HEADQUARTERS
AIR MATERIEL COMMAND
WRIGHT FIELD, DAYTON, OHIO

TSFPE/JWT/djm/2-6275

MEMORANDUM REPORT ON
P-80A Airplane, AAF No. 44-85075

Date 14 February 1947

SUBJECT: Performance Flight Tests

OFFICE TSFPE Contract or Order No.

SERIAL No. TSFTE-2053 Expenditure Order No. 559-11

A. Purpose

1. To report the results of tests conducted on the P-80A airplane, AAF No. 44-85075, to aid in determining the variations in performance to be expected from different P-80A airplanes in service. This airplane was obtained on loan from March Field, California, and was reported to have the poorest performance of any P-80A airplane in service.

B. Factual Data

1. The tests on the P-80A airplane, AAF No. 44-85075, were requested by the Engineering Standards Section of the Engineering Division, in Expenditure Order No. 559-11 dated 7 January 1947, to obtain information needed in preparing technical orders for this type of aircraft. Six flights were flown at Wright Field by the Fighter Operations Section, Flight Test Division, between 22 January 1947 and 27 January 1947.

2. The P-80A airplane, AAF No. 44-85075, was a standard production airplane with a paint finish, wing tip racks, and six 50 caliber machine guns installed in the nose with the gun ports uncovered. A J-33-9 engine which developed 3570 pounds of static thrust at 11,500 rpm on its original acceptance tests was installed in the airplane. The total time on the airplane was 140 hours and 20 minutes and the total engine time was 28 hours and 25 minutes when it arrived at this station. At the time of the test the turbine blade clearance was .051 inches and the average tail pipe nozzle diameter was 18.59 inches. The paint was cracked and chipped and the skin had many surface irregularities. Photographs showing the finish and external configuration of this airplane have been included in Appendix II. The airplane was in poor condition when it arrived at Wright Field. A list of the maintenance items completed before the airplane was considered safe to fly is included in Table 1, Appendix II. The only items that were corrected which would affect the performance were the following:

a. Tail cone adapter leaked excessively.
b. Nose compartment doors not flush with nose section.
c. Right landing gear drooped two inches when the gear was retracted on jacks.

The tests were to have been flown with the airplane as it was delivered to Wright Field but it was considered unsafe to fly the aircraft without correcting the above items.

3. A sensitive free air temperature gage was installed for these tests. The standard airspeed, altimeter and tachometer were replaced by calibrated sensitive test instruments and the standard fuel flow counter and burner pressure gages were calibrated. The instruments removed from the airplane were checked to make sure that they were not the reason for the reported poor performance.

4. The airplane was loaded to a gross weight of 11,560 pounds with the CG located at 28.7% M.A.C. to facilitate a comparison of the performance of this airplane with that obtained on other P-80A airplanes at the same weight. The loading consisted of the following:

Basic Weight	8,464 pounds
Pilot	160
Parachute	40
3 Gallons Oil	26
425 Gallons Fuel	2,753
Ballast	117
Gross Weight	11,560 pounds

The basic weight of 8464 pounds was close to the 8500 pound average basic weight for this type of aircraft.

5. Level flight tests were run at 5000 feet, 20,000 feet and 35,000 feet. At each altitude stabilized speed points were obtained at a sufficient number of engine rpm's to cover the complete speed range. The climb performance was measured in the climbs to the 20,000 and 35,000 foot test altitudes. One additional flight was made to obtain an airspeed calibration against the Flight Test Division pacer P-80A airplanes, AAF Nos. 44-85121 and 44-85113. The flying characteristics appeared normal at all times except that evidences of compressibility trouble (duct rumble, vibration, noise, etc.,) became apparent at a slightly lower indicated airspeed than usual for the average P-80A airplane.

6. All performance data have been corrected to standard atmospheric conditions and have been plotted on curves found in appendix I. Original data

corrected for instrument error only is given in tabular form in Appendix III.

7. The airspeed position error correction is given in Figure 1. This correction is slightly greater than the average curve for P-80A airplanes but is within the normal variation.

8. Curves of rpm required on a standard day versus speed (true speed times the square root of the density ratio) at 5000 feet, 20,000 feet and 35,000 feet are given in Figure 2. From these curves the high speed and cruising speed performance at altitude has been determined and is given in Figure 3. The maximum speed of this P-80A airplane was 526 mph at 12,000 feet at 11,500 rpm. The maximum cruising speed at 10,300 rpm was 434 mph at 24,000 feet.

