

# EXPERTS IN EVIDENCE

Air accident investigations the ADF way

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Many of us are familiar with the accident and investigation process when a commercial or GA aircraft is involved. But what happens when there is an air safety incident or accident involving the Australian Defence Force?

The crew of a RAAF EA-18G Growler escaped uninjured when the aircraft experienced a catastrophic power loss during the latter stages of its takeoff roll from Nellis Air Force Base, Nevada.

The incident, in January 2018, was reported online at the time by *Australian Aviation*: “The aircraft was taking off for a famil flight over the Nellis Test & Training Range in preparation for the commencement of Exercise Red Flag 18-1 when, as it approached rotation speed, it suffered what Defence has described as a “malfunction”, with the crew forced to conduct a high-speed abort.

“The two crew stayed with the aircraft until it came to rest off the side of Nellis’s eastern runway, and were able to climb out of the jet and get clear of the rapidly growing fire.



“The highly trained aircrew responded to the emergency situation and performed a ground evacuation.”

The event was classified as an accident, according to Lieutenant Commander Daryl Whitehead, the lead investigator for the Australian Defence Force, and, “thankfully there was no loss of life.”

LCDR Whitehead had the challenging responsibility of sifting

through the evidence and writing a comprehensive report on the accident.

In these situations, the intent of the report is to identify what happened so any repetition of the accident can be avoided in the future.

“Aviation accidents are investigated for many reasons”, he says, “but the primary reason is to establish the contributing factors present so that measures can be taken to prevent recurrence.”

He added that “.... the Directorate of Defence Aviation and Air Force Safety within the Defence Aviation Safety Authority investigates accidents not to attribute blame, but to determine within the framework of a just and fair culture, what happened, why it happened and how Defence can prevent it happening again.

“We must be prepared to deploy personnel at very short notice to investigate Defence aviation accidents, wherever such accidents may occur. Accordingly, all our investigators are personally and professionally prepared to deploy”, LCDR Whitehead said.

The size and composition of the Aviation Accident Investigation

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Team (AAIT) will reflect the scale of the accident or event and the 'on-ground' situation such as the military situation or threat, location, climate, infrastructure, accommodation, transportation limitations or other constraints.

"Some circumstances may require an initial team with follow-up support.

"The availability of on-site expertise such as aircrew, air traffic control, engineering, and so forth will also impact the size and constitution of the team and dictate what equipment is required on-site. Each team will have an investigator in charge, an operations lead and a technical lead (who may be dual-hatted thereafter). Arrangements for the formation of the AAIT will be coordinated between the director and the relevant service headquarters as appropriate."

Time is of the essence for a successful investigation. The first thing the investigation team does is a "walk through" to ensure the site is safe to work on and to determine what evidence is available.

There are different categories of evidence and some are "perishable" which means they can disappear or become unreliable quickly. These include ground impact marks, evidence of fluid leaks and witness accounts. Other kinds of evidence such as physical remains may need to be removed to another location for more extensive analysis. Usually there is pressure to clear the site, especially if it is on an operational airfield.

"Evidence underpins successful investigations", said LCDR Whitehead. "Evidence is broadly defined as anything that can support an assertion. Evidence may support the assertion directly, as a proof or a truth, or it may be considered circumstantial, requiring an inference to connect it to a conclusion of fact.

"Evidence can vary in strength, and multiple pieces of evidence can support singular conclusions, and vice-versa. An accident investigator is interested in evidence of all varieties – testimonial, direct, circumstantial, forensic and so on. All can be used to piece together what has occurred in the accident sequence. Evidence should always be assessed through the analysis process to determine its relevance, its applicability, and its strength, before conclusions are drawn."

He explained that there are four different categories of evidence – physical, non-physical, perishable and vulnerable.

"Broadly speaking, evidence relating to aircraft accidents can be categorised as either physical or non-physical. Evidence is usually also classified as either perishable or vulnerable: physical evidence is evidence that exists as discreet items or outcomes, that may be collected to assist the investigation. It is not simply an item that may be picked up and placed in an evidence bag, but could also be the physical condition of a cockpit switch position or a ground impact scar, which can be recorded by photograph or other document."

