AUSTRALIAN DEFENCE FORCE
Aviation Safety
Occurrence Investigation
INVESTIGATION is a fundamental part of the Defence Aviation Safety Management System and when occurrences happen, trained people and appropriate processes must be in place to investigate those occurrences.

An investigating officer must be a skilled operator, able to collect and analyse information to discover the causal factors involved and the risks, hazards and controls that are present.

The development of safety recommendations is a critical element in our response to an occurrence. Whether investigating an incident, serious incident or accident, safety recommendations can prevent recurrence and improve safety performance. Indeed, the lessons learnt from a unit-level incident investigation will be just as critical in preventing further incidents as those recommendations developed by a highly skilled investigation team investigating an accident.

The information in this booklet is aimed at the unit Aviation Safety Officer or by those investigating unit-level incidents but can be used by any investigator.

The information in the booklet is drawn from the Defence Aviation Safety Manual (DASM) and I encourage you to refer to it during an investigation.

GPCAPT JOHN GRIME
DIRECTOR DEFENCE AVIATION AND AIR FORCE SAFETY

ABOUT THIS GUIDE

This guide is intended to aid the ASO or investigator in the conduct of unit-level investigations. It steps the user through the initial actions, the investigation process, and reporting.

IMPORTANT: This guide is not an accident investigation manual. Any questions regarding the content of this guide should be directed to the next ASO up in the chain of command in the first instance or DDAAFS Deputy Director Safety Investigation (DDSI). Any suggestions or corrections to this booklet should be directed to DDAAFS.

CONTACTS

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AVIATION ACCIDENT NOTIFICATION (24 HRS & 7 DAYS A WEEK)

DDAAFS Duty Officer  02 6144 9199
ATSB Duty Officer    1800 011 034
## CONTENTS

Investigation ........................................................................................................... 7
Initial actions ............................................................................................................ 9
Investigation process ................................................................................................. 10
Occurrence definitions .............................................................................................. 11-12
Initial reporting ......................................................................................................... 13
Investigation flowchart .............................................................................................. 14-15
Evidence .................................................................................................................. 16-21
Analysis .................................................................................................................... 22
Findings ..................................................................................................................... 23
Contributing factors ................................................................................................... 24
Occurrence sequence ................................................................................................. 25
Defences .................................................................................................................... 26
Safety outcomes ......................................................................................................... 27
Reporting ................................................................................................................... 28-29

## DAHRTS CONTRIBUTING FACTORS

Organisational influences ....................................................................................... 30
Pre-conditions for unsafe acts ................................................................................. 31
Unsafe acts or conditions ......................................................................................... 32
Defences .................................................................................................................... 33
**INVESTIGATION**

**WHY**

At a basic level we investigate aviation safety occurrences to determine: WHO, WHAT, WHEN, WHERE, HOW and WHY. But the underpinning reason for an investigation is:

To identify and eliminate system deficiencies and improve system controls to PREVENT RECURRENT.

**COMMAND**

Investigation of aviation safety occurrences should take precedence over all other types of investigation (for example, ADF Investigative Service (ADFIS) or Major Investigation Team investigation), until such time as the appointed investigating officer is satisfied that any immediate safety issues have been identified and all information required to formulate recommendations to prevent a recurrence has been obtained.

In the course of investigating a safety occurrence, should the investigator become aware of any activities that may constitute a Notifiable Incident, they must inform the applicable commander (for example, unit CO et cetera) of their findings and seek guidance.

**PRINCIPLES**

All investigations of Defence aviation safety occurrences should be conducted using the following principles:

- The sole intent is to prevent recurrence.
- The investigation should be commenced as soon as practicable.
- The size and scope should be commensurate with the classification and scale of the occurrence, and the anticipated safety outcomes.
- The investigation should follow a structured process.
- Investigation should determine all factors that contributed to the occurrence, so that appropriate and effective action can be taken to prevent recurrence.

