



Guidance Note on the Investigation of Serious Incidents

Introduction

This guidance note has been produced jointly by the European Civil Aviation Conference (ECAC) and the European Network of Civil Aviation Safety Investigation Authorities (ENCASIA) to assist Safety Investigation Authorities (SIAs) to identify serious incidents and thus decide whether to investigate or not. It summarises the insights from a workshop organised by the ECAC ACC that considered the topic from all perspectives¹. It aims to promote greater consistency in the treatment of serious incidents, without limiting SIA's freedom to make decisions independently.

ICAO defines an incident as “*an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation*”.²

A serious incident is defined as “*an incident involving circumstances indicating that there was a high probability of an accident...*” and notes that “*the difference between an accident and a serious incident lies only in the result*”.

But “high probability of an accident” is inherently subjective and sometimes difficult to establish from the limited information available in an occurrence notification. Conversely, a less serious occurrence may warrant investigation for other reasons.

National and international regulations on the investigation of accidents and incidents give SIA a degree of discretion on what to investigate, and so choices can be made according to the scope for safety learning and the availability of resources to pursue the investigation.

Serious incident investigation plays a pivotal role in advancing aviation safety by identifying vulnerabilities, addressing root causes, and guiding preventive measures. While regulations provide a framework for investigation, the commitment and expertise of SIAs are key drivers of effective safety outcomes.

Obligation to investigate

Internal standards and recommended practices

In accordance with international standards, the State of Occurrence shall institute an investigation into the circumstances of:

- an aircraft accident (Annex 13, 5.1)
- a serious incident when the aircraft is of a maximum mass of over 2,250 kg (Annex 13, 5.1.2)

¹ European Civil Aviation Conference (ECAC) Air Accident and Incident Group of Experts (ACC) Workshop on the Treatment of Serious Incidents, Bratislava, 25 April 2023. [Workshop Report](#)

² Annex 13 to the Convention on International Civil Aviation, Aircraft Accident and Incident Investigation, Chapter 1, Definitions. [add link]

It is also a recommended practice that the State of Occurrence should institute an investigation into the circumstances of a serious incident even when the maximum mass is below 2,250 kg (Annex 13, 5.1.1).

A State may conduct an Annex 13 investigation into an incident not classed as a serious incident, but there is no obligation to do so. When an incident is to be investigated within the context of Annex 13, this shall be notified to other States in the normal way (Annex 13, 4.1).

The conduct of an Annex 13 investigation may be delegated to another State or a Regional Accident Investigation Organisation by mutual arrangement and consent.

European Union Regulations

These international standards have been implemented in the European Union (EU) by Regulation (EU) No 996/2010³ as follows:

Every accident or serious incident involving aircraft to which Regulation (EU) 2018/1139 (The EASA Basic Regulation) applies shall be the subject of a safety investigation (Article 5(1)). The extent of the safety investigation and the procedure to be followed shall be determined by the SIA taking into account the consequences of the accident or serious incident and the lessons it expects to draw from such investigations for the improvement of aviation safety (Article 5(3)).

The SIA may decide to investigate accidents or serious incidents to aircraft that are not subject to the EASA Basic Regulation, as well as incidents to any aircraft, in accordance with the legislation of the Member State, when they expect to draw safety lessons from them (Article 5(4)).

The SIA may decide not to investigate accidents or serious incidents concerned with certain categories of unmanned aircraft, or manned aircraft with a maximum take-off mass less than 2,250kg, when no person has been fatally or seriously injured (Article 5(5)).

National regulations

Whether bound by Reg(EU)996 or not, SIA will also need to consider any obligations to investigate detailed in their own national regulations.

Benefits

The in-depth investigation of a serious incident by a SIA may bring considerable benefits for aviation safety.

- By definition, a serious incident presented a high risk of an accident. This is clearly not an acceptable situation, and further investigation may be needed to establish the circumstances and to identify how and why the safety of the flight was compromised, so that action can be taken to address the safety issues and prevent recurrence.
- Equally, it may be very beneficial to understand why the occurrence didn't escalate into an accident so that the importance of any barriers or mitigations that were effective can be recognised and advocated to help prevent future accidents elsewhere.
- Fortunately, accidents are relatively rare, but incidents are much more common and provide opportunities to identify safety issues before they become manifest in an accident.
- Following an incident or serious incident, the evidence will often be more accessible than following an accident. For example, the whole aircraft should be available for

³ [Regulation \(EU\) 996/2010](#) as amended by Regulation (EU) 2018/1139.

examination, data should be relatively easy to retrieve, personnel should be able to explain what they saw, heard and did.

