

CONTENTS - BOOK 1

Leading Particulars

Introduction

<p>Section 1 - Controls and Exits Chapter</p>		<p>1 - Pilots' controls and equipment 2 - Controls and equipment at crew stations 3 - Emergency controls, equipment and exits - Method of operation</p>
<p>Section 2 - Ground Handling and Preparation for Flight... .. Chapter</p>		<p>1 - Ground handling 2 - Preparation for flight 3 - Loading and C.G. data ◀ 3A - Aircraft weighing using hydrostatic units ▶ 4 - General servicing 5 - Change of role ◀ 5 - Procedure following hazardous incidents ▶</p>
<p>Section 3 - Airframe Chapter</p>		<p>1 - Fuselage 2 - Main planes 3 - Tail unit 4 - Flying controls 5 - Alighting gear 6 - Hydraulic system 7 - Pneumatic system 8 - Air conditioning system 9 - De-icing systems 10 - Oxygen system 11 - Emergency equipment 12 - Vacuum system ◀ 13 - <i>Not applicable to this aircraft</i> ▶ 14 - Water systems 15 - <i>Not applicable to this aircraft</i> 16 - Furnishing and interior fitments</p>
<p>Section 4 - Power Unit Installation Chapter</p>		<p>1 - Power unit 2 - Fuel system 3 - Oil system 4 - Coolant system 5 - Fire protection system 6 - Nitrogen system</p>
<p>Section 5 - Electrical System and Instrument Installation</p>	}	<p>Published separately, refer to Book 2</p>
<p>Section 6 - Radio Installation</p>	}	
<p>Section 7 - Armament Installation</p>	}	

Note:- A list of contents is given at the beginning of each chapter

RESTRICTED

OILS AND LUBRICANTS USED ON SHACKLETON AIRCRAFT

<i>Joint Service Designation</i>	<i>N.A.T.O. Code No.</i>	<i>Ref. No.</i>	<i>Symbol</i>	<i>Component</i>
Oil OM-15	H.515	34B/9100572	-	{ Alighting gear shock absorber struts Hydraulic system
◀ Oil OM-270	0.117	34A/9100554	⊗	{ Accessories gearbox Power plant oil system ▶
Oil OEP-70	0.155	34B/9100539	⊕	Propeller translation unit
Oil OX-14	0.147 (2 oz.) (½ pt.)	34B/9100589	○	Gen. lubrication
◀ Grease XG-277	G.359	34B/9100514	≡	Wheel axles
Grease XG-295	G.352	34B/9423152	■	Gen. lubrication ▶

RESTRICTED

LEADING PARTICULARS

Name Shackleton MR. Mk.2
 Title Four-engined mid-wing monoplane
 Duty Maritime reconnaissance and anti-submarine
 Crew Ten (including two pilots)

GENERAL DATA AND CONTROL SURFACE AREAS

NOTE:- For main dimensions refer to General Arrangement (fig.1)

MAIN PLANE DATA

AEROFOIL SECTION AT ROOT N.A.C.A.230/8
 INCIDENCE 4 deg.
 DIHEDRAL (outer wing, rear spar datum) Nominal 4 deg.
 Actual 3 deg. 30 min.
 DIHEDRAL (outer wing, top surface rear spar)-
 Nominal 2 deg. 40 min.
 Actual 2 deg. 10 min.
 AREAS (in. sq. ft.)
 Main plane including ailerons (gross) 1427.0
 (net) 1295.0
 Ailerons, including tabs (total) 110.1
 Trim tabs, two (total) 2.02
 Balance tabs, two (total) 2.02
 Flaps (total) 146.96

TAIL PLANE AND ELEVATOR DATA

INCIDENCE 1 deg. 15 min.
 DIHEDRAL Nil
 AREAS (in. sq. ft.)
 Tail plane, including elevators and tabs 285.4
 Elevators, including tabs (total) 86.24
 Trim tabs, two (total) 2.86
 Balance tabs, two (total) 4.36

FIN AND RUDDER DATA

AREAS (in. sq. ft.)
 Fins and rudders, including tabs (total) 222.4
 Rudders, including tabs (total) 106.4
 Trim tabs, two (total) 6.3
 Spring tabs, two (total) 5.04

