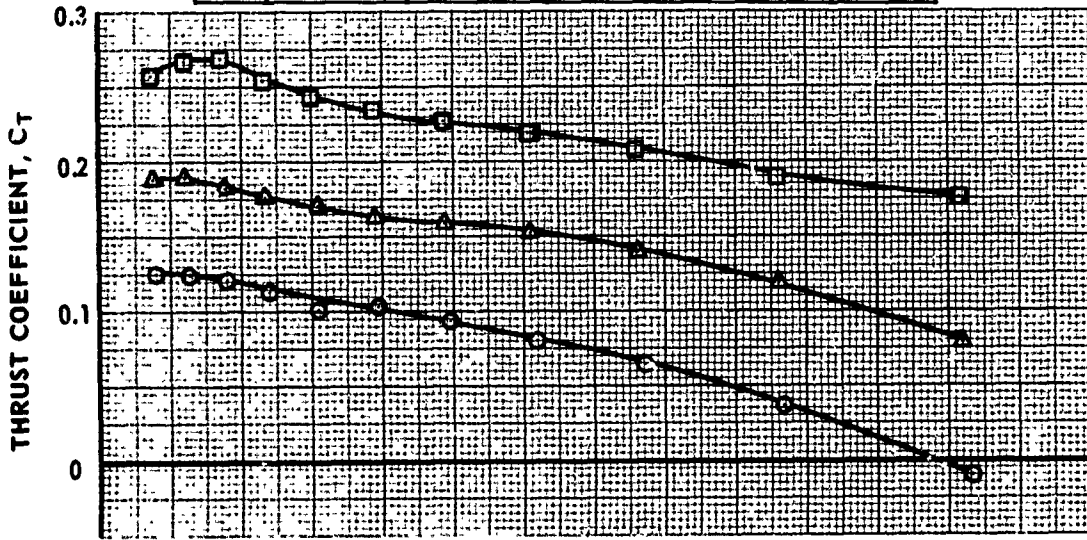
#### EFFECT OF BLADE ANGLE ON LOW SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	4, 5	0.02, 0.05	$L_5 C_1 E_8 B_3 P_{WT} T_1 R_1 R E$	22, 22
△	7, 8			29, 29
□	13, 12			36, 36

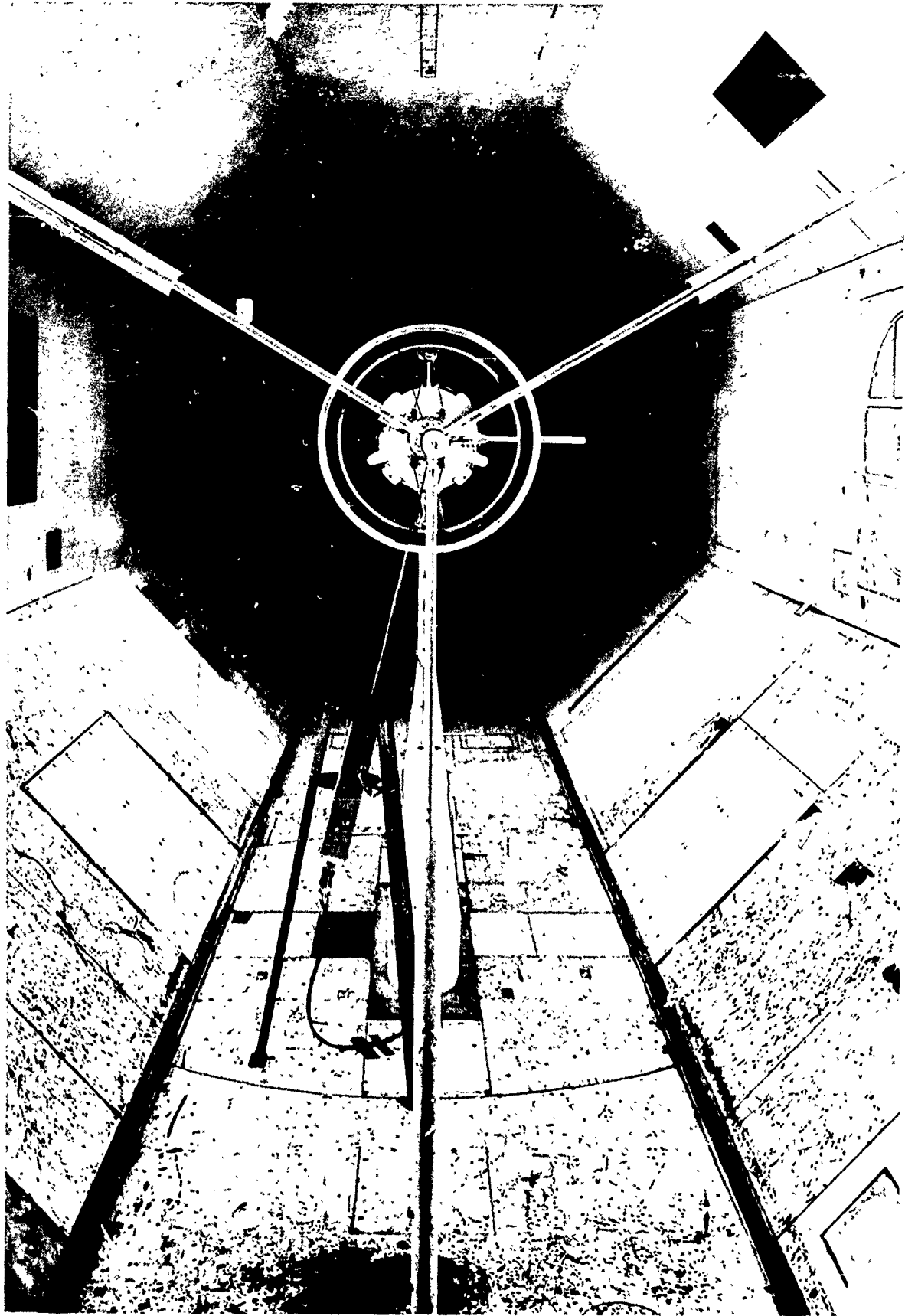


HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON LOW SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	6	0.10	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	22.0
△	9			29.0
□	11			36.0

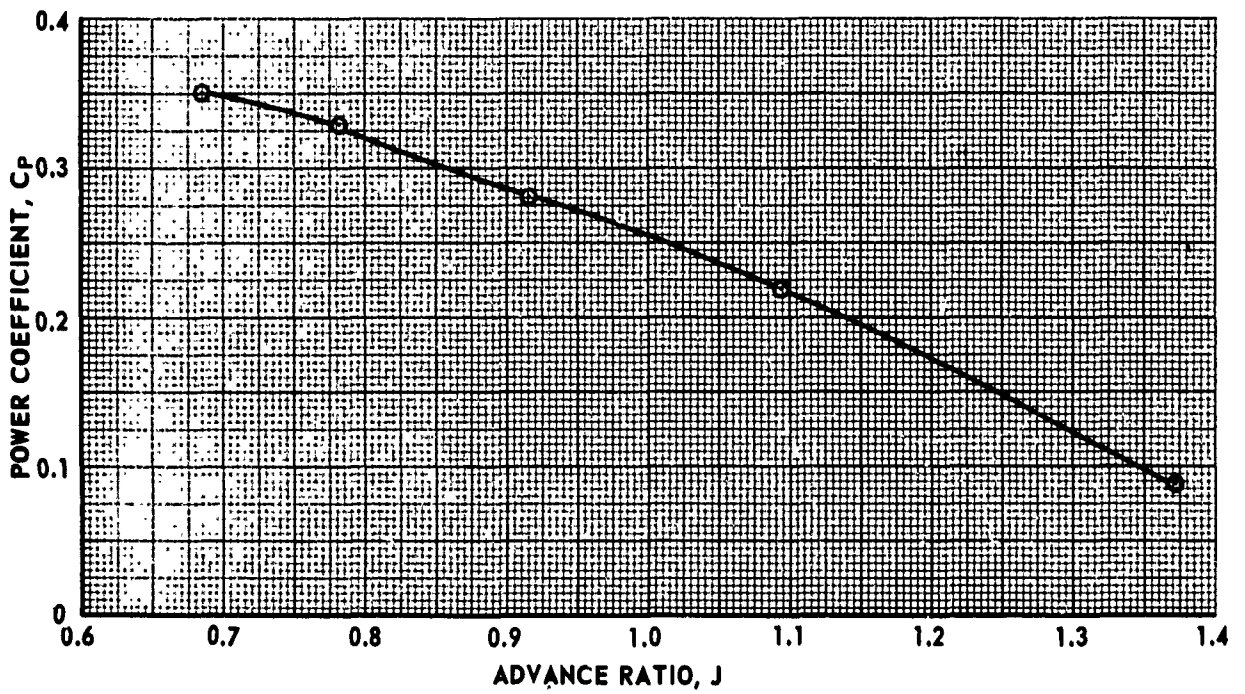
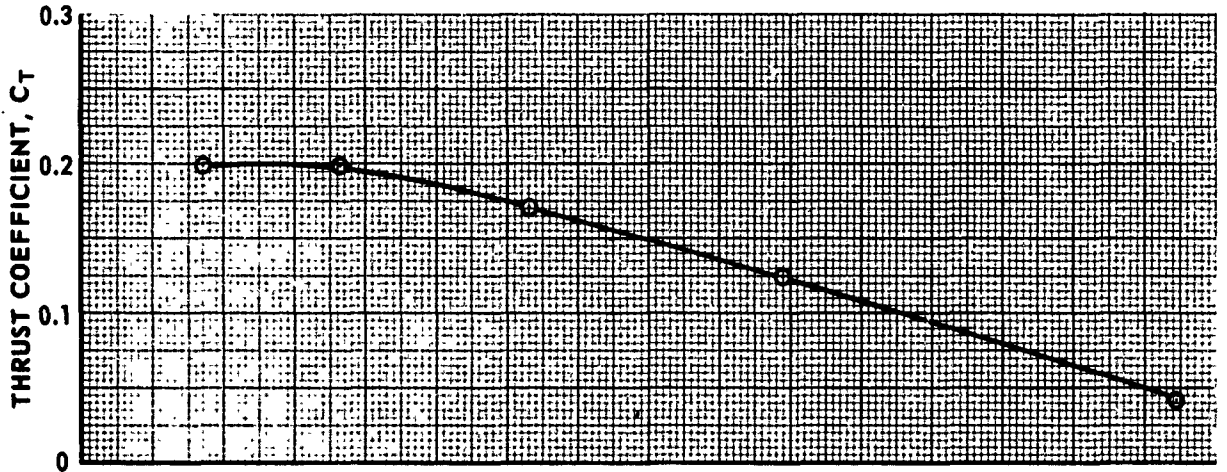


HS VG SHROUDED PROPELLER TEST  
MODEL PROPELLER TEST DYNAMOMETER INSTALLED IN 18-FT TEST SECTION  
VIEW LOOKING DOWNSTREAM



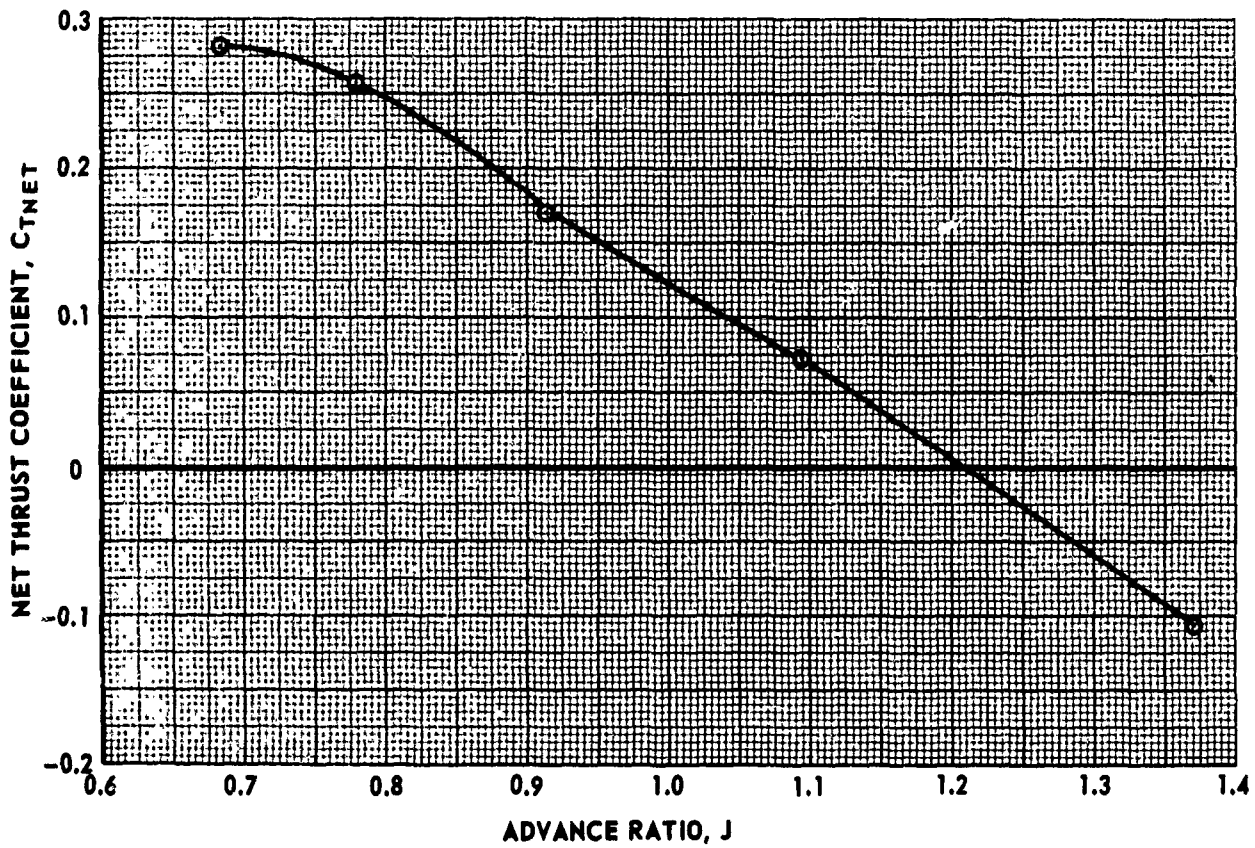
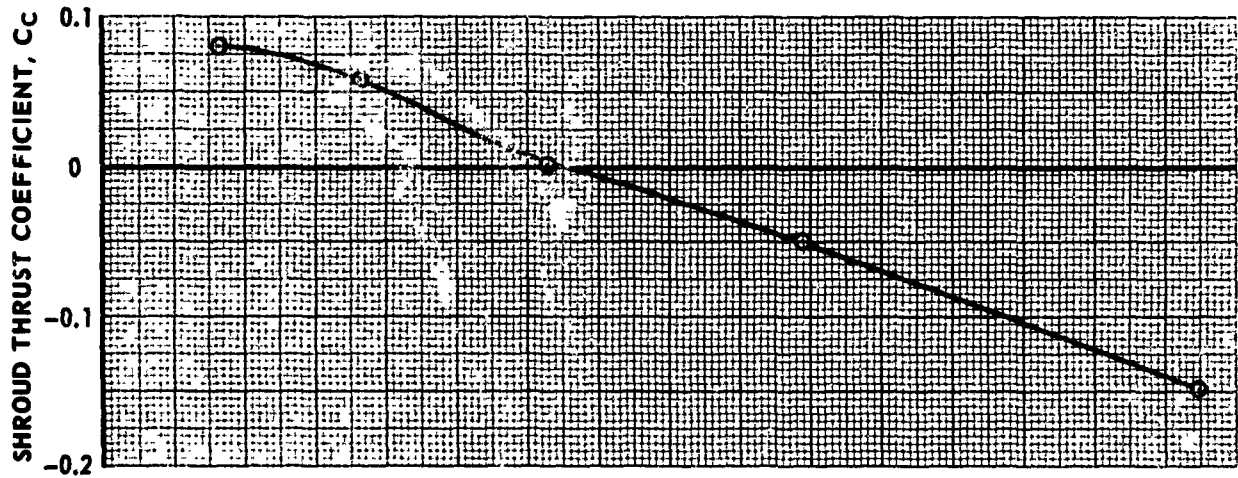
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON LOW SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
⊙	14	0.20	$L_5 C_1 E_8 B_3 P_{WT} T_1 R_1 R_E$	36.0



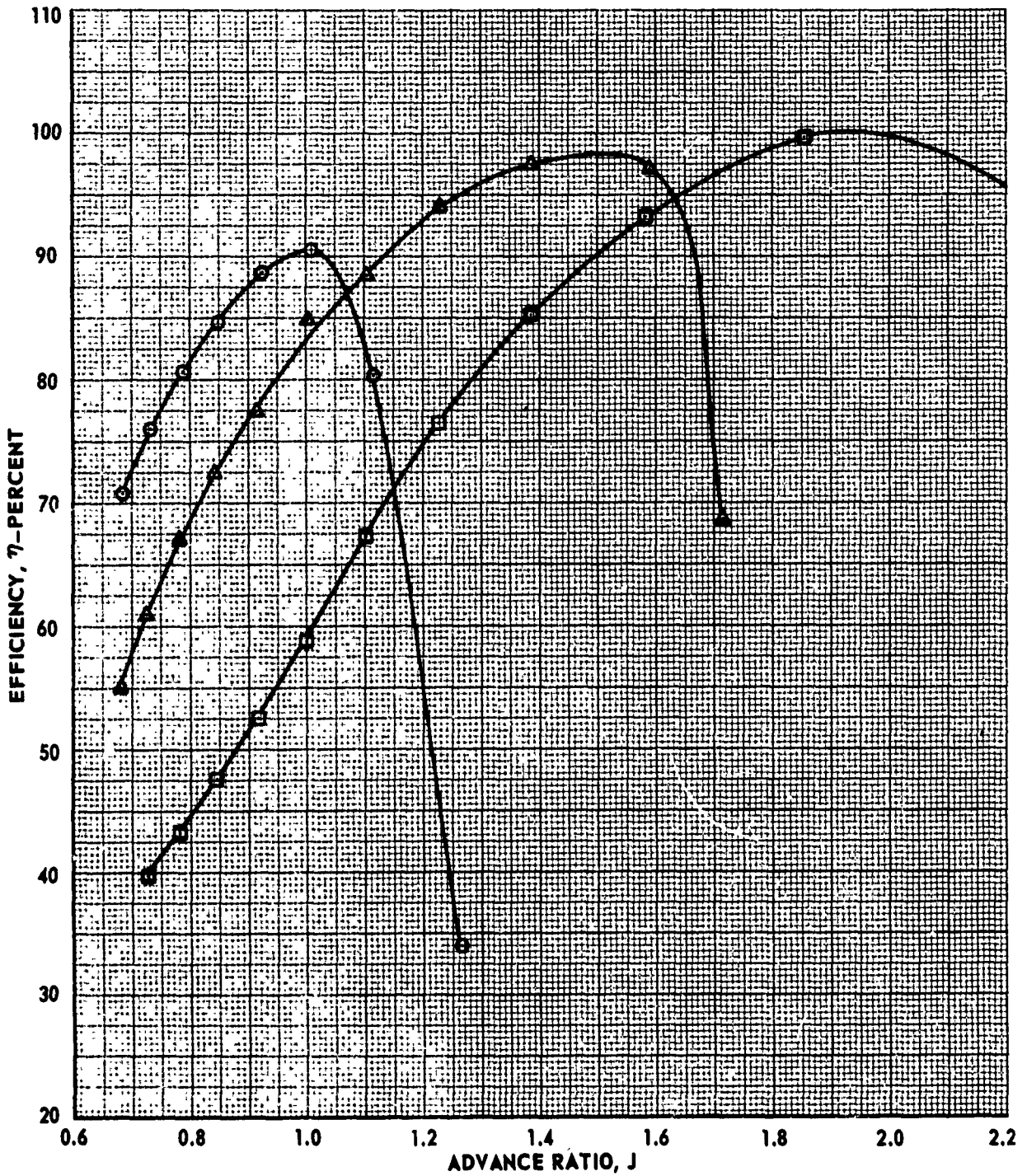
**HS VG SHROUDED PROPELLER TEST**  
**EFFECT OF BLADE ANGLE ON LOW SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	14	0.20	$L_5 C_1 E_8 B_3 P_{WT} T_1 R_1 R_E$	36.0



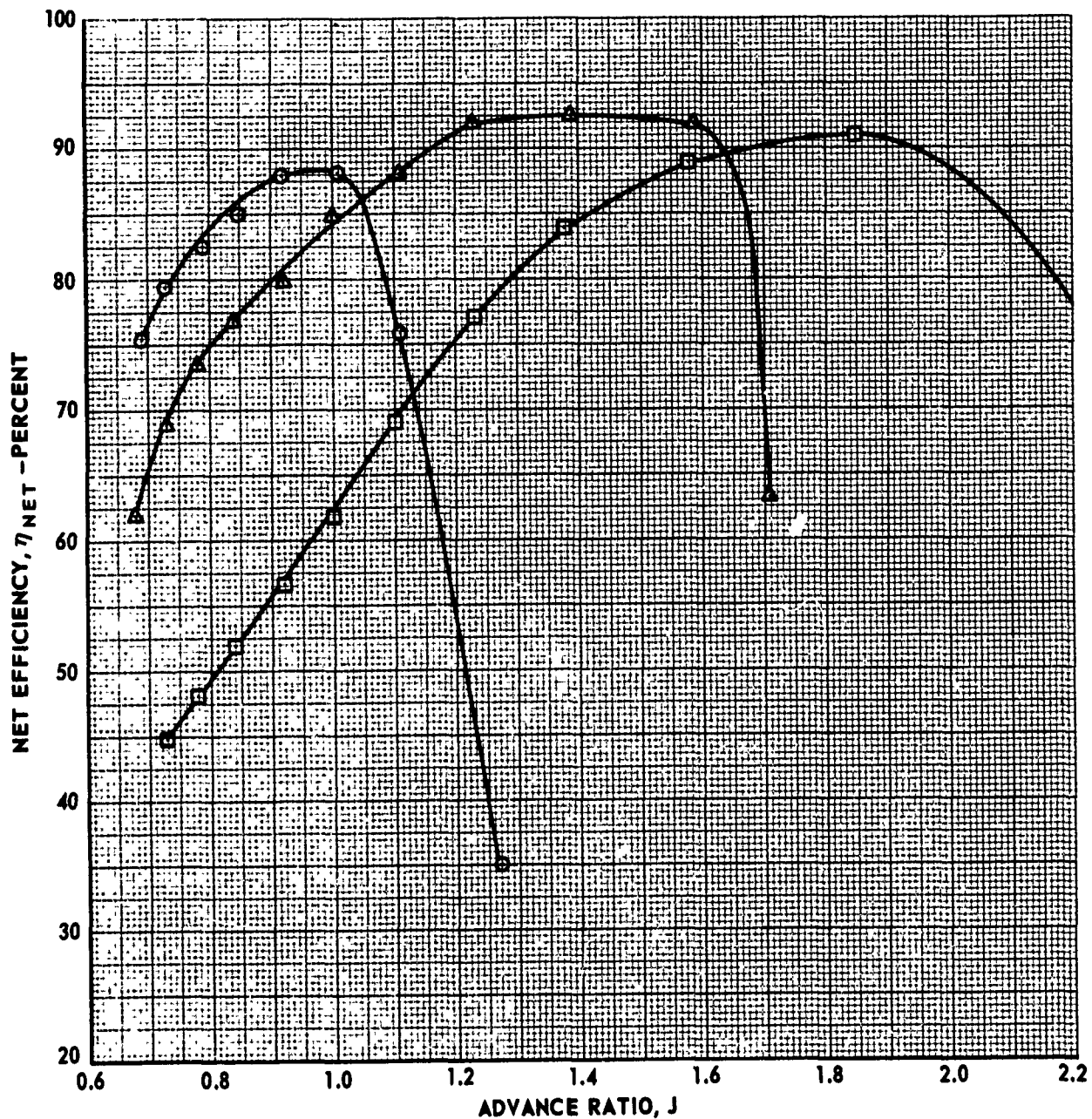
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	39	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	22.0
△	40			30.0
□	42			40.0



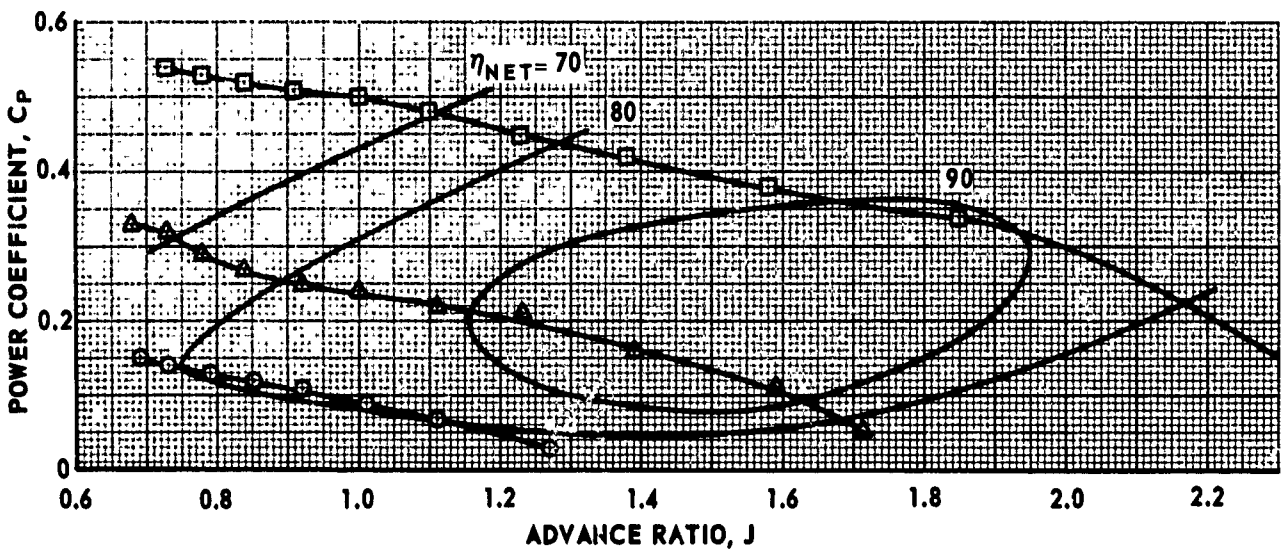
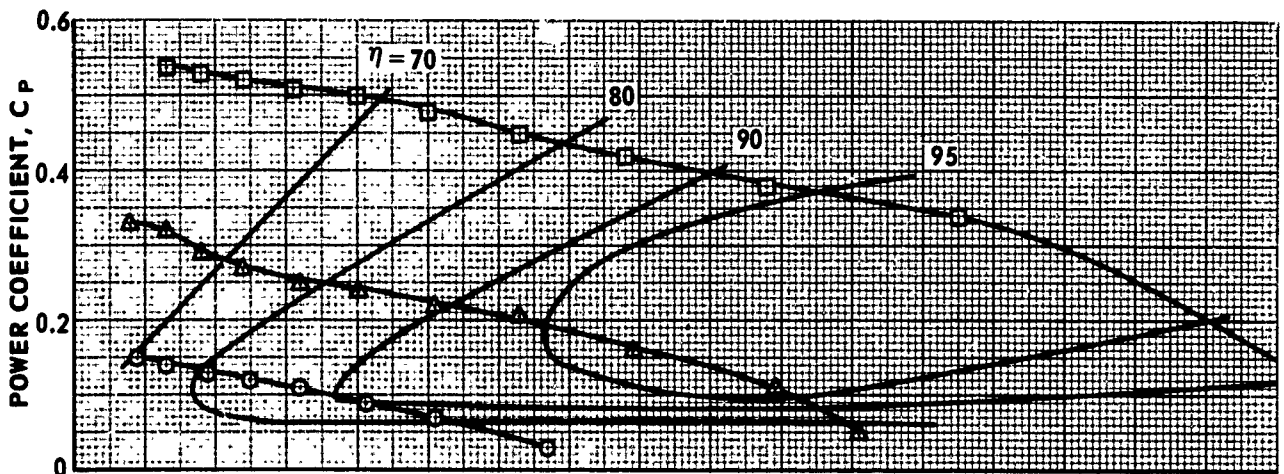
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	39	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	22.0
△	40	↓	↓	30.0
□	42	↓	↓	40.0



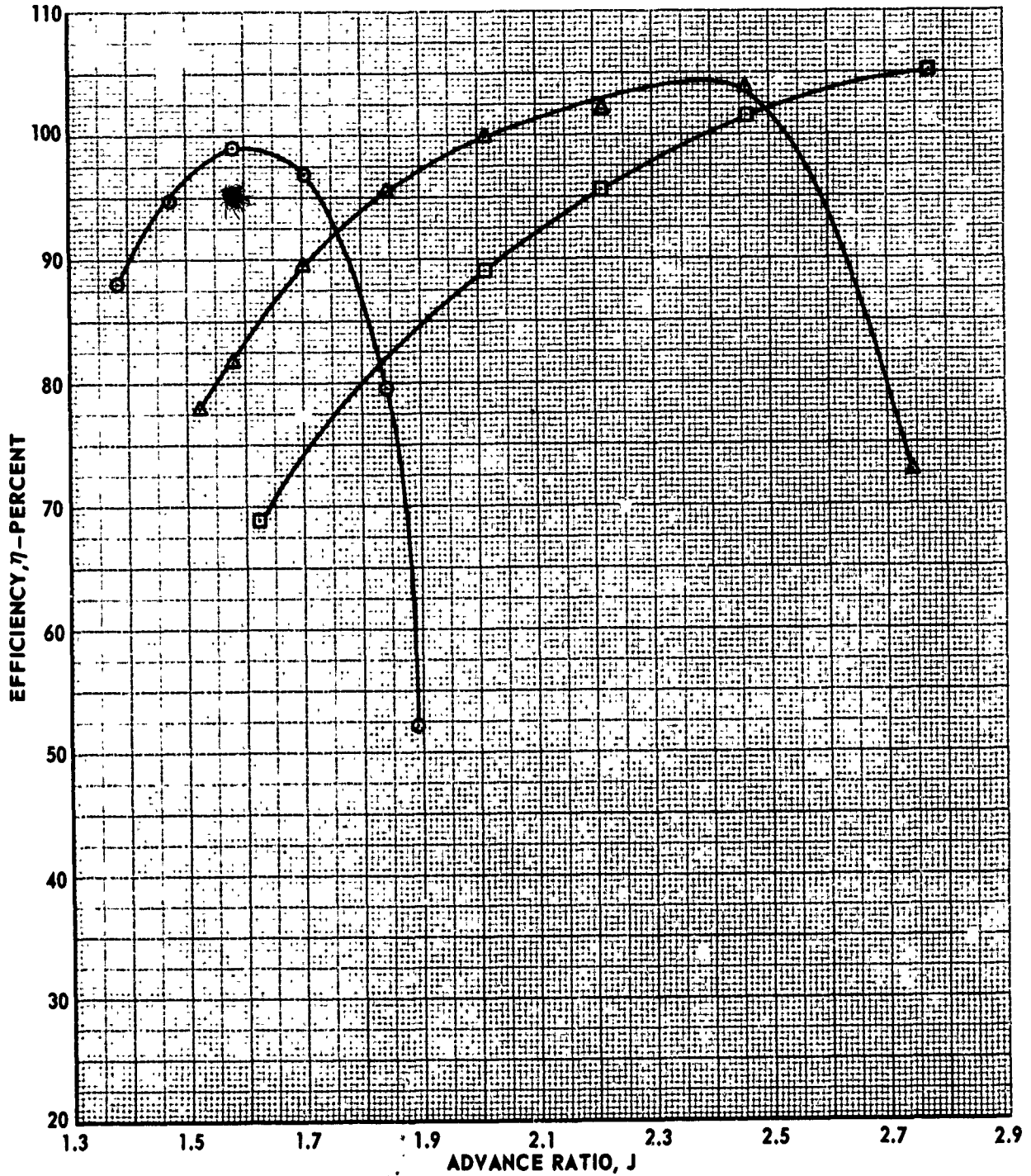
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	39	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	22.0
△	40			30.0
□	42			40.0



