



# **Maintaining an Aircraft Accident Investigation Capability in a Small Military Aviation Organisation**

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## **Author Biography:**

*Wing Commander Wood joined the RAAF in 1980 and completed flying tours on C130H and Falcon 900 aircraft, accumulating 6000 flying hours. Peter's final flying tour was as Commanding Officer 34 Squadron, a position he left on 29Jun01 to take up his post as Deputy DFS. As Deputy DFS Peter has completed the United States Navy Aviation Safety Officer Course and the SCSI Investigation Management Course. His duties at DFS-ADF have included supervising 16 aircraft accident and incident investigations, reviewing accident reports, and presenting to ADF aviation audiences on Accident Investigations. Peter is married to Stephnie.*

# MAINTAINING AN AIRCRAFT ACCIDENT INVESTIGATION CAPABILITY IN A SMALL MILITARY AVIATION ORGANISATION

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## Introduction

1. The Directorate of Flying Safety – Australian Defence Force (DFS-ADF) is the agency responsible for investigating all ADF aircraft accidents worldwide during both peace and war, and assisting with foreign military accidents in Australian territory. DFS-ADF is the only agency in the ADF with an aircraft accident investigation capability, and as such DFS-ADF is required to maintain the capability to, in the first instance, independently respond to aircraft accidents. This accident investigation capability must be able to respond within six hours (a self imposed ADF limit to ensure minimum loss of perishable evidence) to accidents involving crewed aircraft and UAVs from the three ADF services (24 aircraft types), anywhere those platforms may be operating around the world, in both peace and conflict. ADF aircraft types include fast jet strike/fighters, jet and piston-engined trainers, small and medium lift helicopters, small, medium and large transport and tanker aircraft and maritime patrol aircraft.

2. DFS-ADF is a small (depending on where you are from) organisation of 21 personnel, including a Director, Deputy Director, Deputy Director – Education and Training, 12 Desk Officers (Air Safety Investigators (ASI)), with publishing, safety product development, database and administrative support staff. A structural diagram of DFS-ADF is at Figure 1.

