

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 cockpit or performing any operations upon the aircraft.

Note...

The majority of the removable panels on the aircraft are classified as Access Panels and are identified by a system of numbers and suffix letters,

which system is used for all panel references throughout the publication. Identification can be made by referring to the access panel diagrams, in conjunction with the key table (fig. 1, 2 and Table 3 of Sect.2, Chap.4). All fuels, oils and fluids are specified in Leading Particulars.

Tools and equipment

1. For tools and equipment used in the following operations refer to Table 2.

Refuelling

Gravity

2. For gravity refuelling each main tank is provided with a refuelling cap, access panel 97P or 97S, in the upper surface of each main plane. This provision is intended for use only in the absence of the pressure refuelling facilities for which the aircraft is designed, and it should be noted that, due to the fact that the refuelling caps are below the capacity fuel level, it

is not possible to fill the tanks completely by this method.

Pressure

Note...

1. Before commencing to refuel, ensure that a serviceable battery is installed in the aircraft.

2. Select the BATTERY switch on and the flight refuelling switch FL REFUEL for 30 seconds to allow depressurizing of the ventral tank. Afterwards select the flight refuelling switch NORMAL and the BATTERY switch off.

3. To refuel the aircraft:-

(1) Open access panel 63P and, having ensured that the tanker is earthed, connect the tanker bonding lead to the earth point.

(2) Remove the refuelling adapter cap and connect the tanker hose to the refuelling adapter.

(3) Start the tanker pump to commence refuelling; delivery pressure must not be allowed to exceed 50 lb/in² or to fall below 35 lb/in².

(4) Stop the flow from the tanker when all five coloured indicator lights above the refuelling panel are extinguished.

(5) Close the tanker delivery cock, disconnect the hose and bonding lead, refit the refuelling adapter cap and close the access panel.

(6) If it is required to check the tank contents on the cockpit gauges,

TABLE 1 Defuelling cock settings

TANK TO BE DEFUELLED		PORT DEFUELLING COCK	STARBOARD DEFUELLING COCK
MAIN AND LEADING EDGE TANKS	PORT	defuel main tank	isolate wing tanks
	STARBOARD	isolate wing tanks	defuel main tank
	BOTH	defuel main tank	defuel main tank
FLAP TANKS	PORT	normal	isolate wing tanks
	STARBOARD	isolate wing tanks	normal
	BOTH	normal	normal
VENTRAL TANK		isolate wing tanks	isolate wing tanks

connect external a.c. and d.c. power supplies to the aircraft and set the instrument master switch ON.

Note...

The contents of the flap tanks are indicated by depressing the FUEL CONTS - T/E TANK switch on the starboard console.

Defuelling

4. The aircraft is defuelled by applying suction at the refuelling adapter (access panel 63P), using a refuelling tanker on which the cocks have been set to permit flow from the aircraft to the tanker; defuelling depression must not exceed 11 lb/in². Prior to defuelling, all d.c. electrical supp-

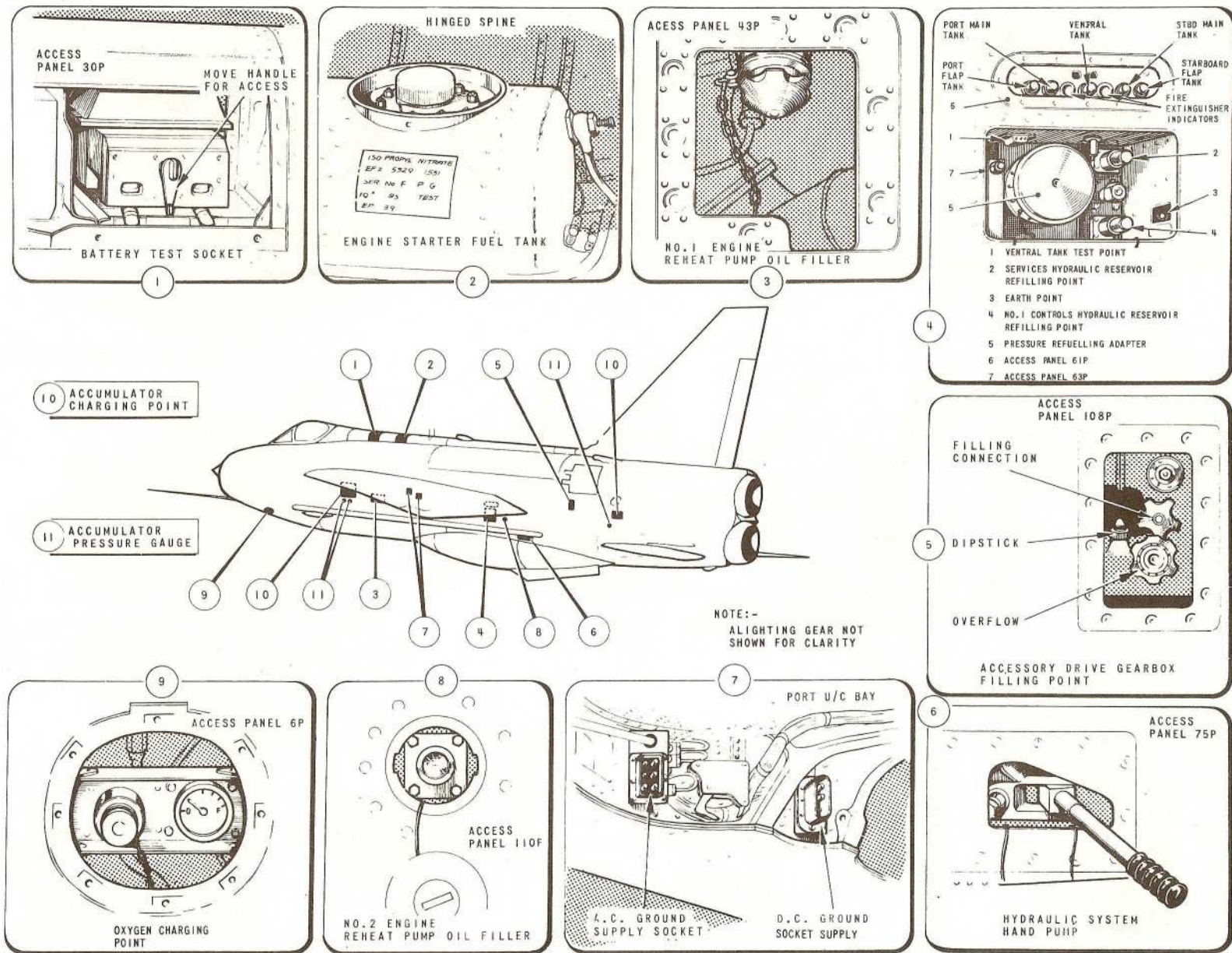


FIG. 1. SERVICING POINTS (I)

