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D.T.S. T E C H N I C A L B U L L E T I N NO. 31.

PART 1. P&ON-56U-Performance

PART 11 P&ON-1CU-Performance

Addendum P&ON-1CU- War Emergency Rated Power Performance.

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PART 11 - P-40M - 1GE.

WAR EMERGENCY RATED POWER PERFORMANCE.

APPENDIX

1. INTRODUCTION.

As the complete Engine data were not received until after the completion of the initial performance trials, it was not known at the time that a war emergency rating had been introduced, as may be seen from the Engine data in the Appendix 1, Page 15.

2. TESTS CARRIED OUT.

Climb and level speed tests were carried out at War Emergency Rating, for which the following engine conditions obtain: 3,000 R.P.M., 57" Boost.

3. RESULTS OF TESTS.

The climb was carried out at 150 m.p.h. A.S.I. in order to get sufficient cooling, with the cooling flaps halfway between "cooling climb" and "full open" positions.

There is an appreciable gain in rate of climb compared with the military power climb below 14,000 feet; the best rate of climb is 3,370 feet/min. at 6,800 feet (Full Throttle Height).

The increase in level speed at sea level is from 287 m.p.h. on military rating to 314 m.p.h. on War Emergency Rating. The full throttle height is at 9,200 feet where the true air speed is 352 m.p.h.

The results are shown in Tables 1 and 2, and on Fig. 1 and 2, and have been reduced to standard conditions in accordance with A. & A.E.E./Res/170.

4. DISCUSSION OF RESULTS.

It is emphasised that cooling is a critical factor in using this power rating and under tropical conditions would impose very definite limits to its use. The engine did not run particularly well during the tests and it is considered that the five minutes limitation stipulated by the manufacturers requires to be strictly observed.

(T.S.561/44).

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No. 1 AIRCRAFT PERFORMANCE UNIT.

LAVERTON.

"BRIEF PERFORMANCE TRIALS OF P-40N AIRCRAFT"
(ALLISON V 1710 - 81).

Part I. - P-40N - 5CU.
Part II. - P-40N - 1CU.

Detail No: 115/29/9.

R.A.A.F. File No.: 9/42/96.

PART I - P-40N - 5CU.

SUMMARY.

The performance of the subject aircraft is summarised as follows:-

I.C.A.N. ALTITUDE	R.P.M.	A.M.P.	MAXIMUM SPEEDS	TIME TO ALTITUDE	RATE OF CLIMB
Feet	No.	in.Hg.	mph.	minutes	ft/minute.
Military Rated Power.					
0	3000	*43.8	273	0	2220
10000	3000	*43.8	310	4.4	2310
15000	3000	*43.8	328	7.3	1960
16200 *	3000	*43.8	332	-	-
20000	3000	37.1xx	324	9.9	1460
27500	3000	28.2xx	294	-	-
30000	3000	-	-	21.6	440
Normal Rated Power.					
0	2600	39.0	266	0	2060
10000	2600	39.0	300	4.8	2130
15000	2600	39.0	318	7.7	1960
15200 *	2600	39.0	318	-	-
20000	2600	32.3xx	303	10.3	1460
27500	2600	24.5xx	283	-	-
30000	2600	-	-	22.0	440

*..... denotes Critical Full Throttle Height.
xx..... denotes Level speeds only.
Service Ceiling. - 33500 feet.

Take Off. - See Part II of this report.

(T.S.561/44).

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1. INTRODUCTION.

Brief performance of the P-40N5 model aircraft was required to verify performance data available.

This report covers:-

(a) Position Error Determination.
(b) Climb Performance.
(c) Level Speed Performance.

2. CONDITION OF AIRCRAFT DURING TRIALS.

(a) AIRFRAME:

TYPE - Kittyhawk - P-40N - 5CU.

Australian Identification No. A29 - 428.

This aircraft was manufactured in U.S.A. by Curtiss Aeroplane Division of Curtiss-Wright Corporation, Buffalo, NY., U.S.A.

The general details were as follows:-

(i) The general outline of the aircraft conforms to that of a P-40E.

(ii) A dorsal wireless mast with aerial fitted.

(iii) A Bead type gun foresight was fitted externally.

(iv) Auxiliary belly tank fittings and steadies were installed as fixed external equipment.

(v) A Weston thermometer element was externally mounted under the port mainplane and it was considered that this would not create drag sufficient to affect the performance results.

(vi) The aircraft finish was the normal grey matt used by the U.S.A.A.F.

(vii) Unsealed blast tubes were fitted to the six 0.50" calibre wing machine guns.

(viii) The exhausts are individual "fishmouth" type without any flame damping.

Other features of general interest are:

(i) The air filter which can be completely by-passed in flight.

(ii) Automatic boost control.

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AIRSCREW:

Name:	Curtiss Electric.
Description:	3 bladed, V.P., electric.
Type:	C532 D - F84, Serial No.56699.
Diameter:	11' - 0".
Blade Serial Nos:	159346, 161735 and 162192.
Blade Drawing No:	89303 - 24W.
Pitch Range:	Low 24.5° to high 54.5°.
Chord C at 0.7R:	10.31".
Chord C at 42":	10.35".
Thickness 0.7R:	0.88".
Thickness at 42":	1.00".
(t/c) 0.7R:	0.085.
(t/c) 42":	0.095.
Rotation:	Clockwise from pilot's seat. R.H.
Weight:	350 lb. (approx.)

Note:

The airscrew blades are cut down from a much larger diameter airscrew. The blade shape is fairly blunt at the tips and has a maximum chord at approximately 38" station. The blade sections are approximately Clark Y, and those near the tip are fairly thick (0.5" at 4" from t e top), although the thickness ratios due to the large chord are normal (0.07.)

(c) ENGINE DETAILS.

Manufacturer:	General Motors.	
Engine Name:	V1710 - 81 (F20M).	
Type:	12 cylinder, liquid cooled in line 'V' engine.	
Weight:	1350 lb ± 2½%.	
Rotation:	LH.	
Specification:	Bore	5.5"
	Stroke	6.0"
	Capacity	1710 cubic inches
	Compression Ratio	6.65 : 1
	Supercharger Ratio	9.60 : 1
	Airscrew gear ratio	2.00 : 1

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Carburettors: Bendix Stromberg Injection Type, Model P.D.12K - 6. Serial No. 137232A. Setting as received.

Engine operating conditions: See Appendix 1, Page 15.

(d) WEIGHT.

The "take-off" weight was determined by weighing at Laverton. This weight showed a reduction of approximately 900 lb. as compared with the earlier models (P - 40K for example). The principal contributions to the weight reduction were as follows:

(a) Fuel Capacity. Reduced by 20%, i.e. from 125 to 100 imperial gallons.

(b) Fuel Tanks. Changed from metal to non-metallic and removal of front wing tank.

(c) Oil Capcity. Reduced by 33⅓%, i.e. from 11 to 7 imperial gallons.

(d) Main Wheels. Reduced from 30" dia. to 27" with corresponding reduction in brake drum sizes etc.

(e) Oil Cooler and Coolant Radiator. These have been changed to mainly aluminium alloy in lieu of copper alloy.

(f) Elimination of Vacuum System. The only blind flying instrument being an electric Bank and Turn Indicator.

(g) Electric Engine Starter has been removed and only a hand inertia type is available.

(h) Electric Trim Tab Motor has been deleted.

(i) Radio Equipment, has been considerably reduced and provision is only made for 1 transmitter and one of the SCR 274-N. radios.

(j) Wing Bomb Racks have been eliminated.

(k) Cockpit Fittings have been simplified, whilst the pilot's seat is of moulded wood construction and not adjustable in flight.

3. TESTS CARRIED OUT.

(A) POSITION ERROR.

The position error correction was measured by the "tower altimeter" method past the Lookout Tower at Laverton. The correction is given in Figure 1 and the pilot head position is shown on Figure 2.

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(B) CLIMBING TRIALS.

Climbs were carried out using Normal and Military Rated Power, and details are given in Table 1 and Figures 3 and 4. Climbing speeds were estimated from a few check partial climbs. The speeds used may not be the optimum, however, the results of the partial climbs showed that the rate of climb changed very little for changes of airspeed of ±5 m.p.h.

(C) SPEED TRIALS.

The level speed performance was determined for the two engine conditions as above. Results are given in Table 2. and Figure 5. It should be noted that actual reduced observations have been shown on the graphs. This has been done to show the unsatisfactory engine running during trials and to assist in future saburation trials. The curves drawn on the figures are considered to be the best from the available data, and the tables have been based on these.

(D) TAKE OFFS.

No actual take offs have been measured on A29-418 but it is intended to carry out such trials on A29-412 (aP40N-1) which should provide sufficient data for this type. See Part II.

4. DISCUSSION AND COMMENTS.

The performance of the aircraft, particularly in top speed is below expectations and this may be due to -

(i) Engine power at height below standard.

