UK RESTRICTED

GROUP 101: AIRCRAFT
SUB. GROUP B: FIXED WING AIRCRAFT

AIR PUBLICATION
101B-0409-1

(Formerly A.P.43261, Vol.1)

Cover 1

CANBERRA PR. MK. 9 AIRCRAFT
GENERAL AND TECHNICAL INFORMATION

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

Sponsored for use in the

ROYAL AIR FORCE by D.Air.Eng.(RAF)

Prepared by British Aerospace, Aircraft Group, Warton Division

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AMENDMENT RECORD SHEET

Incorporation of an Amendment List in this Publication is to be recorded by signing in the appropriate column and inserting the date of making the amendments

A.L.No.	AMENDED BY	DATE
1 - 112	Incorporated	Aug.71
113	G.K.Taylor	5.1.72
114	G.K.Taylor	11.5.72
115	G.K.Taylor	17.7.72
116	G.K.Taylor	17.7.72
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LETHAL WARNING

EJECTION SEATS AND CANOPY JETTISON MECHANISMS

1. Ejection seats and canopy jettison mechanisms are sources of potential danger to personnel and of damage to the aircraft. Serious injury (possibly fatal) may result if any firing mechanisms are inadvertently operated whilst the aircraft is on the ground.

2. The following instructions are to be obeyed:—

R.N. **Safety precautions contained in A.P.(N.)140—Naval Aircraft Maintenance Manual.**

R.A.F. **ALL PERSONNEL before entering the cockpit or cabin of an aircraft fitted with an ejection seat are to report to the N.C.O. immediately in charge of airframe servicing who is to ensure that all safety pins (or other safety devices) are correctly positioned to render the seat and canopy jettison firing mechanisms safe. On completion of servicing, tradesmen are to report to the N.C.O.**

3. Full instructions for rendering the firing mechanisms safe are contained in the A.P.4288 and A.P.(N.)1023 series, in Aircraft Servicing Schedules and in the A.D.5037 series.

WING TIP TANK JETTISON: EXPLOSIVE BOLTS

4. Personnel are warned not to interfere with the controls associated with the above equipment unless the following precautions have been carried out:—

(a) The internal service battery is disconnected and no ground electrical supply is connected to the external supply socket.
(b) The detonator leads are disconnected where necessary.
(c) The detonators are removed where necessary.

NOTE . . . Detonators are not to be held in the hand. During all operations, detonators must be supported by their electrical leads. Hold the leads near the detonator base.

THIS IS IMPORTANT.

FUEL TANK No. 6 EXPLOSION PROTECTION SYSTEM

5. This system includes detonators which are installed in the No. 6 fuel tank. Personnel are warned not to interfere with the controls associated with this system, or attempt to remove the tank, unless the internal service battery is disconnected and no ground electrical supply is connected to the external supply socket.

NOTE . . . These detonators are explosive and must be handled with care. They should be kept away from heat applications, electrical leads, sockets, and batteries and not exposed to severe blows or undue force when fitting.

H.E. IGNITION UNITS: Possible Lethal Charge

6. Personnel are warned that in certain circumstances, the energy stored in the capacitors embodied in the H.E. ignition units may be of a lethal nature. As a safety precaution, it is essential after disconnecting the L.T. Plessey plug and socket to wait for at least one minute before handling the unit.

RADIO FREQUENCY RADIATION HAZARDS: Precautionary measures

7. Airborne equipment:—

(a) When servicing the higher power radio transmitters, operating on centimetric and shorter wavelengths, personnel are to avoid subjecting themselves, or others in the vicinity, to the sustained (non-scanning) output of focusing aerials such as paraboloids and similar dish forms, honeycomb lenzes, and in particular, power-carrying wave guides, whether fitted with terminating radiators or not. Care is also to be taken to avoid exposures of parts of the body, such as eyes and fingers, to the R/F leakage from joints in R/F waveguides carrying high power.

(b) The precautions stated in (a) above, apply to all modern primary radar and R.C.M. transmitter installations, operating on centimetric or shorter wavelengths. It is essential that personnel do not make detailed examination of the radiator, reflector, waveguide opening, of horn or any radar equipment, irrespective of power output during periods of transmission.

