4th Part of Report No. A.& A.E.E./769,c

AIRCRAFT AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
BOSCOMBE DOWN

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 MAP

Liberator VI EW.126
(4 Twin Wasp R.1830-65)

Take-off and handling trials at overload

A.& A.E.E. ref:- ETO/AM.63/12.
M.A.P. ref:- RA.3091/DANA.2.
Period of test:- June 1944.

Progress of issue of report

Report No.	Title
1st Part of A.& A.E.E./769,c	EV.828/G - Position error trials.
2nd -do-	EW.126 - -do-
3rd -do-	BZ.970 - Special flame damping trials with standard exhaust system.

1. Introduction.

The maximum weight at which Liberator aircraft have previously been flown at this Establishment is 62,000 lb. Take-off measurements and general handling tests have now been made on Liberator VI EW.126 at weights up to 65,000 lb. and are dealt with in this part of the report. Liberator VI aircraft at 65,000 lb. are only permitted to carry out straight and level flying and gentle manoeuvres.

2. Condition of aircraft relevant to test.

2.1. General. The chief external features were:-

1. Consolidated turret in nose - 2 x 0.5 in. guns.
2. Glen Martin mid upper turret - 2 x 0.5 in. guns.
3. Consolidated turret in tail - 2 x 0.5 in. guns.
4. Provision for beam guns (guns stowed internally) - 1 x 0.5 in. on each beam.
5. Retractable ball turret.
6. Astro dome and navigation blisters.
7. Faired DF loop.
8. 3 W.T. aerials from fins to fuselage, trailing aerial I.F.F. Mk.III (sword type), Whip aerial, BA aerial.
9. Tail skid.
10. Radio altimeter aerial under each wing.
11. Drift sight.

2.2. Engine numbers and limitations. The following were the numbers of the Twin Wasp R.1830-65 engines fitted:-

PO	PI	SI	SO
BP.403846	BP.431094	BP.430963	BP.431072
A.563221	A.563222	A.564436	A.564437

The engine limitations in force at the time of test were:-

	Boost Ins.Hg.	RPM
Max. for take off.	52	2700

2.3. Propellers. The propellers fitted were 11'6" diameter Hamilton Standard Hydromatic type 23E50-473, Blade Drawing No.64477A-0. The fine pitch setting was 18°.

/The

The serial numbers were:-

PO	PI	SI	SO
FA.4625	FA.4651	FA.4654	NK.73355

2.4. Airspeed system. The pilot's ASI was connected to the pitot of the port pressure head and the common static of port and starboard pressure heads.

2.5. Loading. The tests were made at the following loadings:-

Weight lb.	C.G.position ins.aft of datum. (undercarriage down)
60,000	52.7
61,000	54.8
62,000	55.9
63,000	55.6
64,000	56.8
65,000	56.4

The design CG limits were 42.0 and 60.4 ins. aft of datum. There is no change of CG position on retracting undercarriage.

3. Tests made.

Take-off measurements were made at each of the loadings of para. 2.5., two take-offs being measured at 65,000 lb. Each run was made using 2700 rpm, 52" Hg. boost, gills closed and 15° flap.

A general assessment of the handling qualities was obtained during performance trials at 65,000 lb. but a full series of handling tests was not made. The scope of the tests was limited by the aircraft being restricted to gentle manoeuvres only.

4. Results.

4.1. Take off. The results have been corrected to standard ICAN atmospheric sea-level conditions, zero wind and zero ground slope. They are presented graphically in Fig.1 and given in tabular form below. The results given below have been obtained from faired curves drawn on the assumption that the take-off distance is proportional to W^n, where n was found to be 3.5.

Gills closed

Weight lb	Take-off distance yds.	Distance to 50 ft yds.	TAS Take-off mph	ASI Take-off mph
60000	1180	1730	122	
61000	1250	1840	124	
62000	1320	1950	126	120
63000	1390	2070	128	125
64000	1470	2200	131	125
65000	1550	2630*	135	132

* The actual distances to 50 ft, when corrected to standard conditions were 2500 and 2760 yards (mean 2630 yards) on the two tests made. The value expected from the $W^{3.5}$ law is 2330 yards. This increase in the distance to 50 ft. at 65,000 lb. is due to the increased climbing speed used by the pilot, necessitated by the deterioration in control at this weight.

The take-off was straightforward. The aircraft showed no tendency to swing and the throttles could be opened rapidly. In each case the nose wheel was kept on the ground until a speed of 10 - 15 mph below take-off speed was reached and then the tail was eased slowly down and the take-off made.

/4.2.

