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ROYAL AUSTRALIAN AIR FORCE

DEFENCE INSTRUCTION (AIR FORCE)

AAP 7213.003-2-14B1

MIRAGE AIRCRAFT GENERAL AND TECHNICAL MANUAL

(BOOK 1 OF 4)

Date of Issue: 19SEP83

(S. D. EVANS)
Air Marshal
Chief of the Air Staff

Sponsor: AIR ENG 1A3
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RESPONSIBILITIES OF DISTRIBUTEE

AMENDMENTS TO PUBLICATION

1. Attention is drawn to DI(AF) ADMIN 1-2, paras 17 and 18, in regard to amending this publication. In particular the member to whom this publication is on 'temporary issue' is personally responsible for:

   a. keeping it up to date in accordance with amendment lists issued from time to time; and

   b. producing it for inspection when required.

2. DI(AF) AAP 2001.100 Administration of Publications and Audio-Visual Training Aids, Section 2, Chapter 7, outlines procedures for the incorporation of amendment lists. In particular the distributee is to:

   a. acknowledge receipt of ALs by signing the attached Forms A79F and returning them to the library promptly;

   b. check the amendment certificate to ensure all previous ALs have been incorporated;

   c. incorporate the amendment list in accordance with DI(AF) AAP 2001-100, para 2705; and

   d. action the amendment certificate incorporated in this publication.

LIST OF EFFECTIVE PAGES

NOTE

The portion of text affected by an AL is indicated by a thick vertical line in the outer margin of the page.

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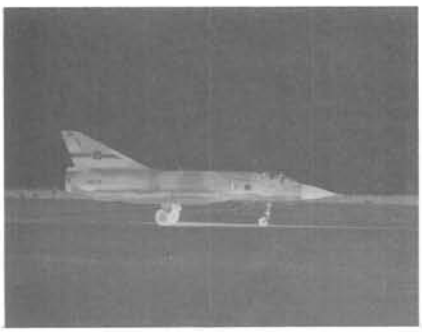
* The asterisk indicates pages changed by the current AL.



MIRAGE III O

MIRAGE III D

AMENDMENT CERTIFICATE

It is certified that the amendments promulgated in the undermentioned Amendment Lists have been incorporated into this copy of the Publication :

Amendment List		*Topic Affected*	** Amendment Effect*	*Amended by*	*Date*
No	*Dated*				
1					
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* **Note.** Insert brief details of page(s) amended, inserted or cancelled.

FOREWORD

General

1. This publication combines and supersedes the previously-issued General and Technical Information publications for Mirage III O and III D aircraft. The publication comprises four books : Books 1 and 2 contain the descriptive text, and Books 3 and 4 the figures.

2. The descriptive text is based on III O, with variations for III D noted. The equipment identification method shown in the example below is used throughout the publication and is meant to show that (1Z) (in this case) is fitted to the cockpit for III O, and to the front cockpit for III D, whilst (201Z) is fitted to the rear cockpit for III D.

3. The most representative figures from the existing General and Technical Information publications have been selected to support the descriptive text. Minor differences may exist between the figure and the aircraft type and, where this occurs, the aircraft type shown is noted on the figure as III O shown, or III D shown. Aircraft applicability is given at the top of each figure.

CAUTION

Schematic diagrams contained in this publication are for reference purposes only, and are not to be used as a direct guide for maintenance.

Amendment Action

4. To assist in maintaining this Publication in an up-to-date condition, users should bring to the notice of higher authority without delay, by use of Publication Review Card or other means of communication, any errors, omissions or suggestions for improvements.

Warnings, Cautions and Notes

5. The following definitions apply to Warnings, Cautions and Notes found throughout the Publication :

WARNING

Operating procedure, techniques, etc, which may result in personal injury or loss of life if not carefully followed.

CAUTION

Operating procedures, techniques, etc, which may result in damage to equipment if not carefully followed.

NOTE

An operating procedure, technique, etc, which it is considered essential to emphasise.

GENERAL CHARACTERISTICS — III O

1. OVERALL DIMENSIONS :

Span ..... 8.22 m
Overall length on ground ..... 15.07 m
Overall height on ground ..... 4.45 m
(Clean aircraft, fuel tanks full)

2. TOTAL WING AREA ..... 34.8 m²

Wing aspect ratio 2.3
Leading edge sweep-back ..... 60° 35′

3. POWER PLANT :

Turbo-jet engine ..... SNECMA ATAR 9C
Sea-level static thrust at 8400 RPM :
Dry engine ..... 9480 lb (4300 kgp)
With afterburner ..... 13,230 lb (6000 kgp)

From M = 1.4, the ATAR 9C turbo-jet engine is capable of an overspeed providing a 9% increase in thrust at M = 2.

Rocket motor (if installed) :
Thrust ..... 2870 lb (1300 kg) during 80 seconds

4. OPERATIONAL EQUIPMENT (according to missions) :

CSF CYRANO II Radar — CSF sight
Two × 30 mm guns (250 rounds)
Missile
Two bombs — STRIM or 500 — 1000 lb (US or UK)
Two MATRA R550 Missiles
One photographic installation
RPK tank (version A only)

5. PERFORMANCE :

Max level flight speed ..... M2 at Alt. = 36,000 ft (11,000 m)
Time to climb to 50,000 ft (15,000 m) ..... 8 min 35 sec at M = 1.8 without rocket motor
Time to climb to 60,000 ft (18,000 m) ..... 7 min 25 sec at M = 1.8 with rocket motor

GENERAL CHARACTERISTICS — III D

1. OVERALL DIMENSIONS :

Wing span ..... 8.22 m
Overall length, on ground ..... 15.8 m
Overall height, on ground ..... 4.50 m
(Clean configuration, fuel tanks full)

2. TOTAL WING AREA ..... 34.8 m^2
Wing aspect ratio 2.3
Leading edge sweep angle ..... 60° 35′

3. POWER PLANT :

SNECMA turbo-prop engine ATAR 9C
Sea-level static thrust at 8400 RPM :
Dry engine ..... 9480 lb = 4300 kgp = 4218 daN
With afterburner ..... 13,230 lb = 6000 kgp = 5886 daN

From M = 1.4, the ATAR 9C engine is capable of an overspeed providing an additional 9% increase in thrust at M = 2

4. OPERATIONAL EQUIPMENT (according to missions) :

CSF sight
Two 30 mm guns (250 rounds)
Two STRIM bombs or two 1000 lb US or UK bombs
Two MATRA Missiles

5. PERFORMANCE CHARACTERISTICS :

Maximum level flight speed ..... M2 at 36,000 ft (11,000 m)
Time to climb to 50,000 ft (15,000 m) ..... 7 min 40 sec at M = 1.8
(from the moment the brakes are released)

ASSOCIATED PUBLICATIONS

AAP 7111.007-2-3	Engine
AAP 7213.001-2-4	Technical Information — Weapons and Navigation Systems
AAP 7213.001-33	Weapons Loading Manual
AAP 7213.001-2-7	Electrical Wiring Diagrams III O
AAP 7213.002-2-8	Electrical Wiring Diagrams III D
AAP 7271.035-3M	1700 Litre Tank
AAP 7271.299-2M	Bomb Carrier Tank
AAP 7271.299-3	Bomb Carrier Tank
DI(AF)AAP 7291.021-2M	OM6 Ejection Seat
AAP 7293.045-3M	Landing Gear Uplocks
AAP 7352.035-2-2	ANCP
AAP 7581.002-3M	Camera
AAP 7844.001-3	Radar Accumulator
DI(AF)AAP 7213.003-100	Mirage Modifications

TABLE OF CONTENTS

NOTE

A comprehensive Table of Contents/List of Figures precedes each chapter.

LIST OF TABLES

NOTE

A List of Tables is contained in the Table of Contents that precedes each chapter in Books 1 and 2.

LIST OF FIGURES

NOTE

A List of Figures precedes each chapter in Books 3 and 4.

MODIFICATION STATE

1. As all RAAF Mirage aircraft had all modifications up to Modification 177 incorporated prior to delivery, it is assumed that the original General and Technical Information publications would have reflected that modification status.

2. The Modifications listed below have been identified in the original General and Technical Information publications, and have been incorporated (unchanged) in this publication.

   179 Electrical — Provision of Noise Suppression Filter in Radar Wiring

   180 Electrical — To Avoid UNDERCARRIAGE NOT DOWN Warning Light from Operating at LOW IAS at Altitude

   197 Electrical — Provision for Future Fitment of Flasher Unit in Undercarriage Warning System

   213 Air Conditioning — Provision of Filter in Radar Pressurization Ducting

   237 Fuselage — Introduction of Hydraulically-Controlled Distributor in the Supply Line to the U/C and U/C Doors Hydraulic Electro Distributors

   258 Electrical Reposition of Sperry Flux Valve in the Fin in lieu of the Wing

   266 Fuselage — Installation of the Flasher Unit of the U/C DOWN, LOCKED FORWARD, Indicator in the Cockpit

   322 Electrical — Introduction of a Connector in the Cockpit and Equipment Regulation Amplifier Circuits

   329 Radio — Provision of Facilities for GPL Doppler Type AN/APN-153(V)

   365 Radio — Introduction of Estimated Point Marker on Radar Scope and Provision for Drift Alignment

   406 Wings — Introduction of Leading Edge Fuel Tank

   614 Fuselage — Introduction of an Access Door to the Throttle Control Microswitches

   635 Fuselage — Introduction of New Type Canopy Seal

   826 Electrical — Introduction of a Master Armament Switch

   835 Instrument — Mirage III D Aircraft — Revised Static Pressure Supply for Rear Cockpit Vertical Speed Indicator

3. The Modifications listed below have been incorporated prior to the issue of this Publication.

   572 Fuselage — Nose Gear Leg — Revised Charging Pressure for the Shock Absorber

   591 Fuselage — Nose Gear Leg — Rework of Truss Universal Joint Pin

   725 Undercarriage — Landing Gear Hydraulic System — Installation of a Shuttle and Non-return Valve

   881 Anti-G Piping — Technological Improvements of Disconnectable Elbow Coupling

   919 Isolation of the AC Power Supply to the MATRA Missile Computer and Harmonization Unit

   926 Electrical — Improvements to Air Weapons — Switching Selections in Mirage III O and III D Aircraft

   958 Fitment of Recording Equipment to Monitor Live Missile Firing

   978 Conversion of Type OM4 Ejection Seat to Type OM6

   1112 Provision on Aircraft for Carrying MATRA R550 Missiles at No 2 Attachment Points

   1113 Provision on Aircraft for Quick Select Gun Plus Magic Missile Firing Mode

   1124 Cockpit Modification to Facilitate OM6 Ejection Seat

4. The Modifications listed below have been checked and found to have no effect on this Publication.

   190 Electrical — Introduction of a Link between Cyrano Radar and MATRA 530 Harmonization Unit

   227 Fuselage — Introduction of Messier Type A5 × 22 879/0 Nose Gear Leg in lieu of Type A22 879M50

   240 Wings — Introduction of Messier Type A33 × 21 289M2/0 Brake Assemblies in lieu of Type A33 × 21 289M1/0

   241 Wings — Introduction of Messier Type A4X 24372 M1 and A5-24372M1 Undercarriage Sequence Distributors in lieu of Types A4X 24372 and A5X 24372

   242 Wings — Introduction of Messier Type A33-202.89.M2/0 Main Wheels in lieu of Type A33-202.89/0

   265 Wings — Introduction of Improved Main U/C Oleo Legs Messier Type A1X 23-317/0V3 and A1X23-318/0V3 in lieu of A1X23-317/0 and A1X23-318/0

   287 Wings — Introduction of Improved Main U/C Actuating Truss Jack Type Messier A1X23-177 M1/0 (LH) and A1X23-178 (RH) in lieu of Messier A1X23-177/0 (LH) and A1X23-178/0 (RH)

   407 Electrical — Installation of Firing Equipment for MATRA Missile

CHAPTER 1

GROUND HANDLING

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LIST OF FIGURES

Figures for this Chapter are contained in DI(AF) AAP 7213.003-2-14, Book 3

CHAPTER 1

GROUND HANDLING

MANHANDLING AND POWER TOWING ON HARD GROUND

Equipment Required

101. The following equipment is required :

a. *Tools*

— Pip-pin A407 with Flag 2-89845

— Pliers and flat screwdriver (if required).

— Canopy unlocking spanner M3-034.

b. *Servicing Equipment*

— Cockpit access ladder EAC11

— Lightweight steering bar

— Tow bar 0688-9022

— 4 Standard chocks type 1

— Aircraft tractor

— Hydraulic power supply unit.

c. *Spares*

— Nose gear tow fitting shear-pin A.45 - 59758.

Preparation of Aircraft (refer to Fig 1-1)

CAUTION

Prior to inspecting, or sitting in, the ejection seat, make sure all applicable safety pins are fitted. Refer to an armament NCO.

CAUTION

Prior to handling the aircraft on the ground, render the anti-shimmy system inoperative by disconnecting the link-rod from the nosewheel leg. The link-rod is to be folded back on the anti-shimmy pivot arm and is to be secured with a pip-pin A407 fitted with a red flag 2-89845. Make sure that the nose wheel self-centring system control push-button is not depressed.

102. Remove the canopy cover if it is in position and open the canopy. If the canopy cover is not fitted, remove all the water from the canopy with a chamois before opening. Place the safety pin in position on the manual control and ensure that the parking brake is not engaged. With an operator in the cockpit, check the No. 1 Emergency system brake hydraulic pressure by turning the battery switch ON and placing the hydraulic pressure selector switch in the desired position.

NOTE

The emergency brake system is capable of four applications when the No. 1 system utility accumulator is discharged and the emergency brake accumulator is charged at 200 bars (2990 lb/in^2).

The emergency brake system is capable of at least twelve applications when both accumulators (No 1 system utility and emergency brake accumulators) are fully charged.

103. Check that the green lights of the undercarriage position indicator are illuminated and be ready to apply the brakes.

NOTE

Do not move the aircraft without brake pressure reserve. Do not push on the elevons. Avoid sharp turns around either wheel.

Manhandling (refer to Fig 1-1)

104. If the aircraft is to be manhandled proceed as follows :

a. Hook the lightweight steering bar onto the aircraft tow fitting.

b. Pull the chocks away.

c. Required personnel : 10 men.

One man seated in the cockpit

One man holding the steering bar (responsible for coordinating the handling operation)

Two men at the main undercarriage

Two men at the inboard control surface fillets.

Two men at the extreme aft end

Two men at the wing tips. (These men do not push but make sure that fin and pylon tanks clear possible obstacles.)

d. Stop the aircraft with the nose wheel straight; chock the aircraft and disconnect the steering bar.

e. Reconnect the anti-shimmy link-rod to the nose gear leg.

Power Towing on Hard Ground (refer to Fig 1-1)

CAUTION

The aircraft is to be fitted with the radar nose cone or the ballasted nose cone when being towed. Do not move the aircraft without brake pressure reserve. Do not use the pitot/static head to rock the aircraft back and forth. Avoid sharp turns around either wheel.

105. To tow the aircraft on hard ground proceed as follows :

a. Required personnel : Five men.

One man sitting in the cockpit

One man to coordinate the handling operation.

One man on the towing vehicle

Two men at the wing tips (to make sure that fin and pylon tanks clear possible obstacles).

b. Hook the tow bar onto the aircraft tow fitting. To centre the nose wheel, lift the aircraft with the shoulder or the back under frame 1.

c. Pull the chocks away and slowly and smoothly tow the aircraft.

NOTE

The aircraft tow fitting is fitted with a shear-pin (2 as spares) which protects the nose gear against excessive loads. The ultimate tensile strength of the shear pin is 100 kg/mm^2 (63.5 tons (U.K.)/in^2). If it is necessary to locally manufacture a shear pin it is mandatory to use steel whose ultimate tensile strength is not greater than 100 kg/mm^2. The steel shear pins are to be manufactured from French Spec. 30 NCD16 or B.S. 597B only.

The shear-pins (permanent and spare ones) are secured with two split-pins, Terry pins and chain, and are easily replaceable.

d. Normally, the tow vehicle driver will slow down as required and the man sitting in the cockpit will not have to apply the brakes, except if absolutely necessary.

e. Stop the aircraft with the nose wheel straight : chock the aircraft and remove the tow bar.

f. Reconnect the anti-shimmy link-rod to the nose gear leg.

106. If the ground is too soft or if the shear-pin does not withstand the load, refer to the debogging procedure.

POWER TOWING ON ROUGH GROUND AND DEBOGGING

Equipment Required

107. The following equipment is required :

a. *Tools*

— Pip-pin A407 with flag 2-89845

— Pliers and flat screwdriver (If required)

— Canopy unlocking spanner M3-034.

b. *Servicing Equipment*

— Cockpit access ladder EAC11

— Debogging Bar

— Towbar 0688-9022

— 4 standard chocks type 1

— Airfield grids.

— Aircraft tractor.

Preparation of Aircraft (refer to Fig 1-3)

108. Before moving the aircraft carry out the following :

a. Level the ground and position the grids in front of the aircraft wheels (or behind the wheels if the aircraft is to be towed rearwards).

b. Render the anti-shimmy system inoperative by disconnecting the link-rod from the nose gear leg. The link-rod is to be folded back on the anti-shimmy pivot-arm and is to be secured with pip-pin A407 fitted with a red flag, 2-89845.

c. Open the canopy and place the safety pin in position on the manual control.

d. With an operator in the cockpit :

(1) Make sure that the nose wheel self-centring system control push-button is not depressed.

(2) Ensure the parking brake is not engaged.

(3) Check that the No. 1 Emergency system brake hydraulic pressure is sufficient to brake the aircraft when required during the towing or debogging operation.

(4) Ensure the undercarriage is locked down (green lights illuminated).

109. Should the emergency brake system be damaged, the man responsible for the handling operation is to take every action to avoid any possible accident (area cleared, chocks available).

110. Remove the blanking plugs from the main wheel spindles (on inboard side) to install the debogging rings.

Forward Hauling (refer to Fig 1-4)

Do not move the aircraft with no brake pressure reserve.

111. Install the debogging assembly as follows :

a. Connect the steering bar to the nose gear tow fitting (pin).

b. Connect the steering bar to the steering arm (integral with the debogging assembly).

c. Connect a debogging ring (integral with the debogging assembly) to each main gear leg (quick-disconnect bayonet coupling)

d. Connect the assembly tow ring to the tow vehicle.

112. To tow the aircraft proceed as follows :

All personnel are to be well clear of the towing cables while the aircraft is being debogged.

a. Tow slowly and smoothly, and straight ahead if possible.

NOTE

The undercarriage is protected against excessive loads by a shear-pin located at the cable-to-main gear connections. A shear-pin, designed to withstand 32.373 kN (7250 lbf) is fitted to each tow

fitting. Four spare shear-pins are secured to the debogging assembly by means of two split-pins.

The steel shear pin has an ultimate tensile strength of 115 kg/mm^2 (73 tons (U.K.)/in^2). If it is necessary to manufacture a shear pin locally, it is mandatory to use steel whose ultimate tensile strength is not greater than 115 kg/mm^2.

b. Once the aircraft is debogged, large turns may be made to bring it over hard ground; turning radius is limited by the cables rubbing against the nose gear (5° relative to aircraft centre line i.e., 0.085 radian approx).

c. If need be, apply the aircraft brakes as the tow vehicle slows down.

d. As soon as the aircraft is back on hard ground, disconnect the debogging assembly, re-install the wheel spindle blanking plugs and tow the aircraft by means of a tow bar 0688-9022.

Rearward Hauling (refer to Fig 1-4)

Do not move the aircraft with no brake pressure reserve.

113. Disconnect the steering bar from its arm and secure the steering arm by means of a hook attached to the debogging assembly.

114. Install the debogging assembly as follows :

a. Connect a debogging ring (quick-disconnect bayonet coupling) to each main undercarriage leg.

b. Connect the tow ring to the tow vehicle.

c. Connect the steering bar to the tow fitting and have an operator guiding the aircraft as it is being towed.

115. Proceed then as for forward hauling.

NOTE

Make sure the cables do not rub against the tyres.

Final Steps

116. When on the parking area, chock the aircraft and remove the tow bar. Centre the nosewheel and reconnect the anti-shimmy link-rod to the nose gear leg.

117. Perform the following operations after debogging :

a. Remove the wheels and carry out a B/S before installing on aircraft.

b. Remove, disassemble, clean and inspect the brake units.

c. Clean, inspect and grease the undercarriage and doors.

d. Carry out geometrical check of undercarriage.

f. Clean all mud and foreign matter from the aircraft surfaces.

AIRCRAFT JACKING

Equipment Required

118. The following equipment is required :

a. *Tools*

— Screwdriver

— Open-ended spanner, 29 mm (if required)

— Canopy unlocking spanner M3-034.

b. *Servicing Equipment*

— 3 standard hydraulic jacks W14809 (58-86 kN) with 340 mm extensions.

— 6 jack adapter pads.

— Cockpit access ladder EAC11.

Preparation

119. Prior to jacking the aircraft carry out the following :

a. Remove the three jack fitting access doors (frame 15 and frame 33).

NOTE

The aircraft may be jacked up with jettisonable stores, as long as armament equipment has been rendered safe and 246, 286 and 374 gal tanks have been defuelled.

b. Screw home by hand the three W14997 jack adapter pads into the jack fittings and tighten using a 29 mm spanner.

NOTE

Ensure the ground is sufficiently hard to prevent the jacks from sinking. If the aircraft is jacked up in the open air, ensure that the wind does not create a dangerous condition.

c. Position the three jacks, fitted with their 340 mm extensions, in the retracted position, under the jack adapter pads. It is possible to use three jacks with 510 mm extensions.

d. Ensure the jacks are approximately vertical.

e. Bring the jacks into contact with the adapter pads.

Lifting

120. To lift the aircraft, proceed as follows :

a. The man responsible for the jacking operation is to coordinate the action of the three operators.

b. Raise the three jacks at the same time, maintaining the safety nut near its stop at the end of the lifting stroke. The safety nut does not reach the ram plain section if the operation is correctly performed.

CAUTION

Make sure the wheels clear the ground if the undercarriage is to be operated.

Lowering

Check that the area beneath the aircraft is clear before lowering the aircraft.

121. To lower the aircraft, proceed as follows :

a. Make sure the undercarriage is locked down. Green lights illuminated (Switch the battery switch ON just for the time required to perform this check).

b. Pump slightly and unlock the safety nut on each jack.

c. Slowly lower the aircraft while gradually unscrewing the safety nut.

d. With the aircraft back on the ground, fully retract the jacks and move them clear of the aircraft.

e. Check that the shock-absorbers are correctly compressed.

f. Unscrew the three jack adapter pads.

g. Re-install the three jack fitting access doors.

PARTIAL LIFTING BY THE NOSE GEAR

Equipment Required

122. The following equipment is required :

a. *Tools*

— Canopy unlocking spanner M3-034

b. *Servicing Equipment*

— Pip-pin A407 with flag 2-89845

— Jack adapter pad A.22915

— Bottle-jack

— 4 standard chocks

— Cockpit access ladder EAC11.

Procedure (refer to Fig 1-5)

123. Prior to partial lifting the aircraft by the nose gear, carry out the following :

a. Place chocks in front and behind the main wheels.

b. Ensure that the parking brake is off.

c. With the nose wheel centreed :

(1) Depress the nose gear neutral steering locking plunger.

(2) Install pip-pin A407 to keep the plunger depressed.

124. The two main features of the jack adapter pad are as follows :

a. An anti-release device (1) which consists of two link-rods connected to the ends of the shock-absorber lower axle-pin through suitable holes and to the ends of the tow fitting axle-pin. In the latter case, the link-rods are attached through one of the three holes provided, depending on the compression state of the shock-absorber and tyre. This device prevents the shock-absorber from extending as the aircraft is being lifted.

b. A jack adapter rod (2) which slides in the jack adapter pad and which can be secured in the down or up position by a pin.

125. Position the jack adapter pad proper by engaging the stud integral with the balance arm pin into the hole provided in the lower section of the adapter pad. Position the jack while manually supporting the jack adapter pad. If possible, place the sliding rod (2) in the low position. Bring the jack into contact to support the jack adapter pad. Ensure the jack is correctly positioned.

126. Install the anti-release device as follows :

a. Holding a link-rod in each hand, pull them apart to tension the spring and fasten them at both ends of the shock-absorber lower axle-pin through the holes provided in the link-rods. Generally it is not possible to fasten the other end of the link-rods at the same time, as the tow fitting axle-pin will be located between two of the three linkrod upper holes; the link-rods will however be kept spread out.

b. To finally install the anti-release device, very slowly raise the jack until the ends of the tow fitting axle-pin face the link-rod holes then push the link-rods into position by hand.

127. Lift the aircraft as required.

Lowering

128. To lower the aircraft, proceed as follows :

a. Lower the jack until it is possible to free the link-rods. Stop lowering and remove the anti-release device.

b. Keep lowering the aircraft until the jack cup is no longer in contact with the jack adapter pad.

c. Remove the jack.

d. Remove pip-pin A407 and make sure that the locking plunger is correctly returned by its spring.

PARTIAL LIFTING BY THE MAIN GEAR

Equipment Required

129. The following equipment is required :

a. *Tools*

— Canopy unlocking spanner M3-034.

b. *Servicing Equipment*

— Pip-pin A407 with flag 2-89845

— Bottle jack

— Jack adapter pad A.22914

— 4 standard chocks

— Cockpit access ladder EAC11.

Procedure (refer to Fig 1-6)

130. Prior to partial lifting of the aircraft by the main gear, carry out the following :

a. Place chocks in front and behind the nose wheel and the main wheel which is to remain on the ground.

b. Make sure the parking brake is off.

c. With the nose wheel centred :

(1) Depress the nose gear neutral steering locking plunger.

(2) Install pip-pin A 407 to keep the plunger depressed.

d. Remove the plug (refer to GA 51605) used to blank the housing provided in the wheel spindle on the inboard side (refer to Fig 1-4, Detail A).

e. Install the jack adapter pad as follows :

(1) Prepare the assembly in a fairly horizontal position (centre-line of cylindrical section parallel to arm).

(2) Insert the cylindrical section (3) so that the axle-pin (4) is fairly parallel with the undercarriage leg. Push fully home.

(3) Rotate the assembly a quarter turn clockwise.

(4) Fold the arm (2) back over the undercarriage leg.

NOTE

If required, rotate the assembly about the cylindrical section C/L so that the notches are correctly facing the spindle stop pin.

131. The jack adapter pad is then made integral with the undercarriage leg. Bring the cup, at upper part of jack, into contact with the jack adapter pad ball-fitting. Ensure the jack is correctly seated.

132. Continue jacking up to the desired position (Frequently check that the jack has no tendency to tilt).

Lowering

133. To lower the aircraft proceed as follows :

a. Lower the jack slowly until the jack cup is no longer in contact with the adapter pad ball-fitting.

b. Remove the jack clear of the aircraft.

c. Remove the jack adapter pad.

d. Re-install the blanking plug (l) (refer to GA 51605) on the wheel spindle.

e. Remove the pip-pin together with its flag and make sure that the locking plunger is correctly returned by its spring.

f. Remove the nose wheel chocks and chock the previously lifted main wheel.

LEVELLING THE AIRCRAFT

Equipment Required

134. The following equipment is required :

a. *Tools*

— Aircraft level RMN.5 (This may be folded up in the gun harmonization tool case MRA. 7)

— Screwdriver, 5 mm

— Open-ended spanner, 29 mm (If required)

— Canopy unlocking spanner M3-034.

b. *Servicing Equipment*

— 3 standard hydraulic jacks W14809 (58.86 kN capacity) with 510 mm extensions.

— 6 jack adapter pads.

— Cockpit access ladder EAC11.

Procedure (refer to Fig 1-7)

135. To level the aircraft, proceed as follows :

a. Jack the aircraft in accordance with instructions contained in paras 119 to 121.

NOTES

- If the aircraft is to be levelled and the undercarriage tested at the same time, then use jacks, 58.86 (13200 lbf) in capacity, fitted with 510 mm. (20 in) extensions under frame 33 and frame 15.
- If the aircraft C/L is to be marked on the ground (parallelism check), make sure that the legs of the jack used at frame 15 are not interfering with the aircraft C/L.

b. Open the canopy and place the safety pin on the safety harness.

c. Carefully clean the bearing face of the three levelling studs located on the cockpit side-formers (2 on LH side and 1 on RH side).

d. Position aircraft level RMN.5 on the three levelling studs.

NOTE

Remove from the aircraft level rear LH stud, the bush which is used for harmonization of the guns.

e. First level the aircraft laterally by adjusting the rear jacks as required to centre the transverse level bubble. It is recommended that the aircraft is placed in a slight nose down attitude rather than in a nose up attitude as it is easier to raise a jack than to lower it.

f. Adjust the nose gear jack as required to centre the longitudinal level bubble.

g. Check that transverse levelling has not been altered.

136. The aircraft may be levelled more accurately by using a theodolite (but this procedure requires more time).

Lowering

137. To return aircraft to its former condition, see para 122.

PARKING AND MOORING

Equipment Required

138. The following equipment is required :

a. *Standard Tools*

— Screwdriver, 5 mm dia.

b. *Tools Provided in Crash Tool Kit*

— Canopy unlocking spanner M3-034.

— 3 rings AH.2

c. *Servicing Equipment*

— Cockpit access ladder EAC11

— 4 standard chocks type 1

— Mooring tool kit.

d. *In Aircraft Tool Box*

— All applicable aircraft covers.

Prevention of Water Ingress into the Cockpit

139. To prevent the ingress of water into Mirage aircraft cockpits the following procedures are to be strictly adhered to :

a. At the cessation of flying, all aircraft are to be hangared where possible or if parked in the open, canopy covers are to be fitted.

b. If aircraft canopies are wet they are to be dried with a chamois before being opened.

c. If operationally acceptable, when aircraft are taxied in wet weather the pilot should leave the canopy down and locked until the ground crew dry the canopy to prevent water running off the canopy surface into the cockpit.

Sheltered Parking (refer to Fig 1-6)

140. Make sure that the post-flight operations have been carried out and select the parking spot.

Prior to any inspection of, or sitting in, the ejection seat make sure all applicable safety pins are fitted. Refer to an armament NCO.

141. In the cockpit :

a. Make sure the battery switch is in the OFF position.

b. Check that the parking brake is off.

c. Remove the safety-pin from the canopy control lever.

d. Close the canopy and lock it with the external control.

142. Remove the cockpit access ladder.

143. Place in position :

a. The main wheel chocks

b. The canopy cover

c. The LH and RH air intake covers

d. The turbo-pump air outlet blanking cap

e. The incidence probe rubber cover and then the PS.8 metal cover which also protects the static pressure inlet.

f. The pitot/static pressure head cover.

g. The total pressure head covers.

h. The jet-pipe cover.

j. The total temperature probe cover.

NOTE

Remove moisture from the probes with a dry rag prior to installing the covers.

144. Ensure that nothing is liable to damage the aircraft structure in case of deflation of a tyre or shock-absorber.

Non-sheltered Parking (refer to Fig 1-8)

145. Carry out the operations specified in paras 140 to 145.

146. If high wind forces are forecast, head the aircraft into the wind and insert the nose-centring pin.

Mooring (refer to Fig 1-6).

147. Moor the aircraft as follows :

a. Screw the mooring rings into the lifting fittings at frames 15 and 33.

b. Drive the mooring stakes into the ground at the apexes of the triangle formed by the three lifting fittings.

c. Moor the aircraft by means of three cables attached to the mooring stakes.

Do not excessively tighten the cables.

d. Check that nothing is liable to damage the aircraft structure in case of deflation of a tyre or shock-absorber.

e. During wet weather, the engine compartment drain is to be kept permanently open (this drain is located on the LH side, forward of the rocket-motor bay tank, (III 0 or rear bay tank III D). refer to Chap 2, Fig 2-7.

f. If operational requirements are such that full pylon tanks 242, 286 or 374 Imp-Gal must be kept on the aircraft, it will be necessary to carry out the following :

(1) Turn the wheels a quarter turn on every before flight inspection or at least once every 48 hrs during the tyre inflation pressure check.

(2) Before the next flight during the taxi run accelerate the aircraft up to 25 kt before take-off.

CHAPTER 2

GENERAL SERVICING

TABLE OF CONTENTS

LIST OF FIGURES

Figures for this Chapter are contained in DI(AF)AAP 7213.003-2-14, Book 3.

CHAPTER 2

GENERAL SERVICING

SAFETY MEASURES AND CHECKS

CAUTION

Prior to commencing any periodic inspection, the following safety measures must be taken as soon as the aircraft is in the hangar.

Cockpit (refer to Figs 2-1 and 2-3)

201. Make sure the ejection seat safety-pins are in position as shown in Figure 2-3.

202. Make sure the instrument panel safety-pin chain is in position for the following controls :

a. Air brakes.

b. Undercarriage controls.

c. External store control.

d. Canopy control.

e. Brake chute control.

f. Standby.

Jettison Initiators

203. Render the jettison initiators inoperative by :

a. Ensuring that if any missiles are fitted, they are removed before the aircraft is towed into the hangar.

b. Before towing,ensure that the pylon tank jettison squib supply plugs are disconnected on each pylon through the pylon side access doors (if the pylons are in position).

Aircraft General

204. If the gun-pack is in position, make sure that the gunpack is removed before the aircraft is towed.

205. Ensure the electro-pump circuit-breaker is pulled out.

Manual Opening of Undercarriage Doors

CAUTION

Refer to Safety Precautions in AAP 7213.003-2-1B1 before manually opening the undercarriage doors.

206. The undercarriage doors must be kept open throughout the inspection. It is most important that personnel be familiar with the principle of operation of the undercarriage doors and that attention be drawn to the precautions to be taken to avoid serious accidents.

WARNING

The three undercarriage door manual control microswitches are connected in series in the electro-valve energization circuit. Pushing the last manual control handle into position will cause the three undercarriage doors to close very rapidly (if the electrical and hydraulic systems are powered).

207. The retracting locking finger located on the manual control rod may gradually wear and fail to catch satisfactorily; hence it is necessary to :

a. Check condition of the locking fingers during each inspection.

b. Always pull at least two undercarriage door manual unlocking handles (even if work is to be carried out only in a single wheel well) in order to ensure that the circuit remains open in the event that one of the handles is accidentally closed.

Closing Of Inspection Doors

CAUTION

Do not close an inspection door before the supervisor has personally inspected each structure-box (for tools, incorrect safety-locking, pipe connections and general serviceability) and has given the order to close the door.

208. After carrying out any general servicing, ensure the inspection doors are closed and locked.

Use of External AC Power Unit

209. The external power receptacle contactor and radar pre-warming relay energization coils are supplied by the radar pre-warming switch. This leads to :

a. The necessity to provide d.c. power when a.c. power is required on the aircraft. For d.c. supply use the battery or a 28V supply through the battery receptacle.

b. Leave the external a.c. power receptacle connected only for the time required for testing to prevent the battery from being discharged into the external power receptacle contactor coil or radar pre-warming relay coil.

Incidence Probe

210. Fully rotate the incidence probe clockwise to prevent the indicator lights from remaining on when the electrical system is energized.

Use of Fuse Breakers Type 4058A or 4058B

211. The fuse breakers should be set on or tripped off as little as possible, and should never be set on under load.

OPENING AND CLOSING UPPER RADIO EQUIPMENT BAY DOOR (refer to AAP 7213.003-2-1B1)

Closing

212. The following instructions are provided to ensure that the upper radio equipment bay door closing mechanism is correctly locked. If greater than normal force is applied when locking any mechanism controlled by fasteners, the elasticity of the mechanism may give the impression that it is locked when, in fact, the locking pins are NOT correctly inserted into the locking holes. This may happen particularly if :

a. Foreign material interferes with the locking hole.

b. The door is incorrectly positioned.

c. The linkage is warped.

213. With the door in the closed position, the operator is to sit astride it and simultaneously press on the end of each fastener with a single finger, applying a locking force not exceeding 2 kg (4.4 lb). This corresponds to a slide fit of the locking pins in the corresponding holes if the linkage is not fouled.

214. If an abnormal force is required, investigate the cause. Particularly ensure that foreign materials are not preventing the door from closing.

Opening

215. The door is to be opened under the same conditions as for closing with the operator astride it. The required force should not exceed 10 kg (22 lb) approximately. The operator must press on both push-plates simultaneously with the thumbs to unlock the fasteners. Pull the fasteners away from the fuselage skin sufficient to enable a finger hold and fully withdraw the locking pins. The fasteners should operate smoothly while withdrawing the locking pins.

216. Once the door is unlocked, it should be possible to lift it open with the two fasteners by exerting a force of about 20 kg (44 lb). Should the guide points be stuck, the edges may be freed by lightly tapping on the lateral sections — avoiding the use, as far as possible, of a lifting tool (which should in no case be used on the fasteners).

REFUELLING FUSELAGE AND WING TANKS AND (IF FITTED) GUN BAY AND ROCKET BAY FUEL TANKS

Equipment Required

217. The following equipment is required :

a. *Tools.*

Flat screwdriver/fuel key

Canopy unlocking spanner M3-034.

b. *Servicing Equipment.*

Cockpit access ladder EAC11.

Wing protective mats (if available).

External d.c. power unit.

c. *Servicing Products.*

Jet-engine fuel F-34 DEF (AUST) 5240.

Preparation (refer to AAP 7213.003-2-1B1 and Fig 2-4)

218. There are several refuelling methods :

a. One or two fuel sources may be used.

b. Either one or two LP pumps may be used. Selection of any one of these methods depends on the time available.

219. The following procedure includes special details for filling the gun bay fuel tank if installed. The refuelling operation itself remains the same, regardless of the method used, and the following is based on the assumption that refuelling is performed by using one fuel source and by starting the two LP fuel pumps.

220. Comply with the safety measures outlined in AAP 7213.003-2-1B1.

221. Ensure that the following electrical bonding connections are made :

a. *Between aircraft and ground :*

ensure the bonding lead is connected from aircraft earthing point to ground.

b. *Between fuel source and aircraft :*

connect the fuel source grounding lead to one of the earthing points provided in the main wheel wells.

c. *Between tanker and ground.*

222. Open the canopy, place the canopy control lever safety pin in position, and (in the cockpit) :

a. Make sure the Electro-Pump circuit-breaker is pulled out on the circuit-breaker panel (RH console).

b. Ensure the fuel shut-off cock is closed (LH console).

CAUTION

Ensure that the control levers of these valves are fully actuated and that they are not restrained in travel (otherwise do NOT refuel but immediately check the linkage and valve). If a friction spot is found as the valve control levers are being operated, and if this friction spot does not prevent the levers from being operated over their entire travel, the fault is to be reported and the linkage is to be checked on the next inspection.

CAUTION

Allow the fuel tanks to depressurise if required (a hissing sound will be heard) with the filler caps

kept in position, then turn the caps 1/8 turn to the left in order to remove them.

223. Fully unscrew the centre screw on the filler caps. During the refuelling operation, the cap must be bearing on the fuselage above the filler port; in no circumstances should the filler nozzle be allowed to rest on the plug retaining stirrup.

224. Release boost pump pressure, then fully pull the control handle of the four vapour relief and refuelling valves of the wing and rocket motor bay fuel tanks. If the gun bay fuel tank is in position, open both access doors 257 (refer to Chap 3) and fully pull the control handle of the two vapour-relief and refuelling valves of the gun bay fuel tank.

225. Connect the external d.c. power unit to the aircraft.

226. Turn the inverter on and read the fuel quantities recorded by the fuel gauges and the fuel remaining indicator. The quantity of fuel required to top up the tanks may be deduced from the values above.

227. Determine the quantity of fuel to be carried by the aircraft according to the planned mission.

Refuelling (refer to AAP 7213.003-2-1B1 and Fig 2-6)

CAUTION

If the aircraft is being refuelled following complete drainage of the fuel tanks, it is imperative that the turbo-pump should be bled (LP pump on — fuel shut-off cock open). Open the bleed port plug located near the 20-micron filter. Once air is completely bled, screw the plug back on and lockwire.

228. Connect the supply refuelling arm electrostatic plug to the aircraft receptacle located in the dorsal fin.

CAUTION

Do not actuate the refuelling valves when the LP pumps are being operated. The refuelling valves are to be opened prior to starting the LP pumps and are to be closed only after stopping the LP pumps.

229. Start refuelling the fuselage fuel tanks Check (by observing the fuel gauge) that one side of the fuselage tanks is starting to fill, then turn the crossfeed switch on. (If needle does not move, or if both needles move, inform the line NCO.) After there is 30 gallons in each main tank, start the LP pumps.

NOTE

During the refuelling operation, check that the aircraft LP pump is coping with the incoming supply. If not, proceed by successive stages.

230. On completion of the refuelling operation, replace the fuel caps, then switch off the LP pumps and disconnect the supply refuelling arm electrostatic plug.

Fuel will not be transferred if the handles are not returned fully home and it will not be possible to close the access doors. Special attention should therefore be paid to correct closing of the valves.

231. Push fully home the control handles of the refuelling and vapour-relief valves of the wing and rocket motor bay fuel tanks and that of the gun bay fuel tank (if installed).

232. By reading the fuel tanker fuel meter, ensure that the quantity of fuel delivered corresponds to that required to top-up the fuel tanks.

233. Read the fuel gauge which records the contents of the fuselage tanks and the inverted flight accumulator. Set the total fuel quantity aboard on the fuel remaining indicator.

Final Steps

234. When refuelling is complete, carry out the following :

a. Switch the inverter off.

b. Disconnect the external d.c. power unit from the aircraft ground power receptacle and close the access door.

c. Disconnect the fuel source electrostatic plug (aircraft wheel well) and earthing points.

d. Remove the safety pin from the canopy control lever, then close and lock the canopy.

e. If density of the fuel loaded is different from that of the fuel previously used, the new fuel density is to be set on the fuel density corrector (on the engine).

REFUELLING PYLON TANKS

Equipment Required

235. The following equipment is required :

a. *Tools.*

Flat screwdriver/fuel key

b. *Servicing Equipment.*

Jet-engine fuel F-34 DEF (AUST) 5240.

Preparation (refer to AAP 7213.003-2-1B1 and Figs 2-3 and 2-6)

236. The two pylon tanks may be refuelled either simultaneously or successively. The pylon tanks may also be refuelled at the same time as the fuselage and wing tanks as the systems are independent.

237. Take safety measures as outlined in AAP 7213.003-2-1B1.

CAUTION

Do not allow the aircraft to stand with full pylon tanks. Refer AAP 7213.003-2-1B1 Worksheet 0200 Austa.

238. It is recommended that the pylon tanks are fuelled just prior to flight.

CAUTION

For manual opening of the undercarriage doors, proceed in accordance with instructions given in para 206.

239. Ensure that the following electrical bonding connections are made :

a. Between aircraft and ground (ensuring that the grounding chain located on the nose gear fork is securely grounded).

b. Between fuel source and aircraft (by connecting the fuel source grounding lead to one of the receptacles provided in the main wheel wells).

c. Between tanker and ground.

240. Remove the pylon tank filler cap access doors.

CAUTION

Allow the tank to depressurize if required. On French S/S tanks, a hissing sound will be heard as the pressure escapes. On Israeli and jettisonable tanks, a relief valve is located in the side of the pylon. The pylon tanks should be found pressurized if refuelling is undertaken not long after the last flight. The filler valve is faulty (jammed open) if the pylon tank is not found under pressure. The valve must be changed in this case. The pylon tanks may also be depressurized by pressing with a finger or a non-metal part on the overpressure/underpressure valves located on the pylons.

241. Remove the filler caps as follows :

a. Unlock the cap by unscrewing the wing-screw while holding the cap to prevent it from rotating.

b. Fully turn the cap to the left and remove it.

Refuelling (refer to Fig 2-4)

CAUTION

Do not spill fuel on the tyres as this will result in perishing of the tyres.

242. Connect the fuel source refuelling arm electrostatic plug to the receptacle provided on top of the pylon tank.

243. Refuel each tank (1100, 1300 or 1700 litres (242, 286 or 374 U.K. gal)) depending on the type of pylon tanks fitted on the aircraft.

Final Steps

244. When refuelling is complete carry out the following :

a. Re-install filler cap after checking condition of the seal. Ensure the wing-screw is fully loosened prior to fitting the cap.

b. Insert the cap and turn it fully to the right.

c. Fully tighten the wing-screw.

d. Disconnect the electrostatic plugs.

e. Disconnect the earth points.

FILLING THE OXYGEN SYSTEM

Equipment Required

245. The following equipment is required :

a. *Tools.*

Screwdriver

Open-ended spanner 17 mm

b. *Servicing Equipment.*

Oxygen trolley

Cockpit access ladder EAC11

Emergency cylinder charging adapter (to be locally manufactured).

c. *Servicing Products.*

Clean and dry rags.

Preparation (refer to AAP 7213.003-2-1B1 W/S 0210)

246. The oxygen system consists of :

a. Normal system : Two 6.6 litre cylinders connected in series. The charge of the normal system cylinders is indicated by a pressure-gauge built into the oxygen control panel located on the RH console.

b. Emergency system : One 0.4 litre cylinder as part of the regulator. The emergency system pressure is indicated by a pressure-gauge located on the oxygen regulator.

c. Provision for separately charging the normal and emergency systems.

WARNING

The considerable danger involved in working on aircraft oxygen systems containing very pure high-pressure oxygen (especially in the presence of foreign materials) requires stringent safety measures to be observed during the filling operation.

- Use clean and dry rags.
- Thoroughly clean the area around the oxygen charging connection access door and remove all greasy spots.
- Clean the linkage booster unit drains (on either side of nose wheel well). Under windy conditions, it is advisable that a clean rag be fitted over these drains to prevent any possible accident (for example, the wind may blow hydraulic fluid onto the oxygen trolley or onto the

charging line orifice as the line is being connected to or disconnected from the aircraft).

247. Place the oxygen trolley approximately 2 metres (6 feet) from the aircraft oxygen charging connection, with the trolley making a 45° angle towards the nose of the aircraft (relative to aircraft C/L).

248. Do not allow the aircraft oxygen cylinders to remain at a pressure below 25 bars (362.6 lb/in²) (pointer within the pressure gauge black-striped yellow range). Charge the cylinders immediately if the pressure drops below 363 lb/in².

249. The emergency cylinder cock is always to be opened after the aircraft control cock. Both of these cocks should be open when the oxygen system is being charged. Otherwise the emergency oxygen cylinder will discharge into the lines and will be emptied prematurely.

250. The following instructions regarding the oxygen trolley should be observed :

a. The oxygen trolley is to be kept in a cool place, away from the sun or any other heat source.

b. Open and close the oxygen cylinder cocks slowly and only by hand.

c. A minimum residual pressure of 3.5 bars (50.7 lb/in²) should be permanently maintained in the oxygen trolley cylinders to prevent any moisture formation.

251. Open the oxygen charging connection access door (three Dzus fasteners).

Filling the Normal System (refer to Fig 2-7)

252. The aircraft oxygen system cylinders are to be refilled after every flight. First charge the normal system and then, if required, the emergency system.

WARNING

Make sure the couplings, screw threads and housing are free from greasy spots. Dry very carefully with dry, clean compressed air. To charge the aircraft oxygen cylinders, the oxygen trolley cocks are to be opened very slowly by hand. Rapid opening of the cocks may cause a sudden compression liable to raise the temperature sufficiently to cause a fire or an explosion. Cocks which cannot be opened or closed manually are to be considered defective. The use of spanners or any other similar means to open or close the cocks is strictly forbidden.

253. To charge the aircraft oxygen cylinders proceed as follows :

a. One operator is required in the cockpit to monitor the filling operation by means of the pressure-gauge (RH console).

b. With the charging line facing away from the aircraft, purge the line by discharging a slight amount of oxygen at reduced pressure. A blanking plug is to be fitted to the free end of the charging line when not in use. Should the water content in the oxygen be too high, follow the instructions contained in Note No 14, Sheet 129 of BTM (Monthly Technical Bulletin) dated 10.1953.

c. Unscrew the plug from the charging connection, clean the threads with a dry rag if required and connect the charging line by offering the charging line orifice directly into the charging connection of the aircraft.

d. Open the oxygen trolley cylinder with the lowest pressure and gradually increase the charging pressure of the aircraft cylinders by adjusting the pressure adjustment screw of the oxygen trolley pressure reducing valve as required. Charge until the aircraft oxygen pressure gauge reading stops increasing.

e. Continue by using successively the cylinders in order of increasing pressures until filling is completed (pointer in the middle of the black-striped white range at 15°C ambient temperature).

f. When the cylinders are fully charged, check that the oxygen trolley pressure gauge records a pressure of approximately 150 bars (2176 lb/in²) for a temperature of 15°C. The beginning of the black-striped white range corresponds to 135 bars (1958 lb/in²) while the end of the same range corresponds to 165 bars (2393 lb/in²). Both values are approximate.

g. Close the charging line cock and disconnect the line. Ensure the oxygen charging connection is not leaking.

Filling the Emergency System

254. The emergency system is filled by connecting the charging line to the coupling provided on the ejection seat oxygen regulator using a suitable high-pressure adapter.

255. Refilling is not to be carried out after every flight but only when the pressure gauge indicates that the emergency cylinder is not full. The emergency oxygen cylinder is to be refilled :

a. If the 8 min. 02 pressure warning light is illuminated.

b. If the pressure gauge pointer is outside the white range.

256. Observe the same precautions and proceed as for charging of the normal system until a pressure of 165 bars (2393 lb/in²) at a temperature of 15°C is obtained. An operator is to monitor the filling operation by means of the oxygen regulator pressure gauge.

257. Once the emergency cylinder is correctly charged (pointer of the oxygen regulator pressure gauge at upper end of the white range after allowing the pressure to stabilize) :

a. Close the charging line cock and disconnect the line.

b. Make sure the oxygen charging inlet is not leaking.

c. Turn the Battery switch to ON and check

that the 8 min. 02 pressure warning light is not illuminated.

