

Revision 2

Xx xxxx-21 March 2022

## Occurrence Investigation

### General

Civil Aviation Authority (CAA) Advisory Circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rules and legislation.

Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

### Purpose

This AC describes an acceptable means of compliance, when investigating and submitting occurrence investigation reports, to meet Civil Aviation Rule *Part 12, Accidents, Incidents and Statistics*.

### Related Rules

This AC provides general guidance for occurrence investigation.

### Change Notice

Revision 2 is a substantive rewrite which, among other things:

- updates content to reflect related ACs, AC12-1 and AC100-1, which have had new revisions since the previous revision of this AC
- revises Appendix A to reflect the form CAA005i, *Occurrence Investigation Report*
- adds references to an AC from Transport Canada which contains a lot of relevant tips and guidance, and
- adds a Version History to make changes easier to track.

~~1 updates the title from *Incident Investigation* to *Occurrence Investigation* and content of this AC to reflect industry best practice.~~

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## Version History

The version history is outlined below:

Revision No.	Effective Date	Summary of Changes
AC12-2, Rev 0	3 April 2000	Initial issue of this AC.
AC12-2, Rev 1	21 March 2016	Updated title from <i>Incident Investigation</i> to <i>Occurrence Investigation</i> and changed the content of this AC to reflect industry best practice.
AC12-2, Rev 2	Xx xxxx 2022	<p>Updates content to reflect related ACs, AC12-1 and AC100-1, which have had new revisions since the previous revision of this AC</p> <p>Revises Appendix A to reflect the form CAA005i, <i>Occurrence Investigation Report</i></p> <p>Adds references to an AC from Transport Canada which contains a lot of relevant tips and guidance, and</p> <p>Adds a Version History to make changes easier to track.</p>

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## Introduction

This AC is intended for certain certificate holders who have are required to undertake a safety an occurrence investigation and submit a report, as required by Part 12, *Accidents, Incidents and Statistics*. It pertains to those occurrences defined in AC12-1, *Mandatory Occurrence Notification and Information*, and also to part of the certificate holder's Safety Management System (SMS), as defined in AC100-1 *Safety Management*.

Part 12 requires certain certificate holders to notify and to provide CAA with details to the Authority of specific types of occurrences. Part 12 is aligned with the certification requirement for organisations, which also requires them to establish an a system for safety management (also referred to as a Safety Management System or SMS) under Part 100, outlined in more detail in AC100-1, *Safety Management Systems*. Since Part 12 investigation and reporting requirements should be incorporated into an organisation's this system, it is also important to be aware of Part 100 requirements.

AC12-1 and AC100-1 should be read in conjunction with this AC. Certificate holders required by Part 12 to notify and to provide details to CAA the Authority are subsequently required to investigate the occurrences and submit their occurrence safety investigation report to CAA the Authority. This must also include any actions taken to prevent reoccurrence of a similar event.

The CAA will further analyse the reports to determine if any other corrective measures are needed on an industry-wide basis.

### CAA's role in Occurrence Investigation

The CAA may choose to take part in an the organisation's internal safety occurrence investigation or conduct an independent occurrence safety investigation. However, where this is not the case, this AC aims to provide advice to help the following guidance is provided to assist with the undertaking of an organisation's run its own internal safety occurrence investigation.

The emphasis of Part 12 is for industry to be responsible for conducting their own safety occurrence investigations, thereby contributing to their SMS by dove-tailing the safety occurrence investigation process with their risk management process.

As described by the SMS risk management processes. The core purpose is to identify hazards and to take all practicable steps to eliminate, isolate or minimise them. There are also useful process steps in AC100-1, *Safety Management*.

However, CAA recognises that not all certificate holders have trained safety investigators, so it maintains a group of qualified investigators who may be consulted for advice or assistance. Organisations who would like more information or advice can contact this team at [investigation@caa.govt.nz](mailto:investigation@caa.govt.nz).

## Purpose of Investigating Occurrences

Historically, the CAA has investigated aviation occurrences to find the causes, and to identify strategies that reduce the risk of reoccurrence. While this purpose remains, the transition to risk-based regulation brings another focus of safety occurrence investigations: the identification and reduction of safety-related risk.

The purpose of any good safety occurrence investigation is to carefully examine the factors that led to an occurrence and to focus on the future, making changes in the organisation that build its resilience against future safety risks. An A-safety occurrence investigations can transform is a means of transforming data about an occurrence into information that the organisation can use to improve its safety performance. It is not the purpose of an occurrence investigation to apportion blame or liability.

