PART 2

SECTION 1 — MANAGEMENT OF THE WEAPONS SYSTEM

CHAPTER 3 — RADAR AND WEAPON SYSTEM FAULTS

Contents

Introduction

1. Faults can occur in the weapons system which are not evident to the pilot. To guard against these, periodic servicing is carried out on the various sections of the weapons system. Faults do occur, however, which can be noted by aircrew.

Reporting

2. It is essential that pilots report faults or suspected faults as accurately and comprehensively as possible in order that they may be diagnosed and remedied. When unserviceability or poor performance are encountered, the pilot must first ensure that the apparent fault is not the result of poor handling or incorrect procedures. If the equipment is at fault, adequate time is normally available to determine all the symptoms for accurate reporting. The following are examples of the points that should be considered.

a. Was the fault intermittent or continuous?

b. At what altitude did it first occur?

c. If it occurred at high altitude, did it correct itself at low altitude?

d. Did switching the transmitter off and on correct the fault; if so was it temporary or permanent?

e. Was CRT flashing obvious?

f. If one computer programme was inoperative, were other programmes satisfactory?

Take visual recorder film of the fault if possible.

3. Whenever possible, the correct technical term for a fault should be used. It is also just as important to report the relevant serviceability of the system as it is to report the unserviceabilities. For example:

a. *Incorrect.* 'AI U/S — No scan'.

b. *Correct.* 'AI U/S. No search phase. Scanner stuck to starboard. Acquisition and track phase satisfactory'.

Radar Faults

4. Whilst the number of possible radar faults is quite large, the points outlined in the following paragraphs will be of assistance in recognising the most likely ones.

5. *Transmitter Serviceability.* The serviceability of the transmitter can be judged by reference to certain features of the radar display:

a. When the transmitter is serviceable, ground returns cause the altitude line to be painted across the display and this appears at a range directly proportional to aircraft altitude. Check that 40 to 80 NM scale is not selected.

b. The altitude line is broad and rather diffuse over the land, but it is a thin, hard line over the sea.

6. *Loss of Pressurisation.* Continuous tripping of the transmitter at altitude may be caused by loss of pressurisation in the radar bullet. If this fault is experienced, the radar must be switched off immediately as continued operation with low pressurisation might cause damage to the radar. The EHT to the transmitter is automatically cut out in the event of pressurisation failure. A brief check of transmitter serviceability can be made when the aircraft altitude

has been reduced to less than 5000 feet. ▶◀ Pressure failure is indicated by a warning on the CRT. Additionally, an override switch enables the pilot to override the pressurisation cut-out in cases of operational necessity. After using the override switch the AI transmitter switch must be selected off and then on again.

7. *Automatic Frequency Control (AFC).* The automatic frequency control circuit ensures that the intermediate frequency of the receiver is maintained at a specific value. If this circuit fails to hold lock, the azimuth timebase sweep pattern is interrupted by vertical blank breaks in the display. If sections of the altitude line or echoes appear between the breaks, the AFC is faulty; if there are no echoes, the transmitter is unserviceable. Switching the transmitter off and on may clear the fault.

8. *Out-of-Focus B-Scope.* When the transmitter is serviceable and the operation and setting of the gain control are satisfactory, the appearance of woolly targets or ground echoes is most likely caused by the B-scope being out-of-focus. This condition does not normally affect the performance of the equipment, but it may make the discrimination of a random target amongst clutter more difficult.

9. *Roll Stabilisation.* The pattern of the ground returns should be constant in relation to the B-scope during search. If the pattern alters at each sweep, particularly with the application of bank, the roll stabilisation equipment is unserviceable.

10. *Lock Transfer to Altitude Line.* When locked on to a target with a low range rate, lock may transfer to the altitude line as the range gate passes through it. Lock may then be maintained on the altitude line, in which case the steering dot deflects both in azimuth and elevation, range rate reduces to zero and the scanner elevation changes. The lock-on sequence should be repeated, but the radar is unserviceable if the condition persists.

System Faults

11. Once the radar is locked on to a target, it is in the automatic mode. The full system is now in operation and information is being obtained from many sources: for this reason, faults may be difficult to recognise and diagnose. Pilot reports on unserviceabilities should therefore comment on the following:

a. *Flight Conditions.* Height, speed and altitude.

b. *Flight Instruments.* Air Data System (VSI, machmeter, and altimeter) and the Master Reference Gyro (attitude indicator and radar artificial horizon).

c. *Weapon System Switches.* Computer, MAS, and LFS/CRT switch positions and hand controller.

d. *B-Scope.* Target range, azimuth and elevation when the fault occurred.

12. *Example.* The importance of correct reporting is illustrated by the following example:

a. A 90° interception in computer switch 2.

b. Fighter at 36,000 feet with target above.

c. Lock-on at 20 NM; scanner 4° in elevation and 15° in azimuth to starboard.

d. Steering dot erratic in elevation until range closed to 3 NM.

e. Range rate 200 knots.

f. Steering demands satisfactory when fighter at 3 NM.

g. Scanner elevation never above 10°.

From this information it can be deduced that the fault was caused by an unserviceability in the rate of change of height information supplied to the AI from the air data system. A comment on the serviceability of the VSI would also have been most helpful in this diagnosis.

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