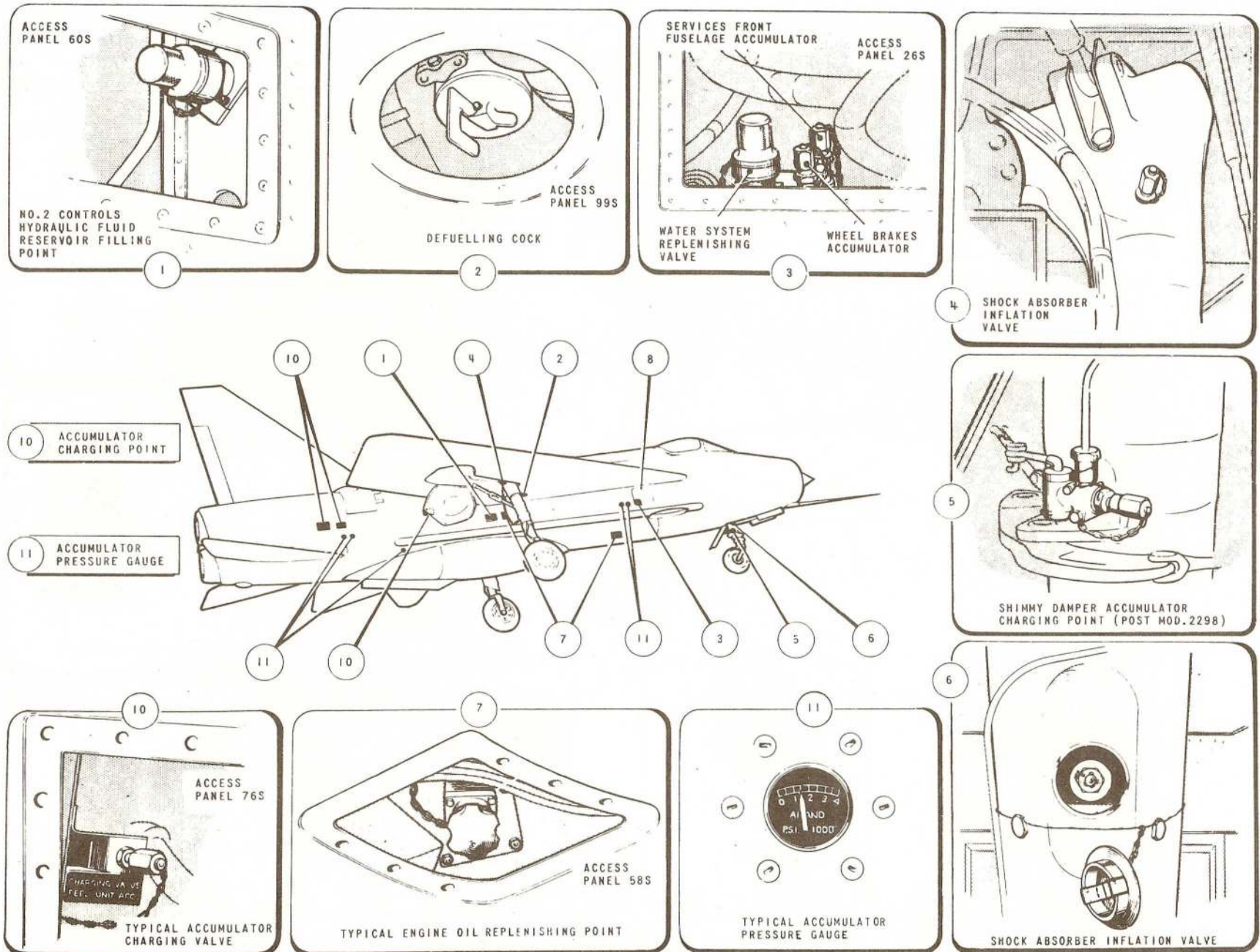


FIG. 2. SERVICING POINTS (2)

lies must be disconnected, and the engine H.P. cocks closed. The tanks may be defuelled individually or in similar pairs by appropriate selection (Table 1) of the two defuelling cocks (fig.2). Access to the cocks is gained through circular panels in access panels 99P and 99S; the panels can be fitted only when the cocks are at NORMAL, i.e. in the flight position, and, with the panels in position, the cocks are locked. Any residual fuel remaining in main tank compartments can be drained using special tool 26DK/95780.

Replenishing

Engine oil sumps

5. Oil is added to the engine sumps through a self-sealing coupling on each engine, using a fluid replenishing can, No.1 engine filler is behind access panel 48S and its sight glass is visible when access panel 44S is removed; No.2 engine filler and sight glass are both behind access panel 58S.

Accessory drive oil sump

Note...

It is important that the sump is checked and replenished immediately after run-down of the turbine, either after flight or after an engine ground run.

6. To replenish the sump:-

- (1) Check the oil level with the dipstick (access panel 108P).
- (2) Remove the blank from the oil overflow union.
- (3) Fit the drain and overflow connector.

(4) Connect a fluid replenishing can to the filler.

(5) Fill until oil appears at the overflow.

(6) Remove the replenishing can and refit the filler cap.

(7) Remove the drain and overflow connector.

(8) Refit and wire-lock the overflow blank.