9. The air miles per gallon measured at different speeds is shown in Figure 4. The maximum air miles per gallon obtained on these tests was 2.2 miles per gallon at 10,300 rpm at 430 mph true airspeed at 34,500 feet altitude.

10. The maximum rate of climb was 4300 ft/min. at sea level in a climb at 11,500 rpm at the indicated airspeed for the maximum rate of climb of the P-80A airplane. A curve of rate of climb versus altitude is given in Figure 5.

11. A comparison has been made between the performance measured on P-80A airplane, AAF No. 44-85075, and that obtained on other P-80A airplanes tested by the Flight Test Division. Representative examples of the best, the worst, and the average P-80A airplanes were used for this comparison. All data presented has been corrected to a common take-off weight of 11,560 pounds and is for a P-80A airplane in the normal clean configuration. The data has been plotted in Figure 6 and is given in tabular form as follows:

Memorandum Report No. TSPTE-2053
14 February 1947

Maximum speed at 11,500 rpm at 11,560 pounds gross weight at take-off.

Altitude	P-80A 44-85075	P-80A 44-85044 #1 Engine	P-80A 44-85044 #2 Engine	P-80A 44-85123	P-80A 44-85462 Unpainted
5000	524	514	---	548	525
20000	523	520	537	531	522
35000	490	507	512	500	502

Cruising speed at 10,300 rpm at 11,560 pounds gross weight at take-off.

Altitude	P-80A 44-85075	P-80A 44-85044 #1 Engine	P-80A 44-85044 #2 Engine	P-80A 44-85123	P-80A 44-85462 Unpainted
5000	418	418	---	439	411
20000	434	428	450	449	422
35000	430	425	440	450	413

Rate of climb (ft/min) at 11,500 rpm at 11,560 pounds gross weight at take-off.

Altitude	P-80A 44-85075	P-80A 44-85044 #1 Engine	P-80A 44-85044 #2 Engine	XP-80A 44-83201
5000	3900	3800	4400	4100
20000	2500	2400	3100	2800
32000	1500	1400	2000	1800

Air miles per gallon at 11,500 rpm at 11,560 pounds gross weight at take-off.

Altitude	P-80A 44-85075	P-80A 44-85044 #2 Engine	XP-80A 44-83201
5000	0.75	---	0.9
25000	1.4	1.3	1.4
35000	1.9	1.8	2.0

Air miles per gallon at 10,300 rpm at 11,560 pounds gross weight at take-off.

Altitude	P-80A 44-85075	P-80A 44-85044 #2 Engine	XP-80A 44-83201
5000	1.0	---	1.1
25000	2.0	1.8	2.0
35000	2.2	2.4	2.8

AAF No.	Remarks
44-85044 (#1 Eng.)	Average P-80A, painted, with low thrust engine.
44-85044 (#2 Eng.)	Average P-80A, painted, with average thrust engine.
44-85123	Fastest P-80A tested, winner of 1946 Thompson Trophy Race.
44-83201 (XP-80A)	Better than average performance.
44-85462	Average production P-80A, unpainted.

13. An accurate thrust comparison was not possible due to limited thrust data obtained on P-80A airplane flight tests to date. It was possible to obtain the static thrust at 11,500 rpm corrected to standard conditions from test cell runs of several of the engines.

J-33-9 engine, Serial No. A-071380, installed in P-80A airplane, AAF No. 44-85075 = 3570 pounds.

J-33-9 engine installed in P-80A airplane, AAF No. 44-85044, Serial No. A-071404 = 3790 pounds. (#2 engine in this airplane).

A static ground thrust curve was obtained on the Wright Field thrust stand and a curve of rpm versus static thrust is given in Figure 7. Figure 7 also shows the static ground thrust obtained on P-80A airplane, AAF No. 44-85462. From these curves it is apparent that at least average thrust was obtained from the engine installed in the P-80A airplane, AAF No. 44-85075.

14. From the foregoing comparison it is apparent that the performance of the P-80A airplane, AAF No. 44-85075, is poorer than average but still within the variation in performance already measured on other P-80A airplanes tested at Wright Field except for high speed above 30,000 feet where it appears that the speed is limited by a lower critical Mach number than that measured on any of the other P-80A airplanes. It is very probable that the performance was even worse at the time this aircraft left March Field due to the maintenance items which were corrected as outlined in Paragraph 2; however, there is no reason for flying an airplane in this condition any more than flying it around with the flaps or wheels down. The performance could be further improved by removing the cracked paint and repairing the poorly fitting access doors and panels, etc., to provide a smoother surface finish.