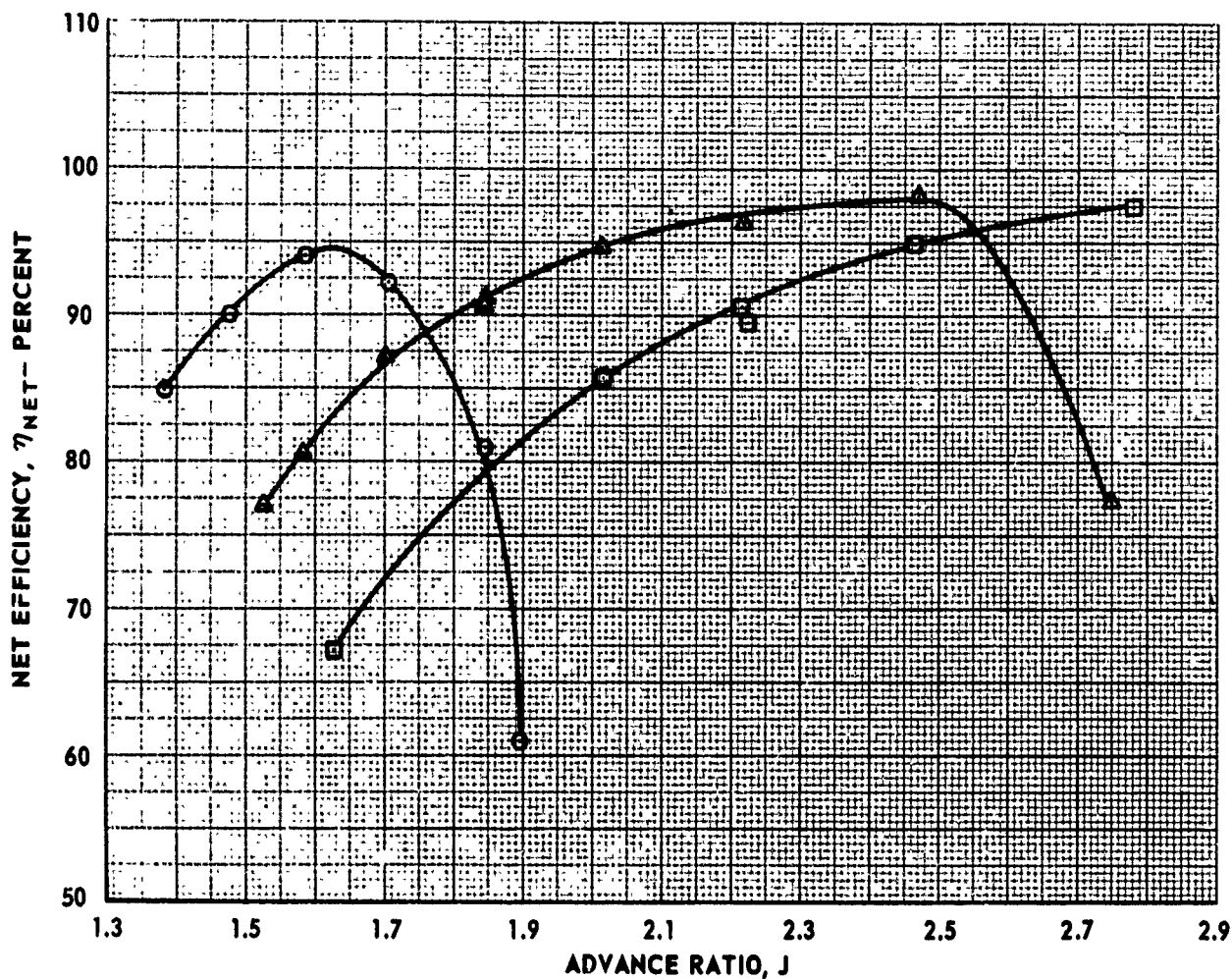
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	41	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	32.0
△	43			43.0
□	45			49.0



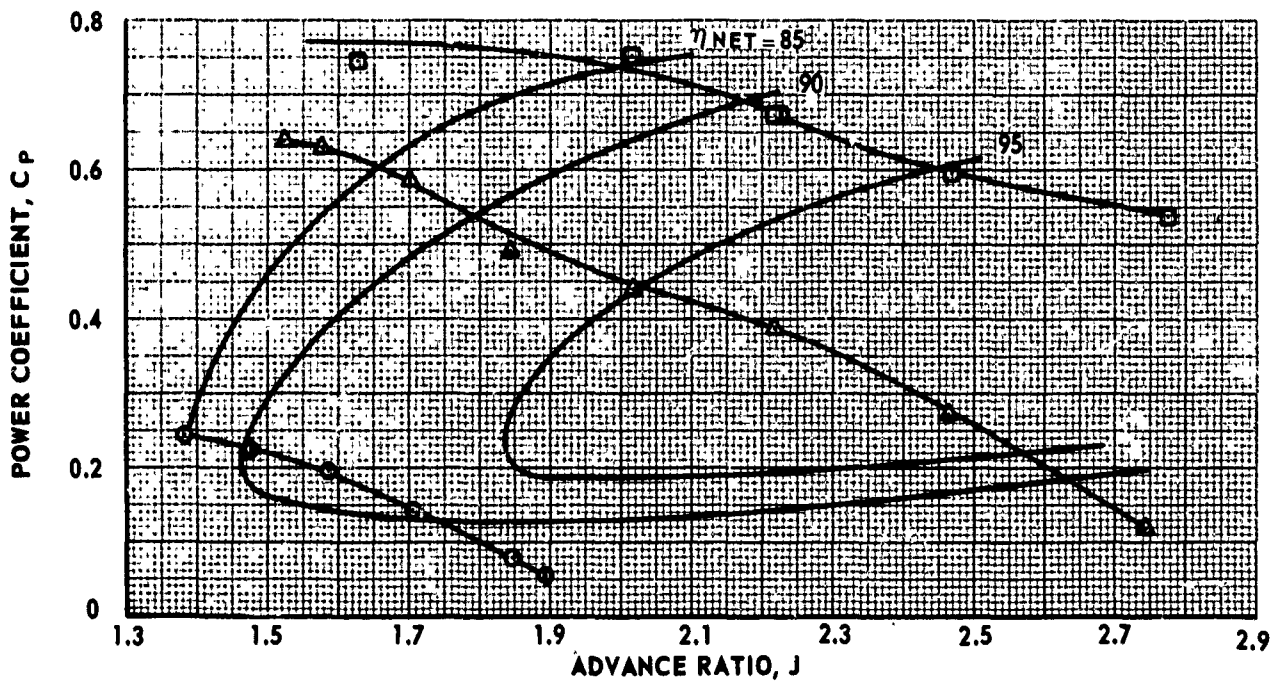
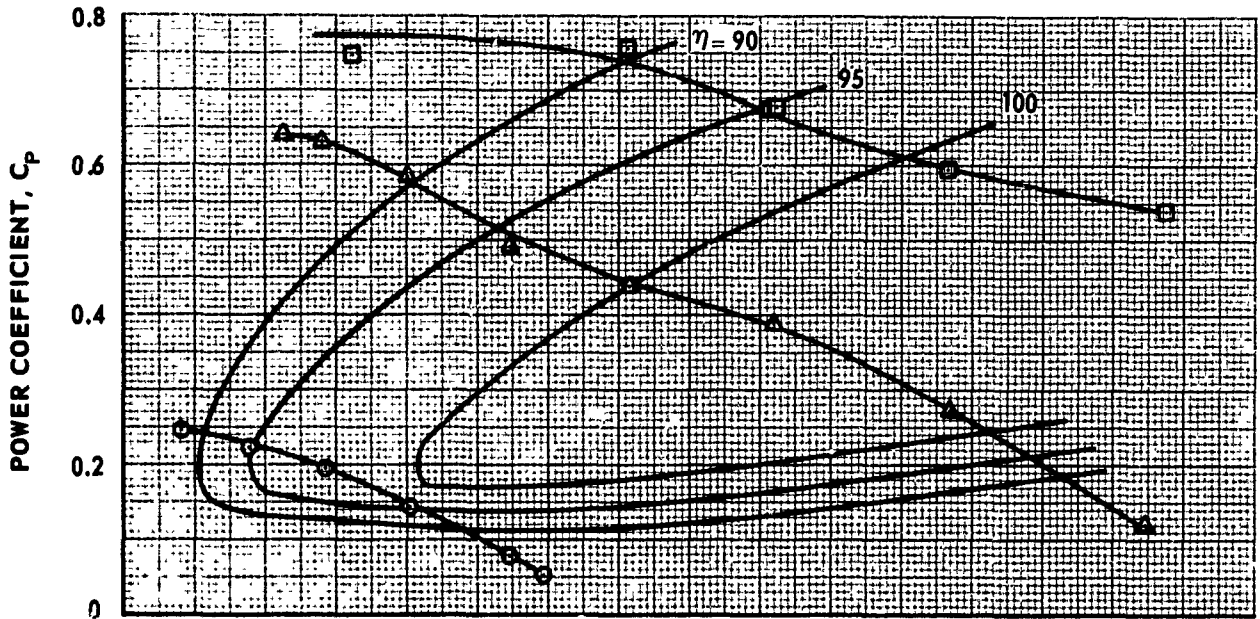
**HS VG SHROUDED PROPELLER TEST**  
**EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
⊙	41	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> F <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	32.0
△	43	↓	↓	43.0
□	45	↓	↓	49.0



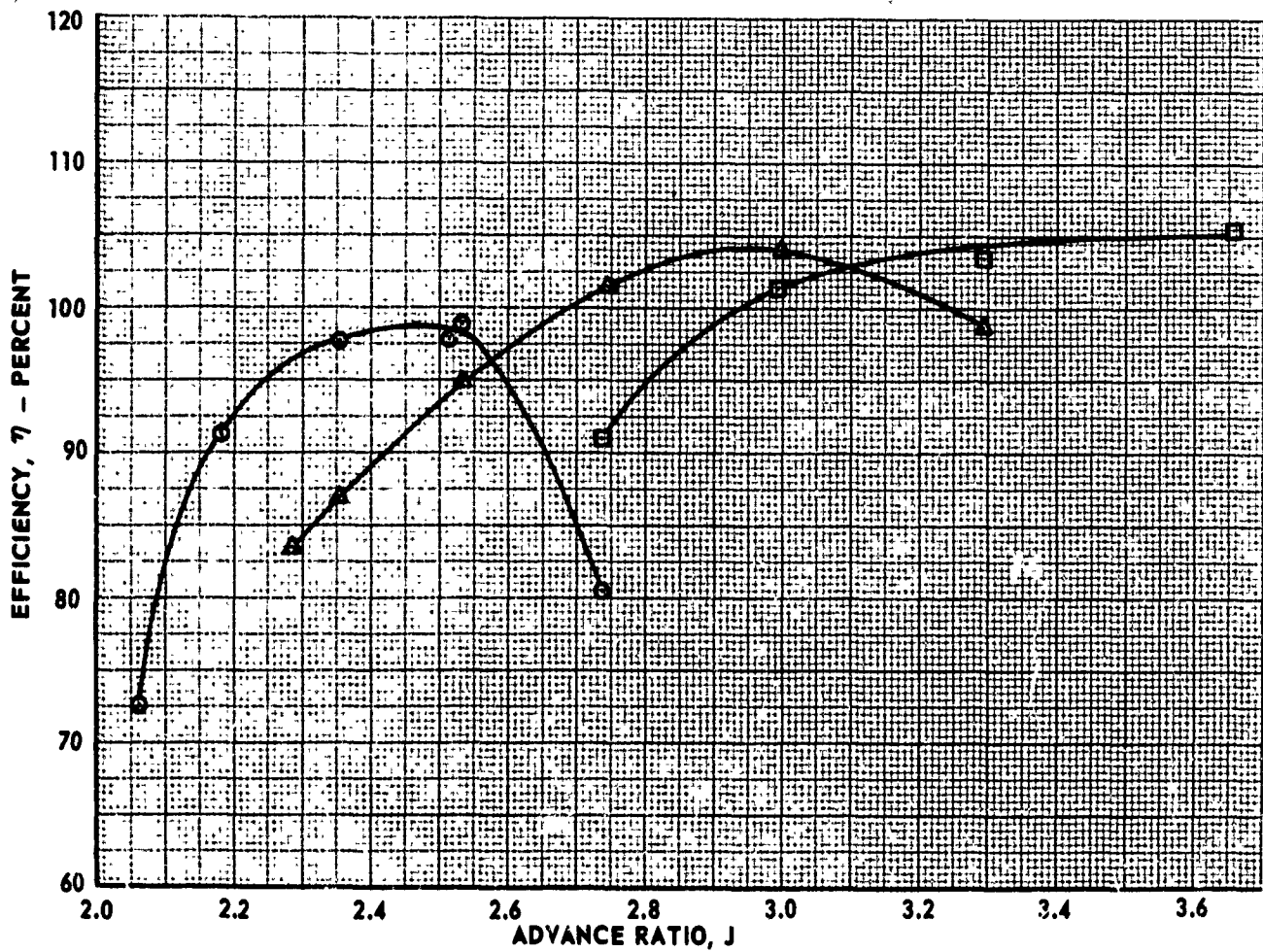
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	41	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	32.0
△	43			43.0
□	45			49.0



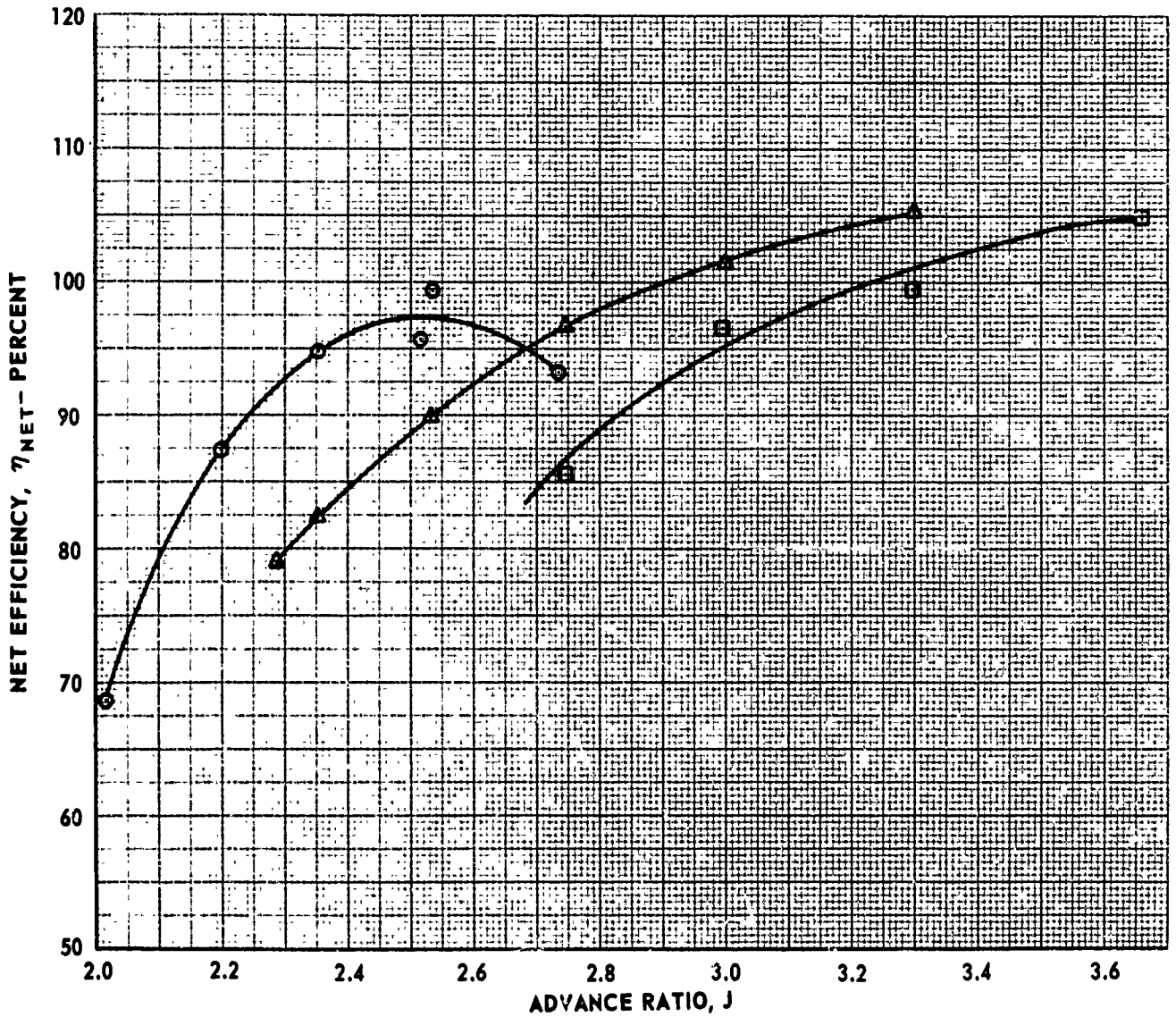
**HS VG SHROUDED PROPELLER TEST**  
**EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	44	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	43.0
△	46	↓		49.0
□	47	↓		54.0



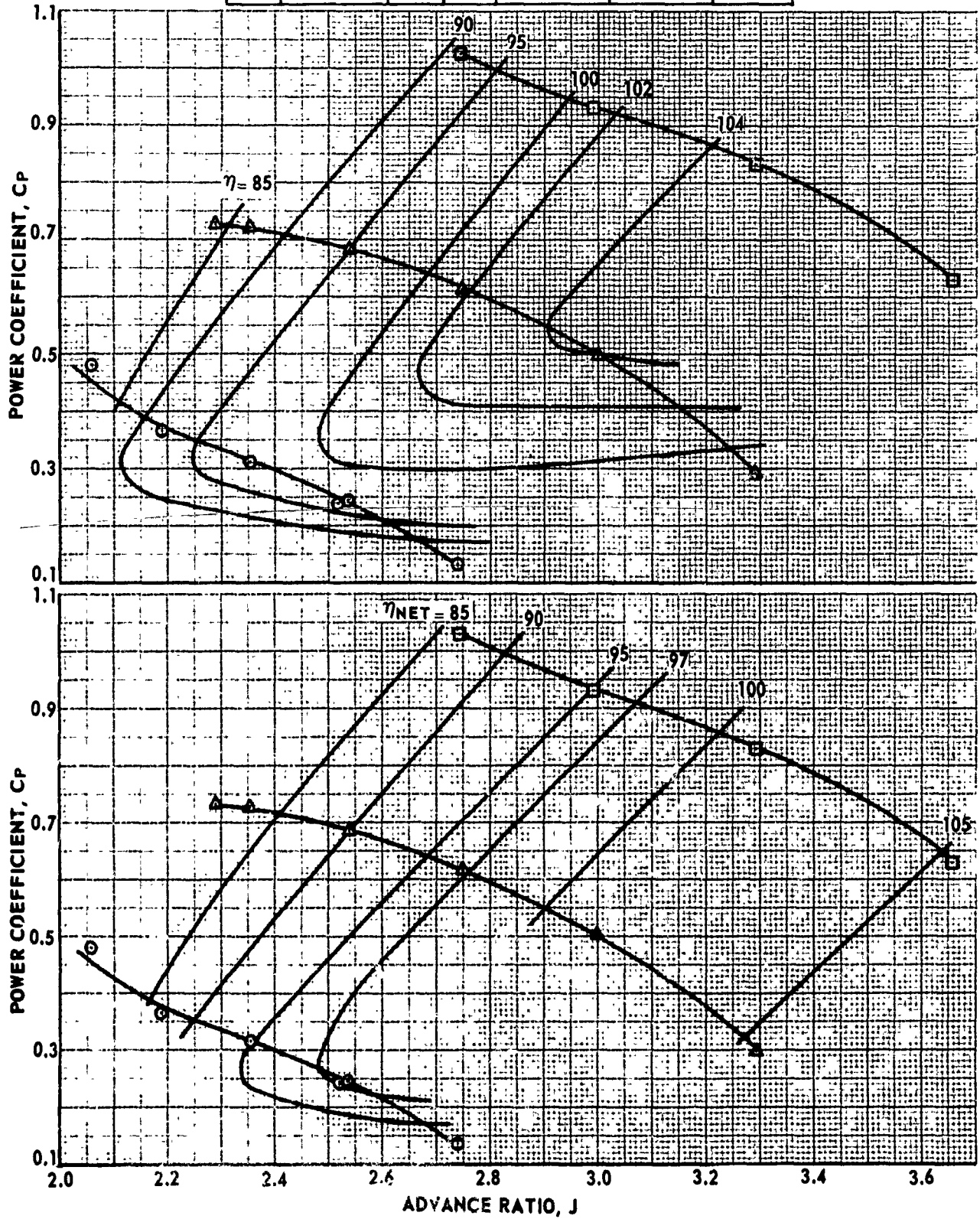
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	44	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	43.0
△	46	↓		49.0
□	47	↓		54.0



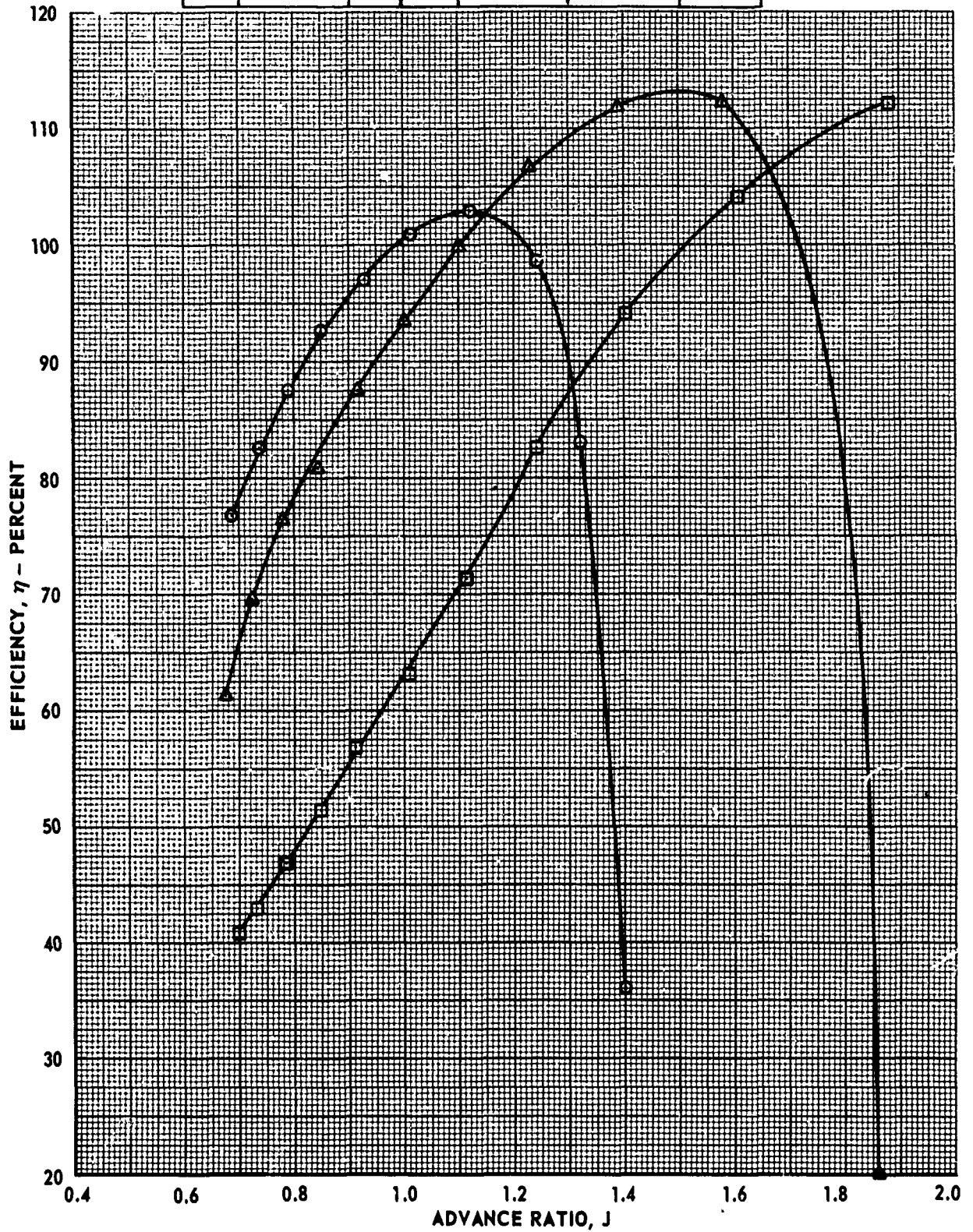
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE ANGLE ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	44	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R E	43.0
△	46			49.0
□	47			54.0



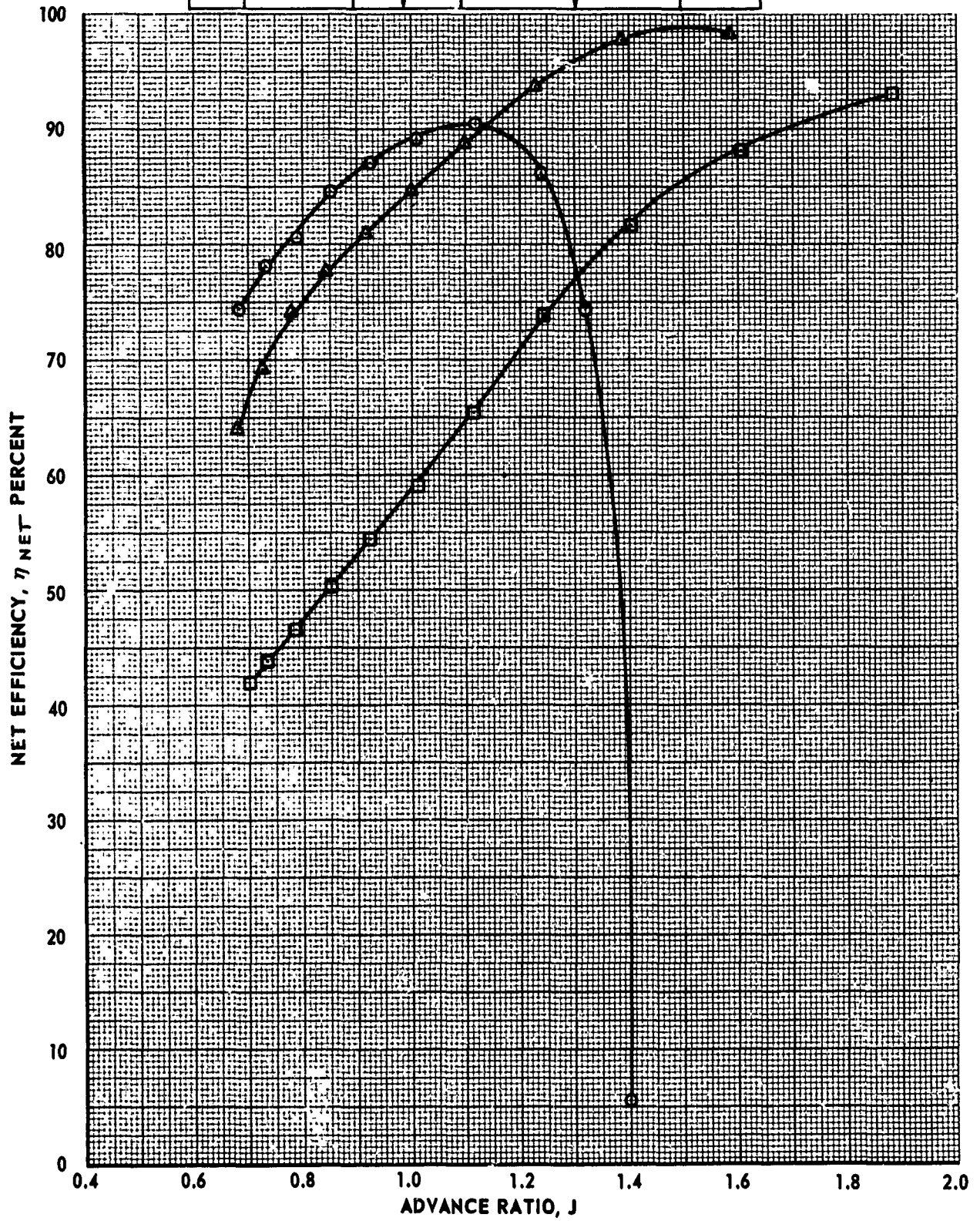
HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER  $E_6$  ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	61	0.20	$L_4 C_1 E_6 B_3 P_{NT} T_2 R_1 R_E$	22.0
△	62			28.0
□	70			38.0



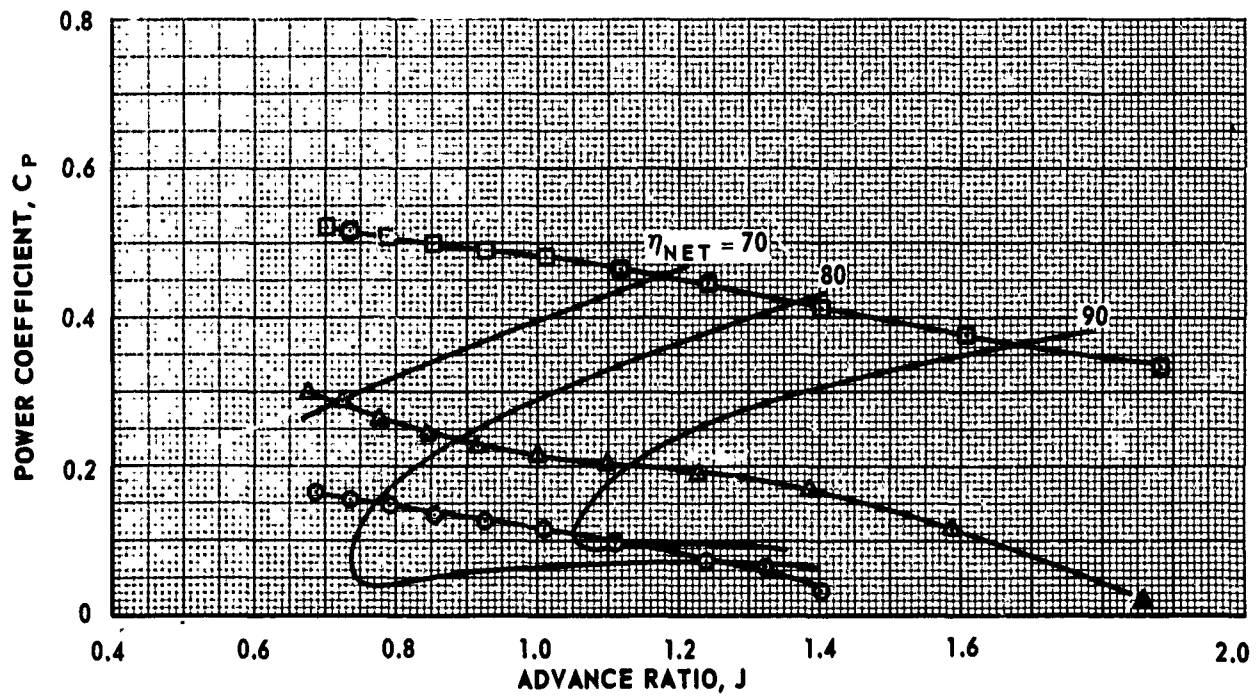
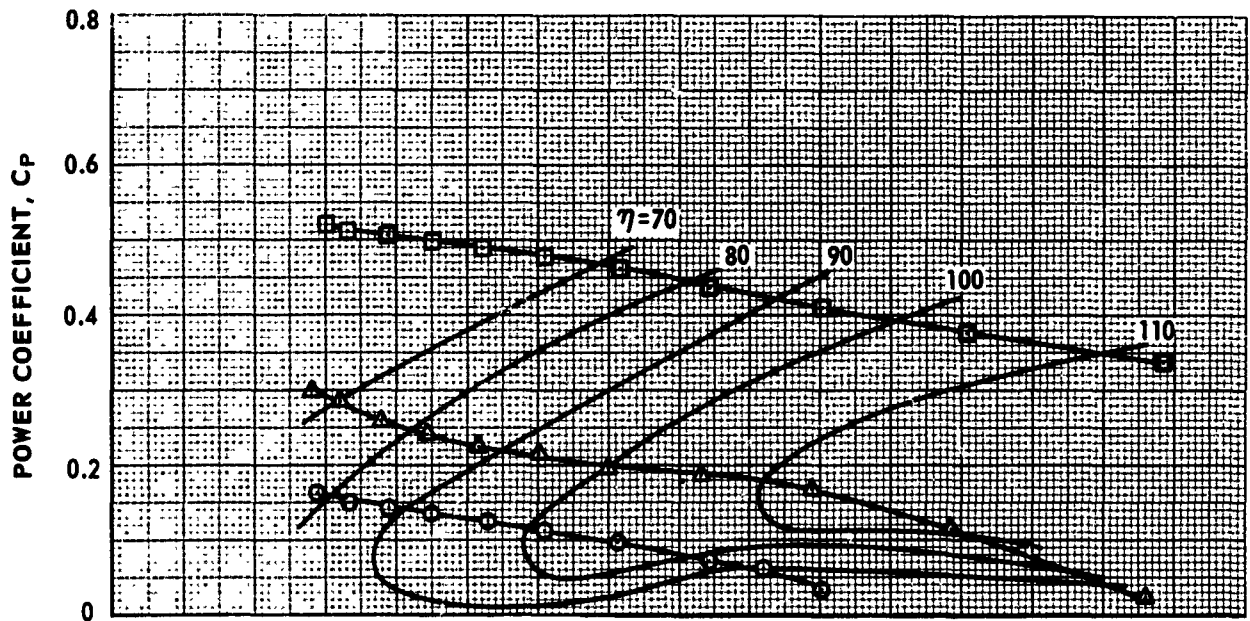
HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER  $E_6$  ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	61	0.20	$L_4 C_1 E_6 B_3 P_{NT} T_2 R_1 R_E$	22.0
△	62			28.0
□	70			38.0