Reheat pump oil reservoirs

7. The reservoirs are filled through self-sealing couplings behind access panels 43P (No.1 engine) and 110P (No.2 engine). Using a fluid replenishing can, fill until excess oil flows from the appropriate skin drain.

Engine starter fuel tank

8. The tank is exposed by opening the hinged section of spine fairing forward of No.2 engine hatch. To assist venting whilst filling, displace the inward vent valve from its seating by depressing a spring-loaded plunger in the banjo bolt at the aft end of the tank.

Oxygen container

WARNING

Liquid oxygen has a temperature of -183 deg C at atmospheric pressure. If it comes into contact with the skin it can cause a severe burn which must have immediate medical attention. Provided that normal precautions are observed, however, no danger need ensue from its use. The precautions to be observed are described in A.P. 4765A, Vol.1 and 6.

9. To replenish the container:-

Note...

The contents gauges can read up to 1.25 litres when the system is empty, due to the presence of small quantities of water vapour in the container.

(1) Remove access panel 6P and the filler valve cap (it may be necessary to depress the manual vent valve to release the pressure in the system).

Note...

If the oxygen system has been disconnected or allowed to empty, the entire system must be purged prior to replenishment.

(2) Connect the hose of a replenishing trolley to the filler valve.

(3) Following the procedure given on the trolley instruction plate, fill the system until the contents gauge registers 2.7 ± 0.1 litres and disconnect the hose.

Note...

Filling beyond 2.8 litres will result only in wastage of oxygen due to peculiarities of the system; the system will ultimately be filled to capacity after the following sequence of events has been noted:-

(a) *No indication on the contents gauge of any increase for approximately 2½ minutes after replenishment begins, but continuous venting from the filler vent. Afterwards, a steady increase up to the moment of disconnection.*

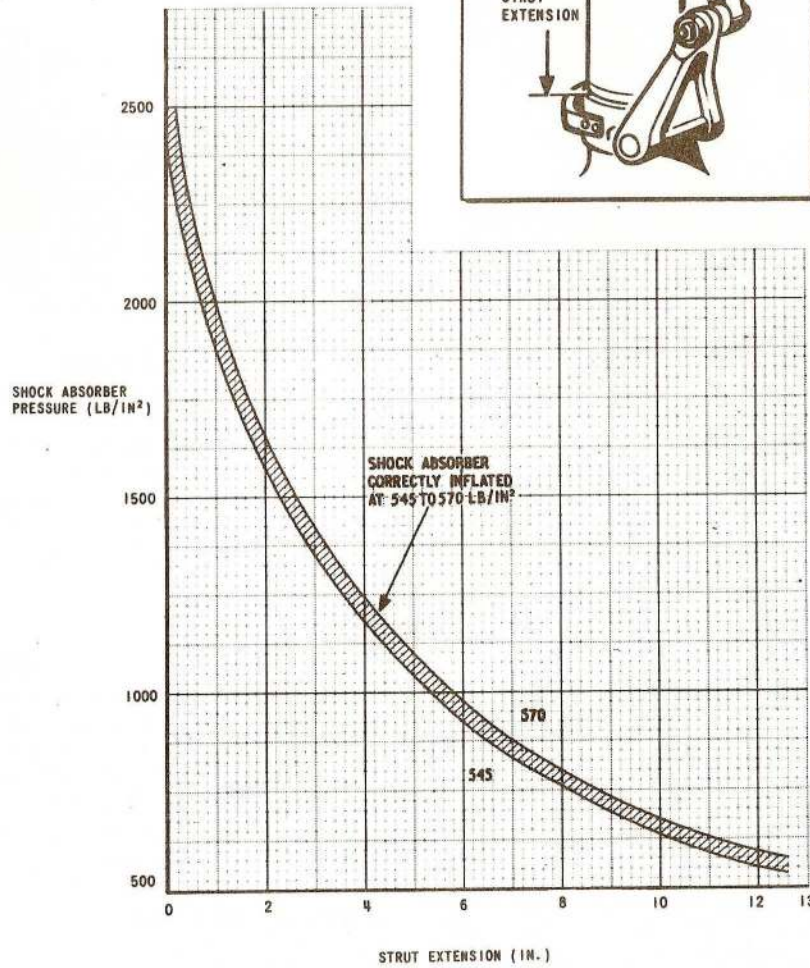
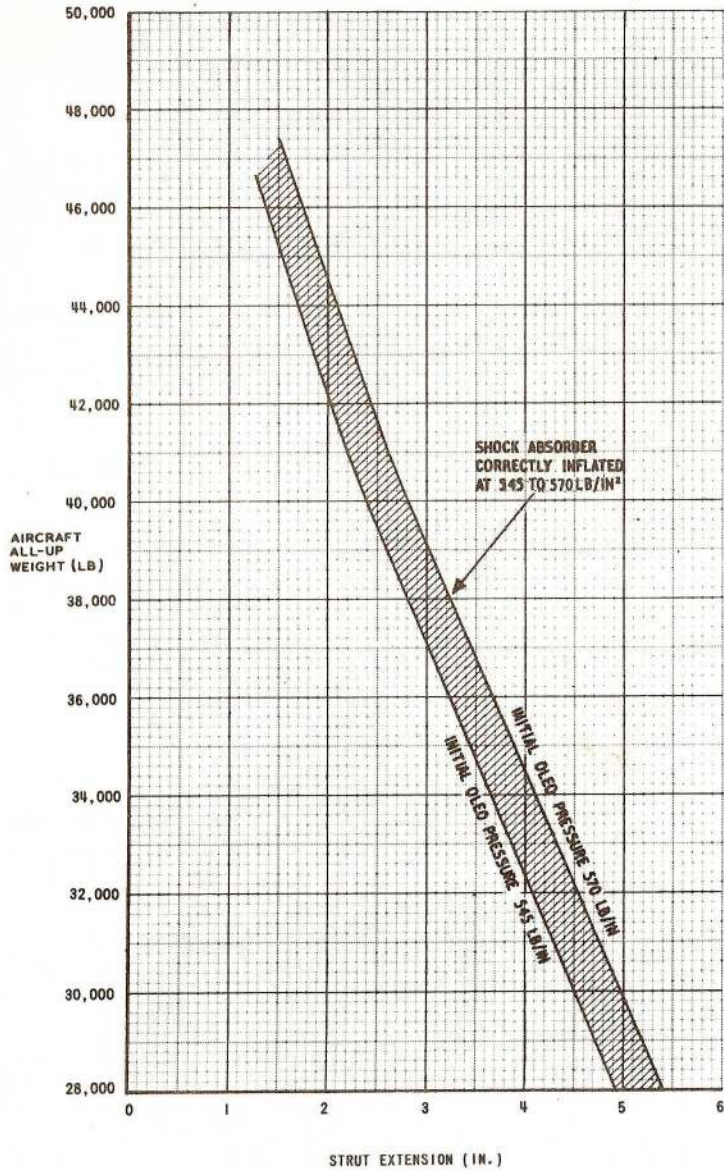