Undertaking a thorough safety occurrence investigation can provide insight into how policies and procedures are designed and implemented and where improvements and cost savings can be made, for example:

- where repeated damage can be prevented by ensuring the correct equipment is available and that it is in good condition, or
- by identifying how ambiguous or confusing procedures could lead to staff not following them.

safety Occurrence investigation forms an important part of an organisation's SMS framework, which is as explained in AC100-1 Safety Management. High calibre safety occurrence investigations should form part of certificate holder's an organisation's training programmes and SMS process, safety management systems, with the safety findings providing individuals and organisations with a better understanding of the risks associated with a task. These investigations should inform the design of the organisation's training programmes.

The International Civil Aviation Organisation (ICAO) Safety Management Manual (SMM) provides the view of ICAO regarding the role of safety investigation in a safety management environment:

*“Apart from establishing findings and the root causes of accidents/incidents, most investigation exercises also uncover hazards/threats. An effective and comprehensive investigation process includes the identification of and discrimination between an ultimate consequence, an unsafe event and hazards/threats that contribute to the accident/incident. This may include any systemic, latent or organizational factors within the entire aviation system framework. In today's proactive safety management environment, there is an important and necessary integration between an accident/incident investigation process and an organization's hazard reporting/identification process. Investigation reporting forms should have a clear provision that hazards/threats uncovered during the investigation process, which would require separate follow-up action by the organization's hazard identification and risk mitigation process, must be documented. It is common for some investigation reports to limit their “conclusion” and “action taken/recommended” to immediate or direct causes only. Thus, any secondary or indirect hazards/threats tend to be overlooked, unless this gap can be bridged by linking the accident/incident investigation and hazard identification processes.”*

## Benefits of Investigating Occurrences and Submitting Reports

Occurrence investigations have played a major role in the improvement of civil aviation safety throughout its history. By mandating safety occurrence investigations, the International Civil Aviation Organisation (ICAO) has implemented a system whereby the safety performance of international aviation as a whole has improved by due to evolving rules, procedures, standards and technology. This is in response to the information the safety occurrence investigations into major accidents and incidents have has provided.

This same philosophy underpins mandatory safety occurrence investigations under Part 12: these safety investigations Under part 12, occurrence investigations are a critical means of improving the safety performance of New Zealand's civil aviation operators. Since a risk-based regulation approach requires an effective SMS, and the CAA is committed to ensuring that the lessons learned from safety occurrence investigations are promulgated so that the aviation system as a whole is able to can benefit from each occurrence investigated.

Individual organisations, aviation associations, clubs and private pilots can also benefit from safety occurrence investigations. and these benefits can also extend to aviation associations, clubs and private pilots. These investigations may be treated as an opportunity to conduct a structured review of policies and procedures, staff and company culture and the work environment. allow an organisation to conduct a structured review of their policies and procedures, their staff and company culture, and the environment in which they work. The Resulting changes that can result from such occurrence investigations can:

- dramatically improve operational performance and efficiency, and most importantly can
- most importantly, increase the level of organisational resilience to risks.

In summary, the safety occurrence investigation turns the occurrence into detailed information that the organisation can learn and improve from. Disseminating the information around the organisation and the sector as a whole wider sector is a key means of improving the safety of the aviation system.

## Investigation Guidance

Ideally, all occurrences should be investigated. However, resources can be limited, so the effort expended should be proportional to the perceived benefit in terms of potential for identifying hazards and risks to the organisation.

This section outlines the areas that the CAA recommend be considered in undertaking an occurrence investigation. This section outlines CAA's recommended guidance for running an occurrence investigation. The guidance is designed to be:

- be understandable and straightforward
- be adaptable to different situations, and capable of gathering sufficient
- contain enough information to determine the different factors that led to the occurrence, and
- lead to ideas about what might be necessary to reduce the risk of reoccurrence, and
- aid in establishing both the corrective and preventative measures needed to prevent any reoccurrence.

It is designed to complement the CA005 Investigation Report format, refer which is explained in Appendix A of this AC.

Most Some large operators may already have detailed safety management tools for conducting their investigations that facilitate the generation of to discover and analyse key safety information, and generate their own occurrence investigation report. These operators may find this AC less useful, as it is should not be constrained by this advisory. This AC is directed at tailored to smaller and non-commercial operators, pilots and engineers who do not have these well-developed tools at their disposal. There are, however, general principles in this AC that are relevant to all operators and organisations.

