

## SECTION 2

GROUND HANDLING AND  
PREPARATION FOR FLIGHT

## LIST OF CHAPTERS

*Note. – A list of contents appears at the beginning of each chapter.*

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- 2    **Preparation for flight**
- 3    **Loading and C.G. data**
- 3A   **Fatigue index data**
- 4    **General servicing**
- ◀ 4A   **External finish and markings** ▶
- 5    *(Not applicable to this aircraft)*
- 6    **Procedures following hazardous incidents.**

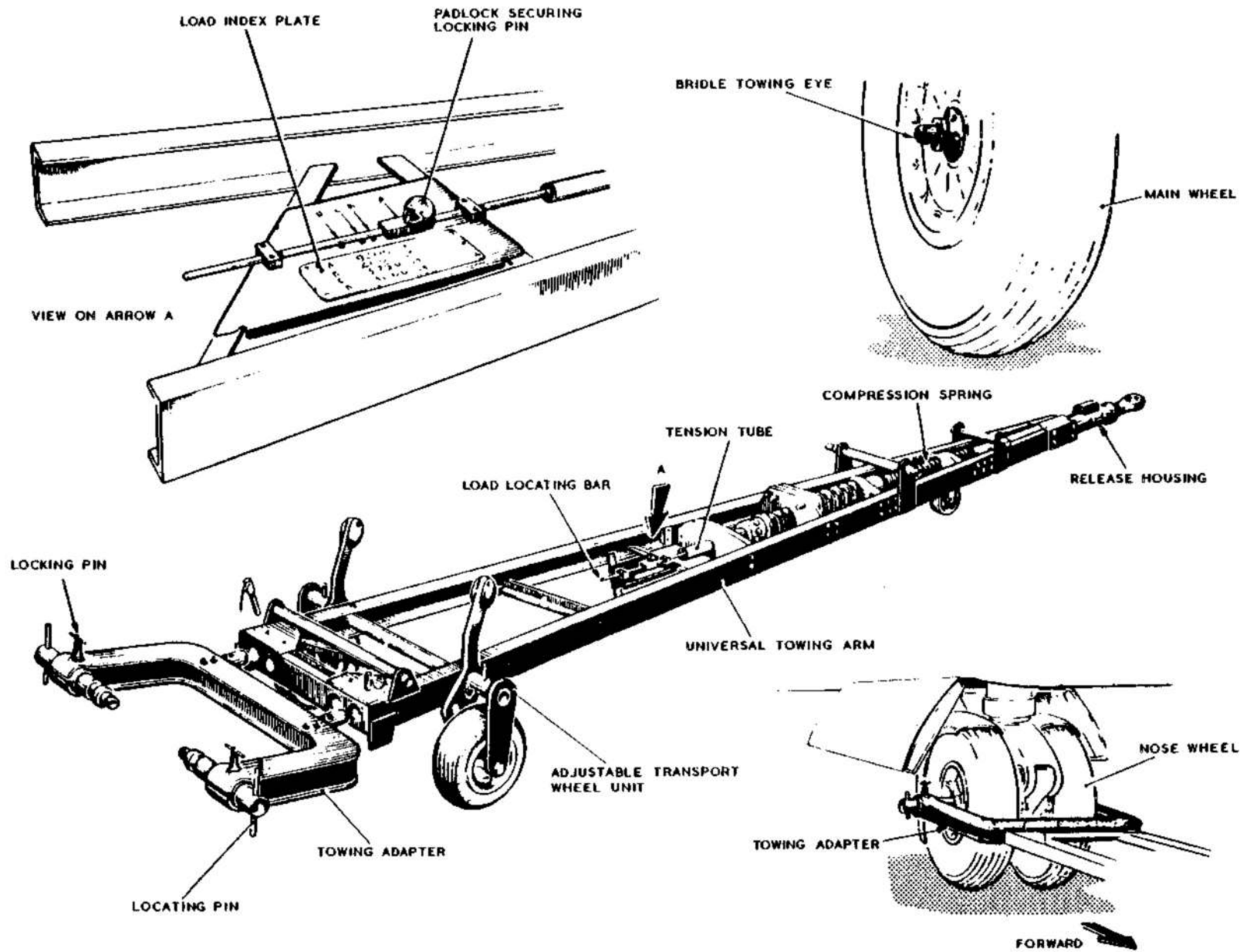
## Chapter 1 GROUND HANDLING

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FIG. I. TOWING EQUIPMENT

**WARNING**

The relevant safety precautions detailed on the **LETHAL WARNING** marker card must always be observed before entering the cabin or performing any operations on the aircraft.

**Introduction**

1. Information on the general handling of the aircraft on the ground is given in this chapter. The equipment necessary for ground handling is listed in Chapter 4 of this section.

**Towing (fig. 1)**

2. Normal towing is from the nose-wheel axle, the towing gear consisting of a towing arm adapted to suit the axle by fitting an adapter. A release mechanism is incorporated in the towing arm to prevent damage to the nose undercarriage in the event of an overload during towing. With the locking pin inserted at the correct position A, on the load index plate on the towing arm, the release mechanism operates at a pull-off load of 9,200 lb. The towing equipment is fully described in A.P.119K-0700 series. The aircraft may, if necessary, be towed either forward or backward from the main wheel axles by attaching a 50 ft towing bridle to the towing eyes on the axles; when towing from the main wheels the aircraft is steered with a steering arm attached to the nose-wheel axle. When towing, an authorized person must be in the cockpit to operate the wheel brakes as necessary.

**Note . . .**

*The wheel brake system hydraulic pressure must not be permitted to fall below 2200 lb/in<sup>2</sup> during aircraft towing.*

**Picketing (fig.2)**

3. The aircraft must, where possible, be picketed facing into wind. Chocks must be positioned fore-and-aft of each wheel, securely

chained and tensioned at all times until the aircraft is being prepared for flight the aircrew have entered, and effective wheel braking has been applied. The following additional safety precautions must be observed:-

(1) For wind speed greater than 25 knots.

- (a) Fit the rudder lock (*para.9*).
- (b) Fit the elevator lock (*para.10*).



(2) For wind speeds greater than 35 knots additionally:-

- (a) Fit the aileron lock (*para.8*).



- (b) If the aircraft is more than 10 deg out of alignment, nose into wind, fit the nose picket.

(3) Wind speeds between 50 knots and 80 knots, additionally:-

- (a) Fit the nose wheel picket.
- (b) Fit the main wheel pickets.
- (c) Fit the secondary pickets.

**CAUTION . . .**

**Design requirements do not cater for the aircraft structure to be capable of withstanding loads from picketing at wind speeds in excess of 80 knots.**

4. The main points of anchorage are at the nose undercarriage, where a lashing is placed over the stay-link lugs on the shock-absorber strut, and at each main undercarriage unit, where a lashing is coupled to a detachable ring-bolt, screwed, from outboard, into the upper hinge-pin of the torque linkage; these points are closed by cover plates in the undercarriage fairings, when not in use. Three secondary points are also provided, one in the underside of each main plane, where screwed holes for detachable

ring-bolts are provided in the main spars, a third screwed hole is provided at frame 42 in the lower surface of the rear fuselage; when not in use these holes are closed by screwed plugs. All lashings must be properly secured to ground anchors. The ring bolts, which are also used for main plane fitting, are stowed inside the rear fuselage, on the port side above the rear access hatch. ▶

**Note . . .**

1. *Whenever the aircraft is parked out in the open for any long period, e.g. overnight, the tail plane should be left in the fully nose down trim position. This will prevent condensation forming on the exposed part of the actuator jack with the consequent risk of icing on a subsequent flight.*
2. *Whenever the aircraft is likely to be subjected to an accumulation of snow on the main and tail planes, it must be picketed at the nose wheel.*

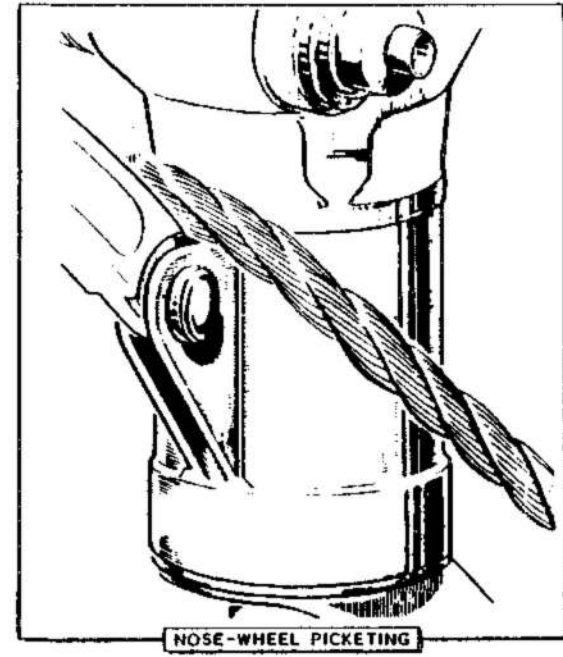
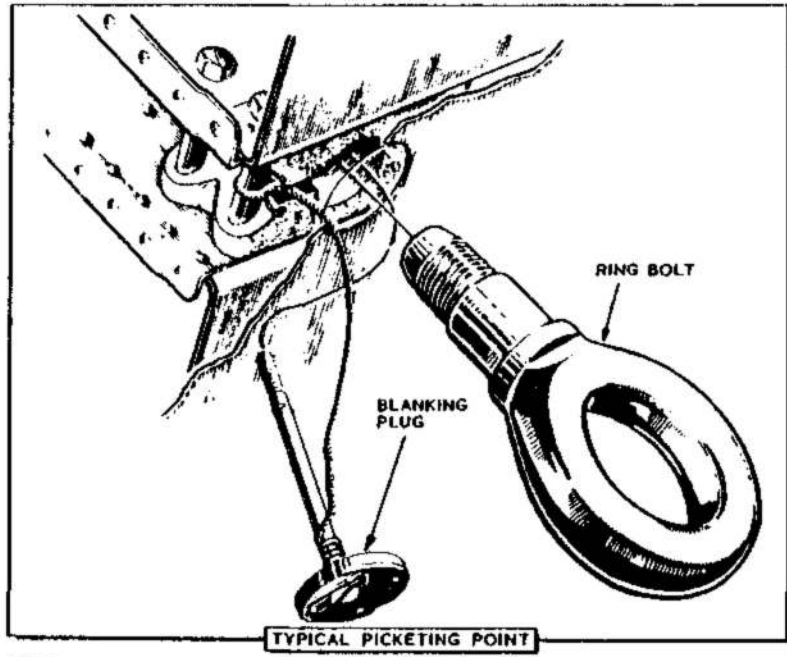
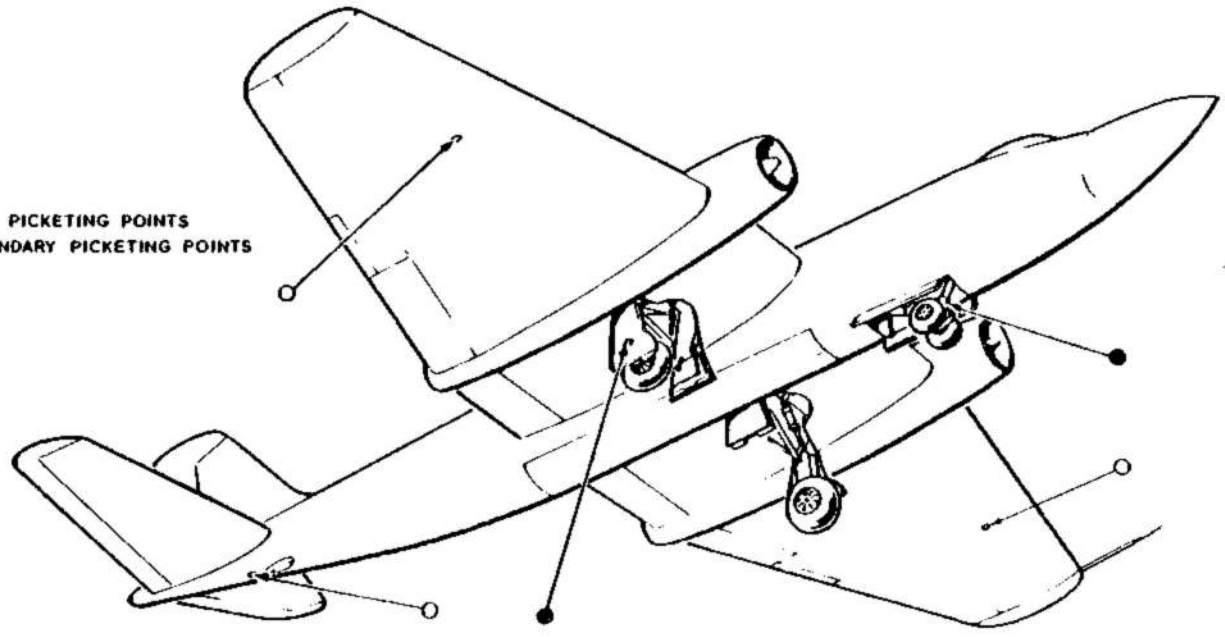
**Alighting gear safety devices****External locks**

5. The alighting gear safety locks must always be fitted before any ground handling is commenced and must only be removed immediately prior to flight. The alighting gear locking arrangements are illustrated in fig. 3 and consist of two U-shaped sleeves which are fitted, one to each main undercarriage jack piston-rod, between the jack body and the piston-rod end-fitting; they are secured by quick-release pins which, with the sleeves, encircle the jack piston-rods. The nose undercarriage is locked by inserting a quick-release pin into a hole in the lower end of the radius rod; this prevents the lock lever disengaging the nose of the stay link.

**Master safety switch**

6. A guarded two-position switch, marked

- MAIN PICKETING POINTS
- SECONDARY PICKETING POINTS



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FIG. 2. PICKETING POINTS

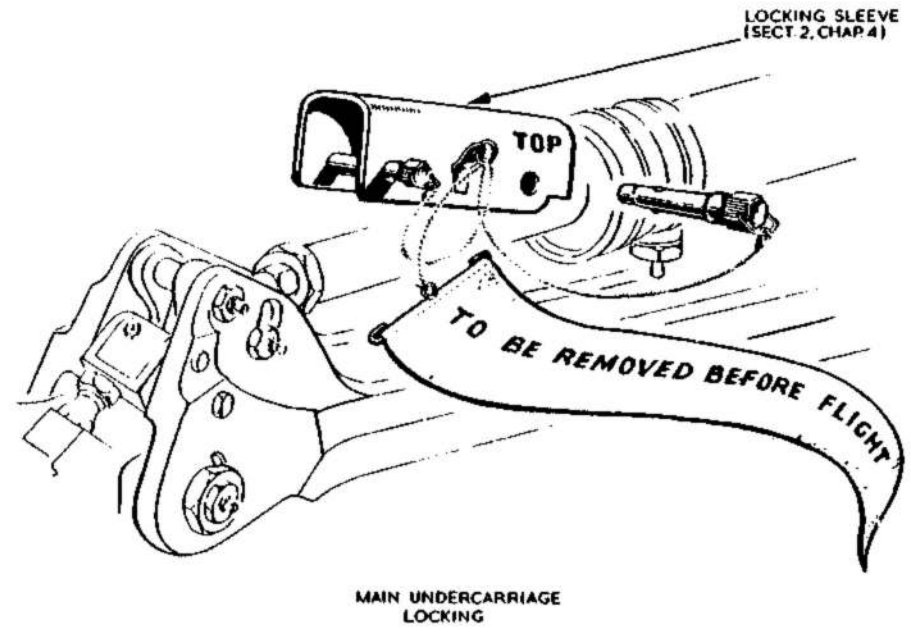
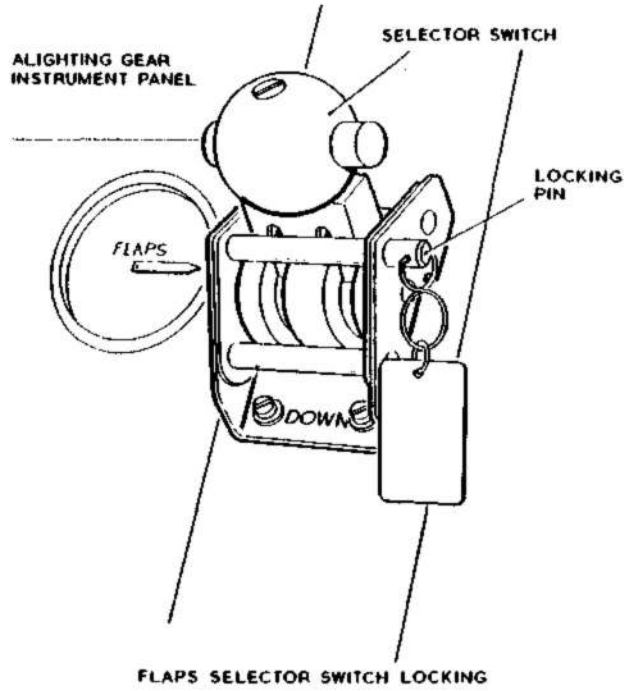
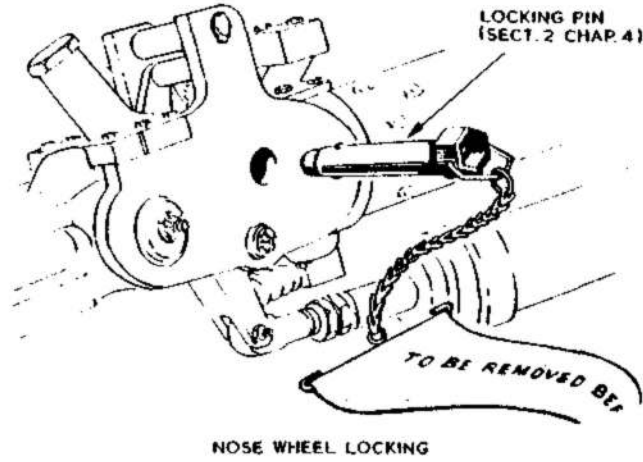


FIG. 3. GROUND SAFETY LOCKS  
◀ FLAPS SELECTOR SWITCH LOCKING DETAILS ADDED ▶

LIVE and SAFE, is fitted adjacent to the alighting gear selector push-switches. When in the SAFE position, the switch breaks the electrical supply to the selector and prevents inadvertent retraction of the alighting gear. The switch must be in the SAFE position at all times whilst the aircraft is on the ground, except during alighting gear retraction tests with the aircraft jacked and trestled.

#### Control surface locks

##### Flaps (fig.3)

- ◀ 7. To prevent inadvertent operation of the flaps, especially when the aileron locks are fitted, a locking pin is inserted in the flaps selector switch bracket. ▶

##### Ailerons (fig.4)

8. The procedure for locking the ailerons is as follows. Ensure that the flaps are up, raise the aileron until it is level with the flap and insert the web of the lock, wide end foremost and the securing strap at the bottom, between the aileron and the flap. Push the lock forward until its upper and lower flanges bear on the aileron and the skin of the main plane, and secure it by attaching the hook at the end of the strap to the leading edge of the flap. Repeat this procedure on the opposite aileron.

##### Note . . .

*The lower flange of the aileron lock fouls the flap, therefore, on no account may the flaps be lowered whilst the locks are in position.*

##### Rudder (fig.4)

9. In addition to rudder locking when the aircraft is parked a requirement exists to lock the rudder during taxiing in high wind conditions. Rudder lock Pt.No.EA3.88.383 is designed to fulfill both requirements. During parking both the rudder and the rudder tab are locked, during taxiing only the rudder is locked, thus allowing free movement of the rudder tab to allow full differential braking. The rudder lock has engraved on its web in white the annotations, THIS SIDE UP

FOR PARKING and THIS SIDE UP FOR TAXYING ONLY, whichever requirement exists the method of fitting is the same and is as follows;

9A. Before fitting the rudder lock ensure that both pip-pins on the ends of the extension springs are secure in the PIN STOWAGE at the wide end of the lock. Centralise the rudder and insert the web of the lock, wide end foremost, between the bottom of the rudder and the top of the rudder stub. Push the lock forward until its flanges bear on both sides of the rudder and stub, remove the starboard pip-pin from the PIN STOWAGE and insert it into the hole in the starboard side of the rudder.

##### Elevator

10. Set the elevator in its neutral position, fit the lock with its web between the elevator and the outboard end of the tab. Secure the lock by inserting the quick-release pins into the sockets on the upper and lower surfaces of the tail plane.

##### Flare-bay doors switch

- ◀ 11. The flare-bay doors operating switch is on the front face of the E.C.P. The doors are opened only for servicing operations and are not operated when the aircraft is in flight. ▶

##### Covers (fig.5)

12. The canopy, wheels, nose and pressure head covers and the static vent plugs must always be fitted whenever the aircraft is picketed. Covers must also be fitted to the engine air-intakes and the jet pipe openings as soon as possible after stopping the engines, and should only be removed immediately prior to starting them.

##### External intercommunication socket

13. Contact can be made with personnel inside the cabin of the aircraft during towing or engine-running operations by means of an external intercommunication socket located in the starboard wheel well, on the fuselage side.

#### Crashed aircraft

##### WARNING

Before attempting to cut away the hatch for the rear crew member, it is essential to look through the navigator's window to see if the crew member has attempted to eject. If the sear has been withdrawn from the ejection gun ensure that the secondary firing cable connecting the safety catch in the restrictor of the breech firing unit to the hatch, is not disturbed otherwise the seat will be ejected.

##### Entry into aircraft

14. In the event of normal entry being impossible, the aircraft may be entered by cutting away, with an axe or other suitable implement, the navigator's escape hatch or the pilot's canopy; these areas are marked by yellow-painted broken lines.

##### Lifting and removal

15. The exact method of lifting and removing the aircraft, and the equipment to be used will depend entirely upon local conditions and requirements. General information, a description of equipment, and suggested methods are given in A.P.119Q-0200-16.

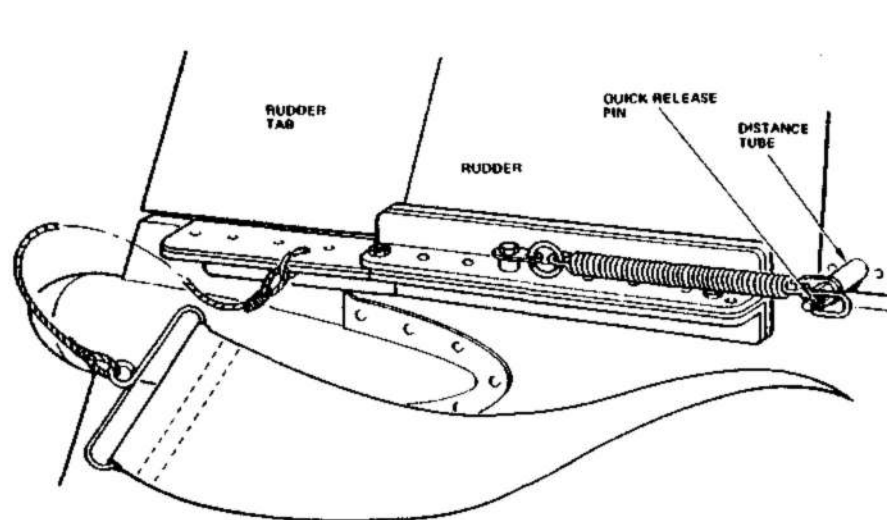
##### WARNING

Before the commencement of lifting operations, refer to the current regulations relating to crashed aircraft, and take the following precautions:-

1. The ejection seat cartridges must be removed or the firing mechanism made safe as detailed in A.P.109A-0001-1.
2. Disconnect all batteries including emergency batteries.
3. All explosives must be made safe and removed.
4. The fuel remaining in the tanks should be removed by means of hose inserted through the filler-cap orifices.

##### Lifting the aircraft (fig.6)

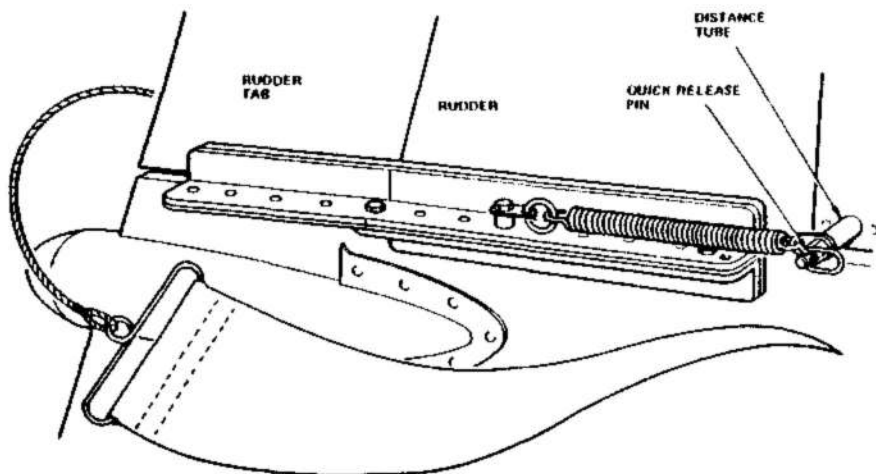
16. Should it be possible to lift the aircraft by



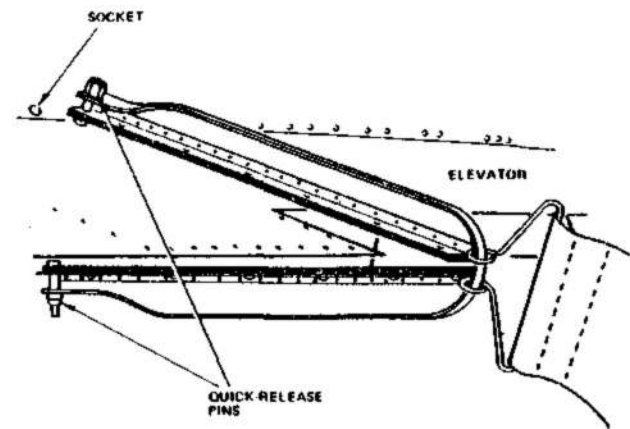
RUDDER SAFETY LOCK - TAXIING



AILERON SAFETY LOCK



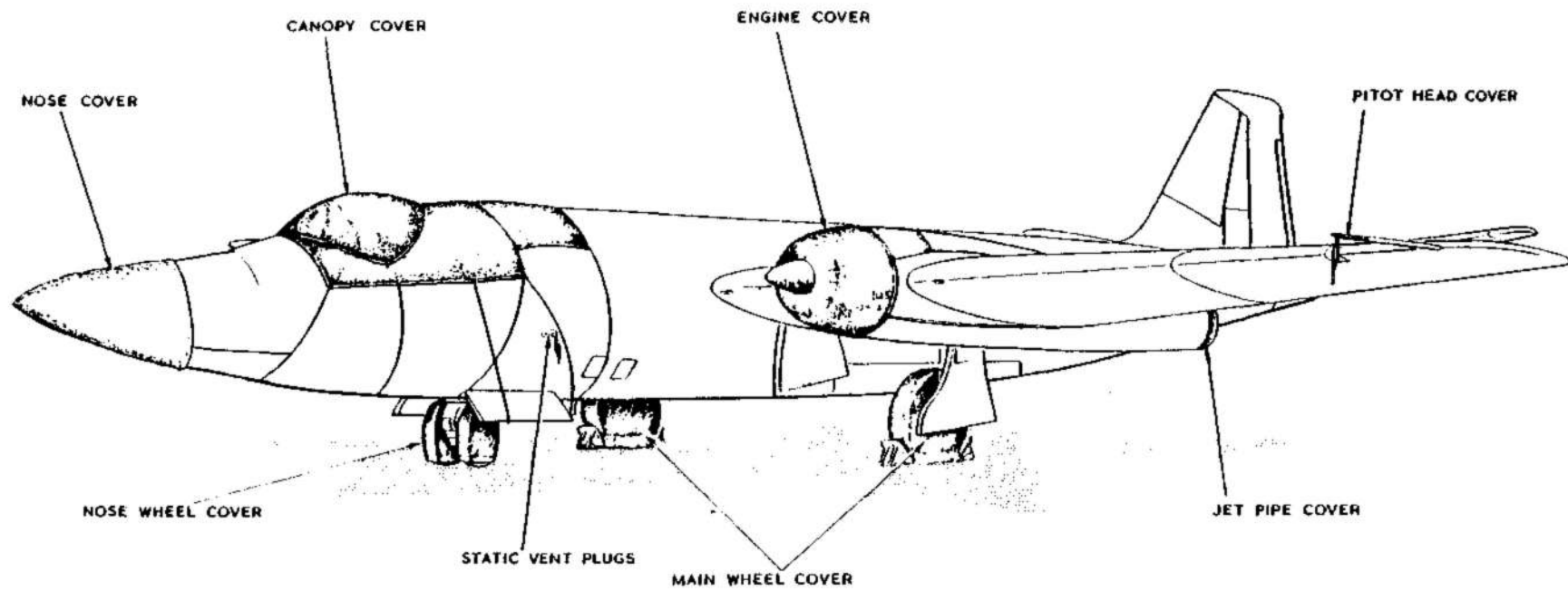
RUDDER SAFETY LOCK - PARKING



ELEVATOR SAFETY LOCK

FIG. 4. CONTROL SURFACES - EXTERNAL LOCKS

◀ TOWING AMENDED TO READ TAXIING ▶



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FIG.5. AIRCRAFT COVERS

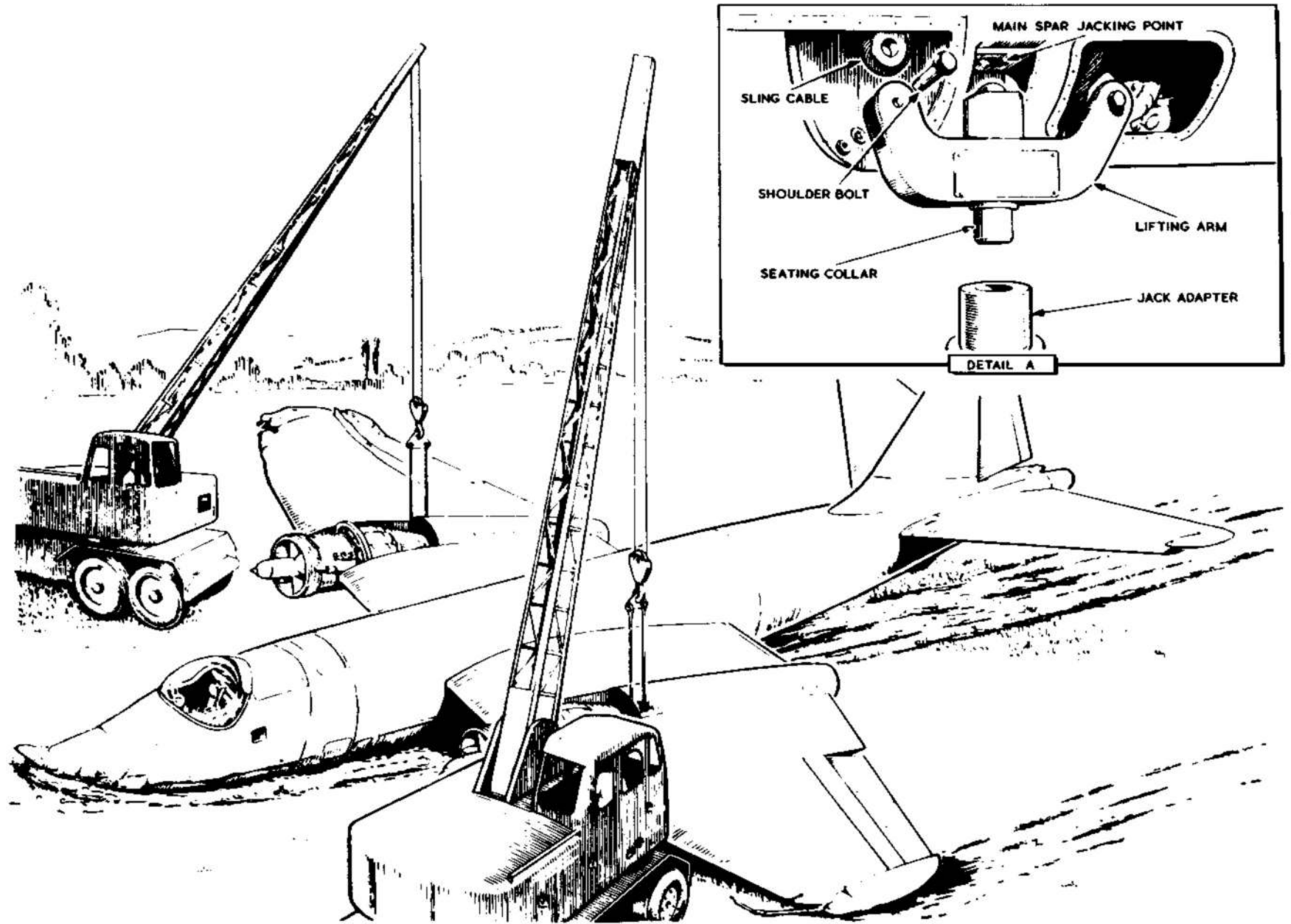


FIG.6. LIFTING A CRASHED AIRCRAFT

cranes or gantries, the following methods may be adopted. A complete set of slings (*Chap. 4*) is capable of lifting an aircraft at its maximum all-up weight; if, owing to crane limitations, this weight is beyond the combined capacity of the cranes available, the weight of the aircraft must be reduced accordingly.