ALIGHTING GEAR

MAIN-WHEEL UNITS

Type Two retractable single-wheel units
 with twin shock-absorber struts
 Panel No. A2660Y
 Shock-absorber struts A.1078Y or A.7088Y
 Type Direct-action oleo-pneumatic
 Air pressure (no load) 1,200 - 1,250 p.s.i.
 Inflation pressure (loaded) Refer to Sect.3, Chap.5
 Oil OM-15 (Ref.No.34B/9100572) N.A.T.O. Code No.H-515
 Wheels A.H.9505
 Tyres
 Covers HJ-R16-N (64 in. x 22.5 in. x 26 in.)
 Tubes H.J.8
 Inflation pressure Refer to Vol.4 of this A.P.
 Brakes A.H.9506
 Setting pressure at brake valves 200 p.s.i.

TAIL-WHEEL UNIT

Type Retractable, twin wheel castoring
 2/00088/001
 Shock-absorber strut lever-suspension liquid-spring
 Type A.4485Y
 Charge pressure (no load) 2,000 p.s.i.
 Static load deflection... .. Refer to Sect.3, Chap.5 of this A.P.
 Oil OM-15 (N.A.T.O. Code No. H-515, Ref.No.34B/9100572)
 Wheels (twin) A.H.9590
 Tyres
 Covers KK.EN.14 or D.R.2565
 Tubes K.K.2
 Inflation pressure Refer to Vol.4 of this A.P.

POWER PLANTS

Type Griffon Mk.57 power plants(E)