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CONTENTS

LUBRICANTS

Designation	Ref. No.	N.A.T.O. Code
XG–273	34B/9423151	—
XG–275 (4 oz.)	34B/9100512	G–350
XG–275 (1 lb.)	34B/9100513	G–350
XG–276	34B/9425139	—
XG–277	34B/9100514	G–359
OX–14 (2 oz.)	34B/9100589	O–147
OX–14 (½ pt.)	34B/9100590	O–147
OX–38	34A/9100591	O–149
OM–15	34B/9100572	H–515
OEP–71	34A/9100540	O–136

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NOTE TO READERS

The subject matter of this publication may be affected by Air Ministry Orders, Servicing Schedules (Vol. 4 or 5) or by "General Orders and Modifications" leaflets in this A.P., in the associated publications listed below, or even in some others. If possible, Amendment Lists are issued to correct this publication accordingly, but it is not always practicable to do so. When an Order, Servicing Schedule or leaflet contradicts any portion of this publication, the Order, Servicing Schedule or leaflet is to be taken as the overriding authority.

◀The coded system of A.P. reference numbering is applied to this publication by A.L. 91, as follows:—

A.P. 101B—0409—1 (formerly A.P. 4326J. Vol. 1)

New leaves issued subsequent to the introduction of the code reference will bear the coded A.P. number; the reference caption of existing leaves will be amended only when leaves are re-issued.▶

The inclusion of references to items of equipment does not constitute authority for demanding the items.

Each leaf, except the original issue of preliminaries, bears the date of issue and the number of the Amendment List with which it was issued. When this Volume is amended by the insertion of new or replacement leaves in an existing chapter, the new or amended technical information will be indicated by triangles, positioned in the text thus:—◀——▶ to show the extent of amended text, and thus:— ▶◀ to show where text has been deleted. When a Part, Section, or Chapter is issued in a completely revised form, the triangles will not appear.

LIST OF ASSOCIATED AIR PUBLICATIONS AND DIAGRAMS

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	A.P.
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◀*Flying controls* 101B—0409—D2 *or*	6988C
Fuel system 101B—0409—D4 *or*	6988F
Hydraulic system 101B—0409—D3 *or*	6988H▶

Note . . . *Availability of the above is given in A.P.*113

LAYOUT OF A.P.101B-0409-1

CANBERRA PR Mk. 9 AIRCRAFT

VOLUME 1	**General and Technical Information**
VOLUME 2	**General Orders and Modifications**
VOLUME 3	**Equipment Schedules and Scales**
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Part 2	Appendix "A"
Part 3	Scales of Unit Equipment
Part 4	Scales of Servicing Spares
VOLUME 4	**Planned Servicing Schedules**
VOLUME 6	**Repair and Reconditioning Instructions**

A.P.101B—0409—15	**Air Crew Manual**
A.P.101B—0409—12	**Ground Handling Notes**
A.P.4326J/O.D.	**Operating Data**

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INTRODUCTION

1. The CANBERRA PR Mk. 9, powered by two Avon Mk. 206 turbo jet aero-engines, is a midwing aircraft designed for high altitude photographic reconnaissance duties. The crew consists of pilot and navigator occupying a pressurised cabin in the front fuselage.

2. The fuselage, which is of all-metal monocoque stressed skin construction, is built in three main sections—front, centre and rear. The joints between the sections are designed to facilitate dismantling for transportation.

3. In the front fuselage, the pressurised cabin includes the hinged nose portion to the aft sloping bulkhead which seals it off from the remainder of the fuselage. Immediately aft of the sloping bulkhead, and extending aft to the front fuselage break frame are equipment compartments and the nose undercarriage bay. The pilot's canopy which is offset to port of the aircraft centre line, consists of a fixed windscreen, and a hinged hood which opens upward and rearward, and is the pilot's means of entry to the cockpit. The navigator's station, entered by opening the hinged nose, has an escape hatch in the roof directly above the navigator's seat.