Non-physical evidence most commonly refers to witness recollections of an occurrence. A witness statement, when transcribed, could become 'physical' evidence, but this would only be the statement itself. Subsequent recall by the witness of additional non-physical evidence could change the utility of the transcript. However, because of the difficulties that may be associated with verifying witness statements, non-physical evidence can be unreliable. Ideally, attempts should be made to confirm non-physical evidence through collection and analysis of supporting physical evidence.

Perishable evidence refers to physical evidence that may degrade over time, and thus should be protected until it can be captured or recorded. Examples of perishable

**'Evidence can be categorised as either physical or non-physical.'**

LCDR DARYL WHITEHEAD

evidence include ground impact marks (which can be trampled or obliterated), evidence of fluid leaks on aircraft components (which can be washed away), or (especially) witness recollections.

Vulnerable evidence is evidence which, in general, will be reasonably permanent, but may be subject to human alteration, either by intentional or unintentional means. Examples of vulnerable evidence include cockpit switch positions post-incident, or maintenance logs. Some evidence may be more vulnerable than others, depending on its nature. For example computerised maintenance logs which have been independently and regularly backed up may be less susceptible to alteration than paper-based logs which are not duplicated."

The range and complexity of evidence sources seems bewildering to the non-expert. "A comprehensive list of potential evidence sources would be limitless", LCDR Whitehead said. "However, typical and frequently utilised sources of evidence include the status of the accident site (before and after accident); aircraft wreckage and aircraft components; fuel, oil and lubricant samples; air traffic control and radar tapes; data recorders, voice recorders, head-up display tapes and so forth; TV recordings, video footage; witness recollections, photographs and statements; volatile and non-volatile

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memory sources such as phones and GPS units; fuel and oil spills; switch, control and control surface positions; sooting and signs of fire; ground marks; weather forecasts; airworthiness records; maintenance documentation and logs and weight and balance documentation and loading, passenger and cargo manifests.”

A full list of possible evidence sources would be much longer. In order to form a complete picture of what happened the team literally looks at everything.

LCDR Whitehead believes that writing the report is the most difficult aspect of any investigation. “It often follows exhaustive field-work and is completed under sometime intense time pressure,” he said.

“The report will be heavily scrutinised and the safety benefits obtained and the reputation of the authority will be affected by its quality.”

The aim of the final report is to explain what happened and why, and to recommend what should be done to prevent recurrence. Thus, each finding should follow logically from the evidence and analysis and each recommendation should have a logical basis in each finding.

In the end, the most important part

of the report is the recommendations which must be logical, feasible and demonstrably linked to preventing a recurrence.

“Although contributing factors may be common with other accidents, the circumstances, events and actions surrounding any accident will be unique. As a result, it is impossible to write a ‘one size fits all’ guide for investigators that will explicitly direct them to the answers they seek. Instead, each accident must be approached using strategies appropriate to the incident itself,” he said.

“Techniques and methods applicable for one accident may not be necessary for another and an investigative approach that is successful in one case may not provide the same result for a seemingly similar situation. The path an investigator ultimately takes may be dramatically different from the one they envisage at the start of their investigation.

“From the beginning of an investigation the team must be cognisant of the requirement to produce the final report. The report writing process must be well planned in advance and have allocated to it adequate resources.

“All investigation team members should contribute to the report and

✦ Aircraft wreckage is typically the most obvious source of physical evidence in an accident. DEFENCE

agree with the report findings and recommendations, and any dissenting views must be recorded.

“The construct, consultation and approval cycle, by its nature, is time consuming.

“Where a risk or hazard is identified early in an investigation that, without mitigation, could lead to recurrence, the team may issue an immediate safety action to command that removes or mitigates that hazard. Thereafter, the measured and accurate report, and its recommendations, takes time. The acceptance of the report by the appointing authority signals the completion of the investigative process.”

LCDR Whitehead has just completed a secondment to the Australian Transport Safety Bureau where he was lead investigator for a civilian helicopter crash, something which not only reinforced the close relationship between military and civilian investigative bodies, but further enhanced his considerable skill-set and preparedness for his current role.

With so much at stake a meticulous attention to detail and considerable patience are essential for an investigator.

The Growler investigation has now concluded. 🌀