AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT

BOSCOMBE DOWN

Airacobras A.H.573 and A.H.701 (Allison V-1710-ZA) Climb and level speed performance.

Progress of issue of report

A.& A.E.E. Ref:- 4475/42/Gen/32/3.
M.A.P. Ref:- R.A.3704/42/A.N.A.1.

Report No.		Title
4th Part of A.& A.E.E./774.	A.H.574.	Tests of automatic boost control.
5th	do.	A.H.589. Carbon monoxide contamination tests.
6th	do.	A.H.573. Weights and loading data.
7th	do.	A.H.574. Climb and level speed performance, and position error.
8th	do.	A.H.574. Cooling trials.

SUMMARY

Performance trials have been made on Airacobras A.H.573 and A.H.701 each fitted with an Allison V-1710.E.4. engine.

The results were:-

Maximum rate of climb 2040 ft/min. at 10,300 ft.
Service ceiling 29,000 ft.
Time to 10,000 ft. 5.1 mins.
" " 20,000 ft. 11.7 mins.
Maximum true air speed in level flight: 355 m.p.h. at 13,000 ft.

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1. Introduction:

The climb and maximum level speed performance of Airacobra aircraft fitted with an Allison V-1710-ZA engine have been measured on aircraft A.H.573 and A.H.701.

The tests were made between 29th July 1941 and 31st August 1942.

2. Scope of tests.

Airacobra A.H.573 was sent to this Establishment in July 1941 for performance trials and the results of the climbing trials given in this report were made on this aircraft. The aircraft crashed before further tests had been completed and Airacobra A.H.589 was obtained as a replacement. Constant ignition trouble was experienced with this aircraft, and the tests were transferred to another Airacobra A.H.701 which was at this Establishment for gun heating trials. The speed tests were made on this aircraft.

The best climbing speed was found from partial climbs on Airacobra A.H.573 to be 150 m.p.h. A.S.I. below full throttle height, decreasing by 3 m.p.h. per 2,000 ft. above this height. These speeds have been used for the climb tests.

The climbs were made with the oil cooler and radiator shutters fully open. For the level speed tests the shutters were flush with the surface of the fuselage.

The pitot position error was measured on A.H.573 and has been reported in the 7th part of report No.A.& A.E.E./774.

3. Condition of aircraft relevant to tests.

3.1. Both A.H.573 and A.H.701 were similar in that they were powered by an Allison V-1710.E.4. engine driving a Curtiss Electric constant speed propeller type C.6315 SH-C-6. The aircraft had similar exhausts which consisted of two backward facing, open ended stub pipes per cylinder. The armament fitted to both aircraft consisted of a 20 m.m. gun firing through the propeller shaft, four 0.3" /guns

guns protruding from the leading edge, and two 0.5" guns in the nose firing through the propeller disc. The muzzles of all the guns were sealed. A small bead sight was fitted to both aircraft in front of the windscreen.

An aerial mast, but no aerial, was fitted on both aircraft. I.F.R aerials were only fitted on A.H.573.

The tests on A.H.573 were made at a take-off weight of 7830 lb. with the centre of gravity 20.3" aft of the datum. A.H.701 was flown at a take-off weight of 7845 lb. with the centre of gravity 20.0" aft of the datum. The centre of gravity limits determined at this Establishment, are 18.8" and 22.3" aft of the datum point, and occur due to dissipational load.

All these centre of gravity positions are with the undercarriage down.

3.2. The limitations for the Allison V-1710.E.4. Engine obtaining at the time of the tests were:-

	R.P.M.	Manifold press. ins. of Hg.
Take-off (5 mins.)	3000	44½
Maximum on climb (30 mins)	2600	37
Maximum for rich level flight (5 min)	3000	42
Maximum for rich mixture cruising	2600	37
Maximum for weak mixture cruising	2300	30½

4. Results.

Details of the climbing trials made on A.H.573 are given in Table I and Fig.I. Details of the speed trials made on A.H.701 are in Table II and Fig.2.

Summarising, the results are:-

Maximum rate of climb: 2040 ft/min. at 10,300 ft.
Service ceiling: 29,000 ft.
Time to 10,000 ft. 5.1 ins.
" " 20,000 ft. 11.7 "
Maximum true air speed in level flight 355 m.p.h. at 13,000 ft.

TABLE I
AIRACOBRA A.H.573
Weight - 7830 lb.
Performance on the climb.
Radiator and oil cooler shutters open

Standard Height Feet	Time from Start. mins.	Rate of Climb. Ft/min.	True Air Speed. m.p.h.	A.S.I. m.p.h.	Position error and compressibility corrections. P.E.C.	Comp.	R.P.M.	Boost IN inches of Hg.
0	0							
2000	1.1	2040	157	150	+2.3	-.1	2600	37.2
4000	2.05	2040	161.5	150	+2.3	-.2	"	37.2
6000	3.0	2040	166.5	150	+2.3	-.2	"	37.2
8000	4.0	2040	171.5	150	+2.3	-.3	"	37.2
10300 *	5.15	2040	178	150	+2.3	-.3	"	37.2
12000	6.05	1785	180	147	+2.2	-.4	"	35.0
14000	7.2	1585	180.5	144	+2.1	-.5	"	32.5
16000	8.45	1385	183	141	+2.0	-.5	"	30.0
18000	9.95	1190	184.5	138	+1.8	-.6	"	27.8
20000	11.65	985	186.5	135	+1.6	-.6	"	25.7
22000	13.9	795	188.5	132	+1.5	-.7	"	23.9
24000	17.0	600	190	129	+1.3	-.7	"	22.1
26000	21.0	410	189	124	+1.2	-.7	"	20.5
28000	27.7	215	189	120	+.9	-.8	"	19.0
29000	34.8	120	190	118	+.8	-.8	"	18.2

* Full throttle height. Service ceiling = 29,000 ft. Estimated absolute ceiling = 30,200 ft.

