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**MARTLET AND ARMAMENT EXPERIMENTAL ESTABLISHMENT**

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BOSCOMBE DOWN

Martlet IV FN.111  
(Cyclone GR.1820-G.205a-3)

Climb and level speed performance

A. & A.E.E. ref: 4485/22-AS.69/2  
M.A.P. ref: Res.Air.3911/RIN3, a.  
Period of tests: December 1942 - May 1943.

DATE	14/12/42	STOCK	21
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This report deals with the aircraft (or equipment) as tested. Action to remedy defects or decisions to accept items not in strict compliance with the specification are matters for decision and action by the Ministry of Aircraft Prod'n

Report No.	REDUCE TO	PROGRESS OF	AUTHORISED	DATE	TITLE
5th Part of A. & A.E.E./762, b.	12	Issue of report	[Signature]	13/12/42	Brief handling trials at the aft C.G. limit.
6th do.					F.N.111 - Gun heating.
7th do.					F.N.111 - Navigation.
8th do.					F.N.111 - Flame damping trials with twin open exhaust stacks.
9th do.					F.N.111 - Gun heating.

1. Introduction.

Previous parts of this Report, namely the 3rd and 5th parts, have dealt with the position error trials and handling trials respectively. This part of the Report deals with the performance of the aircraft on the climb and in level flight.

2. Condition of aircraft relevant to tests.

2.1 General. The Martlet IV is similar to the Martlet II in general outline, folding wings, etc. but has a Wright Cyclone GR.1820 engine and a Hamilton Hydromatic propeller in lieu of the Pratt and Whitney engine and Curtiss electric propeller of the Martlet II. The Martlet IV retains the cooling gill installation as fitted in the Martlet II. The Martlet IV also differs from the other variants in that there is provision for carrying 2 x 100 lb. bombs under the wings. However, no bombs or racks were fitted during the current tests.

2.2 External features. The aircraft tested was fitted with a VHF aerial beneath the starboard wing, an R/T aerial mounted on an aerial mast behind the pilot, and IFF aeriels attached to the leading edge of the tail plane and to the sides of the fuselage.

The leading edge gun ports and underwing ejector chutes were sealed. The engine exhaust system consisted of two open ended pipes exhausting below the fuselage.

A Hamilton Hydromatic 3-blade propeller of 10'1" diameter was fitted. Report. Details of the type and position of the pressure head were given in the 3rd Pt. of this/

2.3 Loading. The aircraft was loaded to a take-off weight of 7,740 lb. with the centre of gravity 29.4" aft of the leading edge (undercarriage down). At the above weight, raising the undercarriage moves the centre of gravity back 0.2".

2.4 Engine numbers and relevant limitations. The numbers of the Wright Cyclone GR.1820 engine fitted and the limitations pertaining to the tests made are given below:-

Air Ministry number: A.210557  
Maker's number : 38841

	R.P.M.	Boost Ins.Hg	Supercharger gear
Take-off (5 min. duration)	2500	45 *	M.S.
Climb (continuous)	2300	37.5	M.S.
		40	F.S.
All-out level (5 mins.)	2500	45 *	M.S. & F.S.
Continuous cruising (weak mixture)	2020	29	M.S.
		30	F.S.

\* This limitation is allowed when an automatic boost control is fitted. An automatic boost control was fitted on Martlet IV FN.111 and hence these limitations were applicable.

3. Scope of tests.

Ceiling climbs were done at maximum permissible climbing power at the best climbing speed as determined from partial climbs.

Level speed measurements were made under the following conditions:-

- (i) In M.S. supercharger gear between 2,000 ft. and 7,300 ft. at all-out level power conditions.
- (ii) In M.S. supercharger gear between 2,000 ft. and 15,500 ft. at maximum weak mixture cruising conditions.
- (iii) In F.S. supercharger gear between 7,300 ft. and 26,000 ft. at all-out level power conditions.
- (iv) In F.S. supercharger gear between 15,500 ft. and 26,000 ft. at maximum weak mixture cruising conditions.

4. Results of tests.

The results have been corrected to standard atmospheric conditions by the methods of AAE/Res/170. The level speed performance figures have been corrected to 95% of the take-off weight (i.e. 7,350 lb.)

The position error correction used for the analysis was previously determined on this particular aircraft and was given in the 3rd Pt. of this Report.