4. The centre fuselage incorporates, as an integral part of a reinforced double frame, the centre section of the main plane spar, the main plane attachment lugs on the spar section protruding beyond the fuselage profile. The main plane rear wall (spar) attachment lugs are also incorporated on a reinforced double frame, this frame and the spar frame forming bulkheads across the fuselage. Immediately aft of the break frame, at the forward end of the section and forward of the break frame at the rear end, are the front and mid camera compartments. The apertures in the undersurface of the fuselage below the camera windows in each compartment are closed by hydraulically-operated sliding doors. Access to the mid camera compartment is obtained by entering the aircraft through the hatch in the rear fuselage but, at the front compartment, the fuselage undersurface is formed by port and starboard hinged fairings and an access panel fitted centrally between the fairings. A floor is fitted between the front camera compartment and the spar frame and also, at a higher level, between the spar frame and the mid camera compartment. Forward of the spar frame, the fuselage above the floor is divided by bulkheads into four tank bays. Aft of the spar frame is a single tank bay which terminates at a removable bulkhead just forward of the mid camera compartment. All the tank bays are lined with an inner metal skin riveted to the fuselage structure. A fuel tank of all-metal construction and shaped to conform with the fuselage profile is suspended below the floor forward of the spar frame by metal straps attached to trunnions on the fuselage longerons. Below the floor aft of the spar frame and extending aft to the bulkhead at the mid camera compartment, is the flare bay which is closed by two hydraulically-operated doors.

5. The rear fuselage incorporates the rear camera compartment and carries the tail unit. A hatch, closed by a hinged cover, is fitted in the undersurface immediately aft of the break frame and gives access to the mid and rear camera compartments and the rear fuel tank bay in the centre fuselage. The aperture below the rear camera window, like those in the centre fuselage, is closed by hydraulically-operated sliding doors. Built on to the fuselage, at the rear of the section, are the stubs for the fin and tail plane leading edge. The fin attachment lugs are fitted to a stub diaphragm which forms an extension to the rear bulkhead in the fuselage. This bulkhead carries hinge brackets for the variable-incidence tail plane. Aft of the rear bulkhead, the lower half of the fuselage is formed by an extension piece which is supported by a tubular bracing strut connected to the rear bulkhead in the fin stub. The fuselage is finished by a conical fairing attached to the extension piece and the trailing edge of the fin stub.

6. The main planes differ from those fitted to previous Marks of Canberra by an increased chord at the inner wing inboard of the engines and a greater span obtained by extensions fitted at the wing tips. The structure consists of a single main spar, a sectional rear wall and chordwise ribs, the skin being stiffened by spanwise stringers. Attachment to the fuselage is made at the main spar and rear wall positions. Outboard of each engine, an integral fuel tank forms part of the leading edge, and provision is made for the carriage of a jettisonable fuel tank at the wing tip. The split type trailing edge flaps are built in four portions, the inner portions being fitted between the fuselage and the engine nacelles and the outer portions outboard of the engines and extending to the ailerons; both the ailerons and flaps are of all-metal construction. Air brakes are fitted in the outer wings just aft of the main spar outboard of the engines.

7. The electrically-actuated variable-incidence tail plane is a single-spar structure with a false rear spar. The port and starboard units are connected together at the roots, to form a single unit which is hinged to the rear bulkhead in the fuselage. The horn-balanced elevators are of all-metal construction and are interconnected by a coupling link which joins two vertical torque levers secured one to the root of each elevator. The fin is of composite construction, being of wood forward of the single light-alloy spar and of metal aft of the spar.

8. Hydraulic power operation with artificial feel is provided for the ailerons and rudder, but the elevators are operated mechanically by the pilot. Conventional runs of push-pull tubes and levers connect the pilot's controls with the aileron and rudder jack control

valves, and to the elevator operating lever. To obtain equal sensitivity of control at high and low altitudes, the aileron controls are geared to provide two movement ranges, the gear change being operated by an electrical actuator controlled by the pilot. Yaw damping in the rudder controls is applied by the Mk. 2 autostabilizer equipment. Trim tabs are not fitted to the ailerons or rudder but provision is made to adjust the artificial feel to accommodate variations in the neutral positions of the pilot's controls to effect trimming. The variable-incidence tail plane is operated by a pilot-controlled electrical actuator, and the trailing edge flaps and air brakes by hydraulic jacks. A Mk. 10 automatic pilot system is installed with provision for coupling to the I.L.S. for automatic approach.