/TABLE II.

TABLE II
AIRACOBRA A.H. 701
Weight - 7845 lb.
LEVEL SPEEDS
Radiator and oil cooler shutters flush with fuselage

Standard Height Feet.	True Air speed m.p.h.	A.S.I. m.p.h.	Position Error Correction.	Compressibility correction.	R.P.M.	Boost inches of Hg.
6000	326	292.5	+7.6	-1.3	2950	42
8000	335	291	+7.5	-1.7	"	42
10000	343	289	+7.5	-2.2	"	42
12000	351	287	+7.4	-2.7	"	42
13000 X	355	286.5	+7.3	-2.9	"	42
14000	354	281	+7.2	-3.0	"	40.5
16000	351	270.5	+6.8	-3.3	"	37.7
18000	347	259	+6.5	-3.4	"	35
20000	341.5	246.5	+6.0	-3.4	"	32.1
22000	334.5	234	+5.6	-3.4	"	29.3
24000	325	219.5	+5.1	-3.2	"	26.5

X Full throttle height.

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AIRACOBRA. AH-573 FIG 1

WEIGHT ~ 7830 lbs.

RATE OF CLIMB. BOOST, AND TIME TO HEIGHT.

RADIATOR AND OIL COOLER SHUTTERS CLOSED.

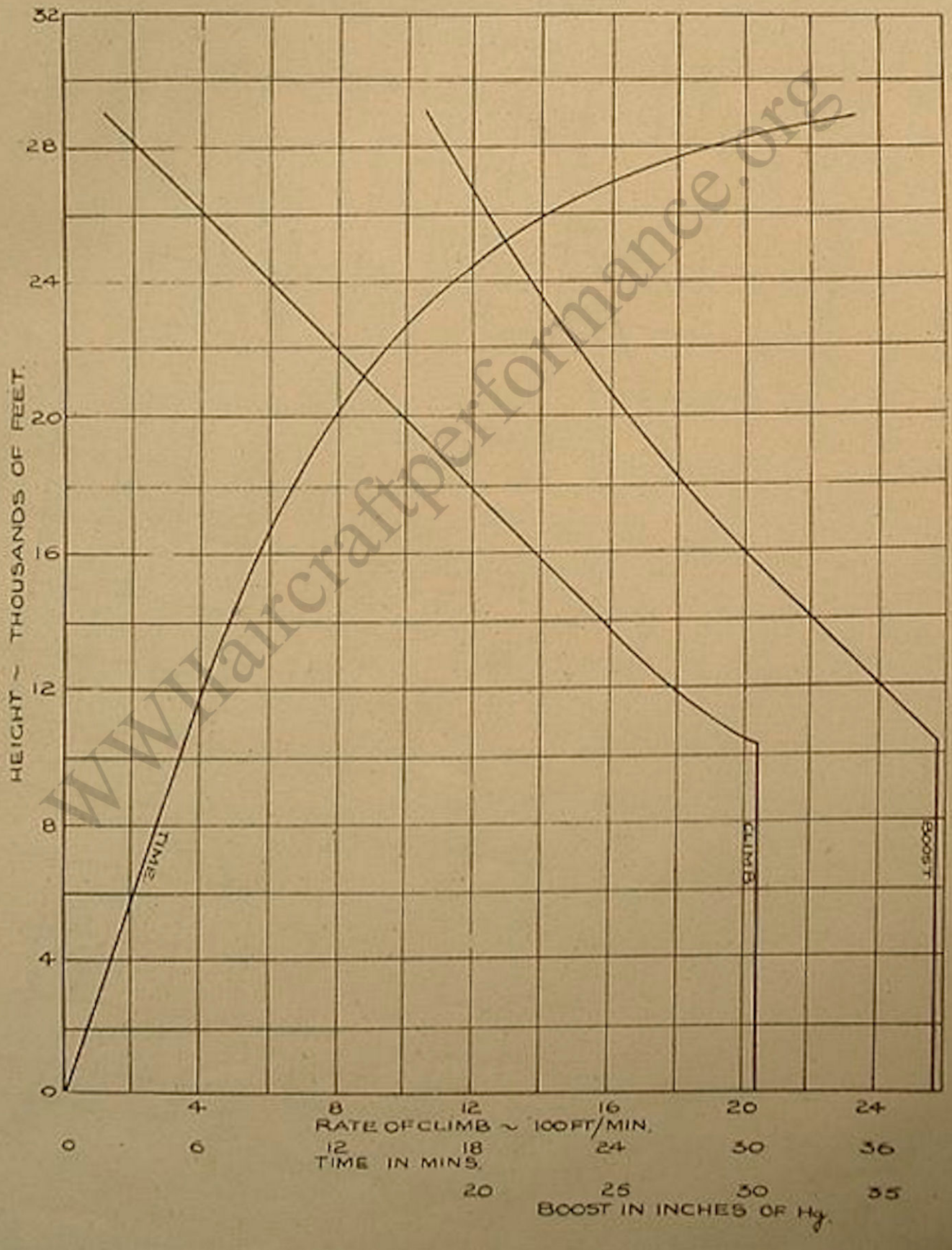

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FIG 2.

AIRACOBRA. AH-701

WEIGHT ~ 7845 lb.

LEVEL SPEEDS AND BOOST AT HEIGHT

RADIATOR AND OIL COOLER SHUTTERS FLUSH WITH FUSELAGE.