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AIRCRAFT AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
BOSCOMBE DOWN

Vampire I TG.274
(Goblin I)

Preliminary handling trials of first production aircraft

This report deals with the aircraft or equipment as tested. Action to remedy details or decisions to accept items not in strict compliance with the specification are matters for decision & action by the Ministry of Aircraft Prodn.

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Progress of issue of report

Report No.	Title
1st Part of A.& A.E.E./819,a.	TG.274 - Weights and loading data.
2nd do.	TG.274 - Carbon monoxide contamination tests.

Summary.

General handling trials have been made on the first production Vampire I TG.274, which differed from the prototype aircraft in having a de Havilland Goblin engine of higher maximum thrust.

The trials were made at the typical service loading of 8610 lb. with the centre of gravity position at 6.3 ins. aft of datum (undercarriage up).

The results of the tests showed the aircraft to be very pleasant for general flying, but the stick force per 'g' to manoeuvre in the looping plane was considered to be lower than was desirable for a modern fighter. Also, aileron overbalance at high Mach numbers, which was present on the prototype Vampire, was more marked on this aircraft.

1. Introduction.

The first production Vampire I TG.274 was delivered to this Establishment for general trials to clear the type for Service use. This part of the Report contains the results of general qualitative handling tests together with brief quantitative measurements of elevator stick forces and normal accelerations at the normal fighter load.

Since the previous tests on the prototype MP.838 were of a very brief nature and the preliminary information from the results received only a limited circulation (reference 1st part of this Report), this present part of the Report has been compiled treating TG.274 as a new type and contains the minimum of references to the previous Report.

Preliminary results of the tests which form the subject of this part of the Report have been forwarded to MAP by letter dated 5.7.45 reference A.& A.E.E./5719,c/1.

2. Condition of aircraft relevant to tests.

2.1 General. The aircraft was the first production Vampire I to be made by Messrs. English Electric. Routine four-view photographs of the aircraft are given at the end of the Report. The salient external features of the aircraft were as follow:-

Plain unslotted air brake flaps were fitted at the trailing edge of the mainplanes between the ailerons and the booms.

Engine air intakes in the leading edge of each wing root.

A sliding balloon non-rear view type hood was provided, with a flat bullet proof windscreen.

Carriers for drop tanks were fitted on the underside of both mainplanes.

/Four

Four 20 mm. Hispano Mark V guns were fitted in the underside of the fuselage with muzzles and ejection chutes sealed.

I.F.F. aerial on underside of fuselage below cockpit.

2.2 Flying controls.

2.21 Elevator. The elevator was of rectangular shape with two mass balance weights fitted on supporting arms on the underside. A combined trimmer and geared balance tab (gear ratio 0.15) was fitted. A 5 lb. inertia weight on a one foot moment arm was fitted in the elevator control circuit, together with bungee in the port boom giving an additional down elevator movement of 10 lb. ft. Fig.1 gives a plan view of the elevator and elevator trimmer.

2.22 Ailerons. The ailerons were of approximate constant chord except at the outboard end, and were fitted with geared balance tabs. Fig.2 shows a plan view of the port aileron and balance tab.

2.23 Rudders. The rudders were fitted with small rectangular horn balances and set back hinges together giving a percentage balance of 15.2. Each rudder was in two separate parts due to the fixed tailplane attachment. A small trimmer tab, which was only adjustable on the ground, was fitted at the trailing edge of each rudder. The trailing edge of both rudders and trimmer tabs was of approximately 5/16" thickness.
Fig.3 shows an elevation of the port fin and rudder with trimmer tab.

2.24 Control column friction. The friction measured at the top of the control column was approximately 6 lb. in the elevator circuit and 2½ lb. in the aileron circuit. The aileron circuit friction is equivalent to the maximum as laid down in AP.970 and the elevator circuit friction is 2 lb. over the maximum.

2.3 Engine installation. The engine fitted was a de Havilland Goblin I which was similar to the Halford H1A previously installed except that it had a maximum static thrust rating of 2700 lb. at sea level as opposed to 2500 lb. on the previous Halford engine. No barostat or fuel booster pump was fitted but it was understood that these will be fitted on later production aircraft.

2.4 Airframe limitations. These were as follow:-

Maximum speed (air brakes open or closed)	510 mph ASI at 5,000 ft.
	430 " " " 15,000 ft.
	350 " " " 25,000 ft.
	280 " " " 35,000 ft.
	(M = 0.76)
Maximum speed with flaps down	170 mph ASI
" " " undercarriage down	200 mph ASI

These limitations also applied to the prototype Vampire I MP.838.

2.5 ASI system. All speeds quoted in this Report were obtained from an airspeed indicator which was connected to the pitot and static sides of a Mk. VIIIB 24 volt pressure head, reference No.6A/729, fitted at the top of the port fin.

2.6 Loading. The tests were done at the following take-off loading:-

Condition	Weight lb.	C.G. Position			
		U/C down		U/C up	
		ins.aft of datum	% SMC	ins.aft of datum	% SMC
Max.fighter load, full fuel, oil, ammunition and service equipment	8610	6.1	28.0	6.3	28.2

The design c.g. limits were from 5.7 ins. to 8.6 ins. aft of datum (i.e., 27.4% to 31.0% SMC).

Use of all ammunition moves the c.g. 2 ins. aft and expenditure of all fuel 0.1 ins. aft at the above loading.

3. Tests made.

General handling tests were made including qualitative assessment of the cockpit layout, ground handling, flying qualities and longitudinal, lateral and directional behaviour and control. Some brief measurements of elevator stick forces and normal accelerations were also obtained using an RAE hand held stick force indicator and a Watt type accelerometer.

