

HAZARDS AT AVIATION ACCIDENT SITES

**GUIDANCE
FOR POLICE
AND
EMERGENCY
PERSONNEL**

Edition 7 2017



Australian Government
Department of Defence



Australian Government
Australian Transport Safety Bureau

GUIDANCE FOR POLICE AND EMERGENCY PERSONNEL



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Directorate of Defence Aviation
and Air Force Safety

Hazards at aviation accident sites

Guidance for police and emergency personnel

Edition 7 – June 2017

ISBN: 978-1-74251-318-8

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HAZARDS AT AVIATION ACCIDENT SITES

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Introduction

The first people to arrive at an aircraft accident site can render valuable assistance to minimise injury and loss of life, reduce property loss through damage and prevent the loss of clues and evidence that are vital to determining the reason for the accident.

Often, emergency services personnel (police, fire brigade and ambulance, and their Defence Force equivalents) are the first trained personnel to arrive at aircraft accident sites. This guide has been prepared by the Australian Transport Safety Bureau (ATSB) and the Directorate of Defence Aviation and Air Force Safety (DDAAFS) to assist these personnel to:

- understand the reporting requirements for military and civil aircraft accidents
- have an awareness of hazards at an aircraft accident site
- consider how to manage the various hazards
- understand the requirements of the *Transport Safety Investigation Act 2003* (TSI Act) and the *Defence Aviation Safety Manual*
- manage and control the accident site to preserve essential evidence necessary for the ATSB or DDAAFS to conduct an effective investigation.

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Role of first responders

There are three main components to the work of first responders to the scene of an aviation accident:

1. Reporting the accident to the ATSB or DDAAFS.
2. Coordination of the accident site including rescuing any survivors, managing fire and hazardous materials and ensuring that the site is secured.
3. Protection of the aircraft wreckage and associated evidence so that an effective investigation can be conducted.

This guide assumes that first responders will apply their own expert training to deal with victims, manage hazards and control the site. It offers specific advice that may be helpful in identifying and managing the particular hazards and risks associated with an aircraft accident. It also contains important advice about preserving evidence at the site.

While there are mandatory requirements in the *Transport Safety Investigation Act 2003* in regard to civil transport accidents, the guidance material contained in this document does not override specific policies or procedures developed by police, emergency services or other agencies, such as airport authorities.

What is an aircraft accident?

Civil: An accident for the purposes of this guide is covered under Part 1, Section 3 of the *Transport Safety Investigation Act 2003*.

An accident means an investigable matter involving a transport vehicle where:

- a person dies or suffers serious injury as a result of an occurrence associated with the operation of the vehicle; or
- the vehicle is destroyed or seriously damaged as a result of an occurrence associated with the operation of the vehicle; or
- any property is destroyed or seriously damaged as a result of an occurrence associated with the operation of the vehicle.

Military: An accident for the purposes of this guide is covered under the *Defence Aviation Safety Manual (DASM)*. An accident means an aviation occurrence that resulted in the loss/destruction of the Aviation System (that is, an aircraft) or the death of any person.

Role of the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government Statutory Agency governed by a Commission. It investigates transport safety occurrences in accordance with the *Australian Transport Safety Investigation Act 2003* (TSI Act). The ATSB is responsible for investigating incidents and accidents involving civilian aircraft. The ATSB is entirely separate from the Civil Aviation Safety Authority and Airservices Australia. The ATSB investigates to find out what happened and to disseminate safety messages aimed at preventing or minimising repeat occurrences. It does not seek to apportion blame or legal liability. The ATSB has powers under the TSI Act to secure the site of an accident and to preserve evidence associated with it.

The international standards and recommended practices for aircraft accident and serious-incident investigations are covered under Annex 13 to the Chicago Convention of 1944, to which Australia is a signatory.



Availability of ATSB investigators

The ATSB has aviation investigators on call 24 hours a day to respond to aviation incidents and accidents. If investigators attend the scene of an accident, it may take some time for them to travel to the location. First responders need to deal with the immediate aftermath of an accident, including rescuing and attending to survivors or removing bodies and dealing with fire and hazardous materials. The ATSB will be available by telephone to first responders on the ground to provide advice and make arrangements for the security of the site until ATSB investigators arrive.

In some cases the ATSB will conduct an office-based investigation that does not require physical attendance by ATSB investigators. The ATSB will provide advice to first responders and the aircraft operator as to the ATSB's requirements in this case.

Are all aviation accidents investigated?

Civil: No, the ATSB does not investigate all aviation accidents. Section 21 of the TSI Act defines the powers of the Chief Commissioner to investigate aircraft accidents. The ATSB selectively investigates serious occurrences including fatal accidents that it believes will yield the most useful safety benefits for the travelling public.

Sports aviation accidents: The ATSB may investigate sports aviation accidents and those involving amateur-built aircraft, particularly fatal accidents involving 'VH-registered' powered aircraft. The ATSB will not normally investigate accidents involving gliders or motor gliders, personal recreation balloon operations or non-VH registered aircraft unless the possible existence of a wider safety issue is indicated.

When the ATSB does not investigate, the ATSB will inform the appropriate sporting body and the police to that effect. In those cases, the police will normally coordinate the accident investigation.

The police may wish to utilise the expertise of the organisations involved in sports aviation to assist their investigation. These may include:

- Gliding Federation of Australia – www.glidingaustralia.org
- Recreational Aviation Australia – www.raa.asn.au
- Australian Parachuting Federation – www.apf.asn.au
- Australian Sport Aviation Confederation – www.asac.asn.au
- Australian Sports Rotorcraft Association – www.asra.org.au

Role of the Directorate of Defence Aviation and Air Force Safety

The Directorate of Defence Aviation and Air Force Safety (DDAAFS) was established under direction by the Minister of Defence, and is responsible for investigating all Australian military aircraft accidents (including accidents involving foreign military aircraft operating in Australia). DDAAFS is staffed by trained aviation safety investigators to independently investigate military aviation accidents and maintains a 24-hour rapid response Aviation Accident Investigation Team (AAIT) capability.

Noting DDAAFS is located in Canberra, the first military personnel to arrive at the scene of a military accident may be qualified safety personnel from the nearest military base that conducts or supports aviation. These personnel are normally authorised by DDAAFS to undertake certain on-scene activities until relieved by the arrival of the AAIT.

Are all Defence aviation accidents investigated?

All Defence aviation accidents will be investigated. Additionally, the relevant Defence controlling authority may direct a Court of Inquiry (COI) be formed to inquire into the circumstances of a military aviation accident. The COI is a legal process, separate from the accident investigation.

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Reporting aviation accidents to the ATSB and DDAAFS

Who must report an aviation accident?

Civil: Under the TSI Act and regulations, responsible persons such as the owner, operator or crew of the aircraft must report the accident immediately to the ATSB. However, sometimes the owner and/or operator may not learn of the accident until some time after the event. The crew may also be unable to notify the ATSB due to personal injuries. Therefore, anyone learning of an aviation accident should report the accident to the ATSB immediately, as well as alerting emergency services as required.

