Advisory Circular

AC12-1

Revision 2 (1)

Occurrence Investigation

4 April 2022

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 (AMC) 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 AMC, when investigating and submitting occurrence investigation reports, to meet Part 12 *Accidents, Incidents and Statistics*.

Related Rules

This AC provides general guidance for occurrence investigation.

Change Notice

ICAO 29th Assembly Resolution A29-3 of year 1992 urges States to promote global harmonization of national rules. In order to implement this Resolution, Mongolian Civil Aviation Regulation has been developed based on “Memorandum for Technical Cooperation” between CAA of Mongolia and New Zealand, signed on 06.May.1999.

Amendment 164 of Annex 1 to the Chicago Convention on International Civil Aviation urges pilots, navigators using radiotelephony, air traffic controllers and aeronautical station operators to comply with the language proficiency requirements; and

Under Article 14 of the Civil Aviation Act, “Use of foreign language in civil aviation” the AC has been released in English version only, in order to prevent any mistranslation and misuse of the aviation safety related documents.

This AC12-2 Rev.2 was issued based on NZ AC12-2 rev.1, dated on 21.Mar.2016.

Rev.2 updates the title from Incident Investigation to Occurrence Investigation and content of this AC to reflect industry best practice.

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Introduction

This AC is intended for certain certificate holders who are required to undertake a safety 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 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 SMS. Part 12 investigation and reporting requirements should be incorporated into this system.

AC12-1 should be read in conjunction with this AC. Certificate holders required by Part 12 to notify and to provide details to the Authority are subsequently required to investigate the occurrences and submit their safety investigation report to 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.

Occurrence Investigation

The CAA may choose to take part in the organisation's internal safety investigation or conduct an independent safety investigation. However, where this is not the case, the following guidance is provided to assist with the undertaking of an organisation's internal safety investigation. The CAA recognises that not all certificate holders have trained safety investigators. The CAA therefore maintains a group of qualified safety investigators who may be consulted for advice or assistance.

The emphasis of Part 12 is for industry to be responsible for conducting their own safety investigations thereby contributing to their SMS by dove-tailing the safety 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.

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 investigations; the identification and reduction of safety-related risk.

The purpose of any good safety 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. A safety investigation is a means of transforming an occurrence into information that the organisation can use to improve its safety performance. It is not the purpose of a safety investigation to apportion blame or liability.

Undertaking a thorough safety 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 identifying how ambiguous or confusing procedures could lead to staff not following them.

Safety investigation forms an important part of an organisations SMS framework, which is explained in AC100-1 *Safety Management*. High calibre safety investigations should form part of a certificate holder's training programmes and safety management systems, with the safety findings providing individuals and organisations with a better understanding of the risks associated with a task. 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 investigations ICAO has implemented a system whereby the safety performance of international aviation as a whole has improved by evolving rules, procedures, standards and technology in response to the information the safety investigations into major accidents and incidents has provided. This same philosophy underpins mandatory safety investigations under Part 12. These safety investigations are a critical means of improving the safety performance of Mongolian civil aviation operators. A risk-based regulation approach requires an effective SMS, and the CAA is committed to ensuring that the lessons learned from safety investigations are promulgated so that the aviation system as a whole is able to benefit from each occurrence investigated.

Individual organisations also benefit from safety investigations, and these benefits can also extend to aviation associations, clubs and private pilots. Safety investigations 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 changes that can result from such safety investigations can dramatically improve operational performance and efficiency, and most importantly can increase the level of organisational resilience to risks. *The safety 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 is a key means of improving the safety of the aviation system.

Investigation Guidance

This section outlines the areas that the CAA recommend be considered in undertaking an occurrence investigation. The guidance is designed to be understandable, adaptable to different situations, and capable of gathering sufficient information to determine the different factors that led to the occurrence and what might be necessary to reduce the risk of reoccurrence. It is designed to complement the CA005 Investigation Report format, refer Appendix A of this AC. Most operators already have detailed safety management tools for conducting their investigations that facilitate the generation of safety information. These operators should not be constrained by this advisory. This AC is directed at smaller and non-commercial operators, pilots and engineers who do not have these well-developed tools at their disposal.

Ideally, all safety 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.

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.

What happened?

This is a clear, 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 heavy on the threshold of the runway, sustaining minor damage to the undercarriage. The pilot was uninjured.

