

SECTION 7

INSTRUMENT INSTALLATIONS

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INTRODUCTION

THE SHACKLETON MR. MK.3, PHASE 3 is a four-engined monoplane designed for long range patrol and reconnaissance duties and extensively equipped to detect and destroy submarines. Bomb bay sealing and heating are provided to give the aircraft a mixed weapon capability. A crew of ten is carried which includes first and second pilots, flight engineer, navigator, tactical navigator and routine attack navigator, the remaining crew can be distributed as, master, secondary and subsidiary sonics operators, A.S.V. operator and two rear look-outs. Relief crew members or passengers can be carried as required.

Constructed in four sections to facilitate transportation, the ovoid section fuselage, of light alloy monocoque construction, incorporates transverse formers spaced by longitudinal stringers. Two main longerons carry the floor, bomb door hinges and attachment fittings for the transverse bomb carriers.

THE MID-WING MAIN PLANE, appears in plan and thickness outboard of the centre plane and consists of five main sections, four trailing-edge sections and two wing-tip tanks, all of light-alloy construction. Split-trailing-edge flaps extend each side from the fuselage to the ailerons, except for gaps where each inner and outer nacelle extends rearward. Each aileron, comprising four sections coupled together, is fitted with a geared and a spring tab. In addition a trim tab is fitted to the port aileron.

THE TAIL PLANE, similar in construction to the main plane, has a fin and rudder at each extremity. Elevators extend from the fuselage to the end of the rear spar and are fitted with a trim and balance tab. Each rudder is fitted with a trim and spring tab.

5. AN ENTRANCE DOOR is provided on the starboard side, rear fuselage centre section and opens inwards.

6. DUAL FLYING CONTROLS are provided. Rudder control is by pendulum pedals incorporating toe-operated brake pedals. Hand-wheel control columns operate the ailerons and elevators. With the exception of parts of the aileron controls in the fuselage comprising chains, tie-rods and cables, tubular push-pull control rods are used throughout. Trim, geared, and fixed tabs are operated by cables, fixed levers, control rods and torsion bars respectively. A Mk.10 automatic pilot is fitted.

7. THE LANDING GEAR comprises two forward retracting main-wheel units, housed in each inboard nacelle, and a rearward retracting, steerable, nose-wheel unit, all of which are hydraulically operated. When retracted, all three units lie within the normal contours of the nacelles and nose of the aircraft with the structure apertures faired in by hydraulically-operated doors. Nose-wheel steering is controlled by a hand-wheel and push button on the first pilot's control column.

8. FOUR GRIFFON MK.58 engines, equipped with two-speed single-stage superchargers and fuel injection units, are housed in quickly-detachable power units bolted to sub-frames. A water/methanol system cables high boost to be used for take-off under full load. The engines are started electrically and detachable hand turning gear is provided for use during servicing.

9. ASSISTED TAKE-OFF UNITS, in the form of two Viper 203 straight-flow turbo-jet engines, are mounted one in each outboard nacelle, at the rear of the Griffon engines. This additional power allows

the Griffon engines to be operated at a lower boost pressure on take-off so improving their reliability.

10. FUEL is carried in twelve tanks, ten being flexible and housed five in each main plane, and two of rigid-streamline shape attached to each wing-tip. Provision is made for a jettisonable overload tank to be installed in the bomb compartment. Two air-operated jettison systems serve the main and wing-tip tanks respectively, independently of each other. Six fuel pumps, housed one in each inner three main tanks, supply fuel to the Griffon and Viper engines, while the outer No.4 and 5 tanks gravity feed into the associated No.3 tank. Fuel transfer from the tip-tank is by nitrogen pressure. Three cross-feed cocks enable fuel to be used from various tank groups.

11. A separate OIL SYSTEM for each Griffon engine has a connection to the appropriate propeller feathering system. The outboard oil tanks are mounted in the outboard nacelles and the inboard tanks at the inboard main plane joints, between the spars. An oil dilution system is provided and oil coolers are mounted with the engine coolant radiators. The Viper engine oil system is completely integral with the engine.

12. AN ACCESSORIES GEARBOX, driven by the Griffon engine, is mounted on the aft face of each firewall, and drives a 12 k.W. generator and a three-phase tachometer generator. An alternator, fitted to the No.1 engine gearbox, supplies power for E.C.M. aerial and plinth de-icing. Additional components driven by the gearboxes are as follows:-

- | | |
|-------------|-------------------------------------|
| No.2 engine | An air compressor. |
| No.3 engine | A hydraulic pump and a vacuum pump. |
| No.4 engine | A hydraulic pump. |

13. ELECTRICAL POWER is supplied by four 12 k.W. Type 527A generators, one driven by each Griffon engine. All four generators have a static voltage control panel controlling the output to 28 volts. The main bus-bar is split into two sections, the two port generators feed one section and the other section is fed by the two starboard generators. If required, these two bus-bar sections may be connected together by operation of a bus-bar couple contactor. A 24-volt, 40 amp.hr. Type K2 Nickel Cadmium battery is connected to each bus-bar via a contactor. Two battery isolation switches, one each for port and starboard, are fitted on the engineer's auxiliary panel. An external ground supply socket, located in the nose of the aircraft, enables a ground supply trolley to be used for starting and ground servicing. Provision is made for connecting an A.A.P.P. unit to the aircraft main bus-bars.