These principles have been developed over many years of aviation accident investigations and have been adapted for the ADF aviation context. Use of these principles ensures that investigations achieve the best safety outcomes, standardisation of reports and facilitation of trend analysis.
INITIAL ACTIONS

CHECKLIST

1. PLAN AND ACT

2. DETERMINE THE INITIAL FACTS
   What happened? When did it happen? Where did it happen? Who was involved?

3. IS THIS AN OCCURRENCE? IF SO, WHAT CLASSIFICATION IS THE OCCURRENCE?
   (see pg 11 of this guide) DASM S3C8

4. WHO NEEDS TO BE CONTACTED?
   • Unit aviation safety personnel • supervisor (flight commander, senior maintenance manager) • executive officer
   • commanding officer • wing, regt or fleet ASO • DDAAFS Safety Investigation • DDAAFS duty officer • higher?
   * (Immediate Safety Report DASM S3 C8 Annex C)

5. IMMEDIATE SAFETY IMPLICATIONS
   • Are there any immediate safety implications to unit personnel, external units or third parties?
   • Make the site safe.
   • Ensure that personnel are adequately protected from any hazard.

6. QUARANTINE EVIDENCE AS REQUIRED

7. APPOINTMENT AS AN INVESTIGATING OFFICER

8. WHO NEEDS TO INVESTIGATE? WHAT PARTS?
   • operations • air traffic control • maintenance • engineering
   • ancillary operations, for example fuel.

9. ARE THERE IMMEDIATE SAFETY IMPLICATIONS FOR OTHER AIRCRAFT/USERS/UNITS?
   • Immediate safety report, and /or hot-issues brief.
   • Other agency reporting (COMCARE, ATSB, ARPANSA, ISS).
   (Ref DASM 53CB)

10. ENTER INITIAL DATA INTO DAHRTS
    This fulfills the seven-day notification requirement, giving you one calendar month from the occurrence date to complete the investigation.

*All accidents and serious incidents (including incidents upgraded to serious incidents) are to be reported to the DDAAFS Duty Officer ASAP.
1 Consult AAP 6730.002 Aviation Accident Work, Health & Safety Manual
**INVESTIGATION PROCESS**

**DID AN AVIATION SAFETY OCCURRENCE HAPPEN?**

Note: Refer to DASM Section 3 Chapter 8 for a definition of an Aviation Safety Occurrence

**YES**

**DID IT INVOLVE A MANNED AVIATION SYSTEM OR CATEGORY 1 UAS?**

**NO**

**ACCIDENT**

DDAAFS investigation

**YES**

* Did the occurrence result in:
  - A fatality
  - Mid-air collision

**SERIOUS INCIDENT**

Independent investigation (DDAAFS/FEG/ wing/ regiment)

**YES**

* Did the occurrence result in:
  - Loss of the UAV
  - The UAV sustaining unreparable damage
  - Damage to property
  - Serious personal injury

**INCIDENT**

Unit-level investigation

**NO**

**EVENT**

No safety investigation required. Complete initial reporting phase as required

**NO**

**OCCURRENCE – DEFINITIONS**

**CLASSIFICATIONS**

How serious an occurrence is determines who will investigate. The selection of the most appropriate occurrence classification is vital. Under-classification can lead to inadequate resources being assigned to an investigation.

The occurrence classifications contained in the DASM may not always cover every specific instance: to specify every single situation and give a definite answer would result in a large, unwieldy document. Instead, DDAAFS relies on the judgement of the safety chain of command to correctly select an appropriate classification.

Sometimes organisations will underestimate the seriousness of an occurrence, usually because they do not consider the occurrence in terms of the wider ramifications that it may have and stick rigidly to the classifications as written in the DASM.

This under-classification is usually found in the serious incident classified as an incident or incidents classified as events.*

When determining what classification you are faced with, start at the highest classification and work towards the lowest (event). If there is some doubt, err towards the higher classification and consult your safety chain (unit, wing, regimental or fleet ASO) or call the DDAAFS duty officer for advice.

**ACCIDENT: An accident is an occurrence that resulted in loss/destruction of the aviation system or death of any person.** This will be investigated by a DDAAFS Aviation Accident Investigation Team.

**SERIOUS INCIDENT: A serious incident can be thought of as almost an accident.** The difference between a serious incident and an accident lies only in the outcome — the aviation system was not lost/destroyed nor was there any loss of life but it almost happened. This will most likely be independently investigated by DDAAFS or wing/regiment ASO. DDAAFS must be consulted in the process of deciding who will investigate a serious incident.

*Then Category 2 UAS assumed. Large Cat 3 UAS (generally those above 7kg MTOW) may also follow this flow but with modifications and exclusions outlined in relevant OIP. Small Cat 3 and Cat 4 UAS safety hazard occurrence reporting is to be in accordance with the defined reporting requirements of the systems’ Unmanned Aircraft System Operating Permit or relevant OIP.