(ii) Poor carburation.

(iii) Airscrew efficiency.

Considerable difficulty was experienced in maintaining smooth running particularly below 25,000 feet, and it is thought therefore, that items (i) and (ii) are complementary in reducing the aircraft's performance below this height. It is considered essential that carburation trials should be carried out on this type of aircraft immediately. In regard to item (iii), it is apparent that this airscrew has been used to promote climbing and altitude performance, but should not have produced such a marked drop in level speed at medium altitudes.

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CLIMBING TRIALS.

WEIGHT 7785 lbs. TABLE 1.

	I.C.A.N. Height	A.S.I.	R.P.M.	A.M.P.	Rate of Climb	Time to Height
	feet	mph	no	ins.Hg.	Ft/min.	min.
	NORMAL RATED POWER					
	Sea Level	138	2600	39	2060	0
	5000	138	2600	39	2080	2.4
	10000	138	2600	39	2130	4.8
M	13200	138	2600	39	2170	6.3
	15000	136	2600	36.2	1960	7.7
	20000	128	2600	30.2	1460	10.3
	25000	121	2600	25.2	950	14.6
	30000	113	2600	20.7	440	22.0
⊕	33500	108	2600	18.2	100	32.8
	MILITARY RATED POWER					
	Sea Level	138	3000	43.8	2220	0
	5000	138	3000	43.8	2260	2.2
	10000	138	3000	43.8	2310	4.4
X	13600	138	3000	43.8	2340	-
	15000	136	2600	36.2	2000	7.3
	20000	128	2600	30.2	1460	9.9
	25000	121	2600	25.2	950	14.2
	30000	113	2600	20.7	440	21.6
⊕	33500	108	2600	18.5	100	32.4

⊕ ..... Service Ceiling.

X ..... Critical Full Throttle Heights.

NOTE.

Cold Carburettor air, Automatic Rich Mixture, Radiator Flap in Combat Climb setting (approx. 10° open) throughout.

On the emergency climb, 3000 r.p.m. and 43.8° M.P. is available for 5 minutes only, therefore Normal Rated Power was used above 12,000 feet to determine "times to height" above that altitude.

(T.S.561/44).

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SPEED TRIALS.

WEIGHT 7785 lbs. TABLE 2.

I.C.A.N. Height	A.S.I.	P.E.C. Comp. E.	T.A.S.	ENGINE RPM.	MANIFOLD PRESSURE
feet	mph	mph	mph	rpm	in Kg.
MILITARY RATED POWER.					
Sea Level	261	+12	273	3000	43.8
5000	259	+11	291	3000	43.8
10000	256	+10	310	3000	43.8
15000	251	+ 9	328	3000	43.8
* 16200	250	+ 8	332	3000	43.8
20000	230	+ 6	324	3000	37.1
25000	200	+ 5	307	3000	30.8
27500	183	+ 5	294	3000	26.2
NORMAL RATED POWER.					
Sea Level	254	+12	266	2600	39.0
5000	252	+11	283	2600	39.0
10000	247	+10	300	2600	39.0
15000	243	+ 9	318	2600	39.0
* 15200	243	+ 9	319	2600	39.0
20000	219	+ 6	309	2600	32.3
25000	191	+ 5	293	2600	26.6
27500	176	+ 5	283	2600	24.5

* Critical Full Throttle Heights.

NOTE.

Cold carburettor air, automatic rich mixture and radiator flap normal (High Speed Setting) throughout speed trials.

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D.K.C. D.T.S. R.A.A.F. H.Q. T.S.7 Fig 1
SPECIAL DUTIES AND PERFORMANCE FLIGHT

CHECKED BY Brown

POSITION ERROR CURVE

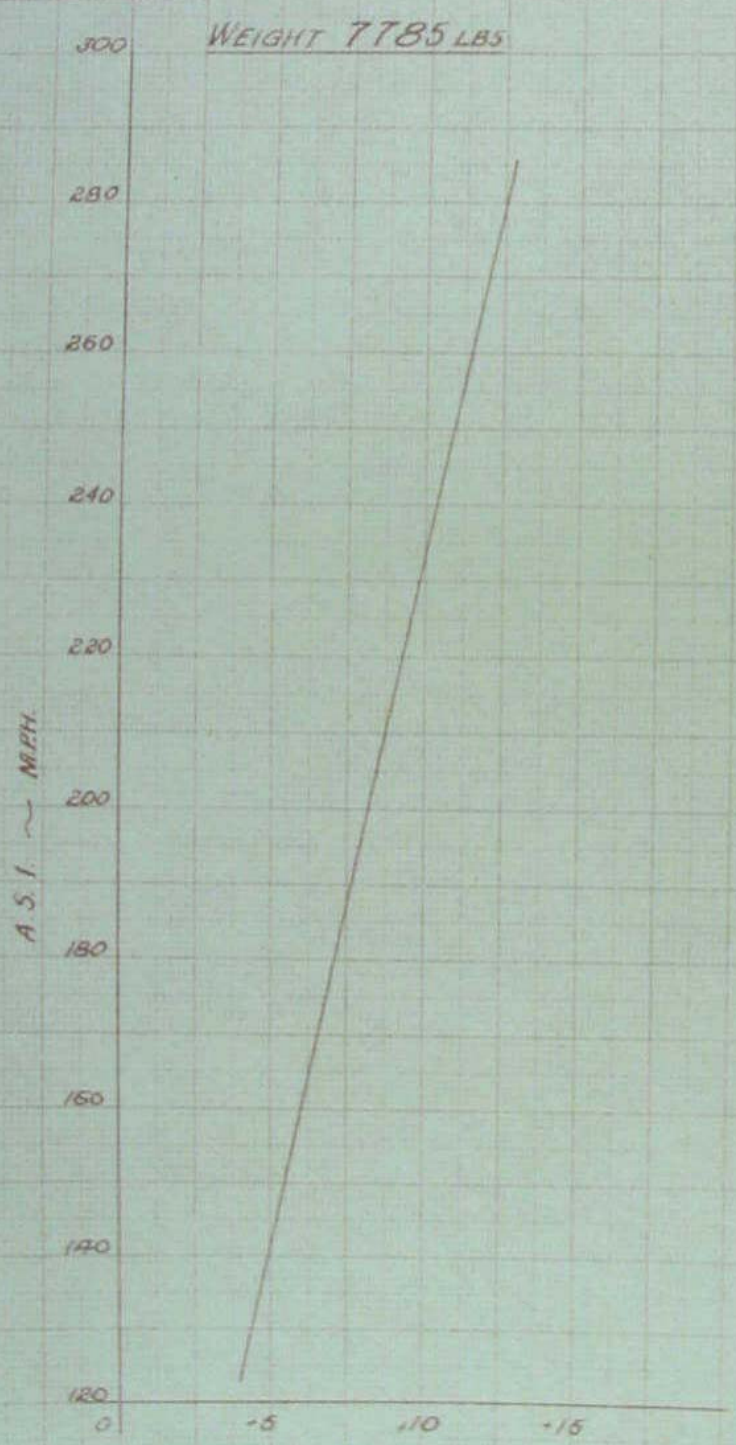
DATE 14-6-44

CORRECTION

P40N-5CU

A29-418

WEIGHT 7785 LBS



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R.A.A.F. D.T.S. R.A.A.F. H.Q. T.S.7
SPECIAL DUTIES AND PERFORMANCE FLIGHT

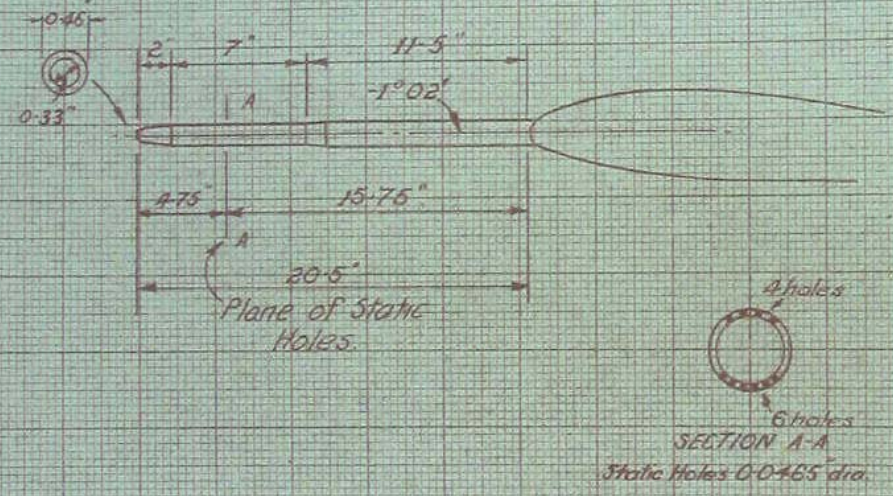
FIG 2

DATE 17-6-44

PITOT HEAD POSITION

P40N-5CU A29-418

WEIGHT 7785 LBS



TYPE OF HEAD	U.S. AIR CORPS TYPE D1 ELECTRICALLY HEATED
POSITION OF HEAD	PROJECTING FROM LEADING EDGE OF PORT MAINPLANE 202" FROM ℄ OF AIRCRAFT.
WING CHORD AT 202"	49·5"
WING SECTION AT 202"	APPROX. N.A.C.A 2209
WING INCIDENCE	+ 1°