(1) Remove the top cowling, service panel, and bottom cowling from each engine.

(2) Open the main spar jacking point access panel and remove the detachable panel immediately aft of this point.

(3) Cut through the top jet pipe cowl on the outboard side aft of the main spar to provide access for the sling cable.

(4) Position the cranes at each outer wing leading edge immediately outboard of the engines. Ensure that the cranes are positioned on good solid ground, or suitably supported by sleepers, etc.

(5) Anchor the tail of the aircraft to prevent swinging but allowing enough slack in the line for lifting.

(6) Lower the slings with one cable each side of the engine fire wall until the cable ends protrude beneath the engine cowlings.

(7) Attach the lifting arms to the cables with the shoulder bolts Part No. EA3.88.317,  $\frac{1}{4}$  in. Whitworth hexagon nuts and special washers Part No. EA3.88.319 and raise the slings until the spherical head on the lifting arm engages in the main spar jacking point.

(8) Raise the aircraft and position a 10-ton

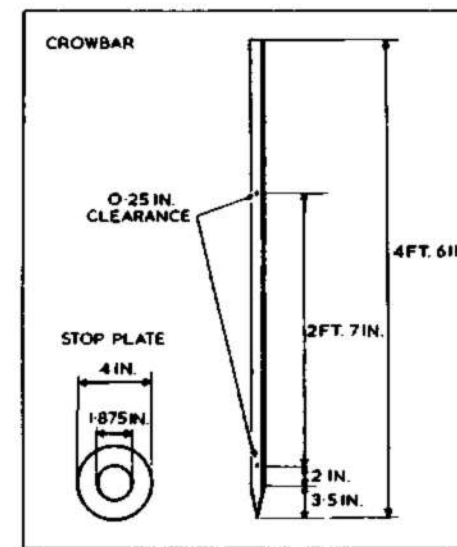
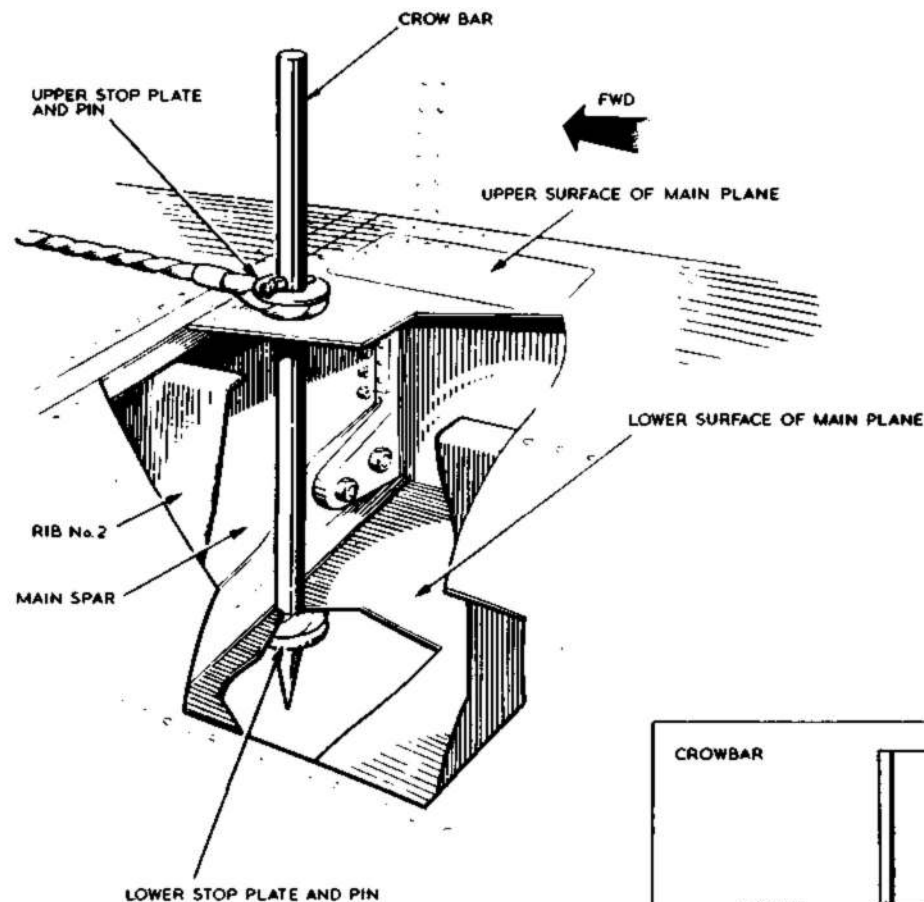


Fig.7. Emergency towing equipment

hydraulic jack and trestle with an adapter beneath each main plane jacking point Chap.4.

(9) Lower the aircraft until the seating collar on the lifting arm is engaged with the jack adapter.

(10) Retaining tension on the slings, trestle the fuselage as instructed in Chap. 4.

*Emergency removal (fig. 7)*

17. The method of removing crashed aircraft from runways, and the equipment required, is as follows:—

(1) Equipment required

(a) Two crow bars (*local manufacture*); make from steel bar, 1½ in. dia. Ref. No. 30A/3048.

(b) Four stop plates (*local manufacture*);

make from 6 S.W.G. steel sheet Ref. No. 30A/534.

(c) Four quick-release pins, Ref. No. 28FP/1200982.

(d) Two 50-ft towing bridles fitted with one ¾ in. shackle, Ref. No. 28Y/1057116 on each end.

(e) Sledge hammer, Ref. No. 1B/9104699.

(f) Suitable towing/winch vehicles.

(2) Recommended method

(a) Place the point of a bridle attachment bar on the inboard front corner of the main spar access panel and, using a sledge hammer, drive through the top panel.

(b) When the bridle attachment bar has penetrated the upper access panel and entered the main plane, thread a towing bridle shackle and stop plate over it, and fit a quick-release pin.

(c) Locate the point of the bridle attachment bar on the lower access panel and force the bar through the main plane until the upper quick-release pin prevents further penetration.

(d) Thread the other shackle end of the towing bridle, and the stop plate over the protruding lower end of the bar, and secure with a quick-release pin.

(e) Repeat this operation on the opposite plane.

(f) Connect the towing bridles to a suitable vehicle and tow/winch clear.

## Chapter 2 PREPARATION FOR FLIGHT

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**WARNING**

The relevant safety precautions detailed on the **LETHAL WARNING** marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

**Introduction**

1. This chapter gives information upon the general preparation of the aircraft for flight. For access to the fuel tanks and other replenishing points refer to fig.2-2A.

**Refuelling**

2. No.1 to 5 fuel tank fillers are located in the top surface of the fuselage and the integral tank fillers are in the upper surface of the main planes. No.6 tank filler is on the starboard side of the fuselage.

**Refuelling/defuelling precautions**

3. The following precautions must be observed when refuelling, or defuelling the aircraft:-

- (1) Verify the correct type of fuel to be used.
- (2) Prior to removing the filler caps, ensure that the fuel hose and refueller are correctly earthed.
- (3) On no account drain No.1, 2, 3 and 4 tanks while fuel remains in No.5 tank without supporting the fuselage at frame 42. When refuelling, fill No.1, 2, 3 and 4 tanks first, when defuelling, always drain No.1, 2, 3 and 4 tanks last.
- (4) When refuelling the main plane integral tanks, fill the inboard compartment of each tank first and secure the filler cap before attempting to fill the outboard compartment.
- (5) Use only a refueller fitted with a Streamline filter.

**Checking the tank contents**

4. The fuel tanks are fitted with capacitor-type fuel contents gauges which indicate correct readings irrespective of the attitude of the aircraft; dipsticks are not required. The gauge indicators register the tank contents when the **BATTERY ISOLATION SWITCH** on the pilot's 'take-off' panel is switched on or when an external supply is connected to the external electrical supply socket (para.13).

**Checking the accessory gearbox oil level**

5. The accessory gearbox oil dipstick is located in the top of the gearbox and is accessible after removing a panel in the main plane (Chap.4). If the oil level is lower than the **FULL** mark on the dipstick, replenish the gearbox through the filler

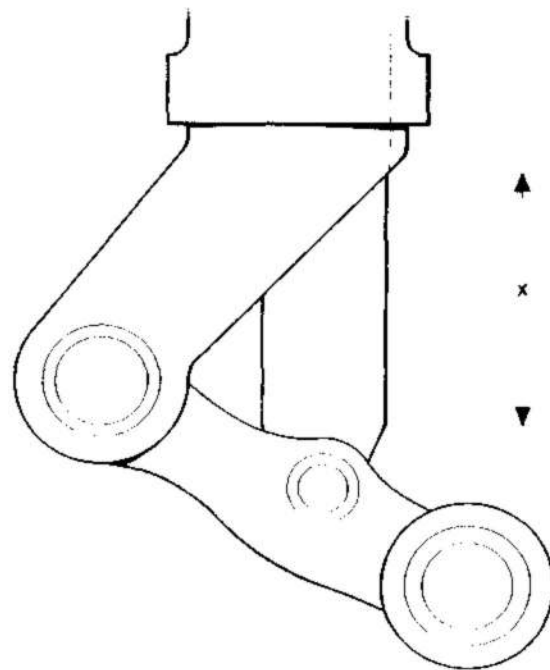


Fig.1. Nose undercarriage shock absorber extension

adjacent to the dipstick. Refer to Leading Particulars for correct oil.

**Note . . .**

The gearbox and sump oil has a deleterious effect on paint, rubber, electric cables etc., care must be taken to avoid spilling it on such parts.

**Refilling the oil sumps**

6. The oil sump filler caps (fig.2) are accessible through removable panels (Chap.4). Refer to Leading Particulars for the correct type of oil. To refill or top-up:-

After the system has been emptied

**(1) Port engine**

- (a) With the aircraft standing on level ground, fill the sump to approximately 1½ in. below the seal face of the sump filler neck.
- (b) Run the engine for 2 minutes at idling rev/min to circulate the oil.
- (c) After stopping the engine, allow sufficient time to elapse for the oil in the system to drain back into the sump (approximately 10 minutes), after which, top up to the level as in (1)(a).

**(2) Starboard engine**

- (a) With the aircraft standing on level ground, fill the sump to approximately ½ in. below the seal face of the sump filler neck.
- (b) Repeat (1)(b).
- (c) After stopping the engine, allow sufficient time to elapse for the oil in the system to drain back into the sump (approximately 10 minutes), after which, top up to the level as in (2)(a).

**Intermediate topping up**

(3) The levels referred to in (1) (a) and (2) (a) are to be rigidly observed.

**Checking the cold-air unit oil level**

7. The combined oil filler and dipstick is located in the top of the cold-air unit and is accessible after removing a panel in the port inner main plane (Chap.4). If the oil level is lower than the FULL mark on the dipstick, replenish with oil OEP-71.

**Note . . .**

*Pour oil slowly into the filler neck allowing a few minutes for it to settle before checking against the dipstick. The oil level is critical, do not overfill.*

**Topping up the hydraulic fluid reservoir.**

8. An elliptical panel in the upper surface of the fuselage, aft of the navigator's escape hatch, provides access to the reservoir filler. The reservoir must be topped up to the maximum possible level with the fluid specified in Leading Particulars; a drain pipe is provided for fluid spilt through overfilling. It is important that hydraulic pressure is exhausted from the main accumulator by operating the flaps or the flare-bay doors until no further movement can be obtained, and from the brakes accumulator by operating the wheel brakes.

**WARNING**

**Before operating the flaps selector, ensure that aileron locks are not fitted. Refer to the Note in Chap.1, para.8.**

8A. Before topping-up the reservoir ensure that the pressures shown on the accumulator pressure gauges (para.9 and 10) agree with those given in Leading Particulars when the system pressure is exhausted. If the pressure shown is in excess of

the given figure it is an indication that fluid is still contained in the respective accumulator. If the pressure is below the given figure the accumulator must be re-charged (para.9 and 10). Also before filling ensure that the alighting gear is down, the flare-bay doors open and the air brakes in. The flaps may be in either the fully up, or fully down positions.

**Hydraulic accumulator inflation**

9. The hydraulic accumulator inflation point is adjacent to the hydraulic accumulator in the starboard undercarriage well, together with its pressure gauge. The correct inflation pressure when the accumulator is exhausted is given in Leading Particulars.

**Brakes accumulator inflation**

10. The brakes accumulator inflation point and pressure gauge are on the forward face of the forward camera bay rear bulkhead, and are accessible through the door of that bay. The correct inflation pressure when the accumulator is exhausted is given in Leading Particulars.

**Oxygen system**

11. The oxygen charging valve is located in the starboard equipment compartment, it is accessible through the bay access door on the starboard side of the fuselage. The charging procedure is described in A.P.107D-0001-1.

**Battery isolating switch**

12. As a number of electrical circuits are without switches and are fed directly from the main positive supply, an isolating switch is fitted to prevent battery drain when the aircraft is on the ground with the engines stopped. The switch is located on the pilot's 'take-off' panel, and must be switched OFF immediately after stopping the engines.

**External electrical supply socket**

13. The external electrical supply socket is located on the main electrical panel on the starboard side of the fuselage. Access is through a door in the lower side of the fuselage, aft of the entrance door.

**Pilot's 'take-off' panel**

14. The 'take-off' panel is located on the port wall of the pilot's cabin. All the switches mounted on this panel must be UP prior to flight.

**Canopy de-misting**

15. Windows provided in the air-drier tubes, connected to the canopy and the plastic nose, permit visual inspection of the contents of the 'tell-tale' compartments. The desiccant used in the air-driers is silica gel, which should be changed when it becomes pink.

**Note . . .**

*Silica gel is blue, when dry.*

**Alighting gear inflation**

16. The inflation pressure of the main undercarriage shock-absorber struts may be checked by measuring the strut extensions and checking these measurements against the graph in fig.4. The initial inflation pressure, with the strut fully extended, should be  $545 \pm 25$  lbf. in.

17. The nose undercarriage is liquid sprung and is not inflated with air consequently graphs are not provided for checking its condition. The

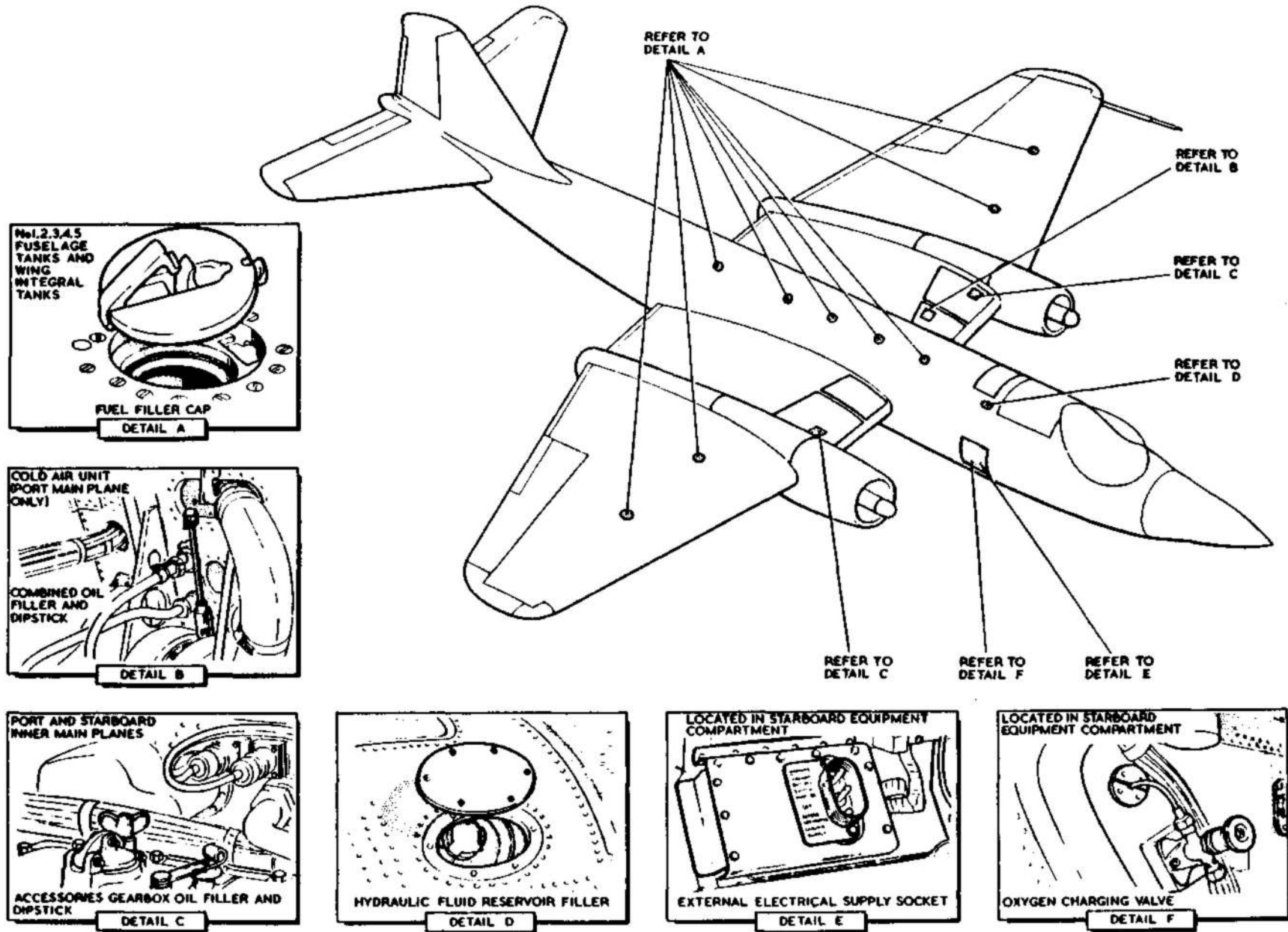
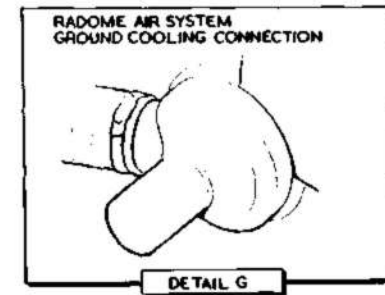
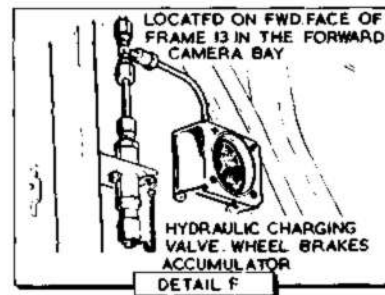
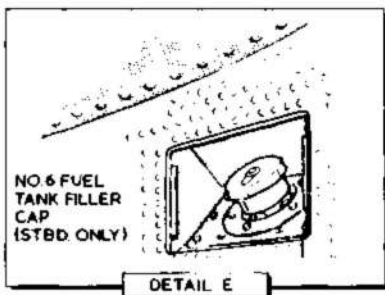
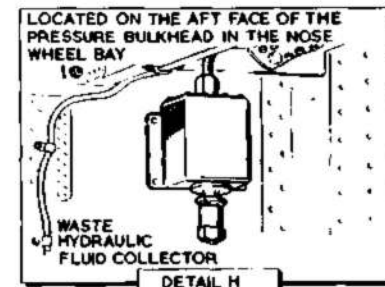
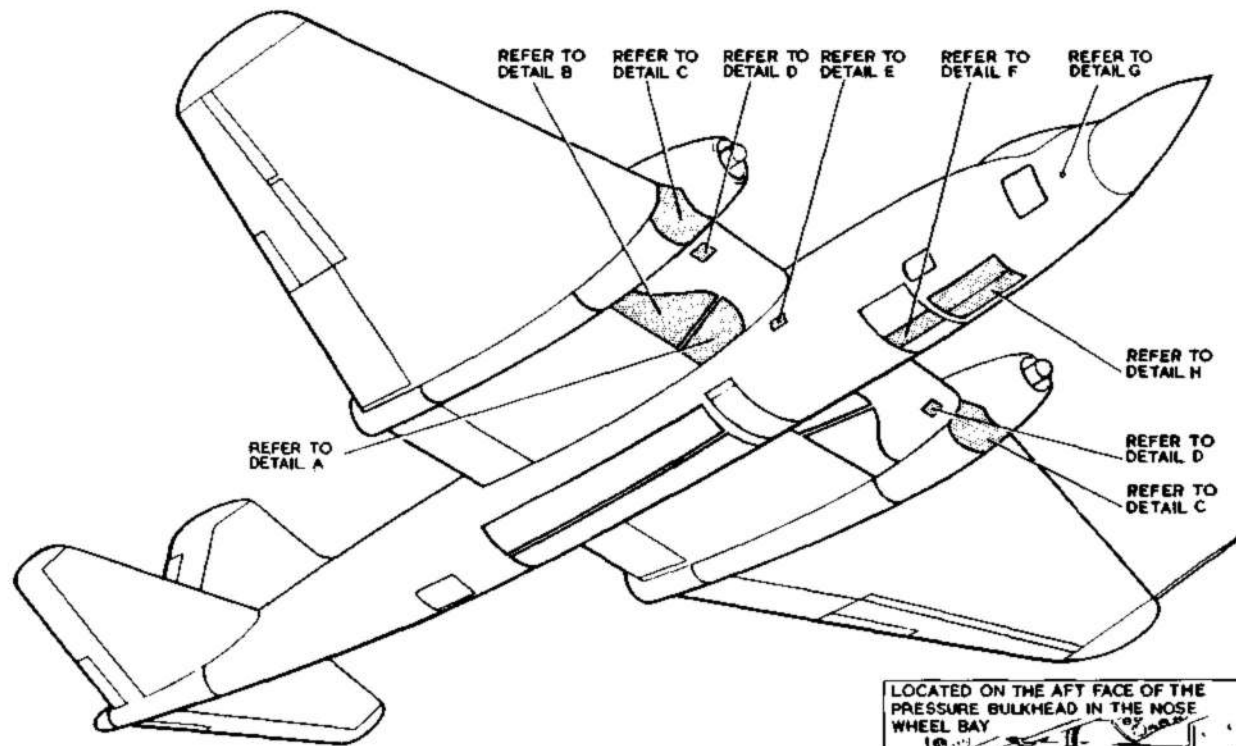
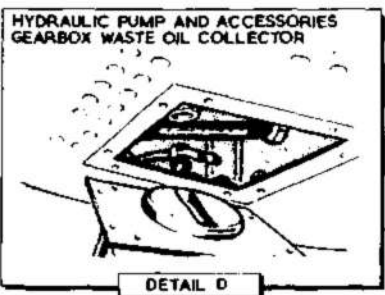
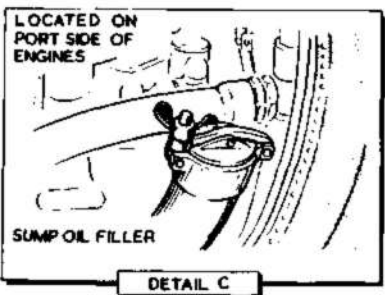
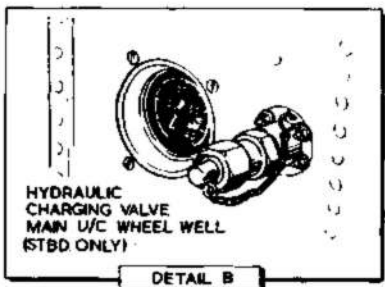
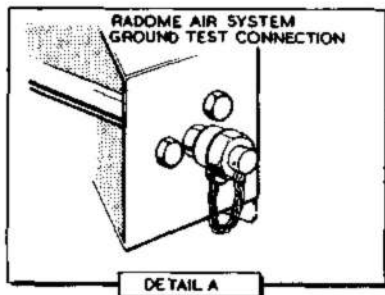
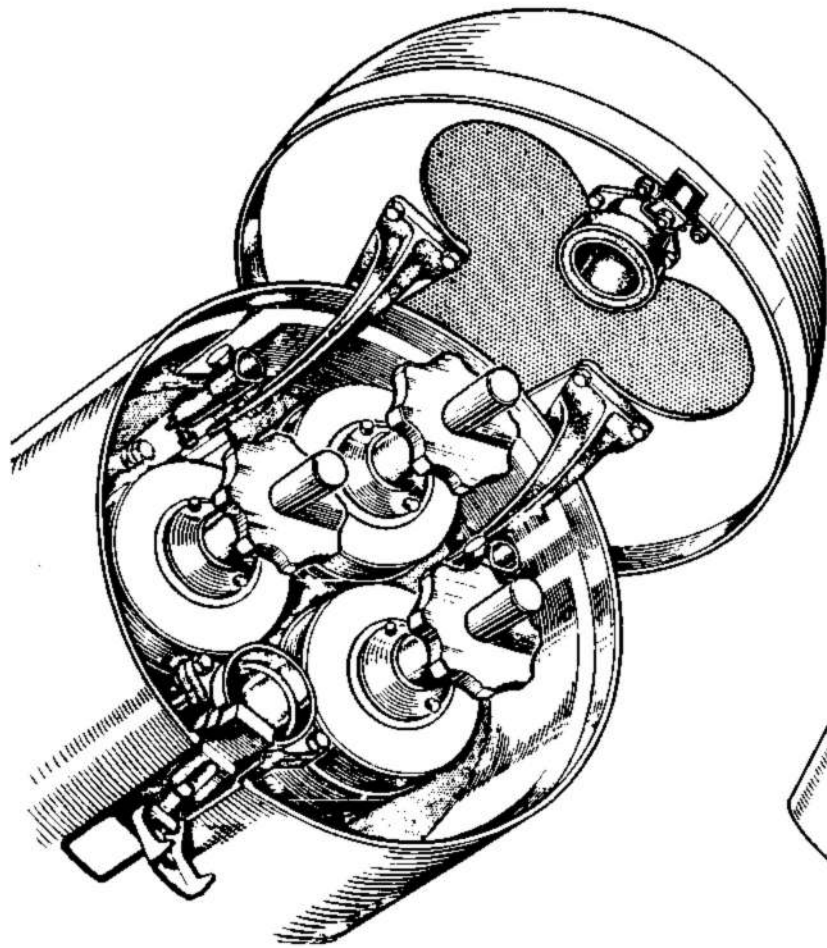


FIG. 2. PRE-FLIGHT SERVICING POINTS



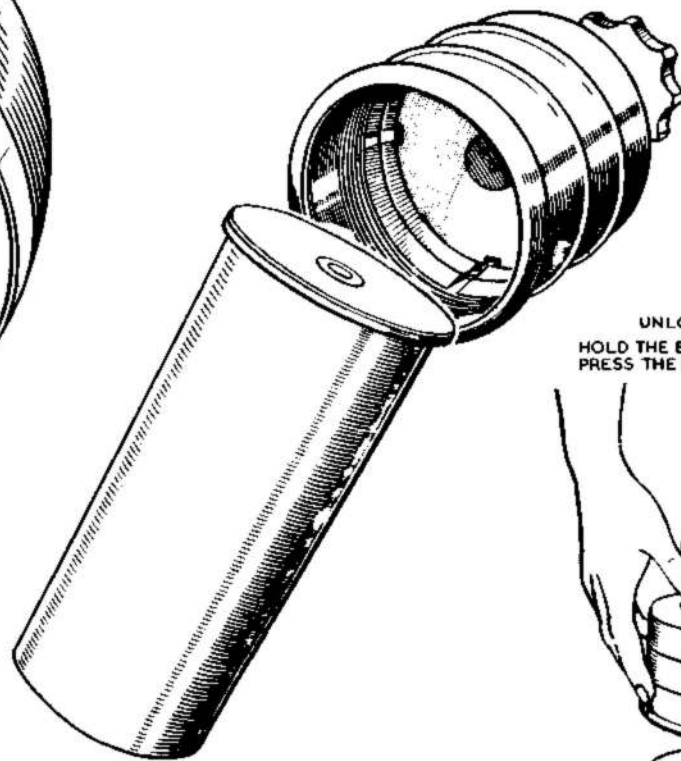
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FIG.2A. PRE-FLIGHT SERVICING POINTS



## REMOVING A BREECH-CAP

RELEASE THE TOGGLE FASTENER AND RAISE THE DOME HEAD OF THE STARTER FAIRING. PRESS THE CENTRAL BUTTON OF THE BREECH-CAP TO BE REMOVED AND UNSCREW THE BREECH-CAP BY THE STARWHEEL UNTIL THE RATCHET DISENGAGES. RELEASE THE BUTTON AND CONTINUE TO UNSCREW UNTIL FREE.



## LOADING A BREECH

PUSH THE CARTRIDGE INTO THE BREECH-CAP AND ENSURE THAT THE EXTRACTOR CLAWS ENGAGE OVER THE RIM OF THE CARTRIDGE. INSERT THE CARTRIDGE INTO THE BREECH AND SCREW THE BREECH-CAP INTO PLACE WITH THE STARWHEEL UNTIL FINGER TIGHT. NOTE - DO NOT OVERTIGHTEN THE BREECH-CAP.

UNLOADING A BREECH-CAP  
HOLD THE BREECH-CAP VERTICAL AND  
PRESS THE EXTRACTOR CLAW BUTTONS

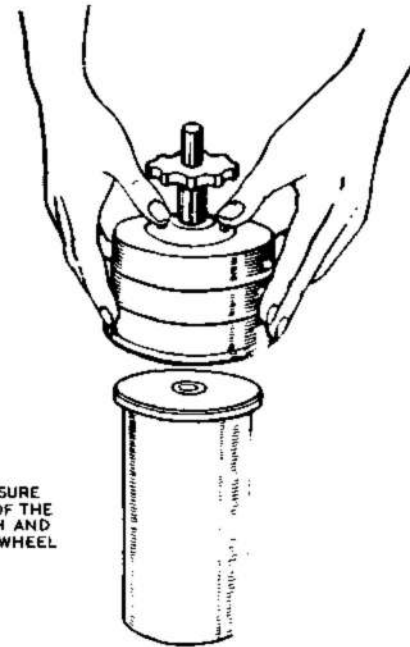


FIG.3. TURBO-STARTER RE-LOADING

shock absorber must be charged to  $1500 \pm 0 \text{ lb/in}^2$  with oil OM-15 and with the nose-wheel clear of the ground for optimum efficiency. After charging, and when the shock absorber has settled down, the extension (*dimension X in fig.1*) should be noted for the most common CG configuration and all-up weight. The serviceability of the unit may be subsequently checked by using this dimension as a norm. Any abnormal variance is to be investigated by jacking up the nose and checking the pressure (*Sect.3, Chap.5B*).

