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ALTITUDE PERFORMANCE AND OPERATIONAL CHARACTERISTICS OF YJ71-A-7 TURBOJET ENGINE

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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SUMMARY

Altitude performance of a YJ71-A-7 turbojet engine, with afterburner inoperative, was determined in the NACA Lewis altitude wind tunnel over a wide range of flight conditions. Engine speed and exhaust-nozzle area were controlled independently during this investigation.

The variation of corrected values of air flow, net thrust, and fuel flow with corrected engine speed was not defined by a single curve with changes in altitude at given flight Mach number. Changes in altitude had very little effect on minimum specific fuel consumption at altitudes up to 45,000 feet. There is one exhaust-nozzle schedule that is nearly optimum for all flight conditions. Performance calculated from pumping characteristics agreed with experimental values and can therefore be used to extend engine performance data.

INTRODUCTION

An investigation was conducted in the NACA Lewis altitude wind tunnel to evaluate the over-all performance characteristics of a YJ71-A-7 turbojet engine over a range of engine speeds and exhaust-nozzle areas at altitudes from 6000 to 55,000 feet and flight Mach numbers from 0.16 to 1.00. Performance data were obtained with afterburner inoperative and are restricted to the engine speed range obtainable with the acceleration air bleed ports closed.

The data are presented in several forms to facilitate interpretation of the results. The variations of corrected values of air flow, net thrust, and fuel flow with corrected engine speed are shown for several flight conditions. Engine performance maps showing the relation between exhaust-gas temperature, engine speed, net thrust, exhaust-nozzle area, and specific fuel consumption are also presented for several flight conditions. The effects of two methods of thrust modulation on specific fuel consumption are compared over a range of altitudes and flight Mach numbers. Engine pumping characteristics are also presented so that the engine pressure ratio, air flow, and fuel flow can be predicted, and over-all engine performance therefore calculated for flight conditions other than those investigated. Variation of net thrust and fuel flow with true airspeed is presented for a range of altitudes including a comparison and extension of the actual data with performance calculated from pumping characteristics. A method for determining jet thrust in flight from exhaust-nozzle pressure drop is discussed. All engine performance data obtained during the investigation are tabulated herein.

Although a specific investigation of engine operational characteristics was not made, some operational problems were encountered in the course of engine operation and are discussed briefly.

APPARATUS AND PROCEDURE

Engine

The manufacturer's static sea-level rating of the YJ71-A-7 engine, with afterburner inoperative, is 9515 pounds of thrust with a specific fuel consumption of 0.989 pound per hour per pound of thrust, an air flow of 158 pounds per second, and a compressor pressure ratio of about 8.9 to 1 at an engine speed of 6100 rpm and a turbine-outlet temperature of 1685° R. The length of the engine with afterburner is 238 inches, the maximum height is $46\frac{1}{4}$ inches, and the maximum width is $39\frac{3}{4}$ inches. The dry weight of engine and accessories is about 4600 pounds. The engine components included a 16-stage axial-flow compressor, a cannular-type combustor with 10 circular inner liners, a three-stage turbine, an afterburner, and a variable-area iris-type exhaust nozzle.

In order to permit acceleration in the engine speed range from 65 to 85 percent of rated speed, at which the compressor operating line approaches the surge line (ref. 1), air is bled from eight bleed ports in the combustor inlet section. These bleed ports operate automatically and are scheduled to be open between 55 and 92 percent of rated engine speed.

Installation

The engine and afterburner were mounted on a wing section that spanned the 20-foot-diameter test section of the altitude wind tunnel (fig. 1). Dry air was supplied to the engine from the tunnel make-up air system through a duct connected to the engine inlet. Throttle valves installed in the duct permitted regulation of the pressure at the inlet of the engine. Engine thrust and drag measurements by the tunnel balance scales were made possible by a frictionless slip joint located in the duct upstream of the engine.

Instrumentation for measuring pressure and temperature was installed at various stations in the engine (fig. 2). Thermocouples for measuring engine-inlet temperature were located upstream of the engine in the inlet duct. The temperatures measured at the exhaust-nozzle inlet (station 6) were used as the turbine-outlet temperatures (station 4) to avoid possible effects of radiation on the temperatures measured at station 4.

Procedure

Engine performance data presented in this report were obtained at the flight conditions shown in the following table:

Altitude, ft	Flight Mach number			
	0.16	0.64	0.82	1.00
6,000	X			
15,000	X			
25,000	X	X		
35,000	X	X		X
45,000	X	X		
55,000	X		X	

Engine performance data were obtained at engine speeds from 86 to 102 percent of rated speed at most flight conditions. The schedule of the bleed ports in the combustor inlet section was interrupted so that the ports would remain closed for all steady-state data presented in this report regardless of engine speed. The surge characteristic of the compressor did not allow steady-state operation at engine speeds below 86 percent of rated with the bleed ports closed. Data were obtained at five fixed settings of the variable-area exhaust nozzle having projected areas of 2.54, 2.685, 2.86, 3.18, and 4.13 square feet.

In order to simulate the various flight conditions, the air flow through the make-up air duct was throttled from approximately sea-level pressure to a total pressure at the engine inlet corresponding to the desired flight condition with complete ram pressure recovery assumed. The static pressure in the tunnel test section, into which the engine exhausted, was set at the desired altitude ambient pressure. The temperature of the inlet air approximated NACA standard values wherever possible with the exception that the minimum temperature obtainable was about 440° R.

Tunnel balance scale thrust values were used for all engine performance data in this report.

The engine fuel used was MIL-F-5624A grade JP-4 having a low heating value of 18,700 Btu per pound and a hydrogen-carbon ratio of 0.171.

The symbols and the methods of calculation used herein are given in appendixes A and B, respectively.

RESULTS AND DISCUSSION

All engine performance data obtained during the investigation are compiled in table I. Inasmuch as engine-inlet air temperatures below 440° R were not obtained and because small errors occurred in tunnel static-pressure settings, the data presented graphically in nongeneralized form have been adjusted to NACA standard altitude conditions by use of the factors δ_a and θ_a (see appendix A).

Generalized Performance

The variation of corrected air flow with corrected engine speed at an exhaust-nozzle area of 2.685 square feet is shown in figure 3 for a range of altitudes and flight Mach numbers. This exhaust-nozzle area is slightly larger than the area required for rated static sea-level performance and slightly smaller than the area for minimum specific fuel consumption. Air flow increased with engine speed up to a speed of about 6400 rpm, after which it was not increased appreciably by a further increase in speed. The corrected air flow at rated corrected engine speed was 167 pounds per second at altitudes below 15,000 feet and decreased to about 163 pounds per second at an altitude of 45,000 feet. This decrease in corrected air flow was primarily due to Reynolds number effects.

The variation of corrected net thrust and fuel flow with corrected engine speed at an exhaust-nozzle area of 2.685 square feet is shown in figures 4 and 5, respectively, for a range of altitudes at a flight Mach number of 0.16. Corrected net thrust and fuel flow increase with engine speed throughout the entire range although corrected fuel flow increased at a greater rate than corrected net thrust at high corrected engine speeds. The increase in corrected net thrust with altitude is associated with reductions in compressor and turbine efficiencies in that a higher corrected turbine-inlet temperature (and therefore pressure) was required to maintain a given corrected engine speed. The elevation of corrected temperature and pressure levels within the engine overcompensated for the reduction in air flow which accompanied the increase in altitude (fig. 3) so that there was a resultant increase in net thrust.

The increase in corrected fuel flow with altitude is associated with reductions in compressor, combustor, and turbine efficiencies.

Performance Maps

Performance maps showing the relation between exhaust-gas temperature, engine speed, net thrust, exhaust-nozzle area, and specific fuel consumption are presented in figure 6 for all flight conditions at which a sufficient range of engine variables was covered. These maps were obtained by cross plotting from curves showing the variation of turbine-outlet temperature, net thrust, and specific fuel consumption with engine speed at the five exhaust-nozzle areas for the various flight conditions. Lines were faired through the average of data points and are within an accuracy of ±3 percent.

For the range of flight conditions investigated, minimum specific fuel consumption occurred at engine speeds between approximately 5100 and 5800 rpm and at exhaust-nozzle areas of 2.86 square feet or less. These engine speeds at which minimum specific fuel consumption occurred correspond to a corrected engine speed of approximately 5600 rpm (92 percent of rated engine speed). As corrected engine speed increased beyond 5600 rpm, the specific fuel consumption increased principally because of a reduction in compressor efficiency. As the exhaust-nozzle area was increased beyond 2.86 square feet, the specific fuel consumption increased principally because of a large increase in tail-pipe pressure loss and a decrease in ideal air-cycle efficiency.

Altitude had very little effect on minimum specific fuel consumption. For example, at a flight Mach number of 0.16 and altitude from 15,000 to 45,000 feet, the minimum specific fuel consumption varied between 0.925 and 0.950 pound per hour per pound net thrust (less than 3 percent). The variation in minimum specific fuel consumption was small because the compressor pressure ratio, and consequently the ideal air-cycle efficiency, increased with altitude and therefore compensated for the attendant reduction in component efficiencies.

An increase in flight Mach number at any altitude caused an appreciable increase in minimum specific fuel consumption. At 35,000 feet, the minimum specific fuel consumption increased from 0.925 to 1.20 pounds per hour per pound net thrust as flight Mach number was increased from 0.16 to 1.00.

On each map is shown an optimum exhaust-nozzle schedule, which is the schedule that provides the best specific fuel consumption for each thrust level. In areas in which the specific fuel consumption was approximately constant over a range of thrust levels, the exhaust-nozzle area is scheduled to be as large as possible to give a greater acceleration margin below the compressor surge limit. This optimum exhaust-nozzle schedule varies with flight conditions and will be discussed later in connection with methods of thrust modulation.

Also on each map are shown the limiting exhaust-gas temperature and the control temperature corresponding to this limiting exhaust-gas temperature. The correlation between control temperature and exhaust-gas temperature is shown in figure 7 for a complete range of flight conditions. If the control temperature is set on the limiting indicated temperature, the true exhaust-gas temperature will be about 30° R above the limiting value at low altitude, will approach the limiting value at an altitude of 45,000 feet, and will be somewhat below the limiting value at an altitude of 55,000 feet and low flight Mach numbers.

Thrust Modulation

Varying the engine speed and varying the exhaust-nozzle area are two simple methods of thrust modulation. The performance obtained by varying the exhaust-nozzle area at rated engine speed and by varying the engine speed at an exhaust-nozzle area of 2.685 square feet is shown in figures 8 to 10. The effect of altitude at flight Mach numbers of 0.16 and 0.64 and the effect of flight Mach number at an altitude of 35,000 feet are presented for thrust levels of 100, 90, 80, and 70 percent of maximum thrust. Maximum thrust is the thrust obtained at rated engine speed (6100 rpm) and rated turbine-outlet temperature (1685° R) for each flight condition.

Varying exhaust-nozzle area at rated engine speed. - For the method of thrust modulation in which the exhaust-nozzle area varies at rated engine speed, the specific fuel consumption would increase as altitude increased at any constant thrust level (figs. 8(b) and 9(b)). This increase is principally the result of a loss in compressor efficiency with an increase in corrected engine speed. Specific fuel consumption also increased as flight Mach number increased (fig. 10(b)). Modulation of thrust by this method, at rated engine speed, had very little effect on specific fuel consumption except at a thrust level of 70 percent of maximum. The higher specific fuel consumption at this condition was due to the exhaust-nozzle area approaching a value that gave very high tail-pipe pressure losses and also a low ideal air-cycle efficiency.

Varying engine speed at a constant exhaust-nozzle area. - Maximum thrust is defined as the thrust at rated engine speed and rated exhaust-gas temperature; therefore, at any given flight condition, there can be only single values of maximum thrust and specific fuel consumption at maximum thrust. The exhaust-nozzle area required to obtain rated exhaust-gas temperature at rated engine speed varied with flight conditions. For thrust levels of 90, 80, and 70 percent of maximum at an exhaust-nozzle area of 2.685 square feet, altitude had little effect on specific fuel consumption (figs. 8(d) and 9(d)) because engine speed decreased as altitude was increased (figs. 8(c) and 9(c)), which caused the corrected engine speed to remain near the one for minimum specific fuel consumption. Minimum specific fuel consumption remained essentially constant with increase in altitude as previously discussed in the section Performance Maps. Specific fuel consumption increased with increase in flight Mach number (fig. 10(d)). Variations in thrust level from 90 to 70 percent of maximum had little effect on specific fuel consumption.

Optimum Thrust Modulation

Comparison of the two methods of thrust modulation presented in the preceding section shows a higher specific fuel consumption by varying the exhaust-nozzle area at rated engine speed than by varying the engine speed at a constant exhaust-nozzle area. At an altitude of 35,000 feet and a flight Mach number of 0.64, the specific fuel consumption at 80 and 90 percent of maximum thrust was 1.14 pounds per hour per pound net thrust by the method of varying the engine speed compared with 1.24 pounds per hour per pound net thrust by the method of varying the exhaust-nozzle area. However, varying the exhaust-nozzle area is advantageous for rapid changes in thrust. At rated engine speed and any flight condition, the net thrust can be modulated about 50 percent of maximum by varying the exhaust-nozzle area.

The optimum thrust modulation schedule would be a combination of these two methods as shown by the optimum exhaust-nozzle schedule on the performance maps (fig. 6). This optimum exhaust-nozzle-area schedule varies considerably with changes in flight condition. However, a schedule that would be simple and nearly optimum for all flight conditions would be to hold the exhaust-nozzle area at approximately 3.0 square feet until rated engine speed is reached, and then close the exhaust nozzle until limiting exhaust-gas temperature is obtained. A smaller exhaust-nozzle area (about 2.8 sq ft) would be slightly better, but an overtemperature control would have to be provided to keep the exhaust-gas temperature within limits at certain flight conditions.

Performance from Pumping Characteristics

Engine performance at flight conditions other than those presented in this report may be calculated from the pumping characteristics presented in figures 11 to 13. These figures show the variation of engine pressure ratio, corrected air flow, and corrected fuel flow with Reynolds number index for a range of engine temperature ratios and a range of corrected engine speeds from 5800 to 6300 rpm. The points shown are not actual data points but represent only the flight conditions at which data were obtained.

Engine pressure ratio decreased at an increasing rate as Reynolds number index was decreased (altitude increased or flight Mach number decreased). As previously discussed in the section Performance Maps, compressor pressure ratio increased with increase in altitude, but the component efficiencies decreased, thus requiring a large increase in turbine pressure ratio to supply component work. The over-all effect was a decrease in engine pressure ratio.

Corrected air flow was not particularly affected by variations in Reynolds number index above a value of about 0.45. However, as Reynolds number index was reduced below this critical value, the air flow decreased appreciably.

Although corrected fuel flow (fig. 13) is not a rigorous function of Reynolds number index, this relation provides a simple method of obtaining fuel flow at any flight condition. Corrected fuel flow increased as Reynolds number index was decreased because of reductions in component efficiencies.

From these figures the engine pressure ratio, corrected air flow, and corrected fuel flow can be obtained by selecting a flight condition (Reynolds number index), engine speed, and turbine-outlet temperature. Tail-pipe and exhaust-nozzle losses are presented in figures 14 and 15, respectively, to assist in calculating thrust. From the pumping characteristics and known losses in the tail pipe and exhaust nozzle, the net thrust, fuel flow, and specific fuel consumption of the engine and exhaust system can be determined. If the characteristics of the inlet system are known, the performance of the entire system can be determined.

The exhaust-nozzle discharge coefficient based on a cold projected area is presented in figure 16. From this curve exhaust-nozzle-outlet area may be calculated for a wide range of flight conditions.

Summarized Performance

The altitude performance of the engine at rated conditions (engine speed, 6100 rpm; turbine-outlet temperature, 1685° R) is summarized in figures 17 and 18, in which the variation of net thrust and fuel flow with true airspeed is shown. The solid curves represent the experimental data and the dashed curves are extensions of the experimental data made by calculating performance from the pumping characteristics. The points shown are not actual data points, but represent only the flight conditions at which data were obtained.

Net thrust increased with airspeed except at very low airspeeds where it decreased slightly. Fuel flow increased as airspeed was increased over the entire range.

The net thrust and the fuel flow calculated from pumping characteristics compare within about ±4 percent with the experimental data. The specific fuel consumption obtained from calculated net thrust and fuel flow would be within about ±6 percent of the experimental data.

Determination of Thrust in Flight

An accurate and simple indication of thrust is desired in order to simplify operation at critical flight conditions such as at take-off or during formation flying. Exhaust-nozzle pressure drop can be easily measured and provides a reasonably good correlation with jet thrust for a fixed-area exhaust nozzle as shown in reference 2.

The variation of scale jet thrust with exhaust-nozzle pressure drop for the YJ71-A-7 turbojet engine at three exhaust-nozzle areas is shown in figure 19 for a range of flight conditions. The faired lines from these three plots have been combined in figure 20 to show the effect of exhaust-nozzle area on the correlation. Since the exhaust-nozzle area affects only the slope of the curve, the correlation can be used for determining thrust in flight if the exhaust-nozzle area is known.

Accuracy in measuring average turbine-outlet total pressure at all flight conditions is essential for this correlation. A 1-percent error in measuring total pressure will cause about a 2-percent error in the jet-thrust value. The turbine-outlet total pressure used in this report was obtained by taking the arithmetic average of 21 probes (seven probes on each of three equally spaced rakes). Integrating total-pressure rakes could probably be used to measure this pressure.

OPERATIONAL CHARACTERISTICS

The principal operational problem encountered during the investigation was associated with the surge characteristics of the compressor. The surge line of the compressor had a severe dip at engine speeds between 65 and 85 percent of rated engine speed (ref. 1). Although the engine was equipped with combustor-inlet bleed ports, accelerations at all altitudes were very slow. At altitudes above 35,000 feet, the engine could be started but could not be accelerated to rated engine speed even with the air bleed ports open. Modifications in compressor design to alleviate the acceleration problem are being considered by the manufacturer.

Another problem encountered was the very rapid deterioration and failure of the first turbine rotor stage. The blades of the first stage were hollow, and the material used had low thermal shock resistance. These factors combined with the high operating turbine-inlet temperatures resulted in severe reduction in turbine life. The life of the first-stage turbine rotor used in this investigation varied between 20 and 70 hours; however, the turbine stators and rotors were of an interim design.

SUMMARY OF RESULTS

The following results were obtained from an altitude-wind-tunnel investigation of a YJ71-A-7 turbojet engine operating over a range of engine speeds and exhaust-nozzle areas at altitudes from 6000 to 55,000 feet and flight Mach numbers from 0.16 to 1.00.

1. The variation of corrected values of air flow, net thrust, and fuel flow with corrected engine speed was not defined by a single curve with changes in altitude at a given flight Mach number. The corrected air flow at rated corrected engine speed was 167 pounds per second at altitudes below 15,000 feet and decreased to about 163 pounds per second at an altitude of 45,000 feet.

2. A minimum specific fuel consumption of 0.925 to 0.950 pound per hour per pound net thrust was obtained at altitudes between 15,000 and 45,000 feet at a flight Mach number of 0.16. The minimum value occurred at the same exhaust-nozzle area (2.86 sq ft) but at lower engine speeds (approximately the same corrected engine speed) with increase in altitude.

3. An increase in flight Mach number at any altitude caused an appreciable increase in minimum specific fuel consumption. The minimum value occurred at smaller exhaust-nozzle areas and slightly higher engine speeds (approximately the same corrected engine speed) as flight Mach number increased. At an altitude of 35,000 feet, the minimum specific fuel consumption increased from 0.925 to 1.20 pounds per hour per pound net thrust as flight Mach number increased from 0.16 to 1.00.

4. The optimum exhaust-nozzle area - engine speed schedule varied with flight conditions. However, a schedule that would be nearly optimum for all flight conditions and yet simple to incorporate would be to maintain an exhaust-nozzle area of about 3.0 square feet until rated engine speed is reached and then reduce the exhaust-nozzle area until limiting exhaust-gas temperature is obtained.

5. Engine performance calculated from pumping characteristics was found to be in close agreement with experimental data and can therefore be considered an acceptable means for predicting performance characteristics at flight conditions other than those investigated.

6. A correlation between exhaust-nozzle pressure drop and jet thrust provided a reasonably accurate method of obtaining jet thrust in flight provided the exhaust-nozzle area is known.

7. Engine acceleration was severely limited by the surge characteristics of the compressor. At altitudes above 35,000 feet, the engine could be started but could not be accelerated to rated engine speed.

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio, April 13, 1953

APPENDIX A

SYMBOLS

The following symbols are used in this report:

A cross-sectional area, sq ft

B thrust scale reading, lb

C_D discharge coefficient, ratio of flow area to cold projected exhaust-nozzle area

C_v effective velocity coefficient, ratio of scale jet thrust to rake jet thrust calculated at exhaust-nozzle inlet

D external drag of installation, lb

F_j jet thrust, lb

F_n net thrust, lb

g acceleration due to gravity, 32.2 ft/sec^2

H altitude, ft

M Mach number

N engine speed, rpm

P total pressure, lb/sq ft abs

p static pressure, lb/sq ft abs

R gas constant, 53.3 ft-lb/(lb)($^{\circ}$R)

T total temperature, $^{\circ}$R

t static temperature, $^{\circ}$R

V velocity, ft/sec or knots

W_a air flow, lb/sec

W_f fuel flow, lb/hr

W_g gas flow, lb/sec

γ ratio of specific heats for gases

δ_a ratio of ambient absolute static pressure to absolute static pressure of NACA standard atmosphere at respective altitude

δ_T ratio of engine-inlet absolute total pressure to absolute static pressure of NACA standard atmosphere at sea-level

θ_a ratio of absolute ambient static temperature to absolute static temperature of NACA standard atmosphere at the respective altitude

θ_T ratio of engine-inlet absolute total temperature to absolute static temperature of NACA standard atmosphere at sea level

φ ratio of absolute viscosity of air at engine inlet to viscosity of NACA standard atmosphere at sea level

Subscripts:

a air

f fuel

i indicated

j jet

n exhaust nozzle

r rake

s scale

0 free-stream conditions

1 compressor inlet

2 compressor outlet

3 turbine inlet

4 turbine outlet

5 diffuser outlet

6 exhaust-nozzle inlet

APPENDIX B

METHODS OF CALCULATION

Flight Mach number. - The flight Mach number, with complete ram pressure recovery assumed, was calculated from the expression

$$M_0 = \sqrt{\frac{2}{\gamma-1}\left[\left(\frac{P_1}{p_0}\right)^{\frac{\gamma_1-1}{\gamma_1}} - 1\right]}$$

Airspeed. - The following equation was used to calculate airspeed:

$$V_0 = M_0 \sqrt{\gamma g R t_0}$$

Temperature. - Total temperatures were determined from indicated temperatures with the following relation:

$$T = \frac{T_i \left(\frac{P}{p}\right)^{\frac{\gamma-1}{\gamma}}}{1 + 0.85\left[\left(\frac{P}{p}\right)^{\frac{\gamma-1}{\gamma}} - 1\right]}$$

where 0.85 is the impact recovery factor for the type of thermocouple used.

Air flow. - Air flow was determined from pressure and temperature measurements in the engine-inlet air duct by use of the equation

$$W_{a,1} = A_1 \sqrt{\frac{2g}{R}}\left(\frac{p_1}{\sqrt{T_1}}\right)\sqrt{\left(\frac{\gamma_1}{\gamma_1-1}\right)\left(\frac{P_1}{p_1}\right)^{\frac{\gamma_1-1}{\gamma_1}}\left[\left(\frac{P_1}{p_1}\right)^{\frac{\gamma_1-1}{\gamma_1}} - 1\right]}$$

Gas flow. - The total weight flow through the engine was calculated as follows:

$$W_{g,6} = W_{a,1} + \frac{W_f}{3600}$$

Scale thrust. - The jet thrust of the engine was determined from the balance-scale measurements by using the following equation:

$$F_{j,s} = B + D + \frac{W_a V_1}{g} + A_1(p_1 - p_0)$$

The last two terms of this expression represent the momentum and pressure forces on the installation at the slip joint in the inlet air duct. The external drag of the installation was determined with the engine inoperative.

Scale net thrust was obtained by subtracting the free-stream momentum of the inlet air from the scale jet thrust.

$$F_{n,s} = F_{j,s} - W_{a,1} \frac{V_0}{g}$$

Calculated thrust. - At any flight condition the following are known: δ_T, θ_T, T_1, P_1, t_0, p_0, and Reynolds number index $\delta_T/\varphi\sqrt{\theta_T}$ (for φ see fig. 21).

When an engine speed and exhaust-gas temperature are selected, the following are obtainable: engine temperature ratio T_6/T_1; corrected engine speed, $\frac{N}{\sqrt{\theta_T}}$.

With the use of figures 11, 12, and 13, values are found for P_4/P_1, $\frac{W_a\sqrt{\theta_T}}{\delta_T}$, and $\frac{W_f}{\delta_T\sqrt{\theta_T}}$.

From these quantities, the turbine-outlet gas-flow parameter can be calculated

$$\frac{W_g\sqrt{T_6}}{P_4}$$

With the use of figures 14 and 15, the tail-pipe pressure loss $\frac{P_4 - P_6}{P_4}$ and the effective velocity coefficient C_v may be found.

Rake jet thrust is given by the following equations based on exhaust-nozzle-outlet total pressure and temperature from the charts presented in reference 3:

$$F_{j,r} = \frac{W_g}{g} V_j \text{ (subcritical)}$$

$$F_{j,r} = \frac{W_g}{g} V_n + A_n(p_n - p_0) \text{ (supercritical)}$$

By definition

$$C_v = \frac{F_{j,s}}{F_{j,r}}$$

Therefore,

$$F_{j,s} = C_v F_{j,r}$$

Scale net thrust is then obtained by subtracting the free-stream momentum of the inlet air from the scale jet thrust

$$F_{n,s} = F_{j,s} - \frac{W_a V_0}{g}$$

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TABLE I. - PERFORMANCE DATA

(a) Exhaust-nozzle

Run number	Altitude, H, ft	Ram pressure ratio, $\frac{P_1}{p_0}$	Flight Mach number, M_0	Tunnel static pressure, p_0, $\frac{lb}{sq\ ft\ abs}$	Equivalent ambient air temperature, t_0, °R	Engine-inlet indicated temperature, T_1, °R	Reynolds number index, $\frac{\delta_T}{\varphi_T \sqrt{\theta_T}}$	Engine speed			Engine total-pressure ratio, $\frac{P_4}{P_1}$	Engine total-temperature ratio, $\frac{T_6}{T_1}$	Net thrust		
								N, rpm	Adjusted, $\frac{N}{\sqrt{\theta_a}}$, rpm	Corrected, $\frac{N}{\sqrt{\theta_T}}$, rpm			F_n, lb	Adjusted, $\frac{F_n}{\delta_a}$, lb	Corrected, $\frac{F_n}{\delta_T}$, lb
1	6,000	1.014	0.141	1688	523	525	0.789	5971	5827	5937	2.447	3.240	7604	7634	9,406
2		1.019	.164	1687	522	525	.790	5849	5713	5816	2.330	3.147	6964	6999	8,573
3		1.017	.155	1687	523	526	.790	5727	5588	5689	2.202	3.038	6357	6389	7,838
4		1.020	.169	1689	523	526	.795	5606	5470	5568	2.091	2.962	5888	5920	7,240
5		1.019	.164	1692	522	525	.795	5484	5356	5453	1.998	2.842	5256	5267	6,449
6		1.022	.176	1689	522	525	.797	5362	5237	5331	1.892	2.766	4732	4751	5,797
7		1.024	.184	1687	521	525	.797	5240	5123	5210	1.797	2.691	4191	4212	5,134
8	15,000	1.021	0.173	1188	488	491	0.611	6093	5948	6264	2.680	3.576	6195	6220	10,804
9		1.021	.173	1187	490	493	.608	5971	5817	6126	2.617	3.467	5913	5943	10,324
10		1.023	.180	1186	490	493	.608	5849	5698	6001	2.546	3.373	5585	5619	9,740
11		1.025	.188	1185	493	497	.600	5727	5562	5853	2.410	3.254	5144	5180	8,961
12		1.026	.192	1186	491	495	.605	5606	5455	5741	2.309	3.158	4771	4800	8,297
13	25,000	1.016	0.152	767	460	462	0.425	5971	5773	6329	2.769	3.716	4178	4274	11,347
14		1.022	.176	766	460	463	.424	5848	5655	6194	2.687	3.613	3992	4092	10,786
15		1.022	.176	767	460	463	.424	5727	5537	6065	2.612	3.512	3781	3868	10,205
16		1.025	.188	767	459	462	.431	5606	5426	5942	2.505	3.413	3539	3620	9,527
17		1.261	.586	765	444	474	.511	6093	5996	6373	2.735	3.700	4392	4506	9,632
18		1.269	.594	765	444	475	.515	5971	5876	6240	2.669	3.571	4250	4361	9,261
19		1.274	.599	763	444	476	.515	5848	5756	6106	2.586	3.471	4071	4189	8,863
20		1.263	.588	765	446	477	.508	5727	5623	5973	2.501	3.350	3732	3829	8,173
21		1.270	.595	767	448	480	.508	5606	5492	5830	2.378	3.256	3604	3687	7,828
22		1.304	.628	766	432	466	.545	5484	5471	5786	2.338	3.182	3463	3550	7,335
23		1.318	.641	765	432	467	.547	5240	5228	5523	2.065	2.931	2792	2865	5,860
24	35,000	1.025	0.188	476	456	459	0.270	5727	5324	6088	2.707	3.680	2436	2548	10,562
25		1.029	.203	479	454	459	.273	5606	5221	5965	2.566	3.563	2287	2378	9,816
26		1.031	.210	480	457	461	.272	5484	5092	5819	2.438	3.436	2161	2243	9,238
27		1.029	.203	479	457	461	.271	5240	4865	5560	2.181	3.226	1750	1820	7,511
28		1.304	.628	477	431	465	.342	5849	5592	6177	2.736	3.660	2798	2921	9,519
29		1.308	.632	477	431	465	.342	5727	5476	6048	2.612	3.555	2604	2719	8,830
30		1.309	.633	479	431	466	.347	5606	5360	5914	2.506	3.442	2429	2526	8,198
31		1.322	.645	481	418	453	.360	5484	5324	5873	2.465	3.395	2460	2546	8,184
32		1.325	.647	480	420	455	.360	5362	5194	5727	2.330	3.273	2194	2277	7,299
33		1.319	.642	480	420	455	.358	5240	5075	5596	2.172	3.147	1978	2053	6,612
34		1.874	.992	478	393	470	.481	5971	5977	6276	2.701	3.617	3795	3954	8,964
35		1.883	.996	477	391	469	.483	5849	5872	6153	2.641	3.527	3617	3776	8,522
36		1.882	.996	476	391	468	.482	5727	5750	6031	2.540	3.429	3421	3578	8,080
37		1.880	.995	474	391	468	.480	5606	5628	5903	2.461	3.353	3194	3357	7,586
38		1.907	1.007	475	393	473	.483	5484	5489	5742	2.330	3.186	2990	3134	6,985
39		1.894	1.001	479	395	474	.483	5240	5233	5481	2.014	2.897	2340	2434	5,459
40		1.902	1.005	480	508	611	.351	5849	5151	5390	1.880	2.863	2082	2161	4,826
41		1.906	1.006	478	512	616	.347	5727	5024	5257	1.746	2.748	1778	1853	4,130
42		1.908	1.007	477	511	615	.347	5727	5029	5261	1.732	2.727	1763	1841	4,099
43		1.912	1.009	477	513	617	.346	5606	4913	5142	1.628	2.632	1521	1588	3,529
44	45,000	1.014	0.141	287	452	454	0.167	5240	4886	5602	2.302	3.399	1120	1202	8,144
45		1.359	.677	287	415	453	.220	5727	5573	6134	2.741	3.786	1774	1904	9,626
46		1.353	.672	289	415	453	.220	5606	5455	6004	2.675	3.711	1671	1781	9,043
47	55,000	1.565	0.827	170	397	451	0.151	5484	5456	5884	2.579	3.721	1110	1248	8,830
48		-----	-----	----	---	453	-----	5362	----	5743	-----	-----	----	----	------
49		-----	-----	163	---	452	-----	5240	----	5612	-----	-----	----	----	------
50		1.588	.841	170	397	453	.153	5240	5213	5612	2.233	3.393	866	973	6,787
51		2.179	1.117	168	361	451	.208	5606	5853	6015	2.694	3.707	1483	1686	8,573
52		2.153	1.107	170	362	451	.208	5484	5714	5884	2.538	3.614	1416	1592	8,186
53		2.151	1.107	172	363	452	.209	5362	5582	5743	2.405	3.467	1268	1407	7,252
54		2.222	1.133	171	359	451	.210	5240	5481	5623	2.205	3.318	1216	1358	6,771