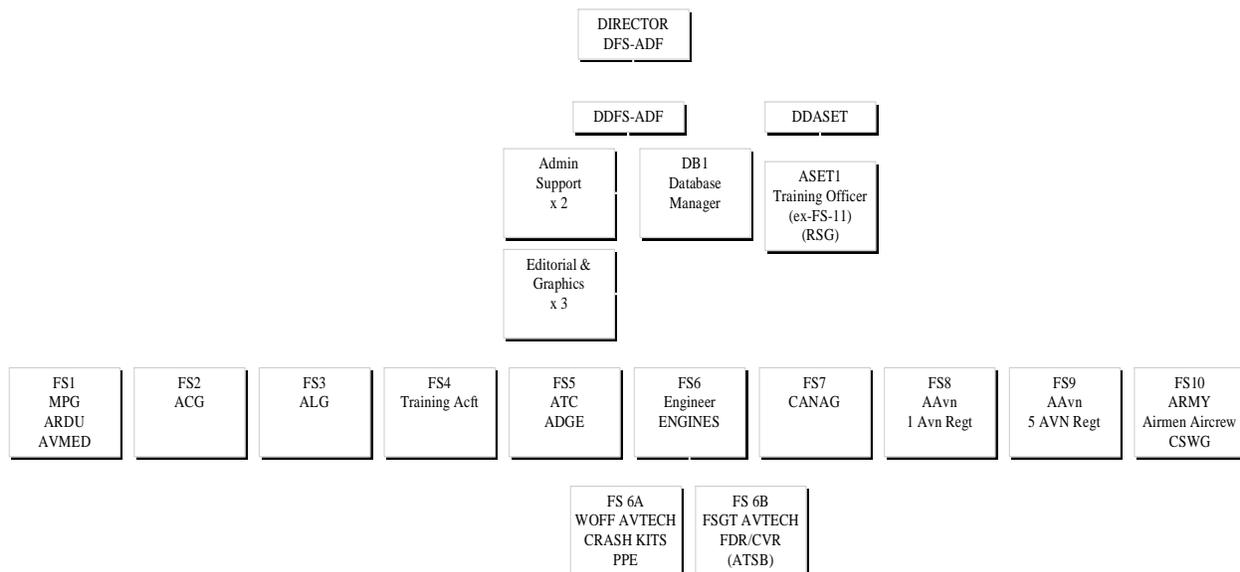


Figure 1. DFS-ADF Structural Organisation

3. Aircraft accident investigation is not the only aspect of DFS-ADF's charter. In addition, DFS-ADF is charged with aviation safety policy development, accident prevention, and aviation safety promotion, education and training across the ADF. Our main aim is to be proactive in promoting aviation safety and assisting ADF aviators and Commanders in enhancing our aviation safety culture and command commitment to aviation safety. DFS-ADF ASIs must therefore be available to support both accident prevention and aviation safety promotion activities as well as being prepared to investigate aircraft accidents. DFS-ADF aims to devote as much time as possible to pro-active safety activities, whilst accepting that maintenance of an aircraft accident investigation capability is an essential requirement.

4. DFS-ADF is required to maintain accident investigation readiness against a recent history of very few major (fatal) aircraft accidents in ADF aviation. At the time of writing, the last fatal accident in Royal Australian Air Force (RAAF) aviation was in April 1999, the last in Australian Army aviation in June 1996, and the last in Royal Australian Navy aviation in December 1995. Despite this apparently safe record, on average DFS-ADF has conducted one accident (non-fatal) and six 'serious incident' investigations for each of the past three years. The ADF's major aircraft accident history is depicted at Figure 2, where the blue columns indicate number of aircraft lost per year since 1965, and the red columns indicate number of personnel lost each year beginning in 1990, up until the loss of Black Hawk 216 on 12 February 2004.

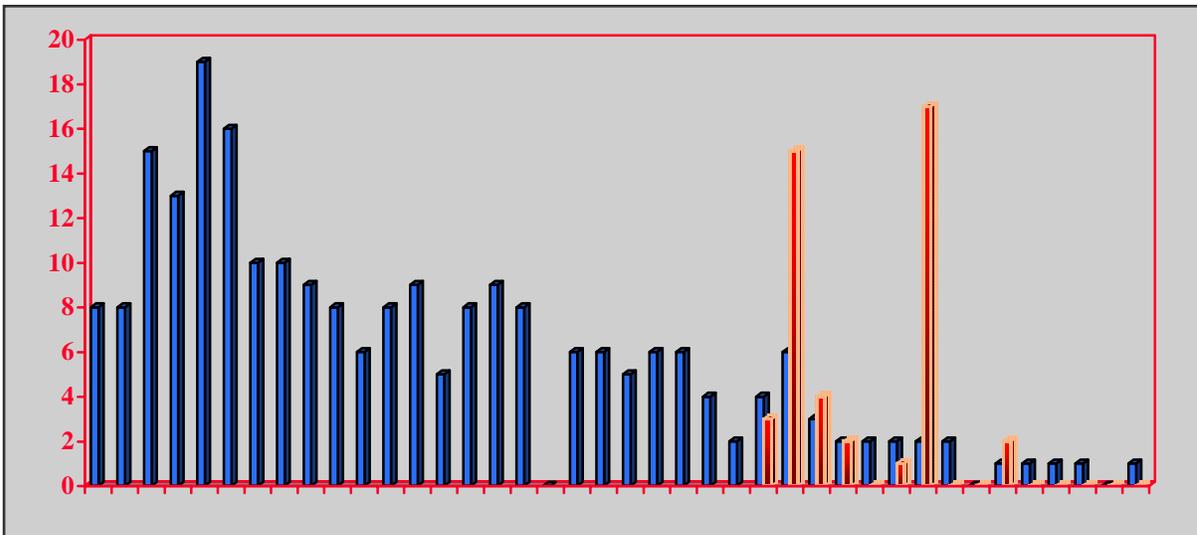


Figure 2. Australian Defence Force Aircraft Accident History

### ASI Training

5. As many readers would know, training ASIs to conduct major aircraft accident investigations takes considerable education, training, exposure and experience. With only a small number of ASIs requiring training annually, the ADF has focussed on providing trained ASIs to support our aviation activities rather than developing and conducting world standard ASI training in-house. Defence ASI training is regularly available only overseas, mainly in the United States and the United Kingdom. At senior policy level, the ADF decided some time ago that

