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18th Part of Report No. A.A.E.E./783  
 6 JUN 1943

AIRCRAFT AND ENGINE EXPERIMENTAL ESTABLISHMENT

BOSCOMB DOWN

Kittyhawk IA L.T.573  
(Allison V.1710 F3R)

Level speed performance with a modified engine cowling incorporating air cleaners	STOCK
DATE 5/1/53	22
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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 Prodn.

A.&A.E.E. Ref:- 4484/1 - A.L.229/6  
 M.A.P. Ref:- D.A.(N.A.)2  
 Period of tests:- 1st May - 9th May, 1943

Progress of Issue of Report

Report No.	Title
13th Part of A.&A.E.E./783.	A.L.229 - Gun heating trials.
14th do.	A.L.229 - Level speed measurements with flame damping exhausts fitted.
15th do.	A.L.229 - Weights and loading data.
16th do.	A.K.751 - Handling and performance with a Hydulignum propeller.
17th do.	A.L.229 & A.K.572 - Handling trials.

1. Introduction.

Kittyhawk I L.T.573 was fitted with a special engine cowling incorporating air cleaners which were housed in fairings on either side of the engine cowling. Level speed tests were required to establish the performance of the aircraft so modified.

Photographs of the nose cowling are attached.

2. Condition of aircraft relevant to tests.

2.1. General. The principal features of the aircraft were:-

- Allison V.1710-F3R engine.
- Curtiss Electric Propeller C532D - F52.
- Modified engine cowling incorporating hot air, cold air, and air cleaner intakes.
- Individual stub exhausts.
- 6 x 0.5" guns in wings with ejection chutes open and leading edge ports sealed.
- Camera gun fairing below starboard wing.
- Bead and ring sight in front of bullet-proof windscreen.
- Faired rear view mirror above windscreen.
- V.H.F. aerial below starboard wing.
- No W/T mast or aerial, and no I.F.F. aeriels.
- Bomb rack beneath fuselage.
- Trailing earth wire forward of tail wheel.
- The pressure head installation was identical to that fitted on Kittyhawk A.K.572, as described in the 8th Part of Report No. A.A.E.E./783.

2.2. Description of air intake control. There are three intakes for carburettor air as detailed below:-

- (a) Normal cold air from intake on top of engine cowling.
- (b) Cold clean air from cleaner intakes on either side of engine cowling.
- (c) Hot air ducted to carburettor from rear of radiator.

Choice of carburettor air is effected by three numbered control knobs in the cockpit. The controls are operated by releasing a locking catch and pulling. The combinations of operation are printed clearly on a plate in the cockpit and are as follows:-

- (i) Normal cold air 1,2,3 IN
- (ii) Clean air only 3 IN; 1,2 OUT
- (iii) Hot air 1 IN; 2,3 OUT

/2.3.

2.3. Loading. All tests were carried out at the following take-off loading:-

Take-off weight 8,650 lb.  
Centre of gravity position 25.9" aft of datum

2.4. Engine numbers and limitations. The relevant operational limitations of the engine fitted, an Allison V.1710-F3R, Nos. 9812/42-34127, were:-

	<u>R.P.M.</u>	<u>Boost</u> <u>Ins.Hg.</u>
All-out level flight (5 min. limit)	3000	42

3. Tests made.

(i) Measurements of all-out level speeds were made from 2,000 to 20,000 ft. with the radiator exit duct gills in the neutral position, using normal cold air only.

(ii) The operation of the air cleaner and the carburettor air controls was tested, each variety of air being used.

4. Results of tests.

4.1. All-out level performance. The performance results have been corrected to standard atmospheric conditions and to 95% of the take-off weight, viz. 8,220 lb., by the methods given in Report No. A.& A.L.E./Res/170. The position error correction has been taken from that given in the 8th Part, Report A.& A.L.E./783, on Kittyhawk A.K.572.

The full results of the all-out level speeds are given in Table I and in Fig. 1. Briefly the results are:-

Standard height (feet)	Max. T.A.S. m.p.h.	Boost Ins.Hg
2,000	292	42
10,000	322	42
13,500*	335	42
20,000	320	32.6

\*Full throttle height.

4.2. Operation of air controls to carburettor.

The three control knobs are within comfortable reach of the pilot. The carburettor air controls were satisfactorily operated at all speeds up to 350 mph. ASI.

Full take-off boost was obtainable with the air cleaners in operation.

On a climb at maximum normal climbing power (2600 rpm. and 37"Hg. of boost), changing over from normal cold air to the air cleaners caused a decrease in boost of 2"Hg. Similarly, when changing from normal cold air to hot air there was a decrease in boost of 1½"Hg.

5. Discussion of results.

Comparing the figures obtained on these tests with those given in the 10th Part of Report No. A.& A.L.E./783, for Kittyhawk I A.L.229 without external fuel tank fitted, suggest that the modified nose cowling incorporating air cleaner ducts makes very little difference to the level speed performance. It should, however, be borne in mind that two different aircraft are being compared, and no accurate conclusions can therefore be drawn (see para. 6).

