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Annual Safety Review 2021

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Foreword by Patrick Ky, Executive Director

FOREWORD BY PATRICK KY, EXECUTIVE DIRECTOR

The COVID-19 pandemic has battered world-wide aviation in a way that could never have been imagined and we are still trying to assess the full extent of the impact that it will have on civil aviation in the longer term. While the pandemic is not yet over, there are signs at last that vaccination offers a viable way to reduce levels of infection and a basis to realistically plan for a full reopening.

At the same time, we recognise that this reopening must be achieved systematically and that it may take some considerable time for operating levels to return to those not seen since 2019. The Agency is working diligently with all our aviation partners through various channels – such as the Return to Normal Operations (RNO) project or the Ramp-up safety promotion initiative – to ensure that industry is equipped to be ready, refreshed and retrained to support safe operations.

Throughout the pandemic, the Agency has continued to work collaboratively with our safety partners, identifying safety risks by surveying experts and undertaking qualitative analysis. This is presented in the Review of Safety Issues Arising from the Pandemic, rather than in the Annual Safety Review. The updated version of this document includes proposed mitigations based on the assessments made and intelligence gathered.

In June 2021 we organised the SAFE 360° conference, which enabled the safety partners from industry and authorities to perform a 360° review of the current and most critical safety issues that may challenge the recovery process.

During the pandemic, EASA also formed an important new partnership in its work with the European Centre for Disease Prevention and Control (ECDC). This partnership led to the establishment of the Aviation Health Safety Protocol that laid out the health protection measures for aviation operations during the pandemic.

In addition to operational, safety and health aspects, security threats impacting safety have to be tackled. As a consequence of its digital transformation, the aviation sector is increasingly subject to cyberattacks. This year has seen a significant increase in cyber events impacting some heavyweights of the sector, and therefore exposing our systemic vulnerabilities. To counter a different type of security threat, EASA has established a trial conflict zone platform to offer a collaborative environment for trusted security professionals to achieve a common understanding of threats and risks.

These examples of integrating different types of risks with aviation safety risks are likely to increase as the aviation system and the world around us evolves. Despite all these challenges and despite a changed safety landscape, the European system has continued to operate safely, effectively and efficiently, as it was designed to do.

This edition of the Annual Safety Review is unusual. The normal annual process of safety performance monitoring compares the review year's safety figures against those of the previous 5 to 10 years. Due to the unique situation in 2020, it is much more difficult to make a review and draw definitive conclusions about the safety performance of the European aviation system. Some trends will have to be monitored over the next few years as the impact and recovery path from the pandemic become clear.

I am confident that, in the remainder of 2021, the aviation sector and all its stakeholders will continue to unite in their efforts to find a common path towards a safe and sustainable recovery. EASA stands ready to play a central part in this joint activity.

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Introduction

EASA would like to welcome you to the 2021 edition of the EASA Annual Safety Review (ASR)[1]. The review has been published since 2005 and is now in its 16th year. The analysis presented in this review provides the data-driven input that supports the decision-making required for the European Plan for Aviation Safety (EPAS).

The Annual Safety Review provides both a statistical summary of aviation safety in the EASA Member States (MS) and identifies the most important safety challenges faced by European aviation today. This analysis drives the development of safety actions for the EPAS and harnesses the experience of EASA Member States and Industry so as to connect the data with the current and future priorities of the Agency.

Data portfolios are provided for each of the aviation domains presented in this edition and build upon the work of previous years. They show the safety issues that have been identified in occurrence data, cross referenced with the key risk areas (or main accident outcomes) to which they contribute. The ASR analysis focuses on aviation safety risks based on occurrence data. This work is a part of the ongoing European Safety Risk Management Process and, in particular, the valuable input from the Network of Analysts[2] (NoA) and Collaborative Analysis Groups (CAGs).

1 Publication of the Annual Safety Review is mandated by Article 72(7) of REGULATION (EU) 2018/1139 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency.

2 See Article 14(2) of REGULATION (EU) No 376/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation.

How the safety review is produced

Information sources

The EASA Annual Safety Review is produced by the Agency's Safety Intelligence and Performance Department, within the Strategy & Safety Management Directorate of EASA. The data presented are based on the accidents and serious incidents collected by the Agency under Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, follow-up and analysis, and through the active search of those events from other official sources. This data collection enables the analysis of two specific data sources:

- **EASA's occurrence database:** The main source of data is the Agency's own database, which covers occurrences and other safety-related information reported to the Agency in its role as competent authority and also accidents and serious incidents notified to the Agency by Safety Investigation Authorities world-wide. This is augmented by information collected by the Agency from other sources.
- **European Central Repository:** The European Central Repository (ECR) is the central database of all occurrences and other safety-related information reported to the competent authorities of the EASA MS, the reporting of which is governed by Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation.

The figures and analyses presented in the Annual Safety Review may differ from safety reports prepared by other organisations and regulators. This is due to differences in collection methods, in the definitions of the data collected, and the subsequent analysis. It is important to identify and understand these differences when comparing safety reports and to keep in mind that each report has its own merits.

European Risk Classification Scheme

Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation introduced the requirement for a common occurrence-risk classification at the national and EASA levels. As a result, the European Risk Classification Scheme (ERCS) was developed, which measures the risk using a 2-dimensional matrix. The ERCS is in the process of being adopted into the legal framework of Regulation (EU) 376/2014, in the first instance via a Commission Delegated Regulation.[3]

Firstly, the matrix's rows consider what the severity would have been if the occurrence being scored had escalated into a fatal accident. This is done by considering both the size of the aircraft involved and the most likely type of accident outcome.

Secondly, the columns measure the probability, by looking at how close the occur-rence was to that fatal accident outcome, based on a weighted barrier model.

EASA began using the method in 2017 and has categorised all the accidents and serious incidents in the Annual Safety Review, including those occurring before 2017. The ERCS is useful because the classification of accidents and serious incidents does not necessarily provide an accurate picture of the risk of those occurrences. For example, a very close near mid-air collision would be classified as a serious incident, while a collision between a ground handling vehicle and an aircraft leading to substantial damage of the latter would be classified as an accident. It is clear that in terms of risk,

3 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

the serious incident in this example would be of a higher risk than the accident. The combination of probability and severity would significantly differ. An analysis using ERCS-applied occurrence data provides an overview of the risks for each domain that were present during the analysed period. However, it does not predict the future risks, which will change because of changing circumstances and the remedial effects of safety mitigating actions.

Chapter overview

This document is split into eight chapters, each of which covers one particular operational domain within the European aviation system. The different domains cover the areas for which a specific data portfolio has been developed. The scope of each domain chapter and corresponding data portfolio, is the EASA MS, either as the state of operator or the state of registry. For the Aerodrome and ATM chapters, this scope is the EASA MS as state of occurrence. The chapters of this review cover the following areas:

Chapter 1 Safety overview

- **Review of global airline safety:** This provides a review of global safety for large commercial air transport aeroplanes.
- **Cross-domain safety overview of EASA MS:** This provides an overview of the most important statistics across all the different domains. It helps to identify which domains are likely to need the greatest focus in the EPAS.

Chapter 2 Aeroplanes

- **Commercial air transport aeroplanes:** This covers all commercial air transport airline (passenger and cargo operators) operations involving aeroplanes, as well as non-commercially operated complex aircraft flown for business operations. The airline and business operations involving complex aircraft are covered under the same data portfolio due to the strong commonalities in their safety issues and key risk areas.
- **Specialised operations:** This covers all aerial work/Part SPO operations involving aeroplanes and involves a wide range of different operational activities including aerial advertising, aerial patrol, agricultural, air shows, parachuting and glider towing.
- **Non-commercial operations:** The chapter covers all non-commercial operations involving aeroplanes and includes analysis of leisure flights as well as flight training and other general aviation activities. Additional information regarding microlights and aircraft registered in third countries has also been included.

Chapter 3 Helicopters

- **All helicopter operations:** This chapter provides an analysis of certified or validated helicopter operations, regardless of the nature of the flight or the size of helicopter.
- **Commercial air transport:** This covers all commercial air transport operations involving helicopters such as Helicopter Emergency Medical Service (HEMS), air taxi or sightseeing, as well as flights to offshore oil, gas and renewable energy installations.
- **Specialised operations:** This covers all aerial work/Part SPO operations involving certified helicopters such as sling load, advertisement, or photography with an EASA MS as state of operator or state of registry.
- **Non-commercial operations:** The section covers all non-commercial operations involving certified helicopters with an EASA MS as state of operator or state of registry. Training flights are included within the non-commercial operations definition.

Chapter 4 Balloons

This chapter covers all operations involving hot air balloons.

Chapter 5 Sailplanes

This chapter covers all operations involving sailplanes.

Chapter 6 Aerodromes and ground handling

This chapter covers aerodrome and ground handling operations that occur within the EASA MS. Therefore, the scope for this chapter is EASA MS as state of occurrence.

Chapter 7 ATM/ANS

This chapter covers air traffic management and air navigation services (ATM/ANS) occurrences within the EASA MS. Therefore, the scope of the chapter is EASA MS as state of occurrence.

Chapter 8 ECR reporting rates

This new chapter reviews the reporting rates in the European Central Repository.

Typical structure for each chapter

Each of the domain chapters in this Annual Safety Review contains specific information, which is useful in understanding the analysis of that domain. The structure of each chapter, as described below, is as similar as possible, while providing the ability to compare information in each domain.

Key statistics: Every chapter begins with a set of key statistics. These figures provide information on the Tier 1 Safety Performance Indicators (SPIs) for that domain, which includes details on the number of fatal accidents, non-fatal accidents and serious incidents. It also outlines the number of fatalities and serious injuries in the domain. In all cases, the figures for 2020 are followed by a comparison with the annual averages over the past 10 years. This helps to provide a reference on how this year's performance relates to historical trends. This information is also provided in a graphical format.

Domain specific analysis: As every domain is different, a further analysis of useful domain specific information is included. For example, within the areas of special operations it is useful to provide information on the type of operation involved in safety events, while some chapters include an analysis of the type of propulsion.

Following on from the inclusion of data relating to human factors and human performance in the domain specific analysis for the aeroplane and sailplane domains in 2020, this analysis is now included in all domains. The term 'human factors' describes human characteristics, abilities and limitations. The knowledge of human factors is used throughout the aviation industry to design systems, equipment and work in ways that support humans in performing at their best. Human performance refers to how people perform their tasks. HF and HP knowledge can also be used diagnostically following safety occurrences, to understand what went wrong, what went right and, more importantly, to understand how to prevent these occurrences from happening again.

Within the EASA occurrence data, human factors and human performance have been identified as having contributed to accident and serious incidents, based on information derived from investigation reports.The same ECCAIRS taxonomy that helps us to identify our safety issues and key risk areas also provides us with human factors and human performance codes.

This taxonomy groups event types at different levels, so that all the issues relating to personnel are grouped at the highest level into "personnel". The personnel issues are then further subdivided into four categories: Experience and knowledge events, physiological events, situational awareness and sensory events, and personnel task performance events. A further two levels of subdivision exist, providing increasing detail on the type of HF or HP identified.

Safety risk analysis: The next part of the analysis, and the most important in each chapter, is the domain safety risk analysis. This section provides an overview of the relative risk level and frequency of each key risk area, as well as outlines the high-risk safety issues for the domain. Safety issues are safety deficiencies related to one or more hazards. They are the actual manifestation of a hazard or combination of several hazards in a specific context. A data portfolio is then provided, listing the domain's safety issues being cross-referenced with the key risk areas.

The data portfolio tables have 2 axes. Along the top, information is provided on the key risk areas, which are the most frequent accident outcomes or potential accident outcomes in that domain. In the context of a safety performance framework, the key risk areas are the Tier 2 safety performance indicators (SPIs) for the domain. The key risk areas are, in most cases, ordered on the basis of their risk levels and determined using the ERCS. On the left-hand axis of the portfolio are the safety issues, which relate to the causal and contributory factors to the key risk areas (accident outcomes). In terms of safety performance, these are the Tier 2+ SPIs. These are prioritised on

the basis of their aggregated risk contribution using ERCS. The occurrences related to the individual safety issues are identified by mapping event types in the ECCAIRS taxonomy to each safety issue.

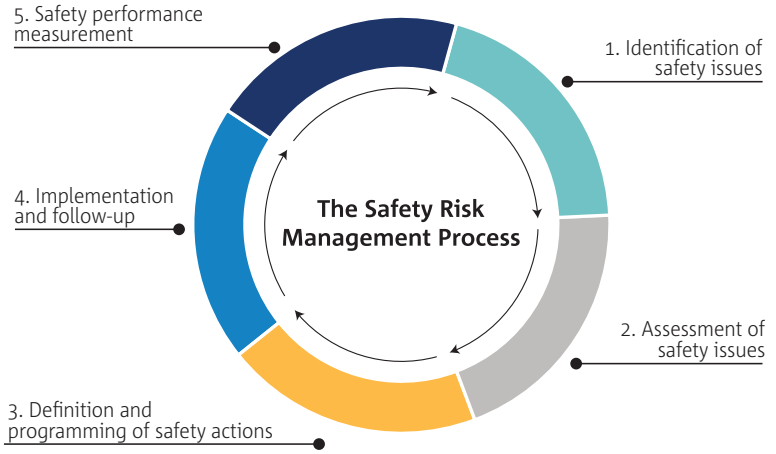
The link with the European Plan for Aviation Safety

The European Plan for Aviation Safety (EPAS) constitutes the regional aviation safety plan (RASP) for EASA Member States. It sets out the strategic priorities, strategic enablers, main risks affecting the European aviation system, and the necessary actions to mitigate those risks to further improve aviation safety in Europe. The EPAS is a five-year plan, updated annually by EASA, with technical inputs from the EASA Advisory Bodies representing Member States and industry. The Plan looks at aviation safety in a systemic manner. The safety priorities and corresponding mitigating actions are determined through the European safety risk management process. While the Plan originates with the EASA Member States, it forms the basis of the Regional Aviation Safety Plan for all States in the ICAO EUR Region.

In addition to the safety intelligence gained through analysing occurrence data, roadmaps have been developed for the general aviation and the rotorcraft domains. These domain specific roadmaps, which are monitored and will continue to develop, augment the overall safety intelligence picture when determining the safety priorities contained in the EPAS.

The Safety Risk Management Process

The main safety risks and corresponding mitigation actions feeding the EPAS are developed through the European safety risk management (SRM) process, which is defined in 5 specific steps as described below:



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 by the CAGs. These candidate safety issues are formally captured by the Agency and

are then subject to a preliminary safety assessment. This assessment then informs the decision on whether a candidate safety issue should be formally included within the relevant safety risk portfolio or be subject to other actions. Advice is taken from the Network of Analysts (NoA) and CAGs. The output of this step in the process are the domain safety risk portfolios. Within the portfolios, both the key risk areas and safety issues are prioritised.

Assessment of safety issues: Once a safety issue is identified and captured within the safety risk portfolio, it is subject to a formal safety assessment. These assessments are prioritised within the portfolio. The assessment process is led by EASA and is supported by the NoA and the CAGs. In addition, group members are encouraged to participate in the assessment itself. This external support is vital to achieving the best possible results. Together, this forms the Safety Issue Assessment (SIA), which provides potential mitigating actions for the EPAS.

This is followed by an impact assessment through the best intervention strategy (BIS) document, defining possible mitigation actions, assessing the implications and benefits of each possible action, and making recommendations on the best mitigation action(s) to be implemented in the EPAS.

Definition and programming of safety actions: Using the combined SIA/BIS, formal EPAS actions proposals are then submitted to the advisory bodies. Once discussed, agreed upon and the required resources secured, the actions are then included in the next version of the EPAS. Prior to publication, the EPAS is approved by the EASA Management Board. Actions that are low cost or require more rapid intervention are often fast-tracked and appear in the next available update of the EPAS. In some cases, more immediate safety actions are needed that may be completed before the next EPAS would be published. Naturally, these are not included within EPAS. Such actions could include the publication of a Safety Information Bulletin (SIB) or take the form of immediate Safety Promotion activities.

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, including research, rulemaking, Member State tasks, safety promotion, and evaluation.

Safety performance measurement: The final stage in the process is then the measurement of safety performance. This serves two purposes, firstly to monitor the changes that have resulted from the implementation of safety actions. Secondly, it also serves to monitor the aviation system so that new safety issues can be identified. To ensure that there is a systematic approach to the work in this step of the SRM process, a Safety Performance Framework has been developed that identifies different tiers of Safety Performance Indicators (SPIs). Tier 1 transversally monitors all the domains and the overview of the performance in each domain. Tier 2 then covers the key risk areas at domain level, whilst Tier 2+ monitors the safety issues. The Annual Safety Review is the annual review of the Safety Performance Framework. It identifies safety trends, highlights priority domains, key risk areas and safety issues. From this step, the SRM process begins again.

The timescales of the SRM process are as follows: The safety data of 2010 – 2019, compared with that of 2020 informs the Annual Safety Review published in 2021, which in turn informs the EPAS of 2022 and beyond.

More information on the EPAS can be found on the EASA website:

https://www.easa.europa.eu/easa-and-you/safety-management/european-plan-aviation-safety

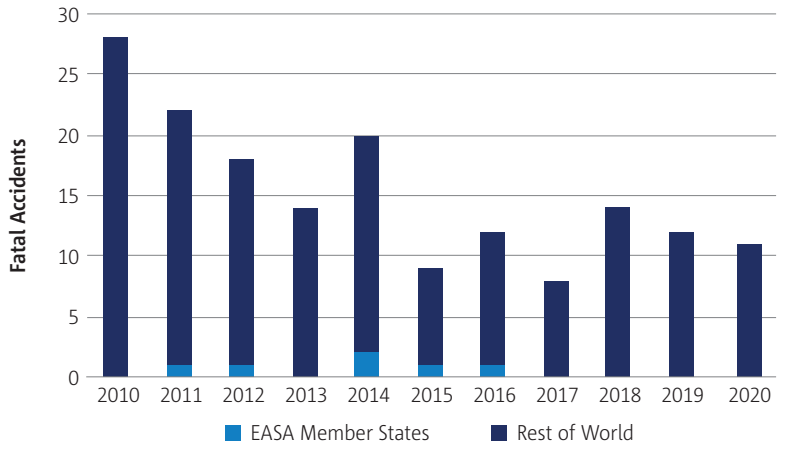
CHAPTER 1

Cross domain overview

1.1 Global airline fatal accidents

This section covers large aeroplane passenger and cargo operations worldwide. The figures show the contribution of EASA Member States' operators to the number of global fatal accidents and fatalities. In Figure 1 it can be seen that the number of fatal accidents and fatalities in 2020 was similar to that of 2019. Although the number of fatal accidents has decreased overall in the period shown, the number of fatalities is more variable, being more dependent on the number of people on board aircraft. EASA Member States' operators did not contribute to the number of global fatal accidents and fatalities in 2020, however worldwide it has been quite a difficult year for aviation safety.

Figure 1 Fatal accidents and fatalities involving large aeroplane passenger and cargo operations, EASA Member States and the rest of the world



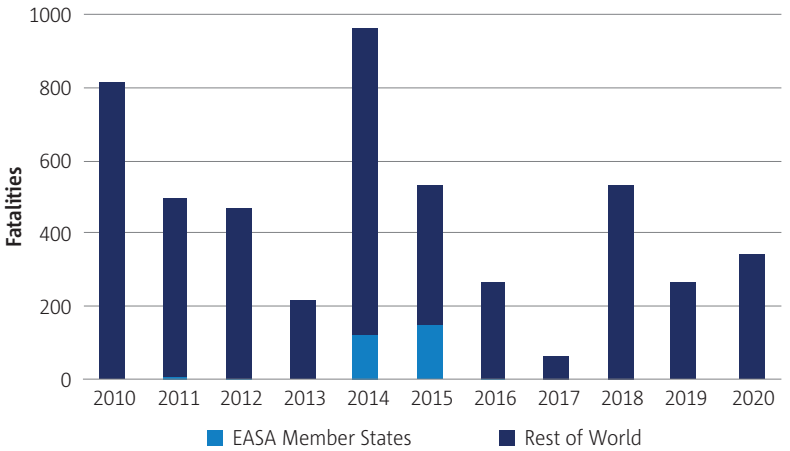
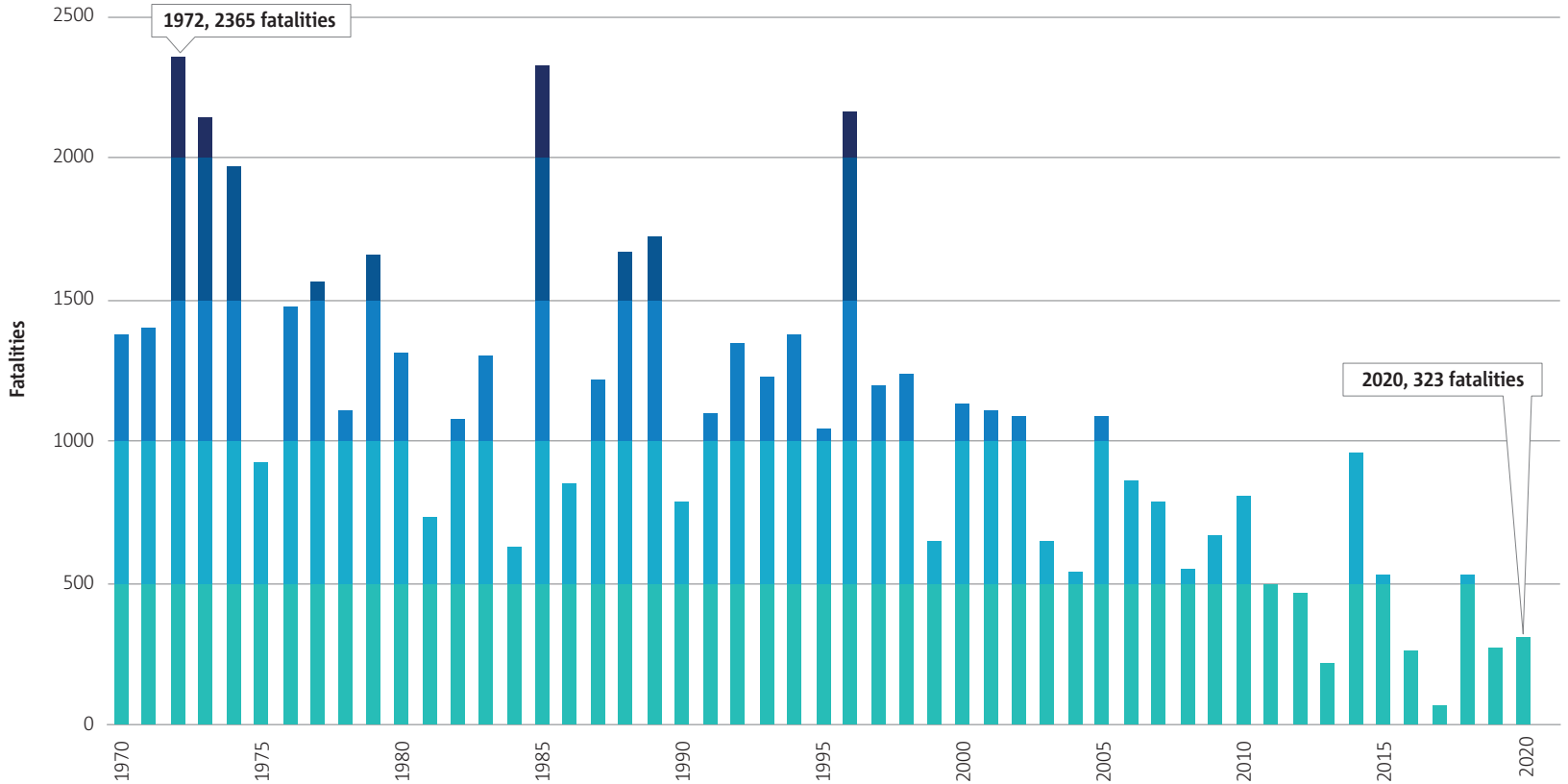


Figure 2 Fatalities involving large aeroplane passenger and cargo operations worldwide



The definition of an accident is set out in EU law[4] and in Annex 13 to the Convention on International Civil Aviation ('Chicago Convention'). Although this definition excludes intentional acts, such acts have often been investigated by safety investigation authorities as potential accidents and the management of safety and security risks are increasingly connected. As such, the figures presented above include security events, of which those from 2020 are shown below:

- 8 January 2020 – near Paramad, Iran - B737-800 shot down during climb, 176 fatalities;
- 4 May 2020 – Bardale, Somalia – EMB120 transporting medical supplies shot down during a go-around, 6 fatalities;
- 8 May 2020 – Austin, Texas, USA – B737-700 struck a man on the runway during landing, 1 fatality.