maintenance of a 'world class' aircraft accident investigation capability was essential, and thus all DFS-ADF ASIs were to be given the best ASI training available. This is an expensive requirement, both in terms of money and human resources, yet one that continues to be fully resourced by ADF leadership. All DFS-ADF ASIs complete a recognised ASI Course, such as the United States Navy Aviation Safety Officer Course, the Cranfield Aircraft Accident Investigation Course or the Southern California Safety Institute Aircraft Accident Investigation Certificate Course. Senior DFS staff also complete a Major Accident Investigation Management Course such as the SCSA Investigation Management Course.

6. Having well-training ASIs is one thing: maintaining their skills and ensuring the ASIs are ready to rapidly respond to an accident is entirely another.

### **Maintaining ASI skills without recent accidents**

7. Not having had a fatal accident in ADF aviation since 1999, and having a 'posting' rotation of DFS-ADF ASIs on average every three years, means that as of early 2004, **no DFS staff had ever attended or participated in a fatal ADF aircraft accident investigation.** Whilst this is a wonderful problem to have (and we hope to still have this problem forever!), in terms of maintenance of ASI skill sets and experience, this is nevertheless a problem. To maintain skills and experience levels, DFS-ADF and/or the Navy's Fleet Aviation Safety Cell (FASC) investigates selected serious incidents. For example, DFS-ADF conducted a full investigation into a near mid-air collision between two training aircraft in 2001, treating the investigation and the resultant recommendations as if the aircraft had in fact collided. In early 2004, DFS-ADF completed two investigations into two serious incidents involving C130 maintenance activities. Reports for such incident investigations are completed to the same structure, standard and depth as accident investigations, both to maintain ASI Aircraft Accident Investigation Team (AAIT) report writing skills and ensure the maximum possible organisational learning outcomes. Recommendations are made in the same manner and to the same command levels as if an accident had occurred rather than a serious incident.

8. In addition to investigating ADF incidents, an inclusion in the DFS-ADF/Australian Transport Safety Bureau (ATSB) MOU allows for DFS-ADF ASIs to act as observers on ATSB accident investigations. This allows DFS-ADF ASIs to observe and learn from ATSB investigation processes, and to maintain skills with using DFS-ADF accident investigation Personal Protective Equipment (PPE) and kit. Since 2001, all DFS-ADF ASIs have participated in at least one ATSB investigation as an observer. DFS-ADF ASIs participated in the investigation into the combined East Timor Government/ATSB investigation into the IL76 accident at Baucau, East Timor on 31 Jan 03. Participation in this investigation exposed the DFS-ADF ASIs involved to a large aircraft accident site with minimal local support and infrastructure, very demanding and austere physical conditions, international investigation liaison requirements and major accident report writing.



Figure 3. IL76 Accident East Timor 31 Jan 2003

### **Maintaining a short notice accident response**

9. As with most aircraft accident investigation agencies, DFS-ADF maintains a go-team. However, given DFS-ADF's small size and the cost of ASI training, in effect the entire in-uniform body of DFS-ADF is the go-team. There is no roster as such: all Desk Officers (ASIs), once trained, are on constant six-hour notice to move for the duration of their tenure at DFS-ADF. They are supported by in-house Administrative Staff who are able to support an AAIT in the field (other than in a war zone) with administration, finances and evidence registers. When an accident occurs, all available DFS-ADF members meet as soon as possible, usually within one hour, in a designated AAIT Room in Canberra to determine the size of the responding AAIT. Those members on deployment or travel elsewhere will be contacted ASAP and placed on immediate notice to respond in case they are attached to the AAIT. In one celebrated (at least in DFS-ADF) case, for an ADF F-111 accident in Malaysia in 1999, one of the AAIT members was required to respond from Wichita Falls, US, where he had just arrived for Jet Engine Mishap Investigation training with the USAF.