RESTRICTED

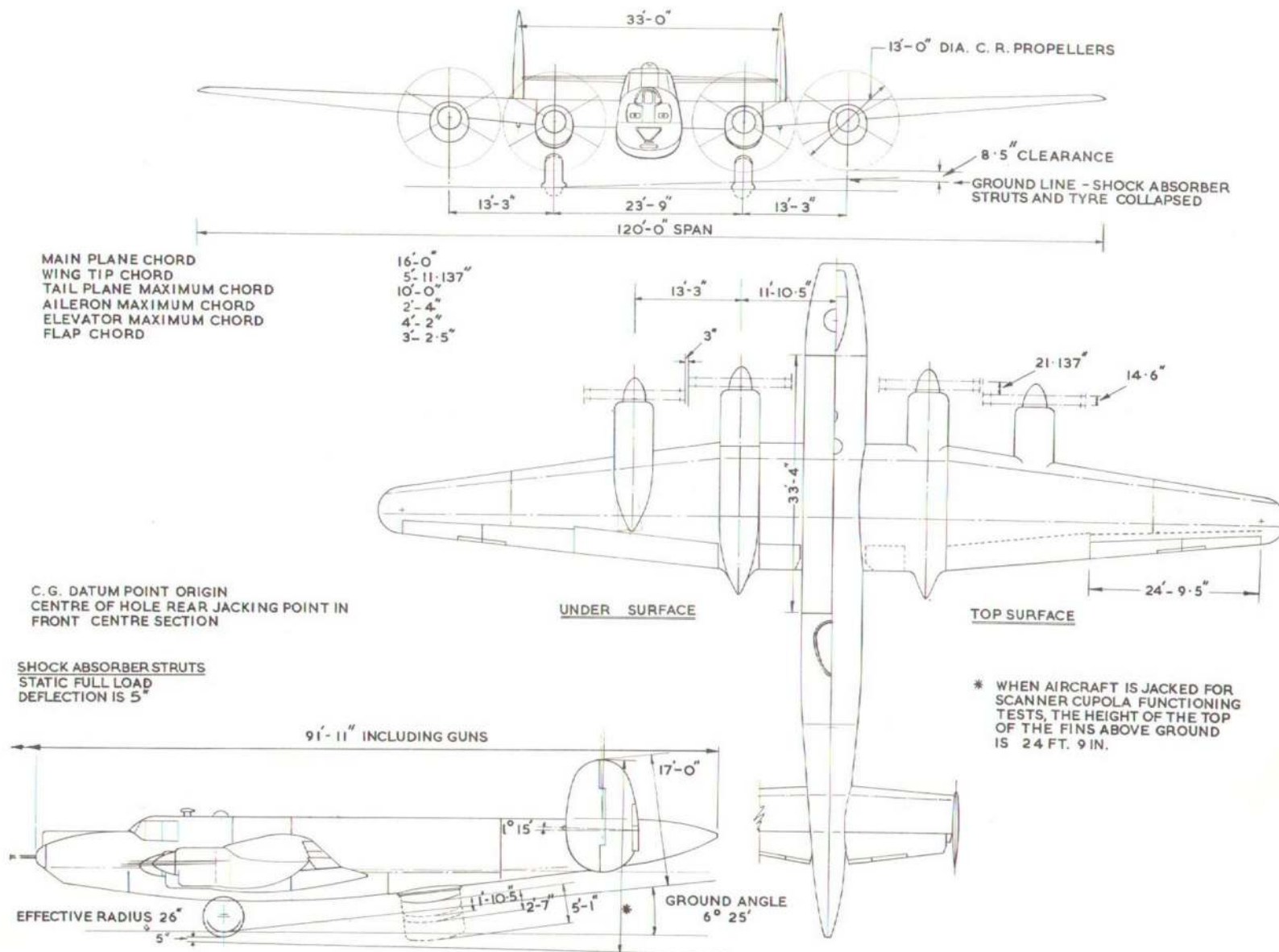


Fig.1. General arrangement
RESTRICTED

ENGINES	Griffon Mk.57
Type	12 cylinder, 60 deg. Vee, pressure-liquid-cooled with two-speed single-stage supercharger
Number	Four
ACCESSORIES GEARBOXES (four)	
No.1	AG4/25 (Ref.No.37L/146)
No.2	AG2/44 (Ref.No.37L/147)
No.3	AG2/45 (Ref.No.37L/149)
No.4	AG2/26 (Ref.No.37L/148)
Oil	OM-270 (N.A.T.O. Code No.O-177, Ref.No.34A/9100554)
ENGINE TACHOMETER GENERATOR	
(Four - one on each gearbox)	K.B.B. 153/01

PROPELLERS

Type Front	DF.160/334/1 (Ref.No.25A/712) or DF.171/334/1 (Ref.No.25A/730)
Rear	DB.160/336/1 (Ref.No.25A/713) or DB.171/336/1 (Ref.No.25A/729)
CONTROL	Hydromatic, constant-speed and feathering
Constant speed unit	AY.203/B
Diameter (front half)	13 ft. 0 in.
PITCH SETTINGS	
Front propeller	
Basic	23 deg.
Fine	23 deg.
Feathered	90 deg.
Rear propeller	
Basic	24 deg.
Fine	24 deg.
Feathered	91 deg.
Direction of rotation	
Front propeller	Left-hand tractor
Rear propeller	Right-hand tractor
TRANSLATION UNIT	P.36674/A (Ref.No.27L/6943)
Oil	OEP-70 (N.A.T.O. Code No.O-155 Ref.No.34B/9100539)
Tank capacity (each unit)	750 C.C.

FUEL SYSTEM

FUEL	Avgas 100/130 grade (N.A.T.O. Code No. F-18, Ref.No.34A/9100444)
	Water/Methanol fluid A.L.10 (Ref.No.34B/9100477)
Fuel tank pumps	F.B.6, Mk.3 (Ref.No. 5UE/4986)
Auxiliary fuel tank pump	B.P.1, Mk.3 (Ref.No. 5UE/3750) or F.B.6, Mk.3 (Ref.No. 5UE/4986)

FUEL TANK CAPACITIES

No.1 tanks (each)	497 gall.
No.2 tanks (each)	541 gall.
No.3 tanks (each)	297 gall.
No.4 tanks (each)	311 gall.

TOTAL FUEL CAPACITY (normal)	3,292 gall.
Auxiliary fuel tank	400 gall.