The same requirements that define an aviation accident also require that these accidents must be investigated with a view to understanding the causes and preventing similar events in the future. Based on the information from accident reports and from preliminary information where the investigations are ongoing, the accidents between 2016 and 2020 had the following characteristics:

- Aircraft upset, runway excursion and terrain collision remain as the most common accident outcomes. The most common flight phase for fatal accidents is approach and landing, however accidents occurring en route have almost double the number of fatalities. This is particularly driven by security and military related events, where all aircraft occupants have lost their lives. In 2020, more than half of the fatalities in the data collected relate to the shooting down of an aircraft by the military.
- Cargo accidents continue to be slightly disproportionately represented in fatal accidents, at approximately 30% of the accidents over the past five years.
- As a last line of defence in most accidents, the crew's ability to manage the challenging circumstances created by technical failures, poor weather and unexpected situations continues to strongly influence accident outcomes. However, it must be recognised that this is the result of both the circumstances of the accident and the day to day decisions taken in the management of aviation organisations, in terms of their safety culture.

4 Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC

1.2 EASA Member States cross domain safety overview

Each domain presented in this review provides the number of fatal accidents and fatalities for 2020 as compared with the preceding ten years, 2010-2019. The impact of the COVID-19 pandemic on aviation is visible in all domains except balloons. The number of fatal accidents and fatalities is in most cases close to the minimum figure of the preceding decade and below the median. The exception is balloons, where the number of fatal accidents is equal to the maximum of the preceding decade and the number of fatalities is higher than the median.

Table 1 reflects the chapter structure of the Annual Safety Review. For the aircraft chapters (aeroplanes, helicopters, balloons and sailplanes), the definition relates to aircraft operated by an EASA Member State air operator's certificate (AOC) holder or an aircraft registered in an EASA Member State.

Table 1 Cross domain comparison of EASA Member States aircraft fatal accidents and fatalities

AIRCRAFT DOMAIN	FATAL ACCIDENTS 2020	FATAL ACCIDENTS 2010-2019 MIN-MAX	FATALITIES 2020	FATALITIES 2010-2019 MIN-MAX	FATALITIES 2010-2019 MEDIAN
AEROPLANES					
CAT airlines	0	0 - 2	0	0 - 150	1
NCC business	0	0 - 1	0	0 - 4	0.5
Specialised operations	3	4 - 12	4	5 - 33	13.5
Non-commercial operations	58	53 - 79	97	91 - 132	103.5
HELICOPTERS					
Overall	4	6 - 17	9	11 - 38	26.5
CAT Operations	1	1 - 5	1	2 - 22	7.5
Specialised Operations	1	0 - 8	2	0 - 17	2
Non-commercial Operations	2	2 - 8	6	2 - 22	10
BALLOONS	3	0 - 3	3	0 - 10	1
SAILPLANES	14	18 - 30	16	21 - 40	28

A separate table is used for aerodromes and ground handling, and another for ATM/ANS, reflecting the different definition for each; the tables include all fatal accidents and fatalities that happened at aerodromes or in airspace in an EASA Member State. Therefore, the infrastructure table not only counts fatal accidents and fatalities that are already in the table for the aircraft chapters, but also some that involved operators or aircraft registered outside of a Member State.

Table 2 Cross domain comparison of EASA Member States infrastructure fatal accidents and fatalities

INFRASTRUCTURE DOMAIN	FATAL ACCIDENTS 2020	FATAL ACCIDENTS 2010-2019 MIN-MAX	FATALITIES 2020	FATALITIES 2010-2019 MIN-MAX	FATALITIES 2010-2019 MEDIAN
AERODROMES AND GROUND HANDLING	0	0 - 3	0	0 - 8	0.5
AIR TRAFFIC MANAGEMENT & AIR NAVIGATION SERVICES	1	0 - 2	7	0 - 8	3

The following graphs show the number of fatal accidents, non-fatal accidents and serious incidents for each aircraft domain, while providing a visual comparison. Please note that the scale of the y-axis is not the same for each chart, although they have in some cases been adjusted to make a comparison easier.

Figure 3 EASA Member States accidents and serious incidents per year for large CAT and NCC business aeroplanes, SPO aeroplanes, CAT helicopters and SPO helicopters

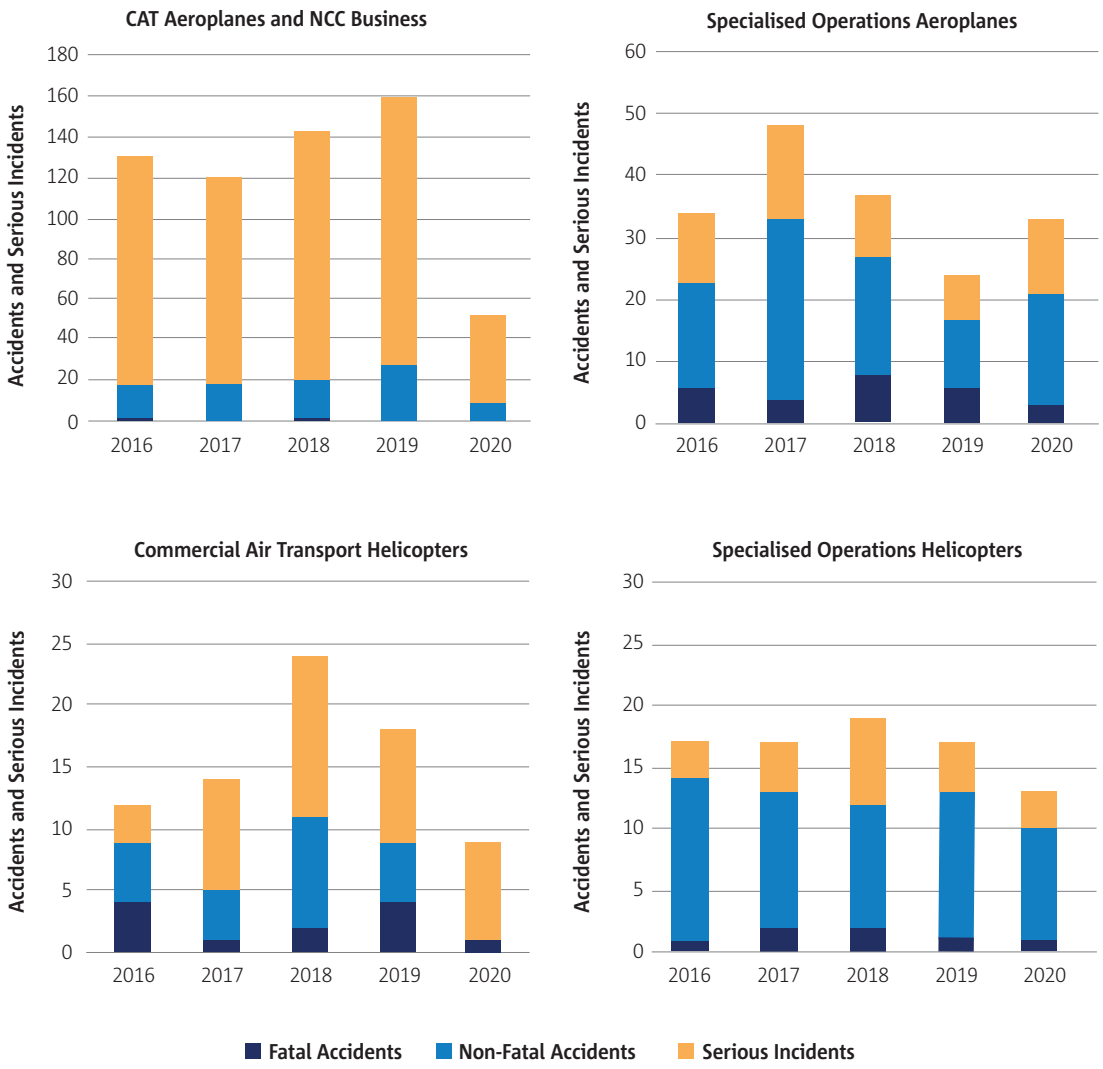


Figure 4 EASA Member States accidents and serious incidents per year for non-commercially operated aeroplanes and helicopters, and all sailplane and balloon operations.

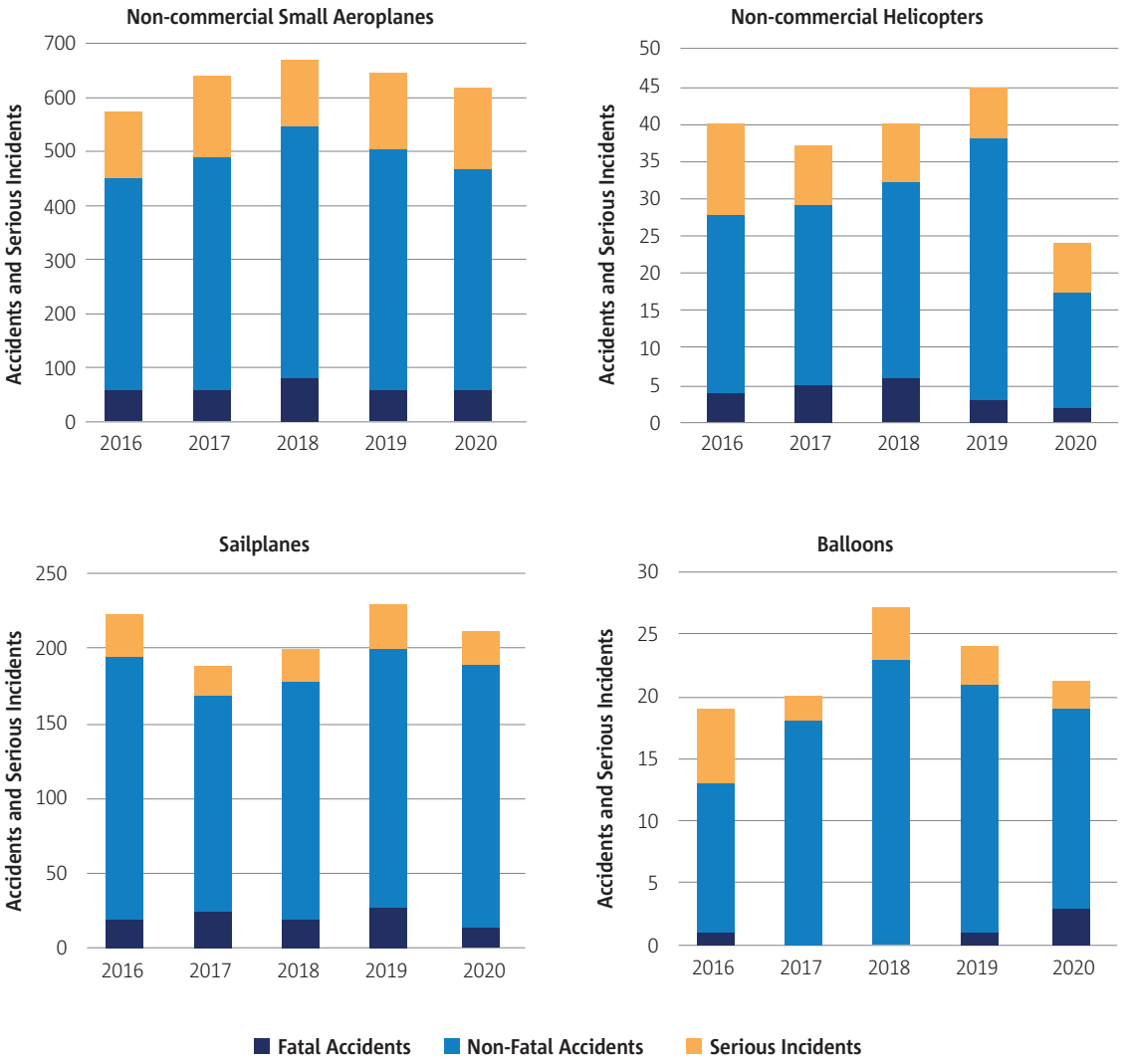
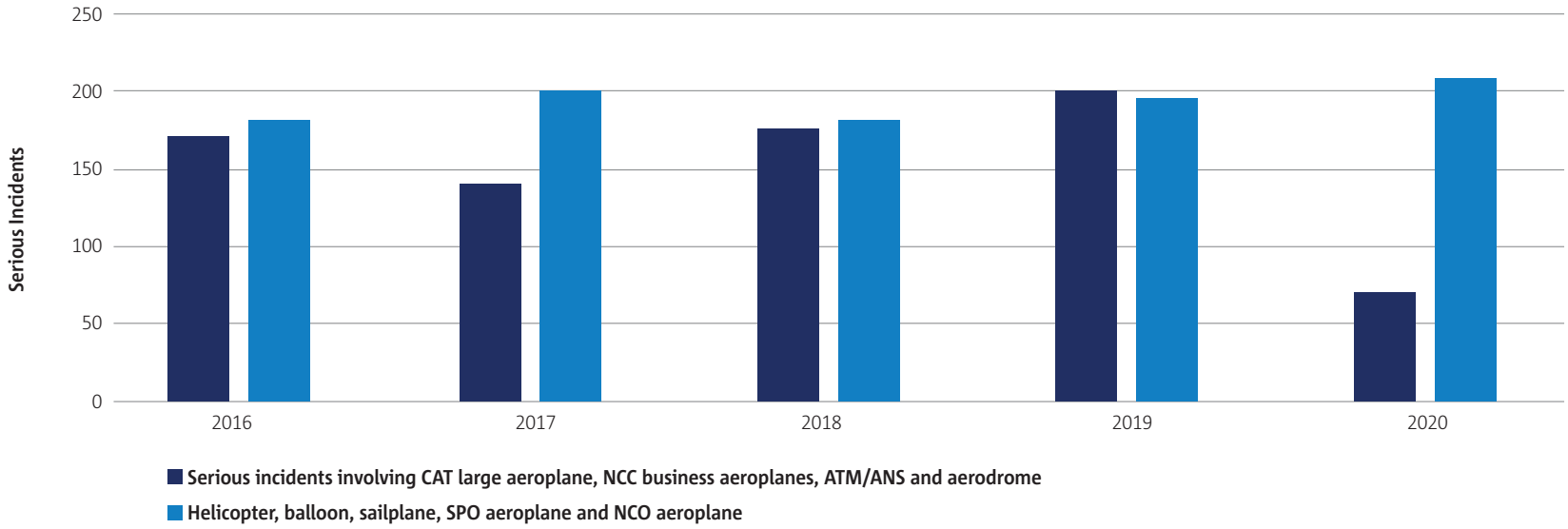


Figure 5 EASA Member States infrastructure related accidents and serious incidents per year

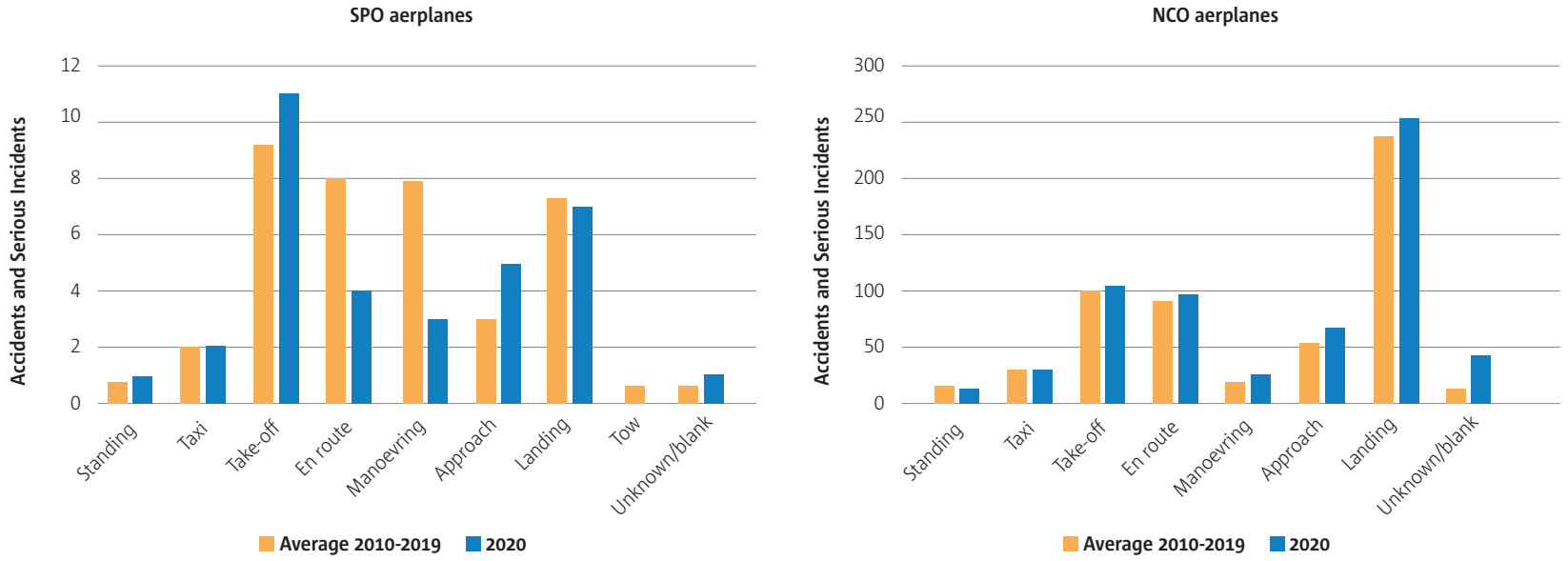
The COVID-19 pandemic has had differing effects on the aviation domains, as can be seen in each chapter of the review. One interesting difference between the domains is that while the number of accidents and serious incidents involving commercial airline operations has reduced significantly, the number of accidents and serious incidents in other domains has been maintained. A comparison of serious incident figures illustrates this most clearly, since the usual (pre-pandemic) number of serious incidents per year in the two categories is similar. Figure 6 compares the number of serious incidents per year in the commercial air transport (CAT) large aeroplane and non-commercial complex (NCC) business aeroplanes, ATM/ANS and aerodrome domains with helicopter, balloon, sailplane, specialised operation (SPO) aeroplane and non-commercially operated (NCO) aeroplane domains.

Figure 6 Serious incidents per year, by domain



In addition to changes in the overall number of accidents and serious incidents, the distribution per phase of flight was also different depending on the domain. For CAT aeroplanes and NCC business, SPO aeroplanes, CAT helicopters and ATM/AMS, the number of accidents and serious incidents in the en route phase decreased proportionately more than other phases of flight. However, for NCO aeroplanes, SPO helicopters, NCO helicopters, balloons and sailplanes, the distributions per phase of flight were very similar to previous years. The distribution of accidents and serious incidents by phase of flight for SPO aeroplanes and NCO aeroplanes are shown alongside one another for comparison.

