

EUROPEAN PLAN FOR **AVIATION SAFETY** (EPAS)

VOLUME III
Safety Risk Portfolio
2026 Edition



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1. INTRODUCTION

1. Introduction: the basis of the EPAS safety mitigation

What is this volume about?

Volume III of the EPAS aims to present the reader with the main aviation safety risks in Europe, how they are analysed, and with more insight on where the mitigation actions in EPAS Volume II are stemming from, in accordance with Article 6(1) of Regulation (EU) 2018/1139.

You can use this volume to:

- understand more about the safety issues and the potential accident outcomes they could lead to that are in the focus of the EPAS;
- use the information on the safety issues to inform decision-making in your own organisation.

The European Safety Risk Management (SRM) process

The main safety risks and corresponding mitigation actions as laid out in the EPAS are developed through the European SRM process. This process aims to identify the safety issues¹ and their mitigation actions. It involves analysis of data from different sources and collaboration with safety partners from national competent authorities and the industry (through collaborative analysis groups, the Network of aviation safety Analysts (NoAs)² or via the D4S programme³.

The SRM process follows five specific steps:



► **Figure 1: The European SRM process**

.....

- 1 Safety issues are safety deficiencies related to one or more hazards. They are the actual manifestation of a hazard or a combination of several hazards in a specific context. They can be assessed in terms of risk and practically managed (mitigated). The level of granularity of a safety issue should not be too detailed, in that it would then be controlled by selective and reactive operational mitigation controls, such as airworthiness directives (ADs) or safety directives (SDs). It should also not be too general, which would render its mitigation unfeasible in an acceptable time frame.
- 2 For easy reference, the 'network of aviation safety analysts', as referred to in Regulation (EU) No 376/2014 of the European Parliament and of the Council, is abbreviated as 'NoAs'.
- 3 [DATA4SAFETY | EASA](#)

1. INTRODUCTION

Identification of safety issues: The identification of safety issues is the first step in the SRM process, and it is performed through the analysis of occurrence data and other safety-related information and supporting information. Candidate safety issues are subject to a preliminary safety assessment. This assessment then informs the decision on whether a safety issue will be included within the safety risk portfolio or be subject to other actions. Within the portfolio, safety issues are prioritised.

Assessment of safety issues: A safety issue captured within the safety risk portfolio is subject to a technical safety assessment. The Agency may be supported by technical experts (e.g. from analysis groups, the NoAs or D4S partners). This collaborative approach with the Agency's safety partners is critical to achieving the best possible results. The output of this second step is a Safety Issue Assessment (SIA), which provides possible mitigation actions for the safety issue. The SIA also constitutes the first part of the best intervention strategy (BIS) report.

Definition and programming of safety actions: This includes an impact assessment of the possible mitigation actions, by assessing the implications and benefits of each possible action, and making recommendations on the best mitigation action(s) for the safety issue. This impact assessment constitutes the second part of the BIS report. The BIS report, with its draft recommended mitigation actions, is then consulted with the Agency Advisory Bodies (ABs). Considering the feedback from the ABs, EASA then decides on which mitigation actions to take. These actions are then included in the next version of the EPAS.

Implementation and follow-up: The next step in the process involves the implementation and follow-up of the actions that have been included within the EPAS. There are different types of actions within the EPAS, e.g. research, rulemaking, Member State tasks, safety promotion⁴ and evaluation.

Safety performance measurement: The final stage in the process is then the measurement of safety performance. This serves to monitor:

- (1) specific changes that have resulted from the implementation of safety actions; and
- (2) the systemic changes that may have occurred in the aviation system and may require additional actions.

The measurement of the performance is done via a safety performance framework that monitors:

- (1) transversally the various domains while looking at the key risk areas at domain level; and
- (2) the specific safety issues.

The Annual Safety Review (ASR) is the annual review of the safety performance framework. It identifies safety trends and highlights key risk areas.

Introducing the Safety Risk Portfolio

EPAS Volume III provides the EASA Safety Risk Portfolio. In its most simplified version, the Safety Risk Portfolio is a list of safety issues at the European level.

The Safety Risk Portfolio forms an essential component of the European SRM process. In developing the portfolio, safety information is gathered and analysed from any possible sources including occurrence data, expert judgement, and safety studies. Safety partners are essential to gathering this safety information.

4 More information on safety promotion is available on the [EASA Together4Safety Community Websites](#).

1. INTRODUCTION

Safety issues⁵

Safety issues are identified through the Agency's analysis of all relevant safety information, including occurrence data. The safety issues qualify to enter or exit the Safety Risk Portfolio according to the level of residual risk they bear. The residual risk considers the available mitigation actions employed to control the safety issue (new or strengthened barriers, other solutions).

The safety issues are grouped by domain⁶ as each domain has its particularities and requires specific expertise. The following domains are part of the SRM process:

- Systemic and conjunctural
- Human factors / human performance
- Commercial air transport — aeroplanes
- Rotorcraft (CAT, SPO, NCO)
- Non-commercial operations — small aeroplanes
- Sailplanes
- Balloons
- Airworthiness
- Air traffic management / air navigation services (ATM/ANS)
- Aerodromes and ground handling

Although the analysis of safety issues is conducted per domain, most safety issues are relevant to more than one domain. Within the Agency, we ensure that such safety issues are analysed from a multi-domain perspective with one domain taking the lead. Thus, while the safety issue may appear in only one domain of the Safety Risk Portfolio, experts from all relevant domains participate in the assessment of the safety issue to ensure the development of a holistic solution. In addition to such efforts, EASA coordinates a multi-domain perspective for such safety issues through the Safety in Aviation Forum for Europe, which is also known as [SAFE 360](#).

The key risk areas

Key risk areas are the determination of the most likely type of accident to which an occurrence could have escalated. They are another core concept in the European SRM process along with safety issues. The key risk areas provide insights to the most common potential accident outcome and the immediate precursors that may lead to the accident outcome. The set of key risk areas (Commission Delegated Regulation (EU) 2020/2034⁷) provides a common taxonomy for the possible accident outcomes, based on which the safety risk management is structured. Prioritisation applies to the safety issues being the safety deficiencies related to one or more hazards. In prioritising safety issues, key risk areas are considered when determining the worst likely accident outcome the safety issue may have escalated to, as part of the residual risk classification (refer to the description of 'prioritisation').

Each safety issue is therefore associated with one, the worst likely key risk area. For example, the safety issue 'Entry of aircraft performance data' may have as an outcome (i.e. key risk area) 'aircraft upset'.

.....

5 Safety issues are safety deficiencies related to one or more hazards. They are the actual manifestation of a hazard or a combination of several hazards in a specific context. They can be assessed in terms of risk and practically managed (mitigated). The level of granularity of a safety issue should not be too detailed, in that it would then be controlled by selective and reactive operational mitigation controls, such as airworthiness directives (ADs) or safety directives (SDs). It should also not be too general, which would render its mitigation unfeasible in an acceptable time frame.

6 A domain is a container that is used to consistently and coherently group safety issues to manage them. It can be led by operational, organisational, consensual or conjunctural considerations.

7 Commission Delegated Regulation (EU) 2020/2034 of 6 October 2020 supplementing Regulation (EU) No 376/2014 of the European Parliament and of the Council as regards the common European risk classification scheme (OJ L 416, 11.12.2020, p. 1) (http://data.europa.eu/eli/reg_del/2020/2034/oj).

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The 10 key risk areas are listed below, using the definitions as per the Delegated Act for the European risk classification scheme:

Airborne collision: a collision between aircraft while both aircraft are airborne; or between aircraft and other airborne objects (excluding birds and wildlife).

Aircraft upset: an undesired aircraft state characterised by unintentional divergences from parameters normally experienced during operations, which might ultimately lead to an uncontrolled impact with terrain.

Collision on runway: a collision between an aircraft and another object (other aircraft, vehicles, etc.) or person that occurs on a runway of an aerodrome or other predesignated landing area. This does not include collisions with birds or wildlife.

Excursion: an occurrence when an aircraft leaves the runway or movement area of an aerodrome or landing surface of any other predesignated landing area, without getting airborne. This includes high-impact vertical landings for rotorcraft/VTOL and balloons/airships.

Fire, smoke and pressurisation: an occurrence involving cases of fire, smoke, fumes or pressurisation situations that may become incompatible with human life. This includes occurrences involving fire, smoke or fumes affecting any part of an aircraft, in flight or on the ground, which is not the result of impact or malicious acts.

Ground damage: damage to aircraft induced by operation of aircraft on ground on any other ground area than a runway or predesignated landing area, as well as damage during maintenance.

Obstacle collision in flight: collision between an airborne aircraft and obstacles raising from the surface of the earth. Obstacles include such things as tall buildings, trees, power cables, telegraph wires and antennae as well as tethered objects.

Terrain collision: an occurrence where an airborne aircraft collides with terrain, without indication that the flight crew was unable to control the aircraft. This includes instances when the flight crew is affected by visual illusions or degraded visual environment.

Other injuries: an occurrence where fatal or non-fatal injuries have been inflicted, which cannot be attributed to any other key risk area.

Security: an act of unlawful interference against civil aviation. This includes all incidents and breaches related to surveillance and protection, access control, screening, implementation of security controls and any other acts intended to cause malicious or wanton destruction of aircraft and property, endangering or resulting in unlawful interference with civil aviation and its facilities. It includes both physical and cybersecurity events.

The links between safety issues and the worst likely key risk areas they contribute to are presented in [Appendix A](#) to this Volume.

Safety issues affected by climate change

Managing the impact of climate change on aviation safety is one of the strategic goals for the Agency (please refer to Volume I of the EPAS). Climate change is likely to affect the frequency and the intensity of hazardous weather phenomena, but also where and at what time of the year such phenomena tend to occur.

Examples of hazardous weather phenomena are severe airborne icing, severe turbulence, low-level wind shear, hail encounters, lightning strikes, etc. Although the effects of climate change on hazardous weather phenomena are rather long-term, they should be considered to ensure that safety risk assessments and risk mitigation measures are sustainable.

The Agency is currently gaining more knowledge on the effects of climate change on aviation safety, with the intent to inform safety issue assessments. To that end, this topic has been one of the core activities of the

1. INTRODUCTION

Agency's Scientific Committee⁸ since it was launched in 2022, and it is tracked by a research action in Volume II of the EPAS. The first findings of the Scientific Committee regarding severe convective storms, hail and clear-air turbulence can be consulted in the Scientific Committee's annual report 2022. The European_Academia@EASA conference in March 2023 covered, among others, how climate change affects aeroplanes take-off performance⁹.

In addition, the Agency has decided to establish a work programme on climate change adaptation, and launched the European Network on Impact of Climate Change on Aviation (EN-ICCA) in November 2023. Comprising relevant experts from national competent authorities, the aviation industry, weather and climate scientists, the work plan of the EN-ICCA includes work on future trends of severe convective storms, jet streams and clear air turbulence and safety concerns resulting from those trends. In addition, trends regarding airborne icing conditions are being investigated and dedicated methodologies for assessing the scientific knowledge on weather hazard trends are being developed.

In the following section, provided that a weather hazard contributes to a safety issue and there are indications that climate change is likely to influence trends related to a particular weather hazard, the affected safety issue is tagged 'CC effect'.

Safety issue prioritisation: Safety Issue Priority Index (SIPI)

Safety issue prioritisation is a structured approach allowing safety issues to be risk-classified in a consistent manner, regardless of the operational domains they belong to, and regardless of the source of the safety intelligence (safety data, experts' inputs, etc.) through which they have been identified.

The approach creates an index that is built upon a residual risk evaluation of the safety issues. 'Residual risk evaluation' means that we consider the worst likely accident outcomes and the effectiveness of their implemented systemic barriers. In other words, a safety issue with the same potential outcome as another one but with additional effective mitigation actions in place will have a lower 'residual risk'.

Other elements that are factored in the prioritisation index are:

- whether the safety issue has already resulted in fatalities, or contributed to a high-energy accident outcome; or
- whether the safety issue is novel, i.e. associated conditions are not fully understood or known, thus the risk may potentially be elevated (e.g. associated with newly introduced technology, unusual operations, innovative design); or
- whether the operational exposure to the safety issue is important (e.g. safety issue is affecting all flights of the domain, or safety issue may only be of concern during training flights, reducing the operational exposure).

Any positive replies to the above questions will imply a higher-priority index.

The resulting index enables a prioritisation of the safety issues for further assessment (refer to SRM process step 2) and support the Agency and its safety partners in deciding what safety assessments are to be launched in priority. The index of all safety issues is reviewed on a regular basis to reflect changes in the elements that were factored in. It is an iterative and continual approach towards prioritisation of safety issues.

The safety issues are grouped by nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome), and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that SIPI is applied to safety issues in the 'systemic' and 'hazards in a context' groups, but not to the 'contributing' safety issues.

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8 Refer to [EASA's Scientific Committee \(SciComm\) | EASA \(europa.eu\)](#).

9 Refer to [European_Academia@EASA conference 2023 - Physical | EASA \(europa.eu\)](#).

1. INTRODUCTION

Higher-risk safety issues in the EU aviation system

As the SIPI method is applied in a structured and consistent manner for the safety issues in the 'systemic' and 'hazards in a context' groups from all domains, it provides a cross-domain perspective of the higher-risk safety issues in the EU aviation system, irrespective of the SRM step they are currently in.

Refer to Table 1 for the top 20 cross-domain safety issues per SIPI. Most of the SIPI scores are in the upper end of medium (3 - <7), and in this edition there is no safety issue that scores with a SIPI high (7-10). The lists below are grouped per nature: hazard in context and systemic issue. The lists do not refer to safety issues from the Aerodrome and Ground Handling domain because this domain requires a review and restructure and was therefore put on hold. This work will be concluded by the next update cycle.

Since 2025, there have been 9 safety issues entering the top 20, highlighted in the tables below. The main reason for this is the update of the SIPI method and that contributing safety issues are not SIPI scored any longer.

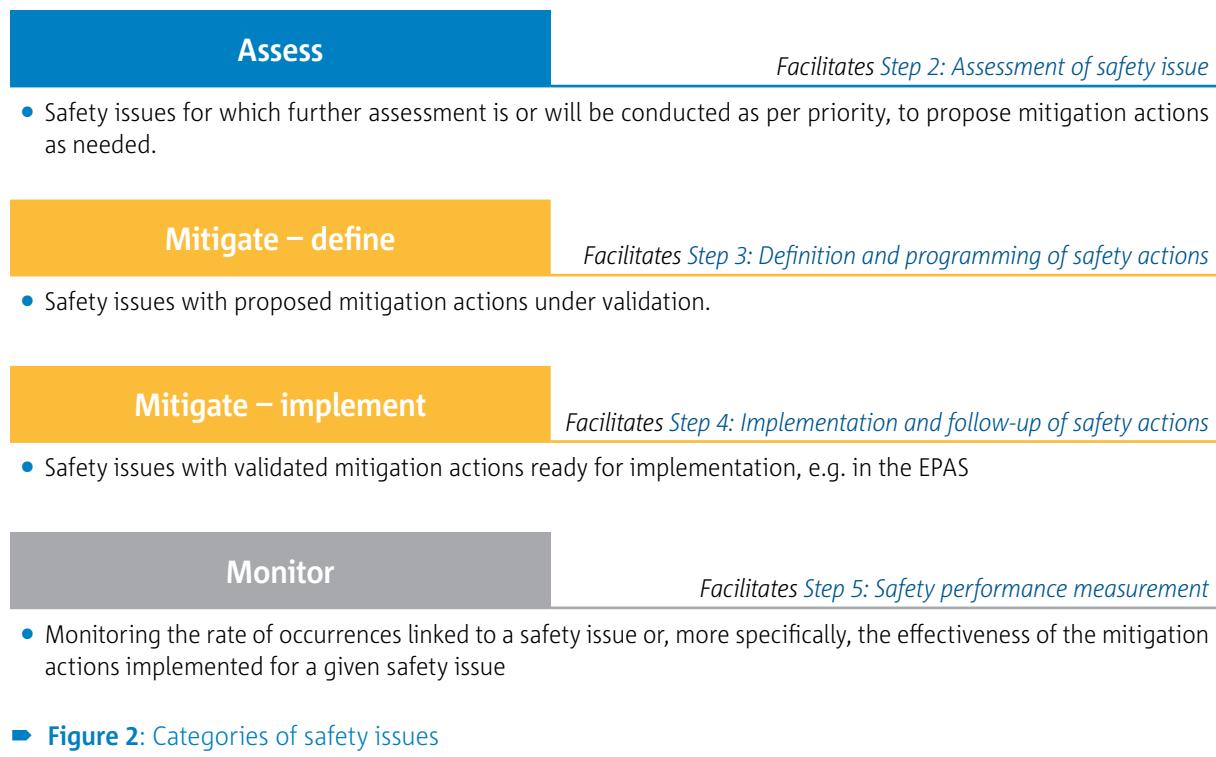
SI group	Domain	SI ID	SI title	Status
Hazard in a context	CAT A	SI-0034	Impact of GNSS interference on civil aviation operations	MITIGATE/DEFINE
	Airworthiness	SI-9012	Oxygen-fed fire in the flight deck	ASSESS/QUEUED
	CAT A	SI-0060	Out-of-spec synthetic aviation turbine fuels (SATF) in operations	ASSESS/ACTIVE
	CAT A	SI-0007	Approach path management	MITIGATE/DEFINE
	ATM/ANS	SI-2006	Inappropriate clearance/instructions in relation to runway operations	ASSESS/ACTIVE
	CAT A	SI-0001	Icing in flight	MITIGATE/IMPLEMENT
	CAT A	SI-0015	Entry of aircraft performance data	MITIGATE/IMPLEMENT
	CAT A	SI-0037	Mishandling of non-precision approaches due to erosion of piloting skills	ASSESS/QUEUED
	CAT A	SI-0003	Adverse weather encounters (turbulence, hail, lightning, ice)	ASSESS/QUEUED
	ATM/ANS	SI-2007	Landing/take-off/crossing without a clearance	ASSESS/ACTIVE
Systemic	CAT A	SI-0035	False or disrupted instrument landing system (ILS) signal capture	ASSESS/QUEUED
	ATM/ANS	SI-2004	Level bust	ASSESS/QUEUED
	Airworthiness	SI-9011	In-flight fire in inaccessible areas	MITIGATE/DEFINE
	Systemic and conjunctural	SI-5530	Errors of civil aircraft identification by ground military forces and airborne assets outside the conflict zone	MONITOR/PASSIVE
	Airworthiness	SI-9005	Outdated certification bases established for major changes to type certificates	MITIGATE/IMPLEMENT
	Airworthiness	SI-9003	Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design	MITIGATE/IMPLEMENT
	HF/HP	SI-3001	Inadequate evaluation of organisational and safety culture due to insufficient leadership competence and/or commitment to HF/HP principles	ASSESS/QUEUED
	Airworthiness	SI-9001	Inadequate management of repetitive defects	MITIGATE/DEFINE
	HF/HP	SI-3012	Lack of accessible and trusted staff support for well-being and fitness for duty	ASSESS/ACTIVE
	Airworthiness	SI-9006	Shortcomings in design and maintenance instructions resulting in maintenance errors	ASSESS/ACTIVE

► **Table 1:** 20 higher-risk cross-domain safety issues grouped per nature (all statuses)

1. INTRODUCTION

Process to handle safety issues in the SRM

Each safety issue is assigned an identification number (SI-DNNN) to facilitate tracking within the SRM process, as well as its relevance to different aviation domains. The safety issues are then categorised in the Safety Risk Portfolio domains as follows:



The links between safety issues in this EPAS Volume III and the mitigation actions in EPAS Volume II are provided in [Appendix B](#) to this Volume.

How are safety issues removed within the SRM?

Safety issues are **removed** from the Safety Risk Portfolio following an assessment concluding that:

- they are no longer relevant or current in the present operational context, or
- they are being refined, or
- they are sufficiently mitigated and that the residual risk is acceptable, without the need for further action or monitoring.

Any decision to remove a safety issue temporarily or permanently from the Safety Risk Portfolio is validated and documented as part of the relevant EU SRM process.

Main changes since the last edition

Since the last edition, the SIPI method has been updated, and the priority has been reviewed for all safety issues, especially considering the exposure of flights in the domain affected, occurrences, novelty, barrier effectiveness, crediting the mitigation actions introduced and implemented in barrier effectiveness. Also, the currency of safety issues has been reviewed, and 'non-current' safety issues have been removed from the portfolio.

1. INTRODUCTION

The most notable changes compared to the last edition are the following:

Two new safety issues have been added to the Safety Risk Portfolio, namely SI-9011 'In-flight fire in inaccessible areas' and SI-0060 'Out-of-spec synthetic aviation turbine fuels (SATF) in operations'. The three highest SIPI score safety issues are SI-0034 'Impact of GNSS interference on civil aviation operations', SI-9012 'Oxygen-fed fire in the flight deck', and SI-9005 'Outdated certification bases established for major changes to type certificates'. Most of the safety issues in the Safety Risk Portfolio have a SIPI score that is in the upper end of medium (3 - <7), and in this edition there is no safety issue that scores with a SIPI high (7-10). Overall, the highest increase in SIPI exceeding 1 point, when compared to the 2025 edition, is for SI-0049 'Flight crew incapacitation', SI-2004 'Level bust' and SI-3012 'Lack of accessible and trusted staff support for well-being and fitness for duty (amended)'. The highest decrease in the SIPI score is for safety issues in the NCO aeroplanes and sailplanes domains, with examples being SI-7012 'Unsafe handling of under/overshoot' and SI-4030 'Carbon monoxide poisoning'.

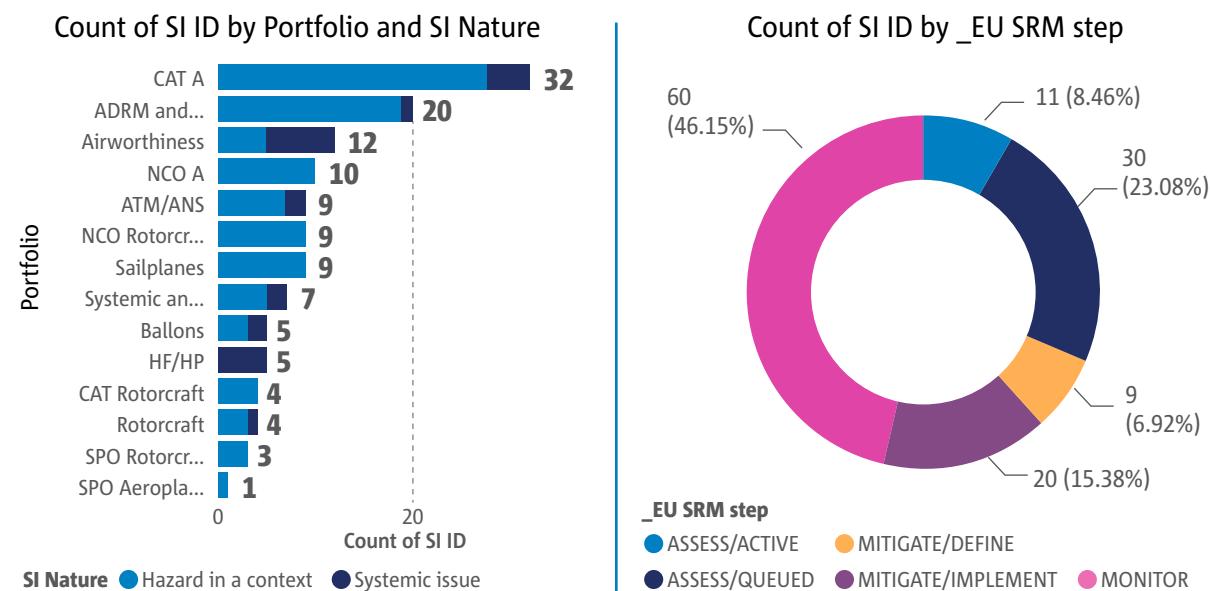
There were 39 safety issues amended and 12 removed from the portfolio.

Overall, the 2026 Safety Risk Portfolio includes 130 safety issues of hazard in a context and systemic nature. Amongst those, 70 have been identified to require either further assessment to identify the best mitigation action or mitigation is planned / being implemented with an EPAS action, namely:

- 11 safety issues are under assessment to determine the barrier effectiveness and propose mitigation actions, where necessary (status: assess active).
- 30 safety issues have been identified for which their detailed assessment has not yet started (status: assess queued); they will be assessed as per their priority.
- For 9 safety issues, the proposed mitigation actions are being defined and the impact assessed (status: mitigate define).
- For 20 safety issues, mitigation actions are being implemented (status mitigate implement). The mitigation actions are shown in EPAS Volume II.

60 safety issues of hazards in context and system safety issues in the portfolio require no further action. These safety issues are being monitored. Out of these 60, 19 are actively monitored with specific safety performance indicators or other means.

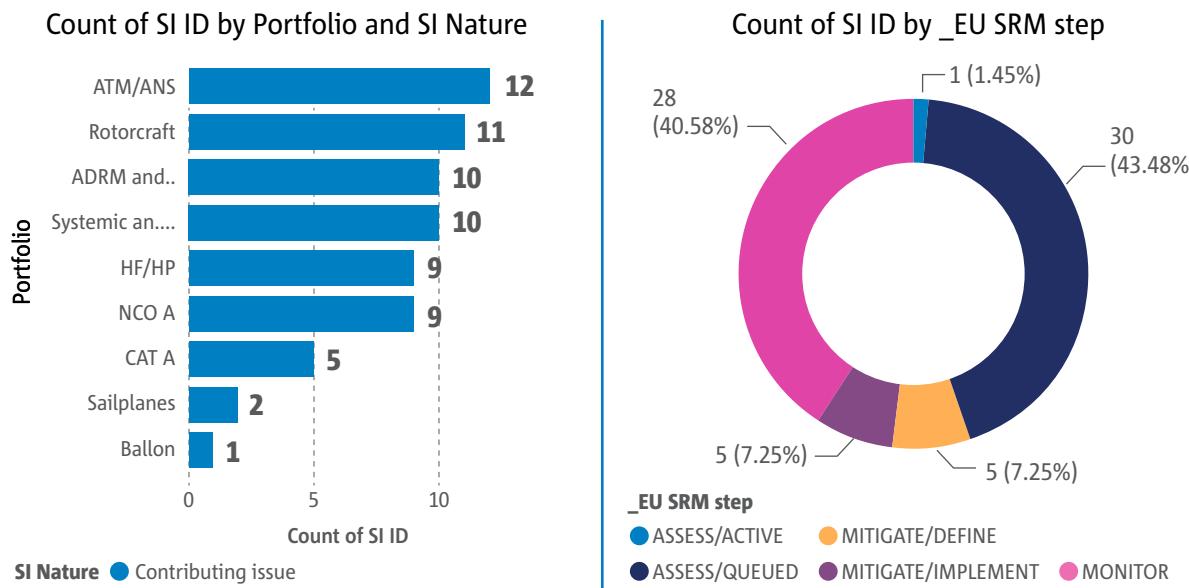
Figure 3 shows the hazards in context and systemic safety issues per nature, domain portfolio and status.