**Note:** Occurrence classification determination requires consideration of all systems involved. For example, a near mid-air collision between a UAV and a manned aircraft is a serious incident because of the level of safety compromise to the manned aircraft.

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*For events, DAHRTS does not provide separate fields to enter investigation results; any evidence collected or analysis conducted should be recorded in the narrative and supervisor’s comments as appropriate.*
OCCURRENCE – DEFINITIONS

INCIDENT: An incident can be thought of as an occurrence that did affect or could affect safety or airworthiness, but the outcome was not serious (that is, injuries, if any, were not serious, and damage, if any, was repairable in less than 14 days). Unit investigation.

EVENT: An event can be thought of as an occurrence that did not affect safety or airworthiness but is worthy of capture, as any repeat occurrences may indicate a wider problem necessitating investigation and possible remedial action. Managed at unit level where resources (time/personnel) and anticipated safety outcomes dictate.

Tips
- Start at the accident level and work downwards to avoid under-classifying the occurrence.
- If in doubt, default to the higher level occurrence type.
- If still in doubt refer up your safety chain (unit, wing, group, regiment or fleet ASO).

INITIAL REPORTING

Conduct the necessary notification reporting IAW DASM Section 3 Chapter 8.
- Immediate Safety Report.
- ASOR and possibly, Sentinel, Comcare, ATSB or ARPANSA reporting – Notification*.

Include factual information:
- What happened.
- When.
- Where.
- Who (de-identified).

Hazard narrative:
- The hazard narrative should be a concise paragraph describing the facts of what happened.
- It should not contain analysis of why the occurrence happened.
- The hazard narrative can be amended at any time during the investigation and review cycle of the ASOR.

Supervisor: SASOR to follow.
CO: SASOR to follow.

Once initial reporting is complete, you now have one calendar month (starting from the occurrence date) to investigate and complete reporting.

*For Comcare and ARPANSA reporting, see Sect 3, Chap 8 Annex G for requirements.
**Determine occurrence classification**

(\textit{DASM} SECTION 3 CHAPTER 8)

\begin{itemize}
  \item \textbf{ACCIDENT} \quad AAIT appointed (DDAAFS investigation)
  \item \textbf{SERIOUS INCIDENT} \quad AAIT appointed (Independent investigation)
  \item \textbf{INCIDENT} \quad Investigating officer appointed
  \item \textbf{EVENT} \quad Possible investigation
\end{itemize}

\begin{itemize}
  \item AAIT/BOI process (\textit{DASM} Section 3 Ch 9)
  \item Terms of reference established by the appointing authority
      Normally only for Serious Incidents. (\textit{DASM} Section 3 Chapter 9)
\end{itemize}

1. Determine initial facts: Who, what, when, where.

2. Quarantine physical data/information: Quarantine aircraft/systems/equipment/tools, recorded data, documents, briefing material, POL samples, et cetera; take photos/video as appropriate; identify witnesses.

3. Gather data/information: Gather data/information relating to environment, organisation, personnel, procedures, materiel, equipment, facilities.

4. Establish an occurrence sequence of events: Establish an initial timeline-based sequence of events to help in the analysis of the occurrence and identify further potential lines of enquiry that may need to be pursued.

5. Conduct analysis: Analyse data/information to identify safety critical events and ask WHY? to determine unsafe acts; local conditions; organisational factors; inadequate, absent and effective defences.

6. Compile findings: Compile concise statements of conclusion based on analysis of the data/information.

7. Determine contributing factors: Identify findings that are contributory to the occurrence and assign appropriate contributing factors from the DAHRTS taxonomy.

8. Confirm sequence of events: Conclude the most probable sequence of events based on findings.

9. Draft actions: To prevent recurrence, recommend actions to the appointing authority to eliminate or reduce the risk of identified hazards/system deficiencies.

10. Frame recommendations: To prevent recurrence, recommend measures that can be taken by external agencies or a higher authority, for appointing authority endorsement, to eliminate or reduce the risk of identified hazards/system deficiencies.

Complete ASOR & advise supervisor

\textbf{Note}: Avoid making early, snap judgements. The investigation steps are depicted in a particular sequence. However, in reality, the investigation process is iterative and may contain smaller cycles of information gathering, analysis, event sequence development, before arriving at the final results.
There are many models that can help the investigator in determining what areas of a system may require investigation and where to look for evidence. The SHEL model was developed in the 1970s and provides a holistic look at a complex system. The model was later updated with a second Liveware to become the SHELL model in the 1980s.

