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# RESEARCH MEMORANDUM

for the

Bureau of Aeronautics, Navy Department

## PRELIMINARY RESULTS OF ALTITUDE-WIND-TUNNEL INVESTIGATION OF X24C-4B TURBOJET ENGINE

## II - ENGINE PERFORMANCE

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# PRELIMINARY RESULTS OF ALTITUDE-WIND-TUNNEL INVESTIGATION OF X24C-4B TURBOJET ENGINE

## II - ENGINE PERFORMANCE

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## SUMMARY

An investigation was conducted in the NACA Cleveland altitude wind tunnel to evaluate the performance characteristics of the X24C-4B turbojet engine over a range of simulated altitudes from 5000 to 45,000 feet, simulated flight Mach numbers from 0 to 1.08, and engine speeds from 4000 to 12,500 rpm. Performance data are presented to show graphically the effects of altitude at a flight Mach number of 0.25 and of flight Mach number at an altitude of 25,000 feet. The performance data are generalized to show the applicability of methods used to determine performance at any altitude from data obtained at a given altitude. A complete tabulation of performance data, as well as lubrication- and fuel-system data, is presented.

Performance parameters depending upon fuel consumption that are obtained from data at one altitude cannot be used to predict these parameters at other altitudes; however, thrust and air-flow values can be predicted for a limited range of altitudes from data taken at one altitude. The exhaust-gas total temperature increased at high engine speeds as the altitude was raised and decreased at all engine speeds as the flight Mach number was increased to 0.98. A further increase in flight Mach number to 1.08 did not affect the exhaust-gas total temperature. The specific fuel consumption based on net thrust increased when the altitude was raised above 15,000 feet. The specific fuel consumption based on net thrust increased as the flight Mach number was raised from 0.25 to 0.87 but was not appreciably affected by further increases in flight Mach number to 1.08.

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## INTRODUCTION

An investigation to evaluate the performance characteristics of the X24C-4B turbojet engine has been conducted in the NACA Cleveland altitude wind tunnel at the request of the Bureau of Aeronautics, Navy Department. Data have been obtained over a range of simulated altitudes and flight Mach numbers throughout the operable range of engine speeds. Extensive instrumentation was installed in the engine to obtain detailed information on the individual components of the engine, as well as the overall engine performance. Details of the instrumentation together with pressure and temperature surveys through the engine are presented in reference 1.

Data are presented herein to show the effects of altitude and flight Mach number on engine performance. The applicability of methods used to generalize the data in order to estimate the performance at various altitudes from performance data obtained at any altitude is discussed. A complete tabulation of performance data, as well as lubrication- and fuel-system data, is presented.

## INSTALLATION

The X24C-4B turbojet engine used in the altitude-wind-tunnel investigation has a sea-level static thrust rating of 3000 pounds at an engine speed of 12,500 rpm. At this rating, the air flow is approximately 58.5 pounds per second and the fuel consumption is 5200 pounds per hour. The engine has an 11-stage axial-flow compressor with a pressure ratio of approximately 3.8 at rated engine speed, a double-annulus combustion chamber, and a two-stage turbine. The exhaust nozzle used in this investigation had an outlet area of 183.1 square inches.

The engine was installed in a streamlined wing nacelle in the test section of the altitude wind tunnel. For this installation, an extended inlet duct, 5 feet long, and an extended tail pipe, 3 feet long, were used. For flight Mach numbers below 0.25, a wooden lip was attached to the inlet duct and air was supplied to the engine from the tunnel air stream (fig. 1(a)). Flight at Mach numbers above 0.25 was simulated by introducing air through the make-up air duct to the compressor inlet at total pressures corresponding to the desired Mach numbers (fig. 1(b)). This air was dried and refrigerated in the tunnel make-up air system and was throttled from approximately sea-level pressure to the desired pressure at the engine inlet. The make-up air duct was connected

to the engine-inlet duct by means of a labyrinth slip joint, which permitted thrust measurements to be made with the tunnel balance scales. For both inlet configurations, complete free-stream ram-pressure recovery was assumed at the compressor inlet.

The engine was extensively instrumented, as shown in figure 2. Pressure and temperature measurements were obtained at eight stations in the engine. A more complete description of the engine, the installation, and the instrumentation is given in reference 1.

## PROCEDURE

Performance characteristics of the engine were obtained at pressure altitudes from 5000 to 45,000 feet, simulated flight Mach numbers from 0 to 1.08, and engine speeds from 4000 to 12,500 rpm. The inlet-air temperature was held at approximately NACA standard values corresponding to the simulated flight conditions, except for high altitudes and low flight Mach numbers. No inlet-air temperatures below -20° F were obtained. A fixed-area exhaust nozzle having an outlet area of 183.1 square inches was used. In order to conserve turbine life, the maximum temperature, as read on any thermocouple at the turbine outlet, was limited to 1250° F. The engine was not operated at an engine speed of 12,500 rpm with this exhaust nozzle at high altitudes and low flight Mach numbers because of excessive turbine-outlet temperatures.

Thrust was measured with the tunnel balance scales and was also calculated from pressure and temperature measurements obtained at the exhaust-nozzle outlet (station 8). In order to correct the scale thrust measurements for external-drag forces, power-off drag runs were made for both engine-inlet configurations. Air flow was calculated from pressure and temperature measurements made at the cowl inlet (station 1) and at the exhaust-nozzle outlet (station 8). Both values of thrust and air flow are presented in the tabulated data; calculated performance parameters and all performance curves involving thrust and air flow are based on thrust measured by the balance scales and air flow measured at the cowl inlet. The symbols and the methods of calculation used in this report are presented in the appendix.

## RESULTS AND DISCUSSION

Performance data obtained at an altitude of 5000 feet and static conditions have been corrected to standard sea-level

conditions and compared with corrected performance data obtained from the Navy acceptance test of the engine at sea-level static conditions (fig. 3). The two sets of data, which are compared on the basis of corrected jet thrust (fig. 3(a)), corrected air flow (fig. 3(b)), and corrected fuel consumption (fig. 3(c)) are in agreement. A corrected jet thrust of approximately 3100 pounds was obtained at a corrected engine speed of 12,500 rpm (fig. 3(a)); thus the rated thrust of the engine was obtained. At the corrected engine speed of 12,500 rpm, the corrected air flow (fig. 3(b)) was approximately 58.5 pounds per second and the corrected fuel consumption (fig. 3(c)) was approximately 3300 pounds per hour.

After the investigation at an altitude of 5000 feet and a flight Mach number of 0 had been completed, a turbine failure occurred. A new turbine assembly was then installed in the engine, and data at other altitudes and flight Mach numbers were obtained. Although no data were obtained at a flight Mach number of 0 after the installation of the new turbine, a study of the data indicated that the corrected jet thrust would have been approximately 2930 pounds at a corrected engine speed of 12,500 rpm and a flight Mach number of 0.

A summary of pertinent engine performance data is presented in table I for the range of operating conditions investigated with the new turbine assembly. A summary of lubrication- and fuel-system data is presented in table II for the same operating conditions.

## Engine Performance

Effect of altitude. - Performance data obtained at a constant flight Mach number of 0.25 at altitudes from 5000 to 45,000 feet are presented to show the effect of altitude on jet thrust (fig. 4(a)), net thrust (fig. 4(b)), air flow (fig. 4(c)), fuel consumption (fig. 4(d)), specific fuel consumption based on net thrust (fig. 4(e)), fuel-air ratio (fig. 4(f)), and exhaust-gas total temperature (fig. 4(g)). As the altitude was raised, the jet thrust, net thrust, air flow, and fuel consumption decreased uniformly. Above an altitude of 15,000 feet, the maximum engine speed was limited by turbine-outlet temperature.

The specific fuel consumption based on net thrust (fig. 4(e)) was unaffected at any engine speed when the altitude was raised from 5000 to 15,000 feet, but was increased at all engine speeds when the altitude was raised above 15,000 feet. The minimum specific fuel consumption at each altitude occurred at an engine

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speed between 11,500 and 12,000 rpm. At an engine speed of 11,500 rpm, the specific fuel consumption based on net thrust increased from 1.13 pounds per hour per pound of thrust at altitudes of 5000 and 15,000 feet to 1.34 at an altitude of 45,000 feet.

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The fuel-air ratio (fig. 4(f)) increased as the altitude was raised; the increase in fuel-air ratio became more pronounced at the higher altitudes. The minimum fuel-air ratio occurred at an engine speed between 9500 and 10,000 rpm for each altitude. At an engine speed of 11,500 rpm, the fuel-air ratio increased from 0.0110 at an altitude of 5000 feet to 0.0174 at an altitude of 45,000 feet.

At high engine speeds, the exhaust-gas total temperature increased as the altitude was raised. At an engine speed of 11,500 rpm, the exhaust-gas total temperature increased from 1315° R at an altitude of 5000 feet to 1540° R at an altitude of 45,000 feet. At the low engine speeds, the variation of exhaust-gas total temperature with altitude was inconsistent. By use of a variable-area exhaust nozzle, the exhaust-gas temperature could be lowered, thereby permitting operation at maximum engine speed at the higher altitudes.

Effect of flight Mach number. - Performance data obtained at an altitude of 25,000 feet at flight Mach numbers from 0.25 to 1.08 are presented to show the effect of flight Mach number on jet thrust (fig. 5(a)), net thrust (fig. 5(b)), air flow (fig. 5(c)), fuel consumption (fig. 5(d)), specific fuel consumption based on net thrust (fig. 5(e)), fuel-air ratio (fig. 5(f)), and exhaust-gas total temperature (fig. 5(g)). Throughout the entire range of engine speeds, raising the flight Mach number increased the jet thrust and air flow and reduced the fuel-air ratio.

Raising the flight Mach number from 0.25 to 0.53 decreased the net thrust (fig. 5(b)) throughout the range of engine speeds for which data were obtained. As the flight Mach number was increased beyond 0.53, the net thrust decreased at low engine speeds and increased at high engine speeds.

As the flight Mach number was raised, the fuel consumption increased at engine speeds above approximately 10,500 rpm and decreased at lower engine speeds. The specific fuel consumption based on net thrust increased at all engine speeds as the flight Mach number was raised from 0.25 to 0.87, but was not appreciably affected by further increases in flight Mach number to 1.08.

At all engine speeds, the exhaust-gas total temperature was reduced as the flight Mach number was increased to 0.98. A further increase in flight Mach number to 1.08, however, did not appreciably affect the exhaust-gas temperature. At an engine speed of 12,500 rpm, the exhaust-gas total temperature decreased from 1550° R at a flight Mach number of 0.25 to 1405° R at a flight Mach number of 1.08. In order to obtain maximum thrust at high flight Mach numbers, use of a variable-area exhaust nozzle would be desirable. By control of the exhaust-nozzle area, a limiting exhaust-gas temperature and, consequently, maximum thrust could be obtained at a given engine speed regardless of flight Mach number. The variable-area nozzle, however, should have a thrust coefficient comparable to that of a fixed-area nozzle.

## Generalized Performance

Altitude performance data presented in figures 4 and 5 have been generalized to standard sea-level conditions by use of the factors $\delta$ and $\theta$. The generalized performance data are presented in figures 6 and 7. The concept of flow similarity and the application of dimensional analysis to the performance of turbojet engines has led to the development of these factors with which data obtained at several altitudes may be generalized. In the development of this method of generalization, the efficiencies of the engine components were considered to be unaffected by changes in altitude. Any changes in component efficiencies therefore lessen the possibility of generalizing data obtained at different altitudes to a single curve.

Effect of altitude. - Data obtained at a constant flight Mach number of 0.25 at altitudes from 5000 to 45,000 feet are compared to show the effect of altitude on the corrected values of jet thrust (fig. 6(a)), net thrust (fig. 6(b)), air flow (fig. 6(c)), fuel consumption (fig. 6(d)), specific fuel consumption based on net thrust (fig. 6(e)), fuel-air ratio (fig. 6(f)), and exhaust-gas total temperature (fig. 6(g)).

Jet thrust, net thrust, and air flow were the only performance parameters that generalized to a single curve at any engine speed or altitude for which data were obtained. Jet-thrust (fig. 6(a)) and net-thrust (fig. 6(b)) data generalized to single curves at altitudes up to 25,000 feet for the range of engine speeds and at all altitudes for corrected engine speeds below 9500 rpm. At corrected engine speeds higher than 9500 rpm, however, the corrected jet thrust and corrected net thrust increased as the altitude was raised above 25,000 feet. The air-flow data (fig. 6(c))

generalized to a single curve at altitudes up to 15,000 feet for all engine speeds, but any increase in altitude above 15,000 feet reduced the corrected air flow for all engine speeds.

Parameters depending upon fuel consumption did not generalize to a single curve for any engine speed or altitude at which data were obtained. Corrected fuel consumption (fig. 6(d)), corrected specific fuel consumption based on net thrust (fig. 6(e)), corrected fuel-air ratio (fig. 6(f)), and corrected exhaust-gas total temperature (fig. 6(g)) increased markedly as the altitude was raised.

Failure of the various performance data to generalize to a single curve for all altitudes and corrected engine speeds is attributed to changes in component efficiencies with altitude. A study of the data has shown that the compressor efficiency for any corrected engine speed decreased as the altitude was raised above 15,000 feet.

The effect of altitude on the components was such that raising the altitude resulted in increased corrected fuel consumption and, consequently, higher corrected fuel-air ratios. This increased fuel-air ratio raised the corrected temperatures and the corrected pressures within the engine.

The increased corrected temperatures and corrected pressures in the tail pipe were of such magnitude with respect to the decreased corrected air flow that the jet thrust and net thrust generalized to single curves for all engine speeds at altitudes up to 25,000 feet but increased at high engine speeds with increases in altitude above 25,000 feet. As the altitude was raised, the corrected fuel consumption increased at a greater rate than the corrected net thrust, which resulted in a rise in corrected specific fuel consumption based on net thrust at all corrected engine speeds. Performance parameters depending upon fuel consumption that are obtained from data at one altitude cannot be used to predict these parameters at other altitudes; however, thrust and air-flow values can be predicted for a limited range of altitudes and engine speeds from data taken at one altitude.

Effect of flight Mach number. - Data obtained at an altitude of 25,000 feet and flight Mach numbers from 0.25 to 1.08 have been compared to show the effect of flight Mach number on the corrected values of jet thrust (fig. 7(a)), net thrust (fig. 7(b)), air flow (fig. 7(c)), fuel consumption (fig. 7(d)), specific fuel consumption based on net thrust (fig. 7(e)), fuel-air ratio (fig. 7(f)),

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and exhaust-gas total temperature (fig. 7(g)). The effect of flight Mach number on the generalized performance data was similar to the effect on the engine performance data presented in figure 5. Inasmuch as the data for a constant flight Mach number and varying altitude did not generalize to single curves, the sea-level engine performance would be somewhat different from that presented in figure 7. The effect of flight Mach number on sea-level performance, however, would probably be similar to that on performance data generalized from 25,000 feet.

## SUMMARY OF RESULTS

An investigation of the performance of the X24C-4B turbojet engine in the Cleveland altitude wind tunnel at altitudes from 5000 to 45,000 feet and flight Mach numbers from 0 to 1.08 gave the following results:

1. Performance parameters depending upon fuel consumption that are obtained from data at one altitude cannot be used to predict these parameters at other altitudes; however, thrust and air-flow values can be predicted for a limited range of altitudes and engine speeds from data taken at one altitude.

2. Increasing the altitude raised the exhaust-gas total temperature at high engine speeds. The exhaust-gas total temperature was lowered at all engine speeds by increases in flight Mach number to 0.98; however, a further increase in flight Mach number to 1.08 did not affect this temperature.

3. The specific fuel consumption based on net thrust was unaffected at any engine speed when the altitude was raised from 5000 to 15,000 feet, but was increased at all engine speeds when the altitude was raised above 15,000 feet.

4. The specific fuel consumption based on net thrust increased at all engine speeds as the flight Mach number was raised from 0.25 to 0.87, but was not appreciably affected by further increases in flight Mach number to 1.08.

Flight Propulsion Research Laboratory,
National Advisory Committee for Aeronautics,
Cleveland, Ohio, December 9, 1947.

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## APPENDIX - CALCULATIONS

### Symbols

The following symbols are used in this report:

| | |
|---|---|
| $A$ | cross-sectional area, sq ft |
| $B$ | thrust-scale reading, lb |
| $c_p$ | specific heat of gas at constant pressure, Btu/(lb)(°R) |
| $D$ | external drag of installation, lb |
| $F_j$ | jet thrust, lb |
| $F_n$ | net thrust, lb |
| $f/a$ | fuel-air ratio |
| $g$ | acceleration of gravity, 32.2 ft/sec$^2$ |
| $J$ | mechanical equivalent of heat, 778 ft-lb/Btu |
| $M_0$ | flight Mach number |
| $m_a$ | mass rate of flow of air, slugs/sec |
| $N$ | engine speed, rpm |
| $P$ | total pressure, lb/sq ft absolute |
| $p$ | static pressure, lb/sq ft absolute |
| $R$ | gas constant, 53.3 ft-lb/(lb)(°R) |
| $T$ | total temperature, °R |
| $T_i$ | indicated temperature, °R |
| $t$ | static temperature, °R |
| $V$ | velocity, ft/sec |
| $W_a$ | air flow, lb/sec |

$\tilde{W}_f$ fuel consumption, lb/hr

$W_g$ gas flow, lb/sec

$W_f/F_n$ specific fuel consumption based on net thrust, lb/(hr)(lb thrust)

$\gamma$ ratio of specific heats

$\delta$ ratio of absolute ambient static pressure to absolute static pressure of NACA standard atmosphere at sea level

$\theta$ ratio of absolute ambient static temperature to absolute static temperature of NACA standard atmosphere at sea level

Subscripts:

0 free air stream

x engine-inlet duct at slip joint

1 cowl inlet

2 compressor inlet

8 exhaust-nozzle outlet

The data are generalized to NACA standard sea-level conditions by the following parameters:

$F_j/\delta$ corrected jet thrust, lb

$F_n/\delta$ corrected net thrust, lb

$(f/a)/\theta$ corrected fuel-air ratio

$N/\sqrt{\theta}$ corrected engine speed, rpm

$T_8/\theta$ corrected exhaust-gas total temperature, $^{\circ}R$

$(W_a\sqrt{\theta})/\delta$ corrected air flow, lb/sec

$W_f/(\delta\sqrt{\theta})$ corrected fuel consumption, lb/hr

$W_f/(F_n\sqrt{\theta})$ corrected specific fuel consumption based on net thrust, lb/(hr)(lb thrust)

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## Methods of Calculation

Thrust. - Thrust was determined from measurements on the tunnel balance scales and by calculation from temperature and pressure measurements obtained at the exhaust-nozzle outlet (station 8). Thrust values presented in the figures were obtained with the tunnel balance scales. With a wooden lip on the inlet duct and air taken from the tunnel air stream, the jet thrust was determined from the balance-scale measurements by means of the following relation:

$$F_j = B + D + m_a V_0$$

When the make-up air duct was attached to the inlet of the engine to obtain high flight Mach numbers, the jet thrust was determined from the balance-scale measurements by use of the relation

$$F_j = B + D + m_a V_x + A_x (p_x - p_0)$$

Jet thrust was calculated from temperature and pressure measurements obtained at the exhaust-nozzle outlet by use of the relation

$$F_j = \frac{2\gamma_8}{\gamma_8 - 1} p_8 A_8 \left[\left(\frac{P_8}{p_8}\right)^{\frac{\gamma_8 - 1}{\gamma_8}} - 1\right] + A_8 (p_8 - p_0)$$

Air flow. - Engine air flow was calculated from temperature and pressure measurements at the cowl inlet (station 1) and at the exhaust-nozzle outlet (station 8). Both air-flow measurements are presented in the tabulated data, but the air flow presented in the performance curves was obtained from measurements at the cowl inlet. Air flow at the inlet was calculated from

$$W_{a,1} = \frac{p_1 A_1}{R} \sqrt{\frac{2Jgc_p}{t_1} \left[\left(\frac{P_1}{p_1}\right)^{\frac{\gamma_1 - 1}{\gamma_1}} - 1\right]}$$

Gas flow at the exhaust-nozzle outlet was calculated from the relation

$$W_{g,8} = \frac{p_8 A_8}{R}\sqrt{\frac{2Jgc_p}{t_8}\left[\left(\frac{P_8}{p_8}\right)^{\frac{\gamma_8 - 1}{\gamma_8}} - 1\right]}$$

Air flow was then determined from:

$$W_{a,8} = W_{g,8} - \frac{W_f}{3600}$$

Temperature. - The engine inlet and exhaust-nozzle-outlet static temperatures were calculated from the indicated temperature, using a thermocouple recovery factor of 0.85, and respective values of pressure, temperature, and ratio of specific heats:

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

Flight Mach number. - The flight Mach number was calculated from the compressor-inlet total pressure with complete ram-pressure recovery assumed.

$$M_0 = \sqrt{\frac{2}{\gamma_2 - 1}\left[\left(\frac{P_2}{p_0}\right)^{\frac{\gamma_2 - 1}{\gamma_2}} - 1\right]}$$

REFERENCE

1. Prince, William R., and Hawkins, W. Kent: Preliminary Results of Altitude-Wind-Tunnel Investigation of X24C-4B Turbojet Engine. I - Pressure and Temperature Distributions. NACA RM No. SE7L22, Bur. Aero., 1947.

TABLE I - PERFORMANCE DATA

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run | Altitude, (ft) | Ram-pressure ratio, $P_2/P_0$ | Flight Mach number, $M_0$ | Tunnel static pressure, $p_0$, (lb/sq ft abs.) | Tunnel temperature, $T_0$ (°R) | Engine speed, N, (rpm) | Compressor-inlet indicated temperature, $T_{1,2}$, (°R) | Calculated jet thrust, $F_j$, (lb) | Scale jet thrust, $F_j$, (lb) | Net thrust, $F_n$, (lb) | Cowl-inlet air flow, $W_{a,1}$, (lb/sec) | Exhaust-nozzle-outlet air flow, $W_{a,8}$, (lb/sec) | Fuel flow, $W_f$, (lb/hr) |
| 1 | 5,000 | 1.037 | 0.23 | 1760 | 529 | 4,000 | 512 | 115 | 128 | 38 | 11.00 | 11.47 | 471 |
| 2 | 5,000 | 1.038 | .23 | 1760 | 530 | 6,000 | 512 | 294 | 291 | 147 | 17.78 | 18.15 | 704 |
| 3 | 5,000 | 1.038 | .23 | 1760 | 520 | 8,000 | 510 | 633 | 626 | 419 | 26.19 | 26.06 | 920 |
| 4 | 5,000 | 1.040 | .24 | 1760 | 538 | 9,000 | 512 | 944 | 933 | 669 | 32.51 | 32.41 | 1075 |
| 5 | 5,000 | 1.037 | .23 | 1753 | 542 | 10,000 | 510 | 1338 | 1303 | 1000 | 39.22 | 38.56 | 1323 |
| 6 | 5,000 | 1.045 | .25 | 1753 | 466 | 11,000 | 509 | 1794 | 1796 | 1414 | 45.89 | 44.34 | 1725 |
| 7 | 5,000 | 1.050 | .26 | 1753 | 466 | 11,500 | 509 | 2077 | 2086 | 1659 | 47.67 | 47.05 | 1840 |
| 8 | 5,000 | 1.048 | .26 | 1767 | 484 | 12,000 | 510 | 2390 | 2360 | 1920 | 51.16 | 49.56 | 2223 |
| 9 | 5,000 | 1.051 | .27 | 1760 | 489 | 12,500 | 495 | 2788 | 2752 | 2278 | 54.35 | 52.57 | 2631 |
| 10 | 15,000 | 1.037 | .23 | 1190 | 440 | 4,000 | 460 | 86 | 85 | 24 | 8.68 | 8.28 | 415 |
| 11 | 15,000 | 1.039 | .23 | 1190 | 436 | 6,000 | 465 | 227 | 218 | 114 | 13.67 | 13.50 | 568 |
| 12 | 15,000 | 1.039 | .23 | 1190 | 438 | 8,000 | 470 | 478 | 476 | 326 | 19.33 | 19.43 | 729 |
| 13 | 15,000 | 1.040 | .24 | 1190 | 442 | 9,000 | 476 | 716 | 703 | 513 | 24.33 | 24.13 | 829 |
| 14 | 15,000 | 1.043 | .25 | 1190 | 442 | 10,000 | 473 | 1008 | 1016 | 782 | 29.45 | 28.82 | 996 |
| 15 | 15,000 | 1.048 | .26 | 1190 | 444 | 11,000 | 469 | 1370 | 1371 | 1092 | 33.96 | 32.72 | 1266 |
| 16 | 15,000 | 1.051 | .27 | 1190 | 447 | 11,500 | 469 | 1657 | 1631 | 1324 | 35.88 | 35.06 | 1523 |
| 17 | 15,000 | 1.052 | .27 | 1190 | 445 | 12,000 | 470 | 1826 | 1792 | 1473 | 37.09 | 35.99 | 1705 |
| 18 | 15,000 | 1.046 | .26 | 1183 | 462 | 12,500 | 475 | 2010 | 1992 | 1686 | 37.46 | 36.34 | 1968 |
| 19 | 15,000 | 1.210 | .53 | 1190 | 523 | 6,000 | 507 | 227 | 229 | -41 | 15.69 | 15.28 | 436 |
| 20 | 15,000 | 1.209 | .53 | 1197 | 523 | 8,000 | 506 | 524 | 508 | 119 | 22.12 | 22.05 | 608 |
| 21 | 15,000 | 1.208 | .53 | 1197 | 494 | 9,000 | 509 | 776 | 741 | 272 | 26.79 | 26.61 | 714 |
| 22 | 15,000 | 1.210 | .53 | 1204 | 504 | 10,000 | 507 | 1079 | 1089 | 538 | 31.90 | 31.18 | 899 |
| 23 | 15,000 | 1.217 | .54 | 1190 | 509 | 11,000 | 500 | 1653 | 1568 | 925 | 36.86 | 36.08 | 1236 |
| 24 | 15,000 | 1.222 | .54 | 1197 | 508 | 11,500 | 493 | 1906 | 1856 | 1159 | 40.18 | 38.97 | 1518 |
| 25 | 15,000 | 1.221 | .54 | 1197 | 515 | 12,000 | 497 | 2104 | 2047 | 1335 | 41.15 | 39.74 | 1740 |
| 26 | 15,000 | 1.212 | .53 | 1190 | 468 | 12,500 | 494 | 2346 | 2297 | 1574 | 42.29 | 41.21 | 1985 |
| 27 | 15,000 | 1.415 | .72 | 1190 | 443 | 8,000 | 498 | 630 | 623 | -9 | 27.15 | 27.02 | 558 |
| 28 | 15,000 | 1.420 | .73 | 1190 | 441 | 9,000 | 499 | 954 | 924 | 165 | 32.55 | 32.25 | 683 |
| 29 | 15,000 | 1.415 | .72 | 1197 | 447 | 10,000 | 502 | 1312 | 1306 | 450 | 37.49 | 36.43 | 869 |
| 30 | 15,000 | 1.425 | .73 | 1190 | 451 | 11,000 | 500 | 1945 | 1912 | 909 | 43.30 | 42.37 | 1293 |
| 31 | 15,000 | 1.423 | .72 | 1190 | 467 | 11,500 | 494 | 2327 | 2262 | 1195 | 46.66 | 45.42 | 1581 |
| 32 | 15,000 | 1.424 | .72 | 1197 | 452 | 12,000 | 500 | 2604 | 2547 | 1449 | 47.73 | 46.42 | 1890 |
| 33 | 15,000 | 1.421 | .73 | 1190 | 482 | 12,500 | 514 | 2826 | 2739 | 1621 | 48.08 | 46.77 | 2163 |
| 34 | 25,000 | 1.037 | .23 | 774 | 440 | 6,000 | 443 | 144 | 152 | 91 | 9.06 | 8.36 | 486 |
| 35 | 25,000 | 1.037 | .23 | 788 | 444 | 8,000 | 445 | 352 | 358 | 259 | 13.57 | 13.57 | 603 |
| 36 | 25,000 | 1.041 | .24 | 781 | 440 | 9,000 | 440 | 517 | 516 | 387 | 17.18 | 16.86 | 678 |
| 37 | 25,000 | 1.046 | .26 | 781 | 441 | 10,000 | 439 | 722 | 730 | 569 | 20.65 | 19.93 | 783 |
| 38 | 25,000 | 1.046 | .26 | 781 | 448 | 11,000 | 441 | 1028 | 1015 | 829 | 23.49 | 22.94 | 961 |
| 39 | 25,000 | 1.049 | .25 | 781 | 451 | 11,500 | 439 | 1188 | 1164 | 964 | 24.59 | 24.03 | 1104 |
| 40 | 25,000 | 1.045 | .25 | 781 | 455 | 12,000 | 439 | 1331 | 1306 | 1108 | 25.47 | 24.80 | 1261 |
| 41 | 25,000 | 1.045 | .25 | 781 | 457 | 12,350 | 441 | 1421 | 1392 | 1192 | 25.60 | 24.92 | 1404 |
| 42 | 25,000 | 1.210 | .53 | 781 | 445 | 7,000 | 455 | 263 | 282 | 61 | 13.70 | 13.21 | 486 |
| 43 | 25,000 | 1.202 | .52 | 788 | 446 | 8,000 | 455 | 405 | 412 | 146 | 16.14 | 16.15 | 552 |
| 44 | 25,000 | 1.211 | .53 | 774 | 442 | 9,000 | 446 | 610 | 604 | 275 | 20.44 | 19.82 | 633 |
| 45 | 25,000 | 1.203 | .52 | 788 | 437 | 10,000 | 451 | 842 | 844 | 472 | 23.81 | 22.65 | 754 |
| 46 | 25,000 | 1.208 | .53 | 774 | 440 | 11,000 | 452 | 1206 | 1186 | 759 | 26.46 | 25.72 | 966 |
| 47 | 25,000 | 1.209 | .53 | 781 | 441 | 11,500 | 454 | 1424 | 1391 | 938 | 28.10 | 27.14 | 1167 |
| 48 | 25,000 | 1.213 | .53 | 781 | 440 | 12,000 | 454 | 1562 | 1523 | 1056 | 28.59 | 27.69 | 1333 |
| 49 | 25,000 | 1.207 | .53 | 781 | 467 | 12,450 | 451 | 1674 | 1674 | 1217 | 29.35 | 27.58 | 1571 |
| 50 | 25,000 | 1.428 | .73 | 781 | 451 | 8,950 | 467 | 680 | 675 | 165 | 22.91 | 22.23 | 568 |
| 51 | 25,000 | 1.417 | .73 | 781 | 442 | 10,000 | 470 | 955 | 964 | 398 | 26.55 | 24.86 | 719 |
| 52 | 25,000 | 1.428 | .73 | 781 | 455 | 10,500 | 464 | 1266 | 1240 | 592 | 29.31 | 28.36 | 874 |
| 53 | 25,000 | 1.420 | .73 | 781 | 441 | 11,000 | 469 | 1439 | 1412 | 742 | 30.35 | 29.37 | 996 |
| 54 | 25,000 | 1.402 | .72 | 788 | 443 | 11,500 | 470 | 1687 | 1628 | 936 | 31.83 | 30.84 | 1263 |
| 55 | 25,000 | 1.428 | .73 | 781 | 443 | 12,000 | 470 | 1883 | 1835 | 1103 | 32.96 | 31.81 | 1434 |
| 56 | 25,000 | 1.424 | .73 | 781 | 465 | 12,400 | 460 | 2116 | 2060 | 1306 | 34.09 | 33.23 | 1670 |
| 57 | 25,000 | 1.424 | .73 | 781 | 465 | 12,500 | 461 | 2151 | 2086 | 1334 | 34.14 | 33.11 | 1730 |
| 58 | 25,000 | 1.624 | .86 | 788 | 480 | 10,000 | 495 | 1123 | 1109 | 337 | 29.27 | 28.28 | 693 |
| 59 | 25,000 | 1.629 | .86 | 774 | 480 | 10,500 | 495 | 1380 | 1342 | 510 | 31.07 | 30.35 | 834 |
| 60 | 25,000 | 1.626 | .86 | 781 | 486 | 11,000 | 496 | 1589 | 1551 | 679 | 32.65 | 31.87 | 986 |
| 61 | 25,000 | 1.625 | .86 | 781 | 489 | 11,500 | 497 | 1891 | 1848 | 927 | 34.56 | 33.61 | 1242 |
| 62 | 25,000 | 1.633 | .87 | 781 | 497 | 12,000 | 500 | 2152 | 2094 | 1131 | 35.85 | 34.90 | 1503 |
| 63 | 25,000 | 1.634 | .87 | 781 | 482 | 12,500 | 490 | 2416 | 2350 | 1351 | 37.71 | 36.58 | 1800 |
| 64 | 25,000 | 1.850 | .98 | 781 | 480 | 8,000 | 503 | 553 | 535 | -159 | 23.16 | 22.58 | 431 |
| 65 | 25,000 | 1.841 | .98 | 788 | 472 | 9,000 | 507 | 884 | 862 | 12 | 27.95 | 27.67 | 502 |
| 66 | 25,000 | 1.837 | .98 | 781 | 475 | 10,000 | 502 | 1298 | 1265 | 303 | 32.41 | 31.50 | 688 |
| 67 | 25,000 | 1.846 | .98 | 781 | 484 | 11,000 | 500 | 1920 | 1861 | 746 | 37.05 | 36.45 | 1084 |
| 68 | 25,000 | 1.846 | .98 | 781 | 481 | 11,500 | 503 | 2208 | 2135 | 970 | 39.00 | 38.01 | 1328 |

| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Specific fuel consumption based on net thrust, $W_f/F_n$ (lb/(hr)(lb thrust)) | Fuel-air ratio, f/a | Exhaust-gas total temperature, $T_8$ (°R) | Corrected engine speed, $N/\sqrt{\theta}$, (rpm) | Corrected jet thrust, $F_j/\delta$, (lb) | Corrected net thrust, $F_n/\delta$, (lb) | Corrected cowl-inlet air flow, $(W_{a,1}\sqrt{\theta})/\delta$ (lb/sec) | Corrected fuel consumption, $W_f/(\delta\sqrt{\theta})$, (lb/hr) | Corrected specific fuel consumption based on net thrust, $W_f/(F_n\sqrt{\theta})$ (lb/(hr)(lb thrust)) | Corrected fuel-air ratio, $(f/a)/\theta$ | Corrected exhaust-gas total temperature, $T_8/\theta$ (°R) | Run |
| 12.395 | 0.0119 | 1089 | 4,048 | 154 | 46 | 13.07 | 573 | 12.457 | 0.0122 | 1122 | 1 |
| 4.789 | .0110 | 1137 | 6,072 | 350 | 177 | 21.12 | 856 | 4.836 | .0113 | 1170 | 2 |
| 2.196 | .0098 | 1188 | 8,112 | 752 | 504 | 31.05 | 1121 | 2.224 | .0100 | 1223 | 3 |
| 1.607 | .0092 | 1178 | 9,117 | 1121 | 804 | 38.58 | 1309 | 1.628 | .0094 | 1212 | 4 |
| 1.320 | .0094 | 1209 | 10,140 | 1573 | 1209 | 46.68 | 1619 | 1.339 | .0096 | 1245 | 5 |
| 1.220 | .0104 | 1257 | 11,176 | 2168 | 1707 | 54.52 | 2115 | 1.239 | .0108 | 1296 | 6 |
| 1.109 | .0107 | 1314 | 11,696 | 2518 | 2002 | 56.58 | 2259 | 1.128 | .0111 | 1361 | 7 |
| 1.158 | .0121 | 1395 | 12,192 | 2827 | 2300 | 60.32 | 2706 | 1.177 | .0125 | 1439 | 8 |
| 1.155 | .0134 | 1477 | 12,900 | 3308 | 2738 | 63.30 | 3263 | 1.192 | .0143 | 1572 | 9 |
| 17.29 | .0133 | 1022 | 4,272 | 151 | 43 | 14.45 | 788 | 18.33 | .0152 | 1165 | 10 |
| 4.982 | .0115 | 1056 | 6,372 | 388 | 203 | 22.89 | 1073 | 5.286 | .0130 | 1192 | 11 |
| 2.236 | .0105 | 1102 | 8,448 | 846 | 580 | 32.55 | 1369 | 2.360 | .0117 | 1229 | 12 |
| 1.616 | .0095 | 1098 | 8,450 | 1250 | 912 | 41.20 | 1548 | 1.697 | .0104 | 1209 | 13 |
| 1.274 | .0094 | 1115 | 10,540 | 1806 | 1390 | 49.68 | 1867 | 1.343 | .0104 | 1242 | 14 |
| 1.159 | .0104 | 1214 | 11,649 | 2438 | 1942 | 57.02 | 2384 | 1.228 | .0116 | 1363 | 15 |
| 1.150 | .0118 | 1311 | 12,190 | 2900 | 2354 | 60.18 | 2870 | 1.219 | .0132 | 1473 | 16 |
| 1.158 | .0128 | 1391 | 12,708 | 3186 | 2619 | 62.27 | 3210 | 1.226 | .0143 | 1560 | 17 |
| 1.167 | .0146 | 1516 | 13,150 | 3564 | 3016 | 63.70 | 3703 | 1.228 | .0162 | 1674 | 18 |
| ----- | .0077 | 856 | 6,240 | 407 | -73 | 26.82 | 806 | ----- | .0084 | 923 | 19 |
| 5.109 | .0076 | 946 | 8,328 | 898 | 210 | 37.57 | 1119 | 5.329 | .0082 | 1023 | 20 |
| 2.625 | .0074 | 995 | 9,342 | 1310 | 481 | 45.63 | 1310 | 2.723 | .0080 | 1072 | 21 |
| 1.671 | .0078 | 1057 | 10,400 | 1913 | 945 | 53.89 | 1642 | 1.738 | .0084 | 1188 | 22 |
| 1.336 | .0093 | 1160 | 11,517 | 2788 | 1645 | 62.60 | 2301 | 1.399 | .0102 | 1270 | 23 |
| 1.310 | .0105 | 1262 | 12,133 | 3281 | 2049 | 67.33 | 2831 | 1.382 | .0117 | 1404 | 24 |
| 1.303 | .0117 | 1361 | 12,624 | 3619 | 2360 | 69.16 | 3236 | 1.371 | .0130 | 1506 | 25 |
| 1.261 | .0130 | 1440 | 13,163 | 4084 | 2799 | 71.41 | 3716 | 1.328 | .0144 | 1592 | 26 |
| ----- | .0057 | 772 | 8,584 | 1108 | -16 | 44.99 | 1065 | ----- | .0067 | 890 | 27 |
| 4.139 | .0058 | 854 | 9,657 | 1643 | 293 | 53.94 | 1303 | 4.447 | .0068 | 984 | 28 |
| 1.931 | .0064 | 949 | 10,680 | 2309 | 796 | 62.06 | 1641 | 2.062 | .0073 | 1084 | 29 |
| 1.422 | .0083 | 1100 | 11,781 | 3400 | 1616 | 71.88 | 2462 | 1.524 | .0095 | 1261 | 30 |
| 1.323 | .0094 | 1187 | 12,386 | 4022 | 2125 | 77.03 | 3028 | 1.425 | .0109 | 1376 | 31 |
| 1.304 | .0110 | 1310 | 12,852 | 4503 | 2562 | 78.79 | 3579 | 1.397 | .0126 | 1502 | 32 |
| 1.334 | .0125 | 1424 | 13,200 | 4870 | 2882 | 80.95 | 4061 | 1.409 | .0140 | 1588 | 33 |
| 5.341 | .0149 | 1087 | 6,534 | 416 | 249 | 22.75 | 1447 | 5.811 | .0177 | 1290 | 34 |
| 2.328 | .0123 | 1098 | 8,688 | 961 | 695 | 33.55 | 1758 | 2.529 | .0146 | 1293 | 35 |
| 1.752 | .0110 | 1067 | 9,828 | 1398 | 1048 | 42.62 | 2006 | 1.914 | .0131 | 1270 | 36 |
| 1.376 | .0105 | 1093 | 10,950 | 1978 | 1541 | 51.09 | 2323 | 1.507 | .0126 | 1311 | 37 |
| 1.159 | .0114 | 1238 | 12,012 | 2750 | 2246 | 58.27 | 2843 | 1.266 | .0136 | 1477 | 38 |
| 1.145 | .0125 | 1335 | 12,593 | 3153 | 2611 | 60.83 | 3275 | 1.254 | .0149 | 1602 | 39 |
| 1.138 | .0138 | 1427 | 13,140 | 3538 | 3002 | 63.01 | 3741 | 1.246 | .0165 | 1710 | 40 |
| 1.178 | .0152 | 1526 | 13,486 | 3771 | 3229 | 63.51 | 4153 | 1.286 | .0182 | 1823 | 41 |
| 7.967 | .0099 | 844 | 7,679 | 764 | 165 | 33.83 | 1444 | 8.752 | .0119 | 1014 | 42 |
| 3.781 | .0095 | 907 | 8,768 | 1106 | 392 | 39.54 | 1624 | 4.143 | .0114 | 1089 | 43 |
| 2.302 | .0086 | 923 | 9,981 | 1651 | 752 | 50.39 | 1919 | 2.552 | .0106 | 1133 | 44 |
| 1.597 | .0088 | 1019 | 11,010 | 2266 | 1267 | 58.07 | 2229 | 1.759 | .0107 | 1236 | 45 |
| 1.273 | .0101 | 1184 | 12,111 | 3243 | 2075 | 65.71 | 2908 | 1.401 | .0123 | 1437 | 46 |
| 1.244 | .0115 | 1306 | 12,639 | 3768 | 2541 | 69.27 | 3474 | 1.367 | .0139 | 1578 | 47 |
| 1.262 | .0130 | 1403 | 13,188 | 4126 | 2861 | 70.47 | 3968 | 1.387 | .0156 | 1696 | 48 |
| 1.291 | .0149 | 1519 | 13,720 | 4535 | 3297 | 72.15 | 4689 | 1.422 | .0181 | 1845 | 49 |
| 3.442 | .0089 | 839 | 9,926 | 1829 | 447 | 55.96 | 1706 | 3.817 | .0085 | 1032 | 50 |
| 1.807 | .0075 | 954 | 11,050 | 2611 | 1078 | 65.09 | 2152 | 1.996 | .0092 | 1165 | 51 |
| 1.476 | .0083 | 1049 | 11,687 | 3359 | 1604 | 71.34 | 2635 | 1.643 | .0103 | 1300 | 52 |
| 1.342 | .0091 | 1137 | 12,166 | 3825 | 2010 | 74.34 | 2984 | 1.485 | .0112 | 1392 | 53 |
| 1.349 | .0110 | 1262 | 12,673 | 4371 | 2513 | 77.55 | 3737 | 1.487 | .0134 | 1532 | 54 |
| 1.300 | .0121 | 1356 | 13,272 | 4971 | 2988 | 80.73 | 4296 | 1.438 | .0148 | 1661 | 55 |
| 1.279 | .0136 | 1449 | 13,851 | 5581 | 3538 | 82.68 | 5052 | 1.428 | .0170 | 1806 | 56 |
| 1.297 | .0141 | 1484 | 13,950 | 5651 | 3614 | 82.87 | 5231 | 1.447 | .0176 | 1848 | 57 |
| 2.056 | .0066 | 923 | 10,970 | 2978 | 905 | 71.64 | 2041 | 2.255 | .0079 | 1110 | 58 |
| 1.635 | .0075 | 1014 | 11,519 | 3669 | 1394 | 77.43 | 2501 | 1.794 | .0090 | 1220 | 59 |
| 1.452 | .0084 | 1099 | 12,056 | 4202 | 1839 | 80.70 | 2927 | 1.592 | .0101 | 1322 | 60 |
| 1.340 | .0100 | 1233 | 12,593 | 5006 | 2511 | 85.50 | 3684 | 1.467 | .0120 | 1483 | 61 |
| 1.329 | .0116 | 1351 | 13,104 | 5673 | 3064 | 88.94 | 4446 | 1.451 | .0139 | 1624 | 62 |
| 1.332 | .0133 | 1438 | 13,800 | 6366 | 3660 | 92.53 | 5383 | 1.471 | .0162 | 1753 | 63 |
| ----- | .0052 | 650 | 8,872 | 1449 | -431 | 56.57 | 1295 | ----- | .0064 | 801 | 64 |
| 41.83 | .0050 | 737 | 9,936 | 2314 | 32 | 67.98 | 1488 | 46.50 | .0061 | 899 | 65 |
| 2.271 | .0059 | 881 | 11,090 | 3427 | 821 | 79.17 | 2067 | 2.518 | .0073 | 1084 | 66 |
| 1.453 | .0081 | 1076 | 12,232 | 5041 | 2021 | 90.26 | 3264 | 1.615 | .0100 | 1331 | 67 |
| 1.369 | .0095 | 1187 | 12,754 | 5784 | 2628 | 95.27 | 3990 | 1.518 | .0116 | 1461 | 68 |

NACA

TABLE I - CONCLUDED. PERFORMANCE

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run | Altitude, (ft) | Ram-pressure ratio, $P_2/p_0$ | Flight Mach number, $M_0$ | Tunnel static pressure, $p_0$, (lb/sq ft abs.) | Tunnel temperature, $T_0$ (°R) | Engine speed, N, (rpm) | Compressor-inlet indicated temperature, $T_{1,2}$, (°R) | Calculated jet thrust, $F_j$, (lb) | Scale jet thrust, $F_j$, (lb) | Net thrust, $F_n$, (lb) | Cowl-inlet air flow, $W_{a,1}$, (lb/sec) | Exhaust-nozzle-outlet air flow, $W_{a,8}$, (lb/sec) | Fuel flow, $W_f$, (lb/hr) |
| 69 | 25,000 | 1.843 | 0.98 | 788 | 478 | 12,000 | 504 | 2508 | 2434 | 1219 | 40.57 | 39.63 | 1625 |
| 70 | 25,000 | 1.836 | .98 | 788 | 477 | 12,500 | 505 | 2774 | 2703 | 1455 | 41.78 | 40.79 | 1932 |
| 71 | 25,000 | 2.063 | 1.07 | 788 | 520 | 9,500 | 509 | 1256 | 1240 | 152 | 33.88 | 32.69 | 588 |
| 72 | 25,000 | 2.078 | 1.08 | 781 | 513 | 10,000 | 505 | 1548 | 1510 | 332 | 36.29 | 35.37 | 714 |
| 73 | 25,000 | 2.074 | 1.08 | 781 | 497 | 10,500 | 504 | 1909 | 1854 | 584 | 38.99 | 38.22 | 925 |
| 74 | 25,000 | 2.076 | 1.08 | 788 | 508 | 11,000 | 505 | 2246 | 2181 | 826 | 41.53 | 40.71 | 1167 |
| 75 | 25,000 | 2.073 | 1.08 | 781 | 515 | 11,500 | 506 | 2600 | 2520 | 1114 | 43.39 | 42.23 | 1488 |
| 76 | 25,000 | 2.073 | 1.08 | 781 | 518 | 12,000 | 505 | 2887 | 2809 | 1355 | 44.90 | 43.74 | 1760 |
| 77 | 25,000 | 2.054 | 1.07 | 781 | 491 | 12,500 | 504 | 3199 | 3120 | 1617 | 46.51 | 45.53 | 2101 |
| 78 | 35,000 | 1.032 | .22 | 493 | 441 | 7,000 | 442 | 156 | 100 | 100 | 6.61 | 6.85 | 420 |
| 79 | 35,000 | 1.041 | .24 | 493 | 445 | 8,000 | 441 | 214 | 215 | 152 | 8.05 | 8.21 | 451 |
| 80 | 35,000 | 1.040 | .24 | 500 | 446 | 9,000 | 438 | 330 | 343 | 263 | 11.02 | 10.62 | 502 |
| 81 | 35,000 | 1.042 | .24 | 500 | 445 | 10,000 | 439 | 477 | 485 | 386 | 13.02 | 12.77 | 563 |
| 82 | 35,000 | 1.048 | .26 | 500 | 446 | 11,000 | 439 | 679 | 681 | 560 | 15.02 | 14.65 | 688 |
| 83 | 35,000 | 1.050 | .26 | 500 | 448 | 11,500 | 435 | 804 | 799 | 669 | 15.86 | 15.48 | 798 |
| 84 | 35,000 | 1.046 | .26 | 500 | 445 | 12,000 | 431 | 900 | 890 | 762 | 16.43 | 15.96 | 910 |
| 85 | 35,000 | 1.046 | .26 | 500 | 446 | 12,200 | 431 | 935 | 918 | 788 | 16.55 | 16.24 | 951 |
| 86 | 35,000 | 1.205 | .52 | 493 | 434 | 8,000 | 448 | 267 | 267 | 97 | 10.31 | 10.46 | 431 |
| 87 | 35,000 | 1.197 | .52 | 493 | 442 | 9,000 | 444 | 381 | 396 | 200 | 12.64 | 12.33 | 491 |
| 88 | 35,000 | 1.200 | .52 | 500 | 441 | 10,000 | 451 | 552 | 554 | 321 | 14.77 | 14.43 | 573 |
| 89 | 35,000 | 1.210 | .53 | 500 | 442 | 11,000 | 444 | 835 | 815 | 536 | 17.30 | 17.10 | 724 |
| 90 | 35,000 | 1.210 | .53 | 500 | 445 | 11,500 | 440 | 977 | 964 | 672 | 18.16 | 17.94 | 849 |
| 91 | 35,000 | 1.205 | .53 | 493 | 451 | 11,900 | 452 | 1013 | 1001 | 714 | 17.85 | 17.62 | 920 |
| 92 | 35,000 | 1.404 | .72 | 500 | 448 | 9,000 | 440 | 469 | 471 | 146 | 15.18 | 14.93 | 461 |
| 93 | 35,000 | 1.404 | .72 | 500 | 446 | 10,000 | 445 | 713 | 701 | 318 | 17.77 | 17.49 | 583 |
| 94 | 35,000 | 1.412 | .72 | 500 | 446 | 10,500 | 446 | 872 | 842 | 426 | 19.36 | 18.86 | 678 |
| 95 | 35,000 | 1.414 | .72 | 500 | 448 | 11,000 | 443 | 1036 | 1002 | 562 | 20.40 | 19.97 | 778 |
| 96 | 35,000 | 1.414 | .72 | 500 | 450 | 11,500 | 443 | 1195 | 1168 | 708 | 21.12 | 20.88 | 915 |
| 97 | 35,000 | 1.418 | .73 | 493 | 451 | 12,000 | 436 | 1354 | 1320 | 854 | 21.82 | 21.23 | 1104 |
| 98 | 35,000 | 1.412 | .72 | 493 | 451 | 12,000 | 431 | 1360 | 1329 | 862 | 22.04 | 21.51 | 1094 |
| 99 | 35,000 | 1.410 | .72 | 500 | 457 | 12,450 | 431 | 1498 | 1457 | 982 | 22.57 | 21.91 | 1302 |
| 100 | 35,000 | 1.602 | .85 | 500 | 449 | 8,000 | 444 | 549 | 542 | 106 | 17.53 | 17.07 | 466 |
| 101 | 35,000 | 1.617 | .86 | 493 | 434 | 10,000 | 445 | 886 | 867 | 345 | 20.50 | 20.26 | 618 |
| 102 | 35,000 | 1.615 | .85 | 493 | 445 | 10,500 | 448 | 1039 | 1006 | 456 | 21.70 | 21.28 | 709 |
| 103 | 35,000 | 1.612 | .85 | 500 | 449 | 11,000 | 445 | 1245 | 1211 | 629 | 23.22 | 22.67 | 839 |
| 104 | 35,000 | 1.608 | .85 | 500 | 453 | 11,500 | 443 | 1452 | 1409 | 801 | 24.18 | 23.75 | 1021 |
| 105 | 35,000 | 1.615 | .85 | 493 | 453 | 12,000 | 450 | 1559 | 1505 | 888 | 24.38 | 23.86 | 1158 |
| 106 | 35,000 | 1.618 | .86 | 500 | 458 | 12,500 | 463 | 1694 | 1644 | 1011 | 24.81 | 24.07 | 1363 |
| 107 | 40,000 | 1.398 | .71 | 394 | 453 | 7,000 | 435 | 188 | 185 | 4 | 8.16 | 8.42 | 410 |
| 108 | 40,000 | 1.406 | .72 | 394 | 461 | 9,000 | 437 | 385 | 380 | 119 | 12.10 | 12.01 | 405 |
| 109 | 40,000 | 1.406 | .72 | 387 | 454 | 10,000 | 441 | 557 | 566 | 272 | 13.64 | 13.47 | 502 |
| 110 | 40,000 | 1.404 | .72 | 394 | 453 | 10,500 | 437 | 707 | 697 | 375 | 15.21 | 14.85 | 583 |
| 111 | 40,000 | 1.404 | .72 | 394 | 455 | 11,000 | 440 | 827 | 807 | 466 | 16.05 | 15.69 | 663 |
| 112 | 40,000 | 1.411 | .72 | 394 | 458 | 11,500 | 443 | 961 | 927 | 570 | 16.73 | 16.24 | 778 |
| 113 | 40,000 | 1.413 | .72 | 387 | 464 | 12,000 | 436 | 1076 | 1062 | 700 | 16.88 | 16.57 | 910 |
| 114 | 45,000 | 1.036 | .23 | 303 | 455 | 8,000 | 441 | 140 | 139 | 102 | 4.85 | 5.12 | 310 |
| 115 | 45,000 | 1.041 | .24 | 317 | 458 | 9,000 | 444 | 207 | 200 | 151 | 6.35 | 6.41 | 350 |
| 116 | 45,000 | 1.052 | .27 | 310 | 458 | 10,000 | 443 | 316 | 312 | 244 | 7.58 | 7.85 | 400 |
| 117 | 45,000 | 1.042 | .24 | 310 | 458 | 10,500 | 442 | 395 | 378 | 310 | 8.31 | 8.73 | 456 |
| 118 | 45,000 | 1.042 | .24 | 310 | 452 | 11,000 | 436 | 463 | 455 | 385 | 9.08 | 9.10 | 537 |
| 119 | 45,000 | 1.048 | .26 | 310 | 440 | 11,300 | 426 | 526 | 512 | 434 | 9.67 | 9.59 | 588 |
| 120 | 45,000 | 1.215 | .54 | 303 | 447 | 7,500 | 444 | 143 | 144 | 52 | 5.30 | 5.53 | 330 |
| 121 | 45,000 | 1.192 | .51 | 317 | 442 | 9,000 | 439 | 265 | 264 | 140 | 8.08 | 7.83 | 390 |
| 122 | 45,000 | 1.210 | .53 | 310 | 442 | 9,000 | 436 | 265 | 273 | 141 | 7.92 | 8.02 | 355 |
| 123 | 45,000 | 1.211 | .53 | 303 | 445 | 10,000 | 437 | 398 | 398 | 245 | 9.10 | 9.27 | 431 |
| 124 | 45,000 | 1.186 | .50 | 317 | 445 | 10,500 | 440 | 479 | 477 | 320 | 10.20 | 10.08 | 502 |
| 125 | 45,000 | 1.192 | .51 | 317 | 445 | 10,500 | 438 | 490 | 489 | 325 | 10.13 | 10.36 | 502 |
| 126 | 45,000 | 1.201 | .52 | 303 | 439 | 11,000 | 440 | 557 | 561 | 393 | 10.22 | 10.37 | 563 |
| 127 | 45,000 | 1.205 | .52 | 303 | 443 | 11,400 | 437 | 633 | 641 | 466 | 10.67 | 10.77 | 633 |
| 128 | 45,000 | 1.416 | .72 | 296 | 448 | 7,500 | 441 | 166 | 171 | 31 | 6.76 | 6.36 | 375 |
| 129 | 45,000 | 1.403 | .72 | 310 | 452 | 9,000 | 439 | 308 | 314 | 116 | 9.32 | 9.14 | 380 |
| 130 | 45,000 | 1.406 | .72 | 310 | 455 | 10,000 | 436 | 477 | 474 | 234 | 11.12 | 11.05 | 431 |
| 131 | 45,000 | 1.405 | .72 | 296 | 444 | 10,500 | 434 | 563 | 555 | 308 | 11.63 | 11.42 | 486 |
| 132 | 45,000 | 1.379 | .69 | 317 | 451 | 11,000 | 439 | 658 | 629 | 368 | 12.54 | 12.32 | 563 |
| 133 | 45,000 | 1.406 | .72 | 310 | 453 | 11,500 | 439 | 787 | 768 | 488 | 12.97 | 12.85 | 668 |
| 134 | 45,000 | 1.397 | .71 | 310 | 442 | 12,000 | 425 | 897 | 873 | 586 | 13.71 | 13.52 | 788 |
| 135 | 45,000 | 1.409 | .72 | 303 | 447 | 12,100 | 429 | 906 | 874 | 586 | 13.80 | 13.35 | 813 |