- Accidents sometimes have significant political, economic, social, technological, legal or environmental consequences. They can generate a lot of external attention, emotion and pressure. Free from such issues, serious incidents can provide a more conducive environment to gather evidence and complete an in-depth investigation focused on improving safety without concerns over blame or liability.
- SIA have the authority to organise and lead a multidisciplinary and multinational team of investigators, experts and advisors. They have the legal powers to access all the evidence, and the tools, techniques and procedures to evaluate it thoroughly.
- SIA are acknowledged as the authoritative experts for air accident and incident investigation. They have a uniquely independent position from which to analyse the evidence impartially. Their findings and recommendations will be published and can be very influential in improving aviation safety.

Together, these factors provide a strong incentive for SIA to undertake the investigation of serious incidents.

Challenges and constraints

The initiation of an investigation depends on the prompt notification of the occurrence to the SIA so they can make a timely decision whether to investigate or not, and the required actions can be taken to preserve any perishable evidence. However, operators can sometimes be unclear on their obligations to report occurrences to the SIA or reluctant to classify them as serious.

At the time of initial notification, the information available may be quite limited or inaccurate which can make it difficult to assess whether the occurrence did involve circumstances indicating a high probability of an accident.

SIA have finite resources and their capacity to undertake a serious incident investigation, where it is not mandatory, may be limited by other ongoing work.

Recommended decision making process

It is important to follow a logical and consistent approach to classify the occurrence according to risk, weigh up any other relevant factors, and then determine whether to initiate a safety investigation.

Step 1A – classify the occurrence

Attachment C to Annex 13 provides a straightforward method to assess whether there was a high probability of an accident.

- Consider whether there was a credible scenario by which the incident could have escalated to an accident.
- If there was, assess the defences remaining and determine if they were effective.
- If few or no defences remained, then there was a high probability of an accident, and the occurrence should be classified as a serious incident; conversely if effective defences remained to prevent the accident scenario, the occurrence may be considered an incident.

		Remaining defences between the incident and the potential accident	
		Effective	Limited
Credible escalation to accident scenario	Yes	Incident	Serious Incident
	No	Incident	Incident

Figure 1 – extract from Attachment C to Annex 13

This assessment is quite broad-brush and adequate for an initial classification of the occurrence based on limited information.

Attachment C to Annex 13 provides a list of examples⁴ of what may be serious incidents. This can be a useful cross-check. However, the list needs to be used with caution as it is not exhaustive, and items on the list may not always be serious incidents because this also depends on the context and the effectiveness of any barriers remaining.

Step 1B – if necessary, consider the risk in more detail (optional)

In many cases, the above process will give a clear indication of the seriousness of an occurrence. However, when it does not, other tools can be used to provide more granularity to the risk assessment. One such tool, the European Risk Classification Scheme (ERCS), has been developed and introduced to ensure a harmonised approach to risk classification of occurrences across EU Member States. It takes a similar approach to Annex 13 Attachment C but additionally requires assessment of the severity of the potential consequences and a more detailed consideration of the barriers remaining to derive a two-digit alphanumeric safety risk score associated with the 10 x 5 ERCS matrix (Figure 2). A score in the red segments of the matrix indicates a high risk of loss of life and would likely merit classification as a serious incident and investigation by the SIA.

⁴ A similar list of examples is provided in an Annex to Regulation (EU) 996/2010 as guidance.

SEVERITY		CLASSIFICATION (ERCS Score)											
Potential Accident Outcome	Score												
Extreme catastrophic accident with the potential for significant number of fatalities (100+)	X	X9	X8	X7	X6	X5	X4	X3	X2	X1	X0		
Significant accident with potential for fatalities and injuries (20-100)	S	S9	S8	S7	S6	S5	S4	S3	S2	S1	S0		
Major accident with limited amount of fatalities (2-19), life changing injuries or destruction of the aircraft	M	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0		
An accident involving single individual fatality, life changing injury or substantial aircraft damage	I	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0		
An accident involving minor and serious injury (not life changing) or minor aircraft damage	E	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0		
No likelihood of an accident	A	<i>No Implication to Safety</i>											
	Corresponding Barrier Score	9	8	7	6	5	4	3	2	1	0		
	Barrier Weight Sum	17-18	15-16	13-14	11-12	9-10	7-8	5-6	3-4	1-2	0		
PROBABILITY OF THE POTENTIAL ACCIDENT OUTCOME													