9. The hydraulically-operated, retractable alighting gear consists of two main undercarriage units and a nose undercarriage. Each main undercarriage unit, which is pivoted in the main plane and retracts inward into the inner wing, has a single wheel mounted in cantilever on an oleo-pneumatic shock absorber strut. Hydraulic disc-type brakes are fitted to the main wheels. The nose undercarriage, which retracts rearward into the fuselage, is liquid sprung, the unit being fully castering and self centring with twin wheels. The undercarriage bays are faired by hydraulically-operated doors.

10. Three separate systems, the 'services' system and port and starboard 'control' systems, provide hydraulic power for the operation of the various services and powered flying controls. The services system, powered by two pumps, one driven by each engine, operates the alighting gear, wheel brakes, flaps, air-brakes, flare bay doors and camera doors; the wheel brakes are controlled by master cylinders mounted on the rudder pedals and the other services by electrically-operated selector valves. An emergency system, powered by a hand pump, is provided for alighting gear lowering; the system is controlled by a mechanically-operated selector valve, the operation of which automatically overrides the electrical control and selects 'down' on the normal selector. The hand pump may also be used during flight to operate the flare bay doors and wheel brakes, but other services may only be operated by hand pump when the aircraft is on the ground. Primary power for the rudder feel simulator and rudder jack is also provided by the services system. The port controls system, powered by a single pump driven by the port engine, provides power for the operation of the aileron inboard jacks and also secondary power for the rudder feel simulator and rudder jack. The aileron outboard jacks are operated by the starboard controls system powered by a single pump driven by the starboard engine.

11. Each engine change unit is secured at four points, two each side of the unit, to two reinforced leading edge members forward of the main spar. It is enclosed by the nose cowling and three panels, all of which are removable. The jet pipe, which is secured to a transition piece fitted to the engine exhaust unit, passes through a fireproof bulkhead at the main spar position and extends to the trailing edge. It is supported on runners and, at the rear end, by fittings at the main plane rear wall position. An accessory gearbox is mounted in the leading edge inboard of each engine. Engine starting is by means of an iso-propyl nitrate turbo-starter system, a fuel tank and pump for which is mounted in the leading edge inboard of each engine. Fuel is carried in five bag-type tanks and a rigid metal belly tank in the centre fuselage, and two integral tanks in the main plane leading edge. Provision is also made for jettisonable tanks at each wing tip. Oil is carried in the engine sumps only.