FOR YJ71-A-7 TURBOJET ENGINE

area, 2.54 square feet

Jet thrust			Air flow			Fuel flow			Specific fuel consumption			Exhaust-gas total temperature			Run number
F_j, lb	Adjusted, $\frac{F_j}{\delta_a}$, lb	Corrected, $\frac{F_j}{\delta_T}$, lb	W_a, $\frac{lb}{sec}$	Adjusted, $\frac{W_a\sqrt{\theta_a}}{\delta_a}$, $\frac{lb}{sec}$	Corrected, $\frac{W_a\sqrt{\theta_T}}{\delta_T}$, $\frac{lb}{sec}$	W_f, $\frac{lb}{hr}$	Adjusted, $\frac{W_f}{\delta_a\sqrt{\theta_a}}$, $\frac{lb}{hr}$	Corrected, $\frac{W_f}{\delta_T\sqrt{\theta_T}}$, $\frac{lb}{hr}$	$\frac{W_f}{F_n}$, $\frac{lb/hr}{lb\ thrust}$	Adjusted, $\frac{W_f}{F_n\sqrt{\theta_a}}$, $\frac{lb/hr}{lb\ thrust}$	Corrected, $\frac{W_f}{F_n\sqrt{\theta_T}}$, $\frac{lb/hr}{lb\ thrust}$	T_6, °R	Adjusted, $\frac{T_6}{\theta_a}$, °R	Corrected, $\frac{T_6}{\theta_T}$, °R	
8248	8281	10,203	130.8	134.6	162.7	7811	7652	9,607	1.03	1.00	1.02	1701	1620	1682	1
7691	7729	9,468	127.0	130.7	157.3	7290	7156	8,922	1.05	1.02	1.04	1652	1576	1633	2
7013	7048	8,647	121.5	125.1	150.6	6625	6497	8,114	1.04	1.02	1.04	1598	1522	1577	3
6577	6610	8,090	117.1	120.4	144.7	6070	5947	7,410	1.03	1.00	1.02	1558	1484	1537	4
5902	5914	7,242	112.9	115.8	139.3	5400	5285	6,588	1.03	1.00	1.02	1492	1423	1475	5
5392	5414	6,605	107.8	110.7	132.7	4920	4824	5,993	1.04	1.02	1.03	1452	1385	1435	6
4849	4873	5,940	102.7	105.5	126.5	4450	4373	5,421	1.06	1.04	1.06	1413	1351	1397	7
6777	6804	11,819	99.8	102.6	169.3	6450	6321	11,564	1.04	1.02	1.07	1756	1673	1856	8
6488	6520	11,328	98.4	101.4	167.5	6090	5963	10,909	1.03	1.00	1.06	1709	1622	1800	9
6172	6209	10,764	96.5	99.6	164.1	5690	5576	10,181	1.02	.99	1.05	1663	1578	1751	10
5737	5777	9,994	93.1	96.5	158.7	5210	5095	9,276	1.01	.98	1.04	1617	1525	1688	11
5358	5390	9,318	90.4	93.4	153.5	4800	4699	8,547	1.01	.98	1.03	1563	1480	1640	12
4507	4611	12,241	66.3	70.2	170.0	4280	4233	12,322	1.02	0.99	1.09	1717	1605	1930	13
4369	4478	11,805	65.5	69.4	167.2	4055	4019	11,602	1.02	.98	1.08	1673	1564	1875	14
4152	4247	11,206	64.4	68.1	164.1	3805	3764	10,874	1.01	.97	1.07	1626	1520	1823	15
3926	4016	10,569	63.1	66.7	160.2	3560	3525	10,160	1.01	.97	1.07	1577	1477	1773	16
5910	6064	12,961	80.8	84.2	169.3	5400	5452	12,386	1.23	1.21	1.29	1754	1699	1919	17
5789	5940	12,614	80.7	84.1	168.3	5220	5271	11,886	1.23	1.21	1.28	1696	1643	1852	18
5600	5762	12,191	79.5	83.1	165.8	4750	4810	10,796	1.17	1.15	1.22	1652	1600	1801	19
5197	5332	11,381	77.5	80.9	162.7	4380	4413	10,004	1.17	1.15	1.22	1598	1541	1739	20
5054	5170	10,977	75.7	79.0	158.0	3930	3939	8,877	1.09	1.07	1.13	1563	1500	1691	21
5009	5134	10,609	77.7	79.8	156.0	3950	4040	8,826	1.14	1.14	1.20	1483	1476	1651	22
4252	4363	8,925	71.9	73.9	143.1	3215	3291	7,114	1.15	1.15	1.21	1369	1363	1521	23
2683	2806	11,633	40.3	45.3	164.3	2600	2528	11,985	1.07	0.99	1.13	1689	1460	1909	24
2547	2649	10,932	39.5	44.2	159.4	2410	2335	11,005	1.05	.98	1.12	1632	1415	1847	25
2422	2514	10,354	38.2	42.7	154.0	2240	2159	10,102	1.04	.96	1.10	1584	1366	1784	26
1981	2060	8,502	35.0	39.2	141.6	1830	1767	8,335	1.05	.97	1.11	1487	1282	1674	27
3831	4000	13,033	52.0	56.8	167.5	3350	3344	12,036	1.20	1.14	1.26	1702	1556	1898	28
3626	3786	12,296	51.2	55.9	164.2	3125	3119	11,190	1.20	1.15	1.27	1653	1511	1843	29
3432	3569	11,583	50.1	54.6	160.4	2900	2884	10,328	1.19	1.14	1.26	1604	1466	1785	30
3420	3540	11,378	51.0	54.3	158.4	2770	2783	9,871	1.13	1.09	1.21	1538	1450	1764	31
3183	3304	10,590	48.9	52.4	152.4	2520	2534	8,953	1.15	1.11	1.23	1489	1397	1699	32
2909	3020	9,725	46.5	49.8	145.5	2250	2262	8,033	1.14	1.10	1.22	1432	1343	1634	33
6060	6315	14,314	75.6	78.7	169.9	4755	4960	11,805	1.25	1.25	1.32	1700	1705	1879	34
5870	6128	13,830	75.1	78.1	168.2	4505	4722	11,165	1.25	1.25	1.31	1654	1667	1831	35
5634	5893	13,308	73.8	76.9	165.5	4190	4401	10,421	1.23	1.23	1.29	1605	1618	1780	36
5345	5618	12,694	71.8	75.2	161.9	3950	4168	9,878	1.24	1.24	1.30	1569	1582	1740	37
5106	5351	11,928	69.6	72.9	155.2	3605	3782	8,816	1.21	1.21	1.26	1507	1512	1652	38
4263	4434	9,946	63.4	66.0	141.5	2820	2929	6,882	1.21	1.20	1.26	1373	1370	1502	39
3922	4071	9,091	53.3	62.8	134.1	3150	2879	6,729	1.51	1.33	1.39	1749	1357	1485	40
3525	3673	8,189	50.4	59.8	127.4	2770	2532	5,907	1.56	1.37	1.43	1693	1303	1426	41
3508	3662	8,156	50.3	59.8	127.4	2740	2512	5,852	1.55	1.37	1.43	1677	1293	1415	42
3189	3329	7,398	47.9	52.1	121.2	2450	2241	5,213	1.61	1.41	1.48	1624	1247	1366	43
1215	1304	8,834	20.8	[illegible]	[illegible]41.5	1195	1195	9,285	1.07	0.99	1.14	1543	1342	1764	44
2463	2643	13,364	32.[illegible]	[illegible]	166.2	2210	2308	12,843	1.25	1.21	1.33	1715	1624	1967	45
2335	2489	12,637	3[illegible]	[illegible].9	161.1	2055	2132	11,912	1.23	1.20	1.32	1681	1592	1928	46
1631	1833	12,975	20.7	23.5	154.0	1362	1523	11,622	1.23	1.22	1.32	1678	1661	1931	47
----	----	------	----	----	-----	1228	----	------	----	----	----	----	----	----	48
----	----	------	----	----	-----	1104	----	------	----	----	----	----	----	----	49
1355	1523	10,619	19.2	21.7	140.3	1107	1238	9,295	1.28	1.27	1.37	1537	1521	1763	50
2454	2790	14,187	30.0	32.7	161.9	1945	2309	12,065	1.31	1.37	1.41	1672	1821	1924	51
2353	2645	13,603	29.2	31.5	157.4	1775	2079	11,013	1.25	1.31	1.35	1630	1770	1876	52
2195	2436	12,553	28.2	30.1	150.6	1630	1884	9,985	1.28	1.34	1.38	1567	1697	1797	53
2126	2375	11,838	27.8	29.7	144.4	1450	1694	8,664	1.19	1.25	1.28	1492	1634	1717	54

NACA

TABLE I. - Continued. PERFORMANCE

(b) Exhaust-nozzle

Run number	Altitude, H, ft	Ram pressure ratio, $\frac{P_1}{p_0}$	Flight Mach number, M_0	Tunnel static pressure, p_0, $\frac{lb}{sq\ ft\ abs}$	Equivalent ambient air temperature, t_0, °R	Engine-inlet indicated temperature, T_1, °R	Reynolds number index, $\frac{\delta_T}{\varphi_T\sqrt{\theta_T}}$	Engine speed: N, rpm	Engine speed: Adjusted, $\frac{N}{\sqrt{\theta_a}}$, rpm	Engine speed: Corrected, $\frac{N}{\sqrt{\theta_T}}$, rpm	Engine total-pressure ratio, $\frac{P_4}{P_1}$	Engine total-temperature ratio, $\frac{T_6}{T_1}$	Net thrust: F_n, lb	Net thrust: Adjusted, $\frac{F_n}{\delta_a}$, lb	Net thrust: Corrected, $\frac{F_n}{\delta_T}$, lb
1	6,000	1.011	0.125	1684	523	525	0.789	6215	6065	6180	2.396	3.189	7694	7748	9,564
2		1.011	.125	1687	523	525	.789	6093	5946	6058	2.346	3.133	7438	7475	9,223
3		1.016	.152	1684	523	525	.789	5971	5827	5937	2.260	3.055	6910	6958	8,548
4		1.017	.155	1687	523	526	.791	5849	5707	5810	2.171	2.968	6451	6483	7,961
5		1.016	.152	1690	524	526	.792	5727	5583	5689	2.078	2.886	5941	5959	7,319
6		1.021	.173	1687	522	525	.795	5606	5475	5574	1.974	2.798	5324	5351	6,543
7		1.021	.173	1687	523	525	.795	5484	5356	5453	1.871	2.714	4796	4820	5,894
8		1.021	.173	1690	523	525	.796	5362	5237	5331	1.784	2.642	4319	4332	5,299
9		1.020	.169	1688	523	525	.795	5240	5118	5210	1.702	2.571	3878	3894	4,766
10	15,000	1.020	0.169	1186	496	499	0.595	6093	5899	6215	2.460	3.301	5557	5590	9,719
11		1.025	.188	1184	493	496	.600	5971	5799	6108	2.395	3.228	5340	5383	9,308
12		1.022	.176	1188	493	496	.600	5849	5681	5984	2.325	3.143	5123	5143	8,929
13		1.021	.173	1184	493	496	.599	5727	5562	5859	2.255	3.058	4793	4812	8,359
14		1.023	.180	1185	493	496	.598	5606	5445	5735	2.144	2.968	4366	4397	7,623
15	25,000	1.021	0.173	765	460	463	0.424	6093	5891	6452	2.601	3.603	3933	4035	10,654
16		1.021	.173	767	460	463	.424	5971	5773	6323	2.549	3.484	3789	3876	10,238
17		1.018	.160	765	462	464	.423	5849	5643	6188	2.494	3.373	3681	3773	9,987
18		1.022	.176	767	461	464	.424	5727	5531	6059	2.411	3.280	3462	3542	9,344
19		1.022	.176	765	461	464	.424	5606	5414	5931	2.324	-----	3244	3328	8,778
20		1.291	.616	766	457	492	.496	6093	5910	6258	2.486	3.352	3923	4021	8,395
21		1.299	.623	762	457	492	.496	5971	5792	6132	2.408	3.244	3775	3888	8,067
22		1.295	.619	765	458	493	.495	5849	5668	6001	2.316	3.142	3541	3633	7,560
23		1.298	.622	762	458	493	.495	5727	5549	5876	2.233	3.057	3340	3440	7,148
24		1.298	.622	766	458	493	.495	5606	5432	5752	2.125	2.957	3021	3097	6,432
25		1.314	.637	768	430	465	.550	5484	5484	5791	2.154	2.978	3185	3255	6,679
26		1.313	.636	768	430	465	.549	5240	5240	5533	1.911	2.757	2510	2568	5,274
27	35,000	1.029	0.203	479	454	458	0.273	6093	5674	6483	2.667	3.771	2569	2672	11,026
28		1.017	.155	479	456	458	.270	5971	5551	6353	2.655	3.662	2478	2577	10,767
29		1.015	.147	478	456	458	.270	5849	5437	6223	2.604	3.566	2425	2527	10,580
30		1.015	.147	478	456	458	.270	5727	5323	6094	2.511	3.452	2283	2379	9,961
31		1.017	.155	479	456	458	.270	5606	5212	5965	2.409	3.354	2110	2194	9,168
32		1.025	.188	478	458	461	.271	5484	5086	5819	2.271	3.230	1967	2050	8,494
33		1.021	.173	478	459	462	.268	5240	4855	5554	2.057	3.041	1599	1666	6,933
34		1.305	.629	478	431	465	.342	6093	5826	6434	2.630	3.645	2756	2872	9,346
35		1.302	.626	480	430	464	.341	5971	5715	6317	2.584	3.547	2698	2801	9,135
36		1.305	.629	479	429	463	.341	5849	5605	6194	2.518	3.436	2561	2663	8,672
37		1.301	.625	479	430	464	.341	5727	5482	6059	2.440	3.332	2410	2506	8,184
38		1.309	.633	479	429	463	.343	5606	5372	5937	2.338	3.227	2221	2310	7,496
39		1.310	.634	478	420	454	.357	5484	5312	5862	2.294	3.163	2153	2243	7,277
40		1.302	.626	480	422	454	.357	5362	5181	5727	2.157	3.033	1929	2002	6,532
41		1.310	.634	481	421	454	.358	5240	5069	5596	2.019	2.923	1747	1808	5,868
42		1.881	.995	479	392	470	.487	6093	6105	6404	2.541	3.489	3650	3796	8,574
43		1.883	.996	478	392	470	.486	5971	5983	6276	2.476	3.391	3506	3653	8,243
44		1.879	.994	481	392	470	.488	5849	5861	6147	2.420	3.277	3353	3470	7,849
45		1.885	.997	477	391	469	.483	5727	5750	6025	2.326	3.183	3142	3280	7,396
46		1.885	.997	480	391	469	.489	5606	5628	5898	2.240	3.083	2947	3059	6,890
47		1.914	1.010	476	392	472	.487	5484	5495	5753	2.135	2.962	2660	2782	6,179
48		1.911	1.009	474	392	472	.481	5240	5250	5497	1.877	2.733	2110	2218	4,929
49	45,000	1.017	0.155	288	456	458	0.167	5727	5316	6094	2.560	3.638	1421	1519	10,262
50		1.028	.199	289	455	459	.167	5606	5210	5959	2.451	3.521	1314	1401	9,362
51		1.010	.118	287	453	454	.167	5606	5221	5993	2.507	3.520	1406	1509	10,260
52		1.018	.160	284	452	454	.166	5484	5114	5862	2.391	3.392	1270	1378	9,299
53		1.021	.173	287	450	453	.167	5362	5011	5743	2.253	3.267	1140	1223	8,233
54		1.014	.141	288	454	456	.167	5240	4875	5591	2.127	3.121	1016	1086	7,363
55		1.351	.670	288	417	454	.220	5971	5797	6383	2.728	3.758	1766	1888	9,607
56		1.353	.672	289	417	455	.220	5849	5678	6247	2.588	3.640	1710	1823	9,255
57		1.353	.672	289	416	454	.220	5727	5567	6122	2.542	3.537	1621	1728	8,773
58		1.360	.678	289	416	454	.221	5606	5449	5993	2.445	3.465	1533	1634	8,254
59	55,000	1.571	0.830	168	397	452	0.151	5727	5698	6139	2.591	3.708	1120	1273	8,977
60		1.592	.843	169	396	452	.153	5606	5585	6010	2.442	3.573	1106	1250	8,700
61		1.580	.836	169	397	452	.152	5484	5456	5879	2.345	3.431	949	1072	7,521
62		1.573	.832	171	397	452	.153	5362	5335	5748	2.164	3.290	888	992	6,985
63		1.576	.833	172	397	452	.154	5240	5213	5617	2.044	3.164	768	852	5,997
64		2.163	1.111	172	362	451	.207	5971	6222	6407	2.704	3.807	1643	1824	9,345
65		2.173	1.115	168	361	451	.207	5484	5725	5884	2.353	-----	1241	1411	7,194
66		2.218	1.131	170	360	452	.210	5362	5603	5743	2.154	3.206	1223	1375	6,865
67		2.229	1.135	170	359	452	.210	5240	5481	5612	2.005	3.088	1115	1253	6,225

DATA FOR YJ71-A-7 TURBOJET ENGINE

area, 2.685 square feet

Jet thrust			Air flow			Fuel flow			Specific fuel consumption			Exhaust-gas total temperature			Run number
F_j, lb	Adjusted, $\frac{F_j}{\delta_a}$, lb	Corrected, $\frac{F_j}{\delta_T}$, lb	W_a, $\frac{lb}{sec}$	Adjusted, $\frac{W_a\sqrt{\theta_a}}{\delta_a}$, $\frac{lb}{sec}$	Corrected, $\frac{W_a\sqrt{\theta_T}}{\delta_T}$, $\frac{lb}{sec}$	W_f, $\frac{lb}{hr}$	Adjusted, $\frac{W_f}{\delta_a\sqrt{\theta_a}}$, $\frac{lb}{hr}$	Corrected, $\frac{W_f}{\delta_T\sqrt{\theta_T}}$, $\frac{lb}{hr}$	$\frac{W_f}{F_n}$, $\frac{lb/hr}{lb\ thrust}$	Adjusted, $\frac{W_f}{F_n\sqrt{\theta_a}}$, $\frac{lb/hr}{lb\ thrust}$	Corrected, $\frac{W_f}{F_n\sqrt{\theta_T}}$, $\frac{lb/hr}{lb\ thrust}$	T_6, R	Adjusted, $\frac{T_6}{\theta_a}$, °R	Corrected, $\frac{T_6}{\theta_T}$, °R	
8279	8337	10,291	135.0	139.4	168.8	7867	7731	9,723	1.02	1.00	1.02	1674	1594	1655	1
8021	8061	9,946	134.5	138.6	167.8	7528	7383	9,281	1.01	.99	1.01	1645	1566	1626	2
7600	7653	9,401	130.5	134.7	162.3	7070	6947	8,696	1.02	1.00	1.02	1604	1527	1586	3
7136	7172	8,806	126.8	130.6	157.4	6535	6409	8,010	1.01	.99	1.01	1561	1486	1540	4
6587	6607	8,115	122.9	126.5	152.3	6050	5916	7,403	1.02	.99	1.01	1518	1443	1498	5
6038	6068	7,421	118.4	121.8	146.4	5540	5438	6,769	1.04	1.02	1.03	1469	1401	1452	6
5477	5504	6,731	112.9	116.2	139.6	4950	4859	6,049	1.03	1.01	1.03	1425	1359	1409	7
4971	4986	6,099	108.2	111.1	133.5	4520	4428	5,514	1.05	1.02	1.04	1387	1323	1371	8
4484	4502	5,511	103.1	106.0	127.4	4120	4040	5,035	1.06	1.04	1.06	1353	1291	1338	9
6121	6158	10,706	98.5	102.3	168.9	5705	5557	10,177	1.03	0.99	1.05	1647	1544	1713	10
5963	6011	10,394	97.7	101.4	166.5	5390	5277	9,611	1.01	.98	1.03	1601	1510	1676	11
5695	5718	9,926	96.0	99.3	163.7	5070	4944	9,041	.99	.96	1.01	1559	1470	1632	12
5342	5363	9,316	93.7	96.9	159.8	4720	4602	8,422	.98	.96	1.01	1517	1431	1588	13
4917	4951	8,585	90.4	93.7	154.3	4340	4245	7,752	.99	.96	1.02	1472	1388	1541	14
4309	4421	11,673	66.4	70.5	169.9	4080	4048	11,706	1.04	1.00	1.10	1668	1559	1870	15
4163	4259	11,248	66.2	70.0	168.9	3850	3809	11,016	1.02	.98	1.08	1613	1508	1808	16
4025	4126	10,920	65.7	69.8	168.5	3640	3600	10,448	.99	.95	1.05	1565	1457	1751	17
3834	3922	10,348	64.5	68.4	164.7	3430	3389	9,795	.99	.96	1.05	1522	1420	1703	18
3605	3699	9,755	62.7	66.6	160.5	3235	3205	9,263	1.00	.96	1.06	----	----	----	19
5553	5692	11,883	81.3	85.9	169.5	4785	4757	10,516	1.22	1.18	1.25	1649	1552	1740	20
5411	5573	11,563	80.5	85.5	167.6	4450	4447	9,766	1.18	1.14	1.21	1596	1502	1684	21
5133	5266	10,959	78.9	83.5	164.1	4140	4116	9,069	1.17	1.13	1.20	1549	1454	1631	22
4898	5045	10,482	76.8	81.6	160.2	3850	3843	8,453	1.15	1.12	1.18	1507	1415	1587	23
4537	4650	9,659	74.7	79.1	155.1	3620	3596	7,907	1.20	1.16	1.23	1458	1369	1535	24
4769	4874	10,001	78.7	80.4	156.2	3605	3684	7,983	1.13	1.13	1.20	1385	1385	1544	25
3966	4057	8,333	72.4	74.1	144.0	2890	2956	6,412	1.15	1.15	1.22	1282	1282	1429	26
2846	2960	12,215	42.1	47.1	169.9	2810	2722	12,833	1.09	1.02	1.16	1727	1498	1955	27
2687	2794	11,675	41.5	46.4	169.3	2645	2557	12,227	1.07	.99	1.14	1677	1450	1898	28
2621	2731	11,435	41.1	46.1	168.4	2500	2422	11,636	1.03	.96	1.10	1633	1411	1849	29
2476	2580	10,803	40.4	45.3	165.7	2350	2276	10,908	1.03	.96	1.10	1581	1366	1790	30
2309	2401	10,033	39.5	44.2	161.1	2230	2156	10,311	1.06	.98	1.13	1536	1328	1739	31
2200	2292	9,500	38.0	42.7	154.6	2015	1947	9,232	1.02	.95	1.09	1489	1281	1677	32
1795	1870	7,783	34.7	39.1	142.1	1660	1603	7,631	1.04	.96	1.10	1405	1206	1579	33
3812	3972	12,926	53.0	57.8	170.3	3400	3388	12,174	1.23	1.18	1.30	1695	1550	1890	34
3743	3885	12,674	52.8	57.3	169.0	3215	3194	11,516	1.19	1.14	1.26	1646	1508	1842	35
3601	3745	12,193	52.4	56.9	167.7	3025	3015	10,845	1.18	1.13	1.25	1591	1461	1784	36
3429	3566	11,645	51.6	56.1	165.6	2800	2787	10,059	1.16	1.11	1.23	1546	1417	1730	37
3234	3363	10,915	50.7	55.1	161.7	2620	2611	9,366	1.18	1.13	1.25	1494	1372	1675	38
3146	3278	10,633	50.2	53.9	158.6	2490	2513	8,998	1.16	1.12	1.24	1436	1347	1641	39
2871	2980	9,721	48.1	51.7	152.5	2240	2246	8,099	1.16	1.12	1.24	1380	1288	1575	40
2664	2757	8,948	46.3	49.5	145.5	2010	2012	7,212	1.15	1.11	1.23	1330	1245	1518	41
5948	6186	13,972	76.5	79.5	171.1	4520	4710	11,160	1.24	1.23	1.30	1640	1648	1812	42
5792	6035	13,617	76.1	79.1	170.2	4265	4454	10,540	1.22	1.22	1.28	1594	1602	1761	43
5624	5821	13,166	75.7	78.2	168.7	4005	4153	9,853	1.19	1.20	1.26	1540	1548	1702	44
5358	5594	12,613	73.8	76.7	165.1	3735	3915	9,249	1.19	1.19	1.25	1493	1505	1653	45
5122	5317	11,975	72.4	74.9	160.9	3500	3648	8,609	1.19	1.19	1.25	1446	1458	1601	46
4794	5015	11,136	70.0	73.1	155.1	3260	3417	7,945	1.23	1.23	1.28	1398	1405	1538	47
4051	4258	9,463	63.8	66.9	142.1	2570	2706	6,298	1.22	1.22	1.28	1290	1296	1419	48
1541	1647	11,129	23.9	27.5	161.9	1535	1523	11,794	1.08	1.00	1.15	1666	1436	1886	49
1465	1562	10,438	23.4	26.8	156.5	1465	1452	11,094	1.12	1.04	1.19	1616	1396	1826	50
1496	1605	10,916	23.5	27.0	160.2	1450	1450	11,310	1.03	.96	1.10	1598	1386	1827	51
1387	1505	10,156	22.6	26.3	154.9	1320	1336	10,331	1.04	.97	1.11	1540	1339	1760	52
1262	1354	9,114	21.8	25.1	147.2	1195	1199	9,244	1.05	.98	1.12	1480	1292	1698	53
1111	1188	8,051	20.8	23.9	141.0	1070	1065	8,276	1.05	.98	1.12	1423	1232	1619	54
2465	2635	13,410	33.5	36.9	170.5	2240	2325	13,029	1.27	1.23	1.36	1706	1608	1950	55
2405	2564	13,016	33.2	36.5	168.5	2080	2152	12,020	1.22	1.18	1.30	1656	1561	1889	56
2302	2454	12,458	32.6	35.8	165.2	1955	2025	11,311	1.21	1.17	1.29	1606	1517	1836	57
2207	2353	11,882	32.0	35.1	161.1	1830	1896	10,531	1.19	1.16	1.28	1573	1486	1798	58
1670	1899	13,385	21.8	24.9	163.3	1447	1637	12,431	1.29	1.29	1.39	1676	1659	1926	59
1655	1870	13,018	21.5	24.4	157.8	1323	1489	11,154	1.20	1.19	1.28	1615	1603	1856	60
1475	1667	11,689	20.7	23.6	153.4	1205	1355	10,239	1.27	1.26	1.36	1551	1535	1782	61
1392	1555	10,949	19.9	22.4	146.5	1072	1192	9,038	1.21	1.20	1.29	1487	1472	1709	62
1263	1402	9,862	19.6	21.8	142.6	969	1070	8,113	1.26	1.26	1.35	1430	1416	1643	63
2680	2975	15,244	32.2	34.3	170.7	2190	2533	13,367	1.33	1.39	1.43	1717	1865	1976	64
2184	2483	12,661	29.2	31.8	157.9	1585	1882	9,861	1.28	1.33	1.37	----	----	----	65
2169	2438	12,175	28.9	31.1	151.6	1428	1677	8,582	1.17	1.22	1.25	1449	1582	1662	66
2019	2269	11,272	27.6	29.7	143.7	1270	1493	7,593	1.14	1.19	1.22	1396	1529	1601	67

TABLE I. - Continued. PERFORMANCE

(c) Exhaust-nozzle

Run number	Altitude, H, ft	Ram pressure ratio, $\frac{P_1}{p_0}$	Flight Mach number, M_0	Tunnel static pressure, p_0, $\frac{\text{lb}}{\text{sq ft abs}}$	Equivalent ambient air temperature, t_0, °R	Engine-inlet indicated temperature, T_1, °R	Reynolds number index, $\frac{\delta_T}{\varphi_T\sqrt{\theta_T}}$	Engine speed: N, rpm	Engine speed: Adjusted, $\frac{N}{\sqrt{\theta_a}}$, rpm	Engine speed: Corrected, $\frac{N}{\sqrt{\theta_T}}$, rpm	Engine total-pressure ratio, $\frac{P_4}{P_1}$	Engine total-temperature ratio, $\frac{T_6}{T_1}$	Net thrust: F_n, lb	Net thrust: Adjusted, $\frac{F_n}{\delta_a}$, lb	Net thrust: Corrected, $\frac{F_n}{\delta_T}$, lb
1	6,000	1.014	0.141	1683	521	523	0.789	6215	6076	6191	2.214	3.038	6979	7028	8,654
2		1.014	.141	1686	524	526	.790	6093	5940	6052	2.158	2.949	6691	6724	8,277
3		1.014	.141	1687	524	526	.790	5971	5821	5931	2.085	2.880	6328	6360	7,828
4		1.016	.152	1687	525	527	.788	5849	5697	5805	2.011	2.786	5805	5834	7,169
5		-----	-----	1687	---	527	-----	5727	----	5683	-----	2.708	----	----	------
6		1.017	.155	1688	522	525	.790	5606	5475	5574	1.847	2.657	4842	4861	5,970
7		1.021	.173	1691	522	525	.797	5483	5356	5453	1.745	2.564	4270	4279	5,231
8		1.023	.180	1684	522	525	.795	5362	5237	5331	1.672	2.510	3885	3912	4,775
9		1.026	.192	1686	521	525	.798	5240	5123	5210	1.596	2.438	3373	3390	4,129
10	15,000	1.017	0.155	1181	493	495	0.598	6215	6036	6364	2.306	3.200	5286	5339	9,314
11		1.019	.152	1184	492	495	.601	6093	5924	6239	2.264	3.123	5144	5185	9,017
12		1.016	.164	1185	493	495	.600	6093	5918	6239	2.270	3.103	5136	5172	9,024
13		1.017	.155	1185	493	495	.600	5971	5799	6114	2.213	3.014	4909	4943	8,620
14		1.020	.169	1185	492	495	.601	5849	5686	5989	2.145	2.943	4645	4678	8,129
15		1.021	.173	1185	492	495	.601	5727	5568	5864	2.067	2.865	4294	4324	7,510
16		1.019	.164	1187	492	495	.601	5606	5450	5741	1.988	2.786	3941	3961	6,893
17	25,000	1.014	0.141	765	468	470	0.418	6093	5840	6404	2.380	3.306	3611	3705	9,847
18		1.018	.160	764	468	470	.419	5971	5723	6276	2.326	3.211	3432	3525	9,335
19		1.016	.152	764	468	470	.418	5849	5606	6147	2.264	3.115	3295	3381	8,972
20		1.016	.152	764	468	470	.418	5727	5489	6019	2.202	3.026	3112	3193	8,474
21		1.018	.160	765	468	470	.419	5606	5373	5892	2.131	2.951	2898	2973	7,871
22		1.298	.622	762	458	493	.495	6215	6022	6377	2.304	3.221	3699	3810	7,916
23		1.294	.619	766	457	492	.496	6093	5910	6258	2.272	3.124	3543	3632	7,564
24		1.296	.621	763	458	493	.495	5971	5786	6126	2.200	3.053	3366	3464	7,203
25		1.298	.622	762	458	493	.495	5849	5668	6001	2.126	2.945	3151	3245	6,743
26		1.301	.625	763	458	494	.494	5727	5549	5870	2.046	2.858	----	----	------
27		1.301	.625	762	458	494	.494	5606	5432	5746	1.955	2.761	2649	2728	5,656
28		1.300	.624	769	430	463	.550	5484	5484	5808	1.993	2.795	2829	2888	5,986
29		1.316	.639	767	429	464	.551	5240	5245	5544	1.776	2.610	2246	2298	4,710
30	35,000	1.010	0.118	477	457	458	0.268	6215	5772	6613	2.539	3.633	2480	2589	10,887
31		1.008	.107	478	457	458	.268	6093	5658	6483	2.494	3.557	2400	2501	10,536
32		1.010	.118	479	458	459	.269	5971	5540	6347	2.459	3.438	2331	2424	10,191
33		1.013	.136	479	456	458	.270	5849	5435	6223	2.390	3.330	2212	2300	9,651
34		1.008	.107	479	458	459	.269	5727	5312	6088	2.337	3.231	2114	2199	9,261
35		1.027	.195	477	454	457	.272	5606	5225	5976	2.243	3.133	1864	2209	8,049
36		1.017	.155	479	458	460	.269	5484	5086	5824	2.117	3.028	1762	1832	7,656
37		1.023	.180	479	459	462	.270	5240	4855	5554	1.900	2.851	1464	1523	6,322
38		1.301	.625	481	429	463	.342	6215	5956	6582	2.441	3.503	2657	2750	8,981
39		1.305	.629	479	429	463	.342	6093	5839	6452	2.406	3.408	2527	2628	8,556
40		1.305	.629	478	429	463	.341	5971	5722	6323	2.349	3.296	2407	2508	8,162
41		-----	-----	478	---	463	-----	5849	----	6194	-----	-----	----	----	------
42		1.310	.634	478	429	463	.342	5727	5488	6065	2.225	3.089	2173	2264	7,345
43		1.308	.632	478	429	463	.342	5606	5372	5937	2.149	3.009	1998	2082	6,765
44		1.322	.645	481	420	455	.357	5484	5312	5857	2.099	2.941	1943	2011	6,464
45		1.317	.640	480	421	455	.357	5362	5187	5727	1.975	2.831	1741	1807	5,829
46		1.326	.648	478	420	455	.357	5240	5075	5596	1.858	2.734	1550	1615	5,174
47		1.872	.991	478	392	469	.482	6215	6227	6538	2.362	3.369	3364	3505	7,952
48		1.866	.988	479	392	469	.482	6093	6105	6410	2.315	3.275	3351	3485	7,932
49		1.887	.998	479	390	468	.490	5971	6001	6287	2.277	3.173	3110	3234	7,281
50		1.862	.986	477	392	468	.480	5849	5861	6159	2.218	3.077	2942	3071	7,011
51		1.864	.987	477	392	468	.480	5727	5738	6031	2.150	2.981	2791	2914	6,643
52		1.891	1.000	478	390	468	.490	5606	5634	5903	2.061	2.889	2642	2753	6 185
53		1.895	1.001	477	392	471	.481	5484	5495	5758	1.959	2.786	2396	2501	5,609
54		1.897	1.002	476	392	471	.481	5240	5250	5502	1.729	2.569	1876	1962	4,395
55		1.889	.999	477	518	621	.339	6215	5420	5682	1.896	2.787	2287	2388	5,372
56		1.881	.995	480	507	607	.350	6093	5371	5634	1.784	2.720	2035	2112	4,768
57		1.901	1.004	477	512	615	.346	5971	5238	5485	1.705	2.582	1796	1875	4,190
58		1.883	.996	478	510	611	.346	5849	5141	5390	1.622	2.520	1546	1611	3,635
59		1.890	1.000	480	508	609	.350	5849	5151	5399	1.603	2.504	1661	1724	3,875
60		1.893	1.000	477	516	619	.342	5727	5004	5244	1.503	2.415	1310	1368	3,069
61		1.908	1.007	479	517	622	.343	5606	4894	5121	1.381	2.291	1080	1123	2,500
62	45,000	1.031	0.210	287	450	454	0.169	6093	5694	6513	2.618	3.733	1515	1626	10,831
63		1.031	.210	289	449	453	.169	5971	5586	6395	2.540	3.667	1495	1594	10,616
64		1.024	.184	290	451	454	.169	5849	5460	6253	2.505	3.544	1430	1519	10,189
65		1.028	.199	287	451	455	.169	5727	5346	6116	2.397	3.440	1358	1457	9,741
66		1.024	.184	289	450	453	.169	5606	5239	6004	2.307	3.327	1302	1388	9,308
67		1.021	.173	289	451	454	.167	5484	5119	5862	2.224	3.200	1148	1224	8,235
68		1.010	.118	287	453	454	.167	5362	4994	5732	2.097	3.090	1076	1155	7,852
69		1.010	.118	289	453	454	.167	5240	4881	5602	1.997	2.976	945	1007	6,848
70		1.355	.674	287	417	455	.220	6215	6034	6638	2.584	3.736	1743	1870	9,482
71		1.349	.669	289	419	456	.220	6093	5901	6501	2.528	3.636	1690	1802	9,170
72		1.349	.669	289	417	454	.220	6093	5915	6513	2.521	3.623	1679	1790	9,110
73		1.348	.668	290	417	454	.220	5971	5797	6383	2.471	3.529	1616	1716	8,746
74		1.349	.669	289	417	454	.220	5849	5678	6253	2.390	3.414	1554	1657	8,432
75		1.347	.667	288	417	454	.220	5727	5560	6122	2.322	3.297	1442	1541	7,865
76		1.348	.668	290	417	454	.220	5606	5442	5993	2.225	3.194	1350	1434	7,306
77	55,000	1.018	0.160	167	452	454	0.095	5849	5454	6253	2.582	3.714	899	1028	11,193
78		1.018	.160	166	453	455	.095	5727	5334	6116	2.473	3.664	797	917	9,978
79		1.024	.184	164	452	455	.095	5727	5340	6116	2.464	3.624	814	948	10,256
80		1.018	.160	164	453	455	.095	5606	5221	5987	2.359	3.547	742	864	9,401
81		1.561	.824	164	398	452	.146	6093	6055	6526	2.625	3.757	1165	1357	9,630
82		1.576	.833	170	397	452	.154	5971	5941	6395	2.522	3.699	1158	1302	9,144
83		1.541	.812	170	399	452	.151	5849	5805	6264	2.557	3.593	1102	1239	8,900
84		1.556	.821	171	399	453	.153	5727	5684	6134	2.447	3.457	1024	1144	8,146
85		1.546	.815	174	401	454	.154	5606	5549	5993	2.279	3.350	1002	1100	7,882
86		1.567	.828	171	398	452	.152	5484	5449	5879	2.108	3.179	905	1011	7,146
87		1.561	.824	173	397	451	.152	5362	5335	5753	2.037	3.111	817	902	6,403
88		1.552	.819	174	399	453	.153	5240	5201	5612	1.863	2.974	702	771	5,502