Figure 7 Distribution of accidents and serious incidents by phase of flight, comparing specialised operations and non-commercial operations involving aeroplanes



CHAPTER 2

Aeroplanes

This chapter covers all aeroplane operations. The chapter is divided in three main sections:

1. Airline and air-taxi passenger and cargo operations conducted by EASA Air Operators Certificate (AOC) holders with aeroplanes of a maximum take-off mass above 5 700 kg and EASA Member State registered complex aeroplanes operating non-commercial operations (NCC);
2. Specialised operations (SPO) conducted by EASA Member States registered aeroplanes or EASA Member States AOC holders. Examples include air ambulance, advertisement, photography, etc.;
3. Non-commercial operations conducted by EASA Member States registered non-complex aeroplanes, having a maximum take-off mass below 5 700 kg and not covered in the sections above. In addition, some key statistics are provided for microlights and aeroplanes registered outside of the Member States.

The data presented are based on the accidents and serious incidents collected by the Agency under Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, follow-up and analysis, and through the active search of those events from other official sources.

For each section, the key statistics are presented. Each section contains an individual data portfolio, providing an overview of the main safety risks for these types of operations at the European level, based on occurrence data.

The list of fatal accidents associated with the scope of this chapter is provided in Appendix 1 of this document, as is a list of fatal accidents involving non-certified aeroplanes (Annex I products).

2.1 Commercial Air Transport – Airlines and Air Taxi – Large Aeroplanes

This section covers the airline and air-taxi passenger and cargo operations of EASA AOC holders with aeroplanes of a maximum take-off mass above 5 700 kg.

Key statistics

The key statistics for this domain are depicted in Table 3 and Table 4 and include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019)[5] and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe. In 2020 there were no fatal accidents involving European Commercial Air Transport (CAT) AOC holders. The number of non-fatal accidents was lower than the average of the previous 10-year period. There was a decrease in serious incidents in 2020 in comparison with the previous year and the average of the previous 10-year period.

Table 3 Key statistics for commercial air transport airline and air-taxi aeroplanes

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
6	Fatal Accidents	0	↓
233	Non-fatal Accidents	8	↓
918	Serious Incidents	42	↓

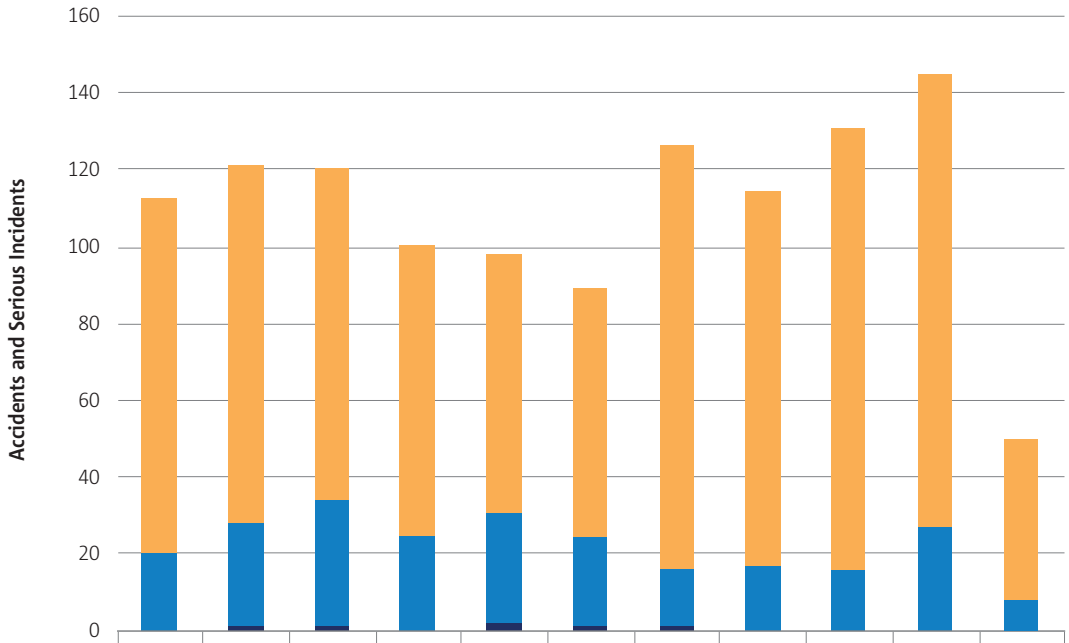
Table 4 Fatalities and serious injuries involving commercial air transport airline and air-taxi aeroplanes

	FATALITIES	SERIOUS INJURIES
2010-2019 total	281	103
2010-2019 max.	150	18
2010-2019 min.	0	6
2020	0	4

5 On 4 August 2018, a Junker-52 crashed in the Swiss Alps while performing a sightseeing flight resulting in 20 fatalities. Due to the type of aircraft involved (not certified by EASA and an "Annex I aircraft" of Regulation (EU) 2018/1139) and the specific type of operation being carried, this accident has not been included in the statistics of this chapter.

Figure 8 shows that the numbers of non-fatal accidents and serious incidents in 2020 have decreased to the lowest levels in comparison with the previous 10-years (2010-2019).

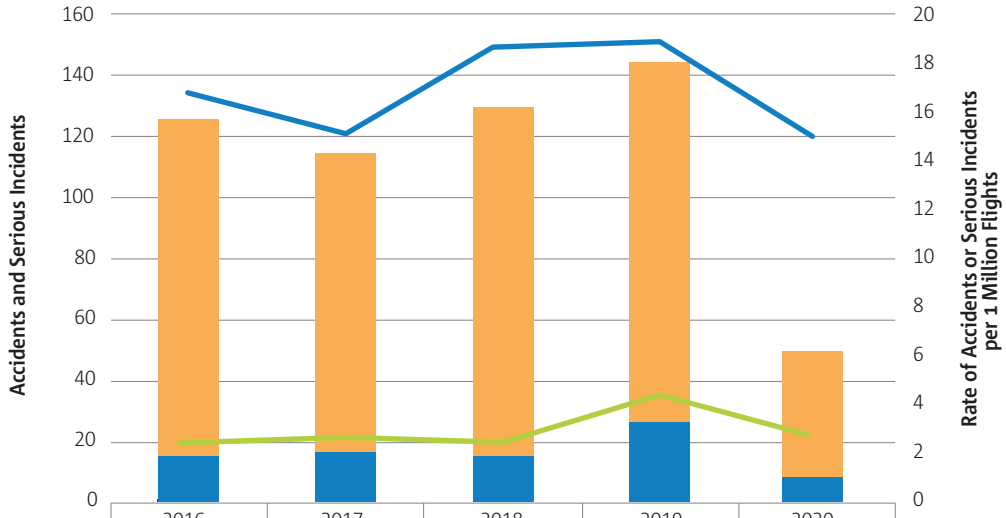
Figure 8 Fatal accidents, non-fatal accidents and serious incidents per year involving commercial air transport airline and air-taxi aeroplanes



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	93	93	86	75	67	64	110	97	115	118	42
Non-Fatal Accidents	20	27	33	25	29	24	15	17	16	27	8
Fatal Accidents	0	1	1	0	2	1	1	0	0	0	0

Figure 9 shows that the rate of accidents has decreased slightly in 2020 and returned to the 2017 and 2018 levels. The rate of serious incidents has dropped more prominently and reached the same level as 2017. These reductions are observed in the COVID-19 pandemic situation that had an impact on the overall 2020 traffic levels which dropped to around the 45% of the previous year. This traffic drop has led to less congested aerodromes and airspace which be benefitted to a reduction of accidents and serious incidents in all flight phases.

Figure 9 Numbers and rates of fatal accidents, non-fatal accidents and serious incidents per million flights involving commercial air transport airline and air-taxi aeroplanes



	2016	2017	2018	2019	2020
Serious Incidents	110	97	115	118	42
Non-Fatal Accidents	15	17	16	27	8
Fatal Accidents	1	0	0	0	0
Serious Incident Rate	17	15	19	19	15
Accident Rate	2	3	3	4	3

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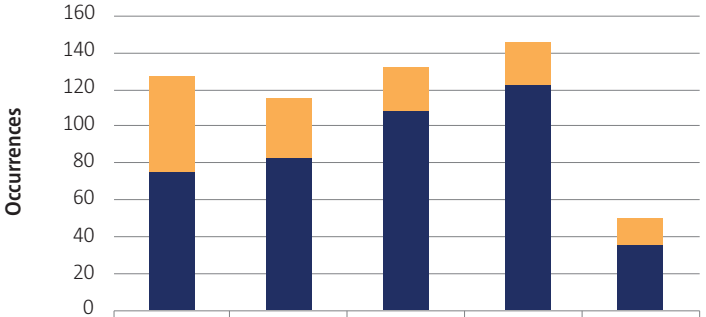
Figure 10 shows occurrences that have been risk scored using the ERCS methodology and divided into higher and lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to the review. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern than the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal or even exceed the risk of some accidents. There had been a steady increase in the number of higher risk occurrences since 2016. Even though the numbers of accidents and serious incidents dropped in 2020, the proportion of higher risk occurrences remained again higher in comparison with lower risk occurrences.

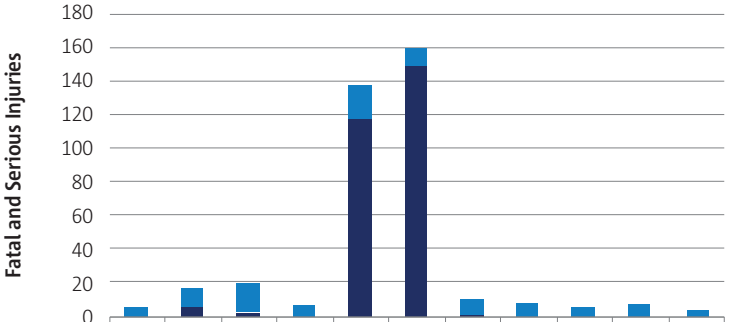
The number of serious injuries in 2020 remains below the average of the previous 10-year period. The number of fatalities per year relates to the size and occupancy of the aeroplane involved in the accident. The causes of injuries in 2020 were attributable to encounters with turbulence during flight and a passenger being injured during disembarkation.

Figure 10 ERCS higher and lower risk occurrences per year involving commercial air transport airline and air-taxi aeroplanes



	2016	2017	2018	2019	2020
Lower Risk (ERCS)	50	31	24	24	14
Higher Risk (ERCS)	76	83	107	121	36

Figure 11 Fatal and serious injuries per year involving commercial air transport airline and air-taxi aeroplanes

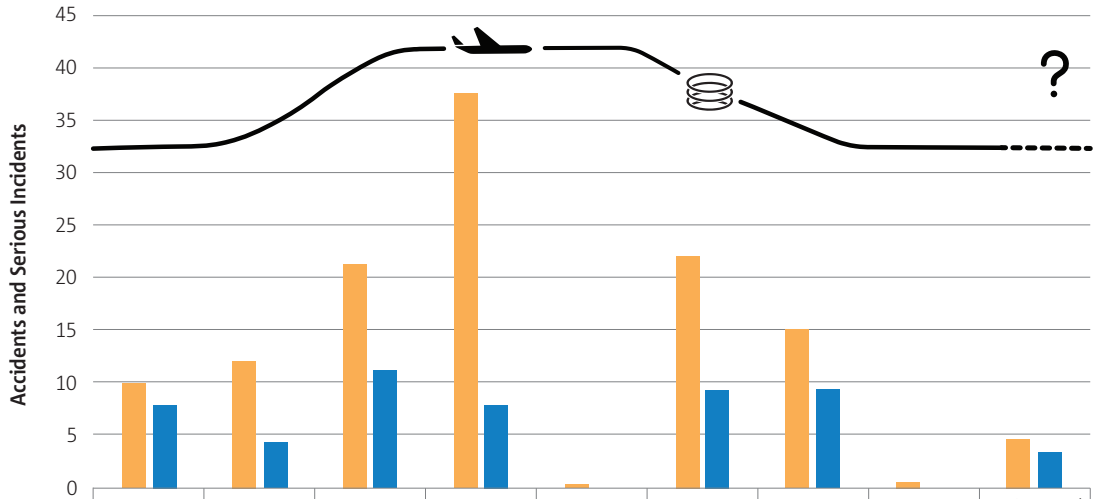


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	6	11	18	8	18	10	9	9	6	8	4
Fatalities	0	6	3	0	120	150	2	0	0	0	0

Phase of flight

The numbers for 2020 in Figure 12 show a distribution of accidents and serious incidents per flight phase with a greater number during take-off, approach and landing due to the more complex nature of those flight phases. En route was also a flight phase where many of the accidents and serious incidents occurred in 2020. However, it was between a quarter and a fifth of the 2010-2019 average. In 2020 there were almost as many accidents and serious incidents during the standing phase compared with the average. The unknown/blank flight phase corresponds to those occurrences where no data was available, and normally relates to the second aircraft in some of the occurrences.

Figure 12 Accidents and serious incidents by phase of flight involving commercial air transport airline and air-taxi aeroplanes



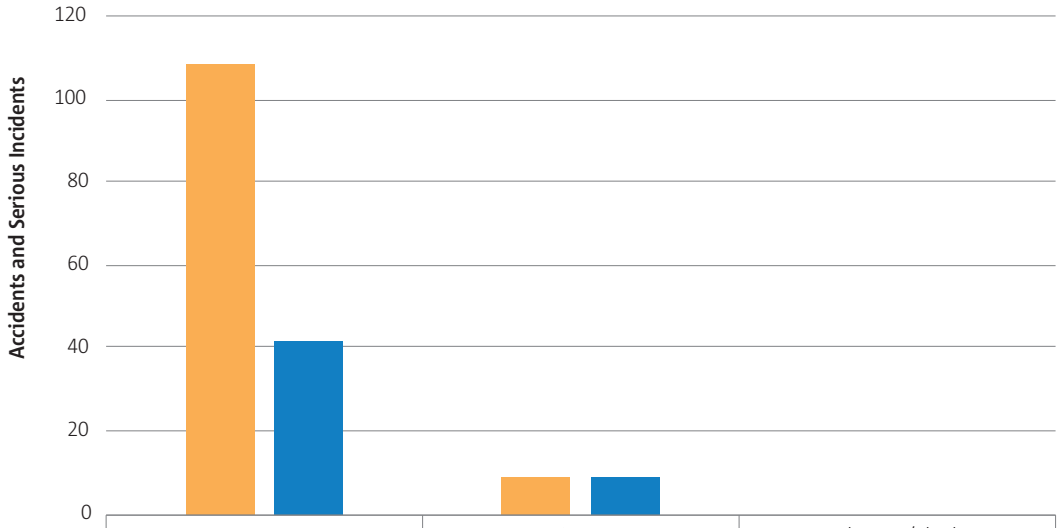
	Standing	Taxi	Take-off	En route	Manoevring	Approach	Landing	Tow	Unknown/ Blank
Average 2010-2019	9.7	12	21.7	38.3	0.4	22.1	15.5	0.5	4.1
2020	8	4	11	8	0	9	9	0	3

Operation type

Figure 13 compares the number of accidents and serious incidents per operation type (passenger and cargo), showing the figures for 2020 compared with the 10-year average (2010-2019). While the number of accidents and serious incidents for cargo flights remained similar to the 10-year average, there was a steep reduction of this number for passenger flight operations. Note that cargo operations in 2020 remained the same or even exceeded the 2019 levels, whereas passenger flights were heavily impacted by the pandemic.

Unknown/blank corresponds to those occurrences where no data on the operation type was available and it normally relates to the second aircraft in some occurrences (e.g. loss of separation between an airliner and another aircraft).

Figure 13 Accidents and serious incidents by operation type involving commercial air transport airline and air-taxi aeroplanes

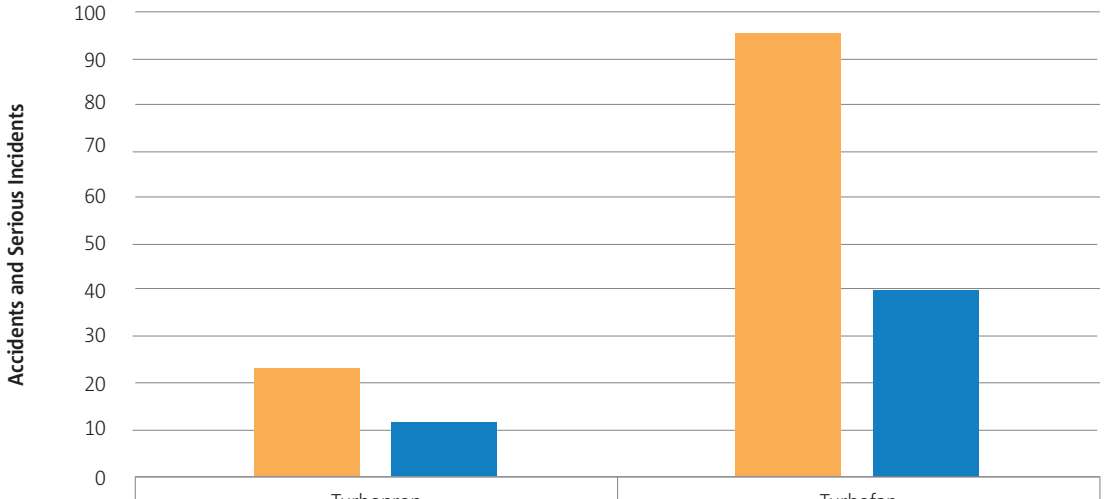


	Passenger	Cargo	Unknown/Blank
Average 2010-2019	108.7	8.3	0.1
2020	41	8	0

Propulsion type

Figure 14 shows that the distribution by propulsion type shows a similar pattern in 2020 compared with the 10-year average, although the absolute numbers are lower. The distribution between turbofan and turboprop is consistent with the aircraft fleet sizes and their different exposure figures.

Figure 14 Accidents and serious incidents by propulsion type involving commercial air transport airline and air-taxi aeroplanes

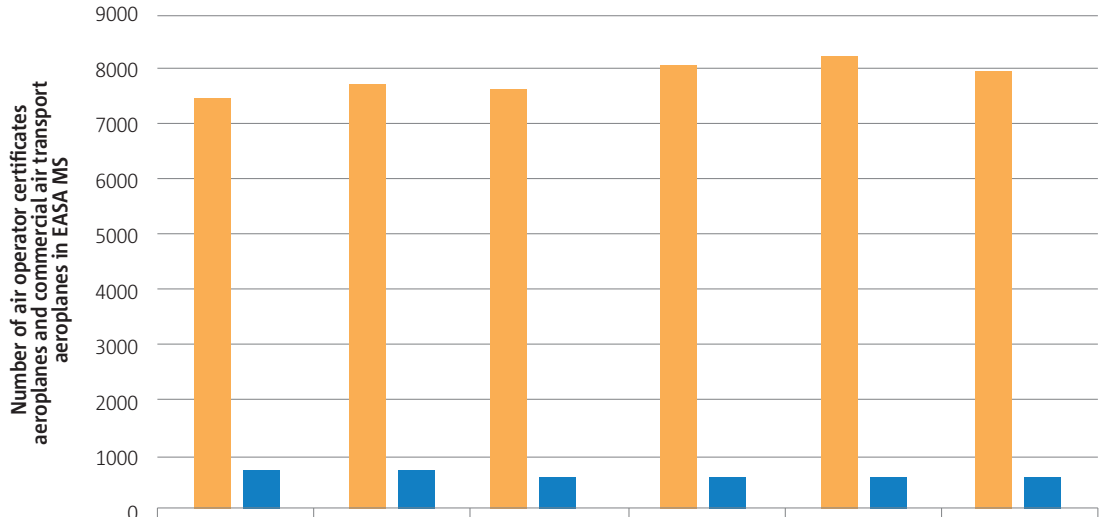


	Turboprop	Turbofan
Average 2010-2019	22.8	95.2
2020	11	40

Numbers of air operator certificate holders and CAT aeroplanes

This year for the first time in this review, the number of air operator certificate (AOC) holders and number of commercial air transport aeroplanes within EASA Member States are presented. Figure 15 shows that in 2020 the number of AOC holders operating aeroplanes has been slightly below the previous 5-year average. The number of CAT aeroplanes has been slightly above the previous 5-year average, however less than in 2019 and 2018.

Figure 15 Number of air operator certificates (aeroplanes) and commercial air transport aeroplanes in EASA MS

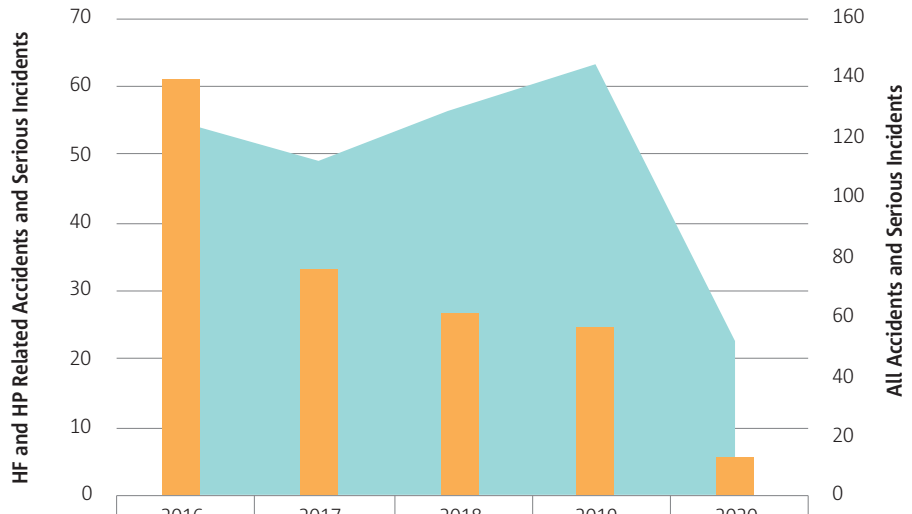


	2015	2016	2017	2018	2019	2020
Aeroplanes (CAT ops)	7550	7737	7677	8174	8273	8045
AOC (A)	715	680	663	679	661	643

Human factors and human performance

Approximately a quarter of commercial air transport large aeroplane accident and serious incident reports identify human factors (HF) or human performance (HP) issues, these are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. Looking at the figures for the past five years, there is an apparent peak in 2016. The figure for 2020 should be viewed as preliminary and is likely to increase, since HF or HP issues are often not recorded within accident and serious incident reports until the final report is published.