DATA FOR X24C-4B TURBOJET ENGINE

| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Specific fuel consumption based on net thrust, $W_f/P_n$ (lb/(hr)(lb thrust)) | Fuel-air ratio, f/a | Exhaust-gas total temperature, $T_8$ (°R) | Corrected engine speed, $N/\sqrt{\theta}$, (rpm) | Corrected jet thrust, $F_j/\delta$, (lb) | Corrected net thrust, $F_n/\delta$, (lb) | Corrected cowl-inlet air flow, $(W_{a,1}\sqrt{\theta})/\delta$ (lb/sec) | Corrected fuel consumption, $W_f/(\delta\sqrt{\theta})$, (lb/hr) | Corrected specific fuel consumption based on net thrust, $W_f/(F_n\sqrt{\theta})$ (lb/(hr)(lb thrust)) | Corrected fuel-air ratio, $(f/a)/\theta$ | Corrected exhaust-gas total temperature, $T_8/\theta$ (°R) | Run |
| 1.333 | 0.0111 | 1307 | 13,296 | 6535 | 3273 | 98.31 | 4836 | 1.478 | 0.0137 | 1605 | 69 |
| 1.328 | .0128 | 1420 | 13,825 | 7258 | 3907 | 101.4 | 5738 | 1.469 | .0157 | 1737 | 70 |
| 3.868 | .0048 | 794 | 10,640 | 3329 | 408 | 81.22 | 1768 | 4.333 | .0060 | 996 | 71 |
| 2.151 | .0055 | 873 | 11,250 | 4091 | 899 | 87.39 | 2176 | 2.420 | .0069 | 1105 | 72 |
| 1.584 | .0066 | 977 | 11,823 | 5022 | 1582 | 93.78 | 2822 | 1.784 | .0084 | 1237 | 73 |
| 1.413 | .0078 | 1078 | 12,375 | 5856 | 2218 | 99.12 | 3525 | 1.589 | .0101 | 1365 | 74 |
| 1.336 | .0095 | 1208 | 12,926 | 6827 | 3018 | 104.58 | 4531 | 1.501 | .0120 | 1529 | 75 |
| 1.299 | .0109 | 1310 | 13,500 | 7610 | 3671 | 108.12 | 5364 | 1.461 | .0138 | 1658 | 76 |
| 1.299 | .0125 | 1407 | 14,063 | 8452 | 4380 | 112.0 | 6404 | 1.462 | .0159 | 1781 | 77 |
| 4.200 | .0177 | 1148 | 7,623 | 627 | 429 | 26.05 | 1963 | 4.576 | .0209 | 1363 | 78 |
| 2.967 | .0156 | 1145 | 8,728 | 923 | 652 | 31.67 | 2112 | 3.239 | .0185 | 1363 | 79 |
| 1.909 | .0126 | 1098 | 9,855 | 1452 | 1113 | 42.59 | 2326 | 2.090 | .0152 | 1318 | 80 |
| 1.459 | .0120 | 1133 | 10,940 | 2053 | 1634 | 50.37 | 2607 | 1.595 | .0144 | 1353 | 81 |
| 1.229 | .0127 | 1288 | 12,045 | 2882 | 2370 | 58.05 | 3188 | 1.345 | .0152 | 1542 | 82 |
| 1.193 | .0140 | 1406 | 12,650 | 3381 | 2831 | 61.02 | 3715 | 1.312 | .0169 | 1701 | 83 |
| 1.194 | .0154 | 1503 | 13,260 | 3766 | 3225 | 62.92 | 4257 | 1.320 | .0188 | 1838 | 84 |
| 1.207 | .0160 | 1531 | 13,481 | 3885 | 3335 | 63.38 | 4448 | 1.334 | .0195 | 1872 | 85 |
| 4.443 | .0116 | 916 | 8,840 | 1146 | 416 | 40.05 | 2044 | 4.913 | .0142 | 1118 | 86 |
| 2.445 | .0108 | 959 | 9,981 | 1700 | 858 | 48.92 | 2337 | 2.724 | .0133 | 1180 | 87 |
| 1.785 | .0108 | 1075 | 11,010 | 2345 | 1358 | 56.77 | 2670 | 1.966 | .0131 | 1302 | 88 |
| 1.351 | .0116 | 1241 | 12,232 | 3449 | 2268 | 65.84 | 3407 | 1.502 | .0144 | 1537 | 89 |
| 1.263 | .0130 | 1369 | 12,834 | 4080 | 2844 | 68.86 | 4010 | 1.410 | .0162 | 1703 | 90 |
| 1.289 | .0143 | 1464 | 13,090 | 4296 | 3064 | 69.65 | 4344 | 1.418 | .0173 | 1768 | 91 |
| 3.158 | .0084 | 821 | 10,269 | 1993 | 618 | 56.30 | 2226 | 3.602 | .0118 | 1068 | 92 |
| 1.833 | .0091 | 989 | 11,340 | 2967 | 1346 | 66.32 | 2798 | 2.079 | .0117 | 1246 | 93 |
| 1.592 | .0097 | 1059 | 11,907 | 3563 | 1803 | 72.25 | 3254 | 1.805 | .0125 | 1362 | 94 |
| 1.384 | .0106 | 1163 | 12,518 | 4240 | 2378 | 75.86 | 3747 | 1.576 | .0137 | 1507 | 95 |
| 1.292 | .0120 | 1280 | 13,087 | 4943 | 2996 | 78.54 | 4407 | 1.471 | .0155 | 1658 | 96 |
| 1.293 | .0141 | 1440 | 13,752 | 5665 | 3665 | 81.72 | 5430 | 1.482 | .0185 | 1682 | 97 |
| 1.269 | .0138 | 1411 | 13,824 | 5704 | 3700 | 82.11 | 5408 | 1.462 | .0183 | 1873 | 98 |
| 1.326 | .0160 | 1560 | 14,342 | 6166 | 4156 | 82.91 | 6348 | 1.527 | .0212 | 2070 | 99 |
| 4.396 | .0074 | 752 | 9,256 | 2294 | 449 | 64.12 | 2282 | 5.082 | .0099 | 1009 | 100 |
| 1.791 | .0084 | 935 | 11,570 | 3721 | 1481 | 76.05 | 3069 | 2.072 | .0112 | 1252 | 101 |
| 1.555 | .0091 | 1027 | 12,096 | 4318 | 1957 | 80.85 | 3506 | 1.792 | .0121 | 1359 | 102 |
| 1.334 | .0100 | 1152 | 12,727 | 5125 | 2662 | 84.93 | 4108 | 1.543 | .0134 | 1543 | 103 |
| 1.275 | .0117 | 1288 | 13,317 | 5963 | 3390 | 88.37 | 5004 | 1.476 | .0157 | 1727 | 104 |
| 1.304 | .0132 | 1394 | 13,812 | 6459 | 3811 | 90.91 | 5721 | 1.501 | .0175 | 1847 | 105 |
| 1.348 | .0153 | 1545 | 14,188 | 6957 | 4279 | 92.51 | 6547 | 1.530 | .0197 | 1990 | 106 |
| 102.5 | .0140 | 781 | 8,022 | 994 | 21 | 38.24 | 2524 | 120.2 | .0184 | 1025 | 107 |
| 3.403 | .0093 | 826 | 10,305 | 2041 | 639 | 56.76 | 2491 | 3.898 | .0122 | 1082 | 108 |
| 1.846 | .0102 | 992 | 11,390 | 3095 | 1487 | 65.48 | 3126 | 2.102 | .0133 | 1285 | 109 |
| 1.555 | .0106 | 1095 | 12,002 | 3744 | 2014 | 71.47 | 3579 | 1.777 | .0139 | 1432 | 110 |
| 1.423 | .0115 | 1194 | 12,551 | 4334 | 2503 | 75.55 | 4063 | 1.623 | .0150 | 1553 | 111 |
| 1.365 | .0129 | 1346 | 13,087 | 4979 | 3061 | 78.96 | 4755 | 1.553 | .0167 | 1743 | 112 |
| 1.300 | .0150 | 1481 | 13,752 | 5807 | 3828 | 80.54 | 5702 | 1.490 | .0197 | 1945 | 113 |
| 3.039 | .0178 | 1157 | 8,720 | 971 | 712 | 31.07 | 2360 | 3.315 | .0211 | 1375 | 114 |
| 2.318 | .0153 | 1167 | 9,783 | 1335 | 1008 | 38.99 | 2537 | 2.517 | .0181 | 1381 | 115 |
| 1.639 | .0147 | 1231 | 10,900 | 2130 | 1666 | 47.47 | 2976 | 1.786 | .0174 | 1463 | 116 |
| 1.471 | .0152 | 1302 | 11,445 | 2580 | 2116 | 52.04 | 3393 | 1.603 | .0181 | 1546 | 117 |
| 1.395 | .0164 | 1425 | 12,067 | 3106 | 2628 | 56.50 | 4021 | 1.530 | .0198 | 1717 | 118 |
| 1.355 | .0169 | 1492 | 12,566 | 3495 | 2962 | 59.36 | 4464 | 1.507 | .0209 | 1842 | 119 |
| 6.346 | .0173 | 1016 | 8,340 | 1006 | 363 | 33.28 | 2562 | 7.058 | .0215 | 1260 | 120 |
| 2.786 | .0134 | 1035 | 10,044 | 1762 | 935 | 48.33 | 2905 | 3.107 | .0167 | 1288 | 121 |
| 2.518 | .0124 | 971 | 10,089 | 1863 | 962 | 48.23 | 2716 | 2.823 | .0156 | 1219 | 122 |
| 1.759 | .0132 | 1139 | 11,200 | 2779 | 1711 | 56.74 | 3371 | 1.970 | .0165 | 1428 | 123 |
| 1.569 | .0137 | 1232 | 11,687 | 3184 | 2136 | 61.17 | 3729 | 1.746 | .0170 | 1530 | 124 |
| 1.545 | .0138 | 1203 | 11,718 | 3264 | 2169 | 60.59 | 3740 | 1.724 | .0172 | 1499 | 125 |
| 1.433 | .0153 | 1347 | 12,254 | 3917 | 2744 | 64.06 | 4380 | 1.596 | .0190 | 1676 | 126 |
| 1.358 | .0165 | 1462 | 12,768 | 4476 | 3254 | 66.53 | 4951 | 1.522 | .0207 | 1833 | 127 |
| 12.10 | .0154 | 891 | 8,558 | 1222 | 222 | 42.36 | 3059 | 13.78 | .0200 | 1158 | 128 |
| 3.276 | .0113 | 891 | 10,278 | 2143 | 792 | 55.71 | 2962 | 3.740 | .0147 | 1161 | 129 |
| 1.842 | .0108 | 1020 | 11,450 | 3236 | 1597 | 66.29 | 3369 | 2.110 | .0142 | 1338 | 130 |
| 1.578 | .0116 | 1121 | 12,054 | 3968 | 2202 | 72.42 | 3988 | 1.812 | .0153 | 1476 | 131 |
| 1.530 | .0125 | 1226 | 12,529 | 4199 | 2456 | 73.49 | 4280 | 1.743 | .0162 | 1590 | 132 |
| 1.369 | .0143 | 1399 | 13,133 | 5242 | 3331 | 77.52 | 5207 | 1.563 | .0186 | 1821 | 133 |
| 1.345 | .0160 | 1503 | 13,920 | 5959 | 4000 | 80.68 | 6239 | 1.560 | .0215 | 2023 | 134 |
| 1.387 | .0166 | 1538 | 13,976 | 6103 | 4092 | 82.22 | 6557 | 1.602 | .0222 | 2053 | 135 |

TABLE II - LUBRICATION AND FUEL SYSTEM

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run | Altitude (ft) | Ram-pressure ratio, $P_2/P_0$ | Engine speed (rpm) | Fuel pressures (lb/sq in. gage) | | | Fuel temperature (°F) | Oil pressures (lb/sq in. gage) | | | | |
| | | | | Pump inlet | Pump discharge | Manifold | | Pump inlet | Pump discharge | Cooler inlet | Cooler outlet | Scavenge |
| 1 | 5,000 | 1.037 | 4,000 | 19.3 | 78 | 4 | 64 | 18.6 | 29 | 31 | 29 | 4 |
| 2 | 5,000 | 1.038 | 6,000 | 19.1 | 156 | 10 | 67 | 18.1 | 50 | 49 | 40 | 4 |
| 3 | 5,000 | 1.038 | 8,000 | 18.8 | 575 | 11 | 90 | 17.6 | 76 | 73 | 57 | 4 |
| 4 | 5,000 | 1.040 | 9,000 | 18.5 | 580 | 27 | 85 | 17.5 | 90 | 87 | 67 | 4 |
| 5 | 5,000 | 1.037 | 10,000 | 18.0 | 577 | 40 | 86 | 17.2 | 102 | 98 | 73 | 4 |
| 6 | 5,000 | 1.045 | 11,000 | 18.5 | 570 | 63 | 73 | 17.3 | 113 | 109 | 79 | 4 |
| 7 | 5,000 | 1.050 | 11,500 | 18.5 | 560 | 75 | 66 | 17.1 | 122 | 119 | 83 | 4 |
| 8 | 5,000 | 1.048 | 12,000 | ---- | --- | 96 | 51 | 18.0 | 128 | 123 | 89 | 4 |
| 9 | 5,000 | 1.051 | 12,500 | ---- | --- | 127 | 47 | 17.7 | 200 | 133 | 94 | 4 |
| 10 | 15,000 | 1.037 | 4,000 | 19.7 | 71 | 3 | 32 | 18.2 | 48 | 49 | 33 | 4 |
| 11 | 15,000 | 1.039 | 6,000 | 19.5 | 140 | 7 | 41 | 17.7 | 72 | 68 | 47 | 4 |
| 12 | 15,000 | 1.039 | 8,000 | 19.7 | 237 | 13 | 51 | 17.6 | 83 | 81 | 60 | 4 |
| 13 | 15,000 | 1.040 | 9,000 | 19.0 | 430 | 18 | 68 | 17.5 | 87 | 85 | 68 | 4 |
| 14 | 15,000 | 1.043 | 10,000 | 19.0 | 586 | 26 | 74 | 17.4 | 104 | 101 | 77 | 4 |
| 15 | 15,000 | 1.048 | 11,000 | 18.5 | 530 | 39 | 73 | 17.3 | 118 | 113 | 84 | 4 |
| 16 | 15,000 | 1.051 | 11,500 | 18.5 | 520 | 51 | 69 | 17.1 | 124 | 120 | 87 | 4 |
| 17 | 15,000 | 1.052 | 12,000 | 18.0 | 500 | 57 | 66 | 17.0 | 134 | 129 | 92 | 4 |
| 18 | 15,000 | 1.046 | 12,500 | ---- | --- | 75 | 50 | 17.8 | 150 | 129 | 97 | 4 |
| 19 | 15,000 | 1.210 | 6,000 | 19.4 | 113 | 5 | 65 | 18.1 | 52 | 52 | 42 | 4 |
| 20 | 15,000 | 1.209 | 8,000 | 19.4 | 193 | 12 | 70 | 17.7 | 76 | 73 | 57 | 4 |
| 21 | 15,000 | 1.208 | 9,000 | 19.1 | 270 | 16 | 84 | 17.7 | 87 | 84 | 68 | 4 |
| 22 | 15,000 | 1.210 | 10,000 | 18.8 | 588 | 25 | 96 | 17.5 | 104 | 101 | 77 | 4 |
| 23 | 15,000 | 1.217 | 11,000 | 18.5 | 540 | 40 | 85 | 17.2 | 119 | 114 | 83 | 4 |
| 24 | 15,000 | 1.222 | 11,500 | 18.1 | 548 | 53 | 78 | 17.1 | 130 | 124 | 90 | 4 |
| 25 | 15,000 | 1.221 | 12,000 | 17.9 | 547 | 65 | 78 | 17.0 | 132 | 126 | 92 | 4 |
| 26 | 15,000 | 1.212 | 12,500 | ---- | --- | 81 | 47 | 17.6 | 152 | 141 | 98 | 4 |
| 27 | 15,000 | 1.415 | 8,000 | 19.5 | 183 | 13 | 50 | 17.6 | 94 | 90 | 66 | 4 |
| 28 | 15,000 | 1.420 | 9,000 | 19.5 | 352 | 18 | 58 | 17.4 | 105 | 101 | 72 | 4 |
| 29 | 15,000 | 1.415 | 10,000 | 19.5 | 622 | 27 | 86 | 17.2 | 113 | 108 | 76 | 4 |
| 30 | 15,000 | 1.425 | 11,000 | 19.0 | 590 | 44 | 76 | 17.2 | 124 | 119 | 84 | 4 |
| 31 | 15,000 | 1.423 | 11,500 | ---- | --- | 60 | 50 | 17.8 | 132 | 126 | 87 | 4 |
| 32 | 15,000 | 1.424 | 12,000 | 18.0 | 560 | 75 | 67 | 17.0 | 139 | 133 | 92 | 4 |
| 33 | 15,000 | 1.421 | 12,500 | ---- | --- | 94 | 62 | 18.0 | 122 | 117 | 88 | 5 |
| 34 | 25,000 | 1.037 | 6,000 | 20.1 | 120 | 5 | 37 | 17.4 | 88 | 85 | 52 | 3 |
| 35 | 25,000 | 1.037 | 8,000 | 20.0 | 197 | 9 | 54 | 17.0 | 118 | 112 | 72 | 3 |
| 36 | 25,000 | 1.041 | 9,000 | 20.1 | 270 | 12 | 62 | 16.6 | 149 | 142 | 86 | 3 |
| 37 | 25,000 | 1.046 | 10,000 | 19.8 | 388 | 17 | 76 | 16.2 | 168 | 159 | 98 | 3 |
| 38 | 25,000 | 1.046 | 11,000 | 19.1 | 594 | 24 | 93 | 16.3 | 169 | 160 | 101 | 4 |
| 39 | 25,000 | 1.049 | 11,500 | 19.0 | 530 | 30 | 83 | 16.2 | 171 | 160 | 101 | 4 |
| 40 | 25,000 | 1.045 | 12,000 | ---- | --- | 37 | 53 | 17.4 | 161 | 154 | 108 | 4 |
| 41 | 25,000 | 1.045 | 12,350 | ---- | --- | 42 | 52 | 17.3 | 160 | 152 | 104 | 4 |
| 42 | 25,000 | 1.210 | 7,000 | 20.0 | --- | -- | 49 | ---- | --- | --- | --- | - |
| 43 | 25,000 | 1.202 | 8,000 | 20.0 | --- | -- | 52 | ---- | --- | --- | --- | - |
| 44 | 25,000 | 1.211 | 9,000 | 20.0 | 254 | 13 | 58 | 17.2 | 111 | 108 | 76 | 3 |
| 45 | 25,000 | 1.203 | 10,000 | 20.0 | 362 | 18 | 71 | 17.0 | 123 | 119 | 83 | 3 |
| 46 | 25,000 | 1.208 | 11,000 | 20.0 | 602 | 26 | 88 | 16.8 | 132 | 126 | 87 | 3 |
| 47 | 25,000 | 1.209 | 11,500 | 19.5 | 553 | 34 | 77 | 16.8 | 138 | 132 | 91 | 3 |
| 48 | 25,000 | 1.213 | 12,000 | 19.0 | 440 | 39 | 71 | 16.8 | 147 | 140 | 100 | 3 |
| 49 | 25,000 | 1.207 | 12,450 | ---- | 204 | 52 | 50 | 17.6 | 157 | 142 | 100 | 4 |
| 50 | 25,000 | 1.428 | 8,950 | 20.0 | 232 | 13 | 65 | 17.6 | 87 | 70 | 70 | 3 |
| 51 | 25,000 | 1.417 | 10,000 | 20.0 | 340 | 19 | 75 | 17.2 | 94 | 73 | 73 | 3 |
| 52 | 25,000 | 1.428 | 10,500 | 19.8 | 593 | 24 | 89 | 17.2 | 114 | 86 | 86 | 3 |
| 53 | 25,000 | 1.420 | 11,000 | 19.5 | 596 | 30 | 82 | 17.2 | 104 | 78 | 78 | 3 |
| 54 | 25,000 | 1.402 | 11,500 | 19.0 | 527 | 38 | 80 | 17.1 | 115 | 82 | 82 | 3 |
| 55 | 25,000 | 1.428 | 12,000 | 19.0 | 500 | 47 | 77 | 17.0 | 134 | 96 | 96 | 3 |
| 56 | 25,000 | 1.424 | 12,400 | ---- | --- | 60 | 50 | 17.7 | 140 | 129 | 93 | 4 |
| 57 | 25,000 | 1.424 | 12,500 | ---- | --- | 63 | 50 | 17.7 | 142 | 136 | 98 | 4 |
| 58 | 25,000 | 1.624 | 10,000 | 19.8 | 347 | 19 | 84 | 16.8 | 132 | 125 | 84 | 3 |
| 59 | 25,000 | 1.629 | 10,500 | 19.5 | 468 | 25 | 91 | 16.7 | 136 | 128 | 88 | 3 |
| 60 | 25,000 | 1.626 | 11,000 | 19.3 | 586 | 31 | 95 | 16.6 | 140 | 132 | 90 | 3 |
| 61 | 25,000 | 1.625 | 11,500 | 19.1 | 562 | 41 | 85 | 16.4 | 145 | 137 | 93 | 3 |
| 62 | 25,000 | 1.633 | 12,000 | 18.9 | 538 | 54 | 81 | ---- | --- | --- | -- | - |
| 63 | 25,000 | 1.634 | 12,500 | ---- | --- | 68 | 54 | 17.3 | 170 | 141 | 99 | 4 |
| 64 | 25,000 | 1.850 | 8,000 | ---- | --- | 9 | 67 | 18.4 | 83 | 81 | 62 | 4 |
| 65 | 25,000 | 1.841 | 9,000 | ---- | --- | 14 | 64 | 18.2 | 90 | 89 | 66 | 4 |
| 66 | 25,000 | 1.837 | 10,000 | ---- | --- | 22 | 63 | 18.0 | 114 | 109 | 77 | 4 |
| 67 | 25,000 | 1.846 | 11,000 | ---- | --- | 37 | 59 | 17.7 | 127 | 120 | 85 | 4 |
| 68 | 25,000 | 1.846 | 11,500 | ---- | --- | 47 | 56 | 17.7 | 133 | 126 | 88 | 4 |

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DATA FOR X24C-4B TURBOJET ENGINE

| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil temperatures (°F) | | | | | | | | | Total oil flow (gal/hr) | Bearing temperatures (°F) | | | Run |
| Pump inlet | Cooler inlet | Cooler outlet | Gear case scavenge | Bearing 2 (fore) scavenge | Bearing 2 (aft) scavenge | Bearing 3 (fore) scavenge | Bearing 3 (aft) scavenge | Scavenge pump discharge | | 1 | 2 | 3 | |
| 93 | 85 | 80 | 79 | 103 | 101 | 104 | 112 | 86 | 66 | 82 | 110 | 124 | 1 |
| 94 | 94 | 85 | 84 | 115 | 110 | 110 | 119 | 94 | 100 | 87 | 119 | 140 | 2 |
| 95 | 95 | 84 | 83 | 127 | 120 | 120 | 132 | 105 | 133 | 94 | 128 | 160 | 3 |
| 93 | 94 | 87 | 87 | 130 | 122 | 122 | 133 | 108 | 100 | 86 | 130 | 175 | 4 |
| 94 | 95 | 90 | 90 | 139 | 129 | 129 | 144 | 115 | 165 | 102 | 138 | 150 | 5 |
| 106 | 103 | 89 | 73 | 133 | 121 | 121 | 134 | 96 | 182 | 98 | 140 | 144 | 6 |
| 100 | 99 | 84 | 71 | 131 | 123 | 127 | 143 | 101 | 190 | 102 | 140 | 153 | 7 |
| 102 | 98 | 85 | 75 | 140 | 128 | 138 | 147 | 109 | 198 | 115 | 133 | 158 | 8 |
| 96 | 92 | 81 | 72 | 142 | 130 | 141 | 154 | 110 | 208 | 114 | 138 | 159 | 9 |
| 80 | 66 | 40 | 34 | 64 | 60 | 64 | 70 | 42 | 67 | 48 | 83 | 86 | 10 |
| 81 | 75 | 57 | 44 | 77 | 75 | 75 | 83 | 55 | 103 | 58 | 90 | 105 | 11 |
| 96 | 87 | 73 | 60 | 105 | 99 | 99 | 117 | 77 | 134 | 73 | 134 | 134 | 12 |
| 124 | 112 | 93 | 70 | 121 | 115 | 116 | 123 | 89 | 150 | 89 | 132 | 155 | 13 |
| 118 | 108 | 90 | 69 | 126 | 118 | 118 | 129 | 94 | 166 | 91 | 140 | 147 | 14 |
| 114 | 103 | 89 | 73 | 133 | 121 | 121 | 134 | 96 | 184 | 98 | 140 | 144 | 15 |
| 110 | 101 | 86 | 73 | 133 | 124 | 124 | 135 | 101 | 192 | 102 | 140 | 153 | 16 |
| 105 | 99 | 84 | 71 | 131 | 123 | 127 | 143 | 101 | 198 | 102 | 140 | 157 | 17 |
| 115 | 108 | 94 | 75 | 140 | 130 | 137 | 146 | 107 | 210 | 108 | 128 | 162 | 18 |
| 97 | 94 | 85 | 85 | 116 | 112 | 112 | 122 | 95 | 99 | 96 | 116 | 130 | 19 |
| 100 | 98 | 90 | 87 | 127 | 123 | 123 | 137 | 105 | 134 | 104 | 124 | 143 | 20 |
| 103 | 100 | 93 | 92 | 129 | 122 | 122 | 134 | 110 | 149 | 108 | 132 | 170 | 21 |
| 102 | 100 | 91 | 90 | 133 | 124 | 124 | 137 | 109 | 165 | 110 | 165 | 120 | 22 |
| 100 | 98 | 88 | 85 | 133 | 124 | 124 | 135 | 107 | 181 | 104 | 140 | 158 | 23 |
| 99 | 97 | 88 | 84 | 137 | 127 | 127 | 138 | 108 | 190 | 103 | 140 | 158 | 24 |
| 100 | 99 | 90 | 89 | 143 | 134 | 138 | 150 | 117 | 197 | 109 | 144 | 160 | 25 |
| 89 | 87 | 77 | 70 | 132 | 120 | 130 | 149 | 104 | 210 | 105 | 128 | 152 | 26 |
| 83 | 75 | 67 | 57 | 103 | 95 | 95 | 113 | 75 | 134 | 91 | 112 | --- | 27 |
| 86 | 80 | 70 | 63 | 112 | 105 | 105 | 123 | 80 | 150 | 98 | 124 | --- | 28 |
| 89 | 87 | 75 | 67 | 123 | 115 | 120 | 133 | 92 | 166 | 105 | 135 | --- | 29 |
| 94 | 91 | 79 | 71 | 132 | 122 | 123 | 139 | 98 | 182 | 106 | 145 | --- | 30 |
| 93 | 87 | 75 | 68 | 130 | 120 | 124 | 140 | 100 | 190 | 91 | 129 | 150 | 31 |
| 92 | 88 | 78 | 73 | 136 | 126 | 130 | 148 | 106 | 198 | 105 | 146 | --- | 32 |
| 121 | 119 | 106 | 95 | 158 | 146 | 157 | 164 | 126 | 210 | 132 | 145 | 173 | 33 |
| 65 | 54 | 40 | 35 | 68 | 62 | 62 | 71 | 48 | 100 | 47 | 85 | 90 | 34 |
| 65 | 60 | 50 | 45 | 82 | 74 | 72 | 84 | 58 | 133 | 57 | 95 | 118 | 35 |
| 61 | 59 | 45 | 45 | 84 | 75 | 75 | 86 | 60 | 149 | 56 | 98 | 132 | 36 |
| 60 | 60 | 47 | 47 | 93 | 81 | 81 | 102 | 66 | 165 | 60 | 106 | 120 | 37 |
| 64 | 65 | 53 | 52 | 105 | 94 | 94 | 111 | 75 | 177 | 70 | 110 | 123 | 38 |
| 65 | 67 | 54 | 54 | 103 | 93 | 95 | 117 | 75 | 182 | 74 | 108 | 130 | 39 |
| 83 | 80 | 67 | 60 | 116 | 105 | 105 | 125 | 83 | 200 | 84 | 105 | 140 | 40 |
| 83 | 80 | 68 | 61 | 119 | 107 | 111 | 130 | 85 | 210 | 87 | 111 | 143 | 41 |
| 75 | 65 | 55 | 48 | 83 | 75 | 75 | 83 | 60 | 119 | 64 | 96 | 108 | 42 |
| 84 | 74 | 61 | 53 | 94 | 86 | 86 | 93 | 66 | 135 | 70 | 92 | 126 | 43 |
| 88 | 78 | 65 | 57 | 103 | 97 | 96 | 112 | 76 | 150 | 75 | 101 | 153 | 44 |
| 90 | 80 | 69 | 61 | 112 | 105 | 104 | 120 | 80 | 166 | 77 | 125 | 150 | 45 |
| 91 | 87 | 69 | 68 | 119 | 110 | 110 | 127 | 91 | 182 | 85 | 130 | 140 | 46 |
| 90 | 88 | 74 | 69 | 122 | 113 | 113 | 128 | 93 | 192 | 97 | 133 | 205 | 47 |
| 93 | 89 | 74 | 69 | 123 | 115 | 115 | 128 | 95 | 198 | 96 | 132 | 144 | 48 |
| 91 | 89 | 75 | 68 | 125 | 115 | 122 | 141 | 98 | 210 | 97 | 120 | 151 | 49 |
| 125 | 115 | 96 | 75 | 122 | 117 | 117 | 125 | 95 | 150 | 102 | 126 | 161 | 50 |
| 129 | 119 | 100 | 82 | 134 | 130 | 130 | 140 | 105 | 166 | 109 | 142 | 166 | 51 |
| 119 | 109 | 94 | 76 | 131 | 123 | 123 | 130 | 100 | 178 | 102 | 140 | 144 | 52 |
| 130 | 120 | 103 | 84 | 142 | 135 | 135 | 145 | 112 | 180 | 102 | 151 | 158 | 53 |
| 123 | 113 | 99 | 82 | 140 | 133 | 133 | 143 | 110 | 188 | 110 | 151 | 167 | 54 |
| 112 | 106 | 89 | 76 | 133 | 125 | 129 | 139 | 106 | 200 | 108 | 140 | 152 | 55 |
| 105 | 103 | 85 | 75 | 136 | 125 | 131 | 118 | 108 | 204 | 105 | 127 | 158 | 56 |
| 100 | 97 | 81 | 71 | 132 | 120 | 129 | 145 | 105 | 207 | 101 | 125 | 158 | 57 |
| 75 | 75 | 68 | 68 | 115 | 105 | 105 | 121 | 85 | 166 | --- | --- | --- | 58 |
| 75 | 76 | 67 | 68 | 120 | 108 | 108 | 125 | 90 | 174 | 100 | 128 | 132 | 59 |
| 77 | 77 | 70 | 69 | 122 | 112 | 114 | 130 | 96 | 181 | 100 | 128 | 226 | 60 |
| 77 | 77 | 70 | 70 | 124 | 115 | 115 | 132 | 100 | 190 | 94 | 130 | 247 | 61 |
| 76 | 78 | 71 | 74 | 130 | 120 | 124 | 139 | 105 | 198 | 98 | 137 | 144 | 62 |
| 84 | 84 | 76 | 75 | 132 | 120 | 127 | 139 | 104 | 126 | 104 | 111 | 136 | 63 |
| 83 | 84 | 75 | 70 | 110 | 103 | 103 | 118 | 85 | 135 | 100 | 104 | 130 | 64 |
| 84 | 85 | 77 | 75 | 119 | 112 | 112 | 129 | 95 | 150 | 104 | 111 | 130 | 65 |
| 82 | 85 | 76 | 74 | 121 | 112 | 112 | 126 | 95 | 165 | 104 | 112 | 135 | 66 |
| 85 | 85 | 78 | 76 | 128 | 117 | 117 | 130 | 100 | 185 | 104 | 113 | 155 | 67 |
| 85 | 86 | 78 | 77 | 131 | 122 | 123 | 139 | 105 | 190 | 97 | 119 | 152 | 68 |

