RESTRICTED

AIR PUBLICATION
4377A
VOLUME I
BOOK I
(SECT. I TO 4)

VALIANT B Mk. I, B/PR Mk. I, B/K Mk. I AND B/K/PR Mk. I AIRCRAFT

GENERAL AND TECHNICAL INFORMATION

Prepared by direction of the Minister of Aviation

W. Sheath

Promulgated by Order of the Air Council

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AIR MINISTRY

(A.I.35, Nov. 55)

AMENDMENT RECORD SHEET

To record the incorporation of an Amendment List in this publication, sign against the appropriate A.L. No. and insert the date of incorporation.

A.L. No.	Amended by	Date
1-97	Incorporated in this Reprint	May, 59.
98		
99		
100		
101	INCORPORATED BY A.P.F.S.	
102		
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104		
105	B Whinton	16-4-6
106		
107		
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109	INCORPORATED BY A.P.F.S.	
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113	CANCELLED BY A/L 133	
114		
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119	B Whinton	1-5-6

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141		8.8.6
142		12.3.63
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144		8.5.63
145		1.4.63.
146	E Murphy	17.4.63
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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 mechanism 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.

MAIN UNDERCARRIAGE DOORS AND UP-LOCKS

4. The main undercarriage outer doors and up-locks (emergency release only) are fitted with explosive bolts. Personnel are warned not to interfere with the controls associated with this equipment.

NOTE TO READERS

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

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

Each leaf bears the date of issue and, when applicable, the number of the Amendment List with which it was issued. New or amended technical information on new leaves which are inserted when this publication is amended will be indicated by solid triangles in the text. The triangles are placed thus ◀ . . . ▶ to show the extent of amended matter and thus ▶ ◀ to show where text has been deleted. When a Section or Chapter is issued in a completely revised form, the triangles will not appear.

This Volume 1 is issued in three covers, and if more than one copy of the publication is held, each set of covers should be given a copy number and kept together.

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LIST OF ASSOCIATED AIR PUBLICATIONS AND DIAGRAMS

	A.P.
◀*Aircraft pneumatic equipment*	4303 *series* ▶
Aircraft fuelling equipment	4511
Aircraft refuelling in flight	4611
Aircraft salvage and salvage equipment	4658*A*
◀*Aircraft tanks*	4117A▶
Aircraft wheels, tyres and brakes	2337
◀*A.R.I.*5378 *and* 5380	2533 *series*
*A.R.I.*5800	2891*H*
*A.R.I.*5810	2894H
*A.R.I.*5829	2557G
*A.R.I.*5848	2887N
*A.R.I.*5851 *and* 5857	2890R
*A.R.I.*5874	2535E
*A.R.I.*5922	2914AP
*A.R.I.*5924	2914AN
*A.R.I.*18011	2534E
*A.R.I.*18064	2528P
*A.R.I.*18089	2876E
*A.R.I.*23051	2883KD
Armaments	1661 *series* ▶
Avon Mk. 20401 *and* 20501 *series engine change units*	4481D & E

	A.P.
◀*Bomb carriers and equipment*	1664 *series* ▶
Dinghies and associated equipment	1182C
◀*Electrical equipment manual*	4343 *series*
Fire prevention and fire extinguishing equipment	957C▶
Ejection seats R.A.F. aircraft, Mk. 3 *series*	4288
Hydraulic equipment, aircraft, Vickers	1803N
◀*Instrument manual*	1275 *series*
Missile storage and procedures	2852B▶
Navigation and bombing system Mk. 1	2894K
◀*Powered flying control units and equipment*	4603A & B▶
Pressurizing and air-conditioning equipment, aircraft	4340
◀*R.A.F. engineering*	1464 *series*
Safety equipment	1182▶
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VALIANT B Mk. 1, B/PR Mk. 1, B/K Mk. 1 and B/K/PR Mk. 1 AIRCRAFT

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***VOLUME 1**	**General and Technical Information**
Book 1	**Containing Sections 1 to 4**
Book 2	**Containing Section 5, Chap. 1 to 5**
Book 3	**Containing Section 5, Chap. 6 to 9 and Sect. 6 and 7**
VOLUME 2	**General Orders and Modifications**
VOLUME 3	**Equipment Schedules and Scales**
Part 1	**Schedule of Spare Parts**
Part 2	**Appendix " A "**
Part 3	**Scales of Unit equipment**
Part 4	**Scales of Servicing Spares**
VOLUME 4	**Planned Servicing Schedules**
VOLUME 5	*Basic Servicing Schedules (not applicable)*
VOLUME 6	**Repair and Reconditioning Instructions**
P.N.	**Pilot's Notes**
G.H.N.	**Ground Handling Notes**
O.D.	**Operating Data**