Organisations can also learn from Transport Canada's equivalent to this AC, although the Transport Canada AC reflects operational differences between the different civil aviation systems:

[Advisory Circular \(AC\) No. SUR-002 \(canada.ca\)](#)

Although the Transport Canada AC has some slight operational differences to CAA, many of the models and templates outline methods that organisations, no matter their scale or scope of their operations, can learn from.<sup>1</sup>

A good safety investigation does three things. It outlines what happened, why it happened, and what should be done to prevent it from happening again.

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<sup>1</sup> An example of a Corrective Action process can be found in Advisory Circular (AC) No. SUR-002, on the Transport Canada webpage [here](#).

A good occurrence investigation does three things. It outlines:

- I. what happened
- II. why it happened, and
- III. what should be done to prevent it from happening again.

### What happened?

This **should be** is a clear and straightforward description of what took place in the occurrence sequence.

For example:

On landing, a significant down draught caught the aircraft. The pilot was unable to arrest the resulting rate of descent. The aircraft landed heavily on the threshold of the runway, and **sustained** sustaining minor damage to the undercarriage. The pilot was uninjured.

It is important to collect information on what happened as soon as practicable, so that the evidence is preserved, and items are not disturbed. Statements from those who witnessed the event should be collected as near to the time as possible, while their memories are fresh.

The amount of time and effort spent on information gathering should be proportionate to the depth of investigation required. All available and relevant information should be collected **at the outset**, as it is difficult to know at this stage what the important facts are.

### Why did it happen?

The difficult part of **an a safety occurrence** investigation is determining what caused the occurrence. There are several prominent ~~cognitive models~~ **tools and techniques** to assist in determining causation including:

- an article on root cause analysis and the '5 Whys' in the Autumn 2020 edition of [Vector – Autumn 2020 \(aviation.govt.nz\)](#), and
- examples in the Transport Canada AC cited on page 7. ~~promulgated in the previous revision of this AC~~, and
- specific tools such as:
  - the [Reason 'Swiss Cheese' model](#), and
  - fault tree analysis methods.

The 5 Whys root cause analysis technique, referenced in the Vector article [above](#), explains how an investigator or team, by repeatedly asking the question "Why?" can peel away the layers of an issue and get to the root cause of the problem.

The Australian/ New Zealand Standard [AS/NZS IEC 62740:2016](#) provides greater detail around the principles of root cause analysis and the various recognised techniques available to help with an investigation.

AC No. SUR-002 also provides guidance around both root cause analysis (including the 5 Whys and fishbone/ Ishikawa methods), and establishing Corrective Actions.

The CAA **also uses** ~~has elected for~~ a simpler method where the four main types of cause are each considered in the **safety occurrence** investigation, as outlined below.



It is important to understand that each area interacts with other areas, and in some cases there is a lot of overlap. Not all categories will apply to every occurrence. Nonetheless, they have been included here to make sure that an a safety investigator or investigation team gathers as much good quality causal information as possible.

### *Human factors*

This part of the investigation asks you to consider the individual(s) involved in the occurrence. Most often this will be the pilot, but it can also include other flight crew, ground crew, engineers and passengers.

Determining an individuals' the involvement of human factors can be a challenging task, so it is important to remember that the investigation purpose is not to assign blame, but rather to identify why the event in question occurred and how reoccurrence can be prevented. Bear in mind that human factors are thought to underlie underpin between 70–80% of aviation accidents, so it is very important that all aviation participants learn as much as possible about this element of aviation safety.

Questions for the safety investigator or team to ask or consider include:

- (a) Were there any physiological factors such as fatigue, vision, or hearing issues that may have been involved?
  - (i) Some specific questions to be considered regarding fatigue are:
    - What time of day did the occurrence happen?
    - How long has the person(s) involved been awake?
    - How long did the person(s) involved sleep for last?
    - What was the quality of their sleep?
    - Were there any sleep or medical disorders affecting the person(s) involved?
- (b) What level of experience and training did the individuals involved with the occurrence have? How experienced and well trained were the individuals involved in the occurrence with:
  - (i) the aircraft type?
  - (ii) the manoeuvre or type of flying being conducted at the time?
  - (iii) the area/location?
- (c) Were any of these common human factors themes involved:
  - (i) situational awareness?
  - (ii) decision making, and/or?
  - (iii) Communication?

### *Aircraft/equipment/mechanical factors*

Under this category, the safety investigator or investigation team considers whether there was anything about the condition or design of the aircraft/equipment and its components/systems that contributed to what happened the occurrence.

Some examples of common aircraft/equipment issues include:

- (a) components failing
- (b) components not working to specification, and or
- (c) components being used beyond specified limitations, and
- catastrophic failure.