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TABLE II - CONCLUDED. LUBRICATION AND FUEL

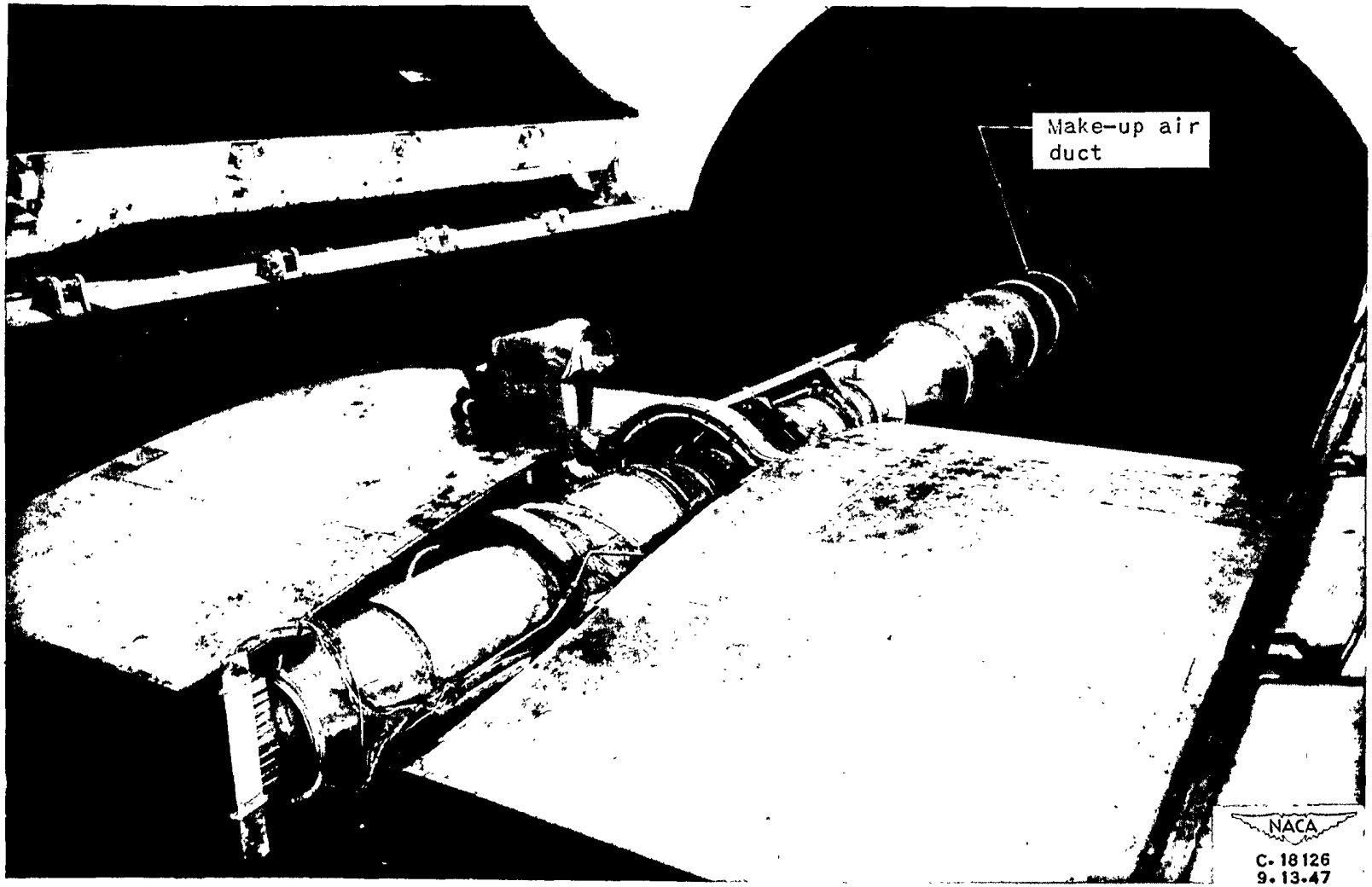
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run | Altitude (ft) | Ram pressure ratio, $P_2/P_0$ | Engine speed (rpm) | Fuel pressures (lb/sq in. gage) | | | Fuel temperature (°F) | Oil pressures (lb/sq in. gage) | | | | |
| | | | | Pump inlet | Pump discharge | Manifold | | Pump inlet | Pump discharge | Cooler inlet | Cooler outlet | Scavenge |
| 69 | 25,000 | 1.843 | 12,000 | ---- | --- | 60 | 54 | 17.6 | 146 | 123 | 93 | 4 |
| 70 | 25,000 | 1.836 | 12,500 | ---- | --- | 77 | 51 | 17.5 | 200 | 138 | 97 | 4 |
| 71 | 25,000 | 2.063 | 9,500 | 20.0 | 257 | 19 | 89 | 17.2 | 104 | 100 | 73 | 4 |
| 72 | 25,000 | 2.078 | 10,000 | 20.0 | 330 | 25 | 86 | 17.1 | 112 | 108 | 78 | 4 |
| 73 | 25,000 | 2.074 | 10,500 | 19.6 | 610 | 33 | 95 | 16.8 | 131 | 123 | 87 | 3 |
| 74 | 25,000 | 2.076 | 11,000 | 19.2 | 594 | 42 | 93 | 16.8 | 133 | 127 | 88 | 3 |
| 75 | 25,000 | 2.073 | 11,500 | 18.8 | 575 | 57 | 83 | 16.8 | 133 | 128 | 90 | 4 |
| 76 | 25,000 | 2.073 | 12,000 | 18.3 | 568 | 71 | 80 | 16.8 | 143 | 136 | 98 | 4 |
| 77 | 25,000 | 2.054 | 12,500 | ---- | --- | 91 | 51 | 17.6 | 183 | 146 | 106 | 4 |
| 78 | 35,000 | 1.037 | 7,000 | 20.0 | 134 | 4 | 47 | 17.5 | 87 | 84 | 57 | 4 |
| 79 | 35,000 | 1.041 | 8,000 | 20.1 | 168 | 6 | 57 | 17.3 | 103 | 99 | 68 | 4 |
| 80 | 35,000 | 1.040 | 9,000 | 20.0 | 208 | 8 | 64 | 17.0 | 120 | 115 | 77 | 4 |
| 81 | 35,000 | 1.042 | 10,000 | 19.9 | 260 | 10 | 72 | 16.8 | 140 | 133 | 90 | 4 |
| 82 | 35,000 | 1.048 | 11,000 | 19.7 | 338 | 15 | 81 | 16.5 | 151 | 144 | 96 | 4 |
| 83 | 35,000 | 1.050 | 11,500 | 19.6 | 454 | 18 | 89 | 16.4 | 161 | 152 | 101 | 4 |
| 84 | 35,000 | 1.046 | 12,000 | ---- | --- | 21 | 57 | 18.0 | 121 | 116 | 88 | 4 |
| 85 | 35,000 | 1.046 | 12,200 | ---- | --- | 22 | 57 | 17.8 | 125 | 119 | 89 | 4 |
| 86 | 35,000 | 1.205 | 8,000 | 20.3 | 186 | 6 | 55 | 16.7 | 131 | 123 | 73 | 3 |
| 87 | 35,000 | 1.197 | 9,000 | 20.4 | 224 | 8 | 64 | 16.8 | 122 | 118 | 77 | 3 |
| 88 | 35,000 | 1.200 | 10,000 | 20.4 | 273 | 11 | 75 | 16.7 | 139 | 133 | 86 | 3 |
| 89 | 35,000 | 1.210 | 11,000 | 20.5 | 388 | 16 | 85 | 16.4 | 161 | 153 | 102 | 3 |
| 90 | 35,000 | 1.210 | 11,500 | 19.8 | 560 | 20 | 96 | 16.2 | 167 | 158 | 104 | 3 |
| 91 | 35,000 | 1.205 | 11,900 | 19.6 | 610 | 22 | 103 | 16.2 | 168 | 160 | 107 | 3 |
| 92 | 35,000 | 1.404 | 9,000 | 20.1 | 204 | 9 | 64 | 17.0 | 121 | 118 | 78 | 4 |
| 93 | 35,000 | 1.404 | 10,000 | 19.9 | 250 | 13 | 71 | 16.9 | 142 | 134 | 90 | 4 |
| 94 | 35,000 | 1.412 | 10,500 | 19.8 | 310 | 16 | 76 | 16.7 | 152 | 144 | 98 | 4 |
| 95 | 35,000 | 1.414 | 11,000 | 19.6 | 405 | 19 | 84 | 16.6 | 157 | 148 | 99 | 4 |
| 96 | 35,000 | 1.414 | 11,500 | 19.4 | 605 | 23 | 95 | 16.4 | 163 | 156 | 103 | 4 |
| 97 | 35,000 | 1.418 | 12,000 | 19.2 | 542 | 30 | 90 | 16.4 | 169 | 160 | 108 | 4 |
| 98 | 35,000 | 1.412 | 12,000 | ---- | --- | 30 | 55 | 17.7 | 122 | 118 | 92 | 4 |
| 99 | 35,000 | 1.410 | 12,450 | ---- | --- | 38 | 52 | 17.9 | 120 | 117 | 90 | 4 |
| 100 | 35,000 | 1.602 | 8,000 | 20.0 | 207 | 10 | 63 | 17.0 | 124 | 119 | 78 | 4 |
| 101 | 35,000 | 1.617 | 10,000 | 19.9 | 273 | 15 | 70 | 16.7 | 151 | 143 | 94 | 4 |
| 102 | 35,000 | 1.615 | 10,500 | 19.8 | 330 | 18 | 75 | 16.8 | 153 | 146 | 100 | 4 |
| 103 | 35,000 | 1.612 | 11,000 | 19.6 | 527 | 22 | 90 | 16.5 | 162 | 154 | 102 | 4 |
| 104 | 35,000 | 1.608 | 11,500 | 19.4 | 588 | 28 | 93 | 16.4 | 167 | 158 | 106 | 4 |
| 105 | 35,000 | 1.615 | 12,000 | 19.2 | 520 | 34 | 86 | 16.4 | 169 | 160 | 107 | 4 |
| 106 | 35,000 | 1.618 | 12,500 | ---- | --- | 42 | 57 | 17.2 | 170 | 155 | 108 | 4 |
| 107 | 40,000 | 1.398 | 7,000 | 20.0 | 132 | 5 | 50 | 17.5 | 87 | 84 | 58 | 4 |
| 108 | 40,000 | 1.406 | 9,000 | 20.1 | 203 | 8 | 71 | 17.0 | 119 | 113 | 74 | 4 |
| 109 | 40,000 | 1.406 | 10,000 | 20.2 | 250 | 10 | 77 | 16.6 | 152 | 144 | 93 | 4 |
| 110 | 40,000 | 1.404 | 10,500 | 20.2 | 280 | 12 | 79 | 16.5 | 160 | 151 | 98 | 4 |
| 111 | 40,000 | 1.404 | 11,000 | 19.8 | 325 | 14 | 84 | 16.4 | 163 | 156 | 102 | 4 |
| 112 | 40,000 | 1.411 | 11,500 | 19.6 | 430 | 17 | 90 | 16.4 | 168 | 159 | 105 | 4 |
| 113 | 40,000 | 1.413 | 12,000 | 19.5 | 612 | 21 | 104 | 16.3 | 169 | 160 | 106 | 4 |
| 114 | 45,000 | 1.036 | 8,000 | 20.0 | 166 | 4 | 70 | 17.4 | 90 | 87 | 62 | 4 |
| 115 | 45,000 | 1.041 | 9,000 | 20.1 | 200 | 6 | 84 | 17.1 | 104 | 100 | 70 | 4 |
| 116 | 45,000 | 1.052 | 10,000 | 20.0 | 240 | 7 | 87 | 17.0 | 121 | 115 | 78 | 4 |
| 117 | 45,000 | 1.042 | 10,500 | 20.0 | 260 | 9 | 90 | 16.8 | 132 | 124 | 85 | 4 |
| 118 | 45,000 | 1.042 | 11,000 | 19.8 | 287 | 10 | 87 | 16.6 | 148 | 139 | 97 | 4 |
| 119 | 45,000 | 1.048 | 11,300 | ---- | --- | 11 | 63 | 18.0 | 121 | 116 | 86 | 4 |
| 120 | 45,000 | 1.215 | 7,500 | 20.3 | 162 | 4 | 67 | 17.3 | 90 | 86 | 60 | 4 |
| 121 | 45,000 | 1.192 | 9,000 | 20.3 | 226 | 4 | 76 | 17.0 | 122 | 117 | 77 | 4 |
| 122 | 45,000 | 1.210 | 9,000 | 20.3 | 217 | 5 | 80 | 17.0 | 120 | 114 | 77 | 5 |
| 123 | 45,000 | 1.211 | 10,000 | 20.4 | 261 | 8 | 87 | 16.6 | 139 | 132 | 86 | 3 |
| 124 | 45,000 | 1.186 | 10,500 | 20.4 | 295 | 9 | 90 | 16.3 | 150 | 142 | 92 | 3 |
| 125 | 45,000 | 1.192 | 10,500 | 20.5 | 296 | 9 | 90 | 16.3 | 150 | 142 | 90 | 3 |
| 126 | 45,000 | 1.201 | 11,000 | 20.2 | 314 | 10 | 90 | 16.0 | 167 | 158 | 100 | 3 |
| 127 | 45,000 | 1.205 | 11,400 | 20.3 | 365 | 13 | 95 | 16.0 | 167 | 157 | 102 | 3 |
| 128 | 45,000 | 1.416 | 7,500 | 20.0 | --- | -- | 59 | ---- | --- | --- | --- | - |
| 129 | 45,000 | 1.403 | 9,000 | 20.1 | --- | -- | 71 | ---- | --- | --- | --- | - |
| 130 | 45,000 | 1.406 | 10,000 | 20.1 | 243 | 9 | 83 | 16.8 | 132 | 126 | 84 | 4 |
| 131 | 45,000 | 1.405 | 10,500 | 20.0 | 260 | 10 | 84 | 16.7 | 147 | 139 | 94 | 4 |
| 132 | 45,000 | 1.379 | 11,000 | 19.8 | 292 | 11 | 85 | 16.6 | 152 | 144 | 97 | 4 |
| 133 | 45,000 | 1.406 | 11,500 | 19.6 | 345 | 14 | 84 | 16.4 | 160 | 151 | 102 | 4 |
| 134 | 45,000 | 1.397 | 12,000 | ---- | --- | 17 | 62 | 17.7 | 137 | 131 | 94 | 4 |
| 135 | 45,000 | 1.409 | 12,100 | ---- | --- | 18 | 62 | 17.6 | 141 | 133 | 96 | 4 |

SYSTEM DATA FOR X24C-4B TURBOJET ENGINE

| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil temperatures (°F) | | | | | | | | | Total oil flow (gal/hr) | Bearing temperatures (°F) | | | Run |
| Pump inlet | Cooler inlet | Cooler outlet | Gear case scavenge | Bearing 2 (fore) scavenge | Bearing 2 (aft) scavenge | Bearing 3 (fore) scavenge | Bearing 3 (aft) scavenge | Scavenge pump discharge | | 1 | 2 | 3 | |
| 86 | 87 | 80 | 80 | 135 | 124 | 131 | 147 | 108 | 200 | 103 | 120 | 152 | 69 |
| 85 | 86 | 80 | 80 | 139 | 128 | 137 | 151 | 115 | 210 | 111 | 129 | 163 | 70 |
| 84 | 90 | 84 | 84 | 129 | 123 | 123 | 138 | 106 | 158 | 114 | 132 | 148 | 71 |
| 86 | 86 | 79 | 80 | 130 | 121 | 121 | 138 | 105 | 165 | 112 | 138 | 144 | 72 |
| 77 | 80 | 72 | 73 | 127 | 116 | 117 | 135 | 100 | 173 | 108 | 136 | 138 | 73 |
| 80 | 87 | 75 | 75 | 130 | 118 | 120 | 137 | 104 | 181 | 108 | 136 | --- | 74 |
| 84 | 85 | 78 | 78 | 133 | 125 | 127 | 146 | 110 | 190 | 96 | 142 | 160 | 75 |
| 86 | 87 | 83 | 84 | 138 | 129 | 133 | 147 | 114 | 197 | 110 | 140 | 158 | 76 |
| 86 | 86 | 80 | 80 | 139 | 125 | 135 | 145 | 111 | 210 | 112 | 124 | 154 | 77 |
| 70 | 65 | 56 | 49 | 86 | 82 | 82 | 86 | 65 | 115 | 56 | 82 | 108 | 78 |
| 73 | 73 | 60 | 55 | 98 | 90 | 90 | 100 | 73 | 132 | 62 | 90 | 110 | 79 |
| 74 | 74 | 62 | 58 | 101 | 95 | 94 | 103 | 75 | 152 | 66 | 94 | 121 | 80 |
| 73 | 74 | 63 | 59 | 105 | 98 | 96 | 112 | 77 | 167 | 68 | 96 | 128 | 81 |
| 73 | 75 | 64 | 62 | 106 | 100 | 100 | 115 | 82 | 181 | 78 | 112 | 128 | 82 |
| 74 | 75 | 64 | 63 | 106 | 100 | 100 | 118 | 83 | 190 | 83 | 113 | 133 | 83 |
| 120 | 114 | 100 | 84 | 137 | 130 | 131 | 144 | 112 | 195 | 108 | 120 | 160 | 84 |
| 113 | 109 | 95 | 79 | 136 | 125 | 128 | 140 | 109 | 195 | 102 | 118 | 156 | 85 |
| 59 | 57 | 45 | 43 | 82 | 73 | 72 | 80 | 60 | 133 | 57 | 86 | 98 | 86 |
| 72 | 70 | 57 | 55 | 91 | 90 | 90 | 107 | 74 | 151 | 70 | 87 | 110 | 87 |
| 72 | 70 | 60 | 59 | 106 | 99 | 96 | 113 | 78 | 166 | 74 | 104 | 140 | 88 |
| 74 | 70 | 60 | 59 | 106 | 92 | 92 | 115 | 78 | 182 | 76 | 113 | 135 | 89 |
| 73 | 72 | 61 | 59 | 106 | 98 | 97 | 117 | 78 | 191 | 82 | 116 | 140 | 90 |
| 71 | 70 | 61 | 61 | 113 | 102 | 102 | 116 | 84 | 191 | 84 | 112 | 134 | 91 |
| 73 | 73 | 59 | 55 | 99 | 93 | 91 | 110 | 75 | 149 | 72 | 90 | 125 | 92 |
| 73 | 73 | 61 | 58 | 106 | 98 | 95 | 113 | 76 | 166 | 72 | 112 | 124 | 93 |
| 73 | 74 | 63 | 58 | 108 | 99 | 97 | 113 | 78 | 174 | 71 | 110 | 124 | 94 |
| 73 | 73 | 62 | 59 | 105 | 97 | 97 | 114 | 78 | 181 | 72 | 109 | 155 | 95 |
| 72 | 74 | 63 | 60 | 110 | 100 | 98 | 116 | 80 | 190 | 78 | 113 | 126 | 96 |
| 73 | 75 | 63 | 60 | 110 | 101 | 103 | 119 | 84 | 192 | 79 | 114 | 132 | 97 |
| 124 | 115 | 99 | 75 | 136 | 126 | 130 | 143 | 107 | 198 | 100 | 123 | 160 | 98 |
| 135 | 128 | 110 | 84 | 150 | 139 | 143 | 154 | 120 | 205 | 112 | 134 | 172 | 99 |
| 73 | 73 | 57 | 55 | 97 | 93 | 93 | 111 | 76 | 149 | 72 | 90 | 112 | 100 |
| 70 | 70 | 58 | 56 | 103 | 95 | 93 | 109 | 76 | 167 | 71 | 108 | 122 | 101 |
| 75 | 74 | 62 | 58 | 107 | 97 | 97 | 115 | 76 | 174 | 74 | 114 | 130 | 102 |
| 70 | 73 | 60 | 59 | 103 | 97 | 97 | 114 | 77 | 181 | 70 | 104 | 126 | 103 |
| 73 | 80 | 62 | 60 | 107 | 100 | 100 | 120 | 75 | 190 | 78 | 112 | 134 | 104 |
| 73 | 75 | 63 | 62 | 113 | 104 | 104 | 123 | 85 | 193 | 81 | 116 | 136 | 105 |
| 80 | 80 | 70 | 68 | 124 | 111 | 115 | 126 | 95 | 210 | 104 | 119 | 148 | 106 |
| 69 | 66 | 56 | 53 | 90 | 85 | 85 | 93 | 66 | 113 | 62 | 89 | 117 | 107 |
| 69 | 72 | 60 | 60 | 100 | 94 | 91 | 104 | 75 | 149 | 74 | 92 | 129 | 108 |
| 65 | 66 | 55 | 55 | 103 | 93 | 89 | 106 | 76 | 165 | 67 | 98 | 110 | 109 |
| 67 | 67 | 57 | 57 | 103 | 95 | 92 | 110 | 75 | 174 | 66 | 100 | 132 | 110 |
| 67 | 70 | 59 | 59 | 100 | 95 | 94 | 109 | 76 | 182 | 70 | 105 | 165 | 111 |
| 68 | 70 | 59 | 58 | 103 | 96 | 96 | 114 | 80 | 187 | 78 | 106 | 130 | 112 |
| 70 | 71 | 63 | 63 | 107 | 99 | 98 | 118 | 78 | 193 | 82 | 112 | 124 | 113 |
| 78 | 78 | 69 | 66 | 106 | 99 | 96 | 104 | 79 | 131 | 68 | 98 | 106 | 114 |
| 77 | 79 | 69 | 69 | 112 | 105 | 101 | 114 | 84 | 147 | 72 | 100 | 120 | 115 |
| 77 | 78 | 70 | 70 | 115 | 105 | 104 | 118 | 86 | 164 | 75 | 102 | 120 | 116 |
| 76 | 77 | 70 | 70 | 112 | 105 | 104 | 118 | 87 | 173 | 79 | 101 | 126 | 117 |
| 74 | 76 | 67 | 67 | 106 | 110 | 98 | 112 | 81 | 181 | 80 | 97 | 170 | 118 |
| 100 | 99 | 87 | 75 | 126 | 116 | 116 | 125 | 99 | 186 | 93 | 108 | 148 | 119 |
| 75 | 75 | 63 | 60 | 99 | 92 | 92 | 99 | 75 | 125 | 66 | 92 | 129 | 120 |
| 74 | 73 | 61 | 60 | 101 | 94 | 89 | 94 | 74 | 151 | 68 | 94 | 128 | 121 |
| 71 | 71 | 60 | 59 | 101 | 94 | 90 | 98 | 76 | 148 | 68 | 92 | 134 | 122 |
| 70 | 69 | 60 | 60 | 107 | 99 | 95 | 112 | 77 | 166 | 70 | 95 | 170 | 123 |
| 69 | 70 | 60 | 60 | 103 | 97 | 96 | 114 | 80 | 175 | 74 | 92 | 126 | 124 |
| 68 | 67 | 59 | 59 | 104 | 96 | 95 | 113 | 78 | 175 | 80 | 90 | 129 | 125 |
| 64 | 65 | 55 | 56 | 96 | 91 | 90 | 107 | 78 | 190 | 76 | 84 | 124 | 126 |
| 68 | 66 | 59 | 60 | 104 | 96 | 95 | 112 | 79 | 188 | 81 | 91 | 192 | 127 |
| 75 | 75 | 63 | 59 | 96 | 90 | 90 | 99 | 75 | 127 | 68 | 75 | 122 | 128 |
| 74 | 75 | 64 | 61 | 101 | 95 | 91 | 99 | 75 | 150 | 72 | 96 | 134 | 129 |
| 74 | 74 | 64 | 64 | 110 | 102 | 98 | 113 | 81 | 165 | 75 | 98 | 120 | 130 |
| 73 | 75 | 64 | 63 | 108 | 100 | 98 | 113 | 78 | 174 | 75 | 102 | 124 | 131 |
| 73 | 75 | 65 | 64 | 104 | 97 | 97 | 116 | 80 | 182 | 78 | 96 | 128 | 132 |
| 74 | 75 | 65 | 65 | 105 | 100 | 100 | 115 | 85 | 191 | 80 | 106 | 134 | 133 |
| 96 | 95 | 80 | 72 | 124 | 114 | 114 | 128 | 97 | 200 | 94 | 106 | 146 | 134 |
| 94 | 93 | 80 | 72 | 125 | 114 | 115 | 130 | 97 | 200 | 94 | 105 | 144 | 135 |

(a) Cowling installed.

Figure 1. - Installation of X24C-4B turbojet engine in altitude wind tunnel.




(b) Make-up air duct installed.

Figure 1. - Concluded. Installation of X24C-4B turbojet engine in altitude wind tunnel.