Figure 16 Human factors and human performance accidents and serious incidents involving commercial air transport airline and air-taxi aeroplanes



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	126	114	131	145	50
HF/HP Accidents and Serious Incidents	61	33	27	24	5

The application of HF or HP codes at a high level can be seen in Figure 17. Clearly, task performance issues are more easily discernible following an accident or serious incident than the factors that cause them, such as physiological or experience and knowledge events.

Figure 18 compares the number of accidents and serious incidents with the aggregated ERCS risk score of those occurrences, using detailed HF and HP event codes. It can be seen that some types of event have a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents. In particular, whereas accidents and serious incidents involving personnel actions are quite common, their aggregated risk is much lower when compared to events involving impairment and incapacitation, which has a much higher aggregated risk score.

Figure 17 High level human factors and human performance event codes applied to accidents and serious incidents involving commercial air transport airline and air-taxi aeroplanes

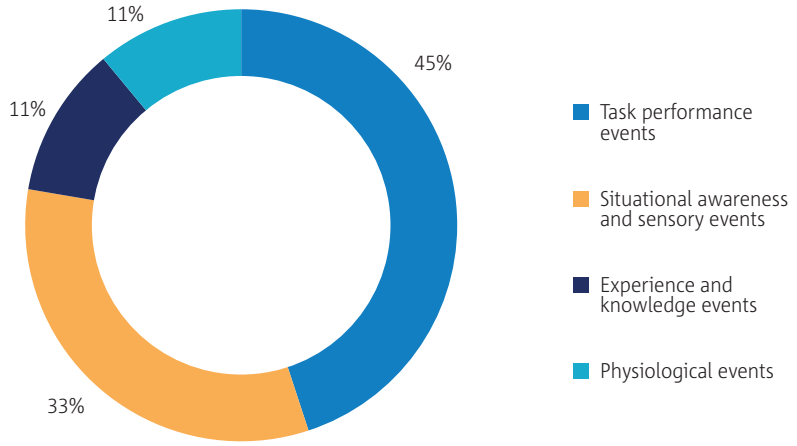
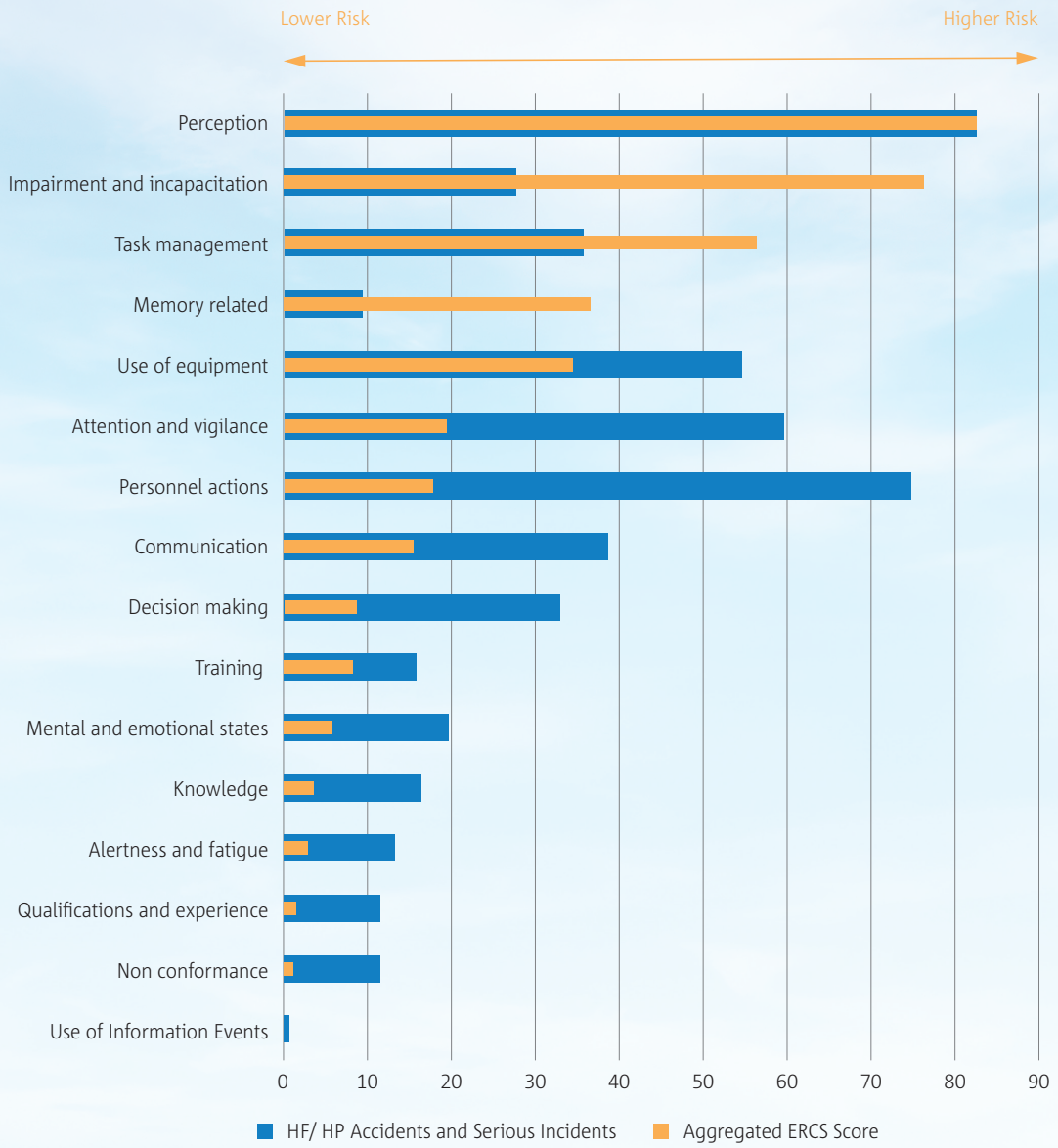


Figure 18 Detailed human factors and human performance event codes by aggregated ERCS score and numbers of accidents and serious incidents involving commercial air transport airline and air-taxi aeroplanes



2.2 Non-commercial complex business aeroplanes

This section covers the safety performance of EASA MS registered complex aeroplanes operating non-commercial operations (NCC).

Key statistics

The key statistics for this domain are in the tables below and include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). Also included is a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe.

Table 5 Key statistics for non-commercial complex business aeroplanes

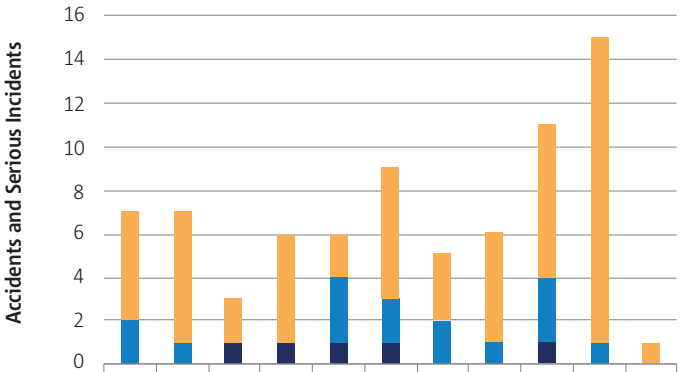
2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
5	Fatal accidents	0	↓
15	Non-fatal accidents	0	↓
55	Serious incidents	1	↓

Table 6 Fatalities and serious injuries involving non-commercial complex business aeroplanes

	FATALITIES	SERIOUS INJURIES
2010-2019 total	10	2
2010-2019 max.	4	2
2010-2019 min.	0	0
2020	0	0

Figure 19 shows that during 2020, there were no fatal and non-fatal accidents involving an EASA MS registered NCC business aeroplanes. The number of serious incidents has significantly decreased in comparison with the average of the previous 10-year period although the level of traffic of NCC business aeroplanes remained at 75% of 2019 level according to the European Business Aviation Association, EBAA.

Figure 19 Fatal accidents, non-fatal accidents and serious incidents per year involving non-commercial complex business aeroplanes



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	5	6	2	5	2	6	3	5	7	14	1
Non-Fatal Accidents	2	1	0	0	3	2	2	1	3	1	0
Fatal Accidents	0	0	1	1	1	1	0	0	1	0	0

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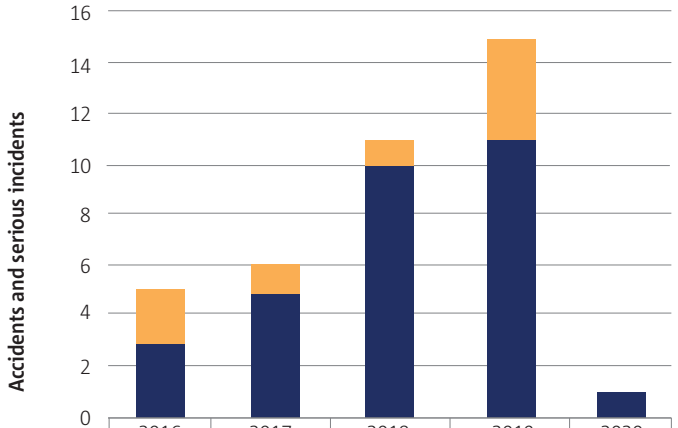
Figure 20 shows occurrences that have been risk scored using the ERCS methodology and divided into higher and lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to the review. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern than the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal or even exceed the risk of some accidents. As can be seen in the figure, there is a low number of lower risk occurrences. This is likely due to the low reporting in the NCC domain, where there is a tendency for higher risk accidents and serious incidents, normally very visible and with severe outcomes, to be reported and investigated.

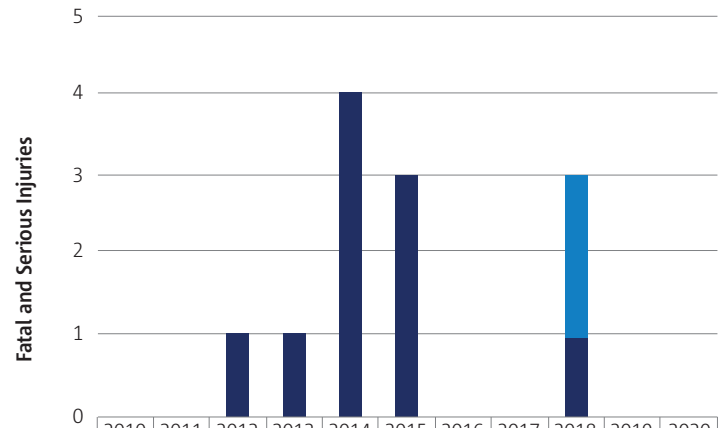
The number of fatalities and serious injuries per year is shown in Figure 21. Due to the size and occupancy of the aeroplanes used in this type of operation the number of fatalities is low, with an average of around 1 fatality per year. As can be seen in Figure 19, there has been approximately 1 fatal accident every 2 years.

Figure 20 ERCS higher and lower risk occurrences per year involving non-commercial complex business aeroplanes



	2016	2017	2018	2019	2020
Lower Risk (ERCS)	2	1	1	4	0
Higher Risk (ERCS)	3	5	10	11	1

Figure 21 Fatal and serious injuries per year involving non-commercial complex business aeroplanes

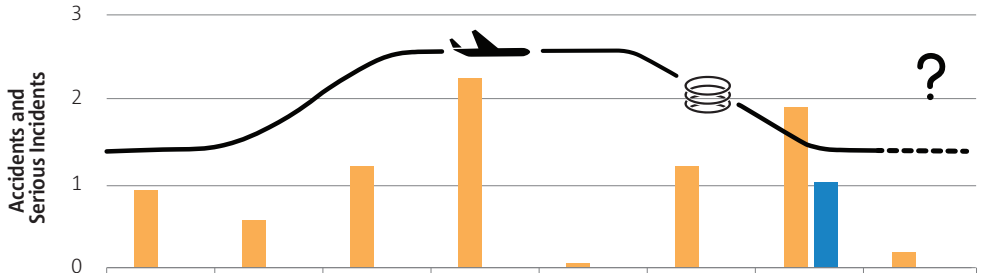


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	0	0	0	0	0	0	0	0	2	0	0
Fatalities	0	0	1	1	4	3	0	0	1	0	0

Phase of flight

The low numbers of occurrences in this domain do not allow any comparison in terms of the phase of flight. However, the data is still presented for information in Figure 22.

Figure 22 Accidents and serious incidents by phase of flight involving non-commercial complex business aeroplanes

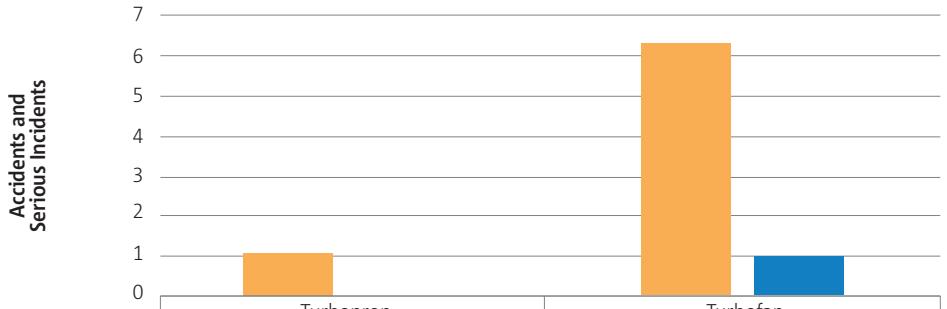


	Standing	Taxi	Take-off	En route	Manoevring	Approach	Landing	Unknown/ blank
Average 2010-2019	0.9	0.6	1.2	2.2	0.1	1.2	1.9	0.2
2020	0	0	0	0	0	0	1	0

Propulsion type

The low figures in this domain do not allow any comparison between the two main propulsion types. However, the data are still presented for information in Figure 23.

Figure 23 Accidents and serious incidents by propulsion type involving non-commercial complex business aeroplanes



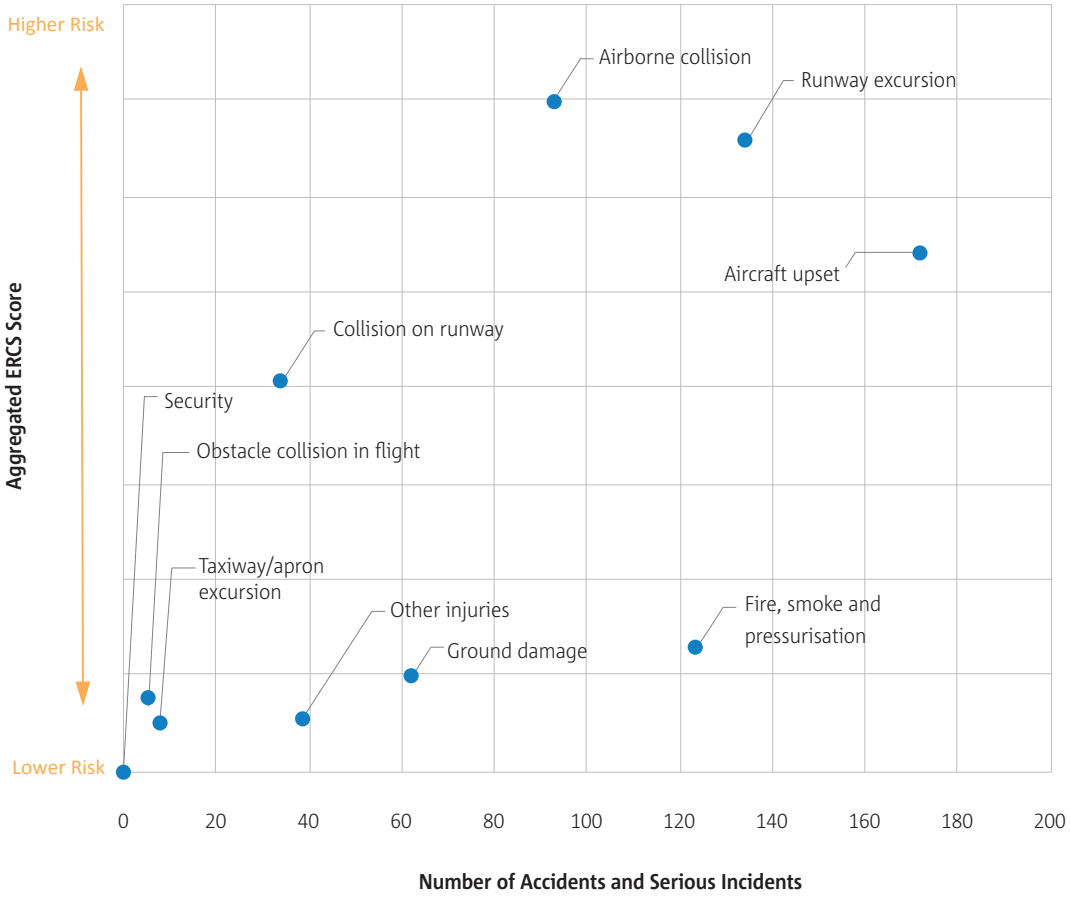
	Turboprop	Turbofan
Average 2010-2019	1.1	6.3
2020	0	1

2.3 Safety risks for large aeroplanes (CAT airlines, air taxi and NCC business)

CAT airlines, air-taxi and NCC business operations are covered by a single data portfolio due to the similarity of the key risk areas and safety issues for these operation types, as well as the small amount of data available for NCC business. The data portfolio is derived from occurrence data from the EASA occurrence repository and the European Central Repository (ECR).

The key risk areas for this domain are highlighted in Figure 24 and are defined by their potential accident outcome and by the immediate precursors of that accident outcome. The data portfolio risk picture by key risk areas in general has retained a similar pattern to the one from the previous year. The most prominent change is for the 'security' key risk area that has significantly reduced. One of the reasons for this is that the data portfolio covers the preceding 5 years and an accident from 2015 that largely contributed to the 'security' key risk area is now outside of the period covered (2016-2020).

Figure 24 Key Risk Areas by aggregated ERCS score and number of risk scored occurrences, involving commercial air transport – airlines and air-taxi



As illustrated in Figure 24, the higher risk key risk areas are:

1. **Airborne collision** includes all occurrences involving actual or potential airborne collisions between aircraft, while both aircraft are airborne, and between aircraft and other airborne objects (excluding birds and wildlife). In 2020 the highest risk contributors were occurrences with loss of separation whilst performing a missed approach due to a windshear encounter and several TCAS resolution advisories.
2. **Runway excursion** includes all occurrences involving actual or potential situations when an aircraft leaves the runway or movement area of an aerodrome or landing surface of any other predesignated landing area, without getting airborne. In 2020 the highest risk contributors were occurrences with delayed rotation due to incorrect centre of gravity calculations and actual runway excursions.
3. **Aircraft upset** includes all occurrences involving actual or potential situations involving an undesired aircraft state characterised by unintentional divergences from parameters normally experienced during operations, which might ultimately lead to an uncontrolled impact with terrain. In 2020 the highest risk contributors were occurrences with delayed rotation due to incorrect centre of gravity calculations, continued flights with undetected wing damage after a wing strike, and a tail strike on take-off.

Figure 25 lists the safety issues in the large aeroplanes data portfolio and shows both the number of occurrences and the risk score. In this case, the aggregated ERCS score is not considered a complete risk indicator and so the number of occurrences is also used. This is because the finer granularity of the safety issue renders this indicator more vulnerable to the reactiveness of the data type used (only accidents and serious incidents).

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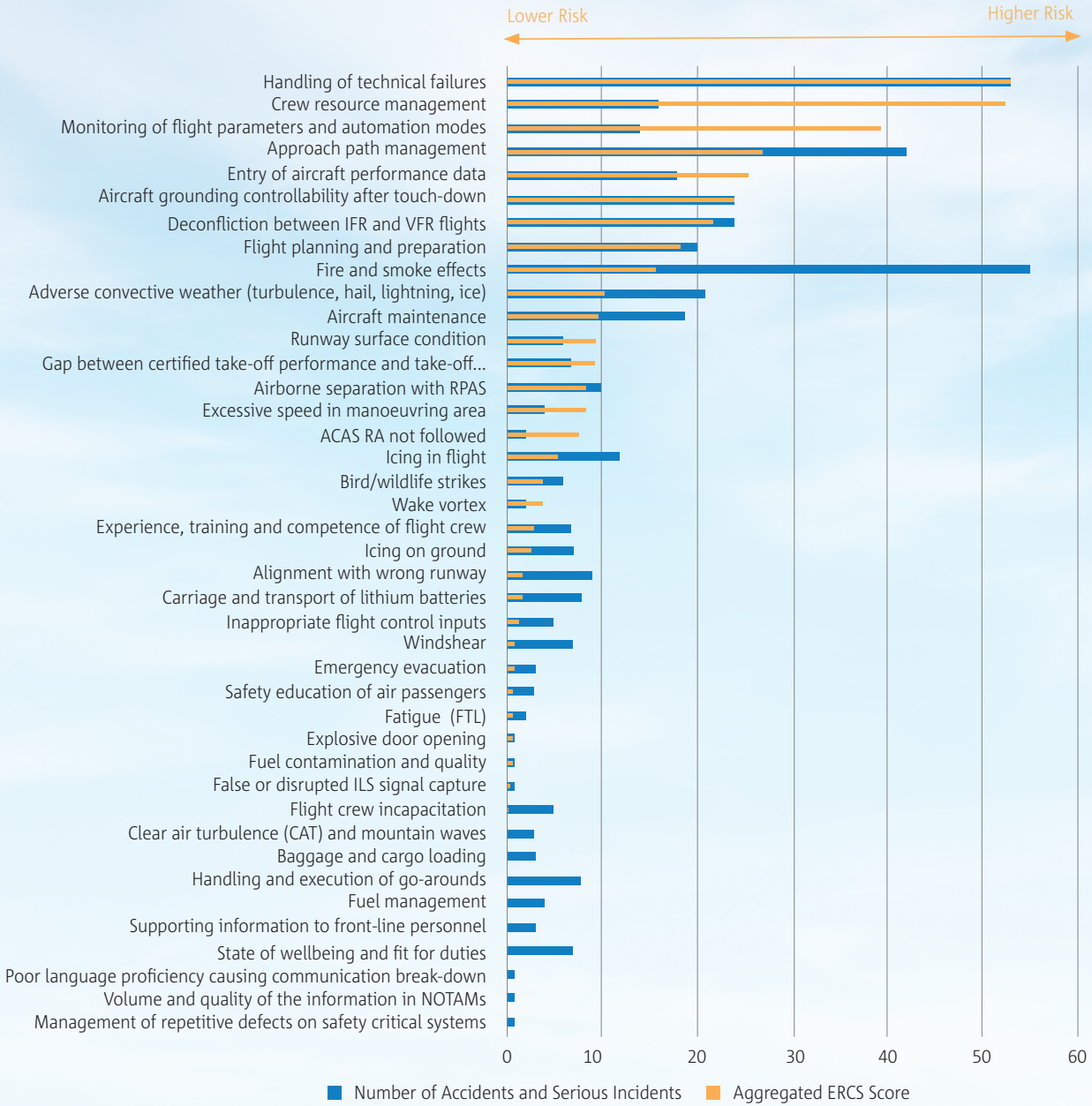
Figure 25 Safety Issues by aggregated ERCS score and numbers of accidents and serious incidents involving commercial air transport – airline and air-taxi



The data portfolio is shown in Table 7 and lists the safety issues for the domain and cross-references these with the key risk areas, highlighting the most important key risk areas and safety issues. The key risk areas are sorted by the aggregated risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues.