Too much information is never a problem!

It is possible that by the time you are advised of an accident, someone else may have already reported it to the ATSB or Defence authorities. Too much information is never a problem, so you should still contact the ATSB or Defence yourself as quickly as possible with your appraisal of the situation and provide as much information as possible.

How can I report?

CIVIL: All civil aircraft accidents must be reported to the ATSB via the toll free number: **1800 011 034**.

MILITARY: Contact the DDAAFS Duty Officer on **02 6144 9199**, or by other methods as detailed in this publication.

What the ATSB or DDAAFS need to know about the accident

You should immediately report as many of the following details as possible:

- Aircraft type, registration and other details:
 - **Civil:** For Australian civil aircraft this normally begins with 'VH' followed by three letters, that is, VH-ABC. If no VH prefix is apparent, the aircraft may be a foreign civil or a sports aviation aircraft. The registration may appear on the side of the fuselage (main body), the tailplane and the wings. There may also be

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operator details and aircraft type identification printed on the aircraft. In any case, provide as much information as possible. All information may be useful.

- **Military:** For Australian military aircraft, aircraft type, serial number, and side number. There may be an N prefix (Navy) or an A prefix (Air Force or Army) on the side of the fuselage (main body) as well as some form of squadron or unit identification on the fin/rudder combination. Foreign military aircraft may be identified differently, but as a rule military aircraft serial numbers are painted on either side of the fuselage.
- Date and time of the accident.
- Crew and passenger details:
 - Names of the pilot/crew and any other people on board, or
 - Name, rank, and service number of the crew members of a Defence aircraft.
- Extent of any injuries to the occupant(s) or others.
- Aircraft's last departure point and its destination.
- Location of the accident, including directions on how to reach the scene.
- Nature of the accident (phase of flight, mission, and description of occurrence).
- Extent of damage to the aircraft.
- Action taken to prevent disturbance of the wreckage until either ATSB investigators or authorised Defence personnel arrive.
- Name and telephone number of the originator of the advice.
- If possible without affecting other priorities, provide ATSB or DDAAFS one or two overview images of the accident site to aid planning.



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Accident site coordination and security

The first emergency organisation at an aircraft accident site could be a volunteer or permanent fire brigade, or a Defence fire service unit, which could call for assistance from other local brigade units. In any case, initiative and liaison are essential, particularly in the early stages when fireground control is critical.

As a rescue officer, you should be careful to avoid becoming a casualty yourself. In the heat of the moment and with the desire to alleviate suffering and minimise casualties, individuals sometimes place themselves at considerable personal risk of injury or death. By being cautious and aware of the hazards at aircraft accident sites, you will be better prepared for the tasks at hand. It is vital that any hazards are detected and secured.

1. Standard hazardous material HAZMAT procedures should be followed.
2. Detailed information about many of the hazards that may be encountered at civil or military aviation accident sites are contained in pages 14 – 30 of this guide.
3. You should familiarise yourself with this material before attending any accident site.

Site control

The site commander must secure all accident sites to prevent unauthorised persons from entering the area and to minimise damage to any ground scars left by the wreckage (which may provide valuable evidence to investigators). The secure area may vary depending on the spread of the wreckage and the terrain, but it should normally extend to at least 50 m from the edge of the wreckage. If the aircraft has



disintegrated in-flight, the wreckage may be scattered over a wide area and there may be a requirement for more than one secured site.

It is important to prevent unauthorised people from entering an accident site. Ensure that bystanders are kept outside an established zone of safety and upwind if possible. This is due to the need to ensure:

- respect for victims
- protection for valuable and important or classified equipment
- preservation of evidence to establish the factors that contributed to the accident
- minimisation of exposure to hazards.

When the ATSB or Defence investigators arrive on site they will coordinate with the site commander to arrange an appropriate time to take control of the site.

Rescue of personnel from wreckage and general site advice

Emergency services personnel should:

- follow their own established processes and procedures
- seek advice about any site or wreckage issues by contacting the ATSB or Defence as appropriate
- make themselves aware of potential site hazards described in pages 14 – 30 of this guide.

Note: Parts of this section provide guidance for non-trained personnel.

Without endangering yourself, rescue and care of survivors are the priorities at an aircraft accident site. If you see survivors in the aircraft and rescue seems possible, you should first consider the following issues:

Approaching the wreckage:

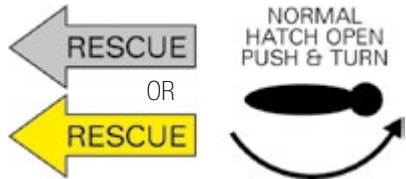
- Keep your eyes and ears open!
- Take particular care when approaching by vehicle. Try to avoid driving along the crash path. Occupants may have been ejected from the aircraft, and tyre marks and traffic can destroy valuable ground impact marks.

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- Protect yourself! Wear appropriate personal protective equipment (PPE), including gloves, eye and breathing protection as required.
- Approach from upwind (with the wind at your back) and downhill if possible.
- Be aware that if the aircraft has disintegrated in-flight, the wreckage and occupants may be scattered over a wide area.
- Be aware of power cables that might have contributed to the accident and may still be live.

Defence aircraft access points, (refer pages 27 – 30 on Defence site hazards):

- For rescue, the location of access doors, hatches, break-in points and cut-out panels are indicated on the external surfaces of military aircraft by a yellow arrow, bordered black (as illustrated). At access doors and hatches the arrow will indicate the external controls with the operating instructions for the controls nearby (see example).



- At break-in points and cut-out panels, the arrow will indicate an area delineated by a broken line (usually yellow). This area can be cut out to gain entry to the aircraft's interior if access doors are blocked or inoperative (see example).



- The position of any emergency equipment that is accessible from outside the aircraft is indicated by a silhouette with an associated description (see examples). If a first-aid kit is carried, its marking (see example) will be found adjacent to an access panel or exit from which the kit is accessible.



Aircraft occupant issues:

- Summon medical assistance if required and render first aid and care to survivors until medical personnel arrive.
- If you see evidence of a post-accident fire, or potential risk from explosion of fuels, pressure vessels or armaments, consider moving survivors a safe distance from the scene.
- Should survivors require immediate evacuation to medical facilities, they should ideally have equipment such as military/civil aircrew life vests removed before transport. These vests can contain hazardous materials such as stored pressure vessels and pyrotechnic devices. Place these in a safe location at the accident site.
- Attempt to account for all occupants if possible. If no one is in the wreckage it is possible that they may have survived and left the scene to seek assistance.

Exclusion zones and hazard prevention:

- To minimise the risk of inadvertent fire, establish a no-smoking zone around the accident site. Volatile/flammable materials such as fuel may have been scattered over a wide area.
- When using cutting devices, use caution to avoid igniting spilled fuel.
- To prevent the ingestion of harmful materials, including biological hazards, establish a no-eating zone around the accident site.