[redacted]

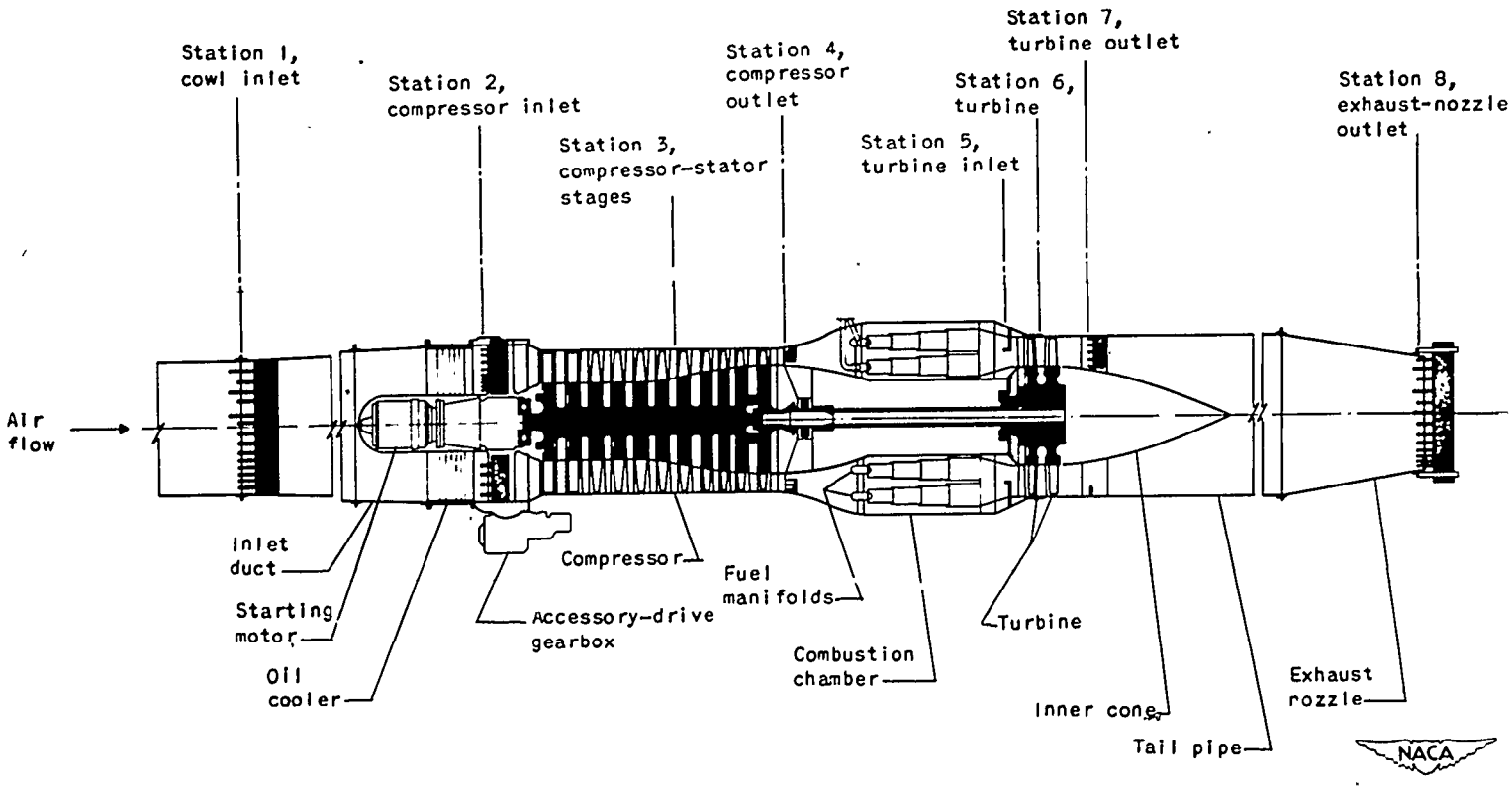
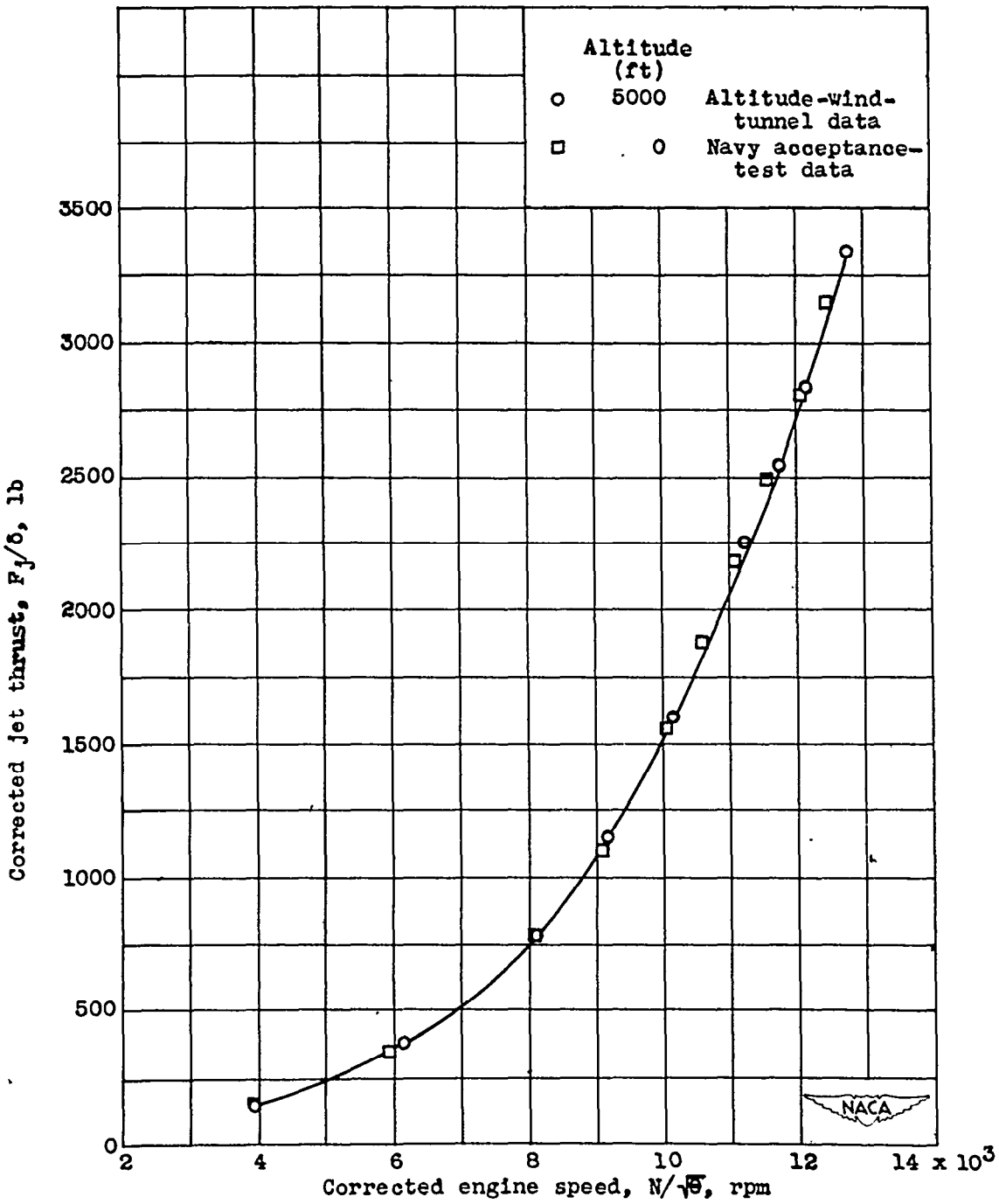


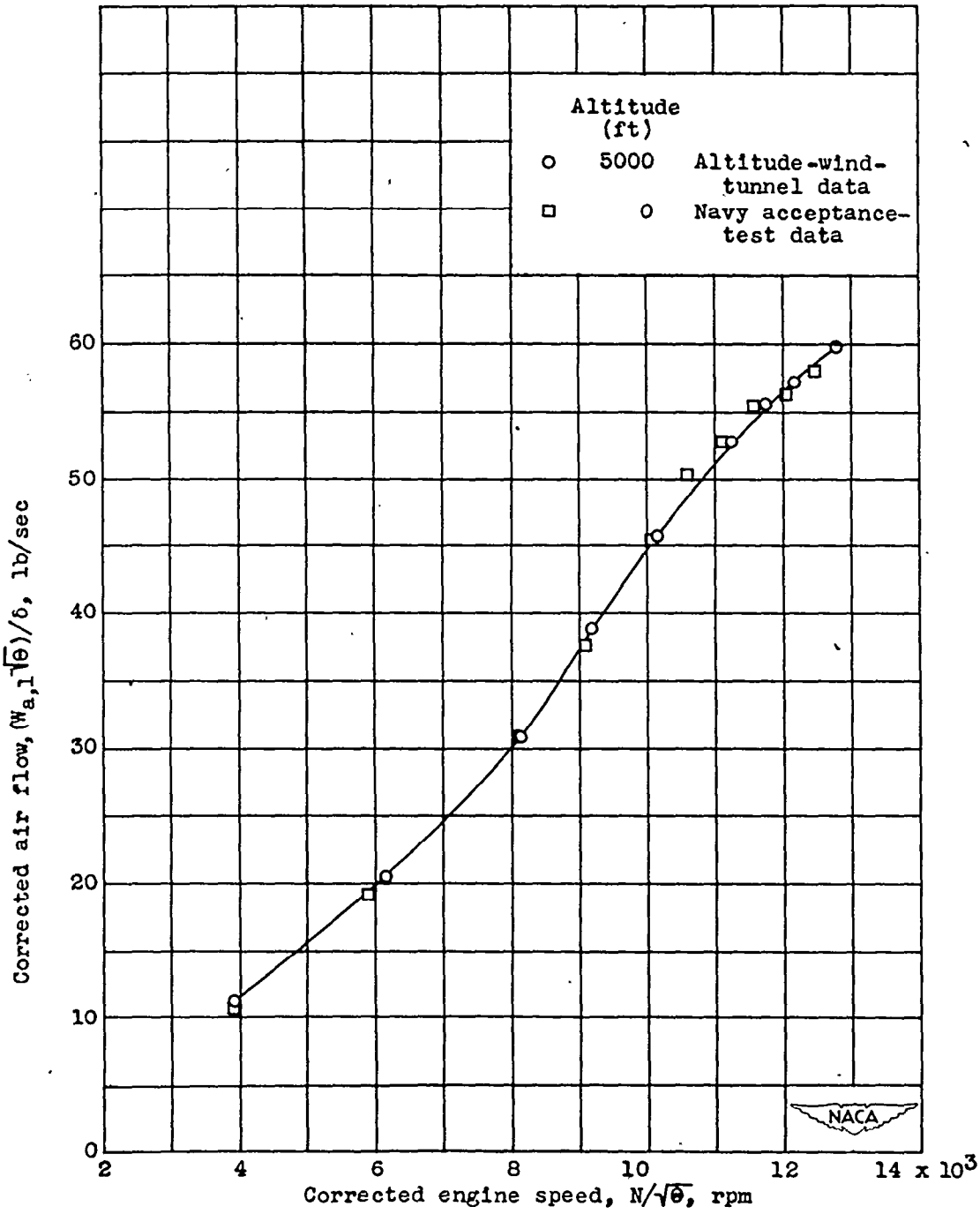

Figure 2. - Sectional side view of X24C-4B turbojet engine showing stations at which instrumentation was installed.

[redacted]



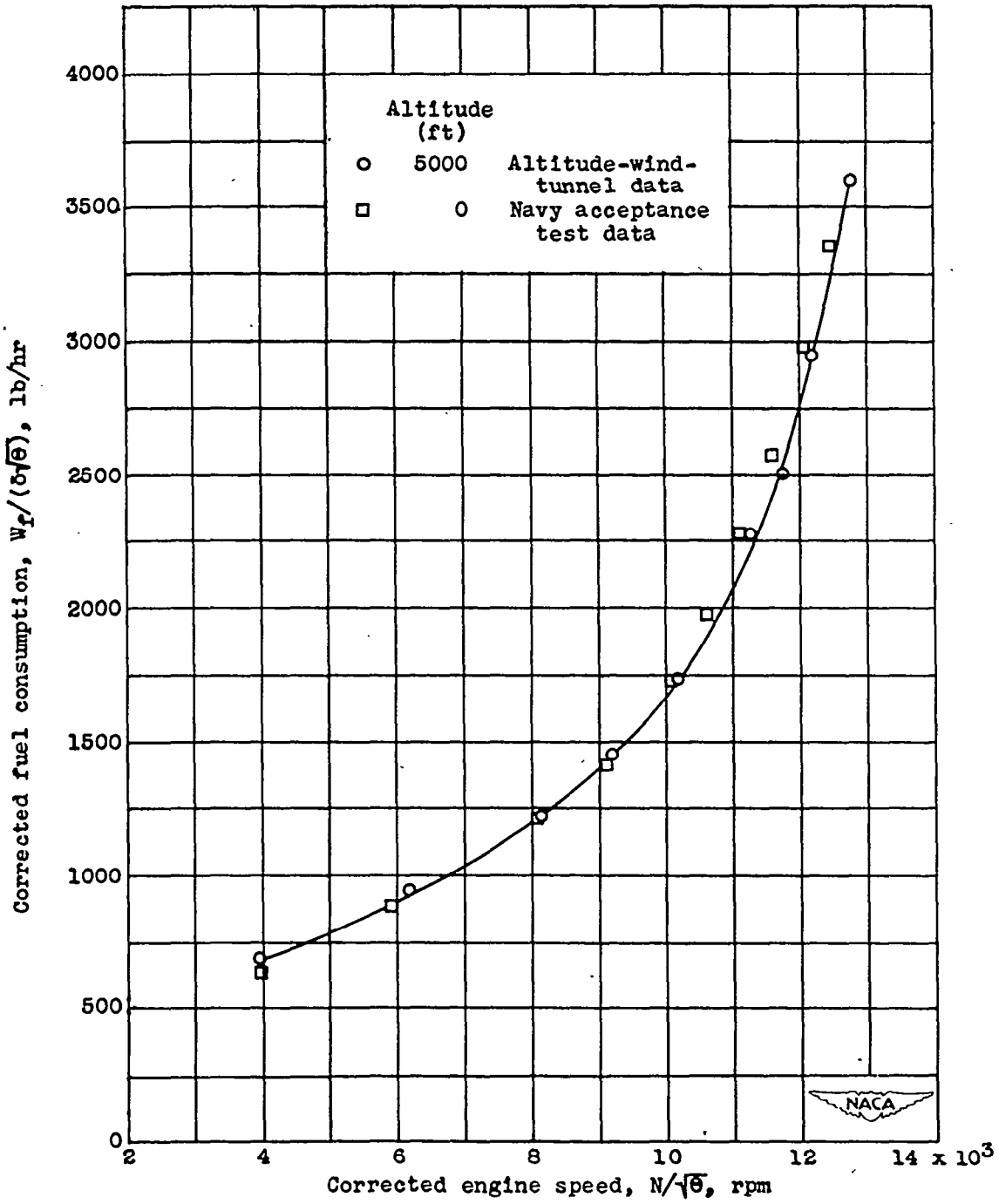

(a) Corrected jet thrust.

Figure 3. - Comparison of altitude-wind-tunnel data with Navy acceptance-test data on basis of variation of turbojet engine performance with corrected engine speed at flight Mach number of 0.



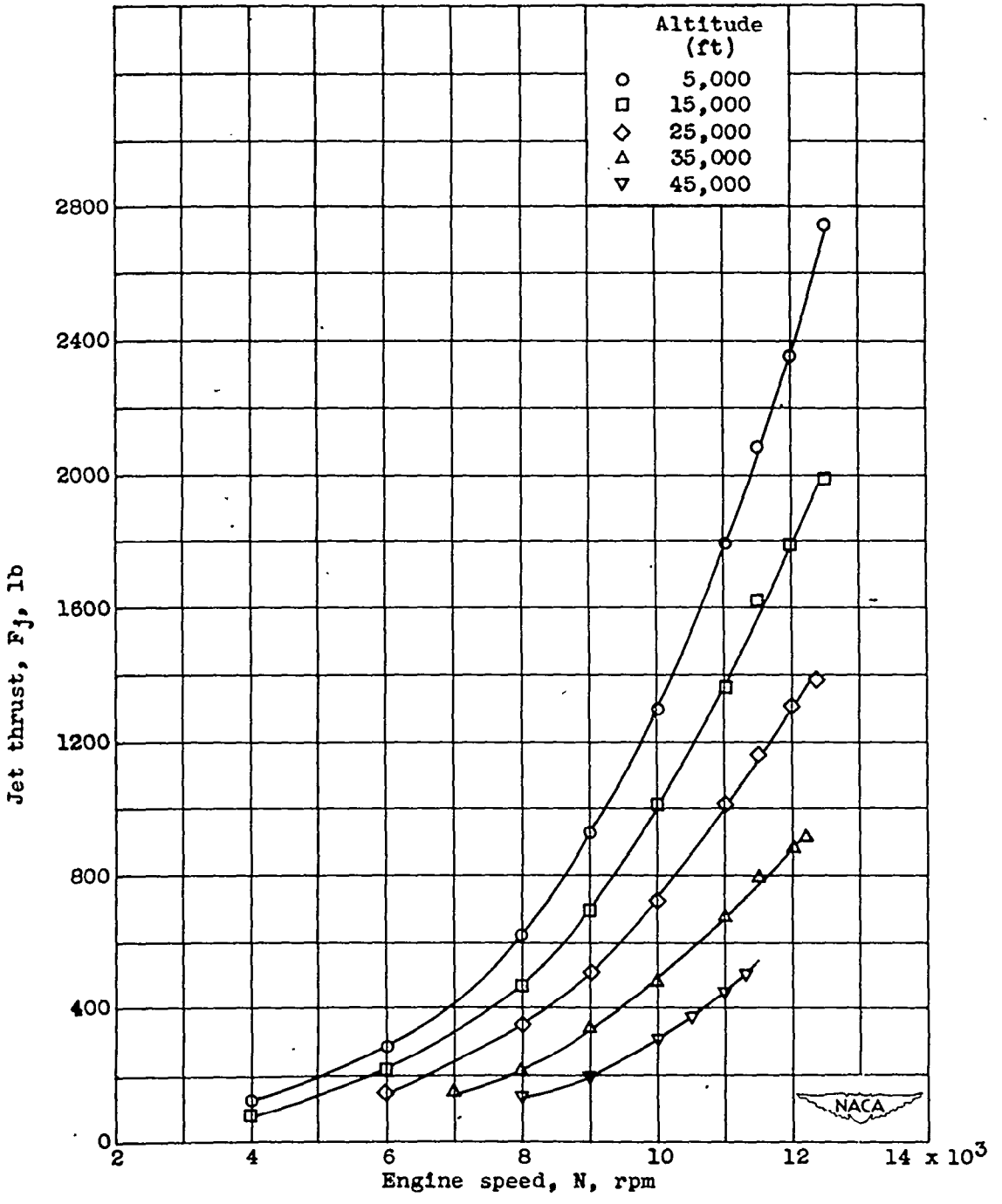

(b) Corrected air flow.

Figure 3. - Continued. Comparison of altitude-wind-tunnel data with Navy acceptance-test data on basis of variation of turbojet engine performance with corrected engine speed at flight Mach number of 0.



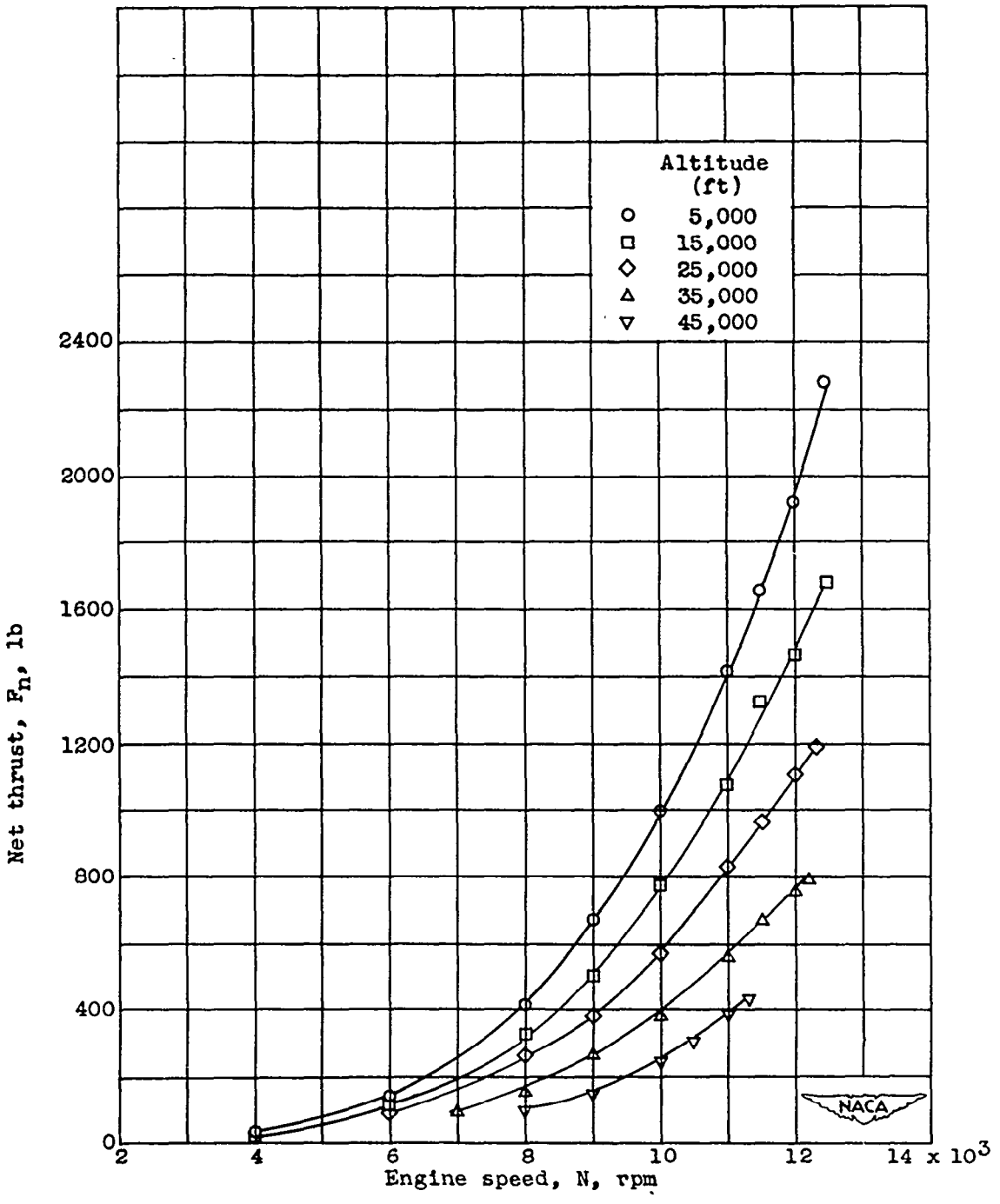

(c) Corrected fuel consumption.

Figure 3. - Concluded. Comparison of altitude-wind-tunnel data with Navy acceptance-test data on basis of variation of turbojet engine performance with corrected engine speed at flight Mach number of 0.



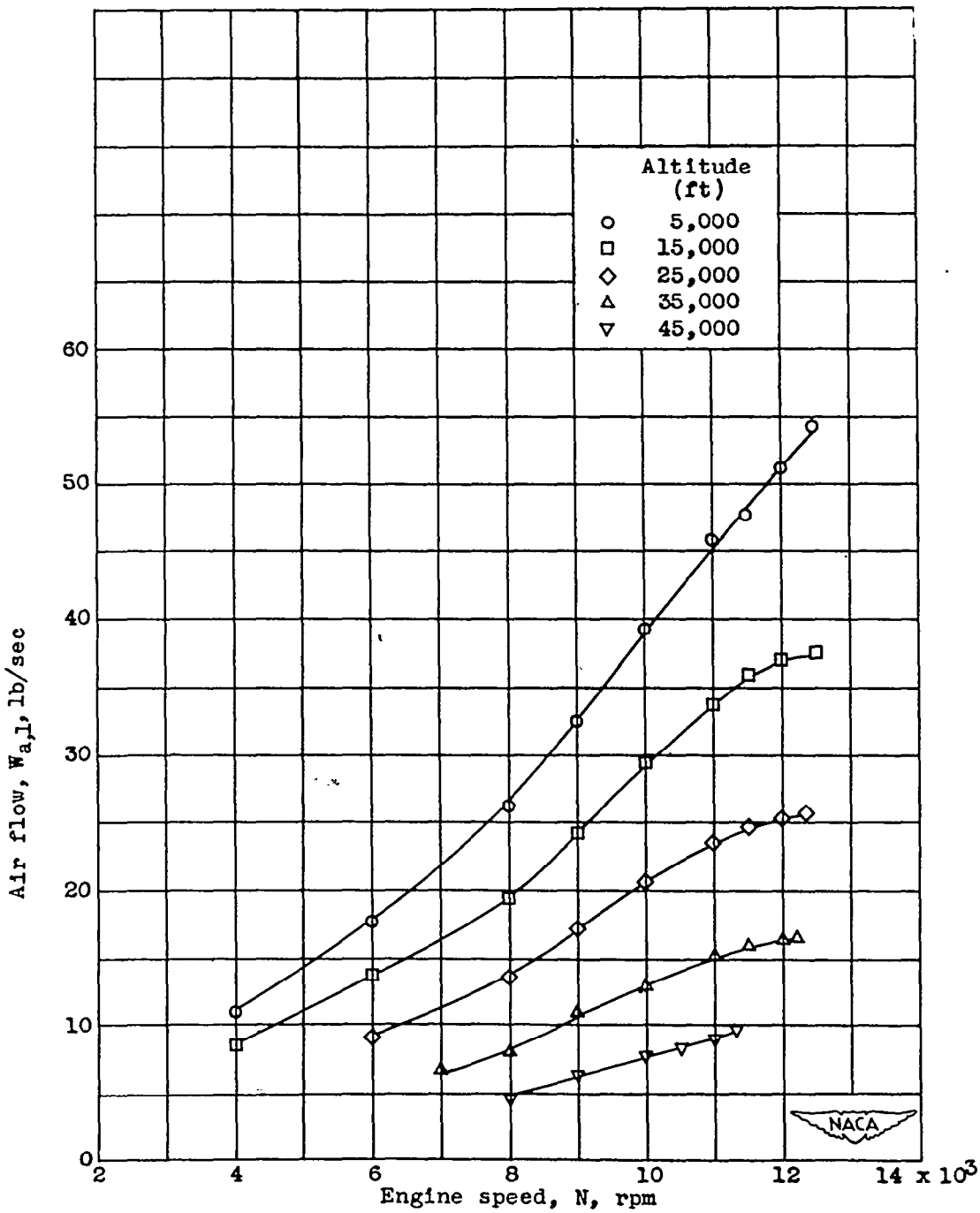

(a) Jet thrust.

Figure 4. - Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



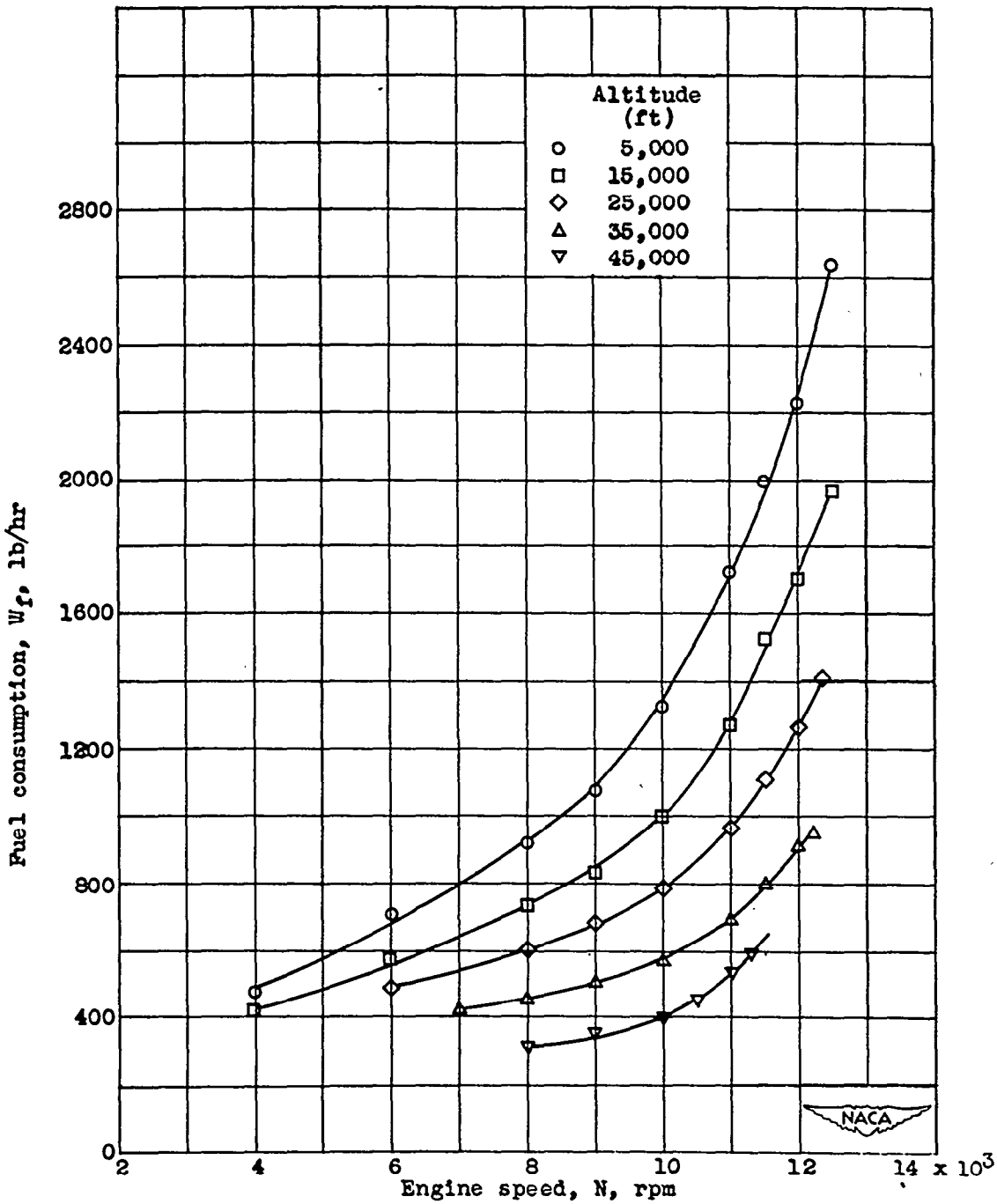

(b) Net thrust.

Figure 4. - Continued. Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



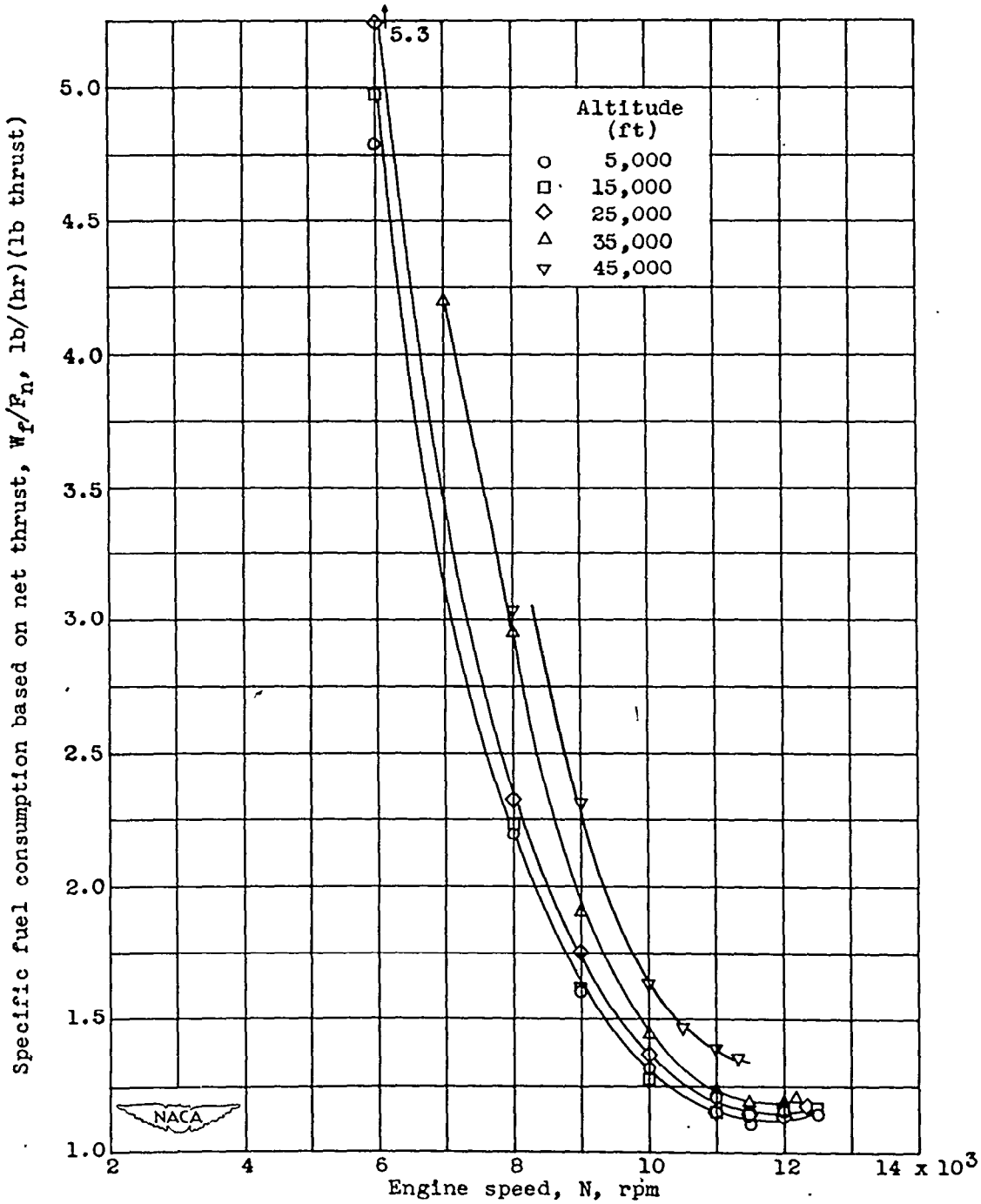

(c) Air flow.