FIG.3. MAIN UNDERCARRIAGE SHOCK - ABSORBER PRESSURE AND EXTENSION

◀ MINOR ALTERATION ▶

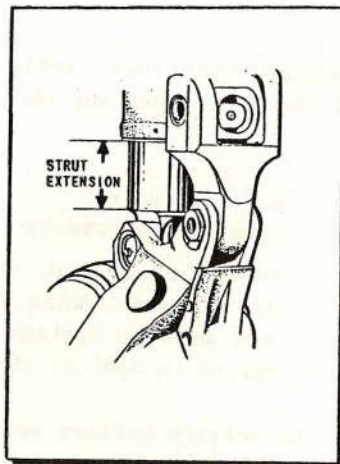
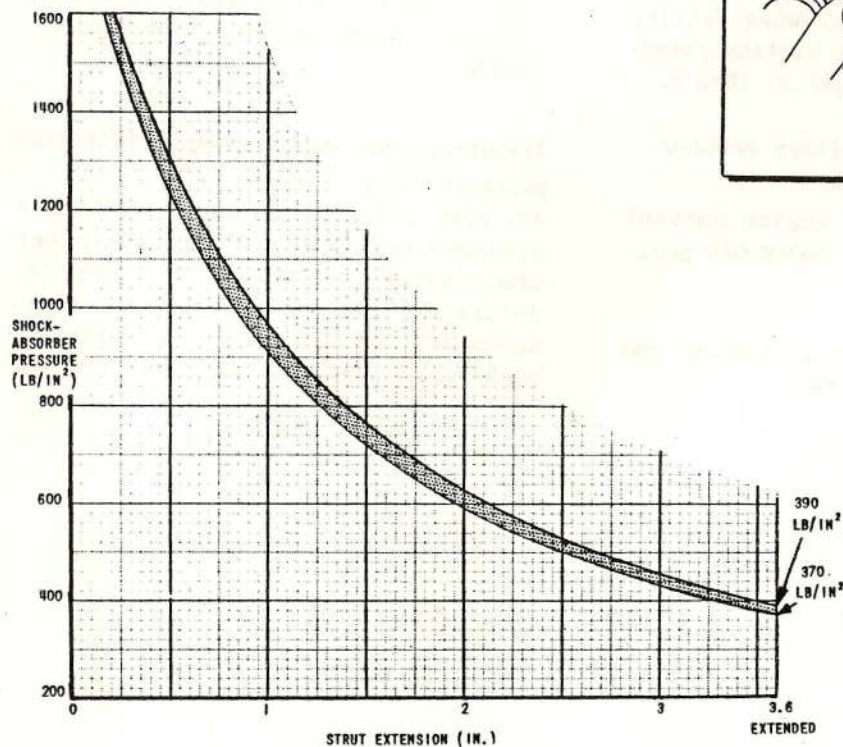


Fig. 4. Nose undercarriage shock-absorber pressure and extension

- (b) After disconnection, a rapid increase to 3.1 - 3.2 litres in the contents gauge indication.
- (c) A static period lasting 1 minute during which no change of condition is observed.
- (d) A rapid rise in contents gauge indication to beyond the F graduation with a similar rapid increase in regulator pressure gauge indication to 230 lb/in², accompanied by gaseous oxygen venting through the nose-wheel bay.
- (e) A fall in pressure to 200 lb/in² and an F reading on the contents gauge.

Emergency oxygen

Note...

To avoid damage to the aircraft it is recommended that the following procedure be carried out as a two-man operation.

10. The charging valve and pressure gauge are situated on the starboard side of the pilot's ejection seat. To replenish:-

- (1) Remove the charging valve blanking cap.
- (2) Connect the oxygen trolley supply hose.
- (3) Replenish until the gauge needle registers FULL.
- (4) Disconnect the supply hose and quickly replace the charging valve blanking cap.

Water boiler and header tank

11. To replenish the system:-

(1) Drain off the contents of the water boiler. Indication that the boiler is empty is given when the initial full bore flow changes to a trickle. Close the valve immediately this occurs, to avoid emptying the header tank.

(2) Remove access panel 27S:-

Note...

To open the drain valve, apply a screwdriver to the slots in the port, press the port inward, and rotate it clockwise through 120 deg before releasing the pressure on the screwdriver. To close the valve reverse the operation.

(3) Remove the blanking cap from the filler and connect a fluid replenishing can, fitted with an adapter, to the filler.

(4) Introduce fluid at a pressure not exceeding 11 lb/in² until excess fluid appears at the overflow pipe forward of the drain valve.

(5) Disconnect the replenishing can, and refit the filler cap and the access panel.

Hydraulic fluid reservoirs

12. To replenish the reservoirs:-

The procedure to be adopted, and the precautions to be taken, when filling the services and controls systems reservoirs are detailed in Sect.3, Chap.6.

Checking the service battery voltage

13. To check the voltage:-

(1) Ensure that both engine control handles are in the H.P. COCKS OFF position.

(2) Select the BATTERY switch and one D.C. FUEL PUMPS switch on.

(3) Note the voltage reading on the voltmeter (*Sect.1, Chap.1, fig.10*) and return the switches to off immediately.