► **Figure 3:** Distribution of hazard in a context and systemic safety issues per domain, nature, and the EU SRM step

1. INTRODUCTION

In addition to the hazards in context and systemic safety issues, the Safety Risk Portfolio includes 69 contributing safety issues. Contributing safety issues will not be actioned in isolation, but together with hazards in a context and systemic safety issues (as per the above). Figure 4 shows the distribution of contributing safety issues per domain, nature, and the EU SRM step:



► **Figure 4: Distribution of contributing safety issues per domain, nature, and the EU SRM step**

The links between all safety issues and the worst likely key risk areas to which they contribute is provided in [Appendix A](#) to this Volume. The links between safety issues and their mitigation actions are provided in the [Appendix B](#) to this Volume.

New safety issues in the portfolio are marked ‘(New)’. Safety issues for which definitions and/or the title were updated are marked ‘(Amended)’.

2. SYSTEMIC AND CONJUNCTURAL — SYS & CONJ

2. Systemic and conjunctural¹⁰ — SYS & CONJ

The Systemic and conjunctural safety issues are used to manage risks at a systemic level affecting several domains or stemming from or being associated with crises.

The effects of the war in Ukraine and other ongoing conflicts are still present and affect the civil aviation sector, namely errors of civil aircraft identification by ground military forces and airborne assets outside the conflict zone, cyberattacks, missing suppliers and low availability of parts, separation with unidentified aircraft, airspace infringement by military UAS, aircraft, missiles, or debris spilling over from conflict zones, and others.

It is important to note that some safety issues, such as ‘reduced available financial resources’, or ‘shortage of operational and technical staff’ cannot be directly addressed by the Agency or the EASA Member States but are important for organisations to include in their safety management systems. In addition, not all safety issues may be applicable in the future due to the fluidity of the circumstances. Some systemic and conjunctural safety issues have been removed this year as being not current anymore.

The safety issues in SYS & CONJ are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence.

Currently there are 17 systemic and conjunctural safety issues. Since the last edition 4 safety issues have been removed from the portfolio because they were either not current any longer or merged with other safety issues.

The highest SIPI score hazards in a context or systemic safety issues for the systemic and conjunctural are ‘errors of civil aircraft identification by ground military forces and airborne assets outside the conflict zone’, ‘airspace infringement by military UAS, aircraft, missiles, or debris spilling over from conflict zones’ and ‘separation with unidentified aircraft’.

Refer to [Appendix A](#) for the link between safety issues and key risk areas.

► **List 1:** Systemic and conjunctural safety issues per category and priority

Assess	Facilitates Step 2: Assessment of safety issue
NIL	
Mitigate – define	Facilitates Step 3: Definition and programming of safety actions
NIL	
Mitigate – implement	Facilitates Step 4: Implementation and follow-up of safety actions
NIL	

10 A critical set of circumstances; a crisis.

2. SYSTEMIC AND CONJUNCTURAL — SYS & CONJ

Monitor	<i>Facilitates Step 5: Safety performance measurement</i>
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Systemic issues and hazards in a context

- [Errors of civil aircraft identification by ground military forces and airborne assets outside the conflict zone \(SI-5530\)](#)
- [Airspace infringement by military UAS, aircraft, or debris spilling over from conflict zones \(SI-5515\)](#)
- [Separation with unidentified aircraft \(SI-5514\)](#)
- [Shortage of operational and technical staff \(SI-5018\)](#)
- [Non-standard and unplanned military activities outside the conflict zones \(SI-5508\) \(Amended\)](#)
- [Reduced available financial resources \(SI-5019\)](#)
- [Aircraft collision with space debris \(SI-5101\)](#)

Contributing issues:

- [Aircraft vulnerability leading to flight safety degradation due to cyberattacks \(SI-5017B\)](#)
- [Airline systems' vulnerability leading to disruptions due to cyberattacks \(SI-5017A\)](#)
- [Cyberattacks \(SI-5017\)](#)
- [Knowledge transfer issue for new generation aviation personnel \(SI-5033\)](#)
- [Missing suppliers and low availability of parts \(SI-5020\)](#)
- [Non-standard operational air traffic routings, reservation of military areas outside the conflict zone \(SI-5532\) \(Amended\)](#)
- [Short time available for training affecting training effectiveness \(SI-5032\)](#)
- [Space weather effects on aviation \(SI-5102\) \(Amended\)](#)
- [Spare parts shortages \(other than aircraft\) \(SI-5504\) \(Amended\)](#)
- [Transition of a civilian airport to mixed civil-military operations \(SI-5533\)](#)

Aircraft collision with space debris (SI-5101)

Some re-entries of rocket bodies have already caused a certain level of disruption in the European airspace. The disruption was caused by the closure of airspace by several national authorities. The non-harmonised response in the affected area further increased the disruption and potentially increased the safety risk for flights in the region (e.g. holding aircraft under the trajectory of the rocket debris).

It is understood that there will be an increase in numbers of re-entry events due to increased space activity (increase in number of rocket launches, satellites, increased probability of airborne collision with debris).

Related SIBs:

- SIBs issued for known re-entry events.

Aircraft vulnerability leading to flight safety degradation due to cyberattacks (SI-5017B)

Aircraft systems may be vulnerable to hacking, or ground support systems leading to faulty maintenance, airline systems causing major disruptions to the air traffic system.

2. SYSTEMIC AND CONJUNCTURAL — SYS & CONJ

Airline systems' vulnerability leading to disruptions due to cyberattacks (SI-5017A)

Airline systems may be vulnerable to hacking, causing major disruptions to the air traffic system.

Airspace infringement by military UAS, aircraft, or debris spilling over from conflict zones (SI-5515)

Airspace infringement by military UAS or aircraft spilling over from conflict zones into the controlled airspace without coordination/permission, as well as debris of shot missiles, could lead to loss of separation. The unexpected presence of military UAS within civilian air traffic areas may disrupt normal operations. There is the potential for misuse of civilian UAS as obstacles, to attack critical sites or to disrupt normal air traffic flows.

Cyberattacks (SI-5017) (Amended)

The aviation industry remains a key target for cyberattacks, with airports, airlines, manufacturers, service providers, and government agencies managing vast amounts of sensitive data. As digitalisation accelerates, new vulnerabilities arise, increasing the sector's exposure to cyber risks.

- Proposed actions to mitigate this safety issue:
- Perform information security risk assessments
- Identify severe threats
- Raise staff and user awareness of cybercrimes
- Constantly train IT and security staff
- Protect sensitive data
- Use multi-factor authentication
- Ensure strong security policy
- Conduct regular unannounced audits
- Advise crew to avoid carrying substantial amounts of company data (laptops or removable storage devices)

Errors of civil aircraft identification by ground military forces and airborne assets outside the conflict zone (SI-5530)

As shown by previous wars, misidentification is easy in the confused arenas of warfare. Blue-on-blue incidents have been numerous in the past. It is not only from one side that the risk develops. If the likelihood of the jamming of electronic aids that may be involved with navigation and/or aircraft identification tools is added, there is a potential risk for civil aircraft becoming subject to missiles or radar laid weapons.

Guidance on how to address this issue is available at:

- EASA CZIBs and relevant NOTAMs

Knowledge transfer issue for new generation aviation personnel (SI-5033)

Many highly knowledgeable people have retired from the industry or changed over to another industry during the pandemic, with little opportunity to provide detailed and gradual handovers to colleagues. As a result, organisations and the industry has lost the experience and tacit knowledge from a generation that in many cases founded the industry we work in and developed the procedures, principles, and regulations that we now take for granted.

2. SYSTEMIC AND CONJUNCTURAL — SYS & CONJ

Missing suppliers and low availability of parts (SI-5020)

The lockdown resulted in difficulties for organisations liaising with their suppliers. Further economic strains have increased problems with maintaining or recovering the supply chains, and/or leading to a lack of spare parts, products, calibrated tooling and others. This may affect the availability of aircraft.

Non-standard and unplanned military activities outside the conflict zones (SI-5508) (Amended)

This safety issue relates to non-standard military activities, such as increased activity of unmanned aircraft patrolling, or surveillance conducted outside conflict zones. The response to the Ukraine war may result in Member States experiencing an increase in unplanned military exercises, as well as movement of military aircraft from certain airbases to others. Unexpected 'due regard' flights could also pose an increased risk for commercial air operations in certain areas. Traffic types that are unusual in certain areas (e.g. formation flights, in-flight refuelling of aircraft, etc.) may increase. Overall, this can lead to increased ATCO workload, reduced airspace capacity, and heightened risk of airborne collision with both manned and unmanned military aircraft.

Non-standard operational air traffic routings, reservation of military areas outside the conflict zone (SI-5532) (Amended)

Ad hoc requests to establish temporary segregated areas (transit corridors) and ad hoc reservation of military areas outside operational hours published in AIPs, may lead to additional workload as they must be coordinated with all parties involved. Recent increases in cross-border training missions, NATO readiness activities, and crisis-related deployments have heightened the frequency of such requests, amplifying coordination complexity.

Reduced available financial resources (SI-5019)

A reduction in available financial resources may cause the loss of key personnel and corporate knowledge, increased pressure on personnel, and affect decision-making. Long-term investment plans may slip or be changed, with consequences long after traffic levels have begun to recover.

Separation with unidentified aircraft (SI-5514)

This safety issue addresses the increased presence of unresponsive and/or unidentified traffic. As an example, between the Finnish and the Estonian territorial waters, there is a narrow corridor of neutral waters providing Russia with access to the Baltic Sea and Kaliningrad. Russian flights may or may not have a transponder on/flight plan, they may or may not be in radio contact, and they use any level that suits their purpose. Such traffic conflicts with the Helsinki inbound–outbound civil traffic or is a completely new category of en-route traffic operating under normal air navigation service (ANS) rules and regulations but within the limitations set for Russian operators concerning the Finnish and the Estonian airspace. The number of flights over neutral waters has drastically increased, increasing in turn the ANS workload and imposing an effect on the flight profiles of civil aircraft.

Shortage of operational and technical staff (SI-5018)

Organisations' limited finances may have limited the number of personnel they employed, and movement restrictions due to the pandemic may have further hampered personnel in remaining in the workplace. Staffing shortages at aerodromes, caused by difficulty in recruiting and retaining ground handlers and significantly exacerbated by the unexpectedly strong recovery of European airline operations may lead to increased human error due to high staff workload/time pressure and unofficial adaptations to streamline tasks, increased time in security checks (passengers and crew) causing delays and constraining pre-flight activities, reduced capacity in supplying ground service equipment to aeroplanes at the stand, and delays causing changes to planned operations. This safety issue also includes shortage of dispatchers, staffing maintenance staff, air traffic services and flight/cabin crews.

2. SYSTEMIC AND CONJUNCTURAL — SYS & CONJ

Short time available for training affecting training effectiveness (SI-5032)

Turnover of operational staff, and required staffing due to increased traffic makes the time available for training short. That may lead in reduced availability of the operational staff or reduced competence. The issue may become a limiting factor on capacity during increased volume of operations or will cause fatigue or overload where there is a reduced number of personnel providing services.

Space weather effects on aviation (SI-5102) (Amended)

The solar activity follows an 11-year cycle. The latest peak was in 2025 (as published on 15 September 2020 on <https://www.weather.gov/news/201509-solar-cycle>); also refer to the paragraph on solar radiation timeline in SIB 2012-09R1). However, there are [sources](#) mentioning that the cycle had started earlier, already in 2019. The following risk considerations are relevant:

- An increased reliance on GNSS as the main source for navigation and time.
- In a similar manner, an increased reliance on satellite-based communications.
- The use of polar routes for aircraft trajectory is increasing as it provides reduction in travel times or evasion of conflict zones. Especially on such routes, airlines also need to consider the effects of solar activity on HF communication: poorer quality, a shift to lower usable frequency bands, and more noise or fading. During extreme solar activity, HF communications may not be available in the polar region.
- The availability, continuity, integrity and accuracy of un-augmented GNSS in the region close to the magnetic equator can rapidly change in time during the event. The most intense scintillation is around the magnetic equator.

Related SIBs:

[EASA SIB 2012-09R1 Effects of Space Weather on Aviation](#)

[EASA SIB 2012-10R1 Single Event Effects on Aircraft Systems caused by Atmospheric Radiation](#)

Spare parts shortages (other than aircraft) (SI-5504)

The current crisis may lead to an increase in the prices of spare parts (other than aircraft, ATM/ANS equipment, aerodromes, ground handling, etc.) and shortages in the availability of electronic equipment, especially if components are manufactured in countries which are directly affected by the crisis or are geopolitically aligned with Russia, and this may have a negative effect on aviation safety.

Transition of a civilian airport to mixed civil-military operations (SI-5533)

In the event of an increase in the number of air operations with military status related to military operations and securing NATO's eastern flank using civil air traffic services, there may be increased risks stemming from mixed civil-military operations at airports, especially during the transition period. When introducing subsequent alert levels and preparing the airport infrastructure for military purposes (temporary logistic bases, field hospitals, fuel bases, etc.), the airport operational procedures may not be fit for the new purpose and can create organisational and operational disruptions to the airport's services. The emerging facilities may pose a potential threat to air operations.



3. Human factors / human performance — HF/HP

The safety issues for Human factors (HF)/human performance (HP) were identified in 2017 by the Agency, in conjunction with the HF Collaborative Analysis Group (CAG), and has since been reviewed regularly. Due to the broad nature of HF/HP safety issues, they contribute to most, if not all, key risk areas.

The safety issues are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description.

All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome), and contributing issue (a safety issue is contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Consequently, the HF/HP-related ones have been reviewed and grouped as systemic or contributing safety issues. During 2024–2025 the HF/HP safety issues were entirely reframed and consolidated to address overlaps, vague definitions and inconsistent granularity. As this is an ongoing exercise, at this stage assess category SIs were reframed around their distinct risk or domain of influence, differentiating between what triggers the risk and how the risk manifests operationally, and the narratives were realigned accordingly. Explicit need for mergers and refinements was addressed as follows: 3 mergers clarified the scope of 6 SIs (3001, 3002, 3004, 3014, 3012 and 3024), 14 of 18 SIs were retained and 1 non-validated safety issue (SI-3022) was removed. The outcomes of this sanitisation exercise are reflected below in the list of safety issues and their descriptions. Note that contributing safety issues are sorted in an alphabetical sequence.

The revision is also in alignment with recent rulemaking and guidance that shape HF/HP practice across domains. In February 2025, EASA adopted ED Decision 2025/002/R, updating the acceptable means of compliance & guidance material AMC & GM to Part-ORO and Part-MED. Said ED Decision adds guidance on in-flight relief (criteria and competence for the relieving pilot, including cruise-relief co-pilot training/checking) and in parallel standardises hand-over briefings with a structured briefing that explicitly covers the aircraft’s navigation and ATC status, reinforcing CRM and decision-making continuity. The amended AMC & GM to Part-MED strengthen clinical guidance (e.g. cardiovascular, obstructive sleep apnoea, mental-health assessments) supporting fitness-for-duty. These are incremental improvements that complement ongoing CRM, upset prevention and recovery training (UPRT) and evidence-based training (EBT) practice rather than overhauling it.

In January 2025, ED Decision 2025/001/R delivered the regular update to the Air Operations AMC & GM with the objective of improving the alignment between the EU air operations regulatory framework and the relevant International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs) and Documents related to the ICAO Universal Safety Oversight Audit Programme (USOAP). In practice, this update introduces editorial and clarifying amendments, including the addition of a standard departure briefing reference in operations manual part B (OM-B), reinforcement of the need for operators to consider conflict zone risk assessments, clarification of wet lease evaluation aspects (including MEL equivalency) and adjustments to how qualification / controlled flight into terrain (CFIT) training requirements are referenced — housekeeping changes to maintain alignment with ICAO. It supports stable training/checking and operator procedural frameworks that are relevant to several HF/HP issues.

On training tools and simulator fidelity, EASA published Opinion No 01/2025 proposing a modernised framework for flight simulation training devices (FSTDs), based on the FSTD capability signature (FCS) and a task-to-tool approach that better matches training tasks with device capabilities. Opinion No 01/2025 was published following the consultation on NPA 2024-101 (flight simulation training device requirements), NPA 2024-102 (new CS-FSTD with structured fidelity levels) and NPA 2024-108 (AMC & GM to Subpart ARA.FSTD and Subpart ORA.FSTD),



which together improve traceability from training need to device requirement and objective testing — key enablers for addressing HF/HP issues related to training effectiveness and competence.

Fatigue evidence base has also been strengthened. The original Effectiveness of Flight Time Limitations (FTL) report (2019)¹¹ continues to inform fatigue risk management (FRM) policy, while FTL 2.0 research deliverables (2024–2025) are progressively documenting alertness impacts across specific duty types and updating the empirical foundation for future improvements. These materials sit alongside Agency's ATCO fatigue programme: the Fatigue Study - Final Report was published on 21 May 2024 and the Follow-up Action Plan on 7 June 2024, providing data-driven recommendations for ATS providers and authorities that map directly to HF/HP concerns on fatigue, workload and vigilance.

Finally, cross-domain learning from certification and continuing airworthiness has been strengthened through the Final Certification Memorandum CM-21.A-A-003 (30 August 2024), which guides design approval holders in analysing HP-originated unsafe conditions using occurrence evidence. This supports systemic HF/HP integration in design, investigation and risk analysis.

► **List 2:** Human factors / human performance safety issues per category and priority

Assess

Facilitates Step 2: Assessment of safety issue

Systemic issues and hazards in a context

- [Inadequate evaluation of organisational and safety culture due to insufficient leadership competence and/or commitment to HF/HP principles \(SI-3001\) \(Amended\)](#)
- [Lack of accessible and trusted staff support for well-being and fitness for duty \(SI-3012\) \(Amended\)](#)
- [Degradation of resilient performance due to suppressed adaptive capacity \(SI-3009\) \(Amended\)](#)
- [Inadequate integration of HF/HP principles and/or HF specialists within organisations \(SI-3004\) \(Amended\)](#)
- [Loss of tacit knowledge in organisations and competent authorities \(SI-3008\) \(Amended\)](#)

Contributing issues:

- [Critical gaps in risk-driven decision-making at strategic and design levels \(SI-3016\) \(Amended\)](#)
- [Failure to sustain vigilance in monitoring and cross-checking tasks \(SI-3015\) \(Amended\)](#)
- [Limitations to causal analysis \(SI-3018\)](#)
- [Workload extremes negatively impacting task performance and decreasing safety \(SI-3006\) \(Amended\)](#)

Mitigate – define

Facilitates Step 3: Definition and programming of safety actions

Contributing issues:

- [Fatigue and quality sleep \(SI-3005\)](#)
- [Training effectiveness and competence \(SI-3011\)](#)

11 [Effectiveness of Flight Time Limitation \(FTL\) Report | EASA](#)



Mitigate – implement

Facilitates *Step 4: Implementation and follow-up of safety actions*

Contributing issues:

- [Design and use of procedures \(SI-3007\)](#)
- [Insufficient human factors competence of regulatory and oversight personnel \(SI-3003\)](#)

Monitor

Facilitates *Step 5: Safety performance measurement*

Contributing issues:

- [Impact of startle and surprise on flight crew management of safety-critical situations \(SI-3010\)](#)

Critical gaps in risk-driven decision-making at strategic and design levels (SI-3016) (Amended)

Decision-making in aviation-related activities can be complex, pressing and involve a high risk. Yet it plays a key role in achieving safe outcomes in every stage (i.e. design, production, operation, maintenance of products, systems and processes) and in every stakeholder (i.e. original equipment manufacturers (OEMs), operators, aerodromes, air navigation service providers (ANSPs), continuing airworthiness management organisations (CAMOs), aircraft maintenance organisations (AMOs), etc.). Upstream decisions (rulemaking, approvals, organisational change) set operational boundaries — when based on narrow models or flawed assumptions, they introduce latent conditions. The SI aims for better tools and competence for complex, trade-off-aware decision-making.

Degradation of resilient performance due to suppressed adaptive capacity (SI-3009) (Amended)

Organisational resilience is a key factor in successfully and safely managing operations, but there is scant regulatory guidance on how to apply the concept. Resilience comprises a system's ability to both withstand disturbance, challenges and change, and recover and sustain operations following disturbance, challenges and change. The SI seeks to recognise and support everyday resilience within SMS and oversight.

Design and use of procedures (SI-3007)

Procedures are used throughout the aviation industry to describe the correct actions and sequence of actions to perform a task. Due to necessity, procedures are designed using assumptions about the circumstances in which they will be applied. While this frequently produces well-designed procedures, the complex nature of the aviation working environment means that not every circumstance can reasonably be accounted for. Regardless of whether the procedure has been designed well or badly, rapid changes in the aviation system can mean that a procedure becomes more difficult to use over time. The SI focuses on designing/managing usable procedures and coping mechanisms when procedures are insufficient.

Failure to sustain vigilance in monitoring and cross-checking tasks (SI-3015) (Amended)

Maintaining appropriate levels of attention and vigilance supports situational awareness. It is important to ensure that the working environment, equipment and processes support the operator in performing the task, and do not introduce additional and unnecessary challenges to the attention and vigilance required for safe operations. Typical descriptions of occurrences include becoming preoccupied with an unusual task rather than managing the more immediate situation; missing a step in a process where the process has become repetitive; lack of monitoring and cross-check leading to undetected data entry errors. The SI targets attentional resilience, team monitoring culture and interface support for cue detection.



Fatigue and quality sleep (SI-3005)

Fatigue is repeatedly identified as one of the most serious challenges within the aviation industry. The signs of fatigue are subtle and limit human performance across the system — prevention depends on both sleep quantity and quality, robust fatigue management, evidence-based training and practical rostering. Recent EASA actions (FTL effectiveness work; AMC1 ORO.FTL.250 fatigue training) and continuing FTL 2.0 research reinforce the SI's focus. SI-3005 strives to ensure that adequate prevention against effects of fatigue is provided in all aviation domains.

Impact of startle and surprise on flight crew management of safety-critical situations (SI-3010)

Surprise and its consequent reaction, startle, is a significant impediment to managing safety-critical situations but not enough is known about how to mitigate it. Research shows that cognitive impairment, particularly in the working memory, can be significant. During an unexpected critical event in aviation, such impairment could be critical to the effective recovery from the situation. Narrowed attention, decreased search behaviour, longer reaction time to peripheral cues, decreased vigilance, degraded problem-solving, performance rigidity, degraded working memory function and critical effects on psychomotor skills are just some of the impairments noted under the effects of startle and surprise. The SI targets human-centred alerting, mode transparency, validation/training methods and their translation into operational procedures.

Inadequate evaluation of organisational and safety culture due to insufficient leadership competence and/or commitment to HF/HP principles (SI-3001) (Amended)

Leadership blind spots and weak culture measurement deter staff from raising safety issues and hinder organisational learning. Positive cultural evolution requires cooperation and shared values across all levels of management and workers. Corporate safety culture is particularly affected by the values and actions of senior management. This SI emphasises leadership competence and active stewardship of culture as core safety enablers across domains.

Inadequate integration of HF/HP principles and/or HF specialists within organisations (SI-3004) (Amended)

An organisation is made up of humans, procedures and processes that work together, often in a hierarchical manner and interacting to achieve a common goal. Insufficient embedding of HF in SMS, design and change processes means decisions on design, procedures, staffing and technology are taken without reliable evidence on human-system performance. This SI discusses systematic HF methods and specialist input across the lifecycle and at key SMS interfaces.

Insufficient human factors competence of regulatory and oversight personnel (SI-3003)

Competence is a set of observable and measurable behaviours that an individual is expected to demonstrate in relation to required task performance. It is important for regulatory staff to have specific HF competence to be able to perform their duties. This also provides an added benefit of improving the conversation on safety and HF between regulatory staff and people at different levels in industry. The SI targets the development and uptake of HF competencies, tools and assessment in authorities.

Lack of accessible and trusted staff support for well-being and fitness for duty (SI-3012)

The EASA-led Task Force on Germanwings Flight 9525 identified a number of safety risks, including the need for pilot support programmes. However, such support programmes are needed in other areas of aviation as well. This has been highlighted in particular throughout and after the COVID-19 pandemic, where aviation professionals have worked under high pressure and often in isolating circumstances. Where aviation staff cannot access confidential, trusted support, well-being concerns may go underground, harming fitness for duty and safety. The SI aligns with the EU psychological-health policy.



Limitations to causal analysis (SI-3018)

Investigations into incidents and hazard observations often result in poor or ineffective interventions because investigations pursue straightforward root causes of the issue. Shallow investigations often address symptoms of the event rather than the error-prone conditions, and consequently rarely prevent reoccurrence. The SI focuses on causal analysis that captures system interactions, performance conditions and learning oriented action.

Loss of tacit knowledge in organisations and competent authorities (SI-3008) (Amended)

Knowledge-sharing, particularly of tacit knowledge, is difficult to do well. This makes knowledge retention in situations of increased staff turnover very difficult. Knowledge development and sharing is about developing the right knowledge and making this knowledge available to the right people at the right time. The SI aims at deliberate capture/transfer to sustain operational continuity and competence.

Training effectiveness and competence (SI-3011)

Despite the obvious technological advances that have made the aviation industry safer and more efficient in the last few decades, the way that those working in the industry are trained has not changed accordingly. ICAO has sought to address this through the development of competency frameworks; however, organisations and States need to assure themselves that they fully appreciate how to utilise competency frameworks to their best advantage, whilst striving for a shared understanding of terms and concepts.

Workload extremes negatively impacting task performance and decreasing safety (SI-3006) (Amended)

The workload issue remains at the top of aviation discussions. It can be considered as consisting of two major components: physical workload and cognitive workload. High physical and mental workload situations often coincide, causing a significant degradation to cognitive capacity and consequently to one's ability to execute a task correctly. In addition, task elements not aligned with staff competence will create additional error-prone conditions. Mismatch between task structures/resources and operational demand — especially during disruptions — drives task saturation, missed steps and workaround drift. The SI calls for task/resource alignment and building margin to absorb peaks and disruption without degrading safety.



4. Commercial air transport — aeroplanes — CAT A

The safety issues for CAT Aeroplanes domain were identified in 2016 by the Agency, in conjunction with the CAT Aeroplanes CAG, and has since been reviewed annually. Each safety issue contributes to a worst likely key risk area as defined in the [Introduction of this Volume](#).

The scope of the domain is commercial air transport (CAT) passenger and cargo operations conducted by EASA and EASA Member State (MS) air operator certificate (AOC) holders with complex aeroplanes and EASA Member State (MS) registered, or operated complex aeroplanes carrying out non-commercial complex (NCC) operations.

Regarding the main key risk areas for this domain, refer to section ‘Safety risks’ of 2.1 ‘Commercial Air Transport (CAT) - complex aeroplanes’ in ASR 2025. These key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. The figure is obtained by aggregating the ERCS score for the risk-scored occurrences relevant to this domain and plotting it against the number of risk-scored occurrences. The risk picture of this domain identifies the key risk areas of greater concern that are aircraft upset, airborne collision and collision on a runway.

