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## FLIGHT INVESTIGATION OF NACA $D_S$ COWLINGS ON THE XP-42 AIRPLANE

## II - LOW-INLET-VELOCITY COWLING WITH AXIAL-FLOW FAN AND PROPELLER CUFFS

By J. Ford Johnston and T. J. Voglewede

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Langley Field, Va.

WASHINGTON

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NATIONAL ADVISOBY COMMITTEE FOB AEROBAUTICS

ADVANCE [redacted] REPORT

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# FLIGHT INVESTIGATION OF NACA $D_S$ COWLINGS ON THE XP-42 AIRPLANE

## II - LOW-INLET-VELOCITY COWLING WITH AXIAL-FLOW FAN AND PROPELLER CUFFS

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## SUMMARY

The results are presented of a series of flight tests of the performance and cooling characteristics in high-speed level flight and in climb of the XP-42 airplane equipped with a short-nose low-inlet-velocity cowling and an axial-flow fan mounted on the spinner. This cowling is one of a series being tested in an effort to improve the performance and cooling characteristics of air-cooled engine installations.

The results of the tests indicated a maximum speed of 330 miles per hour at 890 horsepower at 16,000 feet, which is above the engine critical altitude.

Pressure measurements at the entrances to the cylinder baffles showed a uniform distribution of cooling-air pressures on the front of the engine in high-speed level flight and a fairly even distribution in climb. These front pressures averaged 87 percent of free-stream impact pressure in the high-speed condition, 99 percent in full-power climb at 155 miles per hour, and 105 percent in full-power climb at 140 miles per hour.

Cylinder-head temperatures were well below their specified limit under all conditions, but maximum cylinder-base temperatures in the high-speed condition exceeded their specified limit when corrected to Army summer air. Cylinder-base temperatures in climb were marginal.

When the cylinder baffling was made more nearly standard by removal of the special sealing strips at the bottom of the baffles on the cylinder barrels, maximum base-temperature indications were reduced 15° F. A reduction of this

magnitude brings base temperatures below Army limits in el1 conditions.

## INTRODUCTION

The NACA is conducting an extensive series of flight tests, a,s outlined in references 1 and 2, in an attempt to improve the characteristics of radial. air-cooled engine installations.

In order to differentiate readily between the various installations tested, test numbers have been assigned to each airplane condition. They are as follows:

| Test | Type of cowling and flight; condition |
|---|---|
| 1 | Long-nose high-inlet-velocity cowling with small cowl flaps; high speed |
| 2 | Long-nose high-inlet-velocity cowling with modified cow:! flaps; climb |
| 3 | Short-nose high-inlet-velocity cowling with small cowl flaps; high speed |
| 4 | Short-nose low-inlet-velocity cowling with fan, cuffs, and small. cowl flaps; high speed |
| 5 | Short-nose low-inlet-velocity cowling with fan, cuffs, and modified cowl flaps; climb |
| 6 | Short-nose low-inlet-velocity cowling with fan, cuffs, and modified covl flaps; high speed |
| 7 | As in test 6, 'out with baffle seal strips at base of cylinders removed; high spaed |

The results of tests 1 and 2 are described in reference 1, and those of test 3 in reference 2, The present paper covers tho results of tests 4 to 7,

The design of the cowling and engine installation was a project of the Air-Cooled. Engine-Installation Group stationed *at* the Laboratory, The members of this group associatod with this project included Mr. Howard S. Ditsch, of the Curtiss-Wright Corporation; Mr. Peter Torraco, of the Republic

Aviation Corporation; Mr. William S. Richards, of the Wright Aeronautical Corporation; and Mr. James R. Thompson, of Pratt & Whitney Aircraft, The Army Air Forces, Materiel Command, sponsored the investigation and supplied tho XP-42 airplane. Tlis Curtiss-Wright Corporation, Airplane Division, handled the construction as well as the structural and detail design of the cowling and supplied personnel to assist in the servicing and maintenance of the airplane and cowling during the tests. Pratt & Whitney Aircraft prepared the engiiie and torque meter for the tests and assisted in. the operation and servicing of the engine. The propeller, cuffs, and spinner were supplied by the Curtiss-Wright Corporation, Propeller Division,

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This paper was originally issued (March 28, 1942) as a memorandum report for the Army,

## XP-42 AIRPLANE WITH SHORT-NOSE LOW-INLET-VELOCITY COWLING AND FAN

The XP-42 airplane used in tho tests is described in references 1 and 2. Figure 1 is a dimensioned. drawing of the short-nose low-inlet-velocity cowling and fan installation. Tho outer cowling is the same as that or" the short-nose high-inlet-velocity installation.; but the inner section has been modified by the use of a smaller spinner, the fan, and a straighter diffuser section of greater inlet area designed for an inlet-velocity ratio of 0.3. Figures 2 to 5 are photographs of the cowling as installed on tho airplane.

The Pan had 50 blades, each $2\frac{7}{8}$ inches long, $3\frac{1}{4}$ inches root chord, and. $1\frac{3}{4}$ inches tip chord and set at an angle of approximately 46° to the plane of rotation. The diameter of the spinner at the fan-blade root was 28 inches and the gap between the tip and outer surface of the diffuser was 5/16 inch. The results of wind-tunnel tests of a similar fan are given in reference 3.

The cowling was originally equipped with only two cowl flaps on either side. These four flaps were found to he inadequate for cooling. in climb; and three fixed cowl Plays, whose setting could be changed on the ground, were ad-dad to each side for the climb tests. The added cowl flaps are shown in the closed position in figure 3.

The airplane, as prepared for the tests, weighed 6000 pounds with pilot and full tanks. The airplane was equipped with a standard aerial but had no provision for guns.

## TEST APPARATUS AND PROCEDURE

The installation of the test equipment is described in reference 2,

After preliminary ground-cooling and flight checks, the maximum speed. was determined by making level-flight runs at full power at and above the engine critical altitude, as described in reference 2. The cowl skirt was then cut for the installation of additional cowl flaps, and climb tests were made with the cowl flaps fixed open.

Tho first of these climb tests was a sustained climb to 20,000 feet at approximately 155-miles-per-hour indicated airspeed, an engine speed of 2550 rpm, and 40 inches of mercury manifold pressure to full throttle, with the carburetor setting in automatic rich. The second. climb was to the same altitude at 140-miles-per-hour indicated airspeed and an enginc speed of 2550 rpm in full rich, The manifold pressure was kept at 4-35 inches of mercury for altitudes below 7000 feet, then a.t $41\frac{1}{2}$ inches of mercury to full throttle, All recording instruments except the manometer, used to record cooling-air pressures, were left on throughout each climb, The manometer was loft on for 40 seconds of every minute during the climb.

After the climb tests, the covl flaps were fixed closed and additional high-speed runs.; were made to determine the effect of ths added cowl flaps on the maximum spaed of the airplane.

Mine of the fourteen small. sealing strips between and at the bases of the cylinders were then removed, and high-speed runs were made in order to determine the effect of the sealing strip;; upon the observed cylinder temperatures and cooling-air pressures. The other five sealing; strips were not removed because they were difficult to reach without removal of much of the experimental pressure tubing, ignition harness, and other apparatus. The strips remaining in place were between cylinders 12 and 13, 14 and 1, 1 and 2, 2 and 3, and 9 and 10. Each strip was 2 square inches in area.

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## SYMBOLS

$q_c$ airplana impact pressure, inches of water

$\Delta p$ average pressure drop across engine, inches of water

$\sigma$ free-air density ratio

$Q$ volume flow of free air, cubic feet per minute

$\eta$ propulsive efficiency of propeller and exhaust stack combination

$S$ wing area

$C_D$ drag coefficient of airplane

bhp brake horsepower

$V$ true airspeed

## BESULTS AND DISCUSSION

The data obtained during the high-spcod runs and during tho climbs are presented in tables I and II. The important climb-tost data are shown in figure 6 in tho form of time histories of the climbs.

### Maximum Speed

The values of maximum speed o'btained from level runs at full throttle near and above the engine critical altitude are plotted against density altitude in figure 7. In the same figure are plotted the observed brake horsepower and two parameters representative of the aerodynamic refinement and of the effective power, respectively, as explained in references 1 and. 2. These data are prosented both for the airplane with the original cowl flaps (test 4) and with the modified cowl flaps (tests 6 and 7).

The series of speed determinations with the original cowl flaps gave much more consistent results than were obtained- with the modified cowl flaps,

The observed difference in speed for the two installations was 3 miles per hour, os 1 percent of the speed. As may be seen from figure 7, this speed lose is the result of a loss in both pover and aerodynamle cleanness. The values of the parameter $\left(\frac{bhp}{\sigma}\right)^{1/3}$ show a loss of approximately 1/3 percent or i mile per hour, due to power and tho values of the parameter 53.73 $\left(\frac{n}{SC_D}\right)^{1/3}$ show a loss of 2/3 percent, or 2 miles per hour, due to increased drag.

The speed comparisons of references 1 and 2 are extended in figure 8 to include the observed maximum speed values for the present installation with the original covl flaps. The values shown for the previous XP-42 installations (tests 1 and 3) were chosen as being most nearly representative of the best performance of each installation,

| Installation | Observed maximum speed (mph) | Maximum speed at 1000 hp at 14,500 ft (mph) |
|---|---|---|
| XF-42 short-nose low-inlet-velocity with fan (test 4) | 330 | 337 |
| XP-42 short-nose high-inlet-velocity (test 3) | 336 | 339 |
| XP-43 long-nose (test 1) | 338 | 344 |

did not include the blade angle used in the present fan, extrapolations from those tests indicate that the fan absorbed approximately 20 horsepowor in high-speed level flight, or the power equivalent of 2 miles per hour in top speed.

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## Pressures and Temperatures

The distributions of engine cooling-air pressures far tests 4, 5, and 7 are shown in figure 9.

For the high-speed condition, the cooling-nir pressures on the front of tha engine are very nearly uniform, both as to variation of pressures around the engine and as to variation of pressures with the location of the point of measurement on the individual. cylinder, The press-ares noted on the exhaust side of the barrel of cylinder 3 may be expected. to bo low because the points of measurement lay in the wake of a large ignition-cable conduit and next to a hole in the baffling, The variation of pressures at different points on a given cylinder may be expected to bo smaller with this cowling than with the cowlings previously tested because of the relatively low velocity of the entering cooling-air jot.

In the climbs at 155- and at 140-miles-per-hour indicated airspeed, the variation of cooling-air pressures on both the front and the rear of the engine was somewhat greater than in the high-speed condition; and, as the angle of attack increased, there was an increase in both front and rear pressures at the bottom of the engine as compared with pressures observed near the top of the engine. It is to be noted that, as the power dropped off at altitudes above critical in climb, average front pressures decreased and average rear pressures increased.

The distribution of cylinder head and barrel temperatures is shown in figure 10 to be very nearly the same at full throttle both in high speed rnd in climb when the carburetor-mixture control is in automatic rich, Figure 11 indicates that this distribution pattern remains constant at ell altitudes in that carburetor setting. Comparison of figure 12 with figure 11, however, shows that, although the temperature distribution in full rich is similar at low altitudes to that in automatic rich, it becomes markedly different at high altitudes as the fuel-air ratio increases.

This change in temperature distribution takes place with no change in cooling-air pressure distribution during the climb. (See fig, 9.)

In general, there is no apparent correlation between individual cylinder temperatures and the pressure drops across those cylinders. The effects of the small observed variations in cooling-air pressure are obscured by variations in other factors, such as mixture distribution, charge weight, cylinder construction, and baffling, The results discussed in the preceding paragraph indicate that, for very rich mixtures, the fuel. distribution is the predominating factor in determining the temperature distribution.

The cylinder baffles provided with this engine differ from the baffles ordinarily used in that they fit closer to the fins and include small sealing strips between adjacent cylinder barrels from the bottom barrel fin to the mounting flange. In this test and in previous tests with the same baffling (references 1 and 2), cylinder-head temperatures were well below their specified Army limit but cylinder-barrel temperatures exceeded their limit in the high-speed level-flight condition and were marginal in the climb condition.

It was thought that a more nearly standard baffling arrangement, permitting a flow of cool air around the unfinned portion of the barrel and on the thermocouple, might result in lower temperature indications on the barrels, Those baffle seals which could be reached easily *were* therefore removed for a series of high-speed runs (test 7). Figure 13 shows a comparison of the head and barrel temperatures observed during these runs with temperatures observed while the baffle seals were in place. There was no change in average or in maximum cylinder-head temperatures, but the maximum barrel temperature was reduced by 15° F to 20° F and average barrel temperatures were reduced by 10° F. Figure 9 and table I show that the cooling-air pressures on the front of tho angina did not change. The rear pressures, however, increased by approximately $0.01q_c$, presumably because of the increased air flow where the baffle seals were rsmovcd,

The removal of the baffle-seal strips brought all observed barrel temperatures below the Army limit, (See fig. 13.) Whether this procedure resulted in a cooling of the barrels or of the thermocouples is not established, but the

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apparent reduction of temperatares so achieved would have been sufficient to reduce barrel-temperature indications below the Army limit for this and all previous cowling arrangements in all climb and level-flight tests. Average and maximum cylinder temperatures during climb have been plotted in the time histories of figure 6. In order to facilitate comparison of these temperatures with their specified Army limits, these temperatures have been replotted in figure 14 in °F above free-air temperature. Cylinder-head temperatures were well below their limit but maximum cylinder-barrel temperatures were marginal, The shape of the cylinder-head maximum-temperature curve for the full-rich climb was caused by a change of the maximum temperature from cylinder 13 to cylinder 9.

In the present installation, the amount of cooling-air flow through. the engine could, not be calculated from the pressures observed at the survey rakes in the annulus because of the twist imparted Lo tho air by the fan, Except for the case where the baffle seals are removed, the air flow can, however, be calculated on the assumption that the orifice coefficient, based on average front and rear pressures for tho present installation, is the same as that of the short-nose high-inlet-velocity cowling installation (reference 2). For that installation, the air flow could be calculated from the equation

$$Q = 4120 \sqrt{\frac{\Delta p}{q_c}} \sqrt{\frac{q_c}{\sigma}}$$

where

$Q$ volume flow of free air, cubic feet per minute

$\Delta p$ average pressure drop across engine, inches of water

$q_c$ airplane impact pressure, inches of water

$\sigma$ free-air density ratio

On the basis of the preceding equation, the cooling-air flow through the engine in high-speed level flight with both the original and the modified cowl flaps was approximately 21,100 cubic feet of free air per minute in the range of altitudes tested. The inlet-velocity ratio was then approximately 0.33,

## CONCLUSIONS

1. The maximum speed of the XP-42 airplane obtained with the short-nose low-inlet-velocity cowling, the axial-flow fan, and propeller cuffs was about 2 miles per hour less than that obtained with the short-nose high-inlet-velocity cowling, and about 7 miles per hour less than that obtained with the long-nose high-inlet-velocity covling at the same power and altitude.

2. Cooling-air pressure recoveries on the front of the engine were 87 percent of airplane impact prsssure in the high-speed condition, 99 percent in the full-power climb at 155-miles-per-hour indicated airspeed, and 105-percent in the full-power climb at 140-miles-per-hour indicated airspeed.

3. Cylinder-head temperatures were satisfactory in all conditions, but maximum cylinder-base temperatures exceeded the Army limit in the high-speed condition and were marginal in climb. A more nearly standard baffle arrangement, obtained by removing tha sealing strips from the bottom of the cylinders, reduced the cylinder-base temperature indications below the Army limit,

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## REFERENCES

1. Bailey, F. J., Jr., Johnston, J. Ford, and Voglewede, T. J.: Flight Investigation of the Performance and Cooling Characteristics of a Long-Nose High-Inlet-Velocity Cowling on the XP-42 Airplane. NACA A.R.R., April 1942.

2. Bailey, F. J., Jr., and Johnston, J. Ford: Flight Investigation of NACA $D_S$ Cowlings on the XP-42 Airplane, I - High-Inlet-Velocity Cowling with Propeller Cuffs Tested in High-Speed Level Plight. NACA A.R.R., Jan. 1943.

