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ARROW 1 SERVICE DATA

SECTION 45

ELECTRONICS

IFF AN/APX-6A

(This data supersedes previous issue dated 24 Sep 57)

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LIST OF REVISIONS

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ELECTRONICS

IFF AN/APX-6A

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DESCRIPTION

GENERAL

1 The purpose of the IFF System is to enable the aircraft in which it is installed to identify itself when interrogated by coded transmissions from ground or airborne radar sets. The coded interrogation transmissions can be transmitted in any one of three modes classified as Mode 1, Mode 2 and Mode 3. Each mode of interrogation initiates the transmission of a corresponding mode of reply from the IFF transmitter-receiver (transponder). The reply is presented on the interrogator's radar display adjacent to the target pip.

2 Mode 1 interrogation serves for general identification of any aircraft detected by a ground or airborne radar set. Modes 2 and 3 permit specific aircraft to be identified and distinguished from other aircraft. Normally, modes 2 and 3 are used only when requested by radio or prior to take-off.

3 An emergency reply, which overrides the three normal modes, can be selected. This reply will be transmitted when the aircraft is interrogated irrespective of the mode of interrogation.

4 The system installation comprises the following main component units:

(a) Receiver-Transmitter (Transponder) RT-279/APX.

(b) Receiver-Transmitter Mounting MT-362A/A.

(c) Radar Set Control C-1158/APX.

(d) Antenna Assembly.

RECEIVER-TRANSMITTER (TRANSPONDER)
RT-279/APX

5 The transponder is essentially a receiver-decoder transmitter. Interrogation signals, consisting of pairs of radio-frequency pulses with a definite time interval between the two pulses of each pair, are mixed, detected and amplified by the receiver. The resulting pairs

of video pulses are then passed to the decoder stage. Three decoder stages are provided, one each for modes 1, 2 and 3. The decoders are receptive only to their respective modes as determined by the time interval between the pulses of each pair. Acceptance of a signal by any of the decoders results in a signal to a corresponding mode 1, 2 or 3 pulse generator. The pulse generators produce the reply pulses which are transmitted to the interrogator.

6 In normal operation, a single pulse is transmitted in response to mode 1 or 3 interrogation. Mode 2 interrogation is answered with paired pulses. If the transponder is switched for the emergency reply, all interrogations, irrespective of the mode, are answered with groups of four pulses.

7 The transponder operates within the frequency band 950-1150 Mc/s on two spot frequencies, one for reception and one for transmission. These frequencies are pre-tuned by three controls on the front panel marked TRANS-FREQ, RECR-FREQ and LO-FREQ. Each control actuates a three-digit drum-type counter mechanism connected with the tuning linkage to the transmitter, receiver and local oscillator. A calibration chart is provided on the front panel for recording the settings.

8 A NORM-MOD switch located in a recessed position at the back of the transponder provides for normal operation of the system when selected to the NORM position. The MOD position provides for operation of the system with a Selective Identification Feature (SIF) system not fitted to this aircraft.

9 The control and selection switches for the operation of the transponder are grouped on a Radar Set Control unit. This permits the transponder to be remotely controlled.