The safety issues in the domain are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority (refer to the List 3). The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence. Currently there are 37 safety issues in the CAT A domain. Since the last edition, one safety issue has been removed from the domain, and one safety issues have been added: Out-of-spec synthetic aviation turbine fuels (SATF) in operations (SI-0060). Eight safety issues have been amended.

The highest SIPI score safety issues in the domain are SI-0034 ‘Impact of GNSS interference on civil aviation operations’, SI-0060 ‘Out-of-spec synthetic aviation turbine fuels (SATF) in operations’, SI-0007 ‘Approach path management’, SI-0037 ‘Mishandling of non-precision approaches due to erosion of piloting skills’, and SI-0015 ‘Entry of aircraft performance data’.

In 2025, the safety issue assessment was finalised for SI-0034 ‘Impact of GNSS interference on civil aviation operations’ in step 2 of the EU SRM process. The second phase of the best intervention strategy continued for SI-0039 ‘Aircrew fatigue (FTL)’ and started for SI-0034 ‘Impact of GNSS interference on civil aviation operations’, corresponding to step 3 of the European SRM process.

Refer to [Appendix A](#) for the link between safety issues and key risk areas.

► **List 3:** Commercial air transport — aeroplanes (CAT A) safety issues per category and priority

Assess

Facilitates *Step 2: Assessment of safety issue*

Systemic issues and hazards in a context

- [Out-of-spec synthetic aviation turbine fuels \(SATF\) in operations \(SI-0060\) \(New\)](#)
- [Mishandling of non-precision approaches due to erosion of piloting skills \(SI-0037\) \(Amended\)](#)



- [Adverse weather encounters \(turbulence, hail, lightning, ice\) \(SI-0003\) \(CC effect\) \(Amended\)](#) 
- [False or disrupted instrument landing system \(ILS\) signal capture \(SI-0035\)](#)
- [Alignment with a wrong runway \(SI-0014\)](#)
- [Inappropriate flight control inputs \(SI-0010\) \(Amended\)](#)
- [Ambiguity in operational requirements and lack of authority oversight for non-revenue flights \(SI-0058\)](#)
- [Turbulence encounters \(SI-0003B\) \(CC effect\) \(Amended\)](#) 
- [Implementation of performance-based navigation approach and FMS naming conventions \(SI-0051\) \(Amended\)](#)

Contributing issues:

- [Controller-pilot data link \(CPDLC\) miscommunication \(SI-0059\)](#)
- [Ineffective crew resource management \(CRM\) \(SI-0009\)](#)
- [Safety education of air passengers \(SI-0052\)](#)

Mitigate – define

Facilitates Step 3: *Definition and programming of safety actions*

Systemic issues and hazards in a context

- [Impact of GNSS interference on civil aviation operations \(SI-0034\)](#)
- [Approach path management \(SI-0007\) \(Amended\)](#)
- [Emergency evacuation \(SI-0042\)](#)

Contributing issues:

- [Aircrew fatigue \(FTL\) \(SI-0039\) \(Amended\)](#)

Mitigate – implement

Facilitates Step 4: *Implementation and follow-up of safety actions*

Systemic issues and hazards in a context

- [Icing in flight \(SI-0001\) \(CC effect\)](#) 
- [Entry of aircraft performance data \(SI-0015\) \(CC effect\)](#) 
- [Effectiveness of safety management \(SI-0041\)](#)

Contributing issues:

- [Poor language proficiency causing communication breakdown \(SI-0054\)](#)

Monitor

Facilitates Step 5: *Safety performance measurement*

Systemic issues and hazards in a context

- [Bird/wildlife strikes \(SI-0045\)](#)
- [Flight crew incapacitation \(SI-0049\)](#)
- [Inadequate fuel management \(SI-0025\)](#)
- [Handling and execution of go-arounds \(SI-0019\)](#)
- [Carriage and transport of lithium batteries by passengers or crew \(SI-0027\) \(Amended\)](#)
- [Icing on the ground \(SI-0002\) \(CC effect\)](#) 



4. COMMERCIAL AIR TRANSPORT — AEROPLANES — CAT A

- [Hail \(SI-0003A\) \(CC effect\)](#) 
- [Wake vortex encounter \(SI-0012\)](#)
- [Wind shear \(SI-0024\) \(CC effect\)](#) 
- [Fuel contamination and quality \(SI-0011\)](#)
- [Volume and quality of the information in NOTAMs \(SI-0044\)](#)
- [Laser illumination \(SI-0046\)](#)
- [Runway surface condition \(SI-0006\) \(CC effect\)](#) 
- [Congestion/interference of the electromagnetic spectrum \(5G\) \(SI-0053\)](#)
- [Explosive door openings on parked aeroplanes \(SI-0048\)](#)
- [Disruptive passengers \(SI-0047\)](#)
- [Excessive speed in the manoeuvring area \(SI-0028\)](#)

Adverse weather encounters (turbulence, hail, lightning, and ice) (SI-0003) (CC effect) (Amended) 

This safety issue addresses the ability and capability of the flight crew to manage the entire flight, including dispatch, and the possibility to detect, avoid and/or mitigate the effects of adverse weather on the flight. If not managed well, a flight crew may experience aircraft upset after being forced out of its flight envelope by a severe atmospheric phenomenon, or a significant degradation in performance or the handling qualities of the aircraft, or injuries due to abrupt movements. It also reviews the requirements for the aircraft to fly in certain atmospheric conditions. The main threats of adverse weather in significant meteorological conditions affecting the flight, such as convective processes, air turbulence (CAT and orographically induced), mountain waves, up/down-drafts, wind shear, hail precipitation, lightning, and icing are reviewed in this safety issue.

Effects of climate change under scrutiny

With climate change, severe convective storms may become more frequent and/or intense, and the safety risks caused by the associated threats for CAT aeroplanes may increase. For example, some research works suggest a significant increase of hail precipitation with hailstone size exceeding 5 cm over Europe, and an increase of the lightnings activity.

Ambiguity in operational requirements and lack of authority oversight for non-revenue flights (SI-0058)

This systemic safety issue addresses:

- operational oversight and implementation of safety management for non-revenue flights, such as maintenance check flights, demonstration flights and delivery flights;
- implementation and oversight of the Subpart-SPO.SPEC.MCF requirements by national authorities; and
- manufacturers' flights.

Such flights involve additional risks that are not always understood by the parties involved and these may lead to several key risk areas, including aircraft upset. Additionally, the nature of some of these flights means that it is not always clear who owns the risks or whether the conflicting situations of the different parties involved are conducive to safe operations.

Most of these operations are conducted by AOC holders under Part-CAT of the Air OPS Regulation with defined areas of control and safety management systems, however a considerable number of flights take place each year outside the area of Part-CAT.



Alignment with a wrong runway (SI-0014)

Unintended landing/approach/take-off of an aircraft on/to/from a wrong runway can lead to excursions or collisions. This safety issue addresses cases of landing on / taking off from a runway edge, a taxiway or other surface mistakenly identified by the flight crew as the assigned runway. The mistake could be due to visual acquisition, wrong data entered in the flight management system (FMS), flight crew distraction/confusion or miscommunication between ATC and the flight crew. Other contributing factors include complex aerodrome design, multiple runway thresholds located near one another and other aerodrome-design-related complexities. The safety issue includes the relevant SOPs and the flight crew training, the ATS procedures and the lighting and marking of the aerodrome surfaces.

Related SIB:

[EASA SIB 2018-06 Incorrect Airport Surface Approaches and Landings](#)

Approach path management (SI-0007) (Amended)

This safety issue addresses the inappropriate execution of an approach at any point from FL100 until reaching safe taxiing speed. This can lead to runway excursions, aircraft upset, terrain collision, or airborne collision. It covers all types of instrumental and visual approaches. The following areas are reviewed in this safety issue:

- Management of the energy of the aircraft and the influence of external factors affecting the approach, such as tail or crosswind, wind shear, down/up drafts and other weather-related factors;
- Decision-making process of the flight crew to go around or continue with the approach; and
- SOPs and the relevance of those procedures for the approach flown (including a correct altimeter setting), flight crew training and the existing regulatory framework.

In addition to addressing this safety issue from a flight crew perspective, this safety issue also explores ATM-related factors that may lead to non-stabilised approaches. These include ATCO instructions (e.g. vectoring, intermediate level-off) that result in a high descent profile for the flight crew or bring the aircraft too close to the runway.

Related SIB:

[EASA SIB 2023-03 Incorrect Barometric Altimeter Setting](#)

Bird/wildlife strikes (SI-0045)

Insufficient control of birds and wildlife may lead to either damage to the aircraft or loss of control during take-off or landing. This safety issue addresses the inadequate uncontrolled/excessive presence of birds/wildlife in the aerodrome vicinity, and reviews the controls in place by the different stakeholders e.g. aerodrome operators, aircraft operators, aircraft/engine manufacturers, certification authorities, environment protection agencies, etc.

Carriage and transport of lithium batteries by passengers or crew (SI-0027) (Amended)

Lithium batteries carried or contained in electronic devices on board carry a risk of fire in the aircraft. These batteries may potentially ignite due to a thermal runaway, self-ignition or other heat sources. Lithium batteries may be carried on board an aircraft as part of a check-in luggage of the passengers in the cargo holds or in the cabin in personal electronic devices carried by passengers or crew.

Turbulence encounters (SI-0003B) (CC effect) (Amended)



Clear air turbulence and orographically induced turbulence (i.e. turbulence generated by high mountains) and mountain waves are weather phenomena that may result in aircraft upset or injuries/damage. The issue also



covers the preparation of the flight and the availability of information to enable the flight crew to foresee a possible encounter with such phenomena during the flight.

Effects of climate change under scrutiny

With climate change, moderate-or-greater clear air turbulence associated with jet streams may become more frequent in the future. For example, some research works suggest a significant increase in the probability of encountering moderate-or-greater clear air turbulence at cruise flight levels over the North Pacific, South-East Asia and the North Atlantic.

Congestion/interference of the electromagnetic spectrum (5G) (SI-0053)

The electromagnetic spectrum is crucial to the management of aviation activity as frequencies are required for ATM and ground movements control, navigation aids, weather and ATC radars, radio-altimetry, air-air communications, terrain and ground collision avoidance systems. The spectrum is becoming increasingly congested as traffic levels grow and the increasing demand for bandwidth from other users such as telecoms, radio and television services have led to some portions of the spectrum previously allocated to aviation being diverted for this purpose. This in turn leads to equipage changes (e.g. radar frequencies) and radiotelephony (RTF) frequency congestion. The proximity of competing users can have interference effects that cannot be managed or controlled by either user.

The roll-out of 5G across the world will have an impact on navigational equipment. The issue is that the equipment may not be robust enough against certain 5G frequency bandwidths. In some countries the two (aircraft navigational equipment and 5G networks) may not be able to coexist.

It also includes the potential for interference from 5G transmissions from the passenger cabin.

Related SIB:

[EASA SIB 2021-16 Operations to aerodromes located in United States with potential risk of interference from 5G ground stations](#) (as published through aerodrome NOTAMs)

Controller-pilot data link communication (CPDLC) miscommunication (SI-0059)

The misinterpretation of a CPDLC (controller-pilot data link communications) message occurs when the ATC gives a clearance / information to the flight crew via CPDLC and the flight crew does not comply with it as intended by the ATCO, but the flight crew acts according to their understanding of the message. As an example, misinterpretation is possible with UM79 (CLEARED TO [position] VIA [route]) clearance that might lead to airspace infringement, loss of separation and airborne collision. Another example is a misinterpretation of CPDLC uplink message as a clearance instead of a request which was the intention of the message (UM148 WHEN CAN YOU ACCEPT FL[XXX]). Such a misinterpretation leads to a deviation to another from the cleared flight level, which can lead to an airspace infringement, a loss of separation or to an airborne collision.

As there could be errors introduced in the CPDLC messages and messages could be misinterpreted by both parties (ATCO and flight crew), this issue addresses the miscommunication aspects of using CPDLC.

Disruptive passengers (SI-0047)

Disruptive passengers are defined as passengers who do not follow safety procedures or instructions from the cabin crew. Such behaviour is normally associated with the consumption of alcohol, drugs and certain types of medication. However, it may be also the result of stress or emotional distress. It is important to subdue these passengers as they may pose a safety threat to other passengers or the cabin crew. To achieve this, airlines have to design effective procedures and train cabin crew to handle such situations in a safe manner.



Effectiveness of safety management (SI-0041)

Aviation organisations are required to implement safety management systems as part of their safety programmes. This issue reviews ineffective implementation of safety management systems by the aviation organisations. The complex nature of aviation safety and the significance of addressing HF aspects show the need for an effective management of safety by the aviation organisations. This issue covers the regulatory requirements and promotion of SMS principles, for both aviation authorities and organisations, and the capability to detect, anticipate and act upon new emerging threats and associated challenges. It also includes the settling of the adequate safety culture in organisations and authorities.

Emergency evacuation (SI-0042)

The safety issue refers to the unsuccessful evacuation of an aircraft after an emergency. The areas of risk identified are:

- hand luggage amount blocking the aisle preventing or slowing down the evacuation;
- passengers taking hand luggage preventing or slowing down the evacuation; and
- emergency evacuation with the aircraft engine still running.

This safety issue considers the passenger behaviour and compliance with safety instructions, the decision-making for the flight crew to command the evacuation, the cabin crew to adequately execute it, and the certification requirements to ensure the adequacy of equipment and aircraft systems. As such, relevant SOPs, training for both flight and cabin crew, and the relevant regulatory requirements have to be reviewed to ensure the safe and efficient egress of all passengers during an emergency.

Implementation of performance-based navigation approach and FMS naming conventions (SI-0051) (Amended)

The naming conventions for performance-based navigation (PBN) approach procedures are standardised according to ICAO Circular 336 and amendments to PANS-OPS (Doc 8168).

Until 30 November 2022, approach charts depicting procedures that meet the RNP AR APCH navigation specification criteria had to include either the term RNP (AR) or RNAV (RNP) in the identification (e.g. RNAV (RNP) RWY 23). However, as of 1 December 2022, only the term RNP (AR) is permitted.

As a result, States were required to develop their national transition plans for the RNAV to RNP chart naming, considering the provisions of Amendment 6 to PANS-OPS (Doc 8168) and ICAO Circular 336.

This standardisation has been introduced for three main reasons:

1. Clarity: Many procedures labelled as 'RNAV (GNSS)' actually require RNP capabilities, which include onboard performance monitoring and alerting.
2. Consistency: This aligns chart names with PBN specifications.
3. Safety: It reduces confusion for pilots and air traffic controllers (ATC). Different names, such as RNAV (GPS) RWY XX, RNAV (GNSS) RWY XX, and RNAV (RNP) RWY XX, can lead to inconsistencies in chart identification and flight management system (FMS) encoding.

A similar lack of clarity exists concerning the minimums, including LNAV, LNAV/VNAV, and LPV.

Not implementing a PBN procedure naming convention has resulted in confusion among flight crews operating internationally.



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Entry of aircraft performance data (SI-0015) (CC effect)

The incorrect entry of data into the FMS that is used to set the take-off or landing performance parameters of the aircraft can have catastrophic consequences. This can potentially occur due to miscommunication errors, errors in electronic flight bags (EFBs), entry of data into FMS, last-minute changes by ATC and load masters, and the incorrect calculation of the performance parameters. To mitigate this safety issue, technical solutions are being considered for the long term; in the short to medium term, the focus will be on improvements to SOPs.

Effects of climate change under scrutiny

With climate change, more airports may be exposed to periods of very high air temperature, with effects on take-off performance of aeroplanes and on the cooling down of brakes. The prevailing direction of surface winds may change too. For example, some research works suggest that the number of days where the take-off weight has to be decreased to ensure a safe take-off will significantly increase at some airports.

Excessive speed in the manoeuvring area (SI-0028)

Excessive ground speed of the aircraft during taxiing at the aerodrome before take-off or after landing may lead to collision on the ground, injuries or damage. This safety issue includes also taxiing phases on the runway, e.g. back tracking. Such occurrences may occur due to lapses in SOPs and the associated trainings for the flight crews as well as due to poorly designed aerodrome procedures.

Explosive door openings on parked aeroplanes (SI-0048)

When an aeroplane is parked, cooling or heating of the aeroplane cabin can be provided through the air-conditioning system powered up by the auxiliary power unit (APU) or by an external source of air (e.g. ground air-conditioning cart) ducted to the aeroplane cabin. Closing all aeroplane doors helps to reach and maintain the desired temperature. However, it may also result in an undesired build-up of excessive differential pressure between the cabin and the outside environment if the outflow valve is closed. As a result, this may cause an explosive door opening that can lead to injuries or damage. This may happen during normal operation of the aeroplane, during maintenance activities, or when conducting practical training of personnel on the aeroplane on the ground.

False or disrupted instrument landing system (ILS) signal capture (SI-0035)

Aircraft on approach may potentially capture a false or disrupted ILS or localiser signal due to several factors:

- technical issues with the ILS; or
- interference of the ILS signal by obstacles, aircraft, and vehicles in the sensitive ILS areas; or
- inadequate approach procedures leading to the capture of upper/lower/side lobes.

A false or disrupted capture may lead to terrain collision or runway excursion. Due to its multi-faceted nature, this safety issue also includes the review of existing safety barriers implemented by different stakeholders, such as the CNS providers, aerodrome operators, ATS, aircraft operators, manufacturers as well as regulators.

Related SIB:

[EASA SIB 2014-07 Unexpected Autopilot Behaviour on Instrument Landing System \(ILS\) Approach](#)

Aircrew fatigue (FTL) (SI-0039) (Amended)

Fatigue can negatively affect aircrew performance in the aircraft and pose a hazard to flight safety. In commercial air transport, aircrew rosters are traditionally developed on the basis of prescriptive duty time limits, flight time limits, minimum rest requirements and other constraints such as minimum notification times and prohibition



to combine certain duties, to name a few. These limits and requirements, referred to as flight time limitations (FTL), are presumed to be adequate for maintaining aircrew fatigue at levels that will not put at risk the safety of flight operations. Note that general fatigue issues that are not limited to flight crew fatigue, such as quality sleep, are managed under [‘Fatigue and quality sleep’ \(SI-3005\)](#) in the HF domain.

Flight crew incapacitation (SI-0049)

This safety issue relates to pilot incapacitation, not being able to perform their duties, and the associated risks.

Fuel contamination and quality (SI-0011)

This safety issue relates to the upload of contaminated fuel in the aircraft or to fuel being contaminated once stored in the aircraft fuel system. This safety issue covers all types of contamination from water, algae, polymers, etc.; anything that is sufficient to cause an in-flight shutdown of the engines or to affect adversely the delivery of power from the engines. It also includes the supply chain of fuel that may be the cause of the contamination, the oversight capabilities of the aircraft operators and the regulatory framework of both the fuel supply and the operators’ oversight.

Additionally, it includes the non-compliance with the technical specification for specific fuel type, resulting in wrong flash point, wrong concentration of any required chemical component, etc.

Hail (SI-0003A) (CC effect)



This safety sub-issue of [the adverse convective weather safety issues group \(SI-0003\)](#) focuses on the ‘hail’ phenomenon/precipitation. It is relevant for the take-off/climb and approach/landing phases of flight.

Effects of climate change under scrutiny

[See SI-0003.](#)

Handling and execution of go-arounds (SI-0019)

Inadequate execution of the go-around manoeuvre may lead to aircraft upset, runway excursion, injuries or damage, or collision with terrain. It is the deviation from the SOPs and published go-around procedures. It covers the HF relevant during this manoeuvre (e.g. somatogravic illusion, breakdown of CRM). It includes the procedures and training of the flight crew, and the adequacy of those, regarding go-around with all engines operating (workload).

Icing in flight (SI-0001) (CC effect)



Icing in flight may occur due to various reasons, however, this safety issue is focused on the manifestation of icing during flight caused by an atmospheric icing phenomenon. The typical manifestation is the accretion of ice on aerodynamic surfaces, probes, engine parts or flight control system, leading to degradation of handling quality or performance issues, system failures or malfunctions, or damage on the aeroplane’s structure. When such icing occurs, it is important to ensure that the flight crew is able to recognise the situation and manage the flight in adverse icing conditions. Other sources of icing, such as frozen water leaks from the waste water aircraft system, are excluded from this safety issue. This safety issue is also relevant to the Non-commercial operations — small aeroplanes domain.

Effects of climate change under scrutiny

Climate change is affecting the air temperature and humidity. Moderate and severe airborne icing conditions may become more frequent, more intense, or they may affect larger ranges of altitude, increasing the risk exposure during the flight.



Related SIB:

[EASA SIB 2022-11 SAE Type II, III and IV Aircraft Anti-Icing Fluid Application](#)

Icing on the ground (SI-0002) (CC effect)

Icing on the ground may occur due to an atmospheric icing phenomenon and the adverse effect of the de-icing/anti-icing fluids. If managed poorly, the flight crew may experience aircraft upset or collision with terrain after take-off, runway excursion, injuries or damage. It is crucial to ensure relevant SOPs and training are implemented to ensure that flight crew are able to recognise and manage the effects of adverse icing conditions experienced during the ground phases of flight. This safety issue is also relevant to the Non-commercial operations — small aeroplanes domain.

Effects of climate change under scrutiny

[See SI-0001.](#)

Impact of GNSS interference on civil aviation operations (SI-0034)

The safety issue refers to the dependence of air transport (air operators, air navigation service providers, and original equipment manufacturers) on satellite systems and the potential impact of the associated vulnerabilities on the safety of the flight. Such vulnerabilities include jamming and spoofing that may affect position, navigation, timing, surveillance and communication.

It covers the equipment on board, the ATM/ANS equipment, the SOPs, training and published navigation procedures.

Should the GNSS units malfunction in flight, potential mitigation actions include the procedure to revert to other means of navigation or ground aids in critical flight phases. There is also a risk of normalisation of deviance, due to crews getting used to false warnings.

The situation is exacerbated if several issues are affecting the flight simultaneously that may increase the workload to the flight crew and the ATCO and reduce the capability to recognise and properly react to the situation.

Loss of, misleading or false position, navigation, and timing information has severe repercussions as it can ultimately lead to airborne collision, airspace infringement or terrain collision.

Related SIB:

[EASA SIB 2022-02R3 Global Navigation Satellite System Outage and Alterations Leading to Communication / Navigation / Surveillance Degradation](#)

Inadequate fuel management (SI-0025)

Inadequate management of the fuel to perform the flight that may lead to aircraft upset or collision with terrain. This involves fuel planning, calculation, and the management once the flight has commenced i.e. defined as the point when the first engine has started. It includes the communication and coordination of the flight crew with ATC and the operations department of their organisation, the relevant SOPs, fuel policy and training of the flight crew.

Ineffective crew resource management (CRM) (SI-0009)

The issue encompasses all aspects of the communication that may impact the situational awareness of the crew members and/or the conduct of the flight, including lack of a common action plan, inadequate division of duties, poor coordination between crew members, use of non-standard phraseology, sensory overload



(loss of communications, multiple aural messages, etc.), etc. Good CRM can be achieved by implementing relevant training for flight crew and an effective regulatory framework for CRM requirements. The goal of CRM is to maximise the available resources, through effective communication and efficient workload management.

Inappropriate flight control inputs (SI-0010) (Amended)

As a result of a startle or in abnormal situations, flight crew may inadvertently introduce flight control inputs which may result in a deviation from the actual or intended immediate flight path. Depending on the circumstance and magnitude of input, inappropriate flight control inputs may result in an undesirable safety consequence, such as aircraft upset, runway excursion, injuries or damage. It also addresses the HF affecting the flight crew performance, for instance, by reducing their cognitive capacity to recognise the situation and react appropriately.

Related SIBs:

[EASA SIB 2016-20R1: ATR Flight Controls – Crew Resource Management – Avoiding Dual and Opposite Flight Control Inputs](#)

[EASA 2023-08R1 Reporting of Occurrences Involving Human Interventions Linked to Flight Deck Design, Operating Procedures, Training, or a Combination Thereof](#)

Laser illumination (SI-0046)

Even though it is illegal to shine a laser device at an aircraft in most countries, such errant behaviour still occurs and puts flight crews at risk of temporary or permanent blindness. It may result in pilot distraction, temporary vision impairments and, in serious cases, ocular injury. These effects may pose significant flight safety hazards in critical phases of flight during approach and landing near airports.

Mishandling of non-precision approaches due to erosion of piloting skills (SI-0037) (Amended)

The safety issue refers to the erosion of piloting skills to conduct non-precision approaches as most airline pilots are not required to conduct such approaches frequently. The high standards and wide spread of precision approaches, including the increasing number of PBN, are reducing the exposure, and limiting non-precision approaches to isolated cases (e.g. en-route diversion). The safety issue covers the training and SOPs for the flight crews on non-precision approaches. This safety issue is linked with '[Approach path management](#)' (SI-0007).

Out-of-spec synthetic aviation turbine fuels (SATF) in operations (SI-0060) (New)

The high prices of SBC^{12, 13} compared to conventional jet fuel, alongside the need to comply with the blending mandate and low availability of SBC, might attract fraudulent activities. In addition, as the number of inexperienced new fuel suppliers that enter the market increases, lack of expertise in quality assurance and process knowledge increases the risk of accidental mis-blending.

The two major threats considered in the assessment of this SI are:

- fraudulent out-of-spec SBC; and
- mis-blending of the SBC with conventional jet fuel.

Consequences of out-of-spec SATF can include but are not limited to fuel degradation in fuel storage tanks, increased amount of fatty acid methyl esters and water and deviation of properties that are implicitly controlled

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12 Synthetic blending components (SBC): Fuel blending components derived from non-conventional sources, as defined in ASTM D7566, DefStan 91-091, and EI standards. Under ReFuelEU Aviation, SBC is referred to as sustainable aviation fuel (SAF).

13 Synthetic aviation turbine fuel (SATF): A blend of synthetic blending components (SBC) with fossil-based jet fuel conforming to ASTM D7566. In DefStan 91-091 and JIG standards (JIG 1, JIG 2, JIG 4), SATF is referred to as semi-synthetic jet fuel (SSJF).



in fuel standard specifications (DCN, density-permittivity) but are nevertheless crucial to the safe operation of aircraft. Out-of-spec SATF affect both the engines and the fuel system. Considerable deviation from specifications might cause erroneous fuel quantity indications, filter clogging or, in extreme cases, might cascade into engine system failure.

Poor language proficiency causing communication breakdown (SI-0054)

The use (or misuse) of language can contribute directly or indirectly to an accident. Therefore, a minimum standard level of knowledge of the language used for communication mainly between pilots and ATCOs is critical to flight safety.

ICAO standardised phraseology should be used whenever possible. Also, when phraseology is not applicable, pilots and ATCOs should demonstrate a minimum level of proficiency in plain language.

The effective use of plain language is vital in routine operational situations in which phraseology provides no 'ready-made' form of communication and is especially critical in unusual or emergency situations.

Inevitable language errors should always be considered and judged in the wider context of miscommunication or failure to communicate successfully. The recognition of these errors contributed to the construction of ICAO Operational Level 4 which is considered to be the minimum level acceptable to ensure safe operations.