**C–SHELL model**

The C–SHELL model is a good place to start in any investigation or analysis of an issue — it helps get information organised and may help the investigator appreciate the overall situation.

- **Culture** (Trade/Mustering, Crew, Unit, Service)
- **Software** (computer software, publications, et cetera)
- **Hardware** (tools, aircraft et cetera)
- **Environment** (includes workspace)
- **Liveware** (other personnel)
- **Liveware** (crew)

**Culture**

Individuals and groups develop shared beliefs, values and norms to make sense of the organisation in which they work. An organisation’s culture provides a powerful influence on the way members think, feel and behave.

- What is the safety culture in the unit?
- How does the culture influence the task at hand?
- Are there any undesirable group norms?

**Software**

This category includes documentation such as maps, charts, standard operating procedures, checklists, let-down procedures, standing instructions (SIs) and aircraft flight manuals.

- Was the documentation up to date, fit for purpose?
- Was the information available to the personnel?

**Hardware**

All physical aspects of the aircraft and associated equipment.

- Was the equipment serviceable, suitable?
- Were tools/spares available/authorised/appropriate for use?
- Did the work place constrain access to, or operation of, the equipment?

**Environment**

Look at how each element of the model interacted with the crew or each other and investigate any areas of deficiency or importance.
Recorded evidence
There are several sources of recorded evidence that may be available to the investigator. Some of this is perishable and may be erased through normal maintenance or operational activities (maintenance downloads or simply removing aircraft power). Steps must be taken to preserve this evidence.

Sources include:
- Crash data recorders (cockpit voice and flight data recorders): Note, data is strictly controlled. See current directives and orders.
- On board recordings (usually CVR but can be personal devices).
- Mission or maintenance data recorders. What is on your platform?
- Air traffic control voice and/or radar tapes/records.
- Access swipe cards log work start and finish times.
- HUD/helmet/radar/EW recordings.
- GPS data.
- Briefing boards/notes or partial procedures trainers (PPT).
- Any photos or video taken by witnesses/bystanders.

Interviewing
An interview elicits information from the witness. An interview is the process where the interviewers are attempting to obtain useful information from an interviewee about a particular event and/or other issues.²

Who: Anyone who can shed light on the incident.
When: As soon as practicable.
Where: A quiet, private place or if possible where the incident took place.

The main interviewing tool used in the ADF safety arena is cognitive interviewing developed by psychologists in the 1980s and 1990s. This technique uses specific questioning techniques to assist recall what they saw.

Cognitive interview technique
A very good resource: Interviewing Guidelines for Safety Investigations, developed by the ATSB is available from the DDAAFS intranet site: http://drnet.defence.gov.au/raaf/DDAAFS/Pages/ASO%20Safety%20Resources.aspx

Another useful tool for ensuring the success of interviews is the PEACE model. This model frames the cognitive interview technique and provides a sound environment for the investigating officer:

P Planning and preparation (working out what you will ask).
E Engage and explain (tell the interviewee what you want to achieve and make them comfortable).
A Account (getting the information out of them, using various cognitive interviewing techniques).
C Closure (closing the interview, ensuring interviewee needs are met).
E Evaluation (determining the utility of the information you have received).

Each of these resources should be examined and utilised to ensure that the best result can be obtained.

² Some Interviewing Guidelines for Safety Investigations, Mike Walker, ATSB 2004
**Interviewing tips**

The following tips are integrated into the PEACE model introduced earlier:

**Planning/preparation**
- The interview should be centred around the interviewee.
- Become familiar with the event.
- Determine what you plan to achieve.
- Is the interview location: private, free from interruptions, comfortable?
- Prepare your main questions or interview structure in advance: but be flexible.

**Engage and explain**
- Introduce yourself and others.
- Explain what you are trying to achieve.
- Explain the aim of the investigation.
- Explain the use of any recording devices and obtain permission.

**Account**
- Let the interviewee tell their story first.
- Don't interrupt.
- Initially use open, simple and unbiased questions.
- More direct questions are used to clarify or gain detail later in the interview.
- Use models to help the recollection.
- Visit the scene if appropriate and/or possible.

**Closure**
- Check interview against your original plan.
- All questions answered? At least for now.
- Check if interviewee requires copy of any recording.
- Does the interviewee have any questions?
- Finish on a positive ending.

**Evaluation**
- Write up interview ASAP, especially if not recorded.
- Determine areas for clarification or follow-up.
- Follow up interview required?

