RC/P/1 63A

Ref: Res/Eng/2907/RDE1c.

To File

Ministry of Aircraft Production,
R.D.E.1.c.,
Thames House,
Millbank, S.W.1.

1st November, 1943.

RATING CERTIFICATE

Type Engine: Merlins 28, 29 and 31 Constructor: Packard Motor Car Co. U.S.A.

The above engines have been tested and approved by the U.S. Army Air Corps, but the following power and fuel consumption limits are approved for engines overhauled and tested in Great Britain or the Dominions. All technical data are intended for Official Use Only.

		Low Gear	High Gear	
1.	**International Power Rating:-**			
(a)	International power	1225	1150	b.h.p.
(b)	International r.p.m.	2850	2850	r.p.m.
(c)	International rated altitude	9000	15500	feet
(d)	International rated boost	+9	+9	lb/sq.in.
2.	**Combat Power Rating:-**			
(a)	Max. combat power	1420/1480	1400/1460	b.h.p.
(b)	Max. combat r.p.m.	3000	3000	r.p.m.
(c)	Max. combat power altitude	5500	10500	feet
(d)	Max. combat boost	+14	+16	lb/sq.in.
(e)	Equivalent supercharger compression ratio (15°C)	2.34	2.97	
3.	**Maximum cruising power:-**			
(a)	Max. cruising power	1080	1015	b.h.p.
(b)	Max. cruising r.p.m.	2650	2650	r.p.m.
(c)	Max. cruising power altitude	8750	14750	feet
(d)	Max. cruising boost	+7	+7	lb/sq.in.

4. **Special Emergency Cruising Condition;-**

(For use in the event of an engine failure in multi-engined aircraft.)

(a)	Maximum r.p.m.	2850	r.p.m.
(b)	Maximum boost pressure	+9	lb/sq.in.

5. **Engine Particulars:-**

(a) General Description:- 12 cylinder, Vee type, pressure liquid cooled, with gear driven, two-speed, single stage supercharger.

(b)	Bore	5.4 in.
(c)	Stroke	6.0 in.
(d)	Compression ratio	6.0:1
(e)	Cubic capacity	1649 cu.in. (or 27 litres)
(f)	Propeller reduction gear ratio	
	(i) Merlin 28 and 31	0.420:1
	(ii) Merlin 29	0.477:1
(g)	Direction of rotation (propeller shaft)	Right Hand.
(h)	Constant speed unit drive gear ratio	0.828:1
(i)	Direction of rotation (looking on engine drive)	Clockwise.
(j)	Supercharger drive gear ratios	8.15 and 9.49
(k)	Supercharger impeller diameter	10.25 in.
(l)	Engine speed indicator drive gear ratio	0.25:1
(m)	Nett dry weight (to A.I.D. Inspection Instruction E.124, latest issue)	1470 lb + 2½%

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6. Revolutions:-

	Low Gear	High gear
(a) Max. for climbing flight (1 hr. limit)	2850	2850 r.p.m.
(b) Max. for cruising	2650	2650 r.p.m.
(c) Max. for emergency cruising (see 4)	2850	2850 r.p.m.
(d) Max. for combat (5 min. limit)	3000	3000 r.p.m.
(e) Max. for take-off (permissible for 5 min. or up to 1000 feet)	3000	- r.p.m.
(f) Minimum for take-off at max. boost (7e) or F/T	2225	- r.p.m.
(g) Momentary max. for diving (see A.M.O.A. 57/37)	3600	3600 r.p.m.

7. Boost Pressure (lb/sq.inch):-

(a) Max. for climbing flight (1 hr. limit)	+9	+9
(b) Max. for cruising	+7	+7
(c) Max. for emergency cruising (see 4)	+9	+9
(d) Max. for combat (5 min. limit)	+14	+14/+16
(e) Max. for take off (permissible for 5 min. or up to 1000 ft.)	+14	-
(f) Max. for diving (see A.M.O. A.57/37)	+14	+14/+16

8. Altitudes:-

(a) International	9000	15500 feet
(b) Combat power	5500	10500 feet
(c) Max. cruising power	8750	14750 feet