Runway surface condition (SI-0006) (CC effect)



The mismatch between the actual status of the runway surface condition and the one used to calculate the aircraft landing performance may lead to runway excursions. This safety issue addresses the measurement systems, the methodology to assess the runway surface condition and the reporting methods used to communicate said condition to the flight crews in approach. It also refers to the calculation methods used by the flight crew provided by the operator in the aeroplane flight manual (AFM) / flight crew operating manual (FCOM) and the performance data provided by the aircraft manufacturer.

Effects of climate change under scrutiny

Climate change may increase the occurrence of heavy precipitation events causing sudden runway flooding.

Safety education of air passengers (SI-0052)

Poor air passenger understanding of residual risks inherent in commercial air transport operations is likely to result in failure to comply with safety instructions and advice, with a consequent increase in the risks borne by crew and other passengers.

The understanding by the passengers of the cabin crews' safety role in the cabin (that is not only limited to assistance and selling). Instructions need to be obeyed, the safety purpose understood, attention to briefings paid, especially when relevant to coping with potential distress situations/evacuation.

Volume and quality of the information in NOTAMs (SI-0044)

With the steady growth in the number of notices to airmen (NOTAMs), flight crew are increasingly challenged in processing the volume of information during their pre-flight preparation. It is hard to identify the most important and relevant information, which may result in the flight crew overlooking safety-critical information. This is also exacerbated by the inconsistent quality of the information provided in NOTAMs. The content of a NOTAM does not always adhere to ICAO standards and the use of non-standard acronyms may create confusion or a delay in understanding the content. The safety issue explores the different mitigation actions which can be adopted in the short to medium term while the long-term solution of digital NOTAMs is implemented incrementally across Europe.



Wake vortex encounter (SI-0012)

The safety issue refers to the encounter with the wake turbulence of a preceding aircraft, which may lead to the upset of the trailing aircraft. It includes the possible ATS role in providing separation of the traffic, the SOPs for flight crews to stay away from the wakes of other aircraft and their associated training. Due to the differences in ATS procedures, encounter geometries and mitigation strategies, the safety issue can be divided in two scenarios: 'encounters during arrival and departure' and 'en-route encounters'.

Related SIB:

[EASA SIB 2017-10R1 'En-route Wake Turbulence Encounters'](#)

Wind shear (SI-0024) (CC effect)



The encounter with wind shear on final approach, landing, take-off, and initial climb may lead to aircraft upset or runway excursions. Effective SOPs and the training for the flight crew should be implemented by airlines to ensure that flight crew are well-equipped to avoid or deal with those conditions. Such efforts should also be supplemented by detection of potential wind shear by third parties, such as ATC, and the effective relay of this information to the flight crew.

Effects of climate change under scrutiny

[See SI-0003.](#)



5. Rotorcraft — RTR

The safety issues for Rotorcraft domain were identified in 2021 by the Agency, in conjunction with the European Safety Analysis Group for Rotorcraft (ESAG-R) and has since been reviewed annually. Each safety issue contributes to a worst likely key risk area as defined in the [Introduction of this Volume](#).

Regarding the main key risk areas for this domain, refer to Chapter 3 ‘Helicopter’ section ‘Safety risks’ in ASR 2025. It applies to all three types of helicopter operations: commercial air transport (3.2 ‘Commercial Air Transport (CAT) helicopter’), specialised operations (3.3 ‘Specialised Operations (SPO) helicopters’) and non-commercial operations (3.4 ‘Non-commercial operations (NCO) helicopters’). These key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. The figure is obtained by aggregating the ERCS score for the risk-scored occurrences relevant to this domain and plotting it against the number of risk-scored occurrences. The risk picture of this domain identifies the key risk areas of greater concern that are aircraft upset for commercial air transport helicopters, specialised operations with helicopters, and non-commercially operated helicopters.

The safety issues in the domain are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence.

With the 2026 edition, the Rotorcraft domain introduces the grouping of safety issues by the type of operation, which is also reflected in the ASR (refer to Table 1).

Operation type	SI ID	Safety issue title
CAT Rotorcraft	SI-8019	Impaired visibility conditions except IMC
NCO Rotorcraft	SI-8021	Adverse weather encounter — effects other than IMC
NCO Rotorcraft	SI-8024	Unanticipated yaw/loss of tail rotor effectiveness
SPO Rotorcraft	SI-8025	Vortex ring state
NCO Rotorcraft	SI-8026	Power loss condition
NCO Rotorcraft	SI-8027	Inadequate handling of simulated technical failures and abnormal procedures during a training flight
CAT Rotorcraft	SI-8028	Inadequate airborne separation under VFR operation
CAT Rotorcraft	SI-8030	Bird and other wildlife hazard
SPO Rotorcraft	SI-8031	Inadequate obstacle clearance during any flight phase
NCO Rotorcraft	SI-8036	Navigation-related issues
CAT Rotorcraft	SI-8037	Hoist-operations-related issues
SPO Rotorcraft	SI-8038	External-sling-load-operations-related issues
NCO Rotorcraft	SI-8040	Dynamic rollover
SPO Rotorcraft	SI-8041	Downwash adverse effects
CAT Rotorcraft	SI-8042	Unruly passengers
CAT Rotorcraft	SI-8048	On-board carriage of PEDs with lithium batteries



5. ROTORCRAFT — RTR

Operation type	SI ID	Safety issue title
CAT Rotorcraft	SI-8049	Interference by lasers
NCO Rotorcraft	SI-8050	Loose object in the helicopter cabin
NCO Rotorcraft	SI-8051	Inadvertent flight into IMC

► Table 1: Safety issues by operation type

EASA continues developing and implementing safety enhancement initiatives in alignment with the Rotorcraft Safety Roadmap, our safety strategy aimed to reduce fatalities. The roadmap systematically addresses critical safety aspects, focused on reducing risks and ensuring safer rotorcraft operations industry-wide.

The EU SRM process, discussed in the ESAG-R has identified the following high-risk occurrence categories as safety priorities as presented in ASR 2025:

- Loss of control in-flight (LOC-I);
- Airprox / ACAS alert / mid-air collision (MAC);
- Abnormal runway contact (ARC);
- Controlled flight into terrain (CFIT);
- Collision with obstacle(s) during take-off and landing (CTOL).

The highest SIPI score safety issues in the domain are SI-8031 ‘Inadequate obstacle clearance during any flight phase’, SI-8051 ‘Inadvertent flight into IMC’, and SI-8028 ‘Inadequate airborne separation under VFR operation’.

The following main contributing factors have been identified in the initial or preliminary accident investigation reports for 2024:

- Impaired visibility, leading notably to loss of control in-flight (LoC-I)
- The non-detection of power cables and other obstacles, leading to collision with cables notably in low-altitude operations (LALT)
- The absence of radar coverage and limited use of traffic alert systems in low-altitude environments

► List 4: Rotorcraft safety issues per category and priority

Assess

Facilitates Step 2: Assessment of safety issue

Systemic issues and hazards in a context

- [Unanticipated yaw/loss of tail rotor effectiveness \(SI-8024\)](#)
- [Inadequate handling of simulated technical failures and abnormal procedures during a training flight \(SI-8027\)](#)

Contributing issues:

- [Poor pre-flight planning and preparation \(SI-8017\)](#)
- [Poor operational management at take-off and landing sites \(SI-8034\)](#)
- [Lack of knowledge of aircraft systems and application of procedures \(SI-8011\)](#)
- [Inadequate flight path management with the use of automation \(SI-8022\)](#)
- [Insufficient safety culture of organisation \(SI-8045\)](#)



Mitigate – define

Facilitates *Step 3: Definition and programming of safety actions*

NIL

Mitigate – implement

Facilitates *Step 4: Implementation and follow-up of safety actions*

Systemic issues and hazards in a context

- [Inadequate obstacle clearance during any flight phase \(SI-8031\)](#)
- [Inadvertent flight into IMC \(SI-8051\) \(CC effect\)](#) 
- [Inadequate airborne separation under VFR operation \(SI-8028\)](#)
- [Vortex ring state \(SI-8025\)](#)
- [Impaired visibility conditions except IMC \(SI-8019\)](#)
- [External-sling-load-operations-related issues \(SI-8038\)](#)
- [Ineffective safety management systems \(SI-8044\)](#)

Contributing issues:

- [Pilot fatigue \(SI-8016\)](#)
- [Inadequate training and competence transfer — initial and recurrent training \(SI-8015\)](#)

Monitor

Facilitates *Step 5: Safety performance measurement*

Systemic issues and hazards in a context

- [Power loss condition \(SI-8026\) \(Amended\)](#)
- [Hoist-operations-related issues \(SI-8037\)](#)
- [On-board carriage of PEDs with lithium batteries \(SI-8048\)](#)
- [Downwash adverse effects \(SI-8041\)](#)
- [Dynamic rollover \(SI-8040\)](#)
- [Loose object in the helicopter cabin \(SI-8050\)](#)
- [Adverse weather encounter — effects other than IMC \(SI-8021\) \(Amended\)](#)
- [Bird and other wildlife hazard \(SI-8030\)](#)
- [Interference by lasers \(SI-8049\)](#)
- [Navigation-related issues \(SI-8036\)](#)
- [Unruly passengers \(SI-8042\)](#)

Contributing issues:

- [Incorrect in-flight decision-making \(SI-8014\)](#)
- [Incorrect application of operational rules and procedures \(SI-8012\)](#)
- [Ineffective application of crew resource management and multi-crew cooperation \(SI-8013\)](#)
- [Deficiencies and inconsistencies in operating manuals \(SI-8046\)](#)



Adverse weather encounter — effects other than IMC (SI-8021) (Amended) (CC effect)

The main threats of adverse weather in significant meteorological conditions affecting the flight, such as convective weather phenomena, air turbulence (also orographically induced), high winds, up/down-drafts or microburst, wind shear, hail precipitation, lightning, and icing are reviewed in this safety issue.

This safety issue refers to environmental threats where rapid changes can affect the ability and capability of the flight crew to manage the flight, and the possibility to detect, avoid and/or mitigate the effects of adverse weather on the flight. If not managed well, a flight crew may experience aircraft upset after being forced out of its flight envelope by a severe atmospheric phenomenon, or a significant degradation in performance or the handling qualities of the aircraft, or injuries due to abrupt movements. It also reviews the requirements for the aircraft to fly in certain atmospheric conditions.

The main objective is to promote awareness and encourage the adoption of recommended procedures when operating helicopters in adverse weather conditions.

Bird and other wildlife hazard (SI-8030)

This issue refers to proximity or actual collision with bird and other wildlife during flight operations, contributing to a possible unsafe outcome. It also includes the lack of control or inadequate warning of bird and wildlife hazard at an aerodrome or any take-off and landing sites.

Deficiencies and inconsistencies in operating manuals (SI-8046)

This issue refers to operating manuals not appropriate, not accurate or out of date. It encompasses the pilot's operating handbook (POH), the rotorcraft flight manual (RFM), the FCOM, the SOPs, the quick reference handbook (QRH) and the company operating manual Part B.

Downwash adverse effects (SI-8041)

This safety issue relates to helicopter downwash effects such as the blowing of foreign object debris (FOD) which can lead to injuries or damage to third parties on the ground, or the recirculation of the snow/dust causing possible damage to the helicopter own engines. This safety issue does not include the effect of impaired visibility (addressed in SI-8019).

Dynamic rollover (SI-8040)

This issue refers to the inability to prevent helicopter rollover during take-off, landing or air taxiing/hovering phases. It includes, in particular, the inadequate knowledge of the operating environment (soft landing surface, obstacles), and the inadequate skills to recover after the skid or landing gear enters in contact with possible obstacles and the aircraft started to roll.

Power loss condition (SI-8026) (Amended)

This safety issue relates to the inability to safely continue the flight due to a sudden engine power loss or situation requiring the engine to be deliberately shut down in flight.

Multi-engine and single-engine airplanes operate differently during an engine failure. If a failure occurs on a multi-engine helicopter that causes a major, but not total, loss of power on one engine, it is likely that the engine will be shut down as positive engine-out performance is still available, whereas on a single-engine helicopter it may well be decided to make use of the residual power to stretch the glide distance.

The safety issue addresses, for example, inefficient CRM, inadequate training or abnormal procedures not followed, leading to hard landings or total loss of control in flight.



External-sling-load-operations-related issues (SI-8038)

This safety issue gathers all operational scenarios specific to helicopters flying with external sling load, for both human and non-human cargo, which can contribute to an unsafe outcome. It includes, in particular, sling load falling or contacting terrain or obstacles, sling load contacting the tail rotor, main rotor or fuselage. Unnoticed exceed of the maximum all up mass (MAUM) is also addressed.

Hoist-operations-related issues (SI-8037)

This safety issue encompasses both technical and operational issues specific to hoist operations. It includes hoist malfunctions such as loss of reel in/out functions, hoist cable break due to design issues or due to damage from operational events or inadequate maintenance, but also cable contacts with obstacle or fuselage.

Impaired visibility conditions except IMC (SI-8019)

This safety issue relates to all operational situations where the visibility of the flight crew is impaired, causing a loss of visual cues and situational awareness, leading potentially to obstacle collision, terrain collision or aircraft upset. It includes impaired visibility conditions caused by dust or sand (brownout), snow (whiteout), sun glare, smoke, salt spray or any element that degrades the use of visual cues.

Inadequate airborne separation under VFR operation (SI-8028)

This safety issue relates to the inability, during a VFR flight, to detect, avoid or maintain sufficient airborne separation with other manned or unmanned aircraft, increasing the risk of airborne collision. The safety issue addresses both design and operational aspects involved.

Inadequate flight path management with the use of automation (SI-8022)

This safety issue relates to the inability to follow the intended helicopter flight path with the automatic flight control system (AFCS) being active, contributing to an unsafe outcome. The safety encompasses both technical and operational aspects leading to this situation. It includes, in particular, the ineffective use or monitoring of flight parameters and automation modes, and the inadequate management of the transition manual-automated flight.

Inadequate handling of simulated technical failures and abnormal procedures during a training flight (SI-8027)

This safety issue relates to the inability, during a training flight, to handle simulated technical failures such as power loss or hydraulic system failures, contributing to unsafe outcomes. It includes, in particular, the diagnosis of system failures in flight, and the handling of autorotation and forced landing, leading to hard landings or total loss of control in flight.

Inadequate obstacle clearance during any flight phase (SI-8031)

This safety issue relates to the inability to identify and safely avoid obstacles during any flight phase, in confined areas or in proximity to natural or manmade obstacles, such as, for example, agricultural work or power lines check, both in urban and natural environments.

Inadequate training and competence transfer — initial and recurrent training (SI-8015)

This safety issue relates to the incomplete or inadequate training content as well as ineffective delivery of training for any personnel involved in helicopter operations, including both initial and recurrent training, causing a degradation of competence transfers within an organisation, impacting the necessary knowledge and skills required to operate safely in normal and emergency operational situations.



Inadvertent flight into IMC (SI-8051) (CC effect)

This safety sub-issue of '[Impaired visibility conditions except IMC](#) (SI-8019)' focuses on the safety issue related to a disorientation scenario due to loss of horizon references and/or an accompanying loss of visual contact with the ground. It is a well-known severe risk that can result in various accident types, notably LOC-I, CFIT, collisions with obstacles or cables especially in LALT, and MAC.

This includes also what is called 'scud running' where the pilot flies under low clouds close to the ground to reach their planned destination. It also captures the 'press-on-it' mentality during a VFR flight where pilots put themselves into unnecessary danger trying to reach their destination.

Incorrect application of operational rules and procedures (SI-8012)

This safety issue relates to the flight crew not complying with SOPs or operational manuals, contributing to an unsafe operation outcome. It includes, for example, operating below weather minima, altitude minima, or beyond the helicopter flight envelope.

Incorrect in-flight decision-making (SI-8014)

This safety issue relates to the cases where flight crew decisions during the flight negatively affect the operational safety. It includes, in particular, the decisions on diversions, or on contingency plans.

Ineffective application of crew resource management and multi-crew cooperation (SI-8013)

This safety issue relates to deficiencies in flight crew coordination, integration, communications and workload management, affecting the decision-making and problem-solving capacity, necessary to operate safely the aircraft.

Ineffective safety management systems (SI-8044)

This safety issue relates to ineffective or incomplete application of safety management systems within organisations, in particular change management, SRM, and safety reporting tools and processes.

Insufficient safety culture of organisation (SI-8045)

This safety issue relates to lack of safety policy, leadership and management, resulting in poor staff engagement for safety in the organisation, as well as poor knowledge of safety reporting and 'just culture' principles.

Interference by lasers (SI-8049)

This safety issue relates to events that involve the unintentional or malicious shining of a laser at an aircraft in flight leading to flight crew disorientation or distraction.

Lack of knowledge of aircraft systems and application of procedures (SI-8011)

This safety issue relates to the flight crew lacking the knowledge of the helicopter systems and related procedures necessary to operate safely these systems in normal and abnormal situations, in particular when frequently changing of aircraft types, variants, or configuration/equipment flown.

Navigation-related issues (SI-8036)

This safety issue relates to inadequate or incorrect navigation of the helicopter, both in VFR and IFR operations. It includes, for example, deviations from nominal track, interference or losses of the radio navigation source as well as issues related to helicopter PBN operations.



On-board carriage of PEDs with lithium batteries (SI-8048)

This safety issue relates to carrying on board of personal electronic devices (PEDs) powered by lithium batteries which contain a risk of overheating and fire ignition in the cargo compartment or in the cockpit.

Loose object in the helicopter cabin (SI-8050)

This safety issue highlights the risk posed by loose items in the cabins of helicopters. It relates to carrying on board of personal electronic devices (PEDs) which may become loose and fall in the cockpit. Loose items such as sunglasses, jewellery and hats are also risks being carried out. These types of loose items roaming throughout the flight deck and cabin area can pose much greater hazards including interfering with flight controls (e.g. jamming pedals or limiting other flight control authority) which could ultimately result in an aircraft accident and loss of life.

Pilot fatigue (SI-8016)

This safety issue relates to flight crew tiredness in relation to the duration of the flight or length of the duty, the quality of sleep, exposure towards whole-body vibration (WBV) and noise, degrading performance and contributing to an unsafe outcome. It also includes non-compliance with the approved FTL scheme, or an FTL scheme not fit for purpose.

Poor operational management at take-off and landing sites (SI-8034)

This safety issue relates to poor or inadequate operational management at take-off and landing sites, including aerodromes, heliports, helidecks, and any other urban or natural sites. It includes the management of vehicles, persons, obstacles, the training of ground operations personnel as well as the selection of a suitable landing site.

Poor pre-flight planning and preparation (SI-8017)

This safety issue relates to the inability to carry-out appropriate pre-flight planning due to pilot insufficient knowledge and/or lack of planning resources and information. It includes, in particular, the planning of the weather conditions, navigation, fuel, weight and balance, aircraft performance, and risk assessment for the planned flight.

Unanticipated yaw/loss of tail rotor effectiveness (SI-8024)

This safety issue relates to the inability to detect, control and recover from an unanticipated yaw or a loss of tail rotor effectiveness (LTE) during low-speed phases of flight, leading to the helicopter loss of control.

Unruly passengers (SI-8042)

This safety issue relates to passengers who, during commercial or private flights, do not respect or follow safety procedures, or cause disturbance to the flight crew. It also includes passengers overriding or pressuring professionals. The lack of adequate passenger pre-flight briefing is also addressed within this safety issue.

Vortex ring state (SI-8025)

This safety issue relates to the inability to detect, control and recover from an inadvertent VRS condition in flight, leading to the helicopter loss of control.



6. Non-commercial operations — small aeroplanes — NCO SA

The safety issues for Non-commercial operations — small aeroplanes (NCO SA) domain were identified in 2016 by the Agency, in collaboration with the General Aviation CAG. This year the domain underwent a comprehensive review resulting in the changes highlighted later in the text. The descriptions of the safety issues, with a few exceptions, remain largely as in the previous EPAS edition and no new safety issue has been introduced.

Each safety issue contributes to a worst likely key risk area as defined in the [Introduction of this Volume](#). These key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. This figure is obtained by aggregating the ERCS score for the risk-scored occurrences relevant to this domain and plotting it against the number of risk-scored occurrences. The key risk area contributing the most to the safety issues in the NCO SA domain is aircraft upset, as was the case last year. For more information on the links between safety issues and key risk areas, please refer to [Appendix A](#) to this Volume. For further details regarding the domain, see Section 2.5 of ASR 2025.

The domain safety issues are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence.

Overall, the highest-risk safety issues in the domain by SIPI score are ‘Risks associated with parachuting operations’ (SI-4023), ‘Inadvertent flight into IMC/scud running’ (SI-4008) and ‘Bird and wildlife strikes’ (SI-4013) — previously titled ‘Bird and wildlife strikes at smaller aerodromes/airfields (SI-4013)’; its scope has been expanded to also include in-flight bird strikes after a few fatal accidents involving collisions with large birds. This broader definition has contributed to its higher SIPI score. Among the highest-risk safety issues, ‘In-flight decision-making’ (SI-4003) remains a contributing safety issue with a high SIPI score. For ‘Risks associated with parachuting operations’ (SI-4023), the best intervention strategy (BIS) draft has been discussed with relevant stakeholders, and it is expected to be finalised by end of 2025. The safety issue assessment for ‘Approach path management on GA aeroplanes’ (SI-4005) has been reviewed internally and will now progress towards the BIS stage for an impact assessment of the proposed actions.

An important adjustment made to the NCO SA domain is the merger of ‘Airborne separation (SI-4010)’ with ‘Airborne separation (SI-7005)’ from the Sailplane domain. Both share the same core hazard — loss of separation leading to potential mid-air collision. From a domain perspective, merging them into a single safety issue while addressing sailplane-specific aspects as sub-scenarios improves clarity and reduces duplication.



► **List 5:** Non-commercial operations — small aeroplanes safety issues per category and priority

Assess

Facilitates Step 2: Assessment of safety issue

Systemic issues and hazards in a context

- [Inadvertent flight into IMC/scud running \(SI-4008\) \(CC effect\)](#) 
- [Inappropriate control input \(SI-4029\)](#)
- [Approach path management on GA aeroplanes \(SI-4005\)](#)

Contributing issues:

- [In-flight decision-making \(SI-4003\)](#)
- [Poor pre-flight planning and preparation \(SI-4007\)](#)
- [Training, experience, and competence of individuals \(SI-4004\)](#)

Mitigate – define

Facilitates Step 3: Definition and programming of safety actions

Systemic issues and hazards in a context

- [Risks associated with parachuting operations \(SI-4023\)](#)
- [Pilot management of in-flight technical failures \(SI-4001\) \(Amended\)](#)

Mitigate – implement

Facilitates Step 4: Implementation and follow-up of safety actions

Systemic issues and hazards in a context

- [Airborne separation \(SI-4010\) \(Amended\)](#)

Monitor

Facilitates Step 5: Safety performance measurement

Systemic issues and hazards in a context

- [Bird and wildlife strikes \(SI-4013\) \(Amended\)](#)
- [Mass and balance \(SI-4014\)](#)
- [Damage tolerance to UAS collisions \(SI-4019\) \(Amended\)](#)
- [Icing in flight \(SI-4022/0001\)](#) 
- [Carbon monoxide poisoning \(SI-4030\)](#)

Contributing issues:

- [Crosswind \(SI-4015\) \(CC effect\)](#) 
- [Engine system reliability \(SI-4012\)](#)
- [Fuel management in flight \(SI-4011\)](#)
- [Knowledge of aircraft systems and procedures \(SI-4017\)](#)
- [Operational communication \(SI-4021\)](#)
- [Other aircraft system reliability \(SI-4028\)](#)



Airborne separation (SI-4010) (Amended)

Maintaining airborne separation is one of the key contributory factors in reducing mid-air collision risk. This relies on the pilot's ability to detect and avoid loss of separation and maintain safe distance between the aircraft and the surrounding traffic. This involves adherence to separation minima and visual separation.

The scope has been extended to now include sailplane operations, where gliders often fly in close proximity during thermal climbing and may come uncomfortably close to one another or even collide. This issue also involves collisions or near collisions with other type of aircraft in all types of airspaces.

This safety issue is also relevant for the CAT A and ATM/ANS domains.

Approach path management on GA aeroplanes (SI-4005)

This safety issue addresses the inappropriate execution of an approach at any point from the IAF until reaching safe taxiing speed after landing. This can lead to runway excursions, aircraft upset, terrain collision, or airborne collision. It covers all types of instrumental and visual approaches. The following areas are reviewed in this safety issue:

- Management of the energy of the aircraft and the influence of external factors affecting the approach, such as tail or crosswind, wind shear, down/up drafts and other weather-related factors;
- Decision-making process of the flight crew to go around or continue with the approach; and
- SOPs and the relevance of those procedures for the approach flown, pilot training and the existing regulatory framework.

The main objectives are to train pilots to achieve stabilised approaches on correct speeds, enhance pilots' go-around decisions when the approach is unstable and the deployment of PBN approaches.

Bird and wildlife strikes (SI-4013) (Amended)

This safety issue considers the following contributory factors:

- Pilot's ability/inability to detect, recognise and avoid bird strike or wildlife strike;
- ATC's ability/inability to report the likelihood of bird strikes or wildlife strikes; and
- Aerodrome operator's ability/inability to control the population of birds and other wildlife in the vicinity of the airport.

For pilots experiencing a bird strike or a wildlife strike, the main goal is to enable them to manage the startle effect and control the aircraft correctly to achieve a safe landing.

Carbon monoxide poisoning (SI-4030)

Carbon monoxide (CO) poisoning occurs mostly due to cracks in exhaust systems. Air conditioning systems in small aircraft often lead cold air around the exhaust pipes to heat it before it enters the cockpit. CO poisoning can result in crew incapacitation and death.

Crosswind (SI-4015) (CC effect)



Crosswind conditions increase the complexity of a landing or take-off procedure as the pilot has to consider the crosswind conditions to avoid an aircraft upset or runway excursion. It includes the preparation of the approach and landing and the take-off, and the information received on crosswind, either from external sources or from the aircraft systems. It also includes the certified capabilities of the aircraft type to perform the landing in crosswind conditions (limitations), the SOPs and training of the pilot. It also includes the accuracy of the measurement of the wind conditions and the relay of that information to the pilot prior to landing or take-off.



The ‘Turbulence’ safety issue (SI-4016) is transposed into the ‘Crosswind’ safety issue as many of the turbulence incidents occur during the take-off or approach/landing phases of the flight.

Damage tolerance to UAS collisions (SI-4019) (Amended)

UAS are a growing airborne conflict threat to manned aircraft due to their growing popularity among the public who may not be aware of their obligations under the UAS regulations. It is important to consider the structural tolerance of a general aviation aircraft to withstand impact with UAS and their ability to maintain controllability to enable a safe landing after a collision with an UAS. The damage tolerance has a direct relationship with the weight and size of the UAS, but also with the design of the UAS. The vulnerability of aircraft differs depending on the category of aircraft: large aeroplanes (CS-25), small rotorcraft (CS-27), large rotorcraft (CS-29) and normal, utility, aerobatic and commuter aeroplanes (CS-23).