14. A.C. POWER is required for certain equipment. This power is supplied by eight rotary inverters; four Type 103C, one Type 103A, two Type 201B, and one Type 108. In addition, a Type 509/1/01230 static inverter supplies 250 volts at 50 c/s to the crew's razor socket. All circuits are protected by fuses or circuit breakers and where fuses are situated remote from the main fuse panels, their supply cables are protected by circuit breakers or fuses within the main distribution panel.

15. Electrical control is employed for operation of hydraulically-operated services, fuel cocks, pneumatically-powered engine services, wing-tip and main tank fuel jettisoning, cameras, pyrotechnics and bomb release gear.

16. AIR CONDITIONING and heating of the aircraft cabin and bomb bay is provided by N.A.C.A. intakes and fans working in conjunction with four Dragonair heaters, one of which maintains the bomb compart-

ment at an even temperature to provide for the carriage of stores critical to temperature changes. Heat loss from the bomb compartment is prevented by tubular seals. Warm air supply for demisting the transparent tail cone, pilots', front gunner's, and air bomber's windscreens is taken from the heating system.

17. WIRELESS EQUIPMENT comprises A.R.I.'s, 18089, 5874, 23126, 23117, 18120/4 and 18124/1, 23084, 18011, 18215/1, 5876, 18107/4, 18157, 18108/1 and 18103 (master), 18108/1 and 18103 (second), 18101 and 18208/1.

18. RADAR EQUIPMENT comprises A.R.I.5878, 5848 C.2.P.7, 5885, 18144, 5816 and 5771.

19. DE-ICING SYSTEMS are provided for the aerofoil surfaces, front gunner's windscreen, air bomber's window and the pilots' dry air sandwich windscreen. Electrically-powered hydraulically driven wipers and windscreen washing facilities are provided at the air bomber's and front gunner's position in addition to those fitted to the pilots' windscreens.

20. A COMPRESSED AIR SYSTEM is installed to operate the landing gear down, flaps, bomb doors, and A.S.V. scanner cupola in an emergency, and also to operate the emergency exit. A further compressed air system is provided to operate the camera installation, tail skid, fuel jettison systems, Griffon engine services, Viper intake door, and to pressurize certain fluid tanks. To cater for non-availability of compressed air for servicing, under certain local conditions, a reserve air supply is provided. An independent pneumatic system is provided to pressurize the A.S.V. equipment.

21. FIRE PROTECTION for the Griffon engines, Viper engines, fuel system and cabin heaters is provided by methyl-bromide extinguisher installations. Hand-

operated Bromochlorodifluoromethane extinguishers are provided at various points in the fuselage.

22. EMERGENCY EQUIPMENT includes Type MS-9 self-inflating dinghies, Type SS dinghies, crash axes, fireproof gloves and first aid kits. A parachute exit is in the floor adjacent to the pilots, ditching and escape hatches are also provided in the fuselage.

23. ARMAMENT consists of two 20 m.m. cannon fitted in a nose installation. A maximum of four main stores carriers can be fitted to the bomb bay suspension points at one time, the suspension points used being dependent on the type of stores used. Pyrotechnic stores, carried inside the aircraft, include reconnaissance flares, photo flashes, illuminator flares, smoke floats, and marine markers. A flare chute is fitted in the step in the nose of the aircraft and a flame float ejector and a flame float launching tube are fitted in the rear fuselage. A battery of illuminator flare dischargers is fitted in the starboard side and a photo-flare discharger is fitted in the roof of the fuselage.

24. The pilots' panel is illuminated by tubular ultra-violet lamps in conjunction with red flood lamps. Emergency panel lighting is also provided. Provision is made for carrying oxygen with supplies at all crew stations. Miscellaneous equipment includes two cameras, for vertical and oblique photography, a hand camera, signalling lamp, a signal pistol, a binoculars. The galley, with its associated water system, is equipped with refrigerated cupboards, an electrically heated water boiler, a hot plate and oven, an infra-red grill, and a sink unit. Adjacent to the galley is the wardroom containing three bunks, a folding table and a seat. An Elsan chamber, a closet and a wash-basin are provided in a toilet compartment in the rear fuselage.