Figure 4. - Continued. Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



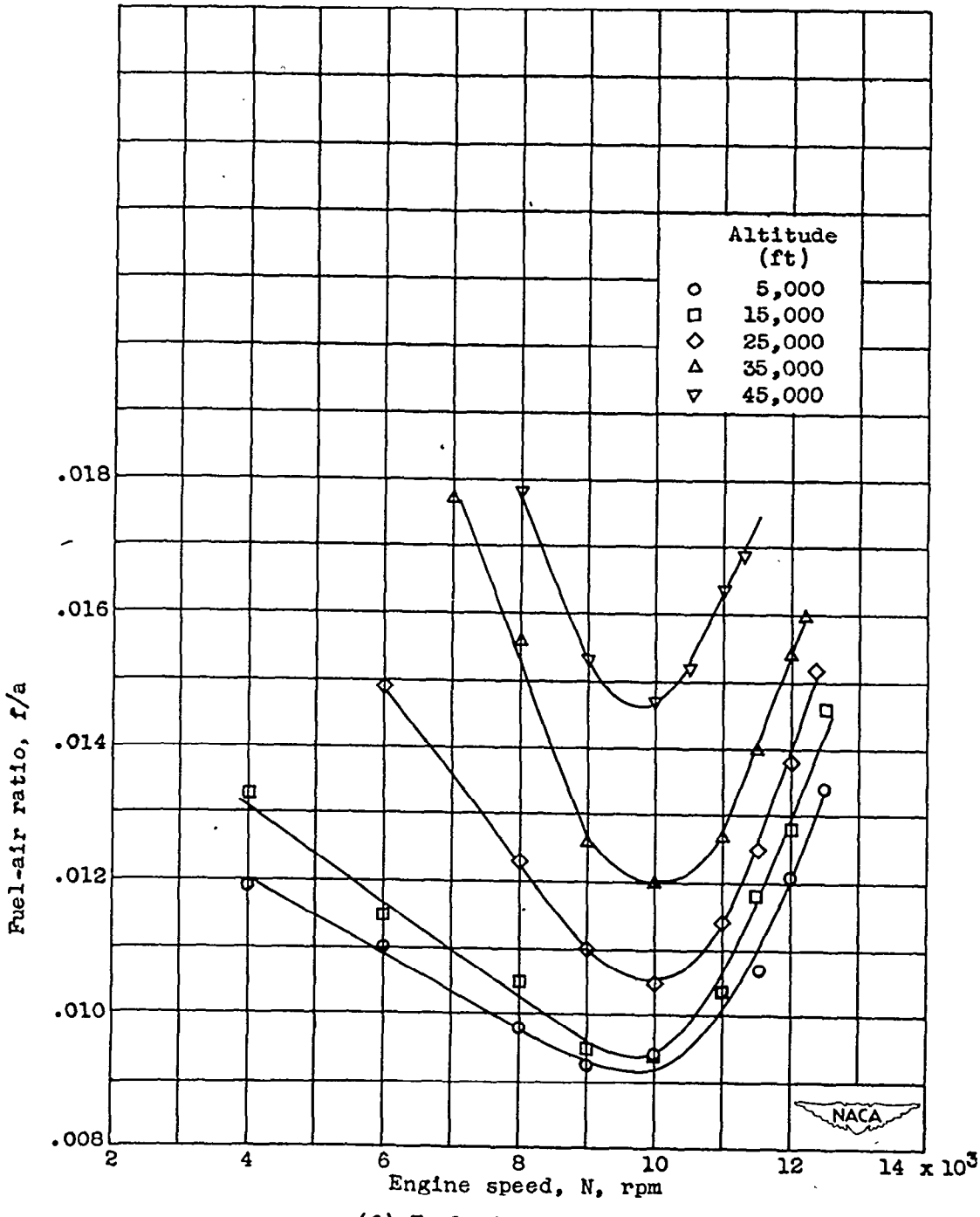

(d) Fuel consumption.

Figure 4. - Continued. Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



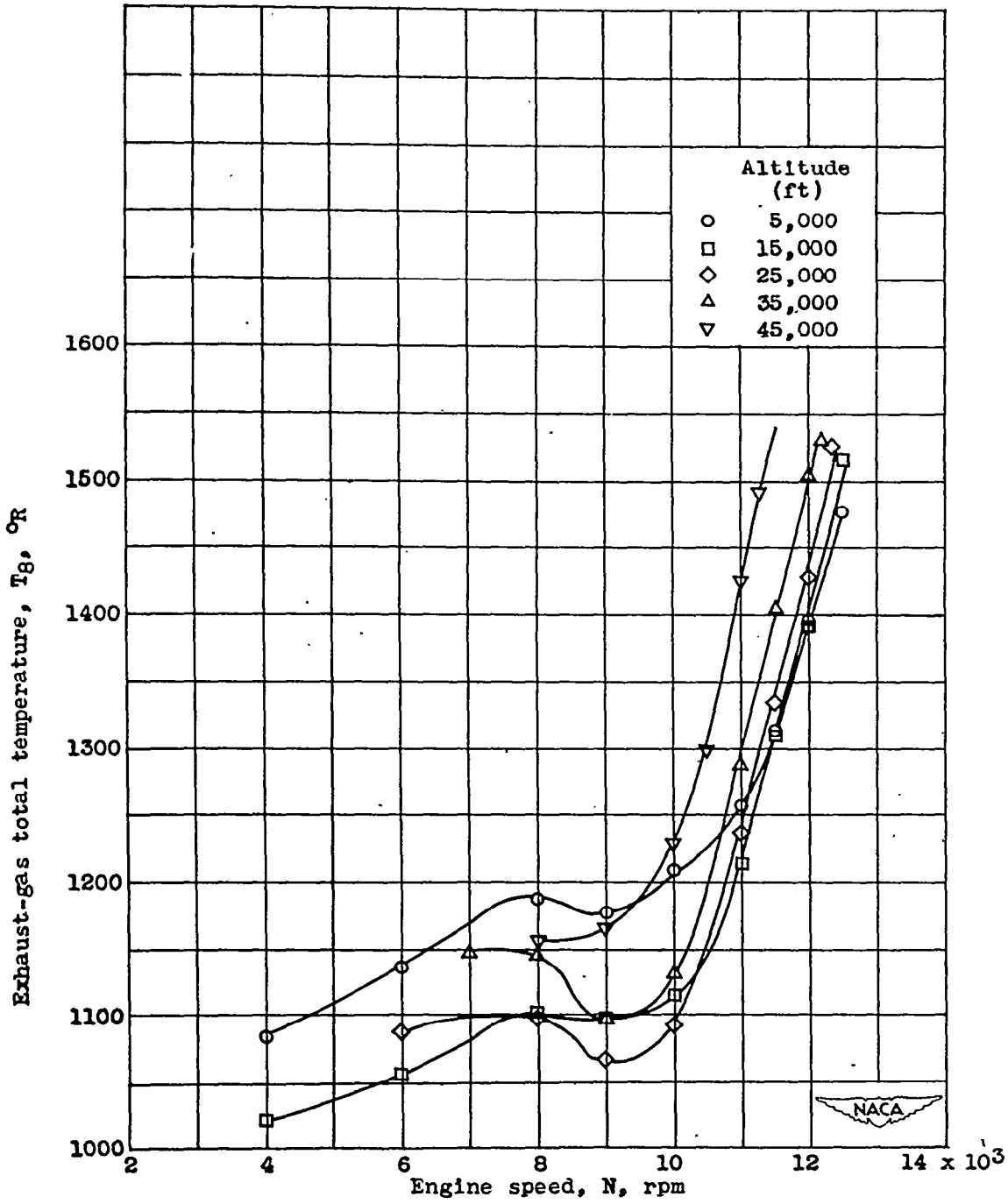

(e) Specific fuel consumption based on net thrust.

Figure 4. - Continued. Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



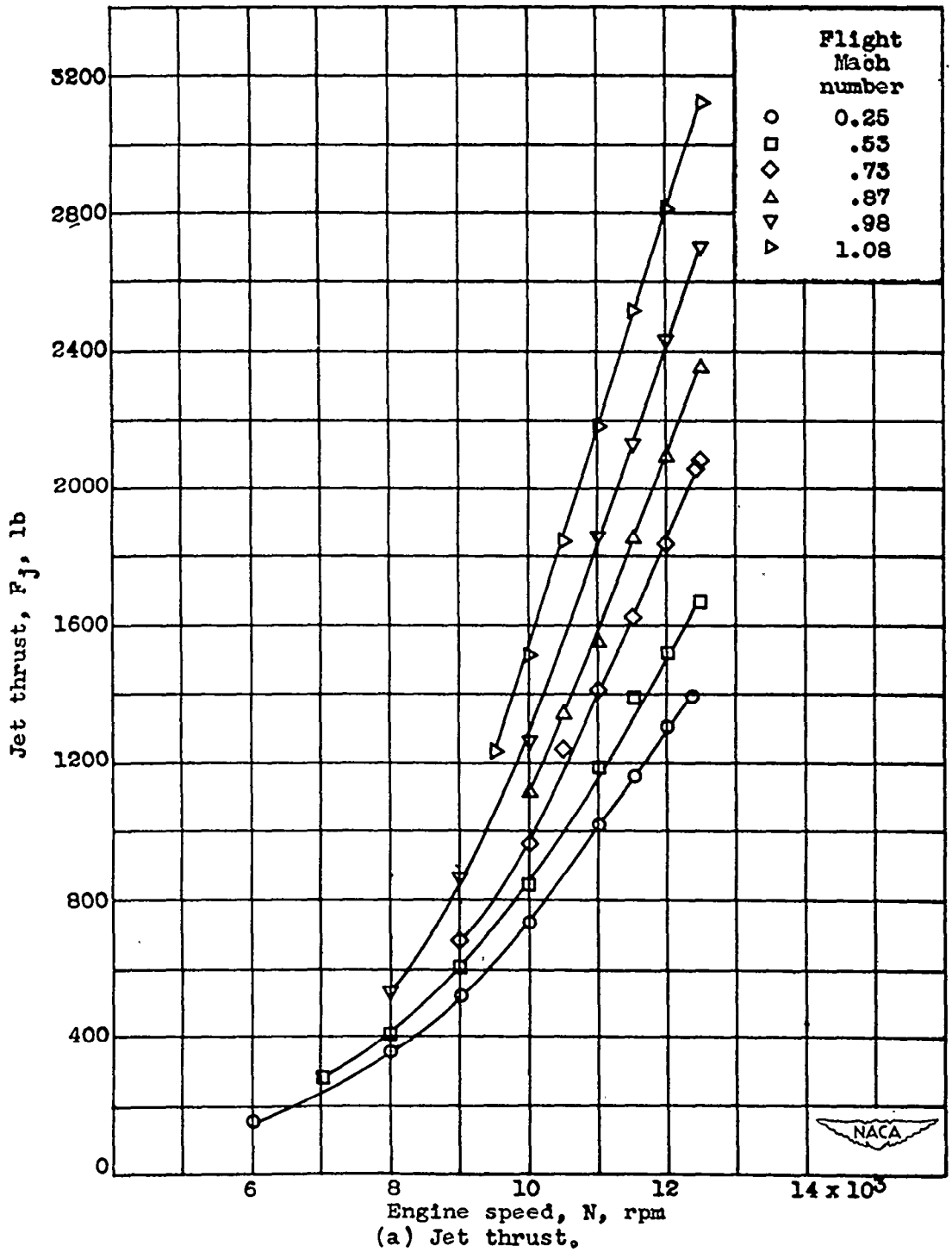

(f) Fuel-air ratio.

Figure 4. - Continued. Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



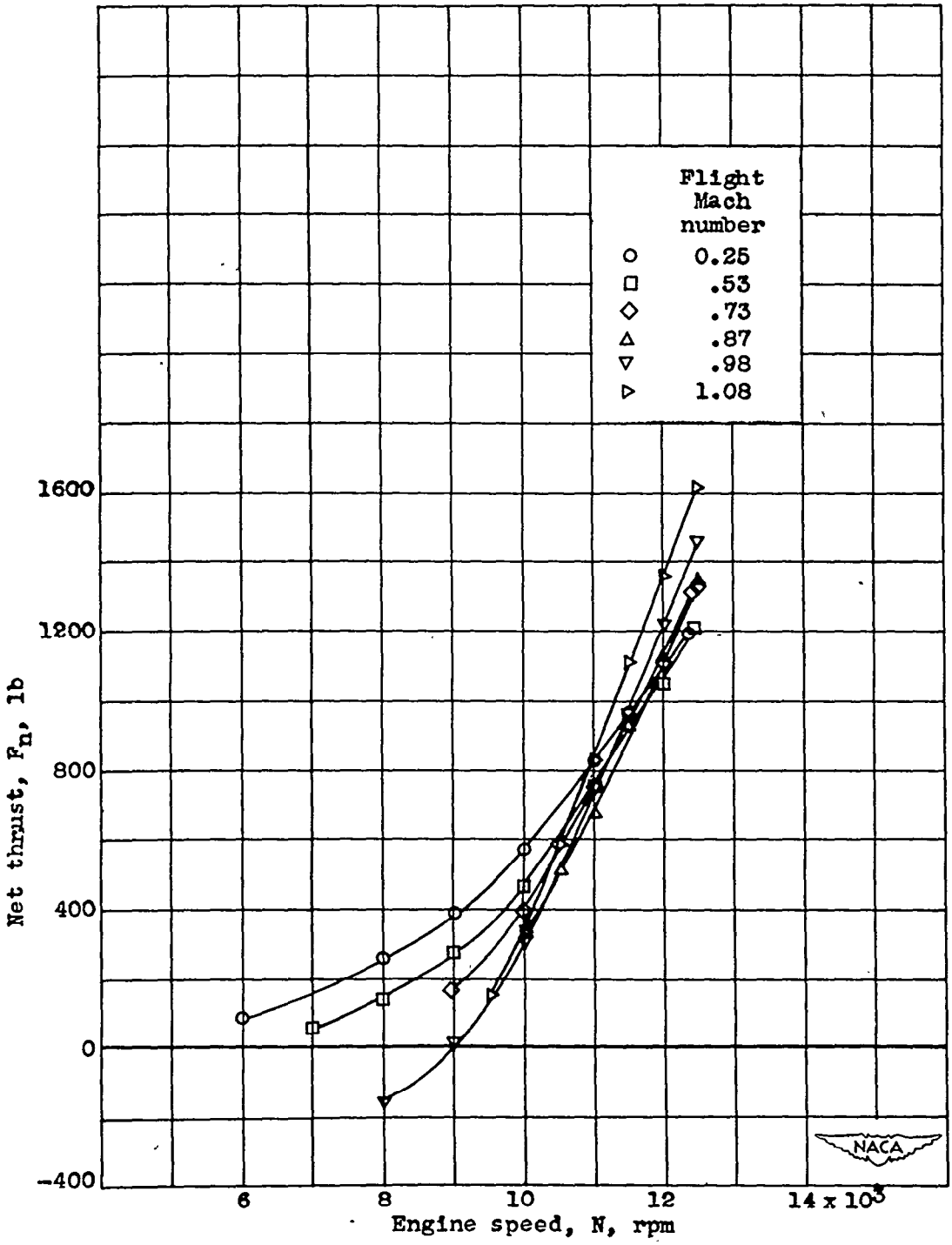

(g) Exhaust-gas total temperature.

Figure 4. - Concluded. Effect of altitude on variation of turbojet engine performance with engine speed at flight Mach number of 0.25.



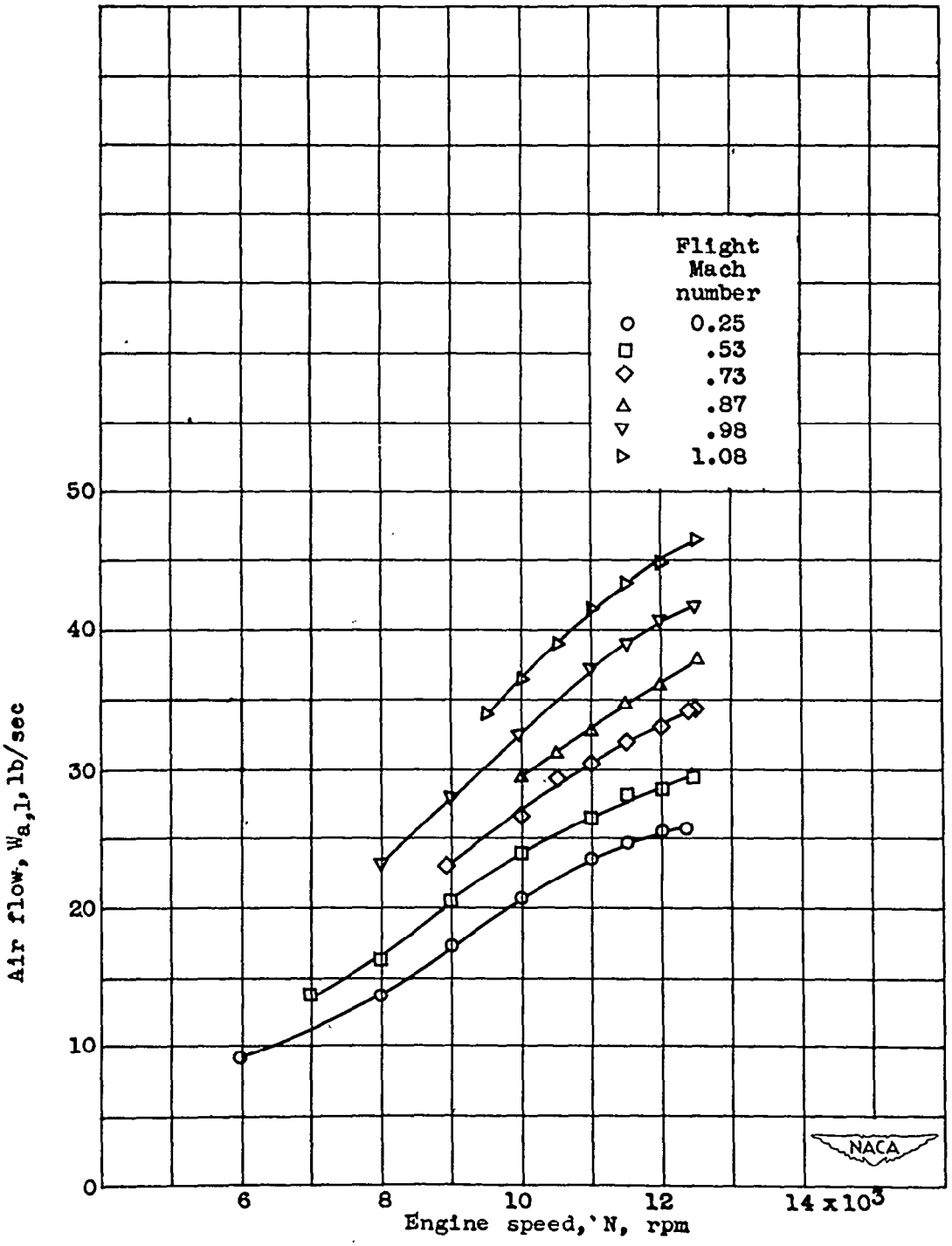

(a) Jet thrust.

Figure 5. - Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



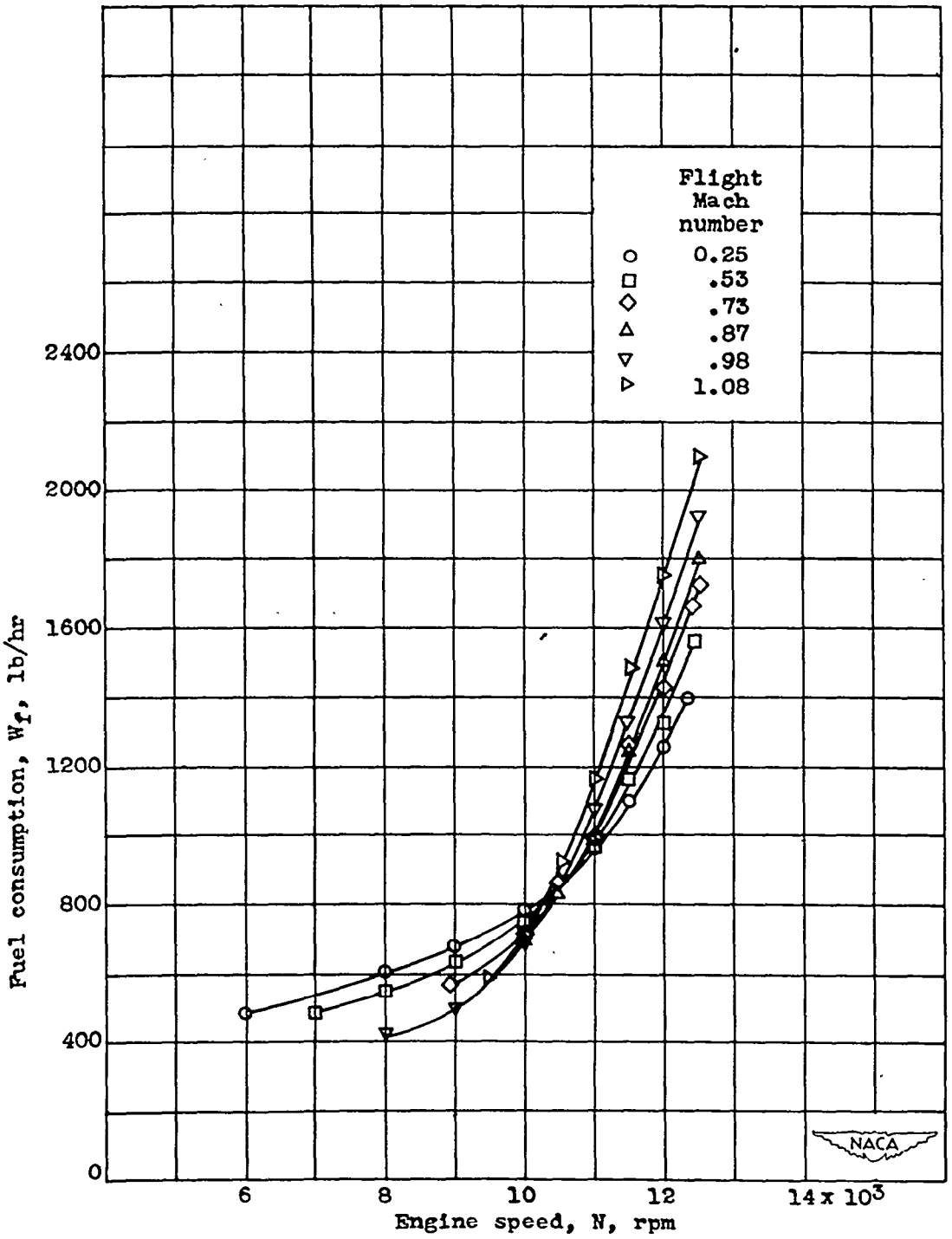

(b) Net thrust.

Figure 5. - Continued. Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



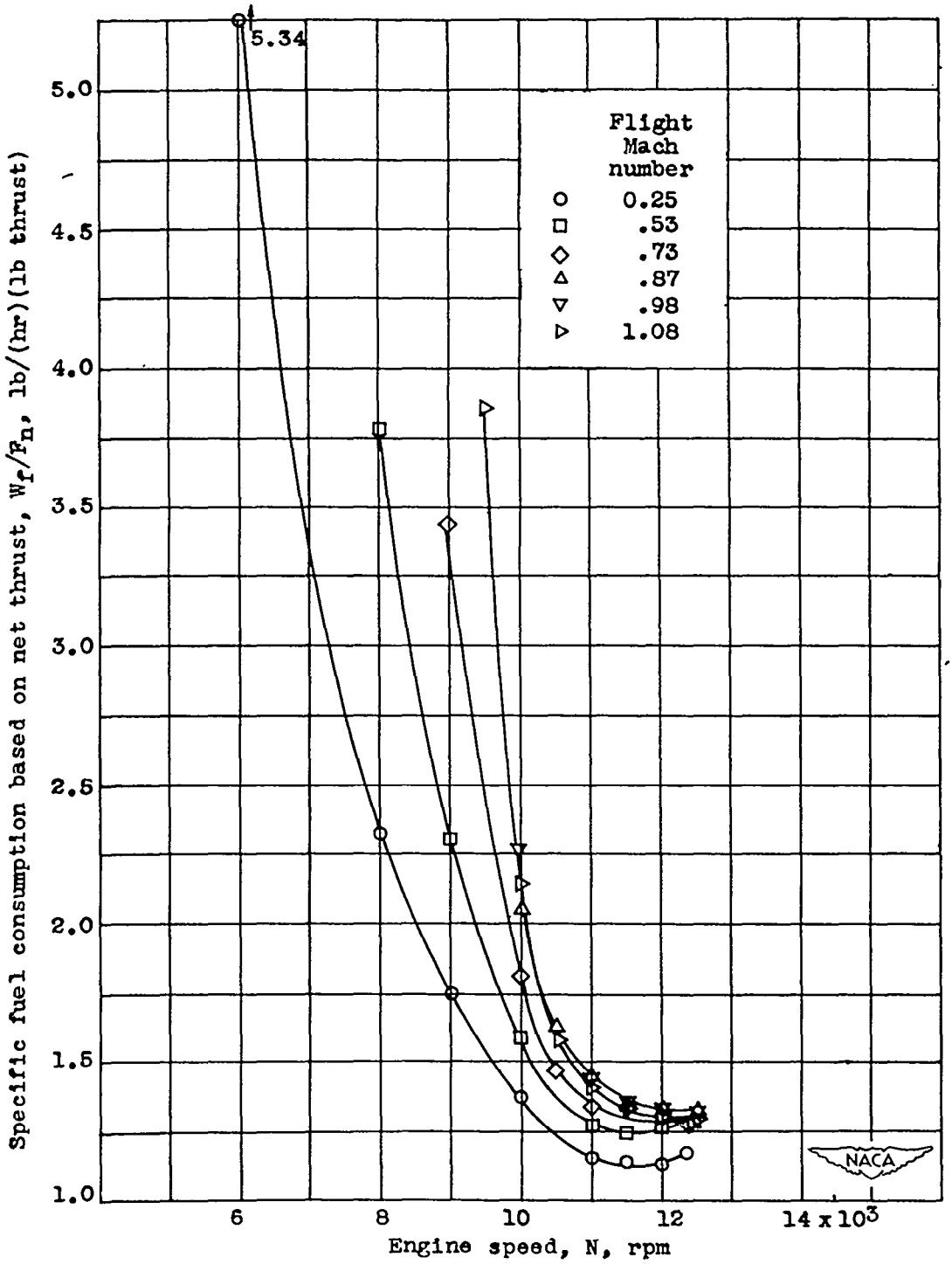

(c) Air flow.

Figure 5. - Continued. Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



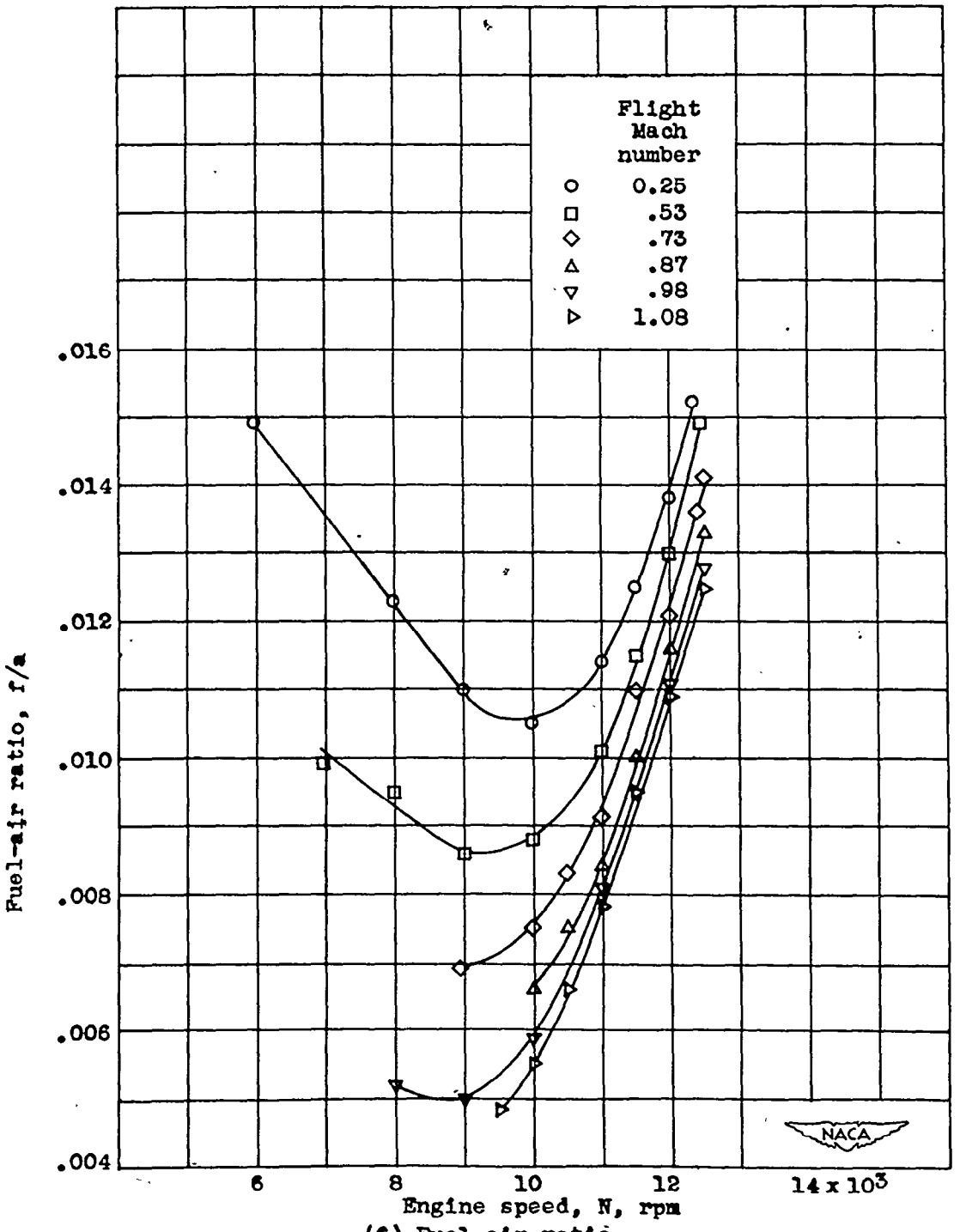

(d) Fuel consumption.