Engine system reliability (SI-4012)

The reliability and handling of any hardware/software system on board the aeroplane is crucial for a safe flight. This issue is focused on the engine and its operation. Failure of any of these hardware/software systems can result in loss of power, leading to loss of control while the pilot is trying to solve the problem.

Fuel management in flight (SI-4011)

This safety issue related to the fuel planning, calculation, and the management once the flight has started. Examples are pre-flight visual fuel quantity inspections including test for water in the fuel, correct mixture leaning during the flight, correct use of fuel valves, pumps, and switches. Fuel management is important to ensure that there is sufficient fuel for the flight or different legs of the flight. Poor fuel management may result in high workload and stress for the flight crew as they have to look for alternate aerodromes/airfields to land at a short notice.

Icing in flight (SI-4022/SI-0001) (CC effect)



Icing in flight may occur due to various reasons; however, this safety issue is focused on the manifestation of icing during flight caused by an atmospheric icing phenomenon. The typical manifestation is the accretion of ice on aerodynamic surfaces, probes, engine parts or flight control system, leading to degradation of handling quality or performance issues, system failures or malfunctions, or damage on the aeroplane’s structure. When such icing occurs, it is important to ensure that the pilot is able to recognise and manage the flight in adverse icing conditions. Aircraft specifically with carburettors are most prone to engine icing in flight. Proposed mitigation actions include the promotion of knowledge on icing conditions and how to handle the aircraft when icing occurs. This safety issue is linked to SI-0001, with the same title, in the Commercial air transport — aeroplanes domain.

Inadvertent flight into IMC/scud running (CC effect) (SI-4008) (Amended)



A poorly executed planned low-altitude flight may result in the aircraft’s collision with objects or surface. This includes also what is called ‘scud running’ where the pilot flies under low clouds close to the ground to reach their planned destination. This also captures ‘press-on-it’ mentality during a VFR flight where pilots put themselves into unnecessary danger trying to reach their destination.

Inappropriate control input (SI-4029)

Occurrences where inappropriate control input by the pilot was evident in the occurrence are addressed in this safety issue.



In-flight decision-making (SI-4003)

To effectively respond to dynamic situations or changes during the flight, the pilot needs to possess the ability to correctly gather information and re-plan in flight. This includes decisions involving navigational matters, problem-solving and avoiding or recovering from low- or no-visibility conditions. This is exacerbated by social and commercial pressures (e.g., pressure from the passenger) to reach the planned destination, pushing the pilot to take unnecessary risks, instead of turning around and try another time. A wrong decision based on incorrect evaluation of the circumstances has caused fatal accidents. Proposed actions are to provide/promote education in the use of available information to enhance the decision-making process. This includes increasing the availability of information and simplifying the presentation of this information to the pilot to facilitate understanding.

Knowledge of aircraft systems and procedures (SI-4017)

This issue refers to the pilot's ability/inability to apply formerly acquired knowledge and training to the current event. This is evident when pilots fly aircraft that they do not have much experience on – i.e. transitional training has not been or inadequately performed resulting in incorrect actions causing even cascade of other problems and inadequate decision-making. It is important for pilots to understand the characteristics of the different systems on board the aircraft. Pilots who are proficient in their knowledge of systems should instinctively use the correct systems; otherwise, they may lose precious time in searching for the correct systems or use the wrong system.

Mass and balance (SI-4014)

The mass and balance of the aircraft may be adversely affected by inadequate or incorrect loading of the aircraft by the pilot. GA pilots usually load their aircraft by themselves and do not use ground handling services. The objective is to improve the calculation of load and balance sheets and ensure that the baggage and cargo are securely fastened to prevent them from shifting and changing the aircraft's centre of gravity.

Operational communication (SI-4021)

Ineffective communication, including language proficiency (all languages), use of standard terminology, hand signals, visual communication, distraction from outer sources (e.g. mobile phones) are all factors that may lead to unsafe situations in the airside operational environment. In a well-functioning operational environment, individuals have the necessary skills to communicate effectively.

Other aircraft system reliability (SI-4028)

This issue refers to the reliability of all aircraft systems, other than the engine and propeller.

Pilot management of in-flight technical failures (SI-4001) (Amended)

Pilots may suffer from non-catastrophic technical failure(s) in the aircraft systems from time to time. It is important for the pilot to have the ability and capability to manage such failures to avoid an aircraft upset. This includes, for example, handling of engine failures, flight control problems as well as failures in navigation systems. Occurrence data shows that the pilot's focus is often fixed on resolving the technical issue instead of flying the aircraft towards the safest landing site. This often results in loss of control and, potentially, fatal accidents.

Poor pre-flight planning and preparation (SI-4007)

Effective pre-flight planning and preparation is achieved by ensuring that the correct processes, tools and information are used by the flight crew/operator to plan the flight. This includes the adequacy, accuracy and timeliness of the information used, how this is processed and digested by the flight crew, and their training and procedures. It includes the flight preparation steps before the flight is initiated.



Risks associated with parachuting operations (SI-4023)

Parachuting operations are flights which are specifically chartered/operated to transport parachutists (called 'skydivers' in sport parachuting) to a designated altitude for jumping out from the aircraft. These operations, usually entailing short flights, are exposed to a range of operational hazards that may relate to changes in weight and balance, possible interference of the parachute deployment devices with structural elements of the aircraft upon exit, insufficient communication between the pilot and the parachutists, non-adherence to SOPs leading to convergent aircraft descent- and free-falling parachutist trajectories (a risk in particular in the case of wing suit or large formation skydiving), etc. This type of operation may also be exposed to organisational hazards such as commercial pressure, lack of or inadequate safety briefings, inadequate monitoring of continuing airworthiness.

Training, experience, and competence of individuals (SI-4004)

This safety issue relates to the pilot's training, experience, and competence to handle the required tasks in flying the aircraft from engine start-up till engine shutdown, as well as their ability to address occurrences they may face during the flight. This issue also addresses training aspects and planning within training organisations.



7. Sailplanes — SP

The safety issues for sailplanes domain were a relatively recent addition to the EPAS. The safety issues have been identified from various sources as per the EU SRM process. This year the domain underwent an extensive review and several adjustments were made.

The safety issues in the domain are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access its description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence.

The highest key risk areas, to which the domain safety issues contribute, are aircraft upset, obstacle collision in flight and terrain collision. Refer to [Appendix A](#) to this Volume for links between safety issues and key risk areas. For further details regarding the domain, see Chapter 5 of ASR 2025.

The highest-priority safety issues in the domain are ‘Approach path management on sailplanes’ (SI-7006), ‘Managing risks in aerotow operations’ (SI-7007) and ‘Incorrect glider assembly before flight’ (SI-7017).

The safety issue ‘Airborne separation (SI-7005)’ from the SP domain has been merged into the NCO SA ‘Airborne separation’ (SI-4010) safety issue. Sailplane-specific scenarios are now covered under SI-4010 to improve clarity and avoid duplication.

Furthermore, it should be noted that since the last edition, no new safety issues have been added to the SP domain.

► **List 6:** Sailplane operations — sailplane safety issues per category and priority

Assess

Facilitates Step 2: Assessment of safety issue

Hazards in a context:

- [Approach path management on sailplanes \(SI-7006\)](#)
- [Winch launch failures \(SI-7002\)](#)

Mitigate – define

Facilitates Step 3: Definition and programming of safety actions

NIL

Mitigate – implement

Facilitates Step 4: Implementation and follow-up of safety actions

NIL

Monitor

Facilitates Step 5: Safety performance measurement

Hazards in a context:

- [Managing risks in aerotow operations \(SI-7007\) \(Amended\)](#)
- [Incorrect glider assembly before flight \(SI-7017\)](#)



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- [Inappropriate flight control inputs \(SI-7016\)](#)
- [High wind encounter \(SI-7013\) \(CC effect\)](#) 
- [Off-field landings \(SI-7011\)](#)
- [Unsafe handling of under/overshoot \(SI-7012\) \(Amended\)](#)
- [Pilot incapacitation \(SI-7001\)](#)

Contributing issues:

- [In-flight decision-making \(SI-7004\)](#)
- [Training, experience, and competence of individuals \(SI-7008\)](#)

Approach path management on sailplanes (SI-7006)

This safety issue is related to the inappropriate execution of an approach at any point during the approach until reaching safe landing. This can lead to runway excursions, aircraft upset, terrain collision or airborne collision. It covers visual approaches. The following areas are reviewed in this safety issue:

- Management of the gliding energy of the aircraft and the influence of external factors affecting the approach, such as tail or crosswind, wind shear, down/up drafts, and other weather-related factors.
- Decision-making process of the pilot to deviate from the normal pattern, choose an alternate landing location or continue with the approach; and
- Procedures and checklists for the flown approach, pilot training and the existing regulatory framework.

The main objectives of this safety issue are to train pilots to achieve stabilised approaches on correct speeds and enhance pilot's decisions when the approach is unstable.

High wind encounter (CC effect) (SI-7013)

This safety issue refers to the encounter of high wind, including crosswind and gust conditions during the landing or the take-off. It includes the preparation and precautions to be taken for the approach and landing and the take-off, and the information received on weather phenomena, either from external sources or from the aircraft systems. It also includes the certified capabilities of the aircraft type to perform the landing in strong wind conditions, the SOPs and training of the pilot. It also includes the accuracy of the perception of the wind of the pilot performing the approach.

Inappropriate flight control inputs (SI-7016)

This safety issue addresses occurrences where wrong or inadequate flight control inputs by the pilot or passenger are the cause of the occurrence.

Incorrect glider assembly before flight (SI-7017) (Amended)

This safety issue addresses an incorrect assembly, or rigging, of sailplanes during flight preparation. In addition, the incorrect insertion of the main wing bolt(s) and connection of control surfaces are reviewed in this safety issue.

In-flight decision-making (SI-7004) (SI-7004)

To effectively respond to dynamic situations or changes during the flight, the pilot needs to possess the ability to correctly gather information and re-plan in flight. This includes decisions involving navigational matters, problem-solving and/or avoiding or recovering from weather-related incidents. This is exacerbated by social



and peer pressures pushing the pilot to take unnecessary risk, instead of turning around, deviate to another airfield or perform a safe out-landing, and try another time. A wrong decision based on incorrect evaluation of the circumstances has caused fatal accidents. Proposed actions are to provide/promote education in the use of available information to enhance the decision-making process. This includes increasing the availability of information and simplifying the presentation of this information to the pilot to facilitate understanding.

Managing risks in aerotow operations (SI-7007) (Amended)

The safety issue addresses the aerotow process, how it is taught and trained and captures occurrences related to aerotowing like, glider too high or too low compared with the towing aircraft, which can cause loss of control, and tow cable release issues.

Off-field landings (SI-7011)

This issue tracks off-field landings which are quite common while gliding; however, it is also quite common for gliders to hit objects during the landing causing substantial damage to the aircraft.

Pilot incapacitation (SI-7001) (Amended)

Lack of oxygen and other events leading to incapacitation of the person on board the aircraft. Medical conditions like heart attack or stroke cannot be predicted and are not included in this issue.

Training, experience, and competence of individuals (SI-7008)

This safety issue relates to the pilot's training, experience, and competence to handle the required tasks in flying the aircraft from launch until landing, as well as their ability to address occurrences they may face during the flight. This issue also addresses training aspects and planning within training organisations.

Unsafe handling of under/overshoot (SI-7012) (Amended)

Given the fact that sailplanes do not normally have an engine and cannot abort the landing and perform a go-around, the likelihood of overshooting or undershooting the landing area is higher than with powered aircraft.

Winch launch failures (SI-7002)

This safety issue refers to the pilot's ability/inability to cope with interruptions of the winch launch procedure. This also includes cable break (simulated or in reality) and wing drop during take-off, as well as failures of the winch system.



8. Balloons — BA

Commission Regulation (EU) 2018/395, creating a dedicated legal framework for the air operations of balloons within the European Union, was published in 2018. This regulation covers key aspects of balloon operations, including pilot licensing, airworthiness, maintenance and operational procedures, addressing the need for a consistent and safe approach to ballooning across Europe.

In September 2020, EASA published the Easy Access Rules - Balloon Rule Book, a comprehensive document consolidating the various legal requirements, AMC and GM related to balloon operations. This rule book facilitates compliance for balloon operators by bringing together the requirements established under Commission Regulation (EU) 2018/395 into one accessible resource. It is part of EASA's Easy Access Rules, which aim to provide clear and accessible guidance to all operators.

While the Balloon Rule Book provides a practical summary of operational safety, maintenance and flight planning, the official regulatory framework is established in the Balloon IR. In the context of the safety issues identified for this domain, some of the relevant rules from the Balloon IR are as follows:

- BOP.BAS.130 – Flight preparation. This rule ensures that the pilot-in-command is familiar with meteorological and aeronautical information relevant to the flight, including current weather reports and forecasts and contingency planning for completing the flight as planned.
- BOP.BAS.145 – Meteorological conditions. This rule explicitly prohibits flights outside the meteorological limitations specified in the AFM, often leading to hard landings and accidents.
- BFCL.160 – BPL — Recency requirements. This rule outlines the recency requirements for pilots, and is complemented by BFCL.215 – Commercial operation rating (for commercial activities) - introduced via Implementing Regulation (EU) 2020/357.

Additionally, in September 2024 EASA issued SIB 2024-12 which addresses the need for balloon pilots to use approved restraint systems during flights, particularly during landings. The bulletin emphasises the importance of using restraints to prevent pilot ejection during hard landings, even when not explicitly required by requirements.

BOP.BAS.175 – Use of restraint system. This rule specifically addresses the need for restraint systems during critical phases of flight, such as landing, or in turbulent conditions.

For the current EPAS Volume III edition, the scope of the Balloons safety risks has been refined to address six safety issues. Of the originally identified safety issues two previously separate issues (Use of non-certified parts in critical balloon structure/equipment (SI-6012) and System reliability and ageing structures SI-6014) have been merged into one (Use of non-certified parts in critical balloon structure/equipment and ageing structures (SI-6012) (Amended)). For the SI on pre-flight planning and weather-related decision-making (SI-6008), the title has been amended to reflect the importance of weather-related decisions and it has been moved from status 'mitigate' to 'assess' — action enabled by the occurrence analysis and barriers in place.

The highest SIPI score safety issues are Pressure to fly (SI-6003) and Powerline collisions (SI-6001) (refer to [Appendix A](#) for the link between safety issues and key risk areas).

Two of the current Balloon-related SIs have been flagged as affected by the climate change (CC effect). Weather forecasts are becoming less reliable, and weather systems are experiencing more variability, including increased frequency of severe weather events. This has led to a reduction in the number of flyable days for balloons.

The safety issues are sorted into the 'Assess', 'Mitigate – define', 'Mitigate – implement', and 'Monitor' categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in



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a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence.

► **List 7: Balloon operations — balloon safety issues per category and priority**

Assess

Facilitates Step 2: Assessment of safety issue

Systemic issues and hazards in a context

- [Pressure to fly \(SI-6003\) \(CC effect\)](#) 
- [Powerline collisions \(SI-6001\)](#)
- [Presence and use of pilot restraints \(SI-6002\)](#)

Mitigate – define

Facilitates Step 3: Definition and programming of safety actions

NIL

Mitigate – implement

Facilitates Step 4: Implementation and follow-up of safety actions

NIL

Monitor

Facilitates Step 5: Safety performance measurement

Systemic issues and hazards in a context

- [Use of non-certified parts in critical balloon structure/equipment and ageing structures \(SI-6012\) \(Amended\)](#)
- [Inadequate ground obstacle clearance \(SI-6006\)](#)

Contributing issue:

- [Pre-flight planning and weather-related decision-making \(SI-6008\) \(CC effect\) \(Amended\)](#) 

Inadequate ground obstacle clearance (SI-6006)

Collisions with ground obstacles, such as trees, buildings or terrain features, continue to occur in ballooning, particularly during approach and landing. Two trends can be observed, with one being low recency of pilots in private operations. The second in commercial activities with a trend of using larger passenger balloons, which demonstrate increasing inertia resulting in even more limited manoeuvrability combined with operating in more marginal wind and weather conditions.

Contributing factors include insufficient knowledge of operating areas, difficulties in judging clearance in low visibility or complex environments and reduced situational awareness during critical phases of flight.

Powerline collisions (SI-6001)

Powerline strikes pose a significant risk in ballooning, often resulting from insufficient situational awareness during flight. Some collisions with powerlines, prominently reported in the media, have led to severe accidents due to resulting fires. Contributing factors include limitations in detecting powerlines from the air, especially in low light or when the sun is low over the horizon, in poor visibility, or when powerlines are obscured by terrain or vegetation. This safety concern is reinforced by the analysis of the most recent occurrences and should continue to be addressed through the safety promotion initiatives.



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Pre-flight planning and weather-related decision-making (SI-6008) (CC effect) (Amended)

The key difference between pre-flight planning and preparation for balloons and pre-flight planning and preparation for other types of aircraft lies in the unique weather briefing and preparation that balloon pilots must consider during pre-flight preparations. Unlike powered aircraft, balloons rely entirely on wind currents for navigation. Forecasts often are neither sufficiently detailed for the local micro-climates experienced in ballooning nor adequately consider the tight wind limitations for safe launch and landing, with gusts not exceeding 10-15 knots. Additionally, balloon pilots need to be highly aware of landing site availability and adequacy for the size and inertia of the balloon they choose to operate. Occurrences have shown that inadequate assessment of weather and wind conditions at the planning stage can significantly increase operational risk.

Presence and use of pilot restraints (SI-6002)

Balloon pilots are required to use restraint systems on balloons with basket compartments or where turning vents are installed. Here, the use of restraints is mandatory for the pilot-in-command — at least during landing. In scenarios or configurations where this is not explicitly required, restraints are still encouraged to enhance safety, especially during hard landings or unpredictable weather conditions. SIB 2024-12 emphasises the importance of using restraints to prevent pilot ejection during hard landings, even when not explicitly required by requirements.

Pressure to fly (SI-6003) (CC effect)

Balloon pilots, especially in commercial operations, often face pressure to fly due to financial and organisational factors. This pressure can lead to hazardous decision-making, such as flying in unfavourable weather conditions, which increases the risk of landing accidents. Group dynamics, also present in balloon fiesta or commercial operators is a common source of this pressure. In addition, organisation set-up, including sub-contractor and self-employment of pilots, is a factor building up pressure to fly. Contributing factors are marginal weather forecasts or operational commitments, such as flights with large number of passengers, where cancellations could result in significant losses for the business and customer dissatisfaction.

Use of non-certified parts in critical balloon structure/equipment and ageing structures (SI-6012) (Amended)

The use of non-certified or unapproved parts increases the likelihood of mechanical failure, particularly in critical areas such as burners, the fuel system and envelope materials. Such failures can directly compromise flight safety if parts do not meet certification standards.

In parallel, ageing and material fatigue also affect the structural integrity of balloons. Over time, repeated use and environmental exposure can reduce the reliability of certified components, leading to a higher risk of system degradation. Regular inspections, preventive maintenance and timely replacement of affected parts are essential to sustain continued airworthiness.

This safety issue reflects the concern over both non-certified parts and natural ageing of certified components, and highlights the importance of maintaining integrity in balloon structures and equipment and compliance with the certification standards.



9. Airworthiness

Safety issues which adversely affect either the initial and continued airworthiness of the type design or continuing airworthiness, may have been identified in the past in the existing product-related domains, such as commercial air transport aeroplanes or rotorcraft. They may have been related to operational suitability data (OSD), continuing airworthiness and/or associated organisations/competent authorities (i.e. design, production, continuing airworthiness management, maintenance). They were however essentially flight-operations-centric.

An Airworthiness domain was, therefore, introduced in 2023 by the Agency to focus on safety issues related to airworthiness and environmental certification, as well as continuing airworthiness¹⁴. The decision to create this domain in the overall safety risk portfolio was driven by the need to integrate the lessons learnt from the B737 MAX accidents in the European SRM process and to centralise airworthiness-related safety issues in one place.

Safety issues relevant to the airworthiness domain are defined where:

- they adversely affect more than one product type or part, more than one organisation, and/or more than one competent authority;
- they would need to be controlled by other means than selective and reactive mitigation controls, such as airworthiness directives (ADs), safety directives (SDs), or inspection/standardisation findings;
- they are framed to scenarios mainly controlled by design, production, maintenance, continuing airworthiness management organisations, and their competent authorities.

The first edition of the Airworthiness domain was published as part of the EPAS Volume III 2024 edition. Unless the safety issue is categorised ‘(Amended)’, the title and/or description have not been modified compared with the last revision of EPAS Volume III.

The safety issues in the Airworthiness domain are sorted into the ‘Assess’, ‘Mitigate – define’, ‘Mitigate – implement’, and ‘Monitor’ categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues, if any, are sorted in an alphabetical sequence.

The second phase of the BIS was completed in late 2025 for the safety issue on inadequate management of repetitive defects (SI-9001), corresponding to step 3 of the European SRM process.

The safety issues identified by the lessons learnt from the B737 MAX accidents continued to provide guidance and regulatory material. In addition to the certification memoranda (CM-SA-002, CM-21.A-A.003), SIB 2023-08 and the amendments to the air operations rules published over the past years, aiming to improve the consideration of flight crew human factors in aircraft certification, mitigation actions associated with the safety issues related to the limited application and inadequate oversight of development assurance (SI-9004) and the outdated certification bases established for major changes to type certificates (changed product rule (SI-9005)) were further processed in 2025:

- CS-ETSO Amendment 18, published in September 2025, as an outcome of RMT.0457 on the regular update of CS-ETSO (NPA 2024-03), revising Subpart A Section 2.4 Failure condition classification and development assurance, identifying ED-79B/ ARP4754B as accepted means of compliance for the development assurance of ETSO articles (SI-9004);

14 In alignment with Regulation (EU) No 748/2012 and Regulation (EU) No 1321/2014 respectively.



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- Commission Implementing Regulation (EU) 2024/2954 of 29 November 2024, based on EASA Opinion 05/2024 (RMT.0710) that was published in June 2024, amended Regulation (EU) 2015/640 (including its Annex I (Part-26)), mandating the installation of a crash-resistant fuel system (CRFS) onto some existing helicopter designs that are still in production and the retrofit of some in-service helicopters (SI-9005);
- RMT.0755, on the changed product rule (CPR), programmed in the EPAS (ref. EPAS Volume II), addresses requirements 21.A.19 and 21.A.101, along with the associated guidance material, based on the recommendations from the CPR International Authorities Working Group (IAWG) which uses as input the CPR Aviation Rulemaking Committee (ARC) that develops industry's proposals in recommendation reports, the first of which was issued in December 2024 (SI-9005); and
- RMT.0764, on the flight crew alerting system of large aeroplanes, programmed in the EPAS (ref. EPAS Volume II), contemplates potential amendment to Part-26 and CS-26 in order to ensure that large aeroplanes issued with a type certificate issued prior to the applicability date of CS 25.1322 Amendment 11 and manufactured after a certain date, are equipped with a flight crew alerting system compliant with the certification standards of CS 25.1322 Amendment 11 to the maximum extent possible (SI-9005).

The assessment of the safety issue on the shortcomings in design and maintenance instructions resulting in maintenance errors (SI-9006) started late 2024, entering step 2 of the European SRM process.

SI-9007 was renamed 'Helicopter rotor and rotor drive system failures', and its description was amended to clarify the scope of the safety issue. Additionally, multiple mitigation actions were introduced late 2024 and throughout 2025:

- The proposed CM-RTS-003, on hybrid bearings at Issue 01, published in December 2024, provides specific guidance for CS-27 or CS-29 rotorcraft for the certification of hybrid bearings in the absence of any dedicated requirement and guidance material;
- The proposed CM-S-007, on post-certification actions to verify the continued integrity of rotorcraft critical parts at Issue 02, published in December 24, supplements the existing guidance for compliance with CS 27/29.602 – Critical Parts by detailing the need for post-certification actions to verify the continued integrity of critical parts. The CM proposes the implementation of a programme, named Continued Integrity Verification Programme (CIVP), to review the certification assumptions relating to critical parts, including the effectiveness of design, maintenance and monitoring provisions, periodically throughout the service life of the helicopter type. Ultimate purpose is to ensure that critical parts are controlled throughout their service life to maintain the critical characteristics on which certification is based (ref. AC 27-1B/ AC 27.602 and AC 29-2C/ AC 29.602); and
- RMT.0752, on the continued integrity verification programme (CIVP), programmed in the EPAS, proposes an amendment to CS-27 and CS-29 to introduce the concept and purpose of the CIVP as already contained in CM-S-007 Issue 2, as well as to develop the necessary guidance addressing aspects such as identification of parts to be included within the scope of the CIVP, defining in-service data and activities to be considered in support of the CIVP and criteria to identify their need, determining the amount of data needed to support verification of assumptions under the CIVP and ensuring a commensurate approach regarding CS-27 and CS-29 rotorcraft.

Related to the safety issue on hazardous conditions following helicopter ditching (SI-9009), RMT.0757 on the air-pocket design feature and occupant underwater escape was programmed in the EPAS (ref. EPAS Volume II), building upon the research project RES.0009 on new flotation systems which was completed late 2023. The rulemaking task proposes to introduce the air-pocket concept as an optional design feature in CS-27 and CS-29, and in the relevant acceptable means of compliance.

SI-9010 was renamed 'Emergency locator transmitters' and personal locator beacons' malfunctions', and its description was amended to reflect the scope of the safety issue.

A new safety issue has been introduced in the Airworthiness domain, namely in-flight fire in inaccessible areas (SI-9011). This safety issue has been identified based on investigation reports outlining the need for additional flammability standards.



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► List 8: Airworthiness safety issues per category and priority

Assess

Facilitates Step 2: Assessment of safety issue

Systemic issues and hazards in a context

- [Oxygen-fed fire in the flight deck \(SI-9012\)](#)
- [Shortcomings in design and maintenance instructions resulting in maintenance errors \(SI-9006\)](#)
- [Use of an airstair for passenger embarking/disembarking on/from large transport aeroplanes \(SI-9008\)](#)

Mitigate – define

Facilitates Step 3: Definition and programming of safety actions

Systemic issues and hazards in a context

- [Inadequate management of repetitive defects \(SI-9001\)](#)
- [In-flight fire in inaccessible areas \(SI-9011\) \(New\)](#)

Mitigate – implement

Facilitates Step 4: Implementation and follow-up of safety actions

Systemic issues and hazards in a context

- [Outdated certification bases established for major changes to type certificates \(SI-9005\)](#)
- [Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design \(SI-9003\)](#)
- [Helicopter rotor and rotor drive system failures \(SI-9007\) \(Amended\)](#)
- [Hazardous conditions following helicopter ditching \(SI-9009\)](#)
- [Limited application and inadequate oversight of development assurance \(SI-9004\)](#)

Monitor

Facilitates Step 5: Safety performance measurement

Systemic issues and hazards in a context

- [Insufficient consideration of flight crew human factors in functional hazard assessments \(SI-9002\)](#)
- [Emergency locator transmitters' and personal locator beacons' malfunctions \(SI-9010\) \(Amended\)](#)

Emergency locator transmitters' and personal locator beacons' malfunctions (SI-9010) (Amended)

Emergency locator transmitters (ELT) are radio beacons installed on most aircraft to transmit distress signals in the event of an accident or emergency landing. Data collected by safety investigation authorities from accident investigation reports involving mainly helicopters and general aviation aeroplanes show that the availability of ELT signal transmission is low after a crash resulting in delayed and impracticable search and rescue (SAR) activity. Finding the aircraft wreckage quickly increases the chance of survival for the occupants and reduces the risk to the pilots of SAR aircraft, who often have to operate in marginal weather conditions.