(4) Note the voltmeter reading in the off-load condition; the reading is satisfactory if it is between 25.1 and 25.8 volts. The reading taken in (3) is satisfactory if it is not more than 1 volt below this reading.

Note...

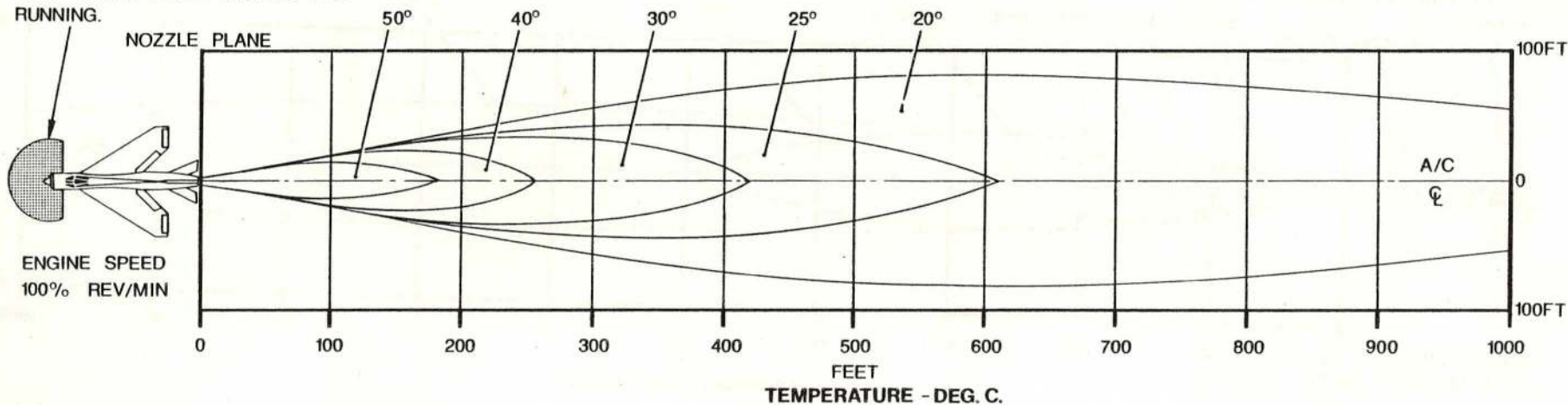
Refer to A.P.4343A, Vol.1, Sect.11, Chap.3 for battery servicing instructions.

Alighting gear shock-absorber inflation pressures (fig.3 and 4)

14. The inflation pressures for fully extended main and nose undercarriage shock-absorber struts are 545 to 570 lb/in² and 380±10 lb/in² respectively, irrespective of all-up weight. The inflation pressure of a main strut can be checked

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20FT RADIUS DANGER AREA
AROUND INTAKE.
KEEP CLEAR WHEN ENGINES ARE
RUNNING.



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AROUND INTAKE.
KEEP CLEAR WHEN ENGINES ARE
RUNNING.

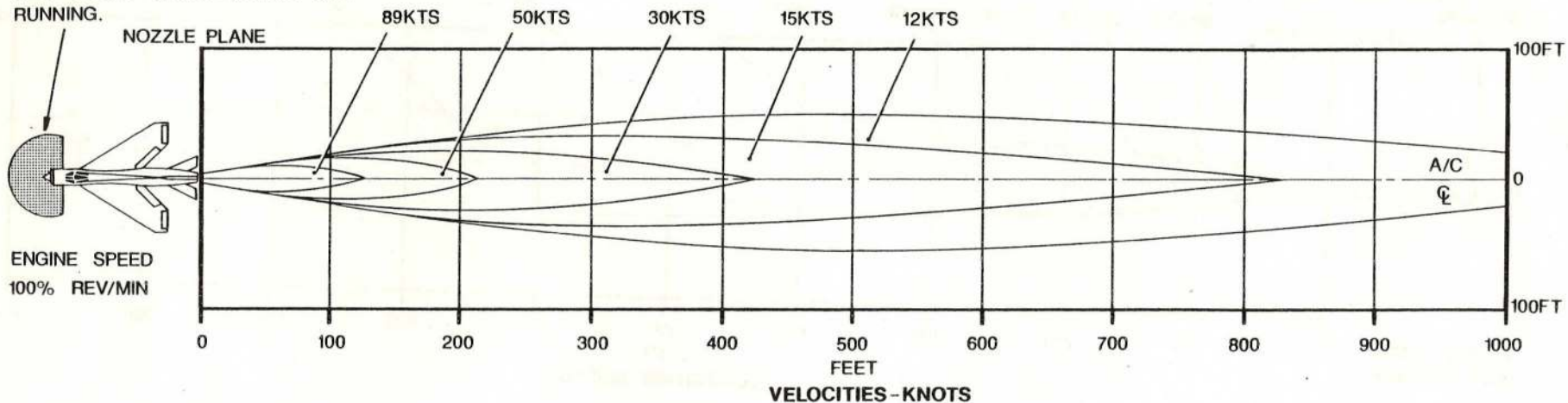
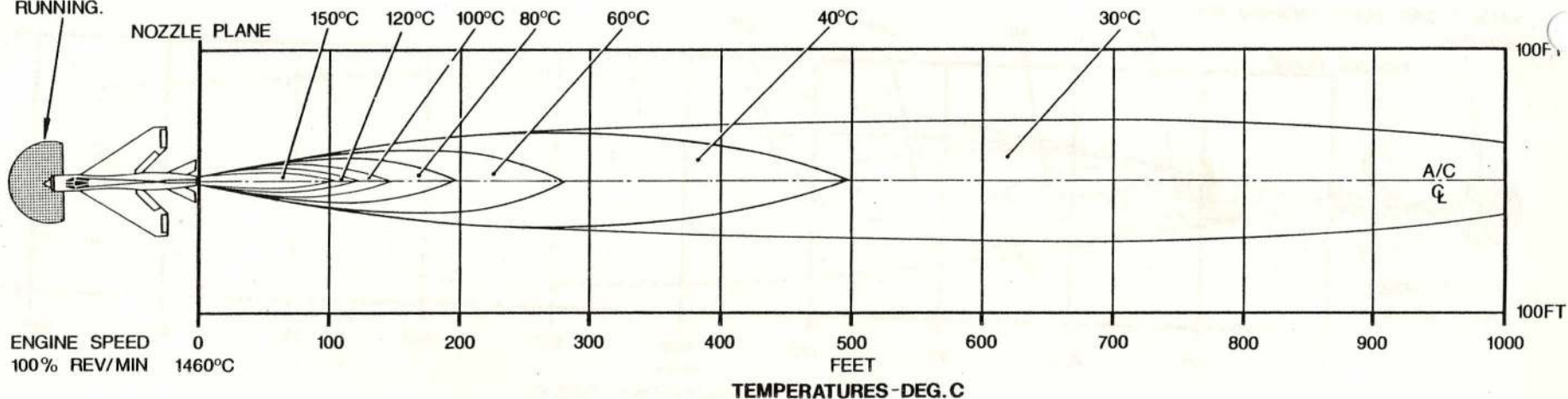