4.2. Handling. From 60,000 to 65,000 lb. there was a noticeable increase in the response of the aircraft to the controls.

The controls on this aircraft were somewhat lighter than those on other Liberator aircraft tested here. This factor gave a distinct improvement over the normal handling qualities of the type.

At these C.G. positions (52.7 - 56.4" aft of datum, undercarriage down) the aircraft showed a tendency to tighten up in turns, the tendency being more marked at low speeds that at higher speeds. Also more attention was required of the pilot to maintain a straight and level course.

When the cooling gills were opened more than 2/3 - $\frac{3}{4}$ violent tail buffeting occurred which increased to a maximum with gills fully open. Although detailed cooling trials have not been carried out preliminary indications are that it is necessary to open the gills on the climb and for some level flight conditions, to obtain adequate engine cooling. Under these conditions the aircraft became very unpleasant to handle and instrument flying was virtually impossible due to the disturbances set up.

Under bumpy weather conditions the aircraft became less pleasant to fly due mainly to the lack of response of the aircraft to the controls and the consequent larger control movements needed.

5. Conclusions.

The take-off at a weight of 65,000 lb. is straight forward, the take-off distance is 1550 yards and distance to 50 ft. is 2630 yards.

The aircraft is considered to have satisfactory handling qualities at 65,000 lb. except when gills are fully open or when the weather is extremely bumpy. Under these conditions the handling is less satisfactory due to the lack of response of the aircraft to the controls.