3. Bell, E, Barton: Test of a Single-Stage Axial-Flow Fan, Rep. No. 729, NACA, 1942.

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## Table Ia.–Pressure data

XP-42 Airplane
Short-Nose Low-Inlet-Velocity Cowling with Fan and Cuffs

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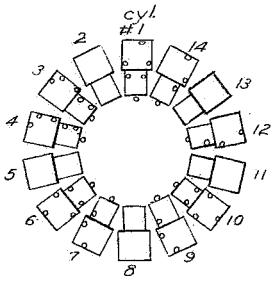
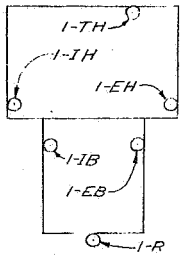
HIGH-SPEED LEVEL FLIGHT

| Test – Flight Run | 4-6 1 | 4-6 2 | 4-6 3 | 4-6 4 | 4-7 1 | 4-7 2 | 4-7 3 | 4-7 4 | 4-9 1 | 4-9 2 | 4-9 3 | 4-9 4 | 4-9 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| True Airspeed, mph | 329 | 328 | 330 | 330 | 330 | 330 | 329 | 329 | 331 | 329 | 330 | 329 | 329 |
| $q_c$, impact press., in. $H_2O$ | 36.6 | 35.4 | 34.6 | 33.4 | 32.6 | 31.4 | 30.5 | 29.4 | 35.6 | 33.4 | 32.2 | 30.2 | 29.5 |
| Atm. pressure, in. Hg | 16.95 | 16.26 | 15.62 | 14.93 | 15.26 | 14.63 | 14.04 | 13.45 | 16.95 | 15.90 | 14.93 | 14.03 | 13.48 |
| Ambient air temp., °F | -11 | -15 | -19 | -23 | -2 | -5 | -13 | -13 | 10 | 1 | -4 | -8 | -15 |
| σ, density ratio | .655 | .634 | .614 | .592 | .578 | .559 | .545 | .522 | .625 | .598 | .568 | .538 | .525 |
| Density altitude, ft. | 13750 | 14750 | 15750 | 16900 | 17550 | 18550 | 19300 | 20600 | 15200 | 16500 | 18050 | 19650 | 20400 |
| rpm | ← Original Cowl Flaps (Closed) → | | | | | | | | | | | | |
| bhp | 946 | 918 | 900 | 867 | 853 | 825 | 792 | 769 | 923 | 877 | 839 | 792 | 769 |
| Manifold press., in., Hg. | 39.6 | 38.6 | 37.1 | 35.8 | 36.1 | 34.6 | 33.6 | 32.1 | 39.6 | 37.6 | 35.6 | 33.6 | 32.1 |

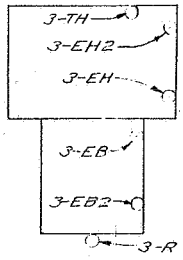
Engine pressure tube locations




Cylinder no. 1




Cylinder no. 3




Method of designating tube locations for typical cylinders

Pressure ratio, $p/q_c$

| | | 4-6 1 | 4-6 2 | 4-6 3 | 4-6 4 | 4-7 1 | 4-7 2 | 4-7 3 | 4-7 4 | 4-9 1 | 4-9 2 | 4-9 3 | 4-9 4 | 4-9 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-R | Sheltered tubes behind engine | .40 | .39 | .40 | .39 | .39 | .38 | .39 | .39 | .40 | .40 | .40 | .40 | .40 |
| 3-R | | .39 | .38 | .39 | .38 | .38 | .38 | .39 | .39 | .40 | .39 | .39 | .39 | .40 |
| 4-R | | .38 | .38 | .38 | .38 | .38 | .37 | .38 | .38 | .39 | .39 | .38 | .39 | .39 |
| 6-R | | .40 | .39 | .40 | .39 | .40 | .38 | .40 | .39 | .40 | .40 | .40 | .40 | .40 |
| 7-R | | .40 | .39 | .40 | .40 | .40 | .38 | .40 | .39 | .40 | .40 | .40 | .40 | .40 |
| 9-R | | .40 | .39 | .40 | .40 | .40 | .38 | .40 | .40 | .40 | .40 | .40 | .40 | .41 |
| 10-R | | .40 | .39 | .40 | .40 | .40 | .38 | .40 | .39 | .41 | .40 | .40 | .40 | .40 |
| 12-R | | .40 | .39 | .40 | .40 | .40 | .38 | .40 | .39 | .41 | .40 | .40 | .40 | .40 |
| 14-R | | .40 | .39 | .39 | .39 | .39 | .38 | .40 | .39 | .40 | .40 | .40 | .40 | .40 |
| 1-EB | Exhaust side of barrel | .88 | .87 | .88 | .87 | .88 | .86 | .88 | .88 | .88 | .88 | .88 | .88 | .88 |
| 3-EB | | .77 | .77 | .78 | .77 | .78 | .77 | .78 | .78 | .78 | .78 | .78 | .78 | .78 |
| 4-EB | | .87 | .87 | .87 | .86 | .88 | .86 | .88 | .88 | .88 | .88 | .88 | .87 | .87 |
| 6-EB | | .89 | .88 | .88 | .87 | .88 | .88 | .88 | .89 | .88 | .88 | .88 | .89 | .88 |
| 7-EB | | .86 | .85 | .86 | .86 | .87 | .86 | .87 | .86 | .86 | .87 | .86 | .86 | .86 |
| 9-EB | | .89 | .88 | .89 | .88 | .89 | .88 | .88 | .90 | .89 | .89 | .89 | .89 | .88 |
| 10-EB | | .90 | .90 | .90 | .90 | .90 | .89 | .91 | .90 | .90 | .90 | .90 | .89 | .90 |
| 12-EB | | .91 | .90 | .91 | .90 | .92 | .90 | .91 | .90 | .93 | .91 | .91 | .91 | .91 |
| 14-EB | | .89 | .87 | .89 | .88 | .88 | .87 | .88 | .88 | .88 | .88 | .88 | .89 | .89 |
| 1-EH | Exhaust side of head | .87 | .86 | .86 | .86 | .86 | .87 | .85 | .87 | .87 | .87 | .86 | .87 | .86 |
| 3-EH | | .81 | .81 | .82 | .80 | .82 | .81 | .81 | .81 | .82 | .82 | .81 | .82 | .81 |
| 4-EH | | 92 | 92 | 92 | 92 | .93 | 92 | .92 | .92 | .93 | .92 | .92 | 92 | .92 |
| 6-EH | | .85 | 84 | 85 | 84 | 85 | 64 | .85 | .85 | .84 | .84 | .84 | .84 | .84 |
| 7-EH | | .89 | 88 | .88 | 89 | .89 | 89 | .90 | .88 | .89 | .89 | .89 | .89 | .89 |
| 9-EH | | .88 | 86 | 87 | 86 | 86 | 87 | .87 | .87 | .86 | .86 | .86 | .86 | .87 |
| 10-EH | | 92 | .92 | 92 | 91 | 93 | 91 | .93 | .91 | .92 | .92 | .91 | .92 | .92 |
| 12-EH | | 85 | 83 | 84 | 64 | 84 | 83 | .85 | .85 | .83 | .84 | .83 | .85 | .85 |
| 14-EH | | .89 | .88 | .89 | .88 | .89 | .89 | .89 | .90 | .88 | .89 | .89 | .90 | .90 |
| 1-TH | Top of head | 87 | 66 | 87 | 86 | 86 | 87 | .87 | .87 | .86 | .87 | .87 | .86 | .87 |
| 3-TH | | .87 | 88 | 88 | 87 | 89 | .87 | .89 | .89 | .88 | .88 | .87 | .87 | .88 |
| 4-TH | | .83 | 82 | .83 | 82 | 83 | 83 | 63 | 83 | .83 | 83 | 83 | 83 | .83 |
| 6-TH | | 82 | 82 | 82 | 81 | 82 | 82 | 83 | 83 | .83 | 82 | .83 | 83 | 62 |
| 7-TH | | 88 | 88 | 88 | 87 | 89 | 87 | 89 | .87 | .88 | .88 | 87 | 87 | .88 |
| 9-TH | | 90 | 90 | 90 | 90 | 90 | 90 | 91 | .91 | .91 | 90 | 90 | 91 | 92 |
| 10-TH | | 85 | 83 | 84 | 84 | 84 | .83 | 85 | .85 | .83 | .84 | 83 | 85 | 85 |
| 12-TH | | 85 | 84 | 64 | 84 | .86 | 84 | 86 | .86 | .85 | 85 | 84 | 86 | .85 |
| 14-TH | | .81 | .80 | .81 | .80 | .81 | .80 | .82 | .82 | .80 | .82 | .81 | .82 | .82 |
| 1-IH | Intake side of head | 87 | 87 | 87 | 86 | 87 | 86 | 86 | 88 | .86 | .87 | .87 | .88 | .88 |
| 6-IH | | .89 | .89 | .90 | .89 | .89 | .90 | .90 | .90 | .89 | 90 | .89 | 89 | 90 |
| 10-IH | | .94 | .94 | .94 | .94 | .94 | .93 | .94 | .95 | .94 | .94 | .94 | .94 | .94 |
| 1-IB | Intake side of barrel | .85 | .84 | .85 | .85 | .85 | .84 | .86 | .85 | .85 | .86 | .84 | .85 | .85 |
| 6-IB | | .90 | .89 | .90 | .89 | .90 | .90 | .90 | .90 | .89 | .90 | .90 | .89 | .90 |
| 10-IB | | .90 | .90 | .90 | .89 | .91 | .90 | .90 | .90 | .90 | .90 | .90 | .90 | .90 |
| 3-EH2 | | .81 | .81 | .81 | .80 | .81 | .80 | .82 | .82 | .82 | .81 | .81 | .80 | .81 |
| 4-EH2 | | .91 | .90 | .90 | .90 | .91 | .90 | .91 | .90 | .91 | 91 | .90 | .90 | .90 |
| 3-EB2 | | .71 | .64 | .70 | .69 | .71 | .70 | .70 | .71 | .70 | .71 | .71 | .71 | .71 |
| 4-EB2 | | .81 | .81 | [illegible] | .81 | .82 | .82 | .83 | .82 | .82 | .82 | .83 | .83 | .82 |

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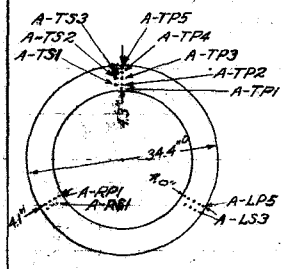
Table 10 (concluded)