The ATSB interview guide has many more tips and techniques and goes into considerable detail for each of the areas above. As such the ATSB guide is considered an excellent resource and investigators are encouraged to make themselves familiar with the guide.
Analysis is the process of taking the evidence and sorting through it to arrive at a logical conclusion of what occurred. The analysis phase involves reviewing and evaluating the available information and converting it into a series of arguments to produce a series of relevant findings. Analysis must be a process founded on sound logic. That is, there is a clearly demonstrable link between gathered information and the resulting findings. No one should read an ASOR and be left asking “Why?” or “What happened?” or “How did they arrive at that conclusion?”. Having established a time-based sequence of events, conduct the following process.

**Process**

- Identify unsafe acts – error and/or violation.
- Identify which mode is likely or possible for the unsafe acts to occur:
  - Human factors, equipment, environment, workspace, CRM, training, supervision.
- Identify why those preconditions existed:
  - Organisational influences;
  - Procedures, resources equipment, manning, documents, culture and climate.
- Analyse organisational factors and system defences:
  - Reverse engineer the AVRM process;
  - Use the models and tools such as; James Reason's model and Bow Tie.
- What prevented the incident from being worse?
- Which controls were effective and why?
- Which controls failed and why?
- What should have stopped it but didn’t?
- What was absent altogether?

**Tips**

- Do not stop at the unsafe act.
- Work through the organisational accident model (also referred to as the Reason Model).
  - unsafe acts → pre-conditions for unsafe acts → organisational factors.
- Always ask “why?”
  - Why did the person do that? Why was the part or tool not available?
- Do you have the evidence to back up your finding?
- Is there a clear link between your evidence and your analysis?
- Evidence → analysis → finding.

**FINDINGS**

**Findings are concise statements regarding all unsafe acts, local and organisational factors.**

- There is no ‘fail to’ do something. A task was not completed. There are almost always reasons why a person did not do something – they did not fail.
- Your findings must directly correlate to your evidence/analysis.
- Some findings may occur well before the incident, particularly in the case of organisational conditions.
- Some findings may not be contributing, but worth noting.

**Examples**

**OPERATIONS**

- The before-landing checklist was not completed.
- The approach speed was higher than normal.
- The aircraft captain was most likely suffering chronic fatigue.

**MAINTENANCE**

- The oil cap was not refitted.
- Tool control procedures were not present.
- The unserviceability was not recorded in the maintenance documentation.
- The oil cap was found by aircrew during their walkaround.
- The maintainer signed the pre-flight, but did not replace the oil-reservoir cap.
- The aircraft captain found the oil cap on the deck during his walkaround.

Note: The Findings section of DAHRTS is not the place for new information or discussion. This should go in Analysis.
CONTRIBUTING FACTORS

(REF DASM Section 3 Chapter 8 Annex D Appendices 4-6)

Determination of all contributing factors is vital, as they lead to the formulation of appropriate and effective actions and/or recommendations to prevent recurrence.

Contributing factors are used to trend aviation incidents across units, wings or groups (or equivalent).

The ADF taxonomy is not exhaustive, if there is any difficulty in assigning contributing factors, the immediate chain of command or DDSI should be contacted for advice.

Notes

- The contributing factors sheet is at the back of this guide.
- In many instances there is more than one contributing factor for each unsafe act, pre-condition for unsafe act or organisational influence.
- There are a few instances where an unsafe act may have only a single contributing factor.
- There are rare instances where there are no contributing factors for an unsafe act.
- Contributing factor must have a related finding or findings.
- Contributing factor identification enables formulation of appropriate and effective actions and recommendations to prevent recurrence.

OCCURRENCE SEQUENCE

Conclude the most probable sequence of events based on findings:
- The occurrence sequence helps properly inform readers of the occurrence as to what happened and when.

Two examples of occurrence sequences follow:

OPERATIONS

Crew was interrupted during before-landing checks by a radio call.

The co-pilot, who was running the checks, responded to the transmission.

Co-pilot did not complete the checklist.

Aircraft captain did not notice the non completion of the checklist by the co-pilot.

Aircraft landed without before-landing checklist being completed and therefore without the landing lights on.

MAINTENANCE

During oil replenishment on a pre-flight, a maintainer noticed the chain that prevents the cap from being misplaced was broken and required re-lockwiring.

The flightline tool board did not have any spare lockwire pliers on it and the maintainer waited for a pair to be returned.

The flightline sergeant asked what was holding up the pre-flight.