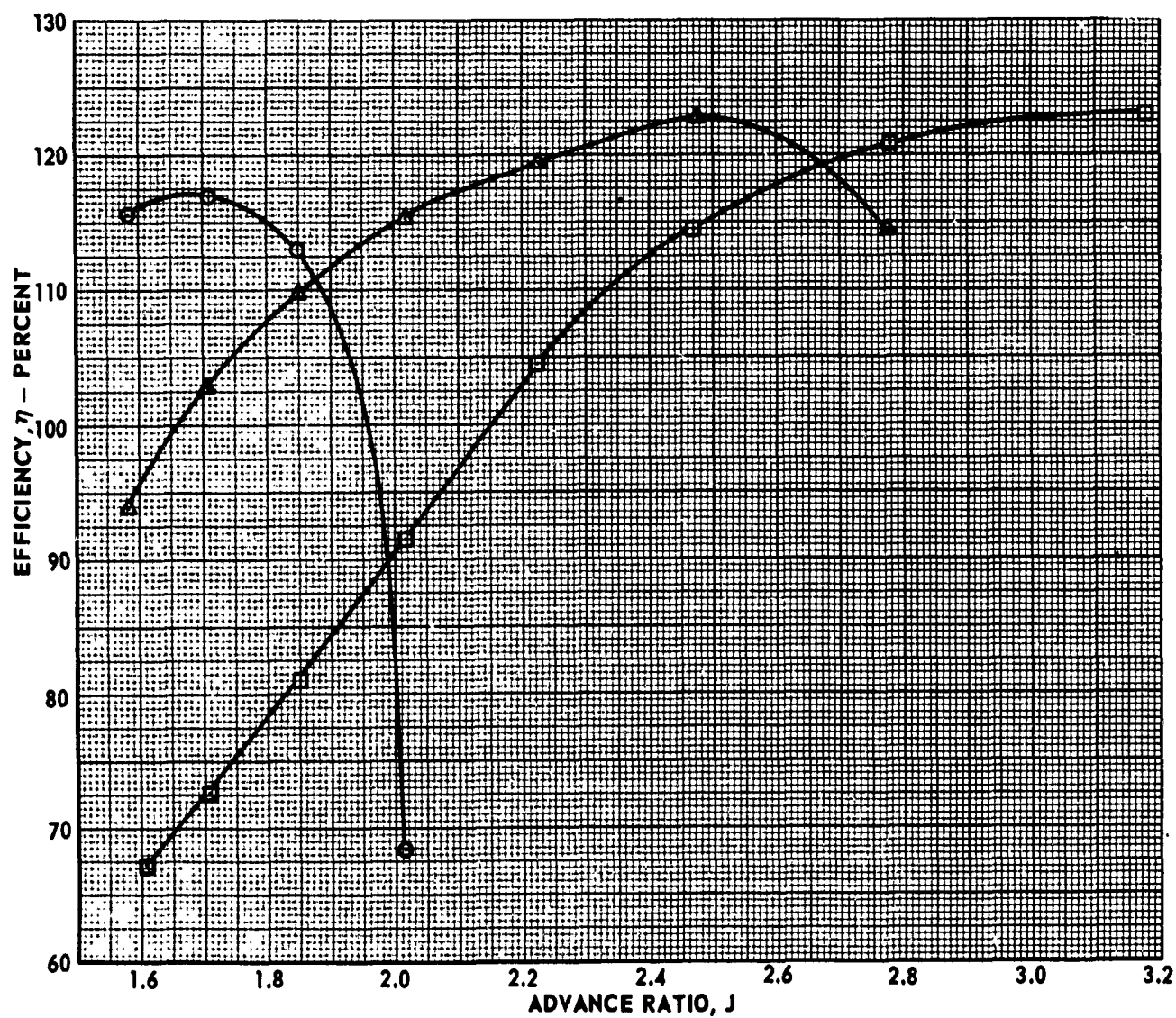
HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER E<sub>6</sub> ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	61	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	22.0
△	62			28.0
□	70			38.0



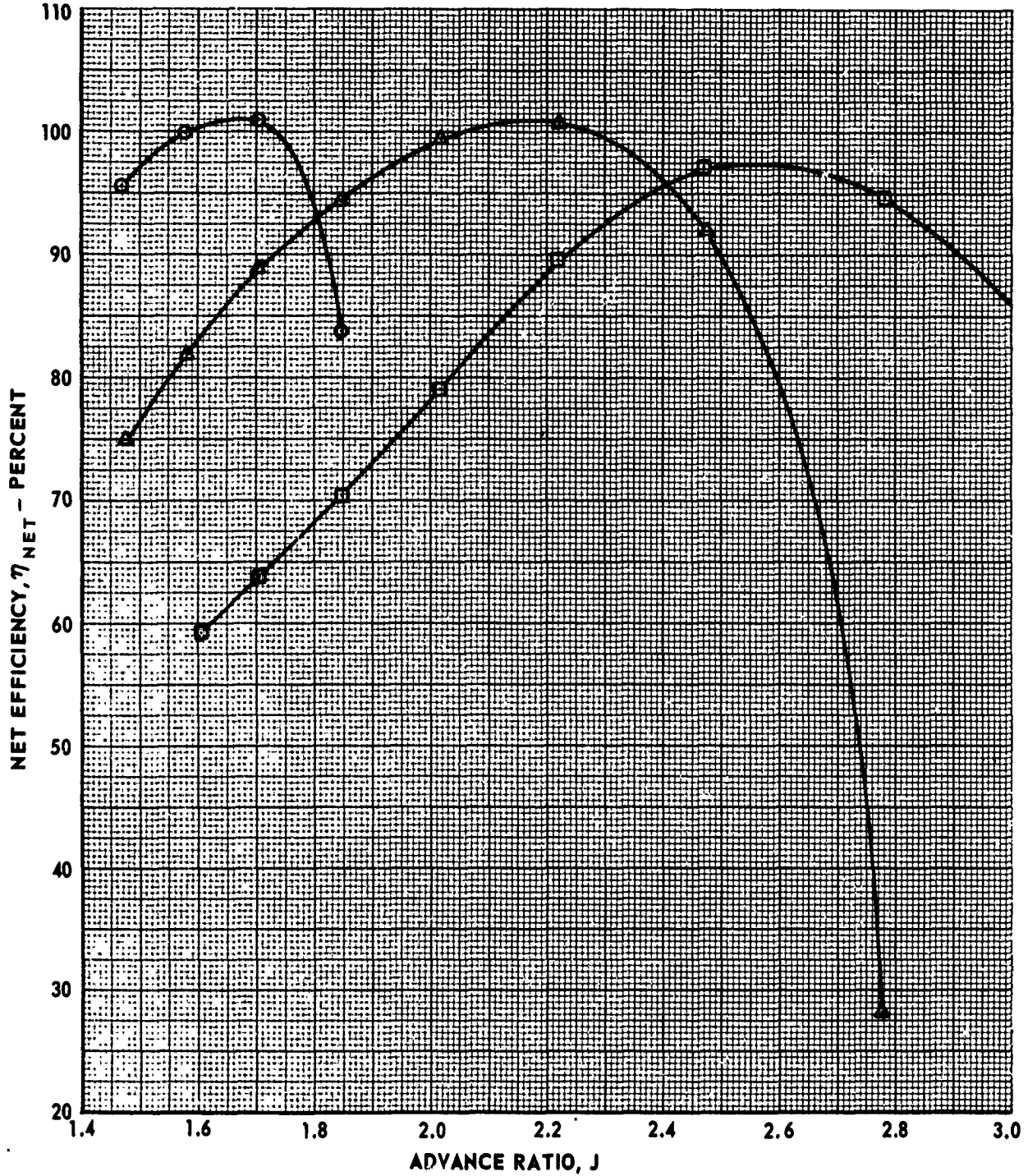
HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER E<sub>6</sub> ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
⊙	63	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	30.0
△	64			41.0
□	66			47.0



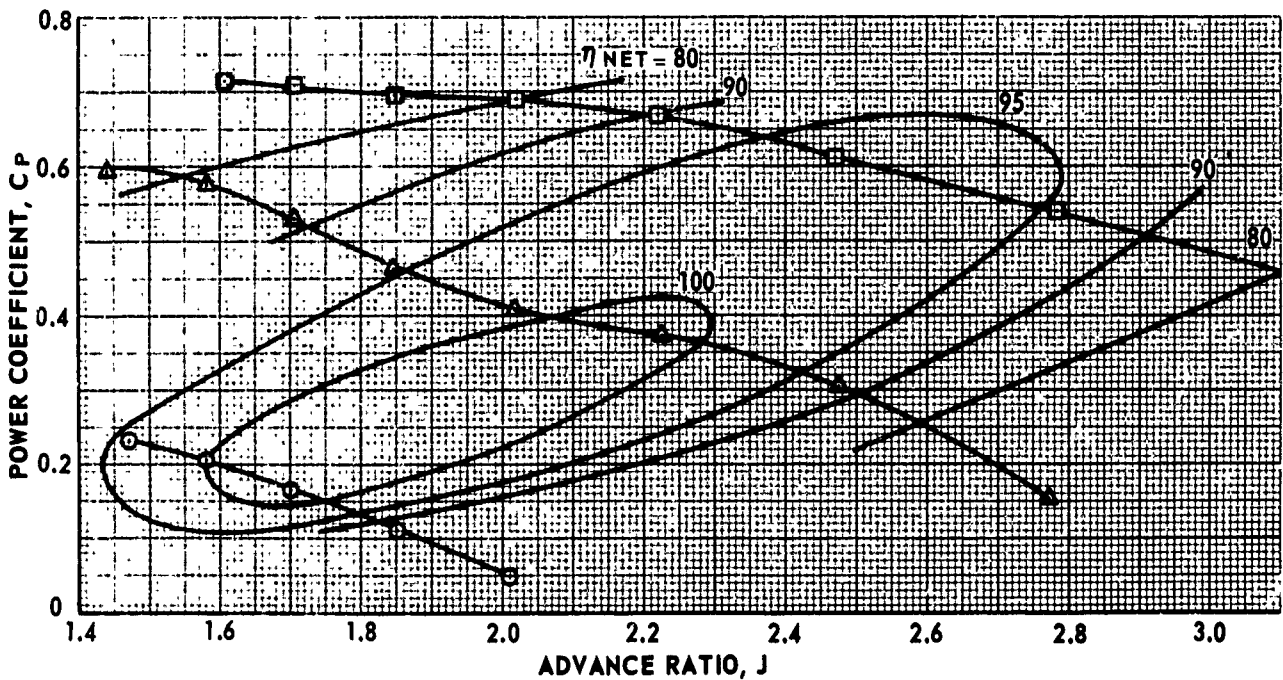
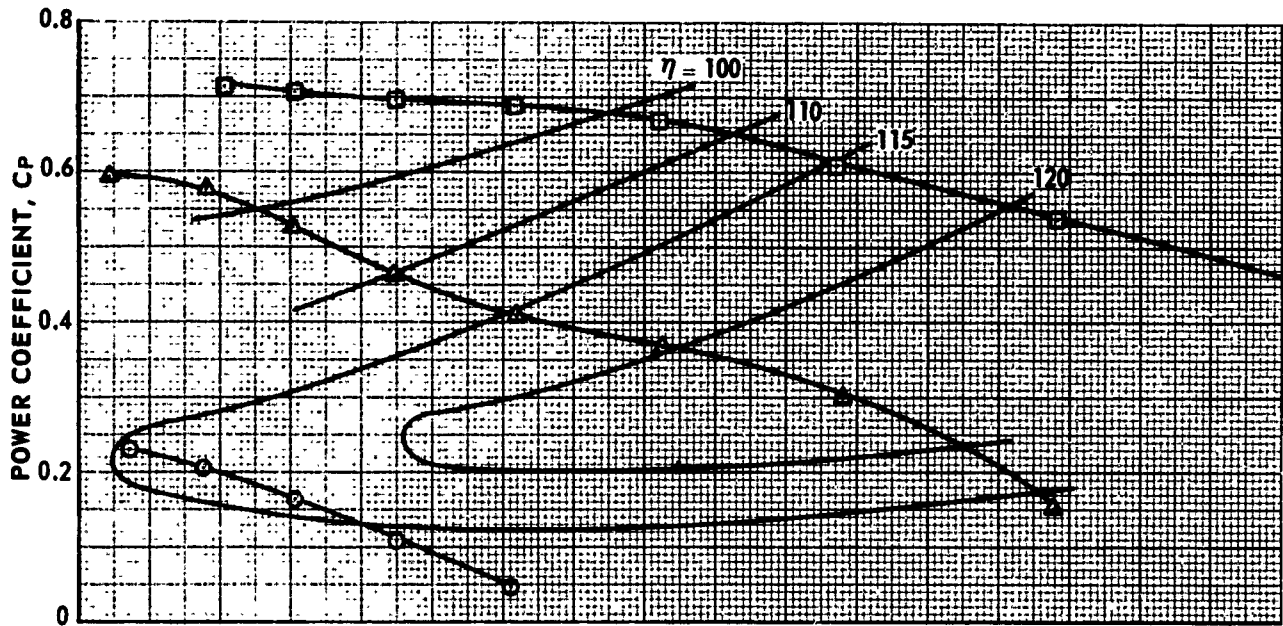
HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER  $E_6$  ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	63	0.40	$L_4 C_1 E_6 B_3 P_{NT} T_2 R_1 R_E$	30.0
△	64			41.0
□	66			47.0



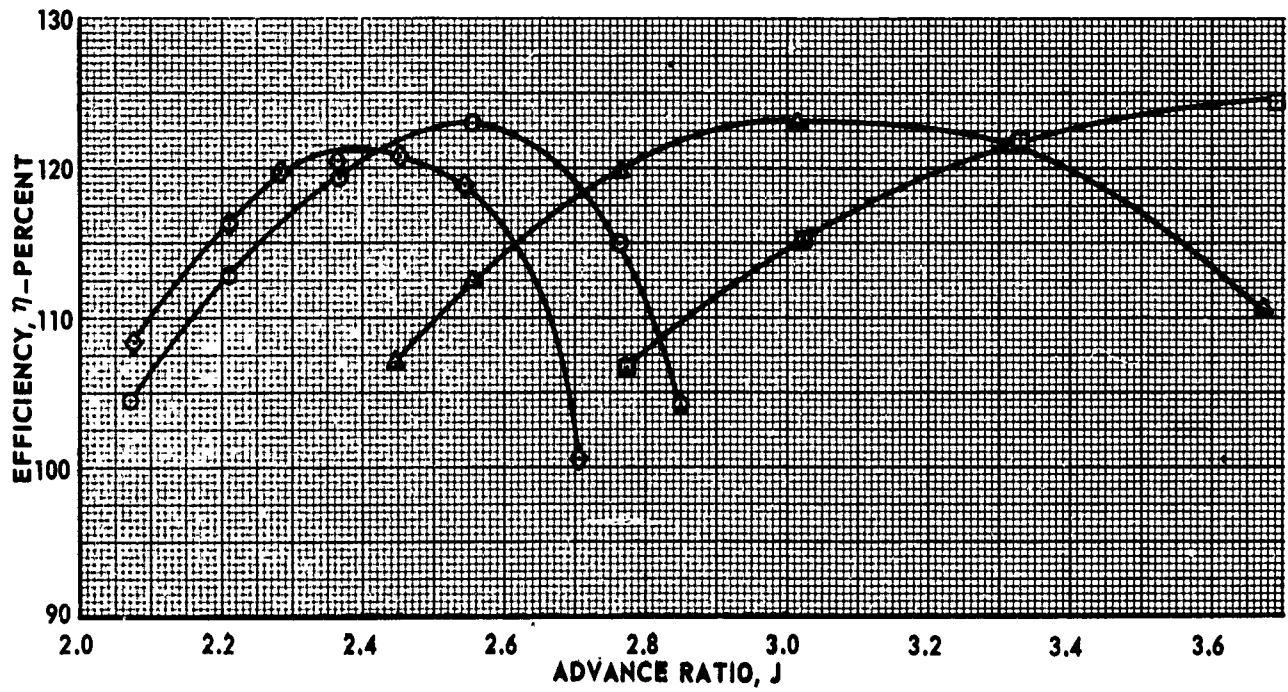
HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER  $E_6$  ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	63	0.40	$L_4 C_1 E_6 B_3 P_{NT} T_2 R_1 R_E$	30.0
△	64			41.0
□	66			47.0



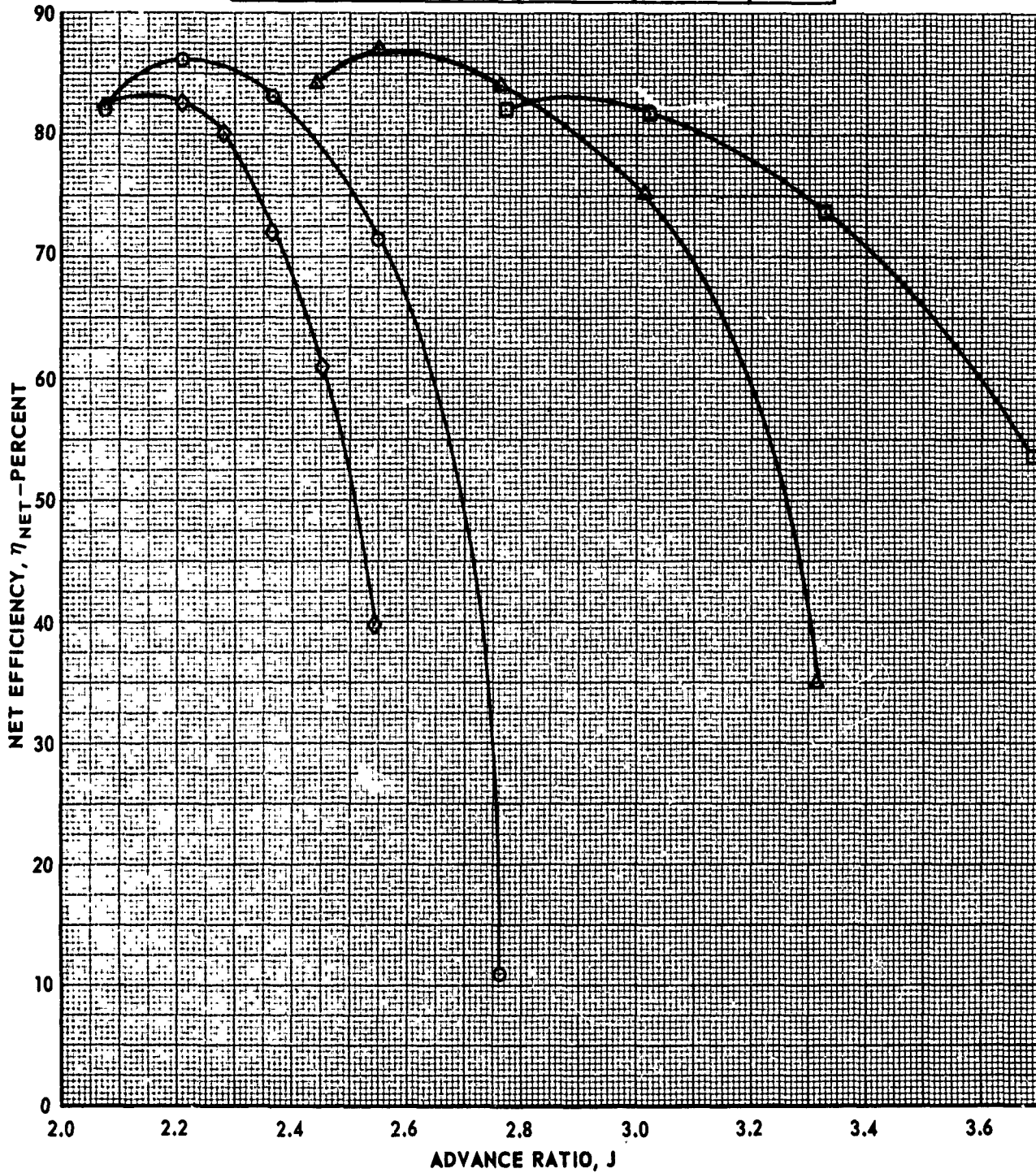
**HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER E<sub>6</sub> ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	65	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	41.0
△				47.0
⊠	68			52.0
◇	69			38.0



HS VG SHROUDED PROPELLER TEST  
EFFECT OF DIFFUSER E<sub>6</sub> ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

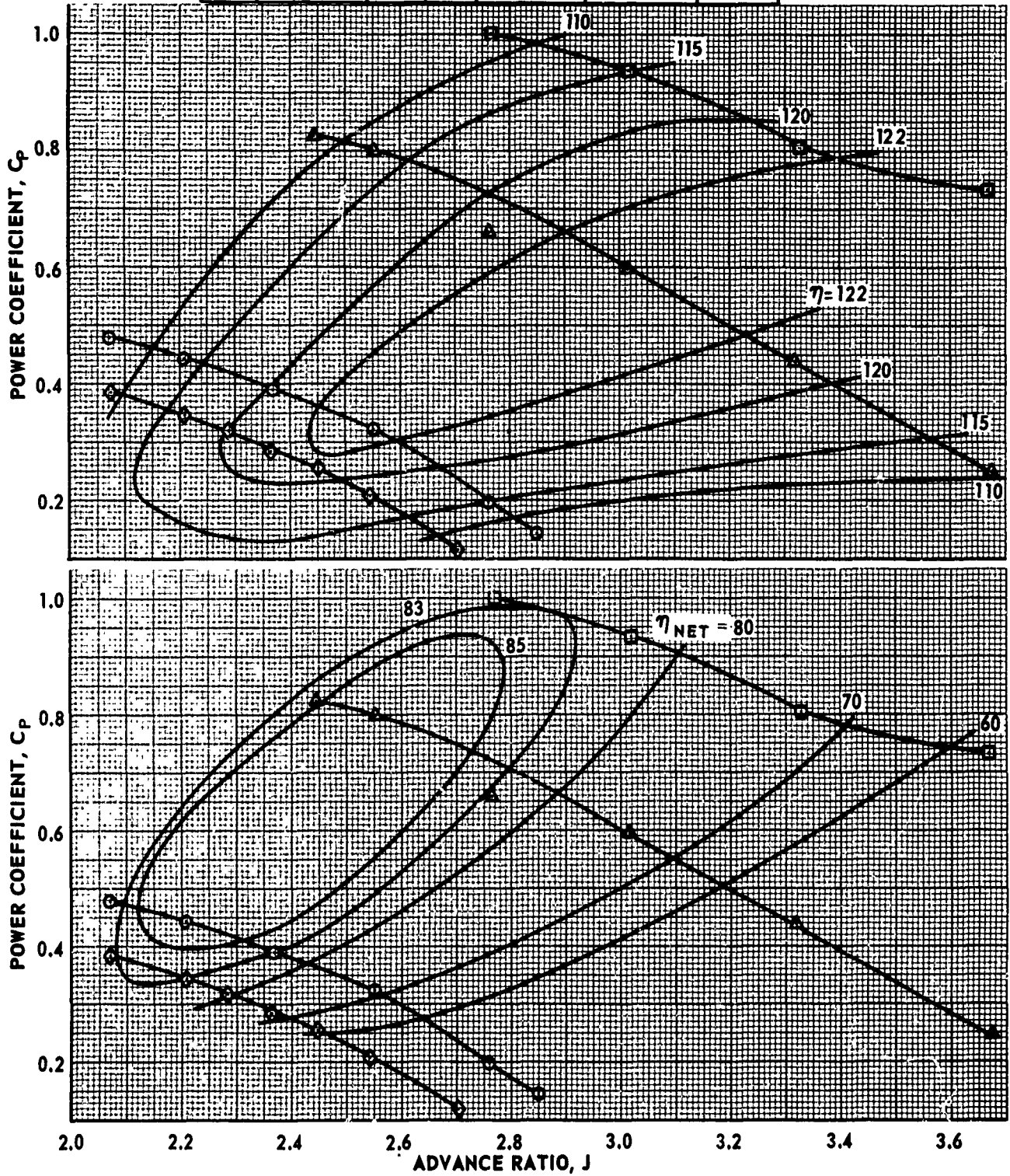
SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	65	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	41.0
△	67			47.0
□	68			52.0
◇	69			38.0



HS VG SHROUDED PROPELLER TEST

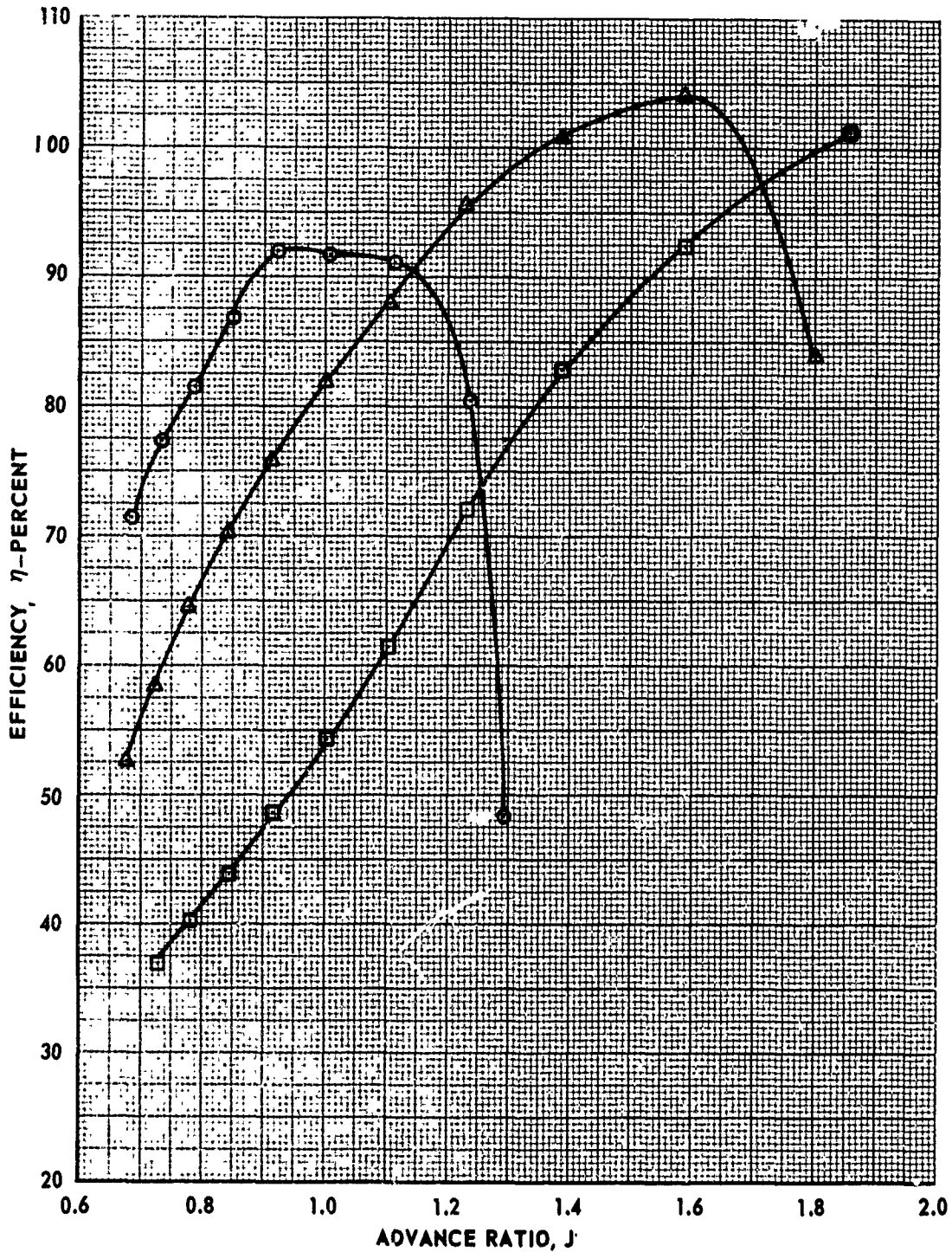
EFFECT OF DIFFUSER E<sub>6</sub> ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	65	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> F <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	41.0
△	67			47.0
□	68			52.0
◇	69			38.0



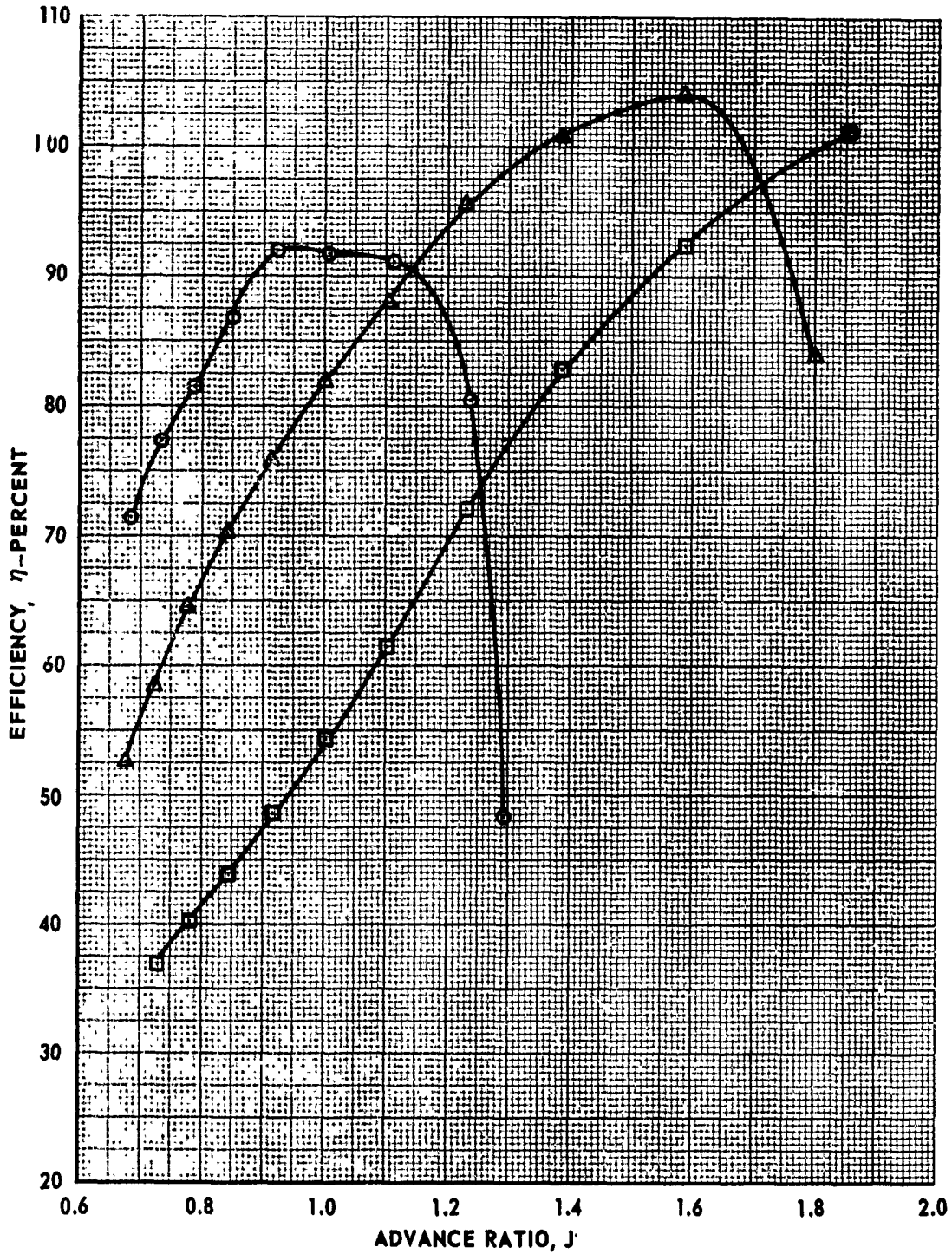
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO:	MACH NO.	CONFIGURATION	$\theta_{3/4}$
⊙	29	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	20.0
△	30			30.0
□	33			40.0