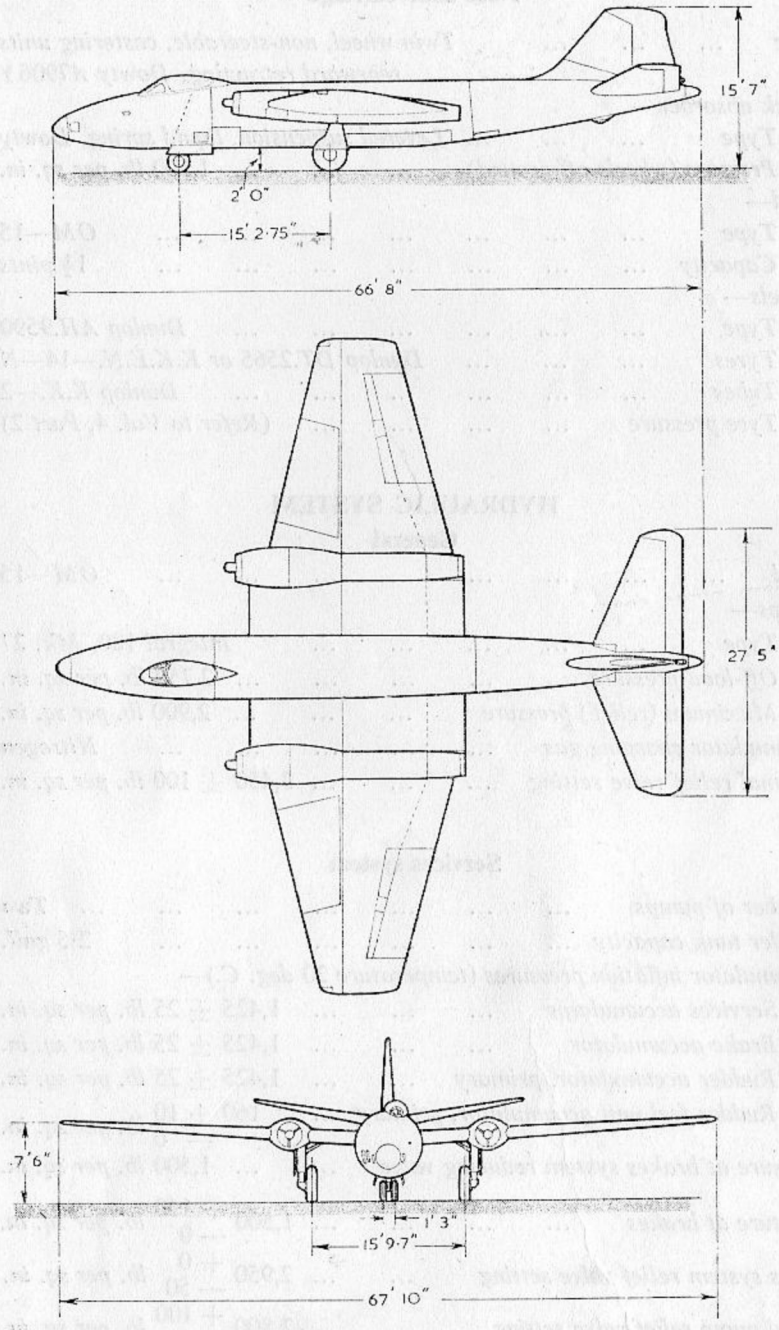
12. Ejection seats are provided for both the pilot and the navigator, and special clothing, necessitated by the high altitude roles of the aircraft, is worn by both crew members. The personal services, oxygen, air conditioning and mic-tel leads are connected to the clothing through a special three-part connector attached to the starboard side of each ejection seat. An air conditioning system supplies air from the engine compressors for cabin pressurisation, cabin and crews ventilated suit conditioning, camera heating, hot air de-misting and canopy sealing. A master unit controls the cabin pressure above 10,000 feet. The temperature of the cabin, which is insulated by a fibre glass blanket, is controlled by the pilot, and the temperature of the ventilated suits by the individual crew members. Automatic control is provided for the temperature of the air for camera heating. A dry air de-misting system, using alumina as the drying medium is provided in addition to the hot air de-misting for the transparent panels in the cabin, and the pilot's canopy. Oxygen is supplied to the crew from cylinders mounted in the main plane, and an emergency cylinder is provided for each crew member; these emergency cylinders are attached to the backs of the ejection seats and may be operated manually while in the aircraft, but operate automatically on ejection.

13. An electrically operated cabin pressure dump, with duplicated switch controls, is installed to improve the navigator's escape facility.

14. To suit the various operational roles of the aircraft, the mounting structure in each of the three camera compartments provides for the installation of alternative cameras and for adjustment to accommodate different focal lengths of lenses and angles of tilt. Flares and photoflash cartridges are carried in the fuselage flare bay.

15. The primary power supply for electrical, instrument, and radio equipment is provided by two direct current generators mounted one on each accessory gearbox. Each generator is designed to deliver 12 k.w. and is controlled at 28 volts by a carbon pile type regulator. A 24 volt, 40 amp. hr. alkaline battery is fitted in the port equipment bay. If necessary a 24 volt, 4 amp. hr. lead acid battery, positioned to starboard on the forward side of the pressure bulkhead, can be switched to supply the turn and slip indicator and pilot's emergency lighting. Secondary power supplies, generated by inverters whose inputs are obtained from the primary system, provide single and three phase alternating current for certain instrument and radio equipment.