MAXIMUM TOTAL FUEL CAPACITY	3,692 gall.
WATER/METHANOL TANKS (two)	13 gall. each
Pumps	S.P.M.7 (Ref.No. 5UE/5272)
Pressure regulating valves	Amal 301/3/025-1

OIL SYSTEMS

ENGINE OIL TANKS (four)	
OIL	OM-270 (N.A.T.O. Code No.O-117) Ref.No.34A/9100554
Capacity:- Oil	26 gall. each
Air space	6 gall. each
Total oil capacity	104 gall.
OIL DILUTION SYSTEM	
Valve	Teddington FAW/A/330 (Ref.No.27V/4011)
Jet	No.3 (Ref.No.27V/2691)
Diameter of jet orifice	0.089 in.
Delivery pressure (nominal)	18 p.s.i.

COOLING SYSTEMS

Coolant	A.L.-3 (N.A.T.O. Code No.S-735, Ref.No.24B/9100470)
Capacity (per system)	8 gall. (approx.)

HYDRAULIC SYSTEM

PUMPS (two - No.3 and 4 engines)	Integral 1160 Issue 6, Mk.2A Type 116, (Ref.No.37J/1217)
Oil	OM-15 (N.A.T.O. Code No.H-515, Ref.No.34B/9100572)
Working pressure	2,200 p.s.i.
RESERVOIR	
Oil capacity	13½ pints (approx.)
Air space	7 pints (approx.)
System oil capacity	10 gall. (approx.)

RESTRICTED

Emergency air cylinders 6D/732
 Charging pressure 1,800 p.s.i.

PNEUMATIC SYSTEMS

COMPRESSORS (two - No.2 and 3 engines) ... SH6/10 (Ref.No.37J/508)
 STORAGE CYLINDERS (four) A.C.O.3147 (Ref.No.27VA/2948)
 Capacity 620 c.c.
 Charging pressure 1,000 p.s.i. ▶
 REDUCING VALVE PRESSURES
 Brakes, camera jacks and engine services 1,000/350 p.s.i.
 Brake parking system 350/200 p.s.i.
 Hydraulic reservoir pressurisation 350/7 p.s.i.
 Windscreen de-icing fluid tank pressurisation 350/7 p.s.i.
 Maintaining valve pressure 250 p.s.i.
 A.S.V. PRESSURISATION SYSTEM
 Storage cylinder Mk.5F (Ref.No.6D/9429887)
 Capacity 1,250 litres
 Charging pressure 1,800 p.s.i. ▶

VACUUM SYSTEM

PUMPS (two - No.2 and 3 engines) ... Pesco B3X, Mk.2 (Ref.No.37J/6)

NITROGEN SYSTEM

STORAGE CYLINDERS (seven) Mk.10A (Ref.No.6D/9429892)
 Capacity 2,250 litres
 Charging pressure 1,800 p.s.i.

DE-ICING SYSTEMS

AEROFOIL SURFACES

System T.K.S.
 Distributors Porous metal
 Pump 8-unit, Type W.28000/7
 Filter Type X.263/0
 Controller 15152
 Fluid AL-5 (N.A.T.O. Code No.S-745, Ref.No.34B/9100472)
 Duration at normal flow 5½ hours (approx.)
 Duration at emergency flow 1 hour (approx.)
 Tank:- Fluid capacity 23 gall.
 Air space 4 gall.

TRANSFER SYSTEM

Pump 8-unit Type W.28000/6
 Filter Type X.263/0
 Fluid A.L.-5 (N.A.T.O. Code No.S-745, Ref.No.34B/9100472)
 Tank:- Fluid capacity 33 gall.
 Air space 3 gall.

WINDSCREEN

Tank:- Fluid capacity 7 gall.
 Air space 0.5 gall.
 Fluid A.L.-8 (N.A.T.O. Code No.S-738 Ref.No.34B/9100475)
 Delivery pressure 7 p.s.i.

WATER SYSTEM

Cold water tank capacity 10 gall.