The performance on the climb is given in Table I, and curves of the rate of climb, time to height and boost are shown in Fig.1. The results are summarised below:-

Max. rate of climb in M.S. supercharger = 1580 ft/min. at 6,200 ft. below:-  
 " " " " " F.S. " = 1400 " " " 14,600 "  
 Time to climb to 10,000 ft. = 6.6 mins.  
 " " " " 20,000 " = 14.6 "  
 " " " " 28,000 " = 29.1 "  
 Estimated Service ceiling = 30,100 ft.  
 " absolute " = 31,300 "

The level speed performance at all-out level and maximum weak mixture cruising powers is given in Table II and Fig.2., and summarised below.

Max. true air speed (all-out level power) = 278 mph (242 knots) at 3,400 ft. in M.S. supercharger  
 " " " " (all-out level power) = 298 mph (259 knots) at 14,600 ft. in F.S. supercharger  
 " " " " (max. weak cruising power) in M.S. supercharger = 257 mph (223 knots) at 12,700 ft.  
 " " " " speed (max. weak cruising power) in F.S. supercharger = 264 mph (229 knots) at 21,000 ft.

TABLE I

Performance on climb

Weight - 7,740 lb.

Cooling gills fully open.

Standard height (ft)	Time from start (mins)	Rate of climb (ft/min)	A.S.I. m.p.h. (knots)	True air speed m.p.h. (knots)	RPM.	Boost (Ins.Hg)	Mixture	S/C gear
0	0	1550	-	-	-	-	Auto rich	M.S.
2,000	1.3	1560	150 (130)	165 (144)	2300	37.5	↓	↓
4,000	2.6	1570	↓	170 (148)	↓	↓	↓	↓
* 6,200	4.0	1580	↓	175 (152)	↓	↓	↓	↓
8,000	5.1	1450	↓	181 (157)	↓	35.0	↓	↓
/ 9,600	6.3	1340	145 (126)	179 (156)	↓	40.0	↓	F.S.

\* Full throttle height.  
 / Change gear height.

(Table contd.)

TABLE I (contd.)

Standard height (ft)	Time from start (mins)	Rate of climb (ft/min)	A.S.I. m.p.h. (knots)	True air speed m.p.h. (knots)	RPM.	Boost (Ins.Hg)	Mixture	S/C gear
10,000	6.6	1340	144 (125)	179 (156)	2300	40.0	Auto rich	F.S.
12,000	8.1	1365	138 (120)	177 (154)				
14,000	9.5	1395	132 (115)	175 (152)				
*14,600	10.0	1400	130 (113)	174 (151)				
16,000	11.0	1280	126 (110)	173 (150)		38.1		
18,000	12.7	1110	120 (104)	171 (149)		35.2		
20,000	14.6	950	114 (99)	168 (146)		32.4		
22,000	16.9	780	108 (94)	165 (143)		29.8		
24,000	19.8	615	102 (89)	161 (140)		27.3		
26,000	23.6	450	96 (84)	158 (137)		24.9		
28,000	29.1	280	90 (78)	154 (134)		22.8		

\* Full throttle height.

Estimated Service ceiling = 30,100 ft.

" absolute " = 31,300 ft.

TABLE II

Level speed at height

Corrected to weight of: 7,350 lb.

Cooling gills closed.

Standard height (ft)	A.S.I. m.p.h. (knots)	Corrections m.p.h.		True air speed m.p.h. (knots)	RPM.	Boost (Ins.Hg)	Mixture	S/C gear
		P.E.	C.E.					
2,000	252 (219)	+14.8	-0.2	274 (238)	2470	45.0	Auto rich	M.S.
*3,400	251 (218)	+14.8	-0.4	278 (242)				
4,000	248 (216)	+14.7	-0.5	278 (242)		44.1		
6,000	239 (208)	+14.3	-0.7	276 (240)		41.0		
/7,300	234 (203)	+14.0	-0.9	275 (239)		45.0		F.S.
8,000	232 (201)	+14.0	-0.9	277 (241)				
10,000	230 (200)	+13.8	-1.2	283 (246)				
12,000	229 (199)	+13.8	-1.4	290 (252)				
*14,600	226 (197)	+13.7	-1.8	298 (259)				
16,000	219 (190)	+13.4	-1.8	295 (256)		42.5		
18,000	208 (181)	+13.0	-1.8	290 (252)		39.0		
20,000	197 (171)	+12.5	-1.9	285 (247)		35.8		
22,000	186 (162)	+12.0	-1.8	278 (242)		32.9		
24,000	174 (151)	+11.4	-1.7	270 (235)		30.3		
26,000	161 (140)	+10.8	-1.5	259 (225)		28.0		

\* Full throttle heights.