PITOT HEAD MANUFACTURER

MANNING-BOWMAN & CO.
MERRIDEN, CONNECTICUT
U.S.A

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D.K.C. D.T.S. R.A.A.F. H.Q. T.S.7 SPECIAL DUTIES AND PERFORMANCE FLIGHT — Fig 3

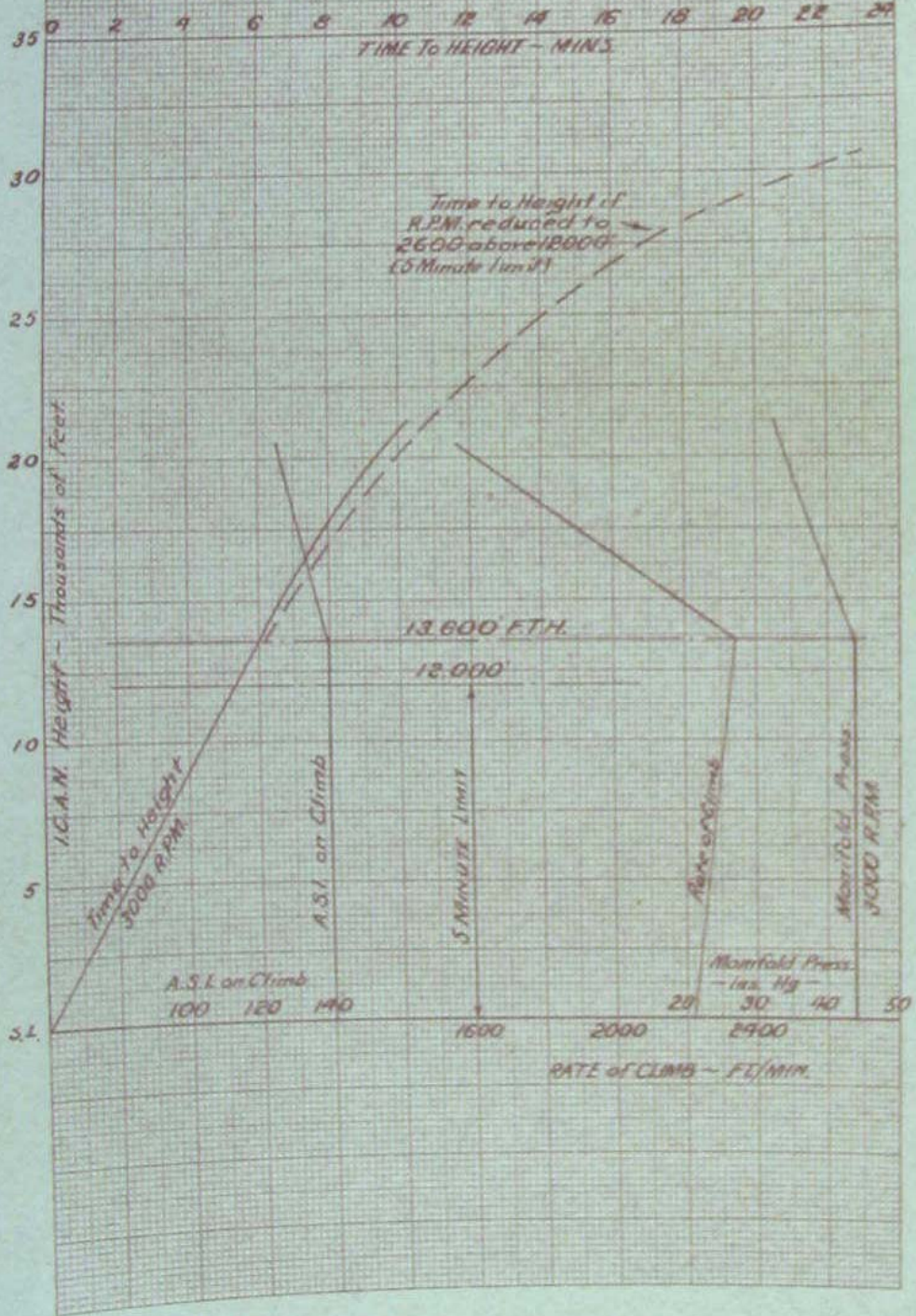
SIGNED BY Crouch — CLIMBING TRIALS — DATE 21-6-44

STANDARD TEMPERATE ATMOSPHERE

P40N-5CU — A29-418

T.O. WEIGHT 7785 LBS

MILITARY POWER



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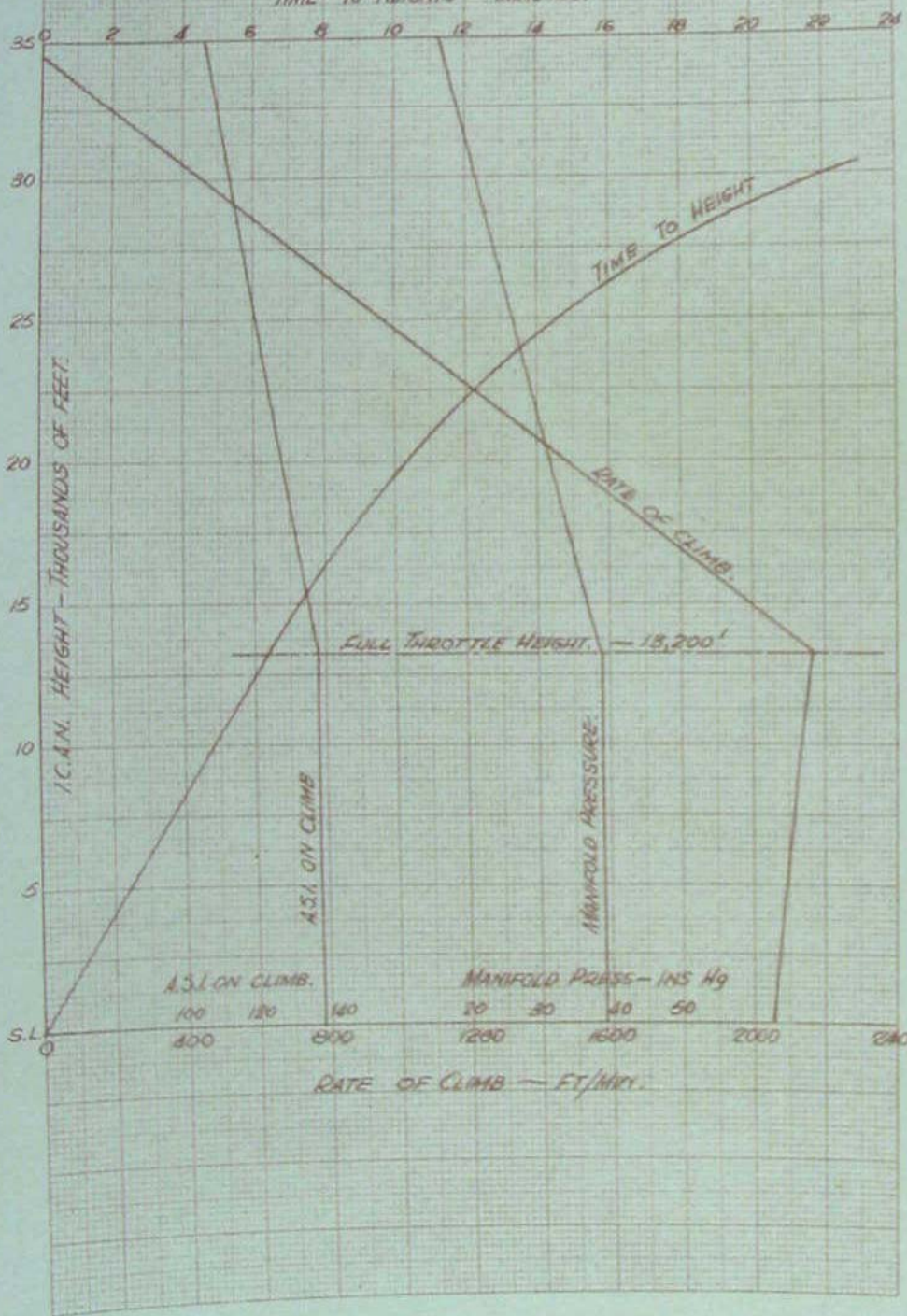
D.T.S. R.A.A.F. H.Q. T.S.7 **FIG. 4.**
SPECIAL DUTIES AND PERFORMANCE FLIGHT

No. CLIMBING TRIALS. DATE 21-6-44.