The highest contributions to the airborne collision key risk area are deconfliction between IFR and VFR flights and airborne separation with RPAS. For the runway excursion and aircraft upset key risk areas, the main common contributing safety issues are handling of technical failures, approach path management, and entry of aircraft performance data.

Table 7 Data portfolio for large aeroplanes (commercial air transport airline and air-taxi and non-commercial business operations)

SAFETY ISSUE	KEY RISK AREAS (ERCS)										
	AIRBORNE COLLISION	RUNWAY EXCURSION	AIRCRAFT UPSET	COLLISION ON RUNWAY	FIRE, SMOKE AND PRESSURISATION	GROUND DAMAGE	OBSTACLE COLLISION IN FLIGHT	TAXIWAY/APRON EXCURSION	OTHER INJURIES	TERRAIN COLLISION	SECURITY
Handling of technical failures	o	x	x		o	o		o		o	o
Crew resource management	o	o	o		o	o			o	o	o
Monitoring of flight parameters and automation modes		o	x								o
Approach path management	o	x	x		o		o		o	o	o
Entry of aircraft performance data		x	x								o

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)										
	AIRBORNE COLLISION	RUNWAY EXCURSION	AIRCRAFT UPSET	COLLISION ON RUNWAY	FIRE, SMOKE AND PRESSURISATION	GROUND DAMAGE	OBSTACLE COLLISION IN FLIGHT	TAXIWAY/APRON EXCURSION	OTHER INJURIES	TERRAIN COLLISION	SECURITY
Aircraft ground controllability after touch-down		x	o					o		o	
Deconfliction between IFR and VFR flights	x										
Flight planning and preparation	o	o	x		o	o	o			o	o
Fire and smoke effects		o	o			x	o				
Adverse convective weather (turbulence, hail, lightning, ice)	o	o	o				x				
Aircraft maintenance		o	o			o	o			o	o
Runway surface condition		o									
Gap between certified take-off performances and take-off performances achieved in operations		o	o								
Airborne separation with RPAS	x										
Excessive speed in manoeuvring area		o						o			
ACAS RA not followed	o										o

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)										
	AIRBORNE COLLISION	RUNWAY EXCURSION	AIRCRAFT UPSET	SECURITY	RUNWAY COLLISION	AIRCRAFT ENVIRONMENT	INJURIES/DAMAGE	TAXIWAY/APRON EXCURSION	OBSTACLE COLLISION IN FLIGHT	GROUND DAMAGE	TERRAIN COLLISION
Icing in flight		o	x			o					o
Bird/wildlife strikes		o	o		o						
Wake vortex	o		o				o				
Experience, training and competence of flight crew		o	o		o					o	o
Icing on ground			o			o				o	
Alignment with wrong runway		o			o		o	o	o	o	o
Carriage and transport of lithium batteries						o					
Inappropriate flight control inputs		o	o				o				
Windshear	o	o	o								
Emergency evacuation						o	o				
Safety education of air passengers						o	o				
Fatigue (FTL)			o								o
Fuel contamination and quality			o								
Explosive door opening							o				

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)										
	AIRBORNE COLLISION	RUNWAY EXCURSION	AIRCRAFT UPSET	SECURITY	RUNWAY COLLISION	AIRCRAFT ENVIRONMENT	INJURIES/DAMAGE	TAXIWAY/APRON EXCURSION	OBSTACLE COLLISION IN FLIGHT	GROUND DAMAGE	TERRAIN COLLISION
False or disrupted ILS signal capture		o			o				o		o
Flight crew incapacitation			o				o				
Clear air turbulence (CAT) and mountain waves			o				o				
Baggage and cargo loading			o							o	
Handling and execution of go-arounds		o	o			o					o
Fuel management			o								
Supporting information to front-line personnel		o	o								
State of wellbeing and fit for duties		o	o								o
Volume and quality of the information in NOTAMs										o	
Poor language proficiency causing communication break-down			o								
Management of repetitive defects on safety critical systems			o								

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

2.4 Specialised operations aeroplanes

The scope of this section covers specialised operations (SPO) involving aeroplanes of all mass categories having an EASA Member State as state of registry or state of operator.

Key statistics

The key statistics for this domain are in Table 8 and Table 9 and include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe. The numbers of fatal and non-fatal accidents in 2020 were lower than the average of the preceding decade, whereas the number of serious incidents was higher than the 2010-2019 average. The number of fatalities and serious injuries were lower in 2020 compared with the 2010-2019 average.

The number of accidents and serious incidents per year is shown in Figure 26. The number of fatal accidents in 2020 was lower than each year in the preceding decade, whilst the number of non-fatal accidents was lower than

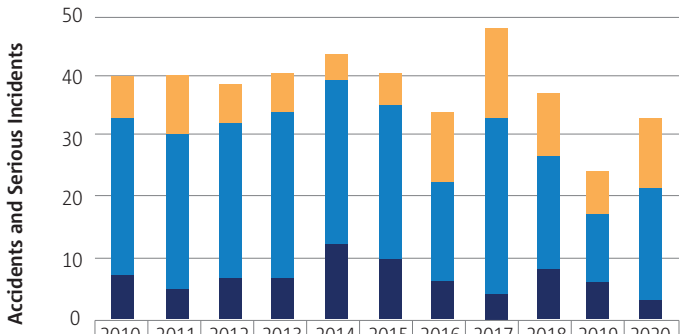
Table 8 Key statistics for specialised operations aeroplanes

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
74	Fatal accidents	3	↓
230	Non-fatal accidents	18	↓
80	Serious incidents	13	↑

Table 9 Fatalities and serious injuries involving specialised operations aeroplanes

	FATALITIES	SERIOUS INJURIES
2010-2019 total	153	73
2010-2019 max	33	18
2010-2019 min	5	1
2020	4	6

Figure 26 Fatal accidents, non-fatal accidents and serious incidents per year involving specialised operations aeroplanes



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	7	9	6	6	4	5	11	15	10	7	12
Non-Fatal Accidents	24	26	25	27	27	25	17	29	19	11	18
Fatal Accidents	9	5	7	7	12	10	6	4	8	6	3

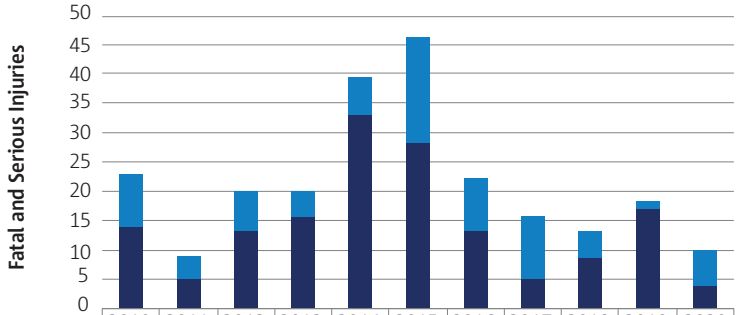
every year except 2016 and 2019. The number of serious incidents in 2020 was higher than all years in the preceding decade except 2017. With most of the investigations into these accidents and serious incidents still ongoing, it is not possible to say whether the COVID-19 pandemic had an effect.

The number of fatalities and serious injuries per year is shown in Figure 27. The number of fatalities in 2020 was lower than each year in the preceding decade. The number of serious injuries was the same as in 2014 and higher than 4 years in the 2010-2019 period.

Phase of flight

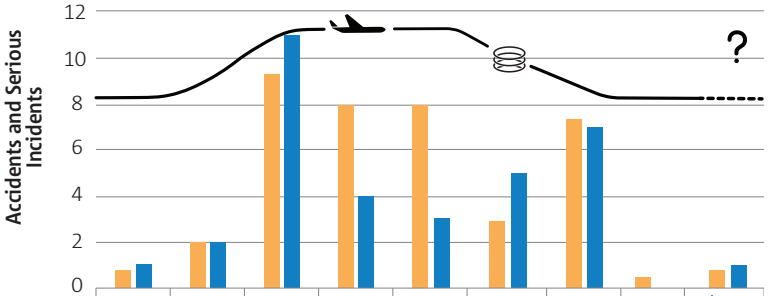
Figure 28 shows the distribution of accidents and serious incidents by flight phase. The numbers of accidents and serious incidents in the take-off and approach phases were higher in 2020 than the average of the preceding decade. The number of accidents and serious incidents in the en route and manoeuvring phases were lower in 2020 than average. In the case of manoeuvring, this is likely to be related to a reduction in airshows and races (see operation type). For the taxi phase the number in 2020 was the same as the average of 2010-2019, whereas for all other flight phases the 2020 numbers were lower than the 2010-2019 average.

Figure 27 Fatal and serious injuries per year involving specialised operations aeroplanes



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	9	4	7	4	6	18	9	11	4	1	6
Fatalities	14	5	13	16	33	28	13	5	9	17	4

Figure 28 Accidents and serious incidents by phase of flight involving specialised operations aeroplanes

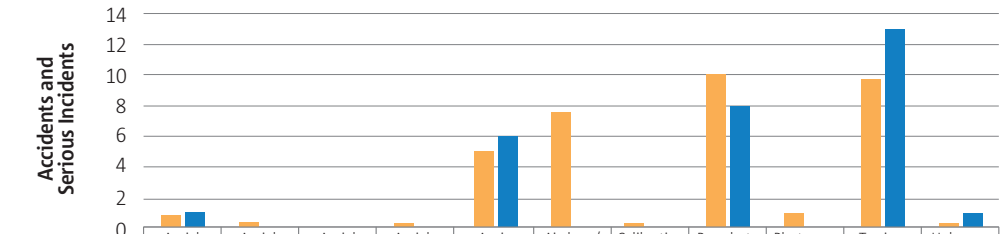


	Standing	Taxi	Take-off	En route	Man-oevring	Approach	Landing	Tow	Unknown /blank
Average 2010-2019	0.8	2	9.2	8	7.9	2.9	7.3	0.5	0.7
2020	1	2	11	4	3	5	7	0	1

Operation type

Figure 29 shows the numbers of accidents and serious incidents by specialised operation. In 2020 the numbers of towing, agricultural and aerial advertising accidents and serious incidents were higher than the average of the preceding decade. There were no airshow/race accidents or serious incidents in 2020, when very few, if any, airshows took place. There were also no accidents or serious incidents in the aerial observation, aerial patrol, aerial survey, calibration, and photography operations in 2020.

Figure 29 Accidents and serious incidents by specialised operation type involving aeroplanes

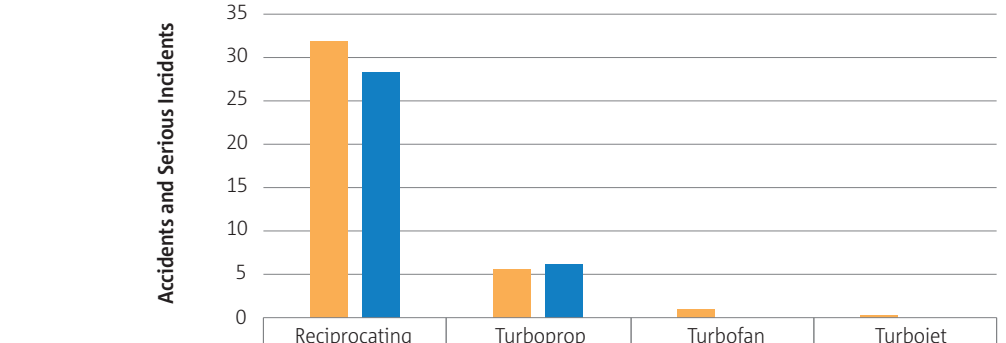


	Aerial Advertising	Aerial Obser-vation	Aerial Patrol	Aerial Survey	Agri-cultural	Airshow/ Race	Calibration	Parachute drop	Photogra-phy	Towing	Unknown
Average 2010-2019	0.9	0.5	0.1	0.2	5	7.5	0.2	10.1	1.1	9.6	0.4
2020	1	0	0	0	6	0	0	8	0	13	1

Propulsion type

Figure 30 shows the numbers of accidents and serious incidents by propulsion type. The number of accidents and serious incidents involving aircraft with reciprocating engines in 2020 was slightly below the average of the preceding decade, whereas the number of involving aircraft with turboprop engines was slightly higher in 2020 compared to the 2010-2019 average. There were no accidents or serious incidents with turbofan or turbojet aircraft in 2020.

Figure 30 Accidents and serious incidents by propulsion type involving specialised operations aeroplanes



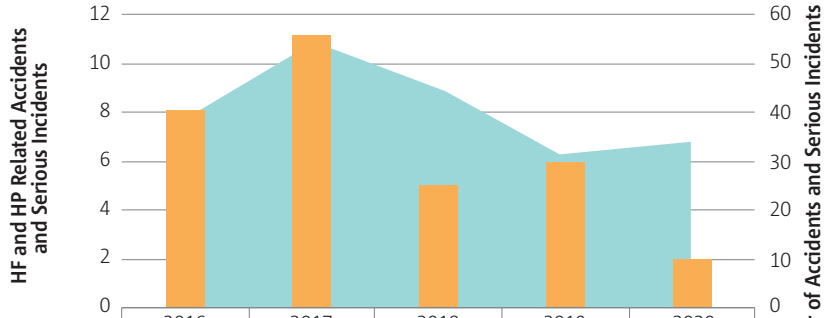
	Reciprocating	Turboprop	Turbofan	Turbojet
Average 2010-2019	31.9	5.7	0.9	0.4
2020	28	6	0	0

Human factors and human performance

Approximately one sixth of specialised operation aeroplane accident and serious incident reports identify human factors (HF) or human performance (HP) issues, these are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. Looking at the figures for the past five years, there is an apparent increase in 2017, followed by a dip in more recent years. The figure for 2020 should be viewed as preliminary and is likely to increase, since HF or HP issues are often not recorded within accident and serious incident reports until the final report is published.

The application of HF or HP codes at a high level can be seen in Figure 32. Clearly, situational awareness and sensory events and task performance issues are more easily discernible following an accident or serious incident than the factors that cause them, such as physiological or experience and knowledge events. This will be particularly true where investigations are not yet complete.

Figure 31 Human factors and human performance accidents and serious incidents involving specialised operations aeroplanes



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	38	55	45	31	34
HF/HP Accidents and Serious Incidents	8	11	5	6	2

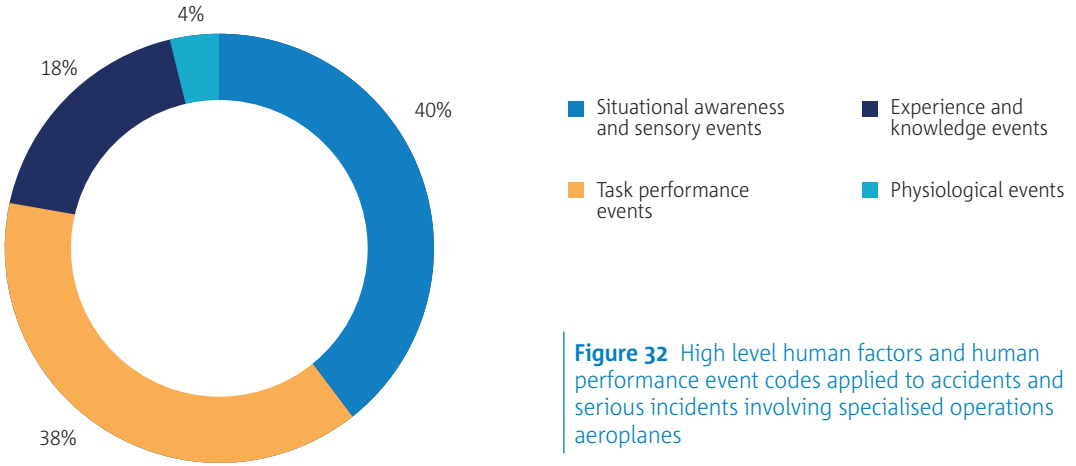
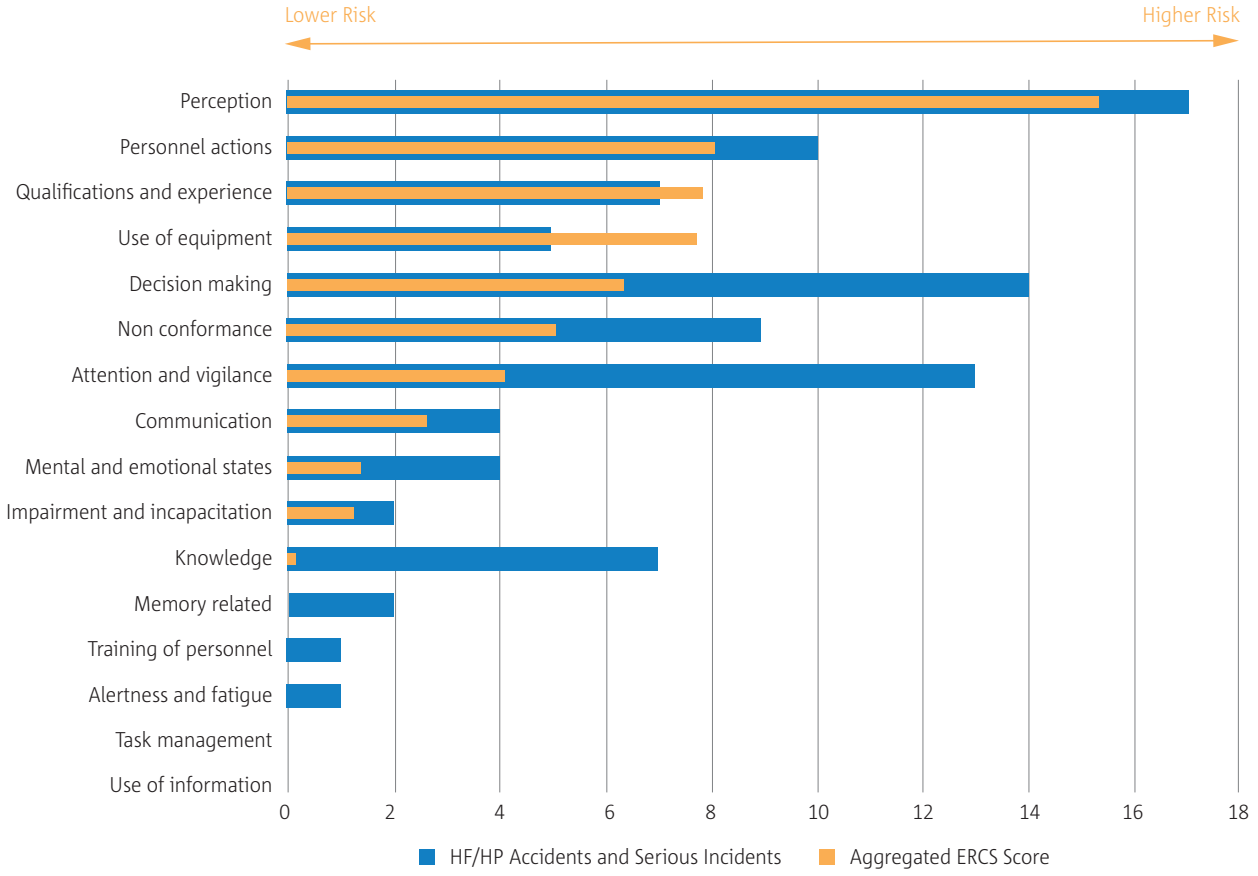


Figure 32 High level human factors and human performance event codes applied to accidents and serious incidents involving specialised operations aeroplanes

Figure 33 compares the numbers of accidents and serious incidents with the aggregated ERCS risk score of those incidents, using detailed HF and HP event codes. It can be seen that some events have a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents. For example, accidents and serious incidents relating to decision making are more numerous but less risky than those relating to use of equipment.