The ELT equipment is considered a passive device whose status is on standby until it is required to perform its intended function. As such, its performance is highly dependent on proper installation and post-installation testing. While the design of the ELT is required to comply with ETSO-C126c published in 2020 at CS-ETSO Amendment 16, occurrences show that malfunctions of the ELT may result from issues related to the installation and maintenance of the system that are outside the scope of the ETSO approval and are specific to the installation on the aircraft.



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Hazardous conditions following helicopter ditching (SI-9009)

This safety issue refers to all hazards endangering the survivability of the helicopter occupants after a ditching has been performed. In addition to the helicopter emergency floatation system (EFS) malfunctions, it addresses the hazards related to an evacuation after a helicopter capsizing such as issues with the emergency exit suitability, signage, the internal and external emergency lighting, the life raft deployment from the cabin or externally, defective or unsuitable survival suits, the inadequate crew and passenger training for underwater escape and the use of emergency and safety equipment such as life jackets and emergency breathing systems.

Helicopter rotor and rotor drive system failures (SI-9007) (Amended)

Rotorcraft are potentially more vulnerable to catastrophic mechanical failures than fixed-wing aeroplanes due to their reliance on the integrity of single-load-path-critical components within the rotor and rotor drive systems. Depending on the methodology applied by the type certificate holder and their designs, there can be more than a hundred critical parts within the rotor and rotor drive systems on one helicopter. A single failure of any of these critical parts can result in a catastrophic effect on the rotorcraft. In addition, the nature of their way of operation makes rotor and rotor drive system components prone to specific modes of degradation and associated failure mechanisms. This has resulted in failures due to design and/or operating characteristics that were not anticipated during compliance demonstration at the time of rotorcraft type certification.

High-profile fatal accidents underscored the importance of ensuring continued integrity of critical parts throughout their service life and suggested the adoption of fail-safe design measures to mitigate potential catastrophic outcomes of rotor and rotor drive system failures.

Inadequate management of repetitive defects (SI-9001)

This safety issue addresses repetitive defects of aircraft systems which may adversely affect aircraft operations and airworthiness if not managed properly.

Managing repetitive defects is multi-dimensional and requires collaboration between all stakeholders in the airworthiness domain, including operators, type certificate holders, continuing airworthiness management and maintenance organisations.

CAMOs hold the main responsibility to manage such defects. Their role, as prescribed by Regulation (EU) No 1321/2014, is to ensure the airworthiness of the aircraft and arrange the rectification of defects. Identification of repetitive defects is a challenge, as well as their technical assessment and resolution. The CAMO interfaces with all other organisations involved.

AMOs are tasked by the CAMOs to perform the necessary maintenance resulting from the AMP or from defect identification. Reporting information from AMO to CAMO may be essential in the management of repetitive defects.

Aircraft operators and flight crews operate the aircraft and are exposed to defects. The flight crew is expected to report them through the aircraft technical log to inform the CAMO. On the other hand, the CAMO should ensure that the flight crew has all information necessary to perform the flight, which may include informing the flight crew of specific defects that could occur in a repetitive manner.

DAHs are responsible for the design of the aircraft. Once informed by the CAMO, they should support the investigation with a view to solving the issue and/ or proposing mitigation actions.

Repetitive defects can be difficult to identify and rectify, and their root causes have the potential to remain latent over long periods of time. They may eventually affect the safe operation of aircraft, particularly when combined with other defects, or when they occur on highly integrated systems, potentially having an impact on automation and/ or on flight crew workload. Besides, the management of repetitive defects involves multiple activities including continuing airworthiness management, aircraft maintenance, flight operations and design. This translates into additional challenges, such as information sharing, communication or interpretation issues,



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which can ultimately affect how well repetitive defects are managed and hence potentially threaten flight safety. There have been cases where repetitive defects were identified as contributing factors to fatal accidents of large aeroplanes in commercial air transport.

In-flight fire in inaccessible areas (SI-9011) (New)

A fire is defined as the combustion of a fuel by oxygen, and occurs when oxygen, fuel and heat combine to create a self-sustaining chemical reaction. If any of these three elements is absent, a fire cannot initiate. Firefighting aboard an aircraft is based on eliminating the oxygen present in the air, using hand-held fire extinguishers. For an extinguishing agent to be effective, it must be applied to the base of the flames (NTSB, 1986).

In the event of an in-flight fire in an inaccessible area (or 'hidden fire'), the fire is not readily accessible, and is difficult to timely detect and locate, making it more challenging to extinguish and more likely to become catastrophically uncontrollable. An inaccessible area is a part of the aircraft fuselage that either requires removal of panels to gain access, or if otherwise exposed, is not readily reachable by a person with the contents of a hand-held fire extinguisher. These areas tend to be behind interior panels (such as sidewalls or ceilings), or areas below the passenger floor. These areas are often prone to contamination from spillage, accumulated dirt or dust, or lubrication, which combined with an ignition source can result in a fire. While class C and class D cargo compartments are inaccessible, they are not considered inaccessible areas for the purpose of this safety issue.

Although the regulatory framework has changed significantly since the Swissair Flight 111 fatal accident in 1998, with the introduction of requirements for the installation and maintenance of Electrical Wiring Interconnection Systems (EWIS) in the Certification Specifications for Large Aeroplanes (CS-25) in 2008, in-flight fires in inaccessible areas continue to pose a risk to aviation. More recent accidents, and related investigation reports, outlined the need for additional flammability standards, the reliance on comprehensive wiring inspection programmes that include regular inspections of remote or hidden areas of the aeroplanes, and the challenges for the crews to locate and fight an in-flight fire in an inaccessible area.

Insufficient consideration of flight crew human factors in functional hazard assessments (SI-9002)

Functional hazard assessments (FHAs) are key elements within the safety assessment process for showing compliance with CS 25.1309. They support the compliance demonstration by ensuring that:

- the identification of failure conditions is complete;
- the classification of failure conditions is correct and adequately substantiated.

The consequences of failure conditions and their severity may be mitigated by relying on flight crew actions. Whether these mitigation actions are valid directly affects the classification and subsequently the safety objectives.

Recent experience has shown that a disparity may exist between:

- the observed flight crew behaviours; and
- the underlying assumptions about flight crew recognition, interpretation, and response that applicants have made during the design certification process.

These discrepancies have resulted in a number of safety recommendations. While guidance on CS 25.1302 clearly states that both normal and non-normal conditions have to be covered, there is no guidance material defining a structured HF methodology for validation of the FHA assumptions with respect to flight crew behaviour.

Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design (SI-9003)

During the design phase of the human/machine interface in the flight deck, the type certificate applicant must demonstrate compliance with the HF requirements, anticipating potential in-service events related to HP and



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implementing design-related mitigation actions. The type certificate applicant must therefore ensure that the design of the flight deck considers a comprehensive set of design principles that are very close to what is well described in the literature under the concept of usability. The ultimate intent of designing a usable flight deck is to prevent as much as practicable any kind of HP issues in both normal and abnormal situations (including failure conditions), and to allow the management thereof should they occur.

Experience has shown that, despite the best efforts made during the initial airworthiness process of the type design, actual flight crew behaviour or performance in service may deviate from what was initially expected by the DAHs and the certification authorities. Such deviations in both normal and abnormal situations (including failure conditions) may have safety consequences and result in serious incidents/accidents if going further unnoticed.

DAHs and certification authorities normally rely on the continued airworthiness process of the type design to further capture and manage design weaknesses, assumptions invalid over time, etc. In such a context, it is therefore paramount that air operators systematically report to the DAHs occurrences involving HP aspects detected by the flight crew during the operator's flight operations and/or detected by the instructor during the operator's simulator training. It is equally paramount that the DAHs investigate these occurrences and are able to determine potential unsafe conditions originated from HP issues.

The existing regulatory material for occurrence reporting and continued airworthiness of the type design does not however fully address these key elements when it comes to HP.

Limited application and inadequate oversight of development assurance (SI-9004)

Demonstration of compliance with system-safety-related certification specifications requires addressing development errors (i.e. errors in requirements, design or implementation). Development assurance activities are the means to minimise the likelihood of development errors occurring within the development life cycle of the aircraft, systems and equipment. These activities are implemented by applicants through development assurance plans and processes at aircraft, system and equipment levels, the acceptability of which are assessed by the Agency against the objectives contained in SAE ARP 4754/ EUROCAE ED-79 'Guidelines for Development of Civil Aircraft and Systems'.

Recent experience has shown however that while applicants understand the development assurance process and underlying activities, they do not always consider that development assurance directly contributes to aircraft/system safety. Analysis of occurrences, reports from safety investigation authorities and certification reviews draw the attention to:

- the limited scope of applicability (exacerbated by the changed product rule, ref. SI-9005),
- the loose application of the process,
- the low level of oversight from the applicant itself (internal and suppliers) and authorities, and/ or
- compliance artefacts almost nonexistent or of poor quality.

Outdated certification bases established for major changes to type certificates (SI-9005)

When defining the applicable certification basis for a major change to a type certificate, Regulation (EU) No 748/2012 introduces flexibility under conditions for selecting an earlier amendment of a certification specification instead of the amendment in effect on the date of application for the change.

Experience has shown that this flexibility can sometimes be exploited by, for instance:

- artificially reducing the scope of significant changes and related changes with preceding and/or succeeding sets of non-significant major changes; or
- applying the exception conditions at equipment/component level while the use of the equipment/component by other systems at aircraft level is significantly changed,



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possibly impairing the initial intent of the Regulation that introduces this flexibility, namely requirement 21.A.101 of Part 21 which is known as the changed product rule. As indicated in the related GM 21.A.101, the intent of the changed product rule is to enhance safety by incorporating to the greatest extent practicable the latest requirements into the certification basis for the changed product.

Besides, it is recognised that the changed product rule brings along its inherent complexity, involving different options, steps and concepts which are sometimes open to different interpretations and to negotiations. Its application on products nowadays is complex, either because of the ever-higher integration of systems (and of systems and structure) or because of the increase in process-based / aircraft level requirements (human factors, system safety, development assurance, security, cybersecurity, etc.). The output of the process, the certification basis, is equally getting more and more complex and less and less intelligible. This complexity has the tendency to distract the authority and applicant resources and move their focus away from design safety.

Oxygen-fed fire in the flight deck (SI-9012)

A fire is defined as the combustion of a fuel by oxygen, and occurs when oxygen, fuel and heat combine to create a self-sustaining chemical reaction. If any of these three elements is absent, a fire cannot initiate. The pressure and concentration of oxygen affect the flammability of a material: the greater the quantity of oxygen present, the easier for the material to ignite, the faster and more extensive the combustion and the higher the temperatures. In the specific case of an oxygen-fed fire, any surrounding material is considered flammable material (i.e. fuel), meaning that only two elements need to be present to initiate the fire: an oxygen-enriched environment (e.g. due to an oxygen leakage) and an ignition source.

Firefighting aboard an aircraft is based on eliminating the oxygen present in the air. In an oxygen-fed fire, the oxygen is however provided in an abnormal quantity, thereby rendering the installed standard fire extinguishers inefficient. Their use may even worsen the situation in the flight deck by creating a highly noxious environment (e.g. halon-based fire extinguishers). The crew oxygen system is no longer usable, as it is directly involved in the undesirable sequence of events. The required portable breathing equipment installed in the flight deck, besides only providing a time-limited protection (15 min), may also become inaccessible due to the immediate vicinity to the fire. The current standard emergency procedures for smoke and fumes, developed to mitigate fires of a different nature from the oxygen-fed ones, are therefore not suitable to fight an oxygen-fed fire in the flight deck. Firefighting such fire situations within the narrow environment of a flight deck with the duty to keep control of the aircraft adds even more complexity to that issue.

Accident investigation reports show that an oxygen-fed fire, characterised by a rapid spread and intense heat, occurring in the confined space of a flight deck, may quickly escalate into an uncontrolled fire, adversely affecting the aircraft structure and systems critical for ensuring continued safe flight and landing.

Shortcomings in design and maintenance instructions resulting in maintenance errors (SI-9006)

Maintenance-related occurrence reports collected under the mandatory occurrence reporting scheme for large aeroplanes over the period January 2005 to December 2011 (UK CAA CAP1367, 2016) showed that 'installation error' and the 'use of approved data' were the most frequent types of errors. Since then, a considerable body of evidence on maintenance errors has been further established, highlighting issues arising from shortcomings in design and maintenance instructions (Royal Aeronautical Society, 2022), which also echoed in the investigation reports of serious incidents and accidents over the past decade.

The deeper systemic issue arises not from the individual performing maintenance activities but from the design approval holder that produced the design and maintenance instructions, e.g. poor accessibility or visibility, ambiguous or misleading maintenance instructions. A key contributing factor for both incorrect installation and failure to follow instructions is the lack of mistake-proofing or error mitigation in aircraft design. Errors can also exist in maintenance instructions, and lack of or insufficient verification can result in difficult-to-use maintenance instructions. In addition, oversight activities indicate that inaccurate, incomplete or ambiguous maintenance



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instructions are not systematically reported by maintenance organisations or by continuing airworthiness management organisations to the design organisations.

Solely relying on warning and caution messages in maintenance instructions, markings or independent inspections to detect maintenance errors, whereas the hazard can be eliminated by careful design, is not considered suitable. As an example, an incorrect assembly that looks right or is believed to function correctly to one maintenance person may equally look right / appear to function correctly to a second maintenance person during an independent inspection.

Although the EU Continuing Airworthiness Regulation (Regulation (EU) No 1321/2014) and the associated guidance material clearly address the application of human factors principles, accidents and incidents related to maintenance errors continue to occur. Since maintainability can be designed in, specifying maintainability requirements early at the design stage of the aircraft system development is considered paramount in mitigating maintenance errors. Introducing the systematic use of human-centred design for maintenance would contribute to reducing the likelihood of maintenance errors and prevent further escalation into accidents or serious incidents. Maintenance errors not only affect the safety of flight but can also be very costly to the air operators and organisations involved in continuing airworthiness.

Use of an airstair for passenger embarking/disembarking on/from large transport aeroplanes (SI-9008)

An airstair is an integrated and retractable stair installed on the aeroplane at one exit so that passengers may board and alight from the aeroplane. They eliminate the need for additional ground support equipment such as a mobile stairway or jetway, for passengers to board or exit the aeroplane.

While airstairs are certified as part of the aircraft design and have been approved for installation on multiple large aeroplanes, the applicable certification requirements do not explicitly address the expected level of safety in the event of use for embarking/disembarking passengers. Note that mobile stairs provided by handling agents at airports are required to meet minimum design standards¹⁵ including stair width and side barriers of a minimum height. As mentioned by recommendation 48 in the research project EASA.2008.C18 on CS-25 cabin safety requirements, published in 2009, there are no regulations governing the height, angle or slip resistance of the steps, or the provision of handrails and side barriers for airstairs. Back in 2007, following four occurrences of personal injury resulting from small children falling through or over the airstair handrails, the FAA published Special Airworthiness Information Bulletin (SAIB) NM-07-47 to owners and operators of 737 series airplanes equipped with forward airstairs, in order to recommend the incorporation of service bulletins, adding warning placards to the risers on the airstair steps and door jams, as well as anti-skid material to the side beams and top stair of the airstairs. The warning placards advised to hold a child's hand while they are on the airstairs. Boeing had also revised the flight attendant manual advising to pay particular attention to persons with small children or those with special needs.

Occurrence data over 2018-2023 for commercial air transport of passengers on large aeroplanes showed an adverse trend in the number of occurrences where passengers sustained injuries when embarking/disembarking the aeroplane. A common element in these occurrences was the use of an airstair by the passengers, as opposed to the use of other airport/aircraft support ground equipment for embarking/disembarking.

15 For instance, BS EN 12312-1:2013 Aircraft ground support equipment: specific requirements - part 1: passenger stairs.



10. Air traffic management / air navigation services — ATM/ANS

The safety issues for ATM/ANS domain were identified in 2017 by the Agency, in conjunction with the ATM/ANS CAG, and has since been reviewed annually. Each safety issue contributes to a worst likely key risk area. As presented in Figure 8.3 of ASR 2025, the two key risk areas with the highest risk in the ATM/ANS domain are 'Airborne collision' and 'Collision on a runway'.

Regarding the main key risk areas for this domain, refer to section 'Safety risks' of chapter 8 'Air Traffic Management of Air Navigation Services (ATM/ANS) in ASR 2025. These key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. This figure is obtained by aggregating the ERCS score for the risk-scored occurrences relevant to this domain and plotting it against the number of risk-scored occurrences. The risk picture of this domain identifies the key risk areas of greater concern that are airborne collision, collision on runway and terrain collision.

The safety issues in the ATM/ANS domain are sorted into the 'Assess', 'Mitigate – define', 'Mitigate – implement', and 'Monitor' categories, which provide a snapshot of their status within the European SRM process by priority. The safety issue prioritisation method is described in the [Introduction of this Volume](#). To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome). Note that contributing safety issues are sorted in an alphabetical sequence.

Since the last EPAS Volume III edition the titles of two safety issues have been amended. SI-2006 and SI-2019 have been renamed to better address the nature of these safety issues. The content of the safety issue 'Airborne conflict with an unmanned aircraft system (UAS)' (SI-2014) has been slightly amended. One safety issue ('Safety issues raising from new technologies and automation' (SI-2015)) has been deleted as it is considered to be addressed during a change management process.

The highest SIPI score safety issue in the domain is 'Inappropriate clearance/instructions in relation to runway operations' (SI-2006) followed by 'Landing/take-off/crossing without a clearance' (SI-2007) and 'Level bust' (SI-2004).

Refer to [Appendix A](#) for the link between safety issues and key risk areas.

The safety issues 'Deconfliction with aircraft operating with a malfunctioning transponder/non-operative transponder' (SI-2002), 'Airspace Infringement' (SI-2025) and Inefficient conflict detection with the closest aircraft (SI-2003) are at the BIS stage for impact assessment of the proposed mitigation actions.

► [List 9: ATM/ANS safety issues per category and priority](#)

Assess

Facilitates [Step 2: Assessment of safety issue](#)

Systemic issues and hazards in a context

- [Inappropriate clearance/instructions in relation to runway operations \(SI-2006\) \(Amended\)](#)
- [Landing/take-off/crossing without a clearance \(SI-2007\)](#)
- [Level bust \(SI-2004\)](#)



- [Airborne conflict with an unmanned aircraft system \(UAS\) \(SI-2014\) \(Amended\)](#)
- [Mass diversions \(SI-2032\) \(CC effect\)](#) 

Contributing issues:

- [Controller overload \(SI-2019\) \(CC effect\) \(Amended\)](#) 
- [Cybersecurity in ATC \(SI-5017C\)](#)
- [Insufficient weather information \(turbulence/wind shear/convective weather\) available to ATC \(SI-2008\)](#)
- [Failure of air-ground communication service \(SI-2018\) \(CC effect\)](#) 
- [Failure of navigation services \(SI-2016\) \(CC effect\)](#) 
- [Failure of surveillance services \(SI-2017\) \(CC effect\)](#) 
- [Unreliable provision of weather information \(wind on the ground\) \(SI-2009\)](#)
- [Use of more than one language on frequency \(SI-2029\)](#)

Mitigate – define

Facilitates Step 3: Definition and programming of safety actions

Systemic issues and hazards in a context

- [Airspace infringement \(SI-2025\)](#)

Contributing issues:

- [Deconfliction with aircraft operating with a malfunctioning/non-operative transponder \(SI-2002\)](#)
- [Inefficient conflict detection with the closest aircraft \(SI-2003\)](#)

Mitigate – implement

Facilitates Step 4: Implementation and follow-up of safety actions

Systemic issues and hazards in a context

- [ACAS RA not followed \(SI-2001\)](#)

Monitor

Facilitates Step 5: Safety performance measurement

Systemic issues and hazards in a context

- [Lack of effectiveness of safety management systems \(SI-2026\)](#)
- [Inadequate ATCO-pilot operational radio communication \(SI-2027\)](#)
- [Inadequate procedure design and obstacle publication \(SI-2028\)](#)

ACAS RA not followed (SI-2001)

The ACAS is considered one of the last lines of defence in preventing an airborne collision. This safety issue pertains to the situations where the flight crew of one or both aircraft ignore the ACAS RA, react excessively late, do not follow the instruction regarding vertical rate precisely or respond in opposite direction. Flight crews are required to comply immediately with all resolution advisories (RAs), unless doing so would endanger the aircraft. Similarly, ATCOs are required not to provide further ATC instructions once the flight crew reports the RA. The appropriate responses which flight crew and ATCOs are expected to demonstrate in the event of an ACAS RA are outlined in ICAO and EU regulatory documentation.



Airborne conflict with an unmanned aircraft system (UAS) (SI-2014) (Amended)

The increasing popularity of drones, especially drones of less than 25 kg operating in the 'open' category, has inadvertently led to an increased likelihood for airborne collision risk between drones and manned aircraft. This is largely due to unauthorised activity of drones in both take-off and approach paths of commercial airlines up to 5 000 ft. While less common, unauthorised activity of drones may also pose a collision hazard when an aircraft is flying en-route. Authorised UAS operations in the 'specific' category may include UAS flights at altitudes at which other (manned) aircraft will fly, and therefore these could possibly pose risks as well. For example, failure of the UAS guidance and control system or degradation of technical systems supporting e-identification, geo-fencing, detect and avoid, (self)-separation or collision avoidance, could create the risk of airborne collision between manned aircraft and UAS. Human factors issues and unintended remote pilot/operator errors could result in airspace violations, procedural deviations, and altitude deviations (thereby increasing the risk of airborne collision). This safety issue is exacerbated by the fact that UAS are often not detected by ground equipment and/or on-board conspicuity devices of other aircraft.

As a result of a drone sighting, aerodrome traffic may be stopped or diverted, leading to secondary risks, such as fuel shortages, airspace capacity saturation and an increased workload of air traffic controllers and pilots.

Airspace infringement (SI-2025)

Airspace infringement occurs when an aircraft enters notified airspace without previously requesting and obtaining clearance from the controlling authority of that airspace or enters the airspace under conditions that were not contained in the clearance. Such incidents of infringement pose a safety risk to traffic within the controlled airspace and increase the ATCOs' workload. The safety issue addresses infringement by aircraft flying using VFR in controlled airspace (Class A to D), aircraft accessing airspace without ATC clearance, and infringement of restricted airspaces such as danger areas, restricted areas, prohibited areas and temporary segregated/reserved areas by all types of traffic.

Controller overload (SI-2019) (CC effect) (Amended)



Controller overload refers to a complex situation where the ATCO on operational duty can no longer manage the existing levels of air traffic in a safe manner. As ATCOs are personnel responsible for the safe, orderly and expeditious flow of air traffic, it is important to address any situation which impairs the controller's ability to achieve the desired levels of safety. A complex situation may arise due to a confluence of external or internal factors. External factors include aircraft deviation from the planned trajectory, unexpected bad weather conditions, reduction of available airspace, amongst others. Internal factors include degradation of ATM system performance, system maintenance, blocked runway, amongst others. When assessed individually, some of these contributory factors may have a minor impact on safety. However, when compounded, these factors may manifest in unsafe management of the traffic demand.

Cybersecurity in ATC (SI-5017C)

ATM systems have become increasingly digitalised to reap efficiency gains. However, a move towards the digital sphere exposes ATM systems to more vulnerabilities and threats to confidentiality, integrity and availability of the systems. Given the strong interdependence of the different domains in the aviation industry, a cyberattack on ATM systems may compromise safety and integrity of the aviation system as a whole. In addition to terrorist-related attacks, the safety issue is concerned with how ATM systems can remain resilient in the face of attacks perpetrated by hackers to gain access to systems or cause disruption for non-terrorist purposes and attacks carried out for commercial espionage. Link with [SI-5017 'Cyberattacks'](#).

Deconfliction with aircraft operating with a malfunctioning/non-operative transponder (SI-2002)

When an aircraft with a non-operative transponder or malfunctioning transponder operates in an airspace where aircraft must be equipped with a secondary surveillance radar (SSR) transponder, the incorrect information



transmitted by the transponder increases the risk of airborne collision or terrain collision. Without a functioning transponder, ATC may be misled by the incorrect data on the aircraft's position, and this may result in ATC issuing a clearance which poses a safety risk to another aircraft or to the aircraft itself if the clearance directs it into a terrain e.g. a mountain. As the operation of ACAS is contingent on a functioning transponder, other nearby aircraft will not be able to receive traffic advisories or RAs to maintain separation with the aircraft without a functioning transponder should the need arise. This safety issue explores the frequency of such occurrences and whether the existing procedures suffice in mitigating the risk posed by aircraft operating without a functioning transponder.

Failure of air-ground communication service (SI-2018) (CC effect)



Failure of the air-ground communication system may degrade the performance of the communications service and increase safety risk to an unacceptable level. Air-ground communication refers to aeronautical fixed and mobile services to enable air-to-ground voice or data communication for ATC purposes. Common failures in voice communications include radio equipment malfunction (in the air and on the ground), loss of communication, blocked frequency, radio interference, and sleeping VHF receiver problem.

Failure of navigation services (SI-2016) (CC effect)



Failure of navigation services can lead to the loss of the facilities and services (VOR, DME, ILS, GNSS, NDB) that support aircraft with positioning and time, and thus increase safety risk to an unacceptable level.

This could potentially lead to the situation that the crew does not know the correct position of the aircraft, or the indicated position is not correct. This could lead to the overload of the ATCOs when they are required to provide the missing information verbally or via the system. For example, a corrupted/interrupted ILS signal can lead to an unstabilised approach, go-around, and even CFIT.

This safety issue covers appropriate maintenance, procedures to identify failures and their impact on ATS, procedures to operate in degraded modes of operation, and training of staff to deal with abnormal situations.

Failure of surveillance services (SI-2017) (CC effect)



Failure of surveillance services may degrade the performance of ATS and increase safety risk to an unacceptable level. Surveillance systems are used by air traffic control to determine the respective positions of aircraft to allow safe separation. Such systems include cooperative and non-cooperative systems such as PSR, SSR, GNSS and automatic dependent surveillance – broadcast (ADS-B), wide area multilateration (WAM) and systems for processing and displaying surveillance data.

Effective management of these systems is essential in minimising the impact on ATS. This safety issue covers appropriate maintenance, procedures to identify failures and their impact on ATS, procedures to operate in degraded modes of operation, and training of staff to deal with abnormal situations.