| 6-14 | | | | | 6-15 | | | | | 7-17 | | | | | | CLIMB 5-11 | | | | CLIMB 5-18 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | | 1 | 3 | 5 | 7 | 1 | 3 | 5 | 7 | |
| 324 | 328 | 327 | 330 | 326 | 324 | — | 323 | 326 | 325 | 326 | 328 | — | 326 | 328 | Ind. airspeed, mph | 155 | 155 | 152 | 152 | 136 | 138 | 136 | 136 | |
| 30.1 | 32.1 | 33.0 | 34.8 | 35.3 | 34.2 | — | 30.3 | 33.5 | 35.7 | 35.7 | 34.6 | | 31.7 | 31.2 | $q_c$ | 12.0 | 11.9 | 11.4 | 11.4 | 9.2 | 9.4 | 9.2 | 9.1 | |
| 14.37 | 14.92 | 15.64 | 16.21 | 16.91 | 16.15 | 14.88 | 14.00 | 15.52 | 16.76 | 16.86 | 16.08 | — | 14.80 | 14.25 | Pressure altitude range, ft | 2300-4200 | 8100-9500 | 13100-14300 | 17000-17800 | 4000-5700 | 9700-10900 | 14600-15700 | 18400-19400 | |
| -13 | -9 | -6 | -3 | 0 | -15 | -19 | -26 | -17 | -14 | -10 | -11 | | -16 | -19 | | | | | | | | | | |
| .558 | .574 | .598 | .616 | .638 | .630 | .585 | .560 | .608 | .652 | .650 | .621 | | .578 | .560 | Av. free air temp, °F | 22 | 2.5 | 12 | -2 | 16 | 5 | -10 | -22 | |
| 18600 | 17800 | 16550 | 15250 | 14550 | 14950 | 17050 | 18500 | 16050 | 13900 | 14000 | 15400 | | 17550 | 18500 | " b.h.p. | 910 | 925 | 870 | 780 | 975 | 935 | 790 | 650 | |
| 2680 | | | | | | | | | | | | | | | " manifold pr., in. Hg | 39.7 | 38.9 | 37.3 | 32.5 | 42.5 | 41.5 | 35.0 | 30.2 | |
| 805 | 835 | 868 | 898 | 922 | 914 | 884 | 912 | 896 | 942 | 933 | 891 | 858 | 830 | 812 | rpm | 2540 | | | | | | | | |
| 34.3 | 35.7 | 37.1 | 38.5 | 39.9 | 38.3 | 35.7 | 33.7 | 37.1 | 39.9 | 39.9 | 38.4 | 37.4 | 35.7 | 34.4 | | | | | | | | | | |
| Modified Cowl Flaps (Closed) | | | | | | | | | | Baffle Seals Removed | | | | | | Modified Cowl Flaps (Open) | | | | | | | | |
| Pressure ratio, $p/q_c$ | | | | | | | | | | | | | | | Pressure ratio, $p/q_c$ | | | | | | | | | |
| .38 | .37 | .38 | .37 | .37 | .37 | .37 | .38 | .37 | .37 | .38 | .39 | | .39 | .39 | | -.18 | -.18 | -.18 | -.20 | -.30 | -.27 | -.26 | -.25 | |
| .37 | .36 | .38 | .36 | .36 | .38 | .36 | .36 | .36 | .38 | .37 | .38 | | .38 | .36 | | -.17 | -.15 | -.14 | -.14 | -.29 | -.25 | -.26 | -.28 | |
| .37 | .36 | .38 | .35 | .36 | .36 | .36 | .36 | .36 | .37 | .38 | .35 | | .36 | .36 | | -.21 | -.21 | -.18 | -.18 | -.33 | -.30 | -.30 | -.30 | |
| .39 | .38 | .39 | .38 | .38 | .38 | .38 | .38 | .38 | .38 | .39 | .40 | | .40 | .40 | | -.10 | -.08 | -.08 | -.07 | -.16 | -.16 | -.15 | -.15 | |
| .39 | .38 | .39 | .38 | .38 | .38 | .38 | .38 | .38 | .38 | .40 | .40 | | .41 | .40 | | -.10 | -.08 | -.08 | -.07 | -.16 | -.16 | -.13 | -.15 | |
| .40 | .36 | .40 | .38 | .38 | .39 | .39 | .39 | .39 | .39 | .41 | .41 | | .41 | .41 | | -.12 | -.09 | -.09 | -.10 | -.17 | -.14 | -.11 | -.16 | |
| .40 | .36 | .40 | .38 | .38 | .39 | .39 | .39 | .39 | .39 | .40 | .40 | | .41 | .40 | | -.12 | -.10 | -.11 | -.10 | -.18 | -.16 | -.13 | -.15 | |
| .39 | .38 | .39 | .37 | .37 | .38 | .38 | .38 | .38 | .39 | .38 | .39 | | .39 | .39 | | -.21 | -.18 | -.17 | -.18 | -.30 | -.28 | -.25 | -.28 | |
| .38 | .37 | .39 | .37 | .37 | .37 | .37 | .37 | .37 | .38 | .38 | .39 | | .39 | .39 | | -.18 | -.17 | -.17 | -.18 | -.30 | -.30 | -.25 | -.25 | |
| .88 | .87 | .89 | .87 | .87 | .87 | .87 | .87 | .86 | .87 | .87 | .88 | | .88 | .88 | | 1.03 | .98 | .97 | .99 | 1.06 | 1.07 | .97 | .92 | |
| .78 | .77 | .78 | .76 | .76 | .76 | .77 | .77 | .77 | .76 | .75 | .76 | | .77 | .77 | | .74 | .81 | .75 | .72 | .75 | .80 | .74 | .72 | |
| .84 | .84 | .84 | .83 | .82 | .83 | .84 | .83 | .83 | .83 | .83 | .83 | | .84 | .84 | | .94 | .94 | .90 | .90 | .97 | .96 | .99 | .91 | |
| .88 | .88 | .89 | .88 | .88 | .88 | .88 | .88 | .88 | .88 | .88 | .89 | | .89 | .88 | | 1.04 | 1.08 | 1.03 | 1.01 | 1.23 | 1.13 | 1.15 | 1.07 | |
| .86 | .86 | .86 | .85 | .86 | .86 | .86 | .86 | .86 | .85 | .86 | .87 | | .87 | .87 | | 1.02 | .95 | .86 | .95 | 1.13 | 1.04 | 1.09 | 1.01 | |
| .88 | .88 | .89 | .88 | .89 | .88 | .88 | .89 | .68 | .88 | .91 | .91 | | .91 | .90 | | .99 | .93 | .96 | .96 | 1.12 | 1.13 | 1.08 | 1.07 | |
| .91 | .90 | .91 | .89 | .90 | .90 | .90 | .89 | .88 | .90 | .89 | .89 | | .69 | .89 | | .87 | .98 | 1.02 | 1.00 | 1.20 | 1.16 | 1.09 | 1.06 | |
| .91 | .90 | .91 | .89 | .90 | .90 | .90 | .90 | .90 | .90 | .90 | .91 | | .91 | .90 | | 1.03 | .97 | .94 | .97 | 1.06 | 1.09 | .99 | 1.00 | |
| .89 | .87 | .88 | .86 | .89 | .88 | .87 | .87 | .87 | .88 | .89 | .88 | | .90 | .88 | | 1.10 | 1.04 | 1.03 | .97 | 1.11 | 1.09 | 1.01 | .97 | |
| .87 | .86 | .85 | .86 | .86 | .86 | .86 | .86 | .86 | .86 | .86 | .87 | Unsteady | .87 | .86 | | .97 | .93 | .93 | .88 | .95 | .99 | .95 | .87 | |
| .82 | .80 | .81 | .79 | .80 | .80 | .81 | .81 | .80 | .81 | .81 | .81 | | .82 | .80 | | .84 | .85 | .82 | .77 | .83 | .81 | .84 | .77 | |
| .93 | .91 | .92 | .91 | .92 | .91 | .92 | .93 | .93 | .92 | .91 | .91 | | .93 | .92 | | 1.13 | 1.12 | 1.04 | 1.03 | 1.17 | 1.13 | 1.08 | 1.10 | |
| .83 | .82 | .63 | .81 | .82 | .81 | .82 | .83 | .82 | .82 | .81 | .81 | | .82 | .82 | | .98 | .90 | .90 | .86 | .98 | .98 | .92 | .90 | |
| .90 | .69 | .90 | .88 | .68 | .89 | .89 | .89 | .88 | .88 | .89 | .89 | | .89 | .88 | | 1.02 | .97 | .98 | .98 | 1.16 | 1.13 | 1.09 | 1.06 | |
| .88 | .87 | .87 | .86 | .86 | .86 | .86 | .87 | .86 | .86 | .86 | .86 | | .87 | .86 | | .93 | .01 | .89 | .93 | 1.17 | 1.06 | .96 | .96 | |
| .92 | .91 | .93 | .91 | .91 | .91 | .91 | .91 | .92 | .92 | .92 | .91 | | .93 | .93 | | 1.15 | 1.08 | 1.05 | 1.03 | .98 | 1.19 | 1.15 | 1.10 | |
| .94 | .94 | .95 | .93 | .94 | .93 | .93 | .94 | .94 | .93 | .94 | .94 | | .94 | .94 | | 1.17 | 1.10 | 1.06 | 1.04 | 1.17 | 1.17 | 1.15 | 1.13 | |
| .90 | .88 | .90 | .89 | .89 | .88 | .89 | .88 | .88 | .88 | .89 | .88 | | .90 | .89 | | 1.14 | 1.13 | 1.06 | 1.06 | 1.17 | 1.15 | 1.18 | 1.11 | |
| .87 | .86 | .87 | .85 | .85 | .86 | .86 | .86 | .86 | .86 | .86 | .86 | | .84 | .86 | | 1.04 | 1.01 | .98 | .97 | 1.18 | 1.01 | 1.06 | .97 | |
| .88 | .88 | .89 | .87 | .88 | .87 | .89 | .88 | .88 | .88 | .88 | .88 | | .88 | .88 | | .95 | .97 | .94 | .91 | 1.00 | .97 | 1.00 | .93 | |
| .84 | .82 | .84 | .82 | .82 | .82 | .82 | .83 | .82 | .82 | .81 | .82 | | .82 | .82 | | .94 | .88 | .87 | .85 | 1.02 | .92 | .97 | .91 | |
| .83 | .82 | .84 | .81 | .82 | .81 | .82 | .82 | .82 | .82 | .81 | .82 | | .82 | .82 | | .91 | .86 | .87 | .84 | 1.03 | .99 | .91 | .91 | |
| .89 | .88 | .89 | .86 | .89 | .87 | .87 | .88 | .88 | .88 | .88 | .88 | | .88 | .88 | | 1.07 | .99 | 1.01 | .97 | 1.01 | 1.12 | 1.08 | 1.05 | |
| .93 | .91 | .91 | .90 | .90 | .90 | .90 | .90 | .90 | .90 | .91 | .91 | | .91 | .90 | | 1.05 | 1.03 | 1.03 | 1.02 | 1.20 | 1.21 | 1.08 | 1.06 | |
| .85 | .84 | .84 | .83 | .84 | .83 | .84 | .84 | .83 | .83 | .84 | .83 | | .85 | .83 | | 1.03 | .91 | .89 | .88 | .98 | .95 | .90 | .86 | |
| .86 | .85 | .86 | .83 | .84 | .83 | .85 | .85 | .84 | .84 | .84 | .83 | | .85 | .84 | | 1.00 | 94 | 92 | .90 | 1.02 | 1.03 | 1.01 | .93 | |
| .82 | .80 | .81 | .80 | .79 | .79 | .80 | .81 | .80 | .79 | .80 | .80 | | .82 | .81 | | .94 | .92 | .96 | .88 | 1.08 | .96 | 1.00 | .93 | |
| .88 | .87 | .88 | .87 | .87 | .86 | .87 | .87 | .86 | .86 | .87 | .87 | | .87 | .86 | | 1.02 | /00 | 97 | .93 | 1.05 | 1.00 | 1.08 | .96 | |
| .89 | .90 | .91 | .90 | .89 | .90 | .88 | .89 | .90 | .89 | .90 | .90 | | .90 | .90 | | 1.09 | 1.06 | 1.03 | 1.02 | 1.22 | 1.13 | 1.08 | 1.11 | |
| .95 | .94 | .95 | .94 | .94 | .93 | .94 | .94 | .93 | .94 | .93 | .93 | | .95 | .94 | | 1.22 | 1.13 | 1.03 | 1.09 | 1.32 | 1.26 | 1.08 | 1.19 | |
| .85 | .84 | .86 | .84 | .84 | .84 | .84 | .85 | .85 | .84 | .85 | .85 | | .85 | .85 | | .99 | .95 | .89 | .90 | 1.02 | 1.01 | .99 | .91 | |
| .90 | .89 | .90 | .88 | .89 | .88 | .89 | .90 | .89 | .90 | .89 | .89 | | .90 | .90 | | 1.15 | 1.09 | 1.02 | 1.01 | 1.21 | 1.17 | 1.07 | 1.05 | |
| .91 | .89 | .90 | .89 | .90 | .89 | .90 | .90 | .89 | .90 | .89 | .89 | | .90 | .90 | | 1.10 | 1.05 | 1.00 | .97 | 1.14 | 1.12 | 1.07 | 1.03 | |
| .83 | .82 | .82 | .80 | .82 | .82 | .81 | .82 | .82 | .82 | .82 | .82 | | .82 | .81 | | .76 | .81 | .77 | .73 | .66 | .71 | .74 | .69 | |
| .91 | .90 | .91 | .89 | .91 | .90 | .90 | .90 | .90 | .90 | .89 | .89 | | .90 | .90 | | 1.07 | /0/ | '99 | .99 | 1.15 | 1.06 | 1.11 | 1.02 | |
| .70 | .68 | .70 | .68 | .69 | .60 | .69 | .70 | .69 | .69 | .68 | .69 | | .70 | .69 | | 56 | 56 | 57 | .56 | .53 | .55 | .53 | .51 | |
| .82 | .81 | .81 | .79 | .80 | .81 | .81 | .81 | .81 | .90 | .81 | .80 | | .81 | .82 | | .83 | .86 | .86 | .90 | .92 | .87 | .99 | .90 | |

## Table Ib.–Pressure Data.

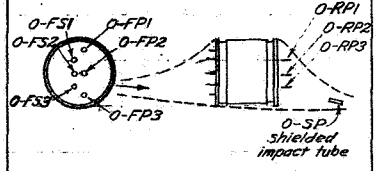
XP-42 Airplane
Short-nose low-inlet-velocity cowling with fan and cuffs

| Test – Flight Run | | HIGH-SPEED LEVEL FLIGHT 4-6 1 | 2 | 3 | 4 | 4-7 1 | 2 | 3 | 4 | 4-9 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| True Airspeed, mph | | 329 | 328 | 330 | 330 | 330 | 330 | 329 | 329 | 331 | 329 | 330 | 329 | 329 |
| $q_c$, impact press., in $H_2O$ | | 36.6 | 35.4 | 31.6 | 33.4 | 32.6 | 31.4 | 30.5 | 29.4 | 35.6 | 33.4 | 32.2 | 30.2 | 29.5 |
| Atm pressure, in. Hg | | 16.95 | 16.26 | 15.62 | 14.93 | 16.25 | 14.63 | 14.04 | 13.45 | 16.95 | 15.90 | 14.93 | 14.03 | 13.43 |
| Ambient-air temp, °F | | -11 | -15 | -19 | -23 | -2 | -5 | -13 | -13 | 10 | 1 | -4 | -8 | -15 |
| σ, density ratio | | .655 | .634 | .614 | .592 | .578 | .559 | .545 | .522 | .625 | .592 | .568 | .538 | .525 |
| Density altitude, ft | | 13750 | 14750 | 15750 | 16900 | 17550 | 18550 | 19300 | 20600 | 15200 | 16500 | 18050 | 19650 | 20900 |
| rpm. | | ← | | | | | | | | | | | | |
| bhp | | 946 | 918 | 900 | 867 | 853 | 825 | 792 | 769 | 923 | 877 | 839 | 792 | 769 |
| Manifold press, in. Hg. | | 39.6 | 38.6 | 37.1 | 35.8 | 36.1 | 34.6 | 33.6 | 32.1 | 39.6 | 37.6 | 35.6 | 33.6 | 32.1 |
| | | ← Original Cowl Flaps (Closed) → | | | | | | | | | | | | |
| Pressure Ratio, $p/q_c$ | | | | | | | | | | | | | | |
| | A-TP1 | .83 | .82 | .83 | .83 | .83 | .82 | .83 | .84 | .83 | .83 | .84 | .83 | .84 |
| | 2 | .85 | .84 | .85 | .84 | .85 | .84 | .85 | .84 | .84 | .86 | .84 | .84 | .85 |
| | 3 | .89 | .88 | .88 | .87 | .89 | .87 | .89 | .89 | .88 | .89 | .89 | .89 | .89 |
| | 4 | .92 | .91 | .91 | .90 | .92 | .90 | .92 | .91 | .92 | .92 | .91 | .91 | .91 |
| | 5 | .87 | .87 | .86 | .87 | .88 | .86 | .88 | .87 | .88 | .89 | .88 | .88 | .88 |
| | A-TS1 | .77 | .77 | .78 | .77 | .78 | .77 | .78 | .78 | .77 | .78 | .77 | .78 | .78 |
| | 2 | .81 | .79 | .80 | .80 | .80 | .80 | .81 | .80 | .80 | .80 | .79 | .80 | .81 |
| | 3 | .78 | .77 | .78 | .77 | .79 | .78 | .80 | .79 | .79 | .79 | .78 | .79 | .79 |
| | A-RP1 | .84 | .83 | .84 | .83 | .84 | .83 | .85 | .84 | .84 | .84 | .84 | .84 | .84 |
| | 2 | .85 | .84 | .85 | .83 | .86 | .84 | .85 | .84 | .85 | .85 | .84 | .84 | .84 |
| | 3 | .90 | .89 | .90 | .89 | .90 | .90 | .90 | .90 | .92 | .91 | .90 | .90 | .90 |
| | 4 | .96 | .94 | .95 | .95 | .96 | .94 | .96 | .95 | .96 | .96 | .95 | .95 | .95 |
| | 5 | .90 | .88 | .90 | .89 | .90 | .89 | .89 | .90 | .90 | .91 | .90 | .90 | .89 |
| | A-RS1 | .80 | .80 | .80 | .79 | .80 | .80 | .80 | .80 | .80 | .80 | .80 | .80 | .80 |
| | 2 | .82 | .80 | .81 | .81 | .80 | .80 | .81 | .80 | .81 | .81 | .80 | .81 | .81 |
| | 3 | .82 | .81 | .82 | .82 | .83 | .81 | .83 | .82 | .83 | .82 | .81 | .82 | .82 |
| | A-LP1 | .83 | .83 | .83 | .83 | .83 | .81 | .83 | .84 | .83 | .83 | .83 | .83 | .84 |
| | 2 | .85 | .84 | .85 | .84 | .86 | .84 | .85 | .84 | .84 | .86 | .84 | .84 | .85 |
| | 3 | .91 | .90 | .91 | .90 | .91 | .90 | .91 | .90 | .92 | .92 | .91 | .90 | .91 |
| | 4 | .93 | .92 | .93 | .92 | .92 | .91 | .93 | .94 | .92 | .93 | .93 | .93 | .94 |
| | 5 | .86 | .86 | .86 | .86 | .87 | .86 | .87 | .87 | .87 | .88 | .86 | .87 | .88 |
| | A-LS1 | .84 | .83 | .84 | .83 | .83 | .82 | .83 | .84 | .83 | .83 | .83 | .84 | .84 |
| | 2 | .85 | .84 | .84 | .84 | .84 | .84 | .85 | .84 | .84 | .84 | .84 | .84 | .85 |
| | 3 | .85 | .84 | .85 | .85 | .86 | .85 | .86 | .86 | .86 | .86 | .85 | .85 | .85 |
| | O-FP1 | .93 | .92 | .93 | .92 | .94 | .93 | .95 | .93 | .93 | .94 | .93 | .93 | .94 |
| | 2 | .99 | .97 | .99 | .98 | .99 | .98 | 1.00 | .99 | .98 | .98 | .99 | .98 | .99 |
| | 3 | 1.02 | 1.00 | 1.01 | 1.01 | 1.02 | 1.01 | 1.01 | 1.02 | 1.01 | 1.02 | 1.01 | 1.01 | 1.02 |
| | O-FS1 | .87 | .86 | .87 | .87 | .87 | .87 | .88 | .87 | .87 | .88 | .87 | .88 | .88 |
| | 2 | .87 | .86 | .88 | .87 | .88 | .88 | .89 | .89 | .88 | .89 | .87 | .89 | .88 |
| | 3 | .90 | .89 | .90 | .89 | .90 | .90 | .91 | .90 | .90 | .91 | .90 | .91 | .92 |
| | O-RP1 | .65 | .64 | .65 | .64 | .65 | .64 | .65 | .65 | .64 | .65 | .65 | .65 | .65 |
| | 2 | .61 | .59 | .61 | .60 | .61 | .60 | .61 | .61 | .60 | .61 | .61 | .62 | .61 |
| | 3 | | | | | | | | | | | | | |
| | O-SP | .59 | .58 | .58 | .58 | .58 | .58 | .59 | .59 | .58 | .58 | .58 | .59 | .59 |
| | C-P1 | .98 | .96 | .97 | .97 | .97 | .96 | .97 | .97 | .98 | .97 | .98 | .97 | .97 |
| | 2 | 1.00 | .98 | 1.00 | .98 | .99 | .98 | .99 | .99 | .99 | .99 | .98 | .98 | .99 |
| | 3 | 1.01 | .99 | 1.00 | 1.00 | 1.02 | .99 | 1.00 | 1.00 | 1.00 | 1.01 | 1.00 | .99 | 1.00 |
| | 4 | 1.02 | 1.01 | 1.01 | 1.02 | 1.02 | 1.01 | 1.00 | 1.02 | 1.01 | 1.02 | 1.01 | 1.02 | 1.00 |
| | 5 | 1.02 | 1.02 | 1.01 | 1.02 | 1.02 | 1.01 | 1.01 | 1.02 | 1.02 | 1.02 | 1.01 | 1.02 | 1.00 |
| | C-S1 | .81 | .80 | .81 | .80 | .81 | .80 | .81 | .82 | .81 | .82 | .81 | .82 | .82 |
| | 2 | .79 | .78 | .79 | .78 | .79 | .78 | .78 | .79 | .79 | .79 | .79 | .79 | .79 |
| | 3 | .78 | .77 | .78 | .78 | .78 | .77 | .78 | .79 | .78 | .79 | .78 | .78 | .79 |
| | 4 | .78 | .78 | .78 | .78 | .79 | .77 | .78 | .79 | .78 | .79 | .77 | .78 | .79 |
| | 5 | | | | | | | | | | | | | |
| | C-TH Impact press in carb. throat | .81 | .81 | .82 | .81 | .81 | .80 | .81 | .82 | .81 | .82 | .82 | .81 | .82 |