**Note . . .**

*The dimension 'X' will vary from aircraft to aircraft and according to the type of shock-absorber unit fitted.*

**Tyre pressures**

18. The tyre pressures for both main and nose undercarriages are given in A.P.101B-0422-5.

**Positioning the aircraft for ground running**

19. The aircraft must be headed into wind for

all ground running, to prevent the hot gases entering the air-intakes and causing overheating. Before starting an engine ensure that the aircraft is well clear of buildings and other aircraft; these, if less than 100 yards behind the aircraft, are liable to be damaged by the stream of hot gases or by loose objects thrown up by the air stream from the jet pipe. The ground in the immediate vicinity of the front of the aircraft must be kept clear of loose objects which may otherwise be drawn into the engine. All personnel should keep well clear of the air-intakes — at least five yards, and safety guards must be fitted to the air-intakes. The aircraft must never be positioned on tarmac for ground running; if possible, position it on concrete, but if a concrete base is not available it may be positioned on grass.

**Reloading the engine starter**

20. The engines are started by triple-breech turbo-starters positioned in the air-brakes of both engines; the procedure for reloading the starter is given in fig.3.

**WARNING**

The starter may be reloaded only when the engine is stationary.

**Cartridge failure**

21. If any cartridge fails to fire allow one minute to elapse before making another attempt to start. If the second and third cartridges fail to fire, wait one minute and check the electrical circuit.

**WARNING**

A period of ten minutes must elapse between the third attempt and reloading the starter.

**Engine-starting button**

22. Should the engine-starting button fail to remain depressed immediately the operator releases his pressure, an interval of at least one minute must elapse before making another attempt in case a start has been initiated. If the button fails to remain depressed on the second attempt, the aircraft must be considered unserviceable and the cause investigated.

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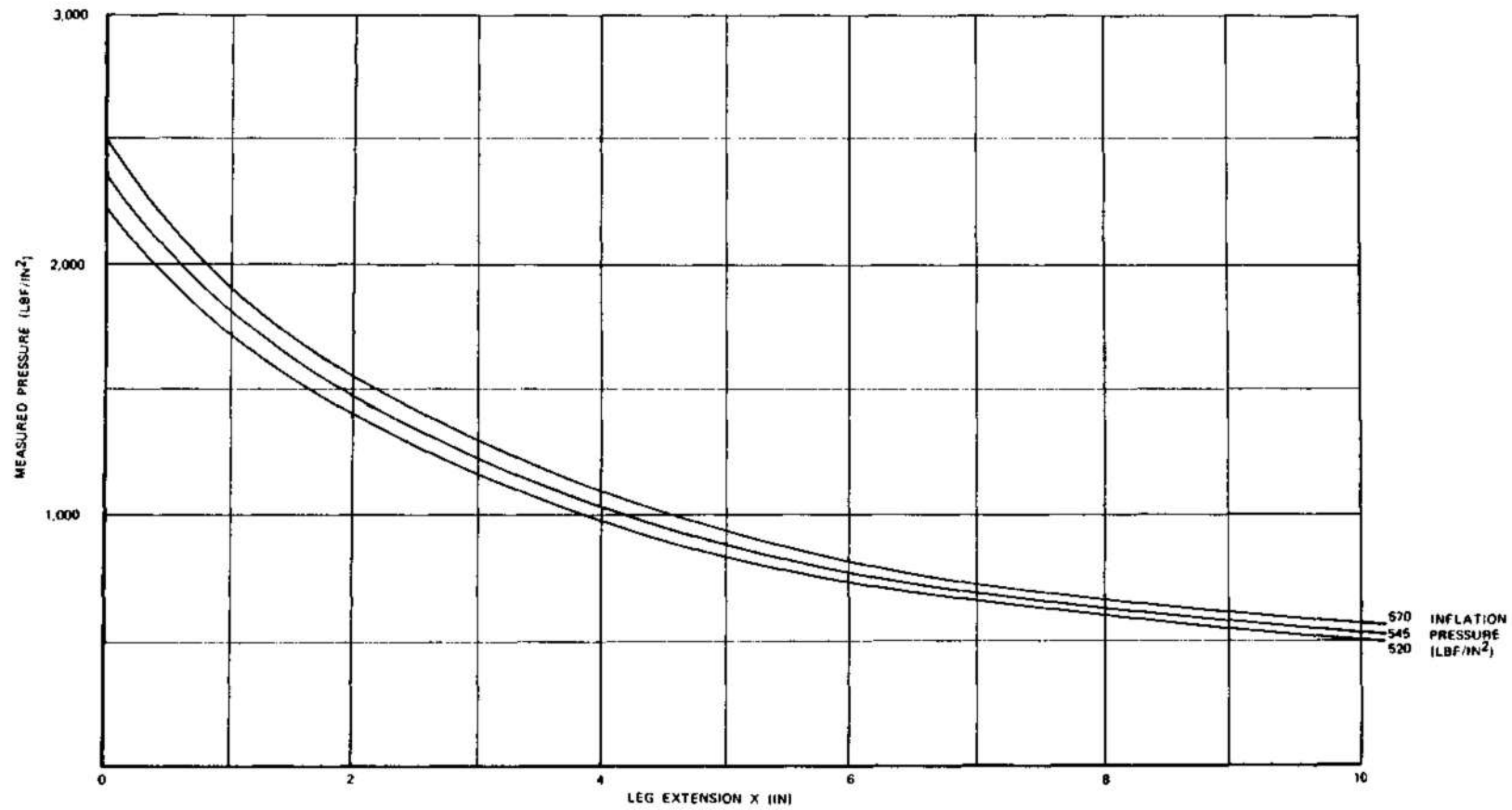
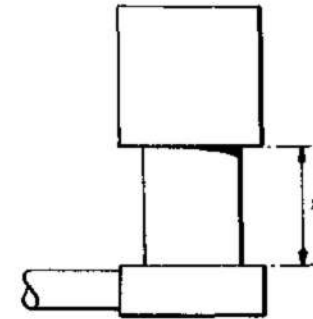


FIG. 4. MAIN UNDERCARRIAGE INFLATION CHART

◀ GRAPH REDRAWN ▶

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Chapter 3    **LOADING AND C.G. DATA**

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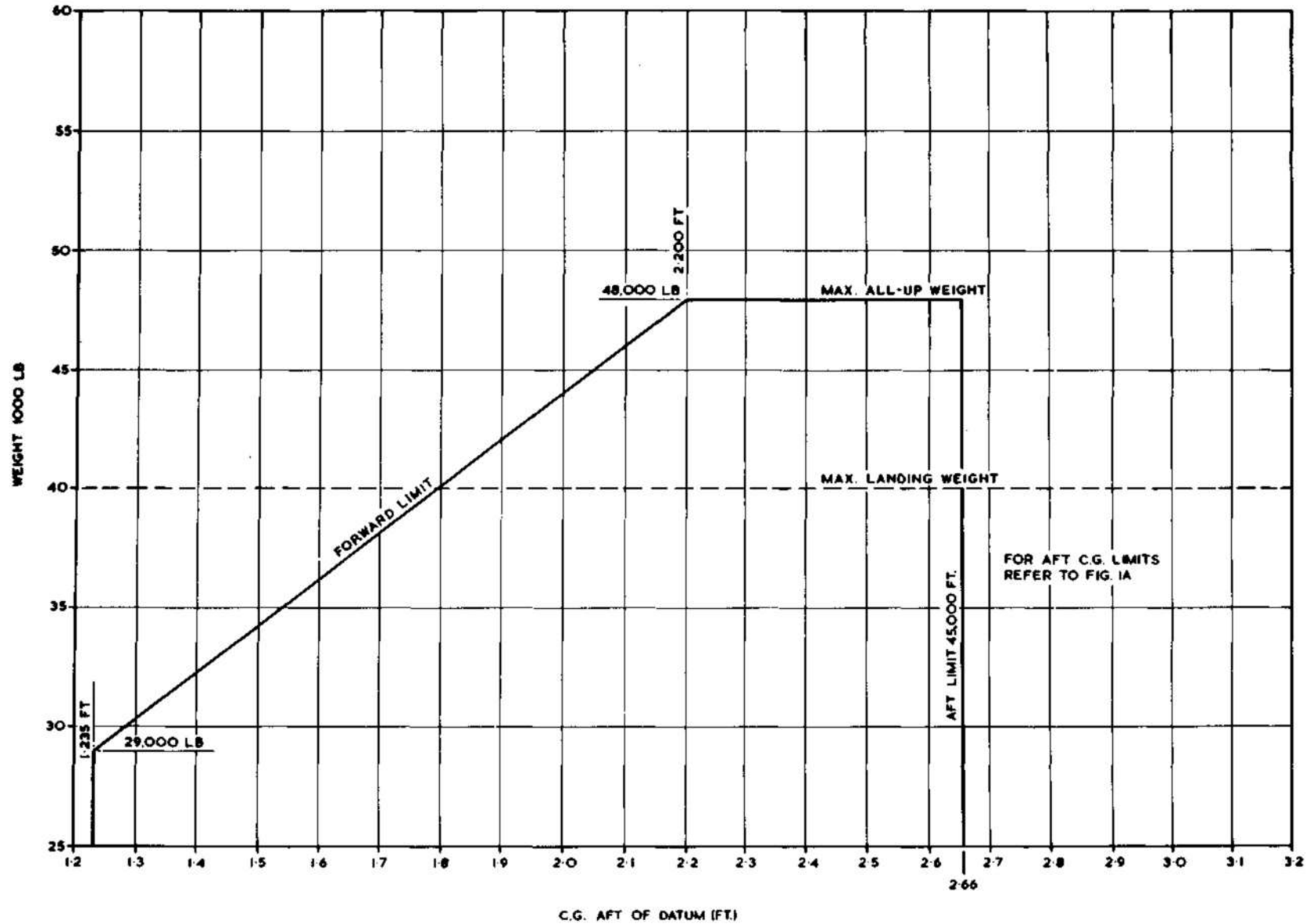


FIG. 1. FLIGHT C.G. LIMITS  
◀AFT LIMITS CORRECTED▶  
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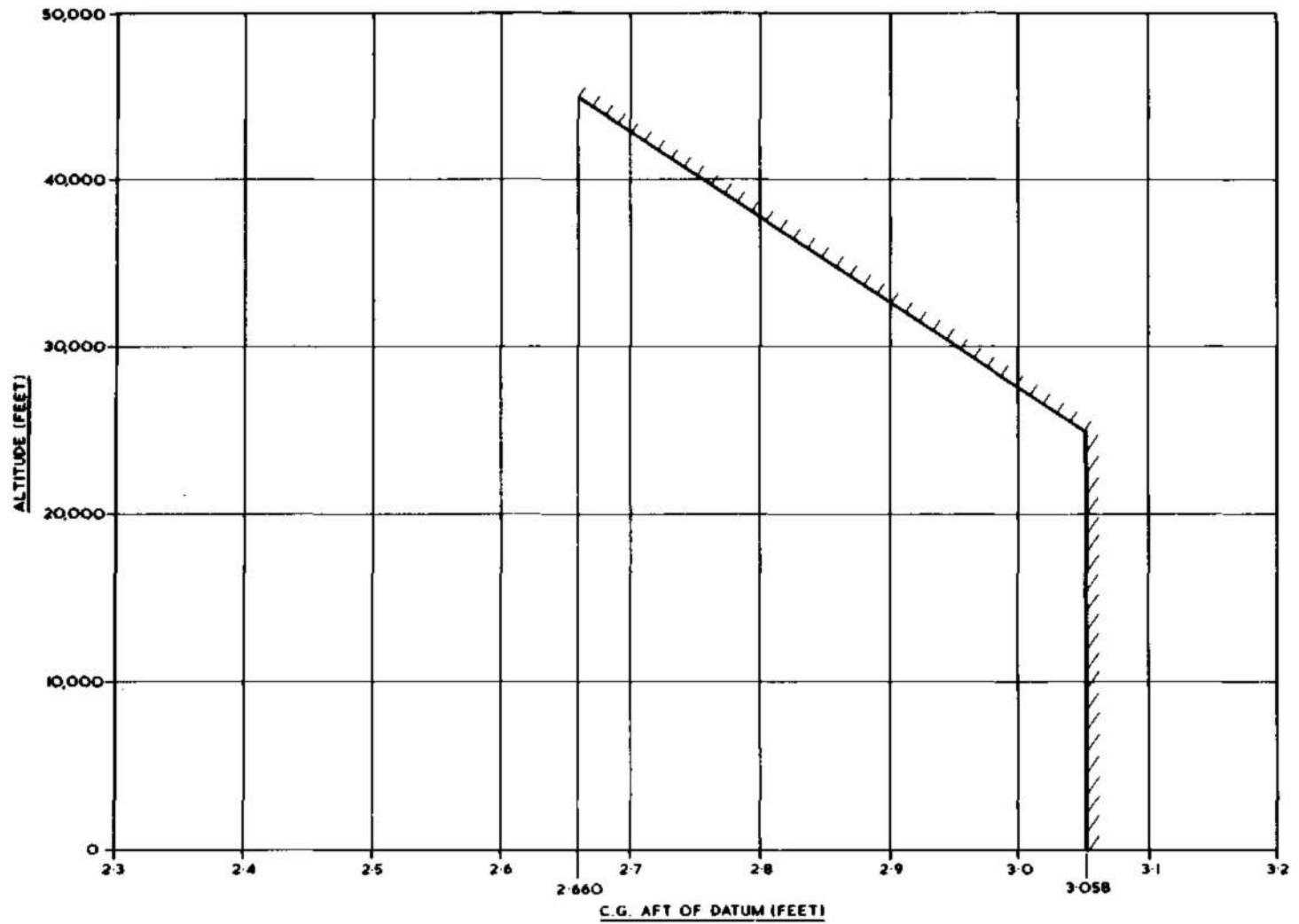


FIG. IA. FLIGHT C.G. LIMITS

**General information**

1. This chapter deals with the effects of different and varying loads upon the C.G. position.

**C.G. position**

2. The aircraft C.G. position is determined with the fuselage datum horizontal (i.e. in the rigging attitude) and with the undercarriage down. All moment arms are measured in feet units parallel to the fuselage datum and are positive when they refer to items aft of the C.G. datum and negative when they refer to items forward of this datum.

**C.G. datum**

3. The C.G. datum is 4.695 ft forward of the spar datum and 0.455 ft below the fuselage horizontal datum. It is indicated by a screw marked C.G. datum on the port side of the fuselage. This screw can be used to suspend a plumb line during weighing operations.

**Flight C.G. limits (fig. 1)**

4. Fig. 1 prescribes the approved handling limits, at any given weight, for C.G. movement measured from the C.G. datum.

**Forward limit**

This is dependant upon the weight of the aircraft. At weights below 29,000 lb the permissible forward limit is 1.235 ft aft. At a weight of 48,000 lb the permissible forward limit is 2.200 ft aft.

**Aft limit****◀ Clean aircraft**

Up to 25,000 ft the aft C.G. is 3.058 ft aft of datum, it then moves linearly forward to 2.660 ft aft of datum at 45,000 ft (fig. 1A). ▶

**Note . . .**

1. *Wing-tip tanks are not fitted to the aircraft.*

2. *If the aircraft is to be taxied over rough ground the aft limit must not exceed 2.885 ft aft.*

**Effect of alighting gear retraction**

5. Retraction of the alighting gear introduces a moment of -1394 lb ft which must be taken into account when making calculations which assume that the alighting gear is retracted.

**Crew movement**

6. Movement of the navigator from his ejection seat to the map reader's seat introduces a moment of -680 lb ft.

**Basic weight and moment**

7. Table 6 refers to a basic weight of 24,520 lb and a basic moment of + 70,633 lb ft. These figures are based on the weighed weight of aircraft Serial No. WH801 incorporating all basic equipment as detailed in Appendix A, Serial No. 2320 - Schedule of Equipment for Canberra T Mk.22 Aircraft. A definition of the term basic weight may be found in A.P.101A-1101-1. The basic weight and C.G. will vary between aircraft depending on their modification standard.

**Maximum all-up weights (fig. 1)**

8. The aircraft is cleared for operational flying at the following maximum weights:-

|          |           |
|----------|-----------|
| Take off | 48,000 lb |
| Landing  | 40,000 lb |

**Note . . .**

*Emergency landings only are permissible at weights in excess of this figure.*

**Alternative load items**

9. If items other than those given are to be carried, their disposition should be similar to that of items given in the all-up weight summary of

approximately the same weight. This will ensure that the aircraft C.G. will at all times remain within the C.G. handling limits, providing that normal fuel drill is adhered to.

**Weighing the aircraft****Preparation****Note . . .**

*Because of the difficulty in draining No. 6 tank and the collector box completely, the aircraft should be weighed with No. 1, 2, 3, 4, 5 and wing integral tanks empty but with No. 6 tank and collector box full.*

**10.**

(1) With the aircraft in the rigging position, carefully drain the fuselage and wing fuel tanks, using the procedure described in Sect. 4, Chap. 2, but ignoring the instructions given in para. 7, for complete drainage of the belly tank and collector box. When draining of top, rear and wing tanks is complete and the drain valves have been closed, fill No. 6 tank and collector box to maximum capacity and replace the filler cap.

(2) Remove all other expendable load items and all possible alternative load items from the aircraft.

**Non-hydrostatic method of weighing**

(3) Information of a general nature concerning the practical measurement of basic weight and moment is contained in A.P.119W-0001-1.

**Hydrostatic method**

(4) The equipment required for weighing the aircraft, using the hydrostatic method, is listed in Sect.2, Chap.4, Table 2. A.P.119W-0301-1 gives general information on hydrostatic units and their use; the following instructions amplify this:-

(a) Jack the aircraft at the main and

front fuselage jacking points (*Sect. 2, Chap. 4*).

(b) Place locally-manufactured wood blocks of sufficient thickness to provide the necessary clearance for the hydrostatic unit and jacks, under the nose and main wheels. Lower the aircraft on to the blocks and remove the lifting jacks.

(c) Assemble:—

(i) A 25-ton hydrostatic unit, a 15-ton jack and jack-to-unit and unit-to-aircraft pad adapters at each main wheel jacking point.

(ii) A 10-ton hydrostatic unit, an 8-ton jack and jack-to-unit and unit-to-nose undercarriage adapters, under the nose undercarriage axle between the twin wheels.

(d) Weigh the aircraft as instructed in A.P.119W-0301-1.

(e) Lower the aircraft on to the wood blocks and remove the weighing equipment.

(f) Jack the aircraft (*Sect. 2, Chap. 4*) and remove the blocks.

(g) Lower the aircraft to the ground and remove the jacks.

**Basic weight determination**

11. To the weight and moment obtained from weighing add:—

(1) The weight and moment of drainable

unusable fuel in the pipe lines (*Note 2 of Table 1*).

(2) The weight and moment of Table 2 items not fitted at weighing but required for flight.

Deduct the weight and moment of all items from Tables 3, 4, 5 and 6 which were fitted at weighing.

The resultant figures are the basic weight and moment.

**Engine data**

12. In the event of an engine change, Form 4908 must be amended to account for any changes in the engine weight and moment in accordance with the values quoted for the individual engine on the engine log card. The C.G. position as quoted on the log card will be to an engine datum and it will be necessary to correct this value to the aircraft C.G. datum (*para. 3*). The following data will affect this correction.

(1) The C.G. of the engine is quoted by the manufacturers in inches fwd. of the rear suspension centre line.

(2) This engine datum is 15.00 in. aft of the aircraft C.G. datum point.

(3) Hence if  $X_e$  is the C.G. position of the engine, as quoted on the log card, then the C.G. of the engine in relation to the aircraft datum in feet is:—

$$\frac{15.00 - X_e}{12} = \text{ft forward of aircraft C.G. datum}$$

This result will be negative denoting that the engine C.G. is forward of the aircraft C.G.

**Modifications**

13. The basic weight given (*Table 6*) includes the modifications quoted in the CAN.22/Y/1 Leaflet, plus the modifications listed in sub para. (1), minus those in sub para.(2):—

(1) 54, 195, 1402, 1463 PART, 1491, 1751 PART, 1726, 1997, 4152, 4933, 4949, 5057A.

(2) Nil.

**Ballast**

14. A total of 79 lb ballast is fitted on frame 48 in the tailcone (*refer to Table 2*). This ballast is fixed and is included in basic weight.

15. To cater for any future forward movement of the C.G. due to changes in equipment standard or modification action, provision has been made at frames 41/42 (+32.325 ft aft) for the fitment of a further 82 lb of ballast Part No. EK5.84.19. This ballast (if fitted in part or whole) is not included in the basic weight and must be added to the aircraft all-up weight summary (*refer to Sect. 3, Chap. 1 for details of installation*).

TABLE I

Summary of drainable and undrainable unusable fuel to be included in basic weight

| Location  | Weight (lb)   | Arm (ft) | Moment (lb ft) |
|---|---------------|----------|----------------|
| Fuel, pipes in wings . . . . .  | 30.00         | +4.035   | +121.00        |
| Fuel, pipes in fuselage . . . . .   | 13.00         | +5.433   | + 70.63        |
| Fuel, recuperators . . . . .  | 64.00         | +1.323   | + 84.67        |
| No. 6 tank and collector box<br>(30 gal unusable and undrainable) . . . . . | 240.00        | -1.101   | -264.00        |
| <b>TOTAL TRAPPED (undrainable) FUEL</b>                                     | <b>347.00</b> |          | <b>+ 12.30</b> |

**Note . . .**

1. Due to the disposition of certain fuel pipes and the fact that the wing tanks are normally drained with the L.P. cocks closed, the above weight of fuel will remain trapped when the fuel tanks are drained.
2. Since all fuel in pipelines and unusable fuel in tanks is included in the basic weight, the following fuel weights must be added when determining the basic weight after weighing the aircraft.

|   |       |        |         |
|---|-------|--------|---------|
| Drainable fuel in pipelines . . . . .                   | 16.00 | +2.977 | + 47.63 |
| Drainable but unusable fuel in integral tanks . . . . . | 32.00 | +2.183 | + 69.86 |

TABLE 2

## Removable load items included in basic weight

| Fig. 2<br>Item<br>No. | Ref.<br>or<br>Part No. | Qty.   | Description   | Weight<br>(lb) | Arm<br>(ft) | Moment<br>(lb ft) |
|-----------------------|------------------------|--------|---|----------------|-------------|-------------------|
| MISCELLANEOUS ITEMS   |                        |        |   |                |             |                   |
| 25                    | 12G/1461               | 64     | Detonator, electric, No. 108, Mk. 3                     | 1.48           | -14.49      | - 21.45           |
|                       | 12G/1278               | 64     | Detonator, electric, No. 108, Mk. 1                     |                |             |                   |
| 30                    | 12G/1462               | 2      | Detonator, electric, No. 108, Mk. 4                     | 0.25           | -12.10      | - 3.03            |
|                       | 12G/1438               | 2      | Detonator, electric, No. 108, Mk. 2                     |                |             |                   |
| 13                    | 12G/1463               | 1      | Detonator, electric, No. 109, Mk. 2                     | 0.02           | 17.38       | - 0.35            |
|                       | 12G/1279               | 1      | Detonator, electric, No. 109, Mk. 1                     |                |             |                   |
| 68                    | 12G/1430               | 4      | Detonator, electric, Type 116, Mk. 1                    | 0.12           | 1.50        | 0.18              |
| 14                    | 12K/1433               | 1 set  | Cartridges, seat ejection, No. 13, Mk. 1 (Pilot)        | 1.00           | 16.10       | 16.10             |
| 31                    | 12K/1433               | 1 set  | Cartridges, seat ejection, No. 13, Mk. 1 (Navigator)    | 1.00           | 11.65       | - 11.65           |
| 62                    | 12K/1223               | 6      | Cartridges, engine starting, electrical, No. 10, Mk. 2  | 18.00          | +19.14      | +344.52           |
| 72                    | 12L/203                | 1      | Destructor, H.E., No. 1, Mk. 1                          | 3.25           | - 9.62      | 31.27             |
| 88                    | 12G/1454               | 1      | Charge, H.E., emergency control severing, No. 1, Mk. 3  | 0.37           | 17.38       | 6.43              |
| 18                    | 22G/9108081            | 1 pair | Gauntlets, protective, fire-fighting, asbestos          | 0.90           | 15.75       | - 14.18           |
| 19                    | 9A/6545-99-211-0670    | 1      | Kits, first aid, aircraft                               | 3.00           | 15.75       | - 47.25           |
| 24                    | 27N/1                  | 1      | Axe, fire   | 2.42           | 14.51       | 35.11             |
| 46                    | 27N/100                | 3      | Extinguisher, fire, methyl bromide, automatic, Type 12A | 10.63          | +13.83      | + 147.01          |
|                       | 27N/152                | 3      | Extinguisher, fire, methyl bromide, automatic, Type 4AX |                |             |                   |
| 40                    | 27N/102                | 2      | Extinguisher, fire, methyl bromide, automatic, Type 14A | 38.62          | + 1.01      | + 39.01           |
|                       | 27N/155                | 2      | Extinguisher, fire, methyl bromide, automatic, Type 8AX |                |             |                   |
| 26                    | 27N/299                | 1      | Extinguisher, fire, trigger, hand operated, Type 34H    | 5.19           | 14.68       | 76.19             |
| 36                    | 5J/6140-99-1115903     | 1      | Battery, secondary, alkaline, 7AH, Type 19-Vo-7LK       | 14.25          | 10.08       | 143.64            |
| 93                    | 5J/6140-99-910-1543    | 2      | Batteries, lead acid, 12 volt, 4AH                      | 9.88           | 19.24       | 190.09            |
| 71                    | 5J/6140-99-949-9955    | 1      | Battery, lead acid, 24 volt, salt Type 20-Vo-35         | 80.00          | 9.51        | -761.04           |
| 44                    | 6D/9429896             | 10     | Cylinders, oxygen, 750 litre, charge                    | 23.44          | + 9.16      | +214.72           |
| 11                    | 6B/2754                | 1      | Compass, check steering, Type E2B                       | 0.26           | 18.73       | 4.87              |
| 23                    | 6B/562                 | 1      | Amplifier unit, Type 'B'                                | 10.00          | 14.79       | 147.92            |
| 43                    | 6B/2906                | 1      | Detector unit, Type 'B'                                 | 1.67           | + 5.70      | + 9.52            |
|                       | 6B/1993                | 1      | Detector unit, Type 'A'                                 |                |             |                   |
| 2                     | 6B/561                 | 1      | Gyro unit, Type 'B'                                     | 6.00           | -19.87      | -119.19           |
| 20                    | 6B/3831                | 1      | Indicator master, Type E.5                              |                |             |                   |
| 22                    | 6B/408                 | 1      | Panel, control, Type A                                  |                |             |                   |
|                       |                        |        |   |                |             |                   |
|                       |                        |        | G.4B Compass  | 6.50           | -15.57      | -101.21           |
|                       |                        |        |   | 1.28           | -15.07      | - 19.29           |

continued

TABLE 2

Removable load items included in basic weight *continued*

| Fig. 2<br>Item<br>No. | Ref.<br>or<br>Part No. | Qty. | Description                                       | Weight<br>(lb) | Arm<br>(ft) | Moment<br>(lb ft) |
|-----------------------|------------------------|------|---|----------------|-------------|-------------------|
| 63                    | 6G/36                  | 1    | Master reference gyro, Type 'E' Mk. 1             | 37.00          | + 7.06      | + 221.22          |
| 64                    | 6G/261                 | 1    | Mounting frame for M.R.G. Type 'E'                | 10.00          | + 7.06      | + 70.60           |
| 65                    | 6G/17                  | 1    | Mounting tray, Type 'B'                           | 1.75           | + 7.06      | + 12.36           |
| 70                    | 6G/18                  | 1    | Power failure unit, Type 'B'                      | 0.50           | -10.64      | - 5.32            |
| 32                    | 6G/21                  | 1    | Relay delay unit, Type 'A'                        | 0.25           | -11.46      | - 2.86            |
| 41                    | 6B/554                 | 1    | Air mileage unit, Mk. 4A                          | 10.50          | + 1.49      | + 15.65           |
| 28                    | 6B/458                 | 1    | Indicator, air position, Mk. 1B                   | 11.20          | -13.18      | - 147.59          |
| 75                    | 6B/293                 | 1    | Indicator, air mileage, Mk. 1                     | 1.69           | -14.50      | - 25.51           |
| 95                    | 6A/4245                | 1    | Altimeter, Mk. 21, 8,000 - 50,000 ft fluorescent  | 0.22           | -19.36      | - 4.24            |
| 3                     |                        | 1    | Altimeter, Mk. 29B, servo-controlled              | 3.50           | -19.75      | - 69.11           |
| 16                    | L82361-04-010          | 1    | Altimeter, Mk. 30A, servo-encoded                 | 4.50           | -15.98      | - 71.89           |
| 35                    | 83271-00-000           | 1    | Pressure error correction unit (Kollsman)         | 5.50           | -10.64      | - 58.52           |
|                       | 6A/2197                | 1    | Clock, Mk. 4, fluorescent                         | 0.37           | -19.60      | - 7.20            |
| 7                     | 6A/2958                | 1    | Clock, Mk. 4B, fluorescent                        | 0.37           | -19.60      | - 7.20            |
|                       | 6A/2089                | 1    | Clock, Mk. 5, ACA fluorescent                     | 0.37           | -19.60      | - 7.20            |
| 9                     | 6A/3451                | 1    | Accelerometer, Mk. 2                              | 0.66           | -18.51      | - 12.22           |
| 4                     | 6A/6819                | 1    | Horizon, artificial, Mk. 611                      | 4.63           | -19.84      | - 91.75           |
| 17                    | 6A/3147                | 1    | Indicator, air speed, Mk. 9H XP                   | 0.75           | -15.98      | - 11.98           |
|                       | 6A/4722                | 1    | Indicator, air speed, Mk. 9M                      | 1.31           | -15.98      | - 20.93           |
| 8                     | 6A/3360                | 1    | Indicator, air speed, Mk. 15A                     | 0.88           | -19.62      | - 17.16           |
| 96                    | 6A/7677                | 1    | Indicator, rate of climb, Mk. 3Q                  | 1.00           | -19.72      | - 19.72           |
| 97                    | 6A/5546                | 1    | Indicator, turn and slip, Mk. 3                   | 2.63           | -19.77      | - 51.99           |
|                       | 6A/3953                | 1    | Indicator, turn and slip, Mk. 2A, electrical      | 2.63           | -19.77      | - 51.99           |
| 5                     | 6A/3384                | 1    | Machmeter, Mk. 2                                  | 1.00           | -19.54      | - 19.54           |
| 67                    | 6A/9657                | 1    | Meter, fatigue, Mk. 16                            | 4.75           | - 0.30      | - 1.43            |
| 12                    | 27KD/375               | 5    | Stoppers, leak, cabin pressure                    | 1.25           | -17.50      | - 21.88           |
| 82                    | 27H/3224               | 1    | Container, urine, Mk. 2 and funnel                | 1.09           | -15.15      | - 16.51           |
| 27                    | 5CX/369                | 1    | Lamp, inspection, Mk. 2 c/w lead                  | 0.80           | -14.11      | - 11.29           |
| 92                    | EA3.80.1989            | 1    | Handle for emergency hydraulic hand pump (stowed) | 0.85           | -16.14      | - 13.72           |
| 47                    | EK5.84.3               | 1    | Ballast in tailcone (fixed)                       | 78.91          | +40.35      | +3183.78          |