The broken chain was discussed and it was agreed that the fix could wait until post-flight maintenance.

The maintainer signed up the pre-flight, forgetting to replace the oil reservoir cap.

The aircraft captain found the oil cap on the deck during his walkaround.

Tips: Only include relevant elements in the final published sequence. The occurrence sequence of events will develop iteratively. Events will be discovered at different points of the investigation and should be placed on the occurrence sequence. Elements not initially thought to be important may become so when additional information comes to light.
In addition to determining what did not work, an investigation should also determine what parts of the system did work. This is particularly important in occurrences where system defences have prevented the situation from escalating in seriousness. In identifying defences that did work, we reinforce the value of those defences and prevent the inadvertent modification of the defence in response to an occurrence. This helps identify which areas of the system can be strengthened to provide added defences.

**SAFETY OUTCOMES**

When framing safety outcomes, investigating officers should use the following mnemonic to ensure consistent and satisfactory outcomes:

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<th>S</th>
<th>SPECIFIC</th>
<th>Does/do the outcome/s address a specific shortcoming (hazard or contributing factor)?</th>
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<tr>
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<td>MEASURABLE</td>
<td>Can the outcome/s be measured?</td>
</tr>
<tr>
<td>A</td>
<td>ACTIONABLE</td>
<td>Can the agency effect the change?</td>
</tr>
<tr>
<td>R</td>
<td>REALISTIC</td>
<td>Can the outcome/s be achieved?</td>
</tr>
<tr>
<td>T</td>
<td>TIME BASED</td>
<td>When is/are the outcome/s due to be completed?</td>
</tr>
<tr>
<td>E</td>
<td>EFFECTIVE</td>
<td>Will the outcome/s effect a change for the better?</td>
</tr>
<tr>
<td>R</td>
<td>REVIEWED</td>
<td>Will the outcome/s be reviewed and closed out?</td>
</tr>
</tbody>
</table>

Example of syntax:

‘that XXSQN review and amend the checklist to eliminate the inconsistency between pilot and co-pilot bold-face actions. This amendment shall be completed NLT dd Mmm yyyy.’

**Tips**

- Another procedure. Additional procedures do not always work. Why did the existing procedure fail and will an additional procedure fix the problem?
- A person cannot be more vigilant, smarter, than they are in a given situation. ‘Be more vigilant’ is a nonsense statement.
- Briefing a unit on an occurrence can be useful but is not a solution in itself. Enduring solutions to prevent recurrence are required.
- Safety outcomes are added into DAHRTS as either an action or recommendation.
- Actions are safety outcomes that can be completed by the unit.
- Recommendations are safety outcomes that need to be completed by agencies outside the unit and should be assigned to the HTA. Units should consider AVRM when implementing actions or suggesting recommendations in order to reduce risk of recurrence so far as is reasonably practicable (SFARP).
- Ask yourself, are your safety outcomes effective? Will your formulated actions and recommendations prevent recurrence/minimise the probability of recurrence to an acceptable level? If not, you have not achieved the intent and purpose of the investigation and hence, more investigative effort is required.
The ASOR is the document that is used to notify, record investigation and action taken on occurrences through to completion. It is the vehicle by which you communicate the results of the investigation to the ADF aviation safety community so that defences can be put in place and lessons shared.

Additionally, your ASOR is an essential part of the overall system that indicates the health of the Aviation Safety Management System. That is, your ASOR, combined with the many others produced, provides commanders with an overview of trends/issues in a unit, wing or regiment.

To this end; accurate, well written ASORs are vitally important. Don’t cheapen your investigation with poor report writing.

Remember, an ASOR template or DAHRTS are only data collection tools. They do not replace high-quality investigations and they rely on accurate data. In addition, if the author does not correctly attribute contributing factors to findings or has contributing factors without a finding there is the very real risk of corrupting the trending or safety analysis ability of DAHRTS.

The following points cover both good practices, common errors and some general tips:

Your ASOR should be:

• **Transparent** – free from personal agendas.
• **Logical** – clear linkages from evidence, analysis and findings.
• **Clear** – easy to read, appropriate style, tone and level.
• **Honest and tactful** – objectively relate the facts with regards to possible sensitivities.
• **Readable** – have good continuity and flow.