4. Results of tests.

4.1 Cockpit layout.

4.11 Ease of entry and comfort. A retractable step on the port side of the fuselage was provided for entry to the cockpit. This retracted into the side as soon as it was relieved of the pilot's weight. Although this ensured retraction before take-off, it was considered unsuitable for maintenance and for leaving the cockpit. The step was found to be too high for a short pilot and it was thought that another step situated lower down and further aft would be of assistance. For ease of maintenance it was thought that a distance piece should be provided to hold the step in the extended position when required.

The seating position was comfortable but the anchorage for the lower straps of the seat harness was situated too far forward, and even when fully tightened the harness did not hold the pilot in tightly. The harness release could not easily be seen or felt as it was rather far back on the right hand side of the seat. It was thought it would be better positioned further forward and higher up. Cockpit ventilation was satisfactory but no heating was provided and the cockpit was cold.

4.12 View. Although the view forward was satisfactory, considerable improvement to the side and rearward view is necessary to bring it up to modern fighter standards. The hood was satisfactory but was placed too far back and consequently the pilot was sitting immediately opposite the thick frame of the side panels. No clear vision panels were fitted, but visibility appeared satisfactory in rain. During gradual descents from high altitude a severe misting on the outside of the front windscreen and on the inside of the side panels occurred, which required some minutes to clear. A dangerous situation may arise if an immediate landing has to be made after descending from high altitude.

4.13 Layout of flying controls and instruments. In general, the cockpit layout was considered satisfactory, but the points which are outlined in the following sub-paragraphs, were considered to require improvement.

4.131 Landing flaps and undercarriage controls. Both control levers fell readily to hand and functioned satisfactorily, but owing to the similar feel of the levers and their close proximity it was considered that there was an extreme likelihood of mistaking the two controls. This has been proved in practice and a modification is understood to be in hand. The neutral position of the flap lever was not positive enough and should be improved.

Although a safety device was incorporated in the undercarriage system to prevent inadvertent retraction on the ground, this did not appear to function satisfactorily in the case experienced at this Establishment. In the event of brake failure, a switch was fitted in the top left hand corner of the main panel, selection of which enabled the undercarriage to be retracted on the ground. It was considered that this switch was too inaccessible and would be difficult to locate in an emergency.

The undercarriage retraction was smooth and satisfactory.

4.132 Brakes. The brake system was of the differential pneumatic type, which worked well and was considered satisfactory, but an emergency brake system such as an air bottle was considered desirable.

/4.133

4.133 Instruments. The fuel gauges required improvement as they were very inconsistent. The readings varied to an abnormal degree with attitude and altitude. They read high when the aircraft was diving and low when the aircraft was climbing. When flying level at the same indicated speed the contents gauges read less at high altitude than at low altitude for a greater actual fuel contents.

The engine speed indicator was difficult to read quickly as the small hand appeared to get out of gear at the higher end of the range, and a mistake of 1000 rpm in the reading could be easily made. It was recommended that a low geared instrument such as that fitted on other jet aircraft would be an advantage for Service use.

4.134 Miscellaneous. The dive brake selector was situated rather far back and when moving the throttle lever it would be possible to move the dive brake selector inadvertently.

The V.H.F. control box was situated out of comfortable reach on the lower left hand side of the cockpit.

4.14 Engine controls.

4.141 Fuel cock. The fuel cock control, which was situated on the left side of the cockpit, was awkward to operate; the pilot could not use his left hand for the full movement of the lever as the trimmer wheel obstructed the run and it was necessary to use the right hand to complete the movement. This would be a disadvantage when restarting in flight as it would entail taking the right hand off the control column.

4.142 Throttle control. The action of the friction damper on the throttle was too coarse and when the screw was tightened slightly, it rendered the throttle almost immovable.

No barostat was fitted on this aircraft but it is understood that later production aircraft will be fitted with these. When the aircraft was climbing at its best climbing speed with an engine speed of 9500 rpm, it was found that, after about 20 seconds, the engine rpm had risen to 10,000. The amount by which the rpm increased became less with increase of altitude. The pilots considered that adjusting the rpm at intervals necessitated by the absence of a barostat was not an important disadvantage.

4.2 Ground handling.

4.21 Engine starting. The engine was started as follows:-

1. Fuel cock control lever was put to "on".
2. Throttle lever was set to closed position.
3. Ground starter battery was connected to aircraft and green warning light on the right hand side of the cockpit was observed to light up.
4. Safety starter switch was switched on.
5. Main starter button pressed for two seconds and released.

The electric starter motor assisted the engine to 3000 rpm and was then switched off with the engine running under its normal cycle.

The engine starting was reliable and generally considered to be comparable with other types of jet-engined aircraft.

4.22 Taxying. A slight pitching motion was noticed while taxying the aircraft on rough ground, but no improvement to the nose wheel action was considered necessary. As there was no slipstream acting on the rudder during taxying, the brakes had to be used for steering. The aircraft was taxied in various wind strengths and directions and it was noticed that there was a tendency to swing to starboard, slight touches of the left brake being required occasionally to steer a straight course. The view ahead while taxying was excellent.

4.3 Flying characteristics.

4.31 Take-off and initial climb. A flap setting of 30° was used for take-off throughout the tests and the elevator trim setting at this loading was neutral. It was possible to run the engine at take-off rpm without creeping of the brakes. When the take-off rpm of 10,000 was reached, the brakes were released and the resulting acceleration was steady and smooth. There was no tendency to swing unless the nose wheel was out of central or the brakes unequally released. When a swing developed, brakes were used to correct it as the rudder was not effective below about 60 mph ASI.

Compared with propeller engined fighters, the aircraft's take-off distance was long.

As is usual with tricycle undercarriage aircraft, vigorous application of the elevator was necessary to get the aircraft airborne in a reasonable distance. At 100 mph ASI, the elevator became effective and the aircraft appeared to "leap" into the air at 110 mph ASI.

The undercarriage retraction took approximately three seconds and resulted in a very slight nose up change of trim. The flaps were retracted immediately after the undercarriage. The action was slow and steady. A slight nose down change of trim was experienced, and the sink was not appreciable.