Final Steps

258. On completion of charging :

a. Re-install the oxygen charging connection plugs.

b. Close the oxygen charging connection access door.

c. Check that the oxygen pressure gauges are not recording pressure drops indicating an oxygen leak.

d. Close the aircraft oxygen control cock and emergency oxygen cylinder cock.

FILLING COCKPIT AIR CONDITIONING SYSTEM EVAPORATOR

Equipment Required

259. The following equipment is required :

a. *Servicing Equipment*

Standard 20-litre dispenser with filler spout.

b. *Servicing Products.*

Distilled water

Cockpit air conditioning evaporator fluid
— (ground temperature ≥5°C)... water
— (ground temperature <5°C)... mixture of water + 30% ethyl alcohol S-738 DEF (AUST) 5438.

Checking and Topping-up (refer to AAP 7213.003-2-1B1 and Fig 2-7)

CAUTION

Ferry flight with 1300-litre (286 U.K. gal) or 1700-litre (374 U.K. gal) additional fuel tanks, regardless of the temperature on the ground, use a mixture of water + 30% ethyl alcohol.

260. To check and top-up the air conditioning evaporator proceed as follows :

a. Lift the locking device and remove the filler port plug.

b. Check the level with a finger; fluid level should be near the filler port.

c. Top-up if required. Topping-up is achieved by means of a standard 20-litre dispenser fitted with a filler spout.

d. Re-install the filler port plug and fold the locking device back into position.

FILLING HYDRAULIC RESERVOIRS

Equipment Required

261. The following equipment is required :

a. *Tools.*

Canopy unlocking spanner M3-034

b. *Servicing Equipment.*

Funnel with a strainer

Cockpit access ladder EAC11

c. *Servicing Products.*

Fluid H-515 MIL-H-5605E

Clean rags.

Preparation (refer to AAP 7213.003-2-1B1 and Fig 2-5)

Check that the undercarriage control safety pin is in position in the cockpit.

262. Reduce the pressure in the systems as follows :

a. Operate the brake pedals to reduce the pressure in the hydraulic system

b. Check that there is no pressure in the servo-control hydraulic systems through the hydraulic pressure indicator; actuate the flight controls if required to reduce the pressure.

263. Ensure that the airbrakes are retracted and the undercarriage is down, the main undercarriage doors may be left open. Open access doors 218 LH and RH (refer to Chap 3).

Fluid Level Check (refer to Fig 2-5)

CAUTION

Fully unscrew the filler plug prior to disengaging it. This will permit the strip to be completely engaged on re-installation.

264. To check the level of the hydraulic fluid :

a. On each hydraulic reservoir, open the two gauge cocks (inboard first) and, as soon as the reservoir is depressurized, open the filler plug.

b. Visually check that the fluid level is not below the white index at the bottom of the filler filter.

Filling (refer to Fig 2-5)

265. Fill the reservoir if required as follows :

a. Open the two bleed screws.

b. Add fluid slowly until fluid starts overflowing under the aircraft.

c. Cease filling and, when the overflow stops, close the bleed screws and gauge cock then lockwire them.

Check that the strip of the filler plug in the bayonet fitting of the port to be plugged is correctly engaged.

d. Re-install the filler port plug and check that it cannot be pulled off.

e. Re-install access doors 218 LH and RH.

Testing

266. If a hydraulic reservoir has been completely drained, the utility systems supplied by this reservoir

should be functionally tested several times to thoroughly bleed air from the systems, and especially from the servo-control hydraulic systems. After testing, top-up if required.

TOPPING-UP THE ACCESSORY GEAR BOX OIL

Equipment Required

267. The following equipment is required.

a. *Tools.*

Dzus fastener screwdriver.

b. *Servicing Equipment.*

Standard 20-litre oil dispenser

Set of adapters MS209 including :

(i) Filler adapter MS209.01

(ii) Overflow adapter MS209.02

(iii) Intermediate couplings

(iv) Filler adapter

(v) Overflow adapter

c. *Servicing Products.*

Oil 0-156 (MIL-L-23699).

Preparation (refer to AAP 7193.008-3M)

268. Access to the accessory gear box filler and overflow couplings is gained directly through the two holes provided in access door 260 (refer to Chap 3). The filler coupling is located at the rear of the aircraft.

269. The accessory gear box has no oil level indicator; the filling operation, therefore, consists only in topping-up with oil.

Procedure

270. To check and top-up the oil :

a. Unlock and then remove the overflow coupling plug (1/4 turn).

b. On the overflow coupling, connect end-to-end, the intermediate coupling and the overflow adapter (the end of which should be placed in a collecting pan).

c. Adjust the oil dispenser pressure to between 2 and 4 bars (29 and 58 lb/in²).

d. Unlock and remove the filler coupling plug.

e. Connect the filler adapter (together with its intermediate coupling) between the filler coupling and the oil dispenser.

f. Fill the accessory gear box until fluid is flowing through the overflow pipe.

g. Disconnect the filler pipe.

h. When oil stops flowing through the overflow pipe (drop-by-drop flow), disconnect the overflow adapter.

j. Wipe the couplings and plugs with clean rags.

k. Check the couplings for correct tightness.

l. Re-install the plugs on the couplings and ascertain that they are correctly locked.

FILLING ENGINE OIL TANK

Equipment Required

271. The following equipment is required :

a. *Tools.*

Fluid dispenser with adapters MS209.

1 overflow collector pan (5-litre capacity approximately).

b. *Servicing Products.*

Oil 0-156 (MIL-L-23699).

General (refer to AAP 7213.003-2-1B1 and Fig 2-6)

272. The engine oil tank is to be serviced after every flight. However, in the case of an aircraft which has been diverted to a field where no Mirage servicing equipment is available, it is not imperative that the oil tank be topped up provided :

a. Duration of the last flight was less than 2 hours.

b. Duration of the planned flight is less than 1 hour.

c. The average oil consumption for the last three flights is less than 1.5 litres per hour.

Filling (refer to Fig 2-6)

CAUTION

Never top-up the oil tank after an engine ventilation.

273. To fill the engine oil tank :

a. Remove the inspection door providing access to the oil tank filler and overflow couplings.

b. Unlock and then remove the plugs for the two couplings.

c. Connect the overflow pipe to the overflow coupling and place the end of the overflow pipe in a collector pan.

d. Connect the oil dispenser pipe to the filler coupling.

e. Ensure the oil dispenser pressure is between 1 and 3 bars (14.5 and 43.5 lb/in²).

f. Fill the oil tank until fluid is flowing through the overflow pipe.

g. Disconnect the filler pipe.

h. Disconnect the overflow pipe when the fluid flow stops.

j. Use a clean lint-free cloth to clean the couplings and plugs, then check the couplings for correct tightness.

k. Re-install the plugs on the couplings and make sure they are properly locked.

l. Re-install the inspection door.

CAUTION

The added oil quantity represents the engine oil consumption over the last operating period. Maximum permissible oil consumption is 1.5 litres/hour (0.33 U.K. gal).

m. Enter in the appropriate oil tally form the quantity of oil added. (Remember to deduct the oil quantity collected from the overflow pipe.)

TOPPING-UP THE AUXIVAR ALTERNATOR OIL

Equipment Required

274. The following equipment is required :

a. *Tools.*

Screwdriver 5 mm dia

Flat screwdriver

Socket-spanners 21 mm and 23 mm

b. *Servicing equipment (servicing with standard fluid dispenser).*

Standard 20-litre fluid dispenser

Set of adapters MS209 :
— Filler adapter MS209.01
— Overflow adapter MS209.02

Intermediate couplings :
— Overflow
— Filler

c. *Servicing Products.*

Oil 0-156 (MIL-L-23699).

Servicing With Standard 20-Litre Oil Dispenser (refer to AAP 7213.003-2-1B1 and Fig 2-7)

275. To top-up the oil in the Auxivar alternator proceed as follows :

a. Open access door 261, RH (refer to Chap 3).

b. Unscrew and remove the overflow port plug with a 21 mm socket-spanner and remove the seal.

c. Connect the intermediate coupling and the overflow adapter end-to-end to the alternator overflow port and place the end of the overflow adapter in a collector pan.

d. Adjust the 0-156 oil dispenser pressure for a maximum pressure of 1.5 bar (21.7 lb/in²).

e. Remove the filler plug with a 23 mm socket spanner and remove the seal. Note that the filler port is located toward the front of the aircraft.

f. Connect the filler adapter (together with its intermediate coupling) between the alternator filler port and the oil dispenser.

g. Slowly fill the alternator. Inject a quantity of oil into the alternator, watching the overflow pipe to see exactly when the oil starts overflowing. Pause after each injection to see whether the fluid begins to overflow. The higher the pressure in the dispenser, the shorter the injections are to be.

h. The proper level is reached when oil flows through the overflow pipe.

j. Disconnect the filler pipe.

k. When oil is no longer flowing through the overflow pipe (drop-by-drop flow), disconnect the overflow adapter together with its intermediate coupling.

l. Check the couplings for correct tightness.

m. Wipe the plugs and change the aluminium seals.

n. Re-install the plugs on the corresponding ports, together with the associated seals (21 mm and 23 mm socket-spanners). Lock-wire the two plugs together.

p. Re-install access door 261 RH.

q. Remove the filler and overflow plugs and seals.

r. Screw the collecting tube over the overflow port.

s. Screw the syringe end piece over the filler port (syringe filled with oil 0-156).

t. Pump oil into the casing until oil flows into the collecting tube.

u. Unscrew the syringe end piece and the collecting tube.

v. Carry out the operations described in l. to p.

CHAPTER 3

GENERAL INFORMATION

TABLE OF CONTENTS

LIST OF FIGURES

Figures for this Chapter are contained in DI(AF) AAP7213.003-2-14 Book 3

CHAPTER 3

GENERAL INFORMATION

ACCESS DOORS AND PANELS

Wing Access Doors (refer to Figs 3-2 and 3-3)

301. Access to equipment and fittings in the wings is gained through the doors listed below and shown in the referenced Figures.

Door No	Access to :
	Wings pre-mod 406
100 LH-RH III O only	Pivot pin of first bell-crank of elevon linkage. Wig-O-Flex coupling in pylon fuel tank system and tubing mounting flanges (pressurization and fuel systems).
	Wings pre-mod 406
101 LH-RH III O only	Pivot pin of second bell-crank of elevon linkage.
102 LH-RH	*Left hand :* Two electric pump pressure switches (Front Signalisation — Rear operation). *Left hand and right hand :* Dismantling of Airbrakes (external flanges), lubrication of airbrakes. Airbrake flaps connecting rod.
103 LH-RH	Adjusting stops for airbrakes.
	Wings pre-mod 406
104 LH-RH III O only	Pivot pin of third bell-crank of elevon linkage.
	Wings pre-mod 406
109 LH-RH III O only	Attachment to structure of sealed tube housing control of inboard servo-control. Junction of both portions of sealed tube.
	Wings post-mod 406
109 LH-RH	No access SEALING DOOR
	Wings pre-mod 406
110 LH-RH III O only	Pivot pin of sixth bell-crank of elevon linkage.

Door No	Access to :
	Wings post-mod 406
110 LH-RH	Pivot pins of second bell-crank of outboard elevon linkage.
	Wings pre-mod 406
111 LH-RH III O only	Attachment to structure of sealed tube housing control of inboard servo-control.
	Wings post-mod 406
111 LH-RH	Bell-crank (in sealed box) of inboard elevon control linkage. Attachment to structure of two sealed tubes. SEALING DOOR
112 LH-RH	Control bell-crank of inboard servo-control slide rod. Sealing of sealed tube housing control of inboard servo-control.
113 LH-RH	Pivot pin of last bell-crank of outboard elevon linkage.
114 LH-RH	Coupling block of servo-control hydraulic piping Sealing base plate of tubes housing hydraulic piping Feeding of inboard servo-control.
115 LH-RH	Navigation light
116 LH-RH	Formation light
117 LH-RH	Tapered pin of outboard elevon centre bearing (Elevon removed).
118 LH-RH	Wing fuel tank strainer. SEALING DOOR
119 LH-RH	Tapered pin of inboard elevon centre bearing (Elevon removed).

Door No	Access to :
120 LH-RH	Actuating point of inboard elevon servo-controls.
121 LH-RH	Actuating point of outboard elevon servo-control
122 LH-RH	Inboard servo-control. Fixed point of servo-control — lubrication. Microswitch electrical connector. Servo-control hydraulic connections.
123 LH-RH	Hydraulic piping connections. Outboard servo-controls.
124 LH-RH	Outboard servo-control Fixed point of servo-control — lubrication. Servo-control hydraulic connections (after separation of servo-control mechanical attachments). Two-piece fairing.
125 LH-RH	Rod pivoting and hinge points on last bell-crank of elevon linkage (control of outboard servo-controls). Missile electrical connector.
126 LH-RH III O	**Wings pre-mod 406** Rod pivoting and hinge points on sixth bell-crank of elevon linkage. Sperry flux valve electrical connector (LH side only) — Mod 258 not incorporated.
133 LH-RH	**Wings post-mod 406** Assembly point of rods on second bell-crank of outboard elevon linkage. Main undercarriage. Fuselage/wing electrical circuit junction. Ground firing connector and ground firing prohibition microswitch 44G (LH side only). Servo-control system accumulators and pressure switches. Hinge points and control of undercarriage fairing doors — lubrication. Connector 90Y (LH side only). Controlled distributor. Equipment air conditioning piping.
135 LH-RH	*Left hand :* Electrical pump accumulator *Left hand and right hand :* Brake electro-distributors.

Door No	Access to :
136 LH-RH	*Left hand :* Two electric pump pressure switches (front : signalisation — rear : Operation) *Left hand and right hand :* Connecting rods of airbrake flaps. Attachment of airbrake bearing cages.
137 LH-RH III O only	**Wings pre-mod 406** Pivoting and hinge points of rods on second bell-crank of elevon linkage.
138 III O only	**Wings pre-mod 406** Fixed point axle-pin of brake actuating jack — lubrication and dismantling.
139 LH-RH III O only	**Wings pre-mod 406** Pivoting and hinge points of rods on first bell-crank of elevon linkage.
140 LH-RH	Access door for disconnection of hydraulic pipes from airbrake actuating jack and for removal of jack.
141 LH	Attachment of electric pump support (quick-release lock).
142 LH III O only	Sperry flux valve (pre-mod 258).
143 LH-RH	Taper pin of inboard elevon centre bearing (elevon removed).
144 LH-RH	Taper pin of outboard elevon centre bearing (elevon removed).
145 LH-RH	Pin attaching actuating rod of outboard elevon servo-control to bell-crank.
146 LH-RH III O only	**Wings pre-mod 406** Clamp on junction of both gun cooling tube portions.
147 LH	Installation of missile guidance antenna.
600 LH-RH	Attachment of front centring pins.

Door No	Access to :
601 LH-RH	**Wings pre-mod 406** Rod pivoting and hinge points on fourth bell-crank of elevon linkage. **Wings pre- and post-mod 406** Pressure switches of LH and RH pylon tank transfer indicating circuits.
602 LH-RH III O only	**Wings pre-mod 406** Pivot pin of fourth bell-crank of elevon linkage.
603 LH-RH	Pylon attaching screws. Pylon spindle sleeve. Nut of door 605 holding rod. SEALING DOORS
604 LH-RH	**Wings pre-mod 406** Pivot pin of fifth bell-crank of elevon linkage. **Wings post mod 406** Pivot pin of bell-crank lever of inboard and outboard elevons.
605 LH-RH	Blanking plug of pylon attaching spindle sleeve (made integral through a rod with the thrust washer on sleeve to which access can be gained through door 603).
606 LH-RH	**Wings pre-mod 406** Rod pivoting and hinge points on fifth bell-crank of elevon linkage. **Wings post-mod 406** Connection of rods to bell-crank lever to sealed compartment.
607 LH-RH	Aircraft/pylon electrical connector. This door is fitted together with door 608 only when the pylon is removed.
608 LH-RH	On door 607. When the pylon is removed, door 608 allows the hole through which the aircraft/pylon connector is coupled to be blanked.
609	Pylon tank fuel transfer coupling.
610	Pylon tank pressurization coupling.
611	Underwing load front locating fitting. Underwing load rear locating fitting.

Door No	Access to :
612 LH-RH III O only	**Wings pre-mod 406** Wig-O-Flex coupling in pylon tank pressurization system.
613 LH-RH III O only	**Wings pre-mod 406** Rod pivoting and hinge points on third bell-crank of elevon linkage. Start of control of Inboard servo-control.
614 LH-RH	**Aircraft post-mod 406** Removal (after dismantling) of connecting rod of sealed box bell-crank. (CAUTION) This door is in two parts and should be removed as follows : (1) Remove the centre screw. (2) Remove the door which is flush with the skin. (3) Using a threaded rod, hold the inner door in position while removing its attaching screws. (4) Tilt the door so that its smaller side is facing the opening and withdraw the door without touching the edge of the opening. Reinstallation is performed in the reverse order of removal.
615 LH-RH	Connection of sliding rod to rigid rod. Electrical wiring. NON-SEALING DOOR
616 LH-RH	Attachment of sealed flight control tube. SEALING DOOR WITH SEAL
617 LH-RH	Pressurization pipe of wing leading edge fuel tank. Sealed flight control tube. SEALING DOOR WITH SEAL
618 LH-RH	Sealed flight control tube. Clamp on pressurization pipe of wing leading edge fuel tank. SEALING DOOR WITH SEAL
619 LH-RH	Pressurization of wing leading edge fuel tank. Sealed flight control tube. Fixed point axle-pin of airbrake actuating jack — lubricating and dismantling. SEALING DOOR WITH SEAL

Door No	Access to :
620 LH-RH	Pylon tank transfer pipe connection. Sealed flight control tube. SEALING DOOR WITH SEAL
621 LH-RH	Gun cooling duct. Pylon tank pressurization pipe passage. NON-SEALING DOOR
622	Sealed flight control tube. Pylon tank transfer pipe. SEALING DOOR WITH SEAL

Fuselage Access Doors (refer to Figs 3-2 and 3-3)

302. Access to equipment and fittings in the fuse is gained through the doors listed below and shown in the referenced Figures.

200	Bleeding and air venting device of wheel brake energisation system.
201 LH-RH	Upper and lower attachments of nose cone.
202 LH-RH III 0 only	*Left hand and right hand :* Pitot static lines. REMOVABLE SEALING DOORS
203 LH-RH III O only	*Left hand :* Roll control bell-crank. Engine control passage. *Right hand :* Pitch control bell-crank. SEALING DOORS Including doors 287 (non-sealing)
204 LH-RH	Attachment of shock-cone actuating screw jacks.
205 LH-RH	Air intakes.
206 LH	Plexiglass to be broken to gain access to canopy ground ejection handle. REMOVABLE SEALING DOORS
207 LH-RH	*Left hand :* DC overvoltage protection box (3P). REMOVABLE SEALING DOORS
208 LH-RH	Removable box providing access for one man into the air intake duct and access to internal doors.

Door No	Access to :
209 LH-RH	*Left hand :* DC power distribution box. *Right hand :* Servo-control detector box : Yaw rate gyro (89C) Pitch rate gyro (96C) Pitch auto-command rate gyro (121C) Oxygen charging line. REMOVABLE SEALING DOORS
210 LH-RH	Additional air intakes.
211 LH-RH	*Left hand :* DC power supply box. *Right Hand :* AC test connector. AC control and protection box (4V). AC excitation box (2V). Grounding connectors (13XY), 19XY). Rate gyro transformer connector (76C). REMOVABLE SEALING DOORS
212 LH-RH *III D only	*Left Hand :* Includes door 288 (DC voltage test). Load shedding box. DC voltage regulator (4P). Standby UHF power supply. Transformer-rectifier (11Z). *DC Power supply box. *Hydraulic pipe bundles. *Throttle control clamp. *AEF Filter. *Transformer-rectifier contactor box. *Right Hand :* Servo-control junction box. AC box. *AC excitation box (2V). *Noise suppressor (17V). *AEF filter. REMOVABLE SEALING DOORS

Door No	Access to :
213 III O only	*Forward* Armament box. AC detector box. IFF transmitter-receiver. Pressure relief valve. Cabin pressure regulator. Gyro platform. *Left hand side* Flowmeter amplifier. Central DC box. N.A. missile guidance antenna filters. *Right hand side* Battery box. Battery. *On floor* Air data computer. N.A missile coder power supply. N.A missile modulator transmitter. Sperry amplifier *On rack* TACAN. Output multipliers. PHI TACAN antenna selector Transformer (post-mod 329) PHI/radar coupler (post-mod 365). *On tilting rack* AMD servo-control box. UHF matching transformer. Main UHF transmitter-receiver. SFENA auto-command box. *Rear of frame 15* Oxygen cylinders. Inverted flight accumulator. MATRA co-ordinate changer. *On the door itself* AMD computing voltage box. Radio-altimeter transmitter-receiver. Radio-altimeter filter. Radio-altimeter failure detector (post-mod 329). G-recording indicator.

Door No	Access to :
214 III O only	One gate valve Five fuel pressurization pressure reducing valves for : fuselage left wing and left bay right wing and right bay inverted flight accumulator pylon tanks. Restrictors in fuel tank pressurization system. AEF filters. Two pipe restrictors (RH side).
214 III D only	Fuel pressurization pressure reducing valves for : fuselage right wing and right bay left wing and left bay inverted flight accumulator. Electrically operated air conditioning valve (4H). Air conditioning pipes. Fuselage suction relief valve. Brake chute control. Rudder control cables. Pressure relief valve box. Restrictor. Auto-command box mount. *On door :* Armament box. (CAUTION) To remove this door, disconnect armament box connectors through door 679.
215 LH-RH	Allow access to sealing doors of forward fuselage tanks. Transfer level valves of pylon fuel tanks, in forward fuselage tanks. Upper cross-feed adapter between forward and rear fuselage tanks.
216 LH-RH	Allow access to sealing doors of rear fuselage tanks. Upper attachments of gauges in rear fuselage tanks. Upper cross-feed adapter between forward and rear fuselage tanks.
217 LH-RH	Allow access to sealing doors of rear fuselage tanks. Transfer level valves of wing tanks and gun bay tank, in rear fuselage tanks.

Door No	Access to :
218 LH-RH *III O only	*Left hand* No. 1 system hydraulic reservoir. Hydraulic system pressurization inlet. *Connector of level detection capacitor. *Right hand* No. 2 system hydraulic reservoir. Crash tool kit.
219	Adjustment plates of undercarriage hydraulic uplocks.
220 LH-RH	LH and RH (see also 268 LH and RH — 258 LH and RH) Manual opening and control linkage of undercarriage door locks (see doors 265 LH and RH). Front wing spar-to-fuselage attachment (frame 20). Pressure transmitter of servo-control system. Connection of wing-to-fuselage hydraulic pipes (wheel brakes and airbrakes). *Left hand* Microswitch (Door 258). Junction of DC/AC ground power receptacles. *Right hand* Junction of No.1/No.2 hydraulic system ground connections. No.2 system pump hydraulic feed filter.
221 LH	Pneumatic detector. Afterburner relay box. Afterburner ignition pressure switch. High tension coil of self-contained starter.

Door No	Access to :
222 LH-RH	*Left hand* Engine main fuel control unit. Power control lever. Thrust corrector solenoid valve. Discharge solenoid valve. Dry engine fuel density corrector. Thrust corrector. Engine drain pipe. Passage for engine fuel vent pipe. *Right hand* Dry engine fuel supply pipe. Connection of bleed pipe to dry engine fuel supply pipe. *Left hand and right hand* Wing-to-fuselage attaching bolts (tightening nuts) (frame 26). Wing tank pressurization valve boxes.
223	One rudder servo-control electrical connector. One light electrical connector. One main UHF coaxial connector. Connection of the four hydraulic pipes for supply and return of the No.1 and No.2 systems. Front fin to fuselage attachment.
224 LH-RH	*Left hand* Engine centring rod Connection of cockpit air conditioning anaconda hose. Two flow injectors. *Right hand* Connection of afterburner turbo-pump air supply anaconda hose. Air filter (compressor/centre casing joint)
225 LH-RH	Engine-to-fuselage attaching pins.

Door No	Access to :
226 LH-RH	*Left hand* LH starting plug and fuel nozzle. Wing fuel transfer pressure switches. Engine pressure tappings (Pip-Pib-Pid-Pot-Pft). Dual body P2 air filter. Connection of fuel tank and hydraulic reservoir pressurization pipe. Connection of equipment air conditioning anaconda hose. *Right hand* Fuel low-pressure pressure switch. RH starting plugs and fuel nozzle. *Left hand and right hand* Installation of control screws of engine vertical positioning eccentric. Connection of drain pipes : Engine air oil Engine. Wing fuel tank pressurization test connections.
227 LH-RH	Upper surface fillets (see also 256 LH and RH) Pressurization pipe and coupling of integral wing fuel tanks.
228 LH-RH	Upper surface fillets (see also 256 LH and RH) Entry in integral fuel tanks of four elevon servo-control hydraulic feed pipes. Attachment to fuselage coupling block. Must be removed to allow removal of door 229.
229 LH	After removal of fillet 228 LH : Access to door 415 Hydraulic coupling block.
230 LH-RH	Upper surface fillets (see also 254 LH and RH). Must be removed to allow removal of doors 231 LH and RH — 234 LH and RH. Rear wing to fuselage attachments (frame 32). Upper attachments of actuating pin fittings of inboard surfaces. Wing/fuselage fuel transfer pipes and couplings. Wing/fuselage electrical connectors.

Door No	Access to :
231 LH-RH	After removal of fillets 230 LH and RH Zero resetting jacks of inboard control surface servo-controls. Inboard control surface servo-control. Protection filter of inboard control surface servo-controls. Position pick-off connectors (99C LH and 100C RH). *Right hand* Pitch transformer (97C) REMOVABLE SEALING DOORS
232 LH-RH	Access to doors 416 LH and RH. *Right hand* Afterburner ignition detection amplifier. REMOVABLE SEALING DOORS
233 LH-RH	Connection of flexible hydraulic hoses of inboard control surface servo-controls. Access to doors 417 LH and RH. Jet pipe temperature thermocouple connector boxes and disconnects (100 Y).
234 LH-RH	Removal of shafts connecting servo-controls to bell-cranks of inboard control surfaces. Opening these doors requires removal of fillets 230 LH and RH.
235 LH-RH	Fin to fuselage fillets. Fin-to-fuselage attachment at frame 30 (see also 223). Fin-to-fuselage attachment at frame 33 (see also 240 LH and RH). Rudder control cables (rudder control bell-crank actuation). Bleed drain of rudder servo-control (passage). Passage of standby UHF trailing edge antenna feeder.
236 LH-RH	Upper surface fillets (see also 249 LH and RH). Access for removal of structural boxes between inboard control surfaces and fuselage.
237 LH-RH	Wing to fuselage trailing edge fillets.
238 LH	Tail cone-to-fuselage electrical connectors (fire detectors in tail cone) (110Y).
239 LH-RH	Lower and upper tail cone attachments.
240 LH-RH	Fin to fuselage attachments (frame 36). Passage of standby UHF trailing edge antenna feeder.

Door No	Access to :
241 LH-RH	*Right hand* Standby UHF trailing edge antenna feeder. *Left hand and right hand* Brake chute control linkage.
242 LH III O only	Connector 29F and mounting surface for transfer gyro. Connector for rocket motor cut-off during engine run (33K).
244	Standby UHF trailing edge antenna.
245	Brake chute fairing (integral with brake chute container).
248 LH-RH	*Left hand* Air vent pipe outlets. General air vent. Engine compartment drain. Engine drain. *Right hand* Fuel system air vent pipe outlet. Engine oil air jet pump drain. Turbo-pump drain.
249 LH-RH	Lower surface fillets (see also 236 LH and RH) Access for removal of structural boxes between inboard control surfaces and fuselage.
251 LH III O only	Telebriefing connector.
253 LH-RH III O only	*Left hand* Standby UHF. *Right hand* Rocket motor timer 32K.

Door No	Access to :
253 LH-RH III D only	*Left hand* Main UHF transmitter (26R). Matching transformer (27R). *Right hand* Standby UHF transmitter (22R). Terminal boxes.
254 LH-RH	Lower surface fillets (see also 230 LH and RH). Wing-to-fuselage attachments (frame 32). Lower attachments of actuating pin fittings of inboard control surfaces.
255 LH-RH III O only	Rocket motor jettisoning initiators, or dummy squibs in rocket motor bay fuel tank version.
256 LH-RH	Multi-piece lower surface fillets (see also 227 and 228 LH and RH). Air vent pipe couplings. *Left hand and right hand* Manual control of refuelling and vapour-relief valves (see also 257). *Left hand* Telebriefing matching box.
257 LH-RH III O only Connector of telebriefing matching box.	*Left hand* Manual control of gun bay tank refuelling and vapour-relief valve. *Right hand* Engine manual refuelling control. Test connectors to : Rocket motor jettisoning initiators (120Y) Telescopic shaft squib (119Y).
257 LH-RH III D only	*Left hand* Manual control handle of front bay tank refuelling and vapour-relief valves. *Right hand* Engine manual refuelling control.

Door No	Access to :
258 LH-RH	(see also doors 220 LH and RH). *Left hand* Removal of junctions. AC and DC ground power receptacles. 'Door closed' indicating microswitch. Ground telephone connector. *Right hand* Removal of junctions. No. 1 hydraulic system ground power connection. No. 2 hydraulic system ground power connection. Rocket motor telescopic drive shaft (III 0 only). Lubrication (III O only).
259 III O only	Telescopic shaft microswitch. Telescopic shaft mechanism. Quick-disconnect missile power supply connectors (91Y and 92Y) and three coaxial connectors are mounted on the door itself.
259 III D only	Electro-valve (103 C) of inboard control surface zero resetting jacks (see also 439 LH). Quick-disconnect missile power supply connector (91Y) (mounted on door itself). Accelerometer sensing unit (67C).
260	Accessory gear box. Accessory gear box filling and overflow adapters (two holes in door). Self-sealing air valve of missile cooling system (III O only).
261 LH-RH	*Left hand and right hand* Wig-O-Flex coupling of wing/gun bay tank fuel transfer pipe. *Left hand* Electrically-operated valve (servo-control emergency shut-off system) (13C). DC generator. Utility system shut-off valve. Utility system filter. *Right hand* Alternator. Alternator filling and overflow adapters. Rocket motor jettison box (121Y) — (III O only) No. 2 system hydraulic pump. No. 2 system anti-vibration accumulator.

Door No	Access to :
263	*Left hand and right hand (hydraulic systems)* Main undercarriage doors. Undercarriage uplocks (see also 219 LH and RH). Fixed point of lateral jacks. Pressure transmitter in No.1 and No.2 servo-control systems (see also 268 LH and RH). Servo-control hydraulic feed filters. Main undercarriage door actuating jacks. Main undercarriage door locks. Grounding connectors. *Left hand* Throttle control.
264	Attachment of four-way coupling (see also 267). Fuel shut-off valve. Fuselage drain. Radar accelerometer.
264A	Missile connector (122Y). Fuel dump valve. Pylon tank and trim bomb pylon jettisoning.
265 LH-RH	Manual opening of main undercarriage doors on ground (safety microswitch).
266 LH-RH	*Left hand* Fuel gauge in rear fuselage tank (with 132 U.K. Gal. (600 litres) warning device) (27Q). *Right hand* Fuel gauge in rear fuselage tank (with 132 U.K. Gal. (600 litres) warning device) (26Q). *Left hand and right hand* LP pumps in rear fuselage tanks. Bleeds on pumps. LP pump interference suppressors and built-in LP pump flow balancing rheostats.
267	Four-way coupling in two-way fuel system from LP pumps (See also door 266) with non-return valve. Gun bay tank fuel transfer valve (22Q). Rear fuselage/gun bay tank transfer block. Connection of gun bay tank filling hose. Pressure switch of gun bay tank fuel transfer indicating system (37Q). Interconnection valve between rear fuselage tanks. TACAN antenna selector. Belly tank non-return valve and self-sealing valve.

Door No	Access to :
268	(See also 220 LH and RH). Front wing spar to fuselage attachment (frame 20). Servo-control system pressure transmitter (see also 263 LH and RH). Main undercarriage door manual opening handle (see also 265 LH and RH). Pylon tank supply pipe couplings. Connections of fuselage/wing hydraulic pipes (wheel brakes and airbrakes).
269	Gun pack (connectors 98Y) or gun bay fuel tank.
270 LH-RH.	Fuselage/wing bell-crank lever of servo-control linkage. Front wing to fuselage attachment (frame 17). Pylon tank pressurization pipe couplings.
271 LH-RH III O only	*Left hand* Contactor box. Connector (117C) on roll stabilizer follow-up. Connector (135C) on linkage servo-control electro-valve. Roll control rod. *Right hand* Shock-cone amplifier box (46C). Shock-cone contactor box (Connector 105Y). Accumulator in utility system (charging). Pitch control rod. *Left hand and right hand* Cup stops (frame 15) of roll and pitch control linkages (see also 657 and 559).
271 LH-RH III D only	*Left hand* Battery box. Contactor box. Supports of connectors (57Y) contactor box and (52Y) battery. Throttle control clamp. *Right hand* Utility system accumulator (charging connector). Shock-cone slaving box (46C). Shock-cone contactor box (connector 105Y). Connector 137Y. *Left hand and right hand* Mixer mechanism output bell-crank and rod. AEF filter.

Door No	Access to :
273 III D only	Hydraulic pipe coupling block. Electro-distributors : Undercarriage. Undercarriage doors. Airbrakes Emergency control slide-valves. Pylon tank and inverted flight accumulator pressurization WIG-0-FLEX couplings. Roll control bell-crank. Pitch control bell-crank. Mixer mechanism. Undercarriage emergency system restrictor valve. Inboard control surface input position pick-offs (98C — LH and RH). Pitch stop microswitch (110C). Front bay fuel tank vapour relief valve. Hydraulically controlled distributor.
274 LH-RH	Locking of gun barrels to gun pack
277 LH-RH III O only	*Right hand* Accumulator in utility system. Pitch linkage servo-control protection filter. Double feed valve (connector 111C). Undercarriage pressure transmitter (6C). *Left hand* Pressure reducing valves (roll). Flasher connector. Light resistor box connector. Roll-linkage servo-control protection filter.
277 LH-RH III D only	*Left hand* Light resistor box (17L) and flasher mechanisms (12L). Gun blast tube. Throttle control passage. *Right hand* Utility system accumulator front attachment. Hydraulic pipes. Gun blast tube.
280	IFF antenna.

Door No	Access to :
	Front web assembly
281 282 283	Safety valve.
III O only	Pressure reducing valve.
	Evaporator.
	Radar heat-exchanger.
	Cockpit and canopy seal pressure test connections.
	Cockpit and canopy seal pressurizing connections.
	AEF filter in cockpit and canopy seal pressurizing system.
	Non-return valve in cockpit and canopy seal pressurizing system.
	Altitude switch (post-mod 180).
	Left hand web assembly
	Cockpit air conditioning system heat exchanger.
	Undercarriage and door uplock.
	Undercarriage door control linkage.
	Electrically operated hot air control valve (4H).
	Cockpit temperature control valve (9H).
	Undercarriage and door emergency distributor.
	Cockpit air conditioning system hot air control valve (8H).
	Landing light boxes.
	Ground alert selector switch.
	Ground conditioning connector.
	Right hand web assembly
	Equipment air conditioning system heat-exchanger.
	Oscar valve.
	Dash-pot filter.
	Equipment air conditioning system temperature control valve.
	Oscar filter.
	Four pitot static system bleeds.
	Radar conditioning system AEF filter (post-mod 213).
	Radar absolute pressure regulator.
	Top wall
	Shock-cone actuator, reduction gear and transmission.
	Two turbo-refrigerators (LH : cockpit air conditioning; RH : equipment air conditioning).
	One brake pressure transmitter (7C).
	Undercarriage pressure transmitter connector GC.
	Emergency brake/parking brake distributor (post-mod 237).
	Oscar system protection filter.

Door No	Access to :
	Rear structural box
281 282 283	Emergency brake accumulator (on top wall).
III D only (Cont)	Generating unit, including : Double braking pressure control electro-distributor Two brake pressure reducing relay-valves.
	Doppler radar transmitter-receiver (post-mod 329).
	Doppler radar test connector (44F).
	G-recording indicator (pre-mod 329).

Door No	Access to :
	FORWARD
281 282 283 III D only	Undercarriage leg attachment fitting and pin.
	Pressure seal system pressure reducing valve, safety valve and non-return valve.
	Bleeds and pressure connections.
	RIGHT HAND SIDE
	Between frames 10 and 12
	Wheel brake system including : Two pressure reducing relay valves. One electro-distributor (connector 41G). Coupling blocks.
	Landing light box with connector 81Y.
	Between frames 12 and 0.
	Nose undercarriage truss and jack attachment.
	Pipes and coupling blocks.
	Undercarriage door hinge fitting and door jack.
	Oscar valve.
	Support of connector 122C (NA dynamometer).
	Between frames 0 and 15
	Pressure relief valve (wheel brakes).
	Emergency wheel brake distributor.
	Pitch pre-servo with connector (107C).
	Pitch servo-control dual feed valve (111C).
	Dash-Pot filter.
	Pitch pre-servo protection filter.
	Cabin pressurization system bleed.
	LEFT HAND SIDE
	Between frames 10 and 0
	Truss attachment.
	Nose undercarriage door manual unlocking control.
	Front undercarriage door lock.
	Microswitch connectors 14G,24G,18G1,6G and 10G.
	Roll trim actuator (22C).
	Undercarriage door actuating jack attachment.
	Undercarriage door control.
	Grounding connectors 1XY, 2XY, 5XY, 6XY, and 7XY.
	Speed-sensitive capsule (52G).

Door No	Access to :
	Between frame 0 and 15
281 282 283 III D only (Cont)	Rear undercarriage door lock.
	Brake chute control attachment clamp.
	Undercarriage and door emergency distributor with connector (2G).
	Emergency brake accumulator.
	Roll pre-servo.
	Roll pre-servo protection filter
	Throttle control bulkhead connection.
	Support of connector (18G2).
	Roll pre-servo.
	Pressure reducing valves.
	AFT OF FRAME 0
	Oscar valve filter.
	Pipe coupling blocks.
	Supports of connectors 59C and 60C.
	Grounding connectors 4XY, 11XY, 12XY and 10XY.
	Auto-command emergency disengage electro-valve (135C).
	Front attachment of shock-cone actuator/ reducing gear unit.
	Air conditioning pipes.
	TOP WALL
	Supports for connectors 26L LH and RH.
	Undercarriage uplock.
	Undercarriage pressure transmitter (6C).
	Wheel brake pressure transmitter (7C).
	Undercarriage door actuating jack.
	Shock-cone actuator/reducing gear with rods.
	Canopy actuator disengage handle.
	REAR BOX — FRAME 15
	Battery.
	Battery ventilating pipe.
	Inverted flight accumulator (lower part).
	Oxygen cylinders (lower part).
	Electric cables.
	Hydraulic pipes.
	Hydraulic power unit.
	Rear attachment of roll and pitch pre-servo
	Connector 108C (auto-command output position pick-off).
	Central box.

Door No	Access to :
287 III O only	Access to nose undercarriage attaching pins (see also 203 LH and RH).
288	(On door 212 — LH only) DC test connector (37P). REMOVABLE SEALING DOOR
289	Afterburner turbo-pump air outlet. Removal of No. 1 hydraulic system pump from engine. No. 1 hydraulic system anti-vibration accumulator. Centrifugal speed detector (regulation).
291	Ionisation probe.
652 LH III O only	Attachment of electric actuator (roll trim).
653 LH-RH III O only	Fixed points of roll and pitch linkage servo-controls.
654 III O only	Pitch control bell-crank. Pitch potentiometer connector. Pitch stop microswitch (110C).
655 LH-RH III O only	*Left hand* Rod pivoting point on roll control bell-crank. *Right hand* Rod pivoting point on pitch control bell-crank. Temperature probe connector (61C). Pitch stop microswitch.
656 III O only	Pivoting points of flight control rods on mixer mechanism. Connector 98C of double potentiometer of inboard control surface servo-controls. Wig-O-Flex couplings in pylon tank pressurization system. Equipment temperature control system connector (135Y).
657 LH III O only	Axle-pin of flight control mixer mechanism. Cup stop of roll control linkage.

Door No	Access to :
658 LH-RH	*Left hand* Brake chute control linkage. Brake chute shackle and hook. *Right hand* Brake chute shackle and hook. Standby UHF trailing edge antenna connector.
659 LH-RH	*Left hand* Brake chute control bell-crank. *Right hand* Brake chute container attaching pip-pin. Passage of standby UHF antenna feeder.
660	(In door 214) Anti-radioactive dust filter (cockpit air conditioning — NOT INSTALLED)
661 III O only	Fatigue-meter meters box.
662 LH-RH	Coupling block of inboard control surface servo-control pipes.
664	Doppler radar antenna (54F). Waveguide.
665	Cockpit fresh air supply scoop. Five aircraft/radar electrical connectors. Connections of two radar conditioning pipes. One fuselage/radar (missile) coaxial connector. One radar pressurization coupling. One total pressure head coupling (to SFENA auto-command box). CYRANO II radar filter. Pitot static system bleed.
670 III D only	Pitot static line fairleads and nose cone/pitot boom couplings. Heat-exchanger clamps. Heat-exchanger duct clamps. REMOVABLE SEALING DOOR

Door No	Access to :
671 LH-RH III D only	*Left hand and right hand* Front/rear pitot static line connection couplings. Pitot static line fairlead *Left hand* Gate valve with connector (9H). Temperature control valve with connector (8H). Turbo-refrigerator pipe connection clamp. Front LH attachment of evaporator (after removal of venturi). *Right-hand* Connector 12Y (pitot-boom) — front section/rear section connection. Turbo-refrigerator. REMOVABLE SEALING DOORS
672 LH III D only	Venturi. REMOVABLE SEALING DOOR
673 LH III D only	TACAN transmitter-receiver (37R). TACAN antenna selector (42R). Missile guidance coder power supply unit (57A). Missile guidance modulator transmitter (58A). Duct temperature sensing unit (6H). Electrical connectors 1Y, 2Y and 8Y. Coaxial connectors : TACAN (70R), Missile (121A) and IFF (9S). Incidence probe connector (12F). Water separator. Two pitot static hose connector supports. Non-return valve and connecting clamp on valve/water separator duct. P2 air inlet duct connecting clamp. REMOVABLE SEALING DOOR
674 LH III D only	Connection of flexible and rigid pitot static lines. IFF coaxial connector (9S). Electrical connectors 1Y and 2Y (see also 673). REMOVABLE SEALING DOOR

Door No	Access to :
675 LH-RH III D only	*Left hand* Altitude-switch (24H). Slaved valve. Pitot static lines. *Right hand* Pressure regulator. Canopy external jettisoning control bell-crank. Oxygen line (filling). Battery ventilating plastic pipe. *Left hand and right hand* Pressure relief/vacuum relief valve. REMOVABLE SEALING DOORS
677 LH-RH III D only	Servo-control amplifier box (82C). Inverted flight accumulator. Sealing door of upper compartment housing two oxygen cylinders. Anti-g valve supply pipe. Brake chute control clamp. Air conditioning pipes. *Left hand* Pre-flight test connector (105C). Servo-control box conenctors (82C J1, 82C J2, 82C J5, 82C J7 and 82C J3). Three fuel pressurization connections (one pressurizing connection and two inverted flight accumulator and fuselage tank test connections). *Right hand* AC detector box (3V). REMOVABLE SEALING DOORS
678 III D only	Servo-control box mount. Inverted flight accumulator. Sealing door of upper compartment housing two oxygen cylinders. Air data computer output multiplier box (with connectors 2CD, 2CC and 2CE). REMOVABLE SEALING DOOR

Door No	Access to :
679 III D only	(In door 214) Auto-command amplifier box (with connectors 120C). Armament box connectors (62Y, 95Y, 93Y and 61Y). REMOVABLE SEALING DOOR
680 RH III D only	Front RH attachment of evaporator. Evaporator filling point.
681 III D only	IFF coding transmitter (7S). Connector 12Y (front section/rear section connection). Missile guidance antenna filter (59A). Accelerometer (68C). Ground conditioning connection. TACAN ventilation and environment nozzle. Rear venturi duct. Water separator front connection.
682 III D only	Pitch control bell-crank. REMOVABLE SEALING DOOR
683 III D only	Pitot static bleed system and canopy seal inflation system lines. Three coaxial connectors.
684 III D only	Roll control bell-crank. Throttle control bulkhead connection. REMOVABLE SEALING DOOR
685 LH-RH III D only	*Left hand* Nose undercarriage pivot. Roll control rod. Throttle control clamp. *Right hand* Nose undercarriage pivot. Pitch control rod.
686 LH-RH IIID only	*Left hand* Roll control bell-crank. Throttle control. *Right hand* Pitch control bell-crank. Flexible and rigid pipe coupling block.

Fin Access Doors (refer to Figs 3-2,3-3,3-4, and 3-5)

303. Access to equipment and fittings in the fin is gained through the doors listed below and shown in the referenced Figures.

300	Standby UHF leading edge antenna coaxial connector. Main UHF fin tip antenna coaxial connector. Navigation lights electrical connector.
301	Rudder control transformer. Rudder control system input inductive pick-off (92C).
302.	Rudder linear trim actuator. Rudder AFU. Releasable bell-crank electro-valve. Rudder control system input follow-up.
303	Incoming control cable bell-crank. Control linkage to releasable bell-crank.
304	Rudder control cable bell-crank : AFU control Releasable bell-crank pivot pin.
305	Head of releasable bell-crank pivot pin.
306	Head of releasable bell-crank control pin.
307	Head of rudder servo-control fixed point axle pin.
308	Servo-control, releasable bell-crank and electro-valve protection filter. Lights, electric cables and UHF antenna feeders.
309	Standby UHF leading edge antenna feeder connector.
310	Head of servo-control jack axle pin.
311	Pivot pin of servo-control actuated bell-crank.
312	Standby UHF leading edge antenna.
313	Rudder actuating bell-crank. Bell-crank actuating rod. Rudder actuating rod.
314	Pivot pin of rudder actuating bell-crank.

Door No	Access to :
315	Shackle attachment. Rudder actuating rod.
317 LH-RH	Navigation lights.
318	Main UHF fin tip antenna.
319	Removal of rudder centre bearing tapered pin (rudder removed).
320	Main UHF fin tip antenna feeder connector.
321	Actuating bell-crank in fin.
322	Rudder servo-control. Rudder release bell-crank and connector. Output follow-up (angular position detector). First bell-crank after rudder servo-control.
350	Fairing (tail warning radar not installed).
352	SPERRY flux valve.

Internal Access Doors (refer to Figs 3-6,3-7 and 3-8)

304. Access to internally installed equipment and fittings is gained through the doors listed below and shown in the referenced figures.

410	Brake chute control. Rudder control cables. Antenna feeder. Rilsan static pressure tube for pressure reducing valves. Wing tank pressurization pipes and couplings. General air vent. Hydraulic reservoir pressurization system.
411	LH and RH wing tank mechanically operated air vent valves. Filter and non-return valves of wing tank pressurization system. Rudder control cables. Brake chute Teleforce flexible control.
412	Rudder control cables. Support brackets of rudder control cable pulleys forward of frame 28. Brake chute control.
413	Support brackets of rudder control cable pulleys at frame 31. Fin to fuselage attaching bolts at frame 33. Passage of brake chute control. Antenna feeder connector.

Door No	Access to :
414 LH-RH	*Left hand* Clamping plates of hydraulic pipes to fin. *Right hand* Couplings of rudder servo-control hydraulic feed pipes.
415	Engine/afterburner pipe junction (sealing check). Afterburner ignition fuel nozzle. Pressure pick-offs (Pip and Pib) on afterburner pressurizing and dump valve.
416 LH-RH	*Left hand* Upper jet pipe temperature thermocouple. Possible installation of P4 pressure pick-offs. *Right hand* Ionization probe power supply. Upper jet pipe temperature thermocouple.
417 LH-RH	*Left hand* Lower jet pipe temperature thermocouple. Possible installation of P4 pressure pick-offs. Hydraulic coupling block. *Right hand* Lower jet pipe temperature thermocouple.
418	Fin to fuselage main attaching bolts (Frame 33). Passage of brake chute control.
419	Adjustment of brake chute control linkage.
427	Inverted flight accumulator feed pipe. Gun bay fuel tank air vent pipe. Gun bay fuel tank vapour-relief valve Teleflex control and turnbuckle.
428 LH-RH	Front fuselage fuel tanks. Drop tank check valves (removable in case of front tank replacement). SEALING DOORS
429 LH-RH	*Left hand and right hand* Fuel pipe from pylon tanks (Wig-O-Flex coupling). Hydraulic pipes (wheel brakes, undercarriage and doors, servo-controls and airbrakes). *Right hand* Gun pack connector (89Y).

Door No	Access to :
430 LH-RH	*Left hand* Starting box with its connector. Afterburner electrical connector. Accessory gear box drive (telescopic shaft). Engine control (Teleforce conduit). No. 1 hydraulic system reservoir and filter. Engine pressure pick-offs. No. 1 hydraulic system reservoir drain valves. Afterburner fuel control unit and single-lever control box. *Right hand* Engine oil tank filler ports. Afterburner fuel supply system. Engine and LABAVIA box electrical connectors. No. 2 hydraulic system reservoir. Turbo-pump. Turbo-pump filter. Afterburner electrically operated valve. No. 2 hydraulic system reservoir drain valves. Afterburner and dry engine fuel system bleed (the latter connected through door 222 RH). No. 1 hydraulic system pump. Afterburner HP pressure pick-offs on afterburner filter. Afterburner fuel filter. Fuel flowmeter. Fuel/FHS fluid double heat-exchanger. Centrifugal speed detector (regulation). *Left hand and right hand* Accessory gear box attaching pins (clamping nuts).
431 LH-RH	*Left hand and right hand* Airbrake actuating jack. *Left hand* Emergency hydraulic system electric pump. Emergency pump suction filter. Emergency hydraulic system pipes with non-return valve and pressure relief valve. *Right hand* Interconnection relay box. LH and RH fuel gauge amplifier. Fire detection box.
432 LH-RH	Bearings of airbrake hinge pins and airbrakes actuating jack axle pins. (Includes doors 580.)

