MDAC-266-WF-11-15-41-60M

CLASSIFICATION CANCELLED
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WAR DEPARTMENT
AIR CORPS, MATERIEL DIVISION

B-17F

MEMORANDUM REPORT ON JMc-da
Boeing B-17F airplane, AC No. 41-24340

Date September 7, 1942

SUBJECT: Acceptance Performance Tests

SECTION Flight

SERIAL No. XB-M-19-1470-A

Contract No.
Expenditure Order No. 425-1-42
Purchase Order No.

A. Purpose

1. To report on acceptance performance tests conducted at the manufacturer's plant on the B-17F airplane, AC No. 41-24340. Airplane equipped with four (4) Wright R-1820-97 engines with torque meters; exhaust driven turbo superchargers; three-bladed constant speed, full feathering propellers, blade design No. 6477A-0, blade angle range 12° to 85° at 42 inch radius. Landing gear retracted, cowl flaps neutral, intercooler shutters wide open unless otherwise specified. Tests were conducted under two load conditions: (a) gross weight of approximately 48,000 pounds (c.g. location 23.73 percent m.a.c., wheels up) and (b) gross weight of approximately 56,000 pounds (c.g. location 23.68 percent m.a.c., wheels up). De-icer equipment in place, marker beacon, radio compass, liaison and command set antenna in place. Armament in normal position: two .50 caliber machine guns, Wright type, chin installation; two .50 caliber machine guns, Turret, Upper (Bendix, model B2 (Briggs Manufacturing Company); two .50 caliber machine guns, Turret, Under (Sperry Company); nose guns not in place but supporting brackets installed in window nose.

B. Test Results

1. Level flight speeds; cowl flaps closed:

Altitude Ft.	True Speed MPH	Ave. Brg Power per Engine	RPM	Spec. Fuel Consumption lb/bhp/hr	Ave. Manifold Press.	Ave. Turbo RPM	Instantaneous Gross Weights
30,000	298.6	887	2500	—	37.7	21,300	39,400
30,000	282.1	867	2500	—	37.7	21,300	55,000
25,000	309	1190 *	2500	.570 (AR)	45.5	21,100*	42,452
25,000	291	1000	2300	.601 (AR)	39.2	16,900	41,947
25,000	285	700	2000	.570 (AR)	30.7	16,300	41,542
25,000	242	600	1900	.457 (AL)	28.9	16,100	41,222
25,000	217	550	1800	.435 (AL)	26.6	15,000	40,892

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Altitude Ft.	True Speed MPH	Ave. bhp per Engine	RPM	Spec. Fuel Consumption lb/bhp/hr	Ave. Man. Press.	Ave. Turbo RPM	Instantaneous Gross Weights	
25,000	205	500	1850	.449 (AL)	22.2	11,800	40,722	
25,000	179	425	1900	.461 (AL)	18.78	9,100	40,[illegible]	
25,000	168	425	1800	.457 (AL)	20.2	10,600	40,422	
25,000	299	1190*	2500	.670 (AR)	45.5	21,100*	49,643	
25,000	278	1000	2300	.604 (AR)	39.2	18,900	48,243	
25,000	237	750	2000	.530 (AR)	30.7	16,300	46,903	
25,000	219	650	1900	.485 (AR)	27.5	15,400	46,583	
25,000	218	650	2050	.526 (AR)	26.5	14,600	46,113	
25,000	229	700	2050	.538 (AR)	28.3	15,300	47,823	
15,000	282	1200	2500	.600 (AR)	45.8	16,300	42,980	1
15,000	264	1000	2300	.600 (AR)	38.9	14,250	42,575	2
15,000	236	750	2000	.530 (AR)	32.0	11,050	42,270	3
15,000	223	650	1900	.480 (AR)	28.8	10,100	42,010	4
15,000	205	550	1710	.467 (AR)	25.5	9,100	41,740	5
15,000	172	400	1750	.456 (AL)	21.9	3200	41,530	6
15,000	167	400	1550	.436 (AL)	22.65	5400	41,270	7
15,000	176	425	1550	.430 (AL)	24.42	7,400	41,130	8
15,000	273	1200	2500	.650 (AR)	45.8	16,300	49,177	9
15,000	255	1000	2300	.600 (AR)	38.9	14,250	48,897	10
15,000	223	750	2000	.530 (AR)	32.0	11,050	48,597	11
15,000	206	650	1900	.500 (AR)	29.0	10,100	48,097	12
15,000	182	550	1710	.475 (AR)	26.4	9,100	47,627	13
15,000	167	500	1800	.441 (AL)	23.18	6,800	47,247	14
15,000	185	550	1850	.448 (AL)	26.0	8,800	46,797	15
5,000	256	1200	2500	.650 (AR)	47.2	10,900	42,957	
5,000	240	1000	2300	.610 (AR)	40.5	8,800	42,627	
5,000	215	750	2000	.525 (AR)	33.6	4,600	42,277	
5,000	202	650	1900	.425 (AL)	33.0	4,100	42,007	
5,000	186	550	1710	.425 (AL)	31.5	3,800	41,637	
5,000	170	450	1400	.428 (AL)	34.6	5,550	41,417	
5,000	147	350	1650	.455 (AL)	28.7	2750	41,187	
5,000	148	350	1450	.440 (AL)	27.1	2750	41,007	
5,000	147	350	1250	.421 (AL)	29.4	2650	40,827	
5,000	252	1200	2500	.650 (AR)	47.2	10,900	53,775	
5,000	234	1000	2300	.610 (AR)	40.5	8,800	52,675	
5,000	207	750	2000	.525 (AR)	33.6	4,600	52,375	
5,000	194	650	1900	.496 (AR)	31.5	4,100	51,955	
5,000	175	550	1710	.467 (AR)	29.3	3,800	51,675	
5,000	161.0	500	1300	.433 (AL)	28.0	3,700	51,075	
5,000	163.0	500	1650	.427 (AL)	30.2	3700	50,995	
5,000	160	500	1900	.441 (AL)	27.3	3700	50,595	
5,000	139.0	450	1750	.437 (AL)	26.4	3400	50,355	