**When demanding the Volume* 1, *state which Books are required*

RESTRICTED

INTRODUCTION

The VALIANT aircraft is a high-wing monoplane of all-metal, stressed-skin construction. It is powered by four Avon 204 or 205 turbo-jet engines and, basically, is a bomber, but certain aircraft are convertible to photographic reconnaissance duties or the refuelling-in-flight (tanker or receiver) role. The crew of six, first and second pilot, two navigators, a wireless operator and a crew chief, are accommodated in a pressure cabin; the two navigators share the bomb-aiming and camera control duties. Ejection seats are fitted for both pilots.

The fuselage is divided into three sections, the nose fairing, the pressure cabin and the main fuselage. With the exception of the nose fairing the structure is of high-tensile, light-alloy, stressed skin construction, flush-riveted externally. The skin plating is reinforced by closely spaced longitudinal stringers of lipped Z-section and bulb angle, and supported on lipped channel-section open frames. Only the stringers are attached to the skin, the frames being inside the stringers, to which they are cleated. Heavier built-up frames are provided in the region of the wing spar and tail unit attachments. The fuselage is of circular section throughout except for the slight blisters formed by the jettisonable canopy and the fairing in the region of the bomb-aimer's window.

The pressure cabin is that portion of the fuselage containing the crew, their controls and associated equipment. Reinforced bulkheads form the fore and aft boundaries respectively, the front bulkhead being convex and the rear concave. An elliptical door gives entry to the cabin on the port side, and, with a hinged windshield forms the parachute exit. An elliptical window is provided on each side of the cabin, that on the starboard side being built into a crash exit. The sextant dome can be pulled in to form an emergency exit.

The main portion of the fuselage contains the nose wheel bay, the servicing bay, the rear bay, the bomb bay, and the fuel tank bay; the bomb bay may alternatively be used to accommodate certain panniers for special equipment, or an E.C.U. carrier. The fuel tank bay is above the bomb compartment, and, when the tanks are in position, has no means of entry.

The main plane is a cantilever, stressed-skin structure, swept back in two stages, the inner plane and the outer plane, the intersection of the two being faired in; thermal de-icing ducts are provided along the leading edge.

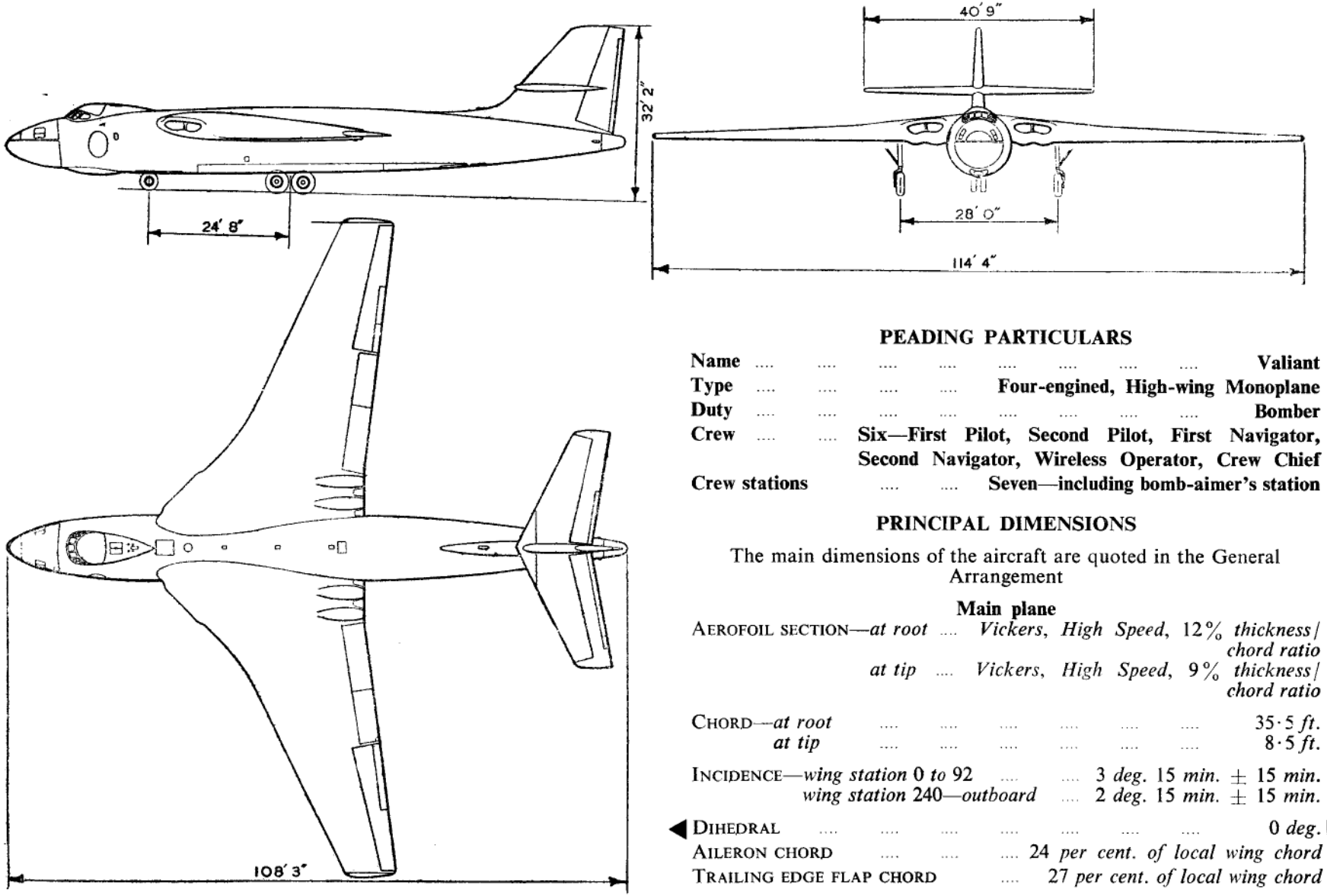
The inner plane, which carries the power plants, is of very short span; the two spars, front and rear, are virtually built integral with the fuselage, the port and starboard spars being joined at the centre line of the fuselage by a fork joint and taper bolts. Flaps are fitted at the trailing edge and form part of the jet pipe outlets.