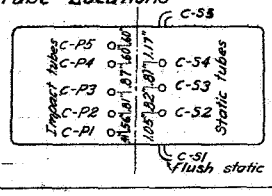



Location of Pressure Tubes in Annulus

Oil Cooler Pressure Tube Locations




Carburetor Scoop Pressure Tube Locations



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## Table Ib.-(Concluded)

| HIGH-SPEED LEVEL FLIGHT CONTINUED | 6-14 | | | | | 6-15 | | | | | 7-17 | | | | | | CLIMB 5-11 | | | | CLIMB 5-18 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | | 1 | 3 | 5 | 7 | 1 | 3 | 5 | 7 |
| Ind. airspeed mph | 324 | 328 | 327 | 330 | 326 | 324 | — | 323 | 326 | 325 | 326 | 328 | — | 326 | 328 | | 155 | 155 | 152 | 152 | 136 | 138 | 136 | 136 |
| $q_c$ | 30.1 | 32.1 | 33.0 | 34.8 | 35.3 | 34.2 | — | 30.3 | 33.5 | 35.7 | 35.7 | 34.6 | | 31.7 | 31.2 | | 12.0 | 11.9 | 11.4 | 11.4 | 9.2 | 9.4 | 9.2 | 9.1 |
| Pressure altitude range, ft | 14.37 | 14.92 | 15.64 | 16.21 | 16.91 | 16.15 | 14.88 | 14.00 | 15.52 | 16.76 | 16.36 | 16.08 | — | 14.80 | 14.25 | | 2300-4200 | 8100-9500 | 13100-14300 | 17000-17800 | 4000-5700 | 9700-10400 | 14801-15700 | 18400-19400 |
| Av Free air temp, °F | -13 | -9 | -6 | -3 | 0 | -15 | -19 | -26 | -17 | -14 | -10 | -11 | | -16 | -19 | | 22 | 25 | 12 | -2 | 16 | 5 | -10 | -22 |
| " bhp | .558 | .574 | .598 | .616 | .638 | .630 | .585 | .560 | .608 | .652 | .650 | .621 | | .578 | .560 | | 910 | 925 | 870 | 780 | 975 | 935 | 790 | 650 |
| " manifold pr., in. Hg. | 18600 | 17800 | 16550 | 15250 | 14550 | 14950 | 17050 | 18500 | 16050 | 13900 | 14000 | 15400 | | 17550 | 18500 | | 39.7 | 37.9 | 37.3 | 32.5 | 42.5 | 41.5 | 35.0 | 30.2 |
| rpm | 2680 | | | | | | | | | | | | | | | | 2540 | | | | | | | |
| | 805 | 835 | 868 | 898 | 922 | 914 | 954 | 812 | 896 | 942 | 933 | 891 | 858 | 830 | 812 | | | | | | | | | |
| | 39.3 | 35.7 | 37.1 | 38.5 | 39.4 | 38.3 | 35.7 | 33.7 | 37.1 | 38.9 | 39.9 | 38.4 | 37.4 | 35.7 | 34.4 | | | | | | | | | |
| | Modified Cowl Flaps (Closed) | | | | | | | | | | Baffle Seals Removed | | | | | | Modified Cowl Flaps (Open) | | | | | | | |
| | Pressure ratio, p/qc | | | | | | | | | | | | | | | | Pressure ratio, p/qc | | | | | | | |
| | .83 | .83 | .84 | .82 | .82 | .83 | .83 | .83 | .82 | .82 | .82 | .84 | | .83 | .82 | | .89 | .83 | .85 | .81 | .85 | .86 | .86 | .84 |
| | .86 | .85 | .86 | .84 | .86 | .85 | .85 | .84 | .84 | .84 | .85 | .86 | | .86 | .85 | | .98 | .93 | .92 | .89 | .96 | .96 | .90 | .88 |
| | .89 | .88 | .89 | .88 | .88 | .88 | .88 | .89 | .89 | .89 | .89 | .90 | | .90 | .89 | | 1.02 | 1.01 | .97 | .95 | .96 | 1.00 | .98 | .93 |
| | .92 | .92 | .93 | .91 | .92 | .91 | .92 | .91 | .91 | .91 | .92 | .92 | | .92 | .92 | | 1.07 | 1.02 | 1.03 | 1.01 | 1.11 | 1.09 | 1.03 | 1.02 |
| | .84 | .81 | .88 | .81 | .88 | .87 | .87 | .87 | .87 | .89 | .88 | .88 | | .83 | .88 | | .91 | .89 | .93 | .91 | .92 | .92 | .89 | .89 |
| | .77 | .76 | .77 | .75 | .76 | .76 | .76 | .76 | .76 | .76 | .76 | .76 | | .77 | .76 | | .64 | .69 | .70 | .70 | .64 | .65 | — | .68 |
| | .82 | .77 | .79 | .77 | .77 | .77 | .78 | .79 | .77 | .77 | .79 | .79 | | .81 | .78 | | .69 | .70 | .72 | .73 | .65 | .69 | — | .72 |
| | .79 | .78 | .79 | .77 | .77 | .78 | .78 | .78 | .77 | .77 | .77 | .78 | | .79 | .79 | | .74 | .75 | .77 | .75 | .65 | .72 | .76 | .74 |
| | .85 | .84 | .85 | .83 | .84 | .84 | .84 | .84 | .83 | .83 | .84 | .84 | | .84 | .84 | | .93 | .89 | .88 | .84 | .97 | .95 | .92 | .87 |
| | .86 | .86 | .86 | .85 | .85 | .85 | .85 | .85 | .85 | .85 | .85 | .86 | | .86 | .85 | | 1.06 | 1.01 | 1.01 | .94 | 1.14 | 1.02 | 1.02 | .97 |
| | .91 | .90 | .91 | .90 | .90 | .90 | .90 | .90 | .91 | .90 | .91 | .91 | | .91 | .91 | | 1.16 | 1.10 | 1.08 | 1.05 | 1.24 | 1.16 | 1.22 | 1.12 |
| | .97 | .95 | .96 | .95 | .96 | .95 | .96 | .95 | .95 | .95 | .95 | .96 | | .95 | .94 | | 1.13 | 1.08 | 1.08 | 1.10 | 1.25 | 1.21 | 1.17 | 1.14 |
| | .90 | .89 | .90 | .89 | .89 | .90 | .89 | .90 | .89 | .90 | .89 | .89 | | .90 | .89 | | 1.00 | .93 | .90 | .96 | 1.05 | .99 | 1.01 | 1.00 |
| | | | | | | | | | | | .80 | .78 | | .77 | .76 | | .72 | .73 | .73 | .78 | .69 | .74 | — | .77 |
| | .80 | .81 | .81 | .79 | .79 | .79 | .80 | .80 | .80 | .81 | .79 | .80 | | .81 | .80 | | .77 | .78 | .79 | .80 | .80 | .83 | — | .82 |
| | .83 | .82 | .80 | .82 | .82 | .82 | .82 | .82 | .81 | .81 | .82 | .82 | | .82 | .81 | | .80 | .78 | .81 | .82 | .79 | .81 | .88 | .83 |
| | .84 | .83 | .84 | .82 | .83 | .83 | .83 | .83 | .83 | .83 | .82 | .83 | | .83 | .82 | | .73 | .74 | .76 | .78 | .73 | .74 | .74 | .74 |
| | .86 | .86 | .86 | .85 | .85 | .85 | .85 | .84 | .85 | .85 | .85 | .85 | | .86 | .85 | | .91 | .86 | .85 | .89 | .90 | .88 | .93 | .89 |
| | .91 | .90 | .91 | .90 | .90 | .90 | .90 | .90 | .91 | .90 | .91 | .91 | | .91 | .91 | | 1.00 | .93 | .94 | .97 | 1.03 | .95 | .99 | 1.03 |
| | .94 | .92 | .93 | .92 | .93 | .92 | .93 | .93 | .92 | .92 | .93 | .94 | | .94 | .93 | | 1.02 | .99 | 1.00 | 1.03 | 1.11 | 1.09 | 1.07 | 1.00 |
| | .87 | .85 | .87 | .85 | .86 | .86 | .86 | .86 | .86 | .86 | .86 | .86 | | .87 | .87 | | .81 | .82 | .85 | .86 | .76 | .76 | .84 | .83 |
| | .83 | .82 | .84 | .83 | .83 | .83 | .83 | .83 | .84 | .83 | .82 | .82 | | .83 | .83 | | .86 | .85 | .83 | .84 | .91 | .86 | — | .88 |
| | .85 | .84 | .85 | .83 | .84 | .83 | .84 | .84 | .84 | .81 | .83 | .84 | | .84 | .83 | | .93 | .98 | .87 | .88 | 1.00 | .98 | — | .91 |
| | .86 | .86 | .87 | .84 | .85 | .85 | .85 | .85 | .85 | .85 | .85 | .85 | | .86 | .85 | | .97 | .93 | .88 | .91 | 1.08 | .92 | .98 | .96 |
| | | | | | | | | | | | .94 | .94 | | .95 | .94 | | 1.13 | 1.15 | 1.16 | 1.15 | 1.34 | 1.30 | 1.24 | 1.17 |
| | | | | | | | | | | | .98 | .97 | | .99 | .97 | | 1.21 | 1.19 | 1.20 | 1.20 | 1.35 | 1.32 | 1.13 | 1.20 |
| | | | | | | | | | | | 1.01 | 1.02 | | 1.02 | 1.01 | | 1.17 | 1.17 | 1.17 | 1.16 | 1.29 | 1.30 | 1.11 | 1.18 |
| | .88 | .87 | .88 | .87 | .87 | .87 | .87 | .87 | .87 | .86 | .87 | .87 | | .87 | .87 | | .95 | .98 | .98 | 1.01 | 1.11 | 1.03 | 1.10 | 1.04 |
| | | | | | | | | | | | .87 | .87 | | .88 | .88 | | .93 | .97 | .96 | 1.00 | 1.13 | 1.01 | 1.07 | 1.04 |
| | | | | | | | | | | | .87 | .90 | | .90 | .90 | | .91 | .93 | .98 | 1.01 | 1.11 | 1.13 | 1.05 | 1.02 |
| | .65 | .63 | .65 | .63 | .64 | .64 | .64 | .64 | .64 | .63 | .63 | .65 | | .65 | .64 | | .48 | .47 | .47 | .48 | .49 | .50 | .49 | .47 |
| | .62 | .60 | .61 | .60 | .59 | .61 | .61 | .61 | .61 | .61 | .59 | .60 | | .61 | .61 | | .34 | .37 | .35 | .39 | .41 | .43 | .42 | .40 |
| | .58 | .58 | .58 | .57 | .57 | .57 | .57 | .58 | .57 | .57 | .56 | .57 | | .58 | .58 | | .35 | .35 | .36 | .37 | .39 | .41 | .39 | .40 |
| | .97 | .97 | .99 | .97 | .98 | .97 | .97 | .97 | .97 | .98 | .98 | .99 | | .99 | .97 | | 1.12 | 1.06 | 1.05 | 1.01 | 1.20 | 1.14 | 1.06 | 1.03 |
| | 1.00 | .98 | 1.00 | .98 | 1.00 | .98 | .99 | .98 | .99 | .99 | 1.00 | 1.00 | | 1.00 | .99 | | 1.17 | 1.11 | 1.09 | 1.04 | 1.24 | 1.18 | 1.09 | 1.05 |
| | 1.01 | .99 | 1.00 | 1.00 | 1.01 | 1.00 | 1.00 | 1.00 | 1.01 | 1.00 | 1.01 | 1.01 | | 1.02 | 1.00 | | 1.23 | 1.16 | 1.12 | 1.05 | 1.27 | 1.16 | 1.10 | 1.09 |
| | 1.02 | 1.00 | 1.01 | 1.01 | 1.02 | 1.01 | 1.01 | 1.01 | 1.01 | 1.02 | 1.02 | 1.02 | | 1.02 | 1.01 | | 1.20 | 1.14 | 1.15 | 1.06 | 1.23 | 1.21 | 1.14 | 1.10 |
| | 1.00 | 1.01 | 1.02 | 1.02 | 1.02 | 1.01 | 1.01 | 1.01 | 1.02 | 1.02 | 1.02 | 1.02 | | 1.03 | 1.01 | | 1.20 | 1.14 | 1.14 | 1.09 | 1.26 | 1.21 | 1.14 | 1.09 |
| | .82 | .80 | .81 | .81 | .82 | .81 | .81 | .81 | .82 | .82 | .83 | .84 | | .83 | .84 | | .85 | .75 | .64 | .66 | .68 | .55 | .55 | .58 |
| | .79 | .79 | .81 | .79 | .79 | .79 | .79 | .79 | .80 | .80 | .80 | .81 | | .81 | .80 | | .79 | .72 | .63 | .62 | .66 | .46 | .49 | .51 |
| | .78 | .78 | .79 | .77 | .77 | .77 | .78 | .79 | .77 | .77 | .78 | .79 | | .79 | .80 | | .80 | .66 | .58 | .60 | .57 | .39 | .43 | .45 |
| | .77 | .79 | .79 | .77 | .77 | .78 | .78 | .79 | .78 | .77 | .79 | .77 | | .77 | .79 | | .78 | .66 | .57 | .59 | .58 | .41 | .45 | .46 |
| | .81 | .81 | .83 | .81 | .82 | .81 | .81 | .81 | .81 | .82 | .83 | .83 | | .83 | .82 | | .87 | .76 | .67 | .67 | .67 | .52 | .53 | .53 |