### *Environmental factors*

This category involves consideration of environmental factors that may have been involved in the occurrence. In New Zealand aviation, this is a factor in a significant large number of occurrences and so requires careful consideration in many safety occurrence investigations.

The common environmental factors are:

- (a) weather (wind, snow, icing, etc.)
- (b) temperature/dew point
- (c) topography/terrain
- (d) surface conditions
- (e) cloud/visibility (including sunstrike), and/ or
- (f) ground-based hazards including trees, masts, and wires.

Where relevant, the safety investigator or investigation team should consider the environmental elements above, in relation to the area/location where the occurrence took place and the prevailing conditions. It is very common for environmental factors to interact closely with human factors, especially with decision making and situational awareness.

### *Organisational/ regulatory and sector factors*

This is the widest level of consideration for the safety investigation. Organisation, and sector and regulatory factors are the these policies, procedures, and practices that might – directly or indirectly – have contributed to what took place. This These factors includes an organisation's Standard Operating Procedures (SOPs) and other procedures, as well as Civil Aviation Rules, airworthiness directives, ACs, and other policies and procedures that influence how an organisation operates.

The safety investigator or investigation team should think about what went on in led to the occurrence and then ask:

- (a) Is there anything about 'the way we do things' in the organisation that might have contributed to the occurrence?

- (b) Is there anything about ‘the way we do things’ in this particular aviation sector (e.g. the agricultural sector, the recreational sector) that might have contributed to the occurrence?
- (c) Were there established procedures written down for personnel to follow?
- (d) Were these procedures evaluated on a regular basis to ensure that:
- (i) they were still functional? and
  - (ii) personnel were following the established procedure?
- (e) Is there anything about the Civil Aviation Rules or policies that might have contributed to the occurrence?

### What should change as a result?

This is the final and most important stage of the safety occurrence investigation. If the investigators or investigating team identified causal factors during the investigation, they need to make recommendations designed to facilitate positive change in the organisation.

These recommendations should lead to corrective and preventative measures being established to help prevent similar risks to safety arising in the future. where the investigator or investigation team makes recommendations on the basis of the causal factors that were identified, if any. It is about ‘trapping’ the information that has been discovered into a safety improvement.

It is this information obtained by the safety investigation that enables changes in the organisation to be made that builds its resilience against future safety risks.

The CAA encourages you to consider:

Are there any tips, information, or advice that you would give to an individual or operator similar to yourself, in order to reduce their chances of a similar occurrence happening to them?

The reason to phrase it like this is to emphasise how the information your safety occurrence investigation provides can ultimately benefit the aviation system as whole.

During the safety occurrence investigation, investigators may also want to consider the avoidance and recovery barriers in place at the time and review their robustness. The investigation may even identify where new barriers need to be placed.

These recommendations, along with any additional hazards that may have been identified during the investigation, can be fed back into your SMS and investigation methods, aiding your organisation’s hazard identification, risk assessment and risk mitigation processes, and driving continual improvement.

For further information refer to AC100-1. and Appendix B of this AC.

## Appendix A—CA005i —Occurrence Investigation Report format Investigation Report Format

The CAA provides an investigation report format on page 3 of the Form CA005i, which can be found [here](#). Participants may use this form if they do not have their own means of providing the information, which has been found to be acceptable to CAA the Authority. This section should be completed once the investigation of the occurrence is complete and preventative actions have been decided. The following table provides brief advice on the information required for each field, but participants are encouraged to provide any additional detail which will help the investigation. As advised in AC12-1, if in doubt about whether something is relevant, provide the information anyway.

DATA FIELD	FILLING ADVICE
Date and time of occurrence	This must be the same as the initial notification submitted to CAA. Choose UTC NZST or NZDT
Location	The geographical location where the occurrence happened or where it was identified. Use the 4-letter ICAO location indicator (for example NZWN) or a 4-digit postcode. If there is no known location indicator or postcode use a description of the nearest recognisable city or town. (See NZAIP Planning Manual for a complete list of NZ location indicators).
Aircraft registration ZK-	The registration mark of an aircraft involved (if applicable).
Aircraft manufacturer and model	The popular name of the aircraft and model. Note: if NZ registration, CAA database will populate this field.
Aircraft registration ZK-	The registration mark of an aircraft involved (if applicable).
Operator/ reporter name	
Contact phone	
Safety finding attributed to: name	The name of the involved organisation or individual person who is responsible for managing the life of the safety finding.
Client ID	The participant or organisations client number.
Aviation document	The rule Part under which the aviation document affected by the safety finding was issued. E.g. Part 135, Part 115 etc.
Rule reference	The specific Civil Aviation Rule on which the safety finding is based. This must be completed for all non-compliance and non-conformance. E.g. rule 91.241
Manual reference	The client's exposition manual, and sub-reference, against which the safety finding is made. This must be completed for all non-compliance and non-conformance.
Non-compliance	Where a person or organisation does not to comply with Civil Aviation legislation, a Civil Aviation Rule or a condition attached to an aviation document. Tick if applicable.
Non-conformance	Where a person or organisation does not conform with a provision of any document forming in whole or in part the agreed standards or condition on which the issue and