*continued*

TABLE 2

Removable load items included in basic weight *continued*

| Fig. 2<br>Item<br>No.                          | Ref.<br>or<br>Part No. | Qty. | Description                                | Weight<br>(lb) | Arm<br>(ft.)  | Moment<br>(lb ft) |        |
|--|------------------------|------|--|----------------|---------------|-------------------|--------|
| <b>A.R.I.5877 (RADIO COMPASS AD.722)</b>       |                        |      |  |                |               |                   |        |
| 33   | 10B/17816              | 1    | Aerial loop, Type 8280 .....               | 2.75           | - 9.74        | - 26.78           |        |
| 83   | 10U/17211              | 1    | Amplifier R.F. Type 8281 .....             | 4.90           | -15.39        | 75.39             |        |
| 84   | 10U/17212              | 1    | Amplifier I.F., Type 8282 .....            | 9.10           | -15.39        | - 140.00          |        |
| 91   | 10I/16287              | 1    | Control unit, Type 8283 .....              | 2.40           | -15.39        | 36.92             |        |
| 34   | 10D/20169              | 1    | Corrector unit, Type QE .....              | 1.10           | 9.74          | 10.71             |        |
| 73   | 10P/16303              | 1    | Filter, voice range, Type 1275 .....       | 1.00           | -12.89        | - 12.89           |        |
| 90   | 10AJ/1572              | 1    | Mounting, Type 8288 (Amplifier R.F.) ..... | 1.86           | 15.39         | 28.60             |        |
| 89   | 10AJ/1573              | 1    | Mounting, Type 8289 (Amplifier I.F.) ..... | 1.00           | 15.39         | 15.39             |        |
| Total, A.R.I.5877 (radio compass AD.722) ..... |                        |      |  | <u>24.11</u>   | <u>14.38</u>  | <u>346.68</u>     |        |
| <b>A.R.I.5930 (SEARCH RADAR)</b>               |                        |      |  |                |               |                   |        |
| 87   | 5841-99-195-3692       | 1    | Control indicator, Ferranti D/3495/81000   | } Alternatives | 9.04          | 15.39             | 139.05 |
|  | 5841-99-119-0620       | 1    | Control indicator, Type 12722              |                | 9.04          | 15.39             | 139.05 |
|  | 5841-99-119-0620       | 1    | Control indicator, Type CAVR 16208         |                | 9.04          | 15.39             | 139.05 |
| 86   | 5841-99-956-3653       | 1    | Indicator, azimuth range                   | } Alternatives | 22.05         | 15.39             | 339.16 |
|  | 5841-99-954-3653       | 1    | Indicator, azimuth range                   |                | 22.05         | 15.39             | 339.16 |
| 29   | 5841-99-104-1349       | 1    | Control, radar set                         | } Alternatives | 5.95          | 13.07             | 77.75  |
|  | 5841-AP214709          | 1    | Control, radar set                         |                | 5.95          | 13.07             | 77.75  |
| 1  | 5841-99-415-0714       | 1    | Radar set, Type 12723 .....                | 236.00         | 23.33         | 5506.35           |        |
| Total, A.R.I.5930 (search radar) .....         |                        |      |  | <u>272.15</u>  | <u>22.23</u>  | <u>6048.73</u>    |        |
| <b>A.R.I.18089 (INTERCOMM.)</b>                |                        |      |  |                |               |                   |        |
| 74   | 10U/5821-99-223-7295   | 1    | Amplifier, Type A.1961M .....              | 6.97           | 13.59         | 94.70             |        |
| Total, A.R.I.18089 (Intercomm.) .....          |                        |      |  | <u>6.97</u>    | <u>-13.59</u> | <u>94.70</u>      |        |

*continued*

TABLE 2

Removable load items included in basic weight *continued*

| Fig. 2<br>Item<br>No.                     | Ref.<br>or<br>Part No. | Qty. | Description  | Weight<br>(lb) | Arm<br>(ft.)  | Moment<br>(lb ft) |
|---|------------------------|------|--|----------------|---------------|-------------------|
| A.R.I.18107/4 (TACAN)                     |                        |      |  |                |               |                   |
| 42  | 10B/20275              | 1    | Aerial, omni, Type 100B .....                        | 1.26           | + 4.70        | + 5.92            |
| 76  | 0624/5826-99-428-0401  | 1    | Control unit, Type 9273 .....                        | 1.23           | -14.95        | - 18.45           |
| 15  | 10Q/5826-99-428-0389   | 2    | Indicator, electrical, Type 9547 .....               | 3.01           | -16.05        | 48.29             |
| 51  | 10AJ/5826-99-430-6051  | 1    | Mounting tray, Type 9274 (for T.R. unit) .....       | 7.77           | +28.66        | + 222.72          |
| 50  | 110D/5826-00-897-5519  | 1    | Transmitter-receiver, Type R.T.636/ARN-72 .....      | 49.63          | +28.66        | +1422.59          |
| 49  | 10D/5826-99-428-0416   | 1    | Coupling unit, Type 9546 .....                       | 7.47           | +29.03        | + 216.84          |
| 48  | 10AJ/5826-99-428-0393  | 1    | Mounting tray, Type 9545 (for coupling unit) .....   | 1.88           | +29.03        | + 54.43           |
| Total, A.R.I.18107/4 (Tacan) .....        |                        |      |  | <u>72.25</u>   | <u>+25.69</u> | <u>+1855.76</u>   |
| A.R.I.23057 (U.H.F. STANDBY)              |                        |      |  |                |               |                   |
| 39  | 10D/5915-99-970-0362   | 1    | Filter, radio interference, Type D.170 .....         | 0.64           | - 8.53        | - 5.46            |
| 37  | 10D/5821-99-945-6726   | 1    | Transmitter-receiver, Type M.6 .....                 | 10.70          | - 9.03        | - 96.66           |
| 38  | 10AJ/5821-99-970-1497  | 1    | Mounting, Type 1031 (for T.R. unit) .....            | 0.80           | 9.03          | 7.23              |
| Total, A.R.I.23057/U.H.F. stand-by .....  |                        |      |  | <u>12.14</u>   | <u>- 9.01</u> | <u>- 109.35</u>   |
| A.R.I.23118 (VOR/ILS AD.260)              |                        |      |  |                |               |                   |
| 77  | 10D/9702194            | 1    | Navigation unit, Type 6402MA .....                   | 9.80           | 14.95         | - 146.48          |
| 21  | 10L/9702196            | 1    | Control unit, Type 7430M .....                       | 1.50           | -15.59        | - 23.39           |
| 6   | 10Q/5840-99-951-4214   | 1    | Indicator, omni-bearing, Type RL.7003-184B .....     | 1.69           | 19.56         | 33.02             |
| 94  | 10Q/5826-99-105-4264   | 2    | Indicator, radial magnetic, Type PW/21/RNA/CPI ..... | 7.20           | -17.77        | - 127.93          |
| 78  | 10D/9704803            | 1    | Receiver, V.O.R. Type 6401M .....                    | 8.20           | -14.95        | - 122.57          |
| 80  | 10D/9702192            | 1    | Receiver, glide slope, Type 6404M .....              | 7.80           | -14.95        | - 116.59          |
| 81  | 10D/9702193            | 1    | Receiver, marker, Type 6403M .....                   | 6.70           | 14.95         | - 100.15          |
| Total, A.R.I.23118 (VOR/ILS AD.260) ..... |                        |      |  | <u>42.89</u>   | <u>-15.63</u> | <u>670.12</u>     |

*continued*

TABLE 2

Removable load items included in basic weight *continued*

| Fig. 2<br>Item<br>No.                            | Ref.<br>or<br>Part No. | Qty. | Description   | Weight<br>(lb) | Arm<br>(ft)   | Moment<br>(lb ft) |
|--|------------------------|------|---|----------------|---------------|-------------------|
| A.R.I.23134/3 (IFF/SSR COSSOR 1520)              |                        |      |   |                |               |                   |
| 45   | 10B/20275              | 2    | Aerial, Type 100B .....                                   | 2.52           | +19.10        | + 48.12           |
| 79   | 5895-99-956-3379       | 1    | Controller, Type 16929 (Cossor Type 1503) .....           | 3.00           | -14.95        | - 44.84           |
| 56   | 10AR/1075637           | 1    | Mounting, Cossor, Type 16946 .....                        | 1.25           | +24.28        | + 30.34           |
| 55   | 5895-99-107-1521       | 1    | Switching unit, antenna, Type 16941 .....                 | 2.00           | +25.21        | + 50.41           |
| 57   | 5895-99-956-3378       | 1    | Transmitter-receiver, Type 16928 (Cossor Type 1520) ..... | 28.00          | +24.28        | + 697.70          |
| Total, A.R.I.23134/3 (IFF/SSR Cossor 1520) ..... |                        |      |   | <u>36.77</u>   | <u>+21.26</u> | <u>+ 781.74</u>   |
| A.R.I.23143/4 (U/VHF PTR 175)                    |                        |      |   |                |               |                   |
| 69   | 10B/5985-99-222-2399   | 2    | Aerial, U.H.F. Chelton, Type 16-1 .....                   | 3.00           | - 6.54        | - 19.61           |
| 66   | 10B/5985-99-951-3781   | 1    | Aerial, V.H.F. ....                                       | 1.46           | + 1.76        | + 2.56            |
| 60   | 10AD/5821-99-932-6361  | 1    | Interconnecting box .....                                 | 1.19           | +20.08        | + 23.85           |
| 10   | 10L/5821-99-945-5739   | 1    | Control unit, radio set, Type C.1607/4 .....              | 3.22           | -18.51        | - 59.60           |
| 85   | 10L/5821-99-107-0030   | 1    | Control unit, radio set, Type C.1607/7 .....              | 2.25           | -15.39        | - 34.62           |
| 61   | 10L/5821-99-943-3247   | 1    | Control unit, receiver muting .....                       | 1.25           | +20.08        | + 25.10           |
| 53   | 10AJ/5821-99-942-8544  | 1    | Mounting tray, radio T/R, Pt. No. MT.1477EARC.52 .....    | 2.66           | +25.74        | + 68.57           |
| 54   | 10L/5821-99-971-1781   | 1    | Transmitter-receiver, D.C. radio, Type PTR175 .....       | 50.00          | +25.74        | +1286.90          |
| Total, A.R.I.23143/4 (U/VHF PTR175) .....        |                        |      |   | <u>65.03</u>   | <u>+19.89</u> | <u>+1293.15</u>   |
| A.R.I.23219/4 (RADAR ALTIMETER)                  |                        |      |   |                |               |                   |
| 52   |                        | 2    | Antenna, Type LG.81.A1 .....                              | 2.00           | +27.93        | + 55.87           |
| 98   |                        | 1    | Indicator, height, Type JG.206D1 .....                    | 1.59           | -19.75        | - 31.40           |
| 58   |                        | 1    | Rack, mounting, Type 1987638-1 .....                      | 2.00           | +24.34        | + 48.68           |
| 59   |                        | 1    | Receiver-transmitter, Type HG.9050 D1 .....               | 13.41          | +24.34        | + 326.29          |
| Total, A.R.I.23219/4 .....                       |                        |      |   | <u>19.00</u>   | <u>+21.02</u> | <u>+ 399.44</u>   |

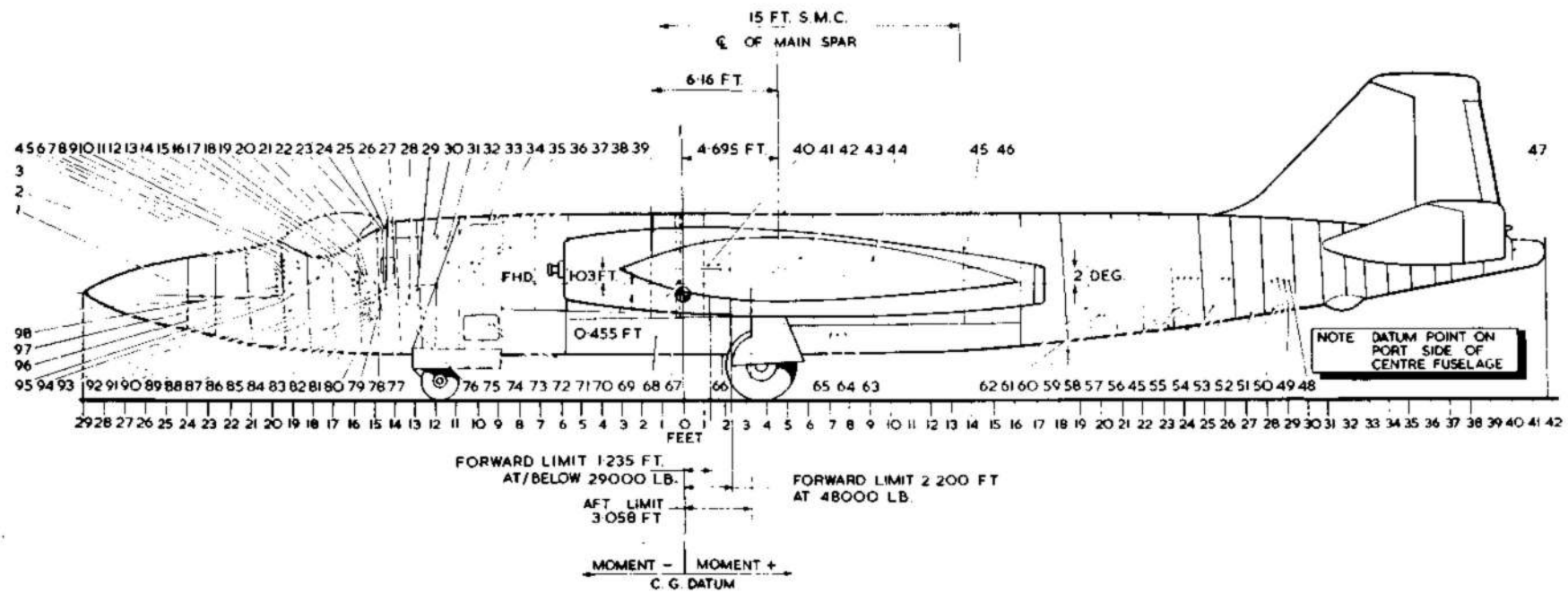


FIG. 2 LOADING AND C.G. DIAGRAM-REMOVABLE LOAD ITEMS

TABLE 3

## Crew and crew removable operating load items common to all roles

| Fig. 3<br>Item<br>No.          | Ref.<br>or<br>Part No. | Qty. | Description   | Weight<br>(lb) | Arm<br>(ft)   | Moment<br>(lb ft) |
|--------------------------------|------------------------|------|---|----------------|---------------|-------------------|
| <b>PILOT AND EQUIPMENT</b>     |                        |      |   |                |               |                   |
| 103                            |                        | 1    | Pilot .....   | 180.00         | -17.56        | -3160.80          |
| 107                            | 22C/1301615            | 1    | Jacket, life preserver, aircrew .....                     | 6.50           | -17.00        | - 110.50          |
| 104                            | 27C/9007619            | 1    | Packs, personal survival, Type 'M', Mk. 3 .....           | 22.00          | -17.51        | - 385.22          |
| 105                            | 15A/1533               | 1    | Parachute assembly, Type 'S' Mk. 18 .....                 | 24.00          | -17.58        | - 421.92          |
| 99                             |                        | 1    | Pilot's notes .....                                       | 0.20           | -19.33        | - 3.87            |
| 100                            | 27H/2768               | 1    | Case, pilot's notes, transparent .....                    | 0.14           | -19.33        | - 2.71            |
| 101                            | 5A/9105033             | 1    | Torch, electric, Type 'Y', c/w cells .....                | 0.72           | -19.33        | - 13.92           |
| 102                            | 6F/171                 | 1    | Pad, writing, knee-type .....                             | 1.38           | -18.40        | - 25.39           |
| 106                            | 6D/2678                | 1    | Oxygen set, Mk. 7J, emergency .....                       | 3.00           | -17.58        | - 52.74           |
|                                |                        |      | <b>Total, pilot and equipment .....</b>                   | <b>237.94</b>  | <b>-17.56</b> | <b>-4177.07</b>   |
| <b>NAVIGATOR AND EQUIPMENT</b> |                        |      |   |                |               |                   |
| 108                            |                        | 1    | Navigator .....   | 180.00         | -13.06        | -2350.80          |
| 112                            | 22C/1301615            | 1    | Jacket, life preserver, aircrew .....                     | 6.50           | -12.65        | - 82.23           |
| 109                            | 27C/9007619            | 1    | Pack, personal survival, Type 'M' Mk. 3 .....             | 22.00          | -13.05        | - 287.10          |
| 110                            | 15A/1533               | 1    | Parachute assembly, Type 'S' Mk. 18 .....                 | 24.00          | -13.10        | - 314.40          |
| 111                            | 6D/2678                | 1    | Oxygen set, Mk. 7J, emergency .....                       | 3.00           | -13.10        | - 39.30           |
| 124                            | 6B/469                 | 1    | Case, carrying, navigator's equipment, containing:- ..... | 1.00           | -13.69        | - 13.69           |
| 125                            | 5A/9105033             | 1    | Torch, electric, Type 'Y' c/w cells .....                 | 0.72           | -13.69        | - 9.86            |
| 126                            | 6E/9604560             | 1    | Binoculars, prismatic, Mk. 5, 5 x 40 mm .....             | 2.13           | -13.69        | - 29.16           |
| 127                            | 6E/320                 | 1    | Binoculars, prismatic, Mk. 5, 7 x 50 mm .....             | 2.00           | -13.69        | - 27.38           |
| 128                            | 6B/47                  | 1    | Protractors, Douglass, 5 in. ....                         | 0.14           | -13.69        | - 1.92            |
| 129                            | 6B/260                 | 1    | Rule, navigation, Mk. 1 .....                             | 0.13           | -13.69        | - 1.78            |
| 130                            | 1B/94                  | 1    | Sets, compass .....                                       | 0.25           | -13.69        | - 3.42            |
| 131                            | 6B/349                 | 1    | Straightedge, 20 in., Mk. 3 .....                         | 0.30           | -13.69        | - 4.11            |
|                                |                        |      | <b>Total, navigator and equipment .....</b>               | <b>242.17</b>  | <b>-13.07</b> | <b>-3165.15</b>   |
|                                |                        |      | <b>Total for pilot and navigator .....</b>                | <b>480.11</b>  | <b>-15.29</b> | <b>-7342.22</b>   |

TABLE 4

## Alternative operating load items

| Fig. 3<br>Item<br>No. | Ref.<br>or<br>Part No. | Qty. | Description  | Weight<br>(lb) | Arm<br>(ft)   | Moment<br>(lb ft) |
|-----------------------|------------------------|------|--|----------------|---------------|-------------------|
| PHOTOGRAPHIC          |                        |      |  |                |               |                   |
| 123                   | 14A/1038274/59         | 2    | Camera, F95, Mk. 4, c/w lens unit, 12 in. F4 ..... | 35.00          | - 7.79        | -272.65           |
| 119                   | 14A/1038274/59         | 1    | Camera, F95, Mk. 4, c/w lens unit, 12 in. F4 ..... | 17.50          | +17.47        | +305.73           |
|                       |                        |      | Total, photographic .....                          | <u>52.50</u>   | <u>+ 0.63</u> | <u>+ 33.08</u>    |

TABLE 5

## Disposable and consumable load items

| Fig. 3<br>Item<br>No.                    | Ref.<br>or<br>Part No. | Qty. | Description                                | Weight<br>(lb) | Arm<br>(ft) | Moment<br>(lb ft) |
|--|------------------------|------|--|----------------|-------------|-------------------|
| FUEL IN WINGS AND FUSELAGE (AT 8 LB/GAL) |                        |      |  |                |             |                   |
| 113                                      |                        |      | Fuel, No. 1 tank, 260 gal .....            | 2080.00        | -4.24       | - 8819.20         |
| 114                                      |                        |      | Fuel, No. 2 tank, 260 gal .....            | 2080.00        | -1.55       | - 3224.00         |
| 115                                      |                        |      | Fuel, No. 3 tank, 220 gal .....            | 1760.00        | +0.97       | + 1709.20         |
| 116                                      |                        |      | Fuel, No. 4 tank, 220 gal .....            | 1760.00        | +3.33       | + 5860.80         |
| 121                                      |                        |      | Fuel, Integral tanks, 856 gal .....        | 6848.00        | +2.18       | +14928.64         |
| 117                                      |                        |      | Fuel, No. 5 tank, 540 gal .....            | 4320.00        | +9.13       | +39441.60         |
| 122                                      |                        |      | Fuel, No. 6 tank, 372 gal .....            | 2976.00        | -1.57       | - 4672.32         |
| 120                                      |                        |      | Fuel, Collector box, 45 gal .....          | 360.00         | +2.64       | + 950.40          |
|  |                        |      | Total for Fuel in Fuselage and Wings ..... | 22184.00       |             | +46175.12         |

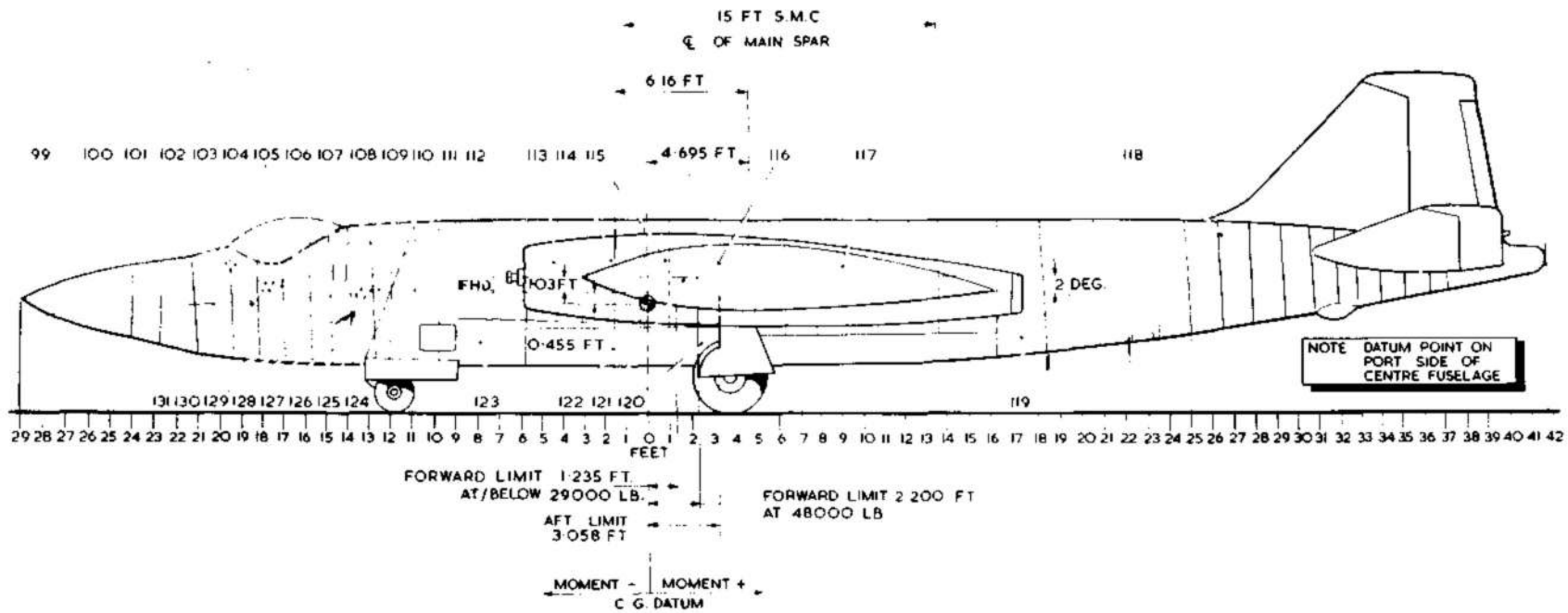


FIG. 3. LOADING AND C.G. DIAGRAM -

- CREW AND CREW REMOVABLE LOAD ITEMS
- ALTERNATIVE OPERATING LOAD ITEMS
- DISPOSABLE AND CONSUMABLE LOAD ITEMS

TABLE 6

## All-up weight summary

| Fig. 3<br>Item<br>No. | Ref.<br>or<br>Part No. | Qty. | Description                             | Weight<br>(lb)  | Arm<br>(ft) | Moment<br>(lb ft) |
|-----------------------|------------------------|------|---|-----------------|-------------|-------------------|
|                       |                        | ◀    | Basic weight .....                      | 24520.00        | +2.881      | +70633.00         |
| 118                   |                        |      | Crew and crew operating equipment ..... | 480.11          |             | - 7342.22         |
|                       |                        |      | Survival packs .....                    | 68.00           |             | + 1801.32         |
|                       |                        |      | F95 cameras (2 off) (forward bay) ..... | 35.00           |             | - 272.65          |
|                       |                        |      | F95 camera (centre bay) .....           | 17.50           |             | + 305.73          |
|                       |                        |      | Operating Weight .....                  | <u>25120.61</u> |             | <u>+65125.18</u>  |

## ITEMS OF EXPENDABLE LOAD

|  |                 |         |                   |
|--|-----------------|---------|-------------------|
| Total for fuel in wings and fuselage (Table 5) ..... | 22184.00        |         | + 46175.12        |
| Total Expendable Load .....                          | <u>22184.00</u> |         | <u>+ 46175.12</u> |
| All Up Weight .....                                  | 47304.61        |         | +111300.30        |
| C.G. Position (wheels down) .....                    |                 | + 2.353 |                   |
| Effect of retracting undercarriage - 1394 lb ft      |                 |         |                   |

## Chapter 3A FATIGUE INDEX DATA

(Completely revised)

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## INTRODUCTION

**General**

1. Every aircraft structure suffers fatigue damage accumulatively, from pilot induced manoeuvres, from gust effects resulting from flight through turbulent air, and from undercarriage-to-wing load transference during the ground-air-ground cycle of take-off and landing. Because of this, each type of aircraft has a safe fatigue life stated which when expired will cause the aircraft to be withdrawn from service, or modified to allow further flying. The declared safe life may be evolved, initially, from calculations but is usually confirmed by full scale fatigue testing. The consumption of fatigue life is monitored as each aircraft is flown in order to ensure that the declared safe fatigue life is not exceeded.

**Fatigue Index**

2. Fatigue life consumed is measured in terms of 'fatigue index' (F.I.) which is a non-dimensional number, calculated either from fatigue meter readings, or by converting sortie hours flown using appropriate fatigue index rates (FI/hr). Generally the fully consumed fatigue life of an aircraft is represented by a fatigue index of 100 but in special circumstances, e.g., following a modification to the aircraft, or re-testing of the structures to revised load spectra, a figure in excess of 100 may be quoted as the fully consumed limit. Also, where major components such as wings, tailplanes, and fins are considered to be interchangeable, it will be necessary to evaluate their individual limiting fatigue lives relative to that of the original critical component established by the fatigue test. The aircraft limiting F.I. will then have to be identified with the least of all such values. The methods of calculating F.I. are described in the following two paragraphs and at the end of this chapter.

**Assessing fatigue life consumption**

3. The most accurate method of determining the F.I. consumed due to gust and manoeuvring effects is by using a fatigue meter. This instrument records on counters the number of times that 'g' thresholds of a pre-determined series of levels are reached or exceeded. By entering the difference values of the counters over a period of flying time into a formula, together with the appropriate numbers of roller and full-stop landings, the incremental F.I. consumption for the period can be calculated. One aircraft type may have several formulae to cover variations in operating role, average all-up weights, or the fitment of different types of fatigue meter. Alternatively, average all-up weight variations may be covered by the use of different weight factors inserted into the fatigue formulae.

**Unmetered flying**

4. For the periods prior to the fitment of fatigue meters, or when an installed meter is unserviceable, fatigue consumption is assessed from details of the flying patterns flown and is dependant upon the type of aircraft manoeuvres and theatre of operations. This assessment enables the design authority to estimate fatigue index consumption rates which, related to hours flown, enables the F.I. consumed for each sortie to be calculated. Because fatigue damage estimates based on sortie patterns are derived from average expected loadings, the F.I. rates are factored to allow for 'worst case' situations. Thus, fatigue consumption assessed on a sortie pattern basis is wasteful when compared with the more accurate fatigue meter based index. Hence, it is essential to give priority to the replacement of defective fatigue meters.

**Flight patterns**

5. The fatigue formulae and fatigue index rate values, for use during periods of fatigue meter unserviceability are compiled in conjunction with some of the flight details given in the 'Statement of Intent' which forms Part 2 of flying 'Patterns and Fatigue Parameters'. This document describes the various sortie patterns to which aircraft are generally expected to fly in terms of average weight, altitude, duration, percentage utilization, etc. Each of the complete sorties is summarized under a descriptive title and allocated a sortie pattern code number on the reverse side of the M.O.D. Form 725. The above parameters form the basis of fatigue consumption studies on major aircraft components other than the main wing attachment on the fuselage, the fatigue life of which is related directly to fatigue meter counts. In both contexts damage levels attributable to any particular mode or modes of flying can be isolated by use of the recorded sortie code number.

It follows that any significant proposed change to a sortie pattern should be referred to the 'Statement of Intent' issuing authority via Air. Eng. 30b.

**Recording of fatigue data**

6. The recording of flight data sortie codes and fatigue meter counts is made currently on M.O.D. Form 725 (Canberra) (ADP) (Revised Sept. 1983), the format of which has been adapted for Automatic Data Processing Techniques. Instructions on the use of this form are given in M.O.D. Form 799/4 (Canberra) (ADP) (Revised Sept. 1983). The in-use form is kept in the aircraft M.O.D. Form 700 and on completion, after four separately recorded flights, is processed at Station Level to yield incremental values of Fatigue Index, Landings, Cabin Pressurizations

and other data to add to previously accumulated totals. A month by month return is made from these totals on STC Form STATS 2062 (revised June 1984) as a statistical monitor of average F.I. rate per mark and of individual aircraft F.I. remaining.

7. The aircraft captain is responsible for completing the sortie details, whilst servicing personnel are responsible for reading fatigue meters and recording the information on M.O.D. Form 725 (Canberra) (ADP). All personnel responsible for the collection and compilation of fatigue data must appreciate the need for accuracy and legibility of the entries. Careless or incomplete recording is dangerous if it causes a less damaging sortie to be recorded, it is also wasteful if, in the interests of safety, the worst case has subsequently to be assumed. In extreme cases continued carelessness or incomplete recordings can result in the premature retirement of an aircraft because of doubt regarding the true F.I. situation.

8. All personnel responsible for reading fatigue meters are to be familiar with, and are to apply, the serviceability checks described in API12G-0203-1, Chapter 2. In particular, the validity of fatigue meter readings are to be checked either before any fatigue life calculations are undertaken at the unit, or before M.O.D. Form 725 is despatched from the unit for fatigue calculations to be performed elsewhere. The replacement of unserviceable meters is to be regarded as a high priority task.

#### Royal Navy Aircraft

8A. The Unit Engineering Section is to submit the originals of M.O.D. Forms 725 for fatigue life calculation by N.A.T.E.C., as specified in the appropriate M.O.D. Form 799/4.