Unsteady

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Table II — Temperature Data

| XP-42 airplane — Short-nose low-inlet-velocity cowling with fan and cuffs. | Test — Flight Run | HIGH-SPEED LEVEL FLIGHT 4-6 1 | 2 | 3 | 4 | 4-7 1 | 2 | 3 | 4 | 4-9 1 | 2 | 3 | 4 | 5 | 6-14 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | True airspeed, mph | 329 | 328 | 330 | 330 | 330 | 330 | 329 | 329 | 331 | 329 | 330 | 329 | 329 | 324 | 328 | 327 | 330 | 326 |
| | $q_c$, impact press., in. $H_2O$ | 36.6 | 35.4 | 34.6 | 33.4 | 32.6 | 31.4 | 30.5 | 29.4 | 35.6 | 33.4 | 32.2 | 30.2 | 29.5 | 30.1 | 32.1 | 33.0 | 34.8 | 35.3 |
| | Atm. pressure, in. Hg | 16.95 | 16.26 | 15.62 | 4.93 | 15.25 | 14.63 | 14.04 | 13.45 | 16.95 | 15.90 | 14.93 | 14.03 | 13.48 | 14.37 | 14.92 | 15.64 | 16.21 | 16.91 |
| | Ambient air temp., °F | -11 | -15 | -19 | -23 | -2 | -5 | -13 | -13 | 10 | 1 | -4 | -8 | -15 | -13 | -9 | -6 | -3 | 0 |
| | σ, density ratio | .655 | .634 | .614 | .592 | .578 | .559 | .545 | .522 | .625 | .598 | .568 | .538 | .525 | .558 | .574 | .598 | .616 | .638 |
| | Density altitude, ft | 13750 | 14750 | 15750 | 16900 | 17550 | 18550 | 19300 | 20600 | 15200 | 16500 | 18050 | 19650 | 20400 | 18600 | 17800 | 16550 | 15250 | 14550 |
| | Rpm | 2680 | | | | | | | | | | | | | | | | | |
| | Bhp | 946 | 918 | 900 | 867 | 853 | 825 | 792 | 769 | 923 | 877 | 839 | 792 | 769 | 805 | 835 | 868 | 898 | 922 |
| | Manifold press., in. Hg | 39.6 | 38.6 | 37.1 | 35.8 | 36.1 | 34.6 | 33.6 | 32.1 | 39.6 | 37.6 | 35.6 | 33.6 | 32.1 | 34.3 | 35.7 | 37.1 | 38.5 | 39.9 |
| | | Original cowl flaps (Closed) | | | | | | | | | | | | | Modified | | | | |
| Cylinder - Point of measurement | | Temperature, °F | | | | | | | | | | | | | | | | | |
| 1 — Gasket thermocouple at rear sp. plug | | | | | | | | | | | | | | | | | | | |
| 2 | | 324 | 317 | 324 | 328 | 354 | 354 | 354 | 360 | 344 | 347 | 352 | 360 | 358 | 335 | 339 | 339 | 333 | 331 |
| 3 | | 353 | 347 | 349 | 349 | 370 | 367 | 367 | 374 | 367 | 365 | 367 | 376 | 372 | 356 | 354 | 354 | 350 | 350 |
| 4 | | 340 | 336 | 337 | 337 | 347 | 347 | 347 | 351 | 333 | 338 | 338 | 344 | 344 | 337 | 339 | 341 | 337 | 337 |
| 5 | | | | | | | | | | | | | | | | | | | |
| 6 | | 328 | 326 | 326 | 326 | 340 | 338 | 335 | 338 | 339 | 340 | 338 | 342 | 338 | 329 | 329 | 331 | 331 | 329 |
| 7 | | 378 | 376 | 381 | 381 | 398 | 397 | 399 | 402 | 395 | 395 | 397 | 402 | 397 | 384 | 380 | 382 | 382 | 380 |
| 8 | | 340 | 333 | 333 | 335 | 354 | 349 | 356 | 358 | 358 | 354 | 356 | 360 | 356 | 350 | 344 | 348 | 346 | 341 |
| 9 | | 365 | 367 | 369 | 371 | 383 | 390 | 390 | 392 | 383 | 390 | 390 | 395 | 392 | 373 | 373 | 373 | 373 | 371 |
| 10 | | 371 | 371 | 374 | 374 | 390 | 392 | 390 | 390 | 386 | 390 | 388 | 390 | 386 | 375 | 371 | 376 | 371 | 369 |
| 11 | | 360 | 360 | 365 | 369 | 388 | 388 | 388 | 390 | 388 | 386 | 381 | 390 | 388 | 375 | 373 | 373 | 369 | 369 |
| 12 | | 347 | 342 | 346 | 351 | 367 | 367 | 370 | 370 | 367 | 370 | 370 | 372 | 365 | 359 | 356 | 358 | 356 | 352 |
| 13 | | 358 | 358 | 369 | 371 | 392 | 395 | 397 | 399 | 388 | 390 | 392 | 399 | 337 | 386 | 386 | 386 | 380 | 378 |
| 14 | | 347 | 342 | 351 | 358 | 379 | 381 | 381 | 386 | 376 | 379 | 381 | 386 | 383 | 367 | 369 | 369 | 365 | 363 |
| 1 — Rear ¢ flange at base of cylinder | | 269 | 267 | 269 | 272 | 285 | 283 | 287 | 289 | 280 | 278 | 282 | 287 | 287 | 284 | 279 | 279 | 277 | 279 |
| 2 | | 274 | 272 | 274 | 274 | 287 | 287 | 287 | 289 | 285 | 285 | 287 | 287 | 287 | | | | | |
| 3 | | 249 | 267 | 267 | 267 | 278 | 278 | 278 | 282 | 278 | 276 | 278 | 280 | 278 | 278 | 273 | 275 | 273 | 273 |
| 4 | | 267 | | 265 | 267 | | 273 | 271 | 276 | 276 | 276 | | | | 274 | 271 | 273 | 271 | 271 |
| 5 | | 264 | 262 | 262 | 262 | 273 | 271 | 271 | 273 | 269 | 269 | 269 | 271 | 272 | 263 | 264 | 264 | 264 | 261 |
| 6 | | 274 | 272 | 276 | 276 | 287 | 285 | 285 | 285 | 283 | 282 | 282 | 285 | 282 | 278 | 277 | 279 | 277 | 277 |
| 7 | | 260 | 258 | 258 | 258 | 259 | 255 | | | | | | | | 250 | 247 | 247 | 245 | 243 |
| 8 | | 267 | 265 | 267 | 267 | 278 | 276 | 276 | 278 | 275 | 276 | 276 | 278 | 276 | 274 | 271 | 271 | 271 | 269 |
| 9 | | 283 | 283 | 285 | 285 | 296 | 294 | 294 | 296 | 289 | 292 | 292 | 294 | 292 | 291 | 286 | 286 | 286 | 286 |
| 10 | | 292 | 292 | 294 | 294 | 306 | 306 | 303 | 306 | 301 | 303 | 301 | 303 | 301 | 299 | 297 | 297 | 294 | 292 |
| 11 | | 263 | 260 | 265 | 265 | 276 | 273 | 273 | 278 | 273 | 273 | 273 | 276 | 273 | 272 | 271 | 271 | 271 | 269 |
| 12 | | 281 | 281 | 283 | 285 | 296 | 296 | 299 | 301 | 294 | 296 | 296 | 296 | 296 | 291 | 290 | 290 | 289 | 285 |
| 13 | | 269 | 267 | 272 | 274 | 287 | 285 | 287 | 288 | 280 | 280 | 285 | 285 | 285 | 282 | 279 | 279 | 277 | 277 |
| 14 | | 272 | 272 | 274 | 276 | 289 | 287 | 287 | 289 | 287 | 287 | 287 | 287 | 287 | 284 | 286 | 284 | 284 | 281 |
| 10 — Intake port | | 184 | 181 | 181 | 179 | 199 | 197 | 194 | 194 | 201 | 199 | 197 | 194 | 192 | 193 | 193 | 193 | 193 | 193 |
| Mixture at blower rim | | 123 | 120 | 120 | 120 | 137 | 137 | 133 | 133 | 144 | 139 | 134 | 130 | 128 | 130 | 130 | 130 | 133 | 133 |
| Fuel on suction side of pump | | 51 | 51 | 51 | 54 | 56 | 59 | 59 | 62 | 56 | 60 | 59 | 62 | 66 | 55 | 55 | 58 | 58 | 61 |
| " " pressure " " " | | 54 | 54 | 54 | 54 | 59 | 62 | 62 | 66 | 60 | 63 | 63 | 66 | 69 | 55 | 55 | 58 | 61 | 61 |
| " in carburetor float chamber | | 51 | 51 | 51 | 51 | 62 | 62 | 62 | 62 | 63 | 63 | 66 | 62 | 63 | 55 | 58 | 58 | 58 | 61 |
| 11 Front spark plug elbow | | 14 | 11 | 5 | -2 | 22 | 19 | 15 | 12 | 34 | 30 | 21 | 18 | 12 | 12 | 18 | 18 | 24 | 24 |
| 11 rear " " " | | 42 | 36 | 33 | 30 | 53 | 50 | 47 | 47 | 63 | 57 | 53 | 50 | 47 | 46 | 49 | 49 | 55 | 55 |
| Recorded free air | | 6 | 2 | -2 | -6 | 16 | 15 | 5 | 5 | 27 | 18 | 13 | 9 | 2 | 5 | 9 | 12 | 15 | 18 |
| Air in carburetor scoop | | 14 | 17 | 14 | -2 | 32 | 25 | 18 | 15 | | | | | | 12 | 18 | 18 | | 27 |
| " at top annular rake | | 11 | 8 | 1 | -2 | 22 | 19 | 12 | 11 | 33 | 27 | 18 | 15 | 8 | 9 | 15 | 18 | 21 | 24 |
| " in front of cyl. #1 | | 14 | 11 | 6 | 1 | 25 | 22 | 18 | 15 | 37 | 30 | 21 | 18 | 15 | 12 | 18 | 21 | 24 | 27 |
| " at exit from oil cooler | | 11 | 5 | 1 | -5 | 28 | 28 | 18 | 21 | 56 | 47 | 25 | 28 | 21 | 12 | 18 | 18 | 24 | |
| Oil-in line | | 132 | 132 | 129 | 129 | 134 | 131 | 130 | 130 | 128 | 130 | 131 | 127 | 131 | 139 | 133 | 143 | 139 | 136 |
| Oil out | | 191 | 191 | 188 | 191 | 199 | 196 | 197 | 198 | 194 | 195 | 195 | 194 | 195 | 195 | 192 | 195 | 199 | 195 |
| Accessory compartment | | 81 | 78 | 75 | 75 | 96 | 95 | 94 | 94 | 102 | 98 | 94 | 97 | 94 | 91 | 88 | 91 | 91 | 94 |
| Left magneto | | 69 | 66 | 63 | 63 | 80 | 80 | 77 | 78 | 70 | 85 | 82 | 81 | 78 | 73 | 73 | 76 | 76 | 79 |
| Pilot's cockpit | | 56 | 54 | 53 | 51 | 64 | 67 | 68 | 67 | 73 | 71 | 69 | 67 | 64 | 59 | 60 | 63 | 63 | 66 |
| Recording instrument compartment | | 51 | 51 | 45 | 45 | 62 | 59 | 59 | 56 | 67 | 66 | 63 | 66 | 56 | 52 | 55 | 58 | 58 | 63 |

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HIGH-SPEED LEVEL FLIGHT, CONTINUED

## Table II - (concluded)

| 6-15 1 | 6-15 2 | 6-15 3 | 6-15 4 | 6-15 5 | 7-17 1 | 7-17 2 | 7-17 3 | 7-17 4 | 7-17 5 | | CLIMB 5-11 a | 5-11 b | 5-11 c | 5-11 d | 5-11 e | 5-18 a | 5-18 b | 5-18 c | 5-18 d | 5-18 e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32.4 | — | 32.3 | 32.6 | 32.5 | 32.6 | 32.8 | — | 32.6 | 32.8 | Ind. airspeed mph | 157 | 154 | 153 | 154 | 152 | 137 | 137 | 137 | 135 | 137 |
| 34.2 | — | 30.3 | 33.5 | 35.7 | 35.7 | 34.6 | | 31.7 | 31.2 | $q_c$ | 12.2 | 11.8 | 11.6 | 11.8 | 11.5 | 9.3 | 9.3 | 9.3 | 8.0 | 9.3 |
| 16.15 | 14.88 | 14.00 | 15.52 | 16.76 | 16.86 | 16.08 | — | 14.80 | 14.25 | Pressure altitude range, ft | 1100-3800 | 6400-8600 | 10700-12700 | 14600-16100 | 17600-18800 | 3500-5900 | 8700-10800 | 13200-14800 | 16800-18400 | 19900-20800 |
| -15 | -19 | -26 | -17 | -14 | -10 | -11 | | -16 | -19 | | | | | | | | | | | |
| .630 | .585 | .560 | .608 | .652 | .650 | .621 | | .578 | .560 | Av. free air temp., °F | 19 | 2.6 | 18 | 6 | -6 | 15 | 7 | -6 | -18 | -27 |
| 14950 | 17050 | 18500 | 16050 | 13900 | 14000 | 15400 | | 17550 | 18500 | " bhp | 900 | 920 | 920 | 840 | 760 | 975 | 930 | 830 | 710 | 600 |
| | | | | | | | | | | " manifold press., in. Hg | 39.5 | 39.9 | 39.8 | 35.3 | 31.6 | 42.5 | 41.6 | 36.5 | 31.7 | 26.5 |
| 914 | 854 | 812 | 896 | 942 | 933 | 891 | 858 | 830 | 812 | Rpm | 2540 | | | | | | | | | |
| 38.3 | 35.7 | 33.7 | 37.1 | 39.9 | 39.9 | 38.4 | 37.4 | 35.7 | 34.4 | | | | | | | | | | | |
| cowl flaps (Closed) | | | | | Baffle seals removed | | | | | | Modified cowl flaps (Open) | | | | | | | | | |
| Temperature, °F | | | | | | | | | | | Temperature, °F | | | | | | | | | |
| 317 | 3Y2 | 331 | 324 | 318 | 318 | 322 | 332 | 337 | 332 | | 302 | 326 | 344 | 336 | 334 | 290 | 330 | 307 | 288 | 275 |
| 338 | 348 | 343 | 341 | 337 | 337 | 339 | 345 | 347 | 341 | | 318 | 340 | 356 | 357 | 357 | 305 | 344 | 336 | 326 | 313 |
| 328 | 334 | 331 | 331 | 329 | 330 | 340 | 337 | 339 | 332 | | 301 | 328 | 347 | 347 | 344 | 296 | 330 | 319 | 309 | 296 |
| 370 | 374 | 371 | 371 | 369 | 379 | 375 | 379 | | 375 | | 323 | 351 | 368 | 378 | 376 | 313 | 336 | 342 | 342 | 332 |
| 319 | 328 | 324 | 324 | 320 | 326 | 328 | 330 | 333 | 328 | | 273 | 302 | 321 | 334 | 334 | 283 | 300 | 307 | 300 | 290 |
| 372 | 382 | 381 | 375 | 373 | 381 | 381 | 383 | 388 | 385 | | 334 | 355 | 372 | 385 | 387 | 317 | 338 | 357 | 357 | 349 |
| 340 | 346 | 343 | 339 | 337 | 341 | 339 | 351 | 354 | 349 | | 292 | 319 | 338 | 355 | 357 | 292 | 313 | 328 | 328 | 324 |
| 357 | 365 | 366 | 360 | 356 | 362 | 366 | 368 | 373 | 370 | | 332 | 351 | 372 | 387 | 389 | 317 | 342 | 363 | 361 | 351 |
| 359 | 370 | 369 | 366 | 362 | 367 | 368 | 375 | 375 | 373 | | 305 | 340 | 359 | 374 | 371 | 311 | 336 | 342 | 334 | 321 |
| 357 | 368 | 366 | 360 | 352 | 360 | 366 | 373 | 377 | 375 | | 328 | 344 | 361 | 380 | 382 | 313 | 349 | 324 | 305 | 294 |
| 342 | 35/ | 352 | 348 | 339 | 343 | 349 | 356 | 360 | 356 | | 702 | 328 | 347 | 361 | 361 | 307 | 334 | 305 | 286 | 271 |
| 353 | 372 | 374 | 371 | 358 | 354 | 362 | 373 | 381 | 377 | | 338 | 357 | 372 | 376 | 378 | 330 | 365 | 313 | 290 | 269 |
| 338 | 355 | 356 | 354 | 339 | 339 | 345 | 356 | 362 | 358 | | 324 | 348 | 359 | 361 | 364 | 321 | 349 | 302 | 280 | 265 |
| 266 | 275 | 276 | 268 | 268 | 271 | 271 | 275 | 277 | 275 | | 230 | 256 | 269 | 271 | 273 | 243 | 267 | 260 | 252 | 248 |
| | | | | | | 273 | 277 | 279 | 275 | | 228 | 253 | 271 | 273 | 273 | 243 | 265 | 260 | 252 | 245 |
| 263 | 269 | 270 | 264 | 264 | 67 | 264 | 269 | 271 | 269 | | 222 | 250 | 265 | 269 | 271 | 241 | 260 | 260 | 256 | 248 |
| 263 | 266 | 266 | 259 | 261 | 258 | 258 | 260 | 262 | 260 | | 37 | 245 | 260 | 267 | 267 | 232 | 252 | 252 | 245 | 241 |
| 256 | 260 | 259 | 255 | 259 | 250 | 250 | 251 | 251 | 250 | | 209 | 237 | 250 | 256 | 256 | 228 | 237 | 243 | 239 | 235 |
| 269 | 275 | 274 | 268 | 270 | 263 | 262 | 264 | 267 | 264 | | 217 | 245 | 262 | 271 | 271 | 232 | 250 | 256 | 254 | 250 |
| | | | | | | | | | | | 200 | 228 | 241 | 250 | 250 | | 224 | 232 | 230 | 226 |
| 260 | 269 | 268 | 259 | 261 | 260 | 262 | 264 | 264 | 262 | | 209 | 241 | 260 | 267 | 265 | 230 | 250 | 258 | 256 | 254 |
| 277 | 285 | 285 | 276 | 278 | 275 | 275 | 277 | 279 | 277 | | 230 | 260 | 275 | 284 | 285 | 248 | 267 | 275 | 271 | 267 |
| 285 | 294 | 293 | 285 | 287 | 273 | 277 | 277 | 279 | 277 | | 135 | 265 | 284 | 294 | 294 | 250 | 269 | 273 | 267 | 260 |
| 260 | 264 | 264 | 253 | 259 | 258 | 258 | 260 | 264 | 260 | | 226 | 247 | 260 | 269 | 271 | 239 | 256 | 252 | 241 | 235 |
| 279 | 285 | 287 | 278 | 278 | 260 | 264 | 267 | 269 | 266 | | 230 | 258 | 273 | 281 | 284 | 245 | 265 | 256 | 248 | 241 |
| 264 | 275 | 276 | 268 | 268 | 264 | 269 | 271 | 275 | 273 | | 232 | 260 | 273 | 275 | 275 | 245 | 265 | 254 | 243 | 241 |
| 266 | 277 | 276 | 272 | 270 | 258 | 260 | 264 | 267 | 264 | | 228 | 254 | 269 | 271 | 271 | 248 | 267 | 258 | 250 | 243 |
| 178 | 183 | 178 | 180 | 180 | 185 | 187 | 187 | 187 | 185 | | 174 | 183 | 185 | 183 | 179 | 175 | 169 | 163 | 153 | 155 |
| 119 | 119 | 116 | 119 | 121 | 123 | 126 | 123 | 123 | 120 | | 103 | 122 | 119 | 134 | 134 | 117 | 128 | 117 | 108 | 36 |
| 47 | 47 | 47 | 50 | 53 | 50 | 50 | 53 | 36 | 56 | | 39 | 42 | 39 | 39 | 36 | 37 | 37 | 37 | 37 | 37 |
| 47 | 50 | 50 | 50 | 56 | 50 | 53 | 53 | 56 | 60 | | 42 | 42 | 39 | 39 | 39 | 40 | 40 | 40 | 40 | 37 |
| 47 | 47 | 47 | 50 | 56 | 53 | 53 | 53 | 53 | 53 | | 44 | 43 | 43 | 43 | 40 | 48 | 42 | 36 | 36 | 30 |
| 7 | 4 | 2 | 7 | 10 | 16 | 16 | 16 | 13 | 7 | | 30 | 37 | 34 | 29 | 15 | 33 | 24 | 14 | 5 | -7 |
| 38 | 38 | 35 | 41 | 41 | 44 | 47 | 47 | 44 | 41 | | 50 | 59 | 58 | 49 | 43 | 54 | 48 | 39 | 30 | 21 |
| 3 | -2 | -8 | 1 | 4 | 8 | 7 | 5 | 2 | -1 | | 25 | 30 | 23 | 12 | 0 | 19 | 10 | -2 | -12 | -21 |
| 7 | 1 | -2 | 7 | 10 | 16 | 16 | 13 | 10 | 3 | | 27 | 31 | 24 | 15 | 0 | 20 | 14 | 2 | -11 | -20 |
| 13 | 7 | 4 | 13 | 17 | 19 | 19 | 16 | 13 | 7 | | 23 | 34 | 28 | 15 | 9 | 27 | 18 | 5 | -1 | -11 |
| 10 | 4 | 1 | 7 | 10 | 13 | 13 | 10 | 7 | 3 | | 27 | 46 | 43 | 24 | 9 | 39 | 18 | 21 | 21 | -14 |
| 136 | 136 | 139 | 133 | 136 | 135 | 129 | 129 | 129 | 129 | | 129 | 142 | 145 | 131 | 131 | 150 | 152 | 146 | 131 | 125 |
| 186 | 189 | 191 | 186 | 189 | 188 | 188 | 188 | 188 | 188 | | 149 | 175 | 187 | 193 | 193 | 176 | 190 | 180 | 184 | 181 |
| 80 | 80 | 77 | 80 | 80 | 84 | 84 | 84 | 84 | 81 | | 74 | 84 | 89 | 86 | 80 | 63 | 63 | 54 | 51 | 45 |
| 62 | 62 | 62 | 62 | 65 | 72 | 72 | 68 | 68 | 65 | | 50 | 50 | 53 | 56 | 56 | 60 | 60 | 57 | 54 | 51 |
| 48 | 48 | 47 | 49 | 52 | 60 | 60 | 60 | 60 | 57 | | 40 | 43 | 43 | 40 | 37 | 42 | 42 | 39 | 36 | 30 |
| 41 | 41 | 41 | 41 | 44 | 50 | 50 | 50 | 50 | 44 | | 37 | 43 | 43 | 40 | 37 | 42 | 42 | 33 | 33 | 27 |