Figure 2 – ERCS safety risk matrix

From 1 January 2023, it is mandatory for EU national aviation authorities (NAA) to classify every occurrence using the ERCS as part of occurrence reporting regulations⁵. Although it is not mandatory for SIA or industry to use the system, it can be a useful tool to help screen large volumes of reported occurrences to detect those that were potentially the most serious. This could be based on the ERCS classification conducted by the NAA, or an ERCS classification conducted by the SIA for their own purposes.

NB whilst the ERCS risk classification and the Annex 13 occurrence classification both consider the probability of an accident, they are not exactly the same thing. It is possible to have an *accident* with a low ERCS score (e.g. C172 ground collision with lighting stanchion leading to damage to aircraft structure); and it is possible to have an *incident* with a high ERCS score (e.g. loss of safe separation between an A350 and B787). This is why the use of the ERCS, although optional for SIA, can be useful because it does factor in the gravity of the potential consequences.

⁵ [Reg \(EU\) 376/2014](#), [Delegated Reg \(EU\) 2020/2034](#) and [Commission Implementing Reg \(EU\) 2021/2082](#).

Step 2 – consider other factors which may influence the decision to investigate

There are many other factors which might influence the decision to investigate a serious incident or an incident, when this is not mandated.

- Type of operation – occurrences involving commercial air transport are more likely to merit in-depth investigation (by the SIA or otherwise) than occurrences involving non-commercial operations because of the risk to public safety.
- Type of accident – ICAO has identified certain types of accident as “global high-risk occurrences” (CFIT, LOC-I, MAC, RE and RI).⁶ Occurrences that could have escalated into one of these accident types may warrant close attention due to their prevalence in accident statistics and capacity to lead to major loss of life.
- Novelty – an occurrence involving a new aircraft type or a new type of operation or indications of a new hazard or risk is more likely to justify in-depth investigation than a repeat of a common occurrence that is already well understood.
- Recurrent safety issue or emerging trend – conversely an occurrence associated with a recurring safety issue of concern, or an occurrence which indicates an emerging trend, may warrant additional attention as an exemplar investigation or as part of a safety study.
- Added value from a SIA investigation – Consider whether any planned investigation by the operator, manufacturer or regulator would be sufficient to establish the circumstances and precipitate the action required to address any safety issues. As noted earlier, there can be considerable added benefit from a SIA-led investigation, particularly when the situation is complex, with multiple interested parties.
- Other factors – whilst the sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents (Annex 13, 3.1), accidents and incidents sometimes take place within a wider context which may further increase the need for an independent investigation conducted by a SIA. These might include societal or political concerns, security issues, or a high level of media / public interest.

Step 3 – consider the resource implications

The classification of an occurrence (as an accident, serious incident or incident), and any further assessment of the risk, should not be influenced by any consideration of the resources required to investigate the occurrence or the resources available. However, once the occurrence has been correctly classified, such factors may need to be considered before deciding on the SIA’s response. SIA have finite resources and, when there is no obligation to investigate, SIA sometimes have to make difficult choices to ensure that those resources are well-focused on the investigations with the greatest potential to lead to improvements to aviation safety.

Step 4 – decide on the SIA response

Where an investigation is required, the SIA shall determine the extent of the investigation and the procedure to be followed, taking into account the consequences of the accident or serious incident and lessons it expects to draw from the investigation for the improvement of aviation safety (Reg(EU)996, article 5.3)

Where an investigation is not required by the regulations, the SIA may still decide to investigate when it expects to draw safety lessons from such an investigation. (Reg(EU)996, article 5.4)

⁶ The EASA European Plan for Aviation Safety and State Safety Programmes also highlight key risk areas at a regional and national level.

So, the bottom line is clear - when deciding whether to investigate a serious incident or an incident, and when deciding the extent of the investigation – it is important to consider, alongside the occurrence classification, risk and other factors, the lessons that may be drawn from the investigation for the benefit of aviation safety. In the immediate aftermath of an occurrence, this is likely to be a subjective judgement informed by experience and sometimes “investigator instinct”.