The outward-retracting main undercarriage units and the wing fuel tanks are carried in the outer planes and provision is made for carrying under-wing tanks or stores. Slotted trailing edge flaps are fitted from the inboard ends of the outer planes to the sealed, internally balanced ailerons which extend to the detachable wing tip. Dive brakes on the bottom surface extend across the inner half of the flap span.

The tail unit is of stressed-skin construction, and consists of a fin and rudder and a swept-back, variable-incidence tail plane to which conventional balanced elevators are fitted. The fin has a considerable dorsal extension forward and the rudder hinge line slopes backwards to the top. The tail plane is mounted high on the fin so as to be well above the jet streams. The leading edges of the fin and tail plane are equipped with thermal de-icing ducts, and the junction of the fin and tail plane is faired in.

The tricycle undercarriage consists of two main wheel units mounted in the outer planes, and a steerable nose wheel unit mounted in the fuselage just aft of the pressure cabin; each unit is lowered and retracted by an electric actuator, and when in the retracted position is totally enclosed by automatically-operated doors. The main wheel units each comprise two wheels supported by shock-absorber struts mounted in tandem and the nose wheel unit comprises twin wheels mounted on an axle which is supported centrally by a single shock-absorber strut. The nose wheel steering and main wheel braking are effected by electro-hydraulic power.

Side-by-side dual controls are fitted; the aileron, elevator and rudder circuits each incorporate in a system of rigid push-pull rods, a power control unit and an artificial feel unit. In the event of the power supply failing, reversion to manual operation is automatic. When the canopy is jettisoned, the elevator controls are disengaged from the hand wheel, which is thrown forward to clear the pilot's legs when he is ejected.



General Arrangement

PEADING PARTICULARS

Name	**Valiant**
Type	**Four-engined, High-wing Monoplane**
Duty	**Bomber**
Crew	**Six—First Pilot, Second Pilot, First Navigator, Second Navigator, Wireless Operator, Crew Chief**
Crew stations	**Seven—including bomb-aimer's station**

PRINCIPAL DIMENSIONS

The main dimensions of the aircraft are quoted in the General Arrangement

Main plane

AEROFOIL SECTION—*at root*	*Vickers, High Speed, 12% thickness/chord ratio*
at tip	*Vickers, High Speed, 9% thickness/chord ratio*
CHORD—*at root*	35·5 *ft.*
at tip	8·5 *ft.*
INCIDENCE—*wing station* 0 *to* 92	3 *deg.* 15 *min.* ± 15 *min.*
wing station 240—*outboard*	2 *deg.* 15 *min.* ± 15 *min.*
DIHEDRAL	0 *deg.*
AILERON CHORD	24 *per cent. of local wing chord*
TRAILING EDGE FLAP CHORD	27 *per cent. of local wing chord*

Tail plane

TAIL PLANE AND ELEVATOR—*chord at root*	12·67 *ft.*
chord at tip	6·14 *ft.*
INCIDENCE	
Fixed portion	0 *deg.*
Variable incidence portion	3 *deg.* 30 *min. nose up, to* 5 *deg.* 20 *min. nose down* (*Sect.* 3, *Chap.* 4, *Table* 2)
SWEEP BACK	25 *deg. on* 25 *per cent, chord line*

Areas (sq. ft.)