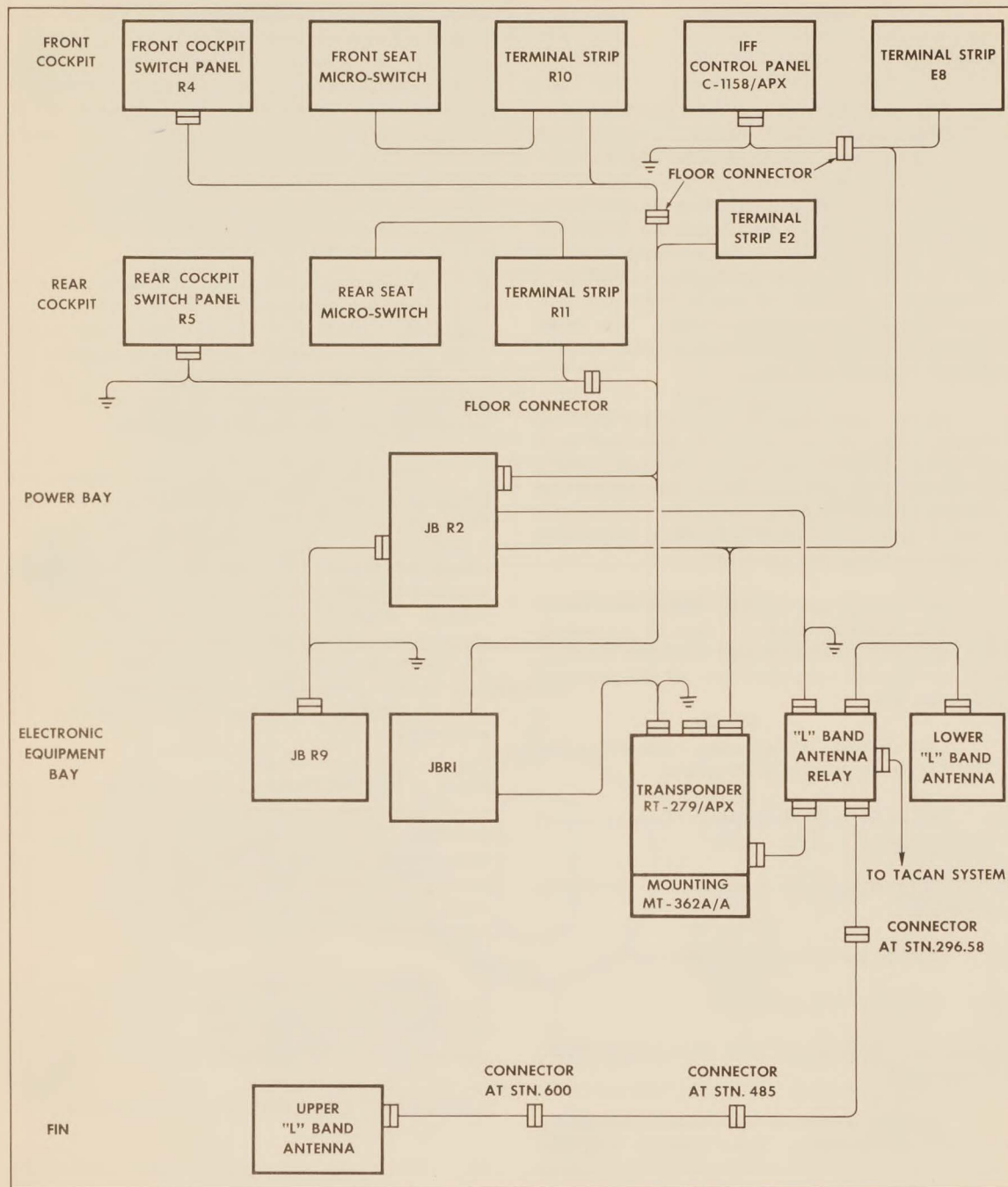
RADAR SET CONTROL UNIT C-1158/APX

10 The radar set control unit C-1158/APX incorporates a five-position master selector switch, two switches for mode selection and a switch for special operation of the system.

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FIG. 1 IFF AN/APX-6A - GENERAL ARRANGEMENT

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11 The master selector switch is marked OFF - STDBY - LOW - NORM - EMERGENCY. When STDBY is selected, all primary power is switched ON and the tubes are heated in readiness for immediate operation. In the LOW position, the sensitivity of the receiver is reduced and replies will be transmitted only upon the receipt of strong interrogation signals. This position is used, primarily, to limit the operating range of the transponder. In the NORM position, the receiver operates at maximum sensitivity.