4.32 Climb. Using climbing conditions of 9500 rpm, the aircraft was trimmed to climb at 220 mph ASI, which appeared to be the best climbing speed. At these conditions the behaviour of the aircraft was satisfactory and the stability was such that it could be flown comfortably with "hands and feet off". If the power were kept the same and the speed reduced to below 180 mph ASI, the port wing tended to drop and the aircraft to yaw to the left. When speed was increased to above 180 mph ASI, the right wing tended to drop and the aircraft to yaw to the right. This change of trim was very small and was only noticeable when the aircraft was flown "hands and feet off".

4.33 Level Flight. In general, the behaviour of the aircraft was satisfactory at all conditions of straight level flight. The aircraft could be flown comfortably for long periods "hands and feet off" in calm air under normal cruising conditions.

In rough air a directional oscillation was sometimes apparent. The nature of the oscillation was not violent. This "snaking" behaviour is further described under para.4.43.

It was noted that it was possible to exceed the aircraft's maximum permissible Mach number when using combat engine conditions of 10,000 rpm in level flight at heights around 35,000 ft. The highest Mach number obtained in level flight was 0.768 and no compressibility effects were apparent apart from aileron overbalance.

4.34 Stalls.

4.341 Flaps and undercarriage up. When trimmed for level flight at about 200 mph ASI, speed was reduced by easing back the control column. At 120 mph ASI, there was slight elevator buffeting becoming more pronounced as speed was reduced. At 110 mph ASI, the rudder became ineffective and the aircraft gradually began to yaw to the left while the lateral stability became poor. At 110 mph ASI, there was a tendency to fly left wing low but it could be corrected by applying a little aileron. This appeared to increase the aircraft's tendency to yaw. At 104 mph ASI, the ailerons gave a slight twitch and simultaneously a gentle stall occurred, the nose dropping a little below the horizon with the yaw to the left increasing. Just before the stall, a moderate pull force was required to keep the nose up and the control column was half way back from the neutral position. Recovery was made by the normal method and was satisfactory.

4.342 Flaps and undercarriage down. At a trimmed speed of 140 mph ASI, tail buffeting was noticeable and became worse as speed was reduced below 110 mph ASI. There was a similar approach to the stall as in the flaps and undercarriage up case, slight aileron twitching occurred at 85 mph ASI and was followed immediately by the nose dropping and the left wing falling away at 84 mph ASI. The stick force to stall was moderate, but due to the marked nose up

/change of trim..

change of trim with flaps down, the control column was ¼ forward from the neutral position. As in the previous case, the recovery was normal.

4.35 Dives. The aircraft was dived to the limiting diving speed of 510 mph ASI at 5000 ft., and was considered satisfactory. During the dive, speed increased rapidly. The change of longitudinal trim with speed from 300 mph ASI was moderate, and could easily be held at 500 mph ASI. Above 400 mph ASI, there was a small vibration of the control column which was slight until the limiting diving speed was reached, where it became more apparent, but it was not considered dangerous. At 500 mph ASI, the ailerons were moderately light and effective, but the rudder was heavy, even for small angular movements.

High altitude dives were also carried out up to the Firm's value of the aircraft's limiting Mach number of 0.76. No abnormal longitudinal behaviour was apparent at speeds up to this Mach number although aileron overbalance became evident at Mach numbers above 0.74 (see para.4.42).

The quantitative measurements of stick forces and accelerations during dives and recoveries (see Figs.4,5 and 6) show the longitudinal behaviour to be satisfactory in out of trim conditions, but when trimmed into the dive the stick force to produce 5 'g' accelerometer reading during the recovery was considered dangerously light.

4.36 Manoeuvrability. All fighter manoeuvres were carried out with ease, the aircraft's manoeuvrability being good. However, the poor directional control (see para.4.43) was inclined to make accurate rolling a little difficult.

When the aircraft was manoeuvred into a tight turn at 170 mph ASI at 35,000 ft. it tended to tighten up at 2.5 'g' accelerometer reading. At 30,000 ft., and 300 mph ASI ($M = 0.71$) it was possible to obtain 5 'g'. This acceleration was considered to be exceptional for a modern fighter at this height owing to the limitations normally imposed by compressibility.

Curves giving quantitative results are included at the end of this Report, Figs.4,5 and 6 give the stick force required to hold the aircraft in an out of trim dive, the acceleration on releasing the control column, and the stick force per increment of 'g', respectively.

4.37 Approach and landing. Due to the aerodynamic cleaness of the aircraft and also because there was considerable thrust from the engine at idling rpm, it was difficult to lose speed quickly during the approach. There was no appreciable change of trim with undercarriage lowering, which took approximately four seconds. When the flaps were lowered below 170 mph ASI, there was a gradual nose up change of trim which could easily be held with a moderate push force. The glide approach with engine off was shallow and the pilots had the impression that the aircraft was underflapped, but it was thought that this was probably due to the considerable thrust generated with the engine at idling speed. The best approach speed was considered to be 110 mph ASI reducing to 100 mph ASI as the airfield boundary was crossed. During the touch-down moderate care had to be exercised in preventing the tail skids from touching the ground. The touch-down speed was between 90 and 95 mph ASI, and no swing was apparent during the run. Although deceleration was fairly high on grass, it was necessary to apply a small amount of brake to decrease the length of the run. A cross wind of 15 mph had no apparent effect on the landing run characteristics.

The aircraft was also landed with the air brakes in the extended position. With the engine at idling speed, the approach was steeper and the run shorter. No adverse characteristics were noticed except for the tail buffeting (see para. 4.44), which always occurred with the air brakes extended.

4.38 Baulked landing. When full power was applied, speed increased slowly with a small nose up change of trim which increased as the undercarriage and flaps were retracted. The change of trim, however, could be easily held by a moderate push force without retrimming. As the flaps were retracted, speed increased quickly and the climbing speed was soon reached. In the pilots' opinion the operation compared very favourably with other modern fighters.