#### Refining of fatigue index

9. During the period of the Canberra Refurbishing Programme, 1978 to 1982, a parallel detailed exercise was undertaken by the A.D.A. to re-assess the flying and fatigue records of all flying Canberras. Account was taken of all special manoeuvres and allowances made to include the ground-air-ground effect on all pre-metered and metered flying. Refined totals of flying hours, landings, cabin pressurizations and F.I. were issued on a Company's marker Form 725 together with the allowable F.I. for each aircraft.

Consistent with the replacement of the fuselage Centre Section Forging, (C.S.F.) which, (if not already achieved at an earlier date), was carried

out during the refurbishing programme, together with the associated repair and inspection programme, agreement was reached with R.A.E. Structures Department, to extend the allowable F.I. for the Canberra to 133. For some aircraft, however, because of special circumstances, the allowable F.I. is quoted at a value less than 133 (SEE para.16). When the fatigue records for an aircraft show that it has consumed 80 per cent of its allowable F.I. action is to be taken in accordance with API00B-01 ORDER 0786, paragraphs 10 and 11. It should be noted that the return of completed Forms 725 should be limited only to those accumulated since the Refurbishing Assessment, identified by the marker Form 725 issued by BAe and filed with the completed forms.

#### Note . . .

*Previously fatigue data was recorded on the following documents:*

#### Entries in the Form 700

F.D.S. 1 and 2

Forms 4832 A and B

Forms 4832 A and B (Revised May, 1966)

Form 725/1 and Form 725/2 (Canberra) Nov. 1970 (provisional issue)

M.O.D. Form 725 (Canberra) (Jan. 1972 issue)

M.O.D. Form 725 (Canberra) (Revised Nov. 1978)

M.O.D. Form 725 (Canberra) (ADP) (Revised Sept. 1983)

Collectively, these documents represent the complete fatigue history of the aircraft and therefore must be preserved intact for possible future reference.

Whenever a mainplane is removed from a refurbished or non-refurbished aircraft for retention as a spare, the above records, or copies of them, should be identified with that mainplane and be available to complete the fatigue history of any new aircraft combination.

#### Action on fitment of a new fatigue meter

10. When a fatigue meter is changed the current M.O.D. Form 725 is to be closed and a new form raised. Block 1 of the new sheet is to be used to record the new meter window readings and the values of total flying hours and landings brought forward from the closed sheet. Further flying is recorded under Block 2. Refer to M.O.D. Form 799/4 (Canberra) (ADP) (Revised Sept. 1983), paras. 4 and 5.

The checks specified in API12G-0203-1, Chapter 2, are to be applied after three hours of flight have been completed with a new or replacement meter installed.

## APPLICATION

## General

11. The fatigue life of the Canberra was originally based on calculations for the high altitude bomber role. However, later operations included low level loft bombing roles producing increased flight loading so a full scale fatigue test was carried out.

12. Prior to the fitment of a fatigue meter, the fatigue consumption was assessed by factoring the flying hours according to the sortie flown. This produced a result called "fatigue hours". These were subsequently expressed as a percentage of a 20,000 hour datum life, and the result quoted in terms of fatigue index (F.I.). At the refurbishing fatigue record assessment all of this earlier flying assessment had to be further modified to take account of the ground-air-ground (G.A.G.) cycle with resultant increases in F.I. consumed.

## Fatigue lives

13. The critical component on test proved to be the fuselage Centre Section Forging (C.S.F.) with the failure of the port front lower boom lug at the wing pick-up point. This was repaired and the test continued until failure occurred at the corresponding lug on the starboard side of the C.S.F.

14. Based on the geometric mean of the load cycles to failure, of the two test results, a particular Safe Life was determined for Canberra aircraft flying in a similar manner to the test flight profiles, or from spectra plotted from actual fatigue meter counts. Safe lives for the other Canberra variants in aircraft weight, speed, altitude etc., have been derived by application of the theory of cumulative damage. In certain cases, where no fatigue meter readings are available for revised forms of flying, the safe life has had to be determined from step by step analysis of the sortie flight profiles. By further extensions of the above procedures fatigue meter formulae and F.I. rates have been derived which express the safe life in terms of the fully consumed F.I.

15. Thus the fully consumed F.I. for all original build Canberras is 100 F.I. and is based on the aforementioned failures of the C.S.F. main attachment lugs. However, because of structural integrity considerations associated with stress corrosion damage, a C.S.F. replacement programme was undertaken on all long term Canberras.

By agreement with R.A.E. Structures the remainder of the tested airframes with a replacement C.S.F. fitted, could be allowed to go to a revised limiting F.I. of 133, the equivalent of the second test failure mentioned above.

16. It follows that all mainplanes have a limiting F.I. of 133 but because certain components were removed, or not representatively loaded during the main fatigue test, revised calculated F.I.'s were allocated to these as follows:

|                              |          |
|------------------------------|----------|
| Fin                          | 160 F.I. |
| Tailplane and Attachments    | 200 F.I. |
| Front Transport Joint Cleats | 231 F.I. |

The replacement C.S.F. still has an allowable fatigue life of 100 F.I. based on the original test results. Therefore, if the total consumed fatigue life of an aircraft is less than 33 at C.S.F. replacement, then the revised allowable F.I. of that aircraft, post replacement, is that value of F.I. plus 100 for the new forging, a total value which will be less than 133. For such aircraft the maximum value of 133 F.I. could only be achieved by a second C.S.F. change.

## Cabin life

17. Based on a full scale test carried out in 1975 a revised datum life for the pressure cabin has been established as 12,900 full pressurizations. This represents a very large increase in cabin life compared to the previously quoted value but it is applicable only to those variants having a fixed, bubble-type canopy. This revised datum life is to be compared with the total of all cabin pressurizations. That is those recorded on the marker Form 725 issued following the refurbishment assessment (See para.9) and the combined totals of the Form 725 recorded events when 15,000 feet and 25,000 feet are reached, plus any ground pressurizations.

Form 725 records events when 15,000 ft and 25,000 ft are reached, plus any ground pressurization, all events being counted as full pressurizations.

## Components limiting aircraft service life

18. A number of components exist on the aircraft which require replacing or reconditioning after a pre-established period. These are listed in AP101B-0400-5A1, Section 2.

**Fuel tanks**

19. In order to conserve fatigue life it is essential to re-fill wing fuel tanks at the commencement of every sortie except when carrying out flight trim checks in accordance with AP 101B-0422-1A, Section 3, Chapter 4, Appendix 1, and to observe, strictly, the fuel drills laid down in AP 101B-0422-15, Part 1, Chapter 2, paragraph 22 where the fuel in these tanks, except for take-off and climb, is listed to be used last.

**Fatigue monitoring**

20. The T MK22 aircraft is fitted with a MK16 type fatigue meter which records and visibly displays in the appropriate window, the number of

times that each of eight different threshold levels of acceleration are reached or exceeded. The letter suffixes by which these 'g' levels are identified are as follows:-

| A    | B    | C    | D    | E    | F    | G    | H    |
|------|------|------|------|------|------|------|------|
| 0.1g | 0.5g | 1.5g | 1.9g | 2.5g | 3.5g | 4.5g | 5.1g |

21. The fatigue meter is located in the starboard main undercarriage bay attached to the slant diaphragm. It must be noted that a revised formulae will be required if any type of fatigue meter other than a MK16 is fitted.

**Fatigue meter formula**

22. The formula for a T Mk.22 aircraft fitted with a Mk.16 fatigue meter is as follows:-

**Note . . .**

*This formula is only applicable for Royal Navy T Mk.22 aircraft as detailed in FLA/CAN/7 issue 1 of 18.10.82. Stress Office, BAe, Military Aircraft Division, Warton Unit, Preston, Lancashire, PR4 1AX.*

**METERED FLYING**

For aircraft without tip tanks fitted:-

$$F1 = \frac{13.4(A) + 0.13(B) + 0.013(C) + 0.25(D) + 2.94(E) + 18.96(F) + 44.56(G) + 45.11(H) + K(LF) + 0.32(LR)}{1000}$$

where the factor is given in Table 1 below and is dependant upon fuel weight at take-off. The coefficient K is given for each case, LR remains unchanged.

**TABLE 1**

| Total fuel load at take-off (lbs) | FACTOR | K     |
|-----------------------------------|--------|-------|
| BELOW 15000                       | 0.7    | 3.42  |
| 15000 - 15999                     | 0.73   | 4.03  |
| 16000 - 16999                     | 0.8    | 4.99  |
| 17000 - 17999                     | 0.88   | 5.84  |
| 18000 - 18999                     | 1.0    | 7.12  |
| 19000 - 19999                     | 1.17   | 8.3   |
| 20000 - 20999                     | 1.35   | 9.5   |
| 21000 - 21999                     | 1.55   | 10.84 |
| 22000 - 22999                     | 1.68   | 11.48 |

A-H represents the total counts recorded in the period considered by the windows marked as follows:-

| WINDOW | A   | B   | C   | D   | E   | F   | G   | H   |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|
| g      | 0.1 | 0.5 | 1.5 | 1.9 | 2.5 | 3.5 | 4.5 | 5.1 |

LF is the number of full stop or braked landings and LR is the number of roller landing in the period considered.

**For aircraft with tip tanks fitted:-**

There is no requirement at present for tip tanks to be fitted to T Mk.22 aircraft. If this requirement should change the design authority should be contacted.

#### UNMETERED FLYING

For periods when a fatigue meter is not fitted, or is faulty, the fatigue index is to be calculated using a fatigue index rate as follows:-

FI = Flying Hours x 0.01 x factor where the factor is dependant upon fuel load at take-off and is as given in Table 1.

If the fuel load at take-off is not known an FI rate of 0.017 should be used.

It should be noted that unmetered flying is undesirable as the fatigue index calculated using the above rates will be pessimistic compared to the equivalent metered method. The increment in F.I. calculated by this method is then added to the total F.I. previously determined from formulae.

## Chapter 4 GENERAL SERVICING

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**WARNING**

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

**Introduction**

1. This chapter contains information on the general servicing of the complete aircraft; servicing of the individual components and systems is given in the appropriate chapters of Sections 3 and 4.

**Ground equipment**

2. The items of ground equipment provided for handling and servicing the aircraft are listed at the end of this chapter. The items are arranged in two tables, Table 1 – Special Ground Equipment (handling and servicing equipment peculiar to this aircraft), and Table 2 – Standard Ground Equipment. These tables contain no items that are normally included in the relevant Appendix A, nor standard equipment normally provided for purposes not confined to aircraft servicing.

**Access panels****WARNING**

The closing panels (Post STI/CAN/583B) must only be removed for access to the engine mounting bracket attachment fasteners. Each bolt securing the panels must be identified during removal of the panels to ensure correct relocation on reassembly of panels.

3. Removable access panels and inspection doors are provided throughout the structure, for access to the controls, services, etc., the positions are illustrated in fig. 5 and 6. Certain panels are secured by screws having concave slots in their heads, and a specially ground screwdriver having a convex blade must be used to remove and insert these screws; these panels are indicated on the illustration. When securing the panels, ensure

that in all cases the correct type of screw is used, as in certain comparatively thin skin areas 120 deg countersunk-headed screws are used.

**Jacking (fig. 1)****Jacking procedure**

4. The aircraft may be jacked by three jacks, positioned one under each main plane in line with the engine nacelles and one on the port side of the fuselage nose. At the main plane positions the jack adapter heads fit into sockets permanently fitted to the main spar, and at the fuselage nose position a removable spigot is screwed into a socket in the structure, below the aft end of the crew escape hatch, to which the adapter head of the jack fits. All jacking positions are marked on the aircraft and the methods of jacking are illustrated in fig. 1.

5. The jacking sequence is:

(1) Using a spanner (Table 1) remove the plug from the socket in the front fuselage and fit the nose jacking spigot (Table 1). Unfasten the hinged panels in the jet pipe cowlings to expose the main plane jacking points.

(2) Place a jack under each main plane jacking point and at the nose jacking spigot; the types of jacks and adapter heads to be used at these points are listed in Table 2.

**Note . . .**

*The main plane jacks must be positioned with the jack body vertical and with the adjustable legs parallel to the lateral axis of the aircraft.*

*The nose jack must be positioned with the jack body vertical and with the adjustable legs parallel to the longitudinal axis.*

(3) Operate the jacks to raise the aircraft, jacking the main planes slightly in advance of the fuselage nose.

(4) When the aircraft is sufficiently raised, the

rear fuselage may be supported, if necessary, at the rear resting point, with a U.J. trestle, No. 7, fitted with the appropriate former (Table 1).

**Note . . .**

*When lowered to the ground after jacking, the aircraft should be rocked to allow the shock absorbers to settle.*

**For main-wheel changing**

6. To jack the aircraft for main-wheel changing:

(1) Ensure that the aircraft is positioned on level ground with a firm foundation.

(2) Place chocks fore-and-aft of each wheel.

(3) Place a 15-ton jack (Table 2) with its adapter head and main wheel changing bracket (Table 1) in position.

(4) Raise the wheel just clear of the ground.

**For nose-wheel changing**

7. To jack the aircraft for nose-wheel changing:

(1) Ensure that the aircraft is positioned on level ground with a firm foundation.

(2) Using a spanner (Table 1) remove the plug from the socket in the nose fuselage, and insert and tighten the jacking spigot (Table 1).

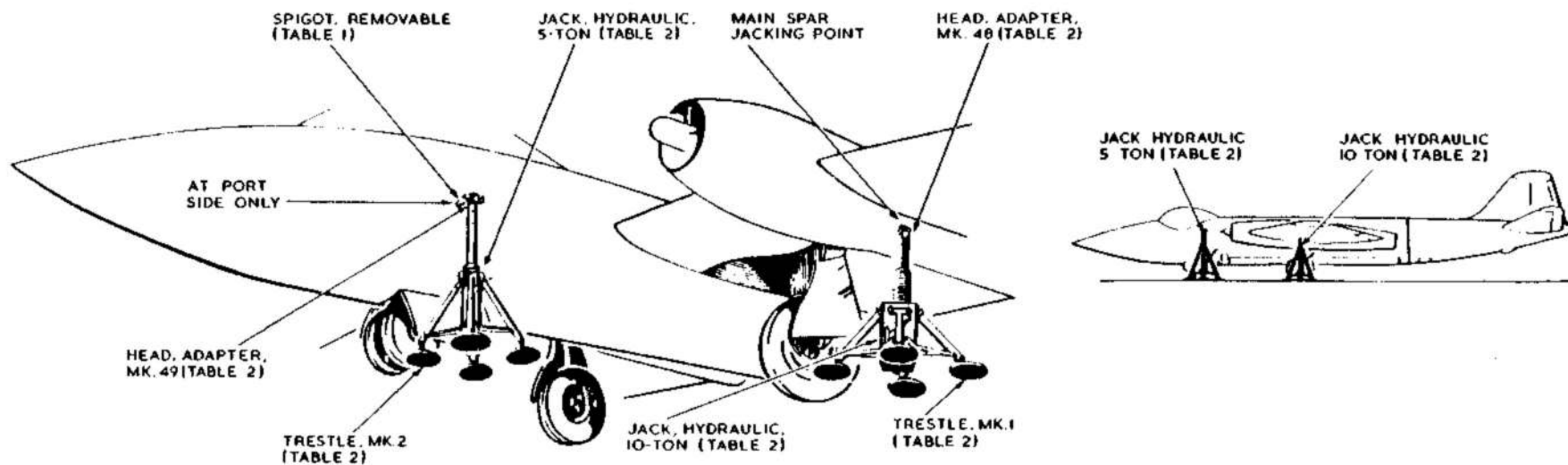
(3) Place chocks fore-and-aft of the main wheels and release the brakes.

(4) Place a 5-ton jack (Table 2) and adapter (Table 1) under the nose spigot, and raise until the nose wheels are just clear of the ground.

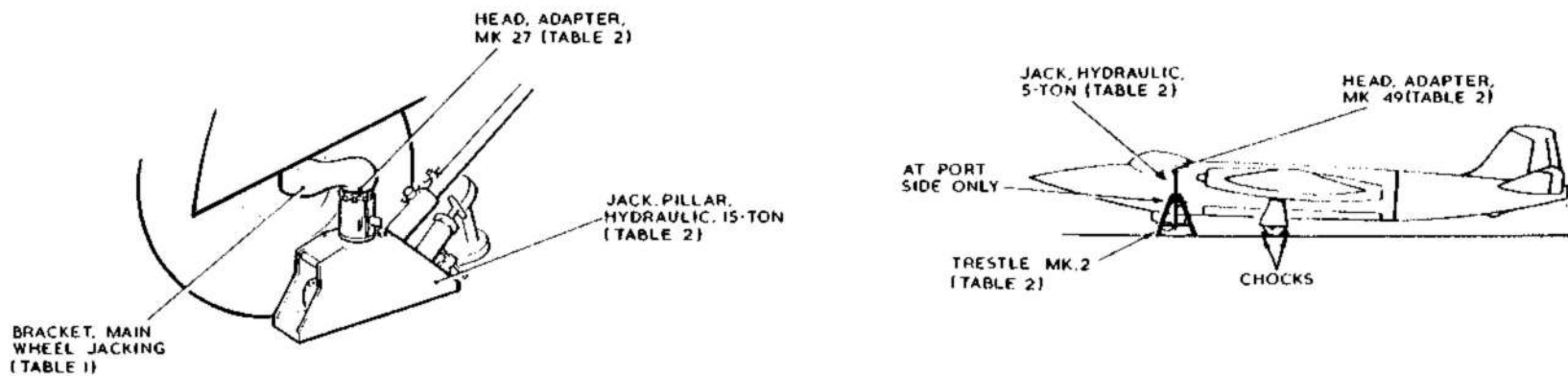
(5) Support the fuselage at frame 42.

**In the open**

8. Fig. 4 shows allowable wind velocity against wind angle through the full range of



NORMAL JACKING PROCEDURE



MAIN WHEEL CHANGING

NOSE WHEEL CHANGING

FIG. I. JACKING

CAI 88 2 155 66

nose-to-wind to tail-to-wind at which the aircraft may be lifted on the main undercarriage pillar jacks for main-wheel changing. In applying this graph there are certain precautions which must be observed:—

- (1) Aircraft may be at any weight between basic and maximum take-off provided that fuselage fuel is evenly distributed.
- (2) Fuelling or defuelling or changes to wing store loading must not be carried out whilst the aircraft is on pillar jacks.
- (3) Ground slope allowance of 4 degrees is permitted in the fore and aft direction only.
- (4) Both main wheels are to be jacked simultaneously.
- (5) Ground locks are to be fitted to all flying control surfaces.
- (6) The 50-knot nose-wheel picketing requirement must be applied when necessary (*Sect. 2, Chap. 1*).

#### Trestling

9. When trestling the aircraft, or components of the aircraft, the correct type of trestle with appropriate former as specified in Table 1 must be used. The methods of trestling are illustrated in fig. 2.

#### Drainage holes

10. Drainage holes are provided in various parts of the aircraft skinning, the number of holes and their position is illustrated in fig. 8. These holes must always be kept free from obstructions, especially those in the jet pipe cowlings.

11. Draining of the pressure cabin is facilitated by the removal of two mushroom headed screw plugs located in the cabin lower skin adjacent to the aircraft centre line. One plug is situated just forward of frame 1 and the other just forward of frame 7. After draining the cabin, care must be taken before screwing back a drain plug, to ensure that no foreign matter remains on or about the plug rubber seal as this will cause loss of cabin pressure. Two 1/8 in. dia. drain holes are also provided for the canopy coaming tube; these are situated at the lowest points of the tube and are plugged with self-tapping screws rolled in Bostik sealing compound to prevent loss of cabin pressure.

#### Order of dismantling

12. The sequence of dismantling an aircraft is given below; detailed information on the removal of individual components is given in the appropriate chapters of Sections 3 and 4.

- (1) Remove the engines and jet pipes from the main planes (*Sect. 4, Chap. 1*).
- (2) Remove the tail plane from the rear fuselage (*Sect. 3, Chap. 3*).
- (3) Remove the rudder and fin from the rear fuselage (*Sect. 3, Chap. 3*).
- (4) Remove the rear fuselage from the front fuselage (*Sect. 3, Chap. 1*).
- (5) Remove the main planes from the front fuselage (*Sect. 3, Chap. 2*).

13. The sequence of assembly is the reversal of that given for dismantling.

#### Rigging of fixed surfaces

14. The main plane, tail plane and fin are fixed cantilever structures which are rigged when correctly assembled to the fuselage; adjustment is, therefore, impossible. The symmetry of the aircraft and the incidence and dihedral of the planes should be checked, however, in the manner indicated in the following paragraphs, after the aircraft has been rigged or whenever it is necessary to verify that the components are true. The location points for the incidence and dihedral gauges are marked on the upper surfaces of the main and tail planes, they are on the centreline of the main spar booms and their positions outboard of the centre-line of the fuselage are indicated in fig. 3.

15. The procedure for checking the alignment and rigging of the aircraft is:

- (1) Jack the aircraft (*para. 4 and 5*).
- (2) Place a lateral leveling gauge (*Table 1*) on the port and starboard leveling brackets at frame 31 (*fig. 3*); the port and starboard ends are indicated on the gauge. Using a clinometer on the gauge, level the aircraft laterally ( $0 \text{ deg} \pm 0 \text{ min}$ ).
- (3) With the lateral gauge in position, place a longitudinal gauge (*Table 1*) on the leveling bracket on the starboard side of frame 29 bulkhead and on the datum pad on the lateral gauge (*fig. 3*). Using a clinometer on the gauge, level the aircraft longitudinally ( $0 \text{ deg} \pm 0 \text{ min}$ ). Support the rear fuselage with a trestle.
- (4) Check for symmetry by measuring the diagonals at the following points on both sides of the aircraft:
  - (a) From a point 2.46 in. aft of frame 1

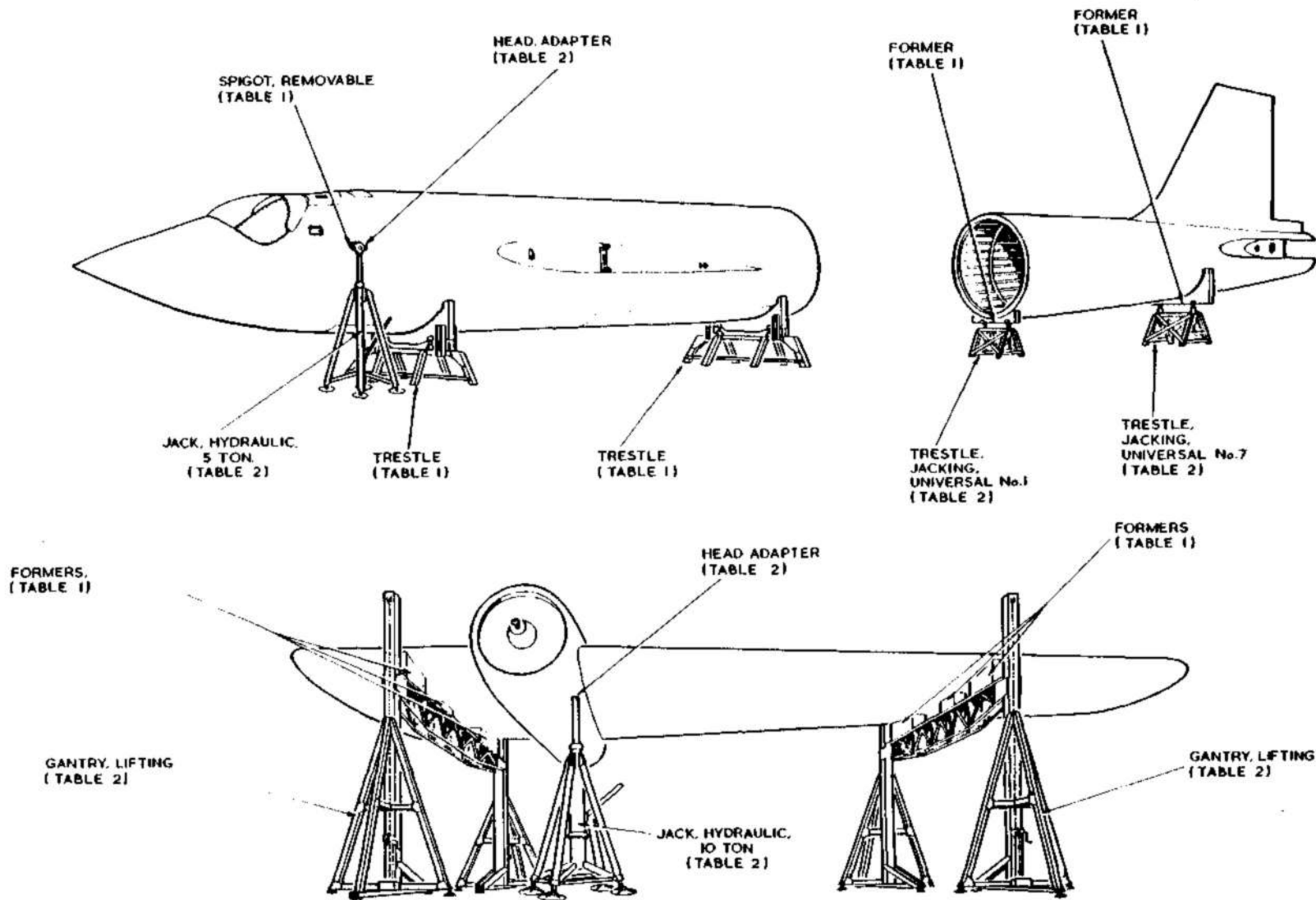


FIG.2. TRESTLING

on the upper surface of the fuselage to the datum bolt on the centre-line of the main plane spar at the wing tip (*fig. 3, dimension A*). The difference between the port and starboard diagonals must not exceed 1.0 in.

(b) From a point 1 in. aft of frame 31 datum on the upper surface of the fuselage to the outboard incidence gauge point on the tail plane, with the tail plane at minimum incidence (*fig. 3, dimension B*). The difference between the port and starboard diagonals must not exceed 0.5 in.

(c) From the datum bolt at the wing tip to the outboard incidence gauge point on the tail plane, on both sides; the dimension should be equal  $\pm 1.0$  in. with the tail

plane at minimum incidence.

(5) Check the main plane incidence and dihedral, using a clinometer, with the gauge (*Table 1*), positioned at each of the three points shown in *fig. 3*. The dihedral reading should be  $2 \text{ deg} \pm 10 \text{ min}$  at all points, and the incidence reading  $5 \text{ deg } 50 \text{ min} \pm 15 \text{ min}$  at the outboard position of the outer wing (*rib 6*),  $5 \text{ deg } 8 \text{ min} \pm 15 \text{ min}$  at the inboard position of the outer wing (*rib 3*) and  $4 \text{ deg } 49 \text{ min} \pm 15 \text{ min}$  at the inner wing position (*rib 3*).

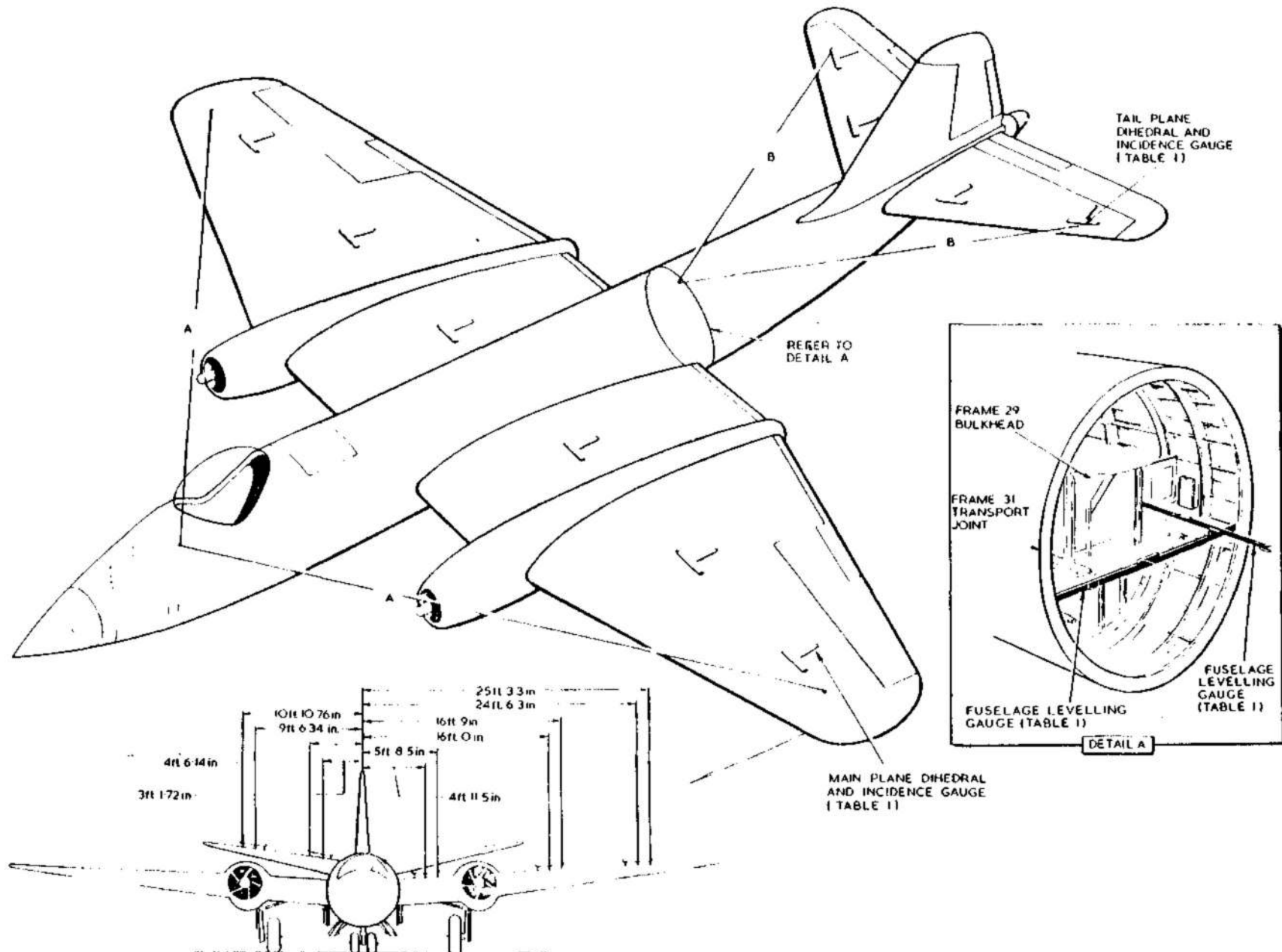
(6) Check the tail plane dihedral (port and starboard) with the tail plane at maximum incidence, using a clinometer, with a gauge (*Table 1*) positioned at the inboard position; the reading should be  $7 \text{ deg } 57 \text{ min} \pm 15 \text{ min}$ .

(7) Check the tail plane incidence at minimum

incidence, using a clinometer, with a gauge (*Table 1*) positioned at the starboard inboard position; the reading should be  $2 \text{ deg } 12 \text{ min} \pm 13 \text{ min}$ . Set the tail plane at maximum incidence and, using a clinometer with the same gauge, check the incidence at the inboard position; the reading should be  $3 \text{ deg } 59 \text{ min} \pm 13 \text{ min}$ . Check the incidence at the outboard position; the reading should be that obtained at the inboard position plus  $1 \text{ deg } 48 \text{ min} + 1 \text{ deg } 2 \text{ min} - 50 \text{ min}$ .