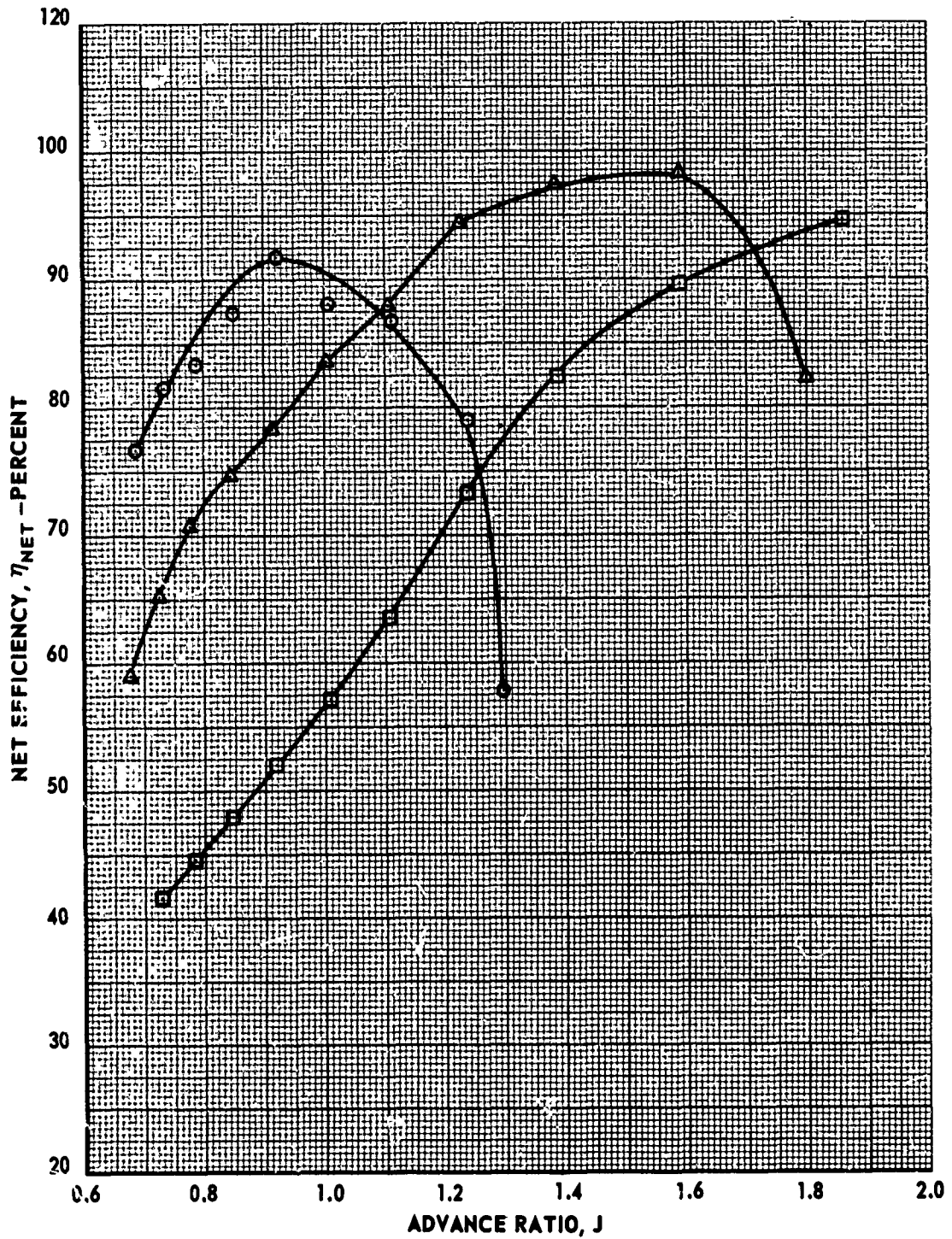
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	29	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> RE	20.0
△	30			30.0
□	33			40.0



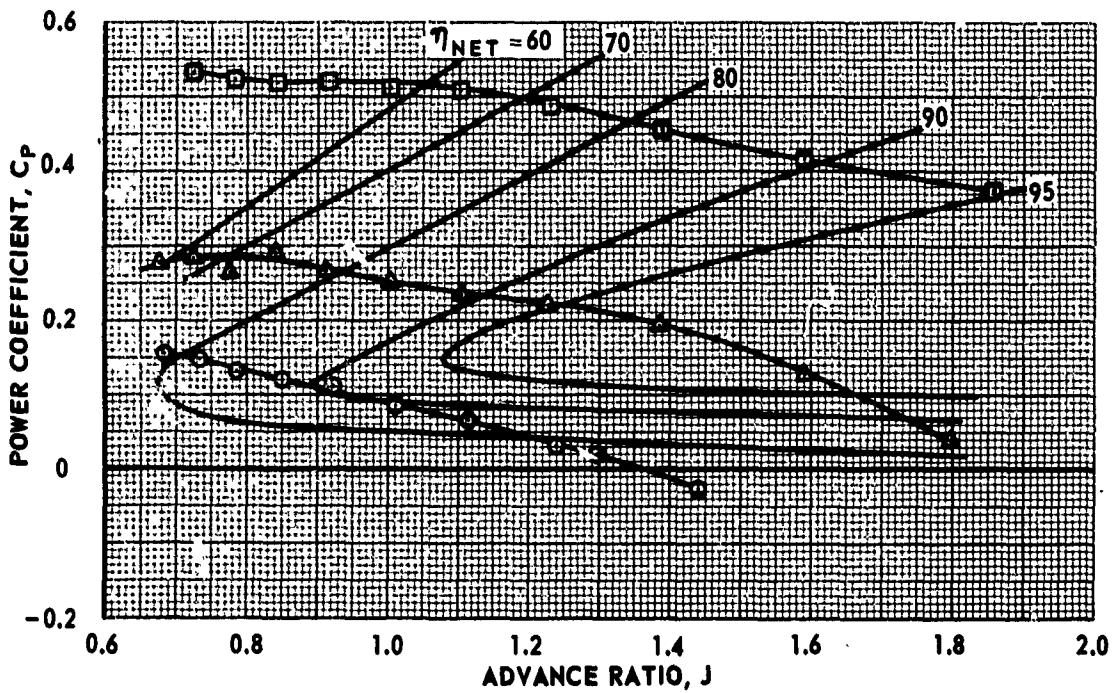
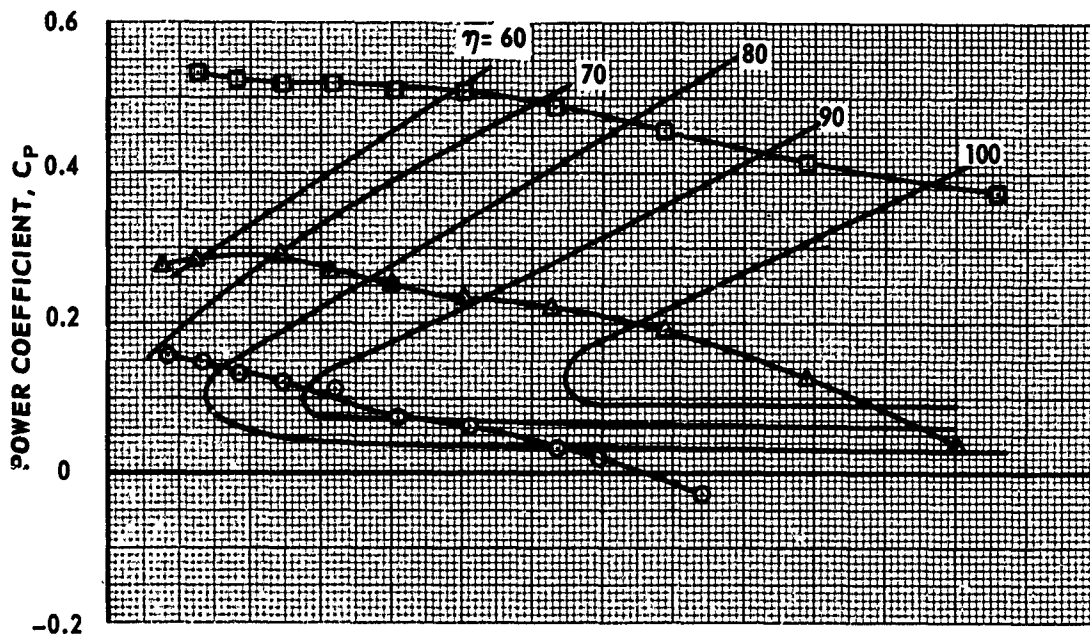
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\beta$ 3/4
⊙	29	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> RE	20.0
△	30			30.0
□	33			40.0



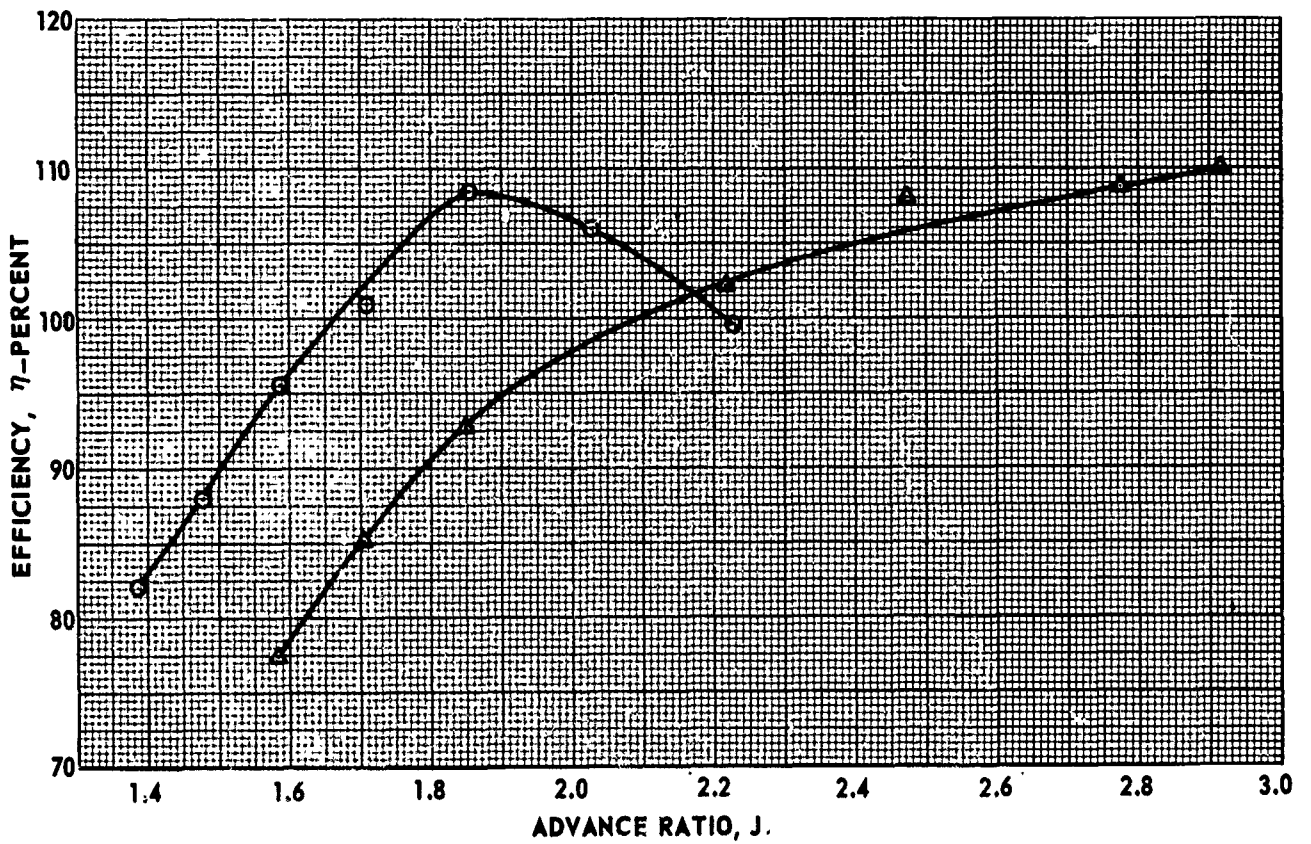
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
○	29	0.20	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	20.0
△	30			30.0
□	33			40.0



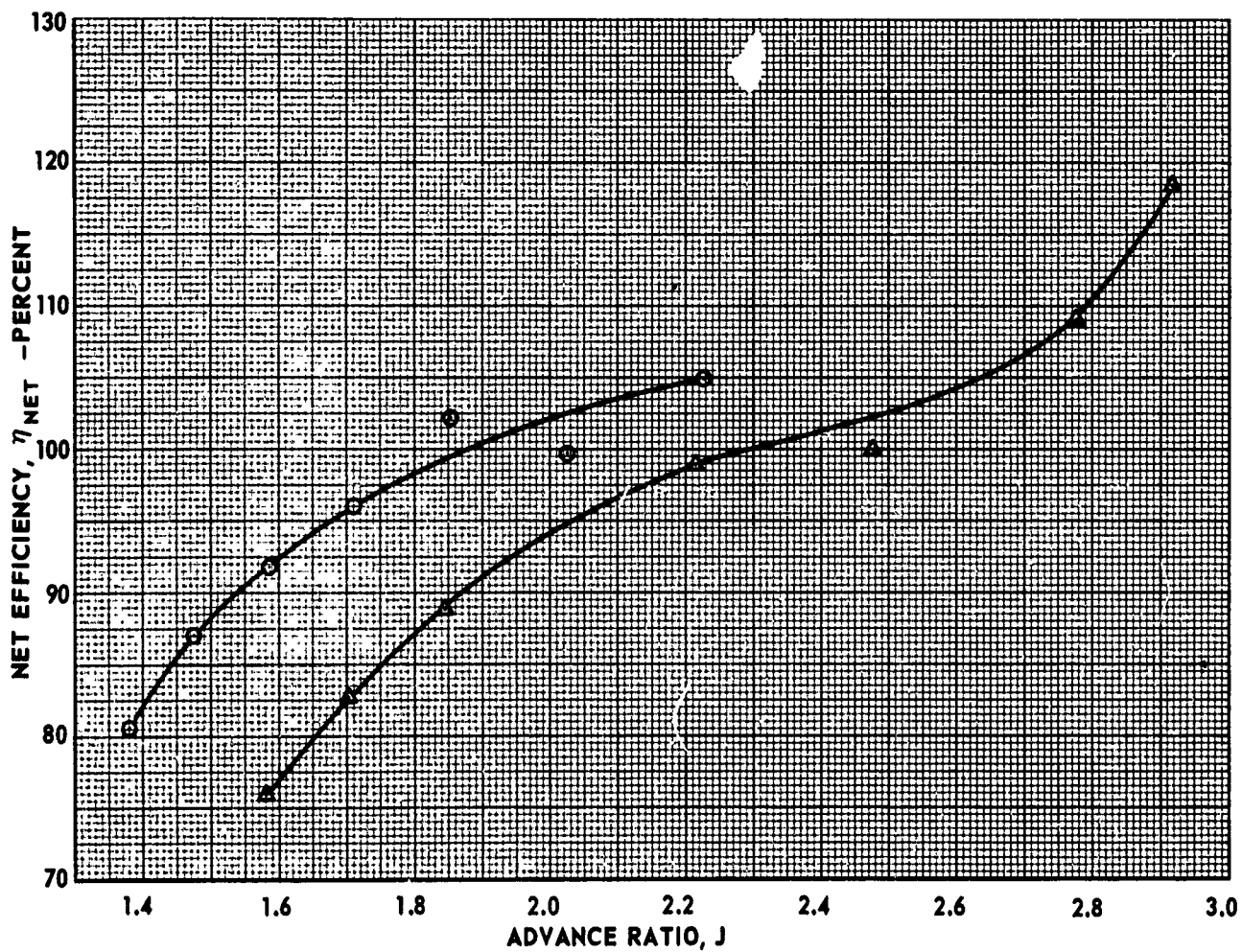
**HS VG SHROUDED PROPELLER TEST**  
**EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
⊙	32	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> PWT <sub>1</sub> R <sub>1</sub> RE	36.0
△	34	↓	↓	43.0



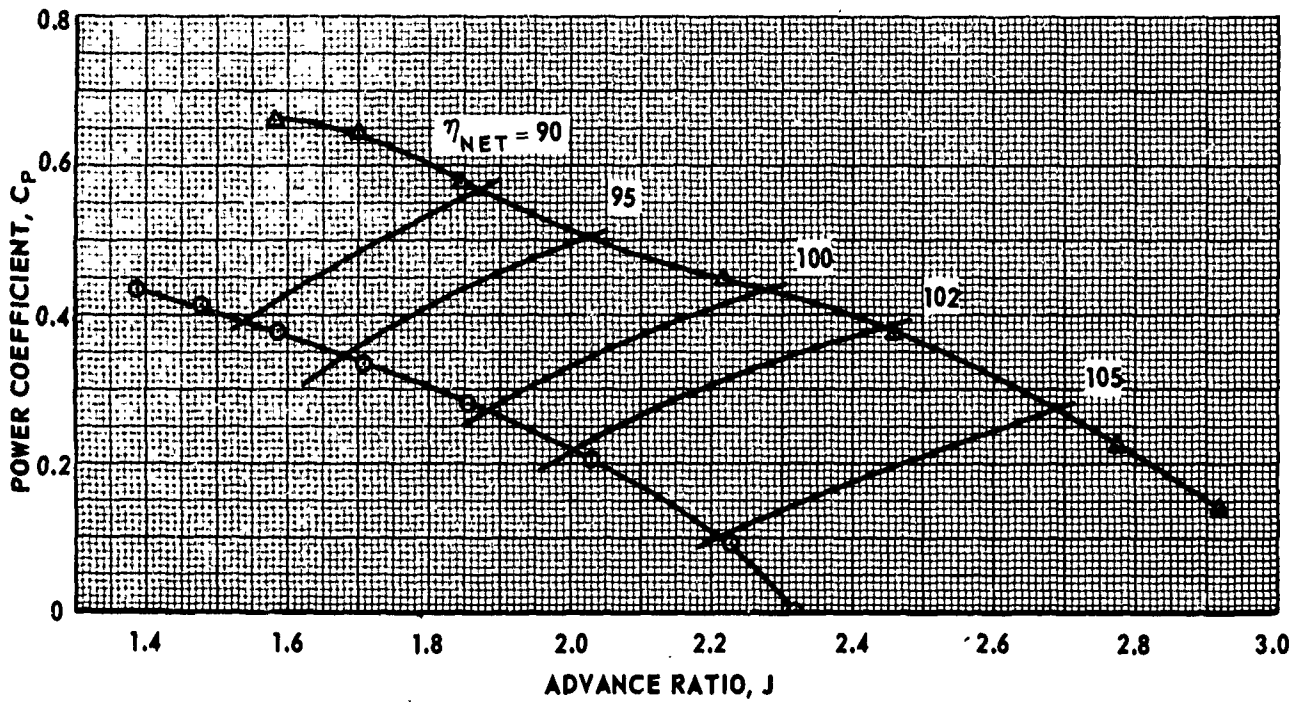
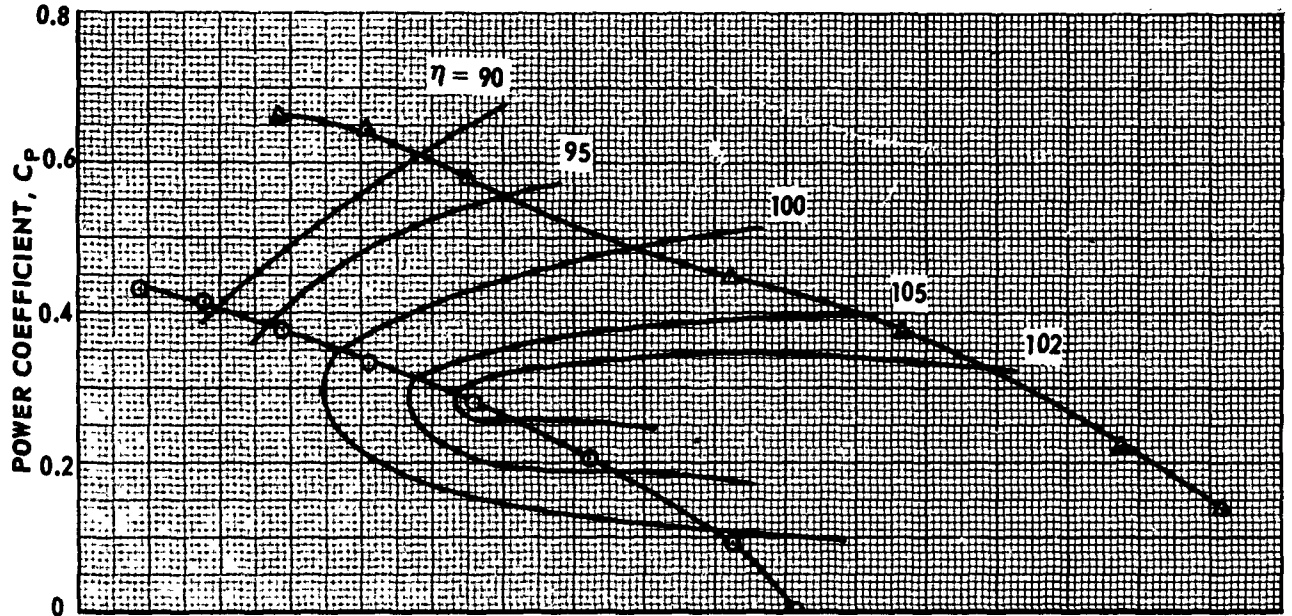
**HS VG SHROUDED PROPELLER TEST**  
**EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	32	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> RE	36.0
△	34	↓	↓	43.0



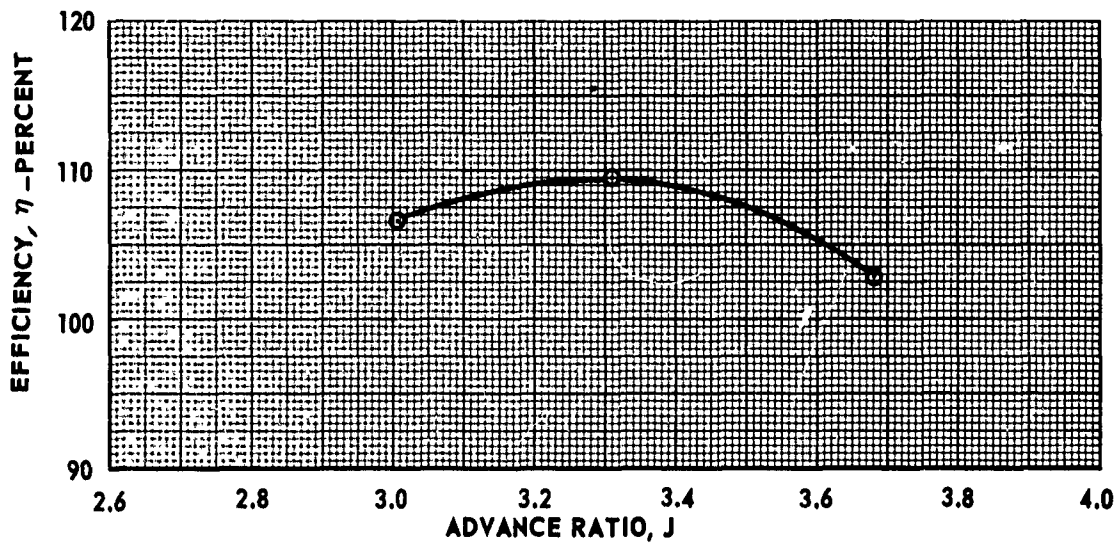
HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta_{3/4}$
○	32	0.40	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> RE	36.0
△	34	↓	↓	43.0



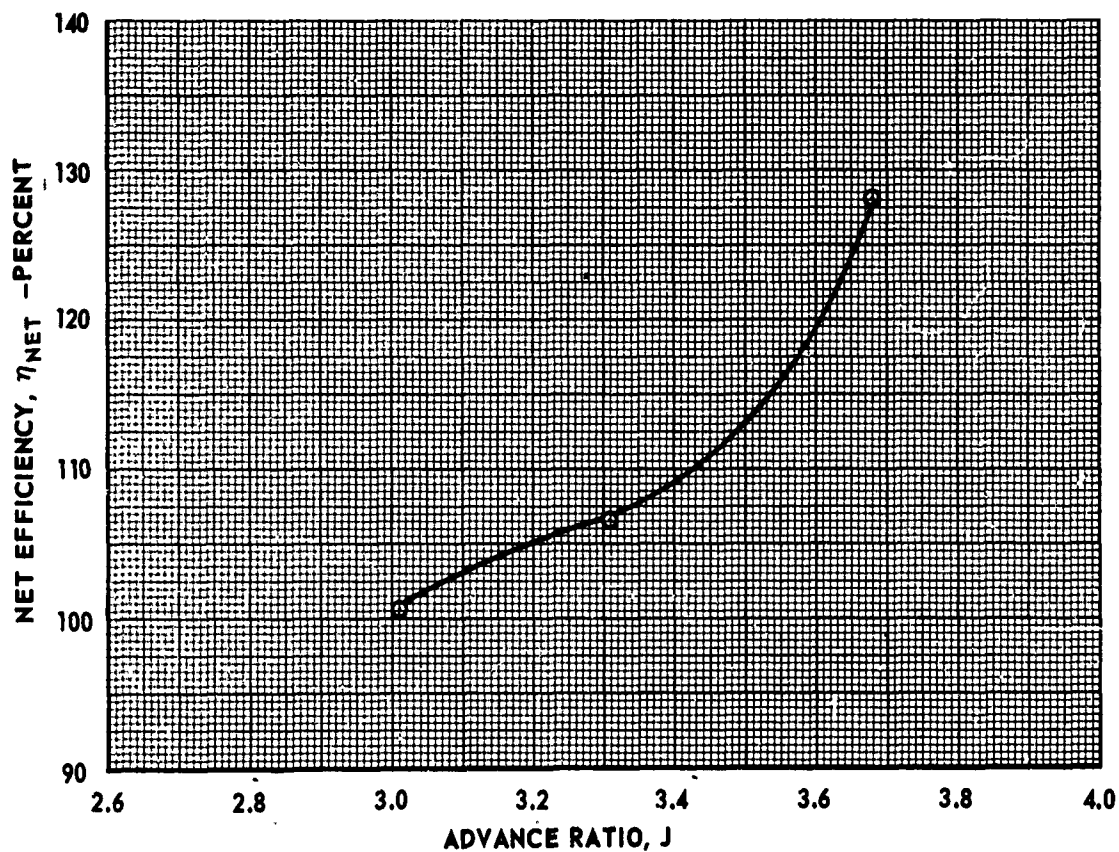
**HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	37	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	50.0



**HS VG SHROUDED PROPELLER TEST  
EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE**

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	37	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> PWT <sub>1</sub> R <sub>1</sub> RE	50.0



### HS VG SHROUDED PROPELLER TEST EFFECT OF BLADE GEOMETRY ON HIGH SPEED SHROUDED PROPELLER PERFORMANCE

SYM	RUN NO.	MACH NO.	CONFIGURATION	$\theta$ 3/4
⊙	37	0.60	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	50.0

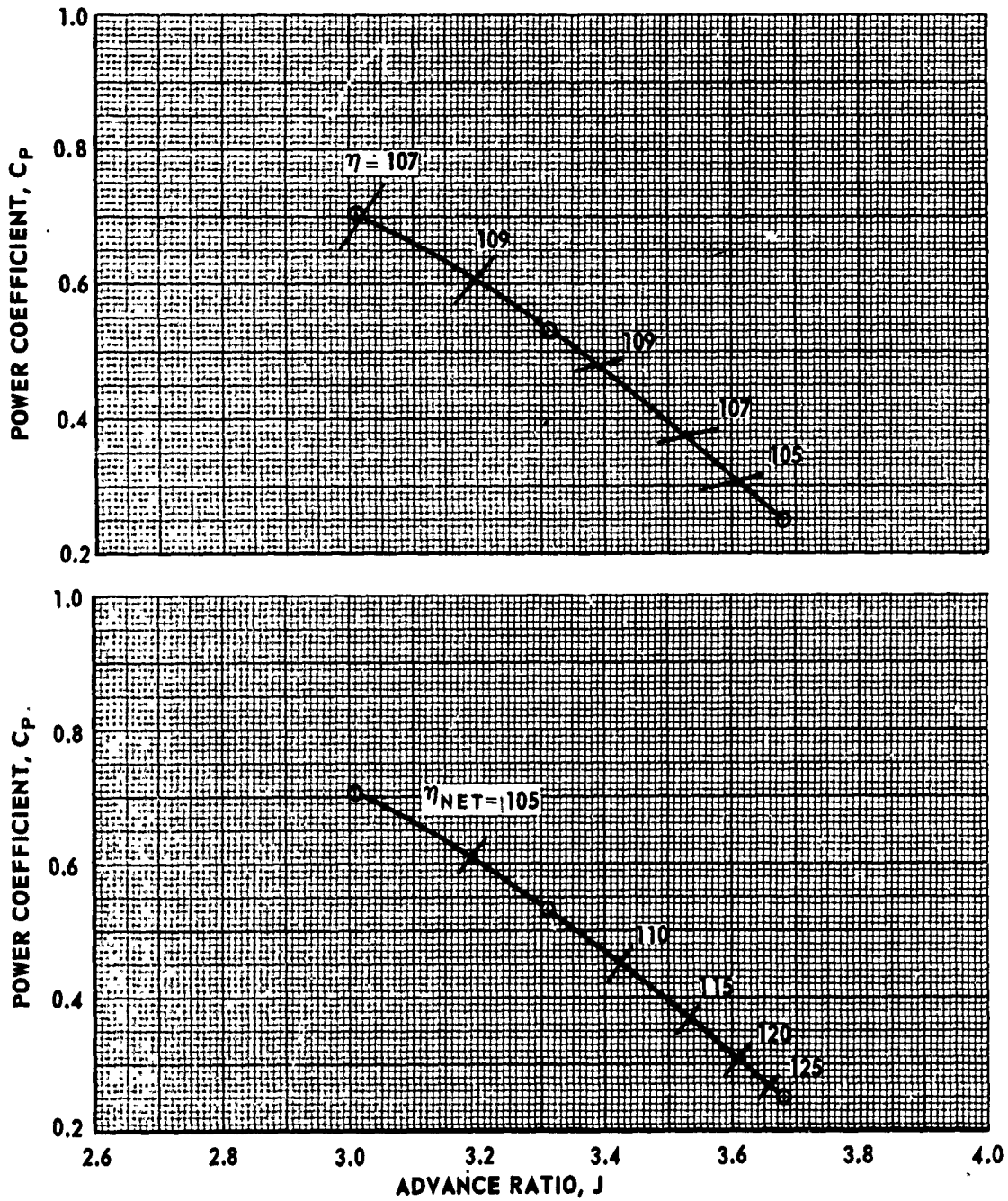


TABLE I

## HS VG SHROUDED PROPELLER TEST

## Test Schedule

## I. Performance Data (Table III)

Configuration	Run Number	Mach Number Range	Figure Number
L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	4-14, 21	0.02, 0.05, 0.10, 0.20	9, 10, 15-20
L <sub>4</sub> E <sub>7</sub> ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	29-37	0.2, 0.4, 0.6	11, 12, 39-47
↓ ↓ ↓ P <sub>NT</sub> T <sub>2</sub> ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	39-48	0.2, 0.4, 0.6	13, 14, 21-29
↓ ↓ E <sub>6</sub> ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	60-71	0.2, 0.4, 0.6	13, 14, 30-38

## II. Pressure Data (Tables VI and VII)

Configuration	Run Number	Mach Number Range	Tabulations Presented	
			Trav. Probe Table VI	*Pressure Table VII
L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub> T <sub>P</sub>	22-24	0.02, 0.05, 0.10	X	X
L <sub>4</sub> E <sub>7</sub> P <sub>NT</sub> T <sub>2</sub> ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	54-59	0.2, 0.4, 0.6		
↓ ↓ E <sub>6</sub> ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	77-80	0.2, 0.4, 0.6	↓	↓

\* Surface pressures, inlet rake, exit rake at one radial station and three propeller rotational speeds, excepting Run 56 where two rotational speeds are included.