MAIN PLANE, INCLUDING AILERONS—*gross*	2,362
nett	1,962
AILERONS, INCLUDING TABS—TOTAL	192·32
AILERON TRIM TABS—TOTAL	19·11
TRAILING EDGE FLAPS—TOTAL	374·16
DIVE BRAKES 19 SQ. FT. EACH SIDE—TOTAL	38
TAIL PLANE, INCLUDING STUBS AND ELEVATORS—GROSS	380·5
ELEVATORS, INCLUDING TABS—TOTAL	146·7
ELEVATOR TRIM TABS—TOTAL	5·97
FIN, INCLUDING DORSAL EXTENSION AND RUDDER—GROSS	263
DORSAL FIN EXTENSION	9·6
RUDDER, INCLUDING TABS	92·5
RUDDER TRIM TAB	3·11
RUDDER BALANCE TAB	6·28

ALIGHTING GEAR

Main wheel unit

Type	*Tandem wheel, two struts, sideways retracting*
Track	28 *ft.*
SHOCK ABSORBER STRUTS	
Type	*Vickers oleo pneumatic*
Air pressure	*Refer to Sect.* 2, *Chap.* 2
Fluid	*OM-15, N.A.T.O. Code H-515* (*Ref. No.* 34*B*/9100572)
WHEELS (TANDEM)	
Type	*Dunlop A.H.* 52020 (*Ref. No.* 27*A*/4596)
Tyres	*Dunlop D.R.*0521 (*Ref. No.* 27*A*/2971)
Inner tube	*Dunlop D.T.*0505 (*Ref. No.* 27*A*/2972)
Tyre pressures	*Refer to Vol.* 4 *of this publication*
BRAKES	
Type	*Dunlop hydraulic*
Operating pressures	1,500 *lb/in²*

Nose wheel unit

Type	*Twin wheel, single strut, fore-and-aft retracting, steerable*
SHOCK ABSORBER STRUT	
Type	*Vickers, oleo pneumatic*
Air pressure	*Refer to Sect.* 2, *Chap.* 2
Fluid	*OM-15, N.A.T.O. Code H-515* (*Ref. No.* 34*B*/9100572)
WHEELS (TWIN)	
Type	*Dunlop A.H.*9861
Tyre	*Dunlop D.R.*2665/1 (*Ref. No.* 27*A*/2973)
Inner tube	*Dunlop K.C.*3 (*Ref. No.* 27*A*/2974)
Tyre pressures	*Refer to Vol.* 4 *of this publication*
Steering angle	50 *deg. each side*

POWER UNIT

Type	*Avon E.C.U.* 20401 *or* 20501
ENGINES (FOUR)	*Avon* 204 *or* 205
Type	*Turbo-jet*
Oil	*OX*-38

FUEL LOAD DISTRIBUTION

Tank location	Tank capacity Gal.	Tank capacity lb at 0·76 s.g.	Usable fuel Gal.	Usable fuel lb. at 0·76 s.g.
	B Mk. 1 *only*			
Fuselage :—				
No. 1 *cell**	734±10	5 578	734±10	5 578
No. 2 *cell**	1 370±10	10 412	1 370±10	10 412
No. 3 *cell**	1 286±10	9 774	1 286±10	9 774
Reserve	590±10	4 484	590±10	4 484
Transfer	710±10	5 396	710±10	5 396
Wing :—				
No. 1	1 106±10	8 406	1 090±10	8 284
No. 2	946±10	7 190	930±10	7 068
Underwing :—				
2 × 1 615 *gal.*	3 230±15	24 548	3 200±15	24 320
Total	9 972±85	75 788	9 910±85	75 316
	B/PR, B/K AND B/K/PR Mk. 1 *ONLY*			
	Distribution as above with addition of :—			
Bomb bay	575±10	4 370	570±10	4 332
Total	10 547±95	80 158	10 480±95	79 648

**Includes port plus starboard individual cells*

OIL SYSTEM

OIL	*OX*-38, *N.A.T.O. Code O*-149 (*Ref. No.* 34*A*/9100591)
SUMP CAPACITY	9½ *pints*
IN THE SYSTEM	2½ *pints*
TOTAL (PER ENGINE)	12 *pints*