Door No	Access to :
433	Hydraulic pipe bundles. Telescopic shaft squib. (Removing this door requires uncoupling of engine compartment drain pipe — see also 439 LH). REMOVABLE SEALING DOOR
434 LH-RH III O only	Gas feeding system of front rocket motor ejector. Access to front rocket motor ejector. (Fitted to III D but not used.)
435 LH-RH	Actuating bell-crank of elevon servo-control slide-valve and sealing of linkage passage.
436 LH-RH III O only	Rocket motor ejector. Gas feeding system of rocket motor ejector and three-way coupling. Fitted to III D but not used.
437 LH-RH	*Left hand* Drain pipe of inboard control surface servo-control. *Left hand and right hand (III O only)* Rocket motor ejector. Gas feeding system of rocket motor ejector three-way couplings.
438 III O only	Attachment of pipes to jettisoning initiators. (Fitted to III D but not used.)
439 LH-RH	*Left hand and right hand* Sealing door for rocket motor version. Non-sealing door for rocket motor bay version. Fuel coupling for mission change over. *Left hand* Quinson and Wig-O-Flex couplings of transfer system. Engine drain pipe. Electro-valve of neutral resetting jacks of inboard control surface servo-controls. (103C) Gun bay tank refuelling valve. *Right hand* Quinson and Wig-O-Flex couplings of transfer system. Bleed screw of engine air/oil drain pipe.

Door No	Access to :
440 LH-RH	Hydraulic pipes. Quinson and Wig-O-Flex couplings.
441 LH-RH	Rear fuselage fuel tanks (removable in case of rear fuel tank replacement). SEALING DOORS
442	Coupling of gun bay fuel tank transfer pipe (sliding door).
443	Gun bay tank flexible refuelling pipe.
444 LH-RH	*Left hand and right hand* Bell-crank to wing control linkage. Hydraulic pipe bundles (wheel brakes, undercarriage and doors, servo-controls and airbrakes).
452 LH-RH	Clamping plates of hydraulic pipes to fin. Couplings of rudder servo-control hydraulic feed pipes.
501 III D only	Rudder control pedal assembly. LH and RH forward quandrants rudder control pedal assembly (pinning) with stops. Turnbuckle and pulleys of rudder control synchronizing cable. Ram air valve. Warning horn (7Z). Cabin temperature servo-amplifier (5H). Adhemar incidence indicator amplifier (11F). Horizon inverter (16F). PHI coupler box. Brake pressure transmitters. Passage of : Emergency brake control. Emergency undercarriage control. Pitot static lines. Manually-controlled canopy demisting valve. SEALING DOOR
502 III D only	Emergency undercarriage control. Dual flasher mechanism (53G). Pitot static line. Air conditioning pipe.

Door No	Access to :
503 III D only	Emergency brake control. Ram air control. Ram air valve pipe. Brake pressure transmitter hydraulic pipes. Passage of control cable of manually-controlled canopy demisting valve. Pitot static line fairlead. Electric cable attaching clamp.
504 III D only	Emergency undercarriage control. Air conditioning pipe.
505 III D only	Emergency brake control. Ram air control. Pitot static line fairlead. Electrical connector 26Y (150 VA inverter).
506 III D only	Pitot static line. Senit flasher mechanism (32G) (on the door). Three electrical connectors with support.
507 III D only	Emergency brake control. Failure warning panel. Hydraulic pressure indicator and pressure selector switch. Switches : battery, generator, alternator, inverter, warning horn, probe heater and gyro centre. Ram air control.
508 III D only	Undercarriage control switch. Shock-cone control. Auto flight function control panel. Pitch, Yaw, Auto-command and Alt. pushbuttons. Auto-command gain control switch.

Door No	Access to :
509 III D only	TACAN control unit. Oxygen control panel. Guns, rockets, bombs and missiles safety switches. Cockpit temperature control panel. Gyro centre control unit. Missile control stick. Pitot static line fairlead. Emergency brake control straight coupling. Passage of ram air control.
510 III D only	Main UHF control unit. Undercarriage uplock synchronizing control. Roll control rod bell-crank. Air conditioning pipe. Pitot static line. Emergency undercarriage control.
511 III D only	Armament control unit. Missile control stick. Pitch control bell-crank (control stick output) and rod. Control stick balancing spring. Pitot static, hydraulic and oxygen lines. Electrical connectors for canopy control (28Y) and helmet visor demisting (44Y).
512 III D only	Power control quadrant assembly. Throttle control lever synchronizing rods. Standby UHF control unit. Emergency fuel control unit control switch. Pitch, roll and rudder trim indicator lights. Range setting unit. PHI lighting rheostat. Missile volume control knob. Missile/TACAN selector switch. Rudder trim switch. Passage of roll control rod, undercarriage uplock synchronizing control, emergency undercarriage control, pitot static and air conditioning lines.

Door No	Access to :
513 III D only	PHI station storage unit. IFF control unit. Circuit breaker box. Emergency brake control clamps. Pitot static, hydraulic and oxygen lines. Pitch control bell-crank and synchronizing rods. Pitch auto-command dynamometer. Pitot static, hydraulic and oxygen lines.
514 III D only	Lighting rheostat box. Switches : fuel shut-off cock, after-burner cock, LP pumps and airbrakes. Starting control. Ignition/Ventilation control. Passage of : throttle control, throttle control lever synchronizing rods, undercarriage uplock synchronizing control, emergency undercarriage control, air conditioning pipe and roll control rod.
515 III D only	Pitch control bell-crank. Front attachment of pitch AFU to bell-crank. Rear attachment of fork-end to auto-command dynamometer. Passage of pitch control synchronizing rod. Pitot static line tee-couplings. Clamp on cables of connectors 32Y, 34Y and 36Y (circuit breaker box).
516 III D only	Roll control bell-crank. Passage of : Anti-G valve, oxygen, air conditioning, and pitot static lines. Throttle control lever synchronizing rods. Throttle control. Undercarriage uplock synchronizing control. Emergency undercarriage control.
517 III D only	Pitch AFU Pitch control synchronizing rod bell-crank. Emergency brake control. Pitot static and hydraulic lines. Electric cable attaching clamp. Emergency brake control tangent box.

Door No	Access to :
518 III D only	Throttle control lever synchronizing rod bell-crank. Passage of : Roll control synchronizing rod. Undercarriage uplock synchronizing control. Emergency undercarriage control. Canopy actuator disengage control. Anti-G valve, oxygen and pitot static lines. Electric cable attaching clamp.
519 III D only	Pitch trim jack with connector (130C). Pitch control bell-crank and rod. Rear attachment of pitch AFU Emergency brake control box. Passage of pitot static and hydraulic lines.
520 LH-RH III D only	Door in air intake duct accessible through door 208 : Rudder control bulkhead connection and pulley.
521 III D only	Oxygen control panel with connector (219H). Cockpit air conditioning control panel. Helmet visor demisting control switch. Helmet visor demisting connector (244Y). Pitch control bell-crank (rear cockpit control stick output). Passage of emergency brake control. Passage of pitot static lines.
522 LH-RH III D only	Door in air intake duct accessible through door 208. Shock-cone control bell-crank.
523 III D only	Gyro centre power supply amplifier with connectors 25 FP2, 25 FP3 and 25 FP4. Fuel tank unit amplifier connectors (48Q and 49Q). Lighting transformer (42 L). Rear cockpit control stick connector (235Y). Emergency brake control straight coupling.
524 III D only	(On the door) : connectors 6G, 10G and 22C. Roll Amedee bell-crank. Roll control bell-crank and rod. Front attachment of roll trim actuator. Intermediate bell-crank between roll AFU and trim actuator. Pitot static line clamp.

Door No	Access to :
525 III D only	Door accessible through door 678. Oxygen cylinder five-way couplings. SEALING DOOR
526 III D only	Roll trim actuator. Amedee bell-crank/roll linkage servo-control connecting rod. Pitot static line bulkhead connection.
527 LH-RH III D only	*Left hand* (On the door) : Connectors 14G, 18G1 and 24G. Roll AFU Roll control rod. Pitot static line coupling. *Right hand* Dash-pot jack. Pitch control rod.
528 III D only	Anti-G valve line. Brake chute Teleforce flexible control. Throttle control lever synchronizing rods. Roll control rod. Canopy jettisoning line. Oxygen line. Canopy actuator disengage control. Electric cables.
529 III D only	Pitch Amedee bell-crank. Dynamometer.
530 LH-RH III D only	Lower attachment of intermediate windshield.

Door No	Access to :
532 III D only	Standby UHF control box (223R). Ministop anti-skid system control switch (234G). Throttle lever connector (241Y). Throttle control lever synchronizing rods. Roll control bell-crank (rear cockpit control stick output). Passage of : Brake chute control. Canopy jettisoning line. Throttle control. Emergency undercarriage control. Canopy actuator disengage control (one clamp). Anti-G valve, oxygen and pitot static lines (one clamp). Electric cable attaching clamp.
533 III D only	Bleeding and air vent device of wheel brake energisation system (rear cockpit).
535 III D only	Lighting resistor chassis with connector (19Y). Lighting transformer (242L). Lighting resistor boxes (6L and 206L). Fuel tank unit amplifiers (48Q and 49Q). Rear cockpit control stick connector (237Y). Emergency brake control bulkhead connection. Pitot static and oxygen lines.
536 III D only	Oxygen cylinders. SEALING DOOR
538 III D only	Radio selector box (203R). Rudder trim switch and indicator light. PHI lighting rheostat (241L). Cockpit lighting rheostat. Pitch and roll trim indicator lights. Fuel shut-off cock and afterburner cock control switches. Power control quandrant with synchronizing rods. Brake chute control. Canopy actuator disengage control. Emergency undercarriage control. Anti-G valve, canopy jettisoning, oxygen and pitot static lines. Electrical cable attaching clamp.

Door No	Access to :
540 III D only	*On the door :* Attachment of anti-G valve. Connectors 202L, 231Y and 238Y. Oxygen, pitot static, anti-G valve and canopy jettisoning lines. Canopy actuator disengage control. Electric cables. *In the boss :* Passage of brake chute control. Emergency undercarriage control bulkhead connection.
550	*Left hand* SEMCA non-return valve, cockpit air conditioning system. Control of undercarriage and door emergency distributor. *Right hand* Wheel brake control. Bulkhead couplings of hydraulic brake system pipes and cockpit pressurization pipes.
551	Pitch control. Pitch AFU (Front attachment). Oscar dash-pot jack. Pitch control rod.
552	*Left hand* Roll control, first relay with pin. Attachment of rods to roll control bell-crank. Throttle control sealed outlet. *Right hand* Pitch control, first relay with pin. Attachment of rods to pitch control bell-crank.
553 RH	*Pitch control* AMD pitch trim actuator and connection (130C). Pitch control rod. Bell-crank between trim actuator and AFU. Pitch AFU (rear attachment to above mentioned bell-crank). Pitch dynamometer fixed connector.
554	Roll control Roll trim actuator and connector (22C). Roll AFU (front attachment). Passage of roll control rod. Passage of throttle control.

Door No	Access to :
555 RH	*Pitch control* Pitch Amedee bell-crank. Dynamometer.
556 LH	*Roll control* Bell-crank before Amedee bell-crank. Roll AFU (rear attachment to bell-crank). Roll control rod (rear attachment to bell-crank.) Nose undercarriage lock connector. Passage of throttle control.
557	*Right hand* Outlet duct of equipment air conditioning heat-exchanger. *Left hand* Outlet duct of cockpit air conditioning heat-exchanger.
558	Roll Amedee bell-crank. Passage of throttle control. Bell-crank and Teleforce flexible control of nose undercarriage door hook opening system.
559	*Left hand* Hydraulic pipe couplings. Roll linkage servo-control. *Right hand* Pitch linkage servo-control. Hydraulic pipe couplings. *Left hand and right hand* Cup stops (frame 15) of roll and pitch control linkages. Hydraulic couplings.
560 LH-RH	*Right hand* Fixed point of pitch linkage servo-control. Pitch control dynamometer. Outlet of equipment air conditioning heat-exchanger. *Left hand* Fixed point of roll linkage servo-control. Roll control rod. Outlet of cockpit air conditioning heat-exchanger. Passage of throttle control (pressure sealed tube).
561 RH	Pitot static system. Fresh air control.
562 RH	Electrical connectors. Air conditioning system.
563	Failure warning panel. Parking brake handle. Hydraulic pressure indicator and pressure selector switch. Inverter, audio warning horn, probe heater/ incidence indicator and tail warning radar switches.
564 RH	TACAN control unit. Oxygen control panel. Cockpit temperature control panel. Guns, rockets, bombs and missiles safety switches. Gyro centre control unit. Missile control stick.
565 RH	Pitch control rod and AMD dynamometer. Radar/armament control unit.
566 RH	PHI control unit. IFF control unit. Circuit breaker boxes. Electrical connectors. Bombs and LABS switches.
567 LH	Passage of emergency undercarriage control. Passage of throttle control. Switches : Lighting panel, Afterburner, Fuel shut-off valve, LP pumps, Starting control, Ignition/ Ventilation and Radar pre-warning. Radar control stick. Roll control rod.
568 LH	Throttle control. Standby UHF control unit. Radio selector box. Passage of emergency undercarriage control. Pitch, roll and rudder trim indicator lights. Roll control rod. Missile volume control knob. Rudder trim switch. Emergency regulation control switch (see also 592)
569 LH	Main UHF control unit. Roll control rod bell-crank. Cockpit air conditioning pipe.

Door No	Access to :
570	*Behind the door* Rudder control pedal assembly. LH and RH forward quadrants of rudder control pedal assembly (rudder bar stops). Fresh air valve. Cockpit temperature amplifier. Brake pressure transmitters. Pitot and static pressure lines. Emergency brake control. Emergency undercarriage control. Radar scope. Cockpit armament box. Rudder pedal cable turnbuckle. *On the door* Radar noise suppressor (Mod 179). SEALED DOOR
571 LH	Undercarriage control switch. Shock-cone control. Automatic flight function panel. Pitch, Yaw, Auto-Command, Alt. and Mach pushbuttons. Emergency undercarriage control. Auto-command gain control switch. Fuel dump pushbutton.
572 LH	SENIT flasher of undercarriage position indicating system (on the door). TEAM Amplifier. TEAM Filter.
573 LH	Emergency undercarriage control. Equipment temperature amplifier.
574	Oxygen cylinder compartments. SEALED DOOR
575 LH	Electrical wiring. Demisting pipe.
576 RH	Hinged door for access to both integrated maintenance test connectors.
577 RH	Electrical wiring protective cover.
580 LH-RH	*On doors 434 LH and RH* Airbrake actuating jack grease nipple.
581 LH	Static pressure inlet of approach speed regulation system.
584	Hinged door for access to test connector of temperature control system (Mod 322).
592 LH	*On door 568* Access to throttle lever microswitches (Mod 614).

Gun Bay and Rocket Motor Bay Access Doors (refer to Fig 3-9)

305. Access to equipments and fittings in the gun bay and rocket motor bay is gained through the doors listed below and shown in the referenced figure.

460 LH-RH	Recovery of links from guns. *Left hand and right hand* Gun pack front and rear attaching screws. Access to guns.
461 LH-RH	*Left hand* LH gun power supply connector. Hoist drive. Instruction plate. *Right hand* Gun power supply connector. General power supply connector for LH and RH guns.
462 LH	Link ejection chutes. Rear gun pack hoisting cables.
463	Front gun pack hoisting cables and hoist.
464 LH-RH	Quick-release couplings of rocket motor bay tank fuel system.
465 LH-RH	Attachment of rocket motor bay tank.
466 LH-RH	Attachment of rocket motor bay tank.
467 LH-RH	Attachment of rocket motor bay tank.
470 LH-RH	Attachment of gun bay tank to aircraft fittings.
471	Pressure reducing valve. Valve box. Non-return valve. Pressurization system filter.
472	Connections : Gun bay tank air vent. Gun bay tank pressurization coupling. Gun bay tank air vent coupling (refuelling).

Door No	Access to :
473	Access to inside of gun bay tank. SEALING DOOR
474	Tank bottom valve. SEALING DOOR
475	Attachment of aircraft fuel pipe junction to gun bay tank.
578	Camera compartments in rocket motor bay (III O) or rear bay (III D). (Not installed.)
579 LH	Door with window (rocket motor bay (III O), or rear bay (III D aircraft), camera. (Not installed.)
582 LH-RH	Attachment of rocket motor bay tank, (III O), or rear bay tank (III D).

WEIGHT AND C.G. LOCATION ACCORDING TO MISSIONS

Fuel and Armament

306. For information about the fuel and armament stores which the aircraft can carry, refer to Figs 3-10 and 3-11.

Weight and C.G.

307. For weight and C.G. locations, refer to the weight sheet summary and Figs 3-12 and 3-13.

Figure 3-7 illustrates a typical utilization of the C.G. computer (clean aircraft) as well as the possible load vectors.

TYRE INFLATION

Pressure Calculation (refer to Figs 3-14 and 3-15)

308. Weight and C.G. location in the take-off configuration are the parameters used to enter the main wheel tyre inflation pressure chart. (Refer to Maintenance Manual.)

CHAPTER 4

AIRCRAFT STRUCTURE

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CHAPTER 4

AIRCRAFT STRUCTURE

WINGS

General (refer to Figs 4-1 and 4-2)

401 The characteristics of the triangular delta wings are as follows :

a. External area — 23.8 m².

b. Chord at root (theoretical) — 6.45 m.

c. Leading edge sweep angle — 66° 34′ 45″.

d. Thickness/chord ratio — 4.5 to 3.5%.

e. Anhedral — −1°.

f. Wing root setting — 0°.

g. Control surfaces :

(1) Outboard Elevon
Length — 1.606 m
Area — 1.14 m²
Maximum deflection
Angles — +13° −25° 30′

(2) Inboard Elevon
Length — 1.19 m
Area — 0.98 m²
Maximum deflection
Angles — +13° −25° 30′

(3) Inboard Control Surface
Length — 0.586 m
Area — 0.53 m²
Maximum deflection
Angles — +13° −25°

Wing Breakdown

402. The major removable and non-removable components are shown below. The wings also incorporate a number of access doors and panels which are described in Chapter 3.

a. *Non-removable components (factory assembled) :*

(1) Centre structure box :

(a) Main structure box (1).

(b) Front structure box (2).

(2) Leading edge (3).

(3) Front spar.

(4) Main spar.

(5) Rear spar.

b. *Removable components :*

(1) Elevons (4).

(2) Inboard control surface (5).

(3) Airbrakes (6).

(4) Main undercarriage door.

Description of General Structure and Stressed Components (refer to Figs 4-1, 4-2 and 4-3)

403. The low-type wing group consists of LH and RH wing planes attached to the fuselage. Each wing may be broken down into several components as follows :

a. Leading edge,

b. Main structure box,

c. Front structure box, and

d. Control surfaces.

404. The loads received by these components are transmitted to the wing to fuselage attachment fittings through a main structure formed by the following components :

a. Front spar,

b. Rear spar,

c. Rib 6,

d. Rib 3,

e. Rib 0, and

f. Main spar.

NOTE

Loads in the wings are evenly distributed.

405. **Front Spar (refer to Fig 4-3).** The front spar takes the leading edge aerodynamic loads. Three stressed zones can be distinguished as follows :

a. *Between rib 0 and main spar (Zone 1).* In addition to the aerodynamic loads A, the front spar receives the undercarriage loads B, (in front structure box) and the airbrake loads F (in front structure box). The front spar absorbs all the bending and shearing loads C. The twisting moments A, D and F are partly taken by the attachment fittings (1) and (2) on rib 0, whereas the remainder is transmitted to the main spar.

b. *Between main spar and rib 6 (Zone 2).* In this zone, the front spar is part of the main structure box. The twisting moment resulting from the aerodynamic loads A is directly transmitted to the structure box.

c. *Between rib 6 and rear spar (Zone 3).* Bending and twisting loads at point A are taken by the spar only. The twisting moment is transmitted to the main structure box.

406. **Front Structure Box (refer to Fig 4-11).** The front structure box is located between the front spar and the main spar. It accommodates the main undercarriage and the airbrakes. Because the bottom surface has large openings for the undercarriage door and airbrake panel, the structure box transmits the residual twisting loads D and F from the front spar (Zone 1) to the main spar through the upper surface.

407. **Main Structure Box (refer to Figs 4-6 to 4-10).** The main structure box comprises the front spar, rib 6, the rear spar, rib 0 and the main spar. It

receives the loads from :

a. *The front spar (Zone 2).* Twisting moment resulting from the aerodynamic loads A on the leading edge.

b. *The rear spar.* On most of its length, the rear spar is part of the main structure box. It is subject to :

(i) Reaction A from the front spar (Zone 3)

(ii) Control surface lift loads E.

c. *Rib 6.* Twisting moment resulting from the control surface reaction E.

d. *Rib 3.* Twisting moment resulting from the control surface reaction E.

e. *Rib 0.* Twisting moment transmitted by the transverse web assemblies and from the rear spar.

f. *Main Spar.* This transmits to the fuselage the bending moment and the greatest part of the wing shearing load. In flight, it receives the twisting loads transmitted by the front structure box and the main structure box ribs. On landing, it takes the undercarriage shearing loads B. The twisting loads from the main structure box are also transmitted through rib 0 and are partly taken by the rear attachment fitting G.

408. **Control Surfaces (refer to Figs 4-15 and 4-16).** There are three box structure type control surfaces on each wing, namely two elevons and one inboard control surface. Each elevon transmits a twisting moment to ribs 3 and 6 through its centre hinge fitting and a shearing load A through each of its three hinge fittings.

409. The inboard control surface includes a single hinge fitting on the wing to which it transmits a shearing load. The twisting moment is taken by the hinge fitting on the fuselage.

410. The airbrake loads are transmitted to the front spar and rib 0.

411. A leading edge slot is provided to create a vortex which prevents local separation of the boundary layer at the rear of the wing (low-speed — high angle of attack).

Non-Removable Assemblies - Main Components (refer to Figs 4-4 and 4-5)

412. **Main Spar.** The main spar (1) is a I-section light alloy drop-forging with slanting ribs (2) at the fittings (3) used for attachment to the fuselage, and vertical webs (4) provided for attachment to the main structure box ribs 0, 1, 2 and 3. A boss (5) is provided as a rear hinge bearing for the undercarriage. This bearing is blanked on the main structure box side by a sealed plug (6) which cannot be removed after assembly of the wing. Bolted to the main spar is the undercarriage fairing door support fitting (7) equipped with a fitting (8) upon which the actuating linkage rotates.

413. Pre-Mod 406. An opening (81) is provided for the front attachment of a flight control linkage sealed passage tube.

414. Post-Mod 406. The opening (81) provided for the flight control linkage sealed passage tube also provides a passage for the fuel. There is another opening (82) for the leading edge pressurization pipe to pass through.

415. **Front Spar.** The front spar (9) is a light alloy channel section drop-forging to which the leading edge is attached. It is fitted with flight control attachment fittings (10), hoist fittings (11), main undercarriage attachment fitting (12) which incorporates the front bearing as well as the support bearing of the undercarriage sequencing system sleeve and the pylon store anchor-ejector (13). A machined fork-fitting (14) near the wing root constitutes the fixed point of the airbrake actuating jack.

416. Post Mod 406.

a. From rib OBA to rib 2B, two angles are provided, (73) at the upper surface and (74) at the lower surface for attachment of the machined skin panels. These angles are attached by screws sealed with a special compound. There is no flight control hinge support in this zone.

b. On the front face, between ribs 1A and 1B, there is a screwed plug (75) for access to the airbrake fixed point. This plug is made leakproof by crushing a seal (76). The plug (75) screws to a backplate (77) bolted and riveted to the front face of the spar (9).

c. On the inner face, between ribs 3F and 4A, there is a flange (78) for the inboard elevon control linkage to pass through. This flange is screwed and locked and made leakproof by means of a special sealing compound.

417. **Rear Spar.** The rear spar (15) is a light alloy channel section drop-forging. It incorporates shackles (16) and fixed bearings (17) which ensure hinging of the inboard control surface and elevons. All the main structure box ribs are attached to the rear spar. The end section of the rear spar is machined into a fork fitting (18) (wing to fuselage rear attachment).

418. III O Only. A local reinforcement consisting of two fittings is screwed between ribs 3b and 4. This reinforcement is provided for attachment of the rear attachment fitting of the 1700 litre tank.

419. **Rib 0.** Rib 0 is formed by three distinct sections as follows :

a. *OBA.* This is a channel section drop-forging which covers the leading edge chord. It is fitted with fittings (19 and 20) used for attachment of the wing to the fuselage.

b. *OC.* This is also a channel section drop-forging ; it is part of the main structure box.

c. *OS.* This is the junction part between OBA and OC. It is made of three parts and consists of two Z-sections assembled by a drop-forged joint-plate (21) at the upper surface. Its very intricate shape is owed to the undercarriage housing. There is a bolted fitting (71) at the

intersection of the front spar and rib 6 for attachment of the Missile pylon.

Assembly of Main Components (refer to Figs 4-4 and 4-5)

420. **Main Spar - Front Spar.** The joggled main spar (1) is embedded in the front spar (9). The main and front spars are assembled by bolting (22) the flanges and the slant end of the main spar to the flanges and the web of the front spar.

421. **Front Spar - Rear Spar.** The front and rear spars (9 and 15) are assembled by bolting (23) the spar webs to a splice fitting (24).

422. **Rear Spar - Rib OC.** The rear spar and rib OC are assembled by bolting (25) the web of the rear spar (15) to the heel of rib OC. This is a sealed assembly.

423. **Rib OC - Main Spar.** Rib OC and the main spar are assembled by bolting (26) the lug of rib OC to the vertical web of the main spar (1). This is a sealed assembly.

424. **Main Spar - Rib OS.** The main spar and rib OS are assembled by bolting (27) rib OS attachment folded sheet (28) to a vertical web of the main spar (1).

425. **Rib OS - Rib OBA.** Both of these ribs are assembled by riveting (29) the webs and the flanges.

426. **Front Spar - Rib OBA.** The front spar and rib OBA are assembled by bolting (30) the slanting end of the front spar (9) to the web of rib OBA and the wing to fuselage attachment fitting (19).

Main Structure Box (refer to Fig 4-9)

427. This box is of the integral structure type and forms a fuel tank. The inner faces of the main spar (1), front spar (2) rear spar (15), rib OC and rib 6A constitute the limits of the fuel tank formed by the main structure box.

428. The box internal structure consists of an interlacing of folded sheet false spars (31) and ribs (32). The components designed to reinforce the structure are also used as anti-surge baffles with flanged holes (33). The upper surface skin (35) and the lower surface skin (34) each consist of two-part variable thickness ribbed light alloy panels. The rib and false spar joint is notched (36) to provide for inter connection between various compartments.

429. Between ribs 3A and 3B the fuel tanks are crossed by a tube (37) made of two sections (38 and 39) through which the elevon control linkage passes. A Wig-O-Flex coupling (41) is provided for connection of the tubes to the spar (1) and the distance piece (40). The free end of the tube (39) enables the components to be axially adjusted.

430. The main structure box incorporates a braced structure (42) located between ribs 3A, 3B and the front (40) and rear (43) distance pieces. Flanged holes (44) and slots (45) are provided at the rear of the structure box (42) for interconnection of the two wing sections. Openings (46) are made in the lower surface panel (34) to allow for operation and passage of the elevon control bell-crank and jacks. The light alloy drop-forged front distance piece (40) carries the jack support (47). From rib OC to rib 3A and from rib 3B to rib 6A, the wing is crossed by a tube (48) provided with Wig-O-Flex couplings (41) at its ends. This tube provides a passage for the elevon actuating jack hydraulic pipes. Pipe (98) which crosses the structure box is a pressurization pipe.

431. **Sealing of the Main Structure Box (refer to Figs 4-9 and 4-10).** Sealing is obtained by brush application of a compound (49) which seals the bearing faces of all the components forming the structure box ; compound strings (50) are used for sealing internal and external corners.

432. The grooves (51) in the sealing screw heads, the countersunk sections (52) of the screw and rivet heads and the nuts (53) all receive one or several coats of compound. Two grooves (54) provided in the lower surface skin (34) and holes (55) drilled about 15 centimeters apart are used to inject the sealing compound under pressure.

433. The doors (56) for access to the elevon control guide tube are removed towards the inside of the structure box. Door (57) for access to the wing fuel tank strainer is removed towards the outside. The doors (56) and (57) which are secured by means of bolts and nuts are made leak-proof by a special rubber seal (58).

434. The flanges located on the fuel sump tube (59), hydraulic control conduit (60), external store rear locating fitting (61), and the drain and bleed point (62) are made leak-proof by brush application of sealing compound (49) and sealing compound strings (50). A gasket (64) is provided to seal the drain plug on its mounting flange. The drain and bleed flange as well as the pressurization pipe flange (63) are provided with a groove to receive sealing compound string (50).

435. Sealing of the main structure box is completed by the following:

a. Located between ribs 3A and 3B are two sealed structure boxes :

   (1) One (91) housing an inboard elevon control linkage bell-crank.

   (2) The other (42) for the control linkage to pass through.

b. The tank is crossed by two tubes :

   (1) One (96) between the front spar and box (91).

   (2) The other (93) between box (91) and box (92).

NOTE

The sealed tube ends are attached to sealed flanges by means of couplings.

c. Similar sealed couplings (97-98) (see section A) provided passages in the main spar for the fuel (81) and pressurization (82) pipes.

d. Ref Fig 4-9 Detail A. On the wing end, the double inlet flange enables the pressurization pipe (82) to be clamped. The assembly is bolted tight to main structure box rib OC.

e. Ref Fig 4-9 Detail F. The drilled flange (101) is bolted under the upper surface skin. It is extended by a welded elbow (102) with an end collar to which the pipe is connected by a Wig-O-Flex coupling fitted with an O-ring seal and washers.

Front Structure Box (refer to Fig 4-11)

436. The front structure box includes the housings for the airbrakes (69) and the main undercarriage (65). The very open structure consists of ribs and flanged webs attached to the skin. An intermediate floor (66) separates the airbrake housing. The upper surface skin (70) is locally reinforced by Klegecell panels (67) sandwiched between the outer skin and a thin sheet metal flange (68) riveted to the skin.

Leading Edge — Pre-Mod 406 (refer to Fig 4-12)

437. The leading edge is a conventional non-removable rib and stringer construction. It is a one part component between rib 0 and rib 6V and ends at the front spar. The leading edge components are :

a. Rib OBA. Drop-forged main component.

b. 33 channel section ribs (2) are provided with flanged holes for passage of the flight controls.

c. Stringers (3) which consist of a top section and a bottom section; these stringers are used to maintain the rib spacing; skin sheets are attaching to these stringers.

d. Finger-plates (4) which are attached to the front spar and to the main front structure box components.

e. A skin panel (5) consisting of three sections distributed spanwise between rib OBA and rib 1D, rib 1D and rib 4C, and rib 4C and wing tip. This skin panel is provided with doors for access to the various internal units.

f. A notch rib which is parallel to the aircraft centreline and interrupts the profile at the level of rib 2D. The notch rib consists of two external channel section steel ribs (6) spaced by a box structure (7).

438. The cambered skin plate (1) is tangential to the upper surface between rib 3F and the lower surface at rib 3D.

Leading Edge - Post-Mod 406 (refer to Figs 4-13 and 4-14)

439. From 0 to rib 2D, the leading edge forms an integral fuel tank. This section includes :

a. rib OBA. Drop-forged master component.

b. drop-forged ribs OG-OH-2D.

c. 12 flanged sheet drilled ribs.

d. one channel section false spar (1).

440. The ribs are attached perpendicularly to the front spar (2) and obliquely to the false spar. The rib noses (3) are riveted to the front face of the false spar. In front of the false spar, a trough (4) forms an electrical cable conduit. The bolted skin consists of lower surface (5) and upper surface (6) machined panels. The leading edge tank is provided with a drain point (7A) and a bleed point (8).

441. The structure box is crossed by a sealed tube (9) into which the elevon control linkage slides on roller bushings distributed in the tube.

442. Rib OBA takes the flanges for :

a. Electrical cable trough (11).

b. Pylon tank pressurization line (12).

c. Gun cooling tube passage (13).

d. Flight control tube passage (14).

e. Pylon tank fuel line (15).

443. Rib 2D takes the flanges for :

a. Pylon tank pressurization line (16).

b. Pylon tank fuel line (17).

c. Flight control tube passage (18).

d. Leading edge tank vent line (19).

e. Fuel supply and return line (20) (elbow flange).

444. The lower surface box, between ribs OG and OH, takes a scoop (21) attached by screws and the gun cooling pipe. This pipe is taken out of the box through a sealed flange (22) attached to rib OG.

445. Only the upper surface box contains fuel. These two boxes are limited by a horizontal web (23) and a vertical web (24).

446 **Sealing.** As in the case of the main structure box, sealing is obtained by brush application of a sealing compound on all mating surfaces upon assembly. Compound strings are formed in the corners and the grooves provided in the skin panels. Sealing compound is also applied on screw heads, countersinks and nuts.

447. **Sealing Method for Flanges.** The fixed section of the flange (20) is attached to the rib web either by means of screws or by means of one eight sided nut. The assembly is coated with sealant. A recess is provided in the flange body for installing two washers (29) with an O-ring (30) seal in between them. Turning the castellated nut (32) causes the collar (31) bearing on the first washers to compress the seal. The castellated nuts and eight sided nuts are lockwired. The elbow flange (20) is made up of two welded parts. Sealed inspection doors are provided for access to the various units.

448. **Zone between Rib 2D and Rib 6V.** This second leading edge zone consists of the following components :

a. Nineteen cut-out folded plate ribs attached at right angles to the front spar. These ribs are interconnected by stringers (40) which are used as distance pieces and provide for attachment of the skin (41).

b. Finger-plates (42) transferring leading edge loads to the structure box.

c. Riveted skin (41).

449. A notch rib which is paralled to the aircraft centreline interrupts the profile at the level of rib 2D. This notch rib consists of two external steel ribs (43-44) spaced by a box structure (45). The cambered skin is tangential to the upper surface between rib 3F and the lower surface at rib 3D. Access to items of equipment is gained through screwed doors (Refer Chap 3).

Removable Assemblies

450. **Elevons (refer to Fig 4-15).** The elevons are of conventional spar and rib construction. The inboard elevon is located between ribs IL and 4K; the outboard elevon is situated between rib 4K and the tip of the fairing. Chordwise the elevons constitute the trailing edge of the wing from the rear spar.

451. The elevon components are as follows :

a. A channel section drop-forged front spar (1) with three integral hinge fork-fittings. Thin sheetmetal curved cover-plates (2) are located between the fork-fittings.

b. A channel section drop-forged false spar (3) to which is attached the front structure box ribs, the trailing edge ribs and the skin.

c. A drop-forged rib (4) located at the centre of the elevon. The servo-control attachment fitting (5) screwed onto the lower surface skin and attached to the false spar (3) is secured to this rib. Attachment fitting (5) is covered by a streamlined fairing (6) attached to the skin.

d. Channel section sheet metal false ribs (7) from 1L to 4K and from 4K to 6P.

e. A machined trailing edge (8).

f. A four part skin panel which forms the machined heavy gauge sheet metal front structure box (9) and the light gauge sheet metal trailing edge structure box (10). In addition, the outboard elevon is fitted with a non-removable light gauge sheet metal tip fairing (11).

452. **Elevons, Installation.** Each elevon is hinged about 3 points consisting of two outer fork-fittings (12) and one central fork-fitting (13). The outer fork-fittings are mounted on shackles (14) fitted with bearings by means of plain pin assemblies (15). The central fork-fittings transmit the elevon axial loads. They are mounted in fixed bearings (16) integral with the rear wing spar. Taper pin and split sleeve assemblies (17, 18 and 19) are provided for installation.

453. The control surface rotates between the shouldered bushes (20) of the control surface fork-fitting and the bushing (21). The centre hinge bearings of the inboard and outboard elevons are provided with grease fittings (22) (at the upper surface).

454. **Inboard Control Surface (refer to Fig 4-16).** Similar in construction to the elevons, the inboard control surface is located bewteen rib OF and rib 1K spanwise and between the rear wing spar and the trailing edge chordwise.

455. The inboard control surface components are as follows :

a. A front spar (1) which is used as a hinge shaft. At the level of rib 1K, a force-fitted pin (2) retained by a bolt (3) is mounted on the shaft. At the level of rib OF, the shaft also takes a force-fitted actuating lever (4) secured by three screws (5). This lever is fitted with a control surface self-aligning hinge bearing (6) which is axially retained by a pinned threaded bushing (7). The control end fork-fitting is also provided with a self-aligning bearing (8). The outer race of the bearing (6) is specially reinforced. In the middle, the front spar is closed by a light gauge sheet metal semi-circular cover (9).

b. A drop-forged false spar (10).

c. Folded sheet false ribs (11) from ribs OF to 1K.

d. A machined trailing edge (12).

e. Heavy gauge skin (13) and light gauge skin (14).

456. **Inboard Control Surface, Installation.** The inbaord control surface hinges on two bearings and is installed as follows :

a. At the level of rib 1K, the pin (2) is mounted without end play in the self-aligning bearing fork-fitting (15) integral with the rear wing spar by means of a washer, nut and pin.

b. At the level of rib OF, the self-aligning bearing (6) is mounted in the fuselage bearing (16) between frames 32 and 33 ; this bearing is fitted with a removable cap to allow for removal of the inboard control surface.

457. **Airbrakes (refer to Fig 4-17).** Each wing is fitted with two airbrake panels, one panel (1) located on the upper surface of the wing, the other panel (2) located on the lower surface.

458. The airbrake panels are actuated by a single jack which is connected to the aircraft structure through fork-fitting (4) and to the bottom airbrake panel through fork-fitting (3). Each airbrake panel is a light alloy internally ribbed drop-forging (5) which is machined to match the outer wing contour. Two longitudinal ribs (6) are provided with tappings for attachment of the airbrake panels to the arms (7). These arms are machined integral with the hinge shaft of each panel. As they are deflected, the airbrake panels are kept synchronized by an adjustable rod (14) hinged about lubricator pins (17 and 18) on fork-fittings (15 and 16).

459. **Airbrakes, Installation (refer to Fig 4-17).** The airbrake panel shafts are hinged on the aircraft structure in bearings (8 and 9) fitted with ball-bearings. The inboard bottom ball-bearing is of the double-row type. Bearings (8) are bolted to rib 1S. Bearings (9) are bolted to base-plates (10) which are attached to rib 8S by means of bolts (11). The ball bearings are locked by caps (12) which are screwed onto steel bushes (13) integral with the hinge-pins. The bolts (19) are lockwired. Only bolts (11) are driven through rib 8S. The grease fitting is accessible through a small inspection door located in each main undercarriage well.

460. Pre-mod 406, access to the lubricator pin (fork-fitting (4)) of the actuating jack is gained through an inspection door in the leading edge after removing an access plug in the front spar.

NOTE

A lower surface stop and an upper surface stop provide for adjustment of the airbrakes in the retracted position.

Table 4-1 Non-removable Assemblies

Index No	Description	Index No	Description
1	Cockpit	9	Gun pack bay or front fuel tank bay.
2	PHI or Doppler compartment	10.	Centre air intake duct.
3	III O Equipment bay III D Upper compartment	11.	Main undercarriage wells.
4	Air intake ducts.	12.	Accessory gear box housing.
5	Nose undercarriage well.	13.	Generator and alternator housing.
6	Oxygen cylinder and inverted flight accumulator.	14.	Engine compartment.
7	Fuel tank housing.	15.	Rocket motor or rear fuel tank bay.
8	III O only, Fuel pressurization system compartment.	16.	Rear side bays.

Main Undercarriage Fairing Door (refer to Fig-18)

461. The main undercarriage fairing door closes the front structure box located between the main spar, the main undercarriage fitting and rib OBA

462. The main undercarriage fairing doors are box structures stiffened by channel sections and angles. The outer skin is designed to match the contour of the wing lower surface. The inner skin incorporates four pressed sections as follows :

a. Pressed section (1) is provided to allow for free displacement of the fairing door actuating rod and for accommodation of the hinge fitting.

b. Pressed section (2) constitutes the housing of the guide bar attachment pin.

c. Pressed section (3) is provided for accommodation of the actuating jack attachment pin and of the corresponding grease nipple.

d. Flanged hole (5) is used to house the head of the shock absorber torque links.

463. **Main Undercarriage Fairing Door, Installation (refer to Fig 4-18).** The main undercarriage fairing door is hinged on a light alloy milled fitting (4). The hinge pin cannot be removed rearwards. To remove the fairing door it is necessary to first disassemble the knuckle which is secured to the wing structure. The movement of the door is dependent on the retraction motion of the main undercarriage (see operating sequence in Chapter 6).

464. The door is actuated through a rod (6). This rod is fitted with self-aligning bearings and is connected to the female fork-fitting (9) by a bolt (7) fitting into two shouldered bushes (8). The fork-fitting (9) is bolted to the attachment fitting (10) which transmits the loads to the entire door.

FUSELAGE

General (refer to Figs 4-19 and 4-20)

465. The one part fuselage is of conventional monocoque construction. The aircraft front section is a conical streamlined body the maximum cross-section of which is located at the cockpit and canopy. The side air intake ducts are situated at the rear frame of the cockpit.

466. The plan form of the fuselage shows a so-called WASP WAIST and the cross-section then develops into the circular cross-section of the engine exhaust section. The fuselage main dimensions are :

a. *Overall fuselage length (from nose cone to brake chute cap).* 14.815 m (III O) — 15.80 m (III D)

b. *Frontal area.* 1.9 m^2. The frontal area is measured around frame 19.

Description of General Structure and of Stressed Components (refer to Figs 4-19 to 4-22)

467. From front to rear, the fuselage consists of the following components :

a. The nose-cone (1) (Radar nose cone or ballasted nose cone).

b. The cockpit (2) the structure of which is subject to the cabin pressure.

c. The inner body (3) which is aft of the cockpit. The cockpit and the inner body are assembled by finger-plates at the lower part and by the canopy support beam at the upper part.

d. An undercarriage well (4) consisting of vertical web assemblies (5) and a floor (6) which transmit the loads resulting from the truss (7) to the sides of the inner body. Frames 13, 14, 15 and 17 provide for symmetrical load distribution under the various landing cases and ensure the continuity between the inner and the outer bodies for the transmission of the general loads.

e. The outer body (8). Frame 26 constitutes a break in the outer body for production assembly. The skin sheets and the stringers are assembled by a finger-plate.

f. The tail fairing (9) which carries the brake chute fairing.

Table 4-2 Fuselage Main Frames

Frame No	Main Function	Construction
2	Front wall of the cockpit; subject to the cabin pressure.	Flanged sheet; it takes the front shield plate as a sealed assembly.
10 III D	Rear wall of the front cockpit.	Flanged sheet (partial frame, lower part).
10 III O	Rear wall of the cockpit (slanting) subject to the cabin pressure and landing loads (nose undercarriage).	Heavy-gauge reinforced plate. Upper part is a box structure.
CO III D	Rear wall of the rear cockpit (slanting) subject to cabin pressure.	Flanged sheet. Upper part is a box structure.
17	Subject to wing leading edge loads (front link-rod) and to fuselage fuel tank pressure.	Two sheet-metal flanges riveted to a ribbed plate.
20	Subject to front wing spar loads.	Flanged sheet.
23	The central part of this frame provides for sealing between the air intake duct and the engine (front face) by a rubber seal.	Two sheet metal flanges riveted to a ribbed plate.
26	Subject to main wing spar loads and to engine thrust.	This frame consists of two light alloy drop-forged frames, 26a and 26b, assembled by means of spacers and sheet metal coupling rings.
32	Subject to wing rear spar loads.	Flanged sheet.
33	Subject to fin main spar loads.	Construction similar to frame 26.
36	Subject to fin rear spar loads.	Heavy-gauge flanged plate and angle.
38	Fuselage to tail pipe fairing joint frame.	Heavy-gauge flanged plate.

468. The above fuselage sections are subject to the maximum loads under the following circumstances :

a. *Nose-cone.* Inertia loads.

b. *Cockpit.* Pressure and inertia loads.

c. *Inner body.* Landing.

d. *Outer body.* According to flight cases.

469. The main frames are frames 2, 10 (III 0) (sloping frame CO for III D), 17, 20, 23, 26, 32, 33, 36 and 38. See description in Table 4-2.

Non-removable Assemblies (refer to Fig 4-22)

470. The structure assembly consists of main frames, secondary frames, web assemblies, finger-plates, stringers and skin plates. From front to rear, the fuselage consists of the items shown in Table 4-1.

471. **Main Frames.** The fuselage main frames are described in Table 4-2.

472. **Main Web Assemblies (refer to Fig 4-22).** The main web assemblies take the structural loads and transmit them to the fuselage assembly. They constitute, together with the frames to which they are attached, the housings intended to receive the removable items of equipment (fuel tanks) or the mobile items of equipment (undercarriage). The main web assemblies form :

a. The nose undercarriage well (5).

b. The main undercarriage wells (11).

c. The gun bay (9).

d. The rocket motor bay or rear fuel tank bay.

e. The rear side bays (16).

473. **Fuselage Main Fittings (refer to Fig 4-22).** The fuselage main fittings are described in Table 4-3.

474. **Cockpit Structure (refer to Figs 4-23 and 4-24).** III D - The front and rear cockpits consist of a pressure sealed compartment the structure of which provides for airconditioning (temperature and pressure). The structure (26) between the two cockpits provides for the attachment of the front cockpit ejection seat, intermediate windshield (27) rear cockpit instrument panel (16) and rear cockpit rudder pedal assembly.

475. The cockpit strength is increased by two light alloy forgings which form the cockpit side formers (1 and 2). Pressure sealing is ensured by the application of sealing compound between the mating surfaces of the various components. Sealing between the cockpit and the canopy is ensured by an inflatable seal (24) surrounding the canopy.

476. Frame 10 (III O) or frame CO (III D) includes the ejection seat attachment fittings (5 and 7) on its front face as well as the canopy hinge fittings (14) and the nose undercarriage leg hinge fitting (11) on its rear face.

477. Screwed into frame 2 (at the front of the cockpit) is a circular shield plate (3). Upon removal of the nose cone, access to internal equipment can be gained through the aperture the shield plate covers.

478 The cockpit is provided with a floor (12) consisting of several ribbed plates. These are bolted onto the folded sheets and web assemblies which stiffen the cockpit assembly.

479. The cockpit is fitted out with :

a. An instrument panel (15) and (16) for rear cockpit III D, divided into two parts.

b. A control pedestal (21) and (22) for III D rear cockpit (attached by means of screw and quick release fasteners).

Table 4-3 Fuselage Main Fittings

Frame No	Main Function	Construction
20	Front cockpit ejection seat lower attachment fitting.	Front cockpit floor (III D). Frame 10 front face (III O).
21	Front cockpit ejection seat upper attachment fitting.	Structure between the two cockpits (III D). Frame 10 front face (III O).
22	Rear cockpit ejection seat lower attachment fitting. III D only.	Slanting frame — front face (III D).
23	Rear cockpit ejection seat upper attachment fitting. III D only.	Slanting frame — front face (III D).
24	Nose undercarriage hinge fitting.	Frame 10 — lower part — rear face.
25	Nose undercarriage truss hinge fitting.	Under rear floor.
26	Canopy hinge fitting.	Slanting frame — upper part.
27	Hoist fitting.	Frame 17 — front face.
28	Front bay attachment fittings (for gun pack or fuel tank - pylon locating fittings).	Rear face of frame 17 — front face of frame 20.
29.	Main undercarriage truss attachment fitting and back-fitting.	Between frames 24 and 26 — lower part.
30	Accessory gear box support.	Between frames 24 and 26 — lower part — centreline.
31	Hoist fitting.	Between frames 26a and 26b — upper part — centre-line.
32	Engine attachment fitting.	Between frames 27 and 28.
33	Rear tank bay (III D) or rocket motor bay (III O) attachment fittings.	Between frames 27 and 33 — on sides of bay.
34	Missile anchor/ejector fittings.	Between frames 20 and 26 — lower part — centreline.
35	Jack fitting.	Frame 33 — lower side part.
36	Brake chute/fin Engine (rear link-rod) attachment fitting	Frame 38 — upper part — centreline.
37	Shock-cone actuator attachment fitting III O only	Slanting frame — rear face.
38	Jack fitting.	Frame 15 — rear face — lower part.
39	Wing attachment fittings.	Frame 26 — lateral ends.
40	Fin attachment fittings.	Upper parts of frames 30, 33 and 36.
41.	Inboard control surface hinge fitting.	Between frames 32 and 33 — on the sides.

c. A LH console (17) and (18) for rear cockpit III D.

d. A sight mount (23).

e. A windshield arch (25).

f. A starboard console (19) and (20) for rear cockpit III D.

g. Fittings (4) for installation of the rudder control pedal assembly.

h. Fittings (6) for attachment of the ejection seat lanyards.

j. Between frames 2 and 6, at the lower part, a cover (13) which fits over the PHI computer or Doppler mounting space.

k. For III D, a compensating cylinder hinge fitting (8), a hinge arm attachment fitting (9) and a screw jack hinge fitting (10).

CENTRE FUSELAGE SECTION

General (refer to Figs 4-25 and 4-26)

480. The centre fuselage section is located between frames 10 and 23. It consists of two sections assembled together at frame 17 (main frame). The centre fuselage section provides the following compartments :

a. The inner body (1) (equipment bay).

b. The air intake ducts (2).

c. The fuselage fuel tank housings (3 and 4).

d. The nose undercarriage well (5).

e. The front bay (6) (gun pack or fuel tank).

f. The main undercarriage wells (7).