FIG.5. DANGER AREAS DURING ENGINE RUNNING (NON-REHEAT)

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20FT RADIUS DANGER AREA
AROUND INTAKE.
KEEP CLEAR WHEN ENGINES ARE
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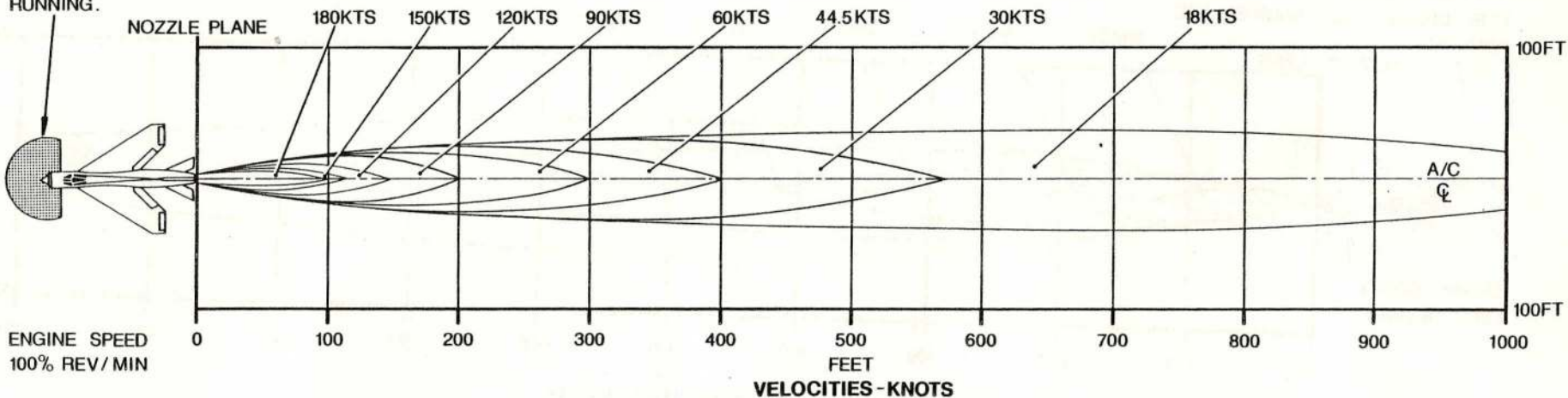
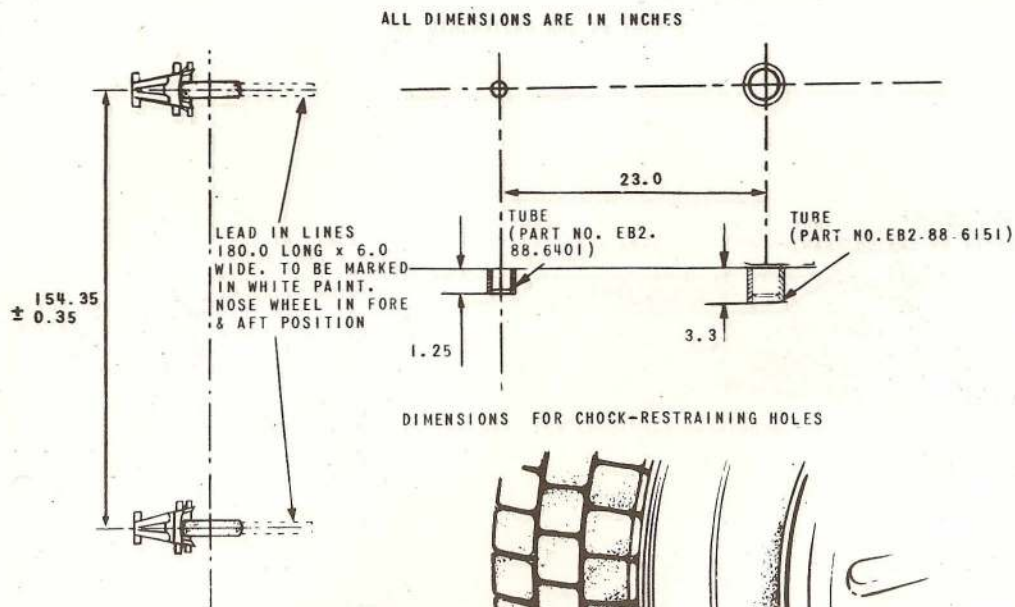


FIG.5A. DANGER AREAS DURING ENGINE RUNNING (WITH REHEAT)