Dealing with the media and aerial exclusion zones (NOTAMS)

Media representatives must remain outside the secured area. Information about the names of casualties is only released by the appropriate authorities and this will happen only after next of kin have been informed by those authorities. The media should not be provided with access to take photographs of the survivors or the deceased. Care should be exercised in the use of mobile telephones or radios to discuss the accident or the personnel involved, as the media may be capable of monitoring communications frequencies. The news media may be prevented from flying over or hovering over the accident site in the interests of safety. A temporary restricted area (no-fly zone) may be established in accordance with section 44 of the TSI Act. This no-fly zone restricts flight above and around the site and is promulgated by means of a 'Notice to Airmen' (NOTAM). This zone will normally be a radius of 1 km and 500 ft vertically.

Civil: The ATSB may release information arising from a civil aviation accident investigation. ATSB investigators are authorised to answer media questions in factual terms at the accident scene during the early part of an investigation. Later releases of information relevant to the ATSB investigation must be cleared by the ATSB's media unit (telephone **1800 020 616**). Police or other organisations should confine their comments to their own work and follow the advice of their own media departments.

The ATSB will not release the names of the crew, passengers, or the aircraft owner. You can obtain the name of the aircraft owner from the Australian Aircraft Register on CASA's website at www.casa.gov.au. The coroner releases the names of the deceased persons and will often use the police as agents.

Military: The release of information arising from a military aviation accident investigation will be through the Defence Single Service Command Public Relations representative, assisted by Defence Media, part of Corporate Communication Branch (CCB). Accordingly, the Officer-in-Charge (OIC) of the AAIT and AAIT members are not authorised to answer any media questions regarding the accident during the early part of an investigation. Formal and subsequent releases of information relevant to the military investigation must be cleared through the appropriate Single Service headquarters, supported by CCB — 24-hour media liaison telephone number **0408 498 664** or **02 6127 1999** during business hours (7 am to 6 pm).

Recovery and salvage of the wreckage

Civil: After the on-site investigation is completed or if the ATSB decides that no on-site investigation will take place, the ATSB's Chief Commissioner through the Investigator in Charge (IIC) will advise the owner when the ATSB no longer requires control over the aircraft wreckage. The owner can then begin salvage or site clean-up. Often, the aircraft insurer is responsible for removing the wreckage and debris from the accident site.

If the coroner or any federal, state or territory government requires any item of wreckage for the purpose of their investigation, they must make a written request to the ATSB prior to the ATSB relinquishing control of the wreckage. In any case, the ATSB will offer the wreckage to the coroner and the Civil Aviation Safety Authority (CASA) prior to releasing it back to the owner.

If the ATSB needs all or part of the wreckage for off-site examination, the IIC will work with the owner to arrange for recovery. The ATSB is normally only responsible for costs that directly arise from the investigation.

Military: DDAAFS is responsible for military aircraft crash site mapping, and the DDAAFS AAIT will ensure adequate mapping is completed to satisfy Defence, the coroner and other agencies. After the on-site investigation has been completed, recovery and salvage of the aircraft, with associated costs, remains the responsibility of the Australian Defence Force (ADF). The AAIT and operating unit will initiate recovery and salvage action.



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Dangerous materials and site hazards

This section provides specific information about some of the dangers at an aircraft crash site. First responders should familiarise themselves with the content of this part and exercise caution when fulfilling their duties at an accident site.

General

Damage to modern aircraft can result in the presence of dangerous materials at an accident site, for example:

- harmful airborne matter such as carbon fibres or asbestos
- toxic materials that may inadvertently be inhaled or affect the skin
- potentially explosive devices such as oxygen bottles, high-pressure tyres, hydraulic accumulators and rocket-deployed parachute systems
- radioactive materials
- biological materials such as blood and human tissue
- for military aircraft, rocket-powered or explosive cartridge-powered ejection seats, pyrotechnics and unexploded ordnance stores
- for aerospace vehicles (which may also be involved in an accident on Australian soil) dangerous gases may vent for some time after landing or the vehicle may contain hazardous pyrotechnic devices or a radioactive power source.

Only those personnel essential to perform immediate actions to extricate survivors, protect the wreckage from destruction by fire or other causes, and prevent danger to other transport or the public should enter an accident site. Try to disturb the wreckage as little as possible, and if in doubt seek specialist advice from maintenance providers, owners, the ATSB or CASA. Special care should be taken at night when hazards are less visible.



Fuel

Aircraft fuels are a primary hazard in case of a post-crash aircraft fire. If ignited they pose danger to survivors, rescue and fire services personnel and others at an accident scene.

Aircraft fuels will come from one of the following groups:

- **Avgas** is a high-octane aviation petrol suited for piston-engined aircraft. It has a relatively low flash point and is highly flammable/volatile. Avgas is used in most civil general aviation aircraft.
- **Avtur** is the kerosene-type fuel used in all jet or turboprop aircraft and does not possess the low flash-point qualities of Avgas. However, when heated its flash point is reduced significantly. This fuel burns longer and more intensely than Avgas.
- **Diesel** is also used in some general aviation aircraft and has similar characteristics to Avtur.
- **Water Methanol** can be used in small quantities to provide extra power for some turboprop aircraft (for example Metro aircraft) in certain flight situations, such as take-off. This substance is alcohol-based and burns without a visible flame. If ignited during a crash, alcohol foam may be required to extinguish the flames.

**Warning: Water methanol is toxic.
Wear full PPE if this substance is suspected.**

Aircraft structures

Materials used in aircraft construction, if subjected to intense heat, can produce hazardous situations or develop toxic side effects.

Metals: Magnesium and aluminium metals in various mixtures are used extensively as structural components in aircraft, particularly where lightweight framing is used. In some aircraft, magnesium is used in wheel rim assemblies. It is also used in pyrotechnics. Magnesium burns with intense heat and radiates powerful light. Water should not be applied as an extinguishing agent to burning magnesium as an explosion may occur. Other hazardous metals such as cadmium, depleted uranium and beryllium are used in small quantities on some aeroplanes and helicopters and can be extremely toxic when exposed to fire or cutting equipment.

Composite materials: Composite materials such as carbon fibre, fibreglass and/or kevlar in epoxy resin are used increasingly in modern aircraft and equipment. When involved in a fire, these materials may

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give off toxic fumes and fibres may be released in the smoke plume. A significant composite material hazard for first responders is related to burnt carbon fibre, particularly in a high-speed impact associated with a simultaneous explosive fire. The small fibres released in this type of accident can be extremely hazardous if inhaled and have been compared to the effects of breathing asbestos fibres. Only personnel equipped with self-contained breathing apparatus (SCBA) or full-face canister respirators with appropriate cartridges should enter the accident site until all fires are extinguished and loose composite fibres suppressed. Composite materials can be suppressed in the short term by fire-fighting foam, but longer term suppression can be provided by spray-on acrylic floor wax (for example Johnson-Diversey, Vectra) or a similar product or poly-acrylic acid. Be aware that once a suppressant is applied it is only useful until the affected area is again disturbed. It must then be re-applied to that area. Whether burnt or not, damaged composite fibres and shards can easily puncture the skin. Handling of composite materials should be minimised and only undertaken with protective equipment such as leather gloves and safety glasses or a face shield.