It is important to collect the information on what happened as soon as practicable, so that the evidence is preserved, e.g. items are not disturbed. Statements from all those who witnessed the event should be collected as near to the time as possible, while 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, as it is difficult to know at this stage what the important facts are.

Why it happened?

The difficult part of a safety investigation is determining what caused the occurrence. There are several prominent cognitive models to assist in determining causation (including the Reason 'Swiss Cheese' model promulgated in the previous revision of this AC). The CAA has elected for a simpler method where the four main types of cause are each considered in the safety 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 a safety investigation 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 the involvement of human factors can be a challenging task.

Remember that the investigation's purpose is not to assign blame or point fingers, 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 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 to ask or consider:

(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 sleep?
        - Were there any sleep/medical disorders affecting the person(s) involved?

(b) 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
    (iii) communication.

Aircraft/equipment factors

Under this category, the safety investigation considers whether there was anything about the condition or design of the aircraft/equipment and its components/systems that contributed to what happened. Common aircraft/equipment issues include components failing or not working to specification/or out of specified limitations, catastrophic failure, etc.

Environmental factors

This category involves consideration of any environmental factors that may have been involved in the occurrence. In Mongolian aviation, this is a factor in a large number occurrences and so requires careful consideration in many safety 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)
(f) ground-based hazards including trees, masts, and wires.

Where relevant the safety investigation 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 decision making and situational awareness.

Organisational and sector factors

This is the widest level of consideration for the safety investigation. Organisation and sector factors are those policies, procedures, and practices that might - directly or indirectly - have contributed to what took place. This includes an organisation's Standard Operating Procedures (SOPs) and other procedures, as well as CAR, airworthiness directives, ACs, and other policies. The safety investigation should think about what went on in the occurrence and then ask:

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

(b) Is there anything about 'the way we do things' in this aviation sector (e.g. the agricultural sector, the recreational flying sector) that might have contributed?

(c) Is there anything about the CAR or policies that might have contributed?

What should change as a result?

This is the final and most important stage of the safety investigation, 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.

<u>The CAA encourages you to consider:</u> What tips, information, or advice would you give to an individual or operators similar to yourself to reduce their chances of having something similar occur to them?

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

The safety investigation may also want to consider the avoidance and recovery barriers in place at the time and review their robustness. It may even identify where new barriers are required 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, aiding your organisations hazard identification, risk assessment and risk mitigation processes. For further information refer AC100-1 and Appendix B of this AC.

Appendix A - CA005 Investigation Report Format

The CAA provides an investigation report format on page 3 of the Form CA005, which participants may use if they do not have their own means of providing the information, which is acceptable to 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 in each field.

DATA FIELD	FILLING ADVICE
Date and time of occurrence	This must be the same as the initial notification submitted to CAA. Choose UTC or ULAT
Location	The geographical location where the occurrence happened or where it was identified. Use the 4-letter ICAO location indicator (for example ZMUB / ZMCK) 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 AIP for a complete list of Mongolian location indicators).
Aircraft manufacturer and model	The popular name of the aircraft and model. Note: if Mongolian registration, CAA database will populate this field.
Aircraft registration JU / EI-	The registration mark of an aircraft involved (if applicable).
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 CAR 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 CAR 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.
Observation	Something the investigator wishes to comment on that will be helpful to the organisation or individual. Tick if applicable.

Safety related concern	A safety finding relating to a practice or concern that cannot be related to legislation or a standard. Tick if applicable.
Critical	An occurrence or deficiency that caused, or on its own had the potential to cause, loss of life or limb. Tick if applicable.
Major	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.
Minor	An isolated occurrence or deficiency not indicative of a significant system problem. Tick if applicable.
Description (what happened?)	Refer to the 'what happened?' section of this AC.
Cause (why it happened?)	Refer to the 'why it happened?' section of this AC. Use additional pages if more than two causal factors have been identified.
Client closing actions (what should change as a result?)	Refer to the 'what should change as a result?' section of this AC.
Completion date	The date which the corrective action was or will be completed. Note: CAA will use this date to track for completion and audit reviews.
Name	The name of the participant representative or quality assurance agent raising the safety finding.
Position	The position in the organisation exposition of the participant representative raising the safety finding notice.
Organisation	The name of the organisation raising the safety finding notice.
Client ID	The licence or approval number of the organisation or person.
Date	The date on which the safety finding was raised. This may be different to the date associated with the occurrence.
Phone number	The daytime contact number of the reporter.
Reporters reference number	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 research the following key phrase:

- 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

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