*Above critical altitude on inboard engines. See paragraph No. 4.

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2. Carburetor pre-heat checks at 5000 feet and 10,000 feet at 2000 RPM and 650 b.h.p. showed a carburetor air temperature rise of approximately 3°C when the intercooler shutters were closed.

3. Climbs with turbo superchargers operating to maintain 1000 b.h.p. up to the critical altitude determined by limiting turbo RPM; climbs were continued above the critical altitude at the power developed with the superchargers operating at the limiting turbo RPM of 21,300. Mixture automatic rich, cowl flaps wide open.

This performance is lower than Production Aircraft, because turbine RPM were raised to 24000 with 10% over run allowed.

Climbs: Light Load Condition

Altitude Ft.	True Speed MPH	RPM	Ave. b.h.p. per engine Inb.	Outb.	Ave. Man. Pressure Inb.	Outb.	Rate of Climb ft/min.	Time to Climb Min.	Gross Weight lbs.
0	124	2300	1000	1000	42.5	42.5	1200	0	44,450
5,000	134	2300	1000	1000	41.5	41.0	1200	4.2	43,500
10,000	144	2300	1000	1000	40.5	40.0	1165	8.4	42,630
15,000	155	2300	1000	1000	39.5	39.3	1100	12.8	42,100
20,000	168	2300	1000	1000	39.0	39.0	1000	17.5	41,650
25,000	181	2300	1000	1000	38.8	38.8	880	22.8	41,050
27,200*	188	2300	1000*	1000	38.8	38.8	820	25.4	40,850
28,600**	192	2300	960	1000**	37.5	39.0	765	27.2	40,700
30,000	197	2300	920	960	36.2	37.2	655	29.3	40,350
35,000	207	2300	770	810	29.7	30.1	230	41.4	39,800
S/C 36,600 ✓	210	2300	720	760	27.5	29.0	100	51.5	39,300
A/C 37,300	212	2300	685	725	25.0	27.0	0	—	—

* Critical altitude inboard engines - Inboard turbos at limiting RPM.
** Critical altitude outboard engines - Outboard turbos at limiting RPM.
S/C Service Ceiling.
A/C Absolute Ceiling.