Figure 5. - Continued. Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



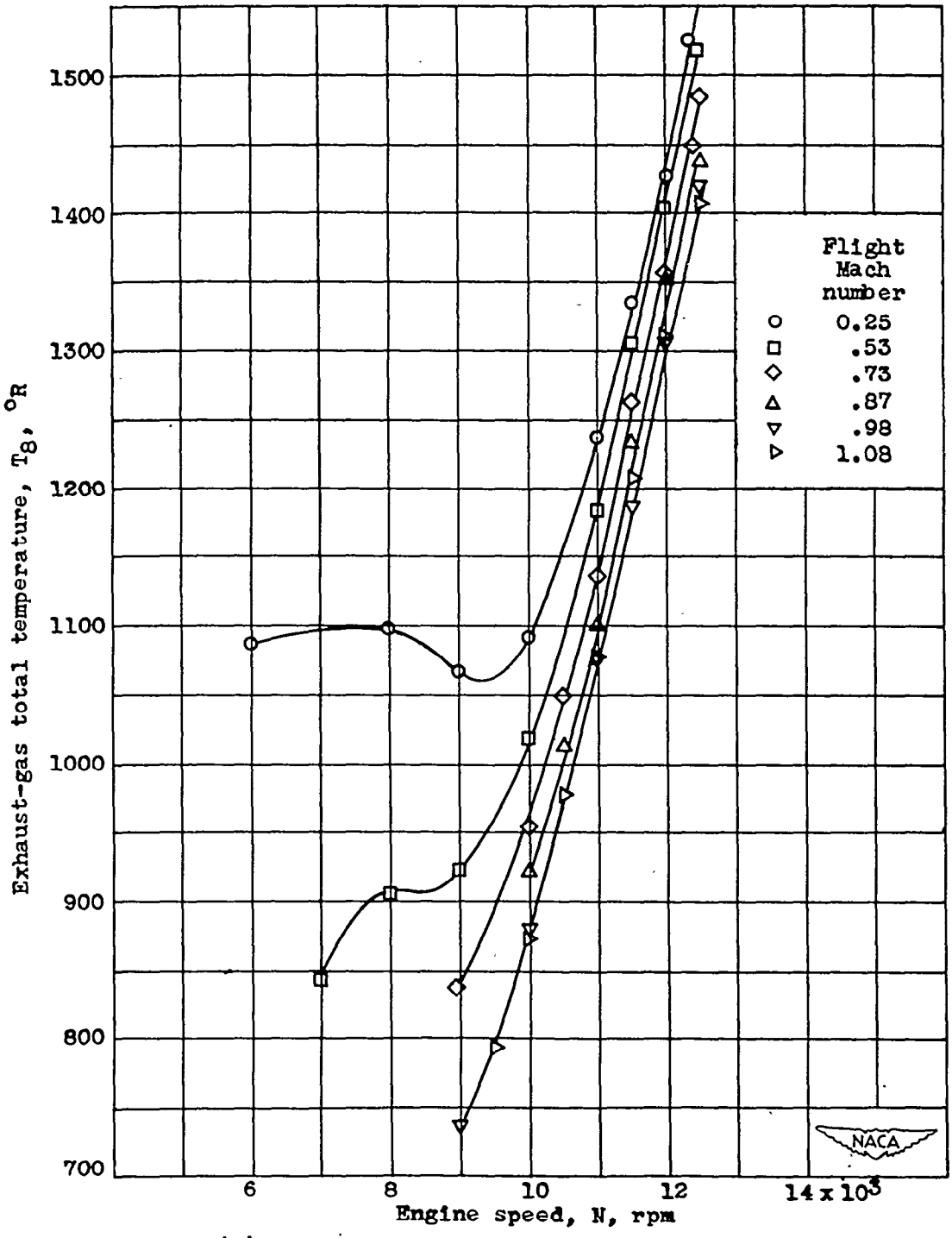

(e) Specific fuel consumption based on net thrust.

Figure 5. - Continued. Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



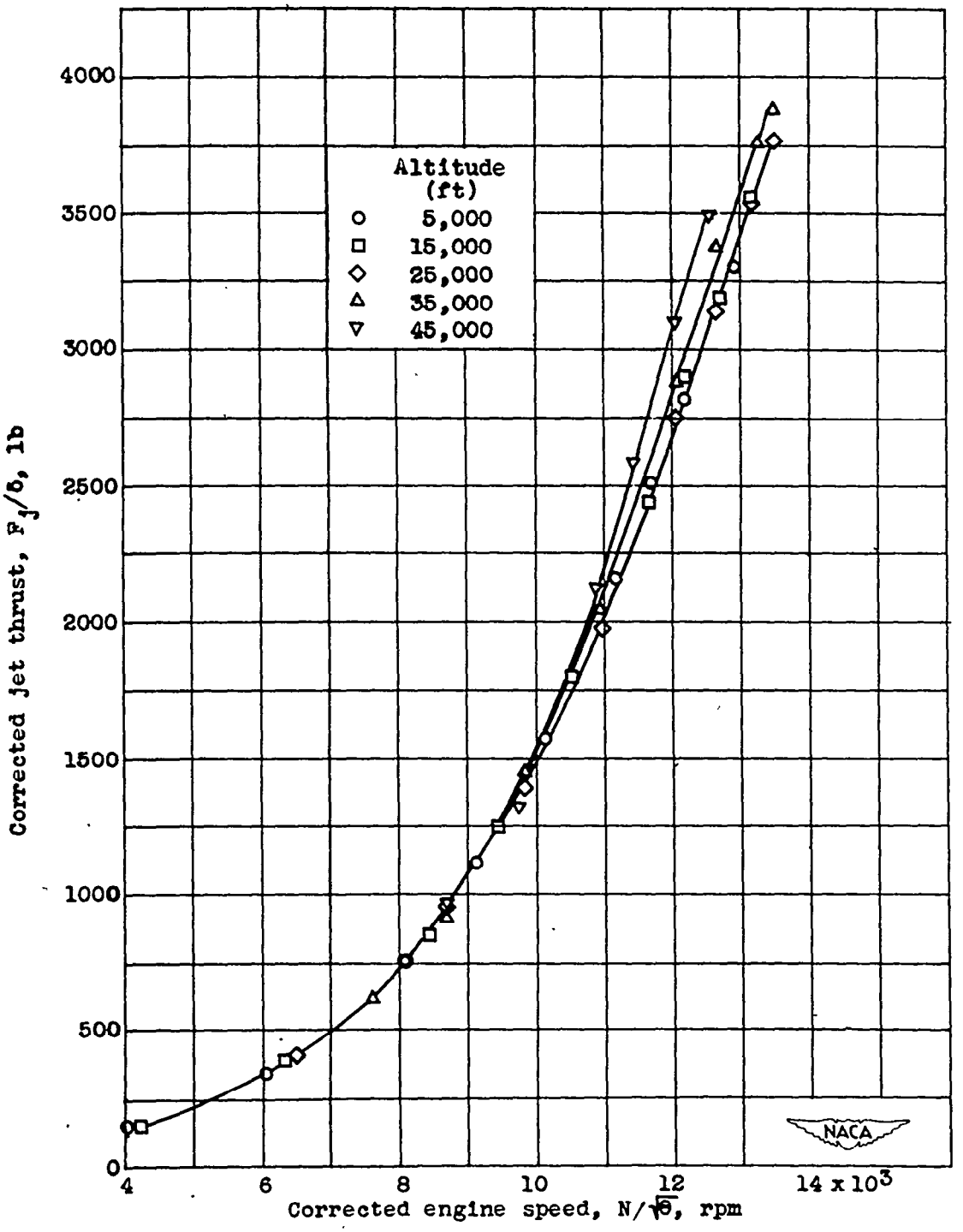

(f) Fuel-air ratio.

Figure 5. - Continued. Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



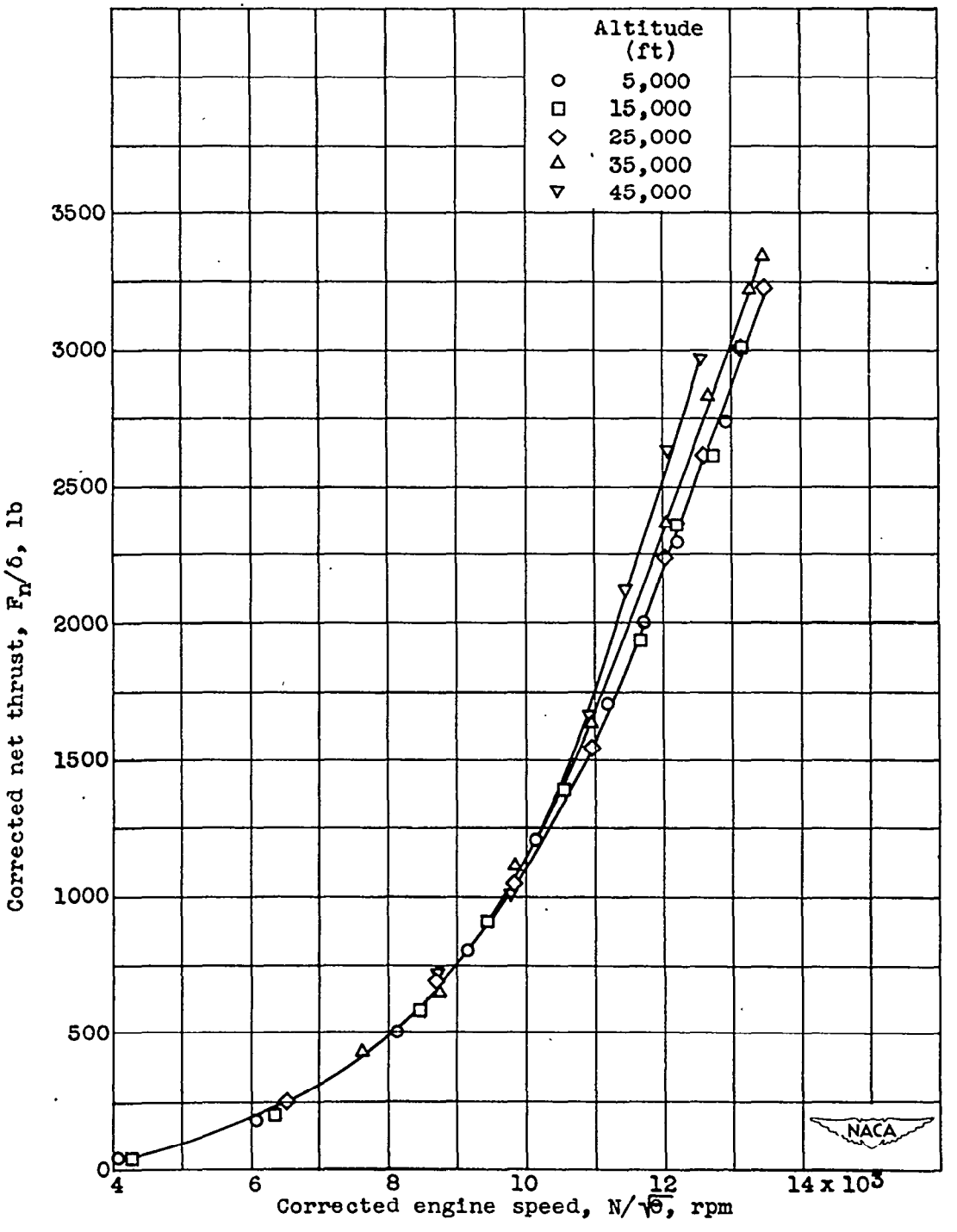

(g) Exhaust-gas total temperature.

Figure 5. - Concluded. Effect of flight Mach number on variation of turbojet engine performance with engine speed at altitude of 25,000 feet.



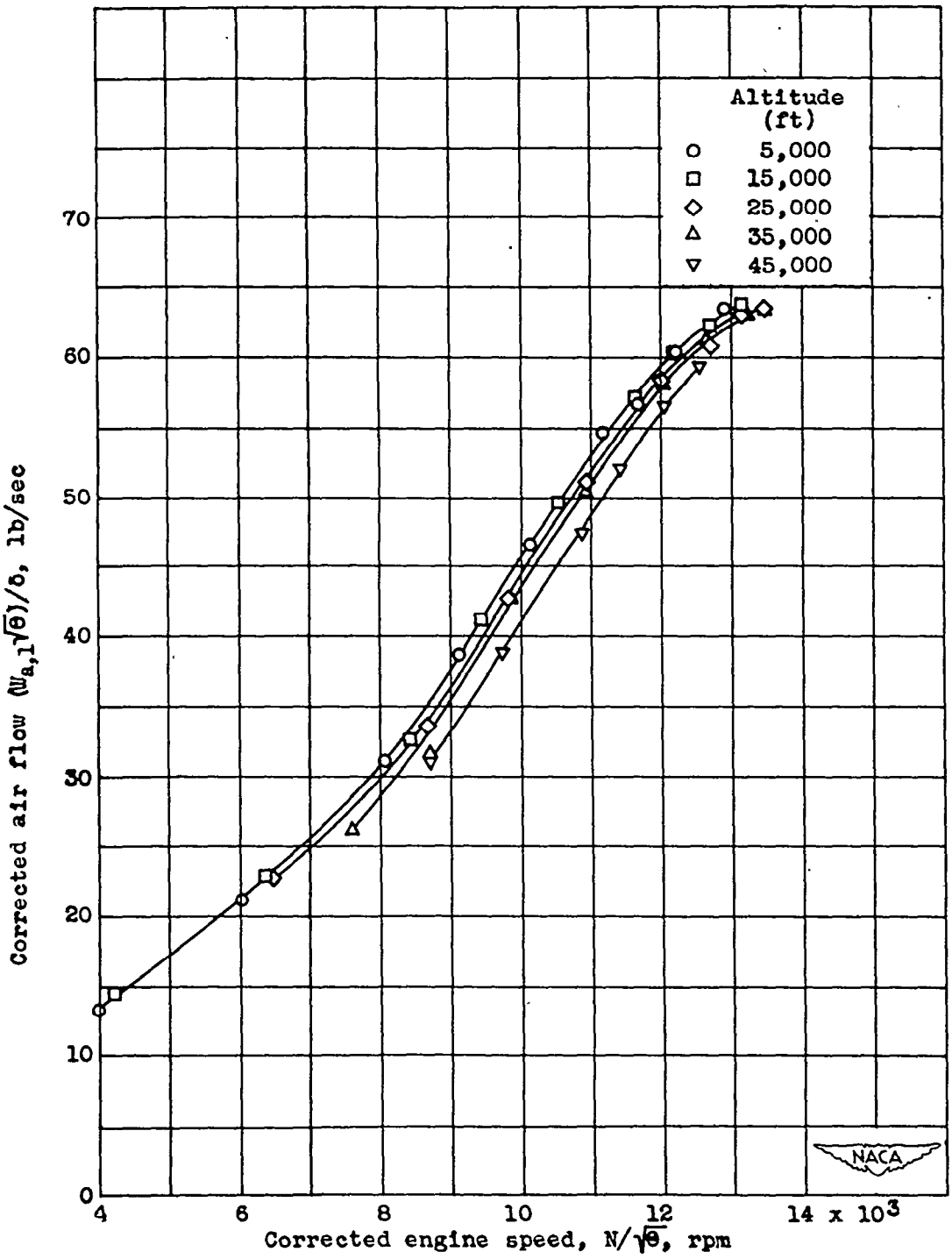

(a) Corrected jet thrust.

Figure 6. - Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



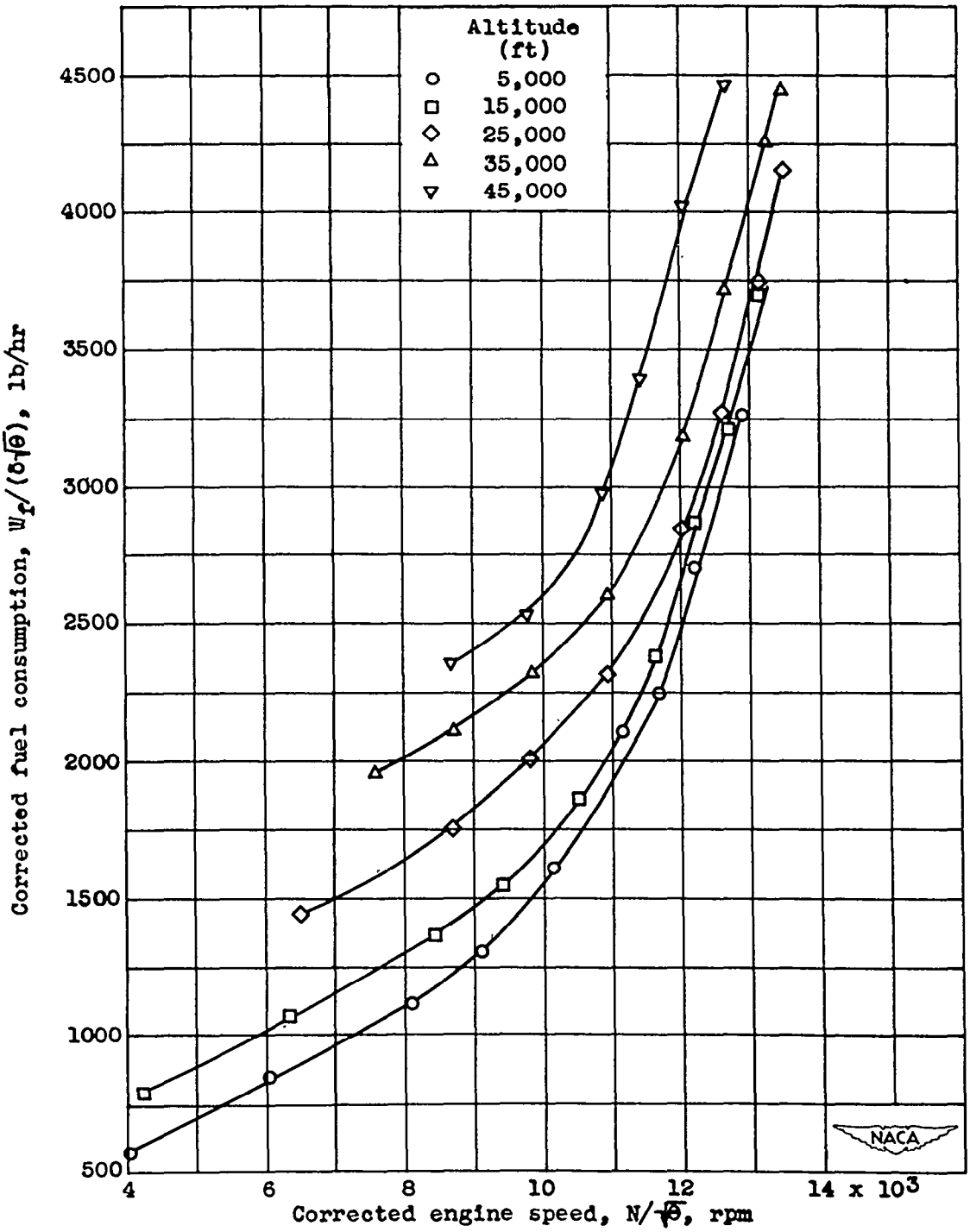

(b) Corrected net thrust.

Figure 6. - Continued. Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



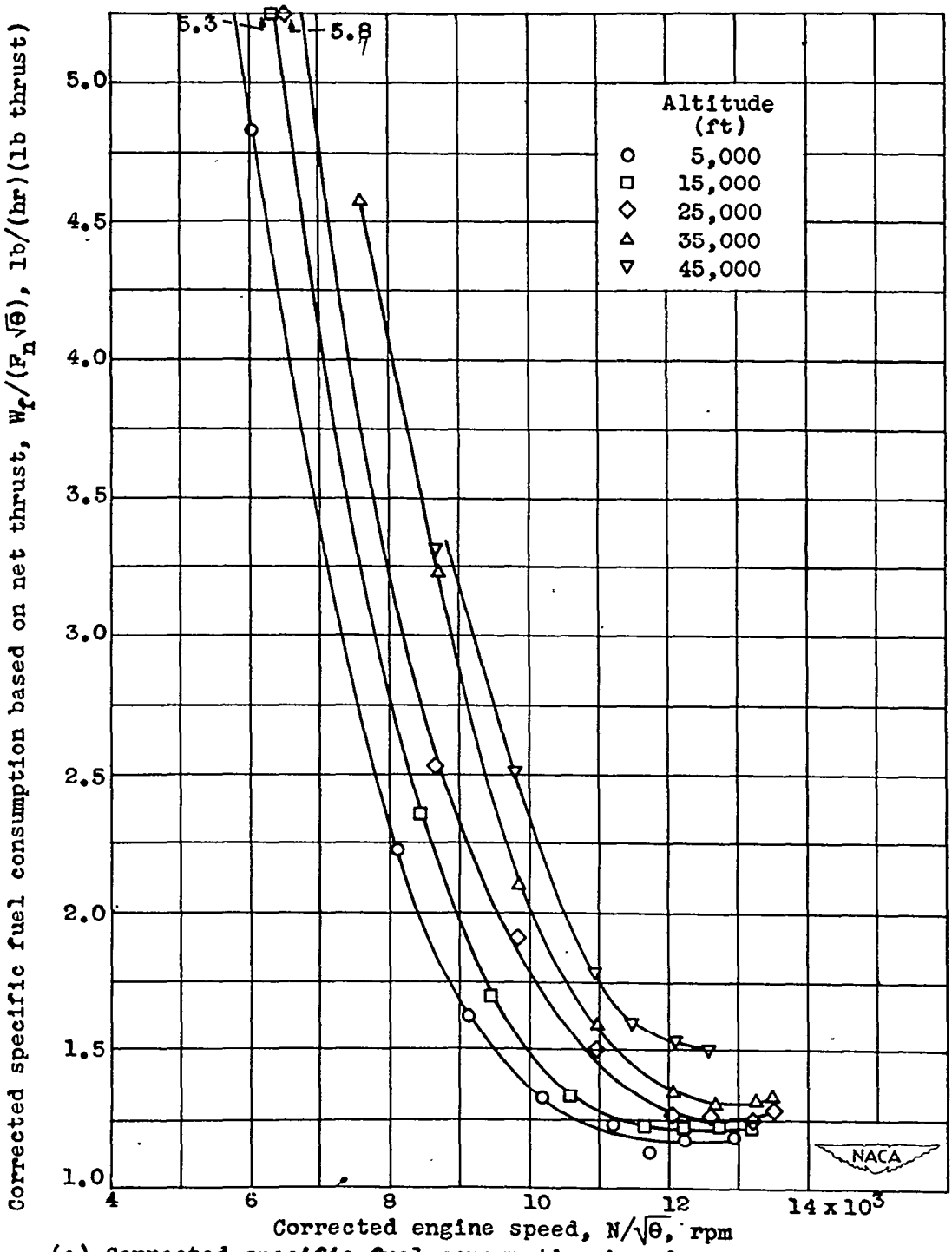

(c) Corrected air flow.

Figure 6. - Continued. Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



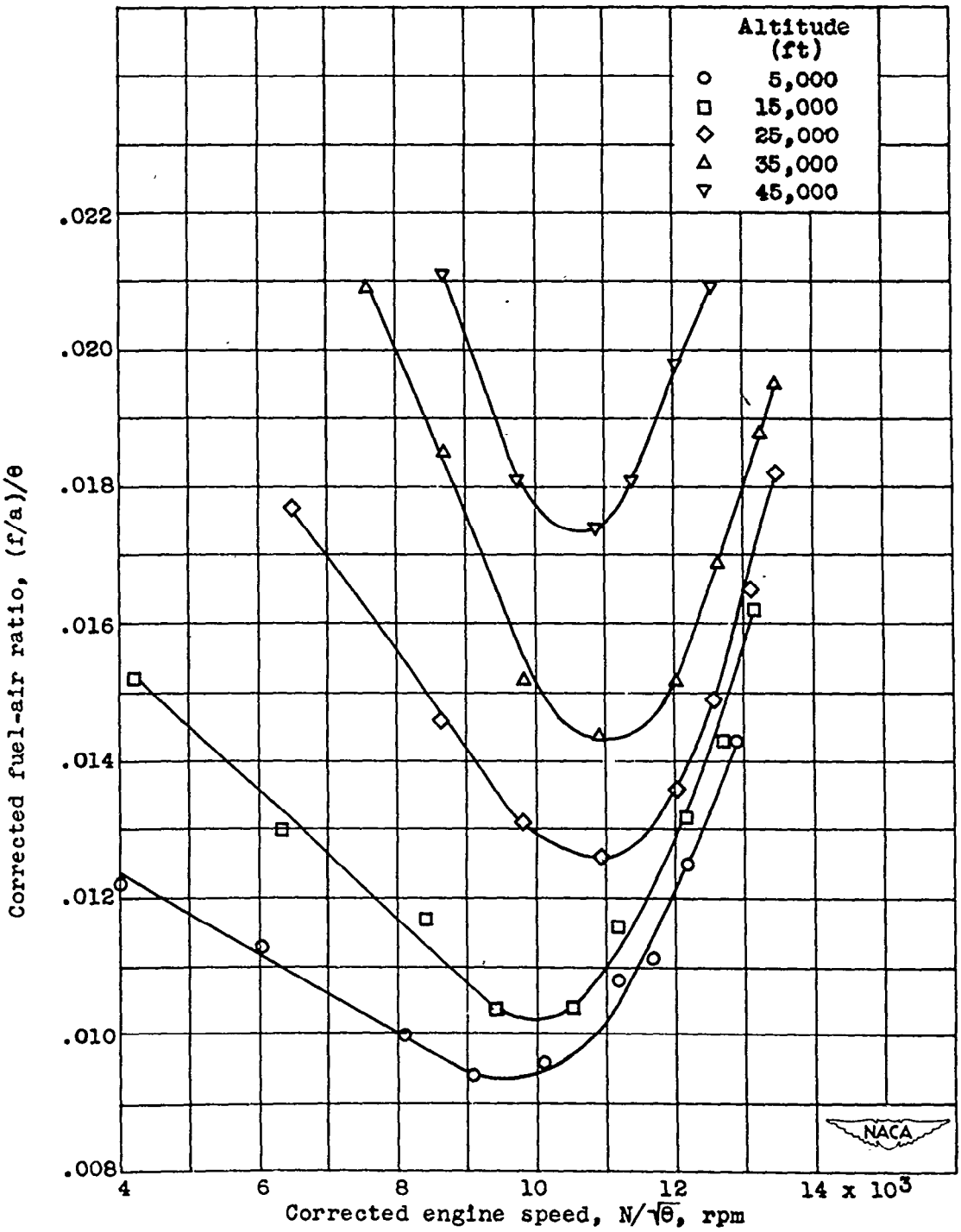

(d) Corrected fuel consumption.