16. Radio and radar equipment appropriate to the role of the aircraft is installed.



General arrangement

LEADING PARTICULARS

Name ... ... **Canberra PR Mk. 9**
Type ... ... **Twin-engined, jet-propelled, mid-wing monoplane**
Duty ... ... **High altitude, photographic reconnaissance**
Crew ... ... **Two**

PRINCIPAL DIMENSIONS

Note . . .
For the main dimensions of the aircraft, refer to the General Arrangement illustration. For the settings and ranges of movement of the main control surfaces, refer to Sect. 3, *Chap.* 4.

Main Plane

Aerofoil section—	
Inner Wing	*R.A.E/D. modified*
Outer Wing	*R.A.E/D.*
Chord—	
At root	22 *ft.* 1 *in.*
At tip	5 *ft.* 5·5 *in.*
Standard mean	15 *ft.* 5·4 *in.*
Incidence	... 2 *deg.*
Dihedral (measured on top surface of wing)	2 *deg.* ± 10 *min.*
Sweep back at ¼ *chord (outer wing only)*	5 *deg.* 10 *min.*
Areas—	
Main plane, including aileron (gross) projected	1,045 *sq. ft.*
Main plane, including aileron (nett) projected	906 *sq. ft.*
Ailerons (total)	72 *sq. ft.*
Ailerons, aft of hinge line (total)	50·4 *sq. ft.*
Flaps (total)	65·2 *sq. ft.*

Tail plane and elevators

Aerofoil section	*R.A.E/D.*
Chord—	
At root (leading edge extended to aircraft centre line) ...	12 *ft.* 0 *in.*
At tip	4 *ft.* 0 *in.*
Standard mean	6 *ft.* 11·5 *in.*
Incidence (measured at the inboard rigging gauge position on the starboard tail plane)	
Variable from	◀ 2 *degs.* 4 *mins.* ±13 *mins. to* 4 *degs.* 7 *mins.* ±13 *mins.* ▶

Dihedral (measured at inboard rigging gauge position at maximum incidence)	7 *deg.* 57 *min.* ± 15 *min.*
Tail plane stub incidence	1 *deg.*
Areas—	
Tail plane, including elevators (gross) projected	190·8 *sq. ft.*
Tail plane, including elevators (nett) projected	166·8 *sq. ft.*
Elevators, including horn (total)	56·8 *sq. ft.*
Elevators, aft of hinge line (total)	41·6 *sq. ft.*
Elevator tabs, aft of hinge (total)	5·44 *sq. ft.*

Fin and rudder

Aerofoil section	*R.A.E/D*
Chord—	
At root	12 *ft.* 10·5 *in.*
At tip	5 *ft.* 4·8 *in.*
Standard mean	8 *ft.* 10·3 *in.*
Areas—	
Fin, including rudder (nett) projected	66·53 *sq. ft.*
Rudder, including horn, projected	28·06 *sq. ft.*

ALIGHTING GEAR

Main undercarriage

Type	*Two single-wheel units retracting inwards, English Electric*
Shock absorber—	
Type	*English Electric oleo pneumatic E.B*6.40·7 *port* *E.B*6.40·8 *starboard*
Air pressure	(*Refer to Sect.* 2, *Chap.* 2)
Fluid—	
Type	*OM*—15
Capacity	12 *pints (approx.)*
Wheels—	
Type	◀ *Dunlop AH.* 51337 ▶
Tyres	43 × 12·5 × 21 *Dunlop DF.* 1621
Tubes	*Dunlop DT.* 1606
Tyre pressure	(*Refer to Vol.* 4, *Part* 2)
Brakes	*Dunlop hydraulic* { *AH*9780 *port*; *AH*9781 *starboard*
Maxaret units	*Dunlop* { *AC*11516 *port*; *AC*11514 *starboard*

Nose undercarriage

Type	*Twin wheel, non-steerable, castering units rearward retracting, Dowty A*7906 *Y*
Shock absorber—	
Type	*Levered suspension, liquid spring, Dowty*
Pressure (wheels off ground)	1,500 *lb. per sq. in.*
Fluid—	
Type	*OM*—15
Capacity	1½ *pints*
Wheels—	
Type	*Dunlop AH.*9590
Tyres	*Dunlop DT.*2565 *or K.K.E.N.*—14—*N*
Tubes	*Dunlop K.K.*—2
Tyre pressure	(*Refer to Vol.* 4, *Part* 2)