6. Further developments.

This aircraft is at present being fitted with a standard cowling and on returning to this Establishment further all-out level tests will be carried out when a more strict assessment of the effect on speed of the modified cowling will be possible.

/TABLE I

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Stan

TABLE I

Level speed performance  
with air cleaner cowling, using normal cold air.

Cooling gills in neutral position. Corrected to 8,220 lb.

Standard height (feet)	T.A.S. m.p.h.	A.S.I. m.p.h.	Corrections m.p.h.		Boost Ins.Hg.	R.F.M.
			F.E.	C.E.		
2,000	292	274	+9.6	-0.3	42	3000
4,000	299	273	+9.6	-0.7		
6,000	307	272	+9.6	-1.1		
8,000	315	271	+9.4	-1.5		
10,000	322	269	+9.3	-1.9		
12,000	330	268	+9.2	-2.4		
13,500*	335	266	+9.1	-2.7		
14,000	335	264	+9.0	-2.8	41.2	
16,000	331	253	+8.0	-2.9	38.3	
18,000	326	242	+7.1	-2.9	35.5	
20,000	320	231	+6.0	-2.9	32.6	

\* Full throttle height.

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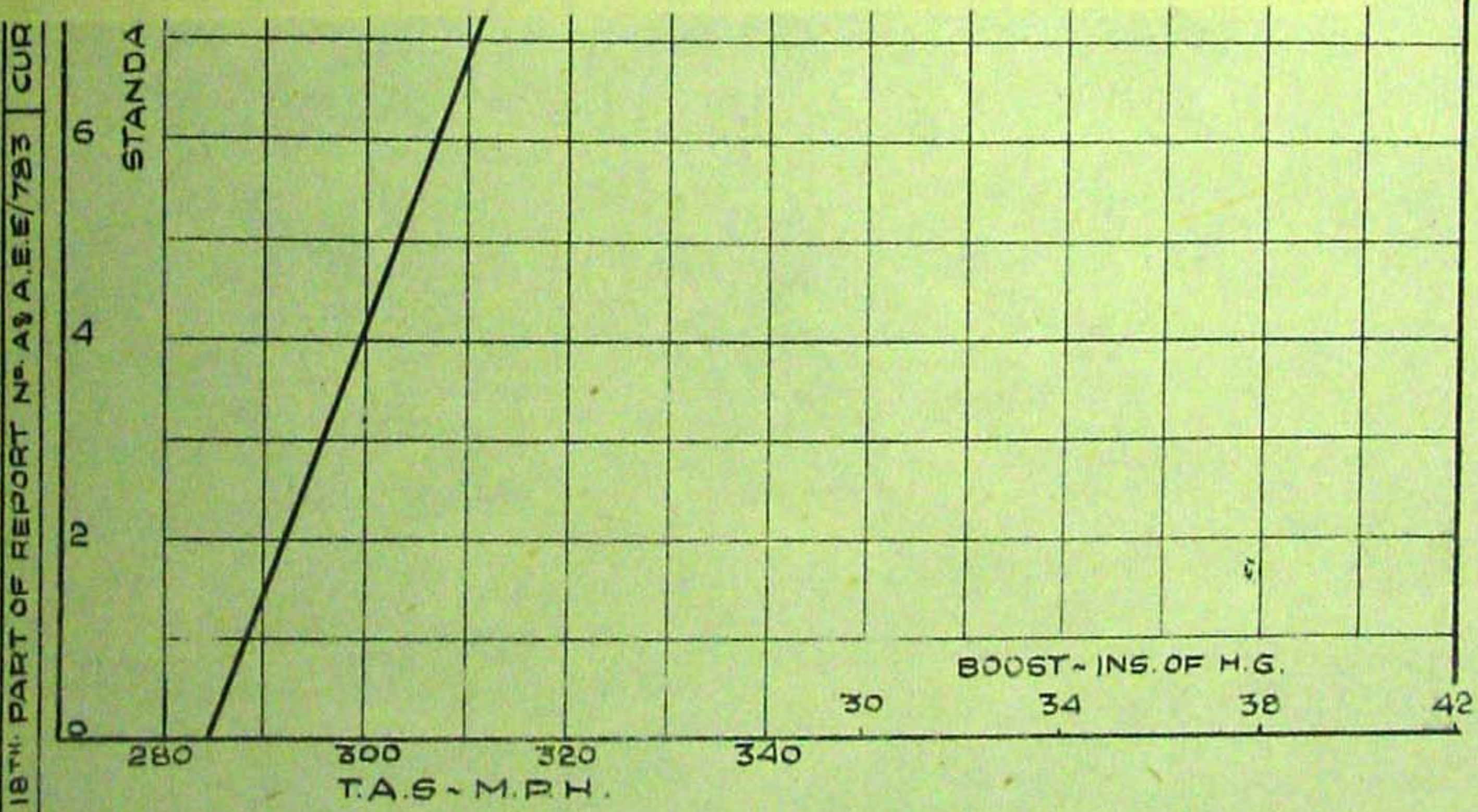
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FIG. 1  
NER