NACA

DATA FOR YJ71-A-7 TURBOJET ENGINE

area, 2.86 square feet

Jet thrust			Air flow				Fuel flow		Specific fuel consumption			Exhaust-gas total temperature			Run number
F_j, lb	Adjusted, $\frac{F_j}{\delta_a}$, lb	Corrected, $\frac{F_j}{\delta_T}$, lb	W_a, $\frac{lb}{sec}$	Adjusted, $\frac{W_a\sqrt{\theta_a}}{\delta_a}$, $\frac{lb}{sec}$	Corrected, $\frac{W_a\sqrt{\theta_T}}{\delta_T}$, $\frac{lb}{sec}$	W_f, $\frac{lb}{hr}$	Adjusted, $\frac{W_f}{\delta_a\sqrt{\theta_a}}$, $\frac{lb}{hr}$	Corrected, $\frac{W_f}{\delta_T\sqrt{\theta_T}}$, $\frac{lb}{hr}$	$\frac{W_f}{F_n}$, $\frac{lb/hr}{lb\ thrust}$	Adjusted, $\frac{W_f}{F_n\sqrt{\theta_a}}$, $\frac{lb/hr}{lb\ thrust}$	Corrected, $\frac{W_f}{F_n\sqrt{\theta_T}}$, $\frac{lb/hr}{lb\ thrust}$	T_6, °R	Adjusted, $\frac{T_6}{\theta_a}$, °R	Corrected, $\frac{T_6}{\theta_T}$, °R	
7647	7701	9,482	135.7	139.8	169.0	7220	7108	8,919	1.04	1.01	1.03	1589	1519	1577	1
7350	7387	9,092	133.6	137.8	166.2	6770	6633	8,319	1.01	.98	1.01	1551	1474	1530	2
6972	7007	8,624	130.7	134.7	162.6	6375	6246	7,833	1.01	.98	1.00	1515	1440	1495	3
6477	6509	7,999	126.8	130.9	157.8	5890	5766	7,219	1.02	.99	1.01	1468	1393	1446	4
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5482	5504	6,759	118.6	122.0	147.1	5030	4933	6,166	1.04	1.02	1.03	1395	1331	1379	6
4972	4982	6,091	116.4	119.4	143.4	4490	4394	5,468	1.05	1.03	1.05	1346	1284	1331	7
4564	4596	5,609	108.2	111.6	133.8	4105	4037	5,017	1.06	1.03	1.05	1318	1257	1303	8
4068	4088	4,979	103.9	106.8	127.9	3750	3684	4,564	1.11	1.09	1.11	1280	1224	1265	9
5804	5862	10,227	98.8	102.8	170.1	5390	5287	9,724	1.02	0.99	1.04	1584	1494	1662	10
5693	5739	9,980	98.9	102.5	169.3	5150	5047	9,245	1.00	.97	1.03	1546	1461	1622	11
5642	5681	9,913	98.7	102.3	169.4	5125	5012	9,221	1.00	.97	1.02	1536	1449	1611	12
5420	5458	9,518	97.5	101.2	167.3	4825	4719	8,676	.98	.95	1.01	1492	1407	1565	13
5192	5228	9,086	95.9	99.4	164.0	4530	4435	8,118	.97	.95	1.00	1457	1377	1528	14
4842	4876	8,469	93.7	97.0	160.0	4215	4127	7,549	.98	.95	1.01	1418	1340	1487	15
4444	4466	7,773	90.6	93.6	154.7	3900	3811	6,986	.99	.96	1.01	1379	1303	1447	16
3918	4020	10,684	65.8	70.4	170.8	3630	3569	10,404	1.01	0.96	1.06	1554	1428	1717	17
3776	3878	10,271	65.4	70.1	169.3	3430	3377	9,806	1.00	.96	1.05	1509	1386	1667	18
3617	3711	9,849	64.4	68.9	167.0	3285	3231	9,403	1.00	.96	1.05	1464	1345	1618	19
3429	3518	9,337	63.4	67.8	164.3	3045	2995	8,714	.98	.94	1.03	1427	1311	1577	20
3225	3309	8,759	62.1	66.5	160.6	2865	2817	8,178	.99	.95	1.04	1387	1274	1533	21
5359	5520	11,468	81.8	86.9	170.7	4480	4471	9,835	1.21	1.17	1.24	1588	1491	1672	22
5192	5322	11,085	81.8	86.5	170.2	4280	4256	9,385	1.21	1.17	1.24	1537	1446	1622	23
4997	5142	10,694	80.6	85.6	168.2	3985	3973	8,750	1.18	1.15	1.22	1505	1413	1585	24
4751	4894	10,167	78.9	83.8	164.5	3720	3713	8,168	1.18	1.14	1.21	1452	1363	1529	25
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4166	4291	8,894	74.4	79.1	155.0	3170	3164	6,937	1.20	1.16	1.23	1364	1281	1434	27
4383	4475	9,274	78.8	80.5	157.5	3280	3349	7,351	1.16	1.16	1.23	1294	1294	1451	28
3721	3807	7,803	73.2	74.8	145.1	2625	2688	5,823	1.17	1.17	1.24	1211	1213	1355	29
2640	2756	11,590	41.5	46.7	171.2	2655	2575	12,402	1.07	0.99	1.14	1664	1436	1884	30
2545	2652	11,173	41.4	46.5	170.9	2545	2462	11,888	1.06	.98	1.13	1629	1405	1844	31
2490	2590	10,886	41.3	46.3	169.7	2390	2306	11,109	1.02	.95	1.09	1578	1358	1783	32
2394	2490	10,445	41.2	46.1	169.0	2275	2199	10,563	1.03	.96	1.09	1525	1317	1726	33
2255	2345	9,879	40.3	45.1	165.9	2110	2035	9,827	1.00	.93	1.06	1483	1276	1676	34
2116	2209	9,137	39.8	44.6	161.3	1960	1907	9,020	1.05	.98	1.12	1432	1244	1627	35
1956	2034	8,499	38.4	43.1	157.1	1803	1739	8,321	1.02	.95	1.09	1393	1198	1571	36
1670	1737	7,211	35.0	39.3	142.6	1486	1432	6,801	1.01	.94	1.08	1317	1131	1480	37
3710	3840	12,540	53.3	57.7	170.3	3170	3144	11,347	1.19	1.14	1.26	1622	1490	1818	38
3582	3725	12,129	53.2	57.7	170.0	3045	3035	10,920	1.20	1.15	1.28	1578	1449	1769	39
3453	3598	11,709	52.7	57.4	168.9	2875	2871	10,326	1.19	1.14	1.26	1526	1401	1711	40
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3208	3343	10,843	51.7	56.3	165.1	2525	2522	9,038	1.16	1.11	1.23	1430	1313	1603	42
3008	3134	10,185	50.7	55.1	162.1	2350	2347	8,428	1.18	1.13	1.24	1393	1279	1562	43
2968	3072	9,875	50.9	54.4	158.6	2260	2266	8,031	1.16	1.13	1.24	1338	1255	1527	44
2715	2818	9,090	48.7	52.3	152.7	2010	2018	7,188	1.15	1.12	1.23	1288	1205	1470	45
2497	2602	8,335	46.8	50.3	146.3	1810	1827	6,452	1.17	1.13	1.25	1244	1167	1419	46
5652	5889	13,361	76.5	79.6	172.0	4255	4443	10,581	1.26	1.27	1.33	1580	1588	1749	47
5617	5842	13,295	76.0	78.9	171.1	4030	4200	10,036	1.20	1.20	1.27	1536	1544	1700	48
5406	5622	12,655	76.5	79.1	170.0	3865	4039	9,528	1.24	1.25	1.31	1485	1500	1647	49
5161	5388	12,299	74.6	77.7	168.7	3580	3145	8,984	1.22	1.22	1.28	1440	1447	1597	50
4979	5198	11,850	73.5	76.6	166.1	3360	3515	8,420	1.20	1.21	1.27	1395	1402	1547	51
4832	5035	11,312	72.8	75.5	161.9	3140	3289	7,739	1.19	1.19	1.25	1352	1366	1499	52
4503	4701	10,542	69.7	72.7	155.5	2865	2997	7,042	1.20	1.20	1.26	1312	1317	1447	53
3820	3996	8,950	64.3	67.1	143.5	2285	2395	5,621	1.22	1.22	1.28	1210	1216	1335	54
4323	4513	10,155	58.8	70.4	151.1	3375	3072	7,247	1.48	1.29	1.35	1731	1317	1447	55
3989	4141	9,346	57.3	67.4	145.2	3035	2777	6,574	1.49	1.31	1.38	1651	1283	1412	56
3732	3896	8,707	55.9	66.5	142.1	2755	2523	5,905	1.53	1.35	1.41	1588	1222	1340	57
3381	3523	7,949	53.5	63.5	136.5	2500	2289	5,417	1.62	1.42	1.49	1540	1190	1308	58
3504	3637	8,175	53.7	63.3	135.7	2480	2267	5,340	1.49	1.31	1.38	1525	1183	1299	59
3045	3179	7,134	50.1	59.9	128.3	2190	1998	4,698	1.67	1.46	1.53	1495	1142	1253	60
2754	2864	6,376	48.0	57.1	121.6	1895	1720	4,007	1.75	1.53	1.60	1425	1086	1189	61
1687	1810	12,060	25.3	29.1	169.4	1725	1730	13,183	1.14	1.06	1.22	1695	1480	1937	62
1666	1776	11,830	25.3	28.8	167.9	1630	1626	12,398	1.09	1.02	1.17	1661	1454	1905	63
1578	1676	11,243	24.9	28.3	165.1	1535	1522	11,692	1.07	1.00	1.15	1609	1402	1839	64
1514	1625	10,860	24.2	27.8	162.6	1400	1402	10,724	1.03	.96	1.10	1565	1364	1786	65
1443	1538	10,316	23.7	27.0	158.3	1310	1305	10,030	1.01	.94	1.08	1507	1316	1729	66
1277	1361	9,160	23.0	26.3	154.6	1195	1190	9,160	1.04	.97	1.11	1453	1266	1661	67
1159	1244	8,457	21.7	25.0	148.1	1060	1059	8,268	.98	.92	1.05	1403	1217	1604	68
1025	1093	7,428	20.9	23.9	141.8	970	963	7,515	1.03	.96	1.10	1351	1172	1544	69
2450	2629	13,328	33.7	37.3	171.8	2285	2380	13,274	1.31	1.27	1.40	1700	1602	1940	70
2390	2548	12,968	33.6	37.0	170.8	2120	2188	12,274	1.25	1.21	1.34	1658	1555	1887	71
2379	2536	12,908	33.6	36.9	170.8	2110	2183	12,241	1.26	1.22	1.34	1645	1550	1880	72
2315	2459	12,529	33.6	36.8	170.2	2000	2062	11,571	1.24	1.20	1.32	1602	1510	1831	73
2245	2393	12,181	33.2	36.5	168.6	1860	1925	10,787	1.20	1.16	1.28	1550	1461	1772	74
2115	2261	11,535	32.5	35.7	165.6	1725	1791	10,057	1.20	1.16	1.28	1497	1411	1711	75
2015	2140	10,905	32.0	35.0	161.9	1610	1660	9,314	1.19	1.16	1.27	1450	1366	1657	76
972	1112	12,101	14.2	17.4	165.3	993	1059	13,222	1.10	1.03	1.18	1686	1466	1927	77
868	999	10,867	13.6	16.8	159.7	910	976	12,169	1.14	1.06	1.22	1667	1446	1902	78
895	1043	11,277	13.6	17.0	160.8	901	979	12,121	1.11	1.03	1.18	1649	1434	1882	79
811	945	10,275	13.3	16.6	157.6	833	904	11,276	1.12	1.05	1.20	1614	1400	1842	80
1727	2012	14,275	22.4	26.3	172.9	1512	1750	13,383	1.30	1.29	1.39	1698	1677	1948	81
1737	1952	13,715	22.9	25.8	168.5	1468	1642	12,413	1.27	1.26	1.36	1672	1655	1918	82
1653	1858	13,350	22.3	25.3	168.3	1397	1559	12,082	1.27	1.26	1.36	1624	1600	1863	83
1584	1769	12,601	22.4	25.2	166.5	1295	1435	11,034	1.26	1.26	1.35	1566	1543	1796	84
1538	1689	12,098	21.6	23.9	158.6	1178	1280	9,903	1.18	1.16	1.26	1521	1491	1739	85
1430	1597	11,291	20.9	23.5	153.8	1075	1193	9,096	1.19	1.18	1.27	1437	1419	1651	86
1330	1468	10,423	20.5	22.8	149.8	988	1085	8,307	1.21	1.20	1.30	1403	1389	1615	87
1189	1306	9,318	19.5	21.6	143.1	873	951	7,328	1.24	1.23	1.33	1347	1327	1545	88

TABLE I. - Continued. PERFORMANCE

(d) Exhaust-nozzle

Run number	Altitude, H, ft	Ram pressure ratio, $\frac{P_1}{p_0}$	Flight Mach number, M_0	Tunnel static pressure, p_0, $\frac{lb}{sq\ ft\ abs}$	Equivalent ambient air temperature, t_0, °R	Engine-inlet indicated temperature, T_1, °R	Reynolds number index, $\frac{\delta_T}{\varphi_T\sqrt{\theta_T}}$	Engine speed: N, rpm	Engine speed: Adjusted, $\frac{N}{\sqrt{\theta_a}}$, rpm	Engine speed: Corrected, $\frac{N}{\sqrt{\theta_T}}$, rpm	Engine total-pressure ratio, $\frac{P_4}{P_1}$	Engine total-temperature ratio, $\frac{T_6}{T_1}$	Net thrust: F_n, lb	Net thrust: Adjusted, $\frac{F_n}{\delta_a}$, lb	Net thrust: Corrected, $\frac{F_n}{\delta_T}$, lb
1	6,000	1.010	0.118	1690	523	524	0.803	6215	6065	6185	1.986	2.773	6048	6066	7,500
2		1.015	.147	1687	525	527	.789	6093	5935	6047	1.935	2.713	5714	5743	7,063
3		1.015	.147	1686	524	526	.790	5971	5821	5931	1.879	2.587	5377	5404	6,646
4		1.015	.147	1685	524	526	.790	5849	5702	5810	1.815	2.559	4914	4943	6,079
5		1.017	.155	1690	524	527	.791	5727	5583	5683	1.746	2.520	4520	4534	5,569
6		1.018	.160	1687	521	524	.803	5606	5481	5579	1.673	2.437	4109	4130	5,062
7		1.022	.176	1685	521	524	.812	5484	5362	5458	1.596	2.382	3597	3619	4,421
8		1.024	.184	1683	520	524	.812	5240	5128	5215	1.468	2.263	2837	2857	3,484
9	15,000	1.017	0.155	1183	492	494	0.600	6215	6042	6370	2.068	2.960	4536	4572	7,979
10		1.017	.155	1186	492	494	.600	6093	5924	6245	2.032	2.866	4385	4411	7,696
11		-----	-----	1185	---	493	-----	5971	----	6126	-----	2.807	----	----	------
12		1.019	.164	1186	491	494	.600	5849	5692	5995	1.929	2.717	3943	3967	6,908
13		1.022	.176	1186	492	495	.601	5727	5568	5864	1.866	2.642	3635	3657	6,347
14		1.023	.180	1188	492	495	.603	5606	5450	5741	1.784	2.578	3335	3348	5,810
15	25,000	1.010	0.118	765	468	469	0.417	6215	5957	6538	2.175	3.158	3226	3310	8,830
16		1.018	.160	765	467	469	.420	6093	5847	6410	2.119	3.047	3099	3180	8,417
17		1.012	.130	765	467	469	.417	5971	5730	6281	2.099	2.953	2986	3064	8,164
18		1.018	.160	766	467	469	.420	5848	5613	6153	2.027	2.870	2878	2950	7,808
19		1.021	.173	765	466	469	.421	5727	5501	6025	1.967	2.793	2658	2727	7,201
20		1.022	.176	767	466	469	.422	5606	5385	5898	1.906	2.716	2479	2536	6,691
21		1.298	.622	763	458	493	.495	6215	6022	6377	2.054	2.968	3114	3204	6,655
22		1.306	.630	759	458	494	.494	6093	5904	6245	2.021	2.866	2967	3068	6,335
23		1.312	.636	760	456	493	.495	6093	5917	6251	2.008	2.870	2943	3040	6,245
24		1.297	.621	762	458	493	.495	5971	5786	6126	1.961	2.789	2845	2930	6,094
25		1.301	.625	762	457	493	.495	5848	5674	6001	1.897	2.710	2655	2735	5,668
26		1.299	.623	762	458	494	.494	5727	5549	5870	1.826	2.619	2418	2491	5,167
27		1.313	.636	761	457	494	.495	5606	5438	5746	1.745	2.547	2158	2227	4,571
28		1.302	.626	769	428	462	.551	5484	5495	5813	1.801	2.584	2330	2379	4,926
29		1.312	.636	769	427	462	.553	5240	5256	5554	1.607	2.400	1804	1842	3,783
30	35,000	1.019	0.164	479	455	458	0.271	6215	5781	6613	2.234	3.367	2103	2187	9,119
31		1.015	.147	478	456	458	.271	6093	5663	6483	2.192	3.253	2018	2103	8,805
32		1.015	.147	479	456	458	.271	5971	5550	6353	2.142	3.142	1959	2037	8,529
33		1.017	.155	479	456	458	.271	5849	5438	6223	2.125	3.037	1847	1921	8,025
34		1.015	.147	479	456	458	.271	5727	5323	6094	2.062	2.959	1768	1839	7,698
35		1.015	.147	479	457	459	.271	5606	5205	5959	1.998	2.887	1656	1722	7,210
36		1.017	.155	479	459	461	.268	5484	5081	5819	1.897	2.792	1529	1590	6,644
37		1.029	.203	479	456	460	.272	5240	4871	5565	1.700	2.609	1219	1268	5,232
38		1.303	.627	479	429	463	.342	6215	5956	6582	2.202	3.240	2241	2331	7,599
39		1.308	.632	478	428	462	.341	6093	5846	6459	2.152	3.149	2137	2227	7,236
40		1.310	.634	478	428	462	.341	5971	5729	6329	2.102	3.039	2047	2133	6,919
41		1.319	.642	479	427	462	.345	5849	5619	6200	2.006	2.933	1961	2039	6,565
42		1.303	.627	482	428	462	.344	5727	5495	6071	1.976	2.846	1815	1875	6,115
43		1.311	.634	479	428	462	.344	5606	5379	5942	1.912	2.762	1648	1714	5,552
44		1.315	.638	480	422	456	.357	5484	5299	5851	1.846	2.686	1578	1638	5,291
45		1.322	.645	481	420	455	.357	5240	5075	5596	1.660	2.514	1309	1355	4,355
46		1.883	.996	477	391	469	.483	6215	6240	6538	2.110	3.115	2952	3082	6,955
47		1.866	.988	477	392	469	.480	6093	6105	6410	2.061	3.006	2783	2905	6,618
48		1.864	.987	479	392	468	.482	5971	5982	6287	2.016	2.908	2641	2747	6,259
49		1.885	.997	477	390	468	.484	5849	5878	6159	1.952	2.827	2549	2661	6,000
50		1.872	.991	478	392	469	.482	5727	5738	6025	1.906	2.733	2349	2448	5,553
51		1.889	.999	478	391	469	.490	5606	5628	5898	1.832	2.655	2155	2246	5,049
52		1.903	1.005	475	389	468	0.492	5484	5517	5775	1.750	2.558	2004	2100	4,691
53		1.903	1.005	475	390	469	.492	5240	5266	5512	1.561	2.377	1503	1575	3,519
54		1.874	.992	477	520	622	.336	6215	5410	5677	1.702	2.568	1849	1930	4,377
55	45,000	1.014	0.141	288	454	456	0.160	6215	5782	6631	2.370	3.559	1387	1483	10,052
56		1.021	.173	288	453	456	.160	6093	5675	6501	2.327	3.458	1332	1424	9,586
57		1.017	.155	289	454	456	.160	5971	5555	6371	2.272	3.357	1291	1376	9,291
58		1.024	.184	288	454	457	.160	5849	5442	6235	2.197	3.247	1224	1308	8,780
59		1.021	.174	290	453	456	.160	5727	5334	6111	2.132	3.134	1146	1217	8,193
60		1.024	.184	291	454	457	.160	5606	5216	5976	2.034	3.028	1026	1086	7,286
61		1.021	.173	289	454	457	.161	5484	5102	5846	1.949	2.930	953	1016	6,836
62		1.021	.173	288	455	458	.159	5362	4983	5705	1.867	2.852	879	940	6,326
63		1.359	.677	290	416	454	.222	6215	6041	6644	2.272	3.454	1502	1595	8,067
64		1.360	.678	289	415	453	.222	6093	5929	6526	2.206	3.340	1436	1531	7,731
65		1.362	.680	290	415	453	.222	5971	5810	6395	2.152	3.230	1389	1475	7,441
66		1.362	.680	290	415	453	.222	5849	5692	6264	2.099	3.137	1322	1404	7,082
67		1.348	.668	290	416	453	.220	5727	5567	6134	2.033	3.020	1199	1273	6,489
68		1.347	.667	291	416	453	.221	5606	5449	6004	1.987	2.934	1127	1192	6,084
69	55,000	1.006	0.092	168	453	454	0.095	6093	5675	6513	2.473	3.711	873	993	10,930
70		1.024	.184	167	450	453	.095	5971	5580	6395	2.351	3.636	804	920	9,945
71		1.024	.184	168	451	454	.095	5849	5460	6253	2.291	3.513	760	864	9,348
72		1.552	.819	172	400	454	.152	6215	6160	6644	2.322	3.581	1111	1233	8,805
73		1.559	.823	170	399	453	.151	6093	6047	6526	2.291	3.470	1056	1187	8,432
74		1.540	.811	174	400	453	.153	5971	5918	6395	2.231	3.355	1027	1128	8,109
75		1.561	.824	173	399	453	.153	5849	5805	6264	2.170	3.245	945	1043	7,406
76		1.541	.812	172	400	453	.152	5727	5677	6134	2.102	3.148	916	1017	7,314
77		1.555	.820	173	399	453	.155	5606	5564	6004	1.996	3.093	866	956	6,812

DATA FOR YJ71-A-7 TURBOJET ENGINE

area, 3.18 square feet

Jet thrust			Air flow			Fuel flow			Specific fuel consumption			Exhaust-gas total temperature			Run number
F_j, lb	Adjusted, $\frac{F_j}{\delta_a}$, lb	Corrected, $\frac{F_j}{\delta_T}$, lb	W_a, $\frac{lb}{sec}$	Adjusted, $\frac{W_a\sqrt{\theta_a}}{\delta_a}$, $\frac{lb}{sec}$	Corrected, $\frac{W_a\sqrt{\theta_T}}{\delta_T}$, $\frac{lb}{sec}$	W_f, $\frac{lb}{hr}$	Adjusted, $\frac{W_f}{\delta_a\sqrt{\theta_a}}$, $\frac{lb}{hr}$	Corrected, $\frac{W_f}{\delta_T\sqrt{\theta_T}}$, $\frac{lb}{hr}$	$\frac{W_f}{F_n}$, $\frac{lb/hr}{lb\ thrust}$	Adjusted, $\frac{W_f}{F_n\sqrt{\theta_a}}$, $\frac{lb/hr}{lb\ thrust}$	Corrected, $\frac{W_f}{F_n\sqrt{\theta_T}}$, $\frac{lb/hr}{lb\ thrust}$	T_6, °R	Adjusted, $\frac{T_6}{\theta_a}$, °R	Corrected, $\frac{T_6}{\theta_T}$, °R	
6607	6627	8,193	135.5	139.3	168.9	6250	6117	7,713	1.03	1.01	1.03	1453	1384	1439	1
6399	6431	7,909	133.8	138.0	166.5	5975	5849	7,329	1.05	1.02	1.04	1430	1356	1408	2
6045	6075	7,472	130.8	134.8	162.6	5585	5472	6,857	1.04	1.01	1.03	1361	1293	1343	3
5563	5596	6,881	127.0	131.1	158.0	5195	5095	6,383	1.06	1.03	1.05	1346	1279	1328	4
5185	5201	6,388	123.1	126.7	152.8	4815	4708	5,886	1.06	1.04	1.06	1328	1262	1308	5
4772	4796	5,879	119.4	122.7	147.8	4340	4264	5,321	1.06	1.03	1.05	1277	1221	1265	6
4297	4323	5,281	114.4	117.8	141.3	3960	3895	4,843	1.10	1.08	1.10	1248	1193	1236	7
3503	3528	4,302	104.0	107.0	128.3	3280	3232	4,008	1.16	1.13	1.15	1186	1136	1175	8
5055	5095	8,892	99.1	102.8	170.1	4770	4674	8,600	1.05	1.02	1.08	1462	1382	1537	9
4903	4932	8,605	98.8	102.3	169.2	4530	4430	8,148	1.03	1.00	1.06	1416	1338	1488	10
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4476	4503	7,842	96.1	99.4	164.2	4520	4424	8,117	1.15	1.11	1.17	1342	1271	1410	12
4193	4218	7,321	93.8	97.1	159.9	3715	3634	6,642	1.02	.99	1.05	1308	1236	1372	13
3888	3904	6,773	90.9	93.9	154.6	3445	3362	6,146	1.03	1.00	1.06	1276	1206	1339	14
3482	3573	9,530	65.7	70.3	171.1	3375	3319	9,719	1.05	1.00	1.10	1481	1361	1639	15
3446	3536	9,359	65.9	70.5	170.2	3180	3131	9,085	1.03	.98	1.08	1429	1316	1582	16
3267	3352	8,932	65.5	70.0	170.2	3000	2954	8,629	1.00	.96	1.06	1385	1275	1533	17
3220	3301	8,736	65.0	69.4	167.6	2845	2798	8,120	.99	.95	1.04	1346	1239	1490	18
3022	3101	8,187	64.0	68.3	164.7	2655	2616	7,566	1.00	.96	1.05	1310	1209	1450	19
2841	2906	7,668	62.5	66.6	160.4	2490	2447	7,069	1.00	.96	1.06	1274	1176	1410	20
4776	4915	10,206	81.9	87.0	170.7	3960	3948	8,683	1.27	1.23	1.30	1463	1374	1541	21
4637	4795	9,900	81.3	86.7	169.3	3745	3752	8,196	1.26	1.22	1.29	1416	1329	1488	22
4633	4786	9,831	81.7	86.9	169.0	3735	3747	8,132	1.27	1.23	1.30	1415	1334	1490	23
4471	4605	9,577	80.3	85.3	167.7	3490	3483	7,671	1.23	1.19	1.26	1375	1291	1448	24
4264	4392	9,104	79.0	83.9	164.4	3260	3257	7,142	1.23	1.19	1.26	1336	1257	1407	25
3980	4099	8,505	76.9	81.7	160.2	3025	3019	6,627	1.25	1.21	1.28	1294	1215	1360	26
3713	3832	7,864	75.0	79.8	155.0	2810	2813	6,100	1.30	1.26	1.33	1258	1184	1322	27
3899	3981	8,242	79.5	81.0	158.6	2830	2896	6,342	1.21	1.22	1.29	1194	1200	1342	28
3281	3350	6,880	73.8	75.1	146.0	2300	2355	5,112	1.27	1.28	1.35	1109	1117	1247	29
2327	2420	10,090	41.9	46.9	170.8	2350	2273	10,840	1.12	1.04	1.19	1542	1334	1746	30
2216	2309	9,668	41.5	46.6	170.2	2210	2140	10,257	1.09	1.02	1.16	1490	1287	1687	31
2156	2242	9,387	41.4	46.3	169.2	2090	2021	9,683	1.07	.99	1.13	1439	1243	1629	32
2055	2137	8,929	41.2	46.1	168.2	1970	1905	9,107	1.07	.99	1.13	1391	1202	1575	33
1961	2039	8,538	40.5	45.3	165.5	1840	1778	8,525	1.04	.97	1.11	1355	1171	1534	34
1846	1920	8,037	39.8	44.6	163.0	1735	1675	8,029	1.05	.97	1.11	1325	1142	1497	35
1723	1792	7,486	38.4	43.1	157.2	1574	1516	7,256	1.03	.95	1.09	1287	1105	1449	36
1452	1510	6,232	35.3	39.6	142.8	1277	1234	5,820	1.05	.97	1.11	1200	1037	1354	37
3297	3429	11,180	53.4	58.0	171.0	2845	2835	10,217	1.27	1.22	1.34	1500	1378	1682	38
3197	3331	10,825	53.2	57.8	170.1	2665	2664	9,565	1.25	1.20	1.32	1455	1339	1635	39
3113	3244	10,522	53.4	57.9	170.2	2515	2514	9,011	1.23	1.18	1.30	1404	1292	1578	40
3028	3149	10,138	52.8	57.2	166.9	2330	2328	8,270	1.19	1.14	1.26	1355	1250	1523	41
2844	2938	9,581	52.1	56.0	165.5	2195	2175	7,840	1.21	1.16	1.28	1315	1211	1478	42
2674	2781	9,009	51.3	55.6	163.2	2055	2051	7,338	1.25	1.20	1.32	1276	1175	1434	43
2587	2685	8,674	50.5	54.2	158.7	1925	1931	6,887	1.22	1.18	1.30	1225	1144	1394	44
2262	2341	7,526	47.3	50.6	147.5	1575	1579	5,596	1.20	1.16	1.28	1144	1073	1305	45
5255	5486	12,381	76.8	79.8	171.9	3780	3962	9,370	1.28	1.28	1.35	1461	1473	1617	46
5042	5264	11,990	75.8	79.0	171.3	3525	3687	8,818	1.27	1.27	1.33	1410	1417	1561	47
4895	5091	11,601	75.7	78.6	170.4	3320	3460	8,286	1.26	1.26	1.32	1361	1368	1509	48
4812	5024	11,327	75.4	78.4	168.6	3120	3274	7,733	1.22	1.23	1.29	1323	1336	1467	49
4558	4749	10,775	73.9	76.8	166.0	2920	3049	7,262	1.24	1.24	1.31	1282	1288	1419	50
4344	4526	10,178	72.7	75.5	162.0	2710	2835	6,680	1.26	1.26	1.32	1245	1255	1378	51
4133	4331	9,675	70.5	73.4	156.7	2500	2637	6,164	1.25	1.25	1.31	1197	1213	1327	52
3470	3637	8,123	65.0	67.8	144.7	2010	2117	4,951	1.34	1.34	1.41	1115	1126	1234	53
3862	4032	9,141	58.4	70.1	151.5	2945	2677	6,367	1.59	1.39	1.45	1597	1210	1333	54
1503	1607	10,892	25.3	29.0	171.7	1582	1574	12,233	1.14	1.06	1.22	1623	1405	1847	55
1474	1576	10,608	25.3	29.1	170.7	1502	1496	11,537	1.13	1.05	1.20	1577	1368	1795	56
1417	1511	10,198	25.1	28.8	169.5	1404	1392	10,781	1.09	1.01	1.16	1531	1325	1742	57
1373	1468	9,849	25.0	28.7	168.0	1316	1308	10,064	1.07	1.00	1.15	1484	1285	1686	58
1284	1364	9,179	24.5	28.0	164.3	1225	1212	9,344	1.07	1.00	1.14	1429	1240	1626	59
1169	1237	8,301	24.0	27.2	159.7	1134	1116	8,585	1.10	1.03	1.18	1384	1198	1572	60
1081	1152	7,754	22.8	26.1	153.4	1028	1019	7,862	1.08	1.00	1.15	1339	1159	1521	61
1002	1071	7,211	21.9	25.2	148.0	941	935	7,204	1.07	1.00	1.14	1306	1128	1478	62
2221	2359	11,929	39.1	37.3	171.5	1960	2023	11,252	1.30	1.27	1.39	1568	1481	1792	63
2147	2289	11,559	33.8	37.0	169.9	1830	1899	10,553	1.27	1.24	1.36	1513	1433	1735	64
2103	2233	11,266	33.8	36.9	169.4	1725	1783	9,694	1.24	1.21	1.33	1463	1385	1678	65
2030	2156	10,875	33.5	36.6	167.9	1630	1684	9,353	1.23	1.20	1.32	1421	1346	1630	66
1879	1995	10,169	32.8	35.8	165.7	1510	1559	8,751	1.26	1.22	1.35	1368	1292	1569	67
1792	1896	9,673	32.1	34.9	161.8	1378	1417	7,967	1.22	1.19	1.31	1329	1256	1524	68
918	1044	11,493	14.9	18.2	174.4	1018	1078	13,622	1.17	1.09	1.25	1685	1462	1926	69
890	1018	11,009	14.4	17.7	166.9	941	1006	12,469	1.17	1.09	1.25	1647	1438	1889	70
845	961	10,394	14.3	17.4	164.7	879	933	11,562	1.16	1.08	1.24	1595	1390	1823	71
1684	1869	13,346	23.0	25.7	170.4	1433	1576	12,141	1.29	1.28	1.38	1626	1598	1859	72
1624	1825	12,968	22.7	25.7	169.1	1354	1511	11,578	1.28	1.27	1.37	1572	1548	1803	73
1597	1754	12,610	23.1	25.5	170.1	1281	1394	10,833	1.25	1.24	1.34	1520	1493	1743	74
1518	1676	11,897	22.9	25.4	167.4	1205	1320	10,118	1.25	1.24	1.34	1470	1448	1686	75
1461	1622	11,666	22.0	24.7	164.5	1104	1214	9,438	1.20	1.19	1.29	1426	1401	1636	76
1408	1554	11,075	21.7	24.2	159.5	1022	1119	8,613	1.18	1.17	1.26	1404	1380	1607	77