TABLE II

HS VG SHROUDED PROPELLER TEST

Wind Tunnel Run Log

Run	Configuration	$\theta_{3/4}$	Test Conditions		Test Objective	Remarks
			Mach No.	RPM		
1	PTR + R <sub>G1</sub> R <sub>G5</sub>	-	Varied	-	Calib.	
2	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>	-	Varied	-	Calib.	
3	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	10	0	Varied	Static bal.	
4		22	.02		Performance	
5		↓	.05			
6		↓	.10			
7		29	.02			
8		↓	.05			
9		↓	.10			
10		36	.02			Aborted: incorrect M
11			.10			
12			.05			
13			.02			
14		↓	.20		↓	
15		A <sub>D</sub>	.10		A-frame T&I's	
16		↓	.02	↓	↓	

TABLE II  
(Contd.)

Run	Configuration	$\theta$ 3/4	Test Conditions		Test Objective	Remarks
			Mach No.	RPM		
17	L <sub>5</sub> C <sub>1</sub> E <sub>8</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> A <sub>D</sub>	22	.02	Varied	A-frame T&I's	
18		↓	.05			
19		29				
20		↓	.10			
21		R <sub>E</sub>	.05		Performance	Repeat of Run 8
22		T <sub>P</sub>	.02	7000	Pressure	Addl. pts. at 7500 & 6500 rpm
23			.05			
24			.10			
25	Clear Test Section	-	Varied	-	Calib.	
26	PTR + R <sub>G1</sub> R <sub>G5</sub>					
27	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>4</sub> R <sub>1</sub> R <sub>E</sub>					
28		B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub>	10	0	Varied	Static balance
29			20	.20		Performance
30			30			
31				.40		Aborted: neg. C <sub>T</sub>
32			36			

TABLE II  
(Contd.)

Run	Configuration	$\theta$ 3/4	Test Conditions		Test Objective	Remarks
			Mach No.	RPM		
33	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>WT</sub> T <sub>1</sub> R <sub>1</sub> R <sub>E</sub>	40	.20	Varied	Performance	
34		43	.40			
35		50				
36						Repeat of Run 35
37			.60			Aborted: blade damage
38	P <sub>WT</sub> T <sub>2</sub>	10	0		Static balance	
39		22	.20		Performance	
40		30				
41		32	.40			
42		40	.20			
43		43	.40			
44			.60			
45		49	.40			
46			.60			
47		54	.60			
48		30	.20			Repeat of Run 40
49	A <sub>D</sub>				A-frame T&I's	

TABLE II  
(Contd.)

Run	Configuration	$\theta_{3/4}$	Test Conditions		Test Objective	Remarks
			Mach No.	RPM		
50	L <sub>4</sub> C <sub>1</sub> E <sub>7</sub> B <sub>3</sub> P <sub>NT</sub> T <sub>2</sub> R <sub>1</sub> A <sub>D</sub>	49	.60	Varied	A-frame T&I's	
51		↓	.40			
52		43	.60			
53		↓	.40	↓	↓	
54		R <sub>E</sub> T <sub>P</sub>	.40	7000	Pressure	Addtl. data at 4300 & 5500 rpm
55		↓				Addtl. data at 4300 & 5500 rpm
56		↓	.60			Addtl. data at 6300 rpm
57		32	.40			Addtl. data at 6000 & 8000 rpm
58		30	.20			Addtl. data at 6000 & 8000 rpm
59		↓				Repeat of Run 58. Addtl. data at 6000 & 8000 rpm
60	E <sub>6</sub>	22		Varied	Performance	Aborted: LGP-30 inoperative
61		↓				

TABLE II  
(Contd.)

Run	Configuration	$\theta_{3/4}$	Test Conditions		Test Objective	Remarks
			Mach No.	RPM		
62	L <sub>4</sub> C <sub>1</sub> E <sub>6</sub> B <sub>3</sub> P <sub>NI</sub> T <sub>2</sub> R <sub>1</sub> R <sub>E</sub>	28	.20	Varied	Performance	
63		30	.40			
64		41				
65		↓	.60			
66		47	.40			
67		↓	.60			
68		52	↓			
69		38	↓			
70		↓	.20			
71		28	↓			Repeat of Run 62
72		A <sub>D</sub>	↓		A-frame T&I's	
73		41	.40			
74		↓	.60			
75		47	.40			Power limit @6950 rpm
76		↓	.60			Power limit @6800 rpm
77		R <sub>E</sub> T <sub>P</sub>	.20	6500	Pressure	Addtl. data @5500 & 7500 rpm



TABLE II  
(Contd.)

Run	Configuration	$\theta$ 3/4	Test Conditions		Test Objective	Remarks
			Mach No.	RPM		
91	Tp4	-	Varied	-	Calib.	$\theta = 23^{\circ}22'$ d = 29.74"
92						$\theta = -44^{\circ}12'$ d = 27.83"
93						$\theta = 32^{\circ}40'$ d = 28.83"

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN	4	M = 0.02	THETA 3/4 = 22.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC						
2	.1784	22.57	.190	.1424	.1335	6.892	.1257						
3	.1523	22.57	.163	.1421	.1326	10.864	.1371						
4	.1522	22.57	.155	.1429	.1403	11.496	.1444						
5	.1327	22.57	.143	.1426	.1324	16.167	.1578						
6	.1175	22.57	.127	.1422	.1315	22.890	.1597						
7	.1053	22.57	.113	.1424	.1319	31.447	.1690						
8	.0952	22.57	.102	.1427	.1323	42.160	.1721						
9	.0869	22.57	.092	.1436	.1344	55.470	.1846						
10	.0799	22.57	.084	.1442	.1358	71.175	.1871						
11	.0748	22.57	.078	.1447	.1377	90.135	.1926						
12	.0698	22.57	.071	.1464	.1423	114.579	.2029						
13	.0654	22.57	.065	.1452	.1451	141.916	.2002						
		1045.23	.155	.3454									

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN	5	M = 0.05	THETA 3/4 = 22.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	V0 VT	ETA ETA NET	CT CT NET	CP	HP	CC						
2	.4528	56.41 392.04	.427 .575	.1163 .1565	.1232	6.351	.0402						
3	.3876	56.41 457.10	.380 .569	.1257 .1880	.1280	10.460	.0624						
4	.3385	56.41 522.55	.340 .541	.1294 .2058	.1287	15.715	.0763						
5	.3004	56.41 587.73	.309 .516	.1324 .2211	.1285	22.330	.0887						
6	.2698	56.41 653.18	.277 .485	.1344 .2349	.1305	31.128	.1005						
7	.2449	56.41 718.37	.253 .459	.1360 .2467	.1314	41.697	.1106						
8	.2241	56.41 783.82	.231 .434	.1376 .2580	.1331	54.834	.1203						
9	.2064	6.41 849.27	.213 .411	.1391 .2688	.1348	70.642	.1297						
10	.1913	56.41 914.59	.196 .389	.1403 .2784	.1369	89.629	.1381						
11	.1781	56.41 979.78	.180 .398	.1421 .3132	.1401	112.744	.1711						
12	.1669	56.41 1044.97	.165 .339	.1418 .2910	.1433	139.907	.1492						

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 6 M = 0.10 THETA 3/4 = 22.00 DEG CONF L5 C1 E8 B3 PWT T1 R1 RE								
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	.9149	113.27	-1.675	-.0102	.0056	.284	-.0715	
		392.17	-13.367	-.0818				
3	.7833	113.27	.564	.0371	.0514	4.154	-.0399	
		457.49	-.042	-.0027				
4	.6848	113.27	.584	.0646	.0757	9.112	-.0158	
		522.68	.441	.0488				
5	.6082	113.27	.543	.0813	.0910	15.587	.0009	
		587.87	.549	.0821				
6	.5466	113.27	.513	.0937	.0999	23.497	.0190	
		653.45	.617	.1127				
7	.4976	113.37	.478	.1032	.1072	33.369	.0318	
		717.72	.626	.1350				
8	.4553	113.37	.404	.1004	.1131	45.838	.0442	
		783.82	.582	.1446				
9	.4196	113.37	.410	.1151	.1175	60.666	.0553	
		849.53	.608	.1704				
10	.3893	113.37	.384	.1206	.1222	78.744	.0664	
		914.72	.595	.1870				
11	.3631	113.37	.353	.1242	.1276	101.085	.0767	
		979.91	.571	.2009				
12	.3400	113.37	.327	.1257	.1307	125.698	.0820	
		1045.49	.540	.2077				
13	.3893	113.37	.382	.1206	.1227	79.076	.0662	
		914.72	.592	.1869				

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN 7		M = 0.02		T'ETA 3/4 = 29.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC							
2	.1775	22.57 392.30	.152 .306	.1919 .3857	.2232	11.542	.1938							
3	.1515	22.57 457.36	.130 .271	.1930 .4027	.2250	18.440	.2097							
4	.1319	22.57 522.94	.104 .233	.1774 .3975	.2248	27.542	.2201							
5	.1165	22.57 588.39	.101 .223	.1964 .4351	.2266	39.538	.2387							
6	.1043	22.57 653.58	.089 .206	.1963 .4517	.2283	54.601	.2554							
7	.0943	22.57 718.76	.081 .190	.1983 .4630	.2298	73.101	.2646							
8	.0872	22.57 784.48	.074 .176	.1996 .4711	.2329	96.311	.2715							
9	.0805	22.57 849.27	.068 .160	.2020 .4742	.2375	124.626	.2721							
10	.0752	22.57 914.72	.063 .045	.2064 .1495	.2458	161.143	-.0569							
11	.0698	22.57 980.30	.073 .154	.2731 .5727	.2590	209.016	.2996							
12	.0654	22.57 1045.49	.051 .123	.2061 .4959	.2638	258.232	.2898							
13	.1320	22.57 522.55	.102 .231	.1767 .3993	.2283	27.901	.2226							
14	.0805	22.57 849.53	.068 .159	.2016 .4723	.2380	124.973	.2707							

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA.

RUN	8	M = 0.05	THETA 3/4 = 29.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC						
2	.4517	56.41	.383	.1711	.2015	10.398	.0899						
		392.17	.585	.2610									
3	.3865	56.41	.323	.1764	.2109	17.282	.1120						
		457.49	.528	.2883									
4	.3374	56.41	.300	.1908	.2143	26.206	.1330						
		522.81	.509	.3238									
5	.2992	56.41	.257	.1865	.2170	37.828	.1533						
		588.39	.468	.3398									
6	.2688	56.41	.230	.1890	.2206	52.702	.1687						
		653.58	.435	.3577									
7	.2440	56.41	.210	.1925	.2237	70.987	.1827						
		718.50	.409	.3752									
8	.2231	56.41	.190	.1942	.2271	93.716	.1978						
		784.21	.385	.3920									
9	.2056	56.41	.173	.1969	.2331	122.140	.2089						
		849.14	.357	.4058									
10	.1904	56.41	.143	.2070	.2549	205.428	.2406						
		914.46	.336	.4274									
11	.1772	56.41	.143	.2070	.2549	205.428	.2406						
		980.17	.311	.4476									
12	.1659	56.41	.129	.2027	.2592	253.232	.2374						
		1045.23	.281	.4401									

TABLE III  
 HS VG SHROUDED PROPELLER TEST  
 PERFORMANCE DATA

RUN 9 M = 0.10 THETA 3/4 = 29.00 DEG CONF L5 C1 E8 B3 PWT T1 R1 RE									
PT	J	V0 VT	ETA ETA NET	CT CT NET	CP	HP	CC		
2	.9099	112.84 392.04	.592 .419	.0795 .0563	.1222	6.265	-.0232		
3	.7796	112.95 457.49	.562 .558	.1179 .1170	.1635	13.294	-.0008		
4	.6812	112.95 522.94	.518 .631	.1392 .1697	.1830	22.223	.0304		
5	.6054	113.06 588.26	.475 .635	.1526 .2039	.1944	33.546	.0513		
6	.5446	113.06 653.31	.435 .623	.1590 .2276	.1988	46.986	.0686		
7	.4940	112.95 718.76	.400 .607	.1643 .2495	.2028	63.964	.0852		
8	.4527	113.06 784.21	.368 .587	.1707 .2719	.2097	85.740	.1012		
9	.4174	113.06 849.66	.338 .564	.1768 .2944	.2178	113.265	.1176		
10	.3875	113.16 914.85	.313 .540	.1840 .3176	.2277	147.542	.1336		
11	.3613	113.16 979.91	.285 .508	.1900 .3386	.2405	191.492	.1486		
12	.3385	113.16 1045.23	.259 .470	.1877 .3403	.2448	236.527	.1526		
13	.6064	113.16 587.87	.474 .630	.1524 .2026	.1950	33.524	.0502		

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 11 M = 0.10 THETA 3/4 = 36.00 DEG CONF L5 C1 E8 B3 PWT T1 R1 RE								
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	.9075	112.74 392.17	.506 .534	.1757 .1854	.3146	16.182	.0096	
3	.7780	112.84 457.36	.496 .613	.1900 .2348	.2978	24.254	.0448	
4	.6797	112.84 522.81	.450 .621	.2067 .2852	.3122	37.980	.0785	
5	.6039	112.95 588.26	.407 .606	.2198 .3274	.3261	56.409	.1075	
6	.5428	112.95 653.71	.364 .577	.2273 .3595	.3381	80.257	.1322	
7	.4931	112.95 718.63	.332 .554	.2362 .3935	.3501	110.415	.1573	
8	.4512	112.95 784.35	.302 .525	.2440 .4230	.3634	149.001	.1790	
9	.4159	112.95 849.53	.275 .496	.2553 .4594	.3850	200.574	.2041	
10	.3861	113.06 914.72	.249 .464	.2697 .5014	.4167	270.455	.2317	
11	.3600	113.06 979.78	.225 .427	.2681 .5080	.4283	341.650	.2399	
12	.3373	113.06 1045.10	.204 .392	.2585 .4974	.4270	413.397	.2390	
13	.6055	113.16 587.87	.401 .596	.2192 .3251	.3303	56.799	.1059	

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN	12	M = 0.05	THETA 3/4 = 36.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC						
2	.4507	56.41 392.30	.313 .516	.2356 .3888	.3392	17.527	.1532						
3	.3857	56.41 457.36	.270 .474	.2430 .4266	.3470	28.407	.1836						
4	.3366	56.41 522.81	.235 .435	.2480 .4580	.3541	43.297	.2100						
5	.2983	56.41 588.52	.208 .402	.2523 .4866	.3603	62.847	.2343						
6	.2680	56.41 653.58	.185 .371	.2536 .5076	.3667	87.600	.2540						
7	.2430	56.41 718.76	.167 .347	.2575 .5347	.3738	118.790	.2772						
8	.2222	56.41 783.95	.151 .321	.2627 .5566	.3854	158.893	.2938						
9	.2045	56.41 849.53	.137 .297	.2736 .5920	.4064	213.226	.3184						
10	.1894	56.41 914.46	.123 .273	.2864 .6314	.4376	286.321	.3450						
11	.1765	56.46 980.04	.111 .248	.2808 .6256	.4441	357.048	.3448						
12	.1653	56.46 1045.10	.101 .226	.2692 .6044	.4404	429.340	.3352						

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN 13		M = 0.02		THETA 3/4 = 36.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC							
2	.1764	22.53 392.43	.124 .256	.2535 .5228	.3593	18.673	.2693							
3	.1502	22.53 457.23	.123 .251	.2962 .6045	.3617	29.728	.3083							
4	.1308	22.53 522.68	.092 .208	.2588 .5851	.3665	44.995	.3262							
5	.1155	22.53 588.26	.081 .185	.2593 .5924	.3699	64.745	.3331							
6	.1045	22.53 653.31	.072 .172	.2594 .6150	.3731	89.463	.3556							
7	.0950	22.53 718.50	.065 .156	.2604 .6243	.3797	121.096	.3638							
8	.0870	22.53 784.35	.059 .144	.2660 .6454	.3893	161.537	.3794							
9	.0803	22.53 849.53	.054 .131	.2769 .6692	.4092	215.695	.3923							
10	.0746	22.53 914.98	.048 .118	.2877 .6958	.4390	289.144	.4081							

RUN 14		M = 0.20		THETA 3/4 = 36.00 DEG		CONF	L5	C1	E8	B3	PWT	T1	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC							
2	1.3714	226.48 522.81	.652 -1.600	.0428 -.1050	.0899	10.634	-.1478							
3	1.0930	225.85 653.18	.618 .369	.1250 .0747	.2210	51.247	-.0503							
4	.9137	226.90 784.08	.548 .551	.1696 .1706	.2824	112.212	.0009							
5	.7821	226.90 914.59	.471 .612	.1982 .2574	.3287	207.297	.0591							
6	.6837	226.90 1045.23	.390 .550	.2000 .2821	.3505	329.923	.0821							

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN 29 M = 0.20 THETA 3/4 = 20.00 DEG CONF L4 C1 E7 B3 PWT T1 R1 RE								
PT	J	VC	ETA	CT	CP	HP	CC	
		VT	ETA NET	CT NET				
2	1.4393	224.79	2.305	-.0387	-.0242	-2.572	.0037	
		505.83	2.081	-.0350				
3	1.2941	224.79	.485	.0080	.0213	3.101	.0015	
		561.74	.578	.0095				
4	1.2364	224.79	.805	.0220	.0338	5.634	-.0004	
		587.60	.789	.0216				
5	1.1110	224.79	.912	.0521	.0634	14.514	-.0024	
		652.92	.869	.0496				
6	1.0087	225.00	.918	.0791	.0870	26.458	-.0031	
		718.37	.881	.0760				
7	.9220	225.00	.921	.1118	.1118	44.179	-.0004	
		783.69	.918	.1113				
8	.8495	225.00	.869	.1253	.1225	61.482	.0007	
		848.88	.874	.1260				
9	.7866	225.00	.816	.1406	.1355	85.033	.0032	
		914.46	.834	.1438				
10	.7317	225.00	.774	.1586	.1498	115.780	.0086	
		980.17	.816	.1672				
11	.6847	225.00	.715	.1641	.1570	147.043	.0122	
		1044.97	.768	.1763				

TABLE III

## HS V6 SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN 30 M = 0.20 THETA 3/4 = 30.00 DEG CONF L4 C1 E7 B3 PWT T1 R1 RE								
PT	J	V0	ETA	CT	CP	HP	CC	
		VT	ETA NET	CT NET				
2	1.7955	224.79	.839	.0191	.0410	2.235	-.0004	
		404.64	.822	.0188				
3	1.5868	224.79	1.041	.0840	.1280	10.067	-.0046	
		457.36	.983	.0793				
4	1.3864	224.79	1.008	.1410	.1940	22.727	-.0046	
		522.29	.975	.1365				
5	1.2294	224.79	.956	.1718	.2210	36.890	-.0021	
		587.73	.944	.1697				
6	1.1038	224.79	.880	.1880	.2356	54.010	-.0002	
		653.31	.880	.1878				
7	1.0013	224.79	.820	.2073	.2529	77.080	.0038	
		718.37	.836	.2111				
8	.9153	224.79	.759	.2239	.2699	106.879	.0076	
		783.82	.784	.2314				
9	.8421	224.79	.703	.2441	.2920	147.084	.0152	
		849.27	.747	.2593				
10	.7790	224.79	.647	.2679	.3223	202.713	.0255	
		914.59	.709	.2934				
11	.7246	224.79	.585	.2847	.3523	272.466	.0337	
		979.78	.654	.3184				
12	.6777	224.79	.527	.2789	.3582	336.731	.0341	
		1045.62	.592	.3130				

TABLE III  
HS V6 SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN	32	M = 0.40	THETA 3/4 = 36.00 DEG		CONF	L4	C1	E7	B3	PWT	T1	R1	RE
PT	J	V0	ETA	CT	CP	HP	CC						
		VT	ETA NET	CT NET									
2	2.3151	448.91	15.470	.0163	.0024	.455	.0056						
		627.06	20.769	.0219									
3	2.2255	449.74	.997	.0420	.0938	19.696	.0023						
		653.31	1.051	.0443									
5	1.8540	450.57	1.086	.1644	.2805	101.373	-.0093						
		783.95	1.024	.1550									
6	1.7098	450.57	1.010	.1968	.3332	152.983	-.0093						
		849.14	.962	.1876									
8	1.4788	450.98	.881	.2481	.4162	293.367	-.0025						
		980.17	.873	.2457									
9	1.3855	450.98	.822	.2576	.4339	370.926	-.0047						
		1045.23	.807	.2529									
10	2.0265	450.98	1.060	.1066	.2038	56.653	-.0061						
		718.76	.998	.1004									
11	1.5884	451.40	.957	.2288	.3795	216.931	-.0088						
		914.59	.920	.2199									

RUN	33	M = 0.20	THETA 3/4 = 40.00 DEG		CONF	L4	C1	E7	B3	PWT	T1	R1	RE
PT	J	V0	ETA	CT	CP	HP	CC						
		VT	ETA NET	CT NET									
2	1.8532	225.43	1.013	.2063	.3771	18.660	-.0137						
		392.17	.946	.1926									
3	1.5858	225.43	.924	.2432	.4170	32.727	-.0074						
		457.36	.896	.2358									
4	1.3860	225.64	.829	.2740	.4581	53.525	-.0011						
		522.55	.825	.2729									
5	1.2308	225.64	.722	.2876	.4904	81.246	.0045						
		587.08	.733	.2922									
6	1.1038	225.64	.615	.2850	.5114	116.753	.0102						
		653.31	.637	.2952									
7	1.0020	225.64	.544	.2790	.5134	155.750	.0147						
		718.24	.573	.2937									
8	.9166	225.85	.487	.2777	.5218	205.662	.0200						
		784.21	.522	.2977									
9	.8440	225.85	.440	.2720	.5211	261.485	.0246						
		849.93	.480	.2966									
10	.7822	225.85	.402	.2713	.5273	329.976	.0309						
		914.85	.448	.3023									
11	.7284	225.85	.371	.2735	.5369	412.882	.0347						
		979.91	.418	.3083									

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 34		M = 0.40		THETA 3/4 = 43.00 DEG		CONF		L4	C1	E7	B3	PWT	T1	R1	RE
PT	J	VO	ETA	CT	CP	HP	CC								
		OT	T	0				3T	0						
2	2.9158	447.67	1.100	.0529	.1403	13.163	.0040								
		496.42	1.184	.0570											
3	2.7722	448.50	1.088	.0874	.2225	24.313	.0004								
		522.94	1.093	.0878											
4	2.4659	448.91	.986	.1498	.3746	58.093	-.0074								
		588.00	.937	.1424											
5	2.2182	449.33	1.046	.2119	.4490	95.434	-.0109								
		653.58	.992	.2009											
6	1.8488	450.16	.927	.2908	.5799	211.823	-.0116								
		783.82	.890	.2792											
8	1.7050	450.57	.852	.3237	.6474	300.553	-.0091								
		849.53	.828	.3145											
9	1.5818	450.57	.775	.3240	.6609	383.144	-.0056								
		914.85	.761	.0318											
10	2.4743	450.57	1.081	.1630	.3731	57.465	-.0122								
		588.13	1.000	.1508											

RUN 35		M = 0.40		THETA 3/4 = 50.00 DEG		CONF		L4	C1	E7	B3	PWT	T1	R1	RE
PT	J	VO	ETA	CT	CP	HP	CC								
		VT	ETA NET	CT NET											
2	3.7084	449.74	1.045	.0622	.2204	10.113	.0051								
		392.17	1.132	.0673											
3	3.1793	450.16	1.095	.1835	.5326	38.718	-.0074								
		457.49	1.051	.1761											
4	2.7881	451.40	.972	.2264	.6494	70.073	-.0134								
		522.81	.914	.2130											
5	2.4771	451.81	.987	.2869	.7197	110.493	-.0158								
		588.39	.933	.2711											
6	2.2262	451.81	.899	.3140	.7772	163.936	-.0159								
		654.10	.854	.2981											
7	2.0250	451.81	.794	.3088	.7867	220.048	-.0126								
		718.63	.762	.2961											
8	1.8576	452.22	.688	.2818	.7607	275.598	-.0110								
		783.82	.661	.2708											
9	1.7136	452.22	.608	.2666	.7504	345.808	-.0089								
		849.27	.588	.2577											
10	2.7945	452.63	.962	.2228	.6470	69.538	-.0184								
		523.07	.882	.2043											
11	2.7954	452.63	1.053	.2435	.6459	69.313	-.0164								
		522.81	.982	.2271											

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN 36		M = 0.40		THETA 3/4 = 50.00 DEG		CONF L4 C1 E7 B3 PWT T1 R1 RE	
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	3.7013	449.33 392.56	1.041 1.128	.0634 .0687	.2255	10.409	.0053
3	2.7774	449.74 522.81	1.057 1.001	.2438 .2308	.6403	69.693	-.0130
4	2.2243	450.98 653.45	.899 .001	.3144 .2994	.7771	164.247	-.0150
5	1.8519	450.98 784.08	.683 .660	.2794 .2696	.7565	276.259	-.0098
6	2.7856	451.40 523.20	1.050 .986	.2449 .2299	.6493	70.315	-.0150

RUN 37		M = 0.60		THETA 3/4 = 50.00 DEG		CONF L4 C1 E7 B3 PWT T1 R1 RE	
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	3.6817	669.80 588.26	1.028 1.280	.0698 .0869	.2498	34.401	.0171
3	3.3108	669.20 653.18	1.095 1.067	.1771 .1726	.5352	101.071	-.0045
4	3.0084	669.20 718.37	1.067 1.018	.2498 .2383	.7042	176.914	-.0115

TABLE III  
HS V6 SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 39 M = 0.20 THETA 3/4 = 22.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE							
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	1.2660	224.37 573.09	.340 .350	.0085 .0088	.0317	4.928	.0002
3	1.1123	224.37 651.09	.803 .759	.0471 .0445	.0652	14.852	-.0026
4	1.0086	224.37 716.20	.905 .882	.0842 .0821	.0938	28.447	-.0021
5	.9225	224.37 781.44	.887 .880	.1049 .1041	.1090	42.941	-.0008
6	.8496	224.37 846.68	.847 .851	.1209 .1214	.1212	60.718	.0005
7	.7873	224.37 911.40	.806 .826	.1364 .1398	.1332	83.227	.0034
8	.7328	224.37 976.77	.760 .795	.1480 .1548	.1426	109.698	.0068
9	.6856	224.37 1041.75	.708 .754	.1544 .1643	.1493	139.393	.0099

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 40 M = 0.20 THETA 3/4 = 30.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE								
PT	J	V0 VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	1.7143	224.37	.686	.0201	.0503	3.146	-.0016	
		423.21	.632	.0186				
3	1.5905	224.37	.971	.0655	.1073	8.368	-.0035	
		455.63	.919	.0620				
4	1.3891	224.37	.975	.1149	.1637	19.051	-.0058	
		520.74	.926	.1091				
5	1.2312	224.37	.941	.1572	.2056	34.129	-.0036	
		586.11	.920	.1536				
6	1.1060	224.37	.885	.1762	.2202	50.108	-.0007	
		651.09	.881	.1755				
7	1.0029	224.37	.833	.1972	.2373	71.874	.0038	
		716.20	.849	.2010				
8	.9170	224.37	.774	.2118	.2509	98.696	.0067	
		781.44	.798	.2186				
9	.8439	224.37	.724	.2304	.2682	134.127	.0142	
		846.55	.769	.2446				
10	.7808	224.37	.672	.2516	.2921	182.448	.0235	
		911.66	.735	.2751				
11	.7262	224.37	.612	.2733	.3242	248.873	.0347	
		976.51	.689	.3079				
12	.6795	224.37	.551	.2683	.3304	307.826	.0338	
		1041.62	.621	.3021				

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 41 M = 0.40 THETA 3/4 = 32.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE

PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	1.8939	443.49 757.22	.522 .619	.0148 .0176	.0538	18.156	.0028
3	1.8450	446.00 781.44	.796 .810	.0343 .0349	.0796	29.159	.0006
4	1.7064	447.25 846.42	.968 .923	.0814 .0776	.1434	66.375	-.0038
5	1.5839	447.67 911.66	.991 .941	.1234 .1171	.1971	113.814	-.0063
6	1.4769	447.67 976.77	.949 .906	.1439 .1374	.2239	159.030	-.0066
7	1.3832	447.67 1042.01	.886 .849	.1592 .1525	.2485	214.230	-.0066

RUN 42 M = 0.20 THETA 3/4 = 40.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE

PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	2.3530	224.37 308.35	.900 .643	.0460 .0328	.1201	2.899	-.0131
3	1.8525	224.37 390.65	.996 .909	.1828 .1668	.3399	16.683	-.0160
4	1.5843	224.37 455.89	.931 .889	.2217 .2117	.3770	29.404	-.0100
5	1.3849	224.58 520.74	.352 .839	.2598 .2559	.4220	48.957	-.0039
6	1.2273	224.58 586.11	.766 .771	.2833 .2850	.4534	75.008	.0016
7	1.1032	224.79 651.09	.673 .692	.2942 .3024	.4819	109.090	.0082
8	1.0004	224.79 716.33	.588 .619	.2934 .3090	.4988	150.353	.0155
9	.9149	224.79 781.31	.526 .567	.2953 .3183	.5135	200.833	.0230
10	.8424	224.79 846.55	.476 .520	.2950 .3222	.5218	259.618	.0272
11	.7804	224.79 911.53	.433 .482	.2955 .3294	.5324	330.698	.0339
12	.7279	225.21 976.64	.398 .449	.2981 .3362	.5445	414.393	.0381

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 43 M = 0.40 THETA 3/4 = 43.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE

PT	J	V0	ETA	CT	CP	HP	CC
		VT	ETA NET	CT NET			
2	2.7418	447.25	.727	.0319	.1202	13.455	.0020
		527.51	.773	.0339			
3	2.4673	447.67	1.037	.1142	.2715	41.657	-.0061
		586.24	.981	.1080			
4	2.2189	447.67	1.022	.1793	.3893	81.870	-.0103
		651.22	.963	.1690			
5	2.0156	448.08	.999	.2189	.4414	123.557	-.0113
		716.85	.947	.2075			
6	1.8473	448.08	.955	.2544	.4917	178.227	-.0116
		781.31	.912	.2428			
7	1.7018	448.08	.896	.3082	.5853	269.963	-.0080
		846.68	.873	.3002			
8	1.5802	448.50	.817	.3264	.6308	362.386	-.0041
		911.53	.807	.3223			
9	1.5247	448.50	.778	.3270	.6401	408.755	-.0030
		944.21	.771	.3239			
10	1.8478	448.50	.954	.2541	.4920	178.346	-.0124
		781.83	.907	.2417			

RUN 44 M = 0.60 THETA 3/4 = 43.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE

PT	J	V0	ETA	CT	CP	HP	CC
		VT	ETA NET	CT NET			
2	2.7385	661.93	.806	.0390	.1324	43.290	.0061
		781.57	.932	.0451			
3	2.5335	663.75	.990	.0951	.2433	100.580	.0005
		846.68	.995	.0956			
4	2.3540	664.36	.977	.1293	.3114	160.456	-.0040
		911.66	.947	.1253			
5	2.1983	664.97	.914	.1530	.3676	232.393	-.0065
		976.64	.875	.1464			
6	2.0614	665.57	.726	.1693	.4805	368.315	-.0087
		1042.01	.688	.1606			
7	2.5165	659.49	.979	.0934	.2400	100.611	-.0020
		846.94	.957	.0914			