(STANDARD TEMPERATE ATMOSPHERE)

P40 N-5CU A29-418

TAKE OFF WEIGHT 7785 LBS
RATED POWER.



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D.K.C. | D.T.S. R.A.A.F. H.Q. T.S.7 SPECIAL DUTIES AND PERFORMANCE FLIGHT | FIG. 5.

CHECKED BY Goudie | DATE 13-6-44

SPEED TRIALS

STANDARD TEMPERATE ATMOSPHERE

P40N-5CU. A29-418

WEIGHT 7785 LBS.

PART II - P-40N - 1CH.

SUMMARY.

The performance of the subject aircraft is summarised as follows:-

I.C.A.N. ALTITUDE	R.P.M.	A.M.P.	MAXIMUM SPEEDS	TIME TO ALTITUDE	RATE OF CLIMB
Feet	No.	in.Hg.	mph.	minutes	ft/minute.
Military Rated Power.					
Sea Level	3000	43.8	287	0.0	2300
5000	3000	43.8	303	2.0	2360
10000	3000	43.8	321	4.1	2410
X 14000	3000	43.8	-	5.8	2450
15000	3000	F.T. or 43.8	339	6.2	2335
X 17000	3000	F.T. or 43.8	346	7.1	-
20000	3000	F.T.	340	8.5	1750
25000	3000	F.T.	328	12.2	1160
30000	3000	F.T.	307	18.2	575
Normal Rated Power					
Sea Level	2600	39.0	274	0.0	1940
5000	2600	39.0	291	2.5	2000
10000	2600	39.0	307	5.0	2065
X 13800	2600	39.0	-	6.8	2095
15000	2600	F.T. or 39.0	324	7.4	1980
X 16100	2600	F.T. or 39.0	327	8.1	-
20000	2600	F.T.	322	10.4	1440
25000	2600	F.T.	310	14.8	895
30000	2600	F.T.	298	23.4	355

X ..... denotes Critical Full Throttle Height.

Service Ceiling. - Undetermined.

Take Off. - Shortest distance to unstick = 220 yds. (45° flap).

Shortest distance to clear 50 ft. screen. = 515 yds (15° flap).

(T.S.561/44).

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1. INTRODUCTION.

As stated in Part 1 performance data was required on this alternative N model.

2. CONDITION OF AIRCRAFT DURING TESTS.

(a) AIRFRAME:

TYPE Kittyhawk P-40N - 1CU.

Australian Identification No. A29 - 412.

This aircraft was manufactured in U.S.A. by Curtiss Aeroplane Division of Curtiss - Wright Corporation, Buffalo, NY., U.S.A.

The differences between this model and the P-40N - 5CU, are as follows:-

(i) The metal pilots seat of the N1 has been substituted by a wooden non adjustable type in the N5.

(ii) The undercarriage 30" diam wheels of the N1 has been replaced by 27" diam type.

(iii) The addition of Recognition lights to the N5.

(iv) Provision of wing bombs and full tank installation to N5.

(v) Addition of a Draft Curtain to N5.

(vi) A redesign of the armour plating - the N5 to add protection to the pilots arms.

(b) AIRSCREW:

See PART 1 of this report.

(c) ENGINE DETAILS:

See PART 1 of this report.

(d) WEIGHT:

See Appendix 2. The standard weight to which the results have been reduced is 7900 lb.

3. TESTS CARRIED OUT.

(A) POSITION ERROR CURVE.

The position error curve is shown in Figure 1, and the details of the pressure head are as given in Part 1. The correction was ascertained by the tower-aneroid method.

(B) CLIMBING TRIALS.

The results are given in Table 1 and on Figure 3.

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(B) CLIMBING TRIALS. (Contd.).

Reduction to standard atmospheric conditions has been carried out in accordance with A. & A.E.E./Res./170.

The Military power condition engine limitation is 15 minutes, and within this period an altitude of at least 25,000 feet should be reached under normal conditions. In view of the fall in engine power above full throttle height, it should, however, be possible to maintain engine revolutions at 3000 R.P.M. and thus carry out a full climb to ceiling.

The figures and curves pertaining to this engine condition were, however, not obtained from continuous climbs, which had to be abandoned on account of overheating of the engine. The air temperatures were generally well above standard during the tests, and oil and glycol temperatures reached maximum values in approximately 8000 feet of climbing, with the radiator shutter open at combat climb.

Partial Climbs were carried out to ascertain the best climbing speeds for the two engine conditions employed. On military rating, the optimum climb was obtained at 130 m.p.h. A.S.I., as compared with 135 m.p.h. A.S.I. on maximum continuous rating (Rated Power). These speeds are, however, too low if air temperatures are higher than standard, and under tropical conditions it will be necessary to increase the speed to 150 m.p.h. A.S.I., as well as to open the radiator to "full open", with a consequent drop in performance.

The climbs on maximum continuous power could only be maintained to 29,000 feet, when they had to be abandoned due to the engine misfiring and spluttering. Carburation was generally erratic and there was much scatter of results of the trials on this engine condition. On military rating the engine was running much better at altitude, although service ceiling was not reached due to over-heating of the engine.

(C) SPEED TRIALS.

The results are quoted in Table 2 and Figure 4, and have been reduced to standard atmosphere in the same way as the climb results.

It is noticeable that the airspeeds are well maintained at altitude, which is probably due to the comparatively high solidity of the airscrew. As in the case of the climbing trials, carburation troubles precluded results being obtained above 30,000 feet.

(D) TAKE-OFF TRIALS.

The take-offs were made from the North-South concrete runway at Laverton and have been corrected to zero wind, standard sea level temperature and pressure, and to a total weight of 7900 lbs. The standard take-off technique was employed, i.e., the aircraft flown off, without brakes, after the shortest possible ground run consistent with full controllability during the climb. Such short runs, however, would not normally be used for service pilots.

The take-offs were carried out for flap angles of 0°, 15°, 30° and 45°, and the results may be found in Table 3 and Figure 2.

(T.S.561/44).

4. DISCUSSION OF PERFORMANCE.

As in the case of A27-418, carburation troubles at high altitudes were a noticeable factor. Generally this aircraft, however, had a better engine, and the performance both on climb and level speed was superior to that of the P-40N - 5CU. This was particularly marked above 25,000 feet.

The engine operating conditions as employed during the trials are not exactly as shown in the table of engine operation, (App.1), but this information was only obtained after the greater part of the tests had been completed. In the absence of exact information, conditions as laid down for earlier models of Allison engines were adopted.

(T.S.561/44).

5. RESULTS.

CLIMBING TRIALS.

WEIGHT: 7900 lb. TABLE 1.

I.C.A.N. Height	I.A.S.	R.P.M.	A.M.P.	Rate of Climb	Time to Height
feet	mph	No.	in.Hg.	Ft/min.	minutes
NORMAL RATED POWER.					
Sea Level	137.5	2600	39.0	1940	0.0
1000	137.5	2600	39.0	1950	0.5
2000	137.5	2600	39.0	1965	1.0
3000	137.5	2600	39.0	1975	1.5
5000	137.5	2600	39.0	2000	2.4
7500	137.5	2600	39.0	2035	3.75
10000	137.5	2600	39.0	2065	5.05
12500	137.5	2600	39.0	2095	6.15
X 13800	137.5	2600	39.0	2110	6.90
15000	136.0	2600	37.5	1980	7.50
17500	132.0	2600	34.0	1710	8.85
20000	127.5	2600	31.0	1440	10.40
25000	119.0	2600	26.0	895	14.80
30000	111.0	2600	21.3	355	23.50
MILITARY RATED POWER (15 min. limit).					
Sea Level	132	3000	43.8	2300	0.0
1000	132	3000	43.8	2315	0.4
2000	132	3000	43.8	2325	0.8
3000	132	3000	43.8	2340	1.2
5000	132	3000	43.8	2360	2.2
7500	132	3000	43.8	2385	3.0
10000	132	3000	43.8	2410	4.3
12500	132	3000	43.8	2440	5.2
X 14000	132	3000	43.8	2450	5.8
15000	129	3000	42.3	2335	6.2
17500	126	3000	38.7	2045	7.3
20000	123	3000	35.5	1750	8.5
25000	117	3000	29.5	1160	12.2
30000	111	3000	24.2	575	18.3

X ..... denotes Critical Full Throttle Height.

Radiator: For military rated power, combat climb position up to 16000 ft. for above one notch beyond.
For normal rated power, combat position throughout.

Notes: Carburettor: Cold air intakes.
Mixture: Automatic Rich.

5. RESULTS. (Contd.)

LEVEL SPEEDS.

WEIGHT 7900 lb. TABLE 2.