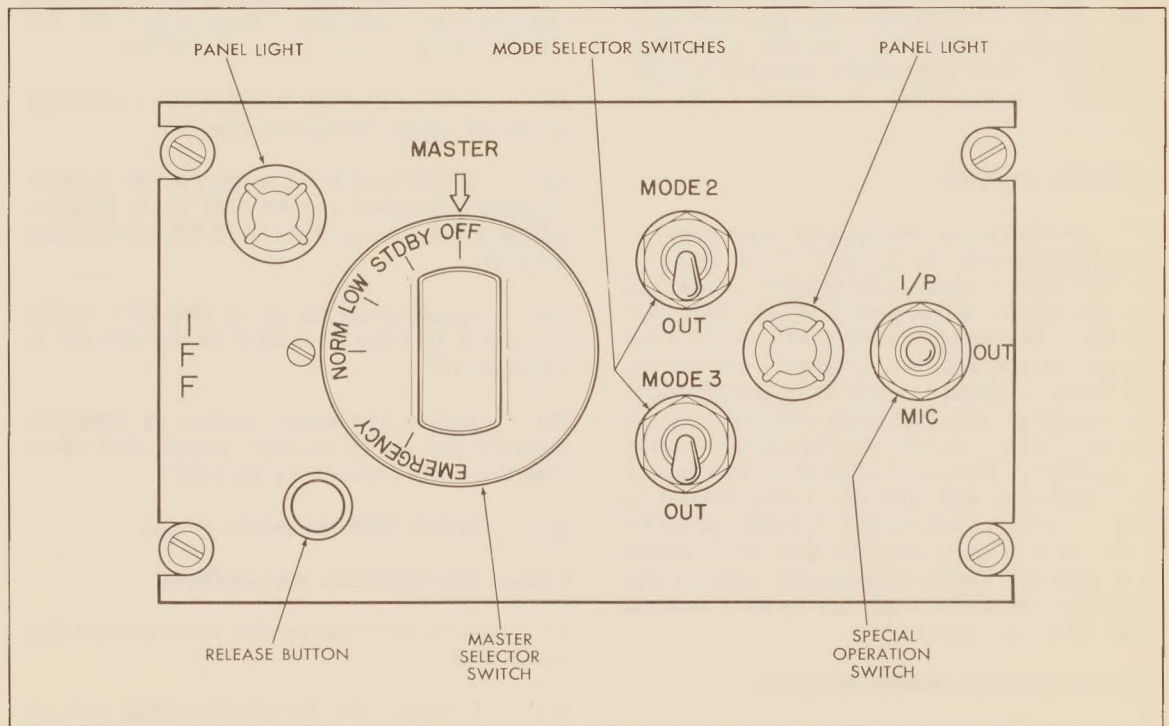
12 When the EMERGENCY position is selected, the receiver operates at maximum sensitivity and, irrespective of the mode of interrogation or the mode selected on the transponder, the emergency reply is transmitted. A mechanical stop prevents the selection of the EMERGENCY position until a release button located adjacent to the position is depressed.

13 The mode selection switches provide for the manual selection of mode 2 and mode 3. The transponder is automatically receptive to mode 1 interrogation when the selector switch is set to the Low and Normal positions and regardless of whether mode 2 and mode 3 are selected.

14 The MODE 2 switch is marked MODE 2 - OUT. When the switch is selected to MODE 2 the system will respond to MODE 1 and MODE 2 interrogations.

15 The MODE 3 switch is marked MODE 3 - OUT. When the switch is selected to MODE 3 the system will respond to MODE 1 and MODE 3 interrogations.

16 The I/P - OUT - MIC switch is a three position switch for special operation of the system on MODE 2. The switch functions are as follows:



TM1-7024-1

FIG. 2 RADAR SET CONTROL UNIT C-1158/APX

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(a) When the switch is held at the spring-loaded I/P (Identification of Position) position, the system will respond to MODE 2 interrogations. This position is inoperative in this aircraft.

(b) When the switch is selected to the OUT position the system will respond to interrogations normally.

(c) When the switch is selected to the MIC position the system will respond to MODE 2 interrogations whenever the UHF transmitter is energized.

DISTRESS OPERATION

17 Emergency operation of the IFF system is obtained automatically upon ejection of either the front or the rear cockpit seat. Micro-switches located on the bulkhead behind each seat are operated upon seat ejection to energize an IFF distress relay. The transponder will then transmit the EMERGENCY reply when interrogated. A UHF/IFF Emergency Press-to-Test switch mounted on panel R4 in the front cockpit is wired in parallel with the micro-switches. This switch is used to check the circuit.