Construction

481. This is a conventional structure with frames (in flanged sheet metal, riveted angle or drop-forged

light alloy) assembled by stringers and covered with riveted panels. The central fuselage structure receives the fittings detailed in Table 4-4.

Prominent Frames

482. Listed below are the main frames contained in the centre fuselage :

a. *10 — Slanting.* Rear wall of cockpit (III O only).

b. *C0 — Slanting.* Rear wall of rear cockpit (III D only).

c. *17.* Joint frame.

d. *20.* Front wing spar pick-up frame.

e. *23.* Sealing frame — engine front face.

Air Intake Ducts (refer to Figs 4-25 and 4-26)

483. Located between frames 13 and 23, the intake ducts direct the air flow to the engine. The air intake duct assembly consists of cambered plates (15) which are assembled by means of joint plates (16) riveted on the outside of the air intake duct body.

484. The side air intake ducts (11) consist of two half cylinders which are riveted to an inner body (17) the front part of which is located at frame 13. The inner body gradually tapers down to frame 20 and then merges with the vertical dividing wall (14).

485. The cylindrical - conical air intake duct (13) is located between frames 18 and 19 this is a space (18) not connected to the air intake ducts which receives air from the boundary layer bleeds and which distributes the bleed air between the engine upper and lower cooling ducts. The air intake ducts join between frames 19 and 23 without however forming a common duct. The two half air ducts are divided by a wall (14) which is shaped to mate with the engine front fairing.

Dividing Wall (refer to Figs 4-25 and 4-26)

486. The dividing wall (14) consists of two light alloy ribbed plates which are riveted together and are secured to the air intake duct by means of angles.

REAR FUSELAGE SECTION

General (refer to Fig 4-27)

487. The rear fuselage section is situated between frames 23 and 38 and consists of two zones as follows :

a. *Cold Zone (between frames 23 and 27).* This zone contains the front section of the engine and carries most of the accessories. In addition, the engine compartment is fitted out with many items of equipment which require large access doors (1). A local flat skin (2) is riveted to the inner walls. The accessory gear box support drop-forging (3) forms a floor component between frames 23 and 26.

b. *Hot Zone (between frames 27 and 38).* This zone is internally lined with riveted cylindrical wafered sheets (4) which form together with the skin plates and the frames a box-structure highly resistant to inertia loads. The space between the inner and the outer skin sheets is ventilated by cooling air from the airscoops located under the LH and RH bottom fillets. The inner skin constitutes an anti-heat radiation screen which protects the structure and other equipment. Two large drop-forgings (5) are bolted to a heavy structure between frames 27 and 28 ; these forgings take the engine mounting trunnions and transmit the loads to frame 26. The outer skin incorporates the wing junction flat fitted with the following various fuselage to wing junction components :

(1) Recess (6) for connection of wing main spar to frame 26.

(2) Connection (7) for wing tank pressurization.

(3) Recess (8) for fuel system Quinson coupling.

(4) Inboard control surface hinge bearing (9) and rear wing attachment fitting.

NOTE

Provision is made for use of a rocket motor by protecting the lower skin at the tail fairing joint against the rocket motor jet efflux by a steel sheet (11) (III O only).

Rear Lateral Bays

488. The rear lateral bays (10) are located between frames 33 and 35 on either side of the rocket motor housing (III O) or rear fuel tank bay (III D). They are ventilated by cooling air from the side air-scoops located between frames 33 and 34; the cooling air is conveyed through rigid and flexible pipes. The air is discharged outside through outlets subjected to negative pressure. The bays accommodate :

a. *III O.*

(1) LH bay — the stand-by UHF transmitter receiver

(2) RH bay — the BZ tail warning radar receiver and the rocket motor timer.

b. *III D.*

(1) LH bay — main UHF T/R (26R) and matching transformer (27R)

(2) RH bay — standby UHF T/R (22R) and terminal boxes.

FUSELAGE REMOVABLE ASSEMBLIES

Ballasted Nose Cone - III O only (refer to Fig 4-28)

WARNING

Before fitment of a dummy nose cone to Mirage aircraft all hydraulic pressure is to be bled-off and some fluid drained from the radar cooling system to prevent damage to the system through thermal expansion. On replacement of the radar nose cone the radar cooling system is to be topped-up with hydraulic fluid as required.

489. **General.** The ballasted nose cone can be installed in place of the radar nose cone. The difference in weight is compensated for by lead weights (4). Internal supports are provided for installation of the pitot-static pressure head.

490. **Description.** The ballasted nose cone is a streamlined stressed-skin body with frames and stringers. The body (1) is locally reinforced by extrusions (2) riveted to the skin between frames D and F. The extrustions take the threaded rods (3) for attachment of the ballast weights (4). The inertia loads resulting from the ballast weights (4) are transmitted to the nose cone attachment fittings by a partial box-structure between frames E and F and a complete box-structure between frames F and G.

491. Located between frames B and C, at the lower part, are two riveted cooling air scoops (14). A box structured door (5) between frames C and E is hinged on two goose necked fittings (6). The internal face of the door consists of a sheet provided with flanged holes. Mounted on the door are two folded sheet supports (16) for electrical resistors.

492. A hot air exhaust outlet duct is riveted to the external face of the door. The door is locked in the closed position by two latch-pins each controlled through a lock (7). The forward section of the cone (9) consists of a formed sheet tipped by a pitot-static pressure head (10). It is attached to the body (1) by means of screws.

493. **Installation.** Frame 1 provides the following attachment points :

a. Two locating pegs (11) used as guides on installation but which do not transmit any load in flight.

b. Four internally threaded bushes (12) which take the mounting pins. Four small doors are provided for access to these pins. The joint is sealed by compressing a rubber extrusion (13) between the nose cone and the fuselage frame 1.

Nose Cone — III D only (refer to Figs 4-29 and 4-30)

494. **General.** The nose cone carries the pitot static tube and is fitted with various supports for installation of airconditioning equipment (refer to Chapter 13), navigation equipment (refer to Chapter 14), armament equipment (refer to Chapter 17) and radio equipment (refer to Chapter 14). Doors are provided for access to the various items of equipment (refer to Chapter 3).

495. **Description.** The nose cone is a streamlined body with a stressed skin riveted to frames and stringers. It consists of the following three main parts :

a. The nose (1).

b. The front section (2).

c. The rear section (3).

496. **Nose.** The nose is located between the tip and frame III of the nose cone and is made from preformed and welded stainless steel plate (4). The lower part accommodates the heat-exchanger air inlet (5). The nose is reinforced by a welded frame II (6) and is assembled to the front section by two rows of screws on the front of frame III. The nose receives the pitot static tube at its tip. (Installation of the pitot static tube is described in Chapter 12.)

497. **Front Section.** Located between frames III and VII, the front section is of conventional construction; its skin (7) and the doublers are made of stainless steel. At frame III, the nose is screwed to a stainless steel plate (8) which is spot-welded to the skin plate (7). The upper front section receives the bolted pitot static tube fairing (9). The lower part between frames VI and VII accommodates the heat exchanger air outlet duct (10). On the front face of frame VII is a vertical evaporator vapour discharge pipe (11). The front section is assembled with the rear section at frame VII by three rows of screws on the front face of the frame.

498. **Rear Section.** The rear section houses most of the equipment items which are mounted to special supports in the nose cone or attached to access doors. The rear section is located between frame VII and frame X (frame assembled with aircraft frame 1). It is of conventional folded plate section, stringer and skin plate construction.

499. **Installation.** The nose cone is attached to the fuselage by four threaded pins (12) that are located on the fuselage and fit into corresponding fittings (13) on the periphery of nose cone frame X. A rubber seal (bonded to frame 1) is compressed between the nose cone and the fuselage.

4100. On the LH side between frames VII and X, a door (14) provides access to the main equipment items located in the rear section. This boxed door (folded plate sections riveted to skin) is hinged about two hinge fittings (15) attached to the structure. The door is sealed through compression of a rubber seal (16) and locked in the closed position by two lock-bolts (17) fitting into two sockets (18) located on the structure. The door is unlocked by latch (19) and the link-rods (20) which withdraw the lock-bolts (17); the door is then free to pivot about its hinge fittings (15).

4101. The IFF coding transmitter mount (22) is bolted to door (21) on the underside of the nose cone between frames VII and IX. The door (21) consists of riveted sections and folded plates and is hinged near frame VII by two self-aligning hinge fittings (23) fitting into two female fittings (24) bolted to the structure. The door is locked by a bolt located in front of frame IX. The lock-bolt is withdrawn by actuating a latch (28) in the aircraft symmetry plane.

4102. **IFF Coding Transmitter Mount (refer to Fig 4-30).** The IFF coding transmitter mount (22) consists of a wafered and cut-out sheet metal chassis stiffened by riveted folded plate. Holes designed to receive the IFF coding transmitter locating studs (29) are provided in the two inner angles. Two lock-wired knurled nuts (3) are provided at the upper part for locking the transmitter in position.

WINDSHIELD

Description (refer to Fig 4-31)

4103. The windshield assembly consists of one front glass panel and two side glass panels embedded in a metal framework.

4104. **Front Windshield Panel.** The front windshield panel consists of three 5.7 mm thick semi-toughened glass panels (5) with two 2 mm thick butyral panels (four 0.5 mm thick layers) (4) fitted in between the glass panels. The five panels constitute a shield which is clamped in a metal framework consisting of two extrusions (6) riveted together. The assembly is sealed by means of sealant (7). The front windshield panel assembly is secured to the arches by means of screws (8).

4105. **Side Windshield Panels.** The side windshield panels (10) are made of a 12.7 mm thick formed plexiglass panel with an Orlon strip (14) stuck lengthwise along the edge of the panel. Inner and outer shims (11) are used to reinforce the Orlon edge strip.

4106. The side windshield panels are attached to the longitudinal members by means of screws (9 and 16) which pass through the Orlon edge strip (14) and the shims (11). The screws (9) are used for attachment of both the front windshield panel and the side panels.

4107. On the front and rear windshield arches, the panels are made leak-proof by means of sealing compound (7) and are covered by strips (12 and 13). The extrusion (15) riveted to the windshield arch (17) is provided to accommodate the canopy seal.

Installation

4108. The windshield is attached to the fuselage between frames 3 and 7.

4109. Removal of the windshield requires first the removal of the LH and RH fairings (1 and 2) for access to screws (3) and of the cover strips (12 and 13) for access to screws (8) after softening of the sealing compound.

Rear Windshield — III D

4110. The purpose of the rear windshield (18) is to protect the rear pilot in case of canopy jettisoning. It consists of three bonded plexiglass elements lined with shims and orlon reinforcements. A plexiglass handle (19) bonded in the top centre of the rear windshield facilitates entry and exit of the rear pilot. The rear windshield assembly is bolted to the frame 10 structure.

CANOPY — III O ONLY

Description (refer to Fig 4-32)

4111. The jettisonable canopy provides access to the cockpit and forms part of the cockpit superstructure. The canopy is located immediately behind the windshield and is hinged to the top of frame 10. The canopy consists of a dome (1) framed in a metal framework.

4112. **Dome.** The dome is made of 9.7 mm thick plexiglass. Shims (2) and reinforcing Orlon strips (3) are stuck to the edge of the dome. The dome is attached to the framework by means of screws (4) which pass through the Orlon shims. Sealing between the dome and the framework is ensured by a special compound (5) applied between the shims and the framework.

4113. **Framework.** The framework consists of extrusions which are riveted and screwed together to stiffen the assembly. It consists of a front arch (6) and a rear arch (7) to which side members (8) are attached. At the upper part, the front arch is fitted with a retracting locking device (21) enabling the canopy to be held in the half-open position. Rotation of the canopy handle controls the rest position. The front arch is also fitted with two rear view mirrors (22). The LH side member is fitted with a support (24) for the canopy shear knife (25).

4114. **Installation.** The canopy is installed as follows :

a. A hinge fitting (9) located at the upper part of frame 10 constitutes the canopy hinge point (19); this fitting is of the open type to provide for jettisoning of the canopy.

b. Two rollers (10) located on the canopy side members. With the canopy in the closed position these rollers are engaged by the fuselage hooks (11).

c. Six guides (12) located on both sides of the canopy centre it in the locked position between the fuselage rollers (13).

d. Two stop screws (14) used for adjustment of the canopy in the locked position. Sealing of the canopy is achieved by two seals (15 and 20). Seal (20) is fitted around the canopy (Rectangular cross-section seal Pre-Mod 635; semi-circular silicone foam seal Post Mod 635).

e. The quick-release balancing rod (16) connected to the fitting (17) by a pip-pin (18).

CANOPY — III D ONLY

Description (refer to Figs 4-33 and 4-34)

4115. The canopy forms the cockpit upper structure and is located immediately behind the windshield. It hinges at the top of the slanting frame and opens widely to provide access to both cockpits. The rear section of the canopy is designed to receive a blind-flying hood for pilot training. The blind-flying hood extends from the slanting frame to the front of the rear cockpit. It has four side attachment points (Refer to description in Chapter 8).

4116. The canopy consists of two domes (1 and 2) separated by a centre arch. The two domes consist of 9.7 mm thick plexiglass embedded in a metal framework. The front dome comprises three formed elements longitudinally jointed by bonded orlon strips (3). The rear dome consists of a single formed element. The metal framework consists of the following components :

a. Front arch (4) Assembled with two side-members (7)

b. Centre arch (5)

c. Rear arch (6)

These metal components consist of extrusions assembled by electric welding and riveting.

4117. The covers forming the side member and arch skin are attached by means of screws and anchor nuts. The front arch (4) is fitted with a handle (8) to facilitate operation of the canopy. Two rear view mirrors (9) are mounted at the upper part of the canopy.

TABLE 4-4 Canopy Fittings

Index No	Qty	Function
11	4	Closed position locks
12	2	Canopy centring guides
13	2	Actuating arm hinge
14	2	Compensating cylinder support
15	2	Canopy guides
16	1	Canopy hinge

4118 **Dome Attachment.** The domes are embedded in the metal framework and are attached by screws (21) fitted through shims (22) and orlon reinforcing strips (23) bonded to the side members and the rear arch. To allow for expansion, the domes are not secured to the front and centre arches; they are only supported by these arches through foam rubber strips (24).

4119 **Sealing.** Sealing of the domes is achieved by :

a. Application of special sealing compound

(25) between the plexiglass domes and the metal framework.

b. Application of polyester resin (26) to the skin attaching screws.

Installation

4120. The canopy is connected to the fuselage by :

a. Hinge fitting (16) retained between the slanting frame fitting rollers (29) located near the rear arch in the aircraft symmetry plane.

b. Four rollers (28) retained by hooks (33) that lock the canopy in the closed position.

c. Two transverse pins (13) that receive the actuator linkage fork-ends.

d. Two swivelling fittings (14) that bear on the shock-absorber ball joints.

4121. At the end of the closing motion the canopy is guided by :

a. Two outer guides (15) that engage between rollers (31).

b. Six inner guides (32) that engage between rollers (35), four of which are made integral with the locking rollers.

4122. Adjustment in the closed and locked position is made by means of two screw type stops (36) that bear on the fuselage side formers at the front.

4123. Sealing in the closed and locked position is ensured by a polyurethane seal (27) surrounding the framework which is compressed by the pressure seal (37) when the latter is inflated (refer to Fig 4-33).

NOTE

To provide for jettisoning, the canopy is hinged to a stop link-rod (38). The canopy separates from the aircraft at the end of the rotation motion (Refer to Chapter 15).

AIR INTAKES

Description (refer to Fig 4-35)

4124. Located between frames 12 and 13 (III O) or frames 11 and 13 (III D) on either side of the cockpit, the air intakes are streamlined bodies semi-circular in cross-section.

4125. Each air intake incorporates an inner skin (2) and an outer skin (3) which are fairly concentric and are assembled by means of folded sheets. At the front, the two skins are joined at a milled edging (4) by riveting on the outside and welding on the inside. The vacant space between the two skins is filled with filler (5) (anti-vibration filler).

4126. A recess is provided at the lower part of the air intake to suit the gun blast tube front lip. The anchor nuts for gun blast tube attachment are riveted to the air intake reinforcement folded sheets. This zone is locally reinforced with a part (12) machined to two different thicknesses and riveted to the air intake.

Installation

4127. The air intakes are screwed to frame 13 internally and externally and to fuselage formed sections laterally. The space between the vertical wall of the air intake and the fuselage forms the boundary layer bleed. The boundary layer bleed is reinforced by folded sheet metal sections (11). The assembly is attached to the fuselage skin by pins (7) through spacers (6), angles (8), shims (9) and retained by nuts (10).

ADDITIONAL AIR INTAKE DOOR

General (refer to Fig 4-36)

4128. The additional air intake door is a removable box structure which is located on the side of the air intake duct between frames 14 and 15 and incorporates a spring loaded door which opens under the action of differential air pressure (that is when the pressure inside the air intake duct is less than the outside pressure).

Description

4129. The box-structure consists of three transverse webs, (1 and 2) at frames 14 and 15, and (3) forward of frame 15. These are assembled by means of riveted formed sections and folded sheets (4 and 5) and are covered by an inner skin (6) formed to match the air intake duct contour and an outer skin (7) formed to match the fuselage contour.

4130. The skin (7) is cut out to receive the door (8) which is hinged about pin (9) and is held closed by a calibrated spring (10) integral with the box-structure through bracket (11). A deflector (12) is provided to prevent the air flow being disturbed. A stop (13) limits the door travel. The thickness of the box-structure is such that it provides a partial passage for air flow. Three TEFLON contact plates (19) are provided on the lower face.

Installation

4131 The box-structure is fitted with a locking linkage controlled by a lock (14). Actuating this lock causes two vertical (17) and two horizontal latch pins (18) to retract through bell-cranks and link-rods (15 and 16), allowing the box-structure to be removed.

SHOCK CONES

General (refer to Fig 4-37)

4132. The air intakes are fitted with sliding shock cones which regulate the air flow under supersonic flight conditions through their longitudinal displacement (Refer to Chapter 9 for information on operation of the shock cones).

Description

4133. Each shock cone consists of a box-structure body which incorporates :

a. Two rails (1 and 2) forming spars to which the frame and extrusion structure of the shock cone is attached.

b. Seven semi-circular lightened and flanged frames (3).

c. A heavy gauge sheet metal stamped skin (4).

d. Top and bottom spring loaded covers (5 and 6)

e. A closing plate (7) located at the front of the shock cone.

Installation

4134. **Sliding Motion.** This is made possible through the use of rollers fitted to the aircraft structure.

The shock cones are guided laterally by four rollers (8) and vertically by four rollers (9). The rollers mate with the shock cone guide rails. A streamlined joint between the shock cones and the fuselage is obtained by spring loaded covers (5 and 6) which are guided by slide tracks (10) attached to the frames. The covers are applied against the front air intake plate (11) by springs (12) which are mounted on mobile rods (13) located between the shock cone frames.

4135. **Closing Plate.** The closing plate is attached by means of a pin (14) with a self-aligning bearing to allow for the slight displacement required by the longitudinal motion of the shock cone.

4136. The closing plate is maintained in a vertical plane by scissors (15) and held against the front plate by the spring loaded covers (5 and 6) linked to the closing plate (7). The contact areas are lined with Teflon (16).

4137. **Linkage Attachment.** The fork (17) of the universal joint yoke is connected to the shock cone structure by a threaded pin (18) locked in position; access to the attachment pin is through a door (19) provided in the shock cone skin.

EQUIPMENT BAY DOOR

Description and Operation (refer to Fig 4-38 for III O and 4-39 for III D)

4138. The equipment bay is closed by a door, between frames 12 and 13, of conventional frame, stringer and skin construction. The equipment bay door consists of two side members (1) attached to three arches (2, 3 and 4) forming a box-structure. On the inside, the door is stiffened by a corrugated sheet (5) and is insulated by a polyurethane coating (6). The door carries two supports (30) for the computing voltage box.

Installation

4139. The equipment bay door is hinged on frame 17 about two hinge fittings (15) fitted with self-aligning bearings. Each hinge fitting (15) is retained by a Pip-pin (16) which is to be withdrawn prior to removal of the door. Near the hinge fittings (15), there are two round headed pins (17) which fit into two socket fittings (18) screwed into frame 17 and which transmit the loads to the structure. The equipment bay is sealed by a rubber seal (19) stuck to the door.

4140. The equipment bay door is provided with a locking system consisting of two longitudinal linkages housed in the two side members (1). The door is opened by actuating two lateral latches (7) which disengage locking pins (10) through a linkage consisting of rods (8) and bell-cranks (9). Spring (13) applies tension to the linkage to hold the assembly in the unlocked position. The front bell-crank (9) comes into contact with the spring stop (14). The locking pins slide in bases (11) bolted to the door side members (1).

4141. **Locking in the Closed Position.** On closing, the bases (11) engage with bored spigots (12), which are screwed to the fuselage side formers. Locking is ensured by the locking pins (10) passing through the spigots in three positions on each side of the aircraft.

4142. **Locking in the Open Position — III O Only (refer to Fig 4-40)** Two link rods (20), connected to the rear part of the door, slide on rollers (21) caged in two rails (22) attached to the aircraft structure. The link rods (20) are locked in the open position by two spring loaded locks (23). A pedal (24) (on RH side of equipment bay, near frame 14) enables the locks (23) to be released through control cables (25); the freed link rods slide forward in the rails and close the door. When the door is in the open position, a safety pin is fitted through rail (22). This pin is stowed on a stirrup (27).

Additional Equipment for Post-Mod 406 Aircraft

4143. Post-Mod 406 aircraft doors take additional items of equipment. They are equipped with :

a. A cross-member in two parts (31 and 32) for attachment of the radio altimeter transmitter-receiver and the mode selector box

b. A support (33) for the accelerometer.

UPPER DOOR — III D ONLY

General (refer to Fig 4-39)

4144. The upper door (1) between frames 17 and 23 maintains a smooth aerodynamic contour immediately aft of the canopy and provides access to, and mounting points for, various items of equipment.

Description

4145. The upper door structure consists of a skin (2 and 3) (composed of two or more plies according to zone requirements) stiffened and reinforced by frames, riveted sections (4 and 5), stringers (6) and folded plates.

4146. A door (8), located between frames 17 and 20, is retained by circlips (9) and consists of a skin (10) and a spot welded wafered inner doubler (11).

4147. Louvered panels (12 and 13) provide equipment cooling between frames 18 and 19 and between frames 21 and 22 on the left hand side.

Installation

4148. The upper door is completely bolted around its periphery.

TILTING RACK — III O ONLY

General (refer to Fig 4-41)

4149. The tilting rack is designed to support various items of equipment associated with the servo-control system and the UHF installation. It is hinged and can be tilted to the right of the aircraft, after opening the equipment bay door, for access to the equipment mounted in the bay. A base plate attached to the rack by means of shock absorbers is provided for mounting the equipment.

Description

4150. The tilting rack consists of a folded plate frame. The rack is hinged by two hinges (1 and 2) bolted to the rack and two hinge brackets (3 and 4) attached to the equipment bay RH side former between frames 12a and 14. The rear hinge (2) takes the lock (5) which fits into the hole provided in the hinge bracket (4) for locking the rack in the tilted position. A spring is used to push the locking pin into the locked position. The assembly is locked in the down position by two pins (6 and 7) which are controlled by a lever (8) through a linkage. These locking pins fit into two fittings (10 and 11) bolted to the fuselage.

Unlocking Control

4151. The assembly is unlocked by means of lever (8) maintained in the rest position on the clip (12). When it is released and pulled forward, the lever (8)

which is hinged on fork-fitting (9), directly causes locking pin (6) to rotate, and pin (7) to retract through a linkage consisting of rods (13 and 14), lever (15) and bell-crank (16).

4152. At the end of the rotational motion, the flat end of the lever (8) abuts on fitting (17) and is held against it by a pin (18). This lever is provided to facilitate the operation of the rack.

GUN PACK

General (refer to Fig 4-42)

4153. The gun pack is a self contained unit which is accommodated in the front bay. It consists of two guns, ammunition boxes, a link recovery box, electrical control boxes (6), a hoisting device and a cooling system. The gun barrels are placed in the gun blast tubes before installing the gun pack in the aircraft; they are secured to the gun pack after the gun pack itself has been attached to the aircraft.

Description

4154. The gun pack is a box which supports a gun barrel on each side. Each barrel is attached to the gun pack by :

a. A quick release centre mount (7)

b. A rear mount (8)

c. The feed door (9 and 10)

d. The link recovery chute (11 and 12).

4155. A box-structured door (13 and 14) is used to close each gun bay after installation of the gun pack in the aircraft. Internally, the gun pack is divided into several compartments as follows :

a. Feed compartment (3) of the LH gun (1)

b. Feed compartment (4) of the RH gun (2)

c. Link recovery box (5)

d. Compartment (15) for the winch and the cooling system.

4156. The door (9 and 10) of each feed compartment is attached to the corresponding gun, i.e., to the LH gun for the rear compartment and to the RH gun for the front compartment, and is used as an ammunition belt guide chute.

4157. The expended links are directed through a curved chute (11 and 12) (also attached to the gun) which is connected to the ammunition box. There is a device at the end of the chute which separates the links; the links are then collected in the recovery box (5) common to both guns. Two doors (16), with Dzus fasteners, are provided at the upper part of the pack to remove the links from the box.

4158. The mechanical winch (17) attached to the gun pack structure is actuated through a removable crank located on the LH side of the aircraft. The winch is fitted with three cables as detailed below. In the stowed position, the endpieces of the cables are locked onto the front and rear faces of the gun pack.

a. One cable (18) located in the aircraft symmetry plane at the front of the gun pack, this cable is directly connected to the winch.

b. Two lateral cables (19 and 20) routed to the rear frame of the gun pack; these cables pass over pulleys (21).

4159. The gun cooling air inlet consists of an air scoop (22) situated on the lower skin. Ram air is directed to the guns through two ducts (23).

Installation

4160. **Hoisting.** The three cables (18, 19 and 20) are uncoiled and their end pieces are locked into the corresponding holes (24) provided in the gun bay. The gun pack is then hoisted by means of the winch after engaging the front (25) and rear (26) slide tracks and until the gun pack and the aircraft fittings abut.

4161. **Attachments.** The gun pack is attached to the aircraft by means of four fittings with captive screws. The two front attachment fittings (27) are attached to the central gun mounts, and the two rear attachment fittings (28) are attached to the rear frame of the gun pack as follows :

a. *Front attachment* The captive screw (29) fits into an internally threaded bush (30) (integral with the aircraft structure) which is prevented from rotating by a pin (31). During the tightening operation, the bush is driven into the bushings (32) until abutting. The lock-plate (33) is fitted into the notch provided in the head of the screw (29) and prevents its notation.

b. *Rear Attachment* The captive screw (34) fits into the aircraft attachment fitting and is prevented from rotating by a lock-plate (35). Once the electric connections have been made, the side access doors (13 and 14) are installed on the swivel fittings (36) of the gun pack and are locked onto the aircraft.

NOSE UNDERCARRIAGE DOORS

General (refer to Fig 4-43)

4162. The nose undercarriage doors are located between frames 10 and 14 and the vertical wheel well webs. The nose undercarriage doors consist of three components as follows :

a. A front shield door (1) between frames 10 and 11 (hinged to the aircraft).

b. A rear shield door (2) between frames 11 and 12 (secured to the undercarriage leg).

c. A rear door (3) between frames 12 and 14 (hinged to the aircraft).

Description

4163. The shield doors consist of light alloy cast panels externally machined to the fuselage contour. On the inside, the shield doors are provided with crossed ribs (4) and bosses to receive the hinge and attachment fittings. The front shield door (1) fitted with two hinge fittings (5) at the front and with two fittings (6) in its centre section for attachment of the rods (20). The rear shield door (2) is fitted with two attachment fittings (7) at the front and with an attachment folded plate (8) at the rear.

4164. The rear door (3) is a box-structure consisting of channel section, Z-section and top-hat section members, an outer skin plate (10) formed to the contour of the fuselage and an inner skin plate (11).

4165. An opening is provided in the outer skin plate (10) for installation of the IFF antenna (9).

4166. From front to rear, the inner skin (11) incorporates :

a. A door (15) for access to the IFF antenna feeder

b. A recess (14) for the nose wheel fork head

c. A recess (13) for the wheel

d. A recess (12) for the landing lights.

4167. The rear door is fitted with three hinge fittings (24 and 25) and two roller fittings (29) which lock the door in the closed position.

Installation (refer to Fig 4-43)

4168. **Front Shield Door.** The hinge fittings (5) are fitted with ball joints (16) and fit into the hinge plate (17) of the nose undercarriage attachment fitting located on the fuselage. The hinge fittings are joined by hinge pins (18), washers and nuts (19). The door rotation is controlled by two link-rods (20) attached to the undercarriage leg. These ball jointed link-rods (20) are connected to a fitting (6) integral with the door, by means of a plain pin (22) and a pinned nut (23).

4169. **Rear Shield Door.** The rear shield door (2) is attached to the undercarriage leg at three points through two bolted fittings (7) at the front and through a folded plate (8) at the rear.

4170. **Rear Door.** The rear door is hinged at three places :

a. Two symmetrical fittings (24) at each end of the door.

b. One centre fitting (25) at frame 12a; this is the main fitting.

4171. The fittings mate with the fuselage bearings (26) fitted with self-aligning bearings; plain pins (27) with grease nipples and locking nuts (28) are used for the connection. The centre bearing (25), which takes the axial loads, is a tight fit and the end bearings (24) are floating. The centre bearing (25) also includes a drilled fork for attachment of the door actuating jack rod. A rubber stop (30) attached to centre bearing (25) limits the door maximum opening travel.

4172. The rear door incorporates a screwed stop (31). When the undercarriage is extended in an emergency, a stop integral with the undercarriage leg comes into contact with stop (31) thus preventing the landing lights being damaged.

MAIN UNDERCARRIAGE DOORS

Description (refer to Fig 4-44)

4173. There are two symmetrical main undercarriage doors located between frames 21 and 25. They consist of a machined structure (2) carrying the various fittings and forks. The skin plate (1) matches the fuselage contour.

4174. The door is fitted with two hinge fittings (6 and 7) at its upper part and two uplocks (3) at its lower part. Fitting (6) incorporates a fork for connecting the door actuating jack. The two uplocks (3) are fitted with rollers (5) mounted on plain pins (8) and retained by circlips (9).

Installation

4175. The door is hinged about the two fittings (6 and 7). Fork-fitting (6) is a tight fit into a hinge bracket (14) located on the fuselage near frame 21 through two shouldered bushes (13). The hinge fitting is mounted with a lubricating pin (15) and nut (16). Fork-fitting (7) is provided with a self-aligning bearing. It is a loose fit into the hinge bracket (10) located near frame 24. This hinge fitting is installed with a lubricating pin (11) and nut (12).

REAR SIDE BAY DOORS

Description (refer to Fig 4-45)

4176. Each rear side bay is provided with a door; the two doors are symmetrical. Located between frames 33b and 35, each door consists of a stamped sheet-metal frame (1) and folded sheets (2).

4177. The riveted skin (3) blends with the fuselage contour. The inner surface is insulated by bonded polyurethane panels. The cooling air exhausts via a flanged aperture (6) and outlet duct (5). The door is hinged at the front on two hinge fittings (7) attached by pins to hinge brackets (13). A stop (14) limits the door opening travel.

4178. The mechanism consists of a bell-crank (8) incorporating a square drive. Rotating the key (9) causes bell-crank (8) to drive locking pins (11) via rods (10). Geometrical linkage locking in the open and closed positions is ensured by a spring (12) and a stop on the base of the bell-crank (8).

Installation

4179. Two self-aligning hinge brackets (13), bolted to the aircraft structure, are provided for installation. The stop (14) is adjustable, thereby permitting the door opening travel to be adjusted.

MAIN EQUIPMENT SUPPORT CHASSIS — III D ONLY

Description (refer to Fig 4-46)

4180. The main items of equipment are generally attached to the aircraft structure by removable lightened metal chassis consisting of :

a. *Fixed frames* Fixed frames are generally bolted or riveted to the aircraft structure and the equipment is then attached to the frame, usually by bolts, clamps or straps.

b. *Shock-mounted assemblies* A shock-mount assembly consists of the following components :

(1) A fixed section (platform or frame) attached to the aircraft structure.

(2) A second section (cradle, mount, plate or container) resiliently mounted on the fixed section through the shock absorbing system. The equipment is mounted on this second section.

4181. Ground continuity is maintained by contact blades or bonding strips. The equipment, mounted on the chassis, can be provided with electrical connector receptacles and cooling orifices. The electrical connector receptacles are a floating fit to allow for correct engagement of the connector plugs.

4182. The knurled nuts used to hold the equipment in position are lock-wired after equipment installation.

TACAN UNIT AND CODER POWER SUPPLY UNIT SUPPORT — III D ONLY

Description (refer to Fig 4-48)

4183. The TACAN unit and coder power supply support is located in the nose between frames VIII and X and is a double mount consisting of sections, webs and folded plates assembled by rivets. The webs feature flanged lightening holes. The support is in the form of two mounts (side by side) allowing the two units to be removed from the LH side of the nose after opening the side access door.

TACAN TRANSMITTER-RECEIVER UNIT SUPPORT

Description (refer to Fig 4-48)

4184. The TACAN transmitter-receiver unit mount (1) includes :

a. Two slide tracks (2) at the bottom of the mount

b. Two locating pins (3) near the electrical receptacle (4)

c. A cooling air pipe (6) connected to an orifice (5)

d. Hooks (7) used to lock the unit in position after tilting the handle located on the front face of the unit.

CODER POWER SUPPLY UNIT SUPPORT

Description (refer to Fig 4-48)

4185. The coder power supply unit mount (11) is located beside the TACAN unit mount. The unit is supported by two pads (12), centred by two holes (13) and locked in position by two knurled nuts (14).

Installation

4186. The support assembly is connected to the structure through four double-action shock absorbers (21, 22, 23 and 24). The shock absorbers are attached to the frames through folded plates (25, 26, 27 and 28). Contact blades (29 and 30) earth the equipment.

INCIDENCE INDICATOR AMPLIFIER SUPPORT

Description (refer to Fig 4-47)

4187. The incidence indicator amplifier support is located between frames 2 and 3 of the fuselage and is accessible after removal of the shield plate on frame 2.

4188. The incidence indicator amplifier is fitted to a platform (1) including four shock absorbers (2). These shock absorbers are bolted at their upper part to a second platform (3) connected to the aircraft structure by two webs (4) bolted under a structure web between frames 2 and 3. The amplifier unit is engaged under the platform and is centred by means of pins (5). It is locked in position by tilting and tightening a knurled nut (6). Contact blades (7) earth the equipment.

BEZU OUTPUT MULTIPLIER BOX SUPPORT — III D ONLY

Description (refer to Fig 4-47)

4189. The Bezu output multiplier box support is located between frames 3 and 5 in the aircraft symmetry plane. The support consists of riveted folded plates and sections (1) forming a frame which is attached by semi-rigid shock absorbers (2) to a sheet metal box of the control pedestal. The front section includes a web (3) fitted with an electrical receptacle (4) and two centring fingers (5). The rear section includes a special screw (6) allowing the output multiplier box to be locked in position by clamping the folded plate (7) which slides between the frame sections.

MISSILE MODULATOR TRANSMITTER UNIT SUPPORT — III D ONLY

Description (refer to Fig 4-49)

4190. The missile modulator transmitter unit support is located in the nose cone between frames VII and VIII on the LH side and is a cylindrical container (1) installed longitudinally in the aircraft. The container is made of sheet metal with flanged lightening holes; it includes a flange (5) at the front and a cover (2) at the rear. Two riveted cross members (6 and 7) support the four shock absorbers (8 and 9).

4191. The modulator transmitter unit is engaged from rear to front and is locked in position by a cover (2) retained by two tilted knurled nuts (3). A flange (4) supports and centres the unit at the front.

Installation

4192. The four shock absorbers (8 and 9) are connected to the nose cone structure through riveted folded plates. Contact blades (10) earth the equipment.

ARMAMENT BOX — III D ONLY

Description (refer to Fig 4-49)

4193. The armament box is located in the upper door between frames 18 and 20 and is accessible after removal of the upper door. The box is connected to the structure through two semi-rigid attachments :

a. *Front attachment* The box is bolted to a cross member (1) (attached to the door) through two gussets (2). The cross member is connected to two folded plates (3) bolted to the upper door by means of semi-rigid attachment plates (4).

b. *Rear attachment* The rear attachment consists of a cross member (5) attached to the upper door between frames 17 and 23. This cross member is fitted with two semi-rigid attachment plates (6) receiving the two locating pins (7) of the box.

GYRO CENTRE — III D ONLY

Description (refer to Fig 4-49)

4194. The gyro centre is longitudinally installed at the bottom of the fuselage between frames 23 and 24.

Installation

4195. The gyro centre is attached at four points :

a. Two rear points including a locking pin (1), a washer (2) and a nut (3) which clamp the unit to a section (4).

b. Two front points locked by special bolts (5) on cradles (6) and connected to the structure through gussets (7).

4196. Adjustment is made by means of shims (8). Once the appropriate adjustment has been performed,

the gyro centres are interchangeable.

AUTO-COMMAND BOX SUPPORT — III D ONLY

Description (refer to Fig 4-50)

4197. The auto-command box support is located between frames 17 and 18 at the upper part of the fuselage and consists of riveted and welded sections. The sections are bolted together and attached to the aircraft structure through shock absorbers. The box is centred by two pins (3) integral with the box. The handle (4) is held in the stowed position by a clip (5). The auto-command box is locked in position on its support by tilting and tightening knurled nuts (6).

Installation

4198. The auto-command box is supported by four double-action shock absorbers (7) as follows :

a. *Front attachment* Two shock absorbers (7) attached to the structure through folded plates (8) riveted to the rear face of frame 17.

b. *Rear attachment* Two shock absorbers (7) attached to the structure through a cross member (9) picked up by a folded plate (10) riveted to the rear face of frame 17b. Contact blades (11) earth the equipment.

PHI BOX SUPPORT — III D ONLY

Description (refer to Fig 4-50)

4199. The PHI box support is installed at the bottom of the fuselage between frames 2 and 5 in a compartment closed by a door with Dzus fasteners (refer to Chap 3). The support consists of folded plates (1) that form the shock absorber supports.

4200. The compartment is provided with four longitudinal base plates (2) secured by JO-BOLT rivets (3). Two channel section folded plates (4) are bolted beneath the base plates. The shock absorbers (5) are attached to the base plates (6) by means of four lock-wired attaching parts (7). The base plates are attached to a section (4) by four screws. The PHI box is thus shock mounted by screws (8) and washers (9) fitted through the folded plates (1) and the shock absorbers (5).

AIR DATA COMPUTER SUPPORT — III D ONLY

Description (refer to Fig 4-52)

4201. The air data computer support is located between the slanting frame and frame 15 in a recess situated at mid-height of these frames. The support basically consists of a folded plate platform (1) fitted with two locating pins (2) near frame 15. The platform is connected to the aircraft structure by two transverse channel sections (3) fitted with bolted shock absorbers (4). The two front shock absorbers are connected to the structure by two pillars (5) riveted to the floor. The air data computer is locked in position by means of two stirrups (6) fitted with clamping screws (7). The rear portion of the transverse channel section (3) is connected to the structure through bolted angles (8). The electrical connectors and the pitot static lines are connected on the LH side of the air data computer.

SIGHT RELAY BOX SUPPORT — III D ONLY

Description (refer to Fig 4-52)

4202. The sight relay box support is a lightened folded plate support (11) located between frames 10 and 12 on the box structure floor in the aircraft symmetry plane.

4203. The support (11) is centred by pins (12) on an angle (13) and locked by an angle (14) at the rear and is secured in position by a screw (15) on a lug (16). The sight relay box is installed by fittings (17) used for both centring and attachment. Two locking systems each consisting of a rest (18) and a base plate (19) attached to the box (11) are provided to lock the sight relay box in position. When removing the sight relay box the vertical bolts must be removed before withdrawing it from the support.

AIR DATA COMPUTER OUTPUT MULTIPLIER AND SERVO CONTROL AMPLIFIER SUPPORT — III D ONLY

Description (refer to Fig 4-52)

4204. The air data computer output multiplier and servo control amplifier support is located between the slanting frame and frame 17 at the upper part of the fuselage in the aircraft symmetry plane. It consists of a lightened folded plate platform (21) stiffened by two cross members fitted with four shock absorbers (22). The shock absorbers are directly bolted to the aircraft structure. Contact blades (23) earth the rear shock absorbers.

4205. The servo-control amplifier is mounted under the platform, engaged in two slide tracks (27) and held in position by a bolt (28) on plate (29).

SUPPORTS IN REAR SIDE BAYS — III D ONLY

Description (refer to Fig 4-51)

4206. The rear side bays each contain a support for the UHF units. The support and method of mounting is similar for both sides (only one side is described). A UHF set support is mounted between frames 33b and 35 on both sides of the aircraft and consists of two parts, a fixed section (1) and a mobile section (2).

4207. The fixed section (1) is in the form of frame with a shock absorber (3) mounted at each corner to a fitting (4). The shock absorbers are directly attached to the aircraft structure.

4208. The mobile section (2) is hinged at point (8) and its range of travel is limited by stay (5). It fits inside the fixed frame (1) and is locked in position by a bolt (6). A retaining spring (13) is riveted to the fixed frame.

4209. The UHF set is located by two pins (7) and is held in position by two knurled nuts. An electrical connector (9) is automatically engaged when the UHF set is fitted to the support. A bonding strip earths the equipment. Cooling is via duct (10) which is provided with a baffle (11) and directs air to the rear of the UHF set. The baffle consists of two lugs (12) located over the endshield of the UHF set dynamotor.

TAIL PIPE FAIRING

General (refer to Fig 4-52)

4210. This is the end section of the fuselage which partially covers the engine tail pipe exhaust section. The brake chute housing (1) is located at the upper part of the tail pipe fairing.

Description

4211. The tail pipe fairing consists of a light frame (2) and an outer skin (3). The front section (4) is box-structured. The rear section (5) is internally lined with braced steel protective plates which are attached by special screws which allow for expansion.

Installation

4212. There are four attachment points which consist of locating spigots and bolts. The two tapered spigots (9) are used to centre the tail pipe fairing. At the upper and lower parts, the two components are attached to frame 38 by self locking bolts (14) through the bearing faces (13). Doors (17) are provided for access to the attachment points. Holes (16) permit attachment of the protective cover.

4213. III O Only. A steel guard plate is mounted at the lower part when the rocket motor is installed.

TAIL UNIT

General (refer to Fig 4-55 and 4-57)

4214. The tail unit consists of a swept back fin and a rudder. The principal characteristics of the tail unit are :

a. *Fin :*

(1) Area ..... 4.4 m² (III O)
..... 4.5 m² (III D)

(2) Leading edge sweepback .. 63° 30′

(3) Thickness/chord ratio 4% to 3.5%

b. *Rudder :*

(1) Area ..... 0.6 m².

(2) Deflection angle ..... ±12°

Fin Description (refer to Fig 4-54)

4215. The fin is a three-spar construction, the centre spar (main spar) is attached to the fuselage by the two flanges that form frame 33. The spar, rib and skin assembly forms a torsion box from the leading edge to the rear spar.

4216. The fin includes :

a. A main slanting spar (1) which is a light alloy I-section drop-forging with two longitudinal bores at its lower vertical section for accommodation of the fin to fuselage attachment bolts at frame 33.

b. A front slanting spar (4) made from folded sheet metal.

c. A rear slanting spar (5) made from folded sheet metal.

4217. Bolted to the front face of the main spar is a servo-control attachment fitting (2) and a flight control bell-crank support fitting (3). Rib 1 is a light-alloy drop forging that has three spars (1, 4 and 5) bolted to it. This rib consists of three sections (7, 8, and 9) and carries the fork-fittings for attachment to the fuselage. Two female fork-fittings (6 and 20) with longitudinal bolts for rib sections (7 and 8) and a male fork-fitting (19) with a vertical bolt for the trailing edge rib section (9).

4218. The front rib section (7) has cut-outs that provide passage for the flight controls and permit the rudder bell-crank to travel freely. The rudder bell-crank is hinged on a female fork-fitting (10) integral with rib section (7). Drilled slanting ribs and flanged sheet stiffeners (11) are arranged between the fin main components to stiffen the assembly. The horizontal rib 26 ends the structure box and supports the fin tip fairing (12).

4219. Ribs 12a and 20D are each fitted a self-aligning bearing (14 and 15) on which the rudder is hinged and bearing fitting (13) is bolted to the rear spar. A fitting (16) is provided to support the flight control bell-crank. Two guide tubes (17 and 18) are used to accommodate the electric cables.

4220. The structural components are assembled to plates (23) and covered by skins of two different thicknesses, rib 1 to rib 16 (21) with the heavier gauge and rib 16 to rib 26 (22) with the lighter gauge metal. The rear section between ribs 20C and 26 houses the BZ tail warning radar (24) when fitted.

4221. **Fin Tip Fairing (refer to Fig 4-54).** The fairing (12) is made of fibreglass and is stiffened by means of ribs; it is attached by screw to rib 26 and houses the main UHF antenna.

4222. **Fin Leading Edge Fairing.** This fairing is located between ribs 13 and 16 and houses one of the standby UHF antennae.

Rudder (refer to Fig 4-55)

4223. **Description.** The main rudder components are :

a. A channel-section spar (1) located near the hinge axis

b. A light alloy drop-forging (2) which houses the centre bearing

c. A channel section false spar (3)

4224. Between spar (1) and false spar (3) are the ribs which form the rudder front section. The front section constitutes, together with plates (4), a rigid structure box to which the trailing edge ribs are attached. The one piece skin (5) is riveted to the structure. The rudder is statically balanced by five weights (6) located at the front.

4225. **Installation.** There are three rudder hinge points located at ribs 12a, 15b and 20d. The rudder is actuated by a rod connected to a fork-fitting (7). The hinge fitting (2) is a male bearing which fits into the female bearing (8) bolted to the hinge fitting located on the fin. Hinging is on a set of bushes, taper sleeves and a bolted pin (9) which take up radial and end play. The hinge is provided with a grease nipple (15) on the RH side. The upper and lower hinges consist of bolted pins (10) which are assembled to the hinge fittings (11 and 12), located on the rudder, and the self-aligning bearings (13 and 14) located on the fin box.

WING TO FUSELAGE ASSEMBLY

General (refer to Fig 4-56)

4226. The wing is attached to the fuselage at four attachment fittings at frames 17, 20, 26 and 32.

Attachment at Frame 17

4227. The female attachment fitting (1) on the wing is bolted to the ball-jointed male attachment fitting (2) on the fuselage. This assembly can be adjusted vertically through the threaded shank of fork-fitting (1).

Attachment at Frame 20

4228. The ball-jointed male fork-fitting (3) on the wing is bolted to the female attachment fitting (4) on the fuselage.

Attachment at Frame 26

4229. This is the main attachment point. The main wing spar (5) fits into the corresponding female fitting consisting of the two flanges (6 and 7) of frame 26. The main spar section, embedded between the two frame

flanges, is attached to the frame by bolts (9) and tapered cylindrical sleeves (8). The sleeves are split over their entire length and take-up any play in the attachment fittings. Attachment bolt heads are internally threaded to permit a bolt puller to be inserted for disassembly. The nuts on bolts (9) are locked with pins (10).

Attachment at Frame 32

4230. The rear spar extends into a ball-jointed male fork-fitting (11) which fits into the corresponding female fitting (12) located on the fuselage. An attachment bolt and a self-locking nut are used for assembly.

Wing to Fuselage Fillet (refer to Fig 4-58)

4231. The wing to fuselage fillet consists of leading and trailing edge fillets that are joined, by a series of panels, to form a smooth wing to fuselage contour.

4232. **Description.** The fillets vary between the upper and lower surfaces :

a. *Upper surface* The contour between the leading edge fillet (1) and the trailing edge fillet (8) is made by a series of panels (3, 4, 5 and 6) that are screwed to jointing plates (2).

b. *Lower Surface* The contour between the leading edge fillet and the trailing edge fillet is made by a series of panels (9, 10, 11, 13, 14, 15 and 17 for the LH side) (9, 10, 11, 14, 15 and 16 for the RH side) that are screwed to jointing plates (2). Panel (9) has provision for pipes and covers the rear structure box (7). Panel (14) has an air scoop and a ventilating duct.

4233. **Installation.** The fillets are attached by screws to the wings and fuselage except for :

a. The trailing edge fillet (8) which is only attached to the fuselage.

b. Panels (6 and 9) which are attached to the fuselage and the rear structure box (7). Panels (13) are fitted with floating attachment nuts.

FIN TO FUSELAGE ASSEMBLY

General (refer to Fig 4-57)

4234. The fin is attached to the fuselage at frames 30, 33 and 36.

Attachment at Frame 30

4235. A female fork-fitting, machined integral with rib 1, is connected to the male fuselage attachment fitting (11) at frame 30 by a bolt (12) fitted from rear to front.

Attachment at Frame 33

4236. This is the main attachment point. At the lower part, the fin main spar is provided with two drilled lugs which form the male attachment fitting that fits between the two flanges of frame 33. An attachment bolt (14) is fitted with a split sleeve (13) that absorbs any play in the attachment fittings. A terry-pin (15) is used to lock the nut onto the attachment bolt.

Attachment at Frame 36

4237. Similar to the attachment at frame 30 except that bolt (17) is fitted from front to rear.

Fin to Fuselage Fillets (refer to Fig 4-57)

4238. These are an assembly of removable formed sheets which maintain a smooth fin to fuselage contour.

4239. **Description.** The fin fillet assembly consists of :

a. One nose fillet (1).

b. Two panels (2) with two riveted cover-plates.

c. Four plain panels (3 and 4).

d. One closing panel (18) fitted with a screw for locking the engine rear suspension rod in the rest position.