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Climbs: Heavy Load Condition

	Altitude Ft.	True Speed MPH	RPM	Ave. b.h.p. per engine Inb.	Outb.	Ave. Man. Pressure Inb.	Outb.	Rate of Climb ft/Min.	Time to Climb Min.	Gross Weight lbs.
	0	138	2300	1000	1000	42.0	42.5	780	0	55,000
	5,000	149	2300	1000	1000	40.8	40.8	775	6.4	55,050
	10,000	160	2300	1000	1000	39.8	39.8	720	13.1	54,500
	15,000	173	2300	1000	1000	39.5	39.0	625	20.5	53,900
	20,000	187	2300	1000	1000	39.5	38.5	520	29.3	53,300
	25,000	204	2300	1000	1000	39.5	38.5	400	40.3	52,850
	27,800*	213	2300	1000*	1000	39.5	38.5	325	48.1	52,575
	29,300**	218	2300	955	1000**	37.0	38.5	240	57.3	52,400
	30,000	219	2300	935	978	36.0	37.3	180	56.7	52,230
S/C	31,000	220	2300	925	945	34.5	35.5	100	63.7	52,000
A/C	32,100	221	2300	870	910	33.0	34.0	0	--	--

* Critical Altitude inboard engines - inboard turbos at limiting RPM.
** Critical altitude outboard engines - outboard turbos at limiting RPM.
S/C Service Ceiling
A/C Absolute Ceiling

4. Critical Altitudes

Approximate Gross Weight lbs.	Flight Condition	Critical Altitude Turbos at 21,300 RPM limit Inb.	Outb.	Ave.	b.h.p. per engine	Engine RPM
41,000	Optimum Climb	27,200	28,600	27,900	1000	2300
36,400	Optimum Climb	27,800	29,300	28,550	1000	2300
--	Level	24,400*	26,400	25,400	1200*	2500
--	Level	--	--	30,700	1000	2300

* At 25,000 feet the b.h.p. of the outboard engines is 1200 b.h.p. per engine at 20,800 turbo RPM; the b.h.p. of the inboard engines is 1130 b.h.p. per engine at limiting turbo RPM (21,300).

5. The following stall data was determined in flight. Wt. 41,000 pounds.

Configuration	Indicated Stalling Speeds Power Off	Power On
Clean	97 MPH	95 MPH
Gear Down	98 MPH	-
Gear and full flaps down	68 MPH	-

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6. The following data was obtained on two and three engine operation. Propellers were feathered and cowl flaps closed on dead engines. Operating engines were run at 2300 RPM and 1000 b.h.p. with cowl flaps wide open and with mixture automatic rich.

Condition Checked	Approximate Weight lbs.	Engines stopped Propellers Feathered	Altitude Ft.	Rate of Climb ft/min.
2-Engine	41,500	#1 and #2	15,000	+55
2-Engine	53,100	#1 and #2	7,300	-135
2-Engine	53,900	#1 and #2	10,500	-200
3-Engine	51,700	#1	21,700	100

Difficulty was experienced in unfeathering the dead engines after an extended period in the feathered position in flight (due to cooling of the oil in the propeller mechanism).

With engines #1 and #2 dead and propellers feathered and with the vacuum selector on #3 engine, the de-icer boots would inflate even when the de-icer valve was in the "off" position.

7. A marked condition of directional hunting was observed in high speed level flight runs. This became more pronounced as the gross weight was increased and the center of gravity was moved aft. Directional hunting was also observed in the heavy weight three-engine climbs (See paragraph 6 above).

8. Total distance required to take off and clear a 50-foot obstacle, using one-third wing flaps was: 1705 feet, average of four trials at a gross weight of 41,000 pounds and 2930 feet, average of best two of four trials at a gross weight of 56,900 pounds; best I.A.S. for take off at 41,000 pounds was 98 MPH; and at 56,000 pounds was 105 MPH.

9. Determination of airspeed errors with two type D-2 airspeed heads supported on each side of and normal to the fuselage in positions 34-1/2° below the horizontal. Heads were located 20.2" from the fuselage and 56.3" aft of the plastic nose section. Static lines interconnected, but only right hand pressure line connected to the cockpit indicator. Barometric pressure at time of the test was 30.07" Hg.

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Indicated Airspeed MPH	Indicator vs. Water Column MPH	Calibrated Airspeed MPH	Airspeed Installation Error MPH
225	226	226	0
215	217	217	0
195	197	197	0
185	187	187	0
175	176	175.5	+.5
155	156	155.5	+.5
135	135	134	+1.0

10. Cooling data obtained during the tests is being forwarded to the Power Plant Laboratory.

Concurrence:

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