TABLE I. - Concluded. PERFORMANCE

(e) Exhaust-nozzle

Run number	Altitude, H, ft	Ram pressure ratio, $\frac{P_1}{p_0}$	Flight Mach number, M_0	Tunnel static pressure, p_0, $\frac{lb}{sq\ ft\ abs}$	Equivalent ambient air temperature, t_0, °R	Engine-inlet indicated temperature, T_1, °R	Reynolds number index, $\frac{\delta_T}{\varphi_T\sqrt{\theta_T}}$	Engine speed: N, rpm	Engine speed: Adjusted, $\frac{N}{\sqrt{\theta_a}}$, rpm	Engine speed: Corrected, $\frac{N}{\sqrt{\theta_T}}$, rpm	Engine total-pressure ratio, $\frac{P_4}{P_1}$	Engine total-temperature ratio, $\frac{T_6}{T_1}$	Net thrust: F_n, lb	Net thrust: Adjusted, $\frac{F_n}{\delta_a}$, lb	Net thrust: Corrected, $\frac{F_n}{\delta_T}$, lb
1	6,000	1.015	0.147	1680	520	522	0.801	6215	6082	6197	1.759	2.582	4343	4382	5390
2		1.017	.155	1685	524	527	.789	6093	5940	6047	1.714	2.480	4046	4070	4997
3		1.016	.152	1690	525	527	.790	5971	5816	5926	1.665	2.429	3752	3763	4622
4		1.016	.152	1690	526	528	.789	5849	5691	5799	1.610	2.379	3486	3496	4295
5		1.018	.160	1687	524	527	.790	5727	5583	5683	1.553	2.321	3119	3135	3843
6		1.018	.160	1686	524	527	.790	5727	5583	5683	1.538	2.313	3067	3082	3779
7		1.024	.184	1686	519	523	.818	5606	5491	5585	1.488	2.254	2656	2669	3254
8		1.019	.164	1690	520	523	.816	5484	5367	5463	1.426	2.197	2478	2485	3045
9		1.026	.192	1690	519	523	.821	5240	5133	5220	1.308	2.078	1845	1851	2251
10	15,000	1.023	0.180	1190	493	496	0.604	6215	6036	6358	1.833	2.760	----	----	----
11		1.024	.184	1188	485	488	.618	6093	5966	6288	1.803	2.695	----	----	----
12		1.022	.176	1186	485	488	.617	5971	5847	6162	1.762	2.611	3046	3064	5318
13		1.024	.184	1185	490	493	.608	5971	5817	6126	1.745	2.588	2993	3014	5220
14		1.023	.180	1188	492	495	.603	5848	5686	5989	1.702	2.521	2810	2821	4895
15		1.022	.176	1189	486	489	.612	5727	5602	5899	1.669	2.483	2673	2681	4656
16		1.024	.184	1186	485	488	.611	5606	5489	5785	1.611	2.400	2387	2401	4158
17	25,000	1.018	0.160	768	455	457	0.437	6215	6042	6625	1.917	3.004	2378	2430	6435
18		1.021	.173	766	457	460	.431	6093	5910	6471	1.862	2.863	2231	2287	6037
19		1.021	.173	767	456	459	.432	5971	5798	6347	1.833	2.786	2146	2195	5798
20		1.023	.180	767	456	459	.436	5727	5561	6088	1.740	2.617	1916	1960	5166
21		1.259	.584	765	444	474	.510	6215	6116	6501	1.844	2.863	2312	2372	5079
22		1.261	.586	767	444	474	.512	6093	5996	6373	1.810	2.753	2196	2247	4805
23		1.264	.589	765	441	472	.514	5971	5896	6264	1.766	2.667	2035	2088	4453
24		1.267	.592	764	441	472	.515	5849	5776	6136	1.717	2.593	1932	1984	4223
25		1.264	.589	766	442	473	.514	5727	5649	5996	1.675	2.510	1718	1761	3756
26		1.264	.589	764	441	472	.513	5606	5536	5881	1.622	2.445	1557	1599	3410
27		1.313	.636	769	426	460	.557	5484	5506	5824	1.573	2.391	1523	1555	3191
28		1.306	.630	769	427	461	.554	5240	5256	5560	1.435	2.223	1032	1054	2175
29	35,000	1.017	0.155	481	457	459	0.271	6215	5772	6607	1.959	3.094	1601	1657	6928
30		1.017	.155	477	457	459	.269	6093	5659	6477	1.940	3.002	1492	1558	6510
31		1.019	.164	479	456	459	.270	5971	5547	6347	1.885	2.889	1432	1489	6209
32		1.015	.147	477	457	459	.269	5849	5431	217	1.860	2.806	1357	1417	5933
33		1.010	.118	479	458	459	.269	5727	5314	6088	1.812	2.717	1319	1372	5767
34		1.017	.155	477	456	458	.270	5606	5212	5965	1.748	2.644	1158	1209	5052
35		1.023	.180	479	456	459	.270	5484	5097	5829	1.659	2.553	1061	1103	4581
36		1.029	.203	477	456	460	.270	5240	4871	5565	1.519	2.409	829	865	3573
37		1.307	.631	479	425	459	.340	6215	5984	6607	1.933	3.020	1649	1715	5574
38		1.307	.631	479	425	459	.340	6093	5867	6477	1.883	2.915	1551	1613	5242
39		1.306	.630	477	425	459	.339	5971	5749	6347	1.849	2.813	1439	1502	4887
40		1.306	.630	477	425	459	.339	5849	5632	6217	1.796	2.728	1382	1443	4693
41		1.307	.631	479	425	459	.340	5727	5515	6088	1.756	2.636	1229	1278	4154
42		1.324	.647	479	425	461	.345	5606	5398	5948	1.667	2.544	1139	1185	3802
43		1.323	.645	477	421	456	.357	5484	5305	5851	1.624	2.478	1021	1066	3423
44		1.328	.650	479	421	457	.361	5362	5187	5716	1.536	2.381	895	931	2978
45		1.881	.995	477	395	473	.478	6215	6207	6507	1.858	2.873	2314	2416	5459
46		1.881	.995	478	395	473	.479	6093	6085	6379	1.820	2.778	2158	2249	5080
47		1.873	.992	479	394	472	.478	5971	5971	6264	1.776	2.689	2043	2125	4819
48		1.893	1.000	477	392	471	.483	5849	5861	6141	1.742	2.603	1958	2044	4588
49		1.871	.991	479	391	468	.482	5727	5750	6031	1.684	2.534	1759	1829	4155
50		1.881	.995	479	390	467	.490	5606	5634	5909	1.633	2.467	1631	1696	3831
51		1.918	1.012	475	388	468	.495	5484	5522	5775	1.562	2.400	1449	1519	3366
52		1.872	.991	478	391	468	.479	5240	5261	5518	1.385	2.233	955	995	2258
53		1.893	1.000	477	517	621	.341	6215	5426	5682	1.505	2.386	1300	1357	3046
54		1.893	1.000	477	524	629	.335	6093	5283	5535	1.396	2.264	1018	1063	2385
55		1.906	1.006	477	517	622	.341	5971	5213	5455	1.331	2.201	891	930	2074
56		1.891	1.000	479	517	620	.342	5849	5106	5351	1.257	2.110	607	631	1418
57		1.918	1.012	477	521	628	.340	5727	4980	5206	1.156	1.997	362	378	837
58		1.900	1.004	478	526	632	.335	5606	4851	5080	1.067	1.910	119	124	277
59	45,000	1.017	0.155	289	455	457	0.160	6215	5776	6625	2.037	3.230	1009	1076	7262
60		1.021	.173	289	454	457	.161	6093	5669	6495	1.990	3.138	973	1037	6979
61		1.021	.173	289	455	458	.160	5971	5549	6353	1.942	3.028	914	974	6556
62		1.017	.155	289	456	458	.159	5849	5430	6223	1.901	2.945	888	947	6391
63		1.024	.184	288	---	---	-----	5849	----	----	1.895	-----	----	----	----
64		1.021	.173	288	456	459	.160	5727	5316	6088	1.837	2.841	795	850	5722
65		1.021	.173	291	455	458	.168	5606	5210	5965	1.771	2.766	740	783	5273
66		1.045	.252	288	454	460	.170	5484	5102	5824	1.661	2.678	668	714	4696
67		1.351	.670	291	415	452	.222	6215	6048	6662	1.992	3.212	1143	1209	6154
68		1.359	.677	290	414	452	.222	6093	5936	6532	1.949	3.104	1093	1161	5871
69		1.354	.673	291	414	452	.222	5971	5818	6401	1.891	2.993	1033	1093	5548
70		1.357	.675	291	414	452	.222	5849	5699	6270	1.843	2.894	966	1022	5175
71		1.352	.671	293	415	452	.223	5727	5573	6139	1.795	2.805	905	951	4835
72		1.345	.665	296	415	452	.224	5606	5455	6010	1.706	2.706	822	856	4371
73	55,000	1.012	0.130	170	453	455	0.095	6215	5789	6638	2.145	3.451	619	696	7614
74		1.012	.130	173	453	455	.095	6093	5675	6507	2.086	3.365	664	733	8028
75		1.556	.821	171	398	452	.152	6215	6176	6662	2.034	3.347	882	985	7016
76		1.547	.815	172	400	453	.152	6093	6039	6526	1.985	3.221	838	930	6666
77		1.549	.816	175	401	454	.154	5971	5911	6383	1.926	3.104	800	873	6246
78		1.555	.820	173	398	452	.153	5849	5812	6270	1.914	3.000	711	785	5593
79		1.546	.815	174	399	452	.153	5727	5684	6139	1.833	2.905	668	733	5254
80		1.560	.823	175	399	453	.156	5606	5564	6004	1.777	2.806	633	691	4906
81		1.559	.823	170	398	452	.152	5484	5449	5879	1.679	2.748	559	628	4464

DATA FOR YJ71-A-7 TURBOJET ENGINE

area, 4.13 square feet

Jet thrust			Air flow			Fuel flow			Specific fuel consumption			Exhaust-gas total temperature			Run number
F_j, lb	Adjusted, $\frac{F_j}{\delta_a}$, lb	Corrected, $\frac{F_j}{\delta_T}$, lb	W_a, $\frac{lb}{sec}$	Adjusted, $\frac{W_a\sqrt{\theta_a}}{\delta_a}$, $\frac{lb}{sec}$	Corrected, $\frac{W_a\sqrt{\theta_T}}{\delta_T}$, $\frac{lb}{sec}$	W_f, $\frac{lb}{hr}$	Adjusted, $\frac{W_f}{\delta_a\sqrt{\theta_a}}$, $\frac{lb}{hr}$	Corrected, $\frac{W_f}{\delta_T\sqrt{\theta_T}}$, $\frac{lb}{hr}$	$\frac{W_f}{F_n}$, $\frac{lb/hr}{lb\ thrust}$	Adjusted, $\frac{W_f}{F_n\sqrt{\theta_a}}$, $\frac{lb/hr}{lb\ thrust}$	Corrected, $\frac{W_f}{F_n\sqrt{\theta_T}}$, $\frac{lb/hr}{lb\ thrust}$	T_6, °R	Adjusted, $\frac{T_6}{\theta_a}$, °R	Corrected, $\frac{T_6}{\theta_T}$, °R	
5034	5079	6,247	135.8	140.0	169.0	5570	5500	6,893	1.28	1.26	1.28	1348	1291	1340	1
4769	4798	5,890	133.9	138.2	166.6	5235	5134	6,416	1.29	1.26	1.28	1307	1242	1287	2
4446	4459	5,477	131.0	134.9	162.6	4850	4738	5,930	1.29	1.26	1.28	1280	1214	1261	3
4161	4173	5,126	127.4	131.3	158.2	4480	4372	5,473	1.28	1.25	1.27	1256	1189	1235	4
3805	3824	4,688	123.1	126.9	152.8	4130	4046	5,050	1.32	1.29	1.31	1223	1162	1205	5
3750	3769	4,620	122.7	126.5	152.2	4115	4032	5,031	1.34	1.31	1.33	1219	1159	1201	6
3424	3441	4,194	120.0	123.1	147.6	3795	3736	4,632	1.43	1.40	1.42	1179	1131	1170	7
3134	3143	3,852	114.9	117.8	141.8	3510	3445	4,298	1.42	1.39	1.41	1149	1100	1140	8
2546	2554	3,106	104.9	107.4	128.5	2820	2770	3,427	1.53	1.50	1.52	1087	1043	1079	9
----	----	------	100.2	103.5	170.3	4275	4164	7,605	----	----	----	1369	1291	1433	10
----	----	------	100.5	103.0	169.5	4030	3962	7,237	----	----	----	1315	1261	1400	11
3631	3653	6,340	99.1	101.7	167.7	3785	3728	6,820	1.24	1.22	1.28	1274	1222	1357	12
3605	3630	6,287	98.4	101.6	167.3	3735	3664	6,683	1.25	1.22	1.28	1276	1211	1344	13
3400	3414	5,923	96.8	100.0	164.7	3525	3441	6,289	1.25	1.22	1.28	1248	1179	1309	14
3238	3248	5,641	95.6	98.0	161.6	3330	3267	5,975	1.25	1.22	1.28	1214	1162	1288	15
2962	2980	5,160	93.0	95.5	157.1	3055	3009	5,493	1.28	1.25	1.32	1171	1123	1247	16
2727	2787	7,379	67.2	70.7	170.7	3080	3060	8,884	1.29	1.26	1.38	1373	1298	1560	17
2607	2672	7,055	66.7	70.5	169.9	2855	2838	8,205	1.28	1.24	1.36	1317	1239	1486	18
2521	2579	6,812	66.5	70.1	169.0	2700	2682	7,755	1.26	1.22	1.34	1279	1206	1445	19
2299	2352	6,198	66.2	68.7	165.3	2360	2345	6,764	1.23	1.20	1.31	1201	1133	1357	20
3829	3929	8,412	81.0	84.4	170.0	3580	3615	8,228	1.55	1.52	1.62	1357	1314	1485	21
3717	3802	8,133	80.9	84.0	169.1	3360	3383	7,691	1.53	1.51	1.60	1305	1264	1428	22
3555	3647	7,778	80.7	83.9	168.4	3150	3192	7,229	1.55	1.53	1.62	1259	1228	1385	23
3448	3541	7,537	80.1	83.3	167.0	2965	3007	6,798	1.53	1.52	1.61	1224	1194	1346	24
3204	3284	7,004	78.8	81.9	164.5	2790	2821	6,385	1.62	1.60	1.70	1187	1155	1301	25
3014	3095	6,601	77.3	80.4	161.5	2595	2632	5,961	1.67	1.65	1.75	1154	1125	1269	26
3136	3202	6,570	80.6	81.9	158.9	2480	2542	5,518	1.63	1.63	1.73	1100	1110	1241	27
2505	2558	5,281	74.3	75.6	147.6	2010	2058	4,496	1.95	1.95	2.07	1025	1032	1154	28
1812	1875	7,841	41.8	46.6	170.1	2055	1975	9,450	1.28	1.19	1.36	1420	1225	1605	29
1702	1777	7,426	41.5	46.7	170.5	1935	1876	8,975	1.30	1.20	1.38	1378	1189	1557	30
1654	1720	7,172	41.5	46.4	169.1	1805	1744	8,321	1.26	1.17	1.34	1326	1144	1498	31
1553	1621	6,790	41.0	46.0	168.4	1700	1647	7,900	1.25	1.16	1.33	1288	1110	1455	32
1475	1534	6,448	40.4	45.3	166.0	1590	1534	7,389	1.20	1.12	1.28	1247	1073	1409	33
1357	1417	5,921	39.5	44.4	161.9	1475	1431	6,846	1.27	1.18	1.36	1211	1047	1371	34
1288	1340	5,562	38.6	43.2	156.9	1344	1299	6,170	1.27	1.18	1.35	1172	1013	1324	35
1064	1111	4,586	35.6	40.0	144.5	1103	1070	5,047	1.33	1.24	1.41	1108	957	1250	36
2709	2817	9,156	53.5	57.9	170.2	2520	2524	9,055	1.53	1.47	1.62	1386	1285	1566	37
2608	2712	8,815	53.3	57.7	169.6	2360	2363	8,480	1.52	1.47	1.62	1338	1240	1512	38
2487	2596	8,446	53.0	57.5	169.3	2220	2232	8,015	1.54	1.49	1.64	1291	1197	1459	39
2425	2532	8,235	52.7	57.2	168.5	2070	2081	7,471	1.50	1.44	1.59	1252	1161	1415	40
2264	2355	7,652	52.2	56.5	166.1	1950	1953	7,007	1.59	1.53	1.69	1210	1122	1367	41
2187	2274	7,300	51.6	55.8	162.3	1800	1802	6,376	1.58	1.52	1.68	1173	1087	1321	42
2044	2134	6,854	50.7	54.7	159.4	1755	1773	6,280	1.72	1.66	1.83	1130	1058	1286	43
1892	1968	6,295	49.1	52.8	153.2	1505	1514	5,337	1.68	1.63	1.79	1088	1018	1236	44
4611	4814	10,877	76.2	79.6	171.6	3365	3509	8,311	1.45	1.45	1.52	1359	1356	1489	45
4450	4637	10,475	76.1	79.3	170.9	3170	3299	7,813	1.47	1.47	1.54	1314	1311	1440	46
4309	4481	10,165	75.6	78.6	170.0	2965	3084	7,336	1.45	1.45	1.52	1269	1269	1396	47
4243	4430	9,941	75.7	78.9	169.0	2810	2940	6,914	1.43	1.44	1.51	1226	1232	1352	48
3968	4127	9,372	74.0	76.7	166.0	2600	2714	6,467	1.48	1.48	1.56	1186	1195	1315	49
3826	3979	8,987	73.3	75.8	163.3	2435	2545	6,028	1.49	1.50	1.57	1152	1164	1280	50
3620	3794	8,409	71.5	74.4	157.8	2230	2354	5,454	1.54	1.55	1.62	1123	1140	1245	51
2889	3010	6,830	64.8	67.2	145.4	1745	1826	4,343	1.83	1.83	1.92	1045	1053	1159	52
3357	3505	7,865	59.3	70.9	152.1	2610	2379	5,590	2.01	1.75	1.84	1482	1129	1239	53
2981	3112	6,984	56.3	67.8	145.2	2260	2046	4,810	2.22	1.92	2.02	1424	1071	1175	54
2806	2929	8,860	55.0	65.7	140.1	2045	1864	4,349	2.29	2.00	2.10	1369	1043	1142	55
2450	2548	5,723	53.2	63.4	135.9	1820	1653	3,889	3.00	2.62	2.74	1308	997	1095	56
2125	2219	4,915	50.2	60.2	127.6	1535	1394	3,227	4.24	3.69	3.85	1254	948	1036	57
1774	1849	4,133	47.2	56.9	121.4	1320	1190	2,787	11.09	9.60	10.05	1207	904	991	58
1137	1212	8,183	25.5	29.2	171.9	1365	1353	10,472	1.35	1.26	1.44	1476	1275	1677	59
1116	1190	8,005	25.3	29.0	170.6	1292	1281	9,877	1.33	1.24	1.42	1434	1241	1629	60
1055	1125	7,568	25.1	28.8	169.4	1222	1211	9,325	1.34	1.24	1.42	1387	1198	1570	61
1014	1081	7,298	24.9	28.6	186.2	1144	1132	8,759	1.29	1.20	1.37	1349	1163	1527	62
----	----	------	----	----	-----	1147	----	------	----	----	----	----	----	----	63
931	995	6,700	24.1	27.7	163.2	1057	1049	8,089	1.33	1.23	1.41	1304	1124	1474	64
874	925	6,227	23.8	27.1	159.2	984	968	7,460	1.33	1.24	1.41	1267	1097	1434	65
857	916	6,025	23.1	26.5	152.6	894	889	6,671	1.34	1.24	1.42	1232	1066	1390	66
1853	1960	9,977	34.1	37.1	171.5	1725	1776	9,955	1.51	1.47	1.62	1452	1375	1668	67
1808	1920	9,711	34.1	37.1	170.8	1690	1676	9,329	1.48	1.44	1.59	1403	1332	1612	68
1738	1839	9,335	33.8	36.7	169.5	1510	1556	8,696	1.46	1.42	1.57	1353	1284	1555	69
1671	1768	8,952	33.7	36.6	168.3	1410	1454	8,100	1.46	1.42	1.56	1308	1242	1503	70
1601	1683	8,554	33.4	36.1	166.5	1320	1349	7,560	1.46	1.42	1.56	1268	1201	1457	71
1500	1562	7,976	32.8	35.1	162.8	1225	1241	6,981	1.49	1.45	1.60	1223	1158	1405	72
681	765	8,376	14.6	17.6	168.1	907	950	11,919	1.46	1.36	1.56	1570	1362	1791	73
727	803	8,789	14.9	17.7	169.2	864	889	11,159	1.30	1.21	1.40	1531	1328	1747	74
1459	1630	11,606	23.1	26.0	171.6	1253	1391	10,684	1.42	1.41	1.52	1513	1395	1738	75
1412	1567	11,232	23.1	25.9	171.8	1178	1296	10,039	1.41	1.39	1.51	1459	1433	1673	76
1380	1506	10,775	23.3	25.7	170.1	1104	1192	9,213	1.38	1.37	1.48	1409	1381	1610	77
1284	1418	10,100	23.0	25.5	168.7	1050	1151	8,857	1.48	1.47	1.58	1356	1339	1558	78
1226	1346	9,644	22.5	24.9	165.2	963	1050	8,118	1.44	1.43	1.55	1313	1293	1509	79
1191	1299	9,231	22.3	24.5	161.3	910	985	7,557	1.44	1.43	1.54	1271	1252	1458	80
1083	1217	8,648	21.0	23.7	156.3	812	907	6,947	1.45	1.44	1.56	1242	1226	1427	81

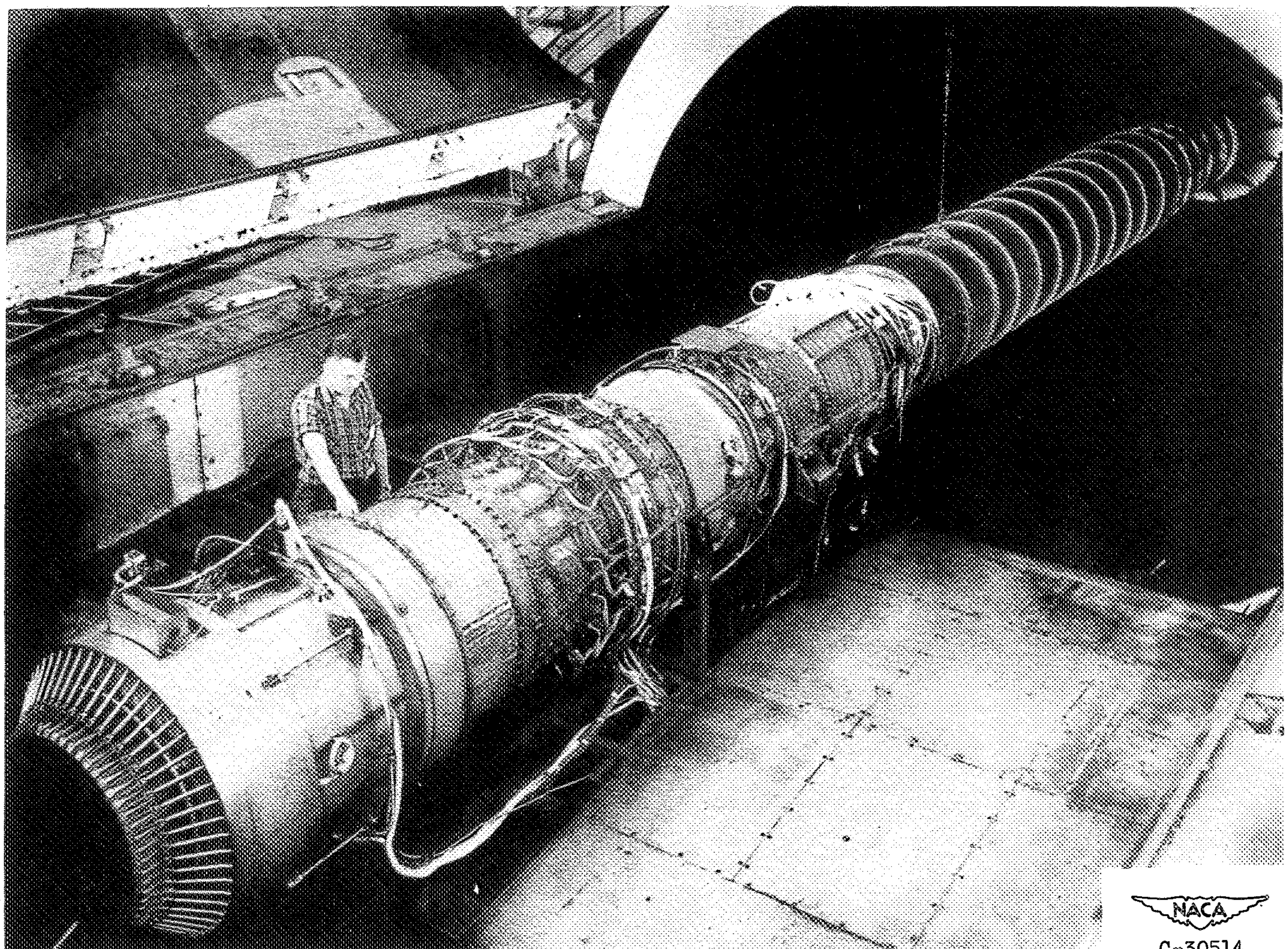
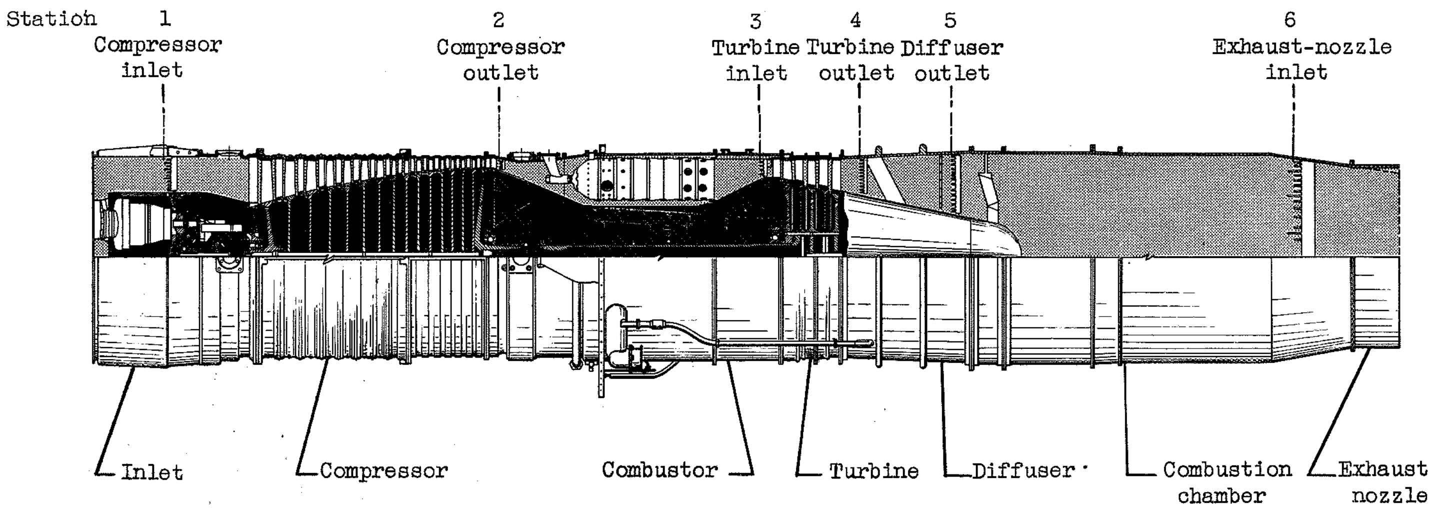


Figure 1. - Installation of YJ71-A-7 in altitude wind tunnel.



Station	Pressure tubes			Thermocouples
	Total	Stream static	Wall static	
1	28	8	4	(a)
2	8	1	--	8
3	8	--	--	4
4	21	--	6	18
5	12	--	1	--
6	20	4	2	12

[a] Six thermocouples located upstream of engine in inlet duct.

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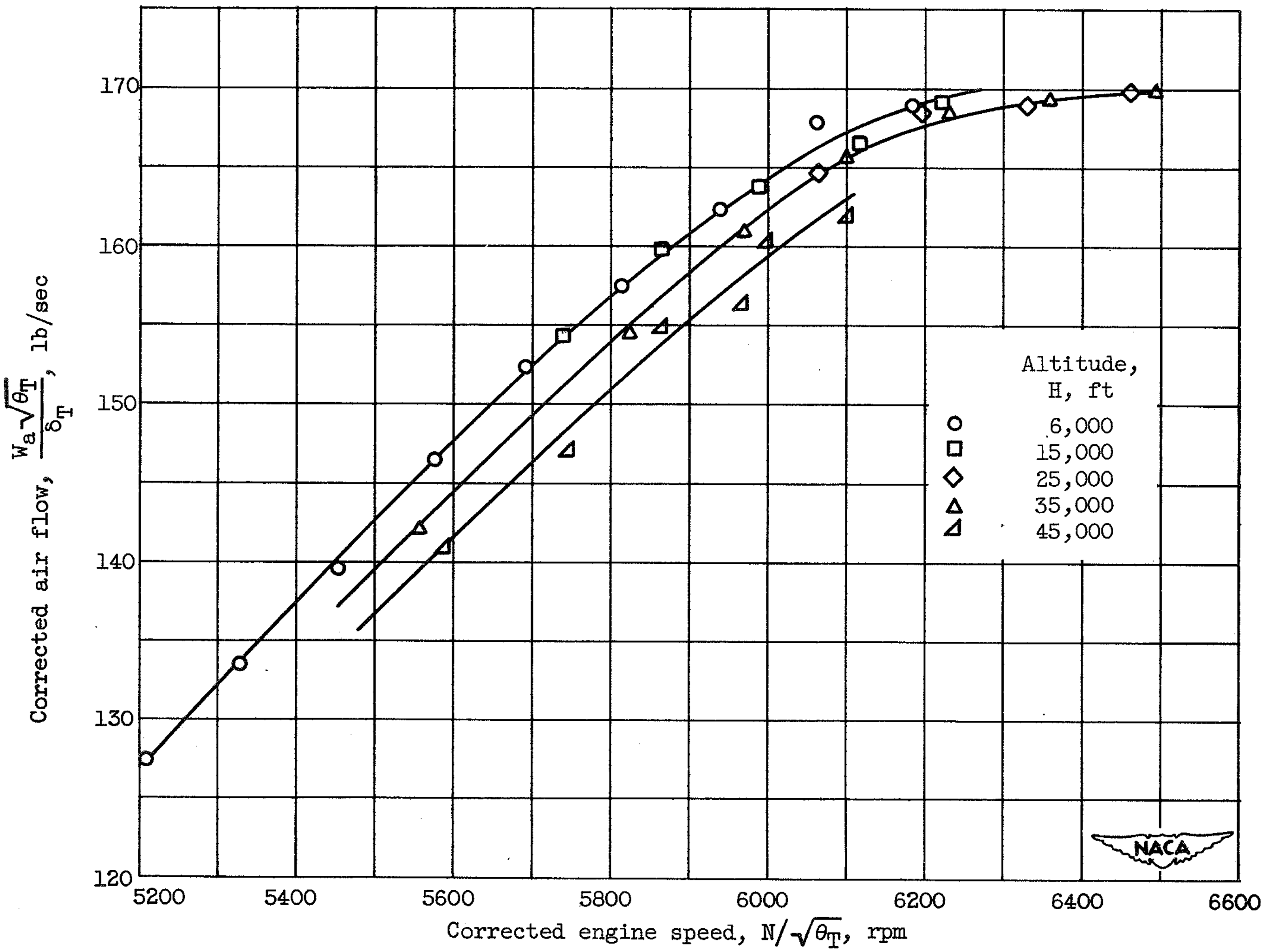
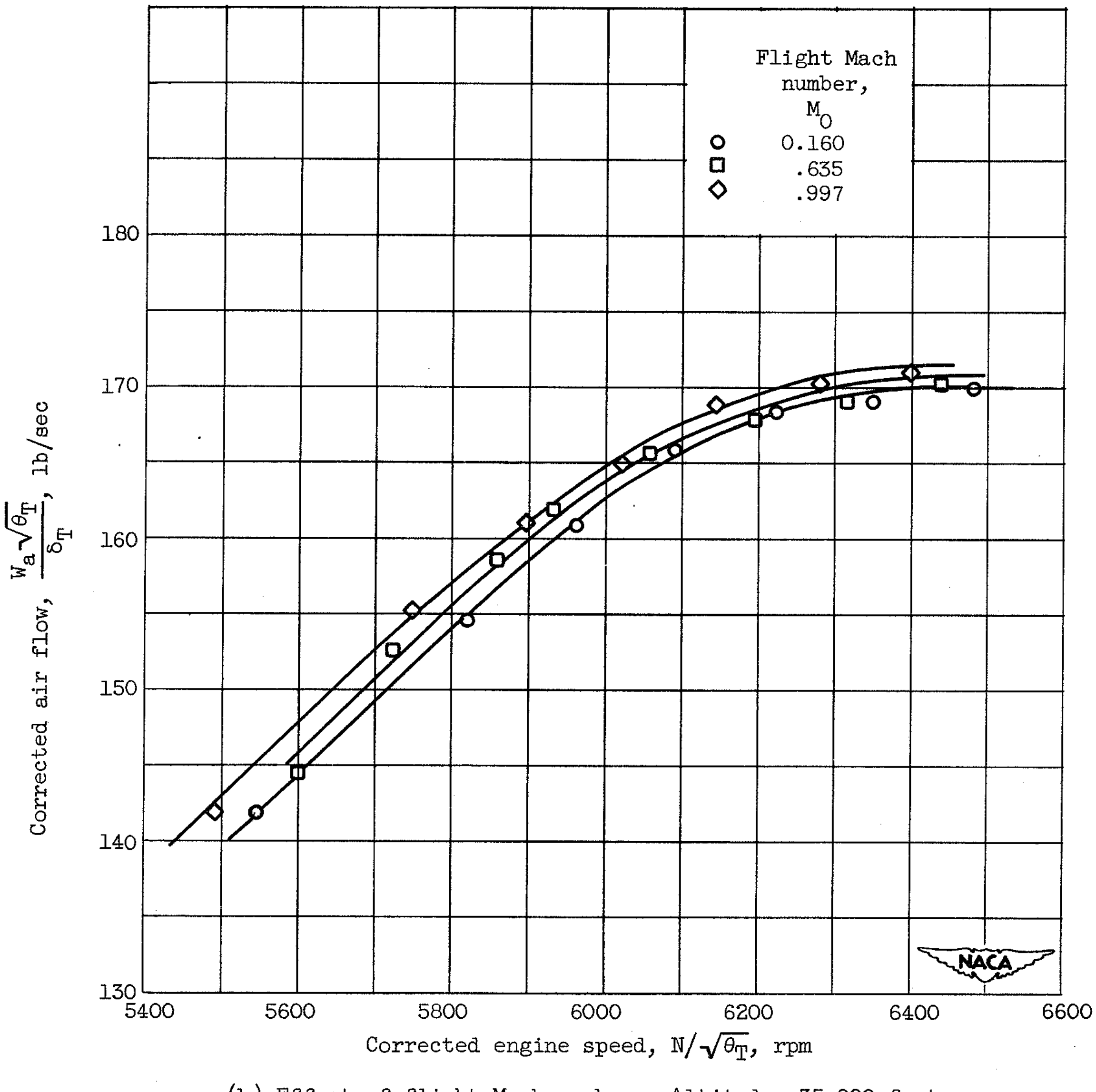
CD-3030

Figure 2. - Cross section of engine showing location of instrumentation.



(a) Effect of altitude. Flight Mach number, 0.16.

Figure 3. - Variation of corrected air flow with corrected engine speed. Exhaust-nozzle area, 2.685 square feet.



(b) Effect of flight Mach number. Altitude, 35,000 feet.

Figure 3. - Concluded. Variation of corrected air flow with corrected engine speed. Exhaust-nozzle area, 2.685 square feet.