4240. **Installation.** The nose fillet (1) is attached to the fuselage by means of screws. The six panels (2, 3 and 4) are screwed onto the fin and the fuselage. The panels (2 and 3) are screwed to jointing plates (5) which are located on the underside of the panels and are fitted with floating anchor nuts.

CHAPTER 5

CONTROLS

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CHAPTER 5

CONTROLS

Table 5-1 Function of Components

Index No	Applicable III 0	Applicable III D	Description	Characteristics and Functions
21C 221C	X	X X	Roll trim controls	These switches are spring loaded in the neutral position and provide two positions in roll. (As the switches are common to both the roll and pitch trim systems, there is a total of four positions.)
22C	X	X	Roll trim actuator	The actuator rotates in either direction and is provided with limit switches.
23C 223C	X	X X	Roll trim indicator lights	These are amber lights of the press-to-test type that illuminate whenever the roll trim is not neutral.
24C		X	Rudder trim control relay	This relay permits the rudder trim system to be controlled from either the rear cockpit or front cockpit (overriding cockpit).
26C		X	Protection box	Protection for the override control system
31C 231C	X	X X	Rudder trim controls	These are three-position switches that control the trim actuator.
32C	X	X	Rudder trim actuator	This actuator is connected to the artificial feel unit and permits the artificial feel unit spring load to be altered as required.
33C 233C	X	X X	Rudder trim indicator lights	These are amber lights of the press-to-test type that illuminate whenever the rudder trim is not neutral.
34C		X	Airbrake override switch	This switch prevents the airbrakes from being operated from the rear cockpit.
36C 236C	X	X X	Airbrake control switches	These switches are located on the throttle control levers and energize the relay (38C).
37C 237C	X	X X	Airbrake indicator lights	Operate when the airbrake panels are extended.
38C	X	X	Airbrake relay	This relay controls the energization current to the electro-distributing valve (39C).
39C	X	X	Airbrake electro-distributing valve	This valve is controlled by the relay (38C); it controls the hydraulic power distribution to the actuating jacks (101 and 102).
40C 41C	X X	X X	Stbd airbrake jack switch Port airbrake jack switch	Operate airbrake light in the cockpit when the airbrake panels are extended.
On 43C	X	X	Auto-Command (A.C.) pushbutton	This pushbutton permits an electrical mode of operation to be selected for the pre-servo. It remains depressed by self-excitation and pops out in case of failure of the auto-command (opening of safety system).
On 43C	X	X	P (Pitch) pushbutton	This pushbutton is used to control the power supply to the pitch damper and the inboard control surface servo-controls.
On 43C	X	X	Y (Yaw) pushbutton	This pushbutton is kept depressed by self-excitation; it controls the power supply to the rudder servo-control electro-valve and to the releasable bell-crank supply electro-valve.
On 43C	X	X	ALT (Altitude Hold) pushbutton	This pushbutton is kept depressed by self-excitation; it controls engagement of the altitude hold system.
76C	X	X	Rate-gyro transformer	This transformer is supplied with 208 volts, 400 Hz power from the inverter through a relay (20V). It supplies : — The yaw rate-gyro (89C) — The pitch rate-gyro (96C).

Index No	Applicable III 0	Applicable III D	Description	Characteristics and Functions
79C	X	X	28V d.c. safety relay	This relay is energized by the servo-control detector (20V); it controls the servo-control system for the inboard control surfaces and rudder.
80C 81C	X X	X X	Yaw damper failure indicating relay Pitch damper failure indicating relay	Each of these causes the DAMP warning light to be illuminated on the failure warning panels (IZ and, for III D, 201Z) in case of failure of the corresponding damper system.
82C	X	X	Servo-control amplifier box	This box contains all the circuits common to the amplifiers (rudder system pre-servo, dampers, inboard control surface system). The special circuits of each amplifier are contained in boxes mounted on the rack by means of quick-release fasteners.
83C	X	X	Auto-command relay	This relay enables the following units to be supplied with 208 volts, 400 Hz power from the alternator : — Auto-command amplifier (120C) — Pre-servo transformer (109C) — Servo-control amplifier box (82C).
86C 286C	X	X X	Auto-command disengage buttons	These buttons are located on the control sticks. They cause the auto-command to disengage through energization of a relay located in panel (43C).
89C	X	X	Yaw rate-gyro	This rate-gyro is powered by the rate-gyro transformer (76C). It is used to detect any angular velocity in yaw which is transmits to the rudder system amplifier.
90C	X	X	Rudder system transformer	This transformer is supplied by the inverter phase B. It provides the required power supply to the system inductive position pick-offs.
91C	X	X	Rudder servo-control	This is a jack with two independent barrels designed to be fed with electrical command signals (normal operation) or mechanical command inputs (emergency operation). Capacity : 4450 lbs (1980 daN) at 2990 lb/in² (206 bars).
92C	X	X	Input inductive position pick-off	This pick-off is driven by the lever bar located in the fin. It detects the pilot control signals which it transmits to the rudder system amplifier.
93C	X	X	Output inductive position pick-off	This pick-off is driven by the servo-control output linkage. It detects the control surface position and then feeds the rudder system amplifier with position information.
94C	X	X	Electro-valve	This valve is connected to the yaw damper safety system. It causes the rudder control system to switch over to the mechanical mode of operation (through the releasable bell-crank (47)).
95C	X	X	Safety microswitches on releasable bell-crank	These microswitches are used to operate the safety system if the load exceeds the limit specified for the bell-crank in either direction.
96C	X	X	Pitch rate-gyro	This rate-gyro is powered by the rate-gyro transformer (76C). It is used to detect any angular velocity in pitch which it transmits to the inboard control surface system amplifier.
97C	X	X	Pitch system transformer	This transformer is supplied by the inverter phase A. It provides the required power supply to the system inductive position pick-offs (LH and RH inboard control surface input and output pick-offs and negative feed-back pick-offs).
98C	X	X	Dual input inductive position pick-off	This pick-off is driven by the mixer mechanism. It detects the pilot control signals in pitch at the level of the mixer mechanism and then feeds the inboard control surface dual amplifier with position information.
99C	X	X	LH output inductive position pick-off	This pick-off is driven by the LH inboard control surface linkage. It detects the control surface position and feeds the inboard control surface dual amplifier with position information.
100C	X	X	RH output inductive position pick-off	This pick-off is driven by the RH inboard control surface linkage. It detects the control surface position and feeds the inboard control surface dual amplifier with position information.

Index No	Applicable III 0	Applicable III D	Description	Characteristics and Functions
101C	X	X	LH inboard control surface servo-control	This is a single barrel jack supplied by the No 2 hydraulic system. Capacity : 5890 lb (2620 daN) at 2990 lb/in² (206 bars). It is electrically controlled through a permanent bleed system and mechanically controlled through a neutral resetting jack (in case of electrical failure).
102C	X	X	RH inboard control surface servo-control	This is a single barrel jack supplied by the No 2 hydraulic system. Capacity : 5890 lbs (2620 daN) at 2990 lb/in² (206 bars). It is electrically controlled through a permanent bleed system and mechanically controlled through a neutral resetting jack (in case of electrical failure).
103C	X	X	Electro-valve	This valve is supplied by the No 2 hydraulic system and supplies the neutral resetting jack. Energized : Jacks not supplied — Inboard control surface servo-control jacks electrically controlled. De-energized : Inboard control surfaces return to a streamlined position.
108C	X	X	Output inductive position pick-off	This pick-off is driven by the linkage downstream of the pitch pre-servo; it feeds the servo-control amplifier box (82C) with the detected signals.
109C	X	X	Pre-servo transformer	This transformer is supplied by the alternator phase A. It provides the required supply voltage to the position pick-offs (108C) and (117C), the dynamometer (123C), and a 26V reference voltage for the auto-command amplifier box (120C).
110C	X	X	Pitch stop microswitch (anti-sticking)	This microswitch prevents the control stick from sticking in the aft position at high altitude.
111C	X	X	Microswitch on dual feed valve	This microswitch is provided to de-energize the hold-down coil of the A.C. pushbutton in case of failure of the No 1 hydraulic system.
113C 114C	X X	X X	Elevon servo-control stop microswitches	These microswitches are used to cut off the integrating network when the servo-controls have reached their maximum capacity. (This is detected by the slide-valve position).
116C	X	X	Roll pre-servo torque motor	This torque motor is fed with stabilizing signals from the amplifier (82C) and drives the distributing slide-valve of the pre-servo (permanent bleed system).
117C	X	X	Position pick-off	This pick-off is driven by the roll linkage downstream of the servo-control; the measured signals are used to slave the pre-servo control to the stabilizing signals.
120C	X	X	Auto-command amplifier box	This box contains the signal processing and amplifying networks, the safety system, the force adapter system and the automatic trim system. It also contains the slaving adapter units.
121C	X	X	Auto-command rate-gyro	This rate-gyro is used to detect the natural pitch angular velocity. It measures the controlled pitch velocity (for the auto-command). It is supplied with 26 volts, 400 Hz power. Precession is controlled by the control stick dynamometer (123C).
122C	X	X	Linkage trim dynamometer	This dynamometer is mounted in the linkage just upstream of the pitch pre-servo and detects any residual force in the control system which it converts into a corrective signal that is fed to the pitch trim jack (130C) through the relay (127C).
123C	X	X	Control stick dynamometer	This dynamometer is mounted in the linkage from the control stick. It measures the pilot control forces which it converts into electrical signals that are fed to the auto-command.
			Pitch trim controls including :	These switches have two positions in pitch and as they are common to both the roll and pitch trim systems, there is a total of four positions.
125C 126C	X X	X X	Front cockpit — Nose down trim contactor switch Front cockpit — Nose up trim contactor switch	Feed the pitch trim jack (130C) with nose up or nose down signals.
325C 326C		X X	Rear cockpit — Nose down trim contactor switch Rear cockpit — Nose up trim contactor switch	Feed the torque motor of the pitch pre-servo with trim signals when the auto-command is engaged and the undercarriage is selected up or down.

Index No	Applicable		Description	Characteristics and Functions
	III 0	III D		
127C	X	X	Pitch trim relay	This relay is energized by the auto-command power supply system. In the rest position it allows the pitch trim jack (130C) to be supplied and controlled through the trim switches located on the control sticks.
130C	X	X	Pitch trim jack	In the closed position it allows the pitch trim jack (130C) to be supplied through the auto-command. This jack is fed with control signals from : a. The pitch trim switches if the auto-command is not engaged b. The auto-command amplifier box (120C) if the auto-command is engaged (correction of out of trim).
131C 331C	X	X X	Pitch trim indicator light — Front cockpit Pitch trim indicator light — Rear cockpit	These are amber lights of the press-to-test type. They are illuminated whenever the pitch trim is not neutral.
134C 334C	X	X X	Emergency disengage controls	These controls permit energization of the emergency disengage electro-valve (135C).
135C	X	X	Emergency disengage electro-valve	This electro-valve permits a simulated failure of the No 1 hydraulic system in the event that the control stick jams.
139C	X	X	Auto-command gain switch	This switch adapts the auto-command gain to the aircraft C.G. It has two positions : Forward C.G. and Aft C.G.
142C 143C		X X	Nose down trim override relay Nose up trim override relay	These relays permit the pitch trim system to be overridden from the front cockpit.
146C 147C		X X	Roll trim relay	This relay permits the roll trim system to be overridden from the front cockpit.
150C	X	X	Over-frequency protection box	This box detects any over-frequency condition in the alternator supply and cuts off the power supply to the auto-command through the protection relay (151C).
151C	X	X	Auto-command protection relay	Controlled by 150C, this relay cuts off the power supply to the auto-command in case of over-frequency conditions.
19V	X	X	Servo-control safety relay	This relay opens whenever a failure is detected by the servo-control detector (20V).
1	X X	X	Front cockpit control stick	The front cockpit control stick is used to control the aircraft through lateral movements in roll and longitudinal movements in pitch. The control stick movements are transmitted to the corresponding linkages through two pressure sealed output bell-cranks. The control stick hand grip carries various electrical controls as follows : a. Firing control b. Trim controls (roll and pitch) c. Auto-command disengage button d. Microphone press-to-talk button e. Roll stabiliser engage button (III O only).
1a		X	Rear cockpit control stick	The rear cockpit control stick is used to control the aircraft through lateral movements of the hand grip in roll and longitudinal movements of the control stick in pitch. It is connected to the front cockpit control stick (1) through a rod and bell-crank assembly. The control stick hand grip carries various electrical controls as follows : a. Trim controls (roll and pitch) b. Auto-command disengage button.
2	X	X	Artificial feel unit (AFU)	The purpose of the artificial feel unit mounted in the roll control linkage is to provide a feeling of the control forces at the control stick. It is of the double gradient type.
3	X	X	Amedee variable reduction ratio bell-crank	The purpose of this bell-crank is to render the control stick less sensitive around neutral.

Index No	Applicable III 0	Applicable III D	Description	Characteristics and Functions
4	X	X	Roll pre-servo	This is a double tandem barrel servo-control. Capacity : 415 lb (184 daN) at 1420 lb/in² (98 bars). Each barrel is fitted with a by-pass slide-valve operated by the No 1 hydraulic system. By-pass valve operation : No 1 hydraulic system Barrel No 1 normally supplied Barrel No 2 by-passed. No 2 hydraulic system Barrel No 2 normally supplied Barrel No 1 by-passed. The pre-servo includes an electrical control unit for use with the roll stabilizer (on No 1 barrel only).
5	X	X	Mixer mechanism	The mixer mechanism receives the roll and pitch control linkage movements from the control stick and converts them into : a. Symmetrical displacements (roll) b. Displacements in the same direction (pitch) which are directed to the elevon servo-control linkage.
6	X	X	Elevon servo-controls	These are double tandem barrel servo-controls. Outboard — Capacity : 9430 lb (4195 daN) at 2990 lb/in² (206 bars). Inboard — Capacity : 10915 lb (4855 daN) at 2990 lb/in² (206 bars). The distributing slide-valves cannot be separated. Each barrel is fitted with a by-pass valve which operates automatically whenever the pressure drops below a given value. The inboard servo-controls are fitted with microswitches which are associated with the auto-command system.
7	X	X	Dual feed valve	This valve is located in the pitch and roll pre-servo feed pipes. a. It causes the pre-servo to be supplied by a single system (No 1 or No 2 hydraulic system) b. In case of failure of the No 1 and emergency hydraulic systems, it causes the servo-controls to be automatically supplied by the No 2 hydraulic system. It is fitted with a microswitch (111C) associated with the auto-command and (for III O) the roll stabilizer safety system.
8	X	X	Artificial feel unit (AFU)	Same functions as (2), but associated with the pitch control and triple gradient type.
9	X	X	Oscar system	This is a g-sensitive valve which creates an additional resistance (in the nose-up direction)proportional to the load factor. It is supplied by the No 1 hydraulic return system. Gradient : 181 lb/in² (12.5 bars)/g from 1.5 to 6g 551 lb/in² (38 bars) above 6g.
10	X	X	Dash-pot	This is a small jack supplied by the No 1 hydraulic system. It creates, at the control stick, an additional resistance which is proportional to the rate of stick displacement (in both directions).
11	X	X	Amedee variable reduction ratio bell-crank	Similar to the roll system variable reduction ratio bell-crank(3).
12	X	X	Pitch pre-servo	This is a double tandem barrel servo-control. Capacity : 865 lb (385 daN) at 2990 lb/in² (206 bars). Each barrel is fitted with a distributing slide-valve and a by-pass valve. Mechanical operation : Barrel No 2 or Electrical operation : Barrel No 1. A double bell-crank system controlled by an electro-valve causes either the No 1 barrel or the No 2 barrel to operate. This servo-control incorporates a filter built into the No 1 barrel (electric barrel) supply system.
13	X	X	Rudder control pedal assembly	This assembly consists of two rudder control pedals with horizontal hinge pins; it is connected to the lever-bar (14) by means of cables. It enables control of the rudder through the displacement of the pedals and operation of the normal brake system by depressing the upper part of the pedals. III D Only. The front and rear cockpit rudder pedal assemblies are synchronized through cables.

Index No	Applicable III 0	Applicable III D	Description	Characteristics and Functions
13a		X	Rear cockpit rudder control (III D Only)	Synchronized with the front cockpit rudder control pedal assembly through cables, this assembly includes two double groove quadrants directly connected to the rudder control cables; the quadrants are connected by cables to the lever bar located in the fin. Same functions as assembly (13).
15	X	X	Rudder artificial feel unit (AFU)	See item (2)
16	X	X	Rudder servo-control	This is a double tandem barrel servo-control. Capacity : 4450 lb (1980 daN) at 2990 lb/in² (206 bars). Operated from the No 1 and No 2 hydraulic systems. The distributing slide-valves are common to both systems. Mechanically controlled through a linkage or electrically controlled through a permanent bleed system. Hydraulic supply through a filter.
20	X	X	Pressure reducing valves	These valves reduce the roll pre-servo supply pressure from 2990 lb/in² (206 bars) down to 1420 lb/in² (98 bars).
47	X	X	Releasable bell-crank	This is hydraulically supplied through the electro-valve (94C); it disconnects the linkage components located upstream of the servo-control to permit the servo-control to be electrically operated. It is fitted with two safety microswitches (95C) associated with the yaw damper system.
51	X	X	Filter	This is located in the rudder servo-control No 1 hydraulic supply system. Filtering capacity : 20 microns.
52-53	X	X	Filters	These are located in the LH and RH inboard control surface servo-control No 1 hydraulic supply system. Filtering capacity : 20 microns.
54	X	X	Filter	This is located in the roll pre-servo No 1 hydraulic supply system. Filtering capacity : 20 microns.
55	X	X	Filter	This is located in the pitch pre-servo No 1 hydraulic supply system. Filtering capacity : 20 microns.
57	X	X	Dash-pot IAS capsule	This capsule is connected to the dash-pot to create an additional resistance (in both directions) which is proportional to the indicated airspeed (it starts operating above 200 kt IAS).
58	X	X	Filter	This is located in the No 1 hydraulic supply system of the g-sensitive valve (9). Filtering capacity : 50 microns.
61	X	X	Filter	This is located in the No 1 hydraulic supply system (return) of the dash-pot. Filtering capacity : 20 microns.
101 102	X X	X X	RH jack LH jack	Both of these jacks are used to extend or retract the airbrakes.

GENERAL

501. **Description (refer to Figs 5-1 to 5-4)** The flight controls are of conventional design. A control stick for the roll and pitch control surfaces and rudder pedals for the rudder. For III D, the front and rear cockpit controls are synchronized.

502. The control surfaces consist of :

a. Four elevons which are controlled by the roll and pitch controls.

b. Two inboard control surfaces which are controlled by the pitch control only.

c. One rudder which is controlled by the rudder control.

503. The control surfaces are controlled through :

a. Mechanical systems of rods, bell-cranks, idlers and cables.

b. Hydraulic systems of pre-servo and power servo-controls.

c. Electric or electronic systems.

504. A servo-control installation is used to slave the controls to the received control signals. Hydraulic power is used in the servo-controls and the reference signals in the installation are electrical.

ROLL CONTROL SYSTEM

Principle of Operation (refer to Figs 5-5 to 5-11)

505. The control signals originate from the control stick (1) and, for III D, the hand grip of control stick (1a). These control signals are applied to an artificial feel unit (2) (adjustable through the trim system) which gives the pilot an artificial feel similar to the external forces reacting on the control surfaces and to the pre-servo (4) through a variable reduction bell-crank (3).

506. The pre-servo (4) using hydraulic power, actuates the distributing slide-valve of the elevon servo-control (6) through the mixer mechanism (5) and an appropriate linkage. The hydraulically operated elevon servo-control transmits the control force to the elevon which is then deflected in the required direction.

507. The pre-servo working pressure is reduced from 2990 lb/in² (206 bars) down to 1420 lb/in² (98 bars) by two pressure reducing valves (20) mounted on each supply pipe (No 1 and No 2 hydraulic systems). The pre-servo has two main functions :

a. To take-up frictional and inertial forces from the stick, components and linkage between the stick and the pre-servo.

b. Control of the components between the pre-servo and the elevons.

508. **Pre-servo Jack (refer to Figs 5-7, 5-8 and 5-9).** The dual feed valve (7) allows only one barrel of the pre-servo to be supplied at a time (No 1 barrel during normal operation; No 2 barrel in case of failure of the No 1 and emergency hydraulic systems).

509. The operation of the supplied barrel is controlled by two by-pass slide-valves (21 and 22) which are actuated by the No 1 hydraulic system and operate as follows :

a. When supplied from the No 1 hydraulic system, the slide-valves (21 and 22) are operated; barrel No 1 is supplied and the No 2 barrel chambers are interconnected.

b. When supplied from the No 2 hydraulic system, the slide-valves are returned by their springs; barrel No 2 is supplied and the two chambers of barrel No 1 are interconnected.

510. The pre-servo is also electrically controlled by the roll stabilizer. It is fitted with a releasable bell-crank (A) which enables the distributing slide-valves of each servo-control barrel to be cut off. The input lever of the mechanical control is fitted with a locking system (B). During the mechanical mode of the operation, the bell-crank (A) is locked and the lever (B) is unlocked. During the electrical mode of operation, lever (A) is locked on the servo-control barrel by the locking system and lever (B) is unlocked.

511. **Elevon Servo-control Jack (refer to Fig 5-10).** The two servo-control jack barrels are normally supplied. Each barrel is supplied through a non-return valve (23) and a by-pass slide-valve (24) actuated by the corresponding hydraulic pressure. The purpose of the by-pass valve is to by-pass the two chambers of each barrel in case of failure of the corresponding system.

512. Each barrel is provided with a pressure-relief valve (25) built into the piston. The purpose of the pressure-relief valve is to render the jack reversible when the aerodynamic load in the pitch up direction is equivalent to a pressure of 4350 lb/in² (300 bars).

513. The slide-valve (26) actuated by the control linkage distributes the pressure in the chamber corresponding to the direction of displacement; the other chamber is connected to the return system. The jack is thus driven in the required direction and the elevon is deflected accordingly.

PITCH CONTROL SYSTEM

Principle of Operation (refer to Figs 5-12 to 5-14)

514. The control signals originate from the front cockpit control stick (1) and, for III D, the rear cockpit control stick (1a). These control signals are applied to the following units :

a. An artificial feel unit (8) (Adjustable

Table 5-2 Hydraulic Supply — Roll Pre-servos

Operating Case refer to Fig 5-11	Pre-servo (4)	Elevon Servo-control (6)
Normal supply	Operated from No 1 hydraulic system Pressure : 1420 lb/in² (98 bars)	Operated from No 1 and No 2 hydraulic systems. Pressure : 2 × 2990 lb/in² (206 bars)
No 1 hydraulic system failure (emergency system operating)	Operated from emergency system Pressure : 1420 lb/in² (98 bars)	Operated from emergency and No 2 hydraulic systems. Pressure : 2130 + 2990 lb/in²
(147 + 206 bars)	No 1 + emergency hydraulic system failure	Dual feed valve operated Supplied from No 2 hydraulic system. Pressure : 1420 lb/in² (98 bars)
Operated from No 2 hydraulic system only. Pressure : 2990 lb/in² (206 bars)	No 2 hydraulic system failure	Normally operated from No 1 hydraulic system Pressure : 1420 lb/in² (98 bars)
Operated from No 1 hydraulic system only. Pressure : 2990 lb/in² (206 bars)		

through the trim system) which gives the pilot an artificial feel of the forces operating on the control surfaces.

b. A dash-pot (10) acting in both directions, which increases the required control stick force according to the displacement rate of the stick. The dash-pot is connected to a valve fitted with an airspeed capsule. This valve is used to intensify the function of the dash-pot according to the indicated airspeed.

c. An Oscar system (9) which is a hydraulic jack which stiffens the control stick as the load factor is increased.

515. The control signals are also applied to the pre-servo (12) through a variable reduction ratio bell-crank (11). The pre-servo (12) using hydraulic power, actuates the distributing slide-valve of the elevon servo-control (6) through the mixer mechanism (5) and an appropriate linkage. The hydraulically operated elevon servo-control (6) transmits the control force to the elevon which is then deflected in the required direction.

516. **Pre-servo Jack (refer to Fig 5-9).** Principle of operation of the pitch linkage servo-control jack (pre-servo) is similar to that of the roll pre-servo jack, refer to para 508. The pitch pre-servo jack can also be fed with electric control signals from the auto-command.

517. **Elevon Servo-control Jack (refer to Fig 5-10).** Refer to Roll Control System (Paragraph 505).

ROLL AND PITCH CONTROL SYSTEM LINKAGES

Description

518. **Pre-mod 406 (refer to Fig 5-13).** The mixer imparts movement to bell-crank (80) which transmits this movement to elevon servo-controls through an assembly of seven rods (81) hinged on seven bell-crank levers. The two end rods are adjustable. Two of these are double bell-cranks; one is located at the level of rib 3, the other at the level of rib 6.

519. The movement is transmitted to the inboard servo-control from the double bell-crank at rib 3 through a linkage consisting of :

a. An adjustable rod (82).

b. A double bell-crank (83).

c. A rod (84).

d. An adjustable sliding rod (85).

e. An adjustable rod (86).

f. A bell-crank (87).

g. An adjustable rod (88).

520. The movement is transmitted to the outboard servo-control from the double bell-crank at rib 6 through a single adjustable rod (89).

521. **Post Mod 406 (refer to Fig 5-14).** The movement of bell-crank (80) is transmitted by :

a. A hinged rod (90).

b. An adjustable sliding rod (91).

c. Three hinged rods (92) the last of which is adjustable.

522. The movement is transmitted to the inboard servo-control through :

a. A bell-crank lever (93).

b. An adjustable rod (94).

c. A bell-crank lever (95).

d. An adjustable rod (96).

e. A bell-crank (87).

f. An adjustable rod (88).

523. The movement is transmitted to the outboard servo-control through a single adjustable rod (89).

Table 5-3 Hydraulic Supply — Pitch Pre-servos

Operating Case refer to Fig 5-11	Pre-servo (12)	Elevon Servo-control (6)
Normal operation	Operated from No 1 hydraulic system Pressure : 2990 lb/in² (206 bars)	Operated from No 1 and No 2 hydraulic systems Pressure : 2 × 2990 lb/in² (206 bars)
No 1 hydraulic system failure (emergency system operation)	Operated from emergency system Pressure : 2130 lb/in² (147 bars)	Operated from emergency and No 2 hydraulic systems Pressure : 2130 + 2990 lb/in²
(147 + 206 bars)	No 1 + emergency hydraulic system failure	Dual feed valve operated Supplied from No 2 hydraulic system Pressure : 2990 lb/in² (206 bars)
Operated from No 2 hydraulic system only Pressure : 2990 lb/in² (206 bars)	No 2 hydraulic system failure	Normally operated from No 1 hydraulic system Pressure : 2990 lb/in² (206 bars)
Operated from No 1 hydraulic system only Pressure : 2990 lb/in² (206 bars)		

RUDDER CONTROL SYSTEM

Principle of Operation (refer to Figs 5-6, 5-7 and 5-15 to 5-17)

524. The control signals originate from the front cockpit rudder control pedals (13) or, for III D, the rear cockpit control pedals (13a) (synchronized through cables) and are transmitted by control cables to the lever-bar (14) located in the fin. These control signals are applied to an artificial feel unit (15) (adjustable through the trim system) and to the distributing slide-valve of the rudder servo-control (16). The hydraulically operated rudder servo-control (16) then actuates the rudder in the required direction.

525. **Rudder Servo-control Jack (refer to Fig 5-16).** Each barrel of the servo-control jack is supplied by one of the hydraulic systems and includes a non-return valve (18) and an interconnecting slide-valve (19).

526. The distributing slide-valve follows the displacements of the control linkage. It admits the pressure from the No 1 and No 2 hydraulic systems in the chambers corresponding to the direction of displacement. This results in displacing the jack which actuates the rudder through a linkage. The rudder servo-control is also fed with electrical control signals from the yaw damper.

FLYING AIDS

General (refer to Fig 5-18)

527. Although the aircraft can be flown adequately with the conventional flight control system (linkages and servo-controls) previously described, there still remain operating limitations mostly due to the large flight envelope (variation in control surface effectiveness between take-off and Mach 2, and at high altitude).

528. Automatic limiting devices are the Oscar valve (9) and the dash-pot (10). The purpose of these hydro-mechanical units is to modify normal aircraft handling by introducing :

a. Forces in proportion to g, by the Oscar system.

b. A viscous friction in proportion to IAS, by the dash pot system.

529. The use of electric and electronic systems enables the aerodynamic parameters to be more accurately taken into account. These systems include :

a. The pitch auto-command.

b. The pitch damper.

c. The yaw damper.

d. The roll stabilizer.

530. The auto-command interprets the pilot control signals in such a manner that the same control signal causes the same aerodynamic effect throughout the complete flight envelope.

531. The dampers are used to improve the aircraft stability in pitch and yaw and the roll stabilizer holds the wings level and the aircraft on the heading flown at the moment of engagement.

532 The auto-command amplifier (120C) is connected to the servo-control amplifier (82C) which, in turn, is connected to the following units :

a. Pre-servos for pitch and roll.

b. Dampers.

c. Inboard control surfaces.

d. Rudder.

Dash-pot (refer to Fig 5-19)

533. **Purpose.** The dash-pot limits the rate of displacement of the control stick in both the nose-up and nose-down directions by viscous friction.

534. The control stick movements cause the fluid to flow in the system with the jack operating as a lift-and-force pump. The load created by the pressure in the jack (56) is applied to the control stick throughout its full range of travel in both directions. The valve (57) incorporated in the No 1 system permits the IAS function to be performed by the jack as follows :

a. At airspeeds below 200 kt, the springs push the IAS capsule of the valve (57) back which cancels any reaction and facilitates handling of the aircraft at low speeds.

b. At airspeeds above 200 kt, the ram pressure expands the IAS capsule the rod of which restricts the passage of the fluid to the valve by closing various ports.

535. The dash-pot is supplied by the No 1 return system through a filter (61) and a restrictor valve (62).

Oscar Valve (refer to Fig 5-19)

536. **Purpose.** The Oscar (9) valve introduces in the dash-pot jack nose-down loads in proportion to the normal acceleration.

Table 5-4 Hydraulic Supply — Rudder Servo Control

Operating Case	Rudder Servo-control (16)
Normal operation refer to Fig 5-17	No 1 + No 2 hydraulic systems Pressure : 2 × 2990 lb/in² (206 bars)
Failure of No 1 hydraulic system only (emergency system operating)	Emergency + No 2 hydraulic systems Pressure : 2130 + 2990 lb/in² (147 + 206 bars)
No 1 + emergency hydraulic system failure	No 2 hydraulic system only Pressure : 2990 lb/in² (206 bars)
No 2 hydraulic system failure	No 1 hydraulic system only Pressure : 2990 lb/in² (206 bars)

537. The Oscar valve is a g-valve which is fed with hydraulic pressure from the No 1 system and supplies the bottom end chamber (56) of the dash-pot (10). The valve consists of a core (51) carrying a needle (52) and is held in the open position by two springs (53 and 54). In the positive direction, the core restricts the fluid return to the reservoir; the chamber (56) is then subject to hydraulic pressure from the No 1 system.

538. The effect of the Oscar valve becomes noticeable from 1.5 g onwards. The pressure applied to the dash-pot is 12.5 bars/g up to 6 g and 38 bars/g beyond 6 g.

Auto-command (refer to Figs 5-20 and 5-21)

539. **General.** The conventional linkage and servo control system permits control of the aircraft by slaving the position of the control surfaces to that of the control stick.

540. The auto-command, fed with the aircraft aerodynamic parameters, receives the pilot control forces, adapts the control forces to the flight conditions and converts them into constant angular velocity signals regardless of the flight envelope (M — IAS — Alt.).

541. In addition to its main function described above, which is to slave the pitch angular velocity to the control stick force, the auto-command also performs the following functions :

a. It holds the aircraft longitudinal attitude without forces being applied to the control stick.

b. It compensates for the small pitch-up or pitch-down moments caused by the operation of the undercarriage or airbrakes, the disengagement of the pitch damper or any other external disturbance.

c. It cancels the control reversal phenomena in the transonic speed range.

d. It permits holding of a constant altitude (refer to Altitude Lock System).

542. The auto-command is engaged by depressing the A.C. pushbutton located on the auto flight function control panel (43C). Engaging the auto-command causes the pre-servo to be electrically operated by energizing the electro-valve (30).

543. **Pre-servo — Principle of Electrical Operation (refer to Fig 5-22).** The locking system consists of two bell-cranks (A) and (B) which are hinged about the same shaft (35). Bell-crank (B) is connected to the control linkage and to the distributing slide-valve of the No 2 barrel. Bell-crank (A) is connected to the distributing slide-valve of the No 1 barrel.

544. Two locks (34) mounted on bell-crank (B) are provided to lock bell-crank (B) onto the servo-control jack body or to interlock the two bell-cranks. Bell-crank (B) is locked hydraulically by electro-valve (30) being energized.

545. The two bell-cranks are automatically interlocked by the action of two return springs (36) when the electro-valve (30) is not energized.

546. Two microswitches (37) are used to open the safety feature system when bell-crank (B) has reached a given point. The two return springs (36) are used to re-centre the bell-crank.

547. **Pre-Servo Control System (First Stage).** This consists of a permanent bleed system connected to the distributing slide-valve of the servo-control jack No 1 barrel. A torque motor (31) is provided to actuate a slide-valve (33) supplied through two calibrated ports (38).

548. Its purpose is to accurately synchronize the displacement of the distributing slide-valve (32) with that of the slide-valve (33) requiring low power from the torque motor (31). The displacement of the slide valve (33) creates a pressure difference in the two chambers C and D and the difference in pressure moves the distributing slide-valve (32).

549. **Servo-control Amplifier — Principle of Operation (refer to Fig 5-21).** Through a network referred to as an error network, this amplifier is fed with the voltage delivered by the auto-command (120C) and the voltage delivered by a position pick-off (108C) actuated by the linkage located downstream of the jack. The difference between the two voltages constitutes the error measurement which is forwarded to the torque motor (31) by the amplifier. The torque motor actuates the distributing slide-valve as required to cancel the error.

550. **Auto-command Assembly — Principle of Operation (refer to Fig 5-21).** The control stick linkage is locked by the pre-servo. The control stick forces are converted by a dynamometer (123C) into electrical signals which are fed to the error network through the two following channels :

a. Pre-control channel which delivers direct control signals corrected for the indicated airspeed and the altitude.

b. Rate-gyro precession channel which feeds the rate-gyro with pilot induced rate information (degrees/second).

551. The rate-gyro delivers signals resulting from :

a. The precession signals delivered by the dynamometer.

b. The actual angular velocity of the aircraft.

552. For attitude control of the aircraft, these rate-gyro signals are integrated before being applied to the error network. Non-integrated (degrees/second) signals are used to stabilize the system.

Safety Features (refer to Fig 5-21 and 5-22)

553. The auto-command is provided with many safety features. The opening of one of the safety feature systems results in de-energizing the hold-down coil of the a.c. pushbutton located on the auto flight function control panel (43C). The a.c. failure warning lights are illuminated on the centralized failure warning panels (IZ) and for III D (201Z), the jack electro-valve is de-energised and the servo-control jack is switched over to the mechanical mode of operation. The safety feature system ground return is established by a microswitch (IIIC) mounted on the dual feed valve. It is interrupted if the valve operates as a result of a failure in the No 1 hydraulic system.

554. **Auto-command Over-frequency Protection.** The over-frequency protection box (150C) (located between frames 15 and 16 on the RH side) detects any over-frequency condition in the a.c. network and cuts off the power supply to the auto-command through a relay (151C).

Table 5-5 Auto-command Safety Features

Description	Principle	Effect or Remarks
Electrical lock safety feature.	Measures the error at the input of the auxiliary amplifier.	Variable value according to the Mach number, altitude or undercarriage down configuration. Cancelled under servo-control saturation conditions.
Precession safety feature. Pick-off power supply safety feature.	Operated by a failure in the precession system. Operates when one of the pick-offs is not supplied.	Avoids having erroneous control signal measurements.
Output pick-off signal circuit safety feature.	Operates if the wire breaks or earths.	This type of failure is not provided for by the lock.
Torque motor safety feature.	Operates if the torque motor earths or open-circuits.	Faulty operation of the torque motor.
No 1 and Emergency system failure safety feature.	Operated by failure of the No 1 and emergency hydraulic systems.	Microswitch (111C) operated by the dual feed valve (*if No 2 system is operating*).
Disengagement as the result of excessive forces on the control stick.	Disengagement takes place when abnormal forces are exerted on the control stick.	Safety microswitches operated.
Pilot control force detection system safety feature.	Operated by a fault in the load detector circuit.	Covers the control force detector output and the precession channel.
Over-frequency safety feature	Detection of over-frequency conditions in the a.c. supply of the auto-command through box (150C).	Interruption of d.c. supply to (82C) and (120C) through relay (151C).

555. **Auto-command Emergency Disengagement (refer to Figs 5-22 and 5-23).** The emergency disengage switches, (134C) in the front cockpit, and for III D, (334C) in the rear cockpit, control an electro-valve (135C). In the emergency position, the electro-valve cuts off the No 1 hydraulic system supply to the dual feed valve. This valve then supplies barrels No 2 of the pitch and roll pre-servos but not to the No 1 barrels. It also opens the power supply system of the auto-command through microswitch (IIIC).

556. **Quick Auto-command Disengagement.** The auto-command can be quickly disengaged by depressing pushbutton 86C on the front cockpit control stick or for III D, 286C on the rear cockpit control stick.

Special Auto-command Devices

557. **Engagement.** A synchronizing device permits the auto-command to be engaged only if the auto-command signal is null at the torque motor.

558. **Disengagement.** In order to prevent shock loads on disengagement of the auto-command, a dynamometer (122C) is mounted on the input side of the pre-servo jack. This dynamometer is used to detect any possible load on the input side of the servo-control jack and to adjust the trim system accordingly to cancel such loads.

559. **Anti-sticking Device.** This device prevents any inadvertent disengagement of the auto-command and avoids control column sticking effect under the following conditions :

a. *(113C-114C)* Detection of the position of the inboard elevon servo-control slide-valves when the servo-controls have reached their maximum capacity.

b. *(110C)* Detection of the maximum nose-up position in pitch within the zones of low control surface effectiveness.

560 **Auto-command Operation with Undercarriage Extended.** A switch operated by the LH undercarriage leg initiates the following auto-command actions :

a. Allows the trim system to be controlled by the pilot through the cockpit trim control.

b. Electrical integration is cancelled.

c. Position returned to 3.5° nose-up attitude.

d. Pre-control rate is changed.

e. Electrical lock range is modified.

561. The above conditions provide the pilot with a more conventional mode of control with an artificial feel of the control stick forces and an opportunity to trim the aircraft.

562. **Auto-command Variation of C.G. Location.** A switch (139C) located on the LH panel enables the pilot to select either AFT C.G. or FWD C.G. This selection will modify the precommand rate of the auto-command amplifier (120C).

Altitude Lock (refer to Fig 5-24)

563. The altitude lock system in the auto-command holds the aircraft at a constant altitude. It is engaged by depressing a pushbutton located in the bottom LH corner of the auto-flight function control panel (43C). It can be engaged only if the auto-command is in operation.

564. The altitude lock is a barometric altitude holding system; the reference system uses two aneroids as follows :

a. One aneroid is used to operate the system.

b. One aneroid is used for reference purposes.

565. The altitude lock system is provided with the following safety features :

a. Indication of altitude deviation relative to engagement altitude.

b. Indication of the difference between the two aneroids.

c. The altitude lock system can be quickly disengaged by depressing a pushbutton located in the bottom RH corner of the auto flight function control panel (43C).

d. Two switches in the output multiplier of the air data computer, one set for M = 0.95, the other for M = 1.15; these switches cause the ALT pushbutton to pop out when the aircraft is accelerated or decelerated through the transonic range.

Pitch Damper (refer to Fig 5-25)

566. **Purpose and Description.** Under certain flight conditions the aircraft may oscillate about the lateral axis and there is a tendency for these oscillations to amplify. The purpose of the pitch damper is to detect such oscillations and to stop them from the onset.

567. The pitch damper system consists of the following units :

a. Two inboard control surface actuating jacks (40) that are electrically controlled.

b. Two neutral resetting jacks (44).

c. One electro-valve (103C) supplying the jacks (44). An electrical failure will cause these units to operate.

568. **Principle of Operation.** The rate-gyro (96C) detects the slightest pitch angular velocities and forwards a corrective signal to the inboard control surfaces servo-control jacks (40).

569. Control surface corrections are electrically controlled which permits the two following functions to be superimposed :

a. *Compensating function.* The inboard control surfaces are slaved to the mean position of the elevons to improve the control surface effectiveness in pitch.

b. *Damping function.* The inboard control surfaces oscillate by ±1.5° around the position determined by the control stick.

570. The servo-control amplifier (82C) uses signals from the following for each inboard control surface :

a. The input position pick-off (98C) (mixer mechanism).

b. The output position pick-offs (99C and 100C) (linkage downstream of the inboard control surface jack).

c. The negative feed-back pick-off (74) (driven by the distributing slide-valve of each inboard control surface jack (40)).

571. To these signals are superimposed those from the rate-gyro (96C) corrected for the indicated airspeed and the altitude in the air data computer output multiplier box (2C). The resulting signals are used to control the torque motors of the inboard control surface actuating jacks.

572. **Inboard Control Surface Actuating Jacks — Principle of Operation (refer to Fig 5-26).** The principles of operation for the inboard control surface actuating jacks for normal or emergency operations are :

a. *Normal Operation.* The inboard control surface actuating jacks are electrically controlled. The distributing slide-valve follows the movements of the torque motor (41) through a permanent bleed system (42) (which permits the gain curve to be improved). The control unit is supplied by an electro-valve (43) connected to the pitch system. The P pushbutton located on the control panel (43C) controls the power supply to the damping and compensating systems. These systems cannot be individually controlled.

b. *Electrical Failure.* An electrical failure de-energises electro-valves (43) and (103C). The neutral resetting jack (44) locks and the jack changes to the mechanical mode of operation. The jack goes to a neutral position and the inboard control surface is streamlined.

c. *No 2 Hydraulic System Failure.* A hydraulic system failure causes the two by-pass valves (45) to be returned by their springs, the piston is hydraulically locked and the jack is locked in its neutral position. The piston rod is fitted with a pressure relief valve (46) which operates in the event of excessive loads on the control surfaces.

573. **Electrical Circuit.** The P pushbutton on the control panel (43C) controls the power supply to the following units :

a. Neutral resetting electro-valve (103C).

b. Electro-valves (43) of the LH and RH jacks.

c. Servo-control amplifier (82C).

d. Failure indicating system relay (81C).

Table 5-6 Pitch Damper Safety Features

Description	Principle of Operation
a. Differential lock	Operates when the difference between the relative positions of the LH and RH inboard control surfaces has reached 2° 30′.
b. Electrical lock	Operates when the error value is 5° at the RH inboard control surface.
c. Negative feed-back pick-off power supply	Operates in case of incorrect pick-off power supply.
d. Continuity of negative feedback circuits	Operates in case of an open circuit in the pick-off circuit.
e. 400 Hz safety feature	Also associated with the yaw damper system, operates in the event of any over-voltage, under-voltage, over-frequency or under-frequency condition; (not operated if the abnormal condition prevails for less than 1 second).

574. **Safety Features.** The holding coil of the P pushbutton is connected in series with the safety features shown in Table 5-6. When any one of the above safety features is operated, the P pushbutton automatically disengages, the inboard control surfaces are streamlined and the DAMP failure warning lights illuminate on panels IZ and for III D, 201Z through relay (81C).

Yaw Damper (refer to Figs 5-27 and 5-28)

575. **Purpose.** The yaw damper detects and stops any oscillations about the vertical axis.

576. **Principle of Operation.** A rate-gyro (89C) is used to detect the slightest angular velocities about the yaw axis and to transmit corrective signals to the electrically controlled rudder servo-control (16). Two different control signals are fed to the jack through the amplifier (82C) as follows :

a. Rudder control signals from the position pick-off (92C) driven by the lever-bar (14) located in the fin.

b. Damping signals from the yaw rate-gyro (89C). The automatic control signals cause the rudder to oscillate ±2° around the position determined by the fin lever-bar. The signals are corrected for indicated airspeed and altitude.

577. A releasable bell-crank (47), connected in the control linkage, enables switching over from the mechanical mode of operation to the electrical mode of operation and vice-versa. The operation of this bell-crank is controlled by electro-valve (94C).

578. The yaw damper is engaged and disengaged by means of the Y pushbutton on the auto flight function control panel (43C). Damping and rudder control functions can be operated separately. With the Y pushbutton depressed the rudder is electrically controlled and the yaw damper is engaged. With the Y pushbutton not depressed, the rudder is mechanically controlled and the yaw damper is disengaged.

579. **Servo-control Jack — Operation (refer to Fig 5-29).** With the bell-crank (47) disengaged, the rudder servo-control jack torque motor (48) determines the displacement of the slide-valve through a permanent bleed system (through No 2 hydraulic system only). The body of the servo-control jack aligns itself with the position of the slide-valve.

580. **No 1 and Emergency Hydraulic Systems Failure.** The capacity of the servo-control jack is reduced by 50% (only the No 2 barrel is operational).

581. **No 2 Hydraulic System Failure.** Failure of the No 2 system results in locking the bell-crank and switching the rudder control over to the mechanical mode of operation (the Y pushbutton remains depressed on control panel 43C).

582. **Electrical Failure.** Same effect as in the case of the No 2 hydraulic system failure (the Y pushbutton is dis-engaged).

583. **Servo-control Amplifier 82C — Rudder System Module.** The amplifier compares the signals from the output position pick-off (93C) with the signals from the input position pick-off (92C). The signals from the negative feed-back pick-off (91C) are used to improve the system stability. The differential current is applied to the torque motor (48) and takes the damper signals (Corrected for the indicated airspeed and the altitude through the air data computer (1C), and the output multiplier box (2C)) into account.

584. **Safety Features.** The hold-down coil of the Y pushbutton, located on control panel 43C, is connected in series with the safety features shown in Table 5-7. Operation of any one of the above safety features results in disengaging the yaw damper. This failure is indicated by the illumination of the DAMP failure warning light on panels IZ and for III D, 201Z through the relay (80C).

Roll Stabilizer (refer to Fig 5-30)

585. **Purpose.** The purpose of the roll stabilizer is to hold the wings level and the aircraft on the heading flown at the time of engagement.

586. **Principle of Operation.** The released control stick follows the position of the roll pre-servo which is fed with electrical stabilizing signals.

587. The stabilizing signals in heading and roll are detected at the level of the gyro centre (25F); through the output multiplier (27F), these signals are then applied to the roll pre-servo through the electronic servo-control assembly (82).

588. The system can be engaged regardless of the heading, but the roll attitude must be within ±2°. A synchronizing device, incorporated in the stabilizer, is provided to prevent the jerks which might result from wing tank fuel transfer asymmetry (for instance). The

Table 5-7 Yaw Damper Safety Features

Description	Principle of Operation
Circuit continuity for the negative feed-back pick-off (91C)	Operates in case of an open circuit in the pick-off circuit (91C).
Power supply to the negative feed-back pick-off (91C)	Operates in case of incorrect power supply to the pick-off (91C).
Power supply to the output position pick-off (93C)	Operates in case of incorrect power supply to the pick-off (93C).
Earthing of the torque motor (48)	Operates if the torque motor is earthed (48).
Microswitches (95C) on the releasable bell-crank (47)	Operated by abnormal loads on the bell-crank (47).

synchronizing device is cut-off when the roll stabilizer is engaged. The roll command signals are then fed into the loop.

589. **Operation of the Roll Pre-servo.** The operation of the roll pre-servo is identical with that of the pitch pre-servo.

590. **Safety Features.** The safety features are connected in series with the R pushbutton (on panel 43C) holding coil as well as with the microswitch (111C) on the dual-supply valve (ref Table 5-8).

591. The roll stabilizer can be engaged only if the R pushbutton has first been depressed. Engagement is made by depressing the pushbutton (115C) on the stick hand grip. Engagement is possible only when the measured roll angle is less than $\pm 2°$. In case of higher measurements the aircraft can be controlled manually until the roll angle is less than $+2°$. The system can be switched over to the manual mode of piloting by :

a. Depressing the engage button (115C).

b. Applying a force to the control stick — two microswitches actuated by bell-crank A cut off the power supply.

c. Pulling out the R pushbutton on control panel (43C).

d. Depressing the roll stabilizer/auto-command disengage button (86C) on the stick hand grip.

e. Switching over the emergency electro-valve (135C) (controlled failure of the No 1 hydraulic supply system).

592. Unlike the pitch control channel, there is no automatic trim system. Slight jerks may be felt upon disengaging the roll stabilizer due to a change in wing symmetry having occurred while the stabilizer was engaged.

CONTROL STICK

General

593. The control stick is provided to control the aircraft in pitch and roll. For III D, the control sticks in the front and rear cockpits are synchronized through a rod and bell-crank assembly. The control stick hand grips are fitted with various electrical controls detailed in the Cockpit Arrangement chapters.

Control Stick — Front Cockpit (refer to Fig 5-31)

594. **Description.** In addition to the hand grip (1) the control stick consists of :

a. The body assembly (3).

b. The box assembly (4).

c. The control stick base shaft assembly (5).

d. The roll control fork-end (9).

595. The body assembly (3) consists of a formed tube which takes the control stick end-fitting (2) at its upper part. This end-fitting is secured by means of rivets and is fitted with an electrical connector internally and with the screwed hand grip (1) externally. An electric cable clamp (28) is provided on the LH side of the control stick body. The roll control bell-crank (21) is also riveted at the lower end of the body. This bell-crank is provided with a splined bore which takes the pin (29) and is housed in the tapered bearings (13 and 25). Pin (29) is held in position by a bolt (14) and nuts (23 and 24). The stops (20) are attached by means of screws. The bell-crank and roll control rod (16) are assembled by a pin (15).