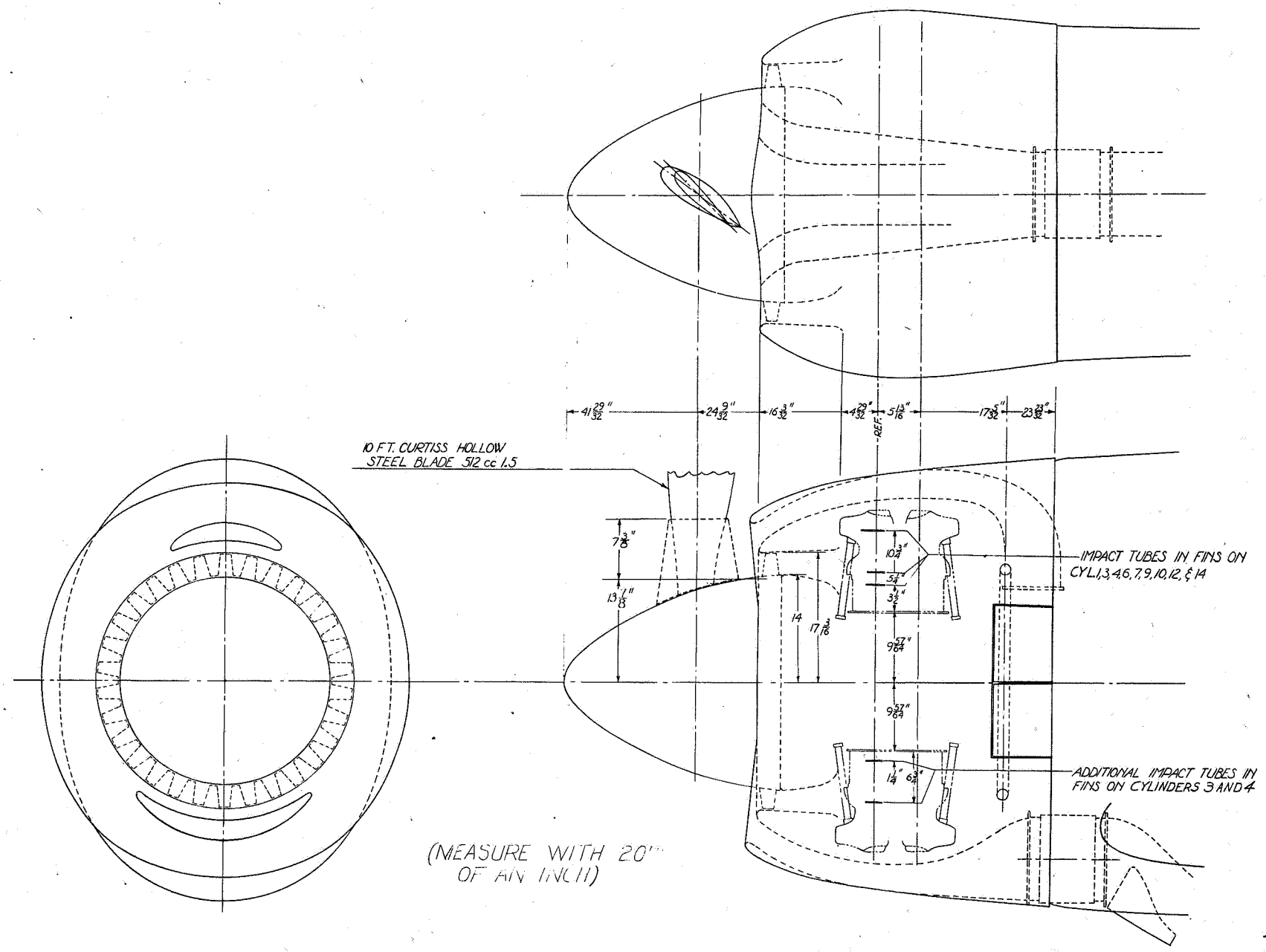



Figure 1.– Short-nose low-inlet-velocity cowling with axial-flow fan.

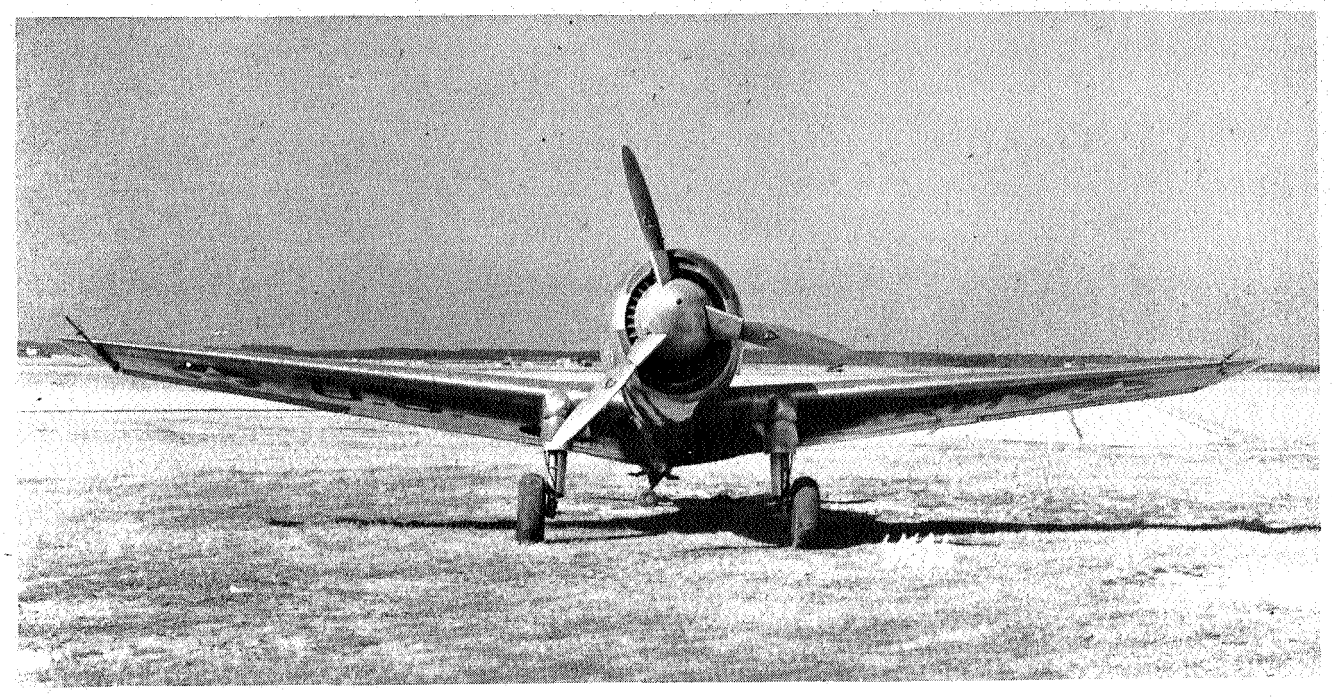


Figure 2.- Front view of XP-42 airplane with short-nose low-inlet velocity cowling and fan (test condition 6).

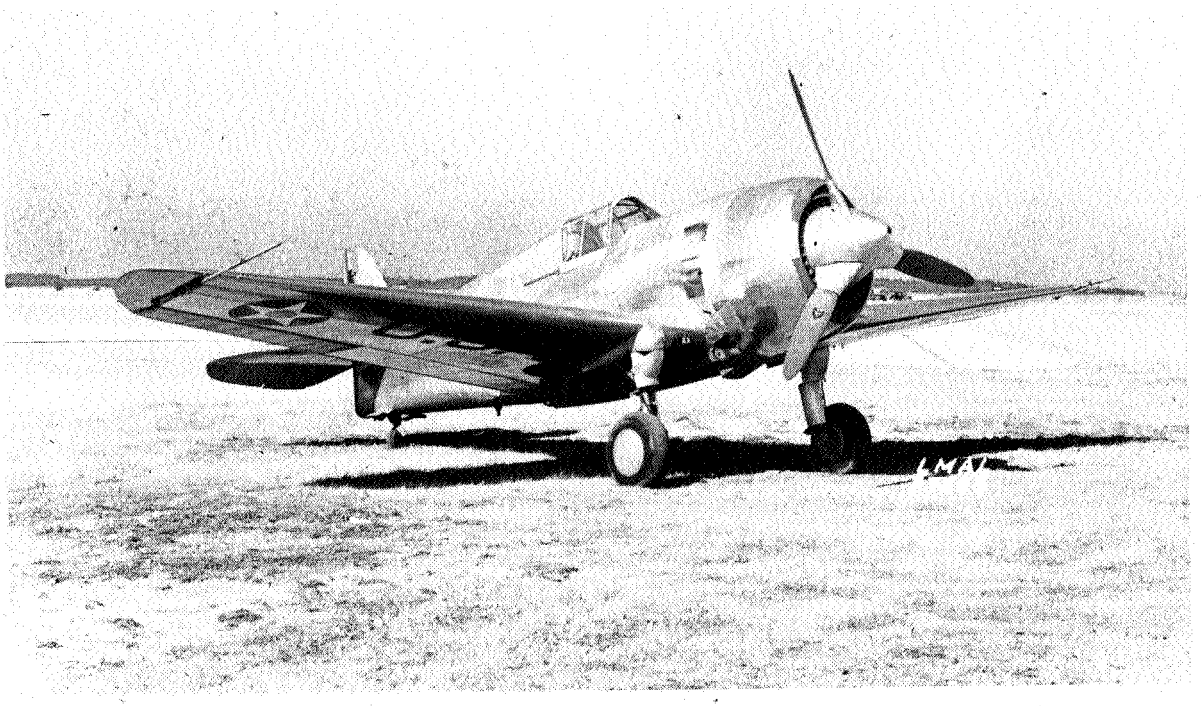


Figure 3.- Three-quarter front view in test condition 6.

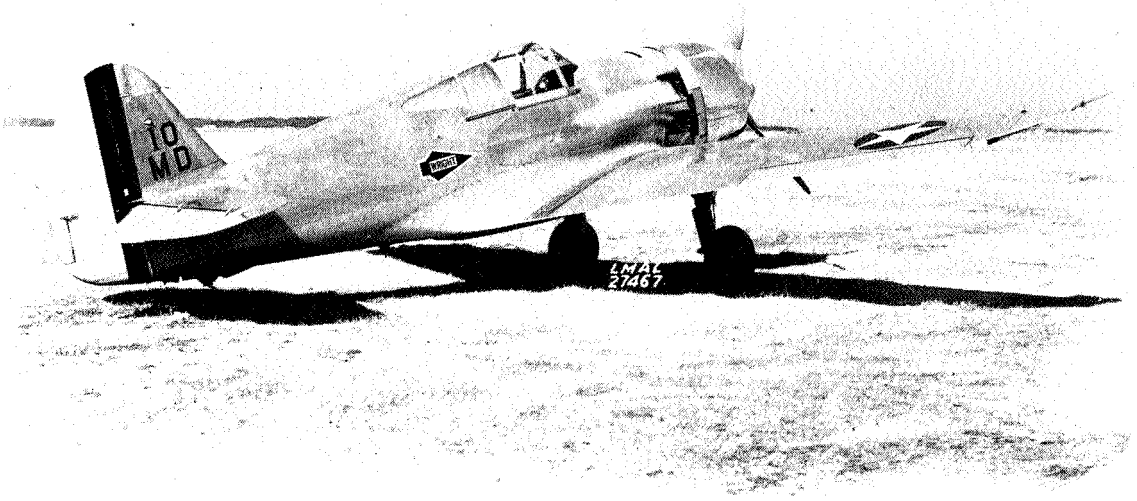



Figure 4.- Three-quarter rear view .n test condition 6.