#### Component weights and dimensions

16. The component weights and dimensions are given in the key to *fig. 7*.



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FIG.3. ALIGNMENT CHECKS AND RIGGING GAUGE POSITIONS

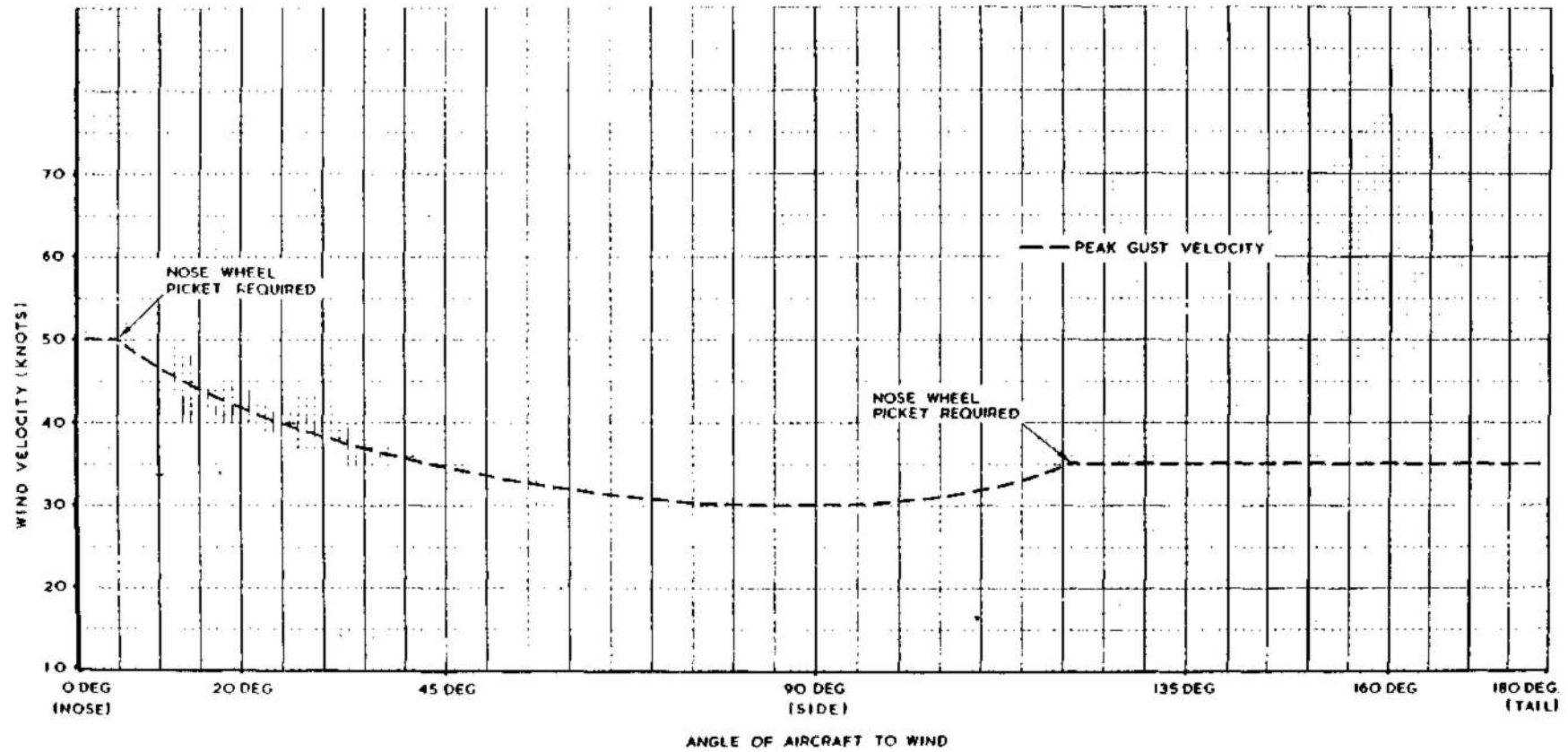
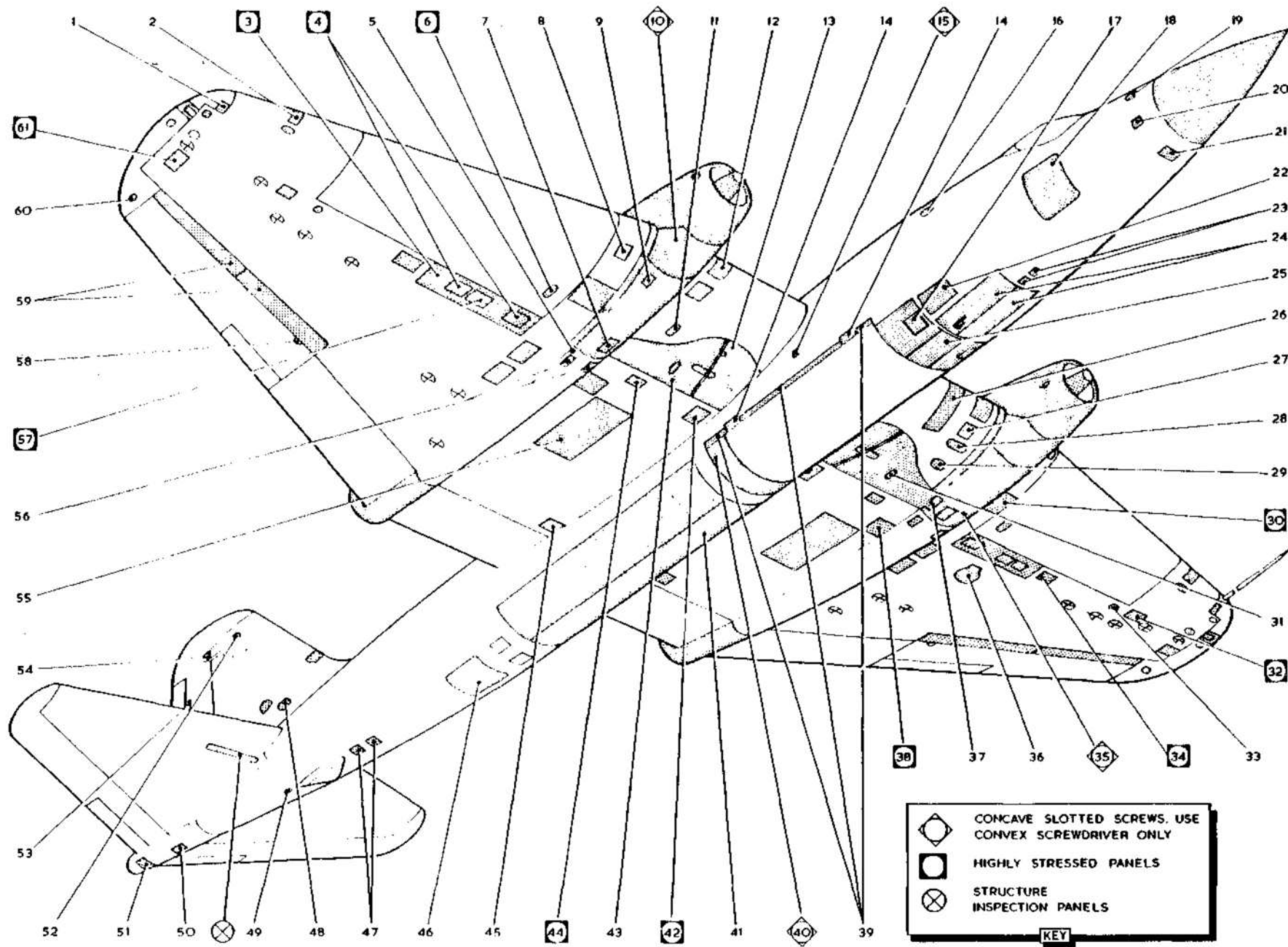


FIG. 4. MAXIMUM PERMISSIBLE WIND VELOCITY FOR JACKING IN THE OPEN

**FIG.5. ACCESS PANELS, LOWER SURFACE AND STARBOARD SIDE**

*(illustration overleaf)*



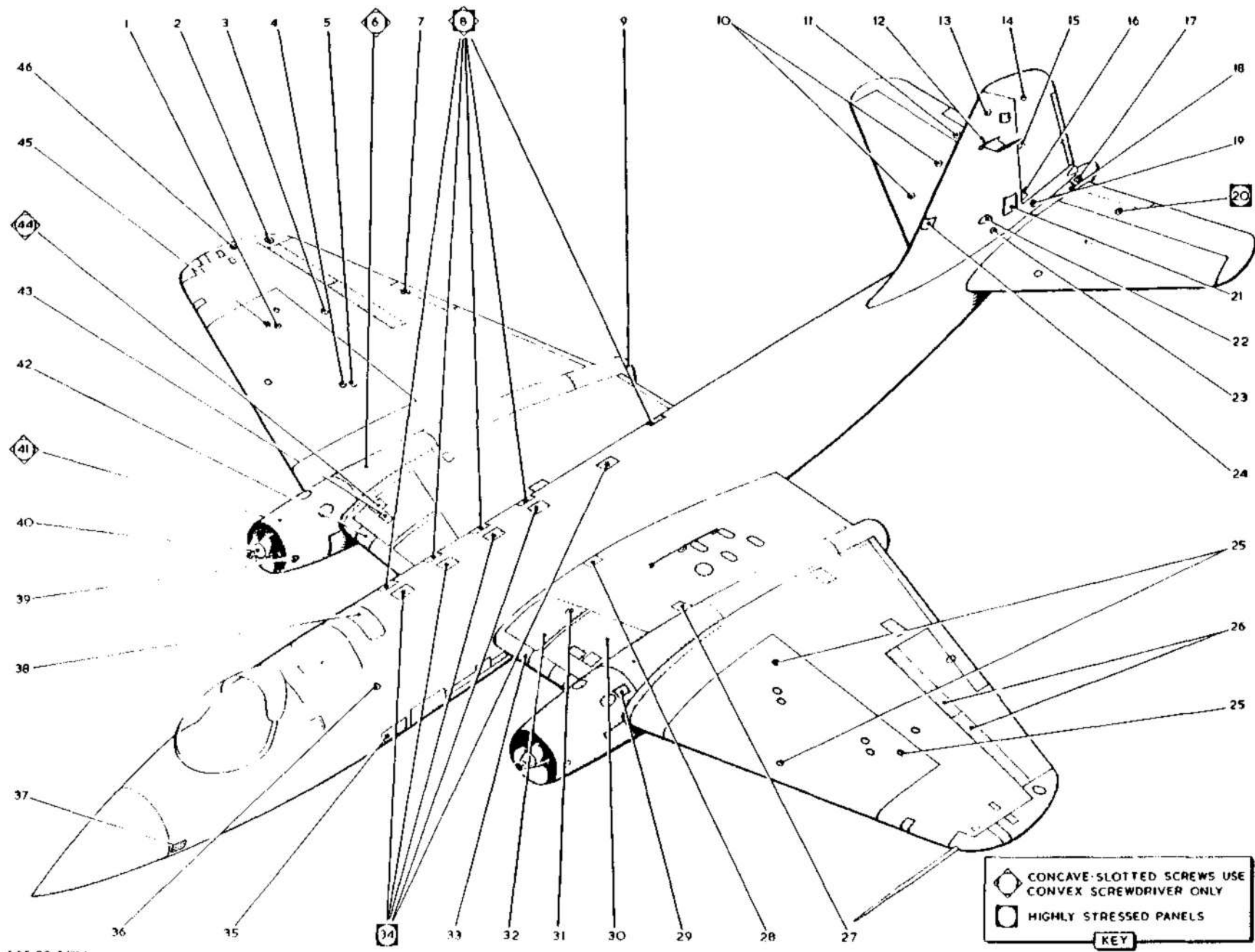
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FIG.5. ACCESS PANELS, LOWER SURFACE AND STARBOARD SIDE

## KEY TO FIG. 5. ACCESS PANELS, LOWER SURFACE AND STARBOARD SIDE

*All panels in the main planes are on both the port and starboard sides, unless otherwise stated*

- |    |  |    |   |    |   |
|----|--|----|---|----|---|
| 1  | NAVIGATION AND TAXYING LAMPS   | 19 | RADOME COOLING FLAP VALVE   | 42 | MAIN SPAR ATTACHMENTS   |
| 2  | GLIDE PATH AERIAL (starboard side)   | 20 | RADOME COOLING AIR VENTS  | 43 | MAIN UNDERCARRIAGE FIXED FAIRING HYDRAULIC ACCUMULATOR CHARGING VALVE and GAUGE (starboard side)  |
| 3  | SERVICE PANEL AIR BRAKES   | 21 | COMBINED VALVE UNIT COLLECTOR BOX   | 44 | AILERON CONTROL TUBES; FUEL AND HYDRAULIC PIPES   |
| 4  | AIR BRAKES MECHANISM   | 22 | MAIN ELECTRICAL PANEL; EXTERNAL ELECTRICAL SUPPLY SOCKET; OXYGEN CHARGING VALVE   | 45 | MAIN PLANE REAR WALL ATTACHMENT   |
| 5  | JACKING POINT  | 23 | GRAVINER CRASH TRIP ELEMENTS  | 46 | CAMERA AND REAR FUSELAGE HATCH REAR DATUM BLOCKS; FLYING CONTROL TUBE COUPLINGS; PICKETING RING-BOLTS STOWAGE; FIRE EXTINGUISHER BOTTLE; No. 5 FUEL TANK; ENGINE STARTER CARTRIDGES |
| 6  | INTEGRAL FUEL TANK COLLECTOR BOX; FUEL PUMP  | 24 | NOSE UNDERCARRIAGE DOORS  |    |   |
| 7  | UNDERCARRIAGE COWLING FLAP ACTUATING LINK  | 25 | FORWARD CAMERA BAY CAMERAS; CAMERA DOOR JACKS; TEMPERATURE CONTROL VALVES   | 47 | RADIO ALTIMETER AERIALS   |
| 8  | SERVICE PANEL RECUPERATOR CONNECTIONS; FUEL PIPE; ZONE 2 AIR-INTAKE PIPE CONNECTOR   | 26 | SERVICE PANEL (port side)   | 48 | RUDDER OPERATING LEVER  |
| 9  | FIRE PANEL   | 27 | ACCESSORIES GEARBOX DRAIN   | 49 | PICKETING POINT   |
| 10 | SERVICE PANEL ENGINE HIGH-PRESSURE FUEL COCK COUPLING; THROTTLE VALVE COUPLING; OIL SUMP DRAIN; OIL SUMP FILLER CAP; OIL FILTERS; LOW-PRESSURE FUEL FILTER AND DRAIN; OIL COOLER PIPES TO SUMP; OIL PRESSURE TRANSMITTER; OIL COOLER; ANTI-ICING PIPE TOGGLE CLAMP | 28 | CONSTANT-FLOW VALVE (port side)   | 50 | DOWNWARD REAR NAVIGATION LAMP   |
| 11 | L.L.S. MARKER AERIAL (starboard side)  | 29 | AIR MILEAGE UNIT (port side)  | 51 | REAR FAIRING ATTACHMENTS  |
| 12 | HYDRAULIC PUMP   | 30 | INTEGRAL FUEL TANK PUMP; FUEL COCKS; FUEL PUMP GLAND DRAIN  | 52 | FIN SLINGING POINT (fabric patch)   |
| 13 | MAIN UNDERCARRIAGE DOOR DOOR JACKS AND SEQUENCE VALVES; RADOME PRESSURIZING VALVES, FILTER, AIR DRIER AND GROUND CONNECTION  | 31 | PICKETING POINT   | 53 | RUDDER TAB CONTROL TUBE   |
| 14 | No. 6 FUEL TANK ATTACHMENTS  | 32 | ELECTRICAL CONNECTIONS  | 54 | RUDDER SLINGING POINT   |
| 15 | No. 6 FUEL TANK FILLER CAP   | 33 | PICKETING POINT   | 55 | SERVICE PANEL OXYGEN CYLINDERS  |
| 16 | HYDRAULIC RESERVOIR FILLER CAP   | 34 | AILERON CONTROL   | 56 | AILERON CONTROL TUBE COUPLINGS  |
| 17 | FORWARD CAMERA-BAY WINDOW  | 35 | ENGINE BOTTOM REAR COWLING  | 57 | FUEL CONTENTS GAUGE CONNECTOR BOX   |
| 18 | MAIN ENTRANCE DOOR HYDRAULIC ACCUMULATOR CHARGING VALVE AND GAUGE (WHEEL BRAKES); PRESSURE GAUGE CONNECTION FOR RADOME PRESSURIZATION TEST   | 36 | LANDING LAMP (port side)  | 58 | AILERON TAB OPERATING LEVER   |
|    |  | 37 | UNDERCARRIAGE COWLING FLAP  | 59 | AILERON SHROUD SCREENS  |
|    |  | 38 | MAIN UNDERCARRIAGE PIVOT PIN  | 60 | AILERON OUTBOARD HINGE PIN  |
|    |  | 39 | No. 6 FUEL TANK FAIRING   | 61 | FLUX DETECTOR (starboard side); ELECTRICAL CONNECTIONS (port side)  |
|    |  | 40 | No. 6 FUEL TANK COLLECTOR BOX; FUEL COCKS AND ACTUATORS   |    |   |
|    |  | 41 | FLARE BAY DOORS HYDRAULIC SELECTOR VALVES; HYDRAULIC RELIEF VALVES; No. 5 TANK FUEL COCKS, ACTUATORS FUEL PUMPS AND MASTER REFERENCE GYRO |    |   |



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FIG. 6. ACCESS PANELS, UPPER SURFACE AND PORT SIDE

## KEY TO FIG. 6. ACCESS PANELS, UPPER SURFACE AND PORT SIDE

*All panels in the main plane are on both the port and starboard sides, unless otherwise stated*

- |    |  |    |  |
|----|--|----|--|
| 1  | INTEGRAL FUEL TANK FILLER CAP, OUTBOARD COMPARTMENT                              | 26 | AILERON SHROUD SCREENS   |
| 2  | AILERON HINGE  | 27 | MAIN UNDERCARRIAGE UP-LOCK HOOK  |
| 3  | MAIN PLANE SLINGING POINTS   | 28 | MAIN SPAR ATTACHMENT   |
| 4  | VENT VALVE, INBOARD COMPARTMENT, INTEGRAL FUEL TANK                              | 29 | CONTROL UNIT BLEED VALVE   |
| 5  | INTEGRAL FUEL TANK FILLER CAP, INBOARD COMPARTMENT                               | 30 | ACCESSORIES GEARBOX; TWO-SPEED GEARBOX; MIXING VALVE (port side); CONSTANT-FLOW VALVE (port side)  |
| 6  | ENGINE UPPER REAR COWLING  | 31 | DIPSTICK, COLD-AIR UNIT (port side)  |
| 7  | AILERON TAB OPERATING LEVER  | 32 | COLD-AIR UNIT (port side); HYDRAULIC, FUEL AND AIR PIPES; SUPPRESSOR; FUEL FLOW TRANSMITTER; AIR COOLER; HYDRAULIC ACCUMULATOR, CUT-OUT VALVE AND NON-RETURN VALVES (starboard side) |
| 8  | FUEL TANK FILLER CAPS  | 33 | SERVICE PANEL (port side)  |
| 9  | JET PIPE REAR CONE JET PIPE ADJUSTMENT POINTS; THERMOCOUPLES                     | 34 | TANK VENTING GALLERIES COUPLING POINTS   |
| 10 | TAIL PLANE SLINGING POINTS   |    |  |
| 11 | ELEVATOR GEARED TAB CONTROL  | 35 | ELECTRICAL ACCUMULATORS; NOSE UNDERCARRIAGE GROUND SELECTOR; CABIN AIR SYSTEM WATER EXTRACTOR AND NON-RETURN VALVE; FLYING CONTROL TUBES AND CONNECTING LEVERS                       |
| 12 | V.O.R./I.I.S. AERIAL   | 36 | FRONT FUSELAGE JACKING POINT   |
| 13 | FIN SLINGING POINT   | 37 | RADOME COOLING AIR VENTS   |
| 14 | RUDDER SLINGING POINT  | 38 | EQUIPMENT BAY HATCH HYDRAULIC RESERVOIR  |
| 15 | RUDDER TAB OPERATING LEVER   | 39 | TURBO-STARTER EXHAUST  |
| 16 | RUDDER CONTROL TUBE ATTACHMENT (port side); RUDDER TAB ACTUATOR (starboard side) | 40 | ENGINE STARTER HOUSING   |
| 17 | TAIL FAIRING ATTACHMENT  | 41 | ENGINE FRONT COWLING   |
| 18 | REAR FAIRING ATTACHMENTS; TAIL PLANE ACTUATOR TOP ATTACHMENT                     | 42 | HYDRAULIC PUMP   |
| 19 | RUDDER LOWER HINGE   | 43 | DIPSTICK, TWO-SPEED GEARBOX  |
| 20 | ELEVATOR SPRING TAB CONTROL  | 44 | ACCESSORIES GEARBOX OIL FILLER CAP   |
| 21 | RUDDER LOWER MASS-BALANCE WEIGHT; FIN REAR ATTACHMENT                            | 45 | VENT VALVE, OUTBOARD COMPARTMENT, INTEGRAL FUEL TANK   |
| 22 | FIN SPAR ATTACHMENT  | 46 | G4B, COMPASS (starboard side)  |
| 23 | REAR FUSELAGE SUPPORT STRUT  |    |  |
| 24 | FIN FORWARD ATTACHMENT POINT   |    |  |
| 25 | INTEGRAL FUEL TANK SLINGING POINTS   |    |  |

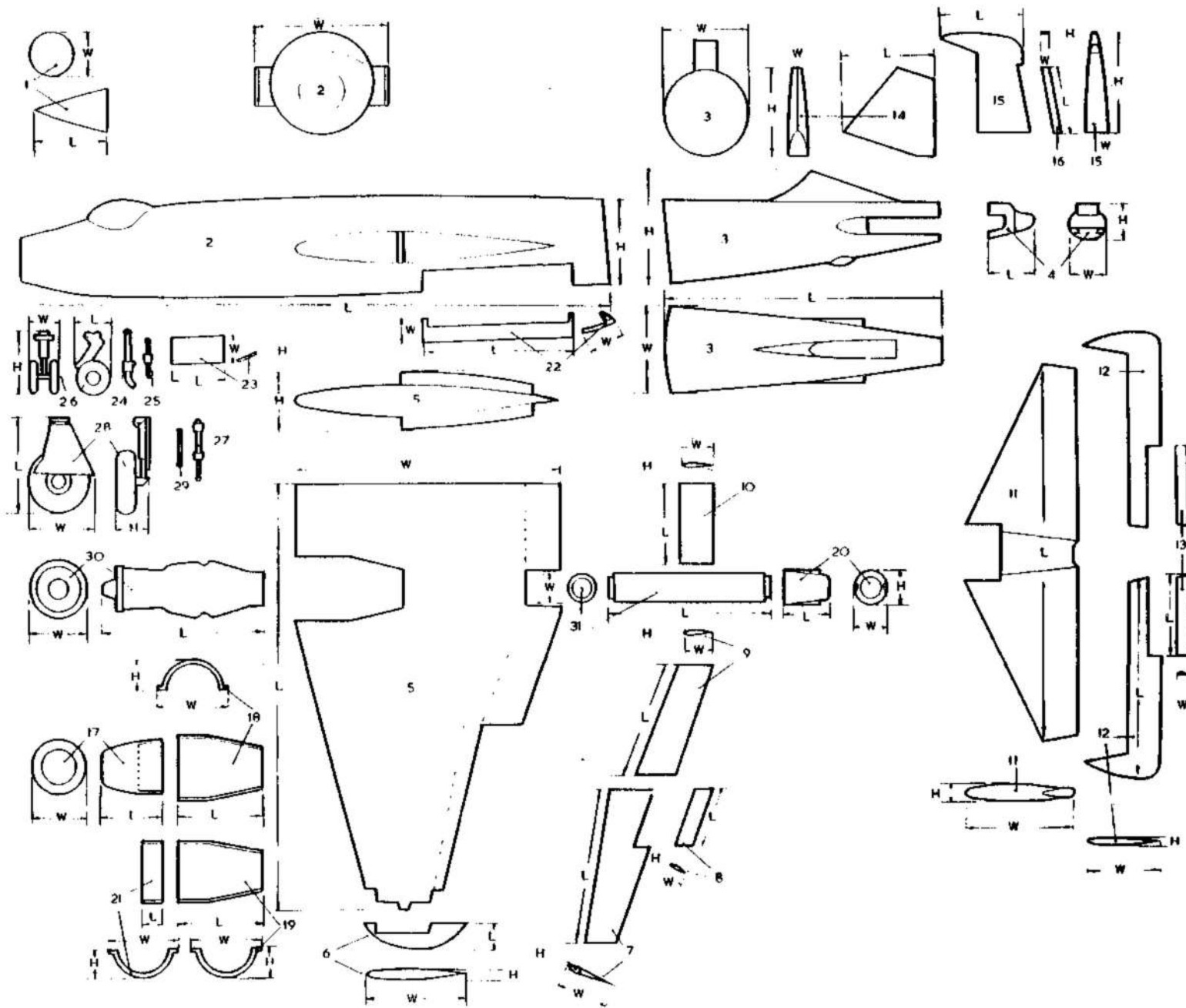


FIG.7. COMPONENT WEIGHTS AND DIMENSIONS

## KEY TO FIG. 7 (COMPONENT WEIGHTS AND DIMENSIONS)

| No. | Component                           | Length<br>(L) | Width<br>(W)            | Height<br>(H) | Tare<br>weight<br>(lb.) | Equipped<br>weight<br>(lb.)        |
|-----|-------------------------------------|---------------|-------------------------|---------------|-------------------------|------------------------------------|
| 1   | RADOME                              | 5 ft. 7 in.   | 3 ft. 2 in.<br>diameter |               |                         |                                    |
| 2   | FRONT FUSELAGE                      | 42 ft. 3 in.  | 7 ft. 7 in.             | 6 ft. 6 in.   |                         |                                    |
| 3   | REAR FUSELAGE                       | 19 ft. 1 in.  | 5 ft. 10 in.            | 7 ft. 11 in.  | 510                     | (less fuel)<br>600                 |
| 4   | REAR FAIRING                        | 4 ft. 9 in.   | 2 ft. 5 in.             | 2 ft. 10 in.  | 25                      | 65                                 |
| 5   | MAIN PLANE                          | 29 ft. 1 in.  | 19 ft. 0 in.            | 4 ft. 3 in.   | 2,352                   | 2,862                              |
| 6   | WING TIP                            | 1 ft. 8 in.   | 7 ft. 8 in.             | 10 in.        | 16                      |                                    |
| 7   | AILERON                             | 12 ft. 6 in.  | 1 ft. 3 in.             | 9 in.         | 93                      |                                    |
| 8   | AILERON TAB                         | 4 ft. 2 in.   | 8 in.                   | 2 in.         | 3                       |                                    |
| 9   | FLAP, OUTBOARD                      | 8 ft. 11 in.  | 2 ft. 9 in.             | 3 in.         | 31                      |                                    |
| 10  | FLAP, INBOARD                       | 5 ft. 7 in.   | 2 ft. 6 in.             | 3 in.         | 22                      |                                    |
| 11  | TAIL PLANE                          | 26 ft. 0 in.  | 7 ft. 9 in.             | 1 ft. 6 in.   | 495                     |                                    |
| 12  | ELEVATOR                            | 13 ft. 11 in. | 4 ft. 5 in.             | 5 in.         | 85                      | 110<br>(with<br>balance<br>weight) |
| 13  | ELEVATOR TAB                        | 5 ft. 7 in.   | 8 in.                   | 2 in.         | 7                       |                                    |
| 14  | FIN                                 | 6 ft. 4 in.   | 1 ft. 6 in.             | 6 ft. 9 in.   | 94                      |                                    |
| 15  | RUDDER                              | 7 ft. 1 in.   | 1 ft. 3 in.             | 7 ft. 0 in.   | 132                     |                                    |
| 16  | RUDDER TAB                          | 5 ft. 5 in.   | 9 in.                   | 2 in.         | 7                       |                                    |
| 17  | ENGINE FRONT COWLING                | 4 ft. 9½ in.  | 3 ft. 10 in.            | 3 ft. 10 in.  | 59                      |                                    |
| 18  | ENGINE TOP REAR COWLING             | 5 ft. 5 in.   | 2 ft. 0 in.             | 1 ft. 3 in.   | 30                      |                                    |
| 19  | ENGINE BOTTOM REAR COWLING          | 5 ft. 5 in.   | 2 ft. 0 in.             | 1 ft. 3 in.   | 33                      |                                    |
| 20  | JET PIPE COWLING                    | 3 ft. 8 in.   | 2 ft. 8 in.             | 2 ft. 7 in.   | 21                      |                                    |
| 21  | SERVICE PANEL                       | 2 ft. 2 in.   | 2 ft. 0 in.             | 1 ft. 9 in.   | 15                      |                                    |
| 22  | FLARE-BAY DOOR                      | 11 ft. 5 in.  | 3 ft. 0 in.             | 1 ft. 8 in.   | 112                     |                                    |
| 23  | NOSE UNDERCARRIAGE DOOR             | 4 ft. 2 in.   | 1 ft. 5 in.             | 3 in.         | 9                       |                                    |
| 24  | NOSE UNDERCARRIAGE<br>RADIUS ROD    | 3 ft. 11 in.  | 4 in.                   | 8 in.         | 20                      |                                    |
| 25  | NOSE UNDERCARRIAGE JACK             | 2 ft. 2 in.   | 5 in.                   | 6 in.         | 9                       | 10<br>(filled)                     |
| 26  | NOSE UNDERCARRIAGE<br>WHEEL AND LEG | 2 ft. 2 in.   | 1 ft. 7 in.             | 3 ft. 7 in.   | 230                     |                                    |
| 27  | MAIN UNDERCARRIAGE JACK             | 1 ft. 11 in.  | 4 in.                   | 7 in.         | 14                      | 16<br>(filled)                     |
| 28  | MAIN UNDERCARRIAGE WHEEL<br>AND LEG | 6 ft. 3 in.   | 3 ft. 11 in.            | 2 ft. 1 in.   | 670                     |                                    |
| 29  | MAIN UNDERCARRIAGE SIDE<br>STAY     | 2 ft. 9 in.   | 8 in.                   | 8 in.         | 36                      |                                    |
| 30  | ENGINE                              | 11 ft. 0 in.  | 3 ft. 6 in.<br>diameter |               | 2,500                   |                                    |
| 31  | JET PIPE                            | 12 ft. 3 in.  | 2 ft. 2 in.<br>diameter |               | 180                     |                                    |