I.C.A.N. Height.	T.A.S.	Engine R.P.M.	A.M.P.
Feet	mph	No	in.Hg.
MILITARY RATED POWER			
Sea Level	287	3000	43.8
5000	303	3000	43.8
10000	321	3000	43.8
15000	339	3000	43.8
X 17000	346	3000	43.8
20000	340	3000	39.0
25000	328	3000	32.0
30000	307	3000	26.0
NORMAL RATED POWER			
Sea Level	274	2600	39.0
5000	291	2600	39.0
10000	307	2600	39.0
15000	324	2600	39.0
X 16100	327	2600	39.0
20000	322	2600	33.5
25000	310	2600	28.0
Ø 28000	298	2600	25.0

X ..... denotes Critical Full Throttle Height.
Ø ..... denotes Carburettor trouble developed.
Radiator: High speed setting.
Mixture: Automatic Rich.
Carburettor: Cold Air intakes.

(T.S.561/44).

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SUMMARY OF TAKE-OFF MEASUREMENTS.

TABLE 3.

CONDITIONS:

Runway: μ = .05. Slope: Insignificant.

Temperature: 15°C. Barometric pressure: 30.17"

Wind: 5 M.P.H., head-wind. Engine: 3000 RPM, 52 In.Hg. Manifold pressure.

Cowl Gills: Fully open.

Weight: 7900 lbs. Mixture: Auto rich.

Flap Setting	Run to Unstick	Time from Rest to Unstick	Distance to clear 50 ft. screen.	A.S.I. at Unstick	A.S.I. on Climb.
%	yards	seconds	yards	m.p.h.	m.p.h.
0°	290	12.2	548	90	115
15°	245	12.4	515	80	102
30°	225	12.0	537	77	97
45°	220	11.4	541	77	97

The take-off paths are shown in Figure 2.

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SPECIAL DUTIES AND PERFORMANCE FLIGHT

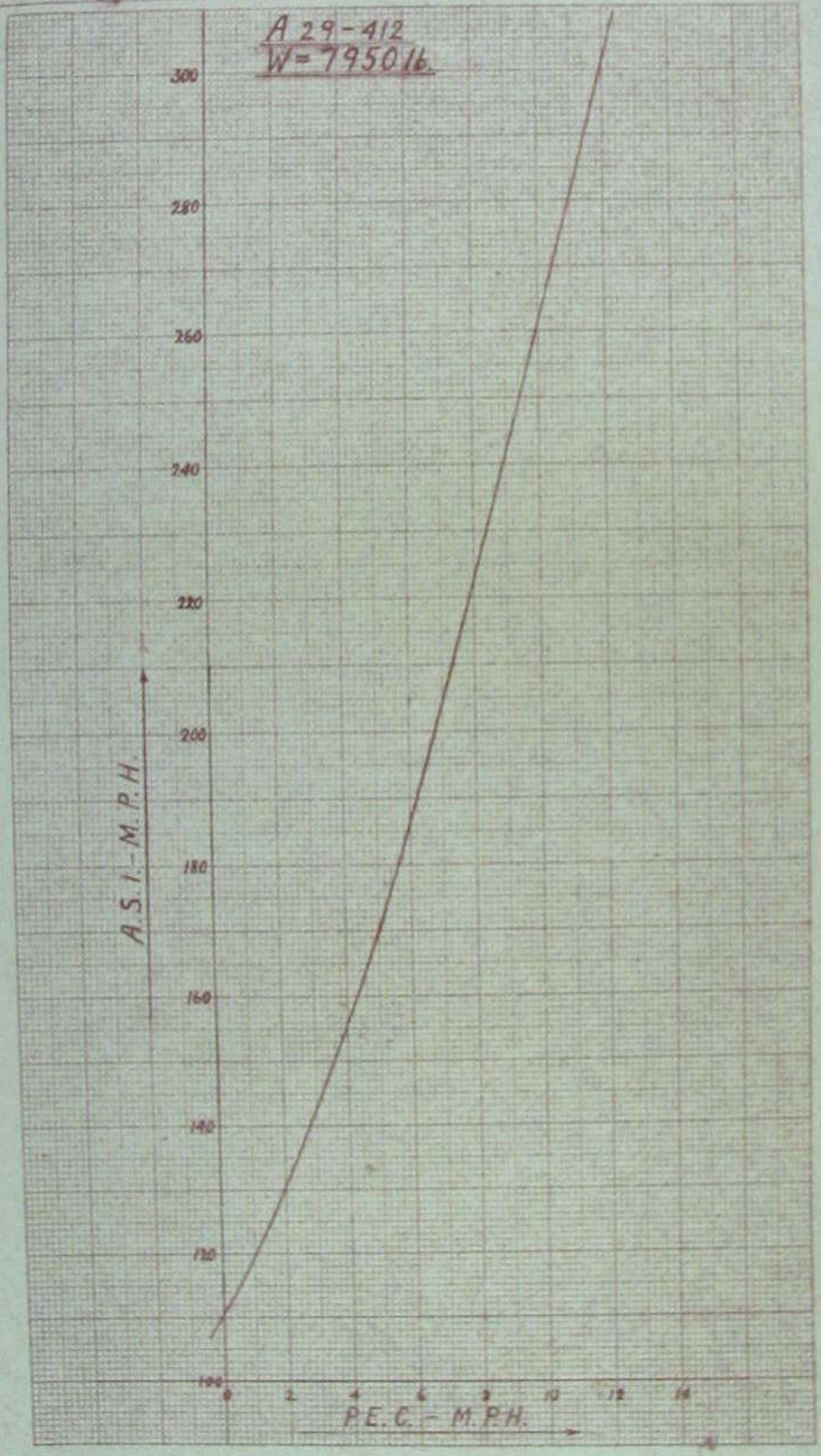
Fig. 1.

CHECKED BY

P40-N POSITION ERROR CURVE

DATE 8/11/43

A 29-412
W = 7950 lb.



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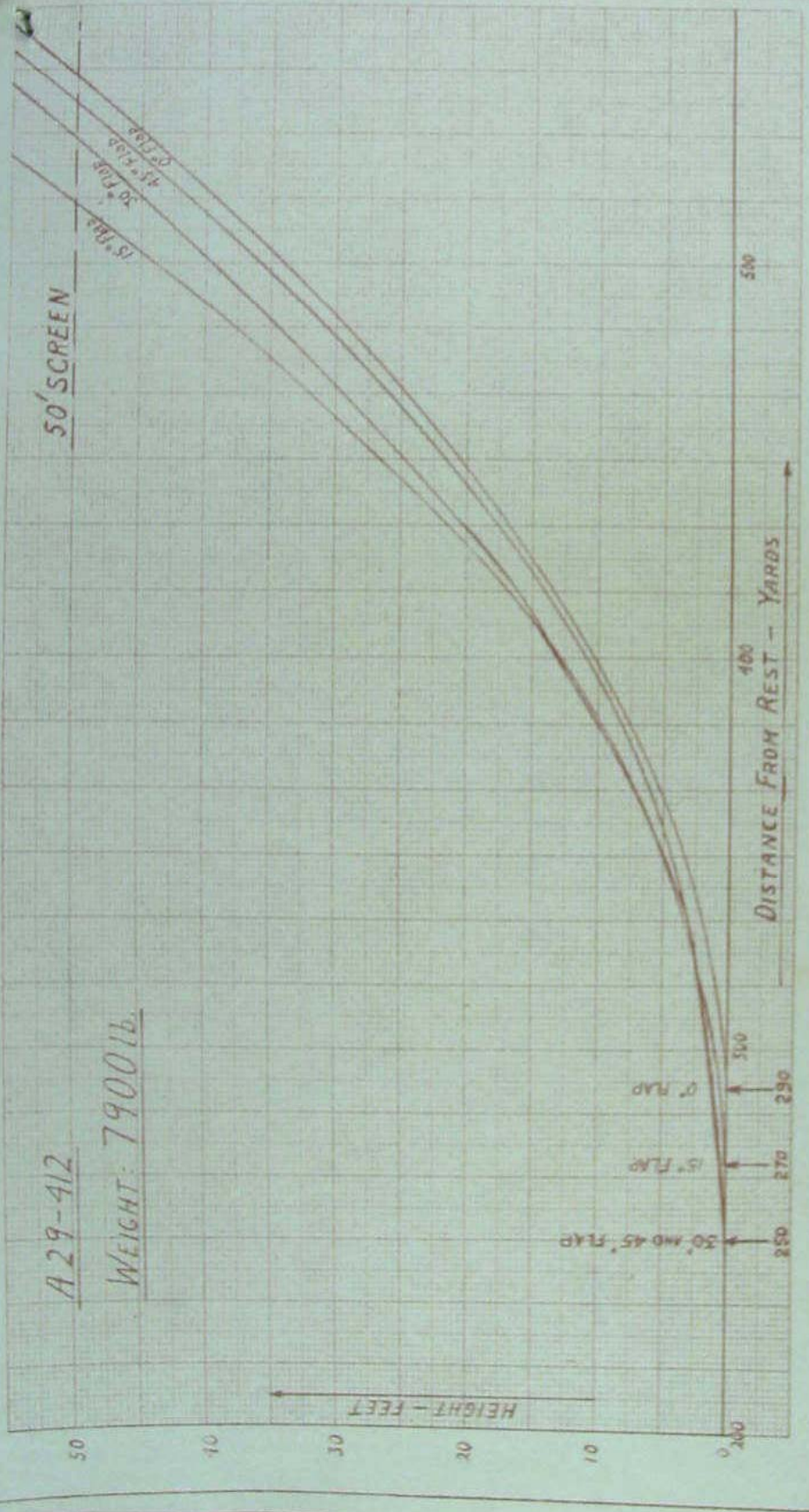
SPECIAL DUTIES AND PERFORMANCE FLIGHT

FIG. 2.