HYDRAULIC SYSTEM

ELECTRICALLY-OPERATED PUMPS

Pumps	*Lockheed Mk.* 7 (*Ref. No.* 37*J*/264)
Motors	*Rotax Type C*7601 (*Ref. No.* 5*UD*/5519)
CUT-IN-PRESSURE	2 000 *lb/in²*
CUT-OUT RELIEF VALVE OPERATING PRESSURE	2 500 *lb/in²*
PRESSURE SWITCH—*cut in pressure*	1 900 *lb/in²*
cut-out pressure	2 300 *lb/in²*
PRESSURE AT BRAKES	1 500 *lb/in²*
FLUID	*OM*-15, *N.A.T.O. Code H*-515 (*Ref. No.* 34*B*/9100572)

PNEUMATIC SYSTEM

Pressure in cylinder	450 *lb/in²*

ELECTRICAL SYSTEM

TYPE	112-*volt and* 28-*volt d.c.*
WIRING	*Single-pole Pren cable,* 112-*volt engineered with S.B.A.C. connector blocks and* 28-*volt with Plessey connector blocks*
GENERATORS (FOUR)	112-*volt* 22½ *kW., Type* 551
ROTARY TRANSFORMERS (THREE)	112-*volt*/28-*volt,* 3 *kW., Type S*3201
BATTERIES	*Four* 24-*volt in series for* 112-*volt system and one* 24-*volt for* 28-*volt system*

VOLTAGE REGULATORS

112-*volt system (four)*	*Type* 91
28-*volt system (three)*	*Type* 66

DIFFERENTIAL RELAYS

112-*volt system (four)*	*Type* 1*A, No.* 1
28-*volt system (three)*	*Type* 2*B*

RADIO EQUIPMENT

General purpose communications	*A.R.I.*5874
V.H.F. communications	*A.R.I.*18064
U.H.F. communications	*A.R.I.*18124
Intercommunication	*A.R.I.*18089
Radio compass	*A.R.I.*23051
I.L.S.	*A.R.I.*18011
Dinghy radio	*T.*3180 *and Standard Kit No.* 1
Radio altimeter	*A.R.I.*5380 *or* 18090
Radio altimeter	*A.R.I.*5378

RADAR

Navigational aid and bombing computor	*pre-Mod.*2884, *A.R.I.*5810 ◀ *post-Mod.* 2884, *A.R.I.*5910 ▶
Navigational aid	*A.R.I.*5829 *and* 5851 *or* 5871
Tail warning system	*A.R.I.*5800
I.F.F.	*A.R.I.*5848
Window	*A.R.I.*18051
Eureka	*A.R.I.*5922
Rebecca	*A.R.I.*5924

DE-ICING SYSTEMS

FLUID	*A.L.*8 *N.A.T.O. Code S*-738 (*Ref. No.* 34*B*/9100475)

WINDSCREEN

Tank capacity	4½ *gal.*
Pumps (2)	*pre-Mod.* 3146, *Dunlop A.C.* 13002 (*Ref. No.* 5*UE*/6244) ◀ *post-Mod.* 3146, *Type A.C.*61272 (*Ref. No.* 5*UE*/7509) ▶

BOMB AIMER'S WINDSCREEN

Tank capacity	2¼ *gal.*
Pump	*pre-Mod.* 3146, *Dunlop A.C.*13000 (*Ref. No.* 5*UE*/6243) ◀ *post-Mod.* 3146, *Type A.C.*61270 (*Ref. No.* 5*UE*/7508) ▶

REFUELLING PROBE

Tank capacity	1 *gal.*
Pump	*Dunlop A.C.*13002 (*Ref. No.* 5*UE*/6244)

ARMAMENT AND PYROTECHNICS

Cartridge, signal, 1½ *in.* (10)	(*Ref. No.* 12*D*/)
Cartridge, 1½ *in. Mk.* 1 (3)	(*Ref. No.* 12*D*/1211)
Detonator, canopy jettison (26)	*No.* 108, *Mk.* 1 (*Ref. No.* 12*G*/1278)
Cartridge, seat ejection, Sets No. 3	(*Ref. No.* 12*K*/1256)
Cartridge, Type H operating head	(*Ref. No.* 12*K*/444)
Destructors, H.E., aircraft	*No.* 1 *Mk.* 1 (*Ref. No.* 12*L*/203)
Signal, distress, 2 *star red, Mk.* 4	(*Ref. No.* 12*D*/1113)
Bombs	(*See Sect.* 2, *Chap.* 3)