C. Conclusions

1. The performance of the P-80A airplane, AAF No. 44-85075, is below average but within the maximum variation in performance measured on other P-80A airplanes at Wright Field.

2. The comparative performance table and graph presented in this report are representative of the maximum variation in performance to be expected from P-80A type aircraft providing they are maintained properly.

Memorandum Report No. TSFTE-2053
14 February 1947

3. Particular attention should be given to the surface smoothness and the proper fitting of all flaps, doors, access panels, and air ducts in the maintenance of high speed jet aircraft.

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FIG 3

TRUE AIRSPEED VS ALTITUDE

P-80A AAF NO 44-85075

PILOT MAJ. R. L. JOHNSON

11560 LBS. GR. WGT @ T.O.

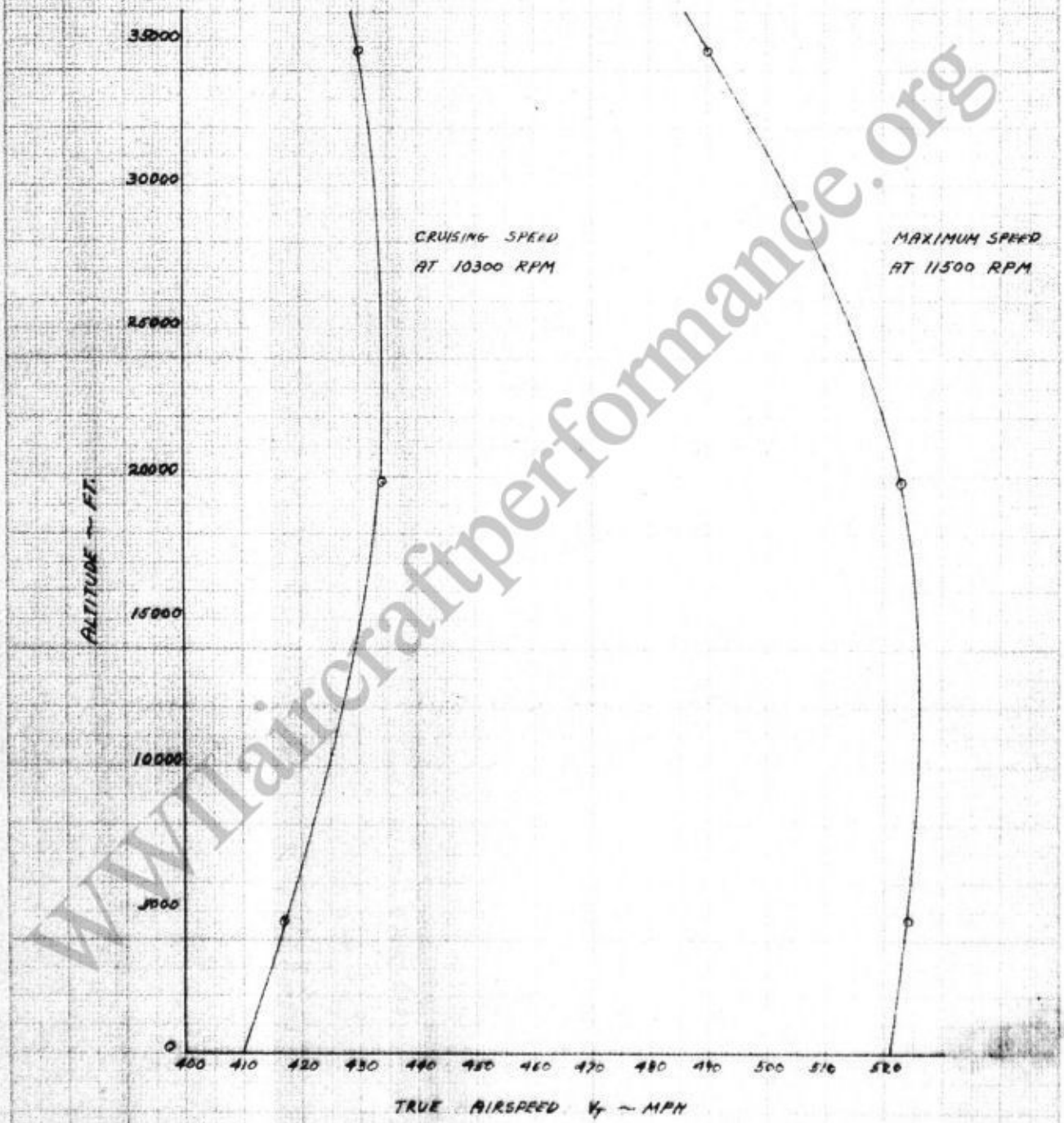

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FIG. 5
RATE OF CLIMB
P-80A AAF NO. 44-85075
GROSS WEIGHT @ T.O. 11360 lbs.
FLOWN 1-23-47
PILOT MAJ. R.L. JOHNSON

