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XXXXXX COMMAND

FLIGHT SECTION

Pursuit Single Engine P-51B-1-NA, AAF No. 43-12093 PFB:mem:19
May 18, 1943

Preliminary high speed and climb performance tests.

BRANCH:
XXXXXXXX Flight Test

FS-M-19-1587-A 452.1-N.A.P-51 43-126

A. Purpose

1. To report results of high speed and climb performance tests conducted at the manufacturer's factory on the P-51B-1-NA airplane, AAF No. 43-12093.

B. Factual Data.

1. Airplane was tested at a take-off gross weight of 8430 pounds, and was equipped as a standard production fighter with four .50 caliber guns with the gun openings taped but shell ejection chutes open, three antenna wires and a short radio mast aft of the cockpit. Finish was filled and sanded and was supposed to be the standard production finish. Airplane equipped with a Packard Merlin V-1650-3 engine with 11.5 inch and 10.1 inch diameter blowers, and with a four-bladed Hamilton Standard propeller, blade design No. V-6487A-24.

Power data obtained from Packard power curve P-18, No. 5 dated Nov. 21, 1942 for the V-1650-3 engine with 11.5 inch and 10.1 inch blowers.

2. High speeds obtained with the oil cooler flap and coolant flap set for automatic operation since there were no provisions on this airplane for selective operation and no time was available for a test installation of a selective control.

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By
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True Airspeed M.P.H.	R.P.M.	Man. Press. " Hg.	BHP from Power Chart	Altitude Ft.	Coolant Flap Position Inches open From Flush	Oil Flap Position Inches Open from Flush.
(a) Low Blower Operation						
363	3,000	60.5	1,450	5,000	6.0	W. O. (5)
394	3,000	60.5	1,485	10,000	5.0	3.5
425	3,000	60.5	1,530	16,800	1.5	1.0
422	3,000	49.0	1,270	23,200	1.0	Flush
(b) High Blower Operation						
422	3,000	60.5	1,270	23,200	1.0	.5
441	3,000	60.5	1,275	29,800	1.0	Flush
421	3,000	48.0	985	35,000	.5	Flush
403	3,000	40.7	815	38,000	.5	Flush

Opening coolant flap to wide open from the flush position slowed the airplane from 337 M.P.H. I.A.S. to 323 M.P.H. I.A.S. at 18,000 Ft.; opening the oil cooler flap decreased the speed an additional 10 M.P.H. I.A.S.

3. Climb Data, 3,000 R.P.M., Oil and Coolant flaps Wide Open.

Altitude Ft.	Man. Press. " Hg.	Rate of Climb Ft/min.	BHP from Chart
(a) Low Blower Operation			
S.L.	60.5	3,600	1,500
5,000	60.5	3,570	1,510
10,000	60.5	3,540	1,525
13,200	60.5	3,520	1,510
17,400	52.3	2,965	1,320
(b) High Blower Operation			
17,400	60.5	2,965	1,320
20,000	60.5	2,915	1,310
26,000	60.5	2,780	1,260
30,000	51.6	2,125	1,075
35,000	41.8	1,280	850
40,000	32.8	450	630
S/C42,000	29.1	100	540
A/C42,600	28.2	0	515

4. Aftercooling for all level flights and climbs appeared to be adequate, however, the degree of aftercooling is dependent on the position of the coolant flap and some unexpected variations in true brake horsepower were obtained. Oil and coolant temperatures are well under the meximum limit and remain almost constant for all conditions of flight if the cooler flaps are in the automatic position. Engine power output is particularly dependent on changes in outside air temperatures due to the effective aftercooler and also to the high pressure ratio obtained through the scoop and blowers.

5. Determination of airspeed and altimeter errors with the standard North American pitot head (Kollsman D-2) location under the right wing with the static holes approximately 34-3/4 inches aft of the leading edge and 14-1/2 inches below the lower surface and approximately one inch outboard from the outer end of the flap.

True Indicated Air Speed M.P.H.	Calibrated Air Speed M.P.H.	Airspeed Installation Error at Sea Level M.P.H.	Altimeter Error at Sea Level Ft.
365	347	+18	+510
350	333.5	+16.5	+450
335	319	+16	+390
315	301	+14	+320
300	287	+13	+290
280	269	+11	+230
250	241	+ 9	+160
230	223	+ 7	+120

This location of the pitot head results in a reverse static pressure change indication so that an increase in altitude is indicated when the plane is nosed down and a decrease in altitude indicated when the plane is climbed momentarily.

6. An additional airspeed and altimeter installation error was found to exist at altitude and was evidently dependent upon Mach's number. If this error in the airspeed and altimeter is neglected, an error in true speed of as great as 13 M.P.H. in level flight at 30,000 ft. may result.

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I.A.S. M.P.H.	Additional Error in I.A.S. at 10,000 Ft. M.P.H.	Additional Error in I.A.S. at 21,000 Ft. M.P.H.	Additional Error in I.A.S. at 31,000 Ft. M.P.H.
335	+1.5	+4.5	—
315	+1.0	+3.5	—
300	+1.0	+3.0	+5.5
280	+1.0	+2.5	+4.5
250	+ .5	+2.0	+3.5
230	+ .5	+1.5	+2.5

In view of the substantial error introduced by locating the airspeed under the wing and the difficulty in determining the error, it is believed that, in the future, all airplanes, on which performance tests are to be run, should be equipped with an airspeed head located on the wing at least one chord length ahead of the leading edge.

7. This airplane was equipped with a pair of sealed balance ailerons which were very light at all speeds up to 400 M.P.H. Some 30° banks were made at 480 M.P.H. and the ailerons forces were still consistent with the loads at low speeds. In general, the ailerons were considered very good, being effective at all speeds up to 500 M.P.H.; they are very light at stalling speeds but are still effective enough for any operation. The handling characteristics of this airplane have been improved by these ailerons which are the best yet fitted to the P-51 type airplane.

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