10. Maintenance of such a blanket short notice accident response requires significant planning and preparation. As DFS-ADF ASIs are also responsible for pro-active Aviation Safety Management System (ASMS) support, they spend up to three months of the year away from Canberra on aviation safety promotion activities. To meet the 'respond from anywhere' requirement, all DFS-ADF ASIs maintain fully packed and stocked personal 'crash bags' containing all personal clothing, military clothing, cool/cold weather clothing, PPE and accident investigation equipment required to support any ADF aircraft accident **anywhere**. The personal crash bags are stocked to allow for the first two days of on-site investigation in any climactic conditions where ADF aircraft may operate. This includes PPE for accident sites in desert, jungle or extreme cold weather conditions. If 'away base' ASIs are attached to the AAIT, their personal 'crash bag' will be deployed for them by 'at home' members of the AAIT.

11. Being a military accident investigation agency, DFS-ADF staff are also on call to investigate aircraft accidents that may occur in conflict. In 2003 this meant being ready to investigate accidents that may have occurred during the ADF involvement in the operations in and around Iraq. This required all DFS-ADF ASIs to be fully trained and equipped in biological and chemical warfare survival, amongst other requirements. Again, higher command commitment to DFS-ADF's investigative capability meant that the considerable preparations and resource costs necessary to meet this requirement were provided. Additionally, plans were initiated with the Defence Science and Technology Organisation (DSTO) and the ATSB to more fully support remaining in-Australia DFS-ADF staff, should DFS-ADF ASIs be investigating an accident in the combat zone when another ADF aviation accident occurred elsewhere. A similar case was experienced when DFS-ADF had three ASIs on the IL-76 accident site in East Timor and a RAAF Caribou subsequently ran off a short strip in the Papua New Guinea highlands in early Feb 03.

12. In addition to ASI personal equipment, DFS-ADF maintains two complete accident 'crash kits' with all the necessary investigation equipment for a DFS-ADF AAIT to be self-sufficient in the field. Having two kits facilitates responding to an accident with an AAIT already deployed, and the benefit of having two complete crash kits was evident for the IL-76 and Caribou accidents described above. The identical kits each include satellite communications, lap tops (with evidence register databases), digital still and video cameras, laser range finders, digital interview recorders, differential GPS Units and other equipment. Once again, higher command commitment to DFS-ADF's investigative capability has meant that the funds requested to support the crash kits have always been provided.

13. Having the best accident investigation equipment is of no value unless ASIs know how to use it. Accordingly, when ASIs arrive at DFS-ADF, they complete a structured induction training course which includes instruction and practical exercises using all equipment. All ASIs are trained on all equipment to enable the maximum flexibility in AAIT composition and accident response. ASIs are encouraged to maintain their skills on all equipment, and are encouraged to take the equipment home to practice with it.

### **DFS-ADF AAIT Composition**

14. A DFS-ADF AAIT will consist of anywhere from three to 12 members depending on the scale and severity of the accident in question. In deciding the composition of the AAIT, DFS-

ADF management and staff consider the scale and severity of the accident, the aircraft type or types involved, and the areas of expertise required. As a minimum, a DFS-ADF AAIT will include the following DFS-ADF personnel:

- A senior investigator, usually the Deputy Director, who has completed Accident Investigation Management training, ASI training and media awareness/liaison training. The senior investigator's role is to provide higher level liaison with local command and support agencies, the media, local service providers, Next of Kin and higher command in Canberra. This higher level liaison is provided to allow the OIC of the AAIT to concentrate purely on AAIT activities.
- An OIC of the AAIT, who has completed ASI training and has been a member of at least one previous ADF AAIT.
- DFS-ADF operations (aircrew) ASIs as required to support the OIC.
- The DFS-ADF engineering ASI.
- The DFS-ADF ASI responsible for CVR/FDR download and analysis.
- The DFS-ADF ASI responsible for aircraft accident site mapping, photography, registering of evidence, security and OH&S issues.

15. In addition to the DFS-ADF ASI 'core', subject matter expertise from other agencies will be sought to support the AAIT as required by the accident scenario. This will generally always include Human Factors, Aviation Medicine and DSTO site mapping and component/fluid analysis support, and may include operations and engineering subject matter experts from the wider ADF familiar with the aircraft type(s) involved in the accident.