9. Power at Sea-level (b.h.p.):-

(a) At max. climbing conditions (6a & 7a)	1135	1015
(b) At max. cruising conditions (6b & 7b)	1000	895
(c) At max. combat conditions (obtained by operating boost control cut-out) (6d & 7d)	1365/1420	1295/1350
(d) At max. take-off conditions (6e & 7e)	1365/1420	-
(e) At min. take off conditions (6f & 7e or F/T)	1010	-
(f) At 3,000 r.p.m. + 12 lb/sq.in. boost (for test purposes only) (obtained by overriding boost control)	1250/1300	

10. Power Curves:-

Power at		2000	2200	2400	2500	2650	2850	3000	r.p.m.
Full throttle at altitudes (8a)	L		735	880	954	1070	1225	1325	b.h.p.
	H		636	778	859	984	1150	1240	b.h.p.
Constant boost + 7 lb/sq.in. at sea level	L		911	954	974	1000	-	-	b.h.p.
	H		844	873	884	895	-	-	b.h.p.
Constant boost + 9 lb/sq.in. at sea level	L		1000	1067	1090	1119	1136	1130	b.h.p.
	H		946	981	1000	1015	1015	992	b.h.p.
Constant boost +14 lb/sq.in. at sea level	L	-	-	-	-	-	1415	1420	b.h.p.
Constant boost +16 lb/sq.in. at sea level	H	-	-	--	-	1355	1365	1352	b.h.p.

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11. Coolant:-

Type: Pressure liquid (70% water +30% ethylene glycol to Specification D.T.D.344. or D.T.D.344.A)

Temperature °C, outlet from engine.

(a)	Maximum for climbing and special emergency (see 4)	125
(b)	Maximum for cruising	105*
(c)	Maximum for combat (5 min. limit)	135
(d)	Minimum for take-off.	60

* Note: Temperatures up to 115°C are permitted for short periods at cruising conditions on fighter aircraft, and for special applications only.

12. Fuel:-

(a) Type: Specification DED.2475 or RDE/F/222 } 100 octane.

(b) Consumption at max. climbing conditions at S.L.

L gear	(1135 b.h.p.,	2850 r.p.m.	.62 - .69 pt/b.h.p./hr.
H gear	(1015 b.h.p.,	2850 r.p.m.	.63 - .71 pt/b.h.p./hr.

(c) Consumption at max. cruising conditions at S.L.

L gear	(1000 b.h.p.,	2650 r.p.m.	.54 - .60 pt/b.h.p./hr.
H gear	(895 b.h.p.,	2650 r.p.m.	.54 - .61 pt/b.h.p./hr.

(d) Consumption at max. combat conditions (2a, b, c, d)

L gear	(1480 b.h.p.,	3000 r.p.m.	.66 - .73 pt/b.h.p./hr.
H gear	(1460 b.h.p.,	3000 r.p.m.	.71 - .79 pt/b.h.p./hr.

(e) Consumption at max. take-off conditions

L gear	(1420 b.h.p.	3000 r.p.m.	.66 - .73 pt/b.h.p./hr.

13. Oil:-

(a) Type: See current issue A.P.1464/C.37-W.

(b) Consumption at max. climbing conditions (6a & 7a) — 34 pts/hr

(c) Consumption at max. cruising conditions (6b & 7b) — 6-20 pts/hr.

(d) Consumption at max. take-off conditions (6e & 7e) — 54 pts/hr.

(e) Oil pressure at r.p.m. 6b (lb/sq.in.)

	Main	Auxiliary
Normal	60	4
Minimum	45	-

Note: To allow for pressure drop when installed in an aircraft the main oil pressure on acceptance test of new or repaired engines should not be less than 10 lb/sq.in. above the figure quoted.

(f) Oil Inlet Temperature, C:-

Maximum	(i) Cruising	90
	(ii) Climbing and emergency cruising (See 4)	90
	(iii) Combat (5 min. limit)	105
Minimum for opening up (cold)		15

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14. Type of Propeller.

Constant Speed, variable pitch propellers of approved type.

15. Special Features.

Merlin 28 is the American built version of the Merlin XX and has the two - piece type of cylinder block. A Bendix injection carburettor is fitted in place of the normal float type.

Merlin 29 is similar to Merlin 28, but an 0.477:1 ratio propeller reduction gear is fitted, and the propeller shaft is splined to suit American propellers.

Merlin 31 is a variant of the Merlin 28 with reversed flow cooling system for aircraft with wing radiators.

(Sgd.) Andrew A. Ross.

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