CONSTITUTION OF CONCRETE BASE:-	
SAND	1 PART
CEMENT	1 PART
BEST QUALITY GRAVEL	2 PARTS

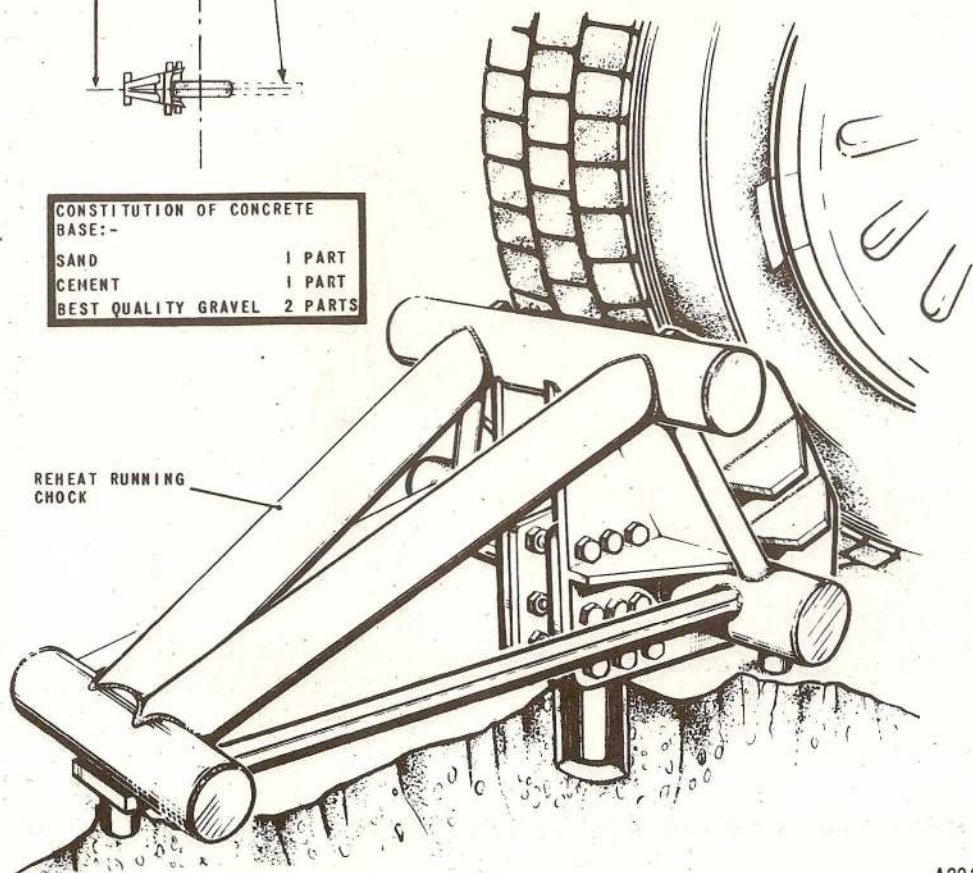


Fig. 6. Wheel chocks for reheat ground running

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with the wheels on the ground by measuring the extension of the strut and the pressure of the compressed shock-absorber (fig. 3, right-hand graph) or, if the all-up weight is known, simply by measuring the strut extension (fig. 3, left-hand graph). Because of variations in the c.g. of the aircraft a curve which relates strut extension to all-up weight cannot be plotted for the nose undercarriage; with the wheels on the ground, therefore, the inflation pressure can only be checked by measuring the extension of the strut and the pressure of the compressed shock-absorber (fig. 4). Pressures are measured with an inflation adapter and pressure gauge. The method of filling with oil and inflating is described in Sect. 3, Chap. 5.

Note...

Before measuring pressures or extensions rock the aircraft to allow the struts to assume their correct static position.

Checking the nose-wheel shimmy-damper accumulator

15. The accumulator is located on the nose wheel port beam aft of the down-lock bracket. It incorporates a grooved indicator rod which protrudes upward, and is correctly charged when the groove coincides with a metal pointer on the top of the accumulator, with the nose wheel centralized. For the method of charging refer to Sect. 3, Chap. 6.

Tyre pressures

16. Refer to Vol. 5.

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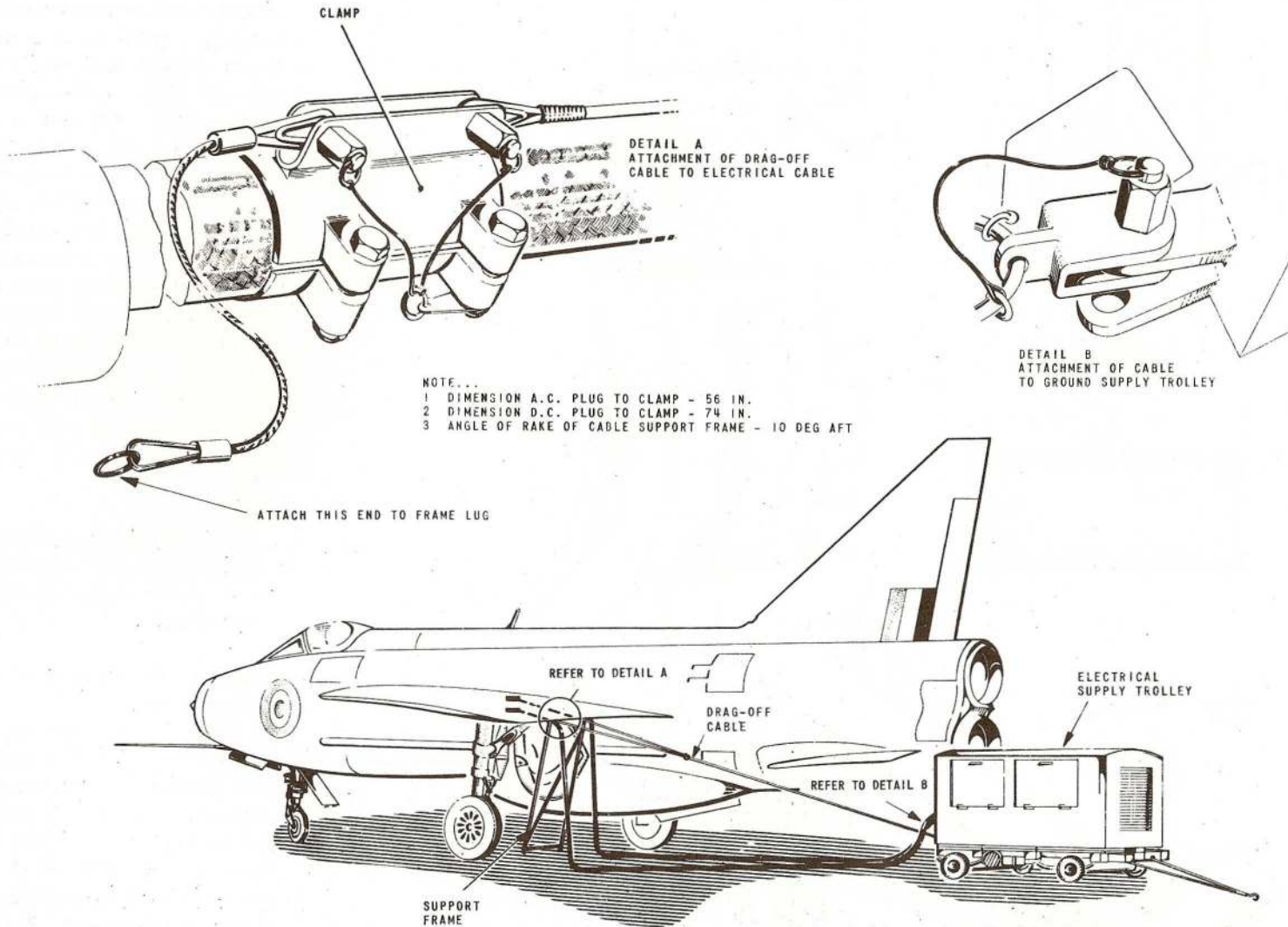