DRAWN BY [illegible]

-P40N: TAKE OFF PATHS-

DATE 8-11-43



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412
WEIGHT: 7900 Lb.

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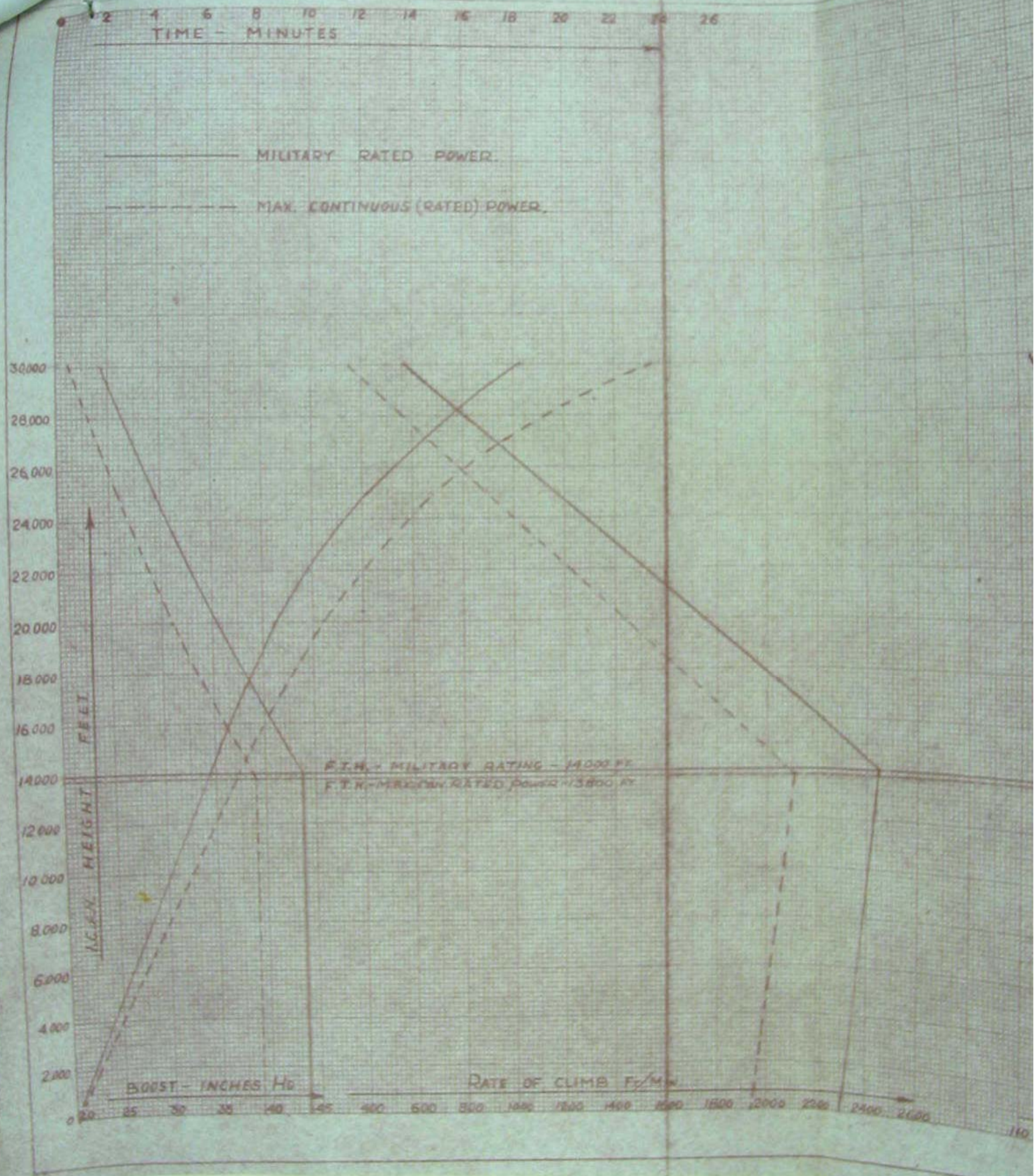
D.T.S. R.A.A.F. H.Q. T.S.7
No. 1.-AIRCRAFT PERFORMANCE UNIT

CLIMB PERFORMANCE.

FIG. 3.

DATE 17/1/44.



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PREPARED BY [illegible]

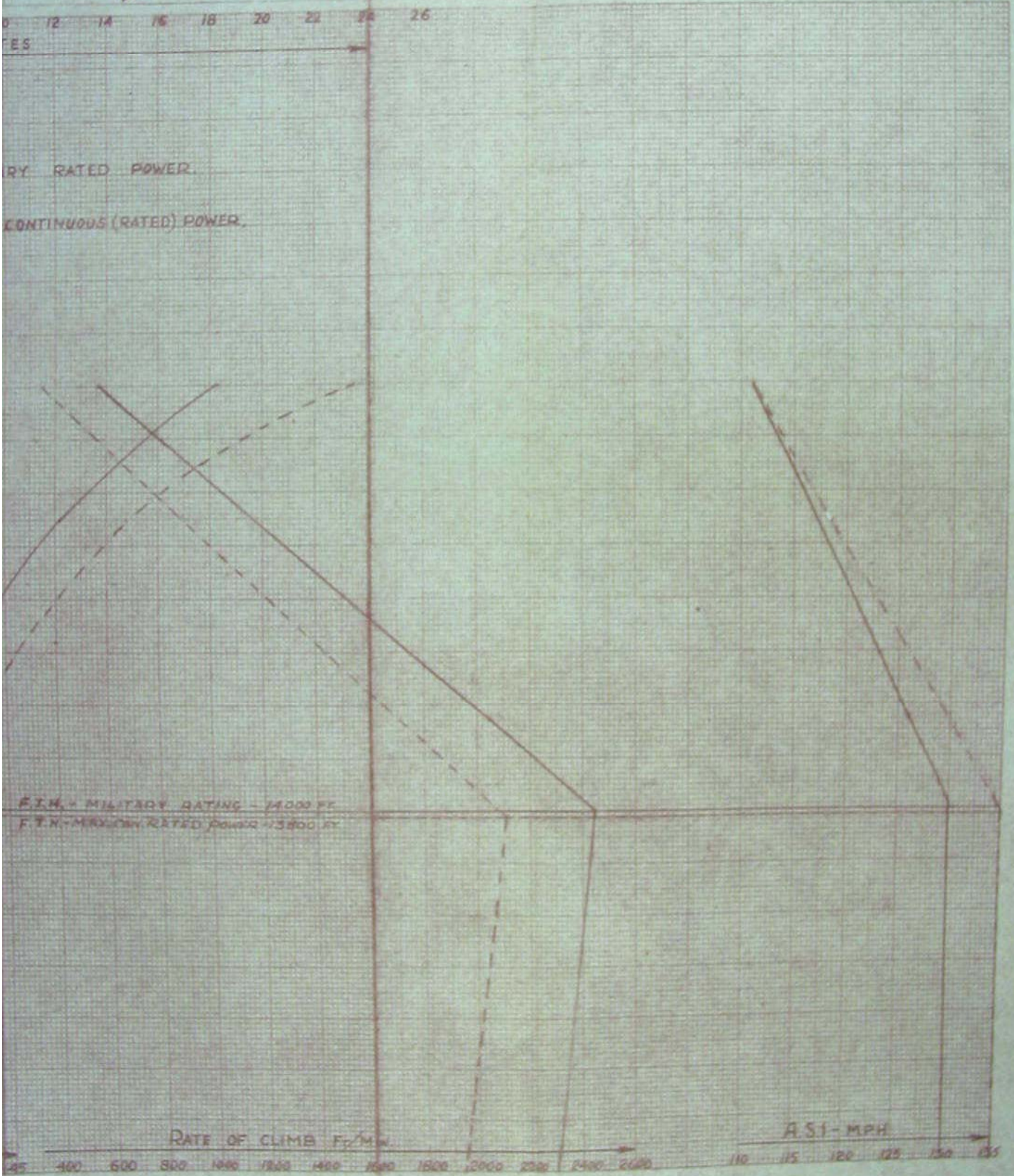
CHECKED BY [illegible]

D.T.S. R.A.A.F. H.Q. T.S.7
No. 1.-AIRCRAFT PERFORMANCE UNIT

Fig. 3.