596. The control stick base (17) forms the bottom of the box assembly (4) and is attached to the box by means of bolts and nuts. On the LH side, the box assembly oscillates on the bearing (8).

597. For III D, a balancing weight (42) is secured under the control stick base (17) through a bolted support bracket.

598. The control stick base shaft assembly (5) is screwed onto the control stick base (17) and transmits movements to the pitch control through a bell-crank (6). An adjustable screw (19) fitted to the bell-crank (18) limits the control stick movement range. Contact with fixed stop (31) limits the nose-down movement and with adjustable stop (32) limits the nose-up movement. The bell-crank is also fitted with a balancing spring (40) which is connected to the aircraft structure through an adjustable rack (41).

599. The roll control linkage is on the LH side of the box (4). Rod (16) is connected to the fork-end (9) through bearings and ball stops and is protected by a bellows (27). The bearings are arranged in a cage (26) screwed onto the fork-end.

5100. **Operation (refer to Fig 5-31).** The control stick operates as follows for pitch and roll :

a. *Pitch control.* The control stick assembly swivels about the bearings in the box and control stick base shaft

Table 5-8 Roll Stabilizer Safety Features

Description	Principle
Pick-off (117C) power supply	Operated when pick-off (117C) supply fails.
Continuity of pick-off circuit (117C)	Operated when the pick-off circuit is broken.
Safety feature on torque motor circuit	Operated when the torque motor circuit is earthed or broken.
Roll safety feature	Operated for ± 10° in roll.
Heading safety feature	Operated for ± 10° in heading.

which operates the controls through the pitch bell-crank (6) mounted on the base shaft (5).

b. *Roll control.* The lateral movements of the control stick result in driving the rod (16) and the roll control fork-end (9) through the roll control bell-crank (21) connected to the control stick. The travel of the bell-crank is limited by stops (30).

5101. **Installation (refer to Fig 5-31).** The control stick is assembled to vertical web assemblies at frame 6 by screws passing through the bearing housings (7 and 8).

5102. **Sealing.** Sealing of the flight controls where they pass through the cockpit wall is ensured by a pressure sealed box located at the rear of frame 10.

Control Stick — Rear Cockpit — III D Only (ref Fig. 5-32)

5103. **Description.** The control stick consists of the following main components :

a. The control stick head (1) fitted with a hand grip (2). The control stick head is a moulded and machined piece which is hinged onto the body assembly (3) through a pin parallel to the aircraft centre line.

b. The body assembly (3) is a boxed assembly which is bolted to the control stick base (7) and fitted with a bearing (8).

c. The control stick pitch control base shaft assembly (4) is bolted to the control stick base (7), and transmits movements to the pitch control through a bell-crank (9). It is fitted with a bearing (10).

d. The roll control fork-end (5) is attached to the bearing housing (12) which transmits lateral movement while absorbing rotational movement.

5104. **Operation (refer to Fig 5-32).** The control stick operates as follows for pitch and roll :

a. *Pitch control.* The control stick assembly rotates about the base shaft assembly bearings and actuates the linkage through the bell-crank (9).

b. *Roll control.* The lateral movements of the hand grip (2) actuates bell-crank (13) and transmits the movement of the rod (14) to bell-crank (15). The latter transmits its movements to the roll control fork-end (5).

5105. The travel of the control stick head (1) is limited by a cam machined integral with the bell-crank (13). This cam abuts the adjusting screws (16).

5106. **Installation (refer to Fig 5-32).** The control stick is assembled to vertical web assemblies between frames 12 and 12b by screws passing through the bearing housings (8 and 10).

5107. **Sealing.** The flight controls are sealed where they pass through the cockpit wall by a pressure-sealed box located between frames 9 and 10 (A and B). It consists of a seal (22) mounted in a cage (23) on the control bell-crank pin (24).

MIXER MECHANISM

General (refer to Figs 5-33 and 5-34)

5108. The mixer mechanism receives the control movements from the pitch and roll linkages and transmits them to the elevon servo-controls in the form of mechanical control movements and to the inboard control surfaces in the form of electrical control signals.

Description (refer to Fig 5-35)

5109. The mixer mechanism consists of a lever (5) fitted with two bell-cranks (4 and 7). At one end, the lever is hinged about a pin (0). The bell-crank (4) is also hinged about pin (0) and connects to the roll control and also to the bell-crank (7) by a rod (3).

5110. The bell-crank (7) is connected to the elevon control rods (6) on the LH side and (1) on the RH side. The rods (1) and (6) are connected to the wing control linkages by two bell-cranks (11). Two adjustable stops (12) on the aircraft structure permit adjustment of the control maximum range of travel. The bell-crank (7) and pitch control rod are both attached to lever (5).

Operation (refer to Figs 5-33 to 5-37)

5111. The mixer mechanism operates as follows for pitch and roll :

a. *Roll control.* When the bell-crank (4) is actuated in roll, the lever rotates about pin (0) and transmits movement to the bell-crank (7) through rod (3). The bell-crank transmits to the RH (1) and LH (6) control linkages equal but opposite control surface deflecting movements.

b. *Pitch control.* The pitch control subjects the bell-crank (7) to back-and-forth movements which are transmitted to the LH (6) and RH (1) control linkages by an equal value and in the same direction. The lever (5), when operated in pitch, rotates a

potentiometer (98C). This potentiometer electrically forwards control signals to the inboard control surfaces (See Pitch Damper).

5112. The mixer mechanism when simultaneously subjected to pitch and roll control movements, algebraically determines the control surface deflection angles. The control surface deflection angles are shown in Figs 5-36 and 5-37 where $\propto g$ is the LH elevon angle, $\propto d$ the RH elevon angle and $\propto c$ the inboard control surface angle. Trailing edge up angles are negative and trailing edge down angles are positive.

Installation (refer to Figs 5-33 and 5-34)

5113. The mixer mechanism is horizontally mounted in the fuselage between frames 16 and 17 on a two part support (9 and 10). The support consists of a plate and an angle assembly secured to the fuselage on the LH side. They support two bearings which take the pin (0) about which the lever (5) is hinged. Two holes are provided to rig the assembly with the elevons in the neutral position.

RUDDER CONTROL PEDAL ASSEMBLIES

General (refer to Fig 5-38)

5114. Each rudder control pedal assembly is used to control :

a. The rudder, by pushing the LH or RH pedal.

b. The normal brake system, by depressing the upper part of the pedals.

5115. The assembly is provided with an adjustment mechanism (4) permitting the position of the pedals to be adjusted as required.

Description

5116. **Front Cockpit Rudder Control Pedal Assembly (refer to Figs 5-38 to 5-40).** Each half section of the assembly consists of :

a. A pedal (5) hinged about a shaft (14).

b. A twin-fork yoke (6) attached to a shaft (2). The outboard fork supports a nine hole adjustment sector (3) fitted with a bearing (7).

c. Springs (11) used to return the brake pressure transmitter to the aft position after operation.

d. A spiral retainer spring (10).

e. A rod and bell-crank assembly which keeps the pedals fairly parallel during the rudder control movements (through an articulated parallelogram).

5117. **Rear Cockpit Rudder Control Pedal Assembly, III D Only (refer to Figs 5-38 to 5-40).** Each half section of the assembly consists of :

a. A pedal (21) hinged on a base at the lower part.

b. A twin-fork yoke (22) attached to a shaft (23). The base (24) is hinged at the lower part of this yoke. The inboard fork supports a nine hole adjustment sector (25).

c. Spring (26) used to return the yoke and pedal assembly to the aft position during adjustment.

d. Spring (27) used to return the pedal against its stop (brake release).

e. A rod and bell-crank assembly which keeps the pedals fairly parallel during the rudder control movements (through an articulated parallelogram).

Operation (refer to Fig 5-41)

5118. The two pedals move in planes parallel to the aircraft symmetry plane. In the front cockpit, their movements are transmitted to two grooved quadrants to which the ends of the rudder control cables are connected. The two quadrants are synchronized by a cable fitted with a barrel-type turnbuckle. The travel of each quadrant is limited by an adjusable stop mounted on the aircraft structure.

5119. III D Only. In the rear cockpit, the movements are transmitted to two double groove quadrants synchronized by a linkage. The front and rear quadrants are synchronized by cables. The rudder control cables are also connected to the rear cockpit quadrants and transmit the rudder control movements to the lever-bar located in the fin.

5120. The movements of the fin lever-bar are then transmitted by rods to the slide-valve of the rudder servo-control (through the releasable bell-crank). The fin lever-bar is also connected to the AFU and trim assembly.

Adjustment

5121. **Front Cockpit (refer to Fig. 5-39).** The rudder control pedals are adjusted by moving the lugs (4) laterally to unlock the adjustment sector (3).

5122. The yoke and pedal assembly presses against the pilot's feet under the action of the spring (10). The rudder control pedals are locked again by releasing the lugs which release the retracting pins.

5123. **Rear Cockpit — III D Only (refer to Fig 5-38).** The rudder control pedals are adjusted by actuating the lugs (28) which unlock the sector (25) through a flexible control.

Braking (refer to Fig 5-39)

5124. **Front Cockpit.** Depressing the upper part of the LH or RH rudder control pedal operates the corresponding brake pressure transmitter through a linkage (8). The brake pressure transmitter control (9) is returned to the brake release stop by a spring (11).

5125. **Rear Cockpit — III D Only.** Depressing the upper part of the LH or RH rudder control pedal operates the corresponding brake pressure transmitter (31) through a linkage (24, 29 and 30). The pedal and linkage assembly is returned to the brake release stop by a spring (27).

Installation

5126. **Front Cockpit (refer to Figs 5-38 and 5-39).** Each half section of the assembly is secured to the cockpit structure through an attachment fitting (1) and a flanged plate box structure (12).

5127. **Rear Cockpit — III D Only (refer to Figs 5-38 and 5-39).** Each half section of the assembly is secured through ball-bearings to a common centre support (32) and a side support (33); the two supports are bolted to the cockpit structure.

Sealing (refer to Fig 5-38)

5128. Sealing of the rudder control linkage is ensured by a sliding assembly mounted in a pressure-sealed box that consists of a piston sliding in a sealed guide; the rudder control cables are attached at both ends of the piston.

ARTIFICIAL FEEL SYSTEMS

General (refer to Figs 5-41 and 5-42)

5129. One of the effects of the servo-controls and of the flying aids is the suppression of the control surface loads normally felt by the pilot during conventional flight. The purpose of the artificial feel system is to restore a gradual feeling of the loads for the three flight control systems (roll control, pitch control and rudder control).

Roll Artificial Feel Unit (refer to Fig 5-41)

5130. The roll artificial feel unit consists of a shouldered three-part rod (4, 8 and 9). The rod has two sliding stops (2 and 3) between its shoulders which separate three springs (5, 6 and 7). The rod assembly is housed in a cylinder (1).

5131. The rod (4) is connected to the linear jack attached to a fixed point. The jack, operated by the actuator (22C), enables the position of the null reaction point to be changed. The cylinder (1) is connected to the control linkage through its end fitting (10).

5132. The unit centre spring (6) is pre-loaded to 17.5 lb (7.8 daN) and the end springs (5 and 7) to 8.8 lb (3.9 daN). Any movement of the control linkage results in the compression of one of the end springs or the centre spring and one of the end springs.

5133. When the load is less than 17.5 lb (7.8 daN), only one end spring is compressed. When the load is more than 17.5 lb (7.8 daN), the centre spring and one of the end springs (end spring corresponding to the direction of the load) are compressed.

5134. The double gradient graph illustrated in detail B shows the extension lengths versus the applied loads. The maximum compression is 38.9 mm in either direction, which corresponds to a load of 62.7 lb (27.9 daN).

5135. The trim actuator (22C) is controlled from the control stick hand grip by button type switches (21C in the front cockpit and 221C for III D in the rear cockpit); this switch also controls the pitch trim system. The jack is operated as long as pressure is applied to the switch.

5136. An amber trim indicator light (23C and for III D, 223C) located on LH console for both cockpits illuminates whenever the trim position is other than neutral.

5137. For III D, two relays (146C and 147C) enable the front cockpit trim control to override the rear cockpit trim control.

Pitch Artificial Feel Unit (refer to Fig 5-42)

5138. The pitch artificial feel unit is located in a parallel connected branch of the pitch control linkage between the control stick and the servo-control. It consists of a cylindrical housing (10) which contains a piston (11) actuated by three pre-loaded springs (12, 13 and 14). Depending on the loads at the control stick, one, two, or three springs are operated (triple gradient system).

5139. The pre-loading dimensions are 92 mm, 107 mm (centre spring) and 85 mm, which respectively corresponds to loads of 19.3 lb (8.6 daN), 47.2 lb (21 daN) and 19.3 lb (8.6 daN).

5140. The reaction loads are 85.1 lb (37.85 daN) in the nose-up direction and 94.6 lb (42.1 daN) in the nose-down direction.

5141. The trim jack (130C) is controlled from :

a. The front cockpit by switches 125C and 126C on control stick hand grip.

b. III D Only, the rear cockpit by switches 325C and 326C on control stick hand grip.

These switches also control the roll trim system.

5142. An amber trim indicator light (131C and for III D, 331C) located on LH console for both cockpits illuminates whenever the trim position is other than neutral (2° nose-up).

5143. For III D, two relays, 142C nose-down and 143C nose-up, enable the front cockpit trim control to override the rear cockpit trim control.

Rudder Artificial Feel Unit (refer to Fig 5-41)

5144. The rudder artificial feel unit is a single action type consisting of a cylinder (10) containing a spring (11), two washers (12) and a shouldered rod (13).

5145. The cylinder is connected to the bell-crank from the trim jack and the shouldered rod to the lever-bar in the fin.

5146. The artificial feel unit is symmetrical in operation which results in the spring being compressed regardless of the direction of displacement. The range of travel is 50 mm. The spring, which is pre-loaded to 44 lb (19.6 daN) on assembly, opposes a 2511 lb (111.7 daN) reaction at the end of its travel.

5147. The trim actuator (32C) is controlled from :

a. The front cockpit by switch (31C) located on the LH console.

b. III D Only, the rear cockpit by switch (231C) located on the LH console.

5148. A protection box (26C) is connected in parallel with the control circuit and an amber trim indicator light (33C and for III D, 233C) located near the trim control is illuminated whenever the trim position is other than neutral.

5149. III D Only. A relay (24C) enables the front cockpit trim control to override the rear cockpit trim control.

AMEDEE VARIABLE REDUCTION RATIO BELL-CRANK

General (refer to Fig 5-43)

5150. The Amedee variable reduction ratio bell-crank is an epicyclic device intended to reduce the control stick sensitivity around the control stick neutral position. It consists of a fixed toothed sector (1) that has mounted to it a hinged bell-crank (2) which carries a planet gear (3).

5151. The lever takes the control stick linkage (A) and the servo-control linkage (B) which is connected to an eccentric pin (4) fitted to the planet gear. The control

stick linkage describes a portion of a circle whilst the servo-control linkage describes a flattened epicycloid (Detail B).

5152. Detail C illustrates the movements of the servo-control linkage corresponding to that of the control stick linkage with and without the Amedee bell-crank connected.

5153. There is an Amedee variable reduction ratio bell-crank in the roll control system and another in the pitch control system.

PRESSURE REDUCING VALVE

Purpose (refer to Fig 5-44)

5154. The purpose of this valve is to reduce the pressure of the roll pre-servo supply system from 2990 lb/in² (206 bars) down to 1420 lb/in² (98 bars).

Description and Operation

5155. The pressure reducing valve consists of a sleeved body (1) provided with various ports which are respectively connected to the supply (2), operating (3) and return (4) pressure systems.

5156. Operating pressure at the end (6) causes the slide-valve (5) to move in the sleeve. The other end of the slide-valve is opposed by an adjustable calibrated spring (7). A circular groove (8) in the slide-valve provides for supply through the corresponding port. A bleed flow through the returned port is obtained through the spring adjustment. This bleed flow results in a pressure drop, the operating pressure being equal to the spring calibration value.

5157. The axial conduit directing the fluid under pressure to the end of the slide-valve has a 0.3 mm calibrated nozzle (9) which damps the slide-valve displacements.

DE-CLUTCHING BELL-CRANK

Purpose (refer to Fig 5-44)

5158. The purpose of the de-clutching bell-crank is to permit rudder operation in the event of either electrical or hydraulic failure.

Description and Operation

5159. The de-clutching bell-crank, connected in the control linkage, consists of two arms (10 and 11) articulated on the same shaft (12). Arm (10) is provided with a lock, the locking pin (13) of which fits into the locking socket (14) integral with the arm (11). The assembly is locked by the release of the spring (15); it is unlocked hydraulically through an electro-valve (94C).

5160. Two microswitches (95C) are mounted on arm (11). A servo-control fault causes either microswitch to operate and opens the safety feature system (see Yaw Damper) if the control moves beyond the travel allowed by the bell-crank. Electro-valve (94C) is no longer supplied and the bell-crank is locked by spring (15). Operation of the microswitches is delayed by two springs (16) mounted on either side of the bell-crank. These springs are calibrated so that locking takes place only in case of excessive loads.

NEUTRAL RESETTING JACK

Purpose (refer to Fig 5.45)

5161. The purpose of the neutral resetting jack is to operate the distributing slide-valve of the inboard control surface actuating jack to return the control surface to the neutral position in case of electrical failure.

Description

5162. The neutral resetting jack consists of :

a. A body (1) including two small jacks (2 and 3). These jacks are supplied from the No 2 hydraulic system through an electro-valve (103C).

b. A lever (4) hinged at one end to the body (1). At the opposite end, the lever is linked by a rod to the distributing slide-valve of the jack. The pistons (5 and 6) of the jacks are tipped with fingers which bear on the lever.

Operation

5163. **Free Position — Electro-valve Energized.** The two chambers of each jack are by-passed with no pressure in the electro-valve. The distributing slide-valve of the inboard control surface actuating jack is electrically controlled and freely drives the lever through the linkage.

5164. **Locked Position — Electro-valve De-energized.** The jacks are supplied by the No 2 hydraulic system. The fingers lock the lever in a position corresponding to the neutral position of the inboard control surface.

AIRBRAKE CONTROL SYSTEM

General (refer to Figs 5-46 and 5-47)

NOTE

In order to prevent any inadvertent opening of the airbrakes on the ground, a safety-pin is fitted to the rocker (105, and for III D, 205) after every flight to lock it in the IN (retracted) position.

5165. The airbrake control system is an electro-hydraulic installation which causes the aircraft to decelerate in flight by the simultaneous extension of two pairs of airbrake panels (103 and 104) opening at the upper and the lower surfaces of the wings.

5166. For III D. The airbrakes can be controlled from either the front or rear cockpit, however, a switch (34C) in the front cockpit can be used to override the rear cockpit. Switch (34C) is lockwired in the closed position.

5167. The airbrake control switch (36C), and for III D, (236C) is located at the tip of the throttle control lever and actuated through a rocker (105), and for III D, (205). The rocker is marked OUT (opening) and IN (closing). The rocker is stable in the IN position; however, a higher pressure on OUT automatically locks it in the OUT position; it is then necessary to positively return it to the IN position when required.

5168. Switch (36C) or for III D, (236C) energises relay (38C) which controls electro-distributing valve (39C), causing the airbrake panels to be either extended or retracted via jacks (101 and 102). The airbrake panels are kept open by hydraulic pressure and are mechanically locked in the closed position by their jacks.

5169. The amber indicator lights (37C), and for III D, (237C) are illuminated when the airbrake panels are opening. These lights are controlled by switches (40C and 41C) and are of the press-to-test type.

5170. The switches (40C and 41C) are operated by

Table 5-9 Airbrakes — Non-operational Condition

Electrical Installation	Hydraulic Installation
Rocker (105) and for III D, (205), in the IN (closed) position.	Jacks (101 and 102) retracted and locked. The jack chambers are connected to the reservoir return system.
Override switch (34C) lock-wired in the closed position for III D	Airbrakes closed.
Electric circuit open at switches (40C), (41C) and (36C) and, for III D, (236C).	The No 1 system pressure is stopped at the inlet of the electro-distributing valve (39C).
Relay (38C) de-energised	Airbrakes closed.
Electro-distributing valve (39C) de-energized.	All valves are closed
Indicator lights (37C) and for III D, (237C), off.	

the jack internal locking devices (101 and 102). Each switch is provided with two microswitches which are used to drop the pressure between the electro-distributing valve (39C) and the jacks when the airbrakes are retracted.

5171. There is no airbrake emergency control system.

5172. The installation enables the pilot to :

a. Completely extend the airbrakes.

b. Keep the airbrakes in the out position by releasing the control switch which automatically locks the control switch in the OUT position.

c. Close the airbrakes by actuating the control switch in the opposite direction.

d. Partially open the airbrakes for a short time by momentarily actuating the control switch; in this case, the airbrakes are retracted automatically as soon as the control switch is released regardless of the degree of opening.

Hydraulic Installation

5173. The required hydraulic power is provided by the No 1 system which permanently supplies the electro-distributing valve (39C). The electro-distributing valve (39C), makes the connections as required to supply the jacks (101 and 102) in both operating directions and it includes two electro-magnets marked ELECTRO-MAGNET No 1 (opening); ELECTRO-MAGNET No 2 (closing). When no excitation current is present (neutral position, airbrakes closed), the hydraulic power supply is blocked and the two chambers of the jacks are connected to the hydraulic reservoir.

NOTE

Provision is made for ensuring that hydraulic pressure is available at all times for the airbrake control system.

5174. The two jacks (101 and 102) are similar; they are of the double-acting type with a mechanical locking device which is effective in the retracted position.

Mechanical Installation

5175. For a description of the airbrakes and their hinge mechanisms, refer to Chapter 4.

Operation (refer to Figs 5-48 and 5-49)

5176. With the airbrakes closed and the airbrake control switch not actuated, the condition of the installation is as shown in Table 5-9.

5177. The airbrakes can be controlled either from the front cockpit or (for III D) from the rear cockpit. In the example in Tables 5-9 and 5-10, they are operated from the front cockpit (refer to Fig 5-48).

Airbrake Actuating Jack (refer to Fig 5-50)

5178. **General.** The airbrake actuating jack is a double-acting hydraulic jack controlled by two microswitches and incorporating an internal mechanical lock that operates when the jack is in the retracted position. The jack is used for retraction and extension of the airbrakes.

5179. **Description.** The airbrake actuating jack comprises the following :

a. A body consisting of a cylinder (145), a base (153) and a locking bush (151); on the inside is a locking piston (115) with a spring and a pawl (117) used to actuate the switch (40C or 41C).

b. A piston (123) with its rod (127) fitted with a locking claw (121) and an extension stop (143).

c. A switch (40C or 41C) with two internal microswitches connected to a cable and a standard 5-socket female connector.

d. A core (149) fitted with a restrictor (147) protected by filters. This device slows down the displacement rate of the jack rod by restricting the fluid flow when the rod reaches the fully retracted position (closing of the airbrakes).

e. Two elbow couplings with inlet filters for connection to the hydraulic systems (E

Table 5-10 Airbrakes — Extension Sequence

Order	Electrical Installation	Order	Hydraulic Installation
1.	Rocker (105) tilted to the OUT position, closing switch (36C). Relay (38C) energised. No 1 electro-magnet of the distributing valve (39C) energised.		
		2.	Pressure applied to the jacks in the rod extension direction. Unlocking of the jacks.
3.	Switches (40C and 41C) are reversed : light (37C) is illuminated and part of the excitation circuit of No 2 electro-magnet of the distributing valve (39C) is closed.		
		4.	The jacks extend up to the internal stop. The airbrakes open (Fig 5-48 illustrates this condition).

NOTE

As long as the rocker is in the OUT position (maintained by the pilot or automatically locked), the No 1 electro-magnet remains energized to maintain the hydraulic pressure in the jacks. If the rocker is not locked or if the pilot releases it, the rocker is automatically returned to the IN position and the airbrakes close.

= retraction system; F = extension system). The two rigid pipes connected to the elbow couplings lead to a coupling block (125) to which the two flexible supply pipes connect.

f. A threaded rod fork-end (131) which permits the length of the jack to be adjusted by ±5 mm on installation.

5180. A reference hole (129) opposite the outer face of the lock-nut (139) is provided to indicate that the length of the jack has been adjusted to a maximum which should not be exceeded.

5181. **Characteristics.**

Length (between centres)
Extended ..... 494 ± 5 mm
Retracted ..... 406 ± 5 mm
Travel ..... 88 ± 1 mm
Capacity (for a 2,843 lb/in² (196 bars) pressure)
Extension direction : 21,238 lb (9,447 daN) (area : 49.01 cm²)
Retraction direction : 16,654 lb (7,408 daN) (area : 38.83 cm²)
Operating hydraulic fluid : H515 (MIL-H-5605E)
Electrical power supply .... aircraft d.c. power system

5182. **Unlocking and Extension (refer to Fig 5-48).** The fluid under pressure is admitted through A, C and F. The piston (115) is moved back and unlocks the claw (121). The switch (40C or 41C) is reversed and the rod (127) extends. The fluid from the chamber (165) escapes through E, B and D.

5183. **Retraction and Locking (refer to Figs 5-49 and 5-50).** The fluid is admitted through A, B and E and the rod retracts. At the travel limits the fluid escaping from the chamber (166), through ports F, C and D, can only pass through opening (167) via restrictor (147); this reduces the piston speed. The claws (121) push the piston (115) back and engage with the bush (151). The piston is then returned into position to lock the assembly. The switch (40C or 41C) is reversed.

5184. **Installation (refer to Figs 5-47 and 5-50).** Ball-joints are fitted at both ends of the airbrake actuating jack. The jack is attached by two pins, with grease nipples, (155 and 135) to the front spar (bottom end) and to the bottom airbrake panel (rod end). Floating mounting nuts (110 and 133) are mounted on the jack and the two pins are safety-locked by lock-plates (132 and 156).

BRAKE CHUTE CONTROL SYSTEM

General (refer to Figs 5-51 and 5-52)

5185. The cruciform brake chute is contained in an interchangeable container (7) attached in a housing provided in the aircraft tail cone.

5186. The brake chute is mechanically controlled from the cockpit through a two-position lever (3) located on the LH side or for III D, from the rear cockpit through a pull handle (29) located on the LH panel. With the control in the OUT position, the brake chute is locked to the aircraft and the container is opened. In the DROP position, the brake chute is dropped after slowing down the aircraft. The brake chute is automatically dropped in case of accidental opening of the container. On the ground, the brake chute control is kept in the DROP position by a safety pin attached to the safety pin rope.

Installation of the Brake Chute Container

5187. The container consists of a cylindrical light

TABLE 5-11 Airbrakes — Retraction Sequence

Order	Electrical Installation	Order	Hydraulic Installation
1.	With the airbrakes out and the indicator light (37C) illuminated, rocker (105) titled to the IN position to unlock it (or release the rocker). Switch (36C) opens the excitation circuit of relay (38C). The No 2 electro-magnet of the distributing valve (39C) is energized and the No 1 electro-magnet is de-energised.		
		2.	Pressure is applied to the jacks (101 and 102) in the rod retraction direction and the airbrakes close (refer to Fig 5-49).
		3.	At the end of the closing travel, the jacks lock the airbrakes in the retracted position.
4.	Switches (40C and 41C) are reversed, indicator light (37C) is extinguished and No 2 electro-magnet of the distributing valve (39C) is de-energised.		
NOTE The installation is now in the position described in Table 5-9.			

alloy housing. The brake chute attaching shackle (20) passes through a flanged hole at the front of the cylinder. The rear end of the container is closed by a jettison cap (8) which is attached by taper pins (22). The pins are kept in their housings by a steel strap (25). After installation, the strap is locked by a retracting rod (12) fitted with a pin (11) tipped by a retracting finger (10).

5188. When installing a new brake chute container, the rod (12) is retracted by compressing the spring (26). Releasing the pressure on the spring causes the finger (10) to re-engage into the strap locking system.

5189. For transport and handling, the container cap is fitted with a safety pin (9).

5190. Ejection of the cap is assisted by a large diameter spiral spring (21) which bears on and is attached to rilsan cup (24). The spring ejects the brake chute by pulling out the extraction strap (27). The container, once mounted on the aircraft, is centred by two studs (13) fitting into the guides (18). The studs are locked by two pip-pins.

Installation of the Brake Chute Control

5191. **Front Cockpit.** The control lever (3) is located between frames 6 and 7 on the LH side above the power control quadrant; it consists of a lever which drives a double bell-crank (2) connected to the linkage by a rod. At the upper part, the folding handle is locked in each position by a spring and is identified by a green ring and a phosphorescent line. The two positions of the lever are indicated by arrows on the cockpit wall.

5192. **Rear Cockpit — III D Only.** The pull handle (29) is located on the LH panel at frame 12 and is provided with a swivel joint. The two controls are interconnected by a linkage and an idler bell-crank to a double lever (28) pivoted between frames 10 and 11.

Linkage Installation

5193. The linkage installation consists of :

a. A Teleforce flexible control (1) from the lever (28) to frame 36 (where the control leaves the cockpit, it is sealed by a seal and putty).

b. A bell-crank and rod system at frame 36 at the end of the flexible control. The bell-crank at frame 37 is fitted with a return spring (30) and two adjustable stop screws provided to geometrically lock the control in the DROP position. At frame 37, the control is connected to the brake chute attaching system lever.

Installation of the Brake Chute Attaching System

5194. This system consists of :

a. Two jaws (5) hinged about a pin secured to the support.

b. A spring box (17) connected to each jaw by a rod.

c. A double lever (4) connected to the control linkage at one end. The lever compresses the spring box (drop position) through two rollers. The other end of the lever is connected to the strap locking retracting rod (12) through rods (16 and 15) and bell-crank (14).

5195. The attaching system incorporates two lateral roller and spring assemblies (19) which maintain, except in case of excessive loads, the attaching shackle (20) in place when the jaws are open.

Operation (refer to Fig 5-52)

5196. **In Flight.** Lever (3) in the DROP position and III D, handle (29) in the forward position. The lever (4) is moved by the linkage and compresses the spring box (17). The jaws (5) are moved to the open position by the rods. The brake chute strap is locked by the retracting rod.

5197. **Landing.** Lever (3) in the OUT position

and III D, handle (29) in the aft position. The linkage relaxes the tension on the spring box (17), the jaws (5) are actuated and the brake chute is locked to the aircraft. The retracting rod is also actuated and the cap retainer strap freed. The container cap is ejected and pulls the brake chute out of the container.

5198. **After Landing.** Lever (3) in the DROP position and III D, handle (29) in the forward position. The jaws (5) are opened and the brake chute is dropped.

CHAPTER 6

UNDERCARRIAGE

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Figures for this Chapter are contained in DI(AF) AAP 7213.003-2-14, Book 3.

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CHAPTER 6

UNDERCARRIAGE

Table 6-1 Function Of Components

Index No	Description	Characteristics and Functions
	UNDERCARRIAGE SYSTEM	
6C	Transmitter — Normal system : undercarriage, wheel brakes, airbrakes	This converts the load resulting from the pressure in the common system (undercarriage, normal wheel brakes, airbrakes) into electrical signals fed to the hydraulic pressure gauge (9C) and for III D, (209C).
3G 203G	Undercarriage Control Switch 203G III D Only	Controls the undercarriage position in conjunction with electro-distributing valve (4G) and various micro-switches.
4G	Electro-distributing valve (retraction-extension)	This is a two electro-magnet valve which is controlled by the control switches (3G) and for III D, (203G) and the various microswitches of the installation. It makes the required hydraulic connections for operation of the undercarriage actuating jacks and uplocks.
5G	Electro-distributing valve (door opening and closing — backward and forward displacement of main wheels)	The functions of this valve are similar to that of valve (4G) controlling the undercarriage door jacks and the longitudinal jacks (12 and 13).
13G	Electro-valve	This is energized (open) when the electro-distributor (4G) is electrically supplied, i.e. when the undercarriage doors are locked open. When closed, it traps the fluid contained in the undercarriage jacks, thereby preventing accidental unlocking.
27G 227G	Undercarriage Warning Light 227G III D Only	Flashes when the throttle control lever is placed in the IDLE position and airspeed falls below 240 knots.
29G 229G	Undercarriage Position Indicator 229G III D Only	Indicates whether the undercarriage is in a safe or unsafe condition.
52G	Speed-sensitive capsule	This capsule is connected to the pitot static system; it prevents the warning light (27G) and for III D (227G) from illuminating at airspeeds above 240 ± 10 kts when the throttle control lever is in the IDLE position and the undercarriage is not locked in the down position.
53G	Dual flasher	This is controlled by 15G, 16G, 47G and 48G to cause the two LH and RH green lights of 29G to flash when the undercarriage is down and locked but not moved aft. The flasher supply is cut-off when the aircraft is on the ground (shock absorber compressed).
12 13	LH longitudinal jack RH longitudinal jack	These are provided to move the main undercarriage legs forwards or backwards.
14 15	LH lateral jack RH lateral jack	These are provided to retract or lower the main undercarriage legs.
19 20	LH uplock RH uplock	These are used to automatically lock the main undercarriage legs in the retracted position.
21 22	LH door actuating jack RH door actuating jack	These are provided to actuate the main undercarriage doors.
23 24 25 26	LH front door lock RH front door lock LH rear door lock RH rear door lock	These are used to lock the main undercarriage doors in the closed position. They are released by a linkage actuated by the door actuating jack (21 or 22) at the beginning of the opening sequence, or by the manual release control when the aircraft is on the ground.
27 28	LH sequencing distributor RH sequencing distributor	These are each operated by the corresponding main undercarriage leg; in an emergency, they control the backward sequence of the main undercarriage legs.
254	Nose undercarriage uplock	This is used to automatically lock the nose undercarriage in the retracted position.

Index No	Description	Characteristics and Functions
	UNDERCARRIAGE SYSTEM (Continued)	
256	Nose undercarriage door actuating jack	This jack is provided to actuate the main nose undercarriage door.
261	Nose undercarriage retraction jack	This jack is used to retract and lower the nose undercarriage leg.
387.	Accumulator	This 0.45 U.K. gal (2.04 litre) accumulator is charged to 1420 lb/in² (98 bars) with nitrogen; it prevents pressure surges and provides a power reserve for the undercarriage, wheel brake and airbrake control systems.
391.	Emergency distributing valve	This valve is mechanically controlled by the pilot; it is used to direct the fluid from the No 2 system to the jacks (12,13,14,15,21,22,256 and 261) and the uplocks (19, 20 and 254) to lower the undercarriage in case of failure of the normal control system.
410	Hydraulically controlled distributor	In case of emergency extension of the undercarriage, this distributor cuts off the No 1 hydraulic system supply to the undercarriage and door electro-distributing valves and connects this supply to the reservoir return system.

Index No	Description	Characteristics and Functions
	WHEEL BRAKE SYSTEM	
6C	Transmitter — Normal system : undercarriage, wheel brakes, airbrakes.	This is associated with the undercarriage system (see 6C)
7C	Transmitter — Emergency and parking brake system	This transmitter converts the load resulting from the pressure stored in the emergency brake accumulator into electrical signals which are fed to the dual hydraulic pressure gauges (9C) and for III D (209C) (see pressure indicating system, para 6171).
23G 26P	Switches, including microswitches A	These operate in parallel with the centrifugal contacts of 39G and 40G to prevent the brakes being applied when the shock absorbers are expanded.
30G	Reversing microswitch	This microswitch is operated by the throttle control lever; with the lever in a position corresponding to : - An engine r.p.m. more than 8000 : - It closes the energization circuit of 41G. - It opens the energization circuit of the Ministop installation. - An engine r.p.m. less than 8000 : - It opens the energization circuit of 41G. - It closes the energization circuit of the Ministop installation.
34G 234G	Ministop installation control switch 234G for III D Only.	This switch is safety-locked in the ON position; it enables the Ministop system to be isolated by the pilot if required while maintaining the opportunity to still apply the brakes.
35G 36G	Ministop electro-distributing valves	Depending on the position of the Ministop installation electric switches, these valves direct the hydraulic fluid either to the brakes or to the reservoir.
39G 40G	Accelerometers	These are provided to establish or to interrupt, together with microswitches A (23G and 26P), the electric control circuits of the Ministop electro-distributing valves.
41G	Electro-distributing valve	Depending on the position of the throttle control levers, this valve allows or prevents the maximum pressure to be directed to the brakes; it is controlled by the reversing microswitch (30G).

Index No	Description	Characteristics and Functions
	WHEEL BRAKE SYSTEM (Continued)	
413a 413b	Transmitters	These constitute part of the two independent brake master cylinders.
414 416	Normal control pressure reducing relays	These are mounted in the supply system of each brake; they enable the brakes to be supplied at a variable pressure. Each relay is itself supplied by the undercarriage system accumulator (387) and is controlled by the hydraulic pressure from one of the transmitters. There are two pressure stages according to whether the engine is idling or at full power. Idling : 943 ±87 lb/in² (65 ±6 bars) for III O 957 ±87 lb/in² (66 ±6 bars) for III D Full power : 1987 ±145 lb/in² (137 ±10 bars).
417	Emergency brake accumulator	This has a capacity of 0.12 U.K. gal (0.55 litre) and is charged to 1,276 +73 lb/in²(88 +5 bars) with nitrogen; it provides a reserve of fluid under pressure enabling the brakes to be applied up to six times in an emergency.
418.	Emergency hydraulic pressure reducing valve	This valve permits a progressive pressure, depending on the control travel, to be directed to the brakes in case of failure of the normal system. The mechanical control of the unit can be locked in an intermediate position (the front cockpit brake handle only in III D aircraft) to hold the braking pressure for parking purposes. Parking brake pressure : 1204 lb/in² (83 bars). Maximum pressure : 1987 lb/in² (137 bars).
420	Rear cockpit transmitter, III D Only	This constitutes part of two independent brake pumps.
421.	Pressure relief valve	This valve permits the fluid to flow back to the hydraulic reservoir in case of excessive pressures in the hydraulic system between the emergency brake accumulator (417) and the emergency hydraulic pressure reducing valve (418). Opening pressure : 3553 lb/in²(245 bars).

GENERAL

Description (refer to Figs 6-1 to 6-4)

601. The undercarriage is a retracting tricycle undercarriage including :

a. The main undercarriage legs, LH and RH (1 and 2), attached to the wings.

b. The nose undercarriage leg (3) attached to the front fuselage section.

602. The leading particulars are as follows :

a. Oleo-pneumatic shock absorbers.

b. Main wheels fitted with hydraulic brakes.

c. Self-centring nose wheel with shimmy damper (no steering control).

d. Low pressure tubeless tyres.

e. Retraction by hydraulic jacks.

f. Main gear with forward and backward moving legs.

603. The wheel wells in the wings and fuselage are closed by doors (4 to 10) which are operated either mechanically or by hydraulic jacks.

Operation

604. The synchronized operation of the undercarriage and undercarriage doors is achieved by electro-hydraulic operation for normal operation and hydraulic-mechanical operation for emergency extension.

605. The control switch (3G) or for III D, (203G) (normal control) permits extension and retraction of the undercarriage. The emergency control handle (408) permits extension of the undercarriage only.

606. A position indicating system (29G) and for III D (229G) is provided to indicate to the pilot at any time that the desired operations are actually taking place.

607. **Normal Operation.** A normal electro-hydraulic system controls the retraction and extension operations of the undercarriage as well as the corresponding operations of the undercarriage doors and the forward or backward motions of the main legs. The doors (6, 7 and 8) are closed after the retraction or extension operations.

608. **Emergency Operation.** An emergency hydraulic-mechanical system is provided in case of failure of the normal system for extension of the undercarriage. For emergency operation, the doors (6, 7 and 8) are not closed again once the undercarriage is extended.

Wheel Brake System

609. Two separate installations provide for normal or emergency operation of wheel brakes.

CAUTION

The normal and emergency brake control systems must not be used at the same time.

610. **Normal Control System.** Permits the aircraft to be braked on landing or during ground manoeuvres and to be held during an engine ground run. This system is controlled by two brake pedals which operate two independent pressure transmitters (413a and 413b) in the front cockpit and for III D, a dual transmitter (420) in the rear cockpit.

611. **Emergency Control System.** The emergency system is used in case of failure of the normal system. It is generally used as a parking brake and also permits the aircraft to be held during an engine ground run. This system is controlled by handle (427) and for III D (423) which operates a mechanically controlled progressive pressure reducing valve (418).

MAIN UNDERCARRIAGE

Description (refer to Figs 6-4 to 6-6)

612. The two main legs, LH and RH, are symmetrical. They retract inwards into the wells provided in the wings and fuselage. Doors are provided to close the wheel wells; the wells are completely closed when the undercarriage is retracted and are only partially closed when the undercarriage is down.

613. Each undercarriage leg includes :

a. An articulated assembly hinged under the wing about an axis parallel to the aircraft centre line; this assembly itself consists of :

(1) A hinge arm (31).

(2) A leg (11) with a built-in shock absorber; the leg is hinged on the hinge arm (31).

(3) A longitudinal hydraulic jack (12) hinged on the leg (11). This jack is locked in either the ram retracted or ram extended position to maintain the leg in the forward or rear position. The jack is used as a longitudinal truss when the undercarriage is down and as a control arm during retraction because of its fixed upper attachment pin (41), refer to Fig 6-6.

b. A lateral hydraulic jack (14) is used for retraction and extension and constitutes a lateral truss through an internal mechanical lock.

c. A wheel (16) fitted with a 750 × 230 × 15/1 tubeless tyre. The wheel is cantilever mounted outboard on an axle.

d. A single-disc hydraulic brake (17) attached to the half-fork of the leg.

e. An automatic uplock (19) with hydraulic unlocking to maintain the assembly in the retracted position by a hook.

f. A mechanical linkage (34) provided to control the sequencing distributor (27).

Undercarriage Doors

WARNING

Release all the hydraulic pressure before operating the undercarriage door handles.

614. The undercarriage doors operate automatically with the undercarriage. For maintenance purposes, it is possible to open the undercarriage doors independently from the undercarriage.

615. The fairing door (9) is linked mechanically to the longitudinal jack. It closes the undercarriage leg housing in the lower wing surface and is locked by the overlapping main undercarriage door.

616. **Main Undercarriage Door.** The main undercarriage door (7) closes the wheel housing in the fuselage up to the wing root where it mates with the fairing door. It is operated by a hydraulic jack (21) the mechanical internal lock of which locks it in the open position. In the closed position, the main undercarriage door is locked by two automatic hook locks engaging roller-fittings. These locks are released simultaneously for door opening by a mechanical unlocking control actuated by the door jack. This door is normally closed except during the undercarriage retraction or extension sequence and remains open only when the undercarriage has been extended by the emergency system.

617. The main undercarriage door (7), the fairing door (9) and its control (33) are structurally and mechanically described in Chap 4. The door actuating jack (21), the door locks and the manual unlocking system are described in paras 680 to 695.

618. The automatic mechanical unlocking control and the manual unlocking system for the main undercarriage door are described in paras 669 to 679. The manual unlocking system is provided for opening the door on the ground.

619. The operation of the above components during retraction and extension of the undercarriage is contained in paras 6154 to 6192.

Installation

620. **Undercarriage Leg (refer to Fig 6-6).** Each main undercarriage leg is accommodated in a structure box provided in the wing, forward of the main spar; the hinge arm (31) pivots in the front and rear bearings included in the structure box. The rear bearing consists of a ball-joint (69) and a two-part cage retained by a hollow screw (59) and a cover (71). The front bearing consists of a ball-joint (52), a shouldered cage (53) and a bolted back-plate (51). The rear pin (66) is attached to the ball-joint (69). A spacer washer (63) is provided for adjustment of the hinge end play. The front pin (54) is free to slide in the ball-joint (52) and may be withdrawn. Its rack control device is operated by a pinion shaft (56) locked by a cup (57) and a nut (58). The ball-joint (49) fitted to the bracket (44) is locked

onto the structure by a shouldered sleeve (47) and a bolt (48).

621. **Lateral Jack (refer to Fig 6-6).** Each lateral jack (14) is hinged about a sleeve (38) in a bushed fitting (35) secured to the wing structure box. The components are assembled by a hollow bolt incorporating a grease nipple (37) screwed into the self-locking floating nut (36) this locks onto the fitting (35).

622. **Uplock (refer to Fig 6-7).** The undercarriage uplock (19) is attached between stringers 12 and 14. Two plates (73 and 74) are provided for the mounting of the uplock. This assembly, which also includes two fixed cleats (76) and two mobile cleats (77), is assembled by two plain bolts (78) and one bolt (79) that incorporates a grease nipple. The undercarriage uplock can be adjusted in two directions by sliding the mobile cleats (77) over the fixed cleats (76).

623. **Fairing Door Control (refer to Fig 6-7).** The upper link-rod (33), fitted with a ball-joint, is used to actuate the fairing door; it is connected by means of a hollow bolt (83) that incorporates a grease nipple, a washer (82) and a self-locking nut (81) to a bushed female fork-end (84) attached to the undercarriage hinge arm.

624. **Sequencing Distributor Control (refer to Fig 6-8).** The length of the rod (34) used for connection to the sequencing distributor (27) can be adjusted through the threaded fork-end (88). The distributor control rod is connected to rod ends (86 and 91) located on the distributor lever and on the hinge arm; these rod ends are fitted with ball-joints. Bolts (87 and 89), are used for connection of the control rod.

Main Undercarriage Leg — Description and Operation (refer to Figs 6-6, 6-9 to 6-11)

625. The undercarriage leg consists of an oleo-pneumatic shock absorber strut attached to the aircraft by a hinged arm.

626. **Hinged Arm.** The hinged arm (31) end-trunnions turn in the bearings in the main wing spar and in the undercarriage attachment fitting. A taper pin (99) is used as a hinge-pin for the upper fork-end of the strut (97). At the front of the hinged arm a bracket (44) is attached to the structure by a shouldered sleeve (47) and a bolt (48). The attachment bracket (42) and two pins (41 and 43) provide the connection points between the bracket (44) and the longitudinal jack (12).

627. **Strut (refer to Figs 6-6, 6-9 and 6-10).** At the upper part of the strut a hard landing indicating piece (60) is held in position by a clamp, refer to Fig 6-6. The centre section (97) of the strut is fitted with a trunnion (103) to which the rod end of the lateral jack (14) is attached by a screwed pin (104) incorporating a grease nipple. Two microswitches, (23G for LH leg and 26P for RH leg) are mounted on the strut level with the trunnion and are operated by the sliding rod (96). One of the microswitches is used to control the regulating circuit of the corresponding accelerometer; the other microswitch is used for undercarriage ground retraction prohibition circuit (2nd microswitch on LH leg) or the load shedding prohibition circuit (2nd microswitch on RH leg). Two fork-fittings at the lower part of the strut provide hinged attachment points for the longitudinal jack rod end (12) and the upper link (108) of the torque link.

628. **Sliding Assembly (refer to Figs 6-9 to 6-11 and 6-18).** The chromium-plated sliding rod (96) forms the cylinder of the shock absorber and is tipped by a half fork (94) fitted with an axle (102). The axle takes the wheel and the brake unit; on the fork side it is closed by a plug (93) which can be removed for installation of the jack adapter pad.

629. An accelerometer operated in connection with the Ministop installation is mounted inside the axle, refer to Fig 6-18. Attached to the half fork is a bracket fitted with a roller (32) used to lock the undercarriage leg in the retracted position. The position of the roller can be adjusted by moving the washers (95). The lower link (113) of the torque-link is hinged about the bottom part of the sliding rod (96) by a pin (116).

630. The torque-links (108 and 113) are identical and are symmetrically mounted on the two main undercarriage legs. The links are hinged about a pin (114). The hinge permits the operating play to be adjusted by nut (111) and also enables the wheels to be aligned by adjusting the cage (109).

631. The two hydraulic brake supply lines (normal and emergency systems) are routed along the fork and the strut. They consist of rigid pipes (118) connected to flexible pipes (119) at the torque-link hinge and centre hinge.

632. The accelerometer cable (92) runs from the base of the half fork along the leg up to a connection box (98). Cable (101) from switch (23G or 26P) also connects to box (98). The single cable from this box is terminated by a standard 5-socket connector.

633. **Shock Absorber (refer to Fig 6-11 and 6-12).** The shock absorber is a double-acting oleo-pneumatic type with a travel of 200 mm. It is operated by hydraulic fluid H-515 (MIL-H-5606E) and nitrogen under an initial pressure of 666 lb/in^2(45.9 bars), pre-Mod 881 or 624 lb/in^{2}post Mod 881.

634. The sliding rod (96) is guided by two rings in the strut; one ring (130) is integral with the upper part of the rod; the other ring (120) is integral with the lower part of the strut. The sliding rod (96) of the undercarriage leg forms the cylinder of the shock absorber. The lower section of the cylinder contains a free separating piston (121) which isolates the fluid from the nitrogen. The upper part of the cylinder is filled with fluid and is divided into four chambers by the piston (129) and restrictor valves (122 and 126). The two restrictor valves are fitted with free valves (123 and 124). The piston is fitted with a spring valve (131).

635. A standard valve (127) without a core is provided at the upper part of the shock absorber for replenishing the shock absorber fluid. A standard valve (117) with a core is provided at the end of the hinge-pin (116) for inflation of the shock absorber, refer to Fig 6-10. A small quantity of fluid remains at the bottom of the nitrogen chamber (132) for lubrication of the walls.

636. The shock absorber functions as follows :

a. *Compression.* The landing loads applied to the shock absorber force the piston (129) and the restrictor valve (122) into the cylinder (96). The fluid from the chamber (134) is forced into the chamber (133); the difference in cross-section of the chambers causes an additional quantity of fluid to flow between the chambers (137) and (133) through the restrictor valve (122) which opens. The

separating piston (121) moves towards the bottom of the cylinder, causing a pressure rise in the shock absorber. The compression motion of the shock absorber is slowed down by the fluid being forced through the orifices of the restrictor valve (126) which are uncovered as valve (124)opens.

b. *Expansion.* On take-off, the undercarriage is relieved of the load, the nitrogen expands in the gas chamber (132) and the fluid is forced out by the separating piston (121). As the fluid forced out of the chamber (133) can only escape through the orifices of the valve (123), the expansion motion is thus slowed down. The fluid then flows through the hollow rod (128) and to the chamber (134) by lifting the valve (131).