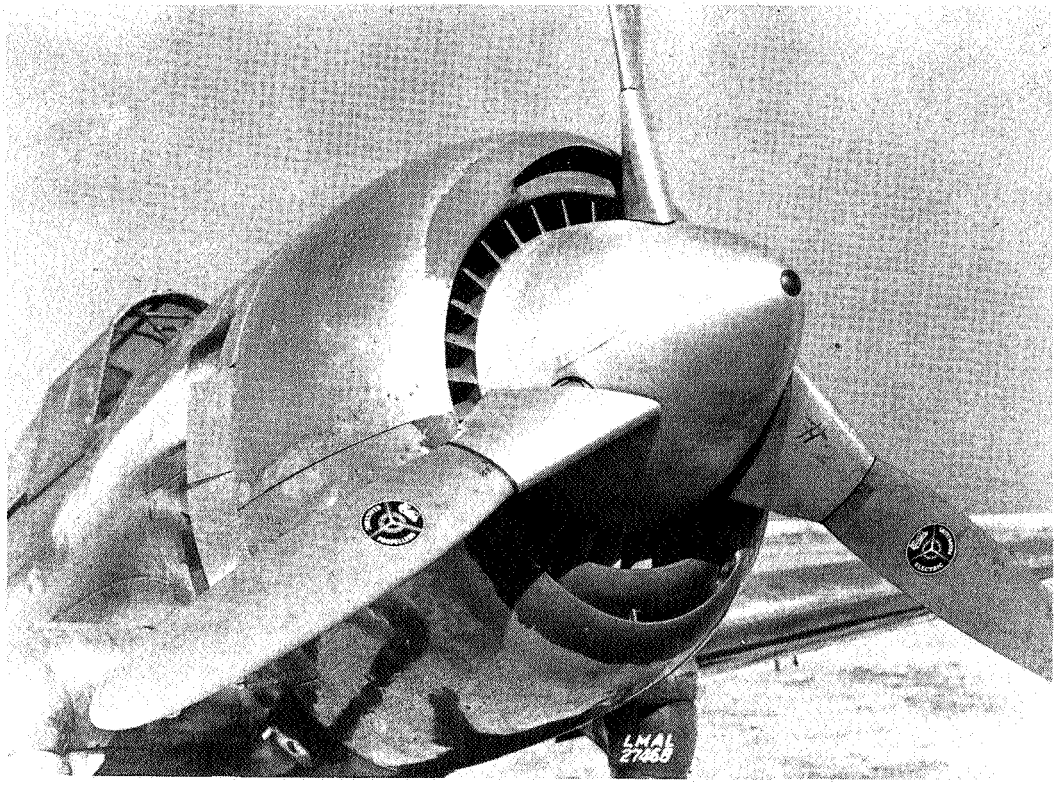
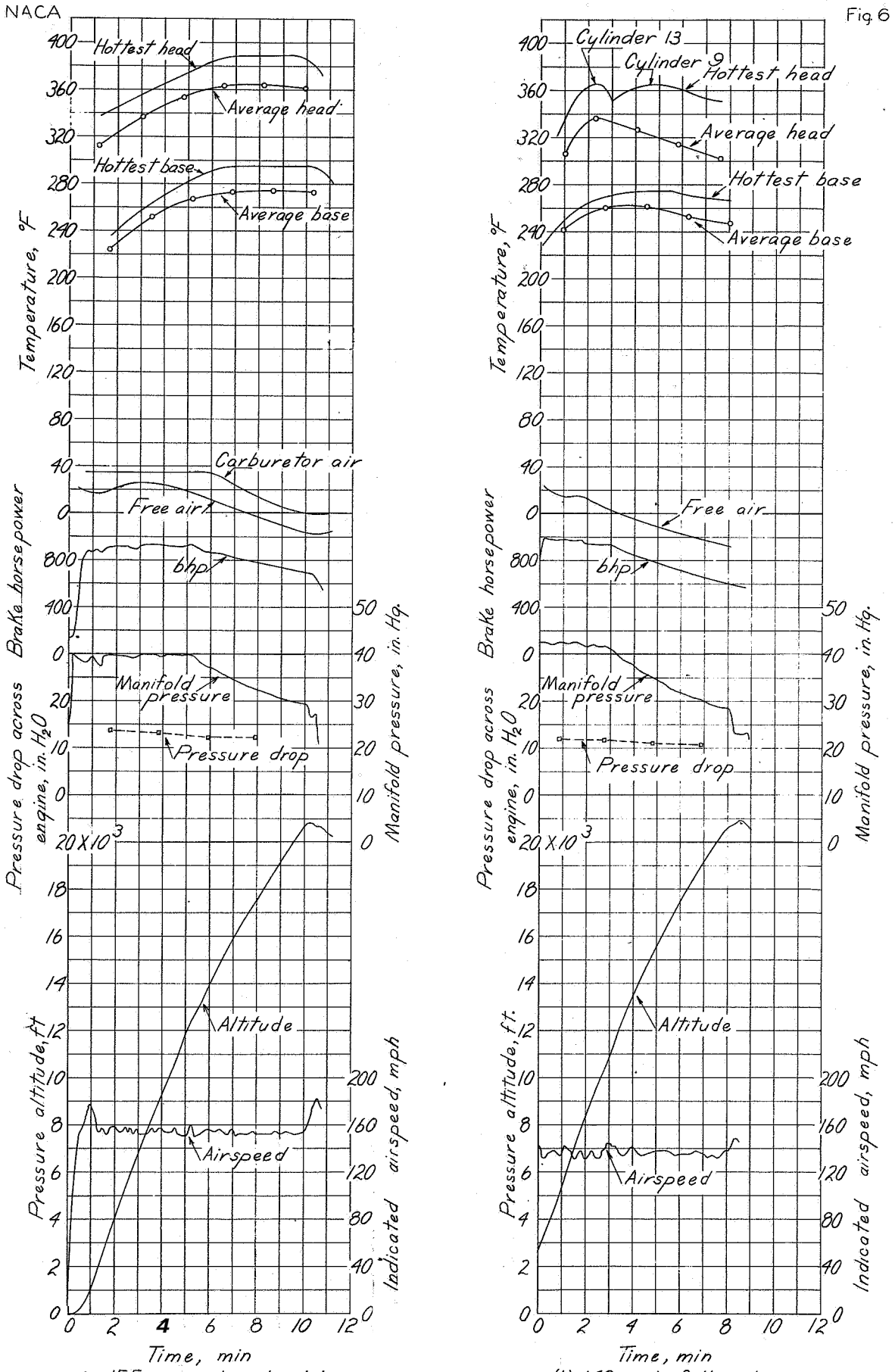



Figure 5.- Close-up of cowling and fan (test condition 6).




(a) 155 mph; automatic rich.

(b) 140 mph; full rich.

(Measure with 5/16" scale)

Fig. 6 — Time histories of climbs in test **5**.

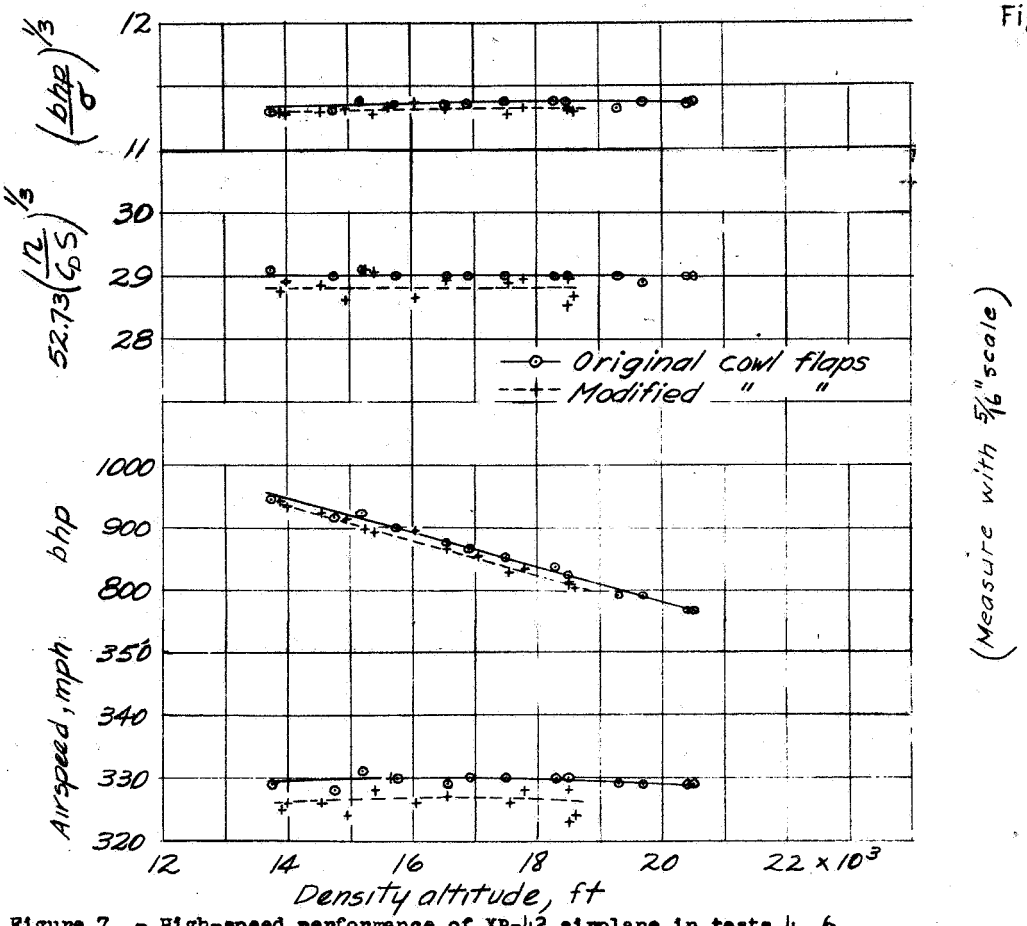



Figure 7. - High-speed performance of XP-42 airplane in tests 4, 6 and 7.

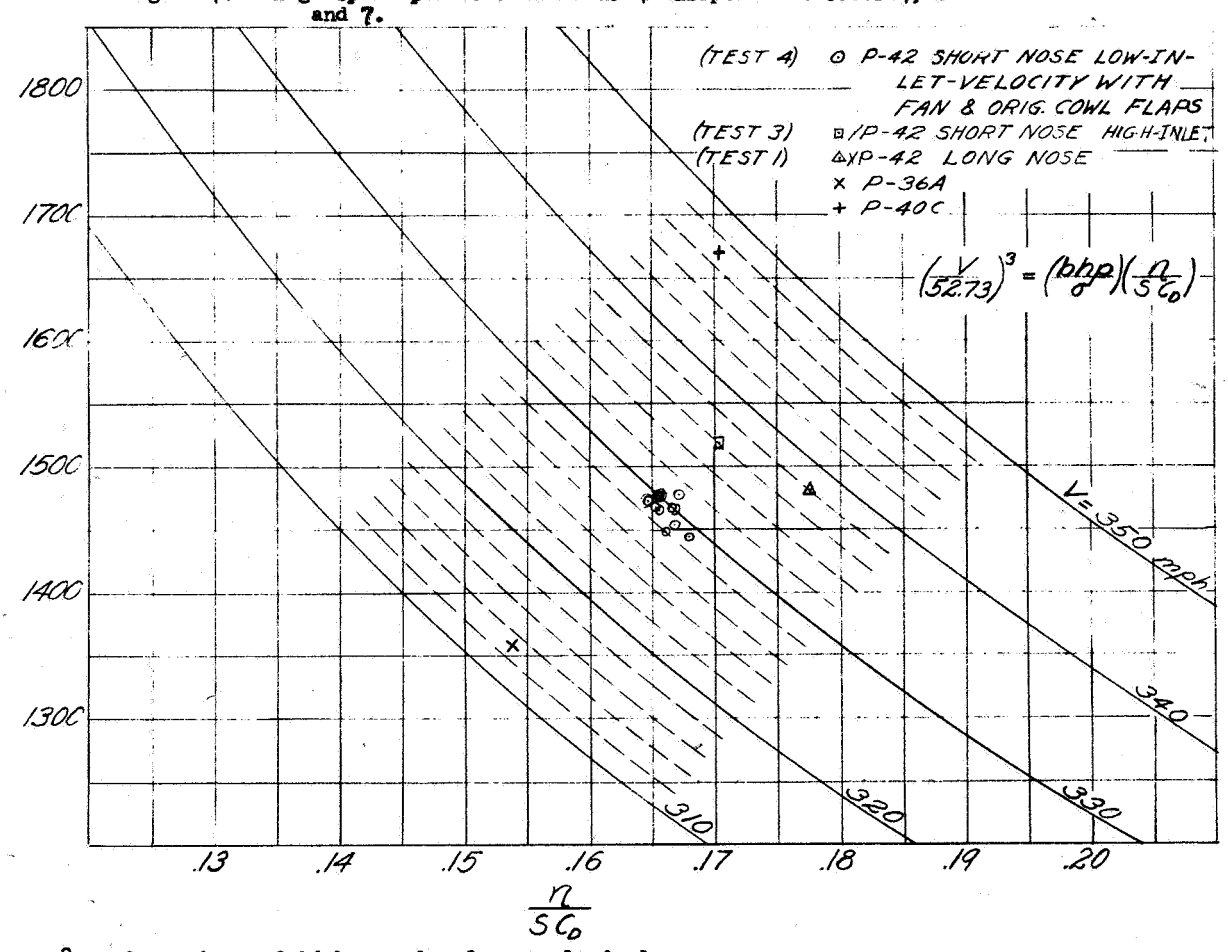



Figure 8. - Comparison of high speeds of several airplanes.

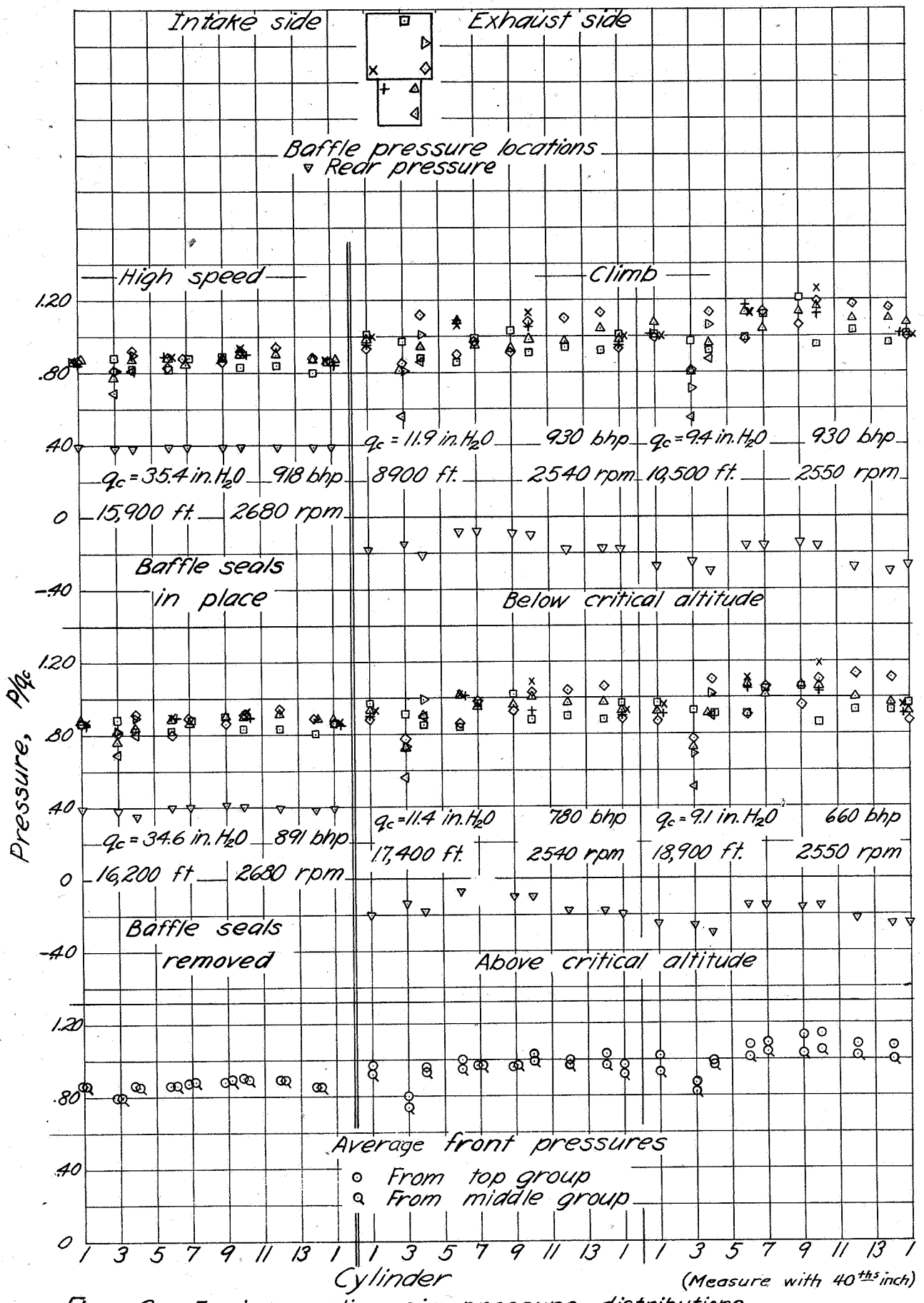



Figure 9.- Engine cooling-air pressure distributions.