4.4 Assessment of control and behaviour.

4.41 Longitudinal. It was considered that the degree of longitudinal stability was satisfactory at the loading tested. For all general flying and manoeuvres, the aircraft's longitudinal characteristics were considered satisfactory apart from the excessively light stick forces to manoeuvre in the looping plane. Some quantitative measurements (see Fig.6) showed that the stick force per 'g' was of the order of 1 to 2 lb. at 10,000 ft. Measurements were attempted at 25,000 ft., but these are not shown in Fig.6 as a reversal of stick force was required to restrict the normal acceleration at speeds below 320 mph ASI. A measurement made at 350 mph ASI gave a stick force per 'g' of 1½ lb.

The elevator forces to hold out of trim conditions in the dive were moderately light at both high and low altitudes (see Fig.4). The acceleration on releasing the control column from out of trim flight built up fairly rapidly especially at high altitude but only in one case (at 25,000 ft.) did the accelerometer reading exceed 5 'g'. At high Mach numbers, the magnitude of the normal acceleration obtainable fell off (see Fig.5).

It was considered that although the trimmer was stiff to operate and consequently accurate trimming difficult to obtain, it was satisfactory for all conditions of flight, there being little change of trim with speed and power.

4.42 Lateral. Throughout the aircraft's speed range and up to a Mach number of about 0.74, the aileron control remained pleasant and light. Effectiveness was good at speeds between 160 mph and 510 mph ASI (the maximum permissible speed), but began to fall off below 160 mph ASI. The aileron stick forces increased slightly with speed, the "feel" remaining excellent. Although the effectiveness could with advantage be improved on the glide with flaps and undercarriage down, it was considered adequate. With the rudder free, turns could be made accurately with ailerons alone over the aircraft's speed range. At 10,000 ft. and 250 mph ASI, the highest rate of roll was 70° per second.

As the report on the prototype Vampire briefly mentioned aileron overbalance at high altitude, this was investigated. Overbalancing and lack of self centring of the control column was experienced at a Mach number of 0.74 and also when normal acceleration was applied at 0.73 Mach number. At high altitudes and Mach numbers, and at low altitudes when acceleration was applied, the amount of travel obtainable by moving the control column sideways appeared to be limited to about ⅓ of the normal travel, but by exerting a force of 50-60 lb. the control column could be moved to half of the normal travel. The travel appeared to be limited by a stop and the cause of this is unknown.

4.43 Directional. The rudder was considered to be the least effective of the controls. It was light for small movements, becoming heavier for larger movements. The speed range over which it was effective was limited. Below a speed of 200 mph ASI, the rudder felt "spongy" and at this speed it was possible to apply full rudder, producing a yaw of only about 5 or 10 degrees (as measured on the directional gyro). This induced a slight roll in the direction of the applied rudder. If ailerons were then applied, to bring the wings level, the yaw damped out and the aircraft would fly without appreciable turn with full rudder applied. At gliding speeds, to obtain any response to the rudder, coarse use was necessary, and it was found almost impossible to sideslip at this speed. It was possible, however, to increase the rate of descent, if required, by using the air brakes. It was considered that the poor rudder control did not seriously affect the handling and manoeuvrability of the aircraft as a whole.

/Brief

Brief qualitative tests were carried out to investigate the directional oscillation characteristics reported on the prototype Vampire. Except in extremely rough air, the directional oscillation was not violent. When induced in calm air by application of the rudder, it damped out in four or five oscillations of decreasing amplitude. When the directional oscillation was induced by bumpy air, it was possible to stop it by checking each oscillation with opposite rudder. It was thought, however, that where disturbances were constantly occurring, it would be tiring for the pilot to be continually correcting the yaw with opposite rudder. Slight short period oscillations were still apparent at high speeds, even in calm air. The directional behaviour was considered unsatisfactory in rough air when considering the aircraft as a gunnery platform, although the directional oscillation was considered to be less disturbing than that experienced on other jet aircraft and was considerably improved compared with the prototype.

4.44 Air brakes. The brakes opened quickly and the resulting nose up change of trim was sudden but easily held by a light push force. There was a slight bank of about 5 degrees to port during the opening and it was throught that this was due to unsynchronised operation. With the brakes extended, a certain amount of tail buffeting was experienced at all speeds. If a dive was made at an angle exceeding 30-40 degrees with brakes extended and closed throttle, the limiting speed was likely to be exceeded. When the air brakes were opened at a trimmed speed of 300 mph ASI at 10,000 ft., there was a nose up change of trim, which if not checked on the control column, produced an accelerometer reading of 2½ 'g'. If the same operation was done at 400 mph ASI, 3.8 'g' was produced. In both cases the push force to counteract the nose up change did not exceed 10 lb. The pull force to hold the nose down change of trim when the brakes were retracted, was light.

It was considered that for such a clean aircraft, the air brakes were essential for losing speed quickly, steepening the approach and decreasing the length of the landing run, but it was thought that they were not effective enough and were inferior to those fitted on other jet aircraft.

5. Conclusions.

5.1 Layout. Taken as a whole, the cockpit layout was considered satisfactory, but it was thought that the points ennumerated below required attention.

(a) The bottom straps of the pilot's harness were too far forward on the seat frame and were too long.

(b) During descents from high altitudes, the front windscreen misted badly, requiring a postponement of landing until the mist cleared.

(c) No method of cockpit heating was fitted, the cockpit being very cold at heights above 30,000 ft.

(d) The pilot's view was poor especially to the rear.

(e) The action of the adjustment screw on the throttle friction damper was too coarse, when moved through a small distance, it made the throttle almost immovable.

(f) Although differently shaped, the flap and undercarriage selector levers could easily be mistaken due to their close proximity.