Figure 33 Detailed human factors and human performance event codes by aggregated ERCS score and numbers of accidents and serious incidents involving specialised operations aeroplanes

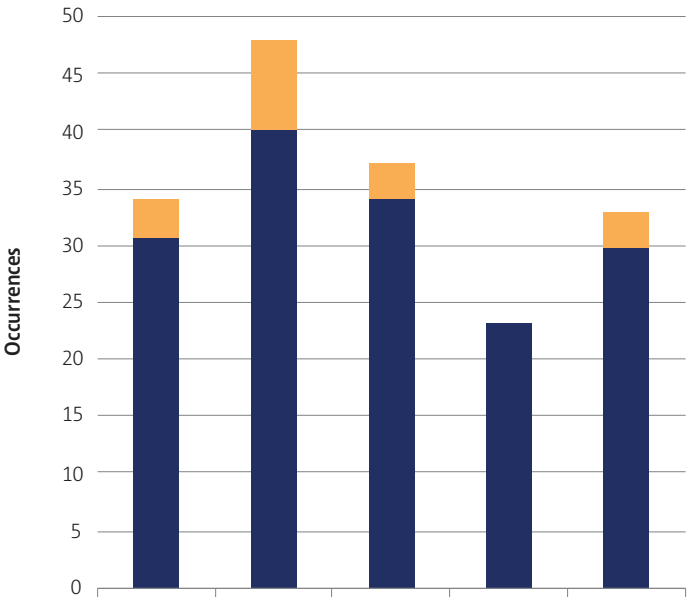


Safety risks for specialised operations aeroplanes

The safety risks for specialised operations aeroplanes have been identified by EASA. They are derived from occurrence data from the EASA occurrence repository and the European Central Repository (ECR).

EASA has reviewed the accidents, serious incidents and some incidents involving specialised operations aeroplanes for 2016-2020 with regard to risk. All occurrences within the scope have been risk assessed using the European Risk Classification Scheme (ERCS) methodology and have been given an ERCS score. The number of ERCS scored occurrences per year is shown in Figure 34.

Figure 34 ERCS higher and lower risk occurrences per year involving specialised operations aeroplanes



	2016	2017	2018	2019	2020
Lower Risk (ERCS)	3	8	3	0	3
Higher Risk (ERCS)	31	40	34	23	30

AEROPLANES

The key risk areas for specialised operations involving aeroplanes are shown in Figure 35. It can be observed that aircraft upset is the highest risk and most common type of accident or serious incident in this domain. There have been approximately 50 occurrences where runway excursion is the key risk area, however the aggregated ERCS risk score of those occurrences is lower than, for example, the risk scores of potential airborne collisions and terrain collisions.

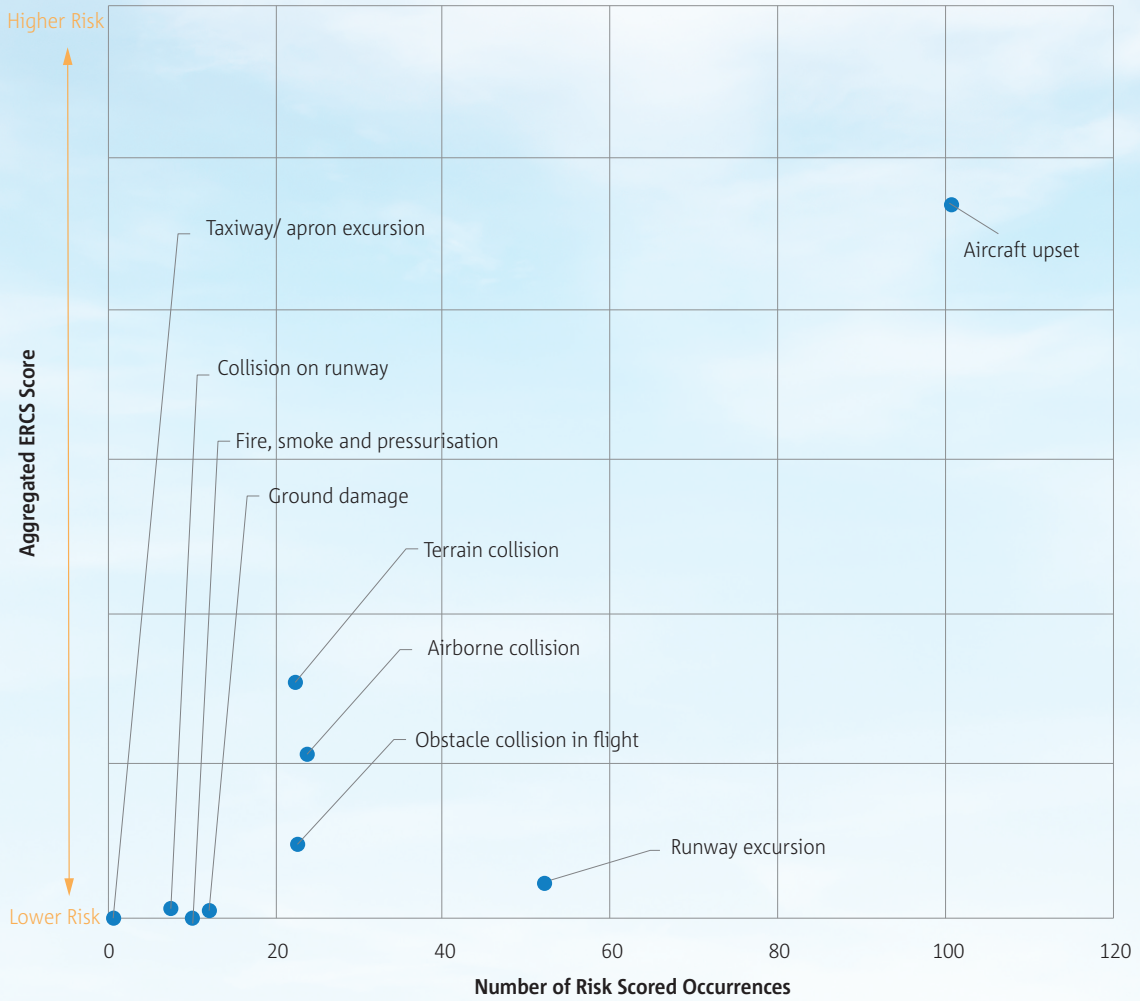
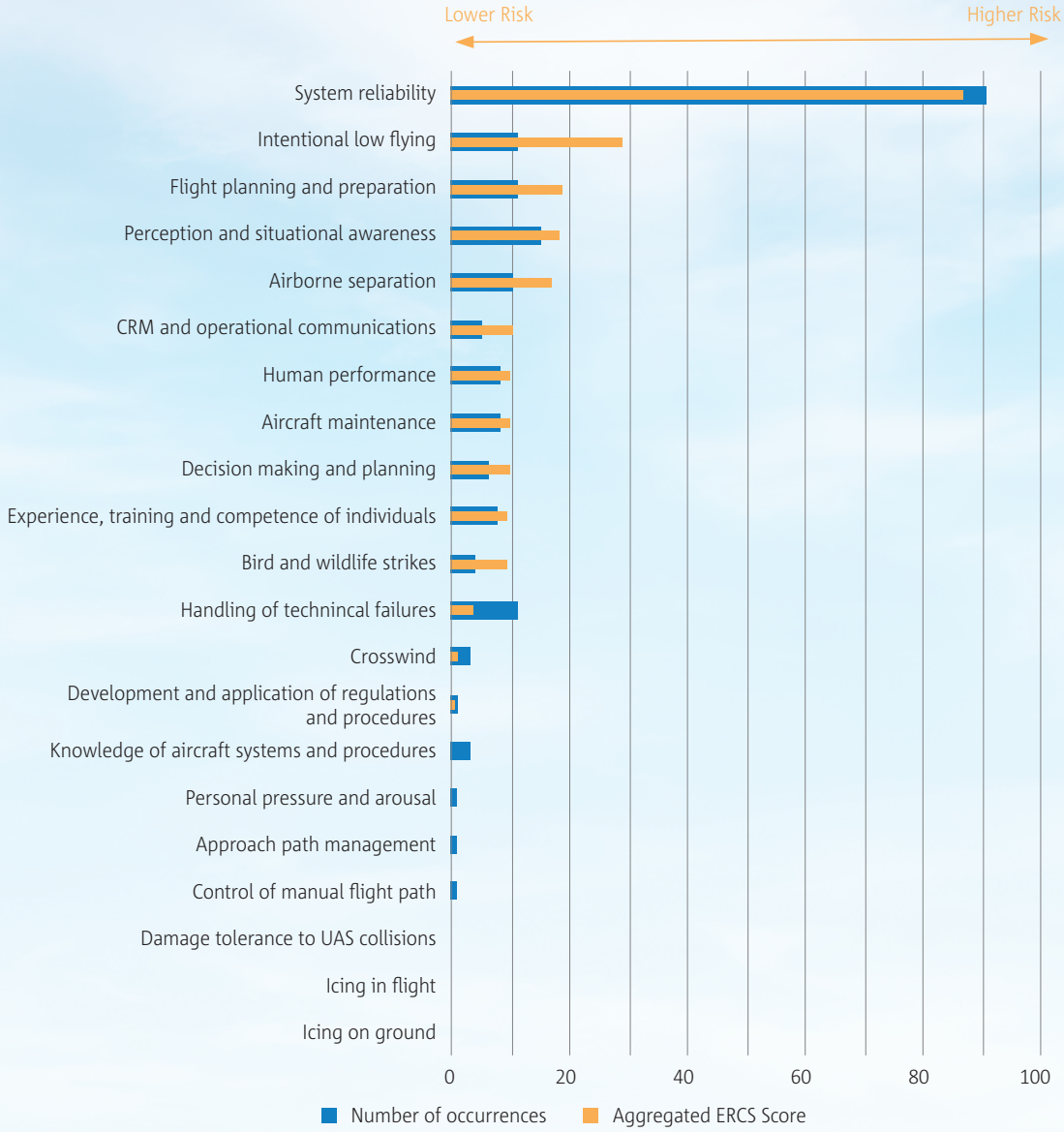


Figure 35 Key risk areas by aggregated ERCS score and number of risk-scored occurrences involving specialised operations aeroplanes

Figure 36 shows a comparison between the number of occurrences per safety issue and their aggregated ERCS score. The number of occurrences provides an indication of how frequently the safety issue occurs, whereas the aggregated ERCS score provides an indication of the accumulated risk of the safety issue. The ERCS score is not used on its own because the finer granularity of the safety issue renders this indicator more vulnerable to the reactiveness of the data type used (only accidents and serious incidents).

Figure 36 Safety Issues by aggregated ERCS score and number of occurrences involving specialised operations aeroplanes



The data portfolio is shown in Table 10 and lists the safety issues for the domain and cross-references these with the key risk areas, highlighting the most important key risk areas and safety issues. The key risk areas are sorted by the aggregated risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues.

Based on the occurrence data, system reliability is the safety issue with the highest aggregated risk score. Perception and situational awareness is the safety issue that affects the most key risk areas, as occurrences for this safety issue could be linked to all key risk areas, except aircraft environment.

Table 10 Data portfolio for specialised operations aeroplanes

SAFETY ISSUE	AIRCRAFT UPSET	TERRAIN COLLISION	AIRBORNE COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION	GROUND DAMAGE	COLLISION ON RUNWAY	FIRE, SMOKE AND PRESSURISATION	TAXIWAY/APRON EXCURSION
System reliability	x	x	o	x	x		o	x	
Intentional low flying	x	o		o	o	o			
Flight planning and preparation	o	o	o	o	o	o			
Perception and situational awareness	o	o	o	o	o	o	o		o
Airborne separation			x						
CRM and operational communications	o	o	o		o				

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

AEROPLANES

SAFETY ISSUE	AIRCRAFT UPSET	TERRAIN COLLISION	AIRBORNE COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION	GROUND DAMAGE	COLLISION ON RUNWAY	FIRE, SMOKE AND PRESSURISATION	TAXIWAY/APRON EXCURSION
Human performance	o	o		o	o		o	o	
Aircraft maintenance	x	o		o				o	
Decision making and planning	o	o	o		o				
Experience, training and competence of individuals	o	o			o		o		
Bird and wildlife strikes	o	o							
Handling of technical failures	x		o	o	o			o	
Crosswind					o	o	o		
Development and application of regulations and procedures							o		
Knowledge of aircraft systems and procedures	o				o				
Personal pressure and arousal				o					
Control of manual flight path	o								
Approach path management	o			o	o				

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

2.5 Non-commercially operated small aeroplanes

The scope of this section covers non-commercial operations involving aeroplanes with a maximum take-off mass below 5 700 kg with an EASA Member State as the state of registry.

Key statistics

The key statistics for this domain are in the tables below and include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe.

Table 11 shows a 7% reduction of fatal accidents between the 10-year average and 2020. The reduction in non-fatal accidents is 2% compared to the 10-year average. The number of serious incidents, however, was more than double in 2020 in comparison with the 10-year average.

Table 12 presents the numbers of fatalities and serious injuries last year compared to the 10-year period. The number of fatalities and the number of serious injuries in 2020 are both lower compared with the 10-year average.

Table 12 Numbers of fatalities and serious injuries involving non-commercially operated small aeroplanes

Table 11 Key statistics for non-commercially operated small aeroplanes

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
621	Fatal accidents	58	↓
4220	Non-fatal accidents	412	↓
746	Serious incidents	152	↑

Table 12 Numbers of fatalities and serious injuries involving non-commercially operated small aeroplanes

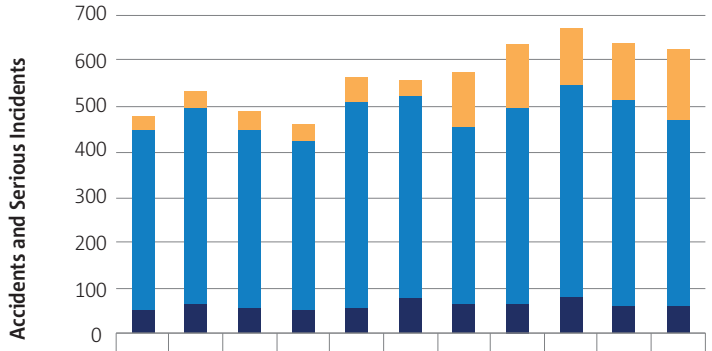
	FATALITIES	SERIOUS INJURIES
2010-2019 total	1068	599
2010-2019 max	132	72
2010-2019 min	91	41
2020	97	48

Figure 37 shows the numbers of fatal and non-fatal accidents and serious incidents per year. Figure 37 also shows an increasing trend of serious incidents from 2016 onwards and the overall trend of accidents is similar. It is estimated that traffic involving non-commercially operated small aeroplanes reduced by 18% in 2020, yet the number of accidents and serious incidents has remained at a very similar level to previous years. Until the accidents and serious incidents have been investigated, it will not be possible to fully understand why the reduction in traffic did not correspond to a reduction in occurrences.

However, it could be assumed that aviation activity was concentrated into times when movement and activity restrictions were temporarily eased, with consequences for pilot recency and familiarity with their tasks.

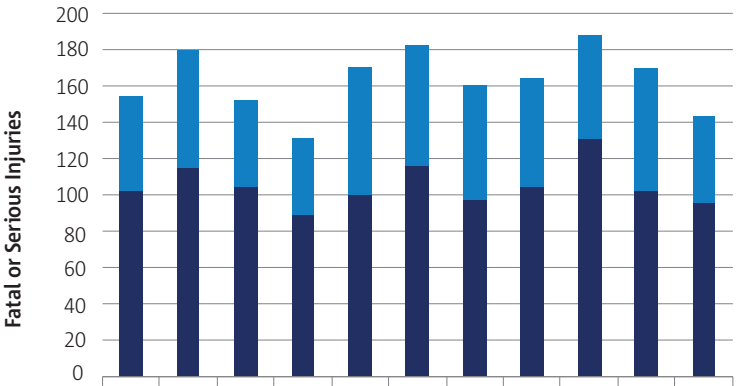
Figure 38 shows the number of fatalities and serious injuries over time. The number of fatalities in 2020 was lower than each year in the preceding decade except 2013. The number of serious injuries was 9% lower compared to the 10-year average of the preceding decade.

Figure 37 Fatal accidents, non-fatal accidents and serious incidents per year involving non-commercially operated small aeroplanes



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	27	37	43	34	52	35	117	144	121	136	152
Non-Fatal Accidents	392	431	392	373	451	441	390	433	469	448	412
Fatal Accidents	53	63	56	50	58	78	63	61	79	60	58

Figure 38 Fatal and serious injuries per year involving non-commercially operated small aeroplanes

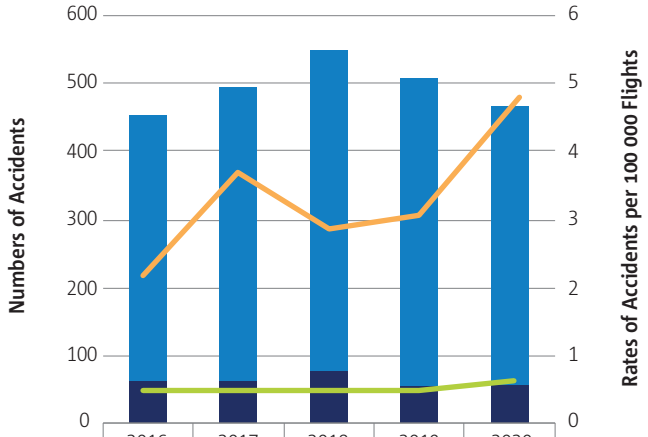


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	55	66	49	41	72	66	64	60	57	69	48
Fatalities	101	116	105	91	100	118	98	105	132	102	97

Rates of accidents

Four years ago, EASA published accident rates for non-commercial operated small aeroplanes for the first time, using the results of a joint EASA/AOPA survey. These figures have been updated in recent years using an AOPA/GAMA survey, including preliminary figures for 2020. The data received from GAMA and AOPA contain an estimated number of flight hours on single engine piston aircraft.

Figure 39 Numbers and rates of accidents involving non-commercially operated small aeroplanes

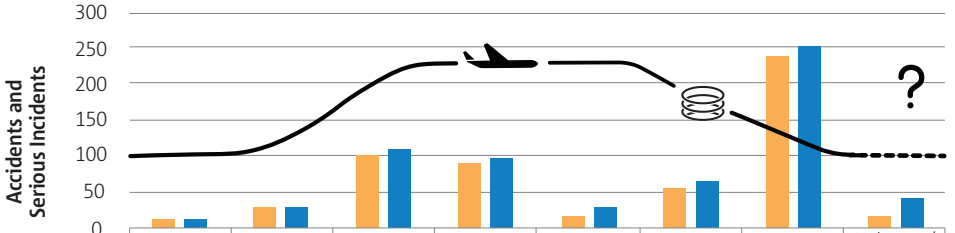


	2016	2017	2018	2019	2020
Non-Fatal Accidents	390	433	469	448	412
Fatal Accidents	63	61	79	60	58
Fatal Accident Rate	0.52	0.51	0.50	0.45	0.66
Non-Fatal Accident Rate	2.32	3.68	2.86	3.10	4.72

Phase of flight

The most common accidents in general aviation happen in the landing phase. These accidents are often classed as runway excursions (see Figure 45) with a low risk of injuries, but result in substantial damage to the aircraft. In 2020, a 5% increase in landing accidents was observed compared to the average of the previous decade. By contrast, the approach phase shows accidents resulting in a loss of control due to low speed and/or steep turns as well as undershoot and collisions with objects. These accidents tend to result in fatalities or serious injuries. Accidents during the approach phase in 2020 have increased by 21% compared to the 10-year average. It can also be observed that accidents during the take-off and en route phases are often due to technical failures and/or loss of control.

Figure 40 Accidents and serious incidents by phase of flight involving non-commercially operated small aeroplanes

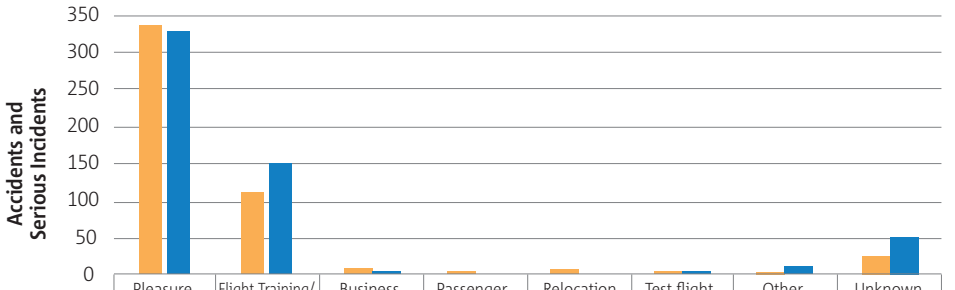


	Standing	Taxi	Take-off	En route	Manoevring	Approach	Landing	Unknown/ blank
Average 2010-2019	14.2	29.5	102.1	89.9	17.9	53.9	239.2	17
2020	13	30	107	97	28	68	253	42

Operation type

The two main operation types in NCO are pleasure/ recreational flying and training flight. In Figure 41, it can be observed that 2020 resulted in a 39% increase in accidents on instructional flights compared to the 10-year average with pleasure flight accidents being slightly below the average of the preceding decade.

Figure 41 Accidents and serious incidents by operation type involving non-commercially operated small aeroplanes



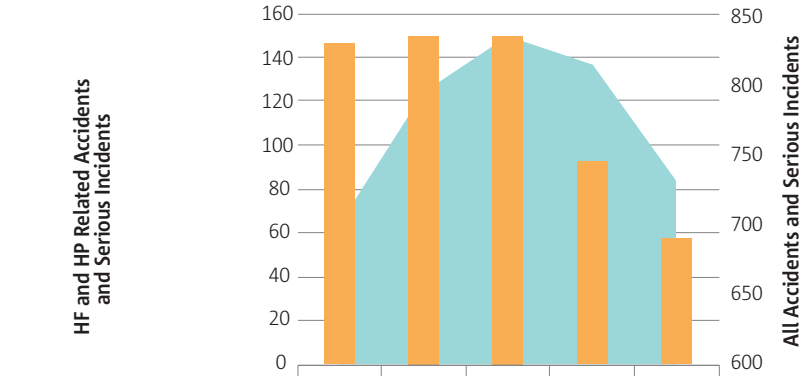
	Pleasure	Flight Training/ Instructional	Business	Passenger	Relocation	Test flight	Other	Unknown
Average 2010-2019	340.3	111.7	10	5	8.2	7.1	6.4	27.4
2020	333	155	5	2	1	5	12	51

Human factors and human performance

Approximately one fifth of non-commercially operated small aeroplane accident and serious incident reports identify human factors (HF) or human performance (HP) issues, these are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. The figures for 2016 – 2018 are relatively stable in terms of the number of HF/HP issues identified, whereas the figures for 2019 and 2020 is showing a significant drop. This is because HF and HP issues are often not recorded within accident and serious incident reports until the final report is published. In addition, there are often less data available to investigators owing to the lack of recording devices on board the aircraft in question.