Inadequate procedure design and obstacle publication (SI-2028)

With the advent of new navigation systems, the design of instrument flight procedures (IFPs) and its publications have become key enablers of the ATM system globally. They must therefore be managed to ensure that quality-assured procedures are provided in support of ATM operations. Poorly designed IFPs can increase the risk of loss of separation, level bust and CFIT. In addition to well-designed IFPs, it is also essential to ensure that information relating to the IFP is accurate and updated in a timely manner. This reduces potential discrepancies during the take-off/approach of the flight.

Inadequate ATCO-pilot operational radio communication (SI-2027)

Good communication between ATCOs and flight crew is essential in ensuring clear understanding of instructions and maintaining situational awareness. ATCO-pilot communication deficiencies may lead to all types of serious



incidents and accidents. Common issues include three or more instructions in a single clearance, incorrect use of standard phraseology, misuse of the aircraft emergency frequency (121.5 MHz), and the uncoordinated introduction of phraseology.

Inappropriate clearance/instructions in relation to runway operations (SI-2006) (Amended)

This safety issue refers to runway incursions following a wrongly given clearance/instruction by ATC to a vehicle or to an aircraft landing on, crossing or taking off from an already occupied runway. This happens when the controllers do not see and notice the occupied runway or misjudge the separation between involved traffic. This misdetection of an occupied runway can be facilitated by human factors such as workload, fatigue, stress but also by aerodrome design or other organisational factors.

Especially during periods of high workload, the controller may accidentally clear an aircraft or a vehicle to enter a runway even though they had already cleared another aircraft to land or take off from the same runway.

Aerodrome design is also another key contributor to this safety issue as flight crew or manoeuvring area vehicle drivers may navigate onto the wrong surface if the design of the aerodrome may lead to disorientation.

Inefficient conflict detection with the closest aircraft (SI-2003)

ATCOs may not detect a conflict between one aircraft and another aircraft close to it due to attention failure. Attention is a limited resource, and numerous processes compete for it. In blind spot events the needed elements of attention — vigilance (maintaining awareness) and focus (concentration on the task) — are adversely affected by:

- (1) competition for the attention resources from other tasks, attempts to remember, increased mental workload; and
- (2) erosion of the attention resources by filtering mechanisms and physiological factors like distraction and fatigue.

ATCOs usually experience this loss of separation ‘blind spot’ after an incorrect descent or climb clearance in the context of a rapidly developing situation. There is normally very little or no time to react and most of the conflicting clearances result in an incident. The scope of this safety issue is limited to controlled airspace. While airspace infringement may potentially result in a controller blind spot, these events are excluded from this safety issue as they are addressed in SI-2025 ‘Airspace infringement’.

Insufficient weather information (turbulence/wind shear/convective weather) available to ATC (SI-2008)

Inaccurate or missing weather information on weather phenomena such as turbulence, wind shear and convective weather on board the aircraft (flight crew) and on the ground (ATCOs) may lead to aircraft flying through weather phenomena without warning. Depending on the severity of the weather phenomena, passengers or cabin crew may sustain injuries on board. This safety issue is focused on IFR flights in the en-route/approach environment, where improvement in the provision of meteorological information will enable controllers to better manage traffic flows and pass weather information to pilots.

Lack of effectiveness of safety management systems (SI-2026)

Ineffective implementation of safety management systems may lead to deficient management of ATM/ANS risks within the service provider organisations. The complex nature of aviation safety and the significance of addressing HF aspects justify the need for an effective management of safety by the aviation organisations. Shared understanding between regulatory/competent authorities and ANSPs is imperative for an effective SMS functioning in an already ultra-safe industry, like aviation. However, the lack of competent and experienced inspectors and regulatory authorities lead to the risk of bureaucratising SMS seeing it only as a compliance



system. This safety issue covers the regulatory requirements and promotion of SMS principles, on both aviation authorities and organisations, and the capability to detect and anticipate new emerging threats and associated challenges. This safety issue is mitigated through the SES Performance and Charging Scheme.

Lack of understanding and monitoring of system performance interdependencies (SI-2022)

The safety performance of the ANSPs can be affected by a multitude of internal and external factors. While most ANSPs are adept at managing the safety hazards related to their provision of services, it is also important to consider the impact of external factors such as commercial pressure and demands related to increasing capacity and environmental protection on the safety performance of ANSPs. It is important to strike a balance between the competing priorities of safety, efficiency, capacity and environment protection, especially in view of limited resources in most ANSPs. To understand such trade-offs better, regulators and ANSPs should analyse safety performance using a dynamic safety model, such as Rasmussen's Migration Model, and develop guidelines to prevent ANSPs from drifting towards unsafe operations under the influence of competing priorities. Metrics related to factors that have not been traditionally linked to safety performance can be developed to monitor this practical drift and serve to provide 'weak signals' in ATM safety performance.

Landing/take-off/crossing without a clearance (SI-2007)

Aircraft landing on, taking off from and crossing runways without a clearance from the ATCO pose a significant runway collision risk. Such events typically happen during critical and high-workload stages of the flight and can result in similar hazardous outcomes, such as runway incursion and runway collision. The safety issue covers contributory factors from both the flight crew and ATCOs ranging from call sign confusion, runway confusion, incorrect phraseology and expectation bias to cockpit overload.

Level bust (SI-2004)

Level bust is defined as any unauthorised vertical deviation of more than 300 ft from an ATC flight clearance. Within reduced vertical separation minima (RVSM) airspace, this limit is reduced to 200 ft. Level bust contributes towards the airborne collision and CFIT key risk areas when the aircraft fails to fly at the level to which it has been cleared. Such events may occur due to communication error, flight crew error in entering the clearance in the flight control unit and insufficient time for the flight crew to react to a late re-clearance.

Mass diversions (SI-2032) (CC effect)

Mass diversions due to airspace and/or airport closure have pervasive repercussions on various aviation domains, ranging from ATC to flight operations, due to their extensive nature. The large amount of displaced traffic results in an overload for ATC and increase workload for the flight crew. This carries the potential for loss of separation as well as other risks related to high-workload tasks and situational awareness. This safety issue covers policies regarding fuel emergencies, air traffic flow management, ensuring that alternate aerodromes have sufficient capacity, and diversions from many airports to one.

Unreliable provision of weather information (wind on the ground) (SI-2009)

The landing phase is considered one of the highest-risk phases of flight due to the high cockpit workload and execution of difficult tasks such as the landing flare. Weather information near the surface of the runway such as tail wind on the ground and cross wind is crucial to assist flight crew during the landing phase. Inaccurate weather information may contribute to non-stabilised approaches and increase the risk of runway excursions. As this topic spans across several aviation domains, the scope of this safety issue is focused on the ANSPs' and ATC's role of ensuring that accurate and timely weather information is provided to flight crew during the landing phase.

Use of more than one language on frequency (SI-2029)

This safety issue refers to the risk that occurs when using different languages at the same time on the ATC frequency. Despite that the default language of international aviation worldwide is English, local languages are used concurrently for air-ground communication. Under certain circumstances, pilots might prefer to use their native language to address controllers and controllers might address ground personnel in their native language. Having several aircraft on one frequency, the result might be that certain aircrews do not understand clearances given to an aircraft in the same airspace and the responses of the aircrew. Therefore, the aircrew might not be aware of what the other aircrew is about to do. This can lead to the loss of situational awareness of the involved parties with regard to the respective other traffic in the same airspace.

11. Aerodromes and ground handling — ADR/GH

The safety issues for Aerodromes and ground handling domain were identified by the Agency in 2017 in collaboration with the Aerodromes and ground handling Collaborative Analysis Group (CAG). This group has been dormant since 2023. During this cycle the Agency has started to sanitise the ADR/GH safety issues by applying the new work instructions for safety issue identification and acceptance of the safety issues in the portfolio. The safety issue sanitisation also provides the opportunity to review the safety issues related to ground handling which are currently in either the 'Assess' or the 'Mitigate – define' category and to document how they will be mitigated by the new safety barriers found in the recently published rules for this sub-domain, which will be fully applicable to ground handling service providers by March 2028¹⁶. Whenever a given safety issue is satisfactorily addressed by the rules, the safety issue in question is reassigned to the 'Mitigate – implement' category¹⁷.

While the sanitisation review of safety issues takes place, the SIPI scoring of the safety issues in the ADR-GH domain is paused, and they are only presented in an alphabetical sequence within the category they are currently assigned. To help the reader, an asterix (*) in the safety issue title and description denotes if a safety issue has not yet been subject to the review. In other words, it indicates that the category of the safety issue might be subject to a change in the future or that the safety issue might be refined, or even deleted.

The safety issues in the domain are sorted into the 'Assess', 'Mitigate – define', 'Mitigate – implement', and 'Monitor' categories. To understand each safety issue better, please click on the safety issue in the list to access their description. All safety issues are grouped by their nature: systemic issue (an issue affecting the EU aviation system, linked with existing rules), hazard in a context (operational issues that may directly lead to an accident outcome) and contributing issue (a safety issue contributing to, or exacerbating, another safety issue; not directly leading to an accident outcome).

The ADR and GH domain contains 30 safety issues. Three safety issues of the domain are marked as being affected by climate change (CC effect).

Please refer to [Appendix A](#) for the detailed links between safety issues and key risk areas. In terms of both aggregated ERCS score and number of contributing safety issues, the top key risk area for the aerodrome and ground handling domain is ground damage.

For more information on the key risk areas associated with the ADR and GH domain, please refer to the 'safety risks' section in Chapter 7 'Aerodromes and Ground handling' of ASR 2025.

¹⁶ See Commission Implementing Regulation (EU) 2025/23 — Requirements for competent authorities to conduct oversight of ground handling services and organisations providing them and Commission Delegated Regulation (EU) 2025/20 — Requirements for ground handling services and organisations providing them. For more information, please see the following information website: [Ground Handling | EASA](#).

¹⁷ During the transition period the ground handling service providers and the national aviation authorities, the former may start applying these regulations, which came into force in March 2025. At the same time, the Ground handling sector may also use the relevant industry standards for the safe provision of their services.



► **List 10:** Aerodromes and ground handling safety issues per category and priority

Assess

Facilitates Step 2: Assessment of safety issue

Systemic issues and hazards in a context

- [Ground conflict during aircraft taxiing operations \(SI-1001\)](#)
- [Ground operations in low-visibility conditions \(SI-1018\)](#)
- [Improper parking and positioning of aircraft \(SI-1026\)](#)
- [Incorrect operation of ground support equipment \(SI-1024\)](#)
- [Ineffective control of birds and wildlife \(SI-1005\)](#)
- [Ineffective control of passengers on the apron \(SI-1009\)](#)
- [Poor safety reporting culture of organisation \(SI-1038\)](#)
- [Pushback operations incorrectly performed \(SI-1028\)](#)

Contributing issues:

- [Errors in load sheets and other documentation/systems \(SI-1022\)](#)
- [Ineffective control of airside works \(SI-1008\)](#)
- [Ineffective maintenance and serviceability of runways/taxiways \(SI-1032\) \(Amended\)](#)
- [Poor maintenance and serviceability of ground support equipment \(SI-1033\)](#)
- [Poor or inadequate apron/stand design and layout \(SI-1003\)](#)
- [Poor or inadequate design of ground support equipment \(SI-1013\)](#)
- [Poor or inadequate runway/taxiway design and layout \(SI-1029\)](#)
- [Worker fatigue leading to human error \(SI-1039\)](#)

Mitigate – implement

Facilitates Step 4: Implementation and follow-up of safety actions

Systemic issues and hazards in a context

- [Inadequate baggage and cargo loading in passenger aircraft \(SI-1004\) \(Amended\)](#)
- [Ground staff movement around aircraft \(SI-1019\)](#)
- [Incorrect operation of air bridges / passenger boarding bridges \(SI-1023\)](#)
- [Poor coordination and control of turnarounds \(SI-1010\) \(Amended\)](#)

Monitor

Facilitates Step 5: Safety performance measurement

Systemic issues and hazards in a context

- [Fuelling operations incorrectly performed \(SI-1017\)](#)
- [Ground operations in high winds, rain and thunderstorms \(SI-1042\) \(CC effect\)](#) 
- [Ground operations in snow/ice conditions \(SI-1043\) \(CC effect\)](#) 
- [Inadequate cargo loading in cargo aircraft \(SI-1006\) \(Amended\)](#)



- [Inadequate handling of dangerous goods and lithium batteries \(SI-1011\) \(Amended\)](#)
- [Jet blast \(SI-1021\)](#)
- [Poor management of emergency/abnormal operations \(SI-1015\)](#)
- [Towing operations incorrectly performed \(SI-1002\)](#)

Contributing issues:

- [Ground handling training programmes disruption \(SI-5031\)](#)
- [Ineffective maintenance and serviceability of apron/stand \(SI-1031\) \(Amended\)](#)

Inadequate baggage and cargo loading in passenger aircraft (SI-1004) (Amended)

The issue relates to the inadequate management or handling of the baggage and cargo loading process which may result in a significant change in the centre of gravity of the aircraft or the actual weight of the aircraft without the flight crew becoming aware. This safety issue includes the procedures, training and equipment provided to the ground handling personnel to perform their duties.

Errors in load sheets and other documentation/systems* (SI-1022)

This safety issue covers errors and omissions in load systems and documentation or systems for recording loading of aircraft. Errors in the load sheets and other documentation can lead to incorrect pre-flight calculations of flight parameters, which may put the aircraft in an unsafe state. In a well-functioning operational environment, the completion and reconciliation of load sheets and other documentation or systems for recording loading of aircraft are carried out properly.

Fuelling operations incorrectly performed* (SI-1017)

This safety issue covers the management and handling of the aircraft refuelling process and its coordination/oversight. In a well-functioning operational environment, fuelling operations are correctly managed to ensure that all activities are carried out effectively in accordance with relevant regulations, procedures and processes. Adherence to the procedures and communication with crew (flight/cabin) during fuelling with pax on board or during embarking/disembarking are important factors to avoid fire, spillage, contamination, misfuelling and incorrect fuel load and fuel quality, etc.

Ground conflict during aircraft taxiing operations* (SI-1001)

This safety issue covers all potential ground conflict events that may occur when the aircraft is moving under its own power on the taxiway, such as collisions or near collisions with other aircraft, ground vehicles, ground equipment and ground infrastructure, or persons.

Ground handling training programmes disruption* (SI-5031)

Over 2023, it was observed in many EASA Member State airports that the shortage of ground handling staff led to recruiting staff with low competence and experience. In addition to the issues faced for all aviation personnel in missing training and reduced recency, ground handling has the following unique factors:

- higher staff turnover requiring more frequent training;
- less secure job contracts in some companies leading to extensive loss of staff rather than furlough;
- seasonal staff recruitment (may or may not be a problem);
- seasonal recurrent training; for example, for winter operations.



Ground operations in high winds, rain, and thunderstorms* (SI-1042) (CC effect)

Negative effects of high winds, intense rain and thunderstorms on ground operations may lead to unsafe situations in the airside operational environment, such as equipment malfunctions (e.g. non-functioning windscreen wipers on vehicles) or equipment caught by winds, as well as danger of staff and/or passengers being struck by lightning. In a well-functioning operational environment, the effective handling and management of ground operations in high winds, intense rain, thunderstorms, etc. will mitigate the risks of unsafe situations.

Ground operations in low-visibility conditions* (SI-1018)

Negative effects of low visibility in ground operations may lead to unsafe situations in the airside operational environment, especially potential collisions on the ground. In a well-functioning operational environment, the effective handling and management of ground operations in low visibility conditions will mitigate the risks of unsafe situations.

Ground operations in snow/ice conditions* (SI-1043) (CC effect)

Negative effects of winter conditions on ground operations may lead to unsafe situations in the airside operational environment. In a well-functioning operational environment, the effective handling and management of ground operations in winter conditions will mitigate the risks of unsafe situations.

Ground staff movement around aircraft (SI-1019)

This safety issue addresses the movement of ground personnel around the aircraft on the apron during the aircraft turnaround process, resulting in potential unsafe separation between the personnel and the aircraft. Such unsafe separations can cause fatal injuries due to an aircraft engine ingestion or jet blast, or due to direct collisions between the aircraft and the ground personnel. The safety issue considers all phases of the turnaround, in particular when:

- the aircraft moves under its own power, which is the case for almost all arrivals at the parking stand;
- the aircraft is moved during the pushback phase and the towing phase;
- any uncontrolled movement of the aircraft on the apron which is not caused by the aircraft own power;
- aircraft cross-bleed engine starts are performed and a high engine power is used in areas where only idle power is expected.

This safety issue only addresses the unsafe separations of ground personnel moving by their own means on the apron; it does not include the movement of personnel when driving vehicles on the apron, which is addressed by SI-1024. This safety issue does not include the movement of passengers on the apron, which is addressed by SI-1009.

Improper parking and positioning of aircraft* (SI-1026)

This safety issue covers the procedures and processes of marshalling, parking or positioning of aircraft which, if done incorrectly, may lead to damage or injuries. It includes issues related to visual parking aids, manual marshalling and stand allocation. In a well-functioning operational environment, aircraft are marshalled, parked and positioned on an aerodrome such that sufficient clearance from other aircraft and objects is ensured.

Inadequate cargo loading in cargo aircraft (SI-1006) (Amended)

This safety issue covers the management or handling of the cargo loading process that may lead to ground damage or other safety repercussions. Cargo loading is correctly managed and handled to ensure that all activities are carried out effectively in accordance with relevant regulations, procedures and processes.



The issue relates to the inadequate management or handling of the cargo loading process, which may result in a significant change in the centre of gravity of the aircraft or the actual weight of the aircraft without the flight crew becoming aware. This safety issue includes the procedures, training and equipment provided to the ground handling personnel to perform their duties.

Inadequate handling of dangerous goods and lithium batteries (SI-1011) (Amended)

Fires involving lithium batteries and/or other dangerous goods, in the hold areas of the aircraft, followed by the potential inability to extinguish any subsequent fire may lead to an aircraft environment incompatible with human life. In a well-functioning system, dangerous goods and lithium battery handling is correctly identified and managed to ensure that all activities are carried out effectively in accordance with relevant regulations, procedures and processes.

Incorrect operation of air bridges / passenger boarding bridges* (SI-1023)

This safety issue covers the operation of air bridges or passenger boarding bridges (PBBs), which, if done incorrectly, may lead to collisions between aircraft and PBBs or injuries to personnel or passengers. In a well-functioning operational environment, the operation of air bridges follows effective user training and the correct use of effective procedures and processes.

Incorrect operation of ground support equipment* (SI-1024)

This safety issue covers the operation of both motorised and non-motorised ground support equipment (GSE) on the aerodrome movement area, which, if done incorrectly, may lead to collisions between aircraft and GSE or injuries to personnel or passengers.

This safety issue also includes the inadequate positioning or securing of GSE such as baggage trolleys/dollies, unit load devices (ULDs), steps, etc. when they are not in use. If done incorrectly, GSE may be blown around the apron due to bad weather, jet blast or other external influence and, consequently, cause damage to aircraft or injuries to passengers or personnel.

Ineffective control of airside works* (SI-1008)

Improper supervision, coordination and control of airside works may lead to aircraft damage and/or injuries. Airside works are properly supervised, coordinated and controlled to ensure safe operations. This safety issue covers all potential events that may occur where airside works are involved, such as ingestion of FOD produced by construction equipment/material, aircraft collisions with vehicles/equipment, etc.

Ineffective control of birds and wildlife* (SI-1005)

Insufficient control of birds and wildlife may lead to either damage to the aircraft or loss of control during take-off or landing. By understanding bird and wildlife habitats in detail, aerodrome operators can develop and implement bird and wildlife hazard management plans to manage such activity in and around the aerodrome, thereby minimising the risk for bird strikes and bird ingestions in engines, which may lead to critical situations during take-off/climb and approach/landing.

Ineffective control of passengers on the apron* (SI-1009)

This safety issue covers the ineffective or insufficient control of passengers on the apron or any other operational area of the aerodrome or airport. If passengers move outside of designated areas on the apron, the risk of sustaining injuries increases. In a well-functioning operation, passengers are correctly controlled between leaving the terminal and entering the aircraft and vice versa.



Jet blast* (SI-1021)

This safety issue covers the management of ground running or taxi patterns, which may lead to injuries or damage due to jet blast. In a well-functioning operational environment, ground running and taxi patterns are properly managed to mitigate the consequences of jet blast.

Poor coordination and control of turnarounds (SI-1010) (Amended)

This safety issue relates to inadequate management or coordination of the turnaround process of complex motor-powered aeroplanes (CMPA). It covers the period between the aircraft being parked on the stand until the aircraft departs from the aircraft stand by means of pushback or towing. The safety issue includes the non-application or incorrect application of procedures due to mismanagement and lack of coordination with the aerodrome operator and other handling companies. This safety issue especially affects aerodromes with a high number of apron operations, those with apron capacity problems and those that host air operators' operations with short turnaround times.

Ineffective maintenance and serviceability of apron/stand* (SI-1031) (Amended)

This safety issue covers the serviceability and maintenance of aprons/stands which, if not performed correctly, may lead to collisions, damage, and/or injuries, including FOD being ingested in aircraft engines or ejected by engines jet blast.

In a well-functioning operational environment, the serviceability and maintenance of aprons/stands are performed effectively and thus facilitate safe operations at aprons/stands.

Poor maintenance and serviceability of ground support equipment* (SI-1033)

This safety issue covers the serviceability and maintenance of both motorised and non-motorised airport GSE including belt loaders, baggage trucks, catering trucks, fuel bowsers and pushback equipment, steps, baggage trolleys/dollies, ULDs, which, if not performed correctly, may lead to damage and/or injuries. In a well-functioning operational environment, the serviceability and maintenance of airport GSE are performed effectively and thus facilitate safe operations of airport GSE.

Ineffective maintenance and serviceability of runways/taxiways* (SI-1032) (Amended)

This safety issue covers the serviceability and maintenance of runways/taxiways which, if not performed correctly, may lead to collisions, damage, and/or injuries, including FOD being ingested in aircraft engines or ejected by engines jet blast. In a well-functioning operational environment, the serviceability and maintenance of runways/taxiways are performed effectively and thus facilitate safe operations on runways and taxiways.

Poor management of emergency/abnormal operations* (SI-1015)

The supervision, coordination and control of emergency/abnormal operations may lead to damage, injuries, and/or impaired responses to emergencies. In a well-functioning operational environment, emergency/abnormal operations are properly supervised, coordinated and controlled to ensure safe operations.

Poor or inadequate apron/stand design and layout* (SI-1003)

Effective apron/stand design and layout is crucial in ensuring safe operations during aircraft taxiing, aircraft parking and loading/unloading of baggage. Poor design and layout may induce the potential for collisions, aircraft damage, and injuries. Important factors to consider are placement and marking of designated areas for parking of ground equipment, proximity to adjacent stands/buildings/structures, evaluation of needed space against the minimum required space, etc.



Poor or inadequate design of ground support equipment* (SI-1013)

This safety issue covers the design of both motorised and non-motorised airport GSE, including belt loaders, baggage trucks, catering trucks, fuel bowsers, pushback equipment, steps, baggage trolleys/dollies. If the design of the equipment is not fit for purpose, it may lead to damage and/or injuries. Effective design of GSE will prohibit occurrences where damage and/or injuries are sustained due to improper design of the GSE.

Poor or inadequate runway/taxiway design and layout* (SI-1029)

Complex runway/taxiway design and layouts may induce a higher probability of runway incursions or the potential for collisions and aircraft damage. In a well-functioning environment, the design of runways/taxiways minimises the likelihood of incursions and/or collisions.

Poor safety reporting culture of organisation* (SI-1038)

This safety issue relates to lack of (or still limited) safety reporting culture in organisations of the aerodrome and ground handling sector. The safety issue addresses in particular the following aspects associated with poor reporting culture:

- some safety events go unreported due to fear of repercussions, lack of awareness of and training on occurrence reporting and just culture;
- safety occurrences reported to authorities (according to Regulation (EU) No 376/2014) and/or organisations are not always shared between the organisations involved in the occurrence. For example, a report submitted by an airline or an aerodrome operator concerning a ground handling issue at a specific airport is not always systematically shared with the ground handling service provider and/or the aerodrome operator.

In a well-functioning organisational environment, the reporting culture and just culture within the organisation facilitates the systematic and accurate reporting of safety events by ground staff to ensure that a safety assessment is carried out.

Pushback operations incorrectly performed* (SI-1028)

This safety issue covers the management, handling and coordination of the pushback, which, if done incorrectly, may lead to collisions with other aircraft or ground vehicles/equipment and/or injuries to ground personnel. In a well-functioning operational environment, pushbacks are correctly managed and coordinated to ensure safe operations.

Towing operations incorrectly performed* (SI-1002)

This safety issue covers all potential events that may occur when the aircraft is being towed, such as collisions with ground vehicles, ground equipment and ground infrastructure, damage to the towing vehicle and/or towing equipment and injuries to towing personnel. It includes both towing performed with nose gear elevation (towbar-less, no person in cockpit), as well as towing with towbar (person in cockpit). In this safety issue, towing operation out of a parking position (pushback) is not included — this is addressed in SI-1028.

Worker fatigue leading to human error* (SI-1039)

The inability to recruit and retain ground handling staff is leading to staff shortages, long working hours and an ageing workforce. In the long term, if left unchecked, commercial growth and expectations will exceed human resources, resulting in unsustainable operations with possible safety-critical impact on flight safety due to human error.

