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ARMY AIR FORCES
MATERIEL CENTER

MEMORANDUM REPORT ON

Pursuit Single Engine P-39M-3, A.C. No. 42-4706 NRR-da

Date November 25, 1942

SUBJECT: Flight Tests

SECTION FlightSERIAL No. FS-M-19-1511-A

Contract No. _____

Expenditure Order No. 430-4-87

Purchase Order No. _____

A. Purpose

1. Report on flight tests of Bell P-39M-3 airplane at the manufacturer's plant. Airplane equipped with Allison V-1710-83 engine and a three-bladed Curtiss Electric constant speed propeller, blade design No. 614-1C-1-5-21, blade angle range 26° to 56°, at 42 inch radius. Gross weight at take-off was 7430 pounds with c.g. at 28.6 percent m.a.c., wheels up. Landing gear retracted; wing flaps neutral; carburetor cold; mixture auto-rich unless otherwise specified; one 37 mm cannon, four .30 caliber wing guns, and two .50 caliber nose guns in place with a corresponding ammunition load of thirty rounds of 37 mm ammunition, three-hundred rounds of .30 caliber ammunition per gun, and two-hundred rounds of .50 caliber ammunition per gun; radio, type 522, and radio mast which acts as an antenna wire in place, antenna removed; belly tank shackle and sway bracing in place; blast tube openings covered with tape. Horsepowers obtained from power curve V-1710-83 and -85 dated September 19, 1942 (2:1 propeller gear ratio; 9.6:1 blower gear).

B. Test Results

1. High speeds, oil cooler shutters in flush position.

Altitude Feet	Speed MPH	RPM	b.h.p.	Prestone Shutter Pos. (Turns from W.O.)	Test Condition
*15,900	373	3000	1125	6	Military Rated Power
** 9,500	385.5	3000	1420	6	War Emergency Power
9,500	350	3000	1125	6	Military Rated Power
2,750	345	3000	1330	6	Throttle open to 57" Hg. Man.-Press.
2,750	322	3000	1125	6	Military Rated Power
30,200	337	3000	635	9	Throttle wide open at military rated RPM.

*Critical altitude for military rated power in level flight.

**Critical altitude for war emergency power in level flight.

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Airplane does not meet Air Corps cooling requirements at any of these powers. Airplane will cool at 30,200 feet with prestone shutter position at six turns from wide open.

2. Effect of prestone shutter position on speed and prestone temperature.

Power	Shutter Position	Change in speed from speed obtained with shutters six (6) turns from wide open.	Prestone Temp. °C	Change in prestone temp. from temp. obtained with shutters six (6) turns from wide open.	Free Air Temp. °C	Press. Alt. Feet
1090	W.O.	-2	117	-4	+16	2120
1090	3 turns from W.O.	-1	118	-3	+16	2120
1090	9 turns from W.O.	+2	123	+2	+16	2120
1090	Flush *	+4	129	+8	+16	2120

*Flush position is thirteen (13) turns from wide open, oil and prestone shutters are spring loaded and therefore not positive in action. Shutters are pushed up toward the flush position by an amount depending on the force of the air stream and the shutter position.

3. Cruising Speeds:

Altitude Feet	Speed MPH	RPM	b.h.p.	Oil Cooler Shutter Position	Prestone Shutter Position	Mixture Setting
15,900	313	2280	700	Flush	Flush	Auto-lean
15,900	301.5	2200	650	Flush	Flush	Auto-lean
15,900	289.5	2100	600	Flush	Flush	Auto-lean
15,900	276	1900	550	Flush	Flush	Auto-lean
15,900	252	1700	470	Flush	Flush	Auto-lean

Prestone cooling in level flight does not meet Air Corps requirements above 70-percent normal power with prestone shutters in the flush position. Airplane will meet Air Corps requirements when using normal rated power (1000 HP at 2600 RPM) with prestone shutters open to six (6) turns from wide open position.

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4. After the preceeding tests trouble was encountered with the engine and a new one was installed. High speed repeated at 15,900 feet was 370 MPH at 3000 RPM and 1130 b.h.p. Climb tests made with new engine and propeller installation.
5. Climb data: Prestone and oil cooler shutters wide open; mixture control in the auto-rich position. Throttle set for 50.5" Hg. at 3000 RPM or wide open when below.

Altitude Feet	Speed MPH	RPM	b.h.p.	Rate of Climb Ft./Min.	Time of Climb Min.
S.L.	154	3000	1185	2870	0
5,000	167	3000	1210	3120	1.67
9,900	180	3000	1250	3320	3.19
15,000	188	*	1040	2640	4.91
20,000	193	*	880	2000	7.09
25,000	198	*	725	1400	10.08
30,000	203	*	595	800	14.76
35,000	208	*	—	200	26.09
S/C 35,900	—	*	—	100	32.09
A/C 36,700	—	*	—	—	—

*Propeller governor would not maintain a constant RPM of 3000 above approximately 10,000 feet in the automatic position. Governor was designed to maintain constant RPM \pm 30 up to approximately 2600 RPM. RPM varied \pm 75 when set for 3000 RPM.

Prestone temperature does not meet Air Corps requirements in 50.5 inches Hg. climb. Highest prestone temperature observed in climb was 123 at 10,000 feet at 1250 b.h.p. with a free air temperature of +4°C. Anticipated prestone out temperature for Air Corps "Hot Day" was 137°C.

6. Climb data: Prestone and oil cooler shutters wide open; mixture control in the auto-rich position. Throttle set for 57" Hg. at 3000 RPM or wide open when below.

Altitude Feet	Speed MPH	RPM	b.h.p.	Rate of Climb Ft./Min.	Time of Climb Min.
S.L.	160	3000	1355	3740	0
5,000	173.5	3000	1395	3840	1.32
6,500	177	3000	1400	3880	1.71
10,000	184	3000	1250	3310	2.69
15,000	189.5	—	1030	2640	4.38

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Prestone temperature does not meet Air Corps requirements in climb at 57" Hg. manifold pressure. Highest prestone temperature observed in climb was 127°C. at 10,000 feet at 1260 b.h.p. with a free air temperature of +5°C. Anticipated prestone out temperature for Air Corps "Hot Day" was 140°C.

7. Determination of airspeed indicator and altimeter installation errors. Pitot tube static openings were 29-1/4 inches out from leading edge of wing and 30-1/2 inches in from left wing tip.

Indicated Airspeed MPH	Indicator vs. Water Column MPH	Calibrated Airspeed MPH	Airspeed Installation Error MPH	Altimeter Installation Error at Sea Level - Ft.
320	321	325.5	-4.5	-160
290	290	293	-3.0	-130
260	258	260.5	-2.5	-100
230	229.5	230	-0.5	-65
200	200	199	+1.0	-30
170	168.5	168	+0.5	-5
140	141	137.5	+3.5	-15
120	122	117.5	+4.5	-25

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