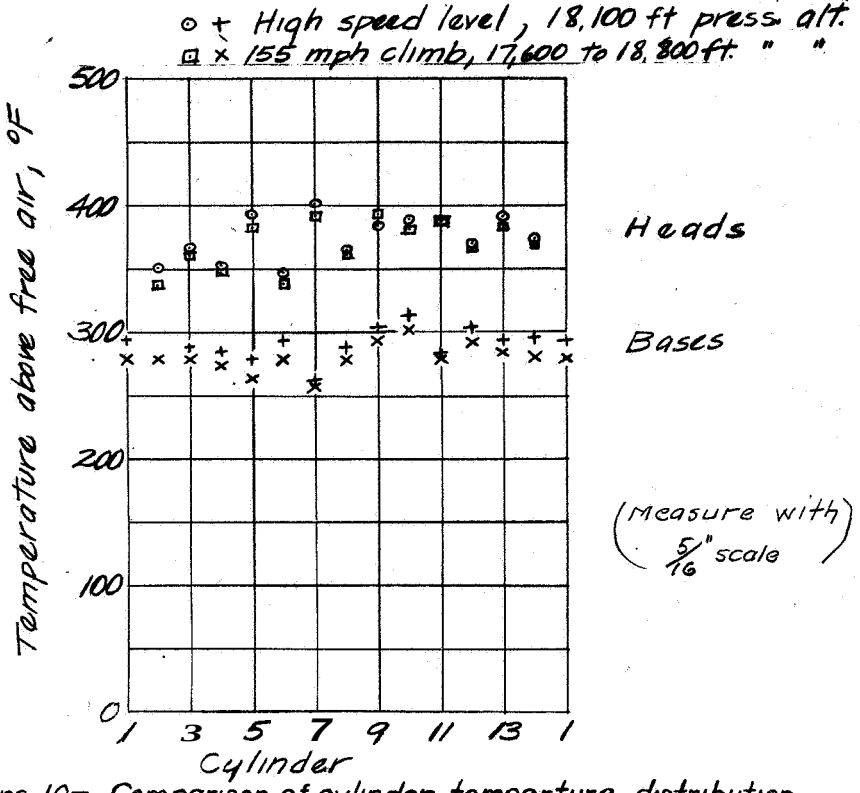



Figure 10.- Comparison of cylinder temperture distribution for climb and high speed at full power in automatic rich (Test 4 and 5).

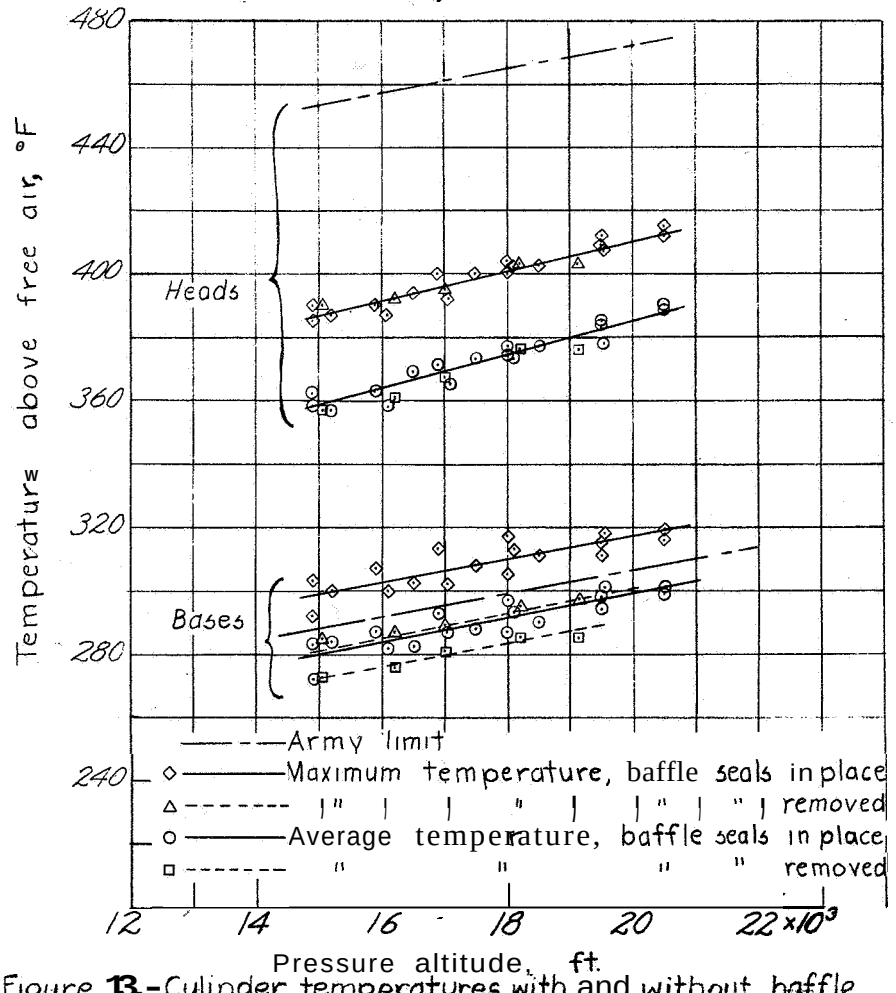



Figure 13.-Cylinder temperatures with and without baffle seal strips in relation to Armu limits (tests 4, 6, una' 7).

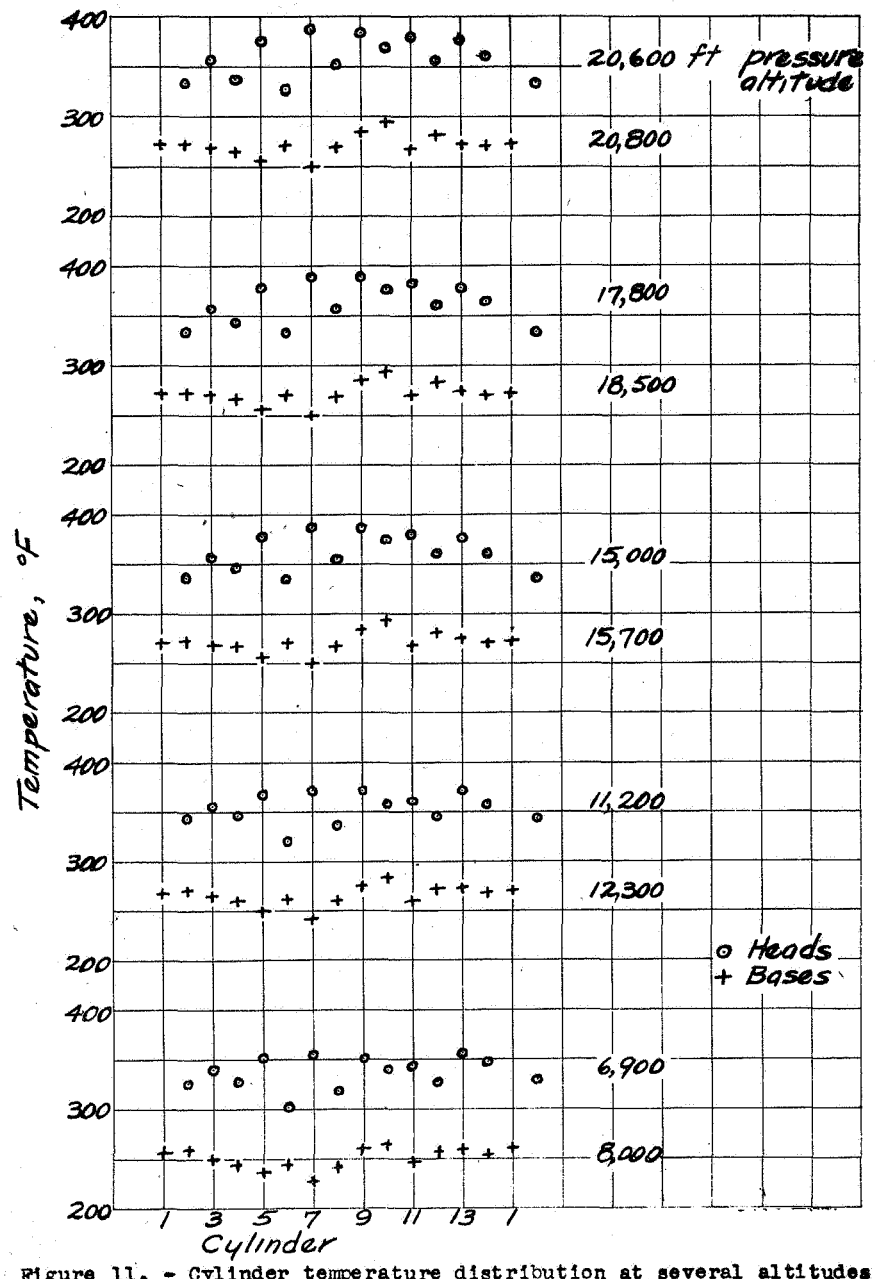



Figure 11. - Cylinder temperature distribution at several altitudes in full-power climb in automatic rich. (Test 5)

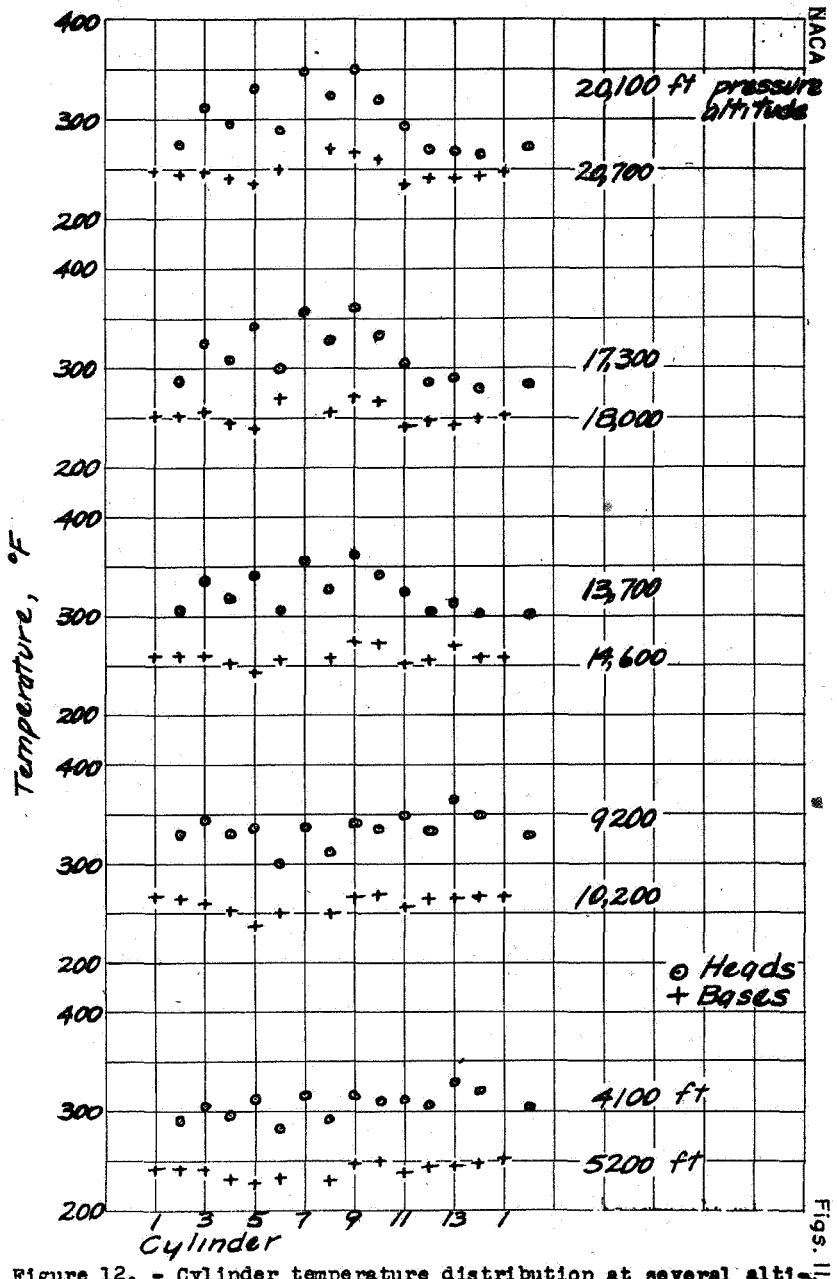



Figure 12. - Cylinder temperature distribution at several altitudes in full-power climb in full rich (Test 5)

(Measure with 5/16" scale)

NACA

Figs. 11,12

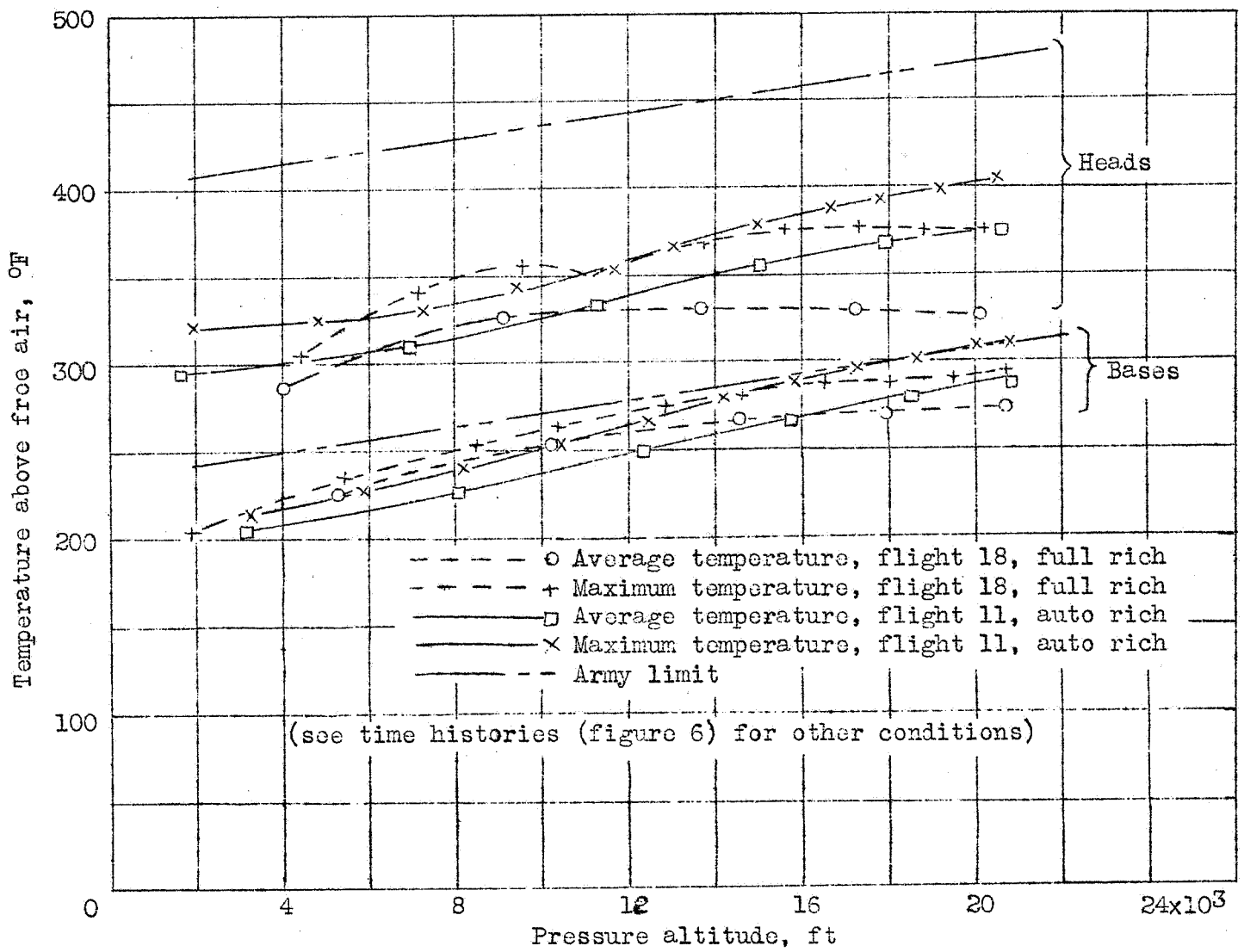



Figure 14.- Cylinder temperatures in climb in relation to Army limits (test 5).