/ Change gear height.

/Table contd.

TABLE II (contd.)

Standard height (ft)	A.S.I. m.p.h. (knots)	Corrections m.p.h.		True air speed m.p.h. (knots)	RPM.	Boost (Ins.Hg)	Mixture	S/C gear
		P.E.	C.L.					
2,000	204 (177)	+12.8	-0.1	224 (194)	2025	29.0	Auto weak	M.S.
4,000	204 (177)	+12.8	-0.2	230 (200)				
6,000	204 (177)	+12.8	-0.4	236 (205)				
8,000	203 (176)	+12.7	-0.6	243 (211)				
10,000	202 (176)	+12.7	-0.8	249 (216)				
*12,700	200 (174)	+12.7	-1.0	257 (223)				
14,000	194 (169)	+12.3	-1.1	254 (220)		27.5		↓
15,500	185 (161)	+12.0	-1.1	249 (217)		29.0		F.S.
18,000	183 (159)	+11.8	-1.3	256 (222)				
20,000	181 (157)	+11.7	-1.4	262 (227)				
*21,000	179 (156)	+11.7	-1.5	264 (229)				
22,000	174 (151)	+11.5	-1.5	260 (226)				
24,000	161 (140)	+10.8	-1.4	250 (217)				
26,000	146 (127)	+10.3	-1.2	236 (205)	↓	↓	↓	↓

\* Full throttle heights.

∧ Change gear height.

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TABLE I (contd.)

Standard height (ft)	Time from start (mins)	Rate of climb (ft/min)	A.S.I.	True air speed	RPM.	Boost (Ins.Hg)	Mixture	S/C
			m.p.h. (knots)	m.p.h. (knots)				gear
10,000	6.6	1340	144 (125)	179 (156)	2300	40.0	Auto rich	F.S.
12,000	8.1	1365	138 (120)	177 (154)				
14,000	9.5	1395	132 (115)	175 (152)				
*14,600	10.0	1400	130 (113)	174 (151)				
16,000	11.0	1280	126 (110)	173 (150)		38.1		
18,000	12.7	1110	120 (104)	171 (149)		35.2		
20,000	14.6	950	114 (99)	168 (146)		32.4		
22,000	16.9	780	108 (94)	165 (143)		29.8		
24,000	19.8	615	102 (89)	161 (140)		27.3		
26,000	23.6	450	96 (84)	158 (137)		24.9		
28,000	29.1	280	90 (78)	154 (134)		22.8		

\* Full throttle height.

Estimated Service ceiling = 30,100 ft.

" absolute " = 31,300 ft.

TABLE II

## Level speed at height

Corrected to weight of: 7,350 lb.

Cooling gills closed.

Standard height (ft)	A.S.I. m.p.h. (knots)	Corrections		True air speed m.p.h. (knots)	RPM.	Boost (Ins.Hg)	Mixture	S/C
		m.p.h.						gear
		P.E.	C.E.					
2,000	252 (219)	+14.8	-0.2	274 (238)	2470	45.0	Auto rich	M.S.
*3,400	251 (218)	+14.8	-0.4	278 (242)				
4,000	248 (216)	+14.7	-0.5	278 (242)		44.1		
6,000	239 (208)	+14.3	-0.7	276 (240)		41.0		
/7,300	234 (203)	+14.0	-0.9	275 (239)		45.0		F.S.
8,000	232 (201)	+14.0	-0.9	277 (241)				
10,000	230 (200)	+13.8	-1.2	283 (246)				
12,000	229 (199)	+13.8	-1.4	290 (252)				
*14,600	226 (197)	+13.7	-1.8	298 (259)				
16,000	219 (190)	+13.4	-1.8	295 (256)		42.5		
18,000	208 (181)	+13.0	-1.8	290 (252)		39.0		
20,000	197 (171)	+12.5	-1.9	285 (247)		35.8		
22,000	186 (162)	+12.0	-1.8	278 (242)		32.9		
24,000	174 (151)	+11.4	-1.7	270 (235)		30.3		
26,000	161 (140)	+10.8	-1.5	259 (225)		28.0		

\* Full throttle heights.

/ Change gear height.

/ Table contd.