Involvement of industry stakeholders

Collaboration with industry stakeholders can enhance the quality and scope of serious incident investigations. Industry participants, including operators, manufacturers, maintenance organisations, and relevant associations, might possess valuable expertise and insights that can contribute to a more comprehensive understanding of the incident’s underlying causes. Engaging these stakeholders in the investigation process can also promote a culture of transparency and shared responsibility for aviation safety improvements.

Continuous learning and adaptation

The landscape of aviation safety is dynamic, characterised by evolving technologies, operational practices, and regulatory frameworks. To ensure that investigations continue to be effective and relevant, SIAs should embrace a culture of continuous learning and adaptation.

Regular review and refinement of investigation methodologies, tools, and processes are essential to keep pace with industry advancements. SIAs can establish feedback mechanisms that solicit input from investigators, industry stakeholders, and other relevant parties to identify areas for improvement. Lessons learned from past investigations should be systematically incorporated into training programs for investigators, fostering a knowledgeable and skilled workforce capable of addressing emerging challenges.

Dealing with uncertainty

It is often the case that the information available in the immediate aftermath of an occurrence may be limited or inaccurate, and more information may need to be gathered to enable a correct classification of the occurrence and appropriate decision on the SIA response.

This information can be gathered by liaison with the operator, airport, air traffic service provider and manufacturer as appropriate, and those directly involved in the occurrence. It may be advisable to conduct a read-out of the flight recorders or review data from other sources such as the quick access recorder, CCTV etc.

These preliminary enquiries can often be conducted without the need to deploy an investigation team into the field. A desk-top review of the available evidence can then be conducted to inform the subsequent decisions on classification and the need for further investigation. But sometimes it is necessary or advisable to deploy investigators to gather evidence and assess the situation themselves. Regardless of the method used, the SIA exercise their full authority during this phase.

It should always be born in mind that the need to preserve evidence pending the SIA decision on classification and response, can have commercial consequences for the operator and so the decision to institute an Annex 13 investigation should not be delayed any longer than necessary, and clear instructions should be given on whether the aircraft can be returned to service and crew released to continue their normal duties.

Some SIA open an Annex 13 investigation to conduct preliminary inquiries but then close the investigation with a short factual report if it is decided that a full investigation is not required.

Proactive communication is vital in the immediate aftermath of the occurrence, to share relevant information between the SIA, the operator, the manufacturer, the airport and other agencies, whilst always protecting the confidentiality of sensitive investigation information.

Given the significance of SIA decisions on instituting or closing an Annex 13 investigation, it is important for transparency and accountability that such decisions are properly documented and formally communicated to all interested parties including by issuing or updating the ACCID, SINCID or INCID report as appropriate in accordance with Annex 13, Chapter 4.

Challenges in investigating complex incidents

In some cases, serious incidents can involve complex factors that challenge the standard investigative process. These incidents might require a more thorough examination due to multiple variables interacting, and potentially impacting aviation safety. The determination of whether to investigate such incidents should involve careful consideration of the unique challenges they present.

For example, incidents involving the convergence of multiple technical malfunctions, human errors, or external factors might require an in-depth investigation to unravel the interplay of these elements. Additionally, incidents with unusual scenarios or previously unobserved trends might need specialised expertise and comprehensive data analysis to fully comprehend the contributing factors.

In such instances, SIAs should collaborate with relevant experts and organisations to gather a diverse range of insights. This cooperative approach can help ensure a holistic understanding of complex incidents and facilitate the formulation of effective safety recommendations.

Enhancing international cooperation

Given the global nature of aviation, fostering international collaboration among SIAs can significantly enrich the investigation process. The sharing of best practices, lessons learned, and innovative investigative techniques can contribute to a collective effort to enhance aviation safety worldwide.

Collaborative initiatives may involve joint investigations or the exchange of information and expertise among SIAs from different countries. This approach can provide a broader perspective on incident causation and prevention strategies, enriching the overall pool of knowledge within the aviation community.

Furthermore, international collaboration allows SIAs to pool resources, particularly in instances where an incident has transboundary implications. Cooperation among SIAs, regulatory bodies, and industry stakeholders can expedite information sharing, evidence gathering, and analysis, leading to more timely and comprehensive investigation outcomes.

To facilitate international collaboration, SIAs should establish clear communication channels, data-sharing agreements, and standardised protocols for joint investigations when appropriate. Regular workshops, seminars, and conferences can serve as platforms for knowledge exchange, helping SIAs stay updated on the latest investigative techniques and technologies.

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