Longitudinal Jack (refer to Figs 6-9 and 6-13)

637. The longitudinal jack (12) is a double-acting jack. It is fitted with two internal claw-locks, each locking the rod in the extreme position. The two locks are similar in principle and consist of the same components. Detailed operation of these locks is contained in para 639 to 647. Operation of the longitudinal jack is illustrated in Fig 6-13.

638. Each lock operates a sequencing switch (49G and 50G) or a sequencing and position indicating switch (47G and 48G). The rod-end (140) permits the length of the jack rod to be adjusted.

639. The supply ports of the jack are each fitted with a filter. These ports are connected by means of rigid pipes (139) to a coupling block (138) together with the control system flexible pipes. Corresponding markings (A and B) are provided on both the jack supply ports and the coupling block. The two (LH and RH) longitudinal jacks are symmetrical.

Lateral Jack (refer to Fig 6-14)

640. The lateral jack is a double-acting jack that includes a counter-rod (143) intended to reduce the thrust during extension.

641. An internal claw-lock (154) is provided to lock the jack rod in the undercarriage down position. A dashpot (144) and a restrictor valve (146) are used to slow down the retraction motion of the jack rod at the end of the retraction travel. The supply ports are each fitted with a filter. A sequencing switch (15G and 16G) is operated by the internal lock. The length of the jack rod can be adjusted by the rod-end (145). The LH and RH jacks are identical and the inlet end-pieces and the pipes are symmetrically arranged.

642. **Claw-Lock (refer to Fig 6-15).** An example of the principle of operation of the claw-lock used to lock the jack rod in the extended position is shown in Fig 6-15. The claw-lock includes (refer to detail A) :

a. A bushing (141) with spring lugs (151) tipped by claws (154).

b. A locking bush (149)

c. A locking piston (148) with a spring (147).

643. **Locking, Principle of Operation (refer to Fig 6-15).** Refer to Detail A. The piston (156) is moved by the pressure of the hydraulic fluid in the chamber (152). The chamber (153) is connected via a restrictor to the return system. This return pressure drives the locking piston (148) against the locking spring (147) and causes the locking piston (148) to bear against the locking cylinder shoulder (160).

644. Refer to Detail B. The lugs (151) are bent to pass the locking bush (149). Upon reaching the end of travel position, the claws (154) on the lugs (151) start to radially deploy. When extension has stopped, return pressure decreases and the locking piston (148) starts to move.

645. Refer to Detail C.In this position, the piston (156) is abutting the locking bush (149). As the back pressure decreases, the locking piston (148) is moved by the tension of locking spring (147) until it locks the legs (151) and operates the microswitch (159).

646. **Unlocking, Principle of Operation.** The assembly is hydraulically unlocked when the jack ram starts retracting.

647. Refer to Detail D. The hydraulic pressure existing in the chamber (153) is applied to the pistons (148 and 156). The chamber (152) is connected to the return system. The piston (148) is moved back, freeing the ends of the locking lugs (151) which, actuated by the piston (156), are deflected to pass the locking bush (149) in the opposite direction.

648. Refer to Details C and D. A lever (157) connected to piston (148), operates the control rocker (158) of switch (159). The switch contacts are reversed on locking and unlocking of the jack.

Wheels (refer to Figs 6-16 to 6-18)

649. The wheels are fitted with tubeless tyres and are interchangeable between the LH or RH undercarriage legs. The wheel consists of two sections assembled by 15 bolts (181), self-locking nuts and cup washers (432). An O-ring (178) is fitted to the wheel rim for sealing. A fixed valve (177) fitted with a seal is provided for inflating the tyre. A safety device is provided to prevent the tyre bursting in case of excessive brake temperature. The safety device consists of four fuse plugs (179) fitted through the half-wheel section on the brake side; the fuse plugs melt at 186 $\pm$10°C.

650. Thermocolour paint in the form of stripes of two different shades and of dots of the same shade is respectively applied on either side of the fuse plugs and on the inner sides of the brake disc driving lugs. This paint marking is intended to indicate the wheel areas which are liable to be exposed to excessive temperature during operation (refer to Fig 6-17).

651. The wheel rotates on a shouldered sleeve (197) with two taper roller bearings (203 and 204). The sleeve enables the end play of the bearings to be adjusted when the wheel is removed and the sleeve is prevented from rotating by the two holes provided for this purpose. The end play is adjusted by means of the castellated nut (199) safety-locked by a cup (198) and a split-pin.

652. A felt gasket (196) is mounted between two flanges retained by circlips to protect the brake against any possible grease leaking from the hub.

653. On the valve side, the hub is closed by a cap (193) attached by means of safety-locked screws; the lugs (194) of the cap are used to transmit the rotational motion of the wheel to the mobile part of the accelerometer (39G on LH side 40G on RH side) mounted in the

wheel axle.

654. The half-wheel (166) on the brake side is provided with eight lugs (168) fitted with steel fittings (174) into which the lugs of the brake disc are fitted. If required, the wheel is balanced before installation of the tyre by means of a small plate (176) supported by the attaching bolts of the fittings (174). The wheel is slid over the axle and is then locked in position by a lug-cup (202) and a pinned screw (201).

655. For tyre pressures refer to Chap 4.

Brakes (refer to Figs 6-16 to 6-19)

656. An interchangeable single disc type brake is fitted to the LH and RH wheel. It is mounted on the axle (102) before the wheel and is locked onto the half fork (94) by two screws (164 and 169) fitted on either side of the axle, refer to Fig 6-18. The screw (164) fits directly into the fork; the screw (169) fits into a shouldered and threaded bush (207) and is locked by a lock-cup and a lock-nut (206). The screw (169) also attaches the emergency slide-valve (188 or 189).

657. **Description.** The fixed part (163) of the brake includes two symmetrical bosses used as cylinders. The hydraulic pressure is simultaneously applied to the two cylinders through the emergency slide-valve (188), the conduits and the counterbore in the bush (191).

658. The brake is hydraulically connected on installation by the bush (187) of the emergency slide-valve fitting into the plain mating section provided in the support (163). The emergency slide-valve permits the brake to be supplied with either the normal brake pressure or the emergency brake pressure.

659. On either side of the wheel driven rotating disc (161) opposite to each cylinder, are two shoes (162 and 173) fitted with riveted friction liners (171). One shoe bears against the half fork (94) the other against the piston of the corresponding cylinder. The shoe (173) slides over two guides (165) maintained in the fixed brake part (163) by removable stops (172). Removing the attaching screws allows the stops (172) to be rotated to permit extraction of the guides (165) thus enable the shoes to be readily replaced.

660. The eight driving lugs (184) of the rotating disc (161) are protected by jumpers (183) attached by means of rivets (186).

661. Both cylinders are fitted in a similar manner and include an automatic wear take-up device and provisions for adjustment of the operating clearance. The principle of operation of the wear take-up is as follows :

a. Balls (211 and 213) are jammed between a splined shaft (212) and the tapered bores provided in the bush (209) with the balls being pushed in opposite directions by a spring (208).

b. The upper cylinder is fitted with a bleed coupling (182).

662. **Operation (refer to Fig 6-19).** For a new brake and with no pressure applied, the parts of the piston are locked as illustrated in detail A of Fig 6-19, and the brakes operate as detailed in paragraphs 663 to 666

663. **Brake Application (refer to Fig 6-19, Detail B).** Under the pressure of the hydraulic fluid from the supply system (normal or emergency system), the two pistons (192) are simultaneously forced against the rotating disc where they exert a braking pressure proportional to the supply pressure. When the piston (192) is forced out of the cage (216) by the pressure, the cage is kept in position as the result of the balls (211 and 213) being jammed under the action of the springs (208 and 214).

664. **Automatic Wear Take-up Device (refer to Fig 6-19).** When the travel of the piston exceeds the value J, which corresponds to the operating clearance, and as the wear of the friction liners (171) is increasing, the piston (192) moves the cage (216) and the balls (213) by hydraulic pressure. The balls are momentarily prevented from jamming. The mobile part assembly of the locking device moves along the splined shaft (212) and, as soon as the assembly stops moving, it is jammed again in the new position by the spring (214).

665. The travel of the device is always equal to the wear dimension A of the brake liners.

666. **Brake Release (refer to Fig 6-19, Detail D).** As soon as the pressure is dropped in the cylinder, the piston (192) is returned by the spring (208) supported by the cage (210). This backward motion allows the brake shoes to move away from the rotating disc and restores the operating clearance J. The piston assembly is again in the position illustrated in detail A, but has been moved by distance A equal to the wear of the brake liners.

Uplock (refer to Fig 6-7)

667. The purpose of the uplock (19) is to hold the undercarriage leg in the up position. The uplock consists of a rocking hook which automatically locks onto the anchor roller located on the leg when the leg is fully retracted. The uplock is hydraulically released on extension of the undercarriage. An external microswitch is operated by the uplock; a detailed description as well as information on the operation of the microswitch are contained in publication AAP 7293.045-3M.

Sequencing Distributor Control (refer to Fig 6-8)

668. The sequencing distributor (27) is a unit which is dealt with in publication AAP 7293.045-3M; it is used in the hydraulic system controlling the extension of the longitudinal jack rod (backward motion of the leg). It is also used as a shut-off valve in the undercarriage emergency extension system. The valve is mechanically opened when the leg reaches a position that permits the wheel to move back without interfering with the doors.

Main Undercarriage Door Control (refer to Fig 6-20)

669. In the closed position, the main undercarriage door (7) is locked by two rollers (233) engaging the hooks of the front (23) and rear (25) door locks. In the open position, the door is stabilized by the internal mechanical lock of the actuating jack (21).

670. During operation of the undercarriage the various door operations are automatically performed by the actuating jack (21). The jack is attached and hinged onto the structure through a bell-crank (227). The travel of the bell-crank and the jack is limited by the jack hinge-pin (232) bottoming in a port (236) provided in the casing (234).

671. The door actuating jack (21), the door locks (23 and 25) and the door manual unlocking system (29) are described in paras 686 and 693.

672. The operation of the door control system associated with the undercarriage control system is given in Figs 6-81 and 6-82 for III 0 and Figs 6-109 and 6-110 for III D. The operation of the door manual ground unlocking system is illustrated in Fig 6-73 for III 0 and Fig 6-112 for III D.

673. **Door Opening.** On opening of the door, the jack is retracted and its hinge-pin (232) abuts the inner edge of the port (236), causing the bell-crank (227) to rotate (see detail A).

674. The bell-crank simultaneously operates the locks (23 and 25) through a mechanical linkage consisting of a bell-crank block (223), two link-rods (222 and 224) and a Teleforce flexible synchronizing control shaft (228). The locks are released and free the door rollers.

675. The door is then opened by the actuating jack (21) and the lock hooks remain open.

676. **Door Closing.** On closing of the door, the actuating jack is extended; the hinge-pin (232) abuts the outer edge of the port (236) and the bell-crank (227) is tilted without operating the mechanical control because of the retracting link-rod (224).

677. The spring (218) is used to reset the locks (23 and 25) the hooks of which were left in the open position. The hooks close automatically onto the rollers (233) when the door is in contact with the adjustable rubber stops (226 and 229) at the end of the closing sequence.

678. **Opening of the Doors on the Ground.** This is possible without using the hydraulic control system, by pulling the handle of the door manual unlocking system (29) to simultaneously release the two locks (23 and 25). A mechanical control consisting of a bell-crank block (217) and a link-rod (219) is provided to link the above mentioned synchronizing control to the door manual unlocking system (29).

679. Access to the door manual unlocking handle is gained by opening a hinged door fitted under the wing fillet. The door (7) is opened by hand after unlocking.

Main Undercarriage Door Actuating Jack (refer to Fig 6-21)

680. The undercarriage door actuating jack is a double-acting hydraulic jack with an internal mechanical lock in the Ram Retracted position operating an electric switch. The jack opens and closes, and locks in the open position, the main door of the main undercarriage.

681. **Description.** The jack consists of :

a. A cylinder (16) taking two screwed end caps (1 and 6) which retain a locking bush (18) and a stop (14). Inside the end cap (1) there is a locking piston (3) fitted with a pawl (2) that controls switch (7G LH and 8G RH).

b. A piston (4) and ram (7) fitted with a claw type lock (17).

c. A reversing switch (7G or 8G) provided with a cable and a standard 3-socket receptacle.

d. Two elbow couplings with inlet filters for connection to the hydraulic supply systems (A = closing system; B = opening system).

e. One rigid pipe (24) connected to the coupling (B); at one end this pipe is attached to the flexible pipe (22) of the opening system by means of the support clamp (21).

f. One flexible pipe (23) connected directly to the coupling (A).

g. A screwed rod-end (9) enabling the length of the jack to be adjusted.

682. The LH and RH jacks are similar; the only difference is the mounting direction of the couplings (A and B) and pipes.

683. **Characteristics.**

a. Length (between centres)
Extended 591 ±5 mm
Compressed 425 ±5 mm.

b. Stroke 166 mm.

c. Capacity (with a 2553 lb/in² (176 bars) pressure.
Ram extension direction 4782 lb (2127 daN)
Area = 12.56 cm²
Ram retraction direction 3503 lb (1558 daN)
Area = 9.42 cm².

d. Operating hydraulic fluid H-515 (MIL-H-5605E).

e. Electrical supply Aircraft d.c. system.

684. **Operation (refer to Fig 6-21).** For information on operation of the claw-type lock, refer toto para 642 and Fig 6-15.

685. **Installation.** The two ends of the jack are fitted with ball-joints. On the structure side, the jack is attached to the bell-crank (227) by a plain pin (232) that incorporates a grease nipple. The pin is retained by a safety locked screw (19). On the door side, the jack rod-end is attached to a fork fitting by pin (12) which is retained by screw (11) safety locked by a lock-plate.

Door Lock (refer to Fig 6-22)

686. At the end of the door closing sequence, each roller (233) strikes the tip of the open cocked hook (16) of the corresponding lock. The hook closes and holds the roller. The locks are released at the same time by the hydraulically operated door actuating jack and by the mechanical linkage described in para 669.

687. **Description.** The lock consists of a box formed by two flanges (11) and a sheet metal cover assembled by a neoprene extrusion; the following parts are articulated in the box :

a. A hook (16) actuated by a spring (21) on opening of the door.

b. A rocker (6) with rollers (3 and 23) applied against the head (18) of the hook by a spring (14).

c. An unlocking finger (4) integral with the toothed hollow shaft (1).

d. A bell-crank (8) including an adjustable stop-screw (9) applied against the control blade of the following microswitch by a

spring (12) :

(1) Microswitch 19G1 on LH front lock.

(2) 19G2 on LH rear lock.

(3) 20G1 on RH front lock.

(4) 20G2 on RH rear lock.

688. This microswitch is fitted with a three wire cable and a standard sealed plug (24); it is attached to one of the flanges (11) by two bolts fitted with lock-plates.

689. The door lock also includes the following :

a. The hook opening stop (19).

b. A hole (2) drilled in the finger (14) and in the flanges to position the finger in the lock closed condition in order to facilitate the adjustment of the external mechanical unlocking control.

690. **Operation (refer to Fig 6-22).** Fig 6-22 illustrates the door lock in the locked position; the door roller (233) is caught by the hook (16) which is prevented from opening by the rocker (6).

691. The door lock operates as follows :

a. *Unlocking.* The finger (4), which is lifted by the unlocking control mounted on the hollow shaft (1), lifts the rocker (6) and the roller (23) is freed from the head (18) of the hook. The hook is tilted by its spring (21) and frees the door roller. The contacts of the microswitch are reversed.

b. *Locking.* The hook (16) is still open; the roller (23) is pulled against the sloping boss (22) by the spring (14); the finger (4) is lowered cocking the lock. The door roller striking the upper tip of the hook causes the hook to tilt and to be locked by the roller (23) which is returned to the position illustrated in Fig 6-22. The contacts of the microswitch are reversed.

692. **Installation.** The door lock is attached by means of bolts through its three hollow shafts (7, 13 and 17). The mounting bolts are also used for installation of an adjustable rubber stop (refer to Fig 6-20, items 226 and 229). The lock and the mechanical linkage are interconnected by a toothed shaft.

Undercarriage Door Manual Unlocking System (refer to Fig 6-20 and 6-22)

693. On the ground, the hydraulically operated door (7 or 8) of each main undercarriage leg is locked in the closed position. The door can be opened manually once its two locks have been released by pulling the manual unlocking handle. The locks are released by the system described in para 678.

694. **Description and Operation.** The control unit consists of a box (18) inside which slides a control with a handle (3) which is returned to its up position by a spring (8). The unit includes :

a. A shaft (14) guided by a screw (6) which also limits the downward travel of the unlocking handle.

b. An adjustable link-rod (13); this rod is fitted with a fork end (12) to which the flexible unlocking control cable is connected. The link-rod (13) is free to slide in the shaft (14) to permit the unlocking control to be normally operated.

c. Handle (3) pinned onto the shaft (14); the handle is fitted with a cam-lock (4) which automatically locks it in the pulled position. The handle is unlocked and returned by the action of spring (8) by depressing the plunger (2).

d. A microswitch (25G LH side; 26G RH side) fitted with a two-wire cable and a standard 3-pin sealed plug (11). This microswitch is operated by a rocker (19) with a roller (21) hinged on the box. The roller (21) is kept in contact by a spring (17) with a slope (7) machined on the shaft (14); it includes an adjustable stop (16) permitting the triggering of the contacts to be adjusted.

e. A lead sealed cover (1).

695. **Installation.** The unit is attached at four points by bolts through drilled lugs (9).

NOSE UNDERCARRIAGE

Description (refer to Figs 6-23 and 6-25)

696. The nose undercarriage retracts rearwards into the undercarriage well provided at the bottom of the fuselage, between frames 10 and 14 for III O, and frames 10 and 15 for III D. Doors close the undercarriage well completely when the nose undercarriage is retracted and partially when the nose undercarriage is extended.

697. The nose undercarriage consists of :

a. A leg (257) with an independent oleo-pneumatic shock absorber, attached and hinged by two arms to attachment fittings mounted on the rear face of frame 10. The leg incorporates a hydraulic anti-shimmy device. Two landing lights (431) are mounted at the lower part of the leg.

b. A self-breaking truss (10) the internal lock of which locks the undercarriage leg in the extended position, III D Only refer to Fig 6-25.

c. A wheel (259) mounted in a fork.

d. A hydraulic jack (261) used to retract and extend the leg. III O Only, this jack acts as a truss in the rod extended and locked position, refer to Fig 6-23.

e. An uplock (254) similar to that of the main undercarriage which holds the leg in the retracted position by a roller (251).

Doors (refer to Figs 6-23 and 6-25)

698. The undercarriage doors and their control and locking systems are not part of the undercarriage :they are, however, functionally associated with the undercarriage. There are three doors.

a. The front shield door (4) hinged at its upper part by fittings at frame 10. It is attached to the leg by two adjustable lateral link-rods (266) which operate it on

retraction and extension of the nose undercarriage.

b. The rear shield door (5) made completely integral with the leg by three screwed lugs. Both of these doors close only when the nose undercarriage is retracted. They close off the front section of the well.

c. The main door (6) hinged longitudinally and closing the rear section of the undercarriage well. The main door is actuated by a hydraulic jack (256) the internal mechanical lock of which locks the door in the open position. In the closed position, the door is locked by roller fittings (262 and 263) caught by two automatic hook type locks. The locks are simultaneously released (for opening) by a mechanical unlocking control operated by the door actuating jack, refer to Figs 6-36 and 6-40. This door remains open only when the undercarriage has been lowered by the emergency extension system (refer to para 6180). It is normally closed, except during the undercarriage retraction and extension sequence. A manual unlocking system is provided to enable the door to be opened on the ground.

699. The structure and the attaching parts of the main door (6) as well as of the front and rear shield-doors (4 and 5) are described in Chap 4. The detailed description of the door actuating jack (256), door locks and door manual unlocking system is given in paras 6140, 6135 and 6148 respectively. The main door automatic mechanical unlocking system and manual unlocking system assembly is described in para 6136. The operation of the above mentioned units on retraction and extension of the undercarriage is described in paras 6174 to 6179.

Installation

6100. **Nose Undercarriage Leg (refer to Figs 6-24 and 6-26).** The nose undercarriage leg (257) is hinged about two bolts (286) fitted to bushed forks (268) integral with machined blocks (288) located at the lower part of frame 10. The arms (271) provided with ball-joints are engaged in the forks (268); the hinge bolts (286) with grease nipples are then fitted; these bolts are retained by washers and self-locking nuts (275) with the heads of the bolts retained by lock-plates (267).

6101. The RH ball-joint is centred by two shims (287). These shims are to be selected on installation to obtain the end play required for correct operation of the undercarriage and proper positioning of the nose undercarriage leg.

6102. **Truss — III D Only (refer to Figs 6.25 to 6.27 and 6.38).** The truss is hinged through its upper triangular arm (237) onto bearing blocks provided with self-aligning bearings; it includes retracting pins (238 and 239) which are controlled by a gear shaft (240) with a hexagonal drive acting on a rack bar (241). The pins (238 and 239) are retracted manually by means of knurled knobs (242) after releasing and turning these knobs.

6103. The truss is installed by aligning the pins (238 and 239) (previously placed in the retracted position) with the self-aligning bearings (243 and 244) in the bearing blocks. The adjustment washers (245 and 246) are fitted between the upper arm and the self aligning bearings.

6104. The lower arm of the truss is hinged onto the undercarriage leg through a gimbal joint (247). The inclination of the leg in the down position depends on the length of the truss; this can be adjusted by screwing or unscrewing the end fitting (248) located in the lower arm of the truss; safety locking is ensured by means of a nut and a retaining ring.

6105. **Actuating Jack (refer to Figs 6-23, 6-26, 6-35 and 6-39).** The installation of the jack (261) on the truss (10) and the undercarriage leg (257) is described in para 6133.

6106. **Front Shield Door (refer to Figs 6-23 to 6-26).** The front shield door (4) is connected to the undercarriage leg by adjustable link-rods (266). These link-rods are attached to the lateral supports (264) by means of screwed and locked bolts (274). Adjustment of the end play is achieved using shim washers (273).

6107. **Uplock (refer to Fig 6-24 and 6-27).** The uplock is attached by two bolts (282) and bolt (281) with grease nipple, to a bracket (269) on the undercarriage leg LH side. The position of the uplock can be adjusted laterally and vertically by means of two symmetrical cleats (284) attached on the outside to the support plates (269). The diameter of the bolt holes in the cleats is larger than that of the bolts to allow sufficient clearance for adjustment. The uplock is adjusted to allow the anchor-roller (251) to be correctly positioned relative to the uplock hook. The uplock is attached to the cleats (284) by two other symmetrical cleats (283) centred on the attaching bolts.

Description and Operation

6108. **Nose Undercarriage Leg (refer to Fig 6-28).** The nose undercarriage leg is a lever-action leg. It consists of :

a. A strut (296) made of drop forged light alloy.

b. A rotating assembly (297) fitted with a wheel fork (291) and hydraulic anti-shimmy device.

c. An independent oleo-pneumatic shock absorber including a wheel self-centring device.

6109. **Strut (refer to Figs 6-27 and 6-28).** The strut (296) carries the anti-shimmy device composed of the jack box (308) and expansion accumulator (307). It also guides the rotating assembly (297) housing the shock absorber. An undercarriage uplock roller (251) is attached at the lower part of the strut.

6110. The supports (264) of the front shield door link-rods are attached to the two upper arms (refer to Fig 6-27) III D Only. The RH support (264) is also used for attachment of the actuating jack. A bushed female fork (272) with a pin (303) is provided for attachment of the lower gimbal joint of the truss (10) (III D), or truss jack (261) (III O). The shock-absorber is attached to the upper part of the strut. It is positioned and prevented from rotating by a rod (301) connected to the strut.

6111. **Rotating Assembly (refer to Figs 6-28 and 6-32).** The tube (297) rotates in two bearings (294 and 302) in the strut. At its lower part, the tube is fitted with a jib (293) which receives the wheel fork (291) through a hollow shaft (292). The fork includes an axle (312) and a bushed fork fitting (311) to which the shock absorber is attached.

6112. A spring loaded pin (348) locked in place with a

safety pin (346) (to which a red streamer is attached), locks the rotating tube (297) and nosewheel in a central position for parking or jacking purposes.

6113. **Shock Absorber (refer to Figs 6-28 to 6-30).** The oleo-pneumatic shock absorber is a double-acting shock absorber. Its stroke is 77.5 mm. It is operated with H-515 (MIL-H-5605E) fluid and is charged with nitrogen at an initial pressure of, Pre-mod 572, 442 lb/in² (30.5 bars), Post-Mod 572, 486 lb/in² (33.05 bars). The shock absorber is an independent unit and is removed by the removal of the rod (refer to Fig 6-28 item 301) the nut (299) and the lower pin (329).

6114. The cylinder (309) is hinged on the fork through a bushed gimbal-joint (326) the upper pin of which carries the inflation valve (324). In the expanded position, the assembly is abutting the two self-centring cams (321 and 322). In the compressed position, the assembly is abutting a shoulder (328) integral with the rod.

6115. At its lower part, the cylinder contains a free separating piston (313) which isolates the fluid from the nitrogen. The upper part of the cylinder filled with fluid, is divided into four chambers by the piston (323), the restrictor (314) fitted with a free valve (316) and the moving restrictor (319) fitted with a spring-loaded valve (318). The spring-loaded valve (317) abuts the valve (316) at the end of the expansion stroke of the shock absorber.

6116. The shock absorber is filled through a port (327) provided with a plug, a seal and a lead sealed cap. The shock absorber operates as follows :

a. *Compression (refer to Fig 6-30).* The landing load on the shock absorber results in driving in the main piston (323) and the restrictor (319). The fluid from the chamber (332) is forced into the chamber (331). The separating piston (313) is forced down into the cylinder, hence the pressure increases in the shock absorber. The compression motion of the shock absorber is slowed down by the fluid being forced through all the orifices provided in the restrictor (314); these orifices are uncovered by the opening of the valve (316).

b. *Expansion.* On take-off, the load on the shock absorber is relieved and this causes the nitrogen to expand in the gas chamber. The fluid forced out of the chamber (331) can only escape through the orifices provided in the valve (316) which covers the restrictor (314). The valve (318) completely covers the orifices of the restrictor (319). The expansion motion is therefore slowed down by the fluid being forced through the valve (316). At the end of the expansion stroke, the valve (317) also cuts in to further restrict the fluid flow.

6117. **Self-centring (refer to Fig 6-31).** The nose wheel must be centred after take-off, on landing, or when the aircraft is bouncing. Under these conditions, the expanded shock absorber automatically centres the nose wheel.

6118. A fixed cam (322) integral with the rod (298) and a mobile cam (321) integral with the cylinder (309) are kept engaged by the nitrogen pressure to ensure the self-centring function.

6119. **Anti-shimmy System (refer to Figs 6-32 and 6-33).** The hydraulic anti-shimmy system consists of an accumulator (307) connected to jacks (338), housed in a box (308) attached to the undercarriage strut. The anti-shimmy system damps the wheel oscillations through a set of levers (336 and 344) connected to the rotating tube (297).

6120. On the ground, the nose wheel angle is limited to ± 65° on either side of the aircraft centreline by the pistons (337) bottoming in the jacks (338), the adjustment of which is facilitated by the nuts (341). In the bottom of each jack are the anti-shimmy valves (342 and 343) and a bleed screw (334).

6121. To tow the aircraft, it is mandatory to disengage the anti-shimmy system in order to give complete freedom to the nose wheel. This operation is performed, as illustrated in Fig 6-32, by removing the pin (347) to disconnect the link-rod (336) and attach the latter rod on the second link-rod by means of safety pin (346).

6122. In case of small deflection of the wheel (turns on the ground for example), the fluid flows freely from one jack to the other through the centre calibrated hole provided in the valve (343) of the jack to which the pressure is applied.

6123. In case of fast and alternated deflections (shimmy), the fluid flow forced out of one jack to the other is higher than the flow allowed by the valve (343). The centre hole then restricts the fluid flow to dampen the deflections of the wheel. During this phase, the valve (342), however, allows the depressurized opposite jack to be rapidly re-supplied from the accumulator (307).

6124. In case of excessive pressure in the jack, the valve (343) opens to discharge the overpressurized chamber. The purpose of the accumulator (307) is to readily re-supply the depressurized jack by maintaining a permanent pressure in the complete hydraulic system.

6125. **Tow Fitting (refer to Fig 6-32).** At the front of the jib (293) of the rotating tube (297) is hinged, in a vertical plane, a fitting (351) the fork (353) of which is provided with a bore (354) for anchorage of the aircraft tow bar. A shear-pin (352) is provided to protect the nose undercarriage against excessive towing loads. Two spare shear-pins (349) are stowed in the tow fitting.

Nose Wheel (refer to Fig 6-34)

6126. The nose wheel is fitted with a 450 × 190-5 tubeless tyre (363), for inflation pressures, refer to Chap 3. The nose wheel consists of two sections (359 and 362) assembled by four bolts (356) with an O-ring (374) for sealing the tubeless tyre. The tyre is inflated through a fixed valve (366) provided with a seal (364).

6127. The wheel rotates over a spacer (373) on two taper roller bearings (357 and 372). The operating end clearance is adjusted before installation of the wheel on the nose undercarriage by means of the notched nut (369) safety-locked by a cup (368) and a split-pin. Felt gaskets (358 and 371) retained by circlips provide external protection for the bearings. A cylinder (361) forming a grease box prevents the grease from leaking onto the leg.

6128. The wheel is installed in the fork (291) by simultaneously fitting the axle (312) in the fork and the spacer; the axle is then secured in position by means of a nut (367) fitted with a split pin.

Truss — III D Only (refer to Fig 6-38)

6129. The truss consists of two arms hinged through a

gimbal joint. With the undercarriage in the down position, the two arms are aligned as the result of their mutual abutment at point (249). Locking is ensured through the engagement of a spring locking bolt (250) fitted to the gimbal joint yoke (276) under a catch (277) of the upper arm.

6130. At the beginning of the undercarriage retraction sequence, the hydraulic pressure is applied to the piston (278) which pushes the locking bolt (250) back and allows the truss to fold under the action of the actuating jack. At the same time, a plunger (279) causes the reversal of the sequencing switch (14G).

6131. The actuating jack is hinged to fork (280) of the upper triangular arm (237). The upper triangular arm also includes two retracting trunnions (238 and 239) for installation on the aircraft (refer to para 6102).

Truss Jack — III O Only (refer to Fig 6-35)

6132. This jack is of the same type as the main gear jacks; it is a double-acting jack with a counter rod, an internal claw-lock for the rod extended position, a dashpot and a restrictor slowing down the rod retraction motion at the end of the undercarriage retraction sequence and filters mounted in the two supply ports. It carries an electric switch (14G) connected to the undercarriage control and position indicating circuit.

Actuating Jack — III D Only (refer to Figs 6-26, 6-27, 6-38 and 6-39)

6133. The actuating jack (261) is attached and hinged at each end through forks (441 and 442). The fork (441) provided with a pin with a grease nipple is connected to the lateral support (264) on the undercarriage leg where it is retained by a nut (443) and a split pin. The upper fork (442) is connected by means of a pin (444) with a grease nipple to the fork (280) of the truss triangular arm (237).

6134. The jack is a double-acting jack and its two connection end-fittings are fitted with filters (445 and 446). A pipe support (447) secured to the cylinder (448) of the jack is provided to clamp the supply pipes.

Uplock (refer to Figs 6-24 and 6-27)

6135. The uplock (254) is provided to hold the undercarriage leg in the retracted position. This uplock is similar to that described in para 666; the electric cable is different.

Nose Undercarriage Door Control (refer to Figs 6-36, 6-40, 6-49 and 6-73)

6136. In the closed position, the door (6) is locked onto the front (253) and rear (252) locks by its rollers (262 and 263). In the open position, the door is stabilized by the internal mechanical lock of the jack (256). As the undercarriage is being operated, the door is automatically actuated by jack (256) through the following mechanical system.

6137. The door control varies between III O and III D aircraft. Description for each aircraft is as follows :

a. *III D Only (refer to Fig 6-40).*

(1) The jack (256) is attached to and hinged onto the aircraft structure at point (381) through a rocker (379), the hinge pin (381) of which is located in box section (378) and rotates a lever (382). The travel section of the rocker and of the jack is limited by an extension to the rocker arm which abuts against two faces of a housing (383) within the box section.

(2) For opening the door, the jack is extended and abuts on the inside of the housing (384) and presses on the spring rod (385) through the lever (382). The movement is simultaneously re-transmitted to the door locks (252 and 253) by the rocker (434) and the adjustable rods (435 and 436). Under the extension action of the jack (256) the hooks tilt, the locks are released and the door opens. In the ram extended position, the jack reaches both an internal stop and an adjustable rubber stop (437).

(3) For closing the door, the jack is retracted. The rocker extension arm (383) abuts on the outer edge of the housing (384) (refer to Fig 6-40 detail A) and the lever (382) is tilted through the spring rod (385) without actuating the mechanical control. The spring incorporated in the rod re-cocks the locks (252 and 253) the hooks of which have been kept open; the hooks automatically close again on the rollers (262 and 263) when the door reaches the adjustable rubber stops (438 and 439) at the end of its travel.

b. *III O Only (refer to Fig 6-36).*

(1) The jack (256) is articulated at the end on a rocker arm (379) which oscillates on a fitting (378) attached to the aircraft structure. The bell-crank (383), driven by the rocker arm (379) with a light angular clearance, is connected to a Teleforce flexible control shaft (381). The flexible control shaft transmits the movement to the two door locks (252 and 253) through a bell-crank (384) and a coupling rod (386).

(2) Opening the door : The hydraulically supplied jack extends. At the beginning of the sequence, the door is locked; the jack rod being locked, the jack moves and drives the rocker arm (379) which actuates the bell-crank (383) which, in turn, pulls the flexible control shaft (381). The lock hooks release the rollers (262 and 263); the door being thus unlocked, the jack extension causes the door to open.

(3) Closing the door : The jack retracts. The heel (T) of the rocker arm (379) abuts the fitting (378). The bell-crank (383), acted upon by the spring (382), actuates the flexible control shaft which re-cocks the locks (252 and 253), the lock hooks remaining open.

6138. On the ground, opening of the door is possible

without operating the hydraulic control system. The door is opened by pulling the handle of the door manual unlocking system (376), which simultaneously releases the two locks (252 and 253) through a link-rod (377). The door is then fully opened by hand.

6139. The door locks and the door manual unlocking handle are mounted on the LH web assembly of the nose wheel well where the handle is easily accessible.

Nose Undercarriage Door Actuating Jack (refer to Fig 6-37 and 6-41)

6140. This is a double-acting hydraulic jack with an internal mechanical lock for the Ram Extended position; an electric switch is operated in this operation. This jack is used to open and close the main door of the nose undercarriage.

6141. **Description.** The nose undercarriage door actuating jack consists of :

a. A body, itself consisting of a cylinder (30) and a base (26) with a scraper ring (24). On the inside is a locking piston (28) subjected to the action of a spring; the piston is fitted with a pawl (10) for operation of a switch (6G).

b. A piston (36) and its rod (32) fitted with the claw-type locking bush (34).

c. A reversing switch (6G) supplied complete with a cable and a standard 3-socket receptacle.

d. Two elbow couplings with inlet filters for connection of the flexible hydraulic supply pipes (40 and 42) (A = closing system; B = opening system).

e. III O Only. A rigid pipe (26) connected to coupling (B) is attached, at its other end, to the support clamp (27) together with the flexible pipe (40) of the opening system. The flexible pipe (42) is directly connected to coupling (A).

f. III O Only. A screwed rod end-fitting (7) enabling the length of the jack to be adjusted (±5 mm). A reference hole (6) appearing opposite to the outer face of the lock-nut (12) indicates that the jack has been adjusted to its maximum length which should not be exceeded. The flexible pipes are not part of the jack.

6142. **Characteristics — III O Only.**

a. Length (between centres) Extended : 544 ±5 mm, Compressed : 416 ±5 mm

b. Stroke : 128 ±1 mm.

c. Capacity (with a 2552 lb/in² (176 bars) pressure.)
Ram extension direction : 3658 lb (1627 daN)
Area = 9.62 cm².
Ram retraction direction : 2249 lb (1000 daN)
Area = 6.16 cm².

d. Operating fluid : Hydraulic fluid H515 (MIL-H-5605E).

e. Electrical power supply : Aircraft d.c. system.

6143. **Characteristics — III D Only.**

a. Length (between centres) Extended :387 mm, Compressed : 302 mm.

b. Stroke 84 mm.

c. Capacity (with a 2553 lb/in² (176 bars) pressure).
Ram extension direction : 4318 lb (1920.8 daN).
Area = 11.34 cm².
Ram retraction direction : 3305 lb (1470 daN).
Area = 8.80 cm².

d. Operating fluid : Hydraulic fluid H515 (MIL-H-5605E).

e. Electrical power supply Aircraft d.c. system.

6144. **Operation (refer to Figs 6-36 and 6-41).** For information on operation of the claw-type lock, refer to para 642.

6145. **Installation — III D Only (refer to Figs 6-40 and 6-41).** The jack is fitted with a single swivelling fork on the cylinder (30) side and with a double fork on the rod side. On the structure side, the jack is attached to the forked rocker (379) of the jack attachment fitting by means of a pin (38) with a grease nipple; the pin is retained by a castellated nut (4) fitted with a split pin (1). On the door side, the jack is attached to the actuating bell-crank (433) which is fitted with a ball-joint; the attachment is made through the rod end fork (16) by means of a pin (18) with a grease nipple; the pin is retained by a nut (20) fitted with a split pin.

6146. **Installation — III 0 Only (refer to Figs 6-36 and 6-37).** The jack is fitted with ball-joints at both ends. On the structure side, the jack is attached to a forked rocker (379) by means of a lubricator pin (2); the pin is retained by a nut (1). On the door side, the jack is anchored to a fork (8) by means of a lubricator pin (9); this pin is provided with a self-locking nut (11).

6147. **Door Lock (refer to Figs 6-36, 6-40 and 6-42).** In the closed position, the nose undercarriage door is locked by its two rollers (262 and 263) which are caught by the hook of a lock at the end of the closing sequence. The locks are released mechanically by the installation described in para 6136. This lock is similar to that described in para 642.

Nose Undercarriage Door Manual Unlocking System (refer to Fig 6-42)

6148. The hydraulically operated nose undercarriage door is normally closed. On the ground, the door can be opened manually after its two locks have been released by pulling the manual unlocking handle. The locks are released mechanically by the installation described in para 6138.

6149. **Description and Operation.** The unit consists of a box (16) on the outside of which an elbow bell-crank (8) is hinged; one arm of the bell-crank is fitted with a handle (2) and the other arm is fitted with a crimped ball-joint (7) to which the rod (377) is connected; the rod is itself coupled to the system to be actuated.

NOTE

The rod (377) is free to slide in the ball-joint (7) to permit the unlocking control to be normally operated without actuating the manual unlocking system.

6150. A spring-catch (3) controlled by a plunger (10) permits the handle (2) to be locked in both of its extreme positions by a slotted-piece (17) integral with the box. A microswitch (24G) is mounted in the box by two bolts which screw into anchor-nuts. The microswitch is fitted with a two-wire cable fitted with a standard 3-socket sealed receptacle. The microswitch is operated according to the two positions of the handle by a roller-rocker (9) hinged in the box.

6151. The roller (6) is kept in contact with a rotary control cam (4) integral with the rotating pin (14) by a spring (13). An adjustable screw-stop (11) permits the triggering of the contacts to be adjusted.

6152. A lead-sealed cover attached by nuts fitted to the four studs (12) of the box is provided to protect the internal mechanism.

6153. **Installation.** The unit is attached to its support by the four studs (12).

UNDERCARRIAGE AND DOOR CONTROL

Description

6154. There are two separate systems :

a. A normal electro-hydraulic control system operated from a two position switch (3G). In III D aircraft switch (3G) is located in the front cockpit and switch (203G) is located in the rear cockpit. This system is used to retract and lower the undercarriage, to operate the undercarriage doors and to move the main legs forwards and backwards. The hydraulically operated undercarriage doors are also closed at the end of the retraction sequence and during the backwards motion of the wheels.

b. A hydraulic-mechanical emergency control system operated by a handle (408) front cockpit only in III D. This system permits the undercarriage doors to be opened, the undercarriage to be extended and the main legs to be moved backward. In this case, the hydraulically operated doors are not closed again during the backward motion of the wheels (refer to para 6).

6155. There is an electrical position indicating system with indicator lights (in each cockpit in III D) enabling the pilot to check, at all times, that the sequence controlled by one or the other of the above mentioned systems is correctly taking place.

6156. An undercarriage downlocked audio checking system is connected to the radio installation; this system enables the transmission of an audio tone to be controlled by the pilot (front cockpit only in III D aircraft) when the undercarriage is down and locked. It consists of a push-button (54G) and a relay (55G) connected in series with the undercarriage down microswitches (14G, 15G and 16G).

6157. Three manual unlocking systems enable the locks of the hydraulically operated doors to be released on the ground for opening the doors (refer topara 6188).

Normal Control (refer to Figs 6-43 to 6-46)

6158. The principle of operation of this control is illustrated in Figs 6-45 and 6-46. The operations shown are hydraulically controlled; these operations are initiated electrically and the corresponding positions are indicated by various microswitches operated by certain components of the installation. The location of the main components is shown in Fig 6-1 and 6-2. The location of the microswitches is shown in Fig 6-44.

6159. **Electrical Control System (refer to Figs 6-48 and 6-84).** The undercarriage is retracted or extended by the pilot placing the lever of switch (3G) (203G in the rear cockpit of III D) in the up or down position. Actuating this switch results in a succession of operations which are electrically sequenced by sequencing microswitches controlling the door and longitudinal jack (5G) and undercarriage (4G) electro-distributing valves.

6160. The microswitches are operated by the claw locks of the undercarriage actuating jacks (lateral and longitudinal), the door actuating jacks and by the door and undercarriage uplocks. The position of these various contacts for each of the sequence operations is shown in the electrical position indication figures.

6161. **Hydraulic System (refer to Figs 6-49 and 6-85).** The hydraulic power is supplied by the No 1 hydraulic system. The undercarriage electro-distributing valve (4G) and the door and longitudinal jack electro distributing valve (5G) are supplied through the electrically controlled distributor (410). The distributor (410) is controlled by the No 2 system through the emergency distributing valve (391). The accumulator (387), mounted in a by-pass branch, absorbs the pressure surges and provides an auxiliary power reserve through the non-return valve (389).

6162. The restrictor valve (388) causes the installation to be supplied by the generating pump before the accumulator (387) is filled by restricting the fluid flow in the accumulator filling direction.

6163. The undercarriage and door actuating jacks as well as the undercarriage uplocks are supplied from the electro-distributing valves (4G) and (5G) which allow the fluid under pressure to flow when they are energized. The electro-distributing valves discharge the pressure to the No 1 system reservoir when the energization current is cut off.

6164. Restrictor valves (397, 398, 399, 406 and 407) mounted at the port A of the undercarriage actuating jacks are provided to slow down the extension motion of the undercarriage and the back-ward motion of the main legs.

6165. Three emergency slide-valves (393, 394 and 396) are used to isolate the emergency system (refer to para 6179) when not in use. The pressure situation in the various components is shown in the hydraulic system operating diagrams.

Position Indication System (refer to Figs 6-48 and 6-84)

6166. The pilot can follow the various operating phases by the green and red lights of the undercarriage position indicator (29G) (and 229G in the rear cockpit) and by the U/C not down warning lights (27G) and (227G) in the rear cockpit.

6167. The illuminating circuits of the undercarriage position lights are controlled by the dual flasher mechanism (53G) and the microswitches mounted on the undercarriage actuating jacks and the door locks.

6168. The U/C not down warning lights (27G), and (227G) in the rear cockpit, are controlled by the throttle microswitch (31G), the speed sensitive capsule and the actuating jack microswitches through the flasher mechanism (32G) and the failure warning panel (1Z) (and 201Z

in the rear cockpit). The intensity of the light can be adjusted by means of the DAY/NIGHT switch on the failure warning panel.

Ground Retraction Prohibition System (refer to Figs 6-48 and 6-81)

6169. The microswitch (23G) opens the unlocking solenoid circuit of the undercarriage control switch (3G) (203G in the rear cockpit) when the shock absorber is compressed. The undercarriage therefore cannot be retracted when the aircraft is on the ground. The undercarriage ground retraction prohibition system can, however, be overridden by depressing a lead-sealed pushbutton (392) located above the control lever of the undercarriage control switch.

6170. An additional safety feature is provided to be fitted when the aircraft is on the ground and not in use. This consists in a safety-pin marked UNDERCARRIAGE CONTROL which is to be passed through the switch casing to lock the switch control lever in the DOWN position.

Pressure Indicating System (refer to Fig 6-47)

6171. The value of the hydraulic pressure available for the normal undercarriage control system can be read on the U/C.B dial of the dual hydraulic pressure gauge (9C), and for III D (209C), when the hydraulic pressure selector switch (8C), and for III D (208C), is in the down position. The dual hydraulic pressure gauge is energized by the potentiometer transmitter (6C) and is located on the RH side panel in the front cockpit and on the RH side of the instrument panel in the rear cockpit. The U/C.B dial of the gauge also indicates the normal brake system and airbrake system pressure.

6172. The EmB dial of the gauge indicates the Emergency brake/Parking brake system pressure. The dual hydraulic pressure gauge is in this case energized by the transmitter (7C).

6173. With the hydraulic pressure selector switch (8C), and for III D (208C), in the up position :

a. The U/C.B dial shows the pressure in the No 1 system.

b. The EmB dial shows the pressure in the No 2 system, and consequently the hydraulic pressure available for the undercarriage emergency lowering system.

UNDERCARRIAGE OPERATION

Normal Undercarriage Control

6174. With the aircraft on the ground :

a. The undercarriage is down and locked.

b. The LH and RH legs are in the aft position.

c. The shock absorbers are compressed.

d. Control switch 3G, and for III D (203G), cannot be moved to the retract position.

e. Undercarriage position indicator (29G), and for III D (229G) : three green lights ON, red light OFF.

6175. **Retraction (refer to Figs 6-81 and 6-109).** On take-off :

a. The shock absorbers expand and reverse switch 23G.

b. Control switch (3G), and for III D (203G), is unlocked.

c. The ground retraction prohibition system is cancelled.

NOTE

For III D, the movements of the front and rear cockpit levers for the undercarriage control switches are mechanically synchronised. The sequencing microswitches are connected in series, therefore, if one of the microswitches controlled by either a leg or a door, fails to operate it interrupts the remaining operations.

6176. The sequence of operations for retraction is shown in Fig 6-81 for III O and 6-109 for III D.

6177. **Extension (refer to Figs 6-82 and 6-110).** With the aircraft in flight :

a. Undercarriage legs locked in uplocks.

b. Doors closed and locked in locks.

c. No pressure in door or undercarriage jacks (lateral and longitudinal).

d. No electro-distributing valves energised.

e. Undercarriage position indicator (29G), and for III D (229G) : green and red lights OFF, U/C light OFF.

6178. When the throttle lever is retarded to IDLE :

a. Engine r.p.m. 8000, switch 31G is reversed.

b. The aircraft speed falls to below 240 knots, the speed sensitive capsule (52G) closes, and the undercarriage can be extended; indicator (27G) and for III D (227G), begins flashing.

NOTE

For III D, the movements of the front and rear cockpit levers for the undercarriage control switches are synchronised.

6179. The sequence of operations for undercarriage extension, with aircraft speed below 240 knots, is shown in Figs 6-82 for III O and Fig 6-110 for III D.

Emergency Extension System

CAUTION

After finding that the normal control system is inoperative, ensure that the lever of the control switch (3G), and for III D, (203G) is left in the DOWN position before pulling the emergency control. After lowering the undercarriage through the emergency system, it is necessary that the two reservoirs should be replenished to the proper level since the fluid used to extend the undercarriage is returned to the reservoir of the No 1 Hydraulic System.

6180. **Description (refer to Figs 6-67, 6-83, 6-103 and 6-111).** The emergency extension system is controlled from the front cockpit only. It permits the undercarriage to be extended in case of failure of the normal Contrary to the normal control system, the emergency system is completely hydraulically operated with the pressure supplied from the No 2 hydraulic system.

6181. The pressure is directed to the door actuating jacks, the undercarriage actuating jacks and the undercarriage uplocks by a single-acting distributing valve (391). The latter valve is operated by a TELEFLEX flexi-

ble control shaft (409) using the two-position handle (408) (with yellow and black stripes) located above the undercarriage control switch.

6182. For III D, The Teleflex flexible control shaft crosses the rear cockpit frame through a pressure sealed unit (411).

6183. The No 2 system pressure also drives the slide valve of the distributor (410). The No 1 system is therefore kept under pressure upstream of the distributor (410) and connected to the reservoir return system downstream of this distributor. After using the undercarriage emergency extension system it is absolutely necessary to reset the distributor when the aircraft is on jacks, to permit the electro-distributing valves (4G) and (5G) to be supplied by the No 1 system. This resetting is manually performed by means of the handle located on the distributor.

6184. Before reaching the jacks and uplocks, the No 2 system pressure is applied to the emergency slide-valves (393, 394 and 396). The lines of the normal control system are isolated. A restrictor valve (401) causes the door actuating jacks to be supplied before the undercarriage actuating jacks. A non-return valve (402) is provided to protect the emergency distributing valve against any possible back-pressure in the return system.

6185. The distributing valves (27 and 28) (see the description of their control in para 668) permits the backing sequence of the main undercarriage legs to be started as soon as the legs are in the proper position during the extension motion.

6186. Non-return valves (403 and 404) are provided to protect the jacks (12 and 13) against any possible overpressure in the return system.