**GOOD PRACTICES**

• **Hazard title** – should be a concise, yet specific description of the occurrence, no more than half a dozen words or so.
• **Hazard narrative** – should build on the title by describing the final outcome of the occurrence sequence clearly and concisely.
• **Linkages** – there must be clear linkages in your report between evidence, analysis, findings, defences, contributing factors and safety outcomes. New information or contributing factors should not suddenly appear in the later sections.
• **Peer review** – have a colleague proof read the report before submission, this is a chance to correct any errors and perform a gross error check of the investigation.

**COMMON ERRORS:**

• **New** information presented in the findings section, supervisor’s or commanding officer’s comments.*

If there is, there is an issue with the investigation. Why was it not discovered/presented earlier?

• **Incomplete** contributing factors and defences. Review your analysis and findings and ensure you have covered all of the contributing factors.

• **Ineffective and non-enduring** actions and/or recommendations to prevent recurrence.

**Tips**

• Reports should be maintained at the unclassified level – there is no need for precise locations/callsigns that may require higher security classifications. The investigation and report needs only focus on the safety aspects.

• **Avoid** jargon or excessive use of acronyms, normal service writing standards apply.

• Remember your audience. The ASOR must be understandable to others outside of your unit.

• **Avoid** emotive language. Report the facts.

• An ASOR should be straightforward; it is not a novel.

• Clearly explain the occurrence sequence.

• Use subsections in the analysis section to address each aspect of the investigation.

• Do not let hidden agendas or special interests cloud the report.

• If the investigation is complete and is ready for release but some actions are still open, consider raising them to the HTA level to allow the unit to release the ASOR but still have actions worked and tracked. Speak to your WASO/RASO/FASO/MASO if necessary.

*Also note DASM S3C8 Annex D P16 which states the CO may include certain comments.
DAHRTS CONTRIBUTING FACTORS

ORGANISATION (Organisational deficiencies latent failures)

ORGANISATIONAL INFLUENCES
Organisational Influences are fallible decisions of upper-level management that directly or indirectly adversely affect supervisory practices, and the conditions and actions of operators. These latent failures generally involve Resource Management, Organisational Climate and Organisational Processes as shown

RESOURCES MANAGEMENT
- Human resources
  - Selection
  - Staffing/manning
  - Training
  - Other
- Financial
  - Cost cutting
  - Lack of funding
  - Other
- Equipment/Facility
  - Suitability
  - Reliability
  - Availability
  - Maintainability
  - Other

ORGANISATIONAL CLIMATE
- Structure
  - Chain of command
  - Delegation of authority
  - Communication
  - Accountability for actions
  - Other
- Policies
  - Human
  - Financial
  - Equipment/facility
  - Other
- Culture
  - Norms and rules
  - Values and beliefs
  - Justice
  - Behaviour
  - Other

ORGANISATIONAL PROCESSES
- Operations
  - Operational tempo
  - Time pressure
  - Production quotas
  - Incentives
  - Measurement/appraisals
  - Schedules
  - Deficient planning
  - Other
- Procedures
  - Standards
  - Defined objectives
  - Documentation
  - Instructions
  - Other
- Oversight
  - Risk management
  - Safety programs
  - Audits
  - Other

THE REASON MODEL

PRE-CONDITIONS FOR UNSAFE ACTS
For all unsafe acts and conditions there are probably organisational pre-conditions for that unsafe act or condition to have occurred. There are two major forms of Preconditions for Unsafe Acts: Substandard Conditions and Substandard Practises.

SUBSTANDARD CONDITIONS
Substandard Conditions refers to the physical and mental capability of the member to carry out the required tasks and the working environment the member must perform the task in. Substandard Conditions may be further broken down into six sub-categories.

Adverse Mental State
- Fixation
- Stress
- Fatigue
- Motivation
- Distraction
- Attention
- Confidence
- Other

Adverse Physiological State
- Illness
- Medication
- Acceleration effects
- Decompression sickness
- Hypoxia
- Trapped gas effect
- G-induced loss of consciousness (G-LOC)
- Incapacitation
- Injury
- Physical fatigue
- Motion sickness
- Disorientation
- Food poisoning
- Other

Physical/Mental Limitations
- Information processing
- Reaction time
- Physical characteristics
- Physical capabilities
- Task saturation
- Other

SUBSTANDARD PRACTICE
Substandard Practises refers to measures within the individual operator’s control to fully prepare for the tasks to be completed. Substandard Practises may be divided into three areas:

Crew Resource Management
- Human behaviour
- Human performance limitations
- Communication
- Assertiveness
- Teamwork
- Leadership/followership
- Decision making
- Workload management
- Automation
- Task/mission planning
- Briefing/debriefing
- Situational awareness