16. As the ADF (in recent history) has had so few major accidents, DFS-ADF management will also consider attaching additional ASIs to the AAIT for experience and currency purposes. For example, in the investigation into the ADF Black Hawk accident on 12 Feb 04, the DFS-ADF Navy ASI was included in the team to provide additional rotary wing expertise to the investigation, but also to gain on-site and report writing experience.

### **Setting up relationships with external agencies**

17. Given DFS-ADF's size and complement, DFS-ADF lacks the resources to independently investigate major aircraft accidents. As mentioned above, assistance may be sought from other agencies, including DSTO, Aviation Medicine and Human Factors experts from the wider ADF, the ATSB and other agencies as required. To facilitate such assistance, DFS-ADF has MOUs in place with DSTO and the ATSB on the provision of support to AAITs. The MOUs are reviewed on a regular basis as lessons are learnt and the organisations evolve. DFS-ADF staff visit DSTO at least once a year to maintain the working relationship and ATSB and DFS-ADF management and staff regularly liaise on a variety of issues.



Figure 4. ADF Black Hawk 216 accident 12 Feb 04.

### **Enabling rapid report writing**

18. For fatal aircraft accidents, the Australian military has a ‘dual process’ for the subsequent investigation. An AAIT conducts an air safety investigation and reports findings of fact to a subsequent Board of Inquiry, which is a legal process with the authority to assign blame and punishment. For accidents with no fatalities, usually only an AAIT is conducted. Regardless, the AAIT will be working under significant time pressure. Final reports are required within approximately 50 days of the accident if a BOI is appointed, and within 90 days if no BOI is appointed. To complete reports within this time frame, the following processes are in place:

- all DFS AAIT reports and incident investigation reports are completed in the same structure and format (IAW ICAO standards);
- all DFS accident investigations follow the same process from commencement to completion;
- when assigned to an AAIT, this becomes the ASI’s primary, and if necessarily only, duty;
- if additional report writing resources are required to facilitate on time completion, such as secretarial and stenographic support, then these are obtained;
- time is set aside for a ‘peer review’ of the AAIT report by non-involved DFS-ADF ASIs before management review; and
- input from senior DFS staff for report review and other requirements are pre-planned and ‘blocked’ in ahead of time.

### **Communicating report recommendations**

19. In the ADF construct, if no BOI is appointed, recommendations from accident investigations are made by the AAIT accident investigation Appointing Authority (AA). In effect, the recommendations form the basis for DFS-ADF’s suggested organisational response

from the AA to the accident. The actual response to the accident is the responsibility of the AA: DFS-ADF's role is to ensure the AA understands the evidence, logic and intent underpinning all the findings and recommendations. The AA has the right to accept, reject or modify any or all of the report recommendations as he or she sees fit. To facilitate the report acceptance process, for non-fatal accidents, the following process takes place:

- the AAIT provides the AA with 2 day, 7 day and 14 day progress reports;
- a 30-day factual report is submitted to the AA outlining all factual information obtained until that point;
- the final AAIT report is provided to the AA within 90 days;
- the AAIT OIC provides the AA and senior staff with a face-to-face brief to explain the logic, intent and reasoning behind the report findings and recommendations;
- the report is considered by the AA and his/her staff for up to 60 days, with DFS-ADF staff providing input to the review process as required/requested by the AA;
- after due consideration, the AA will compile an implementation plan for actioning all the accepted and modified recommendations;
- all rejected recommendations are placed on file and recorded as such; and
- for major accidents, the AA will advise the relevant Service Chief of his/her response to the AAIT report, the reasons for modifying or rejecting recommendations, and the details of the implementation plan.

20. For accidents where a BOI is appointed, the AAIT will follow the same process until submission of a report within 50 days. The report will contain no recommendations, and after the AAIT has tabled their report and given evidence to the BOI, DFS-ADF will take no further part in the process until the BOI recommendations are accepted, rejected or modified by the AA. While not pertinent to the actual investigation, once the BOI has been accepted by the AA and agreed by the relevant Chief of Service, DFS-ADF assists in the development of a Ministerial Submission for release on information to the Next of Kin and the public.