5.2 Handling qualities. The first production Vampire I was considered to be a very pleasant aircraft to fly at the loading tested, and an improvement on the prototype Vampire, particularly in directional behaviour. However, it was considered that the following points should received attention.

(a) The stick forces to manoeuvre in the looping plane were too low.

/(b)

(b) An improvement in aileron effectiveness at gliding speeds was desirable. The rate of roll reached a peak of about 70 degrees per second at 250 mph ASI at 10,000 ft., but it was considered that it could be improved with advantage.

(c) The rudder effectiveness was poor especially at low speeds and the tendency to oscillate directionally was such that the aircraft would probably make a poor gunnery platform.

6. Further developments.

Since the aircraft completed these handling tests, further trials have been made at the aft c.g. position (8.3 ins. aft of datum). These tests showed that the aircraft had an unacceptably light stick force to manceuvre in the looping plane and the degree of stick free stability was unacceptable. Further tests carried out with inertia weights of 10 and 13 lb. feet moment, showed a marked improvement on the aircraft's longitudinal characteristics. Tests have been proceeding to find the optimum size inertia weight to cover the case when drop tanks are carried, since these tanks appear to have a further destabilising effect. The results of these tests will form the subject of a further Report.

Circulation List.

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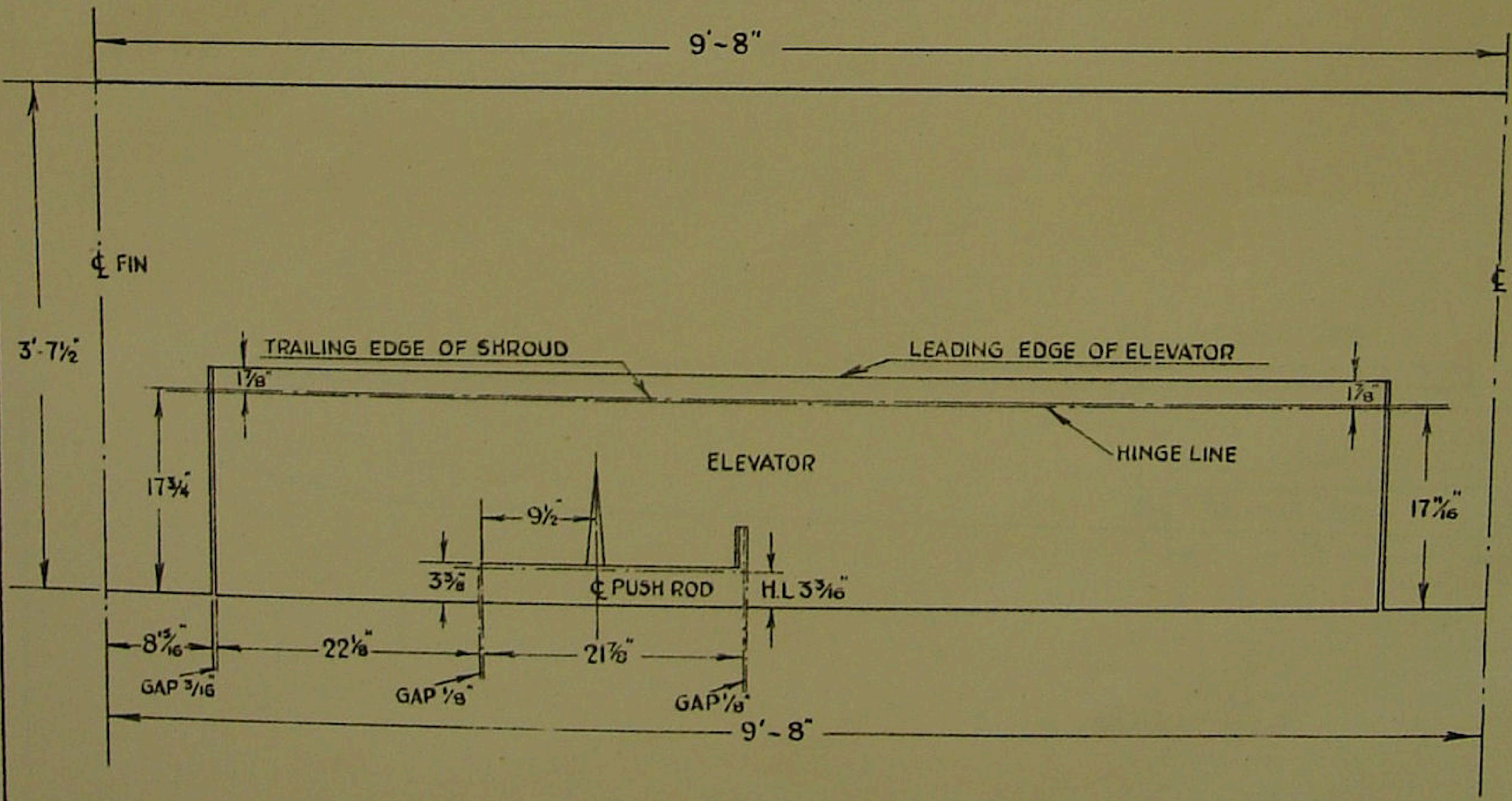
DETAIL OF TAILPLANE.