The application of HF or HP codes at a high level can be seen in Figure 43. Clearly, events relating to task performance are easier to diagnose following an accident or serious incident than the underlying factors relating to the task performance.

Figure 42 Human factors and human performance accidents and serious incidents involving non-commercially operated small aeroplanes



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	701	792	831	814	731
HF/ HP Accidents and Serious Incidents	145	150	150	91	57

Figure 43 High level human factors and human performance event codes applied to accidents and serious incidents involving non-commercially operated small aeroplanes

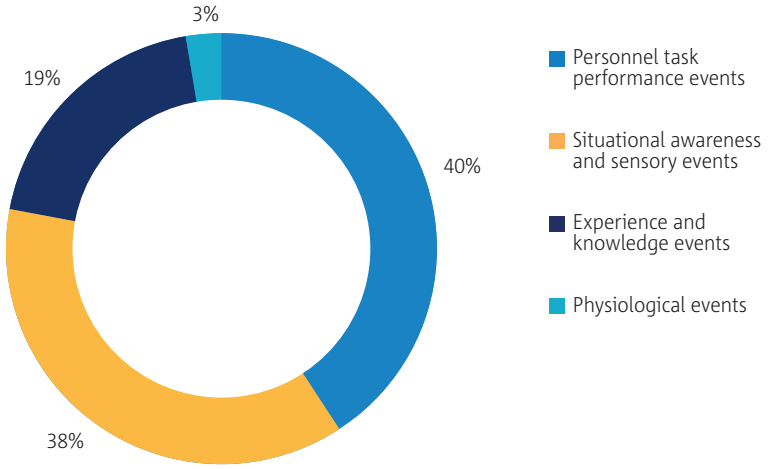
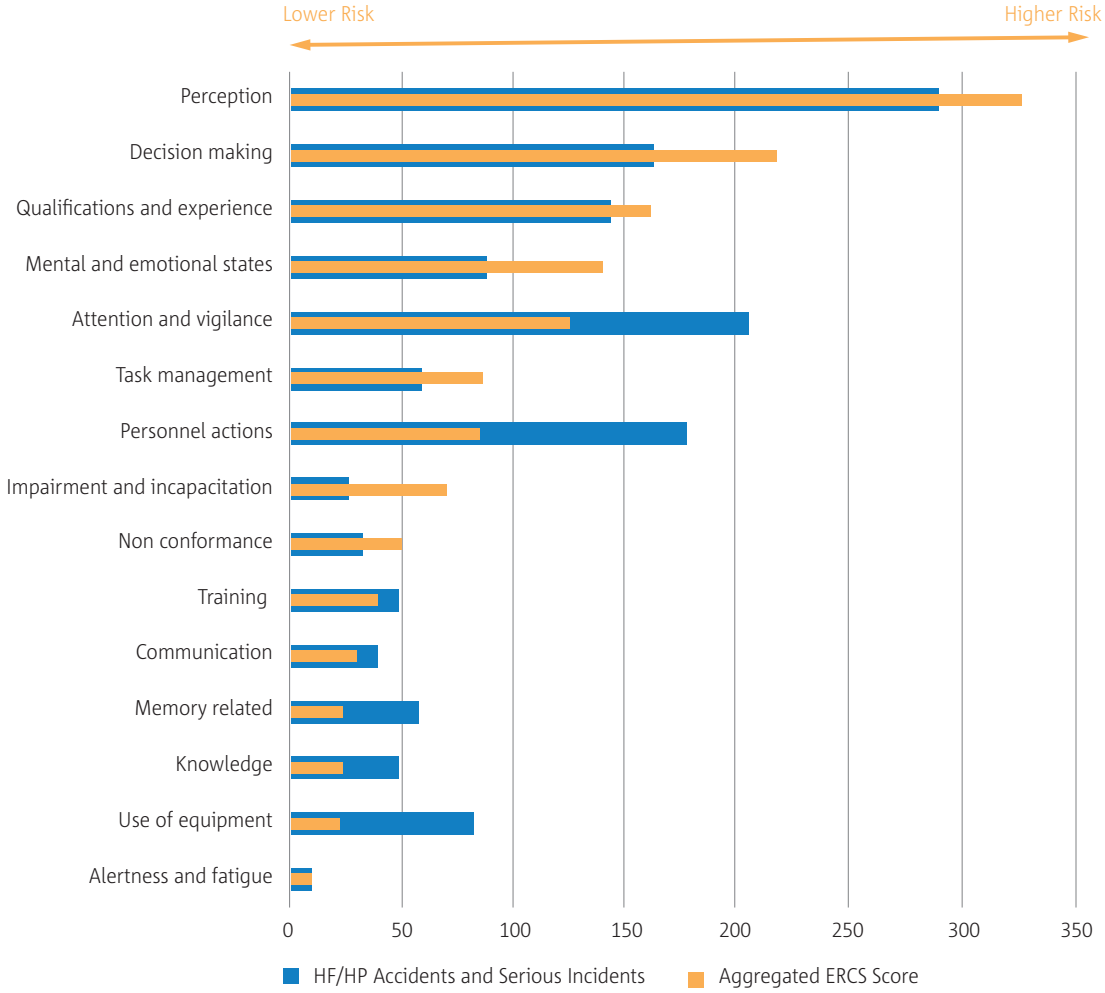


Figure 44 compares the numbers of accidents and serious incidents with the aggregated ERCS risk score of those incidents, using detailed HF and HP event codes. Some events carry a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents.

Figure 44 Detailed human factors and human performance event codes by aggregated ERCS score and numbers of accidents and serious incidents involving non-commercially operated small aeroplanes



Safety risks for non-commercially operated small aeroplanes

EASA has reviewed the accidents and serious incidents involving non-commercially operated small aeroplanes for 2016-2020 with regard to risk. They are derived from occurrence data from the EASA occurrence repository. All occurrences within the scope have been risk assessed using the European Risk Classification Scheme (ERCS) methodology and have been given an ERCS score. Figure 45 shows the key risk areas (KRA) in relation to the number of accidents compared to the aggregated ERCS score. The figure clearly shows that the KRA showing the highest risk is aircraft upset. While runway excursions are common, there is a low risk of fatal or serious injuries associated with them.

The safety issues identified in the non-commercially operated small aeroplane data portfolio are shown in Figure 46. The portfolio has been updated to better differentiate between outcomes and safety issues. The 'stall and loss of control (other)' safety issues in previous publications have been removed as they are outcomes that fall under the aircraft upset key risk area.

Figure 46 shows that the safety issue 'engine system reliability' is the highest both in terms of number of occurrences and risk. This safety issue focuses on engine failures and engine performance problems that force the aircraft to land. Engine failure alone is not usually an issue that leads to a fatal outcome; therefore HF/HP may also play a role although has not commonly been identified in investigation reports. General aviation aircraft usually have good glide ratios, enabling pilots to find a suitable landing area, given their pre-flight preparation and sufficient altitude at the time of the occurrence. This issue is strongly linked to the safety issue 'handling of technical failures'. The issue focuses on the pilot's actions after the engine or other system failure. Many of the accidents under this issue result in serious injuries or fatal accidents. A high-risk score has therefore been attributed.

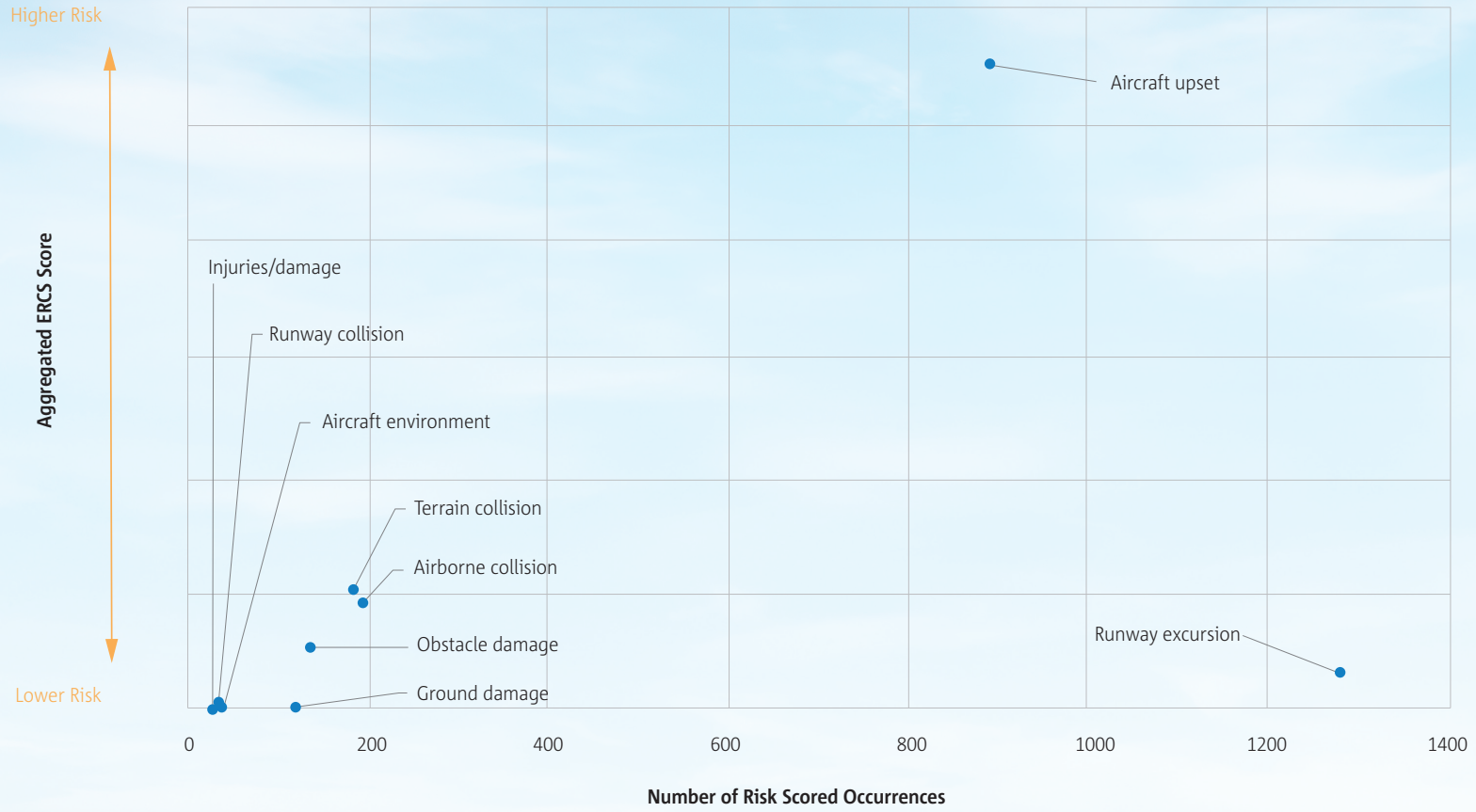
The safety issues of 'inflight decision making and planning', and 'pre-flight planning and preparation' all relate to the 'handling of technical failures' safety issue. These three HF/HP issues highlight the importance of planning each flight carefully and of anticipating various scenarios in the planning. Such scenario planning will help the pilot to react correctly to the safety critical situation and perhaps avoid a serious outcome – specifically loss of control situations. This is supported in Figure 45, which shows aircraft upset bearing the highest risk. Other safety issues that also play a part in aircraft upset are 'approach path management', 'inappropriate control inputs', 'inadvertent flight into IMC/marginal flying' (colloquially called 'scud' flying) and 'experience, training, and competence of individuals'.

In preparing this review, consideration was given to splitting the system reliability issue, which has been used in the portfolio for some time, between engine issues and all other equipment failures for better clarity. Another aspect of the system reliability issue requiring this change relates to equipment failures, as many involve runway excursions due to hard landings and result in damage to landing gears, wings and engines/propellers. Landing gears may break during hard landings, but it is not easy to determine if the gear has been exposed to loads outside the certified specifications or other factors.

The sixth issue, airborne conflict, concerns both actual collisions and near-misses. Due to the nature of the issue, it often bears high risk and is therefore high on the list.

Another issue that has been added to the portfolio is parachute operations. In recent years, accidents have occurred causing multiple fatalities. The operation of the aircraft during parachute operations is somewhat different from normal flying. The aircraft is flown, usually fully loaded with parachute jumpers, to the desired height over the jump area, then the engine is idled and the aircraft lands shortly after to pick up more jumpers. This introduces a different load and stress to the aircraft components than that of non-parachute operations.

Figure 45 Key Risk Areas by aggregated ERCS score and number of risk-scored occurrences, involving non-commercially operated small aeroplanes



There is also the factor of mass and balance. The centre of gravity in some aircraft is sensitive towards where the jumpers sit in the aircraft and in what order they jump. It is of paramount importance that this operation is conducted within the aircraft's flight envelope and operational procedures.

The data presented in Figure 46 has been used to formulate the data portfolio presented in Table 13. Here, the domain safety issues are listed and cross-referenced with the key risk areas, while highlighting the most important key risk areas and safety issues. The key risk areas are sorted from left to right by the aggregated ERCS score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS score. The different colour bands denote high to low risk of the safety issues. However, as many of the occurrences in 2020 are still being investigated, the conclusions and safety priorities may change as the data is further analysed.

The safety issues identified in the non-commercially operated small aeroplane data portfolio are shown in Figure 46, providing a comparison of the number of occurrences per safety issue and their aggregated ERCS score. The number of occurrences provides an indication of how frequently the safety issue occurs, whereas the aggregated ERCS score provides an indication of the accumulated risk of the safety issue. The ERCS score is not used alone because the finer granularity of the safety issue renders this indicator more vulnerable to the reactiveness of the data type used (only accidents and serious incidents).

In this edition, a new safety issue is introduced to the portfolio. The 'inadvertent flight into IMC/scud flying' (previously 'intentional low flying') captures the accidents and serious incidents where pilots have either inadvertently entered IMC or decided to dive under the cloud base in the hope of reaching their destination. These occurrences often end with a loss of control and a fatal outcome. Of the 59 identified occurrences over the last 5 years, the Figure 46 shows clearly how high the risk is.

'Experience, training and competence of individuals', 'pre-flight planning and preparation' and 'inflight decision making and planning' all show the importance of understanding the necessity of recency and proper training. This involves properly planning the flight before starting the engine and making inflight decisions supported by that initial planning.

The safety issue 'mass and balance' (previously 'baggage and cargo loading') was renamed and the query modified to better fit NCO aeroplane operations. GA pilots make their own weight and balance calculations and load their aircraft themselves. The data shows that the aggregated risk is still high for the 24 occurrences that have been attributed to this safety issue.

The data presented in Figure 46 has been used to formulate the data portfolio presented in Table 13 and lists the safety issues for the domain cross-referenced with the key risk areas, which highlights the most important key risk areas and safety issues. The key risk areas are sorted from left to right by the decreasing aggregated risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues. However, as many of the occurrences in 2019 are still being investigated, the conclusions and safety priorities may change as the data is further analysed.

Figure 46 Safety Issues by aggregated ERCS score and numbers of accidents and serious incidents involving non-commercially operated small aeroplanes

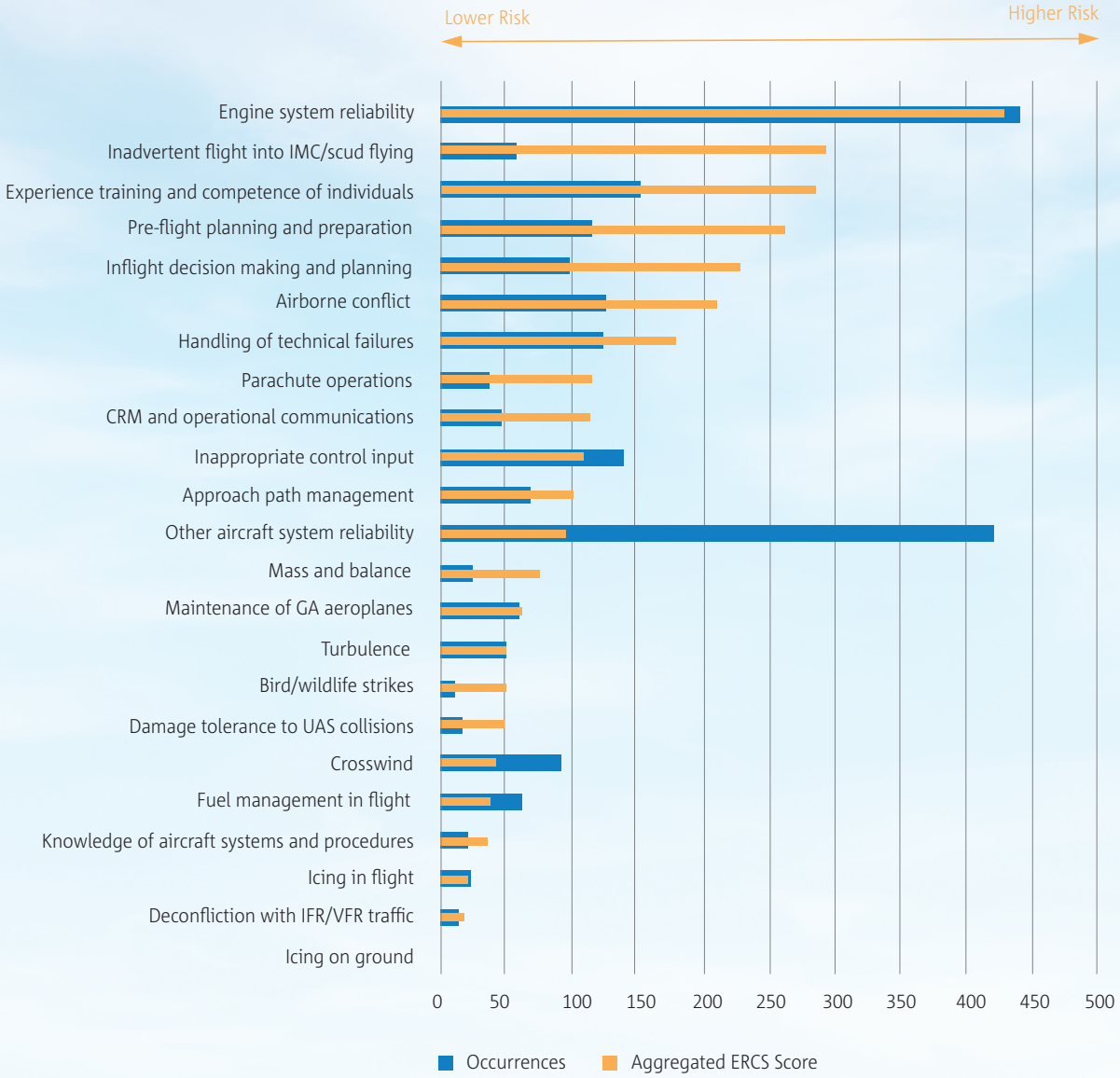


Table 13 Data portfolio for non-commercially operated small aeroplanes

SAFETY ISSUE	KEY RISK AREAS (ERCS)								
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	AIRBORNE COLLISION	RUNWAY EXCURSION	FIRE, SMOKE AND PRESSURISATION	GROUND DAMAGE	COLLISION ON RUNWAY	TAXIWAY/APRON EXCURSION
Engine system reliability	x	x	x	o	x	o	o		
Inadvertent flight into IMC/scud flying	x	x	o	o	x		o	o	
Experience, training, and competence of individuals	x	o	x	o	x	o	o	o	o
Pre-flight planning and preparation	x	o	x	o	x	o	o	o	o
Inflight decision making and planning	x	o	x	o	x			o	
Airborne conflict	o		o	x					
Handling of technical failures	x	o	o	o	x	o	o	o	
Intentional low flying	o	o	o	o					
Parachute operations	x	o	o	o	o	o			
CRM and operational communications	o	o	o	x	o	o	o	o	
Inappropriate control input	x	o	o	o	x		o	o	o
Approach path management	x	o	o		x			o	
Other aircraft system reliability	o	o	o	o	o	o	o	o	
Mass and balance	o	o	o	o	o	o	o	o	

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)								
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	AIRBORNE COLLISION	RUNWAY EXCURSION	FIRE, SMOKE AND PRESSURISATION	GROUND DAMAGE	COLLISION ON RUNWAY	TAXIWAY/APRON EXCURSION
Maintenance of GA aeroplanes	o		o		o	o			
Turbulence	x	o	o	o	o	o	o		o
Bird and wildlife strikes	x	o	o	o	x		o	o	
Damage tolerance to UAS collisions	o		o		o			o	
Crosswind	o	o	o	o					
Fuel management in flight	x	o	o		x		o	o	o
Knowledge of aircraft systems and procedures	x	o	o	o	o			o	
Icing in flight	o	o	o	o	o	o	o	o	
Deconfliction with IFR/VFR traffic	x	o	o	o	o	o	o	o	
Icing on ground				o					

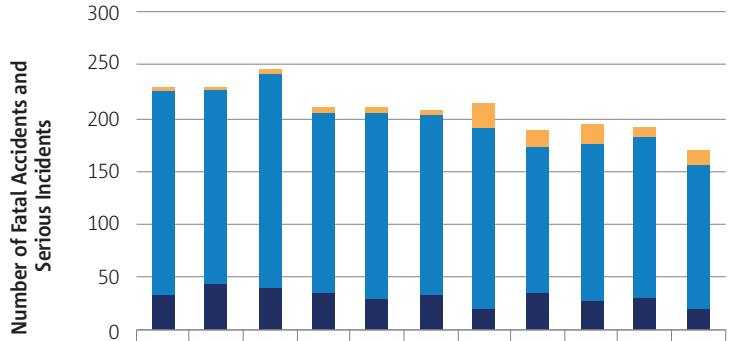
x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

Microlights

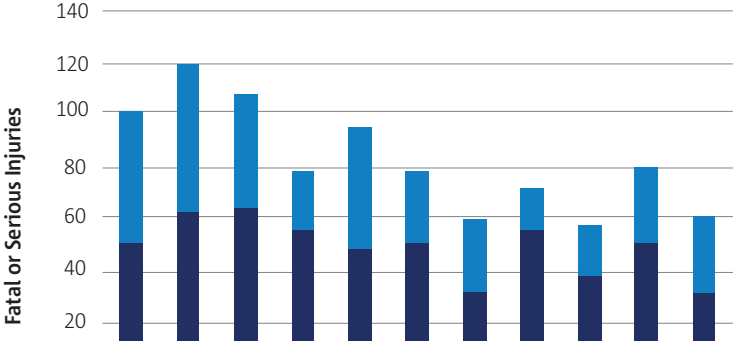
The diversity of general aviation exceeds EASA´s regulatory remit. However, most accidents involving EASA Member State registered microlights and ultralights also occur on European soil. Figure 47 shows accidents and serious incidents from 2010 to 2020 that have been reported to EASA or collected by other means. This data is probably not exhaustive and could change over time. Figure 48 provides an overview of the reported fatalities and injuries during the same period. Overall, it can be seen that the number of accidents, serious injuries and fatalities is decreasing over the period shown in both figures.