AIR CONDITIONING SYSTEM

HEATER (nose position) Ref.No.27U/267
 Name Daniel "Dragonfly"
 Type Enclosed flame, spray jet, C/CH Mk.1

HEATER (rear and midships position) 27U/357
 Name Daniel "Dragonfly"
 Type Enclosed flame, spray jet, C/CH. Mk.2 ▶
 Combustion air regulator Ref.No.27U/270
 Setting 6½ in. W.G.
 Fuel controller Ref.No.27U/268

OXYGEN SYSTEM

STORAGE CYLINDERS (eight) Mk.10A (Ref.No.6D/9429900) ▶
 Capacity (each) 2,250 litres
 Charging pressure 1,800 p.s.i.
 Regulator Mk.10A

FIRE PROTECTION SYSTEM

EXTINGUISHERS - ENGINES

Type Mk.4A, methyl-bromide, 6 lb. (Ref.No.27N/66)
 Mk.5A, methyl-bromide, 12 lb. (Ref.No.27N/69)
 Number four Mk.4A and four Mk.5A
 Flame switches Ref.No.27N/72

EXTINGUISHERS - FUEL AND WATER/METHANOL TANKS

Type Mk.4A, methyl-bromide, 6 lb. (Ref.No.27N/66)
 Number Fourteen

RESTRICTED

ARMAMENT

BOMBING GEAR										
Bomb stations (number)	...	...	...	...	...	...	...	...	...	Fifteen
Heavy bomb station	...	...	...	...	...	...	...	...	...	No.15
Selector switch	...	...	...	...	...	...	...	...	...	Type F
Preselector unit	...	...	...	...	...	...	...	...	...	Type B
Bomb distributor	...	...	...	...	...	...	...	...	...	Type 7
Bomb release circuits available (maximum)	...	...	...	...	...	...	...	...	...	Thirty

Guns (two)	...	...	...	...	...	...	...	...	...	Hispano 20 mm. No.1, Mk.5 (Ref.No.7G/783)
Rounds per gun	...	...	...	...	...	...	...	...	...	300
Power operation	...	...	...	...	...	...	...	...	...	Electro-hydraulic

◀ MID UPPER TURRET (PRE-MOD.771) ▶

Type	...	...	...	...	...	...	...	...	...	17, Mk.6 (Ref.No.50A/180)
Guns (two)	...	...	...	...	...	...	...	...	...	Hispano 20 mm. No.4, Mk.5 (Ref.No.7G/791)
Rounds per gun	...	...	...	...	...	...	...	...	...	350
Power operation	...	...	...	...	...	...	...	...	...	Electrical

PYROTECHNIC INSTALLATIONS

FLARE CHUTE										
Type	...	...	...	...	...	...	...	...	...	Mk.9
Number	...	...	...	...	...	...	...	...	...	One
Reconnaissance flare distributor	...	...	...	...	...	...	...	...	...	Type 9
Cartridge flare dischargers (four)	...	...	...	...	...	...	...	...	...	1.75 in.
Photoflash cartridge discharger	...	...	...	...	...	...	...	...	...	1.75 in.
Distributor (flare or photoflash cartridges)	...	...	...	...	...	...	...	...	...	Mk.1
Signal pistol (1.5 in.)	...	...	...	...	...	...	...	...	...	One

CAMERA INSTALLATION

Day camera	...	...	...	...	...	...	...	...	...	F.24
Night camera	...	...	...	...	...	...	...	...	...	FX.91
Hand camera	...	...	...	...	...	...	...	...	...	K.20
A.S.V. indication recording camera	...	...	...	...	...	...	...	...	...	F.60