TABLE 5  
TAIL UNIT  
TAIL PLANE  
ELEVATOR  
RUDDER TAB

No. OF DRAIN HOLES  
4  
5  
T/H 1

TABLE 1  
FRONT FUSELAGE  
DRAIN PLUG AFT OF FRAME 7  
DRAIN PLUG FWD OF FRAME 1

No. OF DRAIN HOLES  
1  
1

TABLE 2  
CENTRE FUSELAGE  
BELLY TANK  
FLARE DOORS  
AFT OF FRAME 29

No. OF DRAIN HOLES  
3 WATER OUTLET VALVES  
6  
2

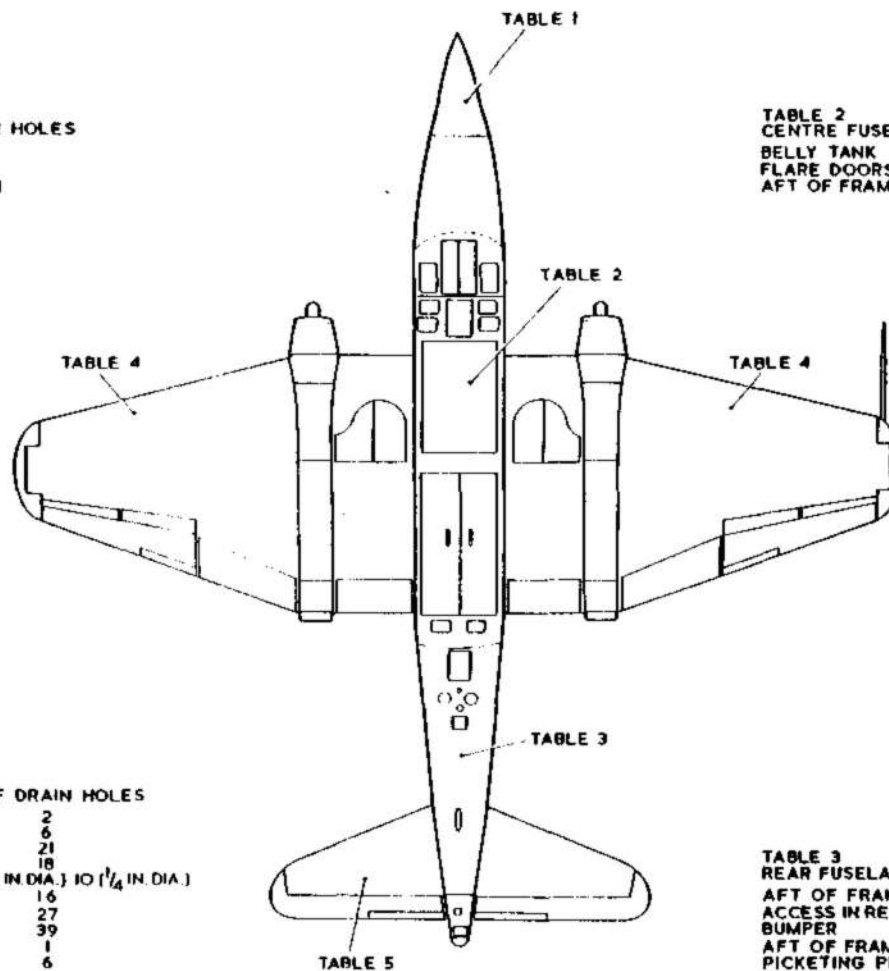


TABLE 4  
WING

FRONT COWLING INTAKE  
SERVICE PANEL  
LOWER REAR COWL  
NACELLE  
JET PIPE FAIRING  
INBOARD FLAP  
OUTBOARD FLAP  
AILERON  
JET END CONE  
INTEGRAL TANKS

No. OF DRAIN HOLES  
2  
6  
21  
18  
10 (1/8 IN DIA.) 10 (1/4 IN DIA.)  
16  
27  
39  
1  
6

TABLE 3  
REAR FUSELAGE  
AFT OF FRAME 46 IN FAIRING  
ACCESS IN REAR FUSELAGE FAIRING  
BUMPER  
AFT OF FRAME 42  
PICKETING PLUG

No. OF DRAIN HOLES  
2  
2  
2 FWD 2 AFT  
2  
1

FIG. 8. DRAINAGE HOLES

TABLE I  
Special ground equipment

| Ref. No.   | Part No.   | Description                          | Application  |
|------------|------------|--------------------------------------|--|
|            |            | <i>Towing and steering equipment</i> |  |
| 26FZ/95022 | EA3.88.15  | Adapter, fork                        | Used with towing arm (Ref. No. 4GB/4409924)                                      |
| 26FZ/95087 | EA3.88.157 | Arm, nose steering                   |  |
|            |            | <i>Jacking equipment</i>             |  |
| 26FZ/95004 | EA1.88.23  | Spigot, nose jacking                 | Used in conjunction with hydraulic jacks for front fuselage raising and lowering |
| 26FZ/95413 | EA3.88.307 | Bracket, main wheel jacking          | Main-wheel changing  |
|            |            | <i>Slings equipment</i>              |  |
| 26FZ/95039 | EA2.88.1   | Sling, nose and mid fuselage         | Front fuselage   |
| 26FZ/95007 | EA1.88.65  | Sling, fuselage tail                 | Rear fuselage  |
|            | EA1.88.919 | Sling, main plane                    | Used with ring bolt EA1.40.169   |
| 26FZ/95009 | EA1.88.59  | Sling, tail plane                    |  |
| 26FZ/95084 | EA1.88.601 | Sling, fin and rudder                |  |
| 26FZ/95273 | EA1.88.785 | Sling, complete aircraft             |  |
| 26FZ/95443 | EB6.88.39  | Sling, integral tanks                | For integral fuel tank installation  |
| 26FZ/95444 | EB6.88.81  | Strap, inner                         |  |
| 26FZ/95445 | EB6.88.83  | Strap, outer                         |  |
| 26FZ/95025 | EA1.88.91A | Former, wing, forward                | Rib 4  |
| 26FZ/95026 | EA1.88.91B | Former, wing, centre                 |  |
| 26FZ/95027 | EA1.88.91C | Former, wing, aft                    | Port   |
| 26FZ/95028 | EA1.88.91D | Former, wing, forward                |  |
| 26FZ/95029 | EA1.88.91E | Former, wing, centre                 | Rib 5  |
| 26FZ/95030 | EA1.88.91F | Former, wing, aft                    |  |
| 26FZ/95031 | EA1.88.92A | Former, wing, forward                | Port   |
| 26FZ/95032 | EA1.88.92B | Former, wing, centre                 |  |
| 26FZ/95033 | EA1.88.92C | Former, wing, aft                    | Rib 4  |
| 26FZ/95034 | EA1.88.92D | Former, wing, forward                |  |
| 26FZ/95035 | EA1.88.92E | Former, wing, centre                 | Starb.   |
| 26FZ/95036 | EA1.88.92F | Former, wing, aft                    |  |
|            |            | <i>Trestling equipment</i>           |  |
| 26FZ/95017 | EA1.88.87A | Former, rear fuselage, front         | Used with U.J.T. No. 1   |
| 26FZ/95018 | EA1.88.87B | Former, rear fuselage, rear          | Used with U.J.T. No. 7   |

continued

TABLE I Special ground equipment – continued

| Ref.No.    | Part No.             | Description                                | Application  |
|------------|----------------------|--|--|
| 26FZ/95037 | EA1.88.417           | Trestle, adjustable, front fuselage, front |  |
| 26FZ/95038 | EA1.88.419           | Trestle, adjustable, front fuselage, rear  |  |
|            |                      | <i>Rigging equipment</i>                   |  |
| 26FZ/95010 | EA1.88.93            | Gauge, incidence and dihedral, main plane  |  |
| 26FZ/95115 | EA3.88.179           | Gauge, incidence and dihedral, tail plane  |  |
| 26FZ/95040 | EA1.88.447           | Gauge, leveling, fuselage                  | Lateral ( <i>cockpit</i> ) and longitudinal ( <i>fuselage frames 29-31</i> ) |
| 26FZ/95093 | EA1.88.747           | Gauge, leveling, fuselage                  | Longitudinal ( <i>cockpit</i> ) and lateral ( <i>fuselage frame 31</i> )     |
|            |                      | <i>Miscellaneous equipment</i>             |  |
| 26FZ/95013 | EA3.88.79            | Bridge, piece, wing                        | Fitted when engine is removed  |
|            |                      | Cowling, slave, port                       | } Fitted for engine ground testing   |
|            |                      | Cowling, slave, starboard                  |  |
| 26FZ/95538 | EB7.88.205           | Guard, safety, engine nacelle              |  |
| 26FZ/95277 | EB7.88.1             | Plate, blanking, air intake                |  |
| 26FZ/95015 | EA1.88.255           | Pin, locking                               | Nose-wheel locking   |
| 26FZ/95089 | EA1.88.743           | Sleeve, locking, main undercarriage        |  |
| 26FZ/95270 | EA3.88.281           | Plug, blanking                             | Cabin pressure control valve   |
| 26FZ/95090 | EA1.88.799           | Strut, jury, tail plane                    |  |
| 26FZ/95083 | EA2.88.35            | Trolley, No.6 fuel-tank                    |  |
|            | (To be issued later) | Trolley                                    | Radome transportation/storage  |
| 26FZ/1970  | EA4.40.169           | Ring bolt                                  | Picketing, main plane and tail plane lifting                                 |
|            |                      | <i>Tools</i>                               |  |
| 26FZ/95103 | Messier<br>T.1342/75 | Block, split                               | Used on dive brakes  |
| 26FZ/95044 | EA1.88.375           | Extractor                                  | Tab torque tube lever, aileron and rudder                                    |
| 26FZ/95104 | EA1.88.825           | Extractor                                  | Aileron hinge pins   |
| 26FZ/95047 | EA1.88.359           | Extractor                                  | Main plane pick-up pins  |
| 26FZ/95292 | A.6300               | Extractor, wheel                           | For main undercarriage wheels  |
|            | A.10056              | Fixture, brake-alignment                   |  |
| 26FZ/95462 | EB6.88.103           | Extractor                                  | } For rudder spring tab removal  |
|            | EB6.88.101           | Tool, separating                           |  |
| 26FZ/95100 | EA1.88.823           | Gauge                                      | } For aileron fixed tab  |
| 26FZ/95101 | EA1.88.821           | Tool, setting                              |  |

continued

TABLE 1

Special ground equipment - continued

| Ref. No.   | Part No.     | Description                                      | Application                               |
|------------|--------------|--|---|
| 26FZ/95048 | E.A1.88.363  | Insertor   | Main plane pick-up pins                   |
| 26FZ/95088 | E.A1.88.733  | Insertor   | Main undercarriage pivot pin              |
| 26FZ/95063 | E.A1.88.395  | Key  | Hydraulic filler cap                      |
| 26FZ/95072 | E.A1.88.551  | Disc, setting                                    | } For rigging engine-controls             |
| 26FZ/95293 | E.A1.88.831  | Indicator  |   |
| 26FZ/95074 | E.A1.88.549  | Plate, setting, throttle-box                     |   |
| 26FZ/95407 | E.B6.88.29   | Plate, setting, port bell-crank lever            |   |
| 26FZ/95295 | E.A1.88.548  | Plate, setting, starboard bell-crank lever       |   |
|            | E.B6.88.27   | Disc, setting, layshaft levers, port engine only |   |
| 26FZ/95490 | E.A1.88.889  | Bolt, slave                                      | } Canopy locating                         |
| 26FZ/95491 | E.A1.88.891  | Pin, locating                                    |   |
| 26FZ/95082 | A/MBEU/70/EE | Rig, re-setting                                  | For elevator snatch unit                  |
| 26FZ/95268 | E.A2.88.113  | Spanner, box                                     | For No. 6 tank filler pipe                |
| 26FZ/95493 | E.A1.88.877  | Spanner, release                                 | For nose undercarriage doors              |
| 26FZ/95059 | E.A1.88.385  | Spanner  | For main undercarriage pivot bolt         |
| 26FZ/95060 | E.A1.88.387  | Spanner  | For main undercarriage pivot nut          |
| 26FZ/95046 | E.A1.88.379  | Spanner, universal                               | Aileron centre hinge pin                  |
| 26FZ/95065 | E.A1.88.365  | Spanner  | Front fuselage jacking socket plug        |
| 26FZ/95086 | E.A3.88.135  | Spanner  | For main undercarriage axle clamp         |
| 26FZ/95493 | E.A1.88.877  | Spanner  | For nose undercarriage "up" locks release |
| 26FZ/95297 | E.B7.88.65   | Template, rigging, aileron                       |   |
| 26FZ/95296 | E.B7.88.55   | Template, rigging, elevator                      |   |
| 26FZ/95265 | E.A3.88.247  | Template, rigging, rudder                        |   |

TABLE 2

## Standard ground equipment

| Ref. No.              | Description                             | Application                                      |
|-----------------------|---|--|
|                       | <i>Towing equipment</i>                 |  |
| 4GB/4409924           | Arm, towing                             |  |
| 4GB/4409987           | Bridle, towing 50 ft                    |  |
|                       | <i>Jacking equipment</i>                |  |
| 4Q/4230825            | Adapter head, Mk. 48                    | Aircraft jacking at main plane                   |
| 4Q/1045838            | Body, jacking, hydraulic, 10 ton        |  |
| 4Q/4230849            | Trestle, Mk. 1                          |  |
| 4Q/4230856            | Trolley, transporter                    | Aircraft jacking at front fuselage               |
| 4Q/4230826            | Adapter head, Mk. 49                    |  |
| 4Q/4230641            | Body, jacking, hydraulic, 5 ton         | Main undercarriage jacking                       |
| 4Q/4230643            | Trestle, Mk. 2                          |  |
| 4Q/4230661            | Adapter head, Mk. 27                    |  |
| 4Q/1045837            | Jack, pillar, hydraulic 15 ton          |  |
| 4Q/4230862            | Trolley, transporter                    |  |
|                       | <i>Trestling equipment</i>              |  |
| 4GB/-                 | Trestle, U.J. No. 1 c/w type A brackets | Rear fuselage support                            |
| 4GB/-                 | Trestle, U.J. No. 7 c/w type A brackets |  |
|                       | Gantry, lifting, comprising:-           | For main plane changing                          |
| 4Q/2309               | Upright, Type A                         |  |
| 4Q/4230656            | Beam, Type A                            |  |
|                       | <i>Engine changing equipment</i>        |  |
| 4GC/4232188           | Sling, engine, Avon, universal, Mk. 2   | Use with 40B/1030                                |
| 40B/1030              | Stand, Avon, universal                  |  |
| 40B/1031              | Adapters, stand, Type Avon/1            |  |
| 4G/4858               | Trolley, E.C.U. servicing, Mk. 2        |  |
|                       | <i>Miscellaneous equipment</i>          |  |
| 4G/6246               | Adapter, inflation Mk. 2                | Use with pressure gauge<br>(Ref. No. 4G/4420034) |
| 1A/4390 or<br>111/118 | Balance, spring, 0-10 lb.               | Static friction loads<br>(flying controls)       |
| 4G/5809               | Gauge, pressure, 0-10 lb.               | Radome pressure testing                          |
| 4G/4342               | Mat, main plane, Type C                 | For undercarriage shock-absorber strut charging  |
| 4G/257                | Pump, oleo undercarriage, Type A        |  |

continued

TABLE 2  
Standard ground equipment -- continued

| Ref. No.            | Description   | Application   |
|---------------------|---|---|
| 4G/3430             | Test rig, static, hydraulic, Mk. 1  | For testing the automatic cut-out valve             |
| 4FE/4226019         | Trolley, electrical servicing, Mk. 4  |   |
| 4GD/5888            | Trolley, high pressure, air charging, Mk. 2B  |   |
| 4F/1715 or          | Trolley, instrument and auto-pilot testing, Mk. 1A  |   |
| 4F/1856             | Trolley, instrument and auto-pilot testing, Mk. 1B  |   |
| 4F/1805             | Trolley, low pressure, pneumatic, Mk. 1B  |   |
| 4GD/4220            | Trolley, oxygen charging, Mk. 2   |   |
| 4F/1041044          | Trolley, pressure cabin testing, Mk. 1C   | Used with adapter, air supply<br>(Ref. No. 4F/1807) |
| 4F/1723             | Trolley, radar hoist, servicing, Type B   |   |
| 4F/1796             | } Trolley, servicing, hydraulic, Mk. 2A or 2B or 2C   |   |
| 4F/2345             |   |   |
| 4F/2375             |   |   |
|                     |   |   |
|                     | <i>Tools</i>  |   |
| 1B/4467             | Gun, lubricating, universal   | } Nose wheel strut shock absorber charging          |
| 27Q/14103           | Adapter, flexible, charging   |   |
| 1C/1201263          | Wrench, torque, 0-150 lb ft   | } Main plane attachment bolts                       |
| 1L/9106397          | Spanner, socket, ¼ in. B.S.F. x ½ in. sq. drive   |   |
| 1L/9106401          | Spanner, socket, bi-hex, 1 in. B.S.F. x ¼ in. sq. drive   |   |
| 1L/9106310          | Adapter, ½ in. socket x ¼ in. plug  |   |
| 1C/9105853          | Screwdriver   | Generator cooling duct                              |
| 1C/9106265          | Spanner, S.E. 1-1/8 in. W   | Main fuel feed                                      |
| 1C/9106572          | Trammels, steel, 42 in.   | Checking tail plane actuator movement               |
| 1B/1277745          | Level, spirit, 0-10 deg   | Checking tail plane incidence                       |
| 27G/5105            | Fixture, brake alignment (A.10056)  | } Wheel brakes                                      |
| 27G/5193            | Gauge, friction pad wear (AD.100071)  |   |
| 27G/5249            | Gauge, tenon wear (AD.100070)   |   |
| 27Y/3564            | Spanner, hook (RS.181/10)   | } Used on air brakes                                |
| 27Y/4933            | Spanner, hook (RS.181/23)   |   |
| 1C/1201352          | Wrench, torque, 5-50 lb ft x ½ in. sq. drive  | } For explosive bolts, pilot's canopy               |
| 1L/9106303          | Adapter, socket, ½ in. sq. socket x 3/8 in. sq. plug  |   |
| 1L/9106389          | Spanner, socket 3/8 in. W x 3/8 in. sq. drive   |   |
| 5A/3859             | Torch, electric, hand, probe, illuminator   |   |
| 36DD/6123           | Spanner, E.38371  | } Generator cooling muff union                      |
| 64JJ/144            | Spanner, BL.2441  |   |
| 27Q 5120-99-4674381 | Dowty resetting tool Pt. No. ST 1657. Locally manufactured resetting tool AP113D-1130-1, Chap.1, Fig.3. | For resetting U/C EMERGENCY UP selection            |

continued

TABLE 2

Standard ground equipment – *continued*

| Ref. No.    | Description                    | Application                       |
|-------------|--------------------------------|-----------------------------------|
|             | <i>Weighing equipment</i>      |                                   |
| 4GB/4399004 | Hydrostatic unit, 25-ton       | Main wheel position               |
| 4GB/4398891 | Adapter (unit to aircraft pad) |                                   |
| 4GB/4398897 | Adapter (jack to unit)         | For use with Ref. No. 4GB/4399004 |
| 4Q/1045837  | Jack, 15-ton                   |                                   |
| 4GB/4399003 | Hydrostatic unit, 10-ton       | Nose wheel position               |
| 4GB/4398902 | Adapter (unit to nose u/c)     |                                   |
| 4GB/4398907 | Adapter (jack to unit)         | For use with Ref. No. 4GB/4399003 |
| 4Q/1054121  | Jack, 8-ton                    |                                   |

**Chapter 4A EXTERNAL FINISH AND MARKINGS**  
◀ (completely revised) ▶**Introduction**

1. For data on external paint finish and markings, reference should be made to A.P.119A-0601-0 – AIRCRAFT PAINTING AND MARKINGS, BAe Drg. EK5-00-3.
2. In service, care must be taken to maintain all servicing, safety and 'break-in' markings in a legible condition. This is essential to

permit the correct replenishment of systems and safe emergency entries.

3. Any removal or deterioration of the external finish must be restored as soon as possible.
4. The static vent plates on the front fuselage are not to be painted or polished. They must be kept clean.

**UK RESTRICTED**

**UK RESTRICTED**

## Chapter 6 PROCEDURES FOLLOWING HAZARDOUS INCIDENTS

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**General information**

1. This chapter deals with the special checks to be made, in addition to any normal servicing which may be due, following the report on  
◀ MOD F720 series of a hazardous incident. ▶

**Hazardous incidents**

2. A hazardous incident is one which could result in damage to the aircraft, the effects of which may not be immediately apparent. This class of damage can arise from:—

- (1) A heavy landing

- (2) Flight in excessive g conditions

- (3) Flight through turbulent air.

- (4) A lightning strike

- (5) Violent braking

- ◀ (6) Buffeting/vibration during flight ▶

**Safety precautions**

3. The following general safety precautions apply throughout the chapter. Safety precautions peculiar to the different items of equipment will be found immediately preceding the relevant servicing instructions.

(1) All personnel must refer to the LETHAL WARNING marker card before entering the cabin or commencing any operation upon the aircraft.

(2) The N.C.O. immediately in charge of airframe servicing is the only person allowed to authorize the following:—

(a) Work by armament tradesmen on such equipment.

(b) Entry by any person into a cabin or compartment containing ejection seats,

cartridge and detonator operated jettison equipment.

(c) The fitting, removal, or repositioning of any safety device.

(3) Upon completion of authorized servicing, all tradesmen concerned must report to the N.C.O. immediately in charge of airframe servicing.

(4) The bomb door operating switch lock must be fitted before any work is commenced in the bomb bay.

(5) Functional tests of electrical equipment must not be carried out during refuelling and defuelling operations.

(6) Before connecting an external electrical power supply, the pressure head heater switch must be OFF.

#### Servicing notes

4.

(1) The examination and checks detailed in this chapter are to be carried out by a Senior N.C.O. assisted by tradesmen as required.

(2) Unless otherwise stated, damage found during this servicing is to be categorized and repaired in accordance with A.P.101B-0400-6.

(3) The appendices list renewals and adjustments which may be made. Renewals are not to be commenced until all examinations have been completed and the overall damage assessed

(4) The instructions have been compiled to cover any possible damage resulting from any type of hazardous incidents reported by the aircrew on MOD. 700 series. Discretion is to

be used in regard to the extent to which the relevant instructions are applied.

(5) Details of new or services components fitted during the servicing must be entered in the relevant columns of MOD. F720 series. ◀ ▶

(6) The tradesmen responsible must sign for the completed servicing in the relevant columns of MOD. F720 series. ◀ ▶

#### Definitions

5. The following definitions apply throughout this chapter: -

(1) DAMAGE - Refer to A.P.101B-0422-5A2, Sect.1.

(2) REPLENISH - Refer to A.P.101B-0422-5A2, Sect.1. ▶

**Appendix 1 HEAVY LANDINGS****LIST OF TABLES**

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TABLE 1 AIRFRAME

(This table details the examination and checks to be carried out.)

## WARNING

Refer to the general safety precautions listed in para. 3.

| ITEM NO. | ITEM  | OPERATION   | A.P. REFERENCE   | RECTIFICATION  | A.P. REFERENCE   |
|----------|---|---|--|--|--|
|          |   | <b>ALIGHTING GEAR</b>   |  |  |  |
| 1        | <b>MAIN UNDERCARRIAGE</b><br>(a) Shock-absorber struts  | (i) Examine for normal and equal extension<br>(ii) Examine for oil leaks  | Sect. 2, Chap. 2<br>1803P, Vol. 1,<br>Sect. 6.                         | (i) Adjust air pressure<br>(ii) Slight leaks – recharge strut<br><br>(iii) Serious leaks – indicate gland failure – renew strut  | Sect. 3, Chap. 5<br>Sect. 3, Chap. 5<br><br>Sect. 3, Chap. 5 |
| 2        | <b>NOSE UNDERCARRIAGE</b><br>(a) Shock-absorber strut   | (i) Examine for normal extension<br>(ii) Examine for oil leaks  | Sect. 2, Chap. 2<br>1803E, Vol. 1,<br>Sect. 6                          | (i) Recharge strut<br>(ii) Slight leaks – recharge strut<br>(iii) Serious leaks – indicate gland failure – renew strut   | Sect. 3, Chap. 5<br>Sect. 3, Chap. 5<br>Sect. 3, Chap. 5     |
|          |   | Jack and trestle the aircraft. Support the rear fuselage with No. 7 universal jacking trestle and former, at frame 42.  | Sect. 2, Chap. 4   |  |  |
| 3        | <b>MAIN UNDERCARRIAGE</b><br>(a) Torque links   | (i) Examine for damage<br>(ii) Check clearance at centre pivot pin. Permissible clearance between 0.001 in. and 0.010 in.   | Sect. 2, Chap. 2<br>1803P, Vol. 1,<br>Sect. 6                          | (i) Renew torque links<br>(ii) Clearance in excess of limit to be rectified by fitting new washer (Ref. No. 261Z/715) with the thickness adjusted to give a clearance of 0.001 in. to 0.004 in.<br><br>Note . . .<br>Serious deviation indicates torque link twisted – renew torque link | Sect. 3, Chap. 5   |
|          | (b) Torque links, side stay, and main attachment lugs<br>(c) Side stays and stay links<br>(d) Side stay upper attachment brackets | (iii) Remove centre pivot pin and examine for bowing, cracks and shear<br><br>Examine for damage  | 1803P, Vol. 2<br>Pt. 3, Sect. 6  | Renew if necessary   | Sect. 3, Chap. 5   |
|          | (e) Retraction jacks  | (i) Examine for damage<br>(ii) Examine securing nuts for movement, and bolts for shearing<br>(iii) Examine spar web in vicinity of brackets for damage  | 101B-0400-6,<br>Pt. 1, Chap. 3   | (i) Renew if necessary<br>(ii) Renew if necessary  |  |
|          | (f) Shock-absorber strut attachment brackets  | (i) Examine for damage<br>(ii) Examine for cracks in web and flanges, and in vicinity of bolt holes<br><br>Note . . .<br>Access to internal parts of brackets can be obtained through lightening holes in web of inboard plate. | 1803P, Vol. 2,<br>Pt. 3, Sect. 6<br><br>101B-0400-6,<br>Pt. 1, Chap. 3 | Renew jacks  |  |

(continued)

TABLE 1 AIRFRAME (continued)

| ITEM NO. | ITEM   | OPERATION   | A.P. REFERENCE              | RECTIFICATION   | A.P. REFERENCE      |
|----------|--|---|-----------------------------|---|---------------------|
|          |  | (iii) Examine bolts attaching top and bottom plates for shearing and signs of movement  |                             | Renew bolts   |                     |
|          |  | (iv) Examine all bracket-to-spar attachment bolts for shearing and signs of movement.   |                             | Renew bolts   |                     |
|          | (g) Main wheels                                | Note . . .<br>When removing or refitting a wheel, it must be fully supported to prevent damage to the oil seal housing.<br>Remove for bay servicing | A.P.2337                    | ◀ Fit serviced wheels and brake units. Check tyre pressures. Secure valve caps. ▶ | 101B-0422-4, Part 2 |
|          |  | ▶ ◀   |                             |   |                     |
|          |  | Note . . .<br>Damage to wheel and brake unit is to be suspected if brake unit is difficult to remove from wheel.                                    |                             |   |                     |
| 4        | NOSE UNDERCARRIAGE                             |   |                             |   |                     |
|          | (a) Torque links                               | Examine for damage  |                             | } If defects exist, change complete strut.  | Sect. 3, Chap. 5    |
|          | (b) Stay link attachment lugs                  | Examine for damage  |                             |   |                     |
|          | (c) Main attachment lug                        | Examine for damage  |                             |   |                     |
|          | (d) Retraction jack                            | (i) Examine attachment fittings for damage  | 1803E, Vol. 2, Pt. 3        | (i) Renew jack  | Sect. 3, Chap. 5    |
|          |  | (ii) Examine ram for damage   |                             | (ii) Renew jack   | Sect. 3, Chap. 5    |
|          | (e) Shock-absorber strut attachment bracket    | (i) Examine for damage  | 101B-0400-6, Pt. 1, Chap. 2 |   |                     |
|          |  | (ii) Examine structure in vicinity for damage   |                             |   |                     |
|          | (f) Attachment bracket top securing bolts      | (i) Examine for signs of shearing   |                             | (i) Renew as necessary  |                     |
|          |  | Note . . .<br>Damage is more likely to occur to top bolts but, if damage is suspected, all four bolts must be removed for examination.              |                             |   |                     |
|          |  | Note . . .<br>The following two items are applicable if damage has been found elsewhere in nose undercarriage or surrounding structure.             |                             |   |                     |
|          | (g) Main pivot bolt                            | Remove and examine for damage   | 1803E, Vol. 2, Pt. 3        | Fit new bolt  | Sect. 3, Chap. 5    |
|          | (h) Radius rod top and bottom attachment bolts | Remove and examine for damage   |                             | Fit new bolts   | Sect. 3, Chap. 5    |
|          | (j) Radius rod stay link                       | Examine for damage  |                             | Fit new stay link   | Sect. 3, Chap. 5    |
|          | (k) Nose wheels                                | ◀ Remove for bay servicing  | A.P.2337                    | (i) Fit serviced wheels ▶<br>(ii) Check tyre pressure-secure valve caps           | 101B-0422-4, Part 2 |

(Continued)



TABLE 1 AIRFRAME (continued)

| ITEM NO. | ITEM  | OPERATION   | A.P. REFERENCE                  | RECTIFICATION  | A.P. REFERENCE |
|----------|---|---|---------------------------------|--|----------------|
|          | (h) Leading edge diaphragm  | Examine for damage  |                                 |  |                |
|          | (j) Skin covering   | Examine for damage  |                                 |  |                |
|          | (k) Engine attachment fittings and pivots   | (i) Examine fittings for damage<br>(ii) Examine engine mounting front outer brackets for damage<br>(iii) Examine engine mounting bolts for tightness  | 101B-0400-6,<br>Part 1, Chap. 3 |  |                |
| 7        | FUSELAGE  |   |                                 |  |                |
|          | (a) Short longitudinal beams immediately forward of nose shock-absorber strut attachment.   | (i) Examine double row of rivets visible on fuselage skin for damage<br>(ii) Examine fuselage skin in vicinity of beams for damage.<br>If strut attachment bracket bolts, or bulkhead carrying the bracket are damaged, or if defects found in (i) and (ii) above, then:-<br>(iii) Cut 3 in. dia. hole in cabin floor at mid point between the two beams (starboard side of navigator's seat).<br>(iv) Examine beams for damage<br>(v) Carry out repairs. | 101B-0400-6,<br>Part 1, Chap. 2 |  |                |
|          | (b) Nose wheel well:-<br>(i) Vertical beam carrying radius rod rear attachments<br>(ii) Rear bulkhead<br>(iii) Side walls<br>(iv) Roof<br>(v) Horizontal beam on roof | Examine for damage  | 101B-0400-6,<br>Part 1, Chap. 2 |  |                |
|          | (c) Fuselage skin immediately aft of wheel well at bottom curve of transport joint  | Examine for damage. Small wrinkles may have existed before the heavy landing occurred and, as skin in this area is unstressed, they are to be ignored.  | 101B-0400-6,<br>Part 1, Chap. 2 |  |                |
|          | (d) Fuselage skin at frame 17 (main plane forward attachment point)   | Examine for damage  | 101B-0400-6,<br>Part 1, Chap. 2 |  |                |
|          | (e) Tail plane attachment bolts   | Examine for damage  | 101B-0400-6,<br>Part 1, Chap. 4 |  |                |
|          | (f) Tail plane attachment fittings  | Examine for damage  | 101B-0400-6,<br>Part 1, Chap. 4 |  |                |
|          | (g) Tail protecting pad   | Examine   |                                 |  |                |
|          | (h) Tail pad surrounding structure  | Examine particularly for distortion   |                                 |  |                |
|          | (j) Fire extinguishers  | Examine for signs of discharge  | Sect.4, Chap.5                  | Discharge indicated by plunger protruding through cap. |                |

(continued)

TABLE 1 Airframe - continued

| ITEM NO. | ITEM | OPERATION | A.P. REFERENCE | RECTIFICATION | A.P. REFERENCE |
|----------|------|-----------|----------------|---------------|----------------|
|----------|------|-----------|----------------|---------------|----------------|

8 AIRCRAFT GENERALLY  
Carry out rigging check

Sect.2, Chap.4

*Notes ...*

1. *If rigging dimensions are found to be correct, this cannot be assumed to indicate that no defects exist.*
2. *Fit all components removed, using new or serviceable items, and carry out necessary adjustments and repairs. Refit all access panels, and remove all tools, rags, and other materials used during the servicing of the aircraft. Enter details of new or serviced components fitted, and sign for completed servicing on Form 700E. ▶*

9 ◀ DELETED ▶

TABLE 2 ENGINES

*(This table details the examination and checks to be carried out).***WARNING**

Refer to the general safety precautions listed in para.3.