Figure 6. - Continued. Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



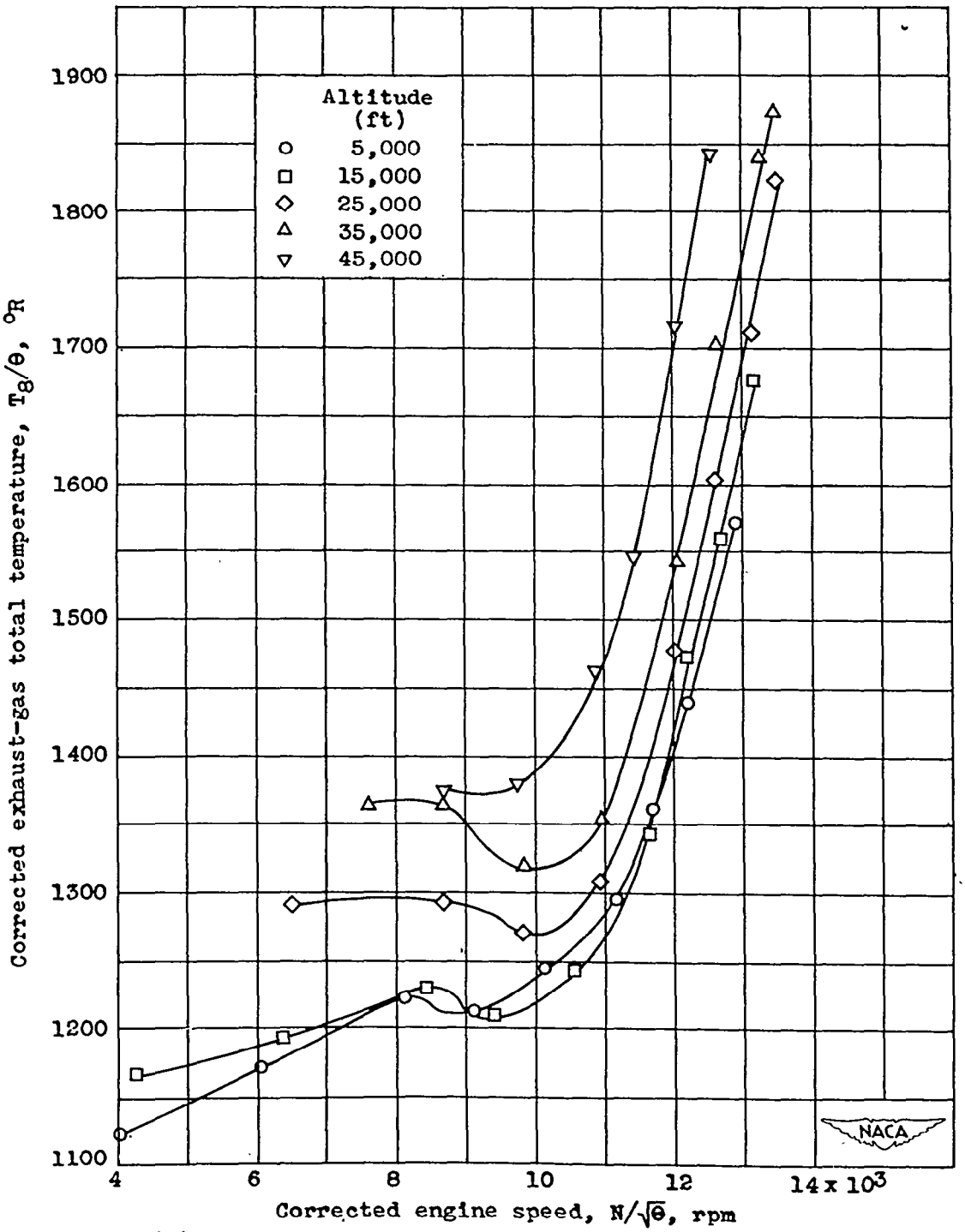

(e) Corrected specific fuel consumption based on net thrust.

Figure 6. - Continued. Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



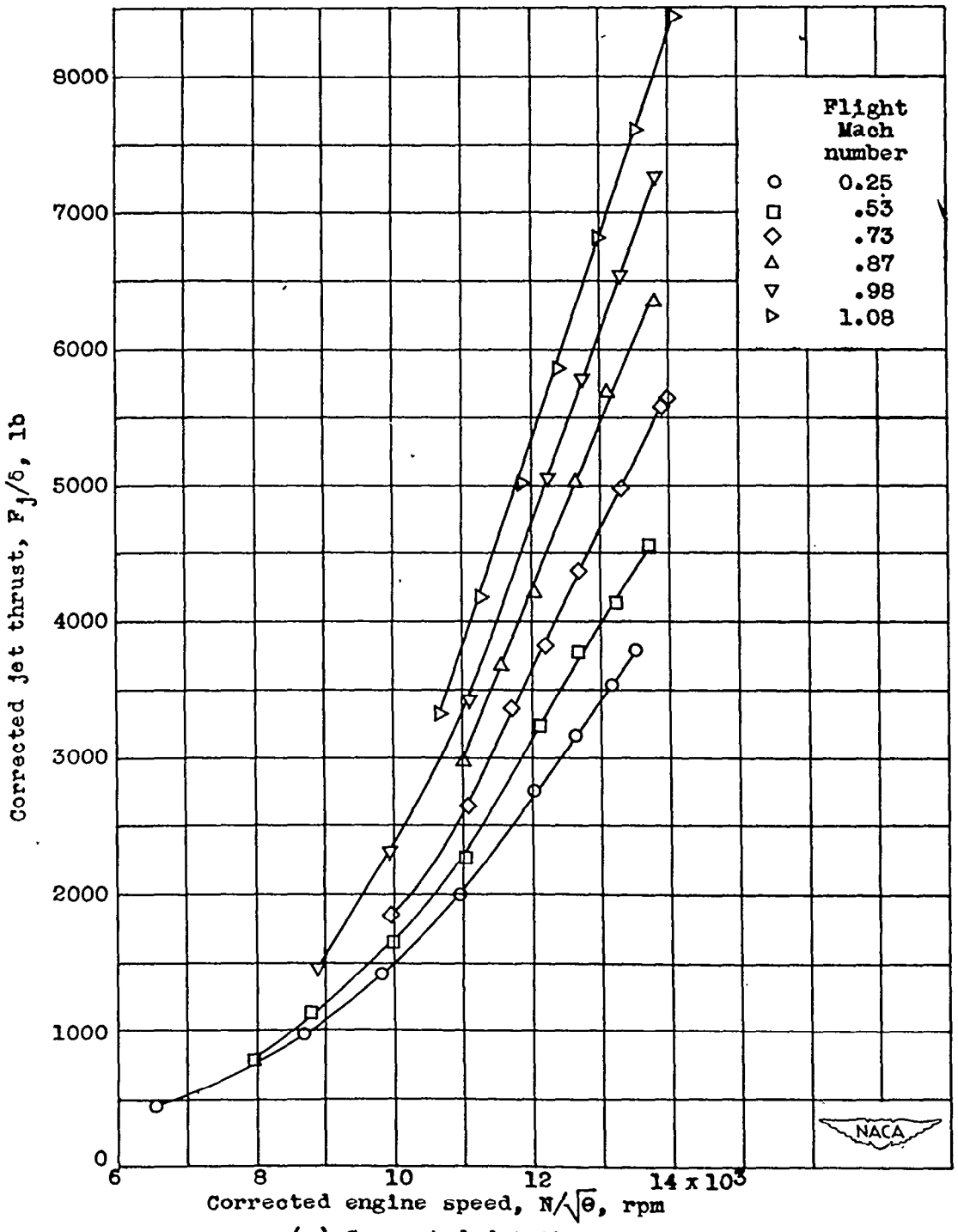

(f) Corrected fuel-air ratio.

Figure 6. - Continued. Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



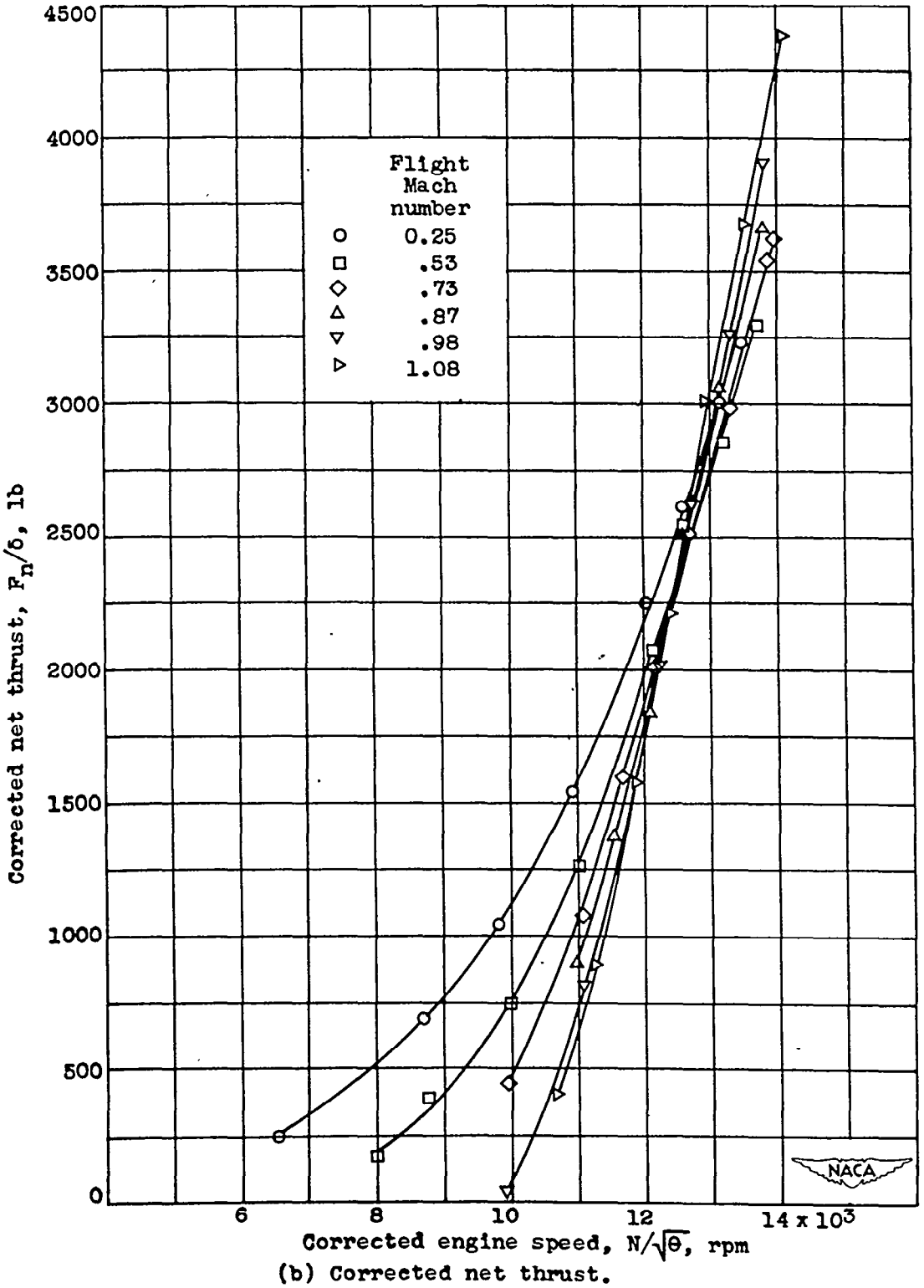

(g) Corrected exhaust-gas total temperature.

Figure 6. - Concluded. Effect of altitude on variation of generalized turbojet engine performance with corrected engine speed at flight Mach number of 0.25.



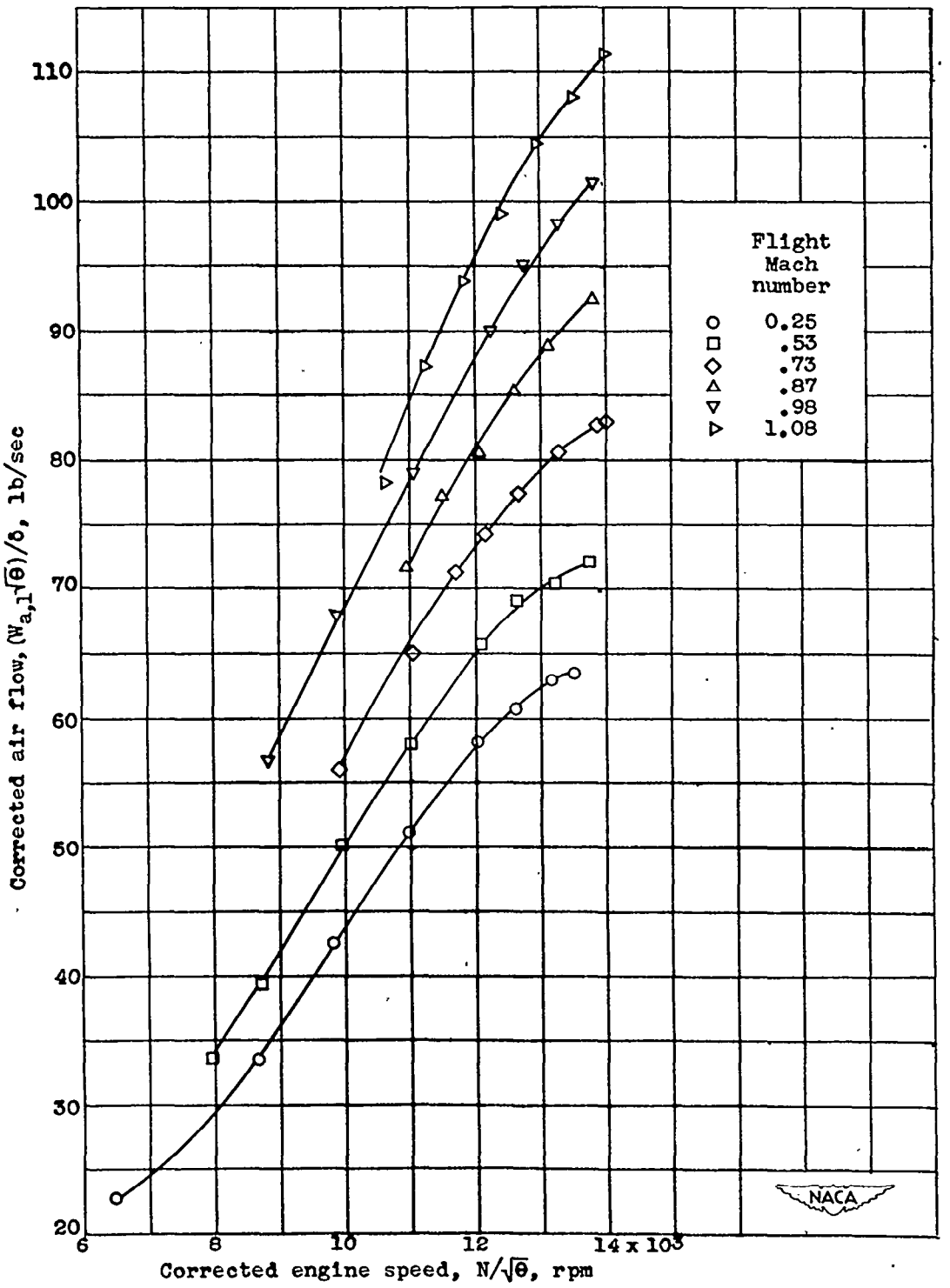

(a) Corrected jet thrust.

Figure 7. - Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.



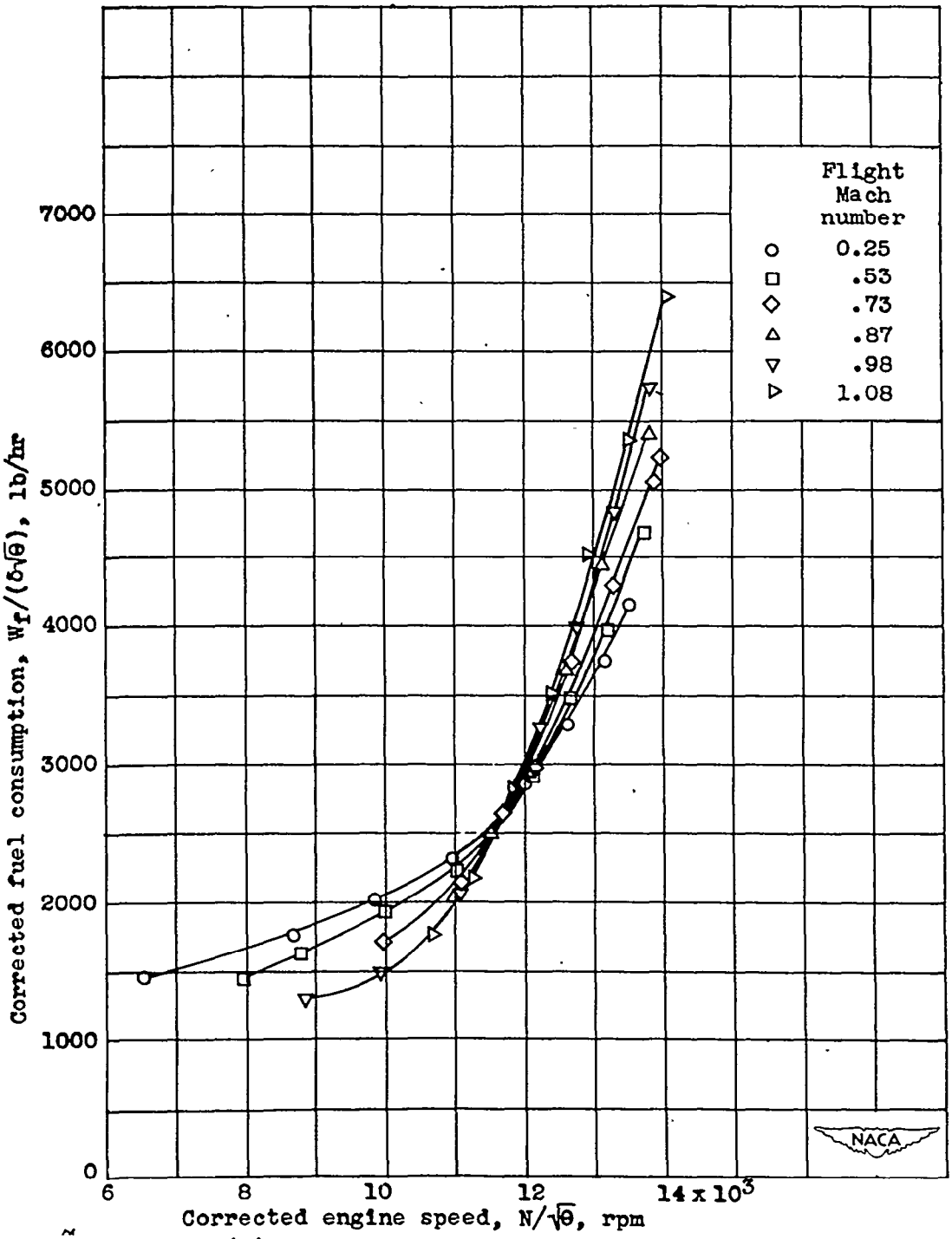

(b) Corrected net thrust.

Figure 7. - Continued. Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.



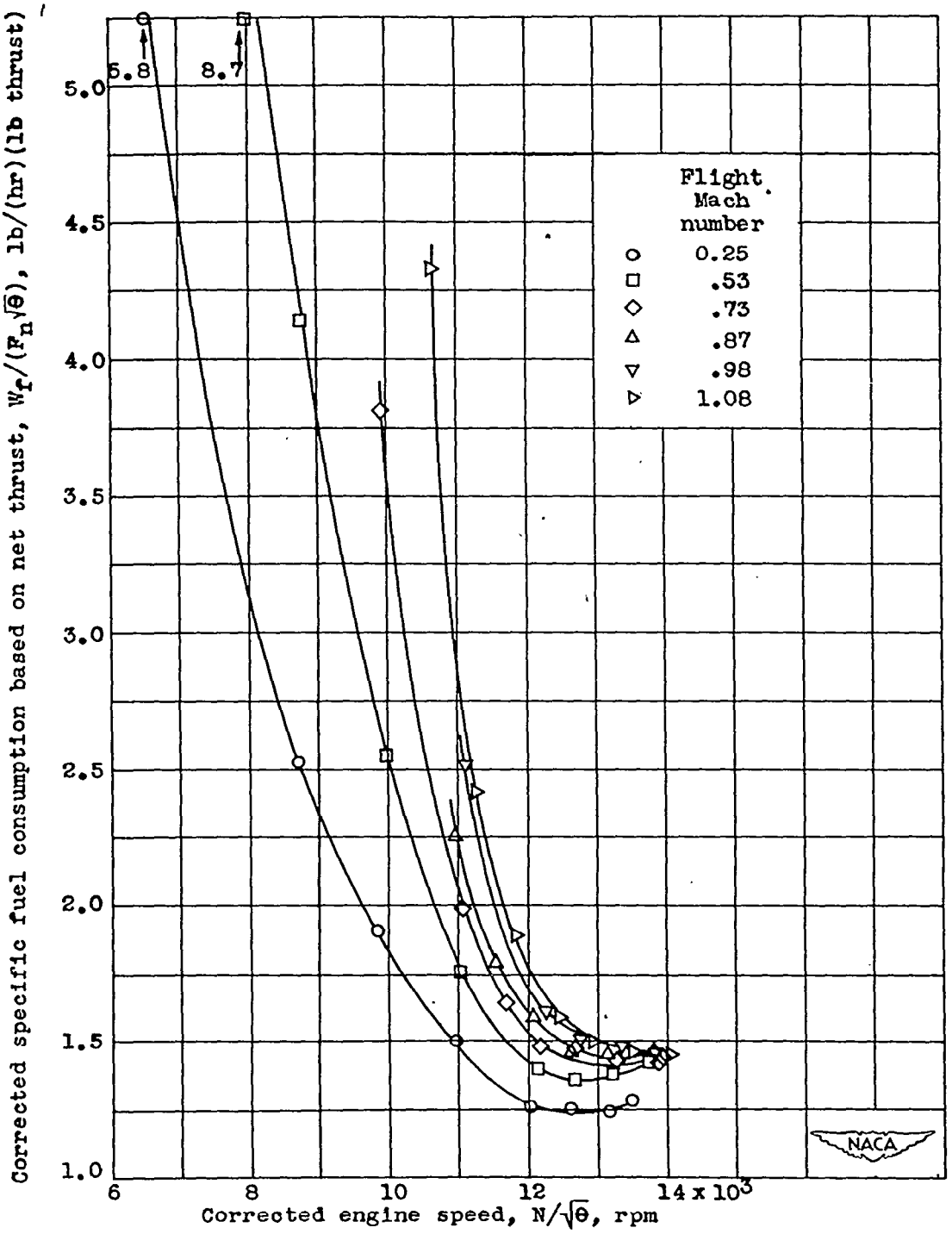

(c) Corrected air flow.

Figure 7. - Continued. Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.



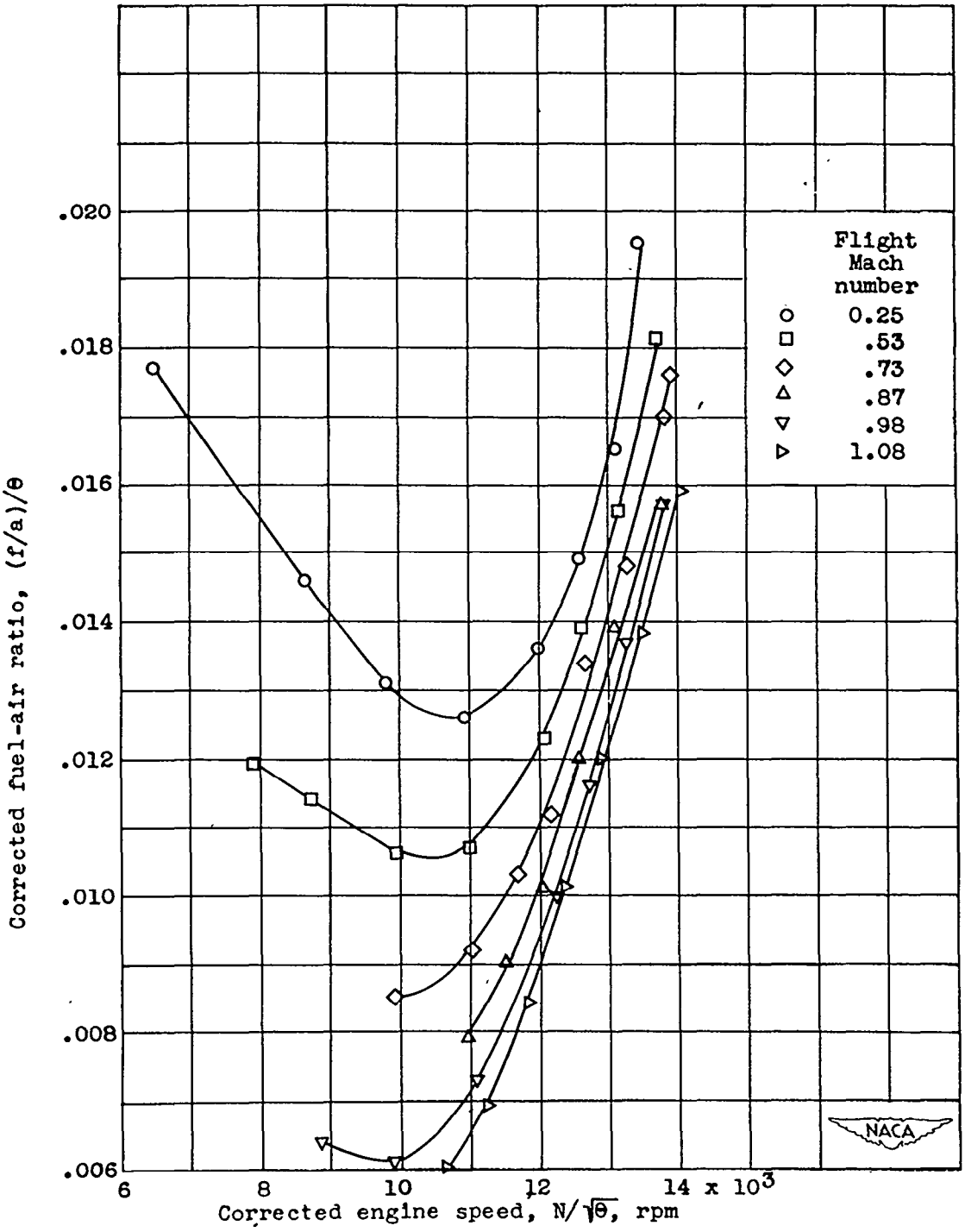

(d) Corrected fuel consumption.

Figure 7. - Continued. Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.



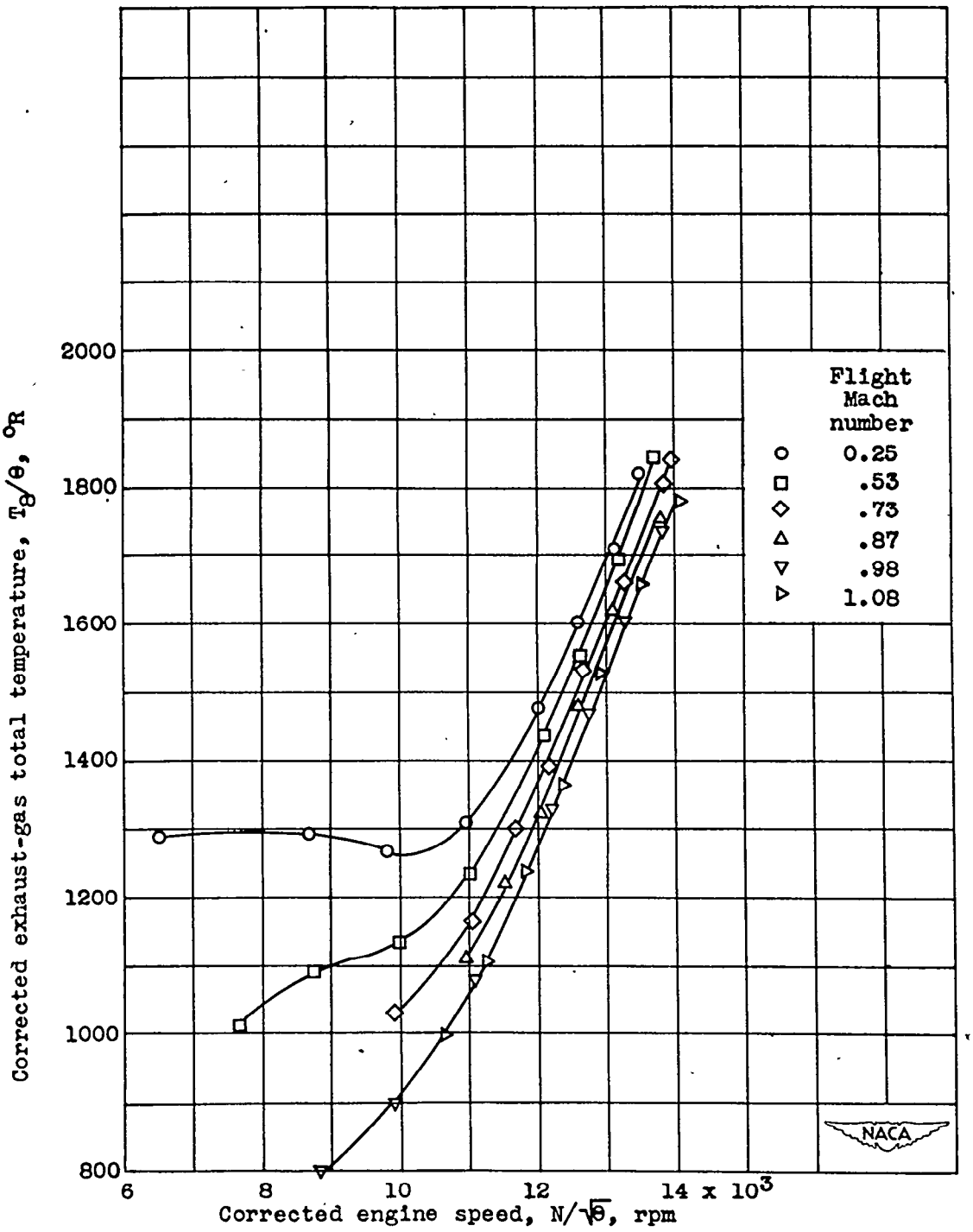

(e) Corrected specific fuel consumption based on net thrust.

Figure 7. - Continued. Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.




(f) Corrected fuel-air ratio.

Figure 7. - Continued. Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.




(g) Corrected exhaust-gas total temperature.

Figure 7. - Concluded. Effect of flight Mach number on variation of generalized turbojet engine performance with corrected engine speed at altitude of 25,000 feet.

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