CLIMB PERFORMANCE.

DATE 17/1/44.



APPENDIX 1.

TABLE OF ENGINE OPERATING CONDITIONS.

ALLISON V1710 - 81 (F20R).

Operating Conditions	Horse Power	R.P.M.	A.M.P.	Altitude	Mixture Control	Rmks.
-	No	No	ins.Hg.	feet	-	-
Take off	1200	3000	52.0	Sea Level	A/Rich	5 mins only
War E. Rating	1360	3000	57.0	" "	"	"
Military Rated Power	1125	3000	44.2	14600	"	15 min. operation only.
Max.continuous (Rated Power.	1000	2600	38.5	13800	"	
Max. cruising	750	2280	30.7	13800	"	
Cruise for min.spec. Fuel Flow	310 370 430 480 510	1950 1950 1950 1950 1950	23.0 23.0 23.0 23.0 T.T.	Sea Level 5000 10000 15000 20000	A/Lean " " " "	

NOTE: These figures obtained from T.O. No.02-5AB-1A.

(T.S.561/44).

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APPENDIX 2.

1. WEIGHT OF AIRCRAFT DURING TRIALS.

TARE WEIGHT			5864 lbs.
REMOVABLE EQUIPMENT (Less Belly Tank)			
Armament:	6.5 Browning Guns	454 lbs.	
	Ammunition boxes, chutes and gun sight	80 "	
	Ammunition	298 "	
			832 lbs.
Wireless:	SCR522 or 27MN		74 "
Miscellaneous:	Oxygen equipment	15	
	Belly Tank Attachment	10	
			25 lbs.
Fuel (7.2 lb/gal)	Rear Wing Tank (45 gal).	324	
	Fuselage Tank (58.2 gal)	420	
			744 lbs.
Oil (9 lb/gal)	7.0 gallons		63 "
PILOT AND PARACHUTE			200 "
	TOTAL WEIGHT.		7802 lbs.

A weight of 7900 lb has been taken as standard full military load for the take-off, climb and level speed trials and correction to this weight made.

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PART 11 - P-40M - 1GE.

WAR EMERGENCY RATED POWER PERFORMANCE.

APPENDIX

1. INTRODUCTION.

As the complete Engine data were not received until after the completion of the initial performance trials, it was not known at the time that a war emergency rating had been introduced, as may be seen from the Engine data in the Appendix 1, Page 15.

2. TESTS CARRIED OUT.

Climb and level speed tests were carried out at War Emergency Rating, for which the following engine conditions obtain: 3,000 R.P.M., 57" Boost.

3. RESULTS OF TESTS.

The climb was carried out at 150 m.p.h. A.S.I. in order to get sufficient cooling, with the cooling flaps halfway between "cooling climb" and "full open" positions.

There is an appreciable gain in rate of climb compared with the military power climb below 14,000 feet; the best rate of climb is 3,370 feet/min. at 6,800 feet (Full Throttle Height).

The increase in level speed at sea level is from 287 m.p.h. on military rating to 314 m.p.h. on War Emergency Rating. The full throttle height is at 9,200 feet where the true air speed is 352 m.p.h.

The results are shown in Tables 1 and 2, and on Fig. 1 and 2, and have been reduced to standard conditions in accordance with A. & A.E.E./Res/170.

4. DISCUSSION OF RESULTS.

It is emphasised that cooling is a critical factor in using this power rating and under tropical conditions would impose very definite limits to its use. The engine did not run particularly well during the tests and it is considered that the five minutes limitation stipulated by the manufacturers requires to be strictly observed.

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CLIMB PERFORMANCE.

WEIGHT 7900 lbs. TABLE 1.

I.C.A.M. Height.	A.S.I.	R.P.M.	A.M.P.	Rate of Climb	Time from Start
feet	mph	no	ins.Hg.	Ft/min.	min.
WAR EMERGENCY RATING					
Sea Level	150	3000	57.0	3100	0
1000	150	3000	57.0	3140	0.3
2000	150	3000	57.0	3180	0.6
3000	150	3000	57.0	3220	0.9
5000	150	3000	57.0	3300	1.5
X 6800	150	3000	57.0	3370	2.1
7500	150	3000	55.5	3270	2.3
10000	150	3000	50.5	2930	3.1
12500	147	3000	46.25	2610	4.0
15000	145	3000	42.25	2300	5.0

X ..... denotes Critical Full Throttle Height.

Note:

Radiator. - Flaps half-way between c.o. and f.o. positions.

Carburettor. - Auto-rich, cold air intakes.

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LEVEL SPEEDS.

WEIGHT 7900 lbs. TABLE 2.

I.C.A.N. Height	T.A.S.	R.P.M.	Boost
feet	mph	no	in.Hg.
WAR EMERGENCY RATING			
Sea Level	314	3000	57.0
5000	335	3000	57.0
X 9200	352	3000	57.0
10000	352	3000	55.25
15000	348	3000	46.75

X ..... denotes Critical Full Throttle Height.

Note:

Radiator. - H.S. position.

Carburettor. - Auto-rich, cold air intakes.

(T.S.561/44).