ANTENNA SYSTEM

18 Two antennas designated the upper L-Band antenna and the lower L-Band antenna, are provided to give satisfactory coverage over the operating frequency range of the IFF system. The upper L-Band antenna is a fan shaped vertical radiator located in the fin tip. The lower L-Band antenna is an annular slot type radiator, mounted flush with the aircraft skin forward of the electronics equipment bay access door. Provision is made to use the L-Band antennas with TACAN if this system is fitted. A two position switch on switch panel R5 in the rear cockpit marked IFF UP/TACAN LOW and IFF LOW/TACAN UP enables the operator to transfer from one L-Band antenna to the other as required.

SYSTEM POWER REQUIREMENTS

19 The IFF system operates on 115 volts AC at 2 amps and 27.5 volts DC at 1.5 amps.

FUNCTION TESTING

GENERAL

20 Function testing of the IFF AN/APX-6A system should be carried out as laid down in the servicing schedule and after overhaul or replacement of associated items of equipment.

21 A calibrated Test Set AN/UPM-8 is required to carry out the function tests described below.

PREPARATION FOR TESTING

22 Prepare to carry out function testing proceeding as follows:

(a) Connect an external 115V AC three phase power supply to the aircraft.

(b) Lower the electronic equipment bay centre access door to gain access to the receiver-transmitter RT-279/APX and disconnect the antenna. Check also that the NORM-MOD switch is set to NORM.

(c) Set up a Test Set AN/UPM-8, connecting up power supply and ground cables.

(d) Check the test set to see that the correct crystals are fitted i.e. 42.9166 Mc/s TRANSPONDER REC and 41.8462 Mc/s TRANSPONDER TRANS.

(e) Select to ON the power ON-OFF switch and check that the pilot light on the test set is illuminated.

(f) Select the mode switch to CHECK, depress the press-to-test switch and check that the meter indicates ACCEPT.

(g) Switch OFF the power supply.

FUNCTION TESTING PROCEDURE

23 Carry out transponder tests proceeding as follows:

(a) Connect the TRANSPONDER jack on the test set AN/UPM-8 to the coaxial attenuator CN-180/UPM-8 supplied with the test set.

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(b) Connect the attenuator to the transponder ANTENNA terminal by means of RG-58/U cable.

(c) Check that the Transponder RECR FREQ and LOW FREQ dials are set to 1030 Mc/s and the TRANS FREQ dial to 1090 Mc/s by reference to the calibration chart on the front panel of the transponder.

(d) Select to ON the power ON-OFF switch and allow the test set 10 minutes to warm up.

(e) Select to ON the master electrical switch in the front cockpit.

(f) Select the master selector switch on the control unit C-1158/APX in the front cockpit to STDBY and allow 10 minutes to warm up.

(g) Check the operation of the transponder against the results shown in Fig 3.

24 Check the IFF distress function proceeding as follows:

(a) Ensure that the UHF radio system is switched off.

(b) Select the master selector switch on the radar set control to NORM, and the mode switches to any position.

(c) Select the mode switch on the test set to EMERGENCY.

(d) Depress the UHF/IFF emergency PTT switch on panel R4 in the front cockpit.

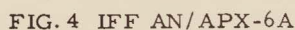
(e) Depress the press-to-test switch on the test set and check that the meter indicates ACCEPT.

25 Switch off the equipment and the test set. Disconnect the test set, reconnect the transponder antenna and raise the electronic equipment bay access door.

