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WAR DEPARTMENT
AIR CORPS, MATERIEL DIVISION

PFB-da

MEMORANDUM REPORT ON
Republic P-47B, A.C. No. 41-5902

Date June 18, 1942

SUBJECT: Acceptance Performance Tests

Orig. to Capt. J. Aldrich.
on loan 7/28/42.

SECTION Flight Section

SERIAL No. PHQ-M-19-1417-A

Contract No.
Expenditure Order No. 430-4-60
Purchase Order No.

A. Purpose

1. To report results of acceptance performance tests run at the manufacturer's plant on the P-47B airplane, A.C. No. 41-5902. Airplane equipped with Pratt and Whitney R-2800-21 engine with torque meter and exhaust driven turbo supercharger and four-bladed Curtiss electric constant speed propeller with cooling cuffs, blade design No. 714-1C2-12; blade angle range 28° to 58°. Gross weight as tested was 12,565 pounds with the c.g. at 32 percent m.a.c.; wheels up. Radio mast and antenna in place and six .50 caliber machine guns installed. All tests with wheels up, wing flaps up, mixture "auto rich" and with pointed windshield installed unless otherwise stated.

B. Test Results

1. High speed in level flight with oil cooler flaps and intercooler flaps flush and throttle wide open with turbo "on" to give military rated power or 18,250 limiting turbo r.p.m.

Altitude Feet	R.P.M.	Manifold Pressure "Hg.	Turbo R.P.M.	Specific Fuel Cons. lbs/hp/hr	B.H.P.	True Speed m.p.h.
5,000	2700	52.0	6,800	.78	2000	352
15,000	2700	51.0	11,800	.77	2000	386
25,000	2700	51.7	16,900	.78	2000	420
* 27,800	2700	52.0	18,250	--	2000	429
30,000	2700	47.5	18,250	--	1845	426
34,000	2700	40.0	18,250	--	1575	412

* Critical Altitude for 2000 b.h.p. at 18,250 turbo r.p.m.

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2. Effect of oil cooler and intercooler flap position on speed at 1605 b.h.p. at 2700 r.p.m. at 5000 feet.

Oil Cooler Flap position	Intercooler Flap position	True Speed m.p.h.	Change in Speed m.p.h.
Neutral	Neutral	323	0
Wide Open	Neutral	316	- 7
Neutral	Wide Open	315	-8
Wide Open	Wide Open	309	-14
Closed	Closed	324	+ 1

3. High speed at 15,000 feet with flat windshield installed was 380 m.p.h. at 2000 b.h.p; at 2700 r.p.m. with cowl flaps closed, oil cooler and intercooler flaps flush. (6 m.p.h. slower than with pointed windshield.)

4. Power required for level flight at 24,550 feet at 237 m.p.h. was 665 b.h.p. at 2100 r.p.m. with cowl flaps closed, oil cooler flaps and intercooler flaps flush.

5. Fuel required for one hour endurance at 25,000 feet at normal rated power was 1105 pounds of gasoline at a speed of 392 m.p.h. at 2550 r.p.m. and 1625 b.h.p. Specific fuel consumption obtained in the test was .68 pounds per b.h.p. per hour. However, the engine manufacturer only guarantees satisfactory operation at this power with specific consumptions above .77 pounds per b.h.p. per hour. Fuel required for one hour endurance at the guaranteed specific fuel consumption would be 1252 pounds.

6. Climb data obtained with throttle wide open, and turbo on to give rated power or 18,250 turbo r.p.m. Cowl flaps, oil cooler flaps and intercooler flaps wide open.