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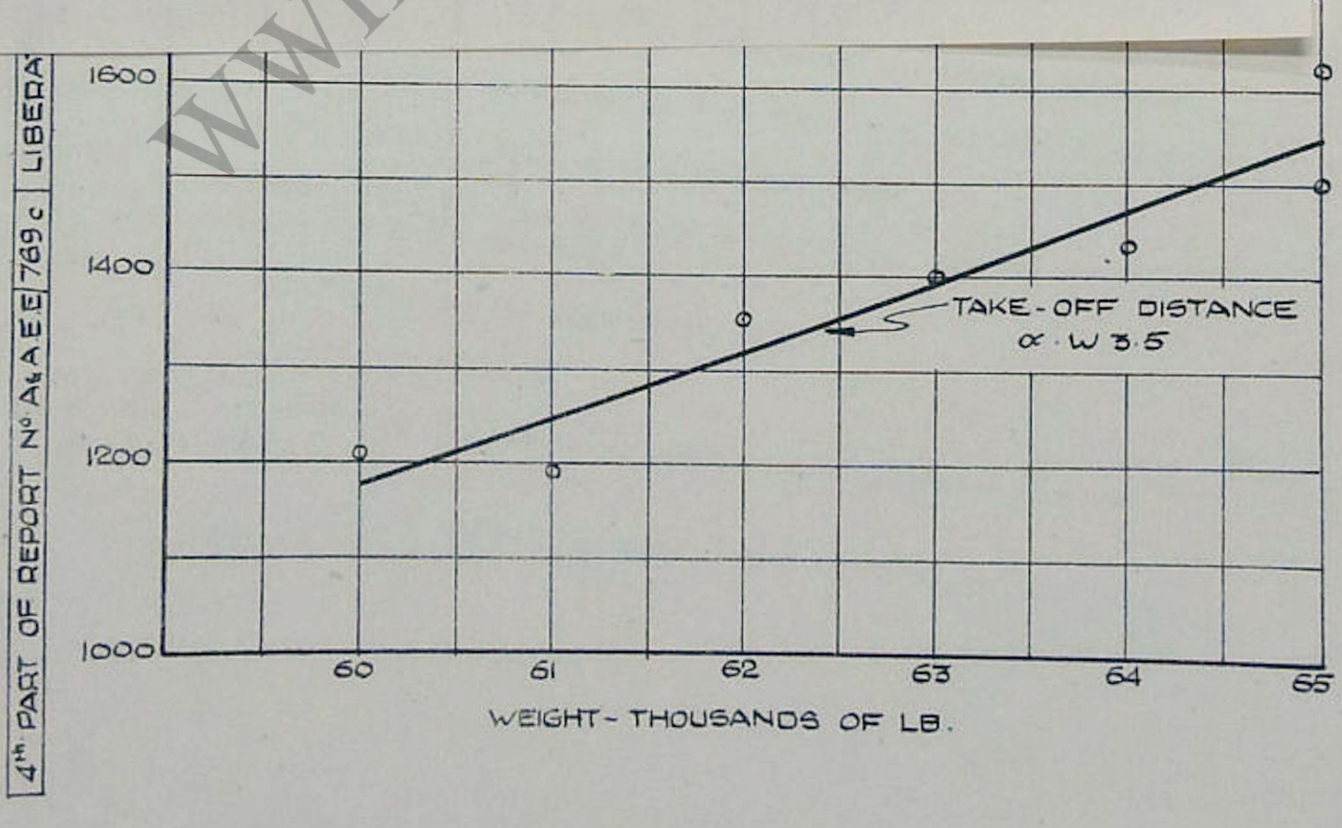
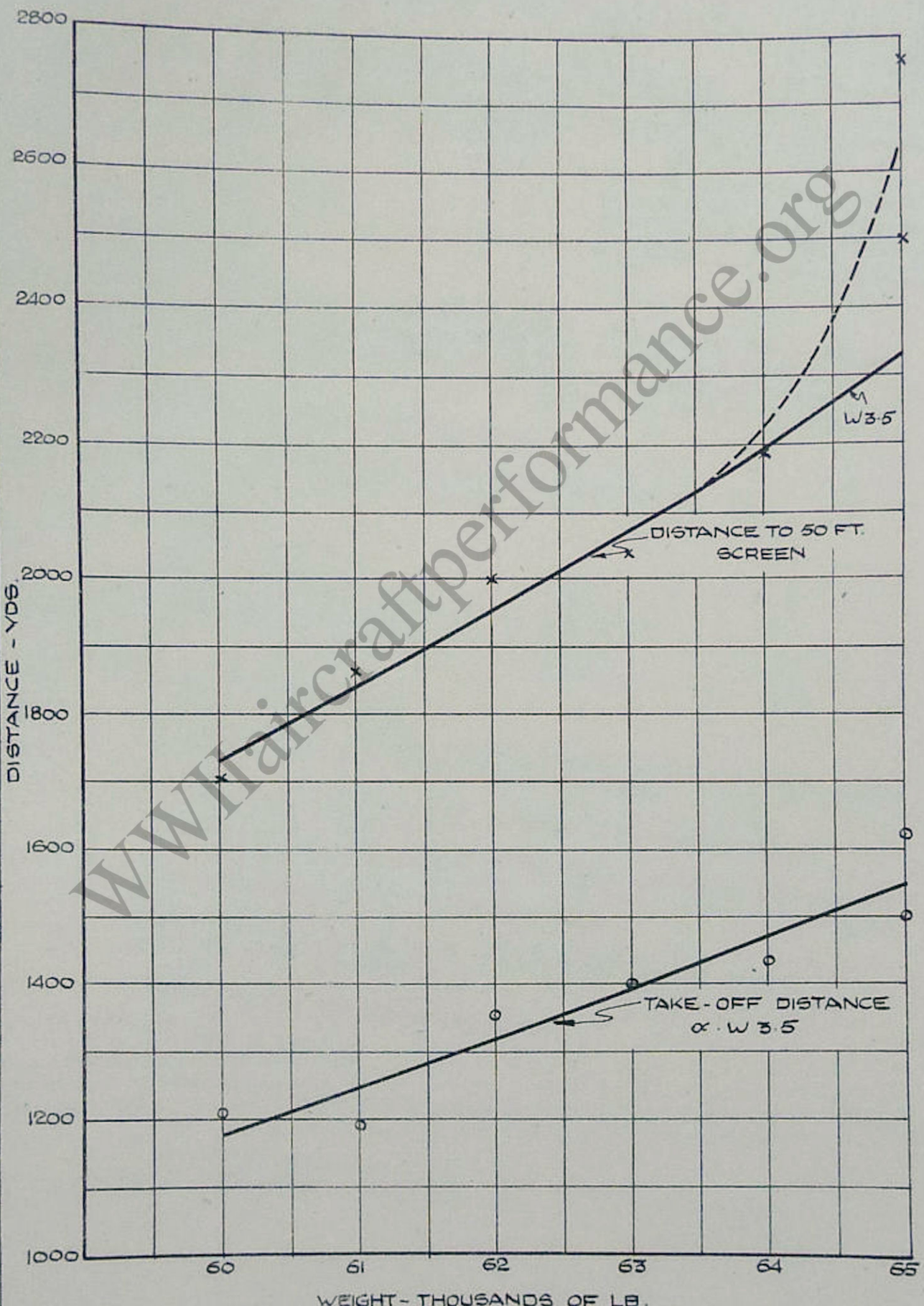


FIG. 1

TAKE - OFF DISTANCE - WEIGHT

CORRECTED TO STANDARD CONDITIONS AND ZERO WIND
GILLS CLOSED 52 "Hg BOOST 2700 R.P.M. 15° FLAP.



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