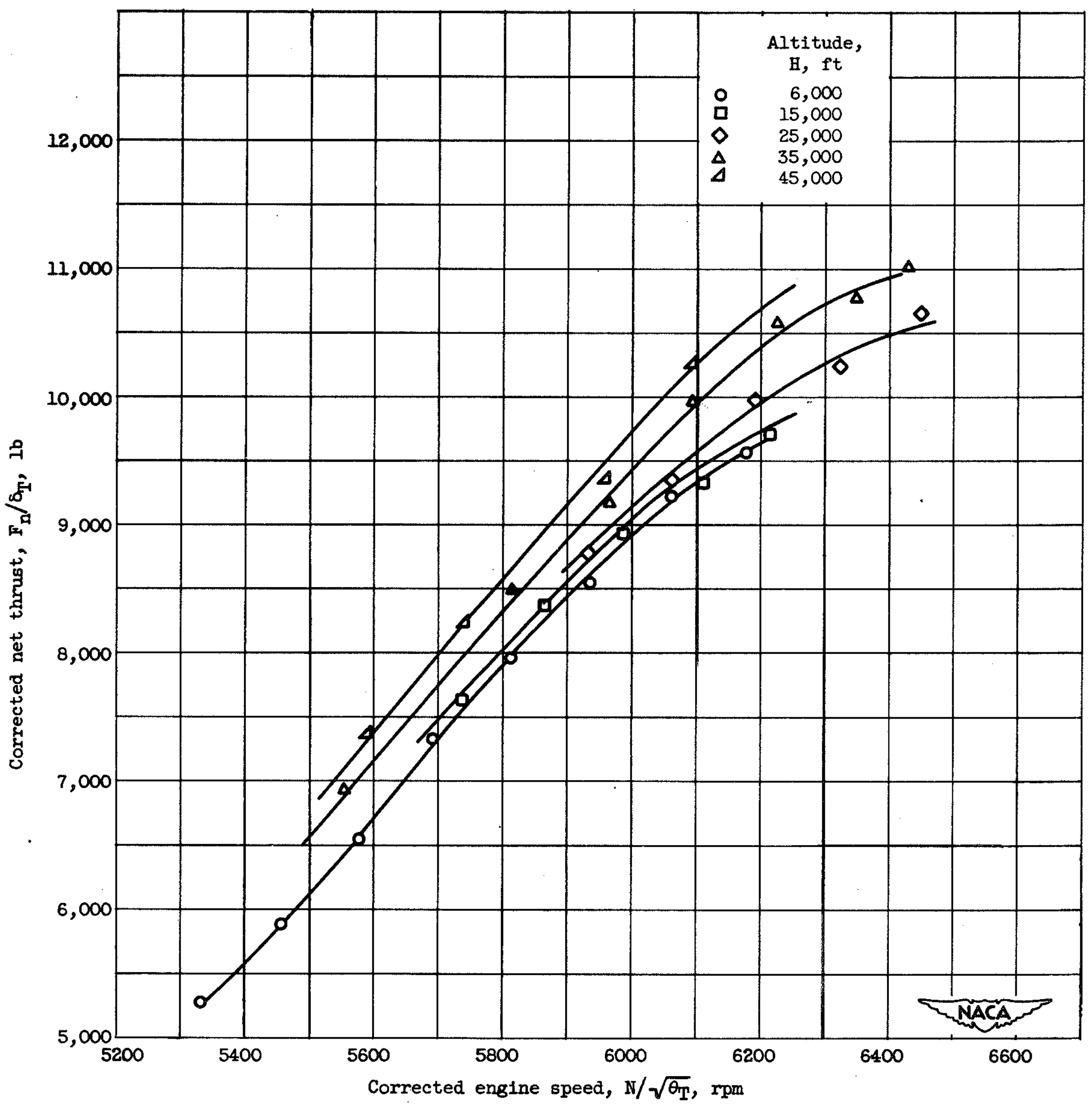


Figure 4. - Effect of altitude on variation of corrected net thrust with corrected engine speed. Flight Mach number, 0.16; exhaust-nozzle area, 2.685 square feet.

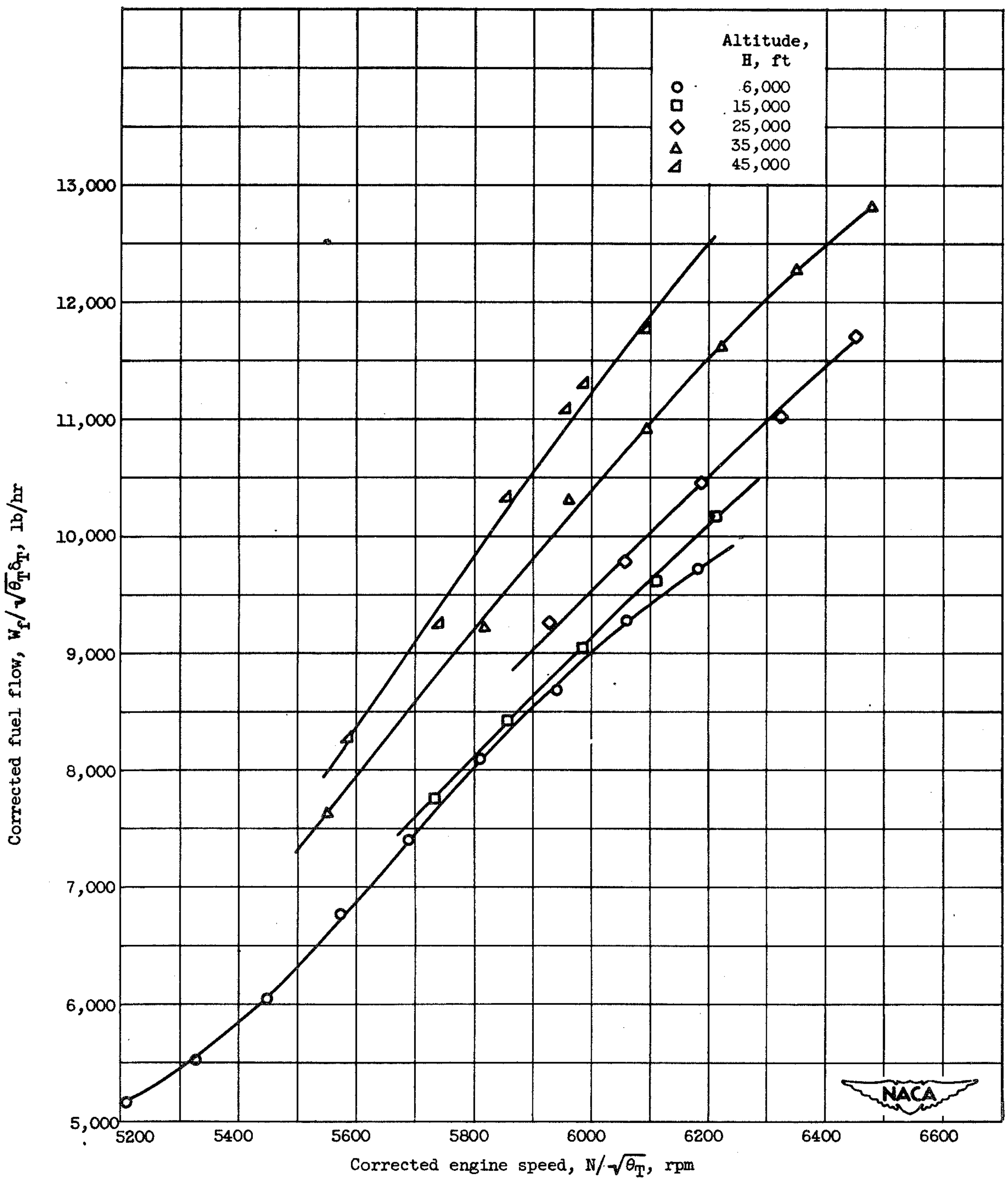
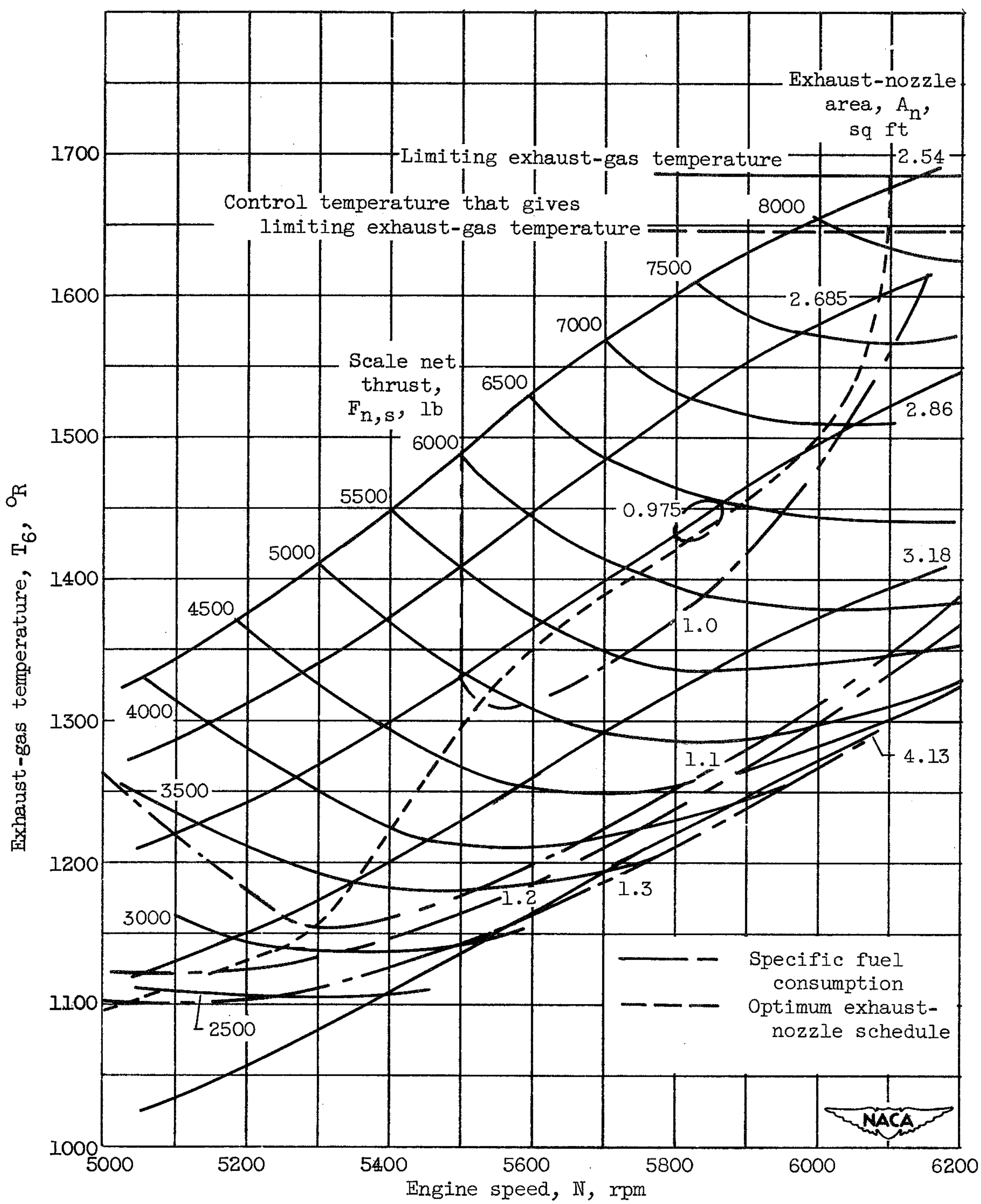
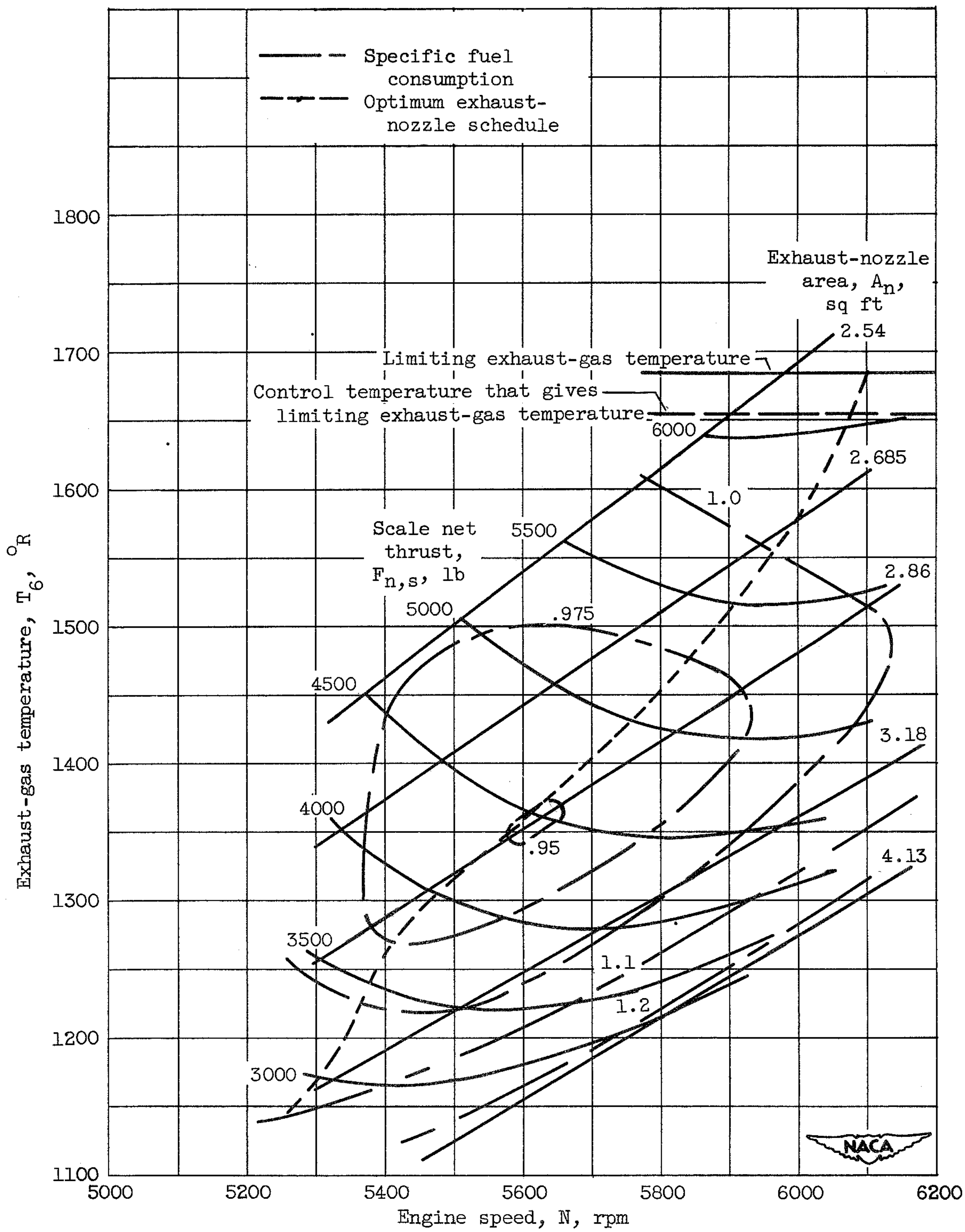


Figure 5. - Effect of altitude on variation of corrected fuel flow with corrected engine speed. Flight Mach number, 0.16; exhaust-nozzle area, 2.685 square feet.



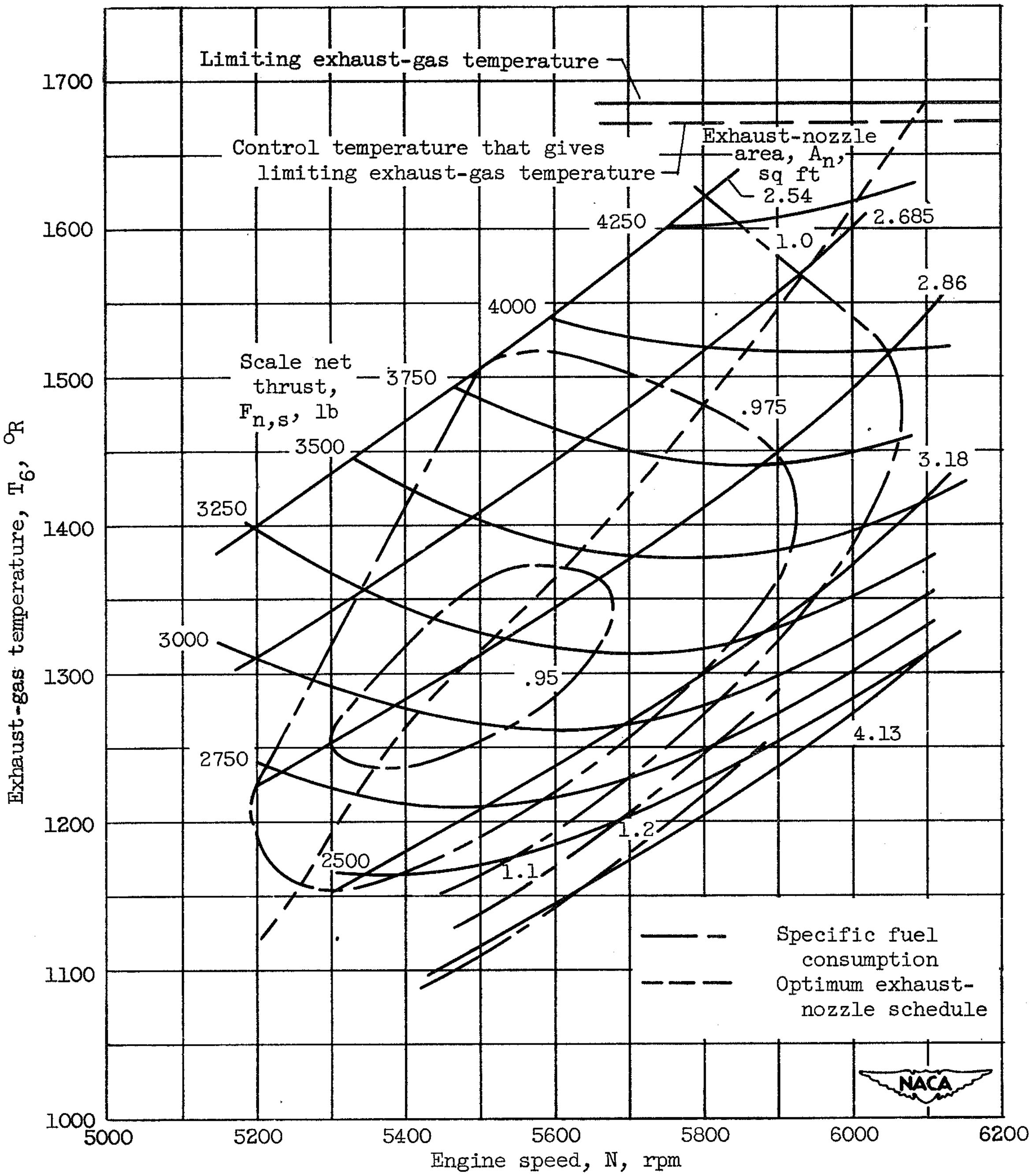
(a) Altitude, 6000 feet; flight Mach number, 0.159.

Figure 6. - Engine performance maps.



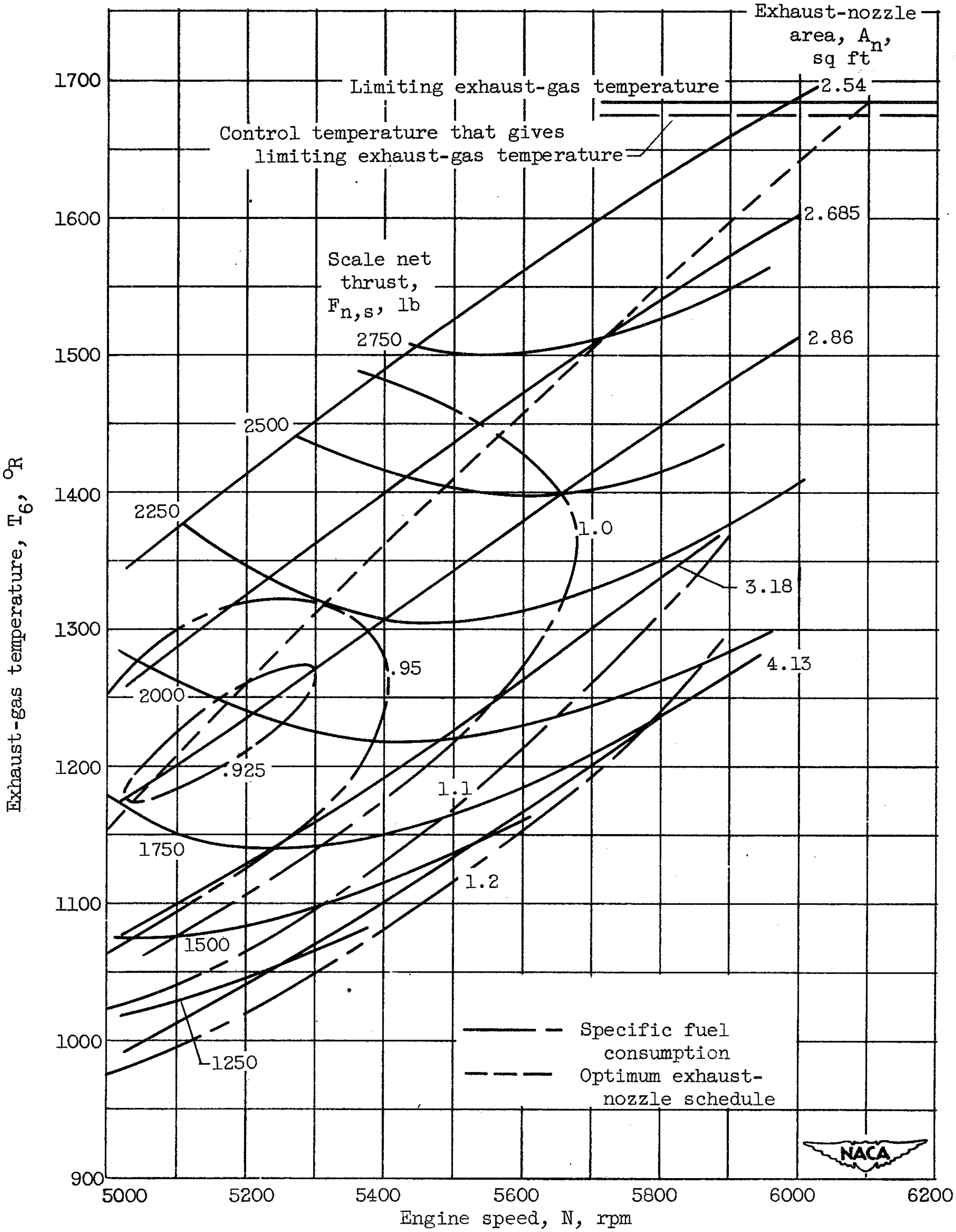
(b) Altitude, 15,000 feet; flight Mach number, 0.173.

Figure 6. - Continued. Engine performance maps.



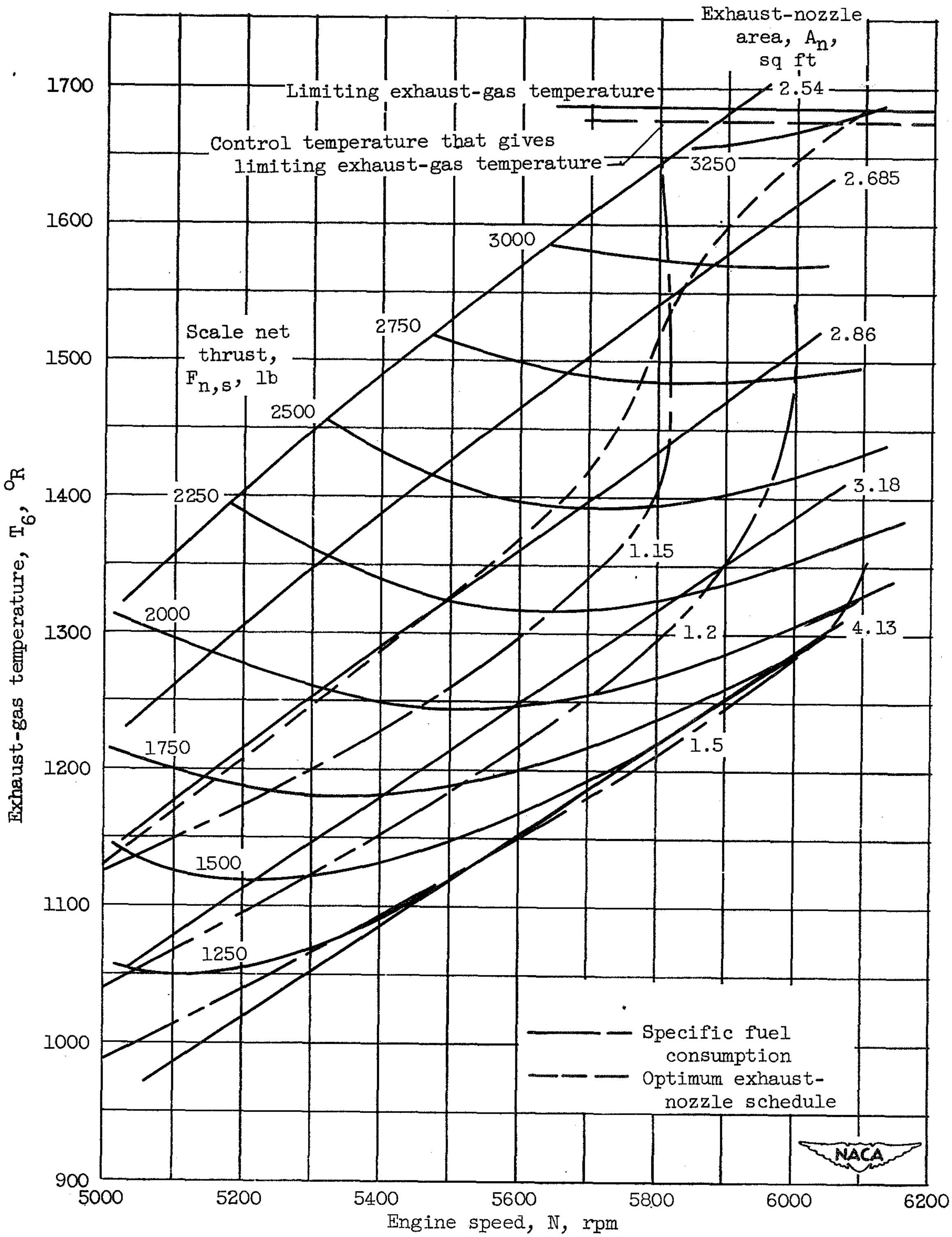
(c) Altitude, 25,000 feet; flight Mach number, 0.163.

Figure 6. - Continued. Engine performance maps.



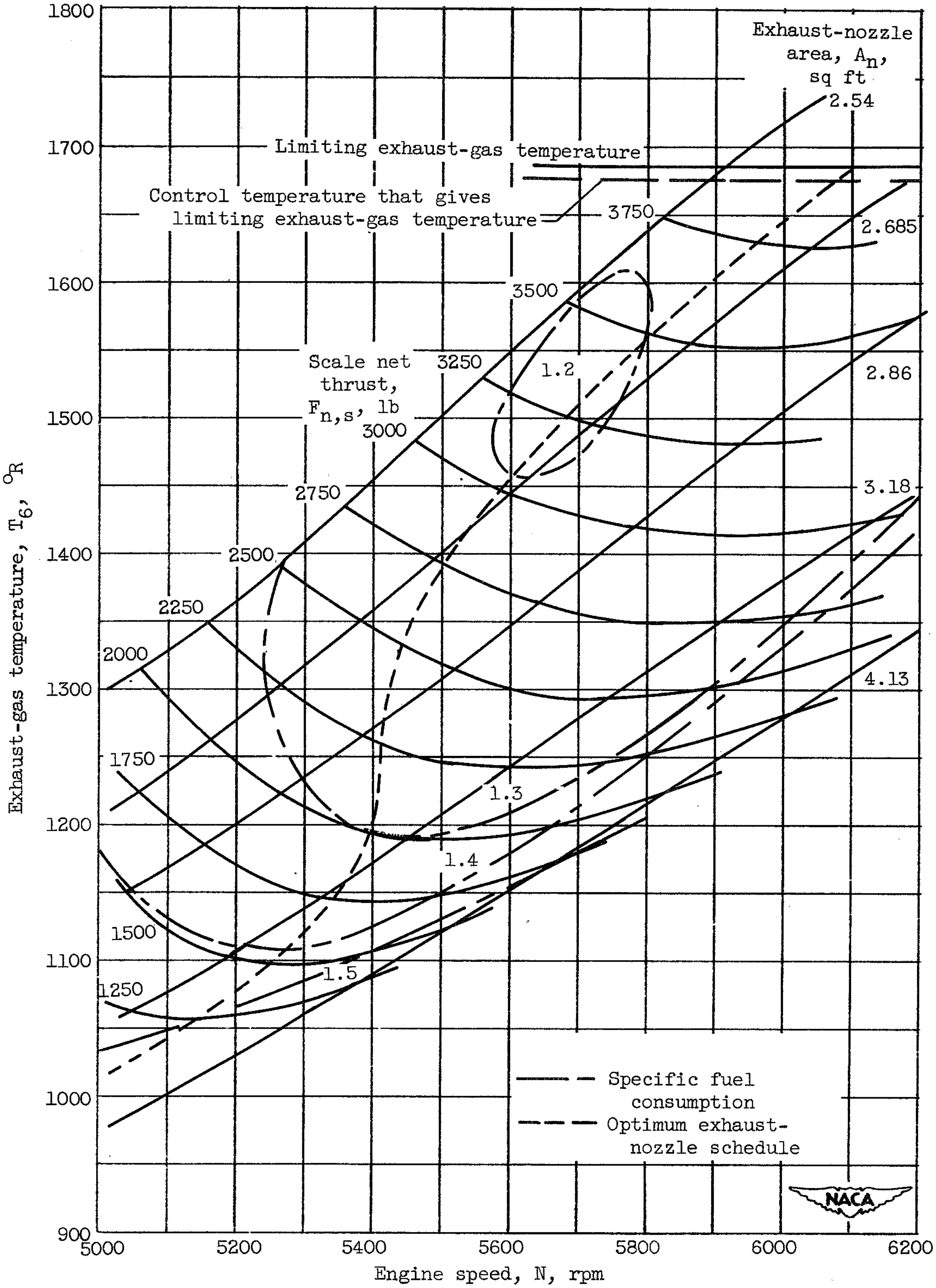
(d) Altitude, 35,000 feet; flight Mach number, 0.160.

Figure 6. - Continued. Engine performance maps.



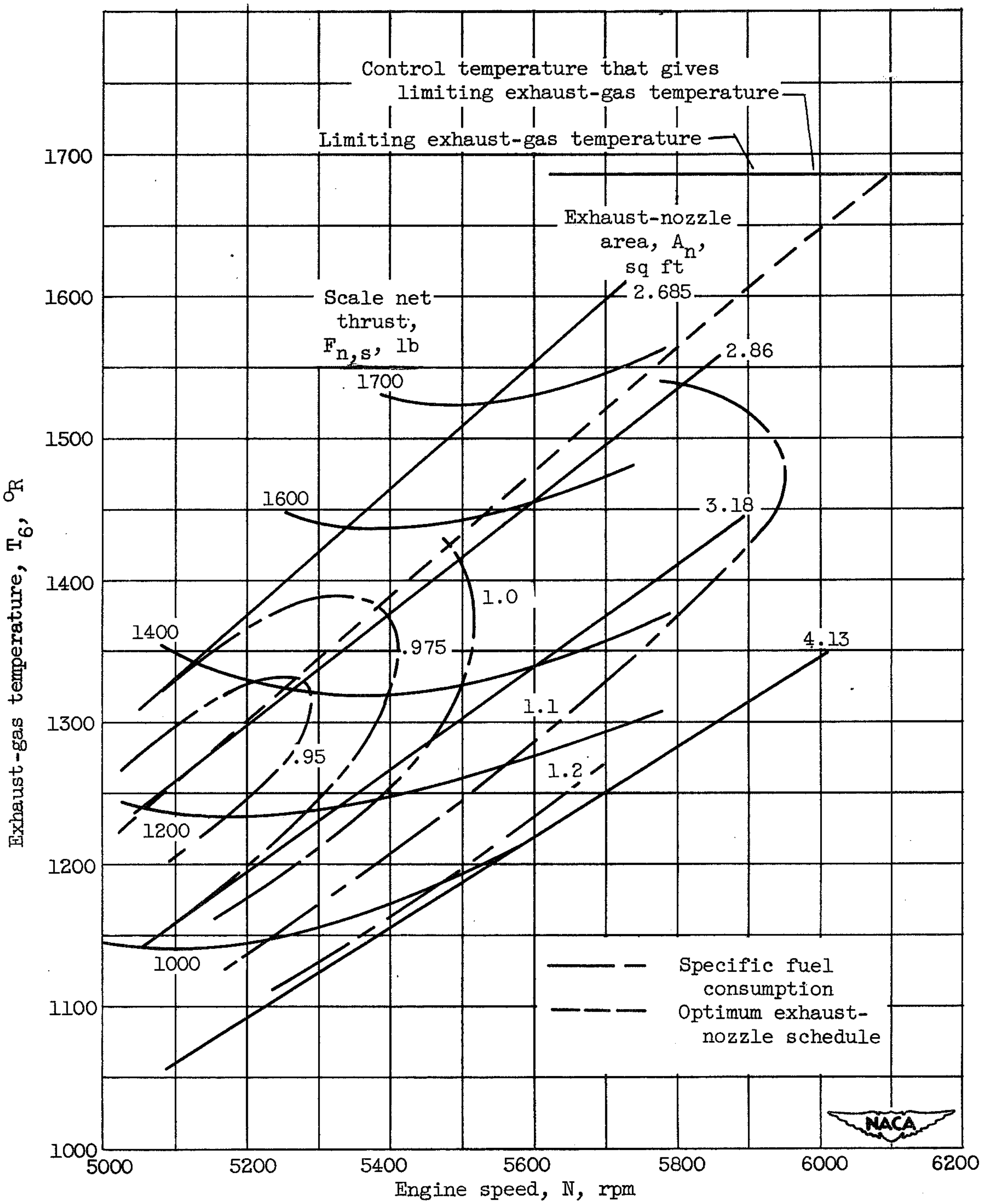
(e) Altitude, 35,000 feet; flight Mach number, 0.635.

Figure 6. - Continued. Engine performance maps.



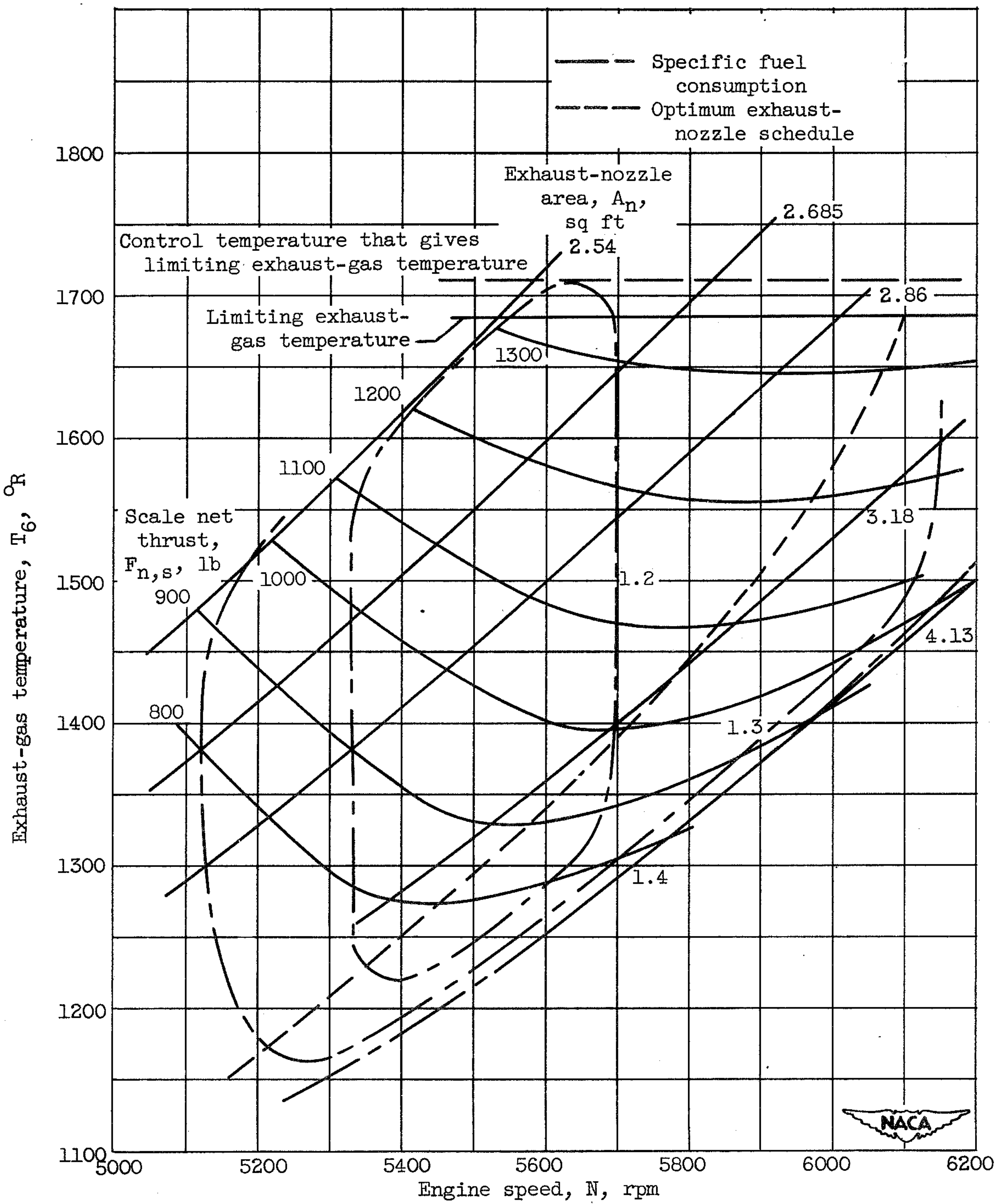
(f) Altitude, 35,000 feet; flight Mach number, 0.997.