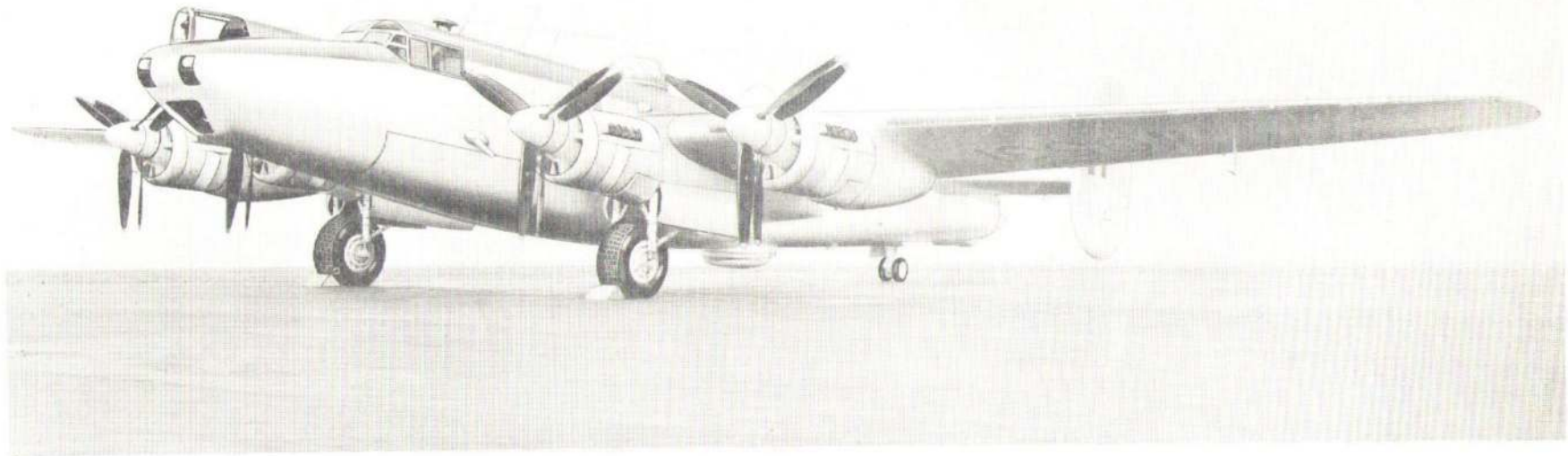
GUNS

FRONT GUN MOUNTING										
Type	N

ELECTRICAL SYSTEM

Wiring system	...	...	...	...	...	...	...	...	...	S.B.A.C. (modified)
Type	...	...	...	...	...	...	...	...	...	Nominal 24-volt, d.c. single pole
Generators	...	...	...	...	...	...	...	...	...	P3, 6 K.w. (Ref.No.5U/4751)
Number	...	...	...	...	...	...	...	...	...	four (one on each accessories gearbox)
◀ Alternator (post Mod.771) ▶	...	...	...	...	...	...	...	...	...	Type N.05041
Number	...	...	...	...	...	...	...	...	...	one (on port outer accessories gearbox) ▶
Accumulators	...	...	...	...	...	...	...	...	...
Type	...	...	...	...	...	...	...	...	...	D, 12-volt, 40 amp./hour
Number	...	...	...	...	...	...	...	...	...	four/connected to give 24-volt, 40 amp./hour supply
Voltage regulators	...	...	...	...	...	...	...	...	...
Type	...	...	...	...	...	...	...	...	...	32
Number	...	...	...	...	...	...	...	...	...	One
Type	...	...	...	...	...	...	...	...	...	23
Number	...	...	...	...	...	...	...	...	...	4
Cut outs	...	...	...	...	...	...	...	...	...
Type	...	...	...	...	...	...	...	...	...	A
Number	...	...	...	...	...	...	...	...	...	Four
Battery isolation relay	...	...	...	...	...	...	...	...	...
Type	...	...	...	...	...	...	...	...	...	R





INTRODUCTION

1. The **SHACKLETON MR. MK 2** is a four engined monoplane basically similar to the Mk.1 version, but having a re-designed nose with two forward guns and a fully streamlined rear fuselage section. The A.S.V. scanner has been moved to the rear centre section and is extended and retracted hydraulically. Various systems and items of equipment have been re-designed and re-positioned. The crew carried is the same as in the Mk.1 version and comprises first and second pilots, flight engineer, wireless operator, radar operator, air gunner, navigator-air-bomber's (2) and rear look-outs (2).

2. THE **FUSELAGE** is a light-alloy, stressed-skin structure of ovoid section and incorporates transverse formers braced by longitudinal stringers and two

main longerons which carry the main floor beams and bomb gear. Hydraulically operated bomb doors are hinged directly to the longerons. For transport purposes the fuselage is divisible into four sections.