Toxic gases and chemicals: Toxic gases are given off when some plastics and adhesives are burnt. After any fires have been extinguished, loose fibres should be avoided. Bear in mind that some materials used in aircraft construction may be rendered harmful after heating in a fire and then being extinguished with water. Their products may be strongly acidic (for example, fluoro polymers such as Viton O-rings used in some engines, which yield hydrofluoric acid), or dangerous to ingest (for example, some magnesium alloys or depleted uranium). It is imperative that all personnel at the accident site wash all exposed areas of skin before eating, drinking or smoking. Dust (or paper) masks cannot protect against toxic gases. Should emergency services personnel at the site exhibit respiratory distress or skin irritation, they should evacuate the site and institute HAZMAT (hazardous material) procedures.

Asbestos: Asbestos can be present in wheel brake pads and, in some older aircraft, as a heat shield such as in a firewall behind an engine or packed around the exhaust of a jet engine. It was also used in smaller quantities in high-temperature plastics and electrical wire insulation. It is uncommon in newer aircraft. Asbestos poses a risk when it is in the form of airborne particles so suppression with floor polish or similar wetting products limits the risk.

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Radiation hazards: Radioactive materials are used in military aircraft and weapons, as counterbalance weights (before the '80s, depleted uranium was used in early Boeing 747s, DC-10s, L-1011s and Boeing helicopters), and as a luminescent instrument/dial paint in some vintage aircraft. If a radiation hazard is known/suspected, contact the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for advice before handling.

High-pressure containers

When subjected to heat or damage, pressure containers and vessels may produce secondary explosions. These may include oxygen bottles (fixed and handheld), liquid oxygen and nitrogen containers, hydraulic accumulators, landing gear struts and tyres, fire extinguisher bottles (fixed and handheld), emergency equipment inflation devices, and pressurised Nightsun spotlight bulbs. Oxygen lines can run the length of an aircraft, and if broken or cut, can cause an explosion or fire. Tyres may be inflated to over 200 psi (1400 kPa).

Dangerous/hazardous cargo

Hazardous cargo may be present or scattered on the accident site. Keep your eyes open.

Electrical

Carbon fibres and some other composite materials are electrically conductive. Therefore, you should take care when operating portable electrical appliances near the accident site. It is possible that loose fibres may cause short circuiting of electronics and electrical equipment if disturbed. Aircraft batteries also represent an ignition source at an accident site, especially when large quantities of fuel have been liberated from the aircraft fuel tanks. If appropriately trained, disconnect the battery. Rescue helicopters are often fitted with rescue cable pyrotechnic cutting squibs. Where the aircraft has contacted powerlines, live wires may be present on the site and may be in contact with the wreckage.



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Fire extinguisher types and their uses

Using inappropriate fire extinguishers on certain types of fires can be ineffective or exacerbate a fire, increasing danger to personnel and equipment. Rescuers should seek expert guidance from trained firefighters before applying firefighting equipment directly onto aircraft fires.

Use of portable communications equipment

Due to the possible ignition of fuel or damaged ordnance by radio emissions, portable communications equipment should not be used in the immediate vicinity of the accident site.

Agricultural and aerial application aircraft

The chemicals carried by agricultural aircraft are normally secured in a hopper, located forward of the pilot's position. You should be aware that this chemical can spill in an accident. The chemicals carried are generally diluted, most often with water but some chemicals are diluted with spray oil, which may be flammable. Some chemicals are poisonous and can react with water to form poisonous gases. Often the presence of chemicals at the site is denoted by the strong smell and a coating on the surface of the ground along the accident trail.



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Approach the aircraft cautiously from upwind and from the opposite direction to the aircraft's flight path. Be aware of powerlines that may have caused the accident. These may still be live and may pose a threat to people at the scene.

Chemicals are packaged with a label and a Safety Data Sheet (SDS)—it is common for a pilot to carry the name of the chemical on the load sheet inside the cockpit; however, it is more likely to be with the loader-mixer (support crew) who may be nearby, or with the farmer. Both the label and the SDS will contain relevant information for emergency situations, including decontamination procedures and first aid.

Fertiliser is generally not a concern in terms of creating a hazard for emergency personnel. Seed is also not a concern to the safety of emergency personnel, other than as a fire risk. Some poisons are carried as bait pellets or granules that can be mistaken for fertiliser.

Aircraft engaged in firebombing operations may be carrying a red product called Phos-Chek or water and surfactant. Neither product should pose a threat to emergency personnel.

Dangers associated with aviation inflatable seatbelt restraints

This information is specific to the AmSafe Aviation Inflatable Restraints (AAIR®). Information and photos have been drawn from the AmSafe publication 'First-Responder Reference Guide'. Additional information should be obtained from AmSafe: www.amsafe.com

**For immediate incident support contact the
Airbag Support Hotline
+1 (602) 850 2787 (US)**

Inflatable seatbelt restraint systems are a self-contained (not connected to aircraft power systems), aircraft restraint system with an airbag built into the restraint webbing.

This airbag is designed to deploy in a significant accident to provide torso and head protection for aircraft crew and passengers.

The restraint system can be incorporated into three-, four- and five-point harnesses and may be installed in a variety of general and commercial aviation aircraft.

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The system consists of the following components:

- Electronic Module Assembly (EMA)—sensing system and power supply.
- Inflator Assembly—comprising a gas canister containing 6250 psi of compressed helium to inflate the airbag during an accident. When the gas is released into the Seatbelt Airbag Assembly via the inflator hose, the gas will be released at ambient temperature.
- Seatbelt Airbag Assembly (SAA)—an aircraft restraint system with the airbag built into the webbing to provide enhanced occupant protection during an aircraft accident.
- Interface Cable Assembly—a cable that connects the EMA, inflator and SAA.

The system is designed so that after deployment, the airbag will deflate in less than 10 seconds to ensure passengers trying to egress the aircraft are not blocked.

Scenario 1: Aircraft crash occurs, which causes the inflatable seatbelt restraint to deploy



When the system is deployed it is rendered inert because the helium-filled inflator assembly has expended its contents.

Note: Some aircraft have multiple seat placements. Depending upon the particular accident, all airbags may not have deployed.

Be sure to check all seat positions in the aircraft for inflatable seatbelt restraints.

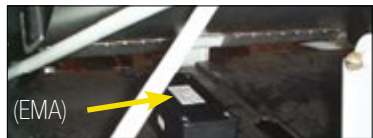
Basically, an inflatable seatbelt is distinguishable from a standard seatbelt restraint by its material covering over the airbag on the webbing (see arrows).

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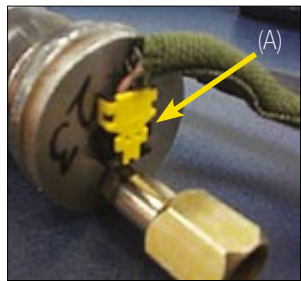
Scenario 2: The inflatable seatbelt restraint does not deploy following an aircraft crash

If an inflatable seatbelt restraint system has not deployed following an accident, be sure to follow the steps below to reduce the risk of deploying the system:

- Disconnect the cable assembly from the Electronic Module Assembly (EMA). The EMA is typically installed under the seat and in some cases is attached to or secured below the floor of the seat.