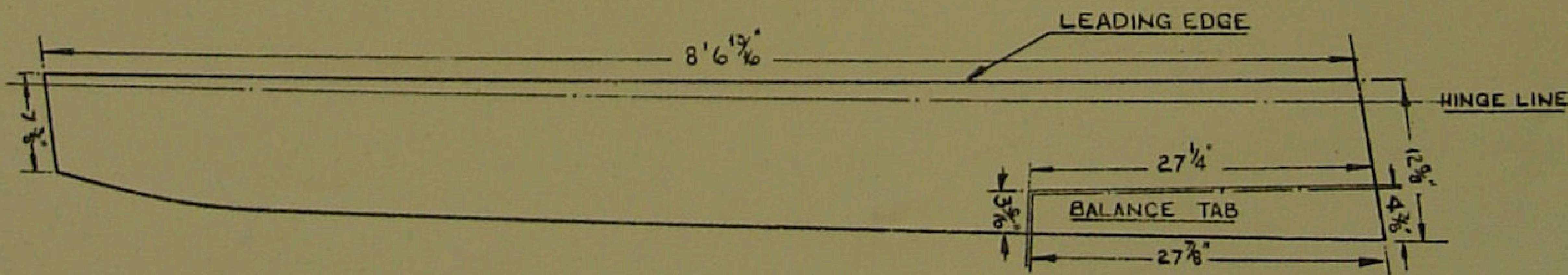


SCALE 1" TO 1'-0"

FIG.1

SK. Nº P509 | 3RD PART OF REPORT Nº A&AEE/819 | VAMPIRE I TG274 | TR. S.M. | CH. | APR. for S. of P. | 17.5.46

SKETCH OF AILERON

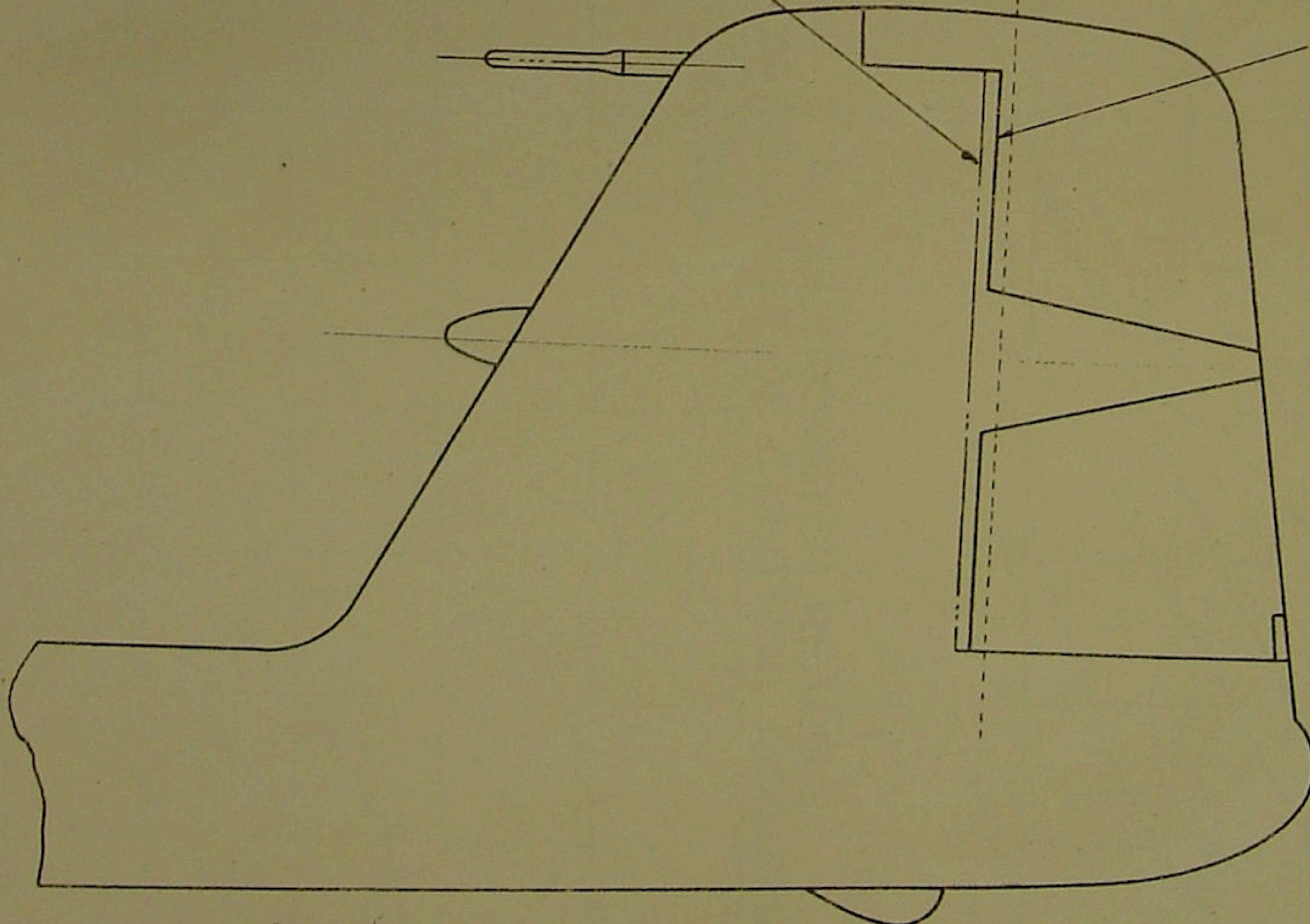


SCALE - 1" TO 1'-0"

FIG. 2.

SK. P.510.	REPORT No. A&AEE/	VAMPIRE I T.G. 274.	TR. J.T.	CH.	APP. for S. of	17.5.46

FIN & RUDDER.



NOTE.- THICKNESS OF TRIMMER AT TRAILING EDGE IS 5/16

SCALE: 1 1/2 TO 1'0".

FIG. 3.