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 45		M = 0.40		THETA 3/4 = 49.00 DEG		CONF	L4	C1	E7	B3	PNT	T2	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC							
2	3.1725	447.67	1.029	.1100	.3389	24.434	-.0070							
		456.15	.964	.1030										
3	2.7744	447.67	1.051	.2042	.5388	57.919	-.0150							
		521.13	.974	.1892										
4	2.4667	448.08	1.016	.2450	.5944	90.791	-.0164							
		586.24	.948	.2286										
5	2.2182	448.08	.956	.2907	.6743	141.196	-.0151							
		651.22	.906	.2756										
6	2.0159	448.50	.891	.3345	.7564	210.390	-.0129							
		716.33	.857	.3216										
7	1.8482	448.50	.864	.3805	.8133	292.241	-.0096							
		780.14	.843	.3710										
8	1.7039	448.50	.694	.3013	.7398	339.638	-.0084							
		846.55	.674	.2930										
9	1.6285	448.91	.688	.3156	.7469	392.216	-.0073							
		885.88	.672	.3083										
10	2.2236	449.33	.955	.2910	.6775	141.252	-.0184							
		651.48	.894	.2726										

RUN 46		M = 0.60		THETA 3/4 = 49.00 DEG		CONF	L4	C1	E7	B3	PNT	T2	R1	RE
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC							
2	3.2945	663.75	.987	.0883	.2946	55.303	.0060							
		651.35	1.054	.0943										
3	2.9971	664.36	1.042	.1742	.5008	124.749	-.0044							
		716.20	1.016	.1698										
4	2.7477	664.97	1.015	.2281	.6172	199.329	-.0106							
		781.44	.968	.2174										
5	2.5354	664.97	.949	.2555	.6824	280.058	-.0136							
		846.42	.898	.2419										
6	2.3522	664.97	.871	.2685	.7245	371.846	-.0143							
		911.92	.825	.2542										
7	2.2869	664.97	.836	.2679	.7322	408.727	-.0146							
		937.83	.791	.2533										

TABLE III  
HS V6 SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 47 M = 0.60 THETA 3/4 = 54.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE								
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	4.0116	662.54	.952	.0921	.3880	40.281	.0098	
		534.02	1.053	.1019				
3	3.6585	663.75	1.055	.1814	.6288	86.110	-.0010	
		586.37	1.050	.1805				
4	3.2959	664.36	1.034	.2606	.8304	155.403	-.0095	
		651.09	.996	.2511				
5	2.9922	664.36	1.015	.3158	.9301	232.182	-.0153	
		716.72	.966	.3004				
6	2.7432	664.97	.911	.3408	1.0264	332.302	-.0206	
		782.09	.855	.3202				

RUN 48 M = 0.20 THETA 3/4 = 30.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 RE								
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	1.6055	226.48	.889	.0472	.0852	6.478	-.0059	
		455.89	.777	.0413				
3	1.4009	226.48	.985	.1116	.1587	18.045	-.0053	
		521.26	.938	.1064				
4	1.2435	226.48	.951	.1507	.1970	31.816	-.0043	
		585.98	.924	.1464				
5	1.1167	226.48	.896	.1737	.2164	47.925	-.0013	
		651.09	.890	.1725				
6	1.0119	226.27	.832	.1874	.2279	67.345	.0023	
		716.33	.842	.1897				
7	.9254	226.27	.782	.2059	.2435	93.384	.0059	
		781.31	.805	.2119				
8	.8512	226.27	.737	.2261	.2610	127.442	.0134	
		846.81	.781	.2395				
9	.7873	226.06	.683	.2450	.2820	172.058	.0219	
		911.53	.744	.2668				
10	.7322	226.06	.625	.2654	.3107	233.105	.0319	
		976.64	.700	.2973				
11	.6848	226.06	.565	.2680	.3247	295.717	.0333	
		1041.75	.635	.3013				
12	1.6023	226.06	.841	.0469	.0892	6.811	-.0021	
		455.89	.803	.0447				

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN	61	M = 0.20	THETA 3/4 = 22.00 DEG		CONF	L4	C1	E6	B3	PNT	T2	R1	RE
PT	J	V0 VT	ETA ETA NET	CT CT NET	CP	HP	CC						
2	1.4003	225.64	.363	.0089	.0343	3.988	-.0075						
		521.26	.056	.0014									
3	1.2420	225.64	.988	.0596	.0749	12.395	-.0074						
		586.50	.864	.0522									
4	1.1161	225.64	1.030	.0909	.0984	22.315	-.0108						
		651.48	.907	.0800									
5	1.0134	225.64	1.012	.1151	.1153	34.710	-.0135						
		716.20	.893	.1016									
6	.9270	225.64	.973	.1330	.1267	49.547	-.0138						
		781.44	.872	.1191									
7	.8534	225.64	.927	.1488	.1370	68.206	-.0127						
		846.94	.847	.1360									
8	.7906	225.64	.876	.1634	.1475	91.728	-.0107						
		912.05	.818	.1528									
9	.7363	225.64	.827	.1746	.1555	118.929	-.0091						
		977.16	.783	.1655									
10	.6884	225.64	.769	.1842	.1648	153.098	-.0057						
		1042.53	.745	.1785									
11	1.3182	225.85	.833	.0395	.0625	8.673	-.0042						
		553.56	.744	.0353									

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 62 M = 0.20 THETA 3/4 = 28.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE								
PT	J	V0	ETA		CT	CP	HP	CC
		VT	ETA NET	CT NET				
2	1.8558	223.94	.000	.0000	.0231	1.138	-.0187	
		390.52	-1.502	-.0187				
3	1.5868	223.94	1.124	.0800	.1130	8.835	-.0099	
		455.76	.984	.0701				
4	1.3871	224.15	1.120	.1353	.1675	19.512	-.0172	
		520.87	.978	.1182				
5	1.2307	224.15	1.068	.1641	.1890	31.346	-.0199	
		585.98	.938	.1441				
6	1.1060	224.15	1.000	.1798	.1988	45.212	-.0203	
		650.96	.887	.1595				
7	1.0029	224.15	.935	.1996	.2139	64.775	-.0189	
		716.20	.847	.1806				
8	.9170	224.15	.876	.2175	.2275	89.455	-.0162	
		781.31	.811	.2013				
9	.8443	224.15	.820	.2346	.2414	120.640	-.0122	
		846.29	.777	.2223				
10	.7813	224.15	.764	.2558	.2615	163.289	-.0070	
		911.53	.743	.2489				
11	.7268	224.15	.697	.2764	.2881	221.189	-.0009	
		976.51	.694	.2754				
12	.6794	224.15	.628	.2786	.3014	281.023	.0060	
		1041.88	.641	.2847				

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN	63	M = 0.40	THETA 3/4 = 30.00 DEG		CONF	L4	C1	E6	B3	PNT	T2	R1	RE
PT	J	VO	ETA	CT	CP	HP	CC						
		VT	ETA NET	CT NET									
2	2.0120	445.17	.686	.0175	.0512	14.450	-.0270						
		715.81	-.376	-.0096									
3	1.8481	446.84	1.131	.0724	.1183	43.104	-.0187						
		781.31	.838	.0536									
4	1.7059	447.25	1.173	.1162	.1689	78.083	-.0161						
		846.29	1.011	.1001									
5	1.5806	446.84	1.158	.1533	.2091	121.039	-.0204						
		911.53	1.004	.1329									
6	1.4763	447.67	1.109	.1776	.2365	167.786	-.0243						
		976.77	.957	.1534									
7	1.3830	447.67	1.036	.1924	.2568	221.085	-.0262						
		1041.75	.895	.1662									

RUN	64	M = 0.40	THETA 3/4 = 41.00 DEG		CONF	L4	C1	E6	B3	PNT	T2	R1	RE
PT	J	VO	ETA	CT	CP	HP	CC						
		VT	ETA NET	CT NET									
2	2.7746	446.84	1.144	.0650	.1575	17.006	-.0489						
		520.87	.283	.0161									
3	2.4745	448.08	1.229	.1516	.3052	46.434	-.0381						
		585.07	.920	.1135									
4	2.2215	448.08	1.195	.2007	.3728	78.152	-.0317						
		651.09	1.007	.1690									
5	2.0188	448.50	1.154	.2350	.4110	114.613	-.0324						
		716.46	.995	.2026									
6	1.8493	448.50	1.099	.2752	.4629	167.408	-.0388						
		781.31	.944	.2364									
7	1.7039	448.50	1.029	.3204	.5303	244.145	-.0436						
		846.81	.889	.2767									
8	1.5811	448.50	.941	.3455	.5802	333.042	-.0444						
		911.40	.820	.3012									
9	1.4735	448.50	.853	.3458	.5970	422.178	-.0419						
		977.03	.749	.3038									

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 65 M = 0.60 THETA 3/4 = 41.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE

PT	J	VO VT	ETA		CT CT NET	CP	HP	CC
			ETA	NET				
2	2.8493	665.57	1.043	.0527	.1440	42.137	-.0788	
		755.79	-.516	-.0261				
3	2.7613	666.79	1.150	.0821	.1972	63.468	-.0743	
		781.05	.109	.0078				
4	2.5506	667.99	1.232	.1574	.3258	132.935	-.0659	
		846.42	.715	.0914				
5	2.3680	668.60	1.195	.1979	.3921	199.713	-.0600	
		911.92	.832	.1379				
6	2.2096	668.60	1.129	.2277	.4455	278.729	-.0535	
		976.64	.863	.1742				
7	2.0718	669.20	1.045	.2425	.4805	364.518	-.0519	
		1042.01	.821	.1905				

RUN 66 M = 0.40 THETA 3/4 = 47.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE

PT	J	VO VT	ETA		CT CT NET	CP	HP	CC
			ETA	NET				
2	3.6330	448.50	1.083	.0658	.2207	10.653	-.0888	
		399.38	-.378	-.0230				
3	3.1802	448.50	1.231	.1701	.4396	31.564	-.0660	
		455.89	.753	.1041				
4	2.7797	448.50	1.210	.2365	.5432	58.261	-.0515	
		521.13	.946	.1850				
5	2.4698	448.50	1.145	.2843	.6131	93.484	-.0430	
		585.98	.972	.2413				
6	2.2204	448.50	1.046	.3160	.6705	140.342	-.0454	
		651.22	.896	.2706				
7	2.0173	448.50	.916	.3139	.6910	192.483	-.0432	
		716.33	.790	.2707				
8	1.8484	448.50	.811	.3068	.6992	252.707	-.0405	
		781.31	.703	.2662				
9	1.7050	448.50	.728	.3038	.7108	326.632	-.0375	
		846.42	.638	.2662				
10	1.6063	448.50	.674	.3020	.7192	394.510	-.0365	
		897.86	.593	.2656				

TABLE III

## HS V6 SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN 67 M = 0.60 THETA 3/4 = 47.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE

PT	J	V0 VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	3.6719	664.97 585.98	1.105 -.886	.0749 -.0600	.2488	33.994	-.1349
3	3.3185	667.99 650.96	1.215 .348	.1610 .0462	.4396	81.600	-.1148
4	3.0161	668.60 716.33	1.231 .751	.2429 .1483	.5950	146.907	-.0946
5	2.7661	669.20 781.31	1.197 .841	.2854 .2007	.6594	210.855	-.0847
6	2.5536	669.80 846.29	1.126 .872	.3530 .2735	.8004	324.669	-.0795
7	2.4470	670.41 883.66	1.072 .843	.3622 .2849	.8264	380.932	-.0772

RUN 68 M = 0.60 THETA 3/4 = 52.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE

PT	J	V0 VT	ETA ETA NET	CT CT NET	CP	HP	CC
2	4.1468	667.99 521.13	1.214 -.241	.1453 -.0288	.4959	47.209	-.1741
3	3.6890	668.60 585.98	1.245 .535	.2476 .1065	.7334	99.078	-.1411
4	3.3293	670.41 650.70	1.217 .736	.2940 .1779	.8042	147.959	-.1161
5	3.0210	670.41 716.59	1.152 .818	.3564 .2531	.9348	229.685	-.1033
6	2.7718	671.01 781.18	1.067 .822	.3975 .3062	1.0320	327.929	-.0913

TABLE III  
HS VG SHROUDED PROPELLER TEST  
PERFORMANCE DATA

RUN 69 M = 0.60 THETA 3/4 = 38.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE								
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	2.7064	664.97 794.98	1.006 -.600	.0435 -.0260	.1171	39.861	-.0695	
3	2.5443	666.18 846.68	1.189 .398	.0976 .0327	.2088	85.524	-.0648	
4	2.4522	666.79 878.98	1.209 .610	.1259 .0636	.2554	116.844	-.0623	
5	2.3671	667.39 911.14	1.206 .720	.1455 .0869	.2855	145.224	-.0586	
6	2.2860	667.99 943.95	1.198 .801	.1678 .1121	.3201	180.724	-.0557	
7	2.2100	668.60 977.03	1.164 .827	.1813 .1288	.3441	215.041	-.0524	
8	2.0752	669.80 1041.75	1.085 .824	.2027 .1539	.3875	292.528	-.0488	

RUN 70 M = 0.20 THETA 3/4 = 38.00 DEG CONF L4 C1 E6 B3 PNT T2 R1 RE								
PT	J	VO VT	ETA ETA NET	CT CT NET	CP	HP	CC	
2	1.8805	227.74 390.65	1.123 .931	.2014 .1671	.3372	16.000	-.0343	
3	1.6056	227.32 455.89	1.042 .882	.2420 .2049	.3726	28.208	-.0371	
4	1.4019	227.32 521.00	.943 .817	.2759 .2390	.4100	46.324	-.0369	
5	1.2414	226.90 585.98	.828 .739	.2934 .2620	.4397	70.935	-.0314	
6	1.1140	226.90 651.61	.715 .654	.2978 .2725	.4639	102.909	-.0254	
7	1.0104	226.69 716.20	.632 .591	.2997 .2805	.4788	141.296	-.0192	
8	.9231	226.48 781.31	.568 .545	.3012 .2892	.4895	187.907	-.0120	
9	.8501	226.48 846.42	.515 .503	.3022 .2955	.4990	243.539	-.0067	
10	.7869	226.27 911.40	.469 .466	.3022 .3008	.5070	309.462	-.0014	
11	.7327	226.27 976.51	.431 .438	.3020 .3065	.5125	384.803	.0044	
12	.7006	226.27 1019.35	.409 .420	.3037 .3121	.5202	444.254	.0083	

TABLE III

## HS VG SHROUDED PROPELLER TEST

## PERFORMANCE DATA

RUN	71	M = 0.20	THETA 3/4 = 28.00 DEG		CONF	L4	C1	E6	B3	PNT	T2	R1	RE
PT	J	VO	ETA	CT	CP	HP	CC						
		VT	ETA NET	CT NET									
2	1.7742	225.21	.834	.0270	.0574	3.231	-.0172						
		410.58	.303	.0098									
3	1.5979	225.43	1.120	.0803	.1146	8.799	-.0113						
		455.63	.961	.0689									
4	1.3971	225.64	1.107	.1331	.1679	19.198	-.0175						
		520.61	.961	.1155									
5	1.2389	225.64	1.067	.1665	.1933	31.517	-.0209						
		585.98	.933	.1456									
6	1.1128	225.64	.999	.1824	.2031	45.467	-.0208						
		651.22	.885	.1616									
7	1.0098	225.64	.934	.2017	.2180	64.868	-.0195						
		716.07	.844	.1822									
8	.9229	225.64	.878	.2213	.2327	89.982	-.0167						
		781.44	.811	.2046									
9	.8495	225.64	.820	.2378	.2462	121.128	-.0133						
		846.68	.774	.2245									
10	.7865	225.64	.762	.2577	.2659	163.313	-.0087						
		911.66	.736	.2490									
11	.7308	225.43	.697	.2811	.2945	222.784	-.0006						
		976.64	.695	.2805									
12	.6828	225.21	.627	.2817	.3064	281.823	.0038						
		1041.75	.636	.2855									

RUN	88	M = 0.40	THETA 3/4 =		DEG	CONF	PTR + B3	PNT	T1	R1	RE5	RE
PT	J	VO	ETA	CT	CP	HP	CC					
		VT	ETA NET	CT NET								
2	2.4881	451.40	.801	.0370	.1149	17.528	.0					
		586.63	.801	.0370								
3	2.2388	451.40	.922	.1017	.2467	51.505	.0					
		651.35	.922	.1017								
4	2.0341	451.40	.931	.1524	.3328	92.388	.0					
		716.20	.931	.1524								
5	1.8628	451.40	.903	.1843	.3800	136.944	.0					
		781.31	.903	.1843								
6	1.7178	451.40	.873	.2071	.4073	186.602	.0					
		846.42	.873	.2071								
7	1.5930	451.40	.833	.2416	.4620	264.399	.0					
		911.53	.833	.2416								
8	1.4840	451.40	.770	.2751	.5300	373.473	.0					
		977.03	.770	.2751								

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 21- 8 CONF. L5 C1 E8 B3 PWT T1 R1 AD THETA 3/4 =29.0 DEG N = 5997 RPM  
 H = 2140 PSF PINF = 2136.22 PSF TSC = 68 DEG F RHO = .00235 SLUGS/CU FT  
 MINF = .0503 VINP = 56.71 FPS QU = 3.729 PSF Q = 3.781 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 297.56 290.56 273.60 273.49 251.79 251.54 232.74 231.81 223.09 219.74 254.59

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.86 14.91 14.94 15.00 15.03 15.04 15.05 15.07 15.08 15.10 15.11 15.13 15.14  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.14 15.15 15.16 15.17 15.17 14.84 15.18 15.19 15.19 15.19 15.18 15.13 15.14

TABLE IV

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RUN=PT 29-7 CONF. L4 C1 L7 B3 PW1 T1 K1 RE THETA 3/4 =20.0 DEG N = 5999 RPM  
 H = 2097 PSF PINF = 2039.02 PSF TSC = 71 DEG F RHO = .00225 SLUGS/CU FT  
 MINF = .1591 VIUF = 224.43 FPS QU = 53.472 PSF G = 56.616 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 222.84 224.29 226.32 223.30 218.79 220.37 218.14 219.97 219.58 219.72 220.73

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.53 14.69 14.63 14.67 14.60 14.68 14.70 14.72 14.72 14.72 14.72 14.71 14.72  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.74 14.73 14.73 14.72 14.72 14.72 14.70 14.47 14.57 14.56 14.56 14.56 14.56

MS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 TABLE IV  
 PRESSURE DATA

RUN-PT 30-0 CONF. L4 C2 C7 C3 C1 C1 C1 RE THETA 3/4 = 30.0 DEG N = 6000 RPM  
 H = 2.097 PSF PINF = 2036.65 PSF TSC = 70 DEG F RHO = .00225 SLUGS/CU FT  
 MANF = .2043 VINP = 230.04 FPS QIU = 56.222 PSF Q = 59.528 PSF

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	263.08	266.27	261.69	263.55	255.93	256.06	253.79	253.41	251.85	249.44	257.58

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.59	14.64	14.69	14.72	14.74	14.75	14.77	14.79	14.81	14.83	14.84	14.86	14.87
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	14.90	14.91	14.93	14.94	14.95	14.96	14.95	14.62	14.56	14.56	14.56	14.56	14.56

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

COMP. 32-5 CONF. L4 CA L7 03 PWT T1 R1 RE THETA 3/4 = 36.0 DEG N = 6001 RPM  
 PRESSURE DATA  
 H = 2086 PSF PINF = 1655.70 PSF TSC = 85 DEG F RHO = .00204 SLUGS/CU FT  
 OUTF = .4122 VINF = 464.70 FPS QU = 208.503 PSF Q = 220.763 PSF

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	398.01	405.18	398.47	404.39	398.20	400.42	400.41	403.31	407.09	407.43	402.09

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	07	08	09	10	11	12	13
PRES.	14.19	14.33	14.45	14.36	14.52	14.64	14.65	14.66	14.67	14.68	14.71	14.73
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25
PRES.	14.73	14.75	14.74	14.74	14.74	14.74	14.72	14.09	14.49	14.49	14.48	14.49

TABLE IV  
 HIS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 PRESSURE DATA

RUN-PT 33- 2 CONF. L4 C3 E7 E3 PUT 11 R1 RE THETA 3/4 =40.0 DEG N = 6004 RPM  
 H = 2104 PSF PINF = 2047.13 PSF TSC = 74 DEG F RHO = .00224 SLUGS/CU FT  
 MIIIF = .1982 VIINF = 224.04 FPS UO = 53.183 PSF  $\phi$  = 56.311 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 274.33 277.21 270.94 276.16 267.69 270.19 264.65 265.69 265.56 264.71 269.73

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.71 14.77 14.81 14.85 14.88 14.90 14.92 14.95 14.98 15.01 15.04 15.05 15.08  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.10 15.12 15.15 15.17 15.18 15.07 15.04 15.01 14.73 14.61 14.61 14.61 14.61

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 PRESSURE DATA

KUN-PT 34-7 CONF. L4 C1 L7 B3 P1 T1 R1 RE THETA 3/4 = 43.0 DEG N = 6000 RPM  
 M = 2106 PSF PXNF = 1079.10 PSF YSC = 73 DEG F RHO = .00212 SLUGS/CU FT  
 MINF = .4069 VINP = 453.74 FPS CU = 205.640 PSF Q = 217.740 PSF

INLET VELOCITIES, FPS

ORIF. .01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 417.74 423.71 416.57 422.48 414.89 415.77 415.63 416.83 419.11 417.52 418.02

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.42 14.50 14.61 14.71 14.79 14.83 14.86 14.90 14.92 14.94 14.97 15.00 15.03  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.07 15.10 15.12 15.15 15.16 15.17 15.14 14.41 14.62 14.62 14.62 14.63

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RECEPT 35-0 CONF. L4 C3 C7 B3 PUT T1 N1 RE THETA 3/4 = 50.0 DEG N = 6000 RPM  
 H = 2108 PSF PINF = 1674.08 PSF TSC = 83 DEG F RHO = .00208 SLUGS/CU FT  
 MINF = .4096 VINP = 400.91 FPS WU = 208.268 PSF Q = 220.514 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 417.20 423.57 418.16 424.51 418.31 421.62 421.68 424.80 427.77 426.66 422.43

EXIT TOTAL PRESSURES, PSIA

ORIF. 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.43 14.50 14.67 14.76 14.04 14.90 14.94 14.98 15.01 15.03 15.06 15.13  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.10 15.18 15.20 15.20 15.14 15.08 15.03 14.37 14.64 14.64 14.64 14.64

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 PRESSURE DATA

RUN-PT 36-5 CONF. L4 C1 E7 B3 PWT T1 R1 RE THETA 3/4 =50.0 DEG N = 6002 RPM  
 H = 2111 PSF PINF = 1681.21 PSF TSC = 86 DEG F RHO = .00207 SLUGS/CU FT  
 MINF = .4091 VINP = 461.71 FPS QU = 208.170 PSF Q = 220.411 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 417.74 424.78 418.42 424.98 417.56 421.37 419.97 424.24 427.48 426.52 422.31

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.51 14.60 14.69 14.79 14.88 14.93 14.97 15.01 15.04 15.06 15.10 15.12 15.16  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.18 15.21 15.23 15.22 15.16 15.10 15.05 14.39 14.66 14.66 14.66 14.66

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

CONF. L4 C1 E7 B3 PWT T1 R1 RE THETA 3/4 = 50.0 DEG N = 5499 RPM  
 PINF = 1619.13 PSF TSC = 95 DEG F RHO = .00183 SLUGS/CU FT  
 VINP = 693.77 FPS Q = 421.430 PSF Q = 446.210 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 AVE  
 VEL. 500.20 500.40 566.67 575.43 569.39 579.41 574.51 577.25 583.66 583.72 574.77

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.01 14.20 14.51 14.71 14.82 14.85 14.86 14.89 14.89 14.90 14.92 14.93 14.95  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.90 14.96 14.96 14.98 14.99 15.00 14.90 13.81 14.66 14.66 14.66 14.66

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 PRESSURE DATA

KUI-PT 39-5 CONF. L4 C1 R7 B3 PNT T2 R1 RE THETA 3/4 = 22.0 DEG N = 6001 RPM  
 H = 2111 PSF PINF = 2053.78 PSF TSC = 68 DEG F RHO = .00228 SLUGS/CU FT  
 MANF = .1985 VINP = 223.10 FPS QU = 53.512 PSF Q = 56.658 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 214.67 217.96 205.46 200.62 215.37 218.69 215.39 217.27 212.06 217.89 214.34

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.68 14.75 14.76 14.64 14.85 14.86 14.87 14.87 14.87 14.86 14.87 14.87 14.86  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.85 14.83 14.81 14.79 14.74 14.69 14.66 14.47 -14.66 14.66 14.66 14.66

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUM-FT 40-6 CONF. L4 C: E7 B5 PNT T2 R1 RE THETA 3/4 =30.0 DEG N = 6001 RPM  
 M = 2108 PSF PINF = 2047.25 PSF TSC = 68 DEG F RHO = .00227 SLUGS/CU FT  
 MINF = .2048 VINP = 230.12 FPS QU = 56.761 PSF Q = 60.119 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 256.67 259.34 244.39 246.84 251.80 255.15 249.09 248.59 234.90 248.56 249.73

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.89 14.79 14.85 14.89 14.91 14.92 14.92 14.93 14.94 14.96 14.97 14.97 14.97  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.97 14.96 14.96 14.95 14.94 14.91 14.89 14.59 14.64 14.64 14.64 14.64 14.64

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 PRESSURE DATA

RUN-PT 41-3 CONF. L4 C1 E7 B3 PNT T2 R1 RE THETA 3/4 = 32.0 DEG N = 6001 RPM  
 H = 2106 PSF PINF = 1872.94 PSF TSC = 68 DEG F RHO = .00213 SLUGS/CU FT  
 MINF = .4228 VINI = 457.96 FPS QU = 210.980 PSF Q = 223.385 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 364.97 370.42 358.75 363.77 373.68 378.02 373.63 378.24 370.21 384.51 371.62

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.25 14.44 14.59 14.69 14.70 14.71 14.71 14.72 14.72 14.66 14.72 14.72 14.73  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.71 14.70 14.67 14.64 14.61 14.56 14.54 13.78 14.62 14.62 14.63 14.62 14.62

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

CONF. L4 C1 C7 B3 P1T T2 R1 RE THETA 3/4 = 40.0 DEG N = 6000 RPM  
 PINF = 2046.69 PSF TSC = 70 DEG F RHO = .00226 SLUGS/CU FT  
 MINF = .2004 VINP = 225.53 FPS JU = 54.334 PSF Q = 57.529 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 276.10 280.37 262.33 267.62 271.26 278.00 269.05 271.30 250.16 269.03 269.55

EXIT TOTAL PRESSURES, PSIA

ORIF. 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.71 14.80 14.92 15.01 15.06 15.10 15.11 15.09 15.11 15.15 15.19 15.22  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.21 15.15 15.06 14.97 14.91 14.88 14.85 14.62 14.62 14.62 14.62 14.62

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 43- 6 CONF. L4 C: L7 83 PNT T2 R1 RE THETA 3/4 =43.0 DEG N = 6000 RPM  
 H = 2104 PSF PINF = 1870.54 PSF TSC = 79 DEG F RHC = .00208 SLUGS/CU FT  
 MINF = .4134 VINP = 463.35 FPS QU = 211.311 PSF Q = 223.736 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 413.96 419.01 404.11 409.21 415.43 420.10 413.30 416.22 396.82 419.03 412.72

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.40 14.54 14.64 14.75 14.83 14.89 14.93 14.95 14.96 14.97 14.98 14.99 15.01  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.01 15.00 15.00 15.00 14.99 14.97 14.92 14.12 14.61 14.61 14.61 14.61 14.61

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

CONF. L4 C1 L7 B3 PIIT T2 R1 RE THETA 3/4 = 43.0 DEG N = 6002 RPM  
 H = 2101 PSF PINF = 1604.57 PSF TSC = 80 DEG F RHO = .00186 SLUGS/CU FT  
 MINIF = .6327 VINIF = 694.59 FPS QU = 424.646 PSF Q = 449.615 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

ORIF. U1 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 529.54 537.86 526.04 533.62 542.47 547.55 546.16 549.54 534.01 556.98 540.38

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 13.76 14.16 14.46 14.62 14.66 14.67 14.68 14.69 14.69 14.69 14.69 14.68 14.68  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.07 14.65 14.64 14.62 14.52 14.53 14.49 12.81 14.57 14.59 14.59 14.59 14.59

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 45-7 CONF. L4 C1 E7 B3 PNT T2 R1 RE THETA 3/4 = 49.0 DEG N = 5991 RPM  
 H = 2099 PSF PINF = 187.06 PSF TSC = 80 DEG F RHO = .00208 SLUGS/CU FT  
 MINF = .4086 VINP = 458.66 FPS QV = 206.519 PSF Q = 218.662 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 430.35 435.64 419.03 425.11 426.35 434.08 426.67 426.98 402.34 429.00 425.74

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.47 14.60 14.74 14.81 14.84 14.86 14.91 14.97 15.03 15.07 15.10 15.10 15.12  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.14 15.14 15.14 15.15 15.10 15.05 15.01 14.27 14.58 14.57 14.57 14.58

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 46-4 CONF. L4 C1 E7 B3 PIT T2 R1 RE THETA 3/4 = 49.0 DEG N = 6001 RPM  
 H = 2095 PSF PINF = 1597.85 PSF TSC = 86 DEG F RHO = .00184 SLUGS/CU FT  
 MINF = .6343 VINP = 700.10 FPS QU = 425.045 PSF Q = 450.038 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 562.78 571.17 559.66 567.69 572.25 577.18 573.79 575.37 558.32 581.78 570.00

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 13.79 14.01 14.34 14.61 14.73 14.80 14.85 14.86 14.87 14.89 14.92 14.93 14.93  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.92 14.91 14.90 14.69 14.83 14.79 14.72 13.15 14.55 14.55 14.55 14.55

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

CONF. L4 C1 L7 B3 PNT T2 R1 RE THETA 3/4 = 54.0 DEG N = 6006 RPM  
 PINF = 1597.11 PSF TSC = 87 DEG F RHO = .00183 SLUGS/CU FT  
 VINP = .6331 VINP = 699.54 FPS QU = 423.271 PSF Q = 448.160 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 579.86 587.65 574.91 583.41 588.65 593.49 508.40 589.04 570.42 593.71 584.95

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 15.92 14.02 14.27 14.55 14.77 14.88 14.94 14.99 15.01 15.05 15.08 15.09 15.10  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.00 15.06 15.08 15.07 15.06 15.03 14.91 13.40 14.53 14.53 14.53 14.53 14.53

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 48- 7 CONF. L4 C1 E7 83 PNT T2 R1 RE THETA 3/4 =30.0 DEG N = 6000 RPM  
 H = 2091 PSF PINF = 2030.61 PSF TSC = 77 DEG F RHO = .00221 SLUGS/CU FT  
 MINF = .205U VINP = 232.31 FPS QU = 56.438 PSF Q = 59.756 PSF

INLET VELOCITIES, FPS

ORIF. 01 05 04 06 07 09 10 12 13 15 AVE  
 VEL. 257.40 259.89 247.86 250.95 252.82 255.36 248.88 250.04 236.54 248.75 250.85

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.57 14.66 14.72 14.75 14.77 14.77 14.78 14.79 14.80 14.82 14.82 14.83 14.83  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.84 14.83 14.83 14.82 14.80 14.76 14.74 14.47 14.52 14.52 14.52 14.52 14.52

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 61- 6 CONF. L4 C1 E6 B3 PNT T2 R1 RE THETA 3/4 =22.0 DEG N = 6001 RPM  
 H = 2120 PSF PINF = 2060.25 PSF TSC = 74 DEG F RHO = .00226 SLUGS/CU FT  
 MINF = .2025 VINP = 228.83 FPS QU = 55.857 PSF Q = 59.142 PSF

INLET VELOCITIES, FPS

OR<sub>r</sub>F. 01 03 04 06 07 09 10 12 13 15 AVE  
 VE, . 195.30 190.43 185.39 183.55 195.18 198.22 198.23 201.07 197.97 203.77 194.41