- Disconnect the connector from the Inflator Assembly, which is typically installed on, below, or just behind the seat.
- Locate the squib connector, squeeze connector sides to release. (A)
- If access to either of these connectors is not possible due to deformation of the seat assembly or the fuselage, it is acceptable to cut the cable that connects to the inflator assembly, or
- Access the SAA connector (yellow) to Cable Interface Assembly and disconnect by sliding the red locking tab backwards to the unlocked position, depressing the yellow tab, and then pulling apart both connector halves.



Red locking tab in LOCKED position

Yellow locking tab

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Scenario 3: Inflatable seatbelt restraint does not deploy and there is a fire following an aircraft crash

- If a fire occurs after an aircraft crash, the Inflator Assembly will autoignite at approximately 230° C (446° F) and will release the stored helium gas to render the system inert and reduce the risk of injury.

Note: The examples provided are indicative of the systems available in civil aircraft.

Ballistic parachutes

Non-pyrotechnic recovery parachute systems

Some whole-of-aircraft recovery parachute systems available use high-pressure compressed air as a propellant. These systems, such as those marketed by Second Chantz from the USA, use carbon fibre-wrapped high-pressure cylinders (3,000 psi to 4,500 psi) up to 1L in volume.

The high-pressure compressed air system incorporates an operating cable that can have a safety pin attached. Pulling the cable removes a pin from a check valve allowing the mechanical release of the pressurised bottle, which travels through the air. The moving bottle is attached to and deploys a recovery parachute.

The system can be drained of pressure by opening up a burst valve (7/16", or 1/8" end wrench) next to the pressure gauge and made safe, with no fire hazard. However, if unfamiliar with the unit, it is advisable to contact the manufacturer using the contact details below.

For questions relating to these systems contact:

Second Chantz USA (John Dunham): +1 (775) 315 0133 or email: john@secondchantz.com





Cirrus aircraft



Civil aircraft fitted with rocket-deployed emergency recovery parachutes

Some civil general aviation aircraft types are fitted with rocket-deployed emergency recovery parachute systems. These parachute systems are designed to recover the aircraft and passengers to the ground if a serious in-flight emergency arises.

The parachute rocket units contain rocket propellant and are a hazard at an accident site if the system has not been activated.

Mishandling or misidentifying these systems could prove fatal.

Systems currently used are mainly from the manufacturers Ballistic Recovery Systems (BRS) and Galaxy Recovery Systems (GRS). However, there are also parachutes from other manufacturers such as Magnum Ballistic Parachutes (MBP) and Junkers Profly that are installed in ultralight aircraft in Australia.

Aircraft types in Australia fitted with rocket-deployed emergency recovery parachute systems include the composite-structured Cirrus Design SR20 and SR22, Pipistrel Virus and Sinus and the Sting TL-2000. These aircraft are fitted with rocket-deployed emergency recovery parachute systems when manufactured. Other types, such as the Cessna 150/152, 172 and 182 series of aircraft can be retro-fitted with BRS systems. There are currently about 100 different mounting installations for ultra-light and other types of aircraft (such as hang gliders and gyrocopters) listed by BRS.

There is little consistency across aircraft types about warning markings on parachute systems and they are not always readily identifiable as a warning. Some carry black text warnings on the external fuselage while others have warning decals on windows adjacent to the parachute exit point.

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Cirrus aircraft warning decal



Pipistrel Virus aircraft warning decal



Rocket-deployed emergency recovery parachute systems are often cable-activated by the pilot via a red handle. The Cirrus Airframe Parachute System (CAPS) has a red CAPS Activation T-handle positioned in a recess in the cabin ceiling lining above the front seats.

The T-handle is concealed by a placard that must be removed before the handle can be pulled for CAPS operation, and has provision for a safety pin. This pin is normally removed by the pilot before flight. The GRS and BRS rocket-deployed parachute units in other aircraft types are activated in the same way.

If the parachute has not been deployed during an accident, a deformed fuselage can put the activation cable under abnormally high tension. This results in the activation device being ready to trigger by any further movement of the wreckage.

More recent Cirrus aircraft use the CAPS activation cable to electronically trigger the ballistic parachute system using aircraft battery power. These aircraft require both aircraft batteries to be

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disconnected following an accident so extreme caution is advised when approaching these aircraft in case the CAPS system should still be live.

BRS and Cirrus Design both indicate that the parachute's rocket will accelerate to well over 160 kph in the first one tenth of a second following activation. Rocket ignition temperatures are in excess of 260° C (500° F).

Aircraft accident sites are often contaminated with flammable materials and with flammable liquids, such as petroleum products, due to the destruction of aircraft integral fuel tanks in wings and fuselages.

Rescue organisations, police and investigators should be vigilant about the type of equipment used on site, including the use of mobile telephones, cutting equipment and flash-proof torches, as they could cause a fire. Any inadvertent activation of a ballistic parachute rocket could also present a direct ignition source for these materials and liquids, and could be hazardous for on-site personnel and accident survivors.

Personnel attending an accident involving an aircraft fitted with a rocket-deployed emergency recovery parachute system should always take appropriate measures to ensure their own safety. This may mean leaving the aircraft on site and cordoning it off until appropriate personnel arrive.



Cirrus aircraft CAPS activation handle and cover

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For further information about rocket-deployed parachutes:

- BRS Inc. publish a document for Emergency Personnel on its website:
brsparachutes.com/brs_aviation_home.aspx
- Cirrus Design Corporation; SR20, SR22, CAPS parachute information:

Australia:

Graham Horne
Mobile: 0408 983315
Email: ghorne@cirrusaircraft.com

USA:

Cirrus 24 Hour hotline: +1 (952) 988 1940 (international)
Air Safety Office: 8am to 5pm,
US Central Time +1 (218) 788 3400

Brad Miller
Manager Air Safety Investigations
Office +1 (218) 788 3625
Mobile +1 (218) 428 1074
Email: bmiller@cirrusaircraft.com

A DVD titled *Cirrus Airframe Parachute System, Advisory DVD for First Responders* is available from Cirrus Design. The DVD demonstrates the dangers associated with the CAPS fitted to the SR20 and SR22 at an accident site and can be accessed through the following link.

Note: viewing the information requires the insertion of the username and password provided below:

www.cirrusaircraft.com/flash.firstresponder
username: cirrus
password: CAPS

X-Air Australia; distributor for Sting TL-2000, Pipistrel Virus and Sinus aircraft and Galaxy Recovery Systems (GRS):

X-Air Australia
Gold Coast, Australia
Ph: 0418 168 665
Ph: 0417 040 052

Further reading for **first responders** of a more general nature is also contained in the US Federal Aviation Administration website:

www.faa.gov/airports/airport_safety/aircraft_rescue_fire_fighting/

Military site hazards

Military aircraft can be especially dangerous after an accident. If in doubt, remain clear of the wreckage.