# MARTLET IV FN III

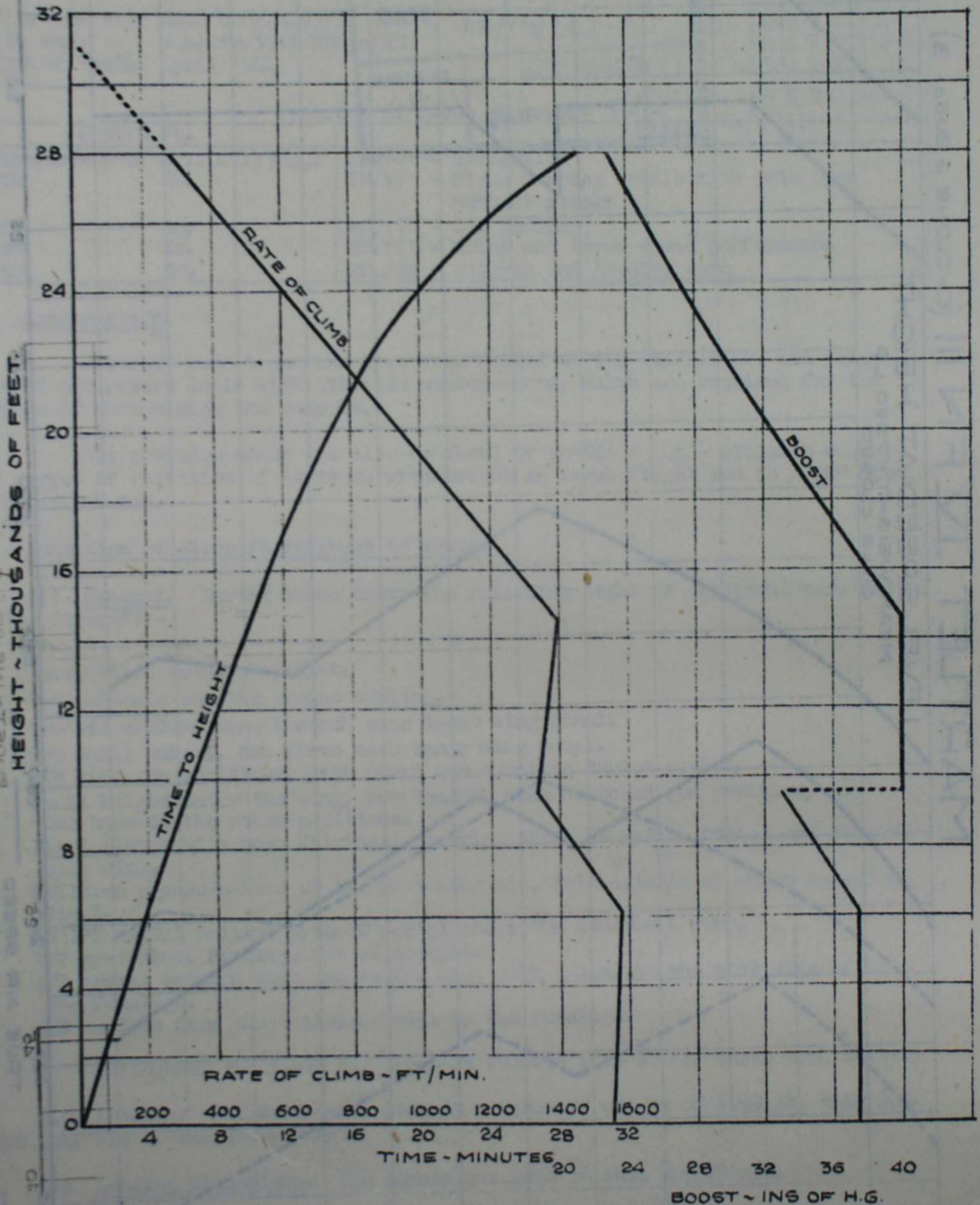
FIG. 1

(CYCLONE G.205a-3)

## PERFORMANCE ON CLIMB

WEIGHT - 7740 LB.

COWLING GILLS FULLY OPEN.



APPROVED. [Signature] CHECKED. S.P.R. 25th/5/43 TRACED. A.A. DATE OF TEST - 21st/10/25th/43 CURVE No. 8482 CURVE No. 7626

# MARTLET IV FN III (CYCLONE G.205a-3)

LEVEL SPEED AT HEIGHT  
 MEAN WEIGHT - 7350 LB.  
 GILLS CLOSED

FIG. 2