3. THE **MID-WING MAIN PLANE** is an assembly of five main and four trailing-edge sections, and tapers in plan and elevation outboard from the centre plane. Hydraulically operated split trailing edge-type flaps extend on either side from the fuselage to the ailerons with the exception of a gap where each inboard nacelle rear fairing extends aft of the main plane trailing edge. Each aileron is in two sections coupled by a torque tube and is fitted with a trim and a balance tab.

4. THE **TAIL PLANE** is similar in

construction to the main plane and has a fin and rudder at each of its extremities. Elevators extend from the fuselage to the end of the rear spar on either side and each has a trim and balance tab. Each rudder is fitted with a trim and a spring tab.

5. The entrance door is on the starboard side at the aft end of the fuselage rear-centre section. It opens inwards and entry is made with the assistance of a light-alloy ladder which is normally stowed in the fuselage rear-centre section.

6. **DUAL FLYING CONTROLS** are provided. The rudders are controlled by pendulum-type pedals provided with toe-operated brake pedals. Two hand wheel-type control columns operate the ailerons and elevators. Tubular push-pull control

RESTRICTED

rods are used throughout except for the aileron controls in the fuselage which are made up of chains, tie-rods and cables. The trim tabs are actuated by cables. A fixed lever and control rod are used to operate each balance tab and the spring tabs are coupled to their associated controls by links and torsion bars. A Mk.9 automatic pilot is installed.

7. TWO MAIN WHEEL UNITS are fitted which retract into wheel compartments between the main plane spars at the inboard engine nacelles. Each unit is actuated by two hydraulic jacks anchored to the rear spar. When retracted, the openings are faired over by pairs of doors operated by links attached to the shock absorber struts. A tail wheel unit is fitted which retracts into a recess in the underside of the rear fuselage. When the unit is retracted the recess is faired over by two doors linked to the unit.

3. FOUR GRIFFON MK.57 or 57A ENGINES, equipped with two-speed, single-stage superchargers and fuel injection units, are housed in quickly detachable power units bolted to sub-frames attached to the main plane. Each sub-frame has a firewall which forms the rear of the power unit when attached and which carries all the connections to the engines from the airframe. The inboard sub-frames are attached to the main plane indirectly through the undercarriage beams, and the outboard sub-frames are attached directly to the front and rear spars of the main plane.

9. FUEL is carried in eight tanks, four on each side, all housed between the main plane spars. Each inner tank, which is of rigid construction, is mounted between the fuselage and the inboard engine nacelle. The other three on each side are of flexible construction and are carried between the inboard engine nacelle and the outer wing joint. All eight tanks are removable. Provision is made for instal-

ling an auxiliary fuel tank in the bomb compartment. Fuel is fed to the engines by a pump in each of the three inner tanks on each side (No.1, 2 and 3) and the outer (No.4) tanks are gravity fed into their adjacent No.3 tanks. Three cross-feed cocks enable fuel to be used as desired from particular tanks or a combination of tanks to feed all four engines.

10. A separate OIL SYSTEM for each engine has a connection to the appropriate propeller feathering system. The outboard oil tanks are in the outboard nacelles and the inboard tanks are mounted at the inboard wing joints between the main plane spars. An oil cock is incorporated in each engine feed pipe. An oil dilution system is provided and the oil and coolant radiators are mounted below the engines in ducts, at the exits of which are controllable shutters. A water/methanol system enables high boost pressure to be used for take-off under full load. The engines are started electrically and detachable hand turning gear for servicing is provided.

11. AN ACCESSORIES GEARBOX is driven by each engine, mounted aft of the associated firewall. The inboard gearboxes have six drive faces and the outboard, four. Each gearbox drives a 6 kW. d.c. generator and a three phase tachometer generator. Additional components driven by the gearboxes are as follows:-

No.1 None.

No.2 An air compressor (pneumatic system-brakes and engine services), a vacuum pump (bomb sight and stand-by for the flight instruments).

No.3 An air compressor (pneumatic system-brakes), hydraulic pump (interconnected with that on No.4 gearbox) and a vacuum pump (flight instruments).

No.4 A hydraulic pump.

After Mod.771, an alternator is fitted to the port outer engine accessories gear box (A.R.I.18144 equipment).