FIG. 7. QUICK-DISCONNECT-GROUND ELECTRICAL SUPPLY TROLLEY

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Charging hydraulic system accumulators

17. The nitrogen pressure in the hydraulic accumulators is indicated by pressure gauges which are flush with the skin (*fig.1 and 2*). Before the gauges are read all hydraulic pressure in the accumulators must be exhausted. Refer to Sect.3, Chap.6, Table 2 for the respective accumulator pressures, hydraulic pressure exhausting and nitrogen charging procedures.

Positioning the aircraft for ground running (*fig.5 and 6*).**Note...**

Ground running is permissible with one engine hatch and the armament pack removed but the consequent shift of c.g. must be taken into consideration when handling the aircraft.

Non-reheat running

18. For ground running of the engines the aircraft should be standing on con-

crete or grass, nose to wind, and well clear of other aircraft or buildings. Debris guards must be fitted over the main air-intake, and the auxiliary intake ducts in the fuselage sides; all small, loose objects must be removed from the vicinity of the air intake. Brakes must be applied and chocks positioned at all wheels.

Reheat running (*fig.6*)

19. The conditions in para.18 must be observed when ground running the engines in reheat: additionally the aircraft must be restrained with special-to-type chocks. When using the chocks, maximum thrust limitations are as follows:-

No.1 engine - FULL REHEAT

No.2 engine - 60 per cent rev/min
(cold thrust)

or vice versa

Ground electrical supply connections

20. Two multi-pin sockets, one for a.c.

and one for d.c., are located on main-plane ribs in the port undercarriage well (*fig.1*). For quick disconnecting purposes, when the aircraft is positioned on the I.R.P., the cables of the 15kVA electrical ground starting trolley can be supported by a frame. For the method of attachment refer to *fig.7*.

Braking parachute installation

21. The procedure for removing and installing the braking parachute is described in Sect.3, Chap.13.

Stand-by turbine isolating valve

22. It is important that the stand-by air turbine isolating valve is in the open position immediately prior to flight. A visual check is made by removing access panel 56S and observing that the position-indicator pointer, which rotates horizontally around the butterfly spindle upper housing, is facing the access panel aperture.

TABLE 2

Tools and equipment

Ref.No.	Description	Application/remarks
26DK/95233	Key, gravity refuelling caps	
26DK/95012	Guard, debris intake	For engine ground running
26DK/95191	Dispenser, hydraulic fluid, Juniper	
26DK/95039	Adapter, priming, hydraulic reservoirs	Use with 26DK/95191
26DK/95368	Pipe, overflow, hydraulic system	
26DK/95220	Adapter, nose wheel shimmy damper	Accumulator charging
26DK/95402	Chocks, restraint assembly	
4G/5378	Can, fluid replenishing pressurized, 10 gallon	
26DK/95817	Coupling, water/glycol replenishing	Use with item 4G/5378
4G/3029	Gauge, pressure 0-3500 lb/in ²	Alighting gear shock-absorber pressure
4G/6246	Adapter, inflation Mk.2	Use with 4G/3029
4G/5874	Gauge, tyre, H.P.	
4G/3743	Pump, tyre inflating, Type 'B'	
71AA or	Trolley, liquid oxygen replenishment Mk.1	
71AA/64	Trolley, liquid oxygen replenishment Mk.2	
4G/4220	Trolley, oxygen charging Mk.2	
4F/3761 or	Trolley, electrical servicing	15 kVA/10kW, I.C.E. driven
4F/4257		
4F/3786 or		
4F/4258 or	Trolley, electrical servicing	15 kVA/10kW, electrically driven
4F/5147		
4G/4864	Can, fluid replenishment, pressurized Mk.1	Engine oil sump and reheat pump
26DK/95038	Connector, drain and overflow	Accessory gearbox
4G/6734	Trolley, nitrogen, charging Mk.1A	
26DK/95134	Guard, auxiliary intake duct	
26DK/95223	Frame, supporting cable	Use with 15 kVA electric starting trolley
26DK/95780	Tool, drain	Main tank defuelling

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LIGHTNING MK. 1
COVER PITOT HEAD
EB2-88-511

The image shows a close-up of a red aircraft fuselage. A grey fabric cover is draped over a section, with the text "LIGHTNING MK. 1", "COVER PITOT HEAD", and "EB2-88-511" printed on it. To the right, a rectangular metal plate is mounted on the red surface. The background shows the curved structure of the aircraft with several rivets.