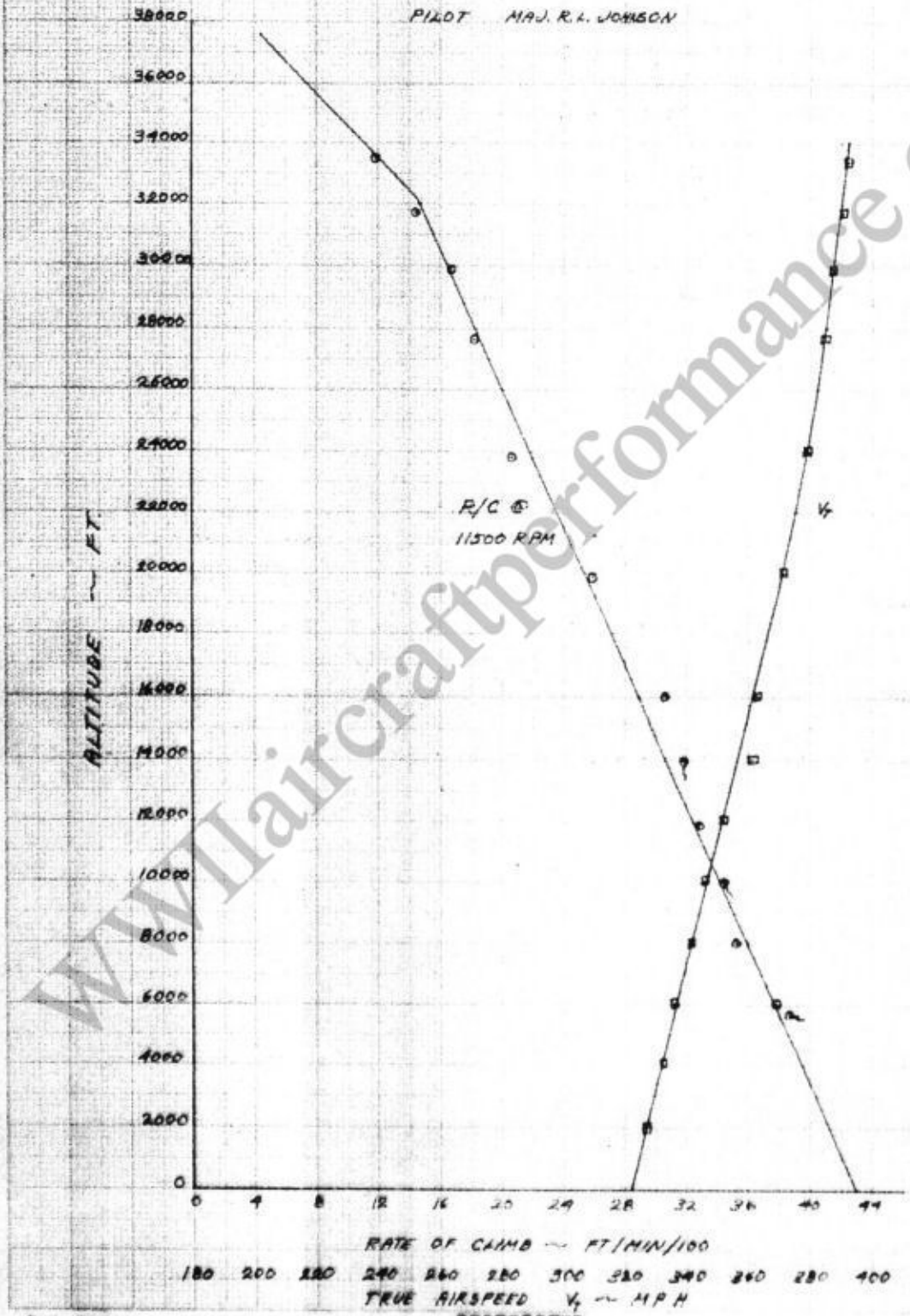

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FIG 6

PERFORMANCE COMPARISON
OF P-80A AIRPLANES
GROSS WGT @ T.O. 11760 lbs.
PILOT: MAJ. R. L. JOHNSON