- Stay clear of wing-mounted tanks, landing gear struts (Oleos) and pressure vessels. These assemblies can explode with devastating effect if disturbed following impact damage and particularly if fire is present.
- Many military jet aircraft such as the BAeS Hawk, some F/A-18 Hornet variants and the turboprop PC9/A trainer have ejection seats fitted. These aircraft also usually have an in-built explosives system for emergency jettisoning of canopies. You should be extremely careful when you see ejection seats among the wreckage. These must be treated as 'armed'. You should leave the 'safing' of ejection seat-fitted aircraft to trained personnel. However, if you urgently need to unstrap and remove survivors from an aircraft, use utmost care and avoid interfering with items colour coded with yellow and black stripes, (see page 29 and/or refer to ADF Publication AAP 6730.002 — *Aviation Accident WHS Manual* if held, for more detailed information on ejection seats and explosive canopies). Additionally, the DDAAFS Duty Officer (telephone 02 6144 9199) is available to assist.
- Systems requiring extra care in their operation or handling due to their containing an explosive device are indicated by a red or grey triangle.
- Further consideration should be given to personal weapons carried by aircrew and the potential for weapons and munitions to be carried as cargo within the aircraft.

In the event of a post-accident fire at a military aircraft accident site, care must be exercised due to the additional hazards likely to be encountered. These additional hazards depend on the aircraft type and are discussed below and need to be recognised for their potential lethality.

Avoid touching anything on the site unless absolutely necessary for rescue or safety reasons. Avoid working near or around running engines, propellers, jet intakes and exhausts at all times.

As with all accident sites, you should **AVOID CONTACT WITH BLOOD, BLOOD PRODUCTS AND PERCEIVED BIOLOGICAL HAZARDS.**

Military aircraft fitted with ejection seats and explosive canopies

Military aircraft such as the Hawk 127, turboprop PC-9/A and the PC-21, operated by the Republic of Singapore Air Force (RSAF) in Perth, are all dual-seat aircraft and have two ejection seats. The F/A-18 Hornet jet fighter can be a single-seat or dual-seat aircraft, depending on the variant, and so may have one or two ejection seats.

Most ejection seats are activated by a looped seat-pan initiating handle coloured yellow and black. That handle is normally located between the legs of the seat occupant.

When rescuing occupants from military aircraft fitted with ejection seats, you must be extremely careful to avoid injuring yourself and the seat occupant. Depending on the type of aircraft, as well as the ejection seats, the canopy will have either an explosive canopy jettison or canopy disintegration system fitted. These can be actuated to gain access to seat occupants, but are only used if the manual cockpit canopy opening system is inoperative.

Instructions on how to use the canopy jettison or canopy disintegration system will be printed next to their external controls. Read the instructions carefully. The canopy or canopy debris will be displaced violently when either system is actuated and can kill or injure unprotected bystanders.

If the manual canopy opening system is inoperative, no post-accident fire is evident, and the seat occupants do not appear to require immediate medical assistance, you should consider waiting for specialist military rescue personnel to gain entry to the cockpit area. If you successfully gain access to the seat occupants, **DO NOT RAISE, MOVE, PULL OR TAMPER WITH ANY HANDLES PAINTED YELLOW AND BLACK** on the ejection seats or anywhere else in the cockpit. These fire or eject the seat or some other safety device, posing extreme danger to yourself and any seat occupants.

Safety pins are normally fitted into seat parts to prevent accidental operation of explosive devices when the aircraft is not in use. It is unlikely that the safety pins will be in place. The ejection seats should always be considered to be armed until specialist military personnel advise otherwise. If possible, and with the assistance of crew members, insert safety pins into ejection seat systems to render them inoperable.

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The FA/18 aircraft has a SAFE/ARMED handle positioned on the extreme forward right side of the seat. This must be in the UP position before attempting to remove the seat occupant. To raise the SAFE/ARMED handle, squeeze the locking lever on the handle and rotate the handle up and forward.

Before attempting to remove seat occupants, remember to unfasten seat, shoulder and parachute harnesses, radio cords, oxygen leads and anti-G hose connections. Take extreme care to ensure that the yellow and black-coloured ejection seat actuating handles are not snagged when removing the seat occupant from the cockpit.

Note: These actions should only take place if absolutely necessary, where danger to the occupant is evident.



REMEMBER:

Spinal injury is common in accidents where the occupant has ejected.
Use care in handling casualties.

Military aircraft explosive stores hazards

Under broad headings, the following can be expected in military aircraft:

Explosive devices

Explosive devices will be present if the aircraft is fitted with ejection seats, canopy jettison/disintegration systems. Such devices will be concentrated in the cockpit area of jet fighter and trainer aircraft, which

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are currently operated only by the RAAF. Navy and Army helicopters fitted with winches, cargo hooks and/or sonar-reeling devices employ electro-explosive devices (within the winch/reeling facility and/or cargo hooks) to enable emergency jettison of the cable or load. Due care should be exercised when operating near this equipment. Some aircraft, mainly Navy, utilise emergency flotation devices in case of ditching. This equipment is generally located on helicopters near the outer central fuselage or on the skid landing gear and may present an additional explosive danger to personnel should they activate at an accident site. Aircraft fire bottles also contain explosive activation devices.

Pyrotechnics

Pyrotechnics will be present on most aircraft operated by the Australian Defence Force. They may consist of one or a mix of coloured signal flares, smoke-generating devices and light emission devices. Such devices will normally be found in the main cabin area of larger military aircraft, the cockpit of smaller aircraft types and on crew personal survival equipment.

Aircraft armament

Aircraft armament may be present in all military aircraft, although it is more likely on F/A-18 Hornet and BAE Hawk aeroplanes and the Tiger helicopter. With the engines not operating, these aircraft should only be approached from the rear, or a slight angle, until the absence of armament has been confirmed. Armament may consist of a single weapon or a mix of high-explosive bombs, rockets, missiles, machine guns and cannons. Normally these items are carried under the wings and will be self-evident. In the case of jet-fighter aircraft the cannon is fuselage-mounted. For helicopters, a door or nose-mounted machine gun or cannon may be fitted.

AP-3C Orion maritime patrol aeroplanes carry a variety of weapons and pyrotechnics. Bombs and rockets may be carried under the wings, while torpedoes and bombs may also be carried in the bomb bay situated under the fuselage just forward of the wings. Small explosive charges and pyrotechnics, such as flare cartridges and smoke markers, are stowed in the fuselage in the area of the main cabin door.

Accidental discharge of armament can occur through tampering with controls used to discharge the armament. Proceed with **EXTREME CAUTION** when extracting personnel or equipment located near

operational controls (that is, the control column or joystick), the instrument panel, or any button or lever coloured red or marked with black and yellow stripes.

Protection of the aircraft wreckage and associated evidence

The ATSB and Defence understand that police and emergency services personnel need to take immediate action when arriving at the scene. However, it is important that wreckage, ground scars and the accident site are disturbed as little as possible. This will assist investigators to determine the factors that contributed to the accident.