	continuance of an aviation document depends. Tick if applicable.
<b>Observation</b>	Something the investigator wishes to comment on that will be helpful to the organisation or individual. Tick if applicable.
<b>Safety related concern</b>	A safety finding relating to a practice or concern that cannot be related to legislation or a standard. Tick if applicable.
<b>Critical</b>	An occurrence or deficiency that caused, or on its own had the potential to cause, loss of life or limb. Tick if applicable.
<b>Major</b>	An occurrence or deficiency involving a major system that caused, or had the potential to cause, significant problems to the function or effectiveness of that system. Tick if applicable.
<b>Minor</b>	An isolated occurrence or deficiency not indicative of a significant system problem. Tick if applicable.
What happened and why it happened? Please provide a brief summary of the occurrence <b>Description (what happened?)</b>	Refer to the 'what happened?' section of this AC.
Human factors - please indicate if any of the factors below may have contributed to the occurrence	Tick any relevant factors listed below, or explain in the 'Other' box.
Comment on how human factors may have contributed to the occurrence	Refer to the 'Human Factors' section of this AC, including answers to any questions.
Equipment/mechanical - please indicate if any of the factors below may have contributed to the occurrence (Note: if you have supplied engineering/defect information in CA005D occurrence report this will usually be sufficient for this part of the investigation)	Tick any relevant factors listed below, or explain in the 'Other' box.
Comment on how equipment/mechanical factors may have contributed to the occurrence	Refer to the 'equipment/ mechanical factors' section of this AC, including answers to any questions.
Environmental factors - please indicate if any of the factors below may have contributed to the occurrence	Tick any relevant factors listed below, or explain in the 'Other' box.
Comment on how environmental factors may have contributed to the occurrence	Refer to the 'environmental factors' section of this AC, including answers to any questions.

Organisational/regulatory - please indicate if any of the factors below may have contributed to the occurrence	Tick any relevant factors listed below, or explain in the 'Other' box.
Comment on how organisational/regulatory factors may have contributed to the occurrence	Refer to the 'organisational/ regulatory factors' section of this AC, including answers to any questions.
Lessons learned - what advice would you give to other operators to reduce their chances of something like this happening to them?	Summarise the main points from the investigation and your findings.
<b>Cause (why it happened?)</b>	Refer to the 'why it happened?' section of this AC. Use additional pages if more than two causal factors have been identified.
<b>Client closing actions (what should change as a result?)</b>	Refer to the 'what should change as a result?' section of this AC.
<b>Completion date</b>	The date which the corrective action was or will be completed. Note: CAA will use this date to track for completion and audit reviews.
<b>Name</b>	The name of the participant representative or quality assurance agent raising the safety finding.
<b>Position</b>	The position in the organisation exposition of the participant representative raising the safety finding notice.
<b>Organisation</b>	The name of the organisation raising the safety finding notice.
<b>Client ID</b>	The licence or approval number of the organisation or person.
<b>Date</b>	The date on which the safety finding was raised. This may be different to the date associated with the occurrence.
<b>Phone number</b>	The daytime contact number of the reporter.
<b>Reporter's reference number</b>	This space is for the client to enter details of any reference number previously allocated to the occurrence and is used to tie the safety finding to the submitter's original reference number.

## Appendix B – Suggested Further Research

For more information, **search** for ~~research~~ the following key phrases **on the internet**:

- James Reason HF Model - Swiss Cheese Model
- Maintenance Error Decision Aid (MEDA)
- Investigation of Human Factors in Accidents and Incidents
- Human Factors Management and Organisation
- Human Factors in Aircraft Maintenance and Inspection
- CONTROL - Hierarchy of controls
- The ARMS Methodology for Operational Risk Assessment in Aviation Organisations
- **Fault tree analysis methods**
- Australian/ New Zealand Standard [AS/NZS IEC 62740:2016<sup>2</sup>](#)

**CAA's website has also been updated recently to include sections on:**

- [Human factors](#)
- [Safety Management Systems \(SMS\)](#)

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<sup>2</sup> Please note that this requires payment.