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AIR CORPS. MATERIEL DIVISION

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MEMORANDUM REPORT ON
Pursuit Single Engine (P-51) A.C. No. 41-37320

MR-da

Date June 16, 1942

SUBJECT: Performance Tests

SECTION Flight Section

SERIAL No. PM-M-19-1415-A

Contract No. DA-140

Expenditure Order No. 126-35

Purchase Order No.

24 June 1944
Judith L. Lichtenhan
Capt. USAF

A. Purpose

1. To report on performance of first production model of North American P-51 airplane, A. C. No. 41-37320. Airplane equipped with Allison V-1710-39 engine with individual intake port screens removed and T-type manifold screens installed; carburetor flange screen and air filter removed; carburetor air intake screen made of parallel vertical wires .05 inches in diameter and laced thru scoop approximately 5/16 inches apart. Equipped with a three-bladed constant speed propeller, blade design No. 89301-6, blade angle range 23° to 58° at 42 inch radius. Gross weight as tested approximately 8114 pounds; e.g. location wheels down 27.49 percent m.a.s. with two cannons in place, and a gross weight of 8524 pounds with four cannons and armor plate in place. Landing gear retracted, wing flaps neutral; radio antenna installed; prestone and oil shutters flush with cowling in level flight; 1/4 open in climb; carburetor cold.

Power Curve used V-1710-39 dated December 12, 1941.

B. Test Results

1. High Speed tests.

Altitude feet	True Speed mph	R.P.M.	B.H.P.	Throttle Position	Test Condition	Mixture
5,100	363	3000	1150	Part	2-Cannons	Auto Rich
* 12,650	396	3000	1150	Wide Open	2-Cannons	Auto Rich
* 12,650	390	3000	1130	Wide Open	4-Cannons	Auto Rich
12,750	374	2600	1000	Wide Open	2-Cannons	Auto Rich

- * Critical altitude for military rated power. It will also be noted that the critical altitude for normal rated power is at practically the same level. Possible explanations for that relationship is that the carburetor ram pressure decreases slightly at engine speeds above 2600 RPM or that the engine power curves are in error.

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2. Cruising speeds, mixture control in automatic lean position. Airplane equipped with two cannons.

Altitude Feet	True Speed mph	R.P.M.	B.H.P.	Throttle Position
13,280	334	2280	750	Part
13,280	314	2200	650	Part
13,280	292	2100	550	Part
13,280	263	1900	450	Part
13,280	218	1700	350	Part

- * 3. Climb data: propeller set for 3000 R.P.M. for first five minutes with throttle open to give 1150 BHP or wide open when below. Climb with two-cannon installation.

Altitude Feet	True Speed mph	R.P.M.	Std. B.H.P.	Rate of Climb Ft./Min.	Time of Climb Min.
0	158	3000	1150	2460	0
5,000	170	3000	1150	2890	1.87
10,000	183	3000	1095	2940	3.51
13,900	193	3000	945	2300	5.00
15,000	195.5	2600	810	1840	5.58
20,000	207	2600	685	1290	8.82
25,000	218	2600	570	770	13.77
30,000	230	2600	470	270	24.29
S/O 31,350	-	2600	-	100	33.84
A/O 32,800	-	2600	-	-	-

- * Since a cooling test was not required, climbs were run with oil and prestone shutters in the same position as on the XP-51, A.C. No. 41-38. In this position the coolant temperatures were 7° C warmer than the maximum temperature allowed on an Army Hot Day. It is recommended that additional cooling tests in climb be run to determine cooling shutter position necessary to meet Air Corps requirements.
4. Carburetor pre-heat test at 9200 feet pressure altitude at 30" Hg. manifold pressure at 2280 RPM, mixture auto rich, free air temperature was 5° C; carburetor air temperature with heat "off" was 17° C; carburetor air temperature with heat "on" was 26° C; manifold pressure 26.3" Hg.; carburetor temperature rise was 9° C, manifold pressure drop was 3.7" Hg. With heat "on" and with throttle open to give same manifold pressure as in full "cold" position, carburetor air temperature 29° C, carburetor temperature rise was 12° C.

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5. Fuel consumption at 13,200 feet with mixture control in automatic lean position at 314 MPH at 2000 RPM at 550 HMP was 291.2 pounds/hour. Specific fuel consumption is .4485 pounds/HMP - hour.
6. Minimum recommended indicated airspeed.

Wing Flaps	Indicated Airspeed MPH	Flight Condition
0°	Approximately 85	Take-off
15°	Approximately 85	Take-off
Full	70 (Power approach)	Landing

7. Determination of airspeed indicator and altitude installation error with wheels and flaps up. Airspeed static openings located approximately 29-1/4 inches from leading edge, 90-1/2 inches from right wing tip, and 14-5/8 inches from bottom wing surface. Barometric Pressure 29.84" Hg.

Indicated Airspeed MPH	Indicator vs. Water Column MPH	Calibrated Airspeed MPH	Airspeed Installation Error MPH	Altimeter Installation Error Ft.
260	260.5	252	+ 8.5	+ 140
240	240	233	+ 7.	+ 110
220	220	214	+ 6.	+ 85
200	200	195	+ 5.	+ 60
180	180	176	+ 4.	+ 40
160	160.5	158	+ 2.5	+ 15

Prepared by *Nathan R. Rosenbaum*
NATHAN R. ROSENBAUM, 2nd Lt., AAF
(Name)

Approved by *J. M. Gillispie*
J. M. GILLISPIE, Colonel, AAF
Chief, Flight Section

Concurrence:

Approved by *F. C. Cannon*
F. C. CANNON, Colonel, AAF
Chief, Exp. Engr. Section

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