Figure 6. - Continued. Engine performance maps.



(g) Altitude, 45,000 feet; flight Mach number, 0.168.

Figure 6. - Continued. Engine performance maps.



(h) Altitude, 55,000 feet; flight Mach number, 0.824.

Figure 6. - Concluded. Engine performance maps.

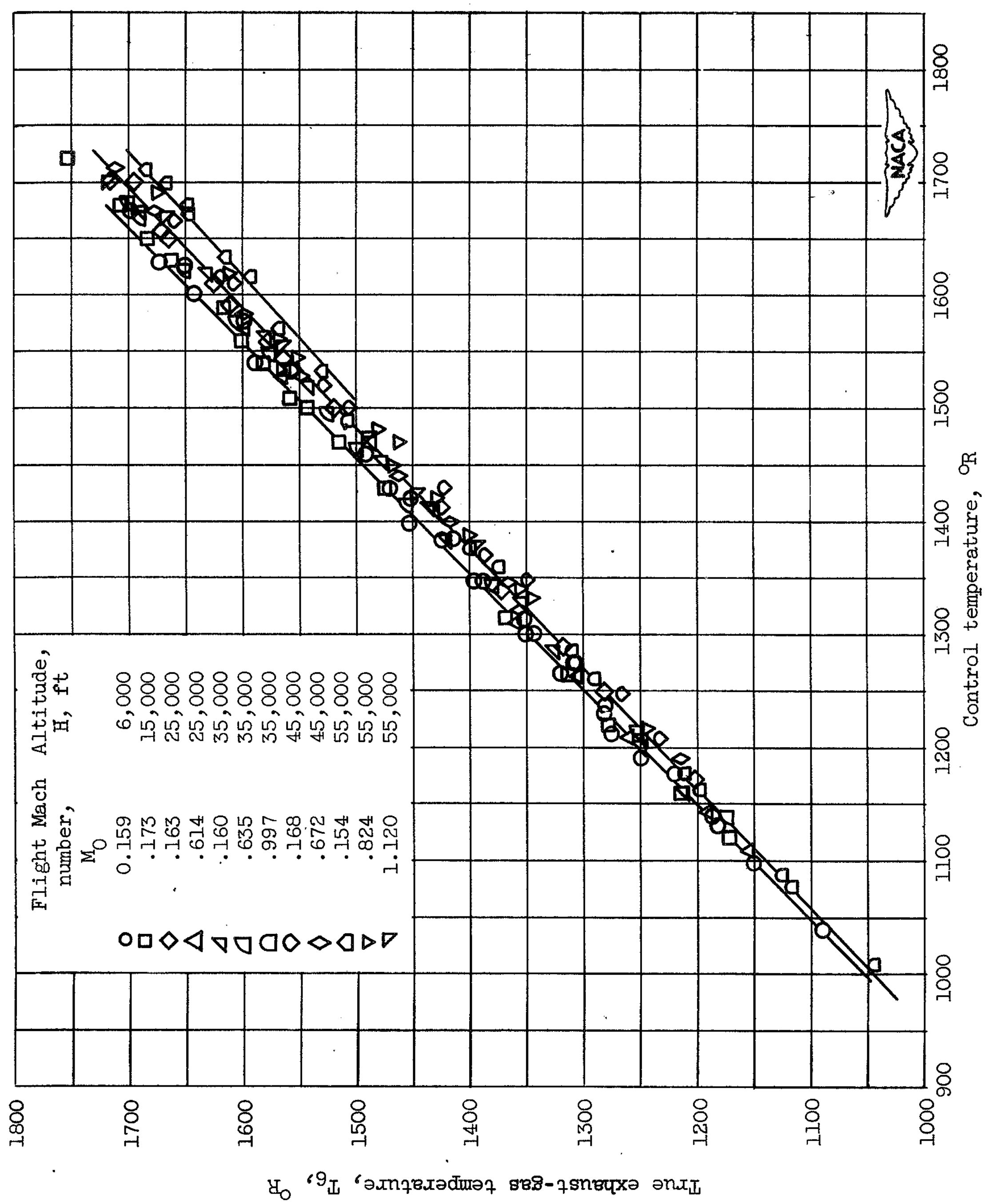
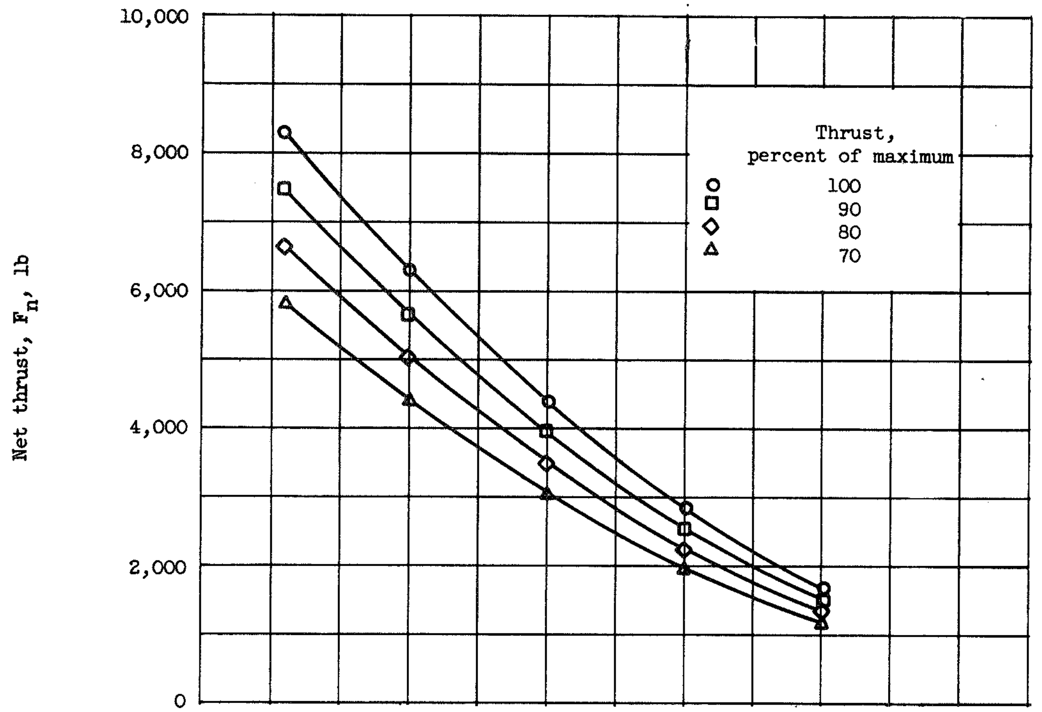
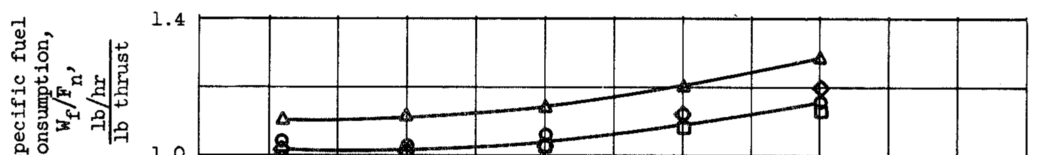


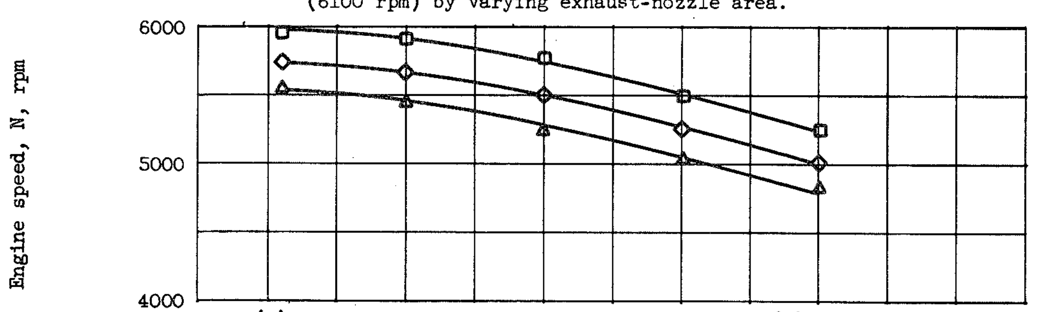
Figure 7. - Error in control temperature with flight condition.



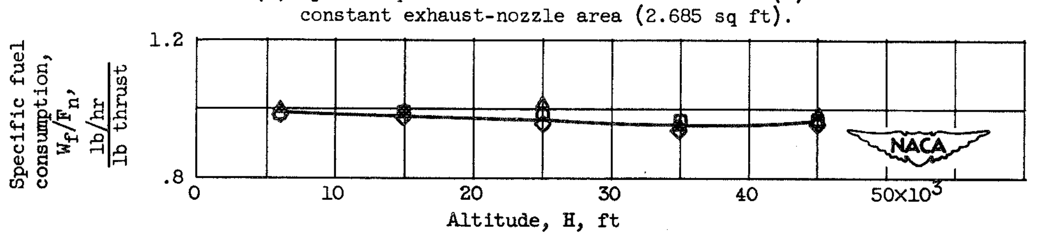
(a) Net-thrust values for methods shown in (b) and (d).



(b) Specific fuel consumption obtained at rated speed (6100 rpm) by varying exhaust-nozzle area.

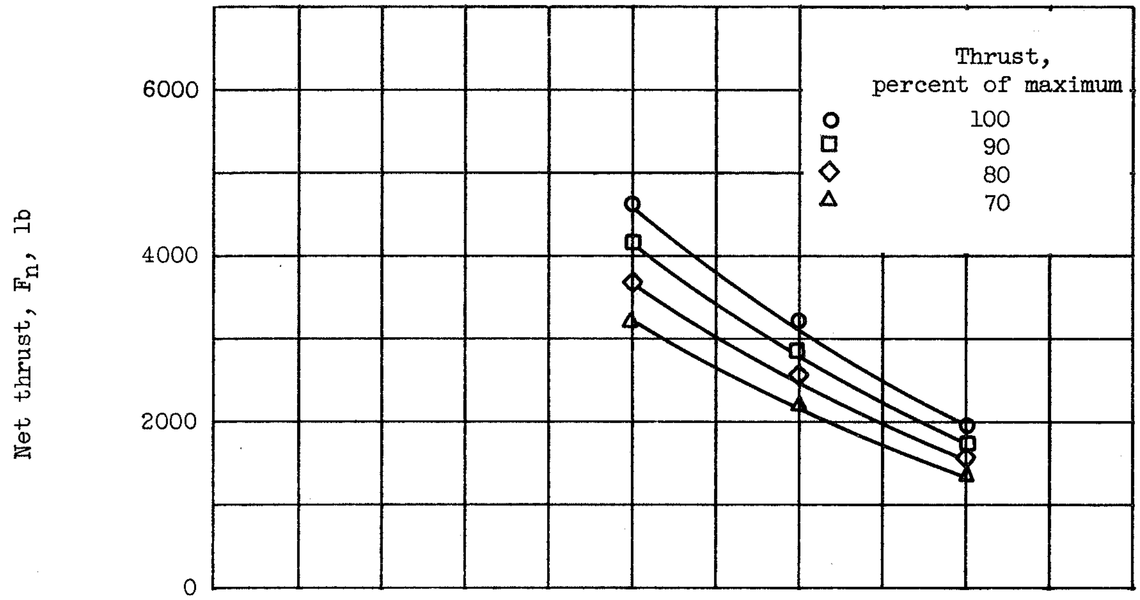


(c) Speed required to obtain thrust shown in (a) at constant exhaust-nozzle area (2.685 sq ft).

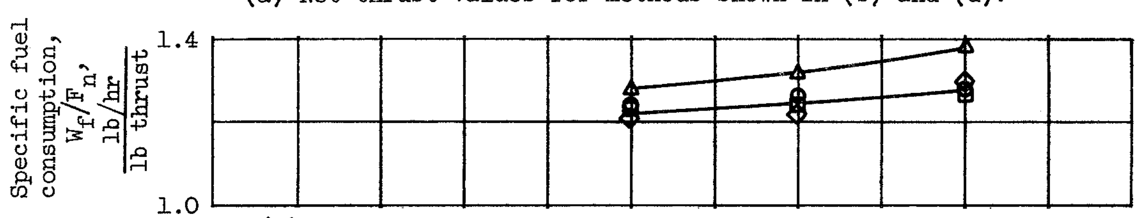


(d) Specific fuel consumption obtained at constant exhaust-nozzle area (2.685 sq ft) by varying speed.

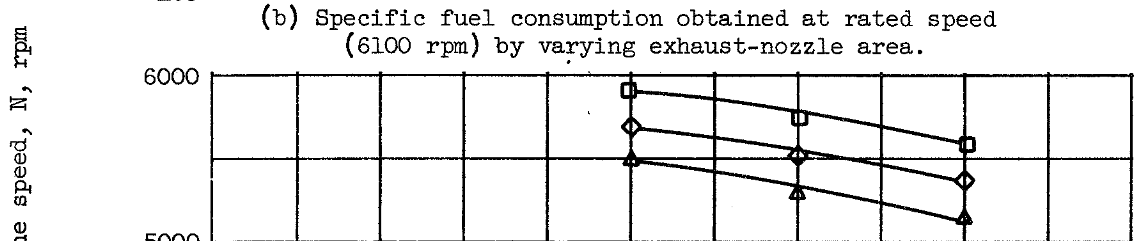
Figure 8. - Effect of altitude on specific fuel consumption for two methods of thrust modulation at flight Mach number of 0.16.



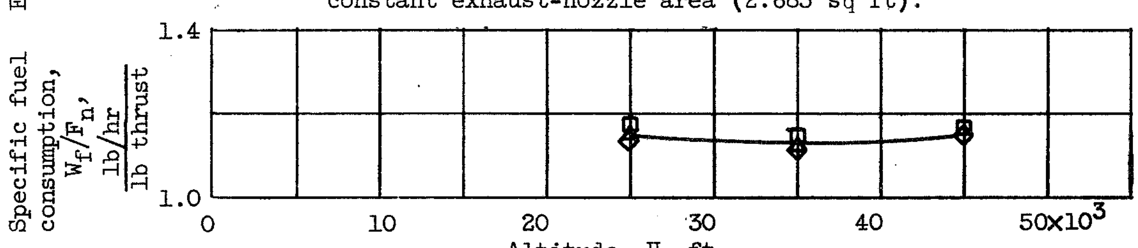
(a) Net thrust values for methods shown in (b) and (d).



(b) Specific fuel consumption obtained at rated speed (6100 rpm) by varying exhaust-nozzle area.

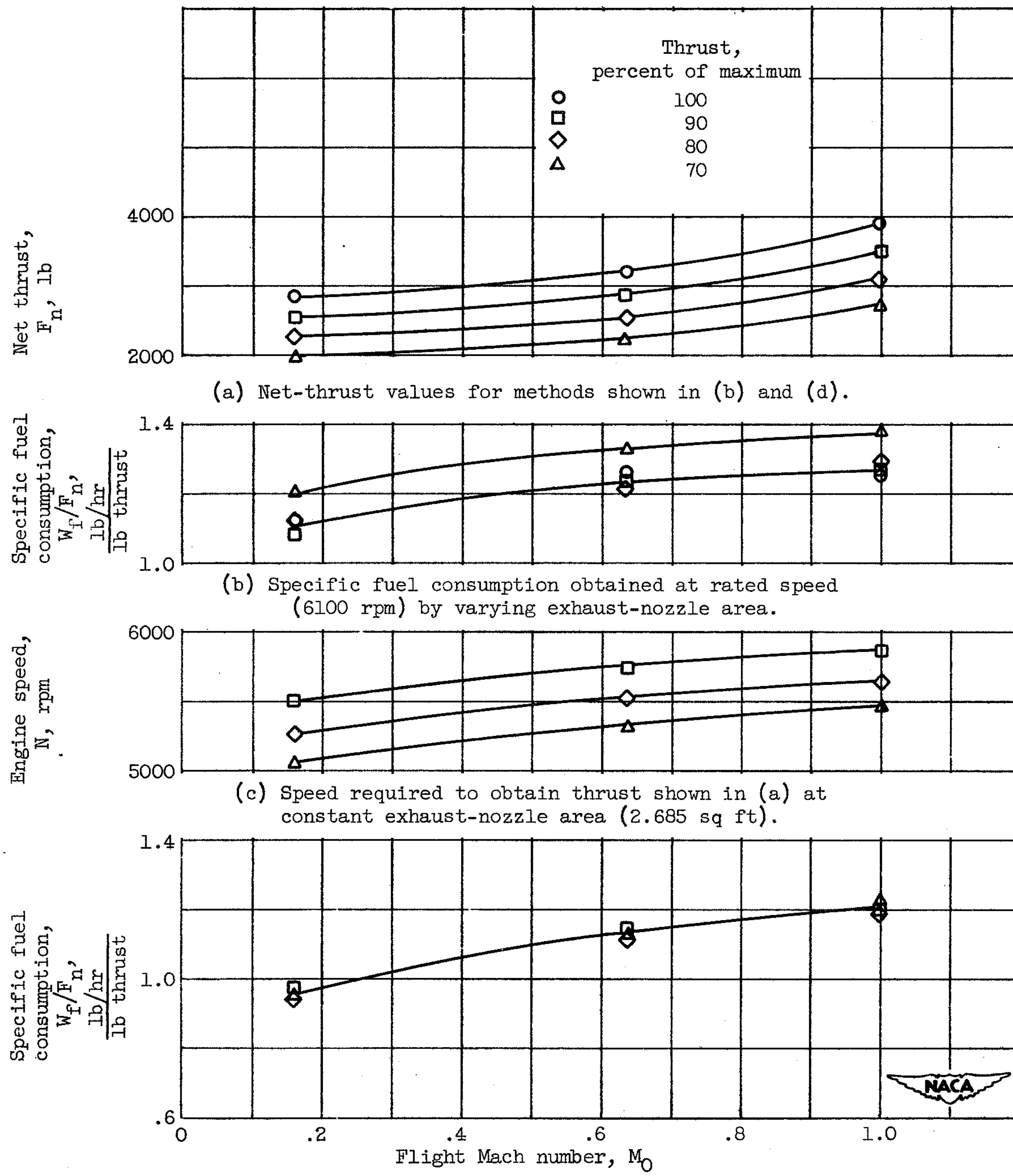


(c) Speed required to obtain thrust shown in (a) at constant exhaust-nozzle area (2.685 sq ft).



(d) Specific fuel consumption obtained at constant exhaust-nozzle area (2.685 sq ft) by varying speed.

Figure 9. - Effect of altitude on specific fuel consumption for two methods of thrust modulation at flight Mach number of 0.64.



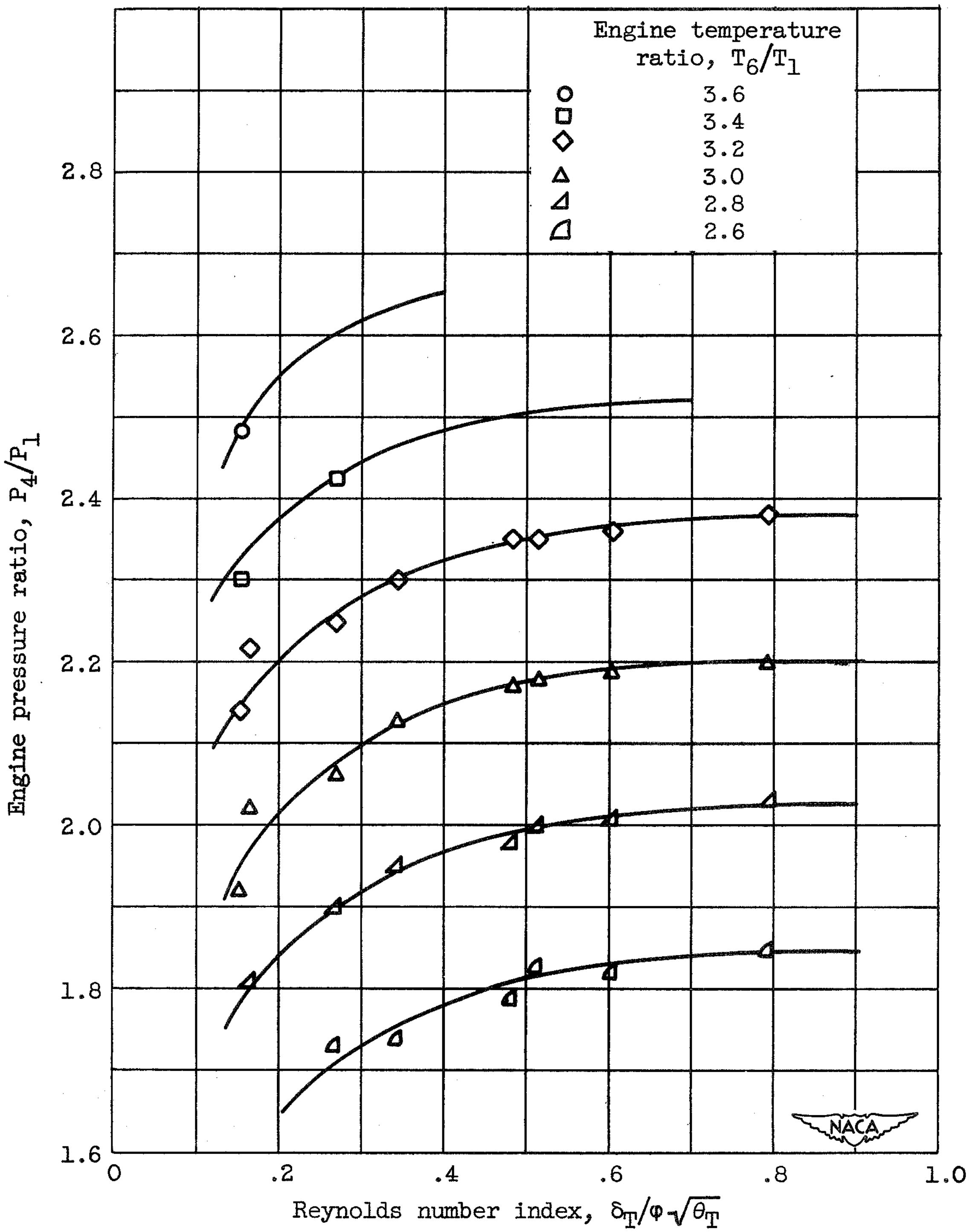
(a) Net-thrust values for methods shown in (b) and (d).

(b) Specific fuel consumption obtained at rated speed (6100 rpm) by varying exhaust-nozzle area.

(c) Speed required to obtain thrust shown in (a) at constant exhaust-nozzle area (2.685 sq ft).

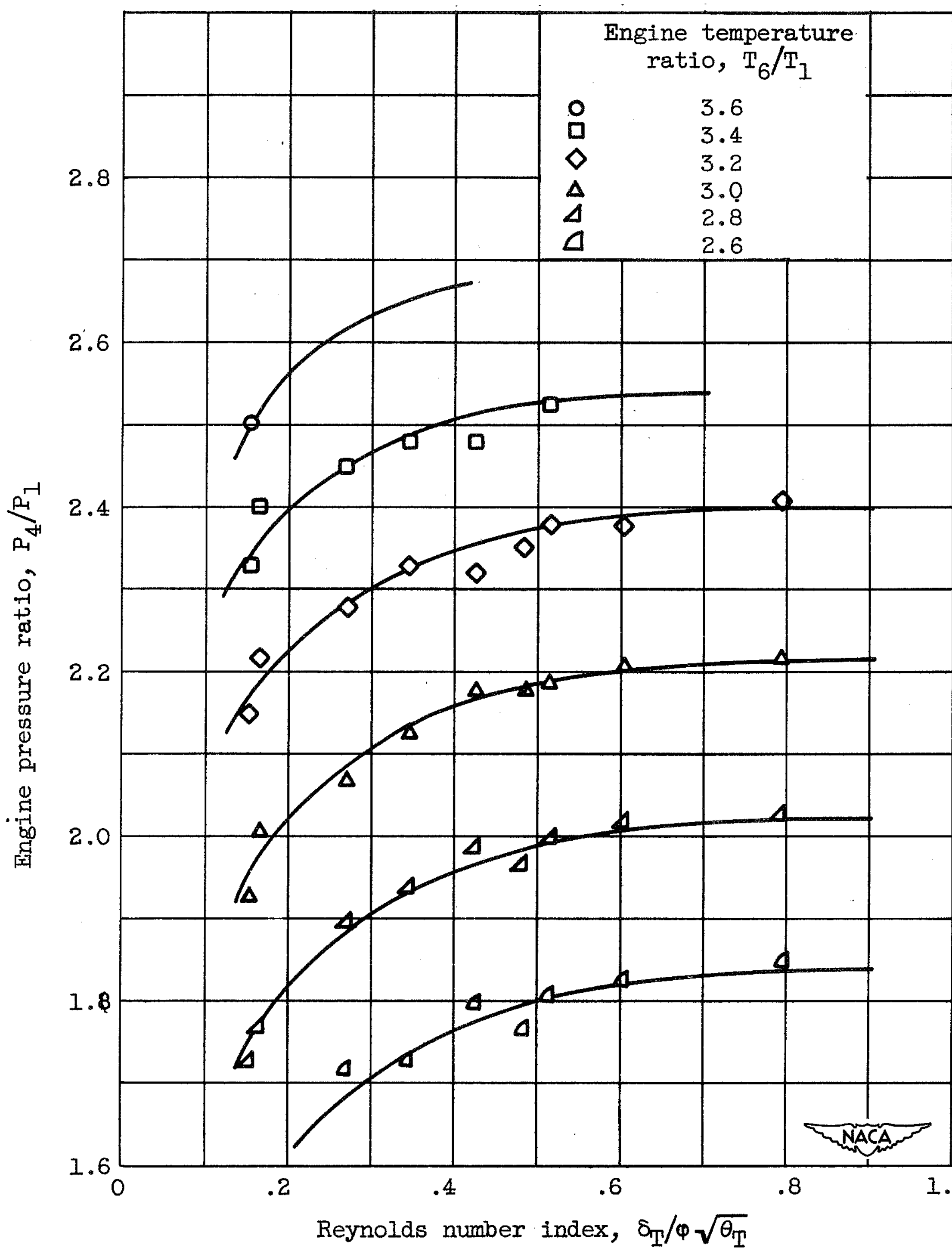
(d) Specific fuel consumption obtained at constant exhaust-nozzle area (2.685 sq ft) by varying speed.

Figure 10. - Effect of flight Mach number on specific fuel consumption for two methods of thrust modulation at an altitude of 35,000 feet.



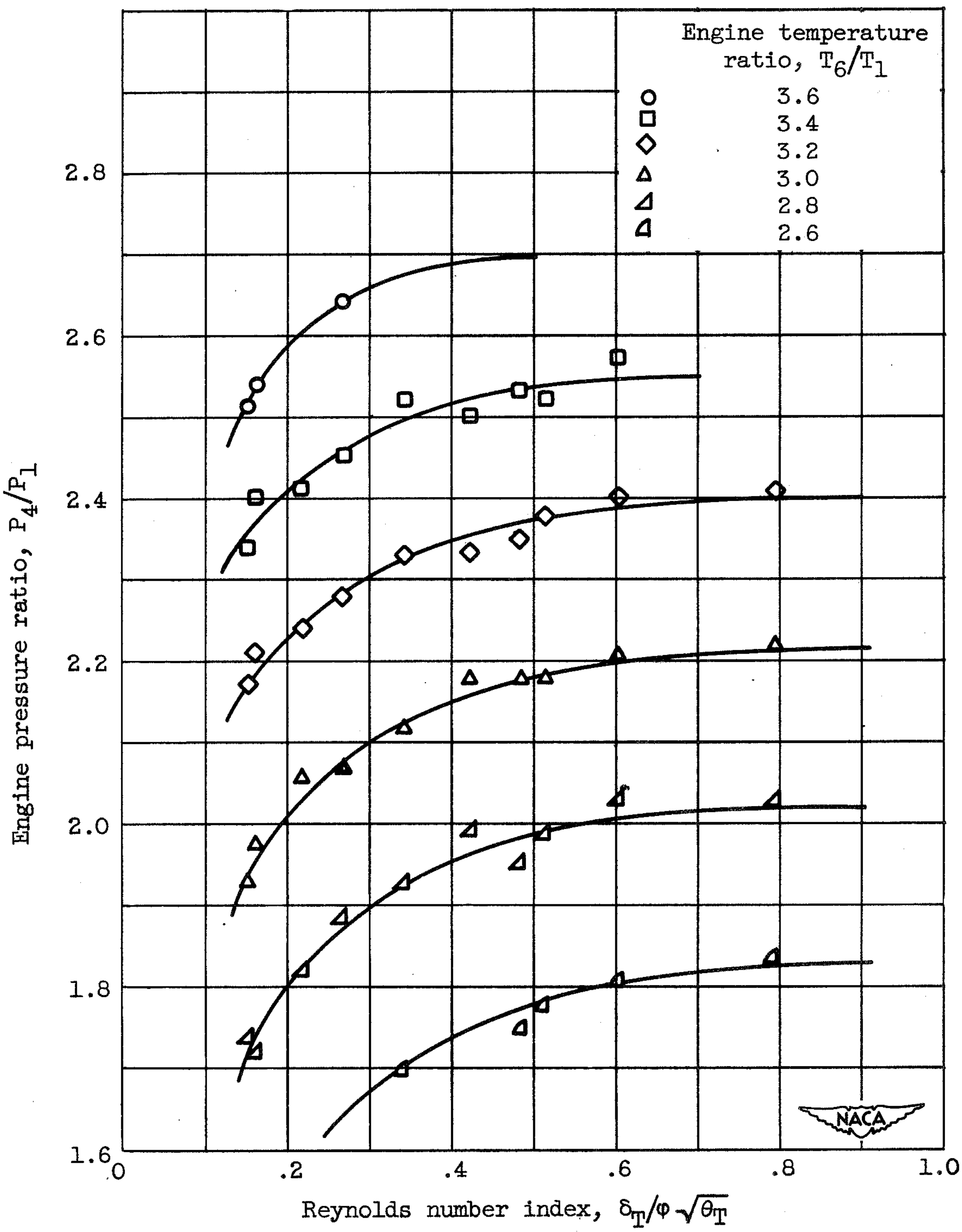
(a) Corrected engine speed, 5800 rpm.

Figure 11. - Variation of engine pressure ratio with Reynolds number index for various corrected engine speeds and engine temperature ratios.



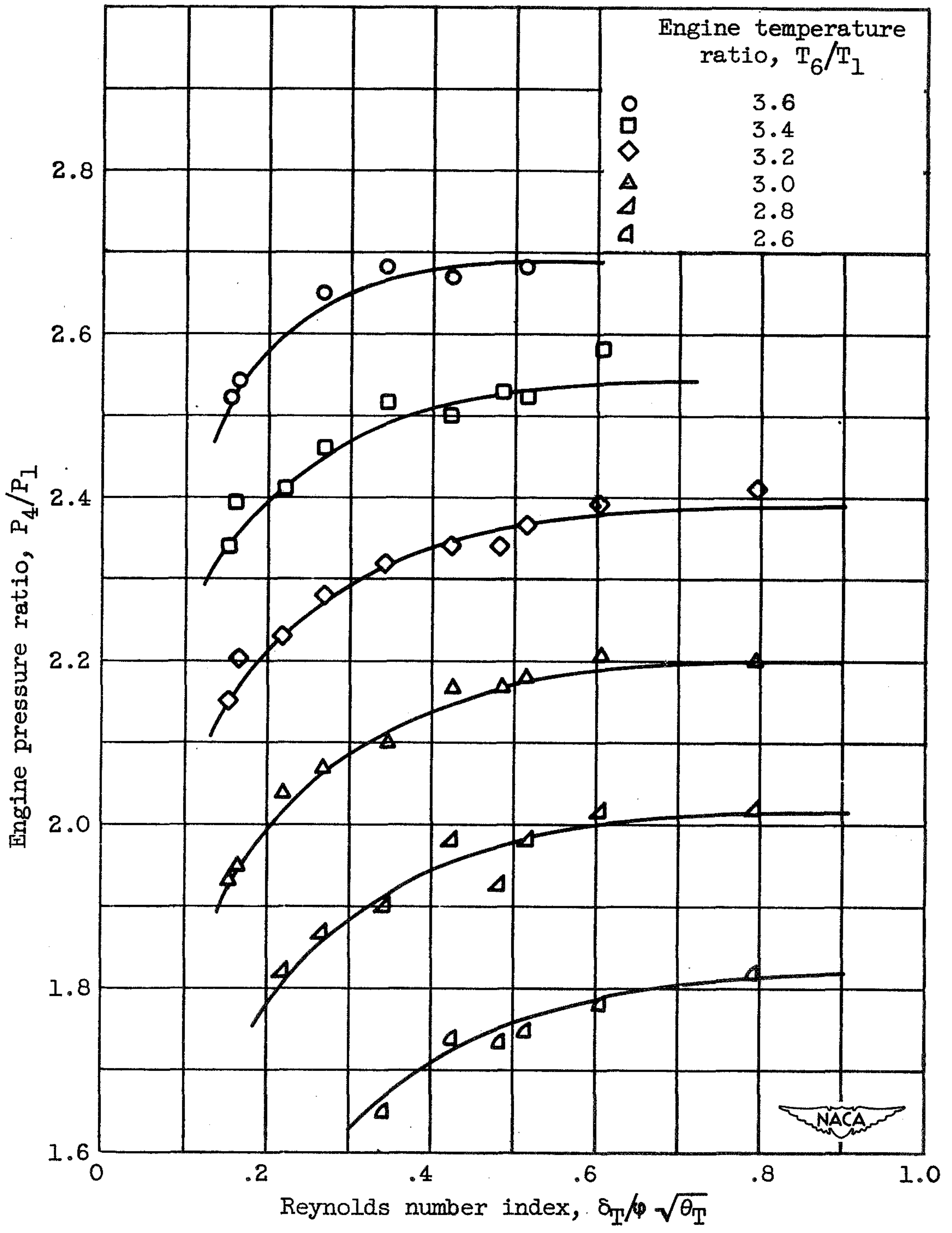
(b) Corrected engine speed, 5900 rpm.

Figure 11. - Continued. Variation of engine pressure ratio with Reynolds number index for various corrected engine speeds and engine temperature ratios.