**SAFETY PRECAUTIONS**

- (1) All starter cartridges are to be removed before commencing servicing.
- (2) Before any servicing on the high energy igniter plugs or the H.T. wiring is commenced, the low tension supply cable to the input plug must be disconnected by an electrical tradesman, and a period of one minute allowed to elapse. This allows dissipation of stored capacitor energy, and prevents inadvertent discharge.
- (3) The high-energy unit is not to be operated with the H.T. lead disconnected.
- (4) The battery isolation switch must be set to OFF, and any external electrical supply disconnected, before loading the starter breech.
- (5) When the turbo-combustion starter is cold (at normal air temperature), three cartridges may be fired at 30 sec intervals. If a cartridge fails to fire, wait 30 sec before trying the next cartridge, or making an investigation. After firing three cartridges in quick succession, a period of 10 minutes must elapse before reloading with a further three cartridges. If these cartridges are fired immediately, a period of 20 minutes must elapse before further reloading.
- (6) Synthetic oil has a deleterious effect on aircraft finishes and electrical cables, and any spilled oil must be cleaned off immediately. Synthetic oils are also injurious to the skin and a prophylactic ointment must be applied to the hands before commencing work.
- (7) The battery isolation switch must be set to OFF before connecting an external electrical supply.

| ITEM NO. | ITEM  | OPERATION   | A.P. REFERENCE                     | RECTIFICATION        | A.P. REFERENCE |
|----------|---|---|------------------------------------|----------------------|----------------|
| 1        | <b>ENGINE MOUNTINGS</b>   |   |                                    |                      |                |
|          | ◀ (a) Forward outboard mounting support diaphragm brackets  | Examine for cracks with the aid of torch probe and mirror attachment through the forward lightening hole in rib 1A in the outer wing. |                                    |                      |                |
|          | (b) Inner mounting brackets   | Examine for damage  | A.P.101B-0400-6,<br>Part 1, Chap.3 | Renew if necessary   |                |
|          | (c) Rear mounting brackets  | Examine for damage  |                                    | Renew if necessary ▶ |                |
|          | If engine damage is suspected, refer to A.P.102C-1507 to 1522-1, Part 2, Sect.3.  |   |                                    |                      |                |
|          | If all components removed, using new or serviceable items, and carry out necessary adjustments and repairs. Refit all access panels and remove all rags, tools, and other materials used during the servicing of the engine installation.<br>Sign for completed servicing on Form 700E. |   |                                    |                      |                |

TABLE 3 ELECTRICAL SYSTEM

(This table details the examination and checks to be made to the electrical system.)

**WARNING**

Refer to the general safety precautions listed in para. 3.

**SAFETY PRECAUTIONS**

- (1) Before any servicing of the high-energy ignition units or the H.T. wiring is commenced, refer to the LETHAL WARNING marker card, and remove the fuses.
- (2) The high-energy ignition units must not be operated with the H.T. cable disconnected.
- (3) When using silicone compound, care must be taken to prevent compound making contact with the eyes.
- (4) When removing lead acid batteries, disconnect the negative cable first. When refitting batteries, connect the positive cable first.
- (5) When the engines are running, the battery isolation switch must be set to 'ON' before disconnecting external electrical supply.
- (6) Functional tests of electrical equipment must not be carried out during refuelling or defuelling operations, and all electrical power must be OFF.
- (7) Both internal and external electrical power supplies must be disconnected before any Breeze plug connections are broken. Electrical power supplies must not be reconnected until Breeze plugs have been refitted. All electrical circuits affected by disconnection of Breeze plugs, must be functionally tested when the plugs have been refitted.
- (8) Dummy fuses must be fitted to all unused fuse positions.
- (9) When components are removed for bay servicing, the appropriate circuit fuses must be removed, and dummy fuses fitted.
- (10) When circuit fuses are removed to facilitate servicing, dummy fuses must be fitted.
- (11) When servicing is completed, ensure that all dummy fuses, except those in unused fused positions, are removed and the correct rating live fuses fitted.

| ITEM NO. | ITEM   | OPERATION   | A.P. REFERENCE   | RECTIFICATION  | A.P. REFERENCE |
|----------|--|---|------------------|--|----------------|
|          |  | Before carrying out functional tests, plug in external electrical supply and switch 'ON'.<br>On completion of tests, switch 'OFF' and disconnect external supply. |                  |  |                |
|          | Battery  |   |                  |  |                |
| (a)      | Main lead acid battery stowage and adjacent structure  | Examine for spilled electrolyte, and corrosion.   | 4343, Vol. 1     | If found, neutralise affected areas and inform airframe N.C.O. Paint with anti-sulphuric paint when requested by airframe N.C.O. |                |
| (b)      | Emergency lead acid battery stowage and adjacent structure   |   |                  |  |                |
| (c)      | Fire extinguisher circuit  | Examine inertia switches. If switches have been tripped, all fire extinguishers will have been discharged. Disconnect extinguishers and inform engine N.C.O.      | Sect. 5, Chap. 1 | Reset inertia switches, and carry out full functional test of circuit. Connect serviced fire extinguishers after fitting.        |                |
| (d)      | Undercarriage micro switches   | Examine for damage  |                  | Renew if necessary   |                |
|          | Refit all access panels, and remove all tools and other materials used during the servicing of the electrical systems.<br>Sign for completed servicing on Form 700E. |   |                  |  |                |

TABLE 4

## Instrument installation

*(This table details the examination and checks to be made to the instrument installations.)***WARNING**

Refer to the general safety precautions listed in para.3.

**SAFETY PRECAUTIONS**

- (1) Ensure that the battery isolation switch is set to OFF before connecting external supply.
- (2) Before disconnecting any plug connections, both internal and external supplies must be disconnected. Electrical supplies must not be reconnected until all plugs have been refitted.
- (3) All electrical circuits affected by disconnection of plugs are to be function-tested after the plugs have been refitted.

| ITEM NO. | ITEM  | OPERATION   | A.P. REFERENCE | RECTIFICATION            | A.P. REFERENCE |
|----------|---|---|----------------|--------------------------|----------------|
|          |   | <p>Note . . .</p> <p><i>Examine the bonding of all components for serviceability and good connection during the course of this servicing.</i></p> |                |                          |                |
|          | PRESSURE CABIN<br>(a) Flight instruments<br>(b) Engine instruments<br>(c) Miscellaneous instruments   | Examine for damage and carry out functioning tests  | 112G series    | Renew items as necessary | Sect.5, Chap.2 |
|          | Refit, or replace with new or serviced parts, all components removed and make necessary adjustments and repairs. Remove all tools, rags and other materials used during servicing. Refit access panels.<br>Sign for completed servicing on Form M.O.D. F700 series. |   |                |                          |                |

TABLE 5 RADAR INSTALLATIONS

(This table details the examination and checks to be made to the radar installations.)

**WARNING**

Refer to the general safety precautions listed in para. 3.

**SAFETY PRECAUTIONS**

- (1) Ensure that the battery isolation switch is set to 'OFF' before connecting external supply.
- (2) Before disconnecting any Breeze plug connections, both internal and external electrical supplies must be disconnected. Electrical supplies must not be reconnected until Breeze plugs have been refitted.
- (3) All electrical circuits affected by the disconnection of Breeze plugs are to be functionally tested after Breeze plugs have been refitted.

| ITEM NO. | ITEM                                   | OPERATION  | A.P. REFERENCE | RECTIFICATION                        | A.P. REFERENCE |
|----------|--|--|----------------|--------------------------------------|----------------|
|          |  | Note Examine the bonding of all components for serviceability and good connection during the course of this servicing. |                |                                      |                |
| 1        | AIRCRAFT generally                     |  |                | Rectify any defects already reported |                |
| 2        | REAR FUSELAGE                          |  |                |                                      |                |
|          | (a) I.F.F./S.S.R. T/R Type 16928       | } Examine for damage   | 114J-0101-16   | Renew items as necessary             |                |
|          | (b) Aerial switch unit                 |  |                |                                      |                |
|          | (c) TACAN T/R Type RT636/ARN72         |  | 116B-0304-1    | Renew items as necessary             |                |
|          | (d) Radar Altimeter T/R Type MG9050 D1 |  |                |                                      |                |
| 3        | NOSE                                   |  |                |                                      |                |
|          | (a) Blue Parrot Radar                  | Examine for damage   |                | Renew items as necessary             |                |
| 4        |  |  |                |                                      |                |
|          | (a) I.F.F./S.S.R.                      | Carry out functional test  | 114J-0101-16   |                                      |                |
|          | (b) TACAN                              | Carry out functional test  | 116B-0304-1    |                                      |                |
|          | (c) Radar Altimeter                    | Carry out functional test  |                |                                      |                |
|          | (d) Blue Parrot                        | Carry out functional test  |                |                                      |                |

Fit all components removed for servicing using new or serviced items, and carry out necessary adjustments or repairs. Remove all tools, rags and other materials used during servicing. Refit access panels.  
Sign for completed servicing on Form 700E.

TABLE 6 WIRELESS INSTALLATIONS

*(This table details the examination and checks to be made to the wireless installations.)***WARNING**

Refer to the general safety precautions listed in para. 3.

**SAFETY PRECAUTIONS**

- (1) Ensure that the battery isolation switch is set to 'OFF' before connecting external supply.
- (2) Before disconnecting any Breeze plug connections, both internal and external electrical power supplies must be disconnected. Electrical power supplies must not be reconnected until Breeze plugs have been refitted.
- (3) All electrical circuits affected by the disconnection of Breeze plug connections are to be functionally tested after Breeze plugs have been refitted.

| ITEM NO. | ITEM                                      | OPERATION  | A.P. REFERENCE | RECTIFICATION                    | A.P. REFERENCE |
|----------|---|--|----------------|----------------------------------|----------------|
|          |   | Note (1) The bonding of all components is to be examined for serviceability and good connections |                |                                  |                |
| 1        | AIRCRAFT generally                        |  |                | Rectify defects already reported |                |
| 2        | AERIALS                                   | Examine for damage   |                | Repair or replace as necessary   |                |
| 3        | External I/C socket (Starboard wheel bay) | Examine for damage   |                |                                  |                |
| 4        | UPPER EQUIPMENT COMPARTMENT               |  |                |                                  |                |
|          | (a) Standby UHF T/R                       | Examine for damage   | 116D-0110-16   | Renew items as necessary         |                |
|          | (b) Aerial switch units, Type 1741        | Examine for damage   | 116D-0105-1    | Renew items as necessary         |                |
|          | (c) Mountings                             | Examine for damage   |                | Renew items as necessary         |                |
| 5        | NAVIGATOR'S STATION                       |  |                |                                  |                |
|          | (a) Amplifier, Type 1961M                 | Examine for damage   | 2876E, Vol. 1. | Renew items as necessary         |                |
|          | (b) Marker receiver Type 6403M            | Examine for damage   |                |                                  |                |
|          | (c) V.H.F. receiver, Type 6401M           | Examine for damage   | 116B-0407-1    | Renew items as necessary         |                |
|          | (d) Glide slope receiver, Type 6404M      | Examine for damage   |                |                                  |                |
|          | (e) Navigation unit, Type 6402MA          | Examine for damage   |                |                                  |                |
|          | (f) I.F. amplifier, Type 8282             | Examine for damage   | 2530M, Vol. 1. | Renew items as necessary         |                |
|          | (g) R.F. amplifier, Type 8281             | Examine for damage   |                |                                  |                |
|          | (h) Mountings and trays                   | Examine for damage   |                | Renew items as necessary         |                |

*Continued*

TABLE 6 WIRELESS INSTALLATIONS -- *continued*

| ITEM NO. | ITEM                              | OPERATION                 | A.P. REFERENCE               | RECTIFICATION            | A.P. REFERENCE |
|----------|-----------------------------------|---------------------------|------------------------------|--------------------------|----------------|
| 6        | REAR FUSELAGE                     |                           |                              |                          |                |
|          | (a) U.H.F./V.H.F. T/R Type PTR175 | Examine for damage        | 116D-0105-1                  | Renew items as necessary |                |
|          | (b) Mixing control unit           | Examine for damage        |                              | Renew items as necessary |                |
|          | (c) Mountings and trays           | Examine for damage        |                              |                          |                |
| 7        | (a) U.H.F./V.H.F.                 | Carry out functional test | 116D-0105-1/<br>116D-0110-16 |                          |                |
|          | (b) I/C installation              | Carry out functional test | 2876E                        |                          |                |
|          | (c) V.O.R./I.L.S.                 | Carry out functional test | 116B-0407-1                  |                          |                |
|          | (d) Radio compass                 | Carry out functional test | 2530M                        |                          |                |

Fit all components removed during servicing, using new or serviced items, carry out necessary adjustments and repairs. Remove all tools, rags and other materials used during servicing of wireless systems and refit all access panels.

Sign for completed servicing on Form 700E

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**General information**

**1.** Check aircraft for damage whenever 5.0 'g' has been reached or exceeded. The indication that an aircraft has exceeded the maximum permissible 'g' loading is normally obtained from the fatigue meter. When an increase in the reading of the highest counter of the meter is recorded beyond the stated limit, an excess 'g' check is required. The limits are:

5.1 'g' with the Mk. 16 fatigue meter.

TABLE 1 AIRFRAME

*(This table details the examination and checks to be carried out.)***WARNING**

Refer to the general safety precautions listed in para. 3.

| ITEM NO. | ITEM                   | OPERATION  | A.P. REFERENCE   | RECTIFICATION                 |
|----------|------------------------|--|--|-------------------------------|
|          |                        | Carry out rigging checks. Correct rigging dimensions cannot be assumed to indicate that no defects exist.  |  |                               |
| 1        | MAIN PLANES            |  |  |                               |
|          | (a) Outboard wing      | Inspect the outboard wing upper surface aft of the main spar, just outboard and inboard of rib 4 (inboard aileron hinge location) for skin buckling and rib distortion   | 101B-0400-6, Part 1, Chap. 3                                   | Repair as necessary           |
|          | (b) Leading edge       | Examine the corners of the air intake slots on the wing leading edge for distortion or cracking.   | 101B-0400-6, Part 1, Chap. 3                                   | Repair or renew as necessary  |
| 2        | SERVICES               |  |  |                               |
|          | (a) Wing root services | Examine all wing root services i.e., fuel, cabin air, hydraulics, engine controls, generator controls for looseness of joints and chafing.   | 101B-0400-6, Part 1, Chap. 7 Sect. 4, Chap. 1 Sect. 5, Chap. 1 | Repair or renew as necessary  |
| 3        | UNDERCARRIAGE          |  |  |                               |
|          |                        | Jack and trestle the aircraft and carry out undercarriage retraction checks. Examine for alignment and locking of the main leg and 'D' doors, and check that the projecting skin tongue on the forward outboard end of the 'D' door is undamaged and fits correctly into the wing skin recess. | 101B-0400-6, Part 1, Chap. 5                                   | Repair or renew as necessary. |
|          |                        | Examine floor girder 18, in No. 6 fuel tank bay at the forward door hinge point, for any distortion or buckling.   | 101B-0400-6, Part 1, Chap. 2                                   | Repair or renew as necessary. |

*(continued)*

TABLE 1 Airframe -- continued

| ITEM NO. | ITEM        | OPERATION | A.P. REFERENCE | RECTIFICATION |
|----------|-------------|-----------|----------------|---------------|
| 4        | ◀ DELETED ▶ |           |                |               |

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TABLE 1

Airframe

**WARNING**

Refer to the general safety precautions listed in para.3.

| ITEM NO. | ITEM                     | OPERATION   | A.P. REFERENCE                       | RECTIFICATION                        |
|----------|--------------------------|---|--------------------------------------|--------------------------------------|
| 1        | AIRCRAFT generally       |   |                                      | Rectify any defects already reported |
| 2        | MAIN PLANES              |   |                                      |                                      |
|          | (a) Access panels        | Remove the inner and outer panels from the upper surface, inner main plane.   | Chap.4                               |                                      |
|          | (b) Inner wing diaphragm | Examine, particularly for cracks, in area adjacent to main plane forward attachment point at fuselage frame 17 and in areas where pipes pass through the diaphragm. | 101B-0400-6, Part 2, Leaflet C.3/17. | Repair as necessary                  |
|          | (c) Access panels        | Refit   |                                      |                                      |
| 3        | ◀ DELETED ▶              |   |                                      |                                      |

## Appendix 4 LIGHTNING STRIKES

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**General information**

1. Lightning strikes usually result in two types of damage, that caused by the actual strikes, and that caused by the discharge of static electricity which follows the strike. It is also possible that heavy static discharges may occur without the aircraft having been struck by lightning. Further, it is possible that certain aircraft components may become strongly magnetized, it being probable that during the lightning discharge heavy electrical currents flow in the metal airframe structure. The magnetic field produced by such electric current is the cause of magnetization, this being an undesirable factor in the vicinity of a compass.

2. A lightning strike usually causes burning of small circular holes of approximately 1/8 in. diameter, which may be clustered in one locality or scattered over a large area, results may also be indicated by burnt or discoloured skin, or rivets.

Evidence of lightning strikes usually appears more prevalent in the fuselage nose section, and outer leading edges.

3. The effects of static discharge may occur as localized pitting or burning and may even result in circular holes of approximately 1/4 in. diameter. Evidence of static discharge usually appears more prevalent on trailing edges, in the lower aft fuselage area, radio aerials and the main-plane extremities, also on the fin and tail-plane tips and trailing edges.

**Examination procedure**

4. Whenever a lightning strike or static electricity discharge is reported, or if it is suspected that these conditions may have been encountered, the aircraft must be examined for evidence of such, as tabulated subsequently, at the first opportunity following the incident. It is

emphasised, however, that where the term 'Examine' is used, the signs of damage being primarily sought are those of lightning strikes and static discharge as defined in para. 2 and 3 respectively. The examination is divided into the following two categories:—

Table 1 - *Preliminary examination* - intended only for en-route aircraft landing away from base, to be followed upon return to base by:—

Table 2 - *Comprehensive examination* - the normal procedure to be carried out at base on termination of flight.

**Note . . .**

*Categorization does not of itself determine repair deferment policy. A decision to defer the rectification of ascertained damage must be related to the effect of the damage upon the airworthiness of the aircraft.*

TABLE 1 PRELIMINARY EXAMINATION (En-route aircraft only)

| ITEM NO. | ITEM  | OPERATION   |
|----------|---|---|
| 1        | (a) Ejection seats<br>(b) Canopy and hatch jettisoning systems                          | Ensure rendered safe.   |
| 2        | Fuselage exterior   | Examine, paying particular attention to nose section, perspex transparencies for crazing, and fuselage underside and tail fairing.                  |
| 3        | (a) Tail-plane surfaces<br>(b) Elevator surfaces<br>(c) Elevator tab surfaces           | Examine, paying particular attention to trailing edges, tips and hinge areas.   |
| 4        | (a) Fin<br>(b) Rudder<br>(c) Rudder tab   | Examine, paying particular attention to trailing edges.   |
| 5        | Main-plane surfaces   | Examine, paying particular attention to outer leading edges, trailing edges, root-ends, air intakes and hinge areas of the control surfaces.        |
| 6        | (a) Aileron surfaces<br>(b) Aileron tab surfaces<br>(c) Flap surfaces<br>(d) Air brakes | Examine, paying particular attention to trailing edges and hinge areas.   |
| 7        | (a) Main-wheel units<br>(b) Nose-wheel unit   | If extended at time of incident:—<br>Examine, paying particular attention to lower portions.  |
| 8        | (a) Main flying controls<br>(b) Flaps<br>(c) Air brakes                                 | Operate each system through full range and check for smooth freedom of movement.  |
| 9        | Fire extinguisher discharged indicator  | Examine and check by feel the indicator pin at the base of the extinguishers for protrusion; if the pin protrudes the extinguisher must be renewed. |
| 10       | Navigation lamps  | Operate, and check for correct functioning.   |
| 11       | All aerials   | Examine.  |
| 12       | (a) Radio equipment<br>(b) Navigation equipment   | Operate, and check for correct functioning.   |
| 13       | Pressure head   | Examine.  |
| 14       | Compass   | Carry out a check swing.  |

TABLE 2 COMPREHENSIVE EXAMINATION (Normal procedure)

| ITEM NO. | ITEM   | OPERATION   | A.P. REFERENCE  | RECTIFICATION   |
|----------|--|---|---|---|
| 1        | (a) Ejection seats<br>(b) Canopy and hatch jettisoning systems | Ensure rendered safe.   | 109B-0101-1.  |   |
| 2        | Front fuselage   | Examine, paying particular attention to (a) the perspex transparencies, (b) nose-wheel doors and underside.   | 101B-0400-6, Pt. 1, Chap. 2.                          | (a) Polish or renew as necessary.<br>(b) Repair as necessary. |
| 3        | Rear fuselage  | Examine, paying particular attention to the underside and rear fairing. Static discharge is usually indicated by a series of small holes along the underside at approximately the centre line.  | 101B-0400-6, Pt. 1, Chap. 2.                          | Repair as necessary.  |
| 4        | (a) Tail plane<br>(b) Fin                                      | Examine, paying particular attention to the trailing edges, tips and hinge areas of control surfaces.   | 101B-0400-6, Pt. 1, Chap. 4.                          | Repair or renew as necessary.                                 |
| 5        | (a) Elevators<br>(b) Elevator tabs                             | (1) Examine, paying particular attention to the trailing edges.<br>(2) Examine hinge assemblies, as far as practicable. If signs of static discharge or pitting are found, extend examination to include all bearing points in the control system.<br>(3) Move the elevator and tabs through the full range of travel and check for freedom of movement and smooth operation.                                       | 101B-0400-6, Pt. 1, Chap. 4.<br><br>Sect. 3, Chap. 4. | Repair or renew as necessary.                                 |
| 6        | (a) Rudder<br>(b) Rudder tab                                   | (1) Examine, paying particular attention to the trailing edges.<br>(2) Examine hinge assemblies and tab-operating mechanism as far as practicable. If signs of static discharge or pitting are found, the examination must be extended to include all bearing points in the control system.<br>(3) Move the rudder and tab through the full range of travel and check for freedom of movement and smooth operation. | 101B-0400-6, Pt. 1, Chap. 4.<br><br>Sect. 3, Chap. 4. | Repair or renew as necessary.                                 |
| 7        | Main planes  | Examine, paying particular attention to the outer leading edges, inboard undersurfaces, air intakes, trailing edges and hinge areas of flying controls, and skin joints.  | 101B-0400-6, Pt. 1, Chap. 3.                          | Repair as necessary.  |

Continued

TABLE 2 COMPREHENSIVE EXAMINATION (Normal procedure) - continued

| ITEM NO. | ITEM  | OPERATION   | A.P. REFERENCE   | RECTIFICATION                 |
|----------|---|---|--|-------------------------------|
| 8        | Ailerons                                    | <ol style="list-style-type: none"> <li>(1) Examine, paying particular attention to the trailing edges.</li> <li>(2) Examine hinge assemblies, as far as practicable. If signs of static discharge or pitting are found, the examination must be extended to include all bearing points in the control system.</li> <li>(3) Move the ailerons through the full range of travel and check for freedom of movement and smooth operation.</li> </ol>  | <p>101B-0400-6, Pt. 1, Chap. 3.</p> <p>Sect. 3, Chap. 4.</p> | Repair or renew as necessary. |
| 9        | Aileron tabs                                | <ol style="list-style-type: none"> <li>(1) Examine, paying particular attention to the trailing edges.</li> <li>(2) Examine hinge assemblies and tab-operating mechanisms.</li> <li>(3) Operate the aileron tabs through the full range of travel and check for freedom of movement and smooth operation.</li> </ol>  | <p>101B-0400-6, Pt. 1, Chap. 3.</p> <p>Sect. 3, Chap. 4.</p> | Repair or renew as necessary. |
| 10       | Flaps                                       | <ol style="list-style-type: none"> <li>(1) Examine, paying particular attention to the trailing edges.</li> <li>(2) Examine hinge assemblies. If signs of static discharge or pitting are found, extend the examination to include all bearing points in the flap control system.</li> <li>(3) Disconnect flap-operating rods at the rear ends.</li> <li>(4) Move the flaps through the full range of travel and check for freedom and smooth operation.</li> <li>(5) Reconnect flap-operating rods.</li> <li>(6) Operate flap system through full range of travel and check for smooth operation.</li> </ol> | <p>101B-0400-6, Pt. 1, Chap. 3.</p> <p>Sect. 3, Chap. 4.</p> | Repair or renew as necessary. |
| 11       | Air-brake assemblies                        | <ol style="list-style-type: none"> <li>(1) Extend and examine.</li> <li>(2) Examine all hinge assemblies. If signs of static discharge or pitting are found, extend the examination to the operation jack bearings.</li> <li>(3) Operate the air brakes and check for full and free movement and smooth operation.</li> </ol>   | <p>Sect. 3, Chap. 2.</p> <p>Sect. 3, Chap. 4.</p>            | Renew as necessary.           |
| 12       | (a) Main-wheel units<br>(b) Nose-wheel unit | If extended at time of incident:<br>Examine, paying particular attention to the lower parts of the shock-absorber struts and wheels.  | 2337, Vol. 1 and<br>1803E, Vol. 1.                           | Renew as necessary.           |

Continued

TABLE 2 COMPREHENSIVE EXAMINATION (Normal procedure) — *continued*

| ITEM NO. | ITEM  | OPERATION   | A.P. REFERENCE                | RECTIFICATION                                 |
|----------|---|---|-------------------------------|---|
| 13       | Aircraft generally  | If any aerials (or other protuberances) have broken away during incident, examine for incidental damage.  |                               | Renew aerials and repair damage as necessary. |
| 14       | ELECTRICAL<br>(a) External lighting<br>(b) Cockpit lighting | Operate, and check for correct functioning.   | Sect. 5, Chap. 1,<br>Group L. |   |
| 15       | ENGINES<br>Fire extinguisher indicator                      | Check by feel, mechanical indicator pin at base of extinguisher for protrusion. If pin protrudes renew extinguisher.  | Sect. 4, Chap. 5.             | Renew as necessary.                           |
| 16       | INSTRUMENTS<br>Compasses                                    | Test and carry out check swing.   | 112G-0321-1                   | Renew as necessary.                           |
|          | Note . . .  | Refer also to A.P.3158, Vol. 2, Leaflet B.22 for the effect of lightning strikes on aircraft flight instruments compass systems.  |                               |   |
| 17       | Aerials   | Examine.  | Sect. 6, Chap. 2.             | Renew as necessary.                           |
| 18       | All connectors<br>(aerials to trans/rec.)                   | (1) Disconnect.<br>(2) Examine, particularly end connections.<br>(3) Check for continuity and leakage from conductor to outer screen.                                     | Sect. 6, Chap. 2.             | Renew as necessary.                           |
| 19       | Aerial switch units   | (1) Examine, particularly connections and contacts.<br>(2) Check for continuity and leakage from conductor to outer screen in both energized and de-energized conditions. | Sect. 6, Chap. 2.             | Renew as necessary.                           |
| 20       | All connectors  | Reconnect   |                               |   |
| 21       | Installation  | Operate, and check for correct functioning.   | Sect. 6, Chap. 2.             |   |
| 22       | RADIO<br>Aerials  | Examine.  | Sect. 6, Chap. 1.             | Renew as necessary.                           |

*Continued*

TABLE 2 COMPREHENSIVE EXAMINATION (Normal procedure) — *continued*

| ITEM NO. | ITEM                                      | OPERATION   | A.P. REFERENCE    | RECTIFICATION       |
|----------|---|---|-------------------|---------------------|
| 23       | All connectors<br>(aerials to trans/rec.) | (1) Disconnect.<br>(2) Examine, particularly end connections.<br>(3) Check for continuity and leakage from conductor to outer screen.                                     | Sect. 6, Chap. 1. | Renew as necessary. |
| 24       | Aerial switch unit                        | (1) Examine, particularly connections and contacts.<br>(2) Check for continuity and leakage from conductor to outer screen in both energized and de-energized conditions. | Sect. 6, Chap. 1. | Renew as necessary. |
| 25       | All connectors                            | Reconnect.  |                   |                     |
| 26       | Installation                              | Operate and, using test equipment, check for correct functioning.   | Sect. 6, Chap. 1. |                     |

**Appendix 5 VIOLENT BRAKING**

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**General information**

**1.** Following an emergency stop, violent braking, or overheating, the wheels, tyres and brakes must be removed and undergo full Bay Servicing.

**Appendix 6 BUFFETING/VIBRATION DURING FLIGHT**

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**General information**

1. The information contained in this appendix is intended as a guide to assist in the determination of sources of buffeting/vibration experienced during flight.
2. Table 1 lists possible sources of buffeting/vibration and the examinations required, but the possibilities of other sources should not be ruled out. Sources from engine running characteristics or malfunctions are not listed.

**Note...**

*(1) Although a diagnosis from an aircrew's report can identify the cause of buffeting/vibration, the source is more likely to be identified*

*from a thorough physical inspection of the airframe and engine installation.*

*(2) Generally it is not expected that airframe faults will generate any vibrations with frequencies above about 25 cycles per second. If the reported vibration approaches this frequency, it is probable that a flying control circuit problem exists and particular attention should be paid to the elevator geared tab backlash.*

*(3) If the frequency of vibrations is in excess of 25 cycles per second the most likely cause is an engine | airframe fault, regardless of any apparent effects of applied 'G' forces.*

TABLE 1 - EXAMINATION OF POSSIBLE SOURCES OF BUFFETING/VIBRATION

## WARNING...

Refer to the general safety precautions in para. 3 of the main chapter.

| ITEM NO | POSSIBLE SOURCE                       | OPERATION   |
|---------|---------------------------------------|---|
| 1       | Jet pipe mounting                     | Check movement  |
| 2       | Transport joints                      | Ensure tight  |
| 3       | Tail plane leading edge/elevator horn | Examine and particularly for lack of continuity and check for correc. gap   |
| 4       | Fin and tail plane root area          | Examine and particularly for poor continuity of joints, oil canning or poor finish                                      |
| 5       | Fin stub                              | Examine and particularly for depressions or repair strips which might affect rudder spring tab                          |
| 6       | Elevator tab shrouds                  | Ensure not bent to obtain correct gap (gap obtained by trimming)  |
| 7       | Tail plane/attachment points          | Examine and particularly for excessive rock due to play at attachment points at fuselage                                |
| 8       | Tail plane stubs and root area        | Check gaps  |
| 9       | Control circuit                       | Check backlash, particularly elevator geared tab circuit  |
| 10      | Air brakes                            | Examine and particularly to ensure that they lay flush with main plane and are not causing local distortion of the skin |
| 11      | Flaps                                 | Examine and particularly for trailing edge distortion due to flap jack load or, excessive looseness                     |
| 12      | All controls and tabs                 | Ensure they conform to weight and balance requirements of drawings  |
| 13      | Mass balance weights                  | Ensure tight  |
| 14      | Undercarriage doors                   | Ensure rigged correctly in undercarriage UP position. Ensure seals are intact and fitting correctly                     |
| 15      | Static vents                          | Examine particularly for correct contour  |
| 16      | Entrance door                         | Check fit with and without cabin pressure   |
| 17      | Bomb or flare bay doors               | Ensure seals intact and fitting correctly   |
| 18      | Canopy fairing                        | Examine particularly for correct contour and ensure fitting tightly   |
| 19      | Inner main plane                      | Examine particularly for poor finish which might disturb air flows and eventually affect tail plane                     |
| 20      | Engine/airframe                       | Ensure no foul exists   |



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