

Appendix B  
**SPECIAL EQUIPMENT**  
**VALIANT WP214**

## APPENDIX B

## Special Equipment — Valiant WP214

## 1 General

This Appendix lists the special equipment fitted in Valiant WP214 and gives details of the power supplies to this equipment, as well as operating instructions for the special power supplies. In addition it details the alterations to the normal aircraft equipment, specific to this role. Special limitations, additional to the normal aircraft limitations, are also included.

## Special Equipment

## 2 Special equipment

(a) The following special equipment, with special aerials as detailed, is fitted.

<i>Equipment</i>	<i>Aerials</i>
ARI x 18105	4 pairs, 1 pair each side of the upper nose cone, and 1 pair each side of the tail just forward of the tail cone.
ARI x 18076	3 flush-fitting disc aerials in the bomb bay deflector.
ARI x 18075	A slot aerial in each wing tip, each with a matching stub.
ARI x 18074	Uses the normal VHF aerial in the tail fin tip (see (b) below)
AN/APR9	One aerial in the bomb bay deflector.
ARI x 5919	Radar head in the nose cone.
ARI x 18146 (alternate fit to No. 1 channel of ARI x 18076)	3 aerials just forward of the tail radar head.

## (b) VHF

As the normal VHF aerial is used for the ARI x 18074, two rod aerials are fitted for the VHF sets. The No. 1 set uses an aerial on the starboard side of the upper fuselage ; the No. 2 set uses one on the port side of the lower fuselage. The normal VHF aerial change-over switch is deleted.

## 3 Controls for special equipment

(a) The special equipment control panel and individual control units are all mounted on the radio crate ; these include the controls and instruments for the power supplies and equipment cooling.

(b) Instrumentation controls to indicate temperature, voltage and frequency of services to the equipment are at the bomb aimer's position. The AN/APR 9 indicator and remote control unit are at the same position. In this position, an oxygen regulator, intercomm socket and special seat are provided for an observer.

## 4 Power supplies

## (a) AC supplies

AC power supplies for the special equipment are obtained from a 200-volt, 30 kva, 3-phase, 400-cycle turbo-alternator. The turbo-alternator is driven by air supplied from the engine compressors, and the output is distributed to the equipment through a junction box in the rear fuselage which incorporates provision for connecting an external supply for ground testing. The junction box is fitted with a ground/flight switch ; this switch must be at flight at all times unless an external supply is connected.

*(b) DC supplies*

Supplies from the normal aircraft 28-volt DC electrical system are used for the turbo-alternator frequency controller, the turbo-alternator air control switches, the ARI x 5919 and for the equipment cooling pump relay. A supply from the normal aircraft 112-volt DC system is used for the equipment cooling pump.

**5 Cooling systems**

*(a)* The special equipment is cooled by a water-glycol cooling system operating through a heat exchanger. The heat exchanger is mounted in a fairing on the upper port side of the rear fuselage which incorporates a ram air intake and an air exhaust vent. The water-glycol system comprises a header tank in the upper port rear fuselage which connects with a fluid reservoir in which is an immersed pump driven from the aircraft 112-volt DC electrical system. Fluid is pumped through two filters, a temperature control valve and the heat exchanger, to the various units of the special equipment, whence fluid is returned to the header tank. The water-glycol pump is controlled by a switch on the turbo-alternator control panel.

*(b)* The ram air intake for the water-glycol heat exchanger (see *(a)* above) incorporates air intake ducts for cooling the turbo-alternator gearbox, the alternator, the turbine control unit and the ARI x 5919 tail radar unit.

*(c) Ground running*

When the equipment or the turbo-alternator are to be operated for ground testing, a cooling air supply must be passed through the ram air intake.

**6 Turbo-alternator***(a) General*

The air pressure used to drive the turbine is drawn from the engine compressors via the tail de-icing ducts on the engine side of the

de-icing shut-off valves. The air supply is taken through two air supply valves whose limit switches operate OPEN and CLOSE indicator lights, one of each for each air supply switch. The turbo-alternator control switches and indicator lights, and the water-glycol pump switch, are on the turbo-alternator control panel on the radio crate. Beside this panel is another panel which carries an alternator voltmeter with phase selector switch, ammeter and frequency meter, as well as a gearbox oil pressure gauge.