12. The four GENERATORS fitted to the gearboxes supply power for the 24-volt electrical system and the generated voltage is stabilised by a master regulator working in conjunction with four generator voltage regulators. A 24-volt, 80-amp. hr. storage battery (four 12-volt, 40-amp. hr. units connected in series/parallel) is charged from the supply generators. Overload protection is provided by thermal circuit breakers and reverse current flow is limited by cut-outs. Single-pole wiring is used throughout the aircraft. The aircraft master switch controls all the services and an external supply socket on the starboard side of the fuselage enables a ground trolley to be used for starting and servicing.

13. All circuits are protected by fuses, and lengthy runs of cable to supply panels, as well as heavy duty services, are protected by thermal circuit breakers.

14. Four ROTARY INVERTERS provide the a.c. supplies for radar equipment, the scanner, auto-pilot and the G4B compass. After Mod.674 and Mod.771 further rotary inverters are fitted. Information will be found in the Appendices to Sect.5, Chap.1.

15. ELECTRICAL CONTROL is employed for the fuel and oil systems, engine controls (the hot and cold air-intakes, radiator flaps and air cleaners which are all electro-pneumatically operated), and for the supercharger gear changes (hydraulically operated from the associated engine oil system). The hydraulic system, camera and pyrotechnics installations and the bomb release gear are electrically controlled.

RESTRICTED

16. RADIO FACILITIES are provided by a M.F./H.F./D.F. transmitter-receiver controlled by the wireless operator, a twin V.H.F. radio-telephone controlled primarily by the pilots and an intercommunication system linked to the G.P. and V.H.F. installations. An additional intercommunication system is also provided. Navigation is assisted by a radio compass.

17. RADAR EQUIPMENT comprises A.S.V., Gee, Loran, Rebecca, I.F.F., A.Y.F. and Sonobuoy installations. All these items are provided with separate aerials. In addition the starboard main aerial, normally used with Loran, can be switched to the G.P. set should failure of the port main aerial occur.

18. Further radio and radar equipment is fitted after the incorporation of Mod. 600, Mod.674 and Mod.771. Information on this equipment will be found in the Appendices to Section 6.

19. DE-ICING SYSTEMS are provided for the aerofoil surfaces, for the pro-

pellors and for the air bomber's window and pilots' dry-air sandwich type windscreen. Mod.768 deletes the propeller de-icing system, the tank of which is then used to supplement the aerofoil de-icing system. The pilots' dry-air sandwich windscreen is fitted with two hydraulically-operated wipers. Fire protection is given by engine and fuel system methyl bromide installations and a system for introducing nitrogen into the fuel tanks as they are emptied.

20. EMERGENCY EQUIPMENT includes Type M.S. 9 self-inflating dinghies, Type K dinghies, crash axes, fireproof gloves, hand fire extinguishers and first-aid packs. A parachute exit in the nose and ditching and escape hatches in the fuselage are also provided.

21. ARMAMENT consists of four 20 m.m. cannon, two in a nose gun mounting and two in a mid-upper turret. Mod.674 deletes the mid-upper turret. Fifteen bomb stations are provided in the bomb compartment in five transverse rows of three and the centre station of the middle

row incorporates a heavy bomb slip. Provision is made for carrying an A.S.R.S. lifeboat. Pyrotechnic stores which can be carried inside the fuselage include reconnaissance flares, photo-flashes, cartridge flares, smoke floats and marine markers. Three flare chute stations are provided, two in the nose and one aft and a flame float chute. After Mod.771 only one flare chute is fitted.

22. The pilots' panel is illuminated by dual ultra-violet and red lighting and two-stage amber and blue equipment is provided for night flying training. Soundproofing extends from former 1 to 22 and an air conditioning system with three independent heaters is installed. Oxygen for all crew members and portable oxygen sets are also provided. Miscellaneous equipment includes two cameras which can both be used for vertical or oblique photography, a hand camera, a signal pistol, signalling lamp and binoculars. There is a galley with an electrically heated urn and hotplate (together with its associated water system), two crew rest bunks, a refuse bin and an Elsan.



This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.