Figure 47 Numbers of fatal accidents, non-fatal accidents and serious incidents per year involving non-commercially operated microlights



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	1	1	3	4	5	2	22	15	17	9	12
Non-Fatal Accidents	193	182	199	167	173	168	169	136	148	149	134
Fatal Accidents	34	45	42	38	31	35	22	37	29	33	23

Figure 48 Numbers of fatal and serious injuries per year involving non-commercially operated microlights



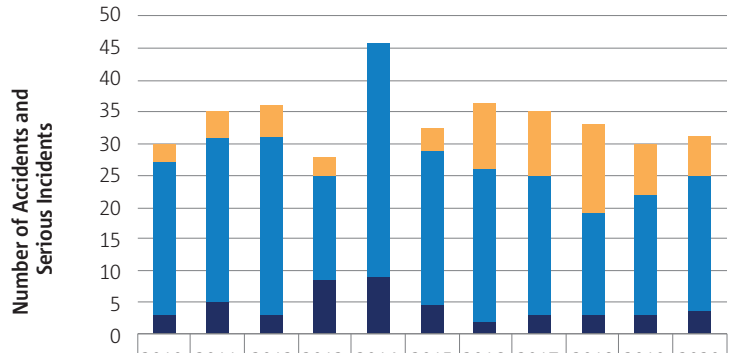
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	51	58	42	23	47	30	28	18	20	30	29
Fatalities	50	62	65	55	48	49	31	54	37	50	31

Aircraft registered outside the EASA Member States

Aircraft registered outside the EASA Member States but operated in one also fall outside of EASA's remit. Most of these aircraft are registered in the United States of America (N-registered aircraft). To provide an overview of this sector EASA now provides figures of accidents and serious incidents that have been reported to or collected by EASA.

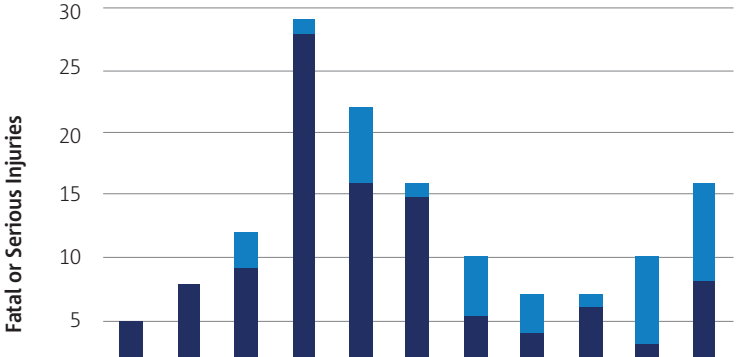
Figure 49 shows 257 non-fatal and 49 fatal accidents from 2010-2020. Figure 50 shows that these accidents resulted in 99 fatalities and 27 serious injuries over the period.

Figure 49 Fatal accidents, non-fatal accidents, and serious incidents on EU/EEA soil per year involving non-commercially operated aircraft not registered in an EASA MS.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	3	4	5	3	0	3	10	10	14	8	6
Non-Fatal Accidents	24	26	28	16	37	24	24	22	16	19	21
Fatal Accidents	3	5	3	9	9	5	2	3	3	3	4

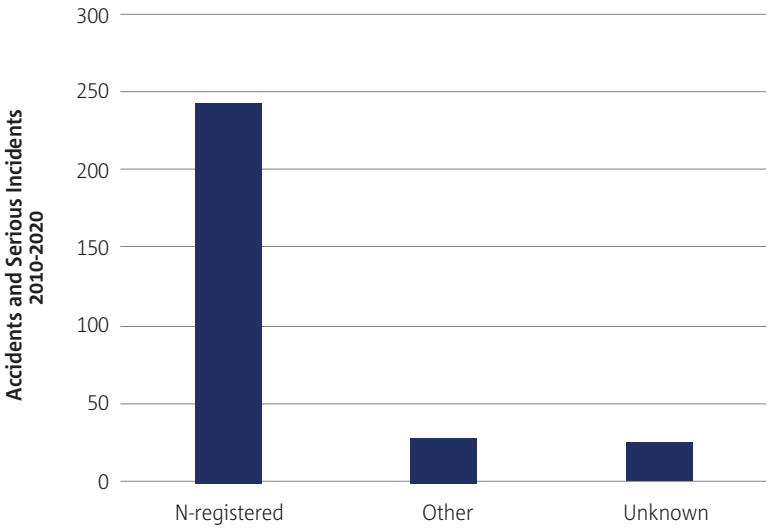
Figure 50 Fatal and serious injuries per year involving non-commercially operated aircraft not registered in the EASA MS



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	0	0	3	1	6	1	5	3	1	7	8
Fatalities	5	8	9	28	16	15	5	4	6	3	8

Figure 51 shows that over the 2010-2020 period the number of N-registered aeroplanes involved in fatal and non-fatal accidents on EU/EEA soil were 245, whereas the number for aircraft registered in other non-EASA member states was 27 and the number for aircraft with unknown registration was 23.

Figure 51 Fatal and non-fatal accidents on non-commercially operated aircraft not registered in the EASA MS



CHAPTER 3

Helicopters

This chapter covers all operations involving certified helicopters. The chapter is divided into four main sections:

1. **All helicopter operations** providing aggregated statistics on certified helicopters performing commercial air transport, specialised operations or non-commercial operations, and for which an EASA MS is either state of operator, state of registry or state of occurrence;
2. **Commercial air transport flights** conducted by EASA Air Operators Certificate (EASA AOC) holders and using certified helicopters. This section brings together commercial air transport helicopter operations for both onshore flights and includes HEMS, air taxi or sightseeing, and those flights to offshore oil, gas and renewable energy installations;
3. **Specialised operations** involving certified helicopters, such as sling load, advertisement, and photography with an EASA MS as state of operator or state of registry;
4. **Non-commercial operations** involving certified helicopters, with an EASA MS as the state of operator or state of registry. This section includes in particular training flights.

The data presented are based on the accidents and serious incidents collected by the Agency under Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, and through actively searching for those events from other official sources.

For each section, the key statistics are presented. The sections 2, 3 and 4 also contain an individual data portfolio, which provides an overview of the main safety risks for these types of operations at the European level, based on occurrence data.

The list of fatal accidents associated with the scope of this chapter is provided in Appendix 1 of this document, as is a list of fatal accidents involving non-certified helicopters (Annex I products).

3.1 All helicopter operations

The scope of this section covers the key safety statistics for certified helicopters performing commercial air transport, specialised operations or non-commercial operations, and for which an EASA MS is either state of operator, state of registry or state of occurrence.

Key statistics

The key statistics for this domain are in Table 14 and Table 15. Included is a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe. The number of fatal accidents and non-fatal accidents in 2020 has reduced by 50% in comparison with the average figures of the previous 10-year period, whereas the number of serious incidents was higher than the average. The number of fatalities and serious injuries in 2020 were also significantly lower than the preceding decade average.

The number of accidents and serious incidents per year are shown in Figure 52. The total number of accidents and serious incidents in 2020 has reduced by around 50% compared to 2019.

Since these figures are not normalised with traffic data, this significant drop in the number of occurrences should be interpreted cautiously, as the exact impact of the COVID-19 pandemic on the flying activity of helicopters at European level is difficult to evaluate at present. The Agency is currently taking action to address the recurrent challenge of evaluating the level of helicopter flying activity in Europe within a specific stream of the rotorcraft safety roadmap.

Table 14 Key statistics for all helicopter operations

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
108	Fatal accidents	4	↓
534	Non-fatal accidents	24	↓
136	Serious incidents	18	↑

Table 15 Fatalities and serious injuries involving all helicopter operations

	FATALITIES	SERIOUS INJURIES
2010-2019 total	271	144
2010-2019 max.	38	23
2010-2019 min.	11	4
2020	9	3

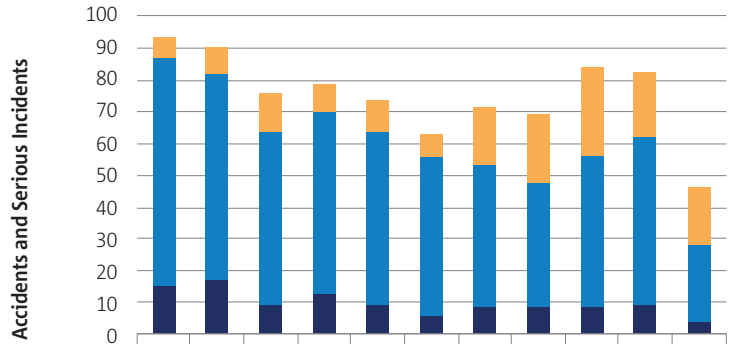
Based on feedback from the rotorcraft community, it can nevertheless be observed that:

- The overall helicopter traffic in the EASA Member States decreased in 2020, but in smaller proportions than the decrease of accidents.
- This change in the level of flying activity in 2020 was very different depending on the type of operation performed.

Also, it should be highlighted that any tangible trend should be based on a multi-year observation. It is therefore prudent to see if the figures in the coming years will confirm or refute any significant decreasing trend in the number of helicopter accidents.

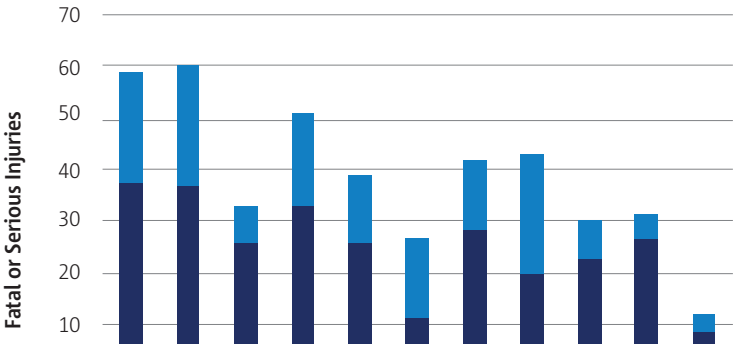
The number of fatalities and serious injuries per year is shown in Figure 53. The number of fatalities and serious injuries in 2020 is the lowest observed in the entire period.

Figure 52 Fatal accidents, non-fatal accidents and serious incidents per year involving all helicopter operations



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	6	7	11	9	9	7	18	21	28	20	18
Non-Fatal Accidents	71	65	54	58	54	50	44	39	47	52	24
Fatal Accidents	16	17	10	12	10	6	9	9	9	10	4

Figure 53 Fatal and serious injuries per year involving all helicopter operations

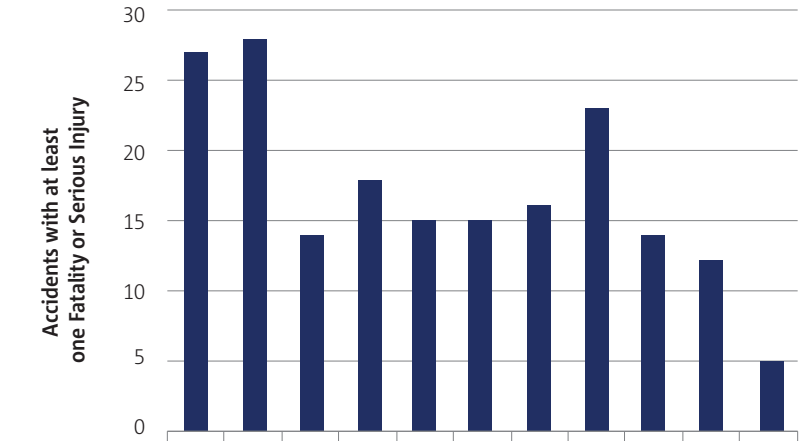


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	21	22	7	18	13	16	13	23	7	4	3
Fatalities	38	38	26	33	26	11	29	20	23	27	9

Rotorcraft safety roadmap SPI

The number of accidents that have caused at least one fatality or serious injury is the safety performance indicator used to monitor the effectiveness of the EASA rotorcraft safety roadmap which was launched in 2018. This indicator is shown in Figure 54. 2020 was the third consecutive year where a decrease in the number of accidents with at least one fatality or serious injury occurred.

Figure 54 Number of accidents with a least one fatality or serious injury for all helicopter operations



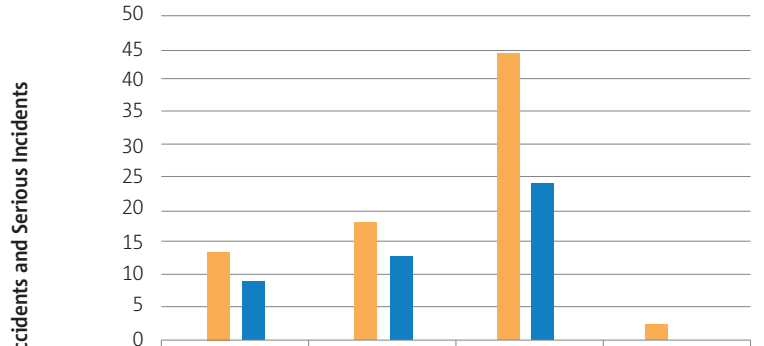
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Roadmap SPI	27	28	14	18	15	15	16	23	14	12	5

Helicopter operations sub-domains

Figure 55 shows the numbers of accidents and serious incidents for the 4 main sub-domains of operations involving certified helicopters. Over the decade 2010-2019, the proportions of each domains are the following:

- 57% of all accidents and serious incidents involved helicopters performing non-commercial operations and for which an EASA MS was either the state of operator or state of registry

Figure 55 Accidents and serious incidents by helicopter operation sub-domains



	CAT-EASA MS AoC holder	SPO-EASA MS operated or registered	Non commercial - EASA MS operated or registered	Third country registered
Average 2010-2019	13.4	17.9	44.7	2.1
2020	9	13	24	0

- 23% of all accidents and serious incidents involved helicopters performing specialised operations and for which an EASA MS was either the state of operator or state of registry
- 17% of all accidents and serious incidents involved helicopters performing commercial air transport conducted by EASA MS Air Operators Certificate (EASA AOC) holders
- 3% of all accidents and serious incidents involved helicopters whose state of operator and state of registry were a third country but for which the state of occurrence was an EASA MS.

In 2020, the figures decreased in absolute numbers for all sub-domains. However, the proportion of occurrences for commercial air transport and specialised operations slightly increased, whereas it decreased for non-commercial operations. This observation should be tempered by the fact that the decrease in activity of non-commercial operations was more pronounced due to the COVID-19 pandemic and its lockdown measures, in comparison with the other domains. These 3 sub-domains are further analysed in the sections 2, 3 and 4 of this chapter respectively.

There was no accident or serious incident occurring in an EASA MS involving a certified helicopter registered in a foreign country in 2020.

Type of certified helicopter (CS27/CS29)

Figure 56 shows the numbers of accidents and serious incidents per type of certified product (CS27 or CS29).

Over the decade 2010-2019, the proportions for each type are the following:

- CS27 helicopters: 89% of all accidents and serious incidents
- CS29 helicopters: 11% of all accidents and serious incidents

In 2020, this number remained equivalent for CS29 helicopters, whereas the number of occurrences involving CS27 helicopters was half as high compared to the preceding decade average.

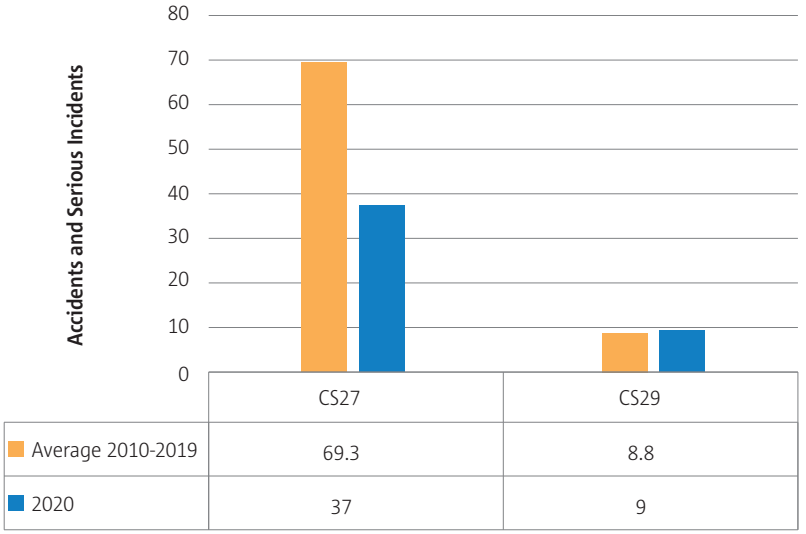


Figure 56 Accidents and serious incidents by certification specification for all helicopter operations

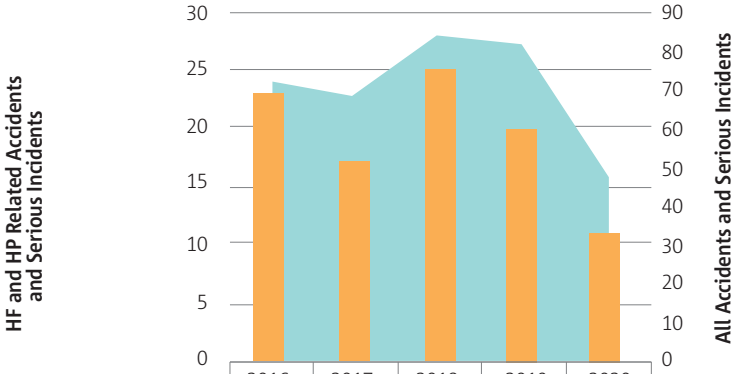
Human factors and human performance

Human factors (HF) or human performance (HP) issues, labelled as 'personnel occurrences' in the ECCAIRS taxonomy, can be identified in over a quarter of accidents and serious incident reports involving helicopters. Looking at the figures for the past five years, the number of identifiable HF or HP issues is relatively stable. Many of these issues are identified following more detailed investigations – meaning that the figures for 2020 are likely to increase once final investigation reports are published.

The application of HF or HP codes at a high level can be seen in Figure 58. Issues relating to situational awareness and sensory events, as well as task performance events, seem to be more commonly experienced, reported or discernible following an accident or serious incident than the factors that cause them.

Figure 59 compares the number of accidents and serious incidents with the aggregated ERCS risk score of those occurrences, using detailed HF and HP event codes. It can be seen that some types of event have a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents. Some occurrence types generate a higher risk per occurrence than others, as can be seen by comparing the risk scores and numbers of occurrences of issues such as mental and emotional states with personnel actions.

Figure 57 Human factors and human performance accidents and serious incidents involving all helicopter operations



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	71	69	84	82	46
HF/HP Accidents and Serious Incidents	23	17	25	20	11

Figure 58 High level human factors and human performance event codes applied to accidents and serious incidents involving all helicopter operations

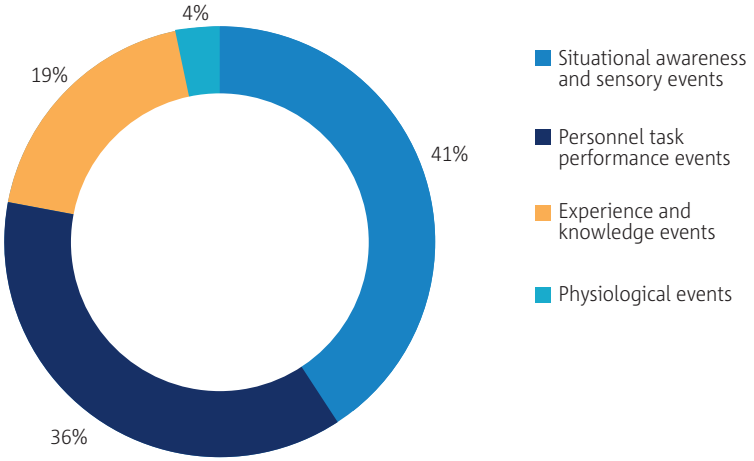