FIG.4

STICK FORCE TO HOLD IN DIVE

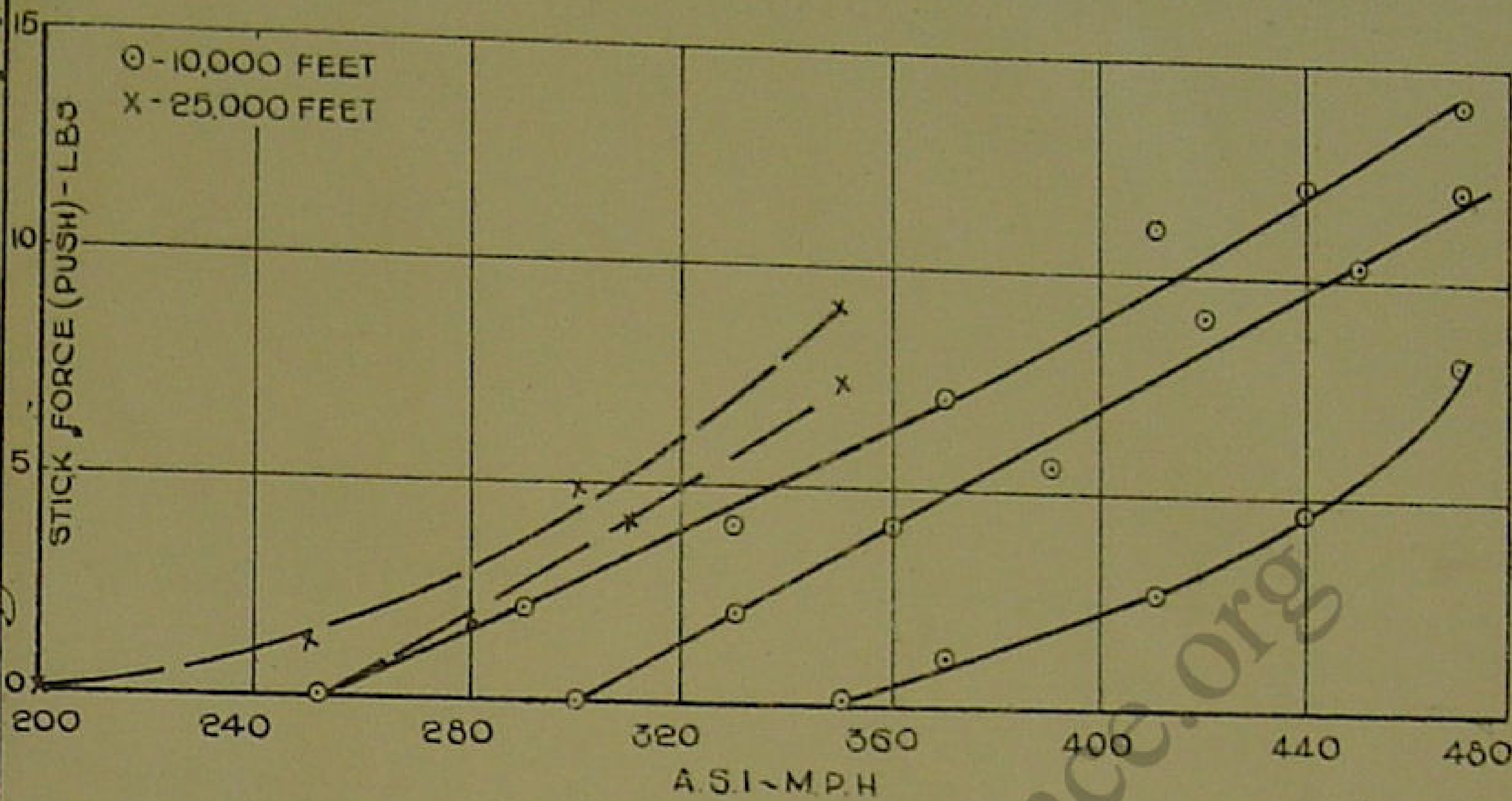
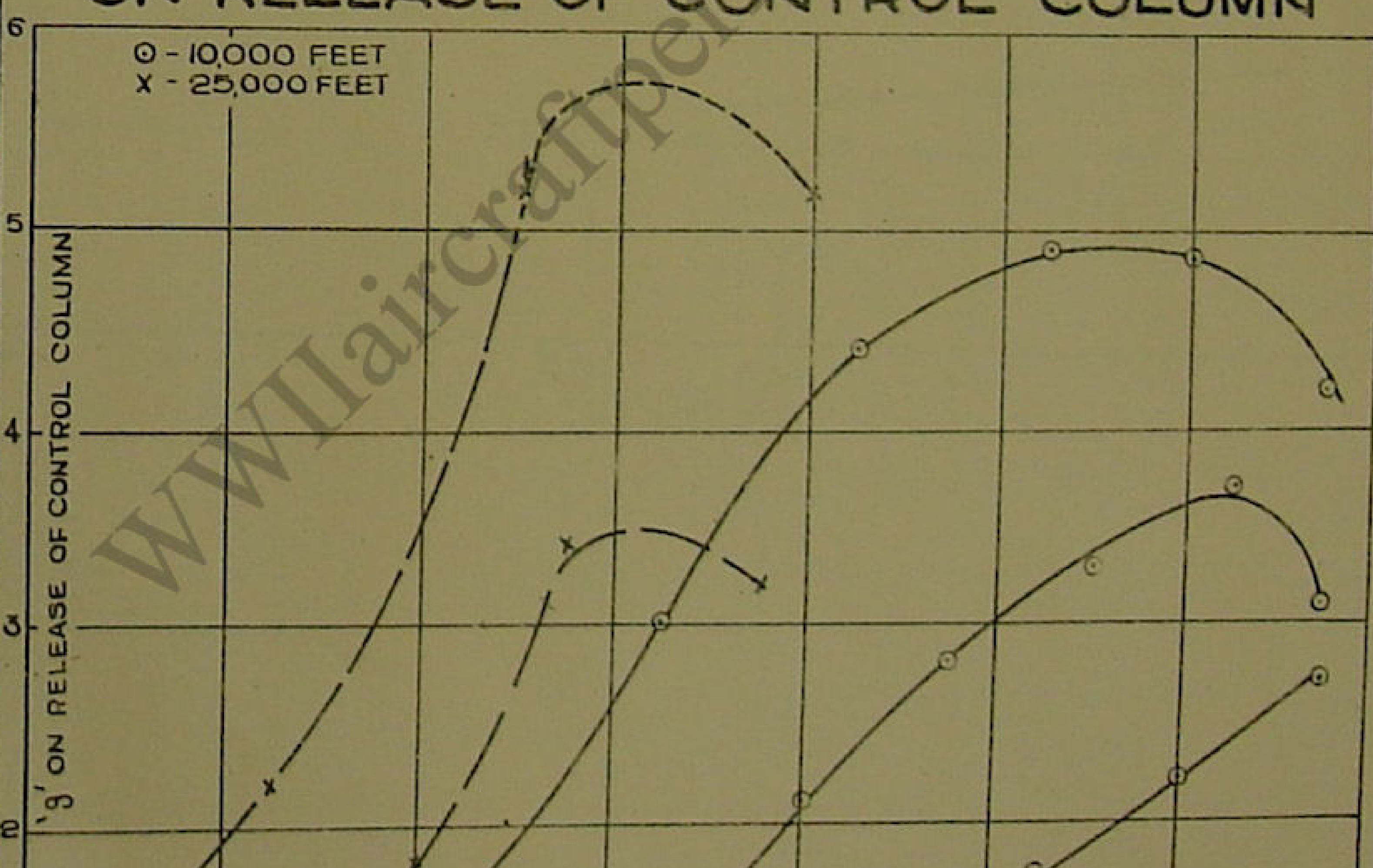