Altitude Feet	True Speed m.p.h.	r.p.m.	Manifold Pressure "Hg.	Turbo R.P.M.	b.h.p.	Rate of Climb Ft/Min	Time of Climb Min.	Remarks
0	172	2700	52.7	5,600	2000	2560	0	Military Power
5,000	183	2700	51.6	8,200	2000	2545	1.95	Climb for 5 Min.
10,000	196	2700	50.6	10,600	2000	2465	3.95	
12,600	204	2700	50.4	11,750	2000	2410	5.00	
12,600	195	2550	41.6 ~~39.6~~	9,400	1625	1800	--	Rated Power
15,000	200	2550	41.4 ~~39.4~~	10,650	1625	1725	6.7	(climb after
20,000	217	2550	41.2 ~~39.2~~	13,200	1625	1565	9.75	(5 Min.Military
25,000	236	2550	41.6 ~~39.6~~	15,700	1625	1380	13.2	(Power climb
30,000	270	2550	40.1	18,250	1625	1140	17.1	Critical Alt.
35,000	305	2550	35.9	18,250	1365	450	23.9	

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(6. Continued)

Above speeds are speeds for maximum rate of climb but the engine does not meet Army Air Force cooling requirements at these speeds. One normal rated power climb was made at a 20 m.p.h. higher indicated air speed at which the engine would cool satisfactorily and the resulting loss in rate of climb was 130 feet per minute at altitudes up to 30,000 feet.

With the mixture control set for "auto rich", the mixtures obtained in the tests were considerably leaner than those at which satisfactory engine operation is guaranteed by the engine manufacturer. The engine would cool better at the richer mixture but less power would be available at limiting manifold pressure or turbo r.p.m.

7. Time to climb to 15,000 feet with engine operating at military rated power of 2000 b.h.p. was 6.03 minutes but only five minutes operation at this power is permissible.

8. Distance required to take-off from a dry sod runway and clear a 50 foot obstacle with the engine operating at 2700 r.p.m. and 51.5" Hg. at 1935 torque horsepower with mixture "auto rich":

Flap	I.A.S. at Take-off m.p.h.	Ground Roll	Distance to 50 foot obstacle feet	Average of
0°	97	1460	2160	Best 3 of 5 trials
1/2 (20°)	93	1320	1890	2 trials
Full (40°)	90	1310	1940	2 trials

9. Distance required to stop on a dry sod runway after landing over a 50 foot obstacle with full (40°) wing flap was 1850 feet; ground roll was 1210 feet; indicated air speed was 110 m.p.h. in the glide and 100 m.p.h. at the point of contact.

10. The indicated stalling speeds obtained in level flight with power off, cowl flaps closed, oil cooler and intercooler flaps neutral were:

a. 105 m.p.h. with flaps and gear up.
b. 108 m.p.h. with flaps up and gear down.
c. 97 m.p.h. with flaps 1/2 down and gear down.
d. 88 m.p.h. with flaps and gear down.
e. 90 m.p.h. with flaps down and gear up.

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11. Gasoline used in this test was in accordance with fuel specification AN-VVF-78, Amendment No. 5, for 100 octane fuel. Use of standard 100 octane fuel resulted in detonation and overheating at high powers due to the lean mixtures at which the engine operates with the PT-13G1-9 carburetor in this airplane.

12. Tests were made with the airplane loaded to 12,560 pounds which consisted of the empty weight of the airplane plus an additional load equal in weight to the design useful load of the airplane. Instead of carrying full ammunition in the wings, an equivalent weight of gasoline in the rear fuselage tank and test equipment in the baggage compartment was carried which resulted in a c.g. location approximately 3-1/2 percent more rearward than with the standard loading for this weight.

13. Determination of air speed and altimeter error with a Kollsman type D-1 air speed head located with static holes 23-3/8 inches ahead of the leading edge of the left wing and 43 inches in from the tip and approximately one inch above the chord line.

Indicated Air speed m.p.h.	Water Column m.p.h.	Calibrated Air speed m.p.h.	Air speed Installation error m.p.h.	Altimeter error at sea level feet
310	311.5	322.5	-11.0	-215
290	290.5	300.5	-10.	-175
260	260.0	268.5	- 8.5	-125
230	230.	237.5	- 7.5	- 90
200	201.0	206.5	- 5.5	- 60
170	170.5	175.0	- 4.5	- 35

Altimeter error at point of contact on landing at 100 m.p.h. indicated air speed was +10 feet; wing flaps full down.

14. Engine and turbo data obtained during the test has been forwarded to the Power Plant Laboratory.

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Concurrence:

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