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TRANSPONDER SWITCH SETTINGS				TEST SET AN/UPM-8	
MASTER SWITCH	I/P SWITCH	MODE 2 SWITCH	MODE 3 SWITCH	MODE SWITCH SETTINGS	METER READING when press-to-test switch is depressed
NORM	OUT	OUT	OUT	1 2 3 EMERGENCY	ACCEPT REJECT REJECT REJECT
NORM	OUT	MODE 2	OUT	1 2 3 EMERGENCY	ACCEPT ACCEPT REJECT REJECT
NORM	OUT	MODE 2	MODE 3	1 2 3 EMERGENCY	ACCEPT ACCEPT ACCEPT REJECT
NORM	MIC	OUT	OUT	1 2 3 EMERGENCY	ACCEPT ACCEPT when UHF PTT switch is depressed. REJECT when UHF PTT switch is released. REJECT REJECT
NORM	I/P	OUT	OUT	1 2 3 EMERGENCY	ACCEPT REJECT REJECT REJECT
EMERGENCY	OUT	MODE 2	MODE 3	1 2 3 EMERGENCY	REJECT REJECT REJECT ACCEPT

FIG. 3 IFF AN/APX-6A - TEST CHART



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COMPONENT DATA SHEET

SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT Control Unit		REF. NO. 45	
AVRO PART NO.		MANUFACTURER RCAF Supply (10EA/44242)		MAN'FR'S PART NO. C1158/APX		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To house a Master selector switch, two mode selection switches and a special operation switch.							
LOCATION Mounted on the LH console in the front cockpit.							
ACCESS Unobstructed when released from the console.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure cable assembly R1040-1. Secure the ground lead. Secure the unit to the console with four quick fasteners.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the panel and switches are securely mounted. Operate the switches and check that the lever action is not sluggish or rough and that the make and break is quick. Check that the ground lead is secure and making good electrical contact.</p>	MEN X MINUTES	
<p>FUNCTIONAL CHECKS</p> <p>Check the panel light filaments for serviceability.</p>	MEN X MINUTES	
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p> <p>Test Set AN/UPM-8 External power supply.</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		

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COMPONENT DATA SHEET

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SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT Receiver-Transmitter (Transponder)		REF. NO. 45	
AVRO PART NO.		MANUFACTURER RCAF Supply (10E1/44240)		MAN'FR'S PART NO. RT-279/APX		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1000 hours	
FUNCTION To receive interrogation signals and transmit signals for aircraft identification purposes.							
LOCATION On the RH side of the electronic equipment bay at station 270.							
ACCESS Release the electronics equipment bay centre access door - 33 camlocs. Release the motor actuator switch access flap on the RH underside of the electronic equipment bay - two camlocs Select the motor actuator switch DOWN and lower the electronic equipment bay centre access door.						MEN X MINUTES	
REPLACEMENT PROCEDURE Slide the unit into the shockmount and secure with two knurled locknuts. Fit and secure three cable assemblies (R1103-2, R1054-3, R1054-5). Secure the ground lead. Select the motor actuator switch UP and raise the electronic equipment bay centre access door. Secure the equipment bay door - 33 camlocs. Secure the motor actuator switch access flap - two camlocs.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the unit is securely mounted. Check that the connectors are securely and properly fitted and are not damaged. Check that the ground lead is secure and making good electrical contact.</p>	MEN X MINUTES	
<p>FUNCTIONAL CHECKS</p>	MEN X MINUTES	
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p> <p>Test Set AN/UPM-8. External power supply.</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		

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COMPONENT DATA SHEET

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SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT Transponder Mounting		REF. NO. 45	
AVRO PART NO.		MANUFACTURER RCAF Supply (10EP/29536)		MAN'FR'S PART NO. MT-362A/A		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION Shockmounts the RT-279/APX Receiver-Transmitter.							
LOCATION Electronic equipment bay RH side.							
ACCESS Release the electronic equipment bay centre access door - 33 camlocs Release the motor actuator switch access flap on the RH underside of the electronics equipment bay - two camlocs. Select the motor actuator switch DOWN and lower the electronic equipment bay access door.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure mounting to airframe with sixteen mounting screws. Select the motor actuator switch UP and raise and secure the electronic equipment bay centre access door - 33 camlocs. Secure the motor actuator switch access flap - two camlocs.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the mounting is securely fitted. Check that the mounting is neither damaged nor distorted.</p>	MEN X MINUTES	
<p>FUNCTIONAL CHECKS</p>	MEN X MINUTES	
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		