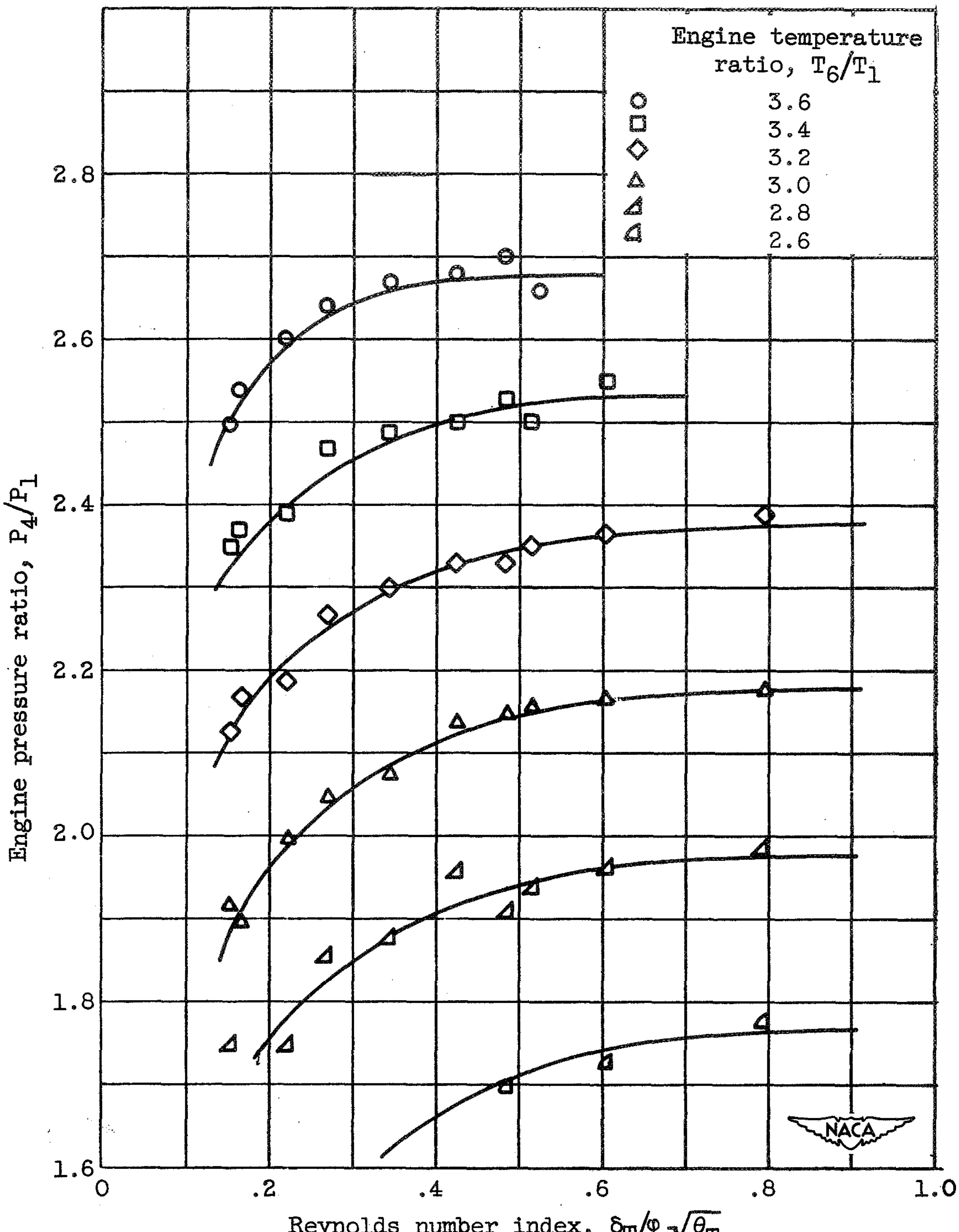
(c) Corrected engine speed, 6000 rpm.

Figure 11. - Continued. Variation of engine pressure ratio with Reynolds number index for various corrected engine speeds and engine temperature ratios.



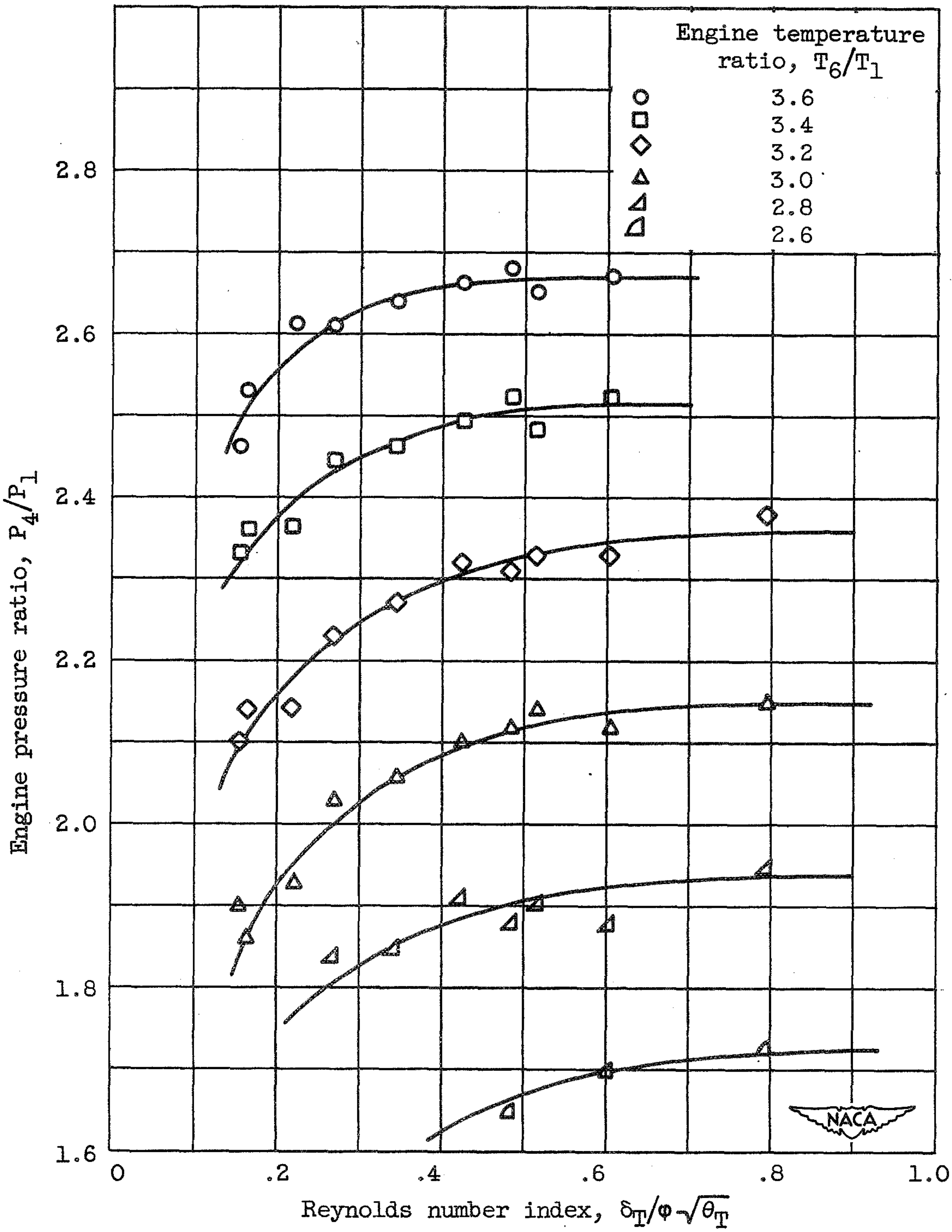
(d) Corrected engine speed, 6100 rpm.

Figure 11. - Continued. Variation of engine pressure ratio with Reynolds number index for various corrected engine speeds and engine temperature ratios.



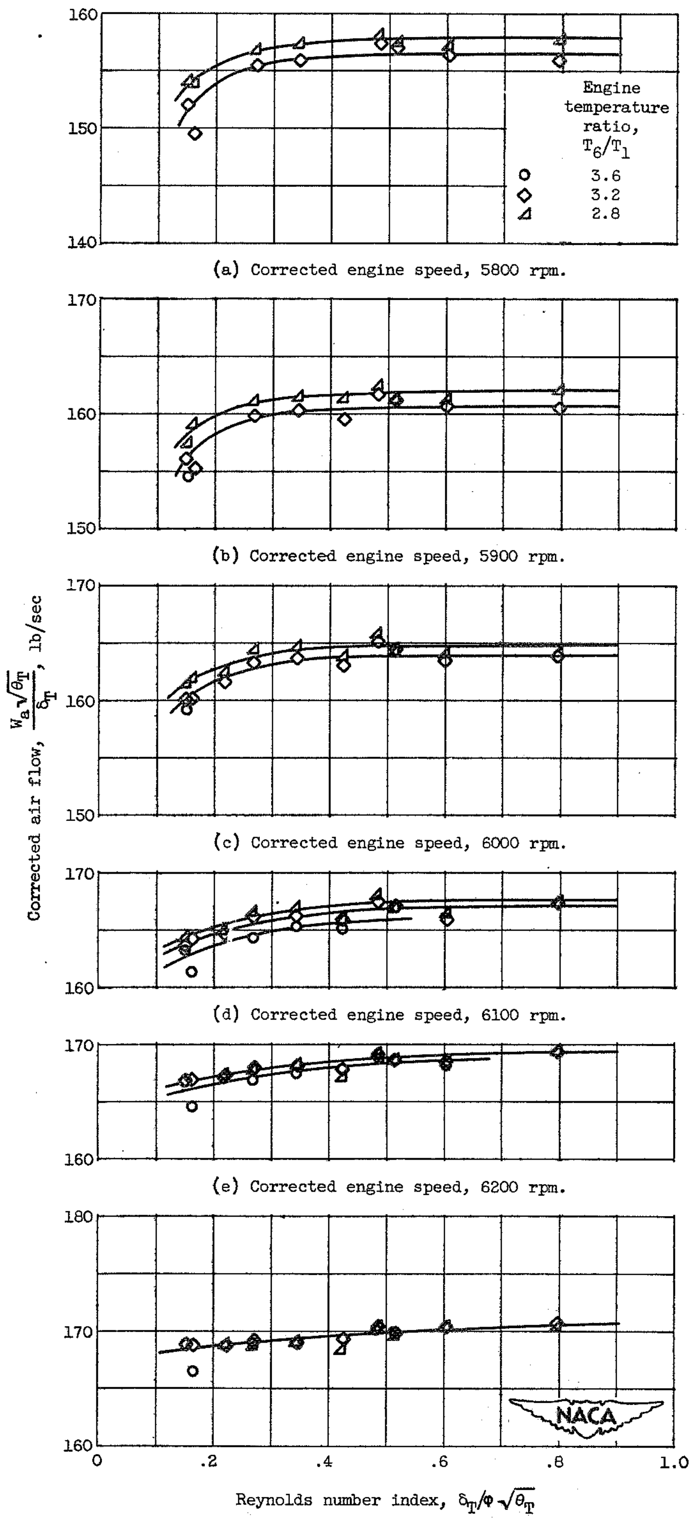
(e) Corrected engine speed, 6200 rpm.

Figure 11. - Continued. Variation of engine pressure ratio with Reynolds number index for various corrected engine speeds and engine temperature ratios.



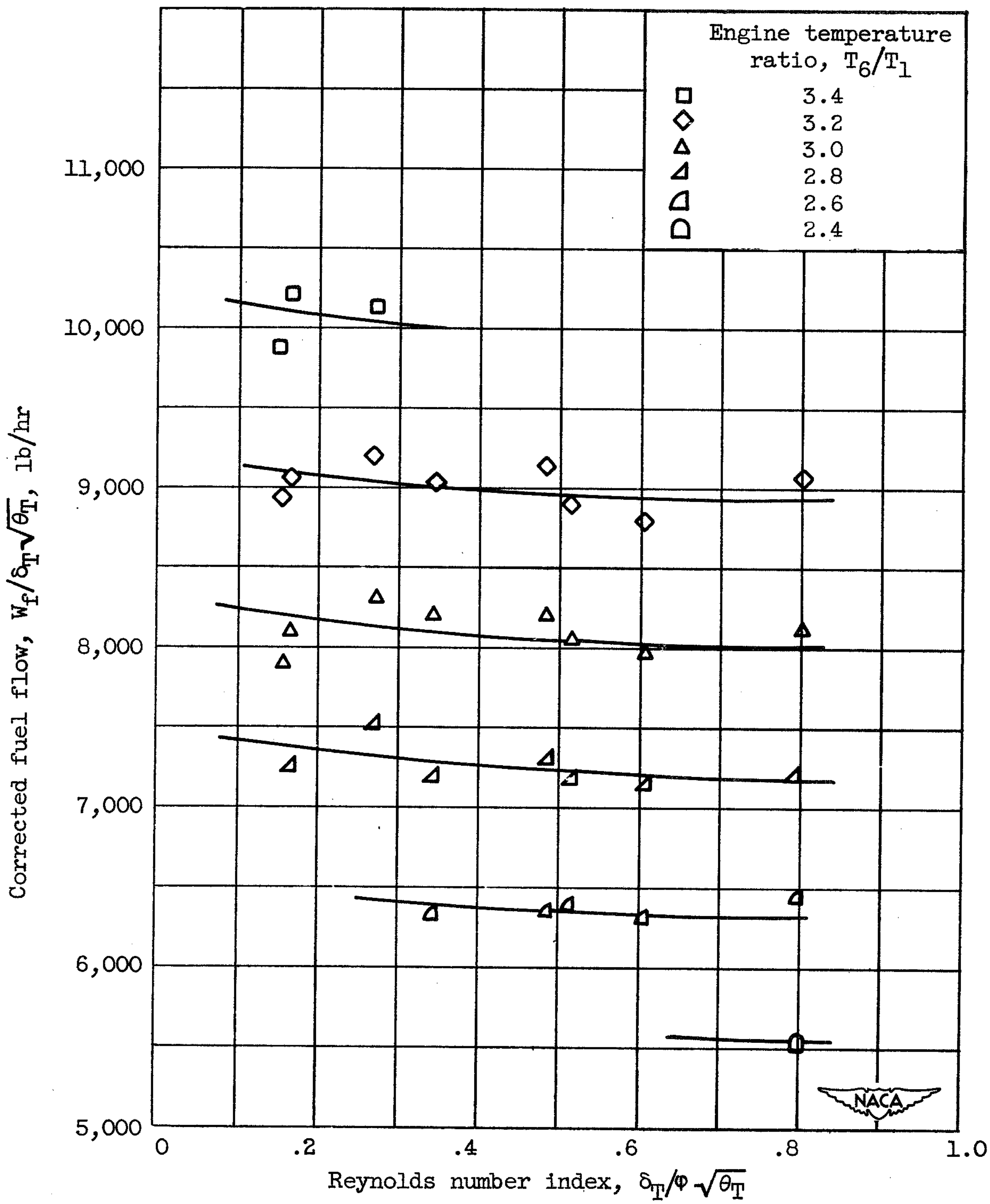
(f) Corrected engine speed, 6300 rpm.

Figure 11. - Concluded. Variation of engine pressure ratio with Reynolds number index for various corrected engine speeds and engine temperature ratios.



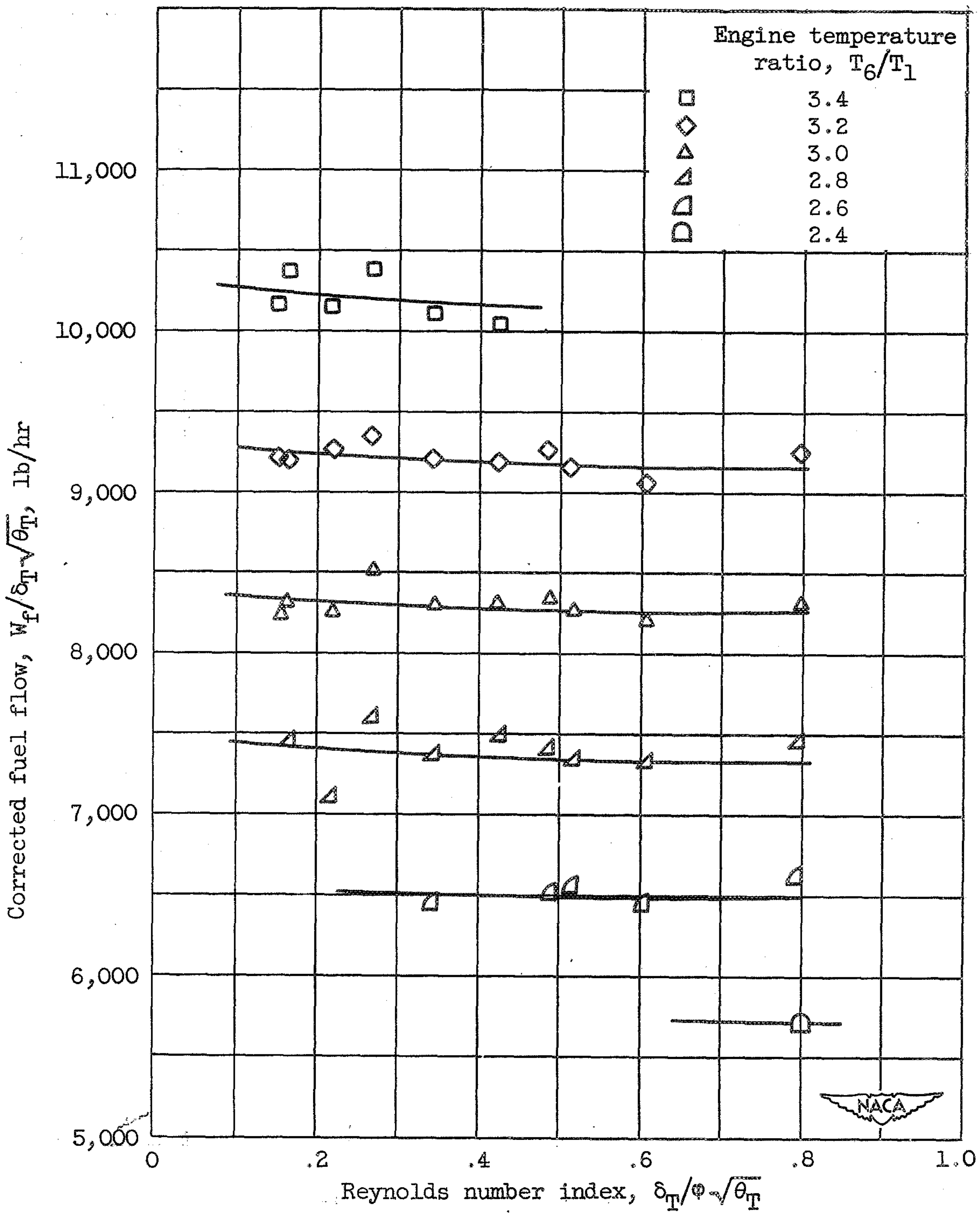
(f) Corrected engine speed, 6300 rpm.

Figure 12. - Variation of corrected air flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.



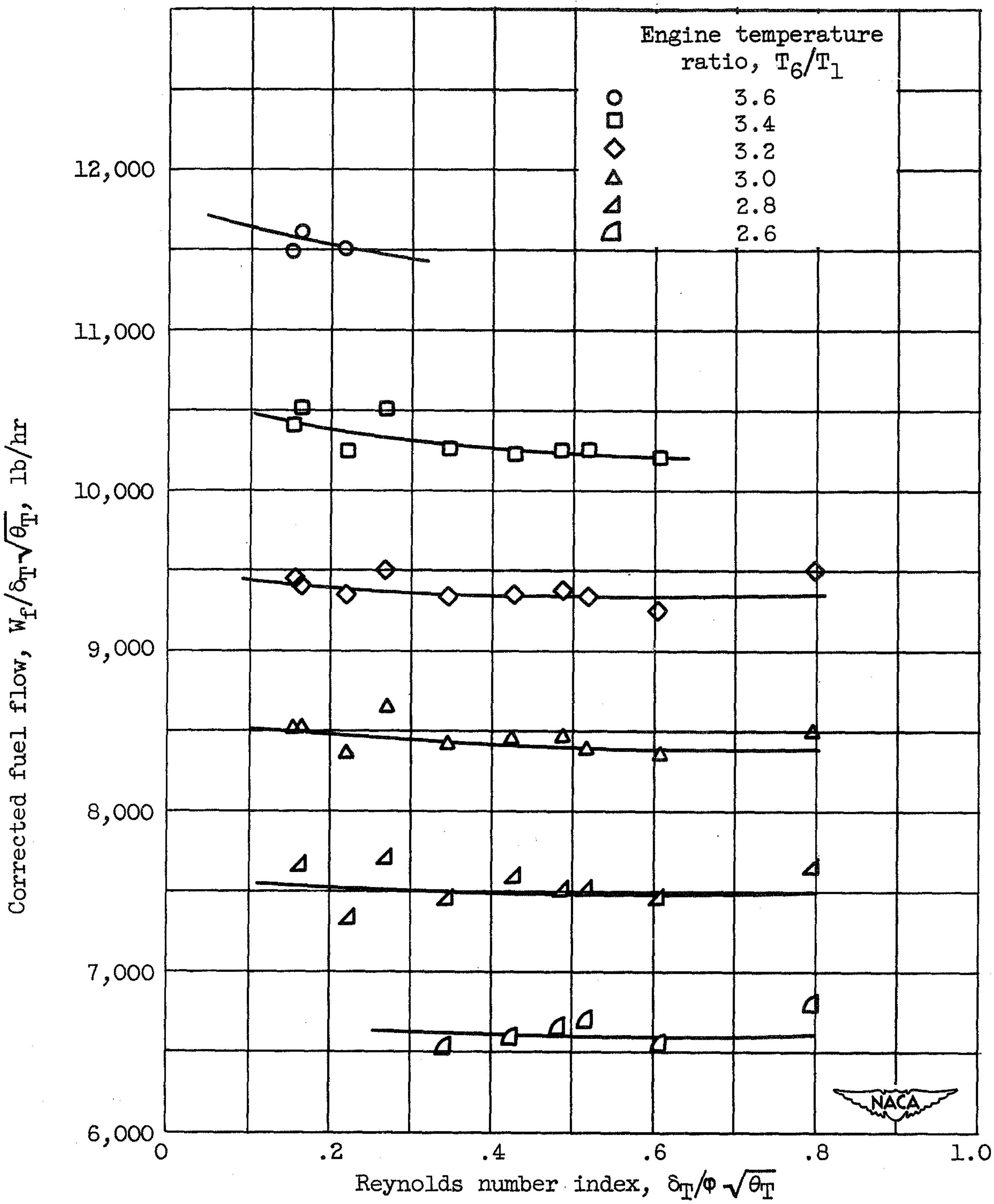
(a) Corrected engine speed, 5800 rpm.

Figure 13. - Variation of corrected fuel flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.



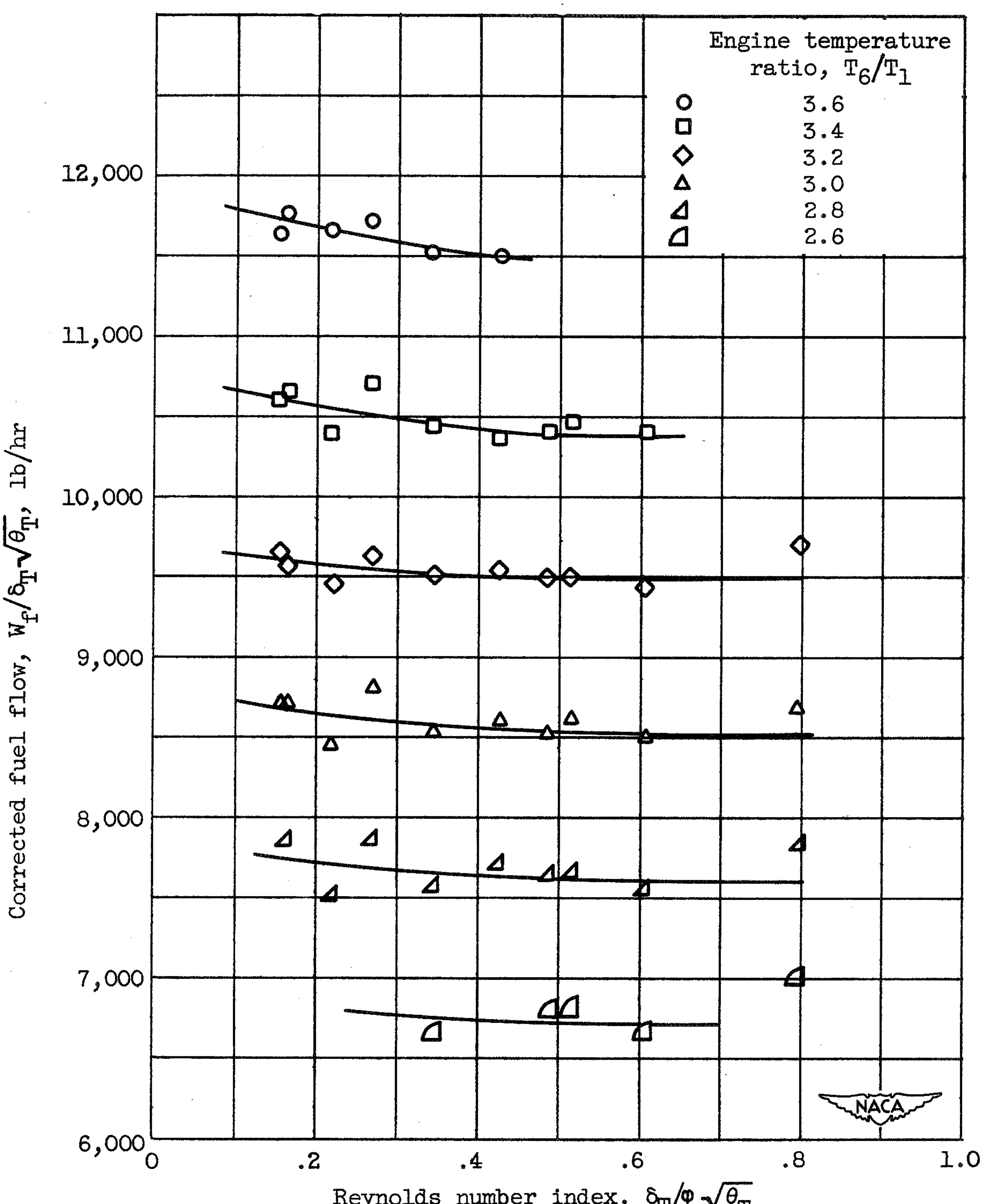
(b) Corrected engine speed, 5900 rpm.

Figure 13. - Continued. Variation of corrected fuel flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.



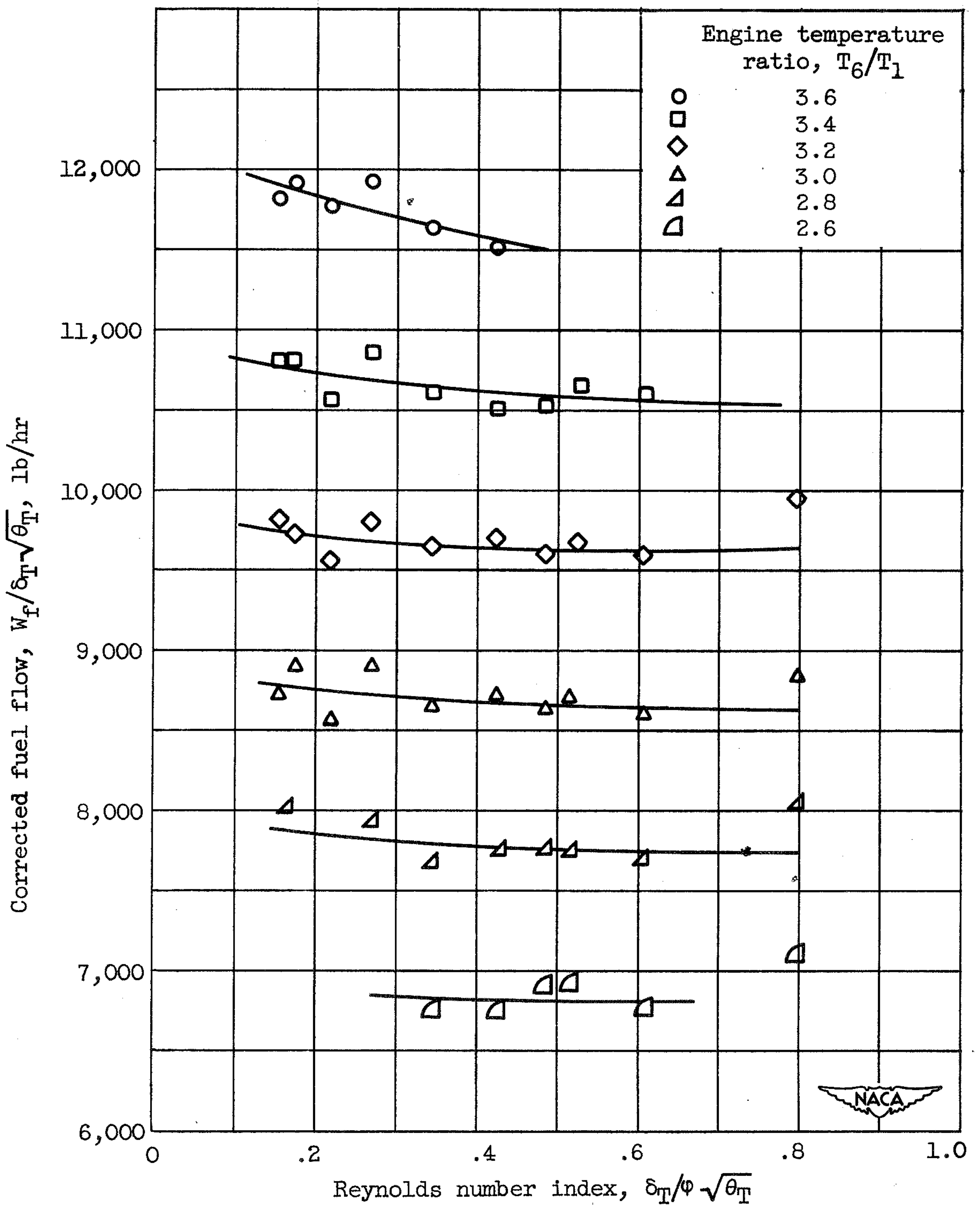
(c) Corrected engine speed, 6000 rpm.

Figure 13. - Continued. Variation of corrected fuel flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.



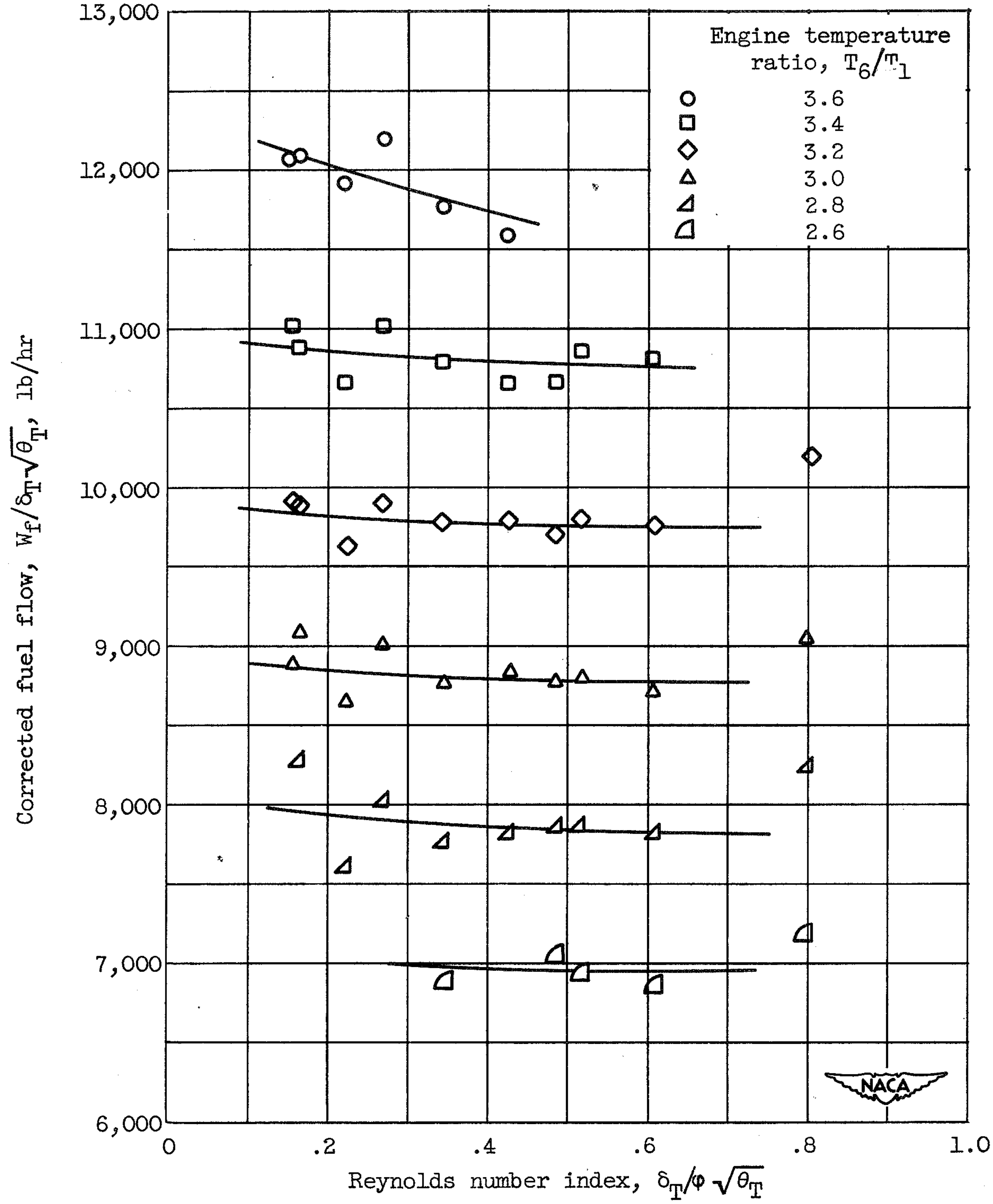
(d) Corrected engine speed, 6100 rpm.

Figure 13. - Continued. Variation of corrected fuel flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.



(e) Corrected engine speed, 6200 rpm.

Figure 13. - Continued. Variation of corrected fuel flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.



(f) Corrected engine speed, 6300 rpm.

Figure 13. - Concluded. Variation of corrected fuel flow with Reynolds number index for various corrected engine speeds and engine temperature ratios.