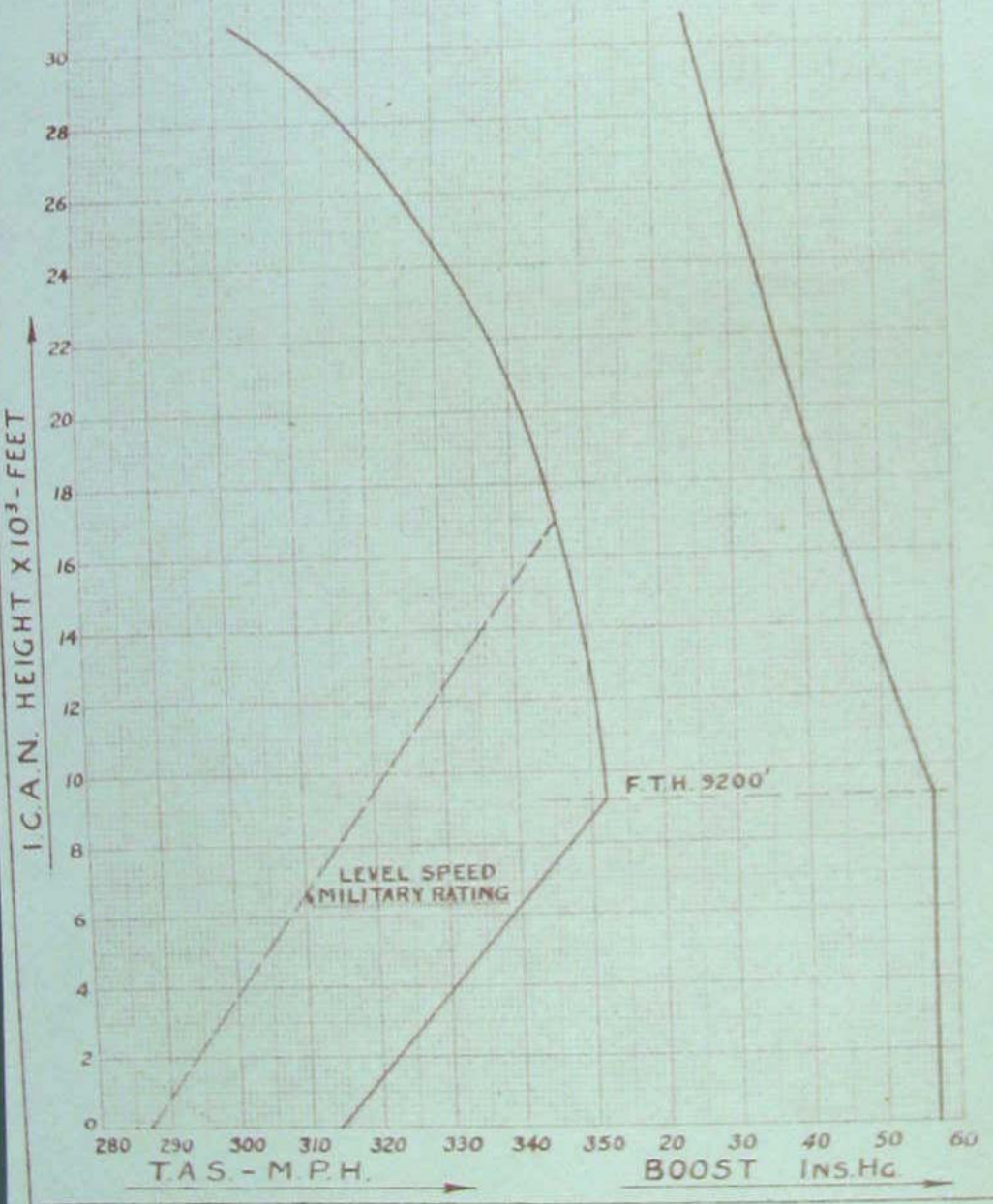
D.T.S. R.A.A.F. H.Q. T.S.7
SPECIAL DUTIES AND PERFORMANCE FLIGHT

FIG. 2

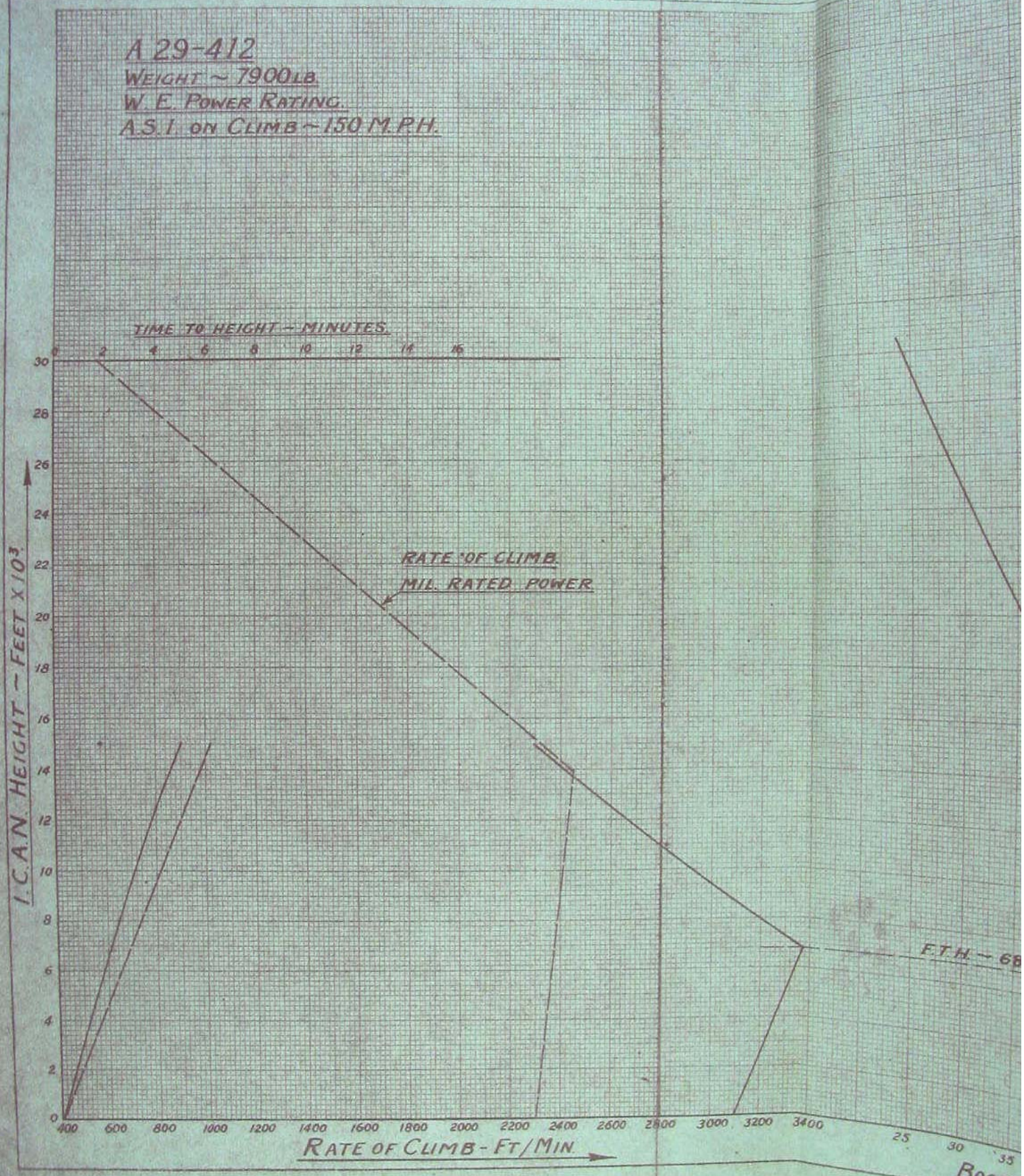
LEVEL SPEED PERFORMANCE

DATE 11 3 44

A29-412
WEIGHT : 7900 LB.
W.E. POWER RATING.



PREPARED BY HASB	D.T.S. R.A.A.F. H.Q. T.S.7 No. 1.—AIRCRAFT PERFORMANCE UNIT	FIG. 1
CHECKED BY [signature]	CLIMB PERFORMANCE	DATE 25-3-44.



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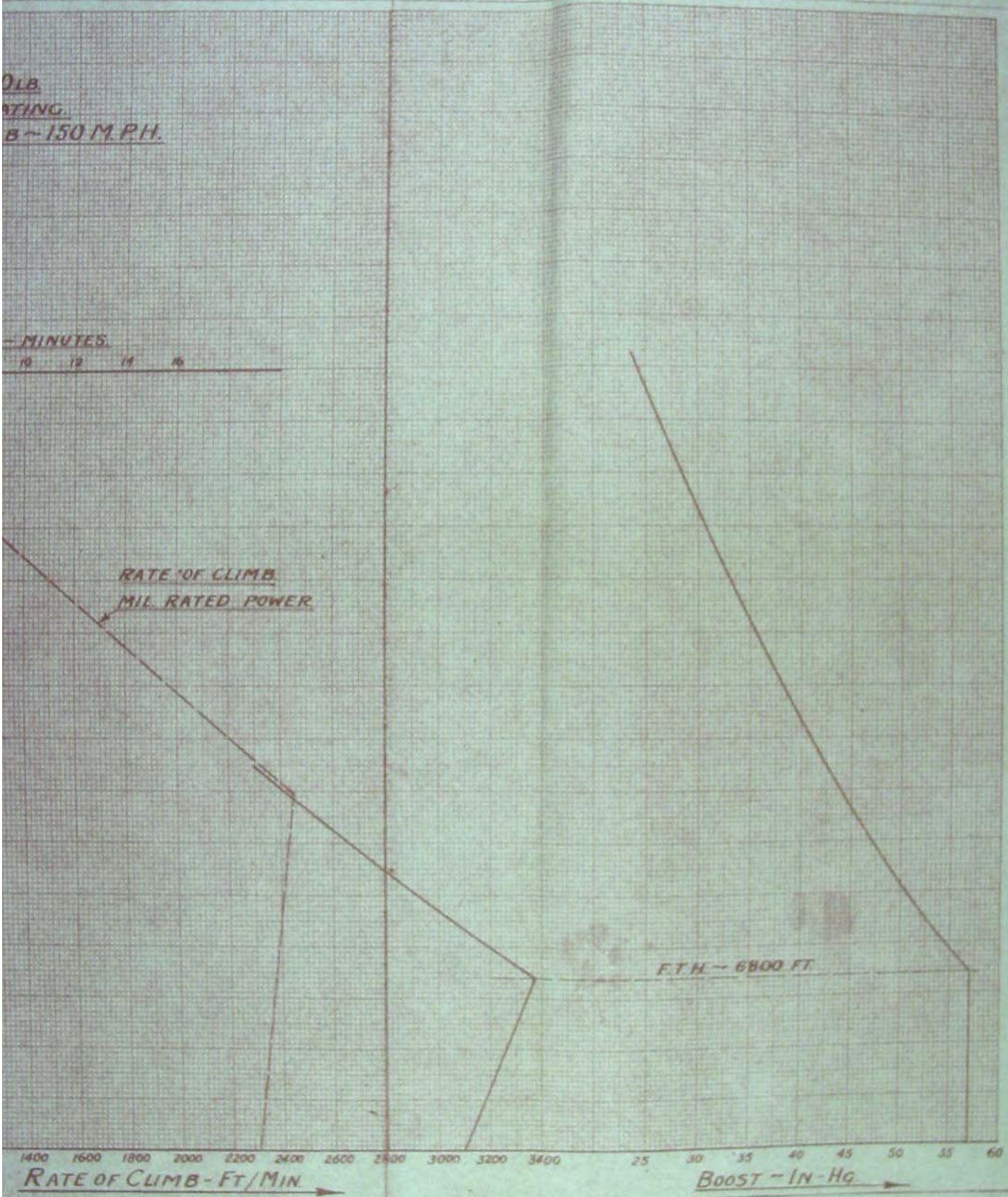
No. 1.–AIRCRAFT PERFORMANCE UNIT

CLIMB PERFORMANCE

FIG. 1

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