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Hazard in a context and systemic safety issues per domain and the worst likely key risk area they are precursors of

Domain	SI nature	SI ID	SI title	Key risk area
ADR and GH	Systemic issue	SI-1038	Poor safety reporting culture of organisation	Other Injuries
ADR and GH	Hazard in a context	SI-1017	Fuelling operations incorrectly performed	Fire, smoke and pressurisation
ADR and GH	Hazard in a context	SI-1001	Ground conflict during aircraft taxiing operations	Ground damage
ADR and GH	Hazard in a context	SI-1044	Ground operations in extreme temperatures	Ground damage
ADR and GH	Hazard in a context	SI-1042	Ground operations in high winds, rain, and thunderstorms	Ground damage
ADR and GH	Hazard in a context	SI-1018	Ground operations in low-visibility conditions	Collision on a runway
ADR and GH	Hazard in a context	SI-1043	Ground operations in snow/ice conditions	Excursion
ADR and GH	Hazard in a context	SI-1019	Ground staff movement around aircraft	Other injuries
ADR and GH	Hazard in a context	SI-1026	Improper parking and positioning of aircraft	Ground damage
ADR and GH	Hazard in a context	SI-1004	Inadequate baggage and cargo loading in passenger aircraft	Aircraft upset
ADR and GH	Hazard in a context	SI-1006	Inadequate cargo loading in cargo aircraft	Aircraft upset
ADR and GH	Hazard in a context	SI-1011	Inadequate handling of dangerous goods and lithium batteries	Fire, smoke and pressurisation
ADR and GH	Hazard in a context	SI-1023	Incorrect operation of air bridges / passenger boarding bridges	Ground damage
ADR and GH	Hazard in a context	SI-1024	Incorrect operation of ground support equipment	Ground damage

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Domain	SI nature	SI ID	SI title	Key risk area
ADR and GH	Hazard in a context	SI-1005	Ineffective control of birds and wildlife	Aircraft upset
ADR and GH	Hazard in a context	SI-1009	Ineffective control of passengers on the apron	Other injuries
ADR and GH	Hazard in a context	SI-1021	Jet blast	Ground damage
ADR and GH	Hazard in a context	SI-1010	Poor coordination and control of turnarounds	Ground damage
ADR and GH	Hazard in a context	SI-1015	Poor management of emergency/abnormal operations	Ground damage
ADR and GH	Hazard in a context	SI-1028	Pushback operations incorrectly performed	Ground damage
ADR and GH	Hazard in a context	SI-1002	Towing operations incorrectly performed	Ground Damage
Airworthiness	Systemic issue	SI-9010	Emergency locator transmitters' and personal locator beacons' malfunctions	Other injuries
Airworthiness	Systemic issue	SI-9001	Inadequate management of repetitive defects	Aircraft upset
Airworthiness	Systemic issue	SI-9002	Insufficient consideration of flight crew human factors in functional hazard assessments	Aircraft upset
Airworthiness	Systemic issue	SI-9003	Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design	Aircraft upset
Airworthiness	Systemic issue	SI-9004	Limited application and inadequate oversight of development assurance	Aircraft upset
Airworthiness	Systemic issue	SI-9005	Outdated certification bases established for major changes to type certificates	Aircraft upset
Airworthiness	Systemic issue	SI-9006	Shortcomings in design and maintenance instructions resulting in maintenance errors	Aircraft upset
Airworthiness	Hazard in a context	SI-9009	Hazardous conditions following helicopter ditching	Other injuries
Airworthiness	Hazard in a context	SI-9007	Helicopter rotor and rotor drive system failures	Aircraft upset
Airworthiness	Hazard in a context	SI-9011	In-flight fire in inaccessible areas	Fire, smoke and pressurisation
Airworthiness	Hazard in a context	SI-9012	Oxygen-fed fire in the flight deck	Fire, smoke and pressurisation

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Domain	SI nature	SI ID	SI title	Key risk area
Airworthiness	Hazard in a context	SI-9008	Use of an airtair for passenger embarking/ disembarking on/from large transport aeroplanes	Other injuries
ATM/ANS	Systemic issue	SI-2026	Lack of effectiveness of safety management systems	Airborne collision
ATM/ANS	Systemic issue	SI-2022	Lack of understanding and monitoring of system performance interdependencies	Airborne collision
ATM/ANS	Hazard in a context	SI-2001	ACAS RA not followed	Airborne collision
ATM/ANS	Hazard in a context	SI-2014	Airborne conflict with an unmanned aircraft system (UAS)	Airborne Collision
ATM/ANS	Hazard in a context	SI-2006	Inappropriate clearance/instructions in relation to runway operations	Collision on a runway
ATM/ANS	Hazard in a context	SI-2007	Landing/take-off/crossing without a clearance	Collision on a runway
ATM/ANS	Hazard in a context	SI-2004	Level bust	Airborne collision
ATM/ANS	Hazard in a context	SI-2025	Airspace infringement	Airborne collision
ATM/ANS	Hazard in a context	SI-2032	Mass diversions	Airborne collision
Balloons	Systemic issue	SI-6002	Presence and use of pilot restraints	Aircraft upset
Balloons	Systemic issue	SI-6003	Pressure to fly	Obstacle collision in flight
Balloons	Hazard in a context	SI-6006	Inadequate ground obstacle clearance	Obstacle collision in flight
Balloons	Hazard in a context	SI-6001	Powerline collisions	Obstacle collision in flight
Balloons	Hazard in a context	SI-6012	Use of non-certified parts in critical balloon structure/equipment and ageing structures	Aircraft upset
CAT A	Systemic issue	SI-0058	Ambiguity in operational requirements and lack of authority oversight for non-revenue flights	Aircraft upset
CAT A	Systemic issue	SI-0041	Effectiveness of safety management	Aircraft upset
CAT A	Systemic issue	SI-0051	Implementation of performance-based navigation approach and FMS naming conventions	Terrain collision

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Domain	SI nature	SI ID	SI title	Key risk area
CAT A	Systemic issue	SI-0044	Volume and quality of the information in NOTAMs	Excursion
CAT A	Hazard in a context	SI-0003	Adverse weather encounters (turbulence, hail, lightning, ice)	Aircraft upset
CAT A	Hazard in a context	SI-0014	Alignment with a wrong runway	Excursion
CAT A	Hazard in a context	SI-0007	Approach path management	Excursion
CAT A	Hazard in a context	SI-0045	Bird/wildlife strikes	Aircraft upset
CAT A	Hazard in a context	SI-0027	Carriage and transport of lithium batteries by passengers or crew	Fire, smoke and pressurisation
CAT A	Hazard in a context	SI-0053	Congestion/interference of the electromagnetic spectrum (5G)	Terrain collision
CAT A	Hazard in a context	SI-0047	Disruptive passengers	Other injuries
CAT A	Hazard in a context	SI-0042	Emergency evacuation	Other injuries
CAT A	Hazard in a context	SI-0015	Entry of aircraft performance data	Aircraft upset
CAT A	Hazard in a context	SI-0028	Excessive speed in the manoeuvring area	Other injuries
CAT A	Hazard in a context	SI-0048	Explosive door openings on parked aeroplanes	Other injuries
CAT A	Hazard in a context	SI-0035	False or disrupted instrument landing system (ILS) signal capture	Terrain collision
CAT A	Hazard in a context	SI-0049	Flight crew incapacitation	Aircraft upset
CAT A	Hazard in a context	SI-0011	Fuel contamination and quality	Aircraft upset
CAT A	Hazard in a context	SI-0003A	Hail	Aircraft upset
CAT A	Hazard in a context	SI-0019	Handling and execution of go-arounds	Aircraft upset
CAT A	Hazard in a context	SI-0001	Icing in flight	Aircraft upset

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Domain	SI nature	SI ID	SI title	Key risk area
CAT A	Hazard in a context	SI-0002	Icing on the ground	Aircraft upset
CAT A	Hazard in a context	SI-0034	Impact of GNSS interference on civil aviation operations	Airborne collision
CAT A	Hazard in a context	SI-0025	Inadequate fuel management	Aircraft upset
CAT A	Hazard in a context	SI-0010	Inappropriate flight control inputs	Aircraft upset
CAT A	Hazard in a context	SI-0046	Laser illumination	Aircraft upset
CAT A	Hazard in a context	SI-0037	Mishandling of non-precision approaches due to erosion of piloting skills	Excursion
CAT A	Hazard in a context	SI-0060	Out-of-spec synthetic aviation turbine fuels (SATF) in operations	Aircraft upset
CAT A	Hazard in a context	SI-0006	Runway surface condition	Excursion
CAT A	Hazard in a context	SI-0003B	Turbulence encounters	Other injuries
CAT A	Hazard in a context	SI-0012	Wake vortex encounter	Aircraft upset
CAT A	Hazard in a context	SI-0024	Wind shear	Aircraft upset
CAT Rotorcraft	Hazard in a context	SI-8030	Bird and other wildlife hazard	Aircraft upset
CAT Rotorcraft	Hazard in a context	SI-8041	Downwash adverse effects	Other injuries
CAT Rotorcraft	Hazard in a context	SI-8037	Hoist-operations-related issues	Other injuries
CAT Rotorcraft	Hazard in a context	SI-8028	Inadequate airborne separation under VFR operation	Airborne collision
HF/HP	Systemic issue	SI-3009	Degradation of resilient performance due to suppressed adaptive capacity (amended)	Other injuries
HF/HP	Systemic issue	SI-3001	Inadequate evaluation of organisational and safety culture due to insufficient leadership competence and/or commitment to HF/HP principles	Airborne collision
HF/HP	Systemic issue	SI-3004	Inadequate integration of HF principles and/or HF specialists within organisations (amended)	Airborne collision

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Domain	SI nature	SI ID	SI title	Key risk area
HF/HP	Systemic issue	SI-3012	Lack of accessible and trusted staff support for well-being and fitness for duty (amended)	Other (e.g. medical, etc.)
HF/HP	Systemic issue	SI-3008	Loss of tacit knowledge in organisations and competent authorities (amended)	Airborne collision
NCO A	Hazard in a context	SI-4010	Airborne separation	Airborne collision
NCO A	Hazard in a context	SI-4005	Approach path management on GA aeroplanes	Aircraft upset
NCO A	Hazard in a context	SI-4013	Bird and wildlife strikes	Aircraft upset
NCO A	Hazard in a context	SI-4030	Carbon monoxide poisoning	Aircraft upset
NCO A	Hazard in a context	SI-4019	Damage Tolerance to UAS Collisions	Airborne collision
NCO A	Hazard in a context	SI-4022 (SI-0001)	Icing in flight	Aircraft upset
NCO A	Hazard in a context	SI-4008	Inadvertent flight into IMC/scud running	Aircraft upset
NCO A	Hazard in a context	SI-4029	Inappropriate control input	Aircraft upset
NCO A	Hazard in a context	SI-4014	Mass and balance	Aircraft upset
NCO A	Hazard in a context	SI-4001	Pilot management of in-flight technical failures	Aircraft upset
NCO Rotorcraft	Hazard in a context	SI-8021	Adverse weather encounter — effects other than IMC	Aircraft upset
NCO Rotorcraft	Hazard in a context	SI-8019	Impaired visibility conditions except IMC	Terrain collision
NCO Rotorcraft	Hazard in a context	SI-8027	Inadequate handling of simulated technical failures and abnormal procedures during a training flight	Aircraft upset
NCO Rotorcraft	Hazard in a context	SI-8051	Inadvertent flight into IMC	Terrain collision
NCO Rotorcraft	Hazard in a context	SI-8050	Loose object in the helicopter cabin	Aircraft upset
NCO Rotorcraft	Hazard in a context	SI-8048	On-board carriage of PEDs with lithium batteries	Fire, smoke and pressurisation

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Domain	SI nature	SI ID	SI title	Key risk area
NCO Rotorcraft	Hazard in a context	SI-8026	Power loss condition	Aircraft upset
NCO Rotorcraft	Hazard in a context	SI-8024	Unanticipated yaw/loss of tail rotor effectiveness	Aircraft upset
NCO Rotorcraft	Hazard in a context	SI-8042	Unruly passengers	Aircraft upset
Rotorcraft	Systemic issue	SI-8044	Ineffective safety management systems	Aircraft upset
Rotorcraft	Hazard in a context	SI-8040	Dynamic rollover	Excursion
Rotorcraft	Hazard in a context	SI-8049	Interference by lasers	Aircraft upset
Rotorcraft	Hazard in a context	SI-8036	Navigation-related issues	Terrain collision
Sailplanes	Hazard in a context	SI-7006	Approach path management on sailplanes	Aircraft upset
Sailplanes	Hazard in a context	SI-7013	High wind encounter	Excursion
Sailplanes	Hazard in a context	SI-7016	Inappropriate flight control inputs	Aircraft upset
Sailplanes	Hazard in a context	SI-7017	Incorrect glider assembly before flight	Aircraft upset
Sailplanes	Hazard in a context	SI-7007	Managing risks in aerotow operations	Aircraft upset
Sailplanes	Hazard in a context	SI-7011	Off-field landings	Obstacle collision in flight
Sailplanes	Hazard in a context	SI-7001	Pilot incapacitation	Aircraft upset
Sailplanes	Hazard in a context	SI-7012	Unsafe handling of under/overshoot	Obstacle collision in flight
Sailplanes	Hazard in a context	SI-7002	Winch launch failures	Aircraft upset
SPO Aeroplanes	Hazard in a context	SI-4023	Risks associated with parachuting operations	Aircraft upset
SPO Rotorcraft	Hazard in a context	SI-8038	External-sling-load-operations-related issues	Aircraft upset

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Domain	SI nature	SI ID	SI title	Key risk area
SPO Rotorcraft	Hazard in a context	SI-8031	Inadequate obstacle clearance during any flight phase	Terrain collision
SPO Rotorcraft	Hazard in a context	SI-8025	Vortex ring state	Aircraft upset
Systemic and conjunctural	Systemic issue	SI-5019	Reduced available financial resources	Aircraft upset
Systemic and conjunctural	Systemic issue	SI-5018	Shortage of operational and technical staff	Airborne collision
Systemic and conjunctural	Hazard in a context	SI-5101	Aircraft collision with space debris	Aircraft upset
Systemic and conjunctural	Hazard in a context	SI-5515	Airspace infringement by military UAS, aircraft, missiles, or debris spilling over from conflict zones	Security
Systemic and conjunctural	Hazard in a context	SI-5530	Errors of civil aircraft identification by ground military forces and airborne assets outside the conflict zone	Security
Systemic and conjunctural	Hazard in a context	SI-5508	Non-standard and unplanned military activities outside the conflict zones	Airborne collision
Systemic and conjunctural	Hazard in a context	SI-5514	Separation with unidentified aircraft	Security

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Safety issues and their corresponding mitigation actions in EPAS Volume II

SI ID	SI title	Action number	Action title	Action status
SI-0001	Icing in flight	RES.0014	Air-data enhanced fault detection and diagnosis	Ongoing
SI-0001	Icing in flight	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-0002	Icing on the ground	RES.0014	Air-data enhanced fault detection and diagnosis	Ongoing
SI-0002	Icing on the ground	RMT.0118	Analysis of on-ground wings contamination effect on take-off performance degradation	Ongoing
SI-0002	Icing on the ground	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-0003A	Hail	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-0003A	Hail	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing
SI-0003B	Turbulence encounters	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-0003B	Turbulence encounters	SPT.0012	Promotion of the new European provisions on pilot training	Ongoing
SI-0006	Runway surface condition	RMT.0722	Provision of digital aeronautical data by the aerodrome operators	On hold
SI-0007	Approach path management	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing
SI-0009	Ineffective crew resource management	RMT.0194	Modernisation and simplification of the European pilot licensing and training system and improvement of the supply of competent flight instructors	Ongoing
SI-0009	Ineffective crew resource management	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing

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SI ID	SI title	Action number	Action title	Action status
SI-0009	Ineffective crew resource management	SPT.0012	Promotion of the new European provisions on pilot training	Ongoing
SI-0012	Wake vortex encounter	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-0012	Wake vortex encounter	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing
SI-0012	Wake vortex encounter	SPT.0012	Promotion of the new European provisions on pilot training	Ongoing
SI-0014	Alignment with a wrong runway	RMT.0722	Provision of digital aeronautical data by the aerodrome operators	On hold
SI-0015	Entry of aircraft performance data	RMT.0741	Take-off performance parameters and position errors — large aeroplanes	Ongoing
SI-0015	Entry of aircraft performance data	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-0019	Handling and execution of go-arounds	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing
SI-0024	Wind shear	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing
SI-0024	Wind shear	SPT.0012	Promotion of the new European provisions on pilot training	Ongoing
SI-0025	Inadequate fuel management	SPT.0097	Promotion of the new European provisions on fuel/energy planning and management	Ongoing
SI-0027	Carriage and transport of lithium batteries by passengers or crew	RES.0016	Fire risks caused by portable electronic devices on board aircraft	Ongoing
SI-0027	Carriage and transport of lithium batteries by passengers or crew	RES.0044	PEDs — lithium battery fire/smoke risk in the aircraft cabin	Ongoing
SI-0034	Impact of GNSS interference on civil aviation operations	IST.0005	PBN Implementation Support	New
SI-0034	Impact of GNSS interference on civil aviation operations	RES.0033	Aviation resilience — cybersecurity threat landscape	Ongoing
SI-0034	Impact of GNSS interference on civil aviation operations	RMT.0761	Revision of Regulation (EU) 2018/1048 (the PBN IR)	New
SI-0039	Aircrew fatigue (FTL)	MST.0034	Oversight capabilities / focus area: flight time specification schemes	Ongoing

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SI ID	SI title	Action number	Action title	Action status
SI-0039	Aircrew fatigue (FTL)	RMT.0492	Development of FTL rules for CAT operations of emergency medical services by aeroplanes (AEMS)	Ongoing
SI-0039	Aircrew fatigue (FTL)	RMT.0493	Update and harmonisation of the FTL rules for CAT by aeroplanes for air taxi and single-pilot operations	Ongoing
SI-0039	Aircrew fatigue (FTL)	SPT.0116	Conferences dedicated to FRM	Ongoing
SI-0041	Effectiveness of safety management	MST.0002	Promotion of SMS	Ongoing
SI-0041	Effectiveness of safety management	MST.0003	Member States should maintain a regular dialogue with their national aircraft operators on flight data monitoring (FDM) programmes	Ongoing
SI-0041	Effectiveness of safety management	MST.0026	Conduct SMS assessment	Ongoing
SI-0041	Effectiveness of safety management	MST.0028	Member States to establish and maintain a State Plan for Aviation Safety	Ongoing
SI-0041	Effectiveness of safety management	MST.0042	Assessment of safety culture of air operators	Ongoing
SI-0041	Effectiveness of safety management	RMT.0251	Embodyment of safety management system requirements into Commission Regulations (EU) Nos 1321/2014 and 748/2012	Ongoing
SI-0041	Effectiveness of safety management	RMT.0681	Alignment of the IRs of the EASA Basic Regulation and of the associated acceptable means of compliance (AMC) and guidance material (GM) with Regulation (EU) No 376/2014	Ongoing
SI-0041	Effectiveness of safety management	RMT.0706	Update of the authority and organisation requirements	Ongoing
SI-0041	Effectiveness of safety management	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-0042	Emergency evacuation	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-0045	Bird/wildlife strikes	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-0047	Disruptive passengers	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing

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SI ID	SI title	Action number	Action title	Action status
SI-0049	Flight crew incapacitation	RMT.0424	Regular update of medical certification requirements for aircrew and air traffic controllers, and the related oversight	Ongoing
SI-0049	Flight crew incapacitation	RMT.0707	Medical regulation — combination of Part-MED (Annex IV) to Commission Regulation (EU) No 1178/2011 and Part ATCO MED (Annex IX) to Commission Regulation (EU) 2015/340	Ongoing
SI-0054	Poor language proficiency causing communication breakdown	MST.0033	Language proficiency requirements — share best practices, to identify areas for improvement for the uniform and harmonised language proficiency requirements implementation	Ongoing
SI-0054	Poor language proficiency causing communication breakdown	RMT.0544	Review of Part-147	Ongoing
SI-0054	Poor language proficiency causing communication breakdown	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-0054	Poor language proficiency causing communication breakdown	SPT.0125	Promotion of the most important safety issues for General Aviation	Ongoing
SI-2014	Airborne conflict with an unmanned aircraft system (UAS)	RMT.0230	Introduction of a regulatory framework for UAS operations and Innovative Aerial Services	Ongoing
SI-2014	Airborne conflict with an unmanned aircraft system (UAS)	RMT.0729	Regular update of Regulations (EU) 2019/945 and 2019/947 (drones in the 'open' and 'specific' categories)	Ongoing
SI-2014	Airborne conflict with an unmanned aircraft system (UAS)	RMT.0730	Regular update of the acceptable means of compliance and guidance material to Regulations (EU) 2019/945 and 2019/947 (drones in the 'open' and 'specific' categories)	Ongoing
SI-2014	Airborne conflict with an unmanned aircraft system (UAS)	SPT.0091	European safety promotion on civil drones	Ongoing
SI-2025	Airspace infringement	MST.0038	Airspace complexity and traffic congestion	Ongoing
SI-2025	Airspace infringement	SPT.0120	Promoting good practices in airspace design	Ongoing
SI-2026	Lack of effectiveness of safety management systems	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-3001	Inadequate evaluation of organisational and safety culture due to insufficient leadership competence and/or commitment to HF/HP principles	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing

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SI ID	SI title	Action number	Action title	Action status
SI-3003	Insufficient human factors competence of regulatory and oversight personnel	MST.0037	Foster a common understanding and oversight of human factors	Ongoing
SI-3004	Inadequate integration of HF principles and/or HF specialists within organisations	MST.0037	Foster a common understanding and oversight of human factors	Ongoing
SI-3004	Inadequate integration of HF principles and/or HF specialists within organisations	RMT.0251	Embodyment of safety management system requirements into Commission Regulations (EU) Nos 1321/2014 and 748/2012	Ongoing
SI-3004	Inadequate integration of HF principles and/or HF specialists within organisations	RMT.0706	Update of the authority and organisation requirements	Ongoing
SI-3007	Design and use of procedures	SPT.0129	Review and recommend methods of design and management of procedures	Ongoing
SI-3008	Loss of tacit knowledge in organisations and competent authorities	RMT.0544	Review of Part-147	Ongoing
SI-3011	Training effectiveness and competence	RES.0055	Training media allocation: simulator versus actual flying	Ongoing
SI-3011	Training effectiveness and competence	RMT.0194	Modernisation and simplification of the European pilot licensing and training system and improvement of the supply of competent flight instructors	Ongoing
SI-3011	Training effectiveness and competence	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-3011	Training effectiveness and competence	RMT.0544	Review of Part-147	Ongoing
SI-3011	Training effectiveness and competence	RMT.0599	Update of Subpart FC of Part-ORO (Evidence-based training & other elements)	Ongoing
SI-3011	Training effectiveness and competence	RMT.0668	Regular update of air traffic controller licensing rules (IRs and acceptable means of compliance and guidance material)	Ongoing
SI-3011	Training effectiveness and competence	SPT.0111	Flight examiner manual	Ongoing
SI-4001	Pilot management of in-flight technical failures	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4001	Pilot management of in-flight technical failures	SPT.0125	Promotion of the most important safety issues for General Aviation	Ongoing
SI-4003	In-flight decision-making	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4003	In-flight decision-making	SPT.0087	Weather awareness for pilots	Ongoing

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SI ID	SI title	Action number	Action title	Action status
SI-4003	In-flight decision-making	SPT.0125	Promotion of the most important safety issues for General Aviation	Ongoing
SI-4004	Training, experience, and competence of individuals	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4005	Approach path management on GA aeroplanes	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4007	Poor pre-flight planning and preparation	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4008	Inadvertent flight into IMC/scud running	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4008	Inadvertent flight into IMC/scud running	SPT.0087	Weather awareness for pilots	Ongoing
SI-4010	Airborne separation	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4010	Airborne separation	MST.0038	Airspace complexity and traffic congestion	Ongoing
SI-4010	Airborne separation	RES.0032	Use of iConspicuity devices/systems in flight information services	Ongoing
SI-4010	Airborne separation	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-4010	Airborne separation	SPT.0119	Promoting iConspicuity	Ongoing
SI-4010	Airborne separation	SPT.0120	Promoting good practices in airspace design	Ongoing
SI-4011	Fuel management in flight	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4012	Engine system reliability	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4013	Bird and wildlife strikes	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4014	Mass and balance	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4015	Crosswind	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4015	Crosswind	SPT.0087	Weather awareness for pilots	Ongoing

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SI ID	SI title	Action number	Action title	Action status
SI-4017	Knowledge of aircraft systems and procedures	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4019	Damage tolerance to UAS collisions	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4021	Operational communication	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4022	Icing in flight	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4022	Icing in flight	SPT.0087	Weather awareness for pilots	Ongoing
SI-4023	Risks associated with parachuting operations	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4023	Risks associated with parachuting operations	SPT.0121	Improving the safety of parachuting operations	Ongoing
SI-4023	Risks associated with parachuting operations	SPT.0125	Promotion of the most important safety issues for General Aviation	Ongoing
SI-4028	Other aircraft system reliability	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-4029	Inappropriate control input	MST.0025	Improvement in the dissemination of safety messages	Ongoing
SI-5017	Cyberattacks	RES.0033	Aviation resilience —cybersecurity threat landscape	Ongoing
SI-8019	Impaired visibility conditions except IMC	RMT.0708	Controlled flight into terrain prevention with helicopter terrain awareness warning systems (HTAWSs)	On hold
SI-8024	Unanticipated yaw/loss of tail rotor effectiveness	SPT.0093	Development of new safety promotion material for high-profile helicopter issues	Ongoing
SI-8027	Inadequate handling of simulated technical failures and abnormal procedures during a training flight	RES.0055	Training media allocation: Simulator versus actual flying	Ongoing
SI-8027	Inadequate handling of simulated technical failures and abnormal procedures during a training flight	RMT.0194	Modernisation and simplification of the European pilot licensing and training system and improvement of the supply of competent flight instructors	Ongoing
SI-8027	Inadequate handling of simulated technical failures and abnormal procedures during a training flight	RMT.0196	Update of the flight simulation training device requirements	Ongoing
SI-8028	Inadequate airborne separation under VFR operation	RES.0021	Preventing mid-air collision risks	On hold

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SI ID	SI title	Action number	Action title	Action status
SI-8028	Inadequate airborne separation under VFR operation	SPT.0119	Promoting iConspicuity	Ongoing
SI-8030	Bird and other wildlife hazard	SPT.0093	Development of new safety promotion material for high-profile helicopter issues	Ongoing
SI-8031	Inadequate obstacle clearance during any flight phase	RMT.0708	Controlled flight into terrain prevention with helicopter terrain awareness warning systems (HTAWSs)	On hold
SI-8031	Inadequate obstacle clearance during any flight phase	SPT.0093	Development of new safety promotion material for high-profile helicopter issues	Ongoing
SI-8037	Hoist-operations-related issues	SPT.0099	Helicopter hoist safety promotion	Ongoing
SI-8038	External-sling-load-operations-related issues	SPT.0093	Development of new safety promotion material for high-profile helicopter issues	Ongoing
SI-8044	Ineffective safety management systems	MST.0002	Promotion of SMS	Ongoing
SI-8046	Deficiencies and inconsistencies in operating manuals	RMT.0724	Improvement of the operational information provided to rotorcraft flight crew	On hold
SI-8051	Inadvertent flight into IMC	SPT.0093	Development of new safety promotion material for high-profile helicopter issues	Ongoing
SI-9003	Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design	RMT.0392	Regular update of the air operations rules	Ongoing
SI-9003	Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design	SPT.0101	Development of new safety promotion material for high-profile safety issues in commercial, large aeroplane operations (including, aerodromes, ground handling, maintenance and ATM/ANS)	Ongoing
SI-9005	Outdated certification bases established for major changes to type certificates	RMT.0031	Regular update of the Initial Airworthiness Regulation and associated acceptable means of compliance and guidance material	Ongoing
SI-9005	Outdated certification bases established for major changes to type certificates	RMT.0755	Changed product rule (CPR)	New
SI-9005	Outdated certification bases established for major changes to type certificates	RMT.0764	Flight crew alerting system — large aeroplanes	New
SI-9007	Helicopter rotor and rotor drive system failures	RMT.0752	Continued integrity verification programme (CIVP)	Ongoing
SI-9009	Hazardous conditions following helicopter ditching	RMT.0710	Improvement in the survivability of rotorcraft occupants in the event of a crash	Ongoing
SI-9009	Hazardous conditions following helicopter ditching	RMT.0757	Air-pocket design feature and occupant underwater escape	New



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