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COMPONENT DATA SHEET

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SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT L-Band Antenna - Upper		REF. NO. 45	
AVRO PART NO. 7-1383-55		MANUFACTURER Sinclair Radio Lab.		MAN'FR'S PART NO. 308-UL		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1000 hours	
FUNCTION To transmit and receive signals in the L-Band. Operates with IFF system or TACAN system as selected by the L-Band antenna selector switch.							
LOCATION Mounted inside the fin tip - combined with the upper UHF Antenna.							
ACCESS Remove the fin tip - 56 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure the antenna to the fin tip - 12 screws. Fit and secure cable assemblies R1107-1 and R1119-1. Refit and secure the fin tip to the fin - 56 screws.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the antenna is securely mounted. Check the antenna for damage, cracks and corrosion. Check that the connectors are securely and properly fitted.</p>	MEN X MINUTES	
	MEN X MINUTES	
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		

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COMPONENT DATA SHEET

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SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT L-Band Antenna - Lower		REF. NO. 45	
AVRO PART NO. 7-1354-39		MANUFACTURER Aircraft Appliances and Equipment		MAN'F'R'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To transmit and receive signals in the L-Band. Operates with IFF system or TACAN system as selected by the L-Band Antenna selector switch.							
LOCATION Mounted on the air conditioning equipment bay access panel at station 237 lower fuselage.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure connector UG-496/U. Fit and secure the unit to the air conditioning bay access panel - 16 screws.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the antenna is securely mounted. Check the antenna for damage and cracks. Check that the connector is securely and properly fitted.</p>	MEN X MINUTES	
<p>FUNCTIONAL CHECKS</p>	MEN X MINUTES	
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		

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SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT Antenna Switching Relay		REF. NO. 45	
AVRO PART NO. 7-1354-13		MANUFACTURER Aircraft Appliances and Equipment		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1000 hours	
FUNCTION To connect the upper and lower L-Band antennas for operation with the IFF and the TACAN systems as selected by the L-Band antenna selector switch.							
LOCATION On the roof of the electronic equipment bay at station 282 RH side.							
ACCESS Release the electronic equipment bay centre access door - 33 camlocs. Release the motor actuator switch access flap on the RH underside of the electronics equipment bay - two camlocs. Select the motor actuator switch DOWN and lower the electronic equipment bay access door.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure unit to airframe using four mounting screws. Fit and secure four connectors (R1056-2, R1101-1, R1102-2, R1104-2). Select the motor actuator switch UP and raise and secure the electronic equipment bay centre access door - 33 camlocs. Secure the motor actuator switch access flap - two camlocs.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the relay is securely mounted. Check that the connectors are securely and properly fitted.</p>	MEN X MINUTES	
<p>FUNCTIONAL CHECKS</p>		
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		

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SYSTEM ELECTRONICS		SUB-SYSTEM IFF AN/APX-6A		COMPONENT Junction Box - R9		REF. NO. 45	
AVRO PART NO. 7-1354-61		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
<p>FUNCTION</p> <p>To house the relay for switching the IFF to give the EMERGENCY reply when interrogated in distress. Also houses the relays and resistance network for emergency operation of the UHF equipment.</p>							
<p>LOCATION</p> <p>On the outer face of the electronics equipment bay centre access door.</p>							
<p>ACCESS</p> <p>Remove access panel on outer face of electronic equipment bay access door - 64 screws.</p>						MEN X MINUTES	
<p>REPLACEMENT PROCEDURE</p> <p>Fit the junction box to the airframe - four screws. Fit and secure cable assembly R1010-9. Refit the access panel on the outer face of the electronic equipment bay access door - 64 screws.</p>						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check the junction box for security of mounting and damage. Check that the connector is securely and properly fitted.</p>	MEN X MINUTES	
<p>FUNCTIONAL CHECKS</p>	MEN X MINUTES	
<p>GROUND HANDLING AND GROUND TEST EQUIPMENT</p> <p>Test Set AN/UPM-8 External power supply.</p>		
<p>SPECIAL TOOLS TO REMOVE OR SERVICE</p>		
<p>REMARKS</p>		