### **Closing out recommendations**

21. Completion of the implementation plan and actioning all recommendations following an accident is a command responsibility. To ensure all recommendations are completed, DFS-ADF plays a monitoring and reviewing role, receiving regular updates, usually quarterly, on the status of recommendation completion. All recommendations are entered into a DFS-ADF database and their current status updated as information is received by the relevant AAs. In this way, all recommendations are tracked to completion to ensure the report recommendation process is closed-loop and no recommendations 'slip through the cracks'. In addition, through the database, a permanent record of the recommendations and their closure is maintained.

### **Using accident reports for aviation safety education**

22. Accident investigations and their resultant report and recommendations are of no value unless they result in the prevention of future accidents and organisational learning. To facilitate these aims, as well as a closed-loop recommendation tracking process, there must be a process of communicating the details of accidents, the actions taken, and the lessons learnt to the entire

aviation community. To this end, after an accident investigation has been completed and the implementation plan formulated, a de-identified copy of the report is circulated to the relevant areas. In addition, an Accident Review, which is a short (usually up to eight pages) document containing the basic accident factual information, findings and recommendations is produced and distributed to all ADF aviation units.

23. After the accident investigation report is completed, DFS-ADF will prepare a PowerPoint presentation containing the accident factual information, findings and recommendations, and relevant and releasable imagery, and deliver the presentation to relevant areas of ADF aviation as soon as practicable. When available, the presentation will be delivered to the general ADF aviation community through such forums as safety days, commander's conferences and flying supervisor's courses.

### **Learning accident investigation lessons**

24. Given the infrequency of DFS-ADF major accident investigations, it is essential to ensure that lessons learnt on individual accident investigations are captured and maintained as corporate knowledge. To this end, after an accident investigation is completed, a 'lessons learnt' workshop is conducted to review the lessons and develop concomitant actions to ensure the lessons are captured. This may require amendments to policy, processes and/or DFS-ADF Instructions or the acquisition of new/improved accident investigation support equipment.

### **Summary**

25. DFS-ADF is a small organisation charged with maintaining the capability to respond within six hours to investigate any accidents involving any ADF aviation platform anywhere in the world. DFS-ADF is required to maintain this capability against a background of no fatal ADF aviation accidents since 1999 and on average one non-fatal accident per year. To maintain this capability, DFS-ADF processes are built on the following tenets:

- All DFS-ADF ASIs are given the best ASI training available.
- To maintain ASI skills given the paucity of major ADF aviation accidents, DFS-ADF:
  - investigates selected ADF aviation serious incidents, making findings and formulating recommendations as if an accident has occurred;
  - in agreement with the ATSB, provides DFS-ADF ASIs as observers on civil aircraft accidents; and
  - where available, attaches additional ASIs to actual ADF aircraft accident investigations for experience and currency purposes.
- A short notice accident response is maintained by keeping up to date personal and duplicated equipment 'crash kits' supplied with up-to-date investigative tools and equipment. All DFS-ADF ASIs are trained on all equipment and encouraged to maintain personal currency.

- Pro-active relationships are established and maintained with internal Defence and external agencies to facilitate support for accident investigations.
- Processes and resources are in place to support rapid AAIT report writing.
- Recommendations from accident investigation reports are formally tracked to completion to ensure organisational learning.
- Briefings, PowerPoint presentations and Accident Reviews are used to educate the ADF aviation community regarding ADF aircraft accidents to ensure organisational learning.
- A 'lessons learnt' workshop is conducted after all accident investigations to review the lessons and develop concomitant actions to ensure the lessons are captured.

DFS-ADF's main aim is to be proactive in promoting and assisting Defence aviators and Commanders in enhancing the ADF's aviation safety culture and commitment to aviation safety. However, through these tenets, despite our recent excellent safety record, we are permanently ready to conduct a professional military aircraft accident investigation, which can stand NOK, Ministerial, public, media and peer scrutiny, and result in the best organisational learning and safety outcomes.