6187. A microswitch (2G) operated by the emergency distributing valve (391) cuts-off the electrical power supply to the normal sequencing circuits. The position indicating circuits are still supplied.

6188. **Operation (refer to Figs 6-83 and 6-111).** After retarding the throttle control lever, the pilot places the lever of the control switch (3G) (and for III D, 203G) in the DOWN position. After finding that the normal control system is inoperative (red and green lights not illuminated on 29G (and for III D, 229G) — U/C not down lights 27G (and for III D, 227G) continuously flashing), the pilot pulls the emergency control without changing the position of the control switch 3G (and for III D, 203G).

NOTE

Only the front cockpit is provided with an emergency extension control.

Undercarriage Door Ground Opening Control (refer to Figs 6-73 and 6-112)

CAUTION

The safety feature described in para 6192 does not prevent the opening of the doors and the automatic undercarriage sequence if the aircraft is on jacks and the control switch (3G) (203G) is inadvertently actuated.

6189. On the ground, the hydraulically operated undercarriage doors are normally closed and locked. Under these conditions, the door closing electro-magnetic circuit is opened by microswitches (18G-2, 19G-1, 20G-1, 47G and 48G); the pressure is dropped in the undercarriage hydraulic system.

6190. In order to gain access to the equipment mounted in the undercarriage wells during the maintenance or preflight operations, provision is made for opening each undercarriage door separately after unlocking it by pulling the corresponding manual unlocking handle (29, 30 and 376) (refer to paras 669 and 6136).

6191. Pulling the handle causes the hooks of the two locks of the door concerned to open and the internal lock microswitches to be reversed; the door can then be readily opened by hand.

6192. Microswitches (24G, 25G and 26G) are opened as soon as these systems are operated to prevent the lock microswitches from closing and to keep the energization circuit of the door closing No 1 electromagnet open. Such an arrangement constitutes a safety feature preventing the open door (or doors) from being inadvertently closed.

WHEEL BRAKE SYSTEM

General (refer to Figs 6-74 to 6-80 and 6-113 to 6-119)

6193. The wheel of each main undercarriage is fitted with a two-piston single-disc hydraulic brake (see description of the brake unit in para 656). The wheels can be braked through two separate systems :

a. A normal system through an electro-hydraulically controlled servo-brake.

b. An emergency system through a hydraulically and mechanically controlled servo-brake.

NOTE

The brakes can be operated both from the front cockpit and the rear cockpit.

Normal Brake System (refer to Figs 6-74 to 6-79 and 6-113 to 6-118)

6194. The LH and RH brakes operate independently in exactly the same manner. The following simplified explanation applies to the LH brake only, controlled from the front cockpit.

6195. The normal brake system is operated by the pilot depressing the brake pedals. Depressing the pedals causes two pressure reducing relays (414 and 416) to be energized by transmitters (413a, 413b and 420). These relays direct a fluid flow to the brakes at a pressure proportional to the control pressure applied to the transmitters which results in the following, regardless of the amount of travel :

a. Closing of the pressure reducing relay port connected to the reservoir return system.

b. Application of the No 1 system pressure to the electro-distributing valve (35G).

6196. The hydraulic systems for the LH and RH brakes are independent which permits differential braking.

6197. The wheel brake system also includes :

a. A Ministop automatic brake controller which permits maximum braking efficiency. The Ministop controller prevents pressure being applied to the brake cylinders until the circuit to the electro-distributing valve is de-energized. The Ministop installation releases the pressure in the brakes provided that the wheels have not reached a certain speed to avoid skidding or as soon as they start skidding.

b. A pressure regulating device operated in connection with the position of the throttle control levers. This device, permits the pressure directed to the brakes to be a lot higher during an engine run (engine r.p.m. more than 8000) than during landing (engine r.p.m. less than 8000). The maximum braking pressure cannot be applied when the aircraft is being landed.

6198. The block diagram in Figs 6-79 and 7-118 show the pressure variations in the brakes for the various aircraft conditions.

6199. **Hydraulic Installation (refer to Figs 6-76 and 6-115).** The hydraulic installation includes :

a. Two single pressure transmitters (413a and 413b) and in III D, one double pressure transmitter (420) the pistons of which are connected to the brake pedals by a linkage. Each piston discharges the fluid to the pressure reducing relay corresponding to the LH or RH brake.

b. Two progressive pressure-reducing relays having two pressure stages (414 and 416) supplied with high-pressure fluid from the No 1 hydraulic power system. The pressure reduced by the relays is proportional to the control pressure applied to the transmitters.

c. A coupling (412) fitted with a valve (two couplings (412) in III D one each for the front and rear cockpit brake systems). The vent is used to vent or close (negative-g flight) the energisation system of the pressure reducing relays (414 and 416).

d. Three non-return valves (422, 424 and 426).

6200. **Electro-Hydraulic Installation (refer to Figs 6-76 and 6-115).** The electro-hydraulic installation includes :

a. Two Ministop electro-distributing valves (35G and 36G) which, when de-energised, allow the fluid under pressure to flow to the brakes. When the valves are energized, the brakes are isolated from the pressure and are connected to the return system.

b. One electro-distributing valve (41G) which, when de-energised, directs the No 1 system pressure to ports of the pressure-reducing relays (414 and 416). When the valve is energized, it prevents the above pressure from being supplied.

6201. This arrangement therefore permits either the maximum pressure (electro-distributing valve energized) or the reduced pressure (electro-distributing valve de-energized) to be directed to the brakes.

6202. **Ministop Automatic Brake Release System (refer to Figs 6-78, 6-79, 6-117 and 6-118).** The Ministop automatic brake release system and the maximum braking pressure regulating system are supplied with electrical power through a microswitch (30G) operated by the throttle control lever. In addition to the electro-distributing valves (35G and 36G) refer to para 6200 the Ministop installation includes the following units :

a. Ministop switches (34G) and for III D, (234G) for manual control of the installation; this ON-OFF switch is normally lock-wired in the ON position.

b. Accelerometers (39G and 40G) continuously driven by the wheels. These accelerometers each include two contacts :

(1) The inertia contact (I) of an oscillating flywheel which is closed when the deceleration of the wheels is high and remains open in all other cases (stopping, acceleration, constant speed and slow deceleration).

(2) The centrifugal contact (C) of a regulator which is opened when the rotational speed of the wheels exceeds 600 r.p.m. and is closed in all other cases.

c. The microswitches (A) incorporated in the switches (23G and 26P) are open when the shock absorbers are compressed and closed when the shock absorbers are expanded (aircraft in flight). For reference only : Note that the microswitches (B) belong to the electrical undercarriage ground retraction prohibition system (LH undercarriage leg) and load-shedding prohibition system (RH undercarriage leg).

6203. The common energization of the electro-distributing valves (35G and 36G) is dependent on the throttle control levers being in a position corresponding to an engine r.p.m. of less than 8000 (refer to Table 6-1, Index No 30G).

6204. The individual energization of each electro-distributing valve is, in addition, dependent on either the closing of contact (I) (high deceleration, tendency to skid) or the simultaneous closing of contact (C) and microswitch (A) of (23G) or (26P) (insufficient adhesion and rotational speed too low).

6205. **Maximum Braking Pressure Regulating System.** Electrically, this installation only uses the electro-distributing valve (41G) and the throttle microswitch (30G).

6206. **Pressure Indicating System (refer to Fig 6-47).** Refer to para 6171.

6207. **Full Power Engine Run (refer to Figs 6-76 to 6-79 and 6-115 to 6-118).** With the throttle control lever in the full power position, the microswitch (30G) closes the electrical energization circuit of the electro-distributing valve (41G) and opens that of the Ministop electro-distributors (35G and 36G). Relay 414 opens and allows a supply from the No 1 Hydraulic power system to the brakes which may then be applied at maximum pressure.

6208. **Landing Impact on Main Wheels.** Refering to engine run braking, microswitch (30G) contacts are reversed when the throttle control levers are in the idle position. Contacts A of microswitch (23G) are closed (shock absorber expanded). The energization circuit of the electro-distributing valve (41G) is open. The electro-distributing valves (35G) and (36G) are energized as long as the wheels rotate at a speed below the opening speed of the centrifugal contact of the accelerometers (39G).

6209. **Landing Roll (refer to Figs 6-77, 6-79, 6-116 and 6-118).** As soon as the wheels have reached a sufficient speed, the centrifugal contact (C) of the two accelerometers open and de-energize the circuit of the electro-distributing valves (35G and 36G). Since the energization circuit of (41G) is open, the pressure reduced by the pressure reducing relay (414) is applied to the brake through the electro-distributing valves (35G and 36G).

6210. **Bouncing (refer to Figs 6-77, 6-79, 6-116 and 6-118).** If one of the main wheels rebounds on landing, the operation is as follows for the rebounding wheel :

a. Beginning of rebound. There is no change in the position of the contacts; the reduced pressure is applied to the brake and the wheel is rapidly slowed down.

b. End of rebound. As soon as the speed of the wheel is back under 600 rpm, the centrifugal contact (C) of the accelerometer (39G) is closed again. Since contact (C) of the accelerometer (39G) and microswitch (A) of the switch (23G) are closed, the energization circuits of the electro-distributing valves (35G and 36G) are energized and the braking pressure to both wheels is released.

6211. **Ministop Brake Release (refer to Figs 6-78, 6-79, 6-117 and 6-118).** When the brakes are firmly applied there is no risk of skidding due to the automatic closing of the accelerometer inertia contacts (I) which energise the electro-distributing valves (35G and 36G) through a secondary circuit. The pressure on the brakes is then immediately released.

NOTE

The opening of the Ministop installation electrical circuit during towing of the aircraft enables the pilot to brake the aircraft at any time with the brake release system being prevented from inadvertently operating.

6212. **Low Speed Roll (refer to Figs 6-78, 6-79, 6-117 and 6-118).** At the end of the landing roll, the shock absorbers are compressed and the contact is open at microswitch (A) of switches (23G and 26P); the contact (C) of the accelerometers (39G and 40G) is closed (wheel at a low speed). The contact (I) of the accelerometers is open (even deceleration). The circuits used to energize the electro-distributing valves (35G and 36G) are open and pressure is applied to the brakes.

6213. **Wheel Skidding at End of Landing Roll (refer to Figs 6-78, 6-79, 6-117 and 6-118).** If the brake pedals are fully depressed, the maximum pressure allowed on landing is applied to the brakes, which causes a deceleration of the wheels sufficient to close the inertia contacts (I) of the accelerometers (39G and 40G). The electro-distributing valves (35G and 36G) are then energized and the brake pressure is released until the wheels have regained an even speed. The contact (I) is then opened, the energization circuits of the electro-distributing valves (35G and 36G) are open and the pressure is applied to the brakes once more.

6214. With the shock absorbers compressed, and microswitch (A) open at 23G and 26P, the braking and brake release periods are controlled only by the inertia contacts (I) of the accelerometers until the aircraft is stopped.

NOTE

For III D, if the two pilots apply the brakes at the same time, their actions do not counteract each other. The reduced braking pressure is proportional to the stronger action.

Emergency Brake/Parking Brake (refer to Figs 6-75, 6-80, 6-114 and 6-119)

CAUTION

Operating both the normal brake control and the emergency brake control at the same time on landing may place the emergency slide-valves in an intermediate position which blocks off the pressure in both the normal and emergency lines.

CAUTION

During an engine-run, the aircraft is generally held on the brakes by the normal system. Holding the aircraft using the emergency system requires, in this case, the handle to be fully pulled and maintained in the pulled position.

CAUTION

Using the emergency control in the emergency position introduces loads high enough to possibly damage the brakes, the wheels and the undercarriage. These units are to be overhauled whenever the emergency brake system has been operated in an emergency.

6215. The emergency brake system is manually operated by a handle (427) or for III D, (423) identified by yellow and black stripes; this handle is located on the RH side of the instrument panel.

6216. Pulling the handle results in isolating the reservoir through the pressure reducing valve (418) and connecting the brakes to the accumulator (417) after the emergency slide-valves (188 and 189) have been moved. The pressure delivered by the pressure reducing valve is simultaneously directed to the two brakes and is fairly proportional to the control handle stroke. The handle is provided with a lock which permits the pressure to be maintained in the brakes when the aircraft is parked (front cockpit only).

NOTE

The hydraulic parking brake is not provided to hold the aircraft for long periods. When parked for long periods, the aircraft is to be moored.

6217. To hold the aircraft on the parking brake, the handle must be pulled until it can be turned a quarter turn clockwise. The handle is then held out by a stop and to release the parking brake the handle must be pulled further out and turned a quarter turn counter-clockwise. (refer to Figs 6-75 and 6-114). When in the park position the handle can be pulled still further aft to obtain a stronger braking action.

NOTE

The use of the parking brake immediately after the brakes have been firmly operated for a prolonged period may result in the liners becoming stuck to the discs.

6218. **Hydraulic Installation (refer to Figs 6-76 and 6-115).** As in the case of the normal system, the brakes are supplied from the No 1 hydraulic system. The accumulator (417) which is fitted with a check-valve (419), provides a reserve of fluid to permit the brakes to be applied a certain number of times in case of failure of the hydraulic power system.

6219. The pressure reducing valve (418) enables a progressive pressure, proportional to the travel of the handle, to be simultaneously applied to the two brakes.

6220. The pressure relief valve (421) is used to discharge, to the reservoir of the hydraulic system, any overpressure accidentally occurring between the accumulator (417) and the pressure reducing valve (418).

6222. The emergency brake system is not subjected to the action of the Ministop brake pressure controller.

6221. Accidental overpressures (expansion resulting from a temperature rise for example) occurring in the brakes are discharged to the hydraulic system reservoir through the pressure reducing valve (418) (port R).

6223. **Pressure Indicating System (refer to Fig 6-47).** Refer to para 6171.

6224. **Brake Release.** Releasing the handle shuts off the hydraulic power supply to the brakes and returns the fluid forced out of the brake cylinders to the reservoir through the pressure reducing valve.

CHAPTER 7

COCKPIT ARRANGEMENT — III 0

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CHAPTER 7

COCKPIT ARRANGEMENT — III O

DESCRIPTION

General (refer to Figs 7-1 to 7-9)

701. As the MIRAGE III 0 is a single-seater, the cockpit accommodates all the units needed by the pilot to control and monitor the various systems.

702. The cockpit is a sealed compartment enclosed by :

a. Frame 2 at the front.

b. Frame 10 at the rear.

c. The hinged canopy at the top.

d. The cockpit floor.

703. The cockpit contains the following (refer to Fig 7-1):

a. The two-part instrument panel (1).

b. The control pedestal (2).

c. A port console (3).

d. A starboard console (4).

e. A rudder pedal assembly (5).

f. A control column (6).

g. An ejection seat (7).

704. Table 7-1 contains an alphanumerical list of the components in the cockpit and gives references to the figure that illustrates the position of the component.

CANOPY OPERATION

Operating Mechanism (refer to Figs 7-9 and 7-12)

705. The canopy operating mechanism comprises two similar assemblies, one on each side of the cockpit. The RH and LH assemblies are synchronized by a shaft and bell-cranks located at the front of the cockpit. The assembly on each side comprises :

a. A locking hook (1) connected to a rod (2) and a bell-crank (3).

b. A spring rod (4).

c. A connecting rod (5).

d. A control lever (6) (RH side only).

e. An adjustable stop (7).

706. The following items are mounted on the shaft of the control lever :

a. A hammer bell-crank (8).

b. A retainer spring (9).

c. A fixed stop (10).

d. A locking cable (11).

e. A roller that actuates the cam controlling the opening of the canopy seal valve.

707. The rear hinge assembly consists of :

a. A hinge rod (12).

b. A bell-crank (13) fitted with a locking stud.

c. An unlocking hook (14).

d. Two balancing bungee cords (15).

708. On the ground, the canopy control lever (6) is locked in the open position by a safety pin (21) (refer to Fig 7-12) fitted through the lever. A red disc labelled CANOPY LOCK is attached to the pin. The safety pin must be removed before the canopy is operated.

709. A full description of the canopy structure is contained in Chap 4.

Closing and Locking the Canopy (refer to Figs 7-9 and 7-10)

710. Check that the safety pin is removed and pull the canopy control lever (6) fully aft. This drives the hammer bell-crank (8) through a stop which pulls cable (11) and brings the hook (14) into the down position. This action frees the bell-crank locking stud and allows the canopy to return to its stable balanced position under its own weight.

711. The canopy is closed by pulling down on the canopy handle, holding the canopy in this position with the left hand and pushing the canopy control lever (6) forward with the right hand. This engages the hook (1) onto the canopy studs and causes a roller to operate the canopy seal valve. The action of spring rod (4) on rod (2) and bell-crank (3) prevents canopy reaction from unlocking the control lever. Canopy locking can be adjusted by stop (7).

NOTE

The canopy can be pushed down directly from the outside instead of being pulled down by the handle.

712. A microswitch (40H) is actuated by the RH linkage. It causes the CAB p warning light on panel (IZ) to remain illuminated and the warning horn (7Z) to sound as long as the canopy is not locked down.

Canopy Unlocking from Inside the Cockpit (refer to Figs 7-11 and 7-12)

713. Pull the canopy control lever (6) aft to the OPEN position. This rotates the bell-crank (3) via rod (5) and opens the hook (l) through the rod (2) once the spring rod (4) on the bell-crank (3) has been moved out of its buttressed position. The unlocked canopy can then be moved from the closed position to the stable balanced position under the action of the balancing bungee cords (15).

714. The buttressing motion of the rod (2) and bell-crank (3) assembly only allows either a Locked or Unlocked condition because of the action of the spring rod (4). A roller is mounted on the canopy control lever (6) to open the canopy seal inflating valve and vent the canopy seal to prevent the seal from being damaged as the canopy is being operated (ref Chap 13).

715. When the canopy is opened, insert the safety pin (21) (refer to Fig 7-12).

Canopy Unlocking from Outside the Cockpit (refer to Fig 7-12)

716. The shaft of the canopy control lever (6) has a square drive that is accessible from outside the cockpit. The spanner (20), contained in the crash kit, fits onto the square drive and operates the canopy control lever thus enabling canopy unlocking or locking to be performed as described in previous paragraphs. The crash kit is accessible through door 218 RM (ref Chap 3).

Locking the Canopy in the Open position (refer to Figs 7-9 and 7-12)

717. Once the canopy is open, a light upward pressure on the handle will cause the canopy to be locked in the open position. This is achieved by the hook (14) engaging the locking stud on bell-crank (13). Ensure that the safety pin (21) is fitted.

COCKPIT LIGHTING

General (refer to Fig 7-13)

718. The cockpit is provided with a lighting system to illuminate all essential flight instruments. There are three types of lighting as follows :

a. Ultra-violet lighting.

b. External red lighting common to certain units.

c. Internal red lighting incorporated in certain equipments.

719. Each of these lighting systems is controlled by rheostats :

a. Three rheostats on box (2L) on the port console.

b. Two rheostats on box (4L) on the pedestal.

c. One rheostat (28L) behind the clock.

720. An automatically-operated map light (25L) is mounted on the cockpit RH side wall.

Ultra-Violet Lighting (refer to Fig 7-13)

721. The UV knob located on the rheostat box (2L) controls two rheostats (which adjust the brightness of the UV lights situated on the windshield arch) and incorporates a cut-off position. These lights are :

a. UV light (34) on the LH side.

b. UV light (35) on the RH side.

External Red Lighting (refer to Fig 7-13)

722. The RED knob (32) on rheostat box (2L) controls a rheostat which adjusts the brightness of the following lights :

a. *LH side.* Two side lights and one shoulder light on assembly 7L and one light assembly (44L) for the auto flight control system control panel (43C).

b. *RH side.* Two side lights and one shoulder light on assembly 8L.

723. The centre knob on box (41L) controls a rheostat (with a cut-off position) which adjusts the brightness of two lights; one (37L) on the LH arch, the other (39L) on the RH arch. Sited just above the UV lights, these lights each illuminate the corresponding half of the instrument panel.

Internal Red Lighting (refer to Fig 7-13)

724. The rheostat (28L) located on the windshield arch adjusts the brightness of the clock (30L) and standby compass (30) lighting. The PANEL LIGHTS knob (31) on box (2L) controls a rheostat which adjusts the brightness of the internal lighting of the following units :

a. *Port Console:*

(1) Radio selector box (3R).

(2) Standby UHF control panel (23R).

(3) Main UHF control panel (28R).

b. *Starboard Console:*

(1) Tacan (38R).

(2) Armament panel (4B).

(3) Cockpit temperature control panel (2H).

(4) IFF coder and control panel (8S).

725. The outer ring on rheostat (41L) controls the brightness of the internal lighting of the navigation computer (38F), Doppler control panel (55F) and station selector box (39F) through transformer (42L).

Map Light/Emergency Light (refer to Fig 7-13)

726. The map light (25L) is mounted on the RH side of the cockpit. It is a red light and has its cable wound onto an inertia reel (22L). The map light is automatically turned on by microswitch (14L) when the light is removed from its case. The microswitch also extinguishes the light when it is returned to the case.

Table 7-1 Component Location

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1	ASI Machmeter	7-3,7-4
2	Altimeter	7-3,7-4
3	Vertical speed indicator	7-3,7-4
4	Brake chute control	7-2
5	Canopy jettison lever	7-2
6	Canopy jettison breech unit	7-8
7	Canopy control lever	7-5
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Index	Description	Fig No
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21	Throttle control lever	7-2
22	Idle stop override button	7-2
29	Demisting control	7-5
30	Standby magnetic compass	7-3,7-4
31	Accelerometer	7-3,7-4
32	Canopy jettison cylinder	7-8
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100	Clock	7-3,7-4
101	Dinghy puncturer	7-3,7-4
102	Map light hook	7-5
103	Hand-rest (Retracting)	7-5
104	Rear-view mirrors (mounted on canopy)	7-3,7-4
392	Ground retraction safety override	7-6
408	Undercarriage emergency extension handle	7-6
427	Emergency/Parking brake handle	7-6
2A	Armament safety panel	7-5
11A	Gun and missile fire control button	7-6
13A	Rapid gun/MAGIC missile button Post-Mods 1112 and 1113	7-2
14A	Sight recorder button	7-6
25A	Sight relay box	7-8
26A	Voltage regulator	7-8
27A	Gyro caging button	7-2
29A	Sight head	7-3,7-4
30A	Closing speed switch	7-5
74A	Missile volume potentiometer	7-2
113A	LH missile lock-on light Post-Mods 1112 and 1113	7-14
114A	RH missile lock-on light Post-Mods 1112 and 1113	7-14
115A	Rapid gun/MAGIC missile light Post-Mods 1112 and 1113	7-14
02B	Armament master switch, replaces 29K Post-Mods 1112 and 1113	7-14
03B	Armament master light, replaces 34K Post-Mods 1112 and 1113	7-14
2B	Rocket, bomb and missile release button	7-6
4B	Radar/Armament panel	7-5
12B	Underwing store jettison button	7-3,7-4
14B	Heading error switch	7-5
15B	LABS switch	7-3,7-4
8C	Hydraulic pressure selector switch	7-6
9C	Hydraulic pressure indicator	7-6
21C	Roll trim switch	7-6
23C	Roll trim indicator light	7-2

Index	Description	Fig No
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125C	Nose-down trim switch	7-6
126C	Nose-up trim switch	7-6
131C	Pitch trim indicator light	7-2
134C	A.C. Emergency disengage switch	7-2
139C	Auto-command gain switch	7-6
2D	Helmet visor demisting control	7-5
11D	Pitot head heater/Incidence indicator control switch	7-6
E	Circuit-breaker panel	7-5
1E	R.P.M. indicator	7-3,7-4
3E	T5 temperature indicator	7-3,7-4
11E	Aircraft limit light	7-3,7-4
13F	Incidence indicator	7-3,7-4
14F	Incidence indicator test button	7-3,7-4
17F	Standby gyro-horizon	7-3,7-4
24F	Gyro centre and heading transfer control panel	7-5
28F	Spherical flight indicator	7-3,7-4
38F	Navigation computer	7-3,7-4
39F	Station selector box	7-5
48F	Gyro centre control switch (with cover and stop watch)	7-3,7-4
49F	Gyro centre failure light	7-3,7-4
55F	Doppler control panel	7-3,7-4
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3G	Undercarriage control lever	7-6
27G	U/C Not Down warning light	7-3,7-4
29G	Undercarriage position indicator	7-3,7-4
34G	Ministop control switch	7-2
53G	Dual flasher unit	7-8
54G	Audio checking tone pushbutton	7-2
2H	Cockpit airconditioning control panel	7-5
7H	Cockpit temperature sensor	7-8
11H	Equipment temperature control valve switch	7-5
12H	Emergency-cold switch	7-5
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21H	Failure detector	7-8
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Index	Description	Fig No
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17K	Emergency afterburner injector pushbutton	7-3,7-4
26K	Approach speed control system lever	7-2
27K	Emergency FCU control switch	7-2
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39K	Slow drain switch	7-2
40K	Slow drain indicator light	7-2
53K	Overspeed pushbutton	7-3,7-4
54K	Overspeed indicator light	7-3,7-4
2L	Cockpit lighting rheostat	7-2
6L	Resistor box	7-8
11L	Navigation light switch	7-2
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22L	Map light winding reel	7-5
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30L	Clock light	7-3,7-4
41L	PHI lighting rheostat	7-3,7-4
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18M	External power receptacle door indicator light (GRD CONN)	7-6
72M	Camera control panel	7-3,7-4
74M	Temperature indicator	7-3,7-4
24P	Load-shedding control switch	7-5
40P	Preheating control switch	7-2
9Q	LH low-pressure pump switch	7-2
10Q	RH low-pressure pump switch	7-2
16Q	Fuel shut-off valve control switch (main LP cock)	7-2
19Q	Bay tank transfer valve control switch	7-3,7-4
20Q	Fuel tank cross-feed switch	7-3,7-4
28Q	130 Gal fuel warning light	7-3,7-4
29Q	Fuel quantity indicator	7-3,7-4

Index	Description	Fig No
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40Q	Fuel transfer indicator	7-3,7-4
44Q	External tank jettison button	7-3,7-4
47Q	Fuel dump switch	7-6
51Q	Fuel remaining indicator	7-3,7-4
3R	Radio selector box	7-2
5R	Microphone press-to-talk button (on control stick hand grip)	7-6
10R	Microphone press-to-talk button (on throttle control lever)	7-2
23R	Standby UHF radio set control panel (red)	7-2
28R	Main UHF radio set control panel (green)	7-2
38R	TACAN control panel	7-5
46R	Radio-altimeter indicator	7-3,7-4
8S	IFF control panel	7-5
12S	Distress contactor	7-8
13S	Programming box	7-8
14S	Programming box	7-8
28S	Radar scope	7-3
29S	Radar control stick	7-2
37S	Tail warning radar control switch	7-6
16V	Inverter switch	7-6
47Y	Break-away connector	7-8
IZ	Failure warning panel including : **a. Warning lights :** **BATT GEN ALT HYD 1 HYD 2 EMG.HYD PITOT 8 min OXY OXY REG. FUEL OIL AUTO-TRIM A.C. DAMP EQ.T CAB.T CAB.P** **b. Switches :** Battery switch Generator switch Alternator switch Battery reset button Generator reset button Alternator reset button	7-6
3Z	FAIL warning light	7-3,7-4
6Z	Audio warning horn control switch	7-6
7Z	Warning horn	7-8

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COCKPIT ARRANGEMENT — III D

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CHAPTER 8

COCKPIT ARRANGEMENT — III D

DESCRIPTION

General (refer to Fig 8-1)

801. The front and rear cockpits are covered by a single canopy which is hinged on the slanting frame and locked in the down position by four hooks controlled by a linkage. The cockpits are enclosed by :

a. Frame 2 at the front.

b. The slanting frame at the rear.

c. The canopy.

d. The cockpit floor.

802. Most of the controls and instruments fitted to the front cockpit are duplicated in the rear cockpit; however, the front cockpit is provided with facilities to override most of the rear cockpit systems.

803. Each cockpit contains the following items :

a. An instrument panel (1).

b. A control pedestal (2).

c. A LH console (3).

d. A RH console (4).

e. A rudder control pedal assembly (5).

f. A control stick (6).

g. An ejection seat (7)

804. The rear cockpit has the following additional items :

a. A blind flying hood.

b. Two foot-rests (8) located near the control stick base.

c. An intermediate windshield.

805. Table 8-1 contains an alphanumerical list of the components in the front and rear cockpits and gives references to the figures that illustrate the position of the component.

CANOPY OPERATION

Operating Mechanism (refer to Figs 8-13 and 8-14)

806. The canopy operating mechanism comprises two similar assemblies, one on each side of the cockpit. The RH and LH assemblies are synchronized by a linkage (8) and bell-cranks (9 and 10) located between the cockpits. The assembly on each side comprises :

a. Two locking hooks (2) connected to rods (3) and bell-cranks (4).

b. Two spring loaded link-rods (5).

c. Three connecting rods (6).

d. One control lever (7) (RH side of front cockpit only).

e. Two adjustable stops (26).

807. The rear hinge section includes :

a. Two hinge arms (12). The fork-ends of these arms are connected to the canopy structure and can be disconnected by releasing their ball-locking system either pyrotechnically for canopy ejection or manually for removal of the canopy on the ground. The pyrotechnical jettisoning system is described in Chapter 15.

b. Two hinge rollers (13).

c. Two stop link rods (14).

d. Two screw jacks (15) driven by the actuator (42M).

e. Two compensating cylinders (16) that partially balance the weight of the canopy.

808. The canopy hinge consists of two open hooks (20) and rollers (13) located on the rear upper section of the canopy. The canopy is manually unlocked by the sliding motion of bush (23) which releases the balls (24) and disengages the forked fitting (25). Actuating the control lever (7) in the canopy opening direction operates a cam controlling venting of the canopy pressure seal to prevent the seal from being damaged during canopy operation.

809. A full description of the canopy structure is contained in Chap 4.

Description of Operation (refer to Figs 8-15 to 8-17)

810. The canopy is opened and closed by actuator (42M) driving screw jacks (15) through two rods. The actuator can be disengaged to permit manual operation of the canopy. Disengagement is accomplished by means of either a mechanical control (11) located on the LH side in the front cockpit or a pull-type control (22) located on the rear face of the slanting frame in the nose undercarriage well.

811. When the toggle switch (39M) is placed in the OP position or when the opening button (37M) is pressed, the self-held relay (40M) is closed via relay (41M) and energises the actuator (42M) until the opening travel limit switch (44M) is actuated.

812. When the toggle switch (39M) is placed in the CL position or when the closing button (38M) is pressed, relay (41M) is closed via relay (40M) and energises the actuator for as long as the switch remains pressed or until the closing travel limit switch (43M) is actuated.

813. A microswitch (45M), located in the RH linkage, breaks the canopy opening circuit to prevent canopy operation when the canopy is locked in the closed position. The canopy is locked in the closed position by either the control lever (7), from the inside, or the square drive (19) using spanner (21) from the outside.

814. Microswitch (40H), which is actuated by the RH linkage, causes the CAB P warning lights, on panels 1Z and 201Z, to illuminate and the warning horn to sound unless the canopy is in the locked position.

Closing and Locking the Canopy (refer to Figs 8-16 and 8-17)

815. Depressing the closing button (38M) energises the actuator (42M), the jacks (15) are driven and lower the canopy. At the end of the travel, the can-

opy structure actuates limit switch (43M) which cuts-off the actuator power supply.

816. The canopy is then locked by pushing the control lever (7) forward. The locking hooks engage the canopy studs and hold the canopy in the locked position. The spring-loaded link-rod (5) and bell-crank (4) assembly is spring tensioned which prevents canopy reaction from unlocking the control lever.

817. The canopy may be closed from the outside by opening the access panel (refer to Fig 8-17) and placing switch (39M) in the CL position. The canopy is then locked down by means of the special spanner (21) which is contained in the crash kit.

Canopy Unlocking and Opening from Inside the Cockpit (refer to Figs 8-14 to 8-17)

818. Pull the canopy control lever (7) aft to the unlocking position. This rotates the bell-cranks (4) via rods (6) and opens the hooks (2) through the rods (3) once the spring-loaded link-rods (5) have been moved out of their tensioned position. The unlocked canopy leaves its closed position under the action of the compensating cylinders (16).

NOTE

The action of the spring-loaded link-rod (5) and bell-crank (4) assembly only allows the canopy to be in a locked or unlocked condition.

819. Press the opening button (37M); this energises the actuator (42M) which drives the jacks (15) to lift the canopy. A spring tensioned link-rod (17), which is connected to the hinge arm (12), actuates the open limit switch (44M) which cuts-off the power supply to the actuator and stops the canopy in the fully open position.

Canopy Unlocking and Opening from Outside the Cockpit (refer to Fig 8-17)

820. Connect special spanner (21) to the square drive (19) on the canopy control linkage shaft situated on the LH side of the aircraft adjacent to the front cockpit. Pull the spanner aft, this moves the canopy control lever aft and unlocks the canopy as described in para 818.

821. Open the panel located on the LH air intake duct to gain access to switch (39M). Place the switch in the UP position; this causes the canopy to open as described in para 811.

COCKPIT LIGHTING

General (refer to Fig 8-18)

822. Each cockpit is provided with a lighting system to illuminate all essential flight instruments. There are three types of lighting as follows :

a. Ultra-violet lighting.

b. External red lighting common to certain units.

c. Internal red lighting incorporated in certain equipments.

823. Each of these installations is controlled by rheostats located on the following :

a. Box 2L — Front cockpit — LH console.

b. Box 202L — Rear cockpit — LH console.

Ultra-Violet Lighting (refer to Figs 8-18 and 8-19)

824. The UV knob located on the light rheostat boxes (2L and 202L) controls two rheostats which adjust the brightness of the UV lights distributed as follows :

a. *Front Cockpit.* On the windshield arch — LH light (55L), RH light (54L), through resistor box (6L).

b. *Rear Cockpit.* On the canopy side structural members — LH light (58L), RH light (59L), through resistor box (206L).

NOTE

The lighting wiring clamped to the rear arch of the canopy is terminated by a connector (216Y) permitting disconnection of the lighting circuit in case of removal or jettisoning of the canopy. This connector is held in position by a clip on the RH side.

External Red Lighting (refer to Figs 8-18 and 8-19)

825. The RED knob on rheostat boxes (2L and 202L) controls a rheostat which adjusts the brightness of the following lights :

a. *Front Cockpit (2L) LH Side.* Shoulder light (47L), Centre light (45L), Servo control panel (44L) and Range setting unit (67L).

b. *Front Cockpit RH Side.* Rear light (50L), Shoulder light (49L), Centre light (48L) and PHI light (65L).

c. *Rear Cockpit (202L) LH Side.* Shoulder light (61L) supplied through light resistor (71L), Centre light (62L) and Throttle lever (60L).

d. *Rear Cockpit RH Side.* Shoulder light (64L) and Centre light (63L).

826. The centre knob of light rheostats (41L and 241L) adjust the brightness of the following lights :

a. *Front Cockpit (41L).* Instrument panel LH glare shield (37L), instrument panel centre section (53L) (standby gyro-horizon) and instrument panel RH glare shield (39L).

b. *Rear Cockpit (241L).* Windshield arch LH side (56L), windshield arch centre section (70L) and windshield arch RH side (57L).

Internal Red Lighting (refer to Figs 8-18 and 8-19)

827. The PANEL LIGHTS knob located on light rheostat boxes (2L and 202L) control a rheostat which adjusts the brightness of the internal lights in the following equipments :

a. *Front Cockpit (2L).* LH console, UHF 1 control box (28R) and UHF 2 control box (23R). RH console, TACAN control unit (38R), Air conditioning control panel (2H), IFF control panel (8S) and Armament control panel (4B).

b. *Rear Cockpit (202L).* LH console, UHF 2 control box (223R) and Selector box (203R).

828. The outer rings of light rheostats (41L and

241L) control the brightness of the internal lights in the following equipments :

a. *Front Cockpit (41L).* PHI indicator (38F) on the instrument panel and station storage unit (39F) on the RH console.

b. *Rear Cockpit (241L).* PHI indicator (238F) on the instrument panel.

Clock And Standby Magnetic Compass Lighting (refer to Fig 8-18)

829. The following is applicable to the front cockpit only. The lighting system provided to illuminate the standby magnetic compass (30) and the clock (101) is controlled by a rheostat (28L), located on the clock support, via light rheostat box (2L). The standby magnetic compass is provided with integral lighting and the clock is illuminated by a light (30L) supplied through a resistor (29L).

830. The inner knobs of rheostats (41L and 241L) control the brightness of the lights in the front cockpit radio selector box (43R) (instrument panel) and rear cockpit radio selector box (243R) (control pedestal).

Map Lights/Emergency Lights (refer to Figs 8-18 and 8-19)

831. The map lights (25L and 225L) are mounted on the RH side of each cockpit. The electrical connector of each map light is wound on an inertia reel (22L and 222L).

832. The map lights are red and are automatically switched on and off. Microswitches (14L and 214L) mounted in the light case close the illuminating circuit as soon as a map light is pulled out of its case. The same microswitch opens the circuit when the light is returned to its case. The intensity of the map light is not adjustable.

NOTE

The front cockpit map light (25L) can be hooked to a bracket provided under the RH arch UV light. The rear cockpit map light (225L) can be hooked to a bracket provided under the UV light located on the RH side member of the canopy.

BLIND FLYING HOOD

General (refer to Fig 8-20)

833. The blind flying hood assembly covers the cockpit; it is intended for instrument flying training. When in the unfolded position, the hood covers the rear cockpit up to the sight head and completely masks the outside from the rear cockpit pilot.

Description (refer to Fig 8-20)

834. The blind flying hood assembly consists of the following components :

a. A rigid framework composed of a LH and RH rail (1) attached to the inner faces of the canopy side members (9) and the rear arch (7).

b. A moving assembly composed of two slides (6) which are provided with ball-bearings (15) and move inside the rails (1). The slides carry three arches (2, 3 and 4) which are provided with ball-joints. A fourth rear arch (5) is attached to the rails but is free to rotate about a ball-joint.

c. A white nylon cover (8) attached to the arches.

d. A front attachment system consisting of two hooks (12) attached to the canopy side members (9). These hooks pick up the eyelets (11) located on triangular fabric pieces (10) attached to the arch (2).

e. Two ball-stops (13) locking the moving assembly in the forward position.

f. A LH and RH elastic cord (14) attached to the arches (2 and 4). These cords return the arch (2) to the up position upon disengagement of the eyelets (11).

Operation (refer to Fig 8-20)

835. **Unfolding.** The hood is unfolded by hand. The slides (6) carrying the three front arches (2, 3 and 4) move inside the rails (1) and are locked in the forward position by the ball-stops (13). The eyelets (11) are then engaged in the hooks (12). The elastic cords (14) keep the front arches under tension.

836. **Folding.** Manually actuating the hooks (12) releases the eyelets (11); the front arches are pulled upward by the elastic cords (14). The assembly is then returned to the aft position after unlocking the slides (6).

837. **Attachment to Canopy.** The rails (1) are attached to the inner faces of the canopy side members (9) at two points as follows :

a. *Front Attachment.* The attachment section (16) of each rail is in direct contact with the canopy side member and is secured by means of a screw and an anchor nut (19).

b. *Rear Attachment.* A screw and an anchor nut (19) taking the end-fitting (17) of the ball-jointed arch (5) and the end-fitting (18) of the arch (7) attach the rail at the rear.

Table 8-1 Component Location

Index No		Description	Ref Fig	
Front Cockpit	Rear Cockpit		Front Cockpit	Rear Cockpit
1	1	ASI/Machmeter	8-4	8-5
2	2	Altimeter	8-4	8-5
3	3	Vertical speed indicator	8-4	8-5
4	4	Brake chute control	8-2	8-9
5	5	Canopy jettison lever	8-2	8-3
6	6	Canopy jettison breech	8-11	8-12
7		Canopy locking lever	8-6,8-18	
8		Canopy actuator disengage lever	8-2	
9		Seal/Ram air control lever	8-6	
12	12	Oxygen valve	8-11	8-3
	16	Canopy balancing jack		8-12
20	20	Anti-g valve	8-2	8-3
21	21	Throttle control lever	8-2	8-3
22		Idle stop override button	8-2	
23	23	Rudder control pedal adjustment control	8-4	8-5
30		Standby magnetic compass	8-4,8-18	
31	231	Accelerometer	8-4	8-5
	44	Pressure regulator		8-12
70	70	Demisting control lever	8-6	8-7
	73	Slaved valve		8-12
100		Rear view mirrors	8-4	
101	201	Clock	8-4,8-18	8-5
102	202	Dinghy puncturer	8-6	8-5
103		Hand-rest	8-6	
104	204	Escape knife	8-4	8-9
105	205	Chest connector cover support	8-2	8-3
106	206	Chest connector support	8-2	8-3
408		Undercarriage emergency extension handle	8-8	
	423	Emergency brake handle		8-9
427		Parking/Emergency brake handle	8-8	
2A		Armament safety panel including : a. Guns switch. b. Rockets switch. c. Missiles switch. d. Bombs switch.	8-6	
11A		Gun/Missile firing button	8-8	
13A		Rapid gun/MAGIC missile (RG/M) button Post-Mods 1112 and 1113	8-2	
14A		Camera pushbutton	8-8	
	17A	Camera control panel		8-12
	25A	G.B.R. sight relay box		8-5

Index No		Description	Ref Fig	
Front Cockpit	Rear Cockpit		Front Cockpit	Rear Cockpit
	26A	Voltage regulator		8-12
27A		Gyro caging button	8-2	
29A		Sight head	8-4	
74A		Missile audio potentiometer (Sidewinder)	8-2	
113A		LH Missile lock-on light Post-Mods 1112 and 1113	8-21	
114A		RH Missile lock-on light Post-Mods 1112 and 1113	8-21	
115A		Rapid gun/MAGIC missile light Post-Mods 1112 and 1113	8-21	
02B		Armament master switch Post-Mods 1112 and 1113	8-21	
03B		Armament master light Post-Mods 1112 and 1113	8-21	
2B		Rocket/Bomb firing button	8-8	
4B		Armament control panel	8-6,8-18	
12B	212B	Wing store jettison button	8-4	8-5
14B		Heading error switch	8-4	
	203B	Armament master light rear cockpit, Post-Mods 1112 and 1113		8-21
	1C	Air data computer		8-12
3C		Hyd. Press. circuit breaker	8-10	
8C	208C	Hydraulic pressure selector switch	8-8	8-5
9C	209C	Dual hydraulic pressure gauge	8-8	8-5
14C		Emg. Hyd. Pump circuit breaker	8-10	
21C	221C	Roll trim control	8-8	8-9
23C	223C	Roll trim indicator light	8-2	8-3
31C	231C	Rudder trim control	8-2	8-3
33C	233C	Rudder trim indicator light	8-2	8-3
34C		Airbrake override switch	8-2	
36C	236C	Airbrake control switch	8-2	8-3
37C	237C	Airbrake unlocked position indicator light	8-4	8-5
42C	242C	Shock cone position indicator	8-4	8-5
43C		Auto function control panel	8-8	
	60C	Shock cone actuator		8-12
73C		AC Pitch circuit breaker	8-10	
75C		Servo control circuit breaker	8-10	
86C	286C	Damper disengage button	8-8	8-9
125C	325C	Nose-down trim contactor switch	8-8	8-9
126C	326C	Nose-up trim contactor switch	8-8	8-9
131C	331C	Pitch trim indicator light	8-2	8-3
134C	334C	Emergency disengage control	8-2	8-5
139C		Auto-command gain switch	8-8	
1D		Visor demisting circuit breaker	8-10	
2D	202D	Visor demisting switch	8-6	8-7
6D		ASI circuit breaker	8-10	
11D		Pitot heater/Incidence indicator control switch	8-8	

Index No		Description	Ref Fig	
Front Cockpit	Rear Cockpit		Front Cockpit	Rear Cockpit
E		Circuit breaker panel	8-6,8-10	
1E	201E	R.P.M. indicator	8-4	8-5
3E	203E	Jet pipe temperature indicator	8-4	8-5
11E	211E	Aircraft limit warning light	8-4	8-5
13F	213F	Incidence indicator	8-4	8-5
14F	214F	Incidence test pushbutton	8-4	8-5
15F		A/H circuit breaker	8-10	
17F	217F	Standby gyro-horizon	8-4	8-5
20F		Comp. circuit breaker	8-10	
24F		Heading selector (gyro centre control panel)	8-6	
27F		Bezu ouput multiplier box	8-4	
28F	228F	Ball attitude indicator	8-4	8-5
38F	238F	PHI indicator	8-4,8-18	8-5,8-19
39F		Station storage unit	8-6,8-18	
48F		Gyro centre control switch	8-8	
57F		Range setting unit	8-2	
1G		Undercarriage Cont. circuit breaker	8-10	
3G	203G	Undercarriage control lever	8-8	8-9
27G	227G	Undercarriage Not Down warning light	8-4	8-5
28G		Undercarriage position indicator circuit breaker	8-10	
29G	229G	Undercarriage position indicator	8-4	8-5
34G	234G	Ministop installation control switch	8-2	8-3
54G		Undercarriage downlocked audio checking tone button	8-2	
1H		Cab. T. circuit breaker	8-10	
2H	202H	Air conditioning control panel	8-6,8-18	8-7
	7H	Cabin temperature sensing unit		8-12
18H		Oxy. 1 Circuit breaker	8-10	
	218H	Oxy. 2 Circuit breaker		8-10
19H	219H	Blinker	8-6	8-7
22H	222H	Electronic oxygen failure detector	8-2	8-7
23H		Cabin pressure switch	8-2	
	40H	Cabin pressure warning microswitch		8-13
4J	204J	Engine fire warning light	8-4	8-5
7J	207J	Afterburner fire warning light	8-4	8-5
5K		Start circuit breaker	8-10	
7K		Engine starting button	8-2	
8K		In-flight relight switch	8-2	
9K		Ignition-Ventilation switch	8-2	
13K	213K	Afterburner cock control switch	8-2	8-3
15K	215K	Afterburner on indicator light	8-4	8-5
16K	216K	Afterburner injection indicator light	8-4	8-5

Index No		Description	Ref Fig	
Front Cockpit	Rear Cockpit		Front Cockpit	Rear Cockpit
17K		Afterburner emergency injector pushbutton	8-4	
26K		Approach control lever	8-2	
27K		Emergency nozzle control switch	8-2	
28K		Emergency FCU actuator control key	8-2	
53K		Overspeed button	8-4	
54K	254K	Overspeed indicator light	8-4	8-5
2L	202L	Light rheostat box	8-2,8-18	8-3,8-19
	6L,206L	Light resistor box		8-7
11L		Navigation light switch	8-2	
14L	214L	Map light microswitch	8-6,8-18	8-7,8-19
19L		Formation light switch	8-2	
22L	222L	Winding reel	8-6,8-18	8-7,8-19
25L	225L	Map light	8-6,8-18	8-7,8-19
27L		Landing light switch	8-2	
28L		Standby magnetic compass/Clock light rheostat	8-4,8-18	
41L	241L	Light rheostat box	8-2,8-18	8-3,8-19
	242L	Lighting transformer		8-7
2M	202M	Fuselage store jettison button	8-4	8-5
18M		Ground connector door indicator light	8-8	
37M		Canopy opening button	8-6	
38M		Canopy closing button	8-6	
	39M	External to rear cockpit — toggle switch		8-14
	42M	Canopy electric actuator		8-13,8-14
43M		Canopy closing limit switch	8-13,8-14	
	44M	Canopy opening limit switch		8-13,8-14
45M		Canopy locked safety microswitch	8-13,8-14	
50M		Standby battery (canopy ejection)	8-11	
51M		Release microswitch box	8-11	
	52M	LH initiator (standby battery)		8-12
	53M	RH initiator (standby battery)		8-12
	54M	LH initiator (battery)		8-12
	55M	RH initiator (battery)		8-12
57M		Resistor (in box)	8-11	
24P		Load shedding switch	8-6	
7Q		LP pump LH	8-10	
8Q		LP Pump RH	8-10	
9Q		LH LP pump control switch	8-2	
10Q		RH LP pump control switch	8-2	
15Q		Main LP cock circuit breaker	8-10	
16Q	216Q	LP cock control switch	8-2	8-3
19Q		Bay tank transfer switch	8-4	

Index No		Description	Ref Fig	
Front Cockpit	Rear Cockpit		Front Cockpit	Rear Cockpit
20Q		Cross-feed control switch	8-4	
28Q	228Q	Fuel low level warning light	8-4	8-5
29Q	229Q	Fuel gauge indicator	8-4	8-5
33Q		Fuel gauge test button	8-4	
40Q	240Q	Fuel transfer indicator	8-4	8-5
44Q	244Q	Fuel tank jettison button	8-4	8-5
47Q		Fuel dump button	8-8	
51Q	251Q	Fuel remaining indicator	8-4	8-5
5R	205R	Microphone press-to-talk button	8-8	8-9
6R		TACAN — Sidewinder switch	8-2	
10R		Microphone press-to-talk button	8-2	
23R	223R	UHF 2 control box	8-2,8-18	8-3,8-19
25R		UHF circuit breaker	8-10	
28R		UHF 1 control box	8-2,8-18	
38R		TACAN control unit	8-6,8-18	
43R	243R	Radio selector box	8-4,8-18	8-5,8-19
	203R	Selector box		8-3,8-19
8S		IFF control panel	8-6,8-18	
12S		Distress switch	8-11	
16V		Inverter switch	8-8	
47Y1	47Y2	Radio quick-release connector (Seat/Pilot)	8-11	8-12
	216Y	Canopy light power connector		8-12
1Z	201Z	Failure warning panel	8-8,8-10	8-5,8-10
2Z		Warn lights circuit breaker	8-10	
3Z		Failure warning light	8-4	
5Z		Horn circuit breaker	8-10	
	203Z	Cancel horn button		8-5
6Z		Audio warning horn switch	8-8	