

PART 1.5 RECOMMENDATIONS

RECOMMENDATIONS MADE DURING THE SERVICE INQUIRY (FOR FOLLOW UP ACTION)

1. **Survival Equipment.** AOC 1 Gp ensures that:
 - a. The cotton ties used to secure the zips of the CSW are removed. Exhibit 32
 - b. The length of the cord attaching the beacon to the CSW is increased by 12". Exhibit 32
 - c. All Sqn SERE Os re-brief their Sqn on the correct use of Fastfind and G2R. In the long term the panel recommends that formal training be given by the SERE School at RAF St Mawgan. Exhibit 32
2. **Aircrew Training.** AOC 1 Gp ensures that TGRF aircrew are reminded of the advice given within the GR4 ACM Book 1, Part 3, Ch 2, para 72-75. Specifically, that:
 - a. Crews should be aware that if they suffer a surge in a benign environment i.e. an apparent engine surge outside typical surge parameters, the drills for **ENG MECH FAIL/TI FIRE (E-31R)** should be carried out. Moreover, this drill should also be actioned if any surge is accompanied by additional engine CWP captions. Exhibit 32
 - b. When actioning the **ENG MECH FAIL** drill, both fire buttons should be pressed 15s after the LP cock has been closed, regardless of which Fire caption is or is not illuminated. This accounts for the possibility that either engine may be subject to a fire, but that the fire warning may not have been triggered. Crews are also reminded that the fire suppression system fitted to the GR4 is not an engine fire extinguisher but an engine bay extinguisher, used to account for the possibility of ancillary engine bay fires following an **ENG MECH FAIL/TI FIRE**. Exhibit 32
 - c. Having made a reasoned decision to shut an engine down, taking into account the above advice, sensible airmanship and good CRM, crews should carry out the **ENG MECH FAIL/TI FIRE** drills ASAP. Crews are reminded that the fuel supply to an affected engine, and/or any associated fire, is only isolated when both HP and LP cocks are closed. Exhibit 32

ADDITIONAL RECOMMENDATIONS

3. **Causes.** The Panel recommend that:
 - a. Hd MilAAIB, through Rolls-Royce, continues to investigate the cause of the initial failure in the right engine. Part 1.4 Para 71/72
 - b. FAST PTL, through Rolls-Royce, carries out a full review of all critical components in the line of breakout, in particular the engine casing and the main and reheat fuel lines. All components identified to be assessed for additional protection from Ti fire breakout and conclusions reported to the Part 1.4 Para 71/72/73

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ODH.

c. FAST PTL conducts further investigations to seek additional modifications that will mitigate the risk of Ti fire breakout in the RB199 and reports his conclusions to the ODH. Part 1.4 Para 72

d. FAST PTL reviews the survivability requirements of Tornado GR4 flexible hydraulic hoses, assesses the potential fire hazard risk and associated control measures, and reports his conclusions to the ODH. Part 1.4 Para 27 Annex M

4. **Contributory Factors.** The Panel recommend that:

a. Hd MilAAIB continues to engage with the fire detection manufacturers in order to assess the effects of fuel cooling on the firewire and the effects of radiated heat on the firewire controller. Part 1.4 Para 23

b. AOC 1 Gp conducts a review into the teaching of the Mech fail/Ti fire drill. Specifically, focussed attention should concentrate on understanding the symptoms of mechanical failure, the likely sequence of events following mechanical failure, aircrew immediate actions and the reasons behind these actions. Part 1.4 Para 46

c. AOC 1 Gp ensures that greater emphasis, during initial and recurrent training, is placed on the importance of isolating the fuel supply to engines that have suffered mechanical failure/Ti fires. Specifically, TGRF aircrew should be made aware of the importance of closing the LP cock as well as the HP cock. Part 1.4 Para 46

d. AOC 1 Gp ensures that greater emphasis, specifically during initial training, is placed on the importance of effective CRM in emergency situations. Training should focus on effective use of crew resources in emergency situations. Part 1.4 Para 88

e. FAST PTL conducts further investigations to seek modifications to the Tornado engine bay fire detection system in order to provide an increased probability of detection of localised fires. Part 1.4 Para 78

f. FAST PTL undertakes investigates potential improvements to the Tornado fire suppression system and makes recommendations to the ODH. Part 1.4 Para 79

g. The Tor PTL implements a system to ensure the process for incorporating incidents/accidents into the hazard log is improved in order to ensure a timely, up to date risk rating exists. Part 1.4 Para 56

h. The Tor PTL conducts a full review of the Tornado hazard log to ensure that the Post Control Status accurately reflects the effectiveness of controls placed in it. Part 1.4 Para 58

5. **Other Factors.**

a. ODHs seek ways to mitigate the risk being carried by PLBs not functioning correctly. Part 1.4 Para 51

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- b. AOC 1 Gp reviews the requirement for a fully automatic personal locator beacon fitted to all crew members of fast jet ac. Part 1.4 Para 50
- c. FAST PTL and the APS PTL conduct further investigation into the performance of the Fastfind personal locator beacon. Part 1.4 Para 52 and 53
- d. ODHs ensure that formalised annual training is given to aircrew in the operation of the Fastfind and G2R beacons. Part 1.4 Para 54
- e. FAST PTL investigates ways to improve the Tornado R-ADR to capture more parameters, specifically CWP captions and LP cock positions, and makes recommendations to the ODH. Part 1.4 Para's 12, 14, and 36a
6. **Observations.**
- a. COS Health reviews the process, and responsibilities, for transporting ejectees back to their units following hospital admission, and ensures that these responsibilities are clearly defined. Part 1.3 Para 24
- b. FAST PTL conducts a review of engine bay fuel pooling and drainage characteristics, assesses the potential fire hazard risk and associated control measures and reports his findings to the ODH. Part 1.4 Para 22 Annex M
- c. Stn Cdr RAF Lossiemouth conducts a full review of F700 documentation to ensure it is at the correct amendment state. Part 1.4 Para 69 Annex H
- d. FAST PTL reviews the specific recommendations made by BAE Systems reports to the Boards of Inquiry into Tornado GR4 ZA599 and Tornado F3 ZE830 accidents, and highlighted to this SI Panel and makes recommendations to the ODH. Annex M section 7.0. Para 4 and 5