EXIT TOTAL PRESSURES, PSIA

OR<sub>r</sub>F. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PR<sub>r</sub>S. 14.79 14.86 14.89 14.91 14.93 14.94 14.94 14.95 14.96 14.96 14.96 14.96 14.95  
 OR<sub>r</sub>F. 14 15 16 17 18 19 20 21 22 23 24 25  
 PR<sub>r</sub>S. 14.95 14.92 14.90 14.60 14.81 14.77 14.49 14.64 14.72 14.72 14.75 14.72

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 62-8 CONF. L4 C1 E6 F3 FNT T2 R1 RE THETA 3/4 = 28.0 DEG N = 6000 RPM  
 H = 21.54 PSF PINF = 2043.27 PSF TSC = 67 DEG F RHO = .00227 SLUGS/CU FT  
 MINF = .2050 VINP = 230.08 FPS QU = 56.757 PSF Q = 60.094 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 211.31 215.97 204.75 209.56 214.74 218.78 216.78 216.93 208.42 218.96 213.62

EXIT TOTAL PRESSURES PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.72 14.81 14.85 14.88 14.88 14.89 14.90 14.91 14.92 14.93 14.94 14.94 14.94  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.95 14.94 14.93 14.91 14.87 14.85 14.85 14.82 14.61 14.61 14.61 14.61 14.61

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 63- 3 CONF. L4 C1 E6 P3 PNT T2 R1 RE THETA 3/4 =30.0 DEG N = 6000 RP.  
 H = 2104 PSF PINF = 1871.33 PSF TSC 72 DEG F RHO = .00211 SLUGS/QU FT  
 MINF = .4126 VINP = 459.51 FPS QU = 210.627 PSF Q = 223.011 PSF

INLET VELOCITIES, FPS

ORIF. 01 02 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 300.62 307.66 300.28 307.67 319.53 325.14 327.66 333.05 331.14 342.60 319.54

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.33 14.46 14.60 14.71 14.74 14.74 14.74 14.76 14.76 14.75 14.75 4.75 14.75  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.74 14.72 14.70 14.66 14.61 14.59 13.70 13.88 14.40 14.58 14.61 14.61 14.61

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 64- 5 CONF. L4 C1 E6 B3 PNT T2 R1 RE THETA 3/4 = 41.0 DEG N = 6000 RPM  
 H = 2103 PSF PINF = 1869.61 PSF TSC 79 DEG F RHO = .00208 SLUGS/CU FT  
 MINF = .4134 VINP = 463.39 FPS QU = 211.246 PSF Q = 223.667 PSF

INLET VELOCITIES, FPS

ORIF. 01 02 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 332.63 340.98 330.61 338.74 348.79 355.07 354.78 358.03 347.29 366.47 347.38

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.5 14.65 14.69 14.76 14.83 14.88 14.93 14.96 14.99 14.99 15.01 15.01 15.02  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.03 15.02 15.02 15.01 14.99 14.95 13.72 14.24 14.60 14.60 14.61 14.61

TABLE IV  
 VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RUN-PT 62-3 CONF. L4 C1 E5 P3 PNT T2 R1 RE THETA 3/4 = 41.0 DEG N = 5998 RPM  
 H = 2102 PSF PINF = 1596.36 PSF TSC 89 DEG F RHO = .00183 SLUGS/CU FT  
 MINF = .6395 VINP = 707.32 FPS QU = 431.611 PSF Q = 456.990 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

CRIF. 01 02 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 436.02 448.99 441.59 449.71 463.60 473.59 478.20 481.93 477.29 495.84 464.70

EXIT TOTAL PRESSURES, PSIA

CRIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 13.93 14.21 14.49 14.57 14.72 14.72 14.72 14.74 14.75 14.74 14.77 4.76 14.75  
 CRIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.73 14.72 14.70 14.67 14.62 14.58 12.44 12.78 13.93 14.49 14.59 14.60

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 56- 8 CONF. L4 C1 E6 G3 PNT T2 R1 RE THETA 3/4 =47.0 DEG N = 2000 RPM  
 H = 2132 PSF PINF = 1867.96 PSF TSC = 80 DEG F RHO = .00208 SLUGS/CU FT  
 MINF = .4141 VINP = 464.61 FPS QU = 211.807 PSF Q = 224.261 PSF

INLET VELOCITIES, FPS

ORIP. 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 AVE  
 VEL. 335.89 344.75 335.40 344.49 353.41 362.10 362.75 367.66 353.03 376.14 353.56

EXIT TOTAL PRESSURES, PSIA

ORIP. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRFS. 14.60 14.72 14.85 14.92 14.91 14.91 14.95 15.01 15.08 15.12 15.17 15.19 15.19  
 ORIP. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRFS. 15.16 15.08 15.00 14.94 14.90 14.89 13.71 14.24 14.60 14.6 14.60 14.60 14.60

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST  
 PRESSURE DATA

RUN-PT 67-5 CONF. L4 C1 E6 P3 PNT T2 R1 RE THETA 3/4 = 47.0 DEG N = 6000 RPM  
 H = 2102 PSF PINF = 1603.35 PSF TSC = 94 DEG F RHO = .00182 SLUGS/CU FT  
 MINF = .6342 VINP = 705.09 FPS QU = 426.349 PSF Q = 451.418 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 455.72 467.40 460.51 468.95 482.64 490.16 493.57 438.24 486.22 509.60 481.30

EXIT TOTAL PRESSURES PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.07 14.23 14.46 14.68 14.83 14.88 14.91 14.93 14.95 14.94 14.97 14.98 15.00  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.01 15.00 15.00 14.99 14.95 14.88 12.68 13.06 14.27 14.59 14.60 14.60 14.60

TABLE IV  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RUN-PT 68-6 CONF. L4 C1 E6 P3 PNT T2 R1 RE THETA 3/4 = 52.0 DEG N = 5999 RPM  
 H = 2101 PSF PINF = 1606.82 PSF TSC 98 DEG F RHO = .00181 SLUGS/CU FT  
 MINF = .6310 VINP = 704.30 FPS QU = 422.945 PSF Q = 447.814 PSF

PRESSURE DATA

INLET VELOCITIES, FPS

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 AVE  
 VEL. 467.21 478.96 471.78 481.14 493.36 501.79 503.50 508.06 489.95 517.63 491.34

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.20 14.34 14.48 14.63 14.78 14.89 14.99 15.05 15.09 15.14 15.16 15.16 15.18  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.20 15.19 15.18 15.16 15.11 14.85 12.53 13.26 14.46 14.59 14.60 14.59 14.59

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 69- 2 CONF. L4 C1 E6 B3 PNT T2 R1 RE THETA 3/4 = 38.0 DEG N = 6105 RPM  
 H = 2097 PSF PINF = 1601.77 PSF TSC = 88 DEG F RHO = .00183 SLUGS/CU FT  
 MINF = .6325 VINP = 699.52 FPS QU = 423.646 PSF Q = 448.556 PSF

INLET VELOCITIES, FPS

ORI. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 429.31 441.19 436.51 444.49 457.66 467.62 471.99 475.10 471.60 489.35 458.48

EXIT TOTAL PRESSURES PSIA

ORI. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 13.93 14.22 14.46 14.61 14.65 14.65 14.66 14.66 14.67 14.68 14.69 14.68 14.66  
 ORI. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.65 14.63 14.60 14.58 14.52 14.51 12.45 12.70 13.73 14.29 14.53 14.56

TABLE IV  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RUN-PT 70- 9 CONF. L4 C1 E6 3 PNT T2 R1 RE THETA 3/4 = 38.0 DEG N = 5000 RPM  
 H = 2097 PSF PINF = 2036.93 PSF TSC = 79 DEG F RHO = .00221 SLUGS/CU FT  
 MINF = .2042 VINP = 231.79 FPS Q = 56.143 PSF Q = 59.444 PSF

:-RESSURE DATA

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 228.24 235.13 223.47 232.3 235.30 242.57 240.95 243.21 226.96 243.90 235.18

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.69 14.77 14.89 14.98 15.03 15.04 15.05 15.07 15.07 15.10 15.14 15.18 15.17  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 15.11 15.00 14.90 14.84 14.83 14.83 14.83 14.84 14.83 14.56 14.56 14.56 14.56

TABLE IV

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 71-8 CONF. L4 C1 E6 B3 PNT T2 R1 RE THETA 3/4 = 28.0 DEG N = 6001 RPM  
 H = 2096 PSF PINF = 2034.78 PSF TSC = 74 DEG F RHO = .00223 SLUGS/CU FT  
 MINF = .2062 VINP = 232.99 FPS QU = 57.209 PSF Q = 60.573 PSF

INLET VELOCITIES, FPS

ORIF. 01 03 04 06 07 09 10 12 13 15 AVE  
 VEL. 211.50 216.38 207.41 212.09 215.97 218.90 217.45 219.20 209.45 219.53 214.79

17-30

EXIT TOTAL PRESSURES, PSIA

ORIF. 01 02 03 04 05 06 07 08 09 10 11 12 13  
 PRES. 14.86 14.75 14.80 14.82 14.83 14.84 14.85 14.86 14.87 14.87 14.88 14.88 14.89  
 ORIF. 14 15 16 17 18 19 20 21 22 23 24 25  
 PRES. 14.89 14.88 14.88 14.86 14.82 14.80 14.36 14.46 14.55 14.55 14.56 14.56

TABLE V  
HS VG SHROUDED PROPELLER TEST  
SHROUD INLET VELOCITIES - FT/SEC

PT	RPM	M = 0.10	THETA 3/4 = 36.00 DEG	CONF	L5	C1	E8	B3	PWT	T1	R1	AD	V10	V12	V13	V15	VAVE
2	4002	226.62	220.40	229.84	214.55	213.6	205.56	203.29	197.62	196.53	196.53	213.77	205.56	203.29	197.62	196.53	213.77
3	5000	284.56	278.67	277.72	258.23	256.9	246.02	243.09	236.0	231.89	231.89	258.07	246.02	243.09	236.0	231.89	258.07
4	6002	349.58	341.57	333.56	307.42	307.6	293.08	288.53	279.13	274.93	274.93	349.58	293.08	288.53	279.13	274.93	349.58
5	7000	427.91	419.61	403.00	368.63	369.5	349.85	344.71	332.40	325.84	325.84	427.91	349.85	344.71	332.40	325.84	427.91
6	7000	427.71	419.63	403.12	369.87	369.9	349.80	345.12	332.57	326.11	326.11	427.71	349.80	345.12	332.57	326.11	427.71

PT	RPM	M = 0.02	THETA 3/4 = 36.00 DEG	CONF	L5	C1	E8	B3	PWT	T1	R1	AD	V10	V12	V13	V15	VAVE
2	4001	222.02	215.85	209.70	183.40	182.8	172.48	168.52	161.28	158.2	158.2	222.02	172.48	168.52	161.28	158.2	222.02
3	5004	282.80	275.65	255.90	233.14	232.7	218.73	213.57	204.97	204.97	204.97	282.80	218.73	213.57	204.97	204.97	282.80
4	6002	349.94	340.65	317.61	286.07	286.4	268.44	262.19	251.46	245.57	245.57	349.94	268.44	262.19	251.46	245.57	349.94
5	7002	428.94	419.17	391.68	351.34	350.9	328.49	322.96	308.2	299.91	299.91	428.94	328.49	322.96	308.2	299.91	428.94

PT	RPM	M = 0.02	THETA 3/4 = 22.00 DEG	CONF	L5	C1	E8	B3	PWT	T1	R1	AD	V10	V12	V13	V15	VAVE
2	4000	157.56	152.20	141.81	131.65	130.2	122.05	122.05	117.40	116.46	116.46	157.56	131.65	122.05	117.40	116.46	157.56
3	5000	199.80	194.00	176.03	167.05	165.0	154.15	150.05	147.5	143.53	143.53	199.80	167.05	150.05	147.5	143.53	199.80
4	6000	243.00	235.96	210.53	201.07	201.6	187.77	185.80	178.39	175.9	175.9	243.00	201.07	185.80	178.39	175.9	243.00
5	7001	291.42	280.03	263.76	264.00	3 C						291.42	264.00				291.42

TABLE V

HS VG SHROUDED PROPELLER TEST

SHPOUD INLET VELOCITIES - FT/SEC

RUN 18 M = 0.05 THETA 3/4 = 22.00 DEG CONF L5 C1 E8 B3 PWT T1 R1 AD

PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE
2	4001	153.36	148.96	147.24	146.42	139.05	130.0	132.11	132.34	127.42	125.26	139.12
3	5000	196.05	191.17	182.79	182.95	170.69	169.9	161.90	161.33	155.39	153.22	172.55
4	5993	242.50	236.47	223.97	222.87	207.92	206.8	195.76	195.44	187.5	183.38	210.27
5	7003	286.89	279.44	263.98	264.92	212.44	243.4	228.65	226.35	218.7	215.15	247.

RUN 19 M = 0.05 THETA 3/4 = 29.00 DEG CONF L5 C1 E8 B3 PWT T1 R1 AD

PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE
2	3002	141.39	137.50	134.10	133.87	126.52	127.2	96.70	119.89	116.03	114.72	124.8
3	3500	165.24	160.42	156.72	155.17	145.82	144.0	137.92	136.60	131.64	128.14	146.27
4	4001	190.77	185.31	177.40	176.21	164.10	164.8	153.39	155.15	149.17	146.8	166.24
5	4500	217.18	210.49	199.13	199.83	185.01	184.8	175.37	170.80	166.99	165.16	187.38
6	5001	241.70	235.82	222.96	222.00	206.04	205.1	192.06	191.25	184.78	182.29	209.41
7	5502	267.91	262.11	246.54	246.02	226.93	227.1	213.16	210.99	202.58	199.53	230.4
8	6000	296.08	289.11	270.93	270.47	248.76	248.3	234.75	229.58	222.36	218.75	252.92
9	7000	355.23	347.67	326.18	325.80	296.97	296.2	278.95	275.16	264.28	259.9	320.55

RUN 20 M = 0.10 THETA 3/4 = 29.00 DEG CONF L5 C1 E8 B3 PWT T1 R1 AD

PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE
2	4001	199.45	193.10	201.95	202.61	190.18	190.6	182.43	181.07	178.93	179.21	189.36
3	4999	243.09	239.29	240.07	240.73	224.10	223.0	214.32	213.23	207.79	206.14	225.37
4	6001	294.67	288.02	283.95	283.09	263.54	263.7	251.05	248.32	241.38	237.77	265.60
5	7001	354.28	347.96	335.64	336.11	309.09	311.0	295.65	292.12	282.71	277.79	314.32

V:  
N.

TABLE V

HS VG SHROUDED PROPELLER TEST

SHROUD INLET VELOCITIES - FT/SEC

RUN 49 M = 0.20 THETA 3/4 = 30.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 AD

PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE
2	4000	204.24	206.23	196.11	198.34	205.11	206.9	204.96	207.73	199.4	2 6.44	2 3.55
3	5002	225.01	225.99	216.76	220.37	223.49	226.4	220.24	222.83	213.05	224.4	221.86
4	6000	255.04	256.78	242.87	246.76	249.99	254.0	247.73	246.69	232.96	246.71	247.96
5	7003	294.18	297.97	279.06	282.25	283.90	288.0	278.67	278.21	256.73	273.34	281.24
6	6000	253.39	256.14	241.77	244.13	247.75	251.7	245.80	245.27	230.39	243.89	246.3

V.3

RUN 50 M = 0.60 THETA 3/4 = 49.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 AD

PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE
2	5005	537.26	545.06	535.00	541.56	550.53	554.5	553.67	557.25	545.15	563.74	548.39

RUN 51 M = 0.40 THETA 3/4 = 49.00 DEG CONF L4 C1 E7 B3 PNT T2 R1 AD

PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE
2	3501	365.75	371.08	361.31	363.48	370.77	376.8	374.40	377.04	370.57	382.77	371.4
3	4001	376.81	382.53	371.85	373.07	380.56	386.7	383.35	385.68	375.75	39.72	38.8
5	6002	366.67	372.11	355.45	362.71	360.31	367.7	358.61	360.45	403.65	362.98	367.9
6	6000	362.09	368.60	352.46	361.63	363.53	374.1	358.94	370.36	412.3	372.85	369.68

TABLE V

HS VG SHROUDED PROPELLER TEST

SHROUD INLET VELOCITIES - FT/SEC

PT	RPM	M	THETA 3/4	DEG	CONF	L4	C1	E7	B3	PNT	T2	R1	AD	V13	V15	VAVE
4	6053	0.60	544.15	532.26	539.37	547.88	552.3	551.16	554.93	551.16	554.93	554.93	AD	445.07	562.	546.45
5	6503	0.60	551.60	545.23	547.69	551.11	561.4	559.12	562.33	559.12	562.33	562.33	AD	551.65	569.81	554.37
6	7003	0.60	561.12	550.57	558.02	565.94	571.1	563.55	571.31	563.55	571.31	571.31	AD	559.86	574.6	557.44
7	7506	0.60	574.79	567.26	520.27	573.19	525.5	569.92	526.35	569.92	526.35	526.35	AD	565.95	531.72	552.57
			527.46	517.82	584.35	528.49	531.2	530.75	529.38	530.75	529.38	529.38	AD	574.19	589.11	540.11

V14

PT	RPM	M	THETA 3/4	DEG	CONF	L4	C1	E7	B3	PNT	T2	R1	AD	V13	V15	VAVE
2	4052	0.40	374.84	367.22	370.92	377.45	374.1	370.48	382.64	370.48	382.64	382.64	AD	376.07	388.3	375.99
3	5002	0.40	397.21	386.54	382.16	396.49	403.1	398.83	401.36	398.83	401.36	401.36	AD	389.82	406.43	395.35
4	6002	0.40	422.47	410.73	415.76	420.11	419.1	419.95	420.28	419.95	420.28	420.28	AD	403.54	418.63	416.95
5	7002	0.40	460.82	445.19	451.93	452.70	460.3	452.17	451.63	452.17	451.63	451.63	AD	418.6	452.48	45.7

PT	RPM	M	THETA 3/4	DEG	CONF	L4	C1	E6	B3	PNT	T2	R1	AD	V13	V15	VAVE
2	4000	0.20	176.74	182.42	181.04	179.49	175.2	169.06	165.70	169.06	165.70	165.70	AD	170.25	166.92	175.1
3	5001	0.20	190.15	197.08	197.40	196.92	191.8	189.42	185.07	189.42	185.07	185.07	AD	190.31	187.82	192.53
4	5999	0.20	208.66	219.10	218.67	220.56	215.4	212.28	208.40	212.28	208.40	208.40	AD	216.68	211.99	215.16
5	7000	0.20	229.25	244.60	245.51	250.63	244.0	244.29	238.52	244.29	238.52	238.52	AD	249.75	244.76	243.6

TABLE V

HS VG SHROUDED PROPELLER TEST

SHROUD INLET VELOCITIES - FT/SEC

PT	RPM	M = 0.40	THETA 3/4 = 41.00 DEG	CONF	L4	C1	E6	B3	PNT	T2	R1	AD	V12	V13	V15	VAVE
2	4001	335.87	V03 325.59	V04 327.57	V06 323.16	V07 320.84	V09 315.7	V10 307.23	V12 301.52	V13 302.96	V15 296.75	VAVE 315.73				
3	5001	349.38	V03 333.81	V04 340.53	V06 336.21	V07 336.26	V09 328.5	V10 321.39	V12 315.52	V13 317.94	V15 311.71	VAVE 329.13				
4	6000	365.47	V03 345.42	V04 359.53	V06 356.37	V07 357.47	V09 349.4	V10 345.11	V12 337.18	V13 341.85	V15 335.35	VAVE 349.32				
5	7001	389.30	V03 363.47	V04 385.33	V06 383.32	V07 385.23	V09 375.4	V10 372.64	V12 362.90	V13 371.05	V15 361.94	VAVE 375.7				

4.5

PT	RPM	M = 0.60	THETA 3/4 = 41.00 DEG	CONF	L4	C1	E6	B3	PNT	T2	R1	AD	V12	V13	V15	VAVE
2	5558	481.78	V03 467.21	V04 472.75	V06 467.95	V07 463.75	V09 455.1	V10 443.13	V12 436.21	V13 437.94	V15 425.98	VAVE 455.19				
3	6004	489.76	V03 472.88	V04 480.23	V06 476.37	V07 473.41	V09 463.1	V10 453.32	V12 445.59	V13 448.16	V15 436.72	VAVE 463.95				
4	7003	502.70	V03 481.91	V04 494.88	V06 489.46	V07 487.43	V09 479.1	V10 469.51	V12 460.00	V13 464.49	V15 453.26	VAVE 478.29				

PT	RPM	M = 0.40	THETA 3/4 = 47.00 DEG	CONF	L4	C1	E6	B3	PNT	T2	R1	AD	V12	V13	V15	VAVE
2	4000	344.41	V03 331.58	V04 337.65	V06 333.79	V07 332.21	V09 324.8	V10 315.60	V12 311.00	V13 314.84	V15 307.81	VAVE 325.37				
3	5002	359.70	V03 341.06	V04 352.49	V06 348.29	V07 349.11	V09 341.3	V10 333.91	V12 326.00	V13 331.54	V15 324.91	VAVE 340.92				
4	6001	374.99	V03 352.97	V04 367.34	V06 363.47	V07 363.93	V09 353.9	V10 348.31	V12 339.29	V13 344.59	V15 336.88	VAVE 354.57				
5	6951	391.92	V03 366.84	V04 385.37	V06 379.26	V07 380.05	V09 367.6	V10 362.68	V12 350.58	V13 358.25	V15 348.91	VAVE 369.15				

TABLE V  
 HS VG SHROUDED PROPELLER TEST  
 SHROUD INLET VELOCITIES - FT/SEC

RUN	76	M	=	0.60	THETA	3/4	=	47.00	DEG	CONF	L4	C1	E6	B3	PNT	T2	R1	AD	V13	V15	VAVE
PT	RPM	V01	V03	V04	V06	V07	V09	V10	V12	V13	V15	VAVE									
2	4504	482.95	471.12	473.39	469.09	465.12	455.0	444.54	437.37	440.67	428.65	456.8									
3	5000	494.26	477.61	484.26	479.35	475.53	467.2	457.91	450.21	452.67	44.72	467.98									
4	6003	505.16	484.76	497.25	492.23	489.80	481.3	471.05	462.16	467.75	456.98	48.85									
5	6802	518.94	494.48	513.35	508.16	507.81	497.9	489.56	478.94	485.77	474.15	496.91									
6	6002	505.24	485.05	496.77	491.61	488.88	481.1	471.84	462.59	467.73	457.36	48.82									
7	5001	493.85	478.69	484.93	478.96	475.34	467.2	455.81	449.01	452.19	44.2	467.63									

TABLE VI  
 HS VG SHROUDED PROPELLER TEST  
 TRAVERSING PROBE DATA

RUN 22 CONF. L5 C1 E8 B3 PWT T1 R1 RE TP THETA 3/4 = 29.0 DEG  
 H = 2133 PSF P1NF = 2132 PSF TSC = 74 DEG RHO = 0.00232 SLUGS/CU FT  
 M = 0.0230 VINP = 23.12 FPS Q = 0.62 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	17.00	6.10	-42.79	71	15.16	14.46	291.66	212.83
3	15.00	2.60	-39.30	71	15.30	14.33	343.62	265.62
4	10.00	8.20	-26.30	70	15.19	14.46	299.34	265.62
5	10.00	(6500 RPM)	-18.96	70	15.14	14.50	277.95	260.05
6	10.00	(7500 RPM)	-25.24	70	15.24	14.40	320.42	286.71
7	6.00	11.30	10.63	70	15.03	14.54	245.97	237.06

RUN 23 CONF. L5 C1 E8 B3 PWT T1 R1 RE TP THETA 3/4 = 29.0 DEG  
 H = 2131 PSF P1NF = 2127 PSF TSC = 74 DEG RHO = 0.00231 SLUGS/CU FT  
 M = 0.0503 VINP = 56.88 FPS Q = 3.74 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	4.32	12.00	28.69	69	14.88	14.64	172.60	148.11
3	6.00	10.80	-16.48	69	15.01	14.50	249.51	235.02
4	10.00	8.00	-32.10	70	15.16	14.43	298.13	250.11
5	10.00	(6500 RPM)	-26.61	70	15.11	14.48	277.42	245.74
6	10.00	(7500 RPM)	-28.57	71	15.22	14.38	319.86	278.11
7	15.00	1.80	-31.47	72	15.28	14.35	336.72	287.07
8	17.00	5.20	-17.18	72	15.11	14.50	274.59	261.25

TABLE VI  
 HS VG SHROUDED PROPELLER TEST  
 TRAVERSING PROBE DATA

RUN 24 CONF. L5 C1 E8 B3 PWT T1 R1 RE TP THETA 3/4 = 29.0 DEG  
 H = 2132 PSF P1NF = 2116 PSF TSC = 76 DEG RHO = 0.00230 SLUGS/CU FT  
 M = 0.1022 VINP = 117.08 FPS Q = 15.75 PSF N = 7003 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	17.00	2.80	-40.28	71	15.06	14.46	273.00	208.02
3	15.00	.40	-38.95	72	15.24	14.28	342.98	266.73
4	10.00	6.20	-32.12	72	15.14	14.40	301.82	254.11
5	10.00 (6500 RPM)	5.70	-27.39	71	15.09	14.44	280.63	247.95
6	10.00 (7500 RPM)	7.00	-30.24	72	15.20	14.34	324.56	278.30
7	6.00	8.90	-2.64	71	15.00	14.46	257.32	253.96
8	4.29	8.40	32.11	71	14.86	14.59	182.71	153.10

RUN 55 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 43.0 DEG  
 H = 2109 PSF P1NF = 1876 PSF TSC = 84 DEG RHO = 0.00207 SLUGS/CU FT  
 M = 0.4133 VINP = 465.37 FPS Q = 224.16 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	14.75	72.50	-10.04	84	15.11	13.22	495.09	146.60
3	12.00	78.00	.28	84	15.43	12.83	579.25	120.43
4	12.00 (4300 RPM)	.60	-.22	77	14.70	13.41	408.66	408.64
5	12.00 (5500 RPM)	3.50	-.16	80	14.93	13.26	464.47	463.61
6	9.00	8.70	.65	84	15.31	12.91	557.39	550.94
7	6.00	11.50	2.85	84	15.15	13.11	515.18	504.22
8	4.69	12.20	6.08	80	14.78	13.44	417.48	405.76
9	12.00	7.70	.31	86	15.42	12.83	580.64	575.39
10	14.70	7.20	-9.60	86	15.09	13.23	491.92	481.21

TABLE VI  
HS VG SHROUDED PROPELLER TEST  
TRAVERSING PROBE DATA

RUN 56 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 43.0 DEG  
H = 2111 PSF PINF = 1614 PSF TSC = 96 DEG RHO = 0.00182 SLUGS/CU FT  
M = 0.6311 VINP = 703.16 FPS Q = 450.06 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	14.75	.90	-10.49	90	14.61	12.35	557.17	547.79
3	12.00	1.40	-.06	94	14.84	12.07	617.72	617.54
4	12.00	.60	.17	93	14.71	12.17	593.20	593.16
5	9.00	3.10	.22	96	14.94	11.97	640.86	639.92
6	6.00	5.60	1.34	95	14.91	12.15	616.53	613.42
7	4.69	7.00	3.38	94	14.77	12.31	580.85	575.52

RUN 57 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 32.0 DEG  
H = 2111 PSF PINF = 1877 PSF TSC = 88 DEG RHO = 0.00206 SLUGS/CU FT  
M = 0.4134 VINP = 467.19 FPS Q = 224.47 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	4.69	7.00	2.86	84	14.77	13.49	409.40	405.84
3	6.00	5.50	.36	84	14.82	13.44	425.34	423.38
4	9.00	3.30	-.69	84	14.90	13.29	459.48	458.68
5	12.00	2.00	-.46	84	14.86	13.30	451.38	451.09
6	12.00	-.20	-.76	82	14.65	13.46	394.66	394.63
7	12.00	3.50	-.61	87	15.01	13.18	490.65	489.71
8	14.75	.10	-9.53	82	14.58	13.64	351.47	346.62

TABLE VI  
 HS V6 SHROUDED PROPELLER TEST  
 TRAVERSING PROBE DATA

RUN 58 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 30.0 DEG  
 H = 2111 PSF P1NF = 2049 PSF TSC = 81 DEG RHO = 0.00222 SLUGS/CU FT  
 M = 0.2064 V1NF = 234.73 FPS Q = 61.12 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	14.75	7.40	-9.20	79	14.96	14.14	321.64	314.85
3	12.00	7.90	.83	80	15.15	13.92	394.99	391.20
4	12.00	(6000 RPM) 6.40	.73	77	14.97	14.08	334.94	332.83
5	12.00	(8000 RPM) 9.90	-.31	83	15.45	13.66	475.44	468.35
6	9.00	10.90	-.10	80	15.14	13.92	392.68	385.60
7	6.00	14.70	1.44	79	15.07	14.01	366.12	354.02
8	4.69	18.30	7.24	78	14.91	14.16	307.81	289.91

RUN 59 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 30.0 DEG  
 H = 2112 PSF P1NF = 2051 PSF TSC = 80 DEG RHO = 0.00222 SLUGS/CU FT  
 M = 0.2057 V1NF = 233.74 FPS Q = 60.75 PSF N = 7000 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	4.69	18.40	7.50	76	14.91	14.16	306.98	288.80
3	6.00	14.70	1.76	78	15.08	14.01	366.98	354.80
4	9.00	10.80	.21	78	15.15	13.93	392.28	385.33
5	12.00	8.10	.49	78	15.16	13.93	394.36	390.41
6	12.00	(6000 RPM) 6.30	1.16	76	14.97	14.08	333.55	331.46
7	12.00	(8000 RPM) 9.70	-.34	82	15.46	13.66	475.49	468.69
8	14.75	7.80	-8.84	78	14.97	14.15	321.69	314.93

TABLE VI  
HS VG SHROUDED PROPELLER TEST  
TRAVERSING PROBE DATA

RUN 77 CONF. L4 C1 E6 B3 PNT T2 R1 RE TP. THETA 3/4 = 28.0 DEG  
H = 2092 PSF PINF = 2031 PSF TSC = 70 DEG RHO = 0.00224 SLUGS/CU FT  
M = 0.2062 VINP = 232.05 FPS Q = 60.42 PSF N = 6500 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	14.26	5.50	-12.97	66	14.77	14.09	290.78	282.05
3	12.00	7.90	3.47	67	14.94	13.93	355.26	351.24
4	10.00	10.00	2.68	67	14.96	13.89	364.67	358.73
5	10.00	(5500 RPM)	3.33	65	14.80	14.03	309.41	305.65
6	10.00	(7500 RPM)	2.88	69	15.19	13.69	430.83	421.95
7	6.69	14.20	1.98	67	14.91	13.95	345.90	335.13
8	4.69	19.60	6.59	65	14.77	14.08	293.50	274.66

RUN 79 CONF. L4 C1 E6 B3 PNT T2 R1 RE TP THETA 3/4 = 30.0 DEG  
H = 2092 PSF PINF = 1859 PSF TSC = 76 DEG RHO = 0.00208 SLUGS/CU FT  
M = 0.4139 VINP = 462.59 FPS Q = 222.93 PSF N = 6500 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	4.69	8.00	2.04	76	14.65	13.49	388.09	384.07
3	6.69	5.30	.97	78	14.68	13.42	404.43	402.64
4	10.00	2.80	2.37	79	14.74	13.29	434.52	433.63
5	10.00	(5500 RPM)	2.13	78	14.53	13.43	378.35	378.08
6	10.00	(7500 RPM)	2.85	76	14.97	13.11	490.25	487.72
7	12.00	5.10	2.87	74	14.70	13.35	416.85	416.14
8	14.26	1.80	-17.56	73	14.42	13.65	314.29	299.49

TABLE VI  
 HS VG SHROUDED PROPELLER TEST  
 TRAVERSING PROBE DATA

RUN 80 CONF. L4 C1 E6 B3 PNT T2 R1 RE TP THETA 3/4 = 41.0 DEG  
 H = 2090 PSF P1NF = 1592 PSF TSC = 94 DEG RHO = 0.00180 SLUGS/CU FT  
 M = 0.6356 V1NF = 706.50 FPS Q = 450.27 PSF N = 6500 RPM