# KITTYHAWK IA ET 573

Fig. 1

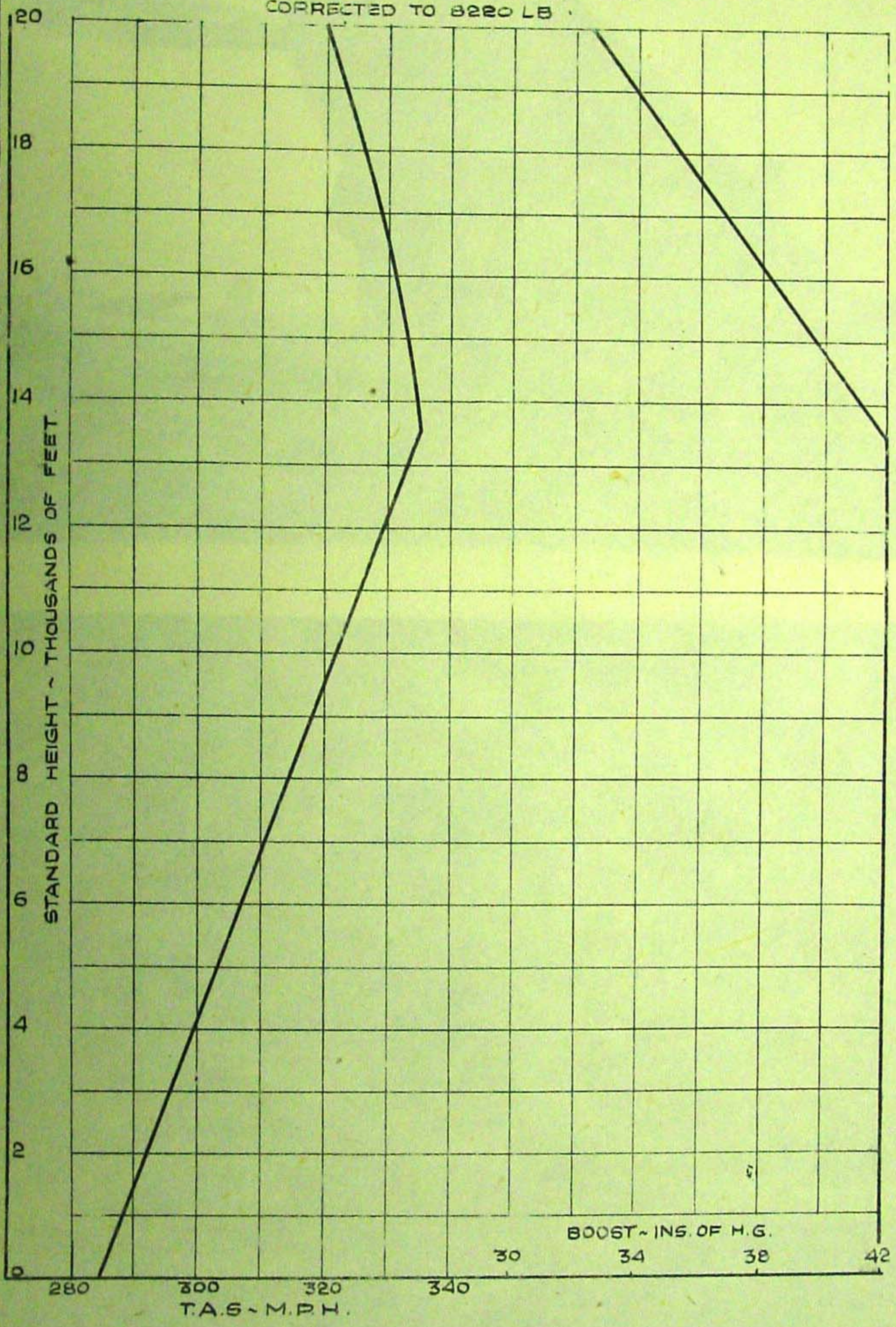
ALLISON V1710 F3. R

## LEVEL SPEED PERFORMANCE WITH AIR CLEANER COWLING FITTED.

USING COLD AIR WITH CLEANERS BY-PASSED.  
COOLING GILLS IN NEUTRAL POSITION.

CORRECTED TO 3200 LB.

18<sup>TH</sup> PART OF REPORT NO. A9 A.E.E./793 CURVE NO. 5288. TRACED. A.A. DATE OF TEST 1/19/54. APPROVED. 2-5-54





A.M. 11430.