FIG 5

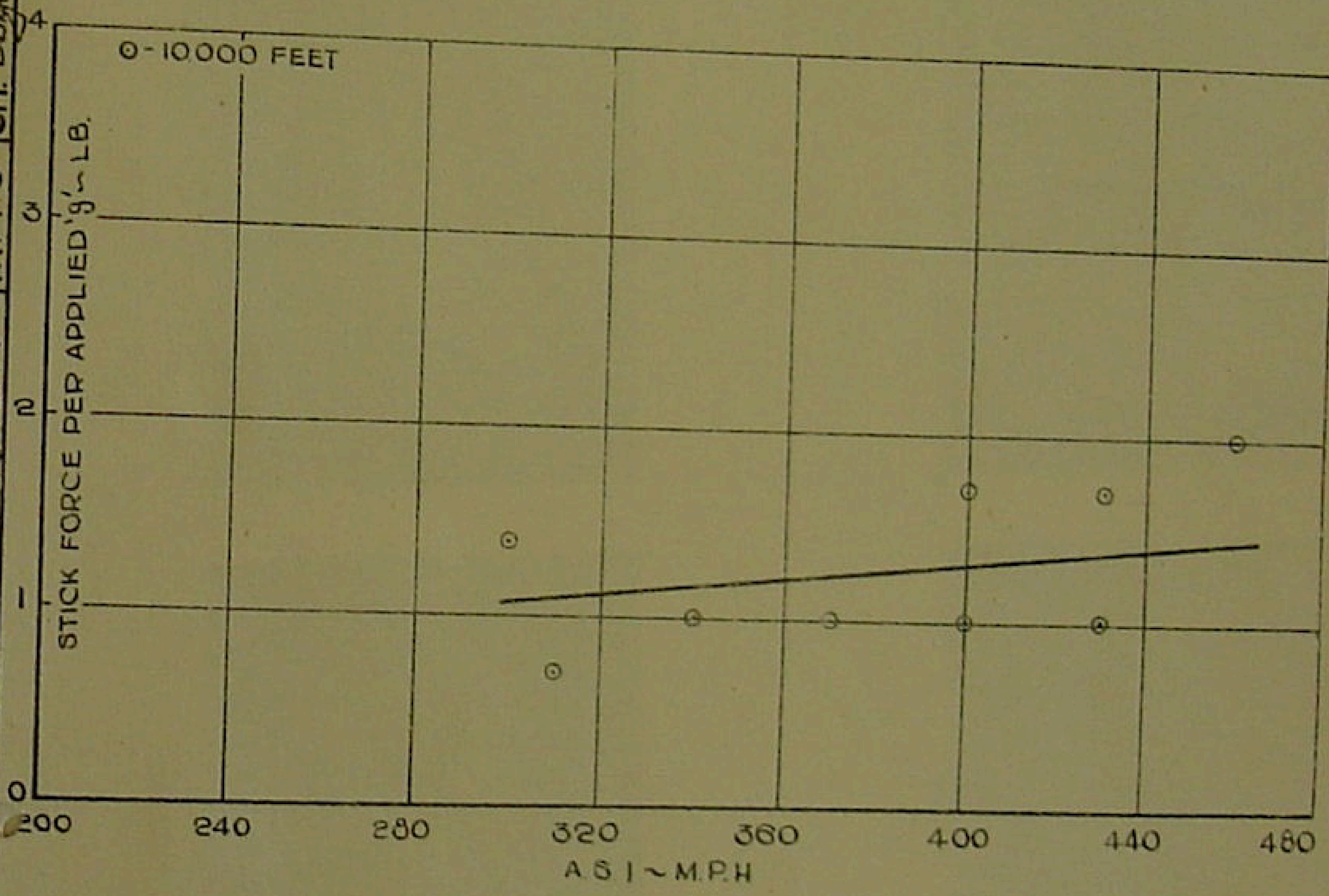
ACCELEROMETER READING ON RELEASE OF CONTROL COLUMN



STICK FORCES AND ACCELERATION IN OUT OF TRIM DIVES

SK. No P507 | 3rd PART OF REPORT No A&AEE/ 818, A | VAMPIRE I. T.G 274 | TR. P.D | CH. | APR. | for S. of P. 29.4.45

FIG. 6.



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STICK FORCE PER INCREMENT OF 'g'

AM NEG Nº 15123 A

B.

C.

D.