Preservation of evidence

Civil: Under Section 43 of the *Transport Safety Investigation Act 2003*, the ATSB may issue a Protection Order for the accident site. When a Protection Order has been issued, relevant personnel including emergency services will be notified. In such cases, no one can enter or interfere with the accident site unless authorised by the ATSB or where necessary to:

- ensure the safety of persons, animals or property;
- remove deceased persons or animals from the accident site (although this should only be done under police supervision);
- move the transport vehicle, or the wreckage of the transport vehicle, to a safe place (if there is a risk that significant evidence could be lost by leaving it in situ); and/or
- protect the environment from significant damage or pollution.

Military: Wreckage should not be removed unless permission is received from the Director, Defence Aviation and Air Force Safety, or the military AAIT. However, if safety is at risk of compromise if the wreckage is not removed as quickly as possible, then permission for such removal is not required.

Preventing further damage and unauthorised access

You rarely need to further disturb the aircraft wreckage once survivors or bodies have been removed. The pilot, crew, owner(s), media and insurance representatives will not have access to the site or wreckage unless the ATSB Investigator in Charge, or the DDAAFS OIC AAIT, approves. The aircraft and any of its wreckage at an accident site

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should be treated as if it were the property of either the ATSB or Defence. You should; therefore, prevent souvenir hunting. As a guide, police should look after the site as if it was a 'crime scene'.

When emergency services and those assisting a coroner to identify and remove the deceased have completed their activities, the ATSB or Defence may use police or other suitable personnel to secure the accident site, pending the arrival of the ATSB or Defence investigation team. If this security is in place, no one can enter or remain on the accident site without the permission of the ATSB Investigator in Charge or Defence OIC AAIT.

Disturbing the wreckage

If the wreckage must be disturbed, such as when freeing survivors or removing bodies, and it is likely that the disturbance may obliterate or alter any marks on the ground or evidence in the wreckage, always try to photograph, sketch, or mentally note the original state of the wreckage to assist with future investigation reference. This also applies to any safety harnesses inhibiting the removal of an individual or switches that need to be moved. As an alternative, safety harnesses can be left fastened and the belt carefully cut some distance from the buckle, thus preserving the evidence. Do not try to restore the wreckage to its original state unless the ATSB investigator, or the DDAAFS OIC AAIT, asks you to do so.

In inclement weather, you can protect and preserve vital areas such as the cockpit, lighter pieces of wreckage and ground scars by covering them with a tarpaulin. If coverings are not available, you can take photographs to record perishable evidence.

Carefully record, as soon as possible, the positions of any survivors/deceased in the aircraft wreckage. Bodies should only be moved under police supervision. If you need to remove a body before the pathologist arrives, first carefully record its position and posture and attach the record to the body.

Please note: It is not essential to the investigation for bodies to be left in situ until the arrival of ATSB investigators or DDAAFS.

Secure the wreckage, including any scattered wreckage away from the main accident site, and any of the aircraft's contents or papers against loss or further damage.

Flight recorders

Flight recorders provide vital but perishable evidence of a flight's last moments. Unless authorised by ATSB or DDAAFS investigators, these units are not to be moved or accessed.

Preserving electronic evidence

Many modern aircraft systems can include stored electronic information that may be vital to the investigation and should be preserved. This information is carried on computer chips that can be sensitive to heat, shock, and electronic fields.

Portable electronic devices such as computers, telephones and global positioning system (GPS) navigation devices may also contain valuable stored information. Although these devices may appear to have been destroyed by the accident and any subsequent fire, their computer chips may still yield valuable information for the investigation. If possible, don't move this material until an ATSB or DDAAFS investigator can provide technical advice. It is realised, however, that care and respect towards the victims of an accident have immediate priority and this may make it difficult to preserve some evidence.

Remember: If evidence must be disturbed before an ATSB or DDAAFS investigator arrives, any photographs or detailed documentation that can be made available may be vital in determining the factors that led to the accident.

Recording details of witnesses to an accident

Witnesses are extremely important in helping determine the factors that contributed to the accident. Preliminary witness recollections detailing first reactions can be valuable to investigators and will normally be untainted by reflection, rumour or exposure to the news media.

Information that should be recorded from witnesses includes:

- witness names, addresses (telephone numbers)
- position from which the witness observed the event
- time of the accident
- weather conditions at the time of accident
- direction that the aircraft was heading and what it appeared to be doing

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- an estimate of the aircraft's height (estimate of angle above surrounding terrain from the observer's position using trees and buildings as a reference where appropriate)
- if smoke or fire was observed in flight
- what sounds were heard
- what was the aircraft's impact angle
- if any objects fell from the aircraft before impact
- if objects did fall from the aircraft, what the flight path of the aircraft was at the time (that is, level, climbing, diving).

Legal and coronial matters

Coronial enquiries

The ATSB and Defence will always assist, when requested, in a coronial inquiry relating to an aviation accident. ATSB investigators will attempt to contact the coroner through the attending police officer during the early stages of the investigation.

Coroners may request wreckage custody and any other item carried on the aircraft at any stage of their investigation. If custody is requested in writing, the requested items would normally be released on completion of the ATSB's investigation.

The Coroner's Office should be contacted on all matters relating to an inquest or inquiry. Coronial services can also offer face-to-face assistance and advice and some coronial jurisdictions provide grief counselling and other support by trained professionals.

Police officers preparing material for a coronial inquiry should be aware that it may be some time before the ATSB and Defence complete their investigations and the findings of the investigation are released. For most investigations, the ATSB will generally release a web update covering verified factual information, usually within 30 days of the accident.

Coordinating with police enquiries

Civil: The ATSB report is for the purpose of safety and prevention of recurrence of accidents and cannot be used in civil or criminal proceedings.

Aviation safety information attracts substantial protection under the TSI Act. For example, sensitive safety information known as Restricted

Information cannot be disclosed for the purpose of a criminal inquiry. This is because, in the interest of future safety, the ATSB requires ready access to all evidence and if used for the purposes of blame, or to determine a liability, such information or evidence may not be so fully available in the future. Organisations that ascribe blame or liability must undertake their own separate investigation. If necessary, the ATSB may appear as an expert witness in any coronial inquiry.

If an aircraft accident is subject to other police inquiries (for example, for the information of a coroner or a criminal investigation), the ATSB will assist where possible, within the constraints of the legislation, provided this does not compromise its own investigation. If early evidence suggests the accident was the result of unlawful interference such as sabotage, the police would normally direct the investigation and the ATSB would not investigate.

Military: If an aviation accident is subject to other police inquiries (for example, for the information of a coroner or a criminal investigation), the OIC AAIT will assist where possible provided this does not compromise its own investigation. If early evidence suggests the accident was the result of some criminal act, Defence would cooperate and investigate as appropriate and as agreed with police authorities.

It is Defence's contention that military aviation safety investigations are conducted to determine the cause(s) and prevent further accidents. Therefore, the OIC AAIT, and team members are responsible for providing a report to the Convening or Appointing Authority requiring the accident investigation.

The DDAAFS OIC AAIT should not appear as an expert witness in any coronial inquiry. Defence Inquiry Regulations provide for the formation of a military COI, which completes a formal report.

Evidence collected by an AAIT during an aviation safety investigation is usually not collected in a form readily usable in a court of law. AAIT members, for example, do not take formal statements under the rules of evidence from witnesses. This is because, in the interest of future safety, the DDAAFS requires ready access to all evidence. However, a military COI may take statements under the rules of evidence from witnesses. Organisations that may wish to ascribe blame or liability must undertake their own separate investigation.

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FIXED WING

Name	Tail No.	MAX Crew	MAX PAX	Ejection Seat	Fuel	Engine Oil	Hydraulic Oil	Oxygen
B350	A32-XXX	2	10	X	AT	✓	✓	G
BBJ 737	A36-XXX	8	36	X	AT	✓	✓	G,P,GG
Challenger	A37-XXX	4	9	X	AT	✓	✓	G,P
CT4B	CR	2	0	X	AG	✓	X	X
C130H Hercules	A97-XXX	5	92	X	AT	✓	✓	L,P
C130J Hercules	A97-XXX	4	126	X	AT	✓	✓	L,P
F/A-18 Hornet	A21-XXX	2	0	✓ 1or 2	AT	✓	✓	L
Hawk	A27-XXX	2	0	✓ 2	AT	✓	✓	OBOGS, G
KC-30A	A39-XXX	14	270	X	AT	✓	✓	G, P, Chem
AP3-C/P-3C Orion	A9-XXX	20	0	X	AT	✓	✓	G, P, EPOS
PC-9/A	A23-XXX	2	0	✓ 2	AT	✓	✓	G
RSAF PC21	9-XXX	2	0	✓ 2	AT	✓	✓	OBOGS, P
Scan Eagle	N/A	0	0	X	✓ see note	X	X	X
Super Hornet	A44-XXX	2	0	✓ 2	AT	✓	✓	OBOGS,G
Wedgetail	A30-XXX	13	8	X	AT	✓	✓	G, P, Chem
C17 Globemaster	A41-XXX	7	126	X	AT	✓	✓	G, P, Chem
Shadow	A43-XXX	0	0	X		✓	X	X
F-35A JFS	A35-XXX	1	0	✓	AT	✓	✓	OBOGS,G
C27	A34-XXX	3	46	X	AT	✓	✓	L,P
Heron	A45-XXX	0	0	X	AG	✓	X	X
P-8A Poseidon	A47-XXX	12	10	X	AT	✓	✓	G, P, EPOS

NOTE: High Octane 2-stroke

ROTARY WING

Black Hawk	A25-XXX	4	10	X	AT	✓	✓	X
Chinook CH-47F	A15-XXX	4	30	X	AT	✓	✓	X
Kiowa	A17-XXX	2	3	X	AT	✓	✓	X
MRH90	A40-XXX	4	18	X	AT/AC	✓	✓	X
S70B-2 Seahawk	N24-XXX	3	10	X	AT/AC	✓	✓	X
AS350B Squirrel	N22-XXX	2	4	X	AT/AC	✓	✓	X
Tiger ARH	A38-XXX	2	0	X	AT	✓	✓	X
RSAF Super Puma	220-XXX	4	22	X	AT	✓	✓	X
Bell 429	N49-XXX	3	5	X	AT	✓	✓	X
MH-60R	A48-XXX	3	2	X	AT	✓	✓	X
EC135T2	N52-XXX	2	5	X	AT/AC	✓	✓	X

1=1 seat 2=2 seat Mod=Module AC=AVCAT AG=AVGAS AT=AVTUR G = Gaseous
 P = Portable L = Liquid Chem = Chemical Oxygen System EPOS = Emergency Postable Oxygen

The following table highlights the hazards associated with the ADF's current aviation inventory. Several Republic of Singapore Air Force (RSAF) aircraft have also been included as they are based in or regularly operate within Australia. Civilian or other foreign military variants of these aircraft are likely to have different equipment fitted.

Radio-active material	Composite Material	Batteries	Explosive Ordnance	Extinguishers	Pressure cylinders	Alloys	Life support
✓	✓	Pb	✓	F,P	✓	✓	✓
✓	✓	NC	✓	F,P	✓	✓	✓
✗	✓	NC	✓	F,P	✓	✓	✓
✗	✓	PB	✗	P	✗	✓	✗
✓	✓	Pb	✓	F,P	✓	✓	✓
✓	✓	NC	✓	F,P	✓	✓	✓
✓	✓	Pb, A, Li, NC	✓	F	✓	✓	✓
✓	✓	Pb, A, Li, NC	✓	✗	✓	✓	✓
✓	✓	A, Li, Pb	✓	F, P	✓	✓	✓
✓	✓	Pb, A, Li	✓	F,B	✓	✓	✓
✓	✓	NC, A, Li	✓	✗	✓	✓	✓
✗	✓	Li, Pb	✓	✗	✓	✓	✓
✗	✓	Li	✗	✗	✗	✗	✗
✓	✓	Pb, Li	✓	F	✓	✓	✓
✗	✓	Li, Nc	✓	F, P	✓	✓	✓
✗	✓	NC, Li	✓	F, P	✓	✓	✓
✗	✓	Li	✓	✗	✗	✓	✗
✓	✓	Pb, Li	✓	F	✓	✓	✓
✓	✓	NC, Li, A	✓	F, P	✓	✓	✓
✓	✓	NC	✗	✗	✓	✓	✗
✗	✓	Pb, NC, Li	✓	F,B	✓	✓	✓

✓	✓	Pb, A, Li	✓	F,P	✓	✓	✓
✓	✓	NC, A, Li	✓	F,P	✓	✓	✓
✓	✓	NC, A, Li	✗	P	✓	✓	✓
✗	✓	NC, Li	✓	F, P	✓	✓	✓
✓	✓	Pb, A, Li	✓	F,P	✓	✓	✓
✗	✓	NC, A, Li	✓	F	✓	✓	✓
✓	✓	NC, A, Li	✓	F,P	✓	✓	✓
✗	✓	NC	✓	F,P	✓	✓	✓
✓	✓	Pb, Li	✓	F,P	✓	✓	✓
✓	✓	NC, Li, A	✓	F, P	✓	✓	✓
✗	✓	NC, Li, Pb	✓	F, P	✓	✓	✓

OBOGS = On-board Oxygen Generation System A = Alkaline Li = Lithium NC = NiCad PB = Lead Acid/Gel
 F = Fixed in Airframe P = Portable handheld CR = Civil registered ✓ = Fitted ✗ = Not fitted

**TO REPORT AN
AVIATION ACCIDENT
TELEPHONE:**

CIVIL



Australian Government
Australian Transport Safety Bureau

Ph: 1800 011 034

MILITARY



Australian Government
Department of Defence

Ph: (02) 6144 9199

24hrs, 7 DAYS A WEEK

**Australia-wide
Poisons Information Centre:
13 11 26**