HYDRAULIC SYSTEM

General

Fluid	*OM*—15
Pumps—	
Type	*Integral* 180, *Mk.* 27
Off-load pressure	2,750 *lb. per sq. in.*
Maximum (relief) pressure	2,900 *lb. per sq. in.*
Accumulator charging gas	*Nitrogen*
Thermal relief valve setting	3,450 ± 100 *lb. per sq. in.*

Services system

Number of pumps	*Two*
Header tank capacity	2·5 *gall.*
Accumulator inflation pressures (temperature 20 *deg. C.)—*	
Services accumulator	1,425 ± 25 *lb. per sq. in.*
Brake accumulator	1,425 ± 25 *lb. per sq. in.*
Rudder accumulator, primary	1,425 ± 25 *lb. per sq. in.*
Rudder feel unit accumulator, primary	$160 \begin{smallmatrix}+10\\-0\end{smallmatrix}$ *lb. per sq. in.*
Pressure at brakes system reducing valve	1,500 *lb. per sq. in.*
Pressure at brakes	$1{,}500 \begin{smallmatrix}+150\\-0\end{smallmatrix}$ *lb. per sq. in.*
Flaps system relief valve setting	$2{,}950 \begin{smallmatrix}+0\\-50\end{smallmatrix}$ *lb. per sq. in.*
Hand pump relief valve setting	$2{,}800 \begin{smallmatrix}+100\\-0\end{smallmatrix}$ *lb. per sq. in.*
Header tank relief valve setting	10 *to* 17 *lb. per sq. in.*

Controls system

Number of pumps	Two
Header tank capacity (two tanks) each	7 pints
Accumulator inflation pressures (temperature 20 deg. C) –	
Aileron outboard jacks accumulator	1425 ± 25 lb/in^2
Aileron inboard jacks accumulator	1425 ± 25 lb/in^2
Rudder accumulator secondary	1425 ± 25 lb/in^2
Rudder feel unit accumulator secondary	+ 10 lb/in^2 160 – 0
Header tank relief valve setting	35 to 40 lb/in^2

POWER UNITS

Type	E.C.U.20601

Engines

Name	Avon Mk.206
Type	Pure jet gas turbine
Fuel - AVTAG (Ref.No.34A/2201037, N.A.T.O. Code No.F40 AVTUR (Ref.No.34A/2201036, N.A.T.O. Code No.F34	
Oil	OX – 38

Starting system

Type ...	Iso-propyl nitrate turbo-starter
Starter ...	Plessey Type L.T.S.A.70
Tank capacity	2 gal
Fuel ...	AVPIN(Ref.No.34B/9423147, N.A.T.O. Code No.S-746)

Accessories gearboxes

Gearbox and adapter - port engine	Rotol, Type PTG 3/52
Gearboxes and adapter - starboard engine	Rotol, Type PTG.3/53
Drive shaft - port engine	Rotol, Type GD.9/80
Drive shaft - stbd.engine	Rotol, Type GD.9/81
Oil	OX – 38
Sump capacity	3.5 pints

FUEL SYSTEM CAPACITY

Top (No.1, 2, 3 and 4) tanks ...	960 gal
Rear (No.5) tank	540 gal
Belly (No.6) tank (including collector box)	417 gal*
◀ Main-plane integral tanks (2 at 428 gal each)	856 gal
Main-plane drop tanks (2 at 244 gal each)	438 gal
Total	3 261 gal

* Excluding 30 gallons of unusable fuel

ELECTRICAL SYSTEM

Wiring...	Plessey
Voltage	28 volts
Generators (two)	Type 514 (28-volts, 12-kw)
Voltage regulators	Type 111
Battery...	Type K (alkaline), 24-volts, 40-amp.hr
Emergency batteries...	Type J(lead acid)24 volts 4 amp. hr.

PRESSURE HEADS

Positions –	
... ...	One on tip of nose
... ...	One on starboard side of nose
Angular settings ...	Parallel to fuselage horizontal datum ± 1 deg.