PT NO	DISTANCE D IN	ZETA DEG	THETA DEG	TTP DEG F	PT PSIA	PS PSIA	VTP FPS	VPR FPS
2	14.26	5.30	-23.66	86	14.37	12.57	496.25	452.61
3	12.00	2.10	1.74	90	14.79	12.13	603.85	603.17
4	10.00	3.00	1.69	90	14.77	12.10	604.75	603.66
5	10.00	(5500 RPM)	1.67	90	14.38	12.39	525.32	525.05
6	10.00	(7500 RPM)	2.50	89	15.09	11.92	656.00	652.98
7	6.69	5.70	1.48	91	14.74	12.27	581.01	577.95
8	4.69	7.70	2.49	93	14.64	12.45	547.78	542.33

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 22- 4 CONF. L5 C1 E8 B3 PWT T1 R1 RE TP THETA 3/4 =29.0 DEG N = 7000 RPM  
 M = 2133 PSF PINF = 2131.84 PSF TSC = 74 DEG F RHO = .00232 SLUGS/CU FT  
 MINF = .0279 VINP = 31.63 FPS QU = 1.144 PSF Q = 1.160 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	10	125	15	175	20	25
S18-96.079	-159.17	-157.11	-184.39	-204.73	-196.81	-189.03	-160.19	-139.02	-127.52	-114.68
S2T	-70.394	.907	-19.947	-5.778	.661	.754	.877	.815	.538	-6.147
30	35	40	50	60	70	80	90	92	94	96
S18-105.51	-80.749	-73.106	-38.026	-27.493	-18.264	-4.002	-4.825	-2.563	-2.873	-2.378
S2T	.908	1.093	.567	.846	.444	.660	.475			

VII-1

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	362.39	353.71	326.20	325.62	296.28	295.53	274.56	270.72	259.37	253.83	301.82

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	07	08	09	10	11	12	13
PRES.	14.61	14.87	14.91	14.99	15.04	15.06	15.08	15.10	15.12	15.14	15.16	15.19
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25
PRES.	15.22	15.23	15.25	15.26	15.28	15.28	15.30	15.31	15.31	15.31	15.28	15.21

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 22- 5 CONF. L5 C1 E8 B3 PWT T1 R1 RE TP THETA 3/4 =29.0 DEG N = 6500 RPM  
 M = 2133 PSF PINF = 2132.34 PSF TSC = 74 DEG F RHO = .00232 SLUGS/CU FT  
 MINF = .0210 VINP = 23.77 FPS QU = .646 PSF Q = .655 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S1B-	138.00	-231.60	-270.93	-302.29	-289.54	-279.16	-238.94	-206.03	-190.07	-171.10	-171.76
S2T	-98.510	1.330	-26.434	-7.073	.236	.509	.102	.345	.291	-11.327	
30	35	40	50	60	70	80	90	92	94	96	98
S1B-	109.82	-122.85	-109.83	-68.235	-44.204	-28.256	-8.184	-7.412	-4.828	-4.938	-3.893
S2T	.782	.670	1.165	.341	.835	.451	.560				

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	329.24	321.62	299.13	298.81	270.73	270.27	250.64	247.34	236.92	231.96	275.67

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.82	14.87	14.90	14.98	15.01	15.03	15.04	15.06	15.07	15.10	15.12	15.14	15.15
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.15	15.16	15.17	15.19	15.19	15.20	15.21	15.22	15.22	15.22	15.20	15.14	15.15

TABLE VII  
MS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 22-6 CONF. L5 C1 E8 B3 PWT T1 R1 RE TP THETA 3/4 = 29.0 DEG N = 7500 RPM  
 M = 2133 PSF PINF = 2131.77 PSF TSC = 74 DEG F RHO = .00232 SLUGS/CU FT  
 MINF = .0288 VINP = 32.63 FPS GU = 1.218 PSF Q = 1.234 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25	
S1B-	105.87	-175.47	-173.30	-204.29	-226.76	-218.44	-210.02	-178.38	-153.17	-142.10	-126.69	-126.42
S2T	-77.205	.825	-21.881	-6.304	.565	.797	.826	.710	.507	-5.463		
	30	35	40	50	60	70	80	90	92	94	96	98
S1B-	113.62	-92.132	-79.884	-42.526	-31.885	-20.281	-5.986	-5.442	-2.439	-3.226	-2.673	-1.682
S2T	.884	1.146	.739	.913	.593	.680	.535					

VII-3

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	395.39	385.59	357.22	357.04	323.11	322.81	299.76	296.34	283.60	276.56	329.74

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.81	14.86	14.91	15.01	15.06	15.09	15.11	15.13	15.16	15.18	15.21	15.24	15.28
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.29	15.30	15.33	15.35	15.37	15.38	15.40	15.41	15.42	15.41	15.37	15.27	

TABLE VII  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 23- 4 CONF. L5 C1 E8 B3 PWT T1 R1 RE THETA 3/4 =29.0 DEG N = 7002 RPM  
 M = 2131 PSF PINF = 2127.44 PSF TSC = 74 DEG F RHO = .00231 SLUGS/CU FT  
 MINF = .0489 VINP = 55.43 FPS QU = 3.508 PSF Q = 3.556 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S18-19-S2T	40.973	-43.012	-53.825	-62.031	-60.783	-59.099	-51.502	-44.097	-40.815	-37.174	-37.114
	-8.890	.950	.425	.940	.850	.790	.780	.890	.880	-1.379	
S18-34-S2T	30	35	40	50	60	70	80	90	92	94	96
	.284	-26.586	-24.375	-13.016	-9.598	-6.119	-1.799	-1.677	-.878	-.990	-.798
	.609	.738	.597	.476	.294	.274	.062				TEO
											.091

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	358.71	351.03	328.45	326.80	298.56	298.35	278.42	276.36	266.08	259.09	304.19

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.79	14.84	14.88	14.97	14.99	15.01	15.04	15.07	15.09	15.11	15.12	15.14	15.16
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.19	15.21	15.22	15.23	15.24	15.25	15.27	15.28	15.28	15.28	15.27	15.20	

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 23- 5 CONF. L5 C1 E8 B3 PWT T1 R1 RE THETA 3/4 =29.0 DEG N = 6500 RPM  
 H = 2131 PSF PINF = 2127.22 PSF TSC = 74 DEG F RHO = .00231 SLUGS/CU FT  
 MINF = .0504 VINP = 57.12 FPS QU = 3.724 PSF Q = 3.775 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25	
S18-	13.816	-31.379	-33.246	-41.908	-48.847	-47.526	-46.550	-40.807	-35.007	-32.093	-29.444	-29.434
S2T			.934	.725	.736	.717	.755	.868	.887	.802	-1.233	
30	35	40	50	60	70	80	90	92	94	96	98	TEO
S18-	27.443	-21.459	-19.419	-12.292	-7.756	-4.850	-1.725	-1.388	-.760	-.817	-.579	-.303
S2T	.584	.630	.582	.354	.316	.135	.135					.087

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	325.22	319.32	299.02	297.65	273.31	272.62	254.77	253.65	244.41	238.02	277.80

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.78	14.83	14.87	14.95	14.97	14.99	15.01	15.04	15.06	15.07	15.08	15.09	15.11
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.13	15.14	15.15	15.16	15.17	15.18	15.18	15.19	15.19	15.19	15.18	15.12	

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 23- 6 CONF. L5 C1 E8 B3 PWT T1 R1 RE THETA 3/4 =29.0 DEG N = 7500 RPM  
 H = 2131 PSF PINF = 2127.08 PSF TSC = 74 DEG F RHO = .00231 SLUGS/CU FT  
 MINF = .0013 VINP = 58.20 FPS QU = 3.866 PSF Q = 3.920 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25		
S1B-	21.778-	45.017-	46.685-	58.323-	66.810-	65.400-	63.631-	55.006-	47.238-	43.685-	39.197-	39.445	
S2T	-10.861	.927	-0.044	1.010	.873	.827	.827	.827	.891	.937	-1.169		
S1B-	35	40	50	60	70	80	90	92	94	96	98	TEO	
S2T	.709	.817	.588	.579	.350	.387	.195	-1.694	-.851	-.988	-.796	-.393	.157

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	391.54	382.76	357.68	357.14	324.83	325.22	303.00	301.21	289.30	282.06	331.47

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.78	14.83	14.89	14.98	15.02	15.04	15.07	15.10	15.13	15.15	15.17	15.19	15.22
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.26	15.28	15.30	15.32	15.33	15.34	15.37	15.38	15.39	15.39	15.37	15.30	

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 24- 4 CONF. L5 C1 E8 B3 PWT T1 R1 RE THETA 3/4 =29.0 DEG N = 7003 RPM  
 M = 2.32 PSF PINF = 2116.28 PSF TSC = 76 DEG F RHO = .00230 SLUGS/CU FT  
 MINF = .1029 VINP = 116.81 FPS QU = 15.463 PSF Q = 15.676 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S1B	-0.854	-5.758	-6.970	-10.194	-12.332	-12.783	-12.811	-11.247	-9.665	-8.981	-8.071
S2T	.913	.998	.294	.308	.271	.248	.239	.251	.244	.358	
S1B	30	35	40	50	60	70	80	90	92	94	96
S2T	-7.669	-6.377	-5.977	-3.060	-2.303	-1.428	-.346	-.289	-.096	-.129	-.053
	.403	.508	.419	.284	.183	.137	.112				.030

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	358.24	351.88	336.99	336.89	309.97	311.21	293.39	291.98	283.01	277.92	315.15

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.75	14.83	14.90	14.96	14.99	15.00	15.02	15.04	15.06	15.08	15.10	15.12	15.13
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.16	15.17	15.19	15.20	15.20	15.21	15.22	15.23	15.23	15.23	15.22	15.16	15.16

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 24- 5 CONF. L5 C1 E8 B3 PWT T1 R1 RE THETA 3/4 =29.0 DEG N = 6500 RPM  
 H = 2132 PSF PINF = 2116.56 PSF TSC = 75 DEG F RHO = .00230 SLUGS/CU FT  
 MINF = .1019 VINP = 115.77 FPS QU = 15.189 PSF Q = 15.398 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S1B	-4.560	-5.637	-8.531	-10.986	-10.897	-10.928	-9.729	-8.331	-7.675	-6.999	-7.065
S2T	.968	.989	.139	.194	.159	.157	.136	.139	.115	.303	
S1B	30	35	40	50	60	70	90	92	94	96	98
S2T	-6.628	-5.604	-5.237	-3.142	-2.029	-1.281	-.381	-.279	-.134	-.120	-.057
	.192	.442	.416	.295	.146	.123	.079				.144

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	327.30	322.79	309.54	308.72	286.89	286.56	270.98	270.51	262.47	257.49	290.33

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.74	14.82	14.89	14.93	14.95	14.97	15.00	15.02	15.03	15.03	15.05	15.06	15.09
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.10	15.11	15.13	15.13	15.14	15.14	15.14	15.14	15.15	15.15	15.15	15.13	15.07

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 24- 6 CONF. L5 C1 E8 B3 PWT T1 R1 RE THETA 3/4 =29.0 DEG N = 7500 RPM  
 M = 2132 PSF PINF = 2116.87 PSF TSC = 76 DEG F RHO = .00230 SLUGS/CU FT  
 MINF = .1009 VINP = 114.61 FPS QU = 14.888 PSF Q = 15.094 PSF

SHROUD SURFACE PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S1B	-1.575	-7.478	-8.853	-12.743	-15.237	-15.710	-15.701	-13.716	-11.629	-10.979	-9.831
S2T	.779	1.003	.435	.372	.318	.313	.280	.304	.273	.330	-9.984
S1B	30	35	40	50	60	70	80	90	92	94	96
S2T	-9.130	-7.830	-7.145	-4.113	-2.817	-1.760	-.565	-.394	-.156	-.180	-.113
	.512	.587	.420	.294	.144	.149	.078				.147

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	389.20	382.28	364.50	364.94	334.38	334.67	315.02	314.82	304.43	296.51	340.28

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	14.74	14.82	14.90	14.97	15.00	15.04	15.07	15.10	15.11	15.12	15.14	15.16	15.20
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	15.22	15.24	15.26	15.27	15.28	15.29	15.32	15.33	15.33	15.33	15.29	15.21	

TABLE VII  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

Run-PT 85-3 CONF. L4 C1 E7 B3 PNT T2 R1 RE T2 THETA 3/4 = 43.0 DEG N = 7001 RPM  
 PRESSURE DATA  
 h = 2109 PSF PI.F = 1375.89 PSF TSC = 84 DEG F RHO = .00207 SLUGS/CU FT  
 WIND = .4125 VI.F = 464.55 FPS WJ = 211.030 PSF Q = 223.438 PSF

SHROUD PRESSURE COEFFICIENTS

LEG	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TEO	
S.B	.189	.107	.078	.052	.042	.045	.035	.027	.050	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006
S.T	.196	.064	.055	.022	.022	.011	-.002	-.029	-.042	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046	-.046
S.B	.35	.242	.365	.373	.372	.367	.346	.347	.342	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330	.330
S.T	-.074	-.092	-.096	-.065	-.062	.079	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151	.151

INLET VELOCITIES, FPS

OK.F.	01	03	04	05	06	07	09	10	12	13	15	AVE
VE.	454.40	461.17	443.28	449.62	451.65	459.50	449.31	450.92	422.06	450.09	449.20	

EXIT TOTAL PRESSURES, PSIA

OK.F.	01	02	03	04	05	07	08	09	10	11	12	13
PR.S.	14.54	14.70	14.87	14.96	15.00	15.04	15.10	15.17	15.24	15.30	15.36	15.43
OK.F.	14	15	16	17	18	19	20	21	22	23	24	25
PR.S.	15.44	15.43	15.42	15.39	15.36	15.33	15.27	14.43	14.64	14.65	14.65	14.65

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 55- 4 COM. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 =43.0 DEG N = 4304 RPM

H = 2109 FSF PI,F = 1875.51 PSF TSC = 84 DEG F RHO = .00207 SLUGS/CU FT

MINF = .4129 VINF = 464.95 FPS QU = 211.364 PSF Q = 223.793 PSF

SHROUDED PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S.B	.780	.608	.499	.434	.405	.384	.354	.337	.327	.308	.275
S.T	-.424	-.355	-.206	-.178	-.169	-.137	-.129	-.139	-.138	-.139	-.139
LEO	30	35	40	50	60	70	80	90	94	96	98
S.B	.270	.223	.219	.309	.292	.289	.292	.284	.278	.275	.268
S.T	-.131	-.136	-.152	-.152	-.118	-.034	.037	.120	.278	.268	.248

VII-11

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	374.00	379.36	369.45	372.14	379.99	385.94	383.21	386.35	376.86	392.04	379.94

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	14.26	14.43	14.58	14.70	14.73	14.73	14.73	14.74	14.75	14.75	14.75	14.74	14.74
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	14.73	14.73	14.72	14.70	14.69	14.67	14.65	13.90	14.64	14.64	14.65	14.65	14.65

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 55- S COV. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 43.0 DEG N = 5503 RPM  
 H = 2109 PSF PI F = 1276.02 PSF TSC = 84 DEG F RHO = .00207 SLUGS/CU FT  
 MINF = .4124 VI F = 454.42 FPS WU = 210.922 PSF Q = 223.324 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S <sub>B</sub>	.314	.460	.362	.311	.282	.272	.252	.238	.260	.206	.171
S <sub>T</sub>	-.180	-.166	-.103	-.099	-.095	-.072	-.074	-.091	-.100	-.099	-.106
S <sub>B</sub>	30	35	40	50	60	70	80	90	94	96	98
S <sub>T</sub>	.180	.139	.215	.311	.319	.219	.317	.301	.298	.289	.265
S <sub>T</sub>	-.095	-.111	-.126	-.126	-.093	-.027	.055	.127	.302	.298	.265

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	402.11	407.73	395.06	396.84	404.08	410.23	405.11	407.69	391.35	410.38	403.06

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	04	05	07	08	09	10	11	12	13
PR.S.	14.40	14.51	14.64	14.76	14.84	14.85	14.90	14.92	14.92	14.93	14.95
OR.F.	14	15	16	17	18	19	20	21	22	23	25
PR.S.	14.94	14.95	14.93	14.93	14.92	14.89	14.85	14.10	14.64	14.65	14.64

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 56- 3 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 43.0 DEG N = 7001 RPM  
 H = 2111 PSF P1/F = 1614.65 PSF TSC = 96 DEG F RHO = .00182 SLUGS/CU FT  
 MINF = .6308 VI/F = 702.90 FPS QU = 424.819 PSF Q = 449.799 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S.B	.099	.781	.620	.503	.439	.410	.389	.346	.464	.649	.277
S.T	-.362	-.353	-.179	-.168	-.132	-.128	-.141	-.148	-.144	-.148	
LEO	30	35	40	50	60	70	80	90	94	96	98
S.B	.282	.233	.267	.331	.329	.330	.331	.315	.310	.299	.277
S.T	-.136	-.146	-.163	-.170	-.126	-.044	.048	.133			

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	561.56	570.01	558.01	563.14	571.77	577.52	573.74	577.90	559.93	583.21	569.68

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	13.86	14.17	14.51	14.78	14.93	14.96	14.97	14.99	15.00	15.00	15.02	15.02	15.02
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	15.01	14.99	14.95	14.87	14.83	14.80	14.70	13.15	14.66	14.66	14.66	14.66	14.66

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RUN-PT 56- 4 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 43.0 DEG N = 6303 RPM  
 H = 2111 PSF P1:F = 1614.86 PSF TSC = 96 DEG F RHO = .00182 SLUGS/CU FT  
 MINF = .6307 VIAF = 702.74 FPS QU = 424.664 PSF Q = 449.634 PSF

PRESSURE DATA

SHROUD PRESSURE COEFFICIENTS

	01	02	04	06	08	10	125	15	175	20	25
S.B	.141	.824	.661	.540	.477	.444	.424	.380	.466	.651	.305
S.T	-.466	-.422	-.250	-.216	-.201	-.164	-.153	-.164	-.168	-.166	-.169
S.B	.30	.35	.40	.50	.60	.70	.80	.90	.94	.96	.98
S.T	-.157	-.163	-.183	-.186	-.143	-.052	.036	.296	.293	.285	.262
											TEO
											.284

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	549.04	556.67	546.43	552.04	560.52	565.39	562.83	567.23	551.42	573.65	558.52

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	13.80	14.19	14.51	14.75	14.81	14.81	14.83	14.84	14.86	14.86	14.86	14.84	14.84
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	14.83	14.82	14.61	14.78	14.71	14.66	14.70	13.00	14.65	14.66	14.66	14.66	

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

RUN-PT 57-5 CONF. L4 C1 E7 E3 PNT T2 R1 RE TP THETA 3/4 = 32.0 DEG N = 7003 RPM  
 H = 2111 PSF P1/F = 1875.38 PSF TSC = 88 DEG F RHO = .00206 SLUGS/CU FT  
 MINF = .4147 V1/F = 466.64 FPS Q1 = 213.209 PSF Q = 225.746 PSF

PRESSURE DATA

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S.B	.684	.523	.425	.356	.338	.314	.304	.279	.014	.272	.230
S.T	-.237	-.232	-.127	-.115	-.110	-.082	-.084	-.095	-.103	-.100	-.101
LEO	30	35	40	50	60	70	80	90	94	96	98
S.B	.241	.198	.220	.305	.310	.312	.316	.301	.295	.286	.267
S.T	-.098	-.107	-.111	-.125	-.085	-.016	.060	.144	.298	.286	.267
											TEO
											.285

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	391.75	397.46	386.35	389.99	397.12	402.80	399.71	402.17	390.13	406.63	396.41

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	14.36	14.50	14.67	14.61	14.88	14.90	14.91	14.92	14.91	14.92	14.92	14.92	14.92
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	14.91	14.90	14.68	14.86	14.80	14.73	14.66	13.92	14.66	14.66	14.66	14.66	14.66

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 57-6 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 32.0 DEG N = 6003 RPM  
 H = 2111 PSF P1/F = 1877.65 PSF TSC = 88 DEG F RHO = .00206 SLUGS/CU FT  
 MINF = .4125 V1/F = 466.28 FPS Q0 = 211.252 PSF Q = 223.674 PSF

SHROUD PRESSURE COEFFICIENTS

	01	02	04	06	08	10	125	15	175	20	25
LEO	.01	.02	.04	.06	.08	.10	.125	.15	.175	.20	.25
S.B	.692	.820	.536	.468	.435	.412	.386	.374	.006	.287	.316
S.T	-.521	-.410	-.239	-.205	-.187	-.152	-.138	-.149	-.148	-.147	-.146
LEO	.30	.35	.50	.60	.70	.80	.90	.92	.94	.96	.98
S.B	.323	.279	.300	.285	.286	.288	.268	.266	.265	.260	.240
S.T	-.133	-.137	-.152	-.119	-.042	.030	.115				

VII-16

INLET VELOCITIES, FPS

	01	03	04	06	07	09	10	12	13	15	AVE
OR.F.	367.24	372.12	363.13	366.98	375.81	380.63	379.11	382.57	375.70	388.10	375.14
VE.											

EXIT TOTAL PRESSURES, PSIA

	01	02	03	04	05	06	07	08	09	10	11	12	13
OR.F.	14.29	14.48	14.62	14.71	14.72	14.72	14.73	14.73	14.74	14.72	14.73	14.72	14.73
PR.S.													
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	14.72	14.70	14.67	14.64	14.61	14.57	14.54	13.81	14.66	14.66	14.66	14.66	14.66

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 57- 7 CONF. L4 C1 E7 B3 FNT T2 R1 RE TP THETA 3/4 = 32.0 DEG N = 8000 RPM  
 H = 2111 PSF PINF = 1875.99 PSF TSC = 88 DEG F RHO = .00206 SLUGS/CU FT  
 MINF = .4141 VINF = 468.00 FPS QII = 212.680 PSF Q = 225.185 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	0A	10	125	15	175	20	25
S.B	.535	.383	.310	.257	.248	.222	.211	.199	.014	.279	.156
S.T	-.099	-.139	-.070	-.068	-.076	-.054	-.057	-.074	-.087	-.084	-.096
LEO	30	35	40	50	60	70	80	90	94	96	98
S.B	.175	.141	.208	.304	.324	.326	.325	.310	.304	.290	.273
S.T	-.087	-.096	-.107	-.119	-.080	-.011	.061	.139			

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	415.15	420.17	406.86	411.51	417.41	423.99	418.94	422.27	407.03	425.00	416.83

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	14.50	14.64	14.78	14.91	15.01	15.05	15.08	15.11	15.12	15.13	15.13	15.13	15.13
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	15.13	15.10	15.07	15.00	14.92	14.83	14.78	14.04	14.66	14.66	14.66	14.66	14.66

TABLE VII  
HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 58- 3 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 =30.0 DEG N = 7003 RPM  
 H = 2111 PSF P<sub>INF</sub> = 2049.33 PSF TSC = 81 DEG F RHO = .00222 SLUGS/CU FT  
 MINF = .2062 V<sub>INF</sub> = 234.54 FPS QU = 57.630 PSF Q = 61.019 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S.B	.341	-1.556	-1.165	-0.860	-0.786	-0.717	-0.629	-0.598	-2.717	-0.617	-0.629
S.T	.860	.597	.418	.341	.287	.240	.204	.157	.134	.115	.084
LEO	30	35	40	50	60	70	80	90	94	96	98
S.B	-.562	-.550	-.093	.370	.444	.448	.444	.411	.413	.406	.383
S.T	.054	.039	-.008	-.019	-.038	.038	.119	.200			.279

VII-18

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	294.41	297.14	281.46	284.66	285.54	290.38	281.05	279.31	258.17	275.61	282.77

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	14.75	14.89	14.97	15.03	15.05	15.07	15.08	15.09	15.10	15.12	15.15	15.16	15.16
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	15.16	15.16	15.16	15.15	15.14	15.10	15.06	14.71	14.66	14.66	14.66	14.66	14.66

TABLE VII  
 HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 58-4 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 30.0 DEG N = 6002 RPM  
 H = 2111 PSF PINF = 2052.23 PSF TSC = 81 DEG F RHO = .00222 SLUGS/CU FT  
 MINF = .2012 VINP = 228.89 FPS QU = 54.945 PSF Q = 58.176 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	03	04	06	07	09	10	125	15	175	20	25
S.B	-.532	-.427	-.310	-.340	-.305	-.310	-.280	-.300	-.300	-.265	-2.897	-.268	-.301
S.T	.514	.292	.188	.104	.068	.046	.033	.031	.031	-.016	-.031	-.045	-.062
LEO	30	35	40	50	60	70	80	90	92	94	96	98	TEO
S.B	-.263	-.286	.021	.348	.371	.374	.379	.321	.331	.319	.314	.272	.255
S.T	-.060	-.089	-.112	-.102	-.095	-.040	.052	.115					

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	255.17	258.17	245.09	246.66	251.21	253.78	248.49	249.27	233.96	245.55	248.74

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR <sub>2</sub> S.	14.70	14.80	14.86	14.89	14.90	14.91	14.93	14.94	14.94	14.95	14.96	14.97	14.98
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR <sub>2</sub> S.	14.97	14.97	14.97	14.96	14.93	14.88	14.87	14.61	14.66	14.66	14.66	14.66	14.66

TABLE VII  
 MS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA  
 RUN-PT 58- 5 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 =30.0 DEG N = 6001 RPM  
 H = 2111 PSF P1/F = 2050.56 PSF TSC = 81 DEG F RHO = .00222 SLUGS/CU FT  
 MINF = .2041 V1/F = 232.17 FPS Q1 = 56.495 PSF Q = 59.817 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	15	175	20	25		
S.B	-1.201	-3.975	-2.257	-1.591	-1.406	-1.310	-1.227	-1.162	-1.120	-2.778	-1.050	-1.031
S.T	.984	.818	.593	.468	.387	.339	.284	.250	.190	.173	.123	.123
S.B	.30	.35	.40	.50	.60	.70	.80	.90	.92	.94	.96	.98
S.T	-.890	-.773	-.196	.416	.506	.518	.508	.453	.446	.444	.415	.372
S.T	.109	.050	.028	-.009	.047	.075	.154	.187				.292

VII-20

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	332.65	337.32	316.53	322.34	319.87	326.05	314.69	312.92	285.70	306.55	317.46

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	14.82	14.96	15.11	15.20	15.24	15.25	15.28	15.30	15.32	15.34	15.36	15.39	15.43
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	15.45	15.46	15.45	15.42	15.34	15.24	15.18	14.82	14.66	14.66	14.66	14.66	14.66

TABLE VII  
MS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT S9-5 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 0.0 DEG N = 7002 RPM  
 H = 2112 PSF PINF = 2050.79 PSF TSC = 80 DEG F RHO = .00222 SLUGS/CU FT  
 MINF = .2054 VINP = 233.39 FPS QU = 57.207 PSF Q = 60.571 PSF

SHROUD PRESSURE COEFFICIENTS

	01	02	04	06	08	10	125	15	175	20	25
LEO											
S.B	.273	-1.633	-1.190	-.874	-.732	-.712	-.650	-.655	-2.717	-.644	-.656
S.T	.846	.603	.414	.292	.226	.210	.151	.121	.083	.071	.046
	30	35	40	50	60	70	80	90	94	96	98
S.B	-.611	-.575	-.126	.478	.437	.447	.445	.398	.398	.388	.322
S.T	-.027	-.011	-.022	-.024	.098	.033	.135	.209			

VII.21

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	293.76	297.03	280.37	282.77	284.06	289.04	280.29	279.02	257.27	274.62	281.82

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR.S.	14.77	14.89	14.99	15.03	15.05	15.07	15.09	15.11	15.11	15.13	15.15	15.17	15.17
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR.S.	15.17	15.17	15.17	15.17	15.16	15.12	15.07	14.72	14.67	14.67	14.66	14.66	

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 59- 6 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 =30.0 DEG N = 6000 RPM  
 H = 2112 PSF PINF = 2049.38 PSF TSC = 80 DEG F RHO = .00222 SLUGS/CU FT  
 MINF = .2078 VINP = 236.09 FPS QU = 58,511 PSF Q = 61.951 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S <sub>B</sub>	.945	-.395	-.257	-.285	-.229	-.224	-.215	-.227	-2.609	-.228	-.247
S <sub>A</sub> T	.492	.270	.177	.108	.069	.060	.025	-.002	-.016	-.032	-.032
LEO	30	35	40	50	60	70	80	90	92	94	96
S <sub>B</sub>	-.210	-.243	.031	.405	.356	.347	.365	.351	.344	.355	.348
S <sub>A</sub> T	-.058	-.059	-.059	-.084	-.079	.000	.075	.180			.286

VII-22

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	256.65	259.01	247.05	248.86	252.25	256.05	251.11	250.60	235.58	248.73	250.59

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR <sub>T</sub> S.	14.71	14.81	14.87	14.89	14.92	14.94	14.94	14.94	14.95	14.96	14.98	14.99	14.98
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR <sub>T</sub> S.	14.97	14.97	14.97	14.76	14.94	14.90	14.87	14.61	14.67	14.66	14.66	14.66	14.66

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 59-7 CONF. L4 C1 E7 B3 PNT T2 R1 RE TP THETA 3/4 = 30.0 DEG N = 8001 RPM  
 H = 2112 PSF PINF = 2050.14 PSF TSC = 80 DEG F RHO = .00222 SLUGS/CU FT  
 MINF = .2065 VINP = 234.62 FPS QU = 57.803 PSF Q = 61.202 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S.B	-1.172	-3.848	-2.213	-1.546	-1.234	-1.175	-1.084	-1.076	-2.664	-1.015	-.974
S <sub>A</sub> T	1.001	.813	.607	.498	.392	.355	.292	.252	.217	.186	.130
S.B	30	35	40	50	60	70	80	90	94	96	98
S <sub>A</sub> T	-.846	-.732	-.148	.430	.544	.542	.523	.480	.466	.457	.421
S <sub>A</sub> T	.109	.086	.082	.022	.054	.114	.178	.240			.377
											TEO

VII-23

INLET VELOCITIES, FPS

OR.F.	01	03	04	06	07	09	10	12	13	15	AVE
VE.	331.84	336.04	316.35	322.38	320.48	328.28	315.77	313.06	285.61	307.72	317.75

EXIT TOTAL PRESSURES, PSIA

OR.F.	01	02	03	04	05	06	07	08	09	10	11	12	13
PR <sub>S</sub>	14.83	14.98	15.12	15.22	15.27	15.29	15.30	15.32	15.33	15.37	15.40	15.42	15.44
OR.F.	14	15	16	17	18	19	20	21	22	23	24	25	
PR <sub>S</sub>	15.46	15.47	15.47	15.44	15.35	15.25	15.19	14.84	14.67	14.67	14.67	14.67	14.67

TABLE VII

HS VARIABLE GEOMETRY SHROUDED PROPELLER TEST

PRESSURE DATA

RUN-PT 80-4 CONF. L4 C1 E6 B3 PNT T2 R1 RE TP THETA 3/4 = 41.0 DEG N = 6500 RPM

H = 2090 PSF PINF = 1595.53 PSF TSC = 94 DEG F RHO = .00181 SLUGS/CU FT

MINF = .6332 VINP = 704.04 FPS QU = 422.904 PSF Q = 447.771 PSF

SHROUD PRESSURE COEFFICIENTS

LEO	01	02	04	06	08	10	125	15	175	20	25
S1B	1.107	.922	.812	.753	.704	.681	.652	.627	.608	.785	.548
S2I	1.105	1.107	-.940	-.530	-.416	-.389	-.368	-.331	-.304	-.310	-.304
S1B	.30	.35	.40	.50	.60	.70	.80	.90	.92	.94	.96
S2I	-.279	-.252	-.243	-.216	-.165	-.049	.062	.155	.227	.428	.385
											.293

VII-24

INLET VELOCITIES, FPS

ORIF.	01	03	04	06	07	09	10	12	13	15	AVE
VEL.	449.80	461.16	457.49	467.21	475.83	483.75	487.49	493.31	483.78	501.78	476.16

EXIT TOTAL PRESSURES, PSIA

ORIF.	01	02	03	04	05	06	07	08	09	10	11	12	13
PRES.	13.92	14.12	14.39	14.63	14.77	14.78	14.80	14.82	14.84	14.85	14.86	14.87	14.87
ORIF.	14	15	16	17	18	19	20	21	22	23	24	25	
PRES.	14.86	14.84	14.83	14.81	14.75	14.68	12.42	12.95	14.09	14.48	14.51	14.52	