*(b) Operation**(i) Starting the turbo-alternator*

Provided that at least one engine is running at not less than 5,500 rpm the turbo-alternator may be started as follows:

- 1 Switch ON the water-glycol pump motor.
- 2 Switch ON the turbo-alternator master switch.
- 3 *Wait one minute.* This is to allow the frequency control unit amplifier valves to warm up.
- 4 Select both air supply valve switches OPEN.
- 5 Check that both CLOSED indicator lights go out and that both OPEN lights come on.

The turbo-alternator will now be operating and the special equipment may be operated as required.

*(ii) The following points should be noted:*

- 1 If it is desired only to operate the turbo-alternator, without switching on any of the special equipment, the water-glycol pump need not be switched on.
- 2 At high altitude the full alternator output will not be available if one air supply fails or is switched off.
- 3 For ground running, only one air supply need be used, and one engine will provide this as long as its rpm are in excess of 5,500. Cooling air must be supplied to the ram air intake. It is recommended that an outboard engine be run so as to minimise tail buffeting.

(iii) *Stopping the turbo-alternator*

The turbo-alternators should be stopped as follows:

- 1 Select both air supply valve switches to **CLOSE**.
- 2 Check that both **OPEN** indicator lights go out and that both **CLOSED** indicator lights come on.
- 3 Switch **OFF** the turbo-alternator master switch
- 4 Switch **OFF** the water-glycol pump motor.

### Additional Alterations

#### 7 Fuel system

The port cell of the fuselage transfer tank has been removed. The fuel capacity quoted in Part I, para 6 is reduced by 355 gallons (2,840 lb) (see para 12). The fuel contents gauges have been compensated for this.

#### 8 Intercomm system

On the port coaming panel are a "I/C—Radio compass" switch, a "P to T navigator" switch and a "Radio compass override" switch. On the starboard coaming panel is an "I/C—Radio compass" switch. These switches function as follows:

(a) *I/C—Radio compass switch.* This enables either pilot to listen to radio compass signals or to the intercomm as required.

(b) *P to T navigator switch.* The navigator can select either intercomm or audio-warning signals (from the ARI x 18105 equipment). Should he be selected to the latter, the pilot, by pressing the "P to T navigator" switch, can speak to the navigator on the intercomm system.

(c) *Radio compass override switch.* This enables the pilot to override the selection of all crew members who have radio compass facilities, by disconnecting them from the radio compass system and enabling him to talk to them on intercomm.

### Limitations

#### 9 General

All limitations quoted in Part II, other than those specifically quoted below, apply to this aircraft. Handling of the aircraft is not affected by the special installation. When landing, the rate of descent on touch-down must be kept low (see Part (IV), para 21).

#### 10 Temperature limitations

The temperature gauge at the APR 9 observer's station can be selected, by the adjacent switch, to show the temperature at various points in the equipment. The temperatures shown on this gauge must always be kept within the following limits:

Switch position	Limits
1	+20°C to -20°C
2 and 3	+26°C to 0°C
4 to 11	+20°C to -20°C
12	OFF

NOTE: ARI x 18146 must not be switched beyond **STANDBY** unless the readings at switch positions 2 and 3 are 0°C or above.

#### 11 Flight in icing conditions

Flight must not be continued in severe icing conditions, as there is no provision for avoiding ice formation in the water-glycol heat exchanger.

## 12 Fuel system

(a) To compensate for the aft CG of the aircraft, the reserve fuel tank contents must not be allowed to fall below 1,350 lb if window bundles are carried and retained, or 2,660 lb if window bundles are not carried or are discharged in flight.

(b) The port cell of the transfer fuel tank is not fitted (see para 7). The starboard cell may be filled if required.

## 13 Armament stores

No armament stores may be carried in this aircraft.

## Performance

### 14 Climb/cruise

Measurements of climb/cruise performance at 0.73M and 0.75M show no difference from the performance figures given in the Operating Data Manual.

### 15 Range

The installation in this aircraft has no appreciable effect on range. Total range will, however, be reduced by virtue of the removal of one cell of the transfer fuel tank and by the restriction in the use of the reserve tank fuel.



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