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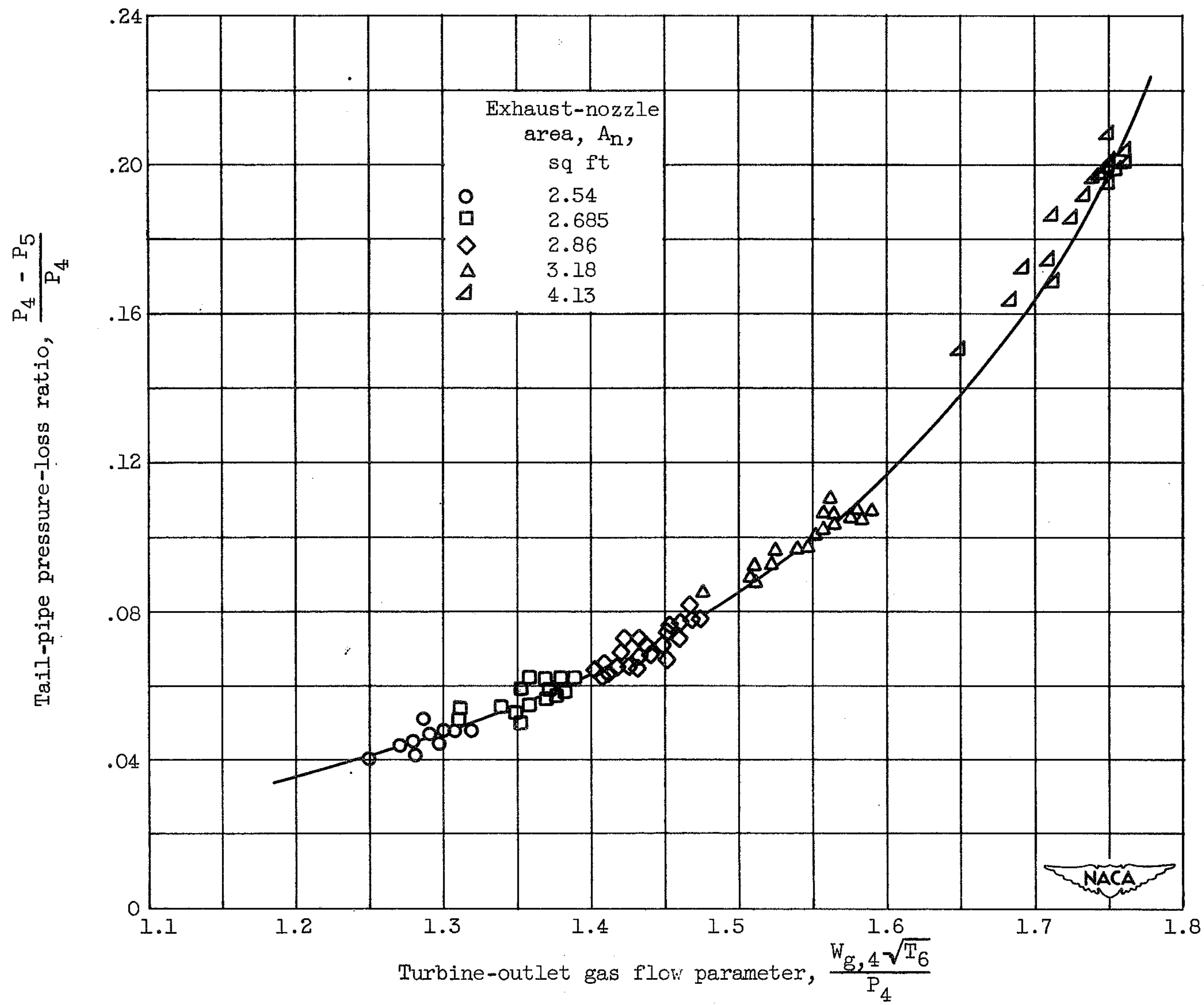

Figure 14. - Tail-pipe pressure loss.

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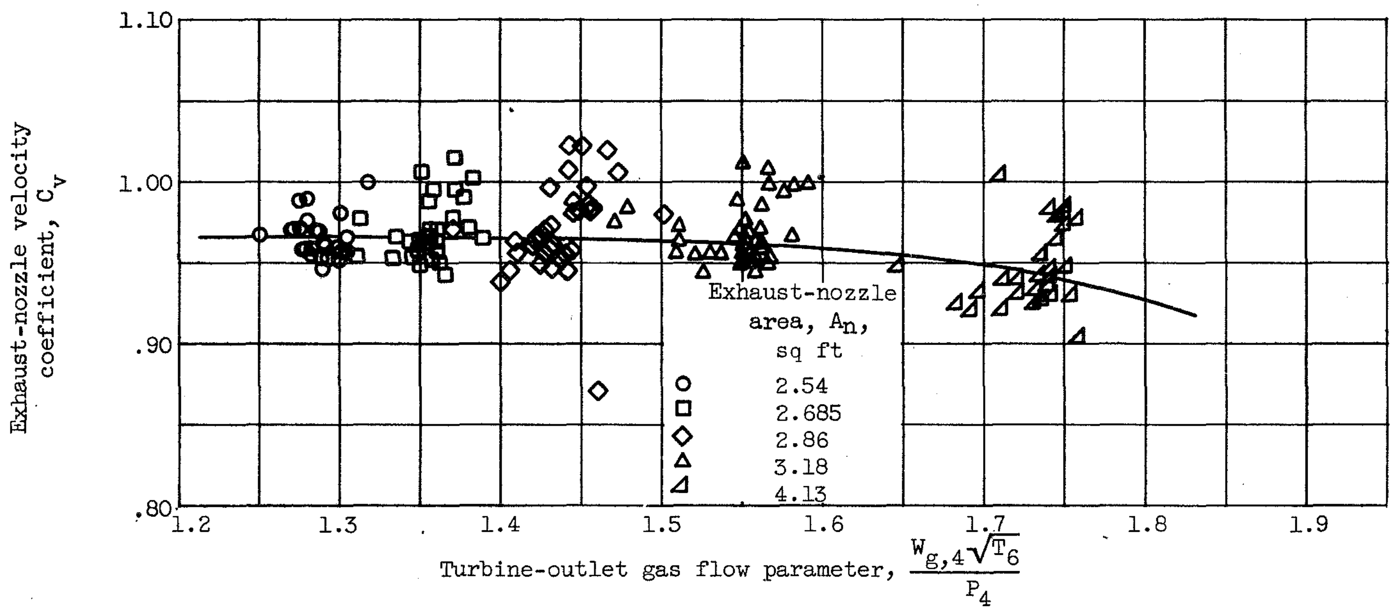

Figure 15. - Exhaust-nozzle velocity coefficient.

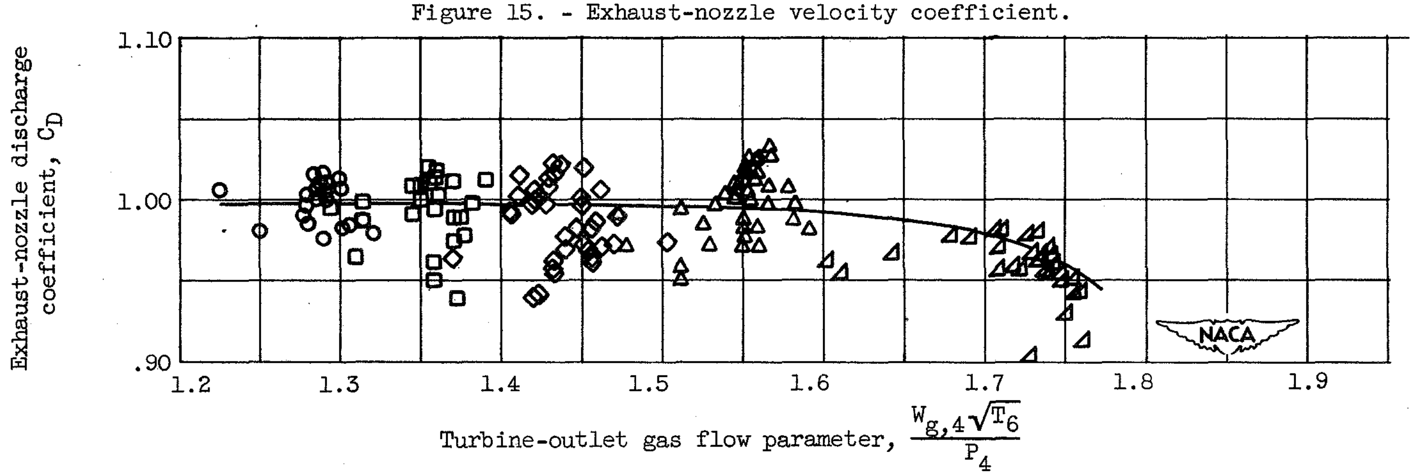

Figure 16. - Exhaust-nozzle discharge coefficient.

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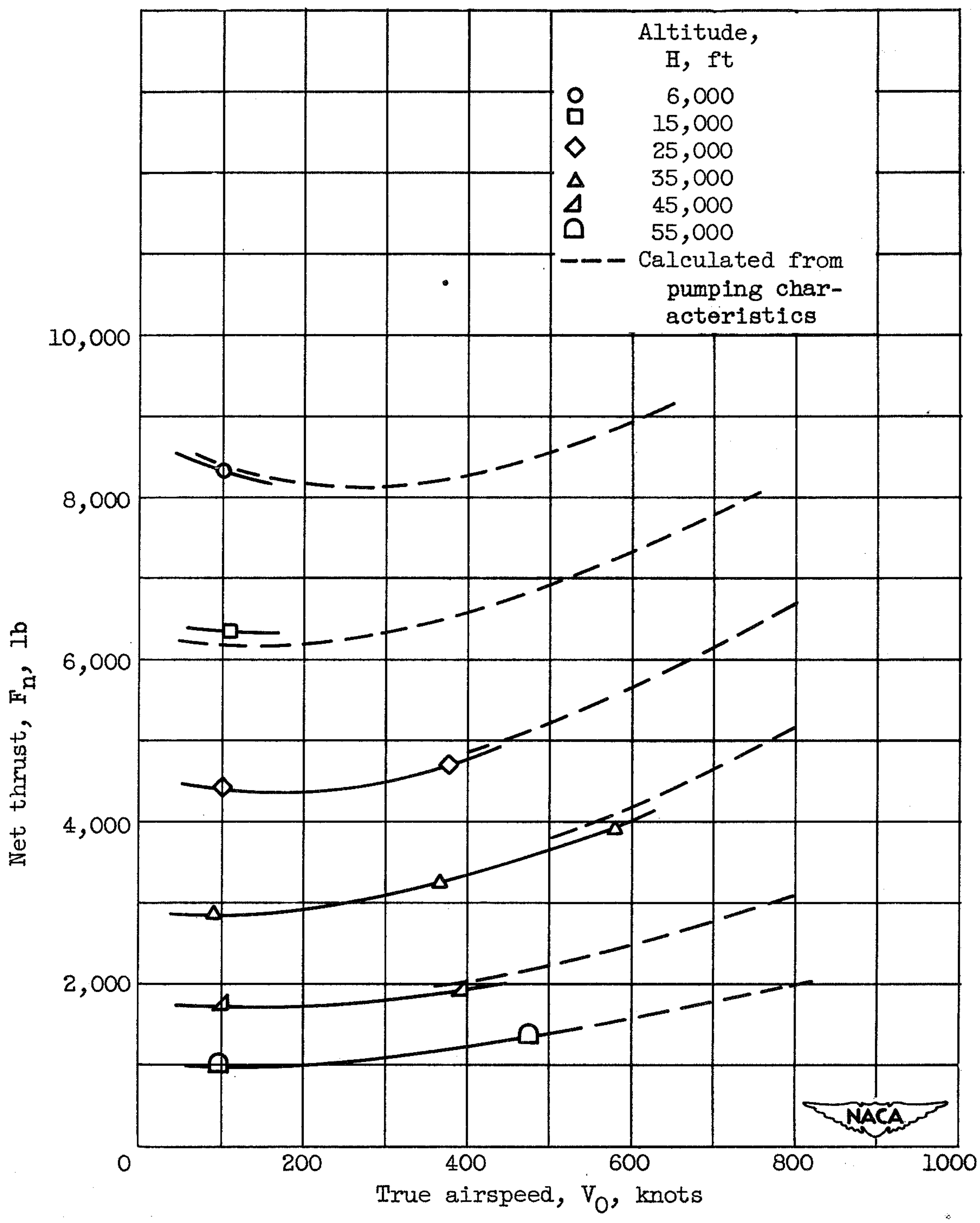


Figure 17. - Effect of true airspeed on net thrust at rated engine speed (6100 rpm) and rated turbine-outlet temperature (1685° R).

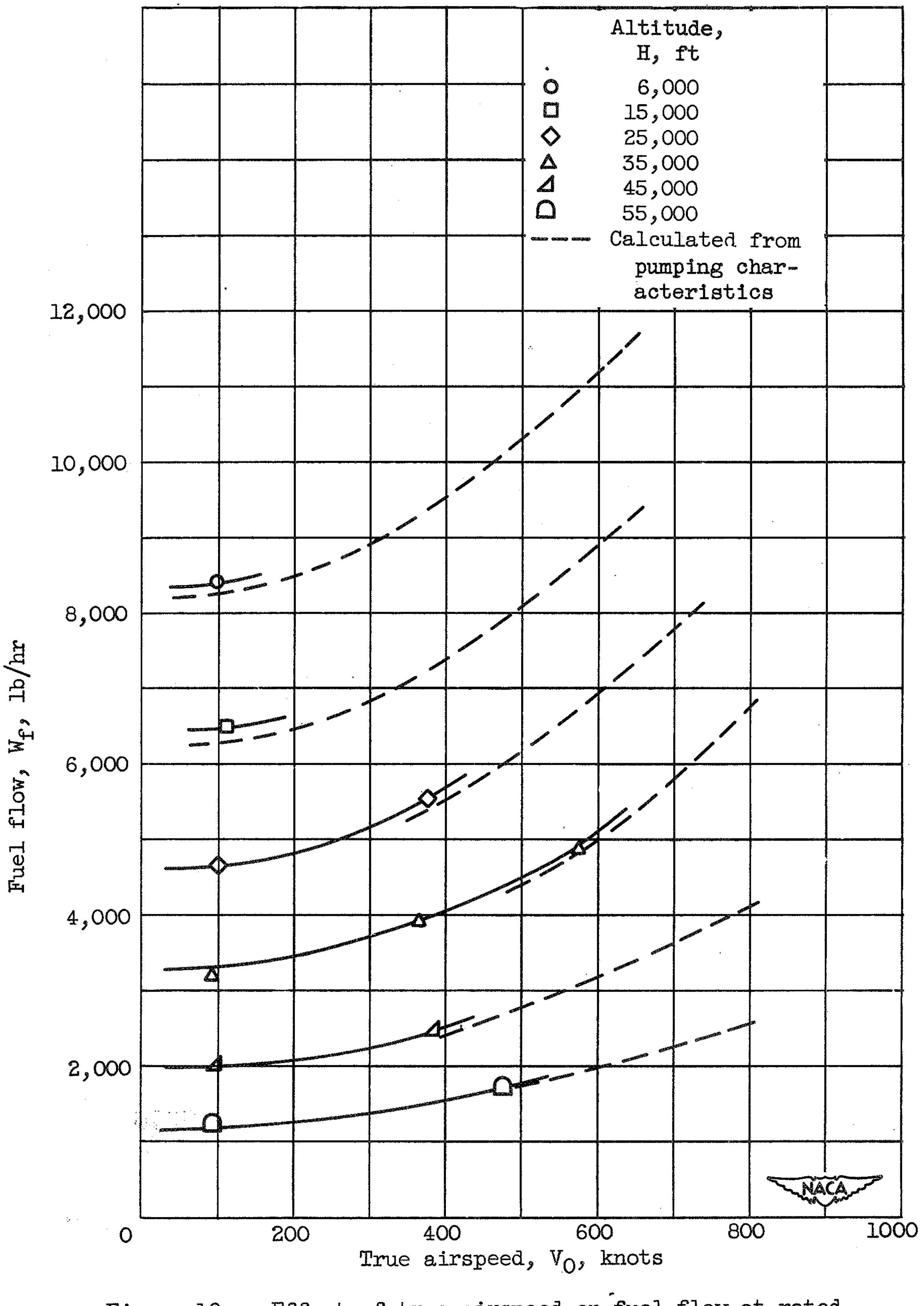
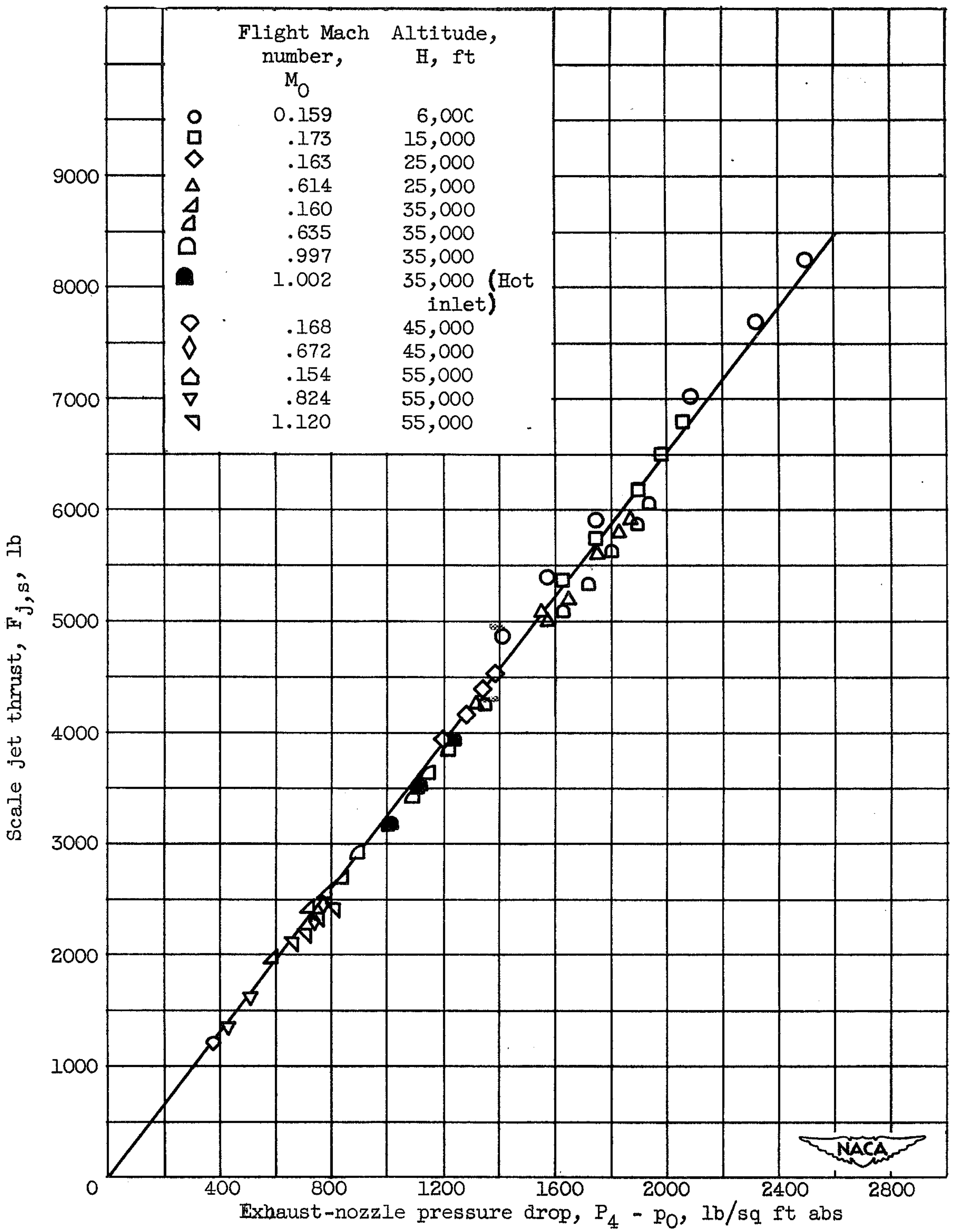
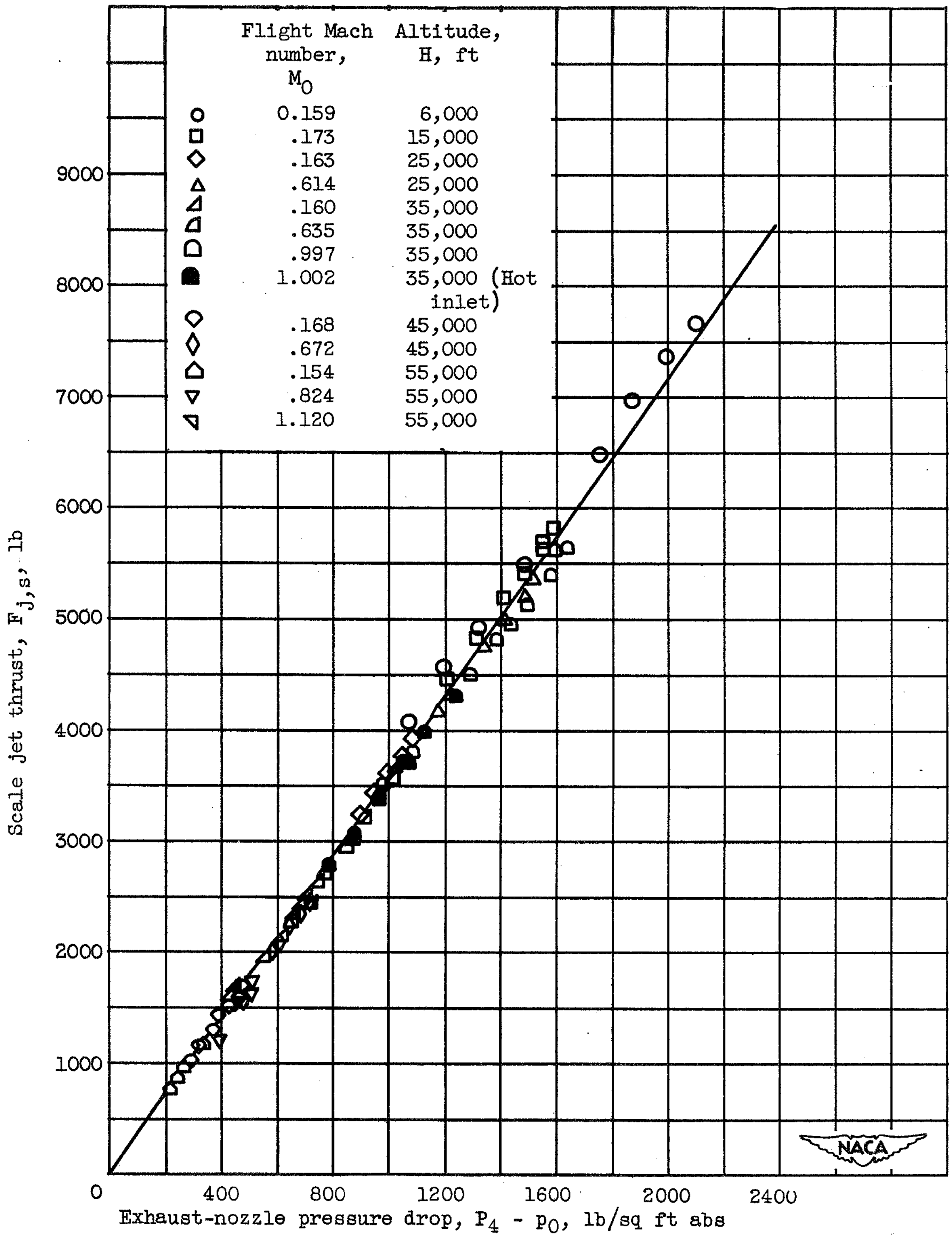


Figure 18. - Effect of true airspeed on fuel flow at rated engine speed (6100 rpm) and rated turbine-outlet temperature (1685° R).



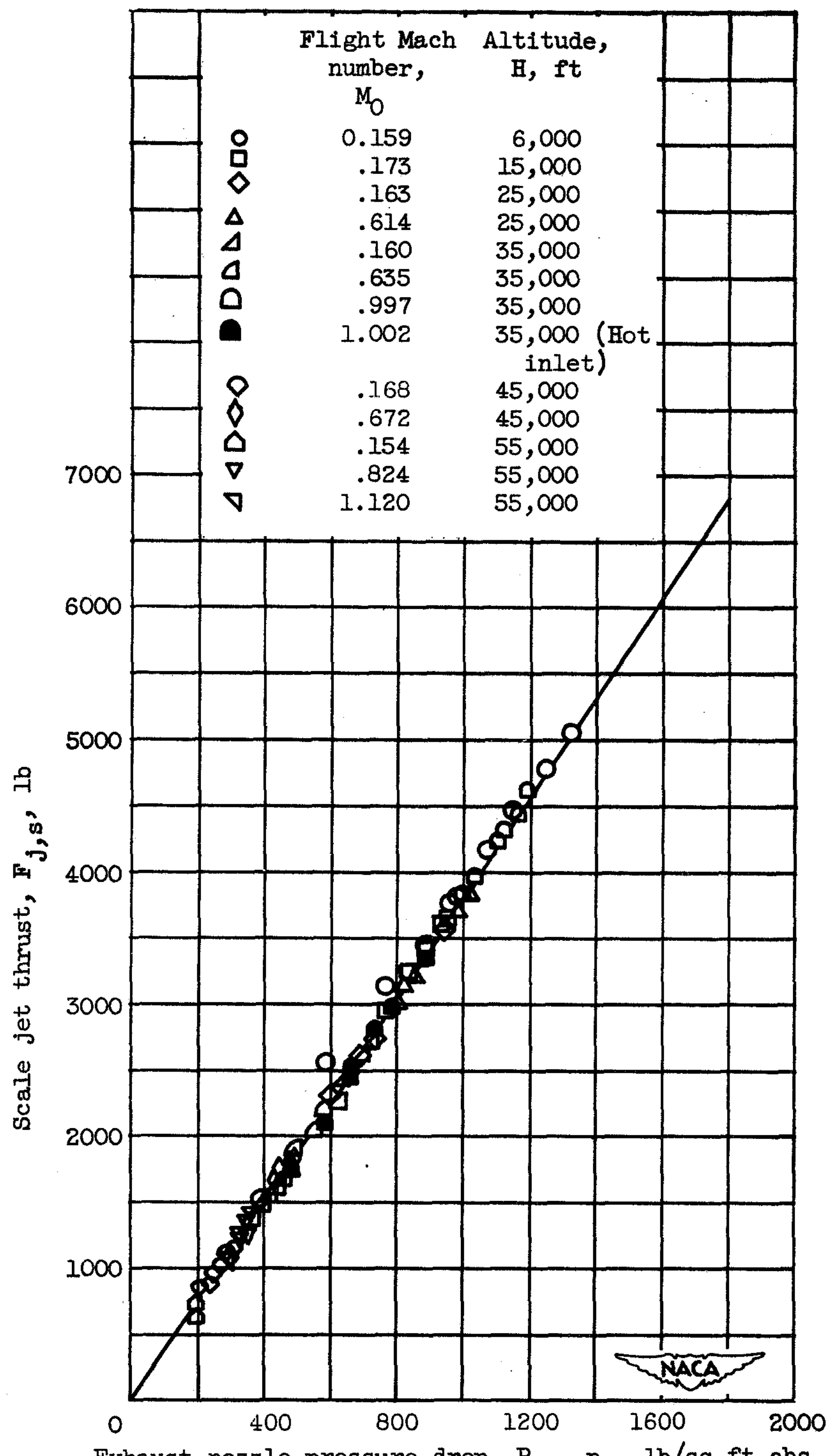
(a) Exhaust-nozzle area, 2.54 square feet.

Figure 19. - Correlation of jet thrust with exhaust-nozzle pressure drop for a range of flight conditions.



(b) Exhaust-nozzle area, 2.86 square feet.

Figure 19. - Continued. Correlation of jet thrust with exhaust-nozzle pressure drop for a range of flight conditions.



(c) Exhaust-nozzle area, 4.13 square feet.

Figure 19. - Concluded. Correlation of jet thrust with exhaust-nozzle pressure drop for a range of flight conditions.

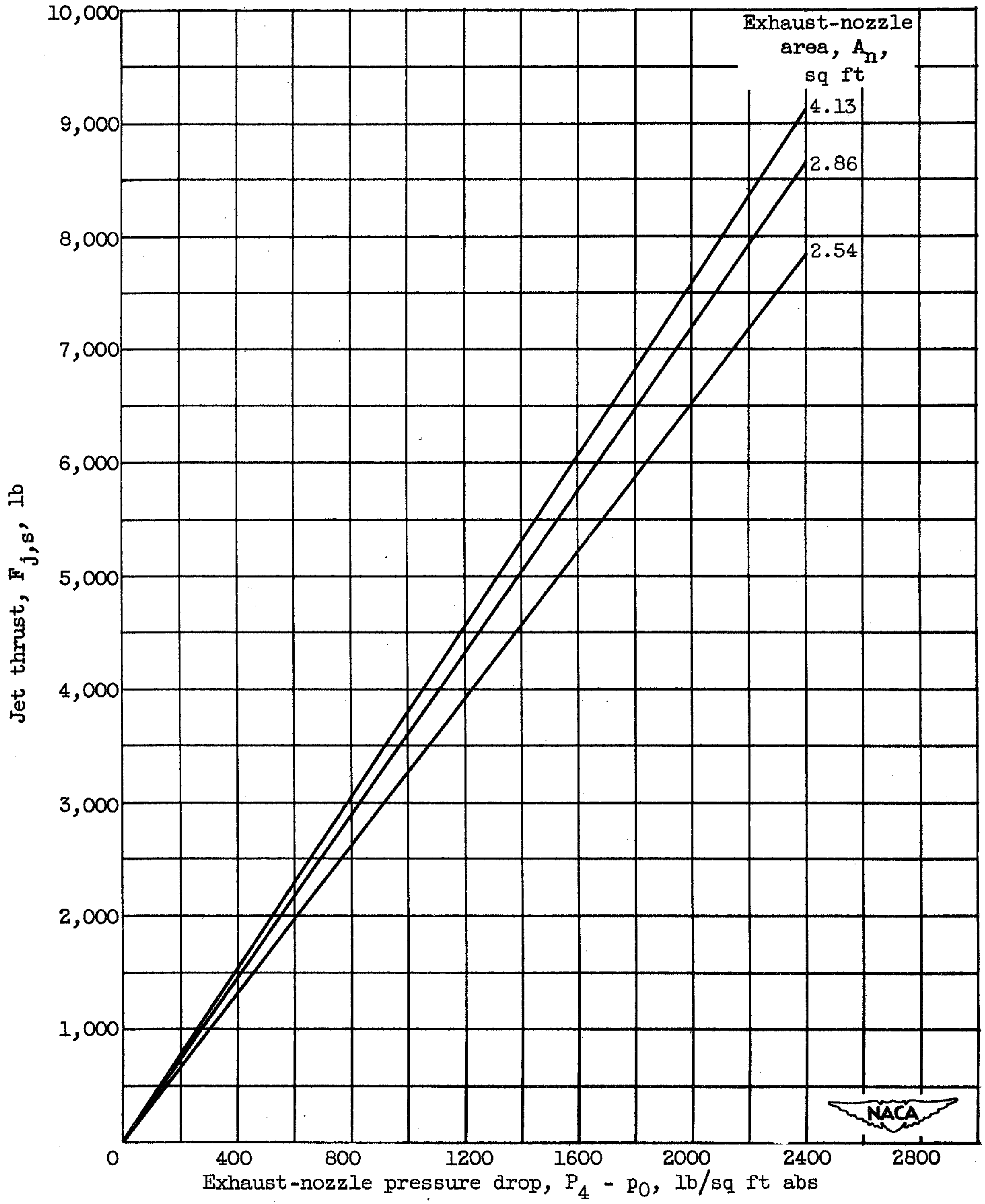


Figure 20. - Correlation of jet thrust with exhaust-nozzle pressure drop for three exhaust-nozzle areas over range of altitudes from 6000 to 55,000 feet and flight Mach numbers from 0.154 to 1.120.

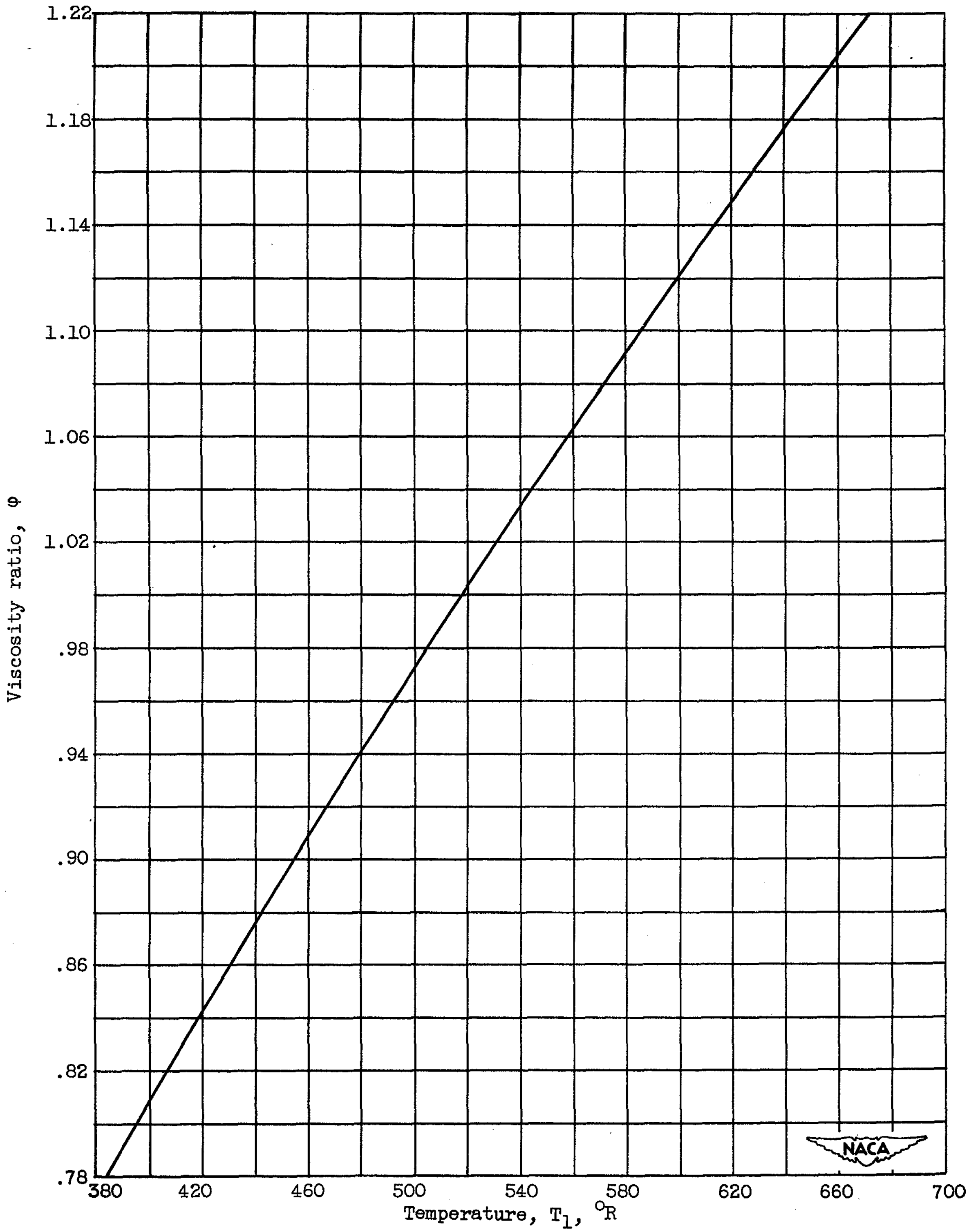


Figure 21. - **Variation** of viscosity ratio **with** temperature.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESEARCH MEMORANDUM

ALTITUDE PERFORMANCE AND OPERATIONAL CHARACTERISTICS

OF YJ71-A-7 TURBOJET ENGINE

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5/19/53

Engines, Turbojet 3.1.3

Smith, Ivan D., Leonard, Charles V., Jr., and Bloomer, Harry E.

Abstract

Altitude performance of a YJ71-A-7 turbojet engine, with afterburner inoperative, was determined in the NACA Lewis altitude wind tunnel over a wide range of flight conditions. Engine speed and exhaust-nozzle area were controlled independently during this investigation.

The variation of corrected values of air flow, net thrust, and fuel flow with corrected engine speed was not defined by a single curve with changes in altitude at given flight Mach number. Changes in altitude had very little effect on minimum specific fuel consumption at altitudes up to 45,000 feet. There is one exhaust-nozzle schedule that is nearly optimum for all flight conditions. Performance calculated from pumping characteristics agreed with experimental values and can therefore be used to extend engine performance data.