Training
- Not trained for task
- Inappropriate training
- Ineffective training
- Other training issues

Supervisory Violations
- Not adhering to rules
- Not qualified on equipment
- Not authorised for task
- Other supervisory violations

DEFICIENT SUPERVISION
Deficient supervision may involve deficiencies in management supervisory processes at the Flight/Unit/ Wing/Regiment/Group levels. Deficient supervision may be divided into four areas:

Inadequate Supervision
- Guidance
- Communication
- Operational doctrine
- Oversight
- Training
- Qualifications or authorisations
- Performance tracking
- Other inadequate supervision

Planned Inappropriate
- Manning
- Risk analysis
- Work tempo
- Crew pairing
- Expectations (resources, pressing)
- Crew rest
- Other inappropriate operations

Failed to Correct Problem
- Documentation
- Behaviour
- Known reported problem
- Other problems

Supervisory Violations
- Not adhering to rules and regulations
- Failed to enforce rules and regulations
- Assigned unqualified personnel
- Other supervisory violations
UNSAFE ACTS OR CONDITIONS
Unsafe acts committed by, or conditions of, operators (aircrew, ATC/ADGE, maintainers) generally take
on two forms: Errors or Violations. Errors are seen in most occurrences, often as the final act in the
occurrence. Violations, on the other hand, are less frequent and represent a willful disregard for the
rules. Not all Errors and Violations are alike and they can be further broken down into subsets as
shown.

ERRORS
There are four types of errors related to aviation safety occurrences: Decision Errors, Skill-based
Errors, Perceptual Errors and Knowledge/Information Errors.

Decision Errors
- Improper procedures
- Wrong response to emergency
- Inappropriate procedure
- Inappropriate/improper decision
- Misdia gnosed situation
- Decision not made
- Other

Skill Based Errors
- Poor technique
- Inappropriate technique
- Failed to recognise implications
- Inadvertent use of controls
- Omitted procedural/checklist step
- Failed to prioritise attention
- Loss of situational awareness
- Other

Perceptual Errors
- (Due to)
- Misjudgment
- Spatial disorientation
- Illusion
- Other

Knowledge Information
- Inadequate task knowledge
- Inadequate procedural knowledge
- Inadequate aircraft knowledge
- Other
- Incorrect information
- Ambiguous information
- Inadequate information

VIOLATIONS
Routine violations occur on a regular basis and therefore to some extent are condoned by the
supervisory chain. Routine violations occur when rules and regulations are not followed because:
the rule/regulation is inappropriate or out of date; operators believe there is a better way of
achieving aims; operators take short cuts to improve efficiency because following the rule/
regulation takes extra time and resources; or a variety of others.

Routine
- Failed to adhere to brief
- Failed to adhere to regulations
- Failed to follow procedures

- Failed to use publications
- Other

Exceptional violations occur irregularly and are not noted as normal behaviour for an operator.
Exceptional violations are not condoned by the supervisory chain.

Exceptional
- Failed to adhere to brief
- Failed to adhere to regulations
- Failed to follow procedures

- Failed to use publications
- Other

DEFENCES/BARRIERS
DEFENCES
System defences will mitigate the adverse consequences of an occurrence and prevent an
occurrence developing into an accident. Defences that prevent occurrences from
propagating into accidents should be recorded to enable trend analysis of ADF aviation
defences to facilitate appropriate defence modification

DETECTION – HOW WAS THE PROBLEM REVEALED?
- Aircraft on-board warning systems
- GPWS/EGPWS
- ACAS/TCAS
- ATC
- Air defence
- Aircrew
- ADATS/TAAATS

- Maintenance personnel
- Maintenance supervisor
- Maintenance independent inspector
- Quality assurance
- Unit maintenance test pilot
- Other

WHAT, IF ANYTHING, LIMITED THE CONSEQUENCES
IN THIS OCCURRENCE
Equipment
- Fire extinguishing systems
- Anti-ice/de-ice systems
- Use of on-board emergency equipment
- Use of ground-based emergency equipment
- emergency services
- Other

Philosophy
- Crew Resource Management
- Aviation Risk Management
- Training
- Other

Procedures
- Operator reaction
- Emergency/abnormal checklist
- Standing instructions
- ACFT diversion/return
- ATC radar/navigation assistance
- Evasive manoeuvre
- See and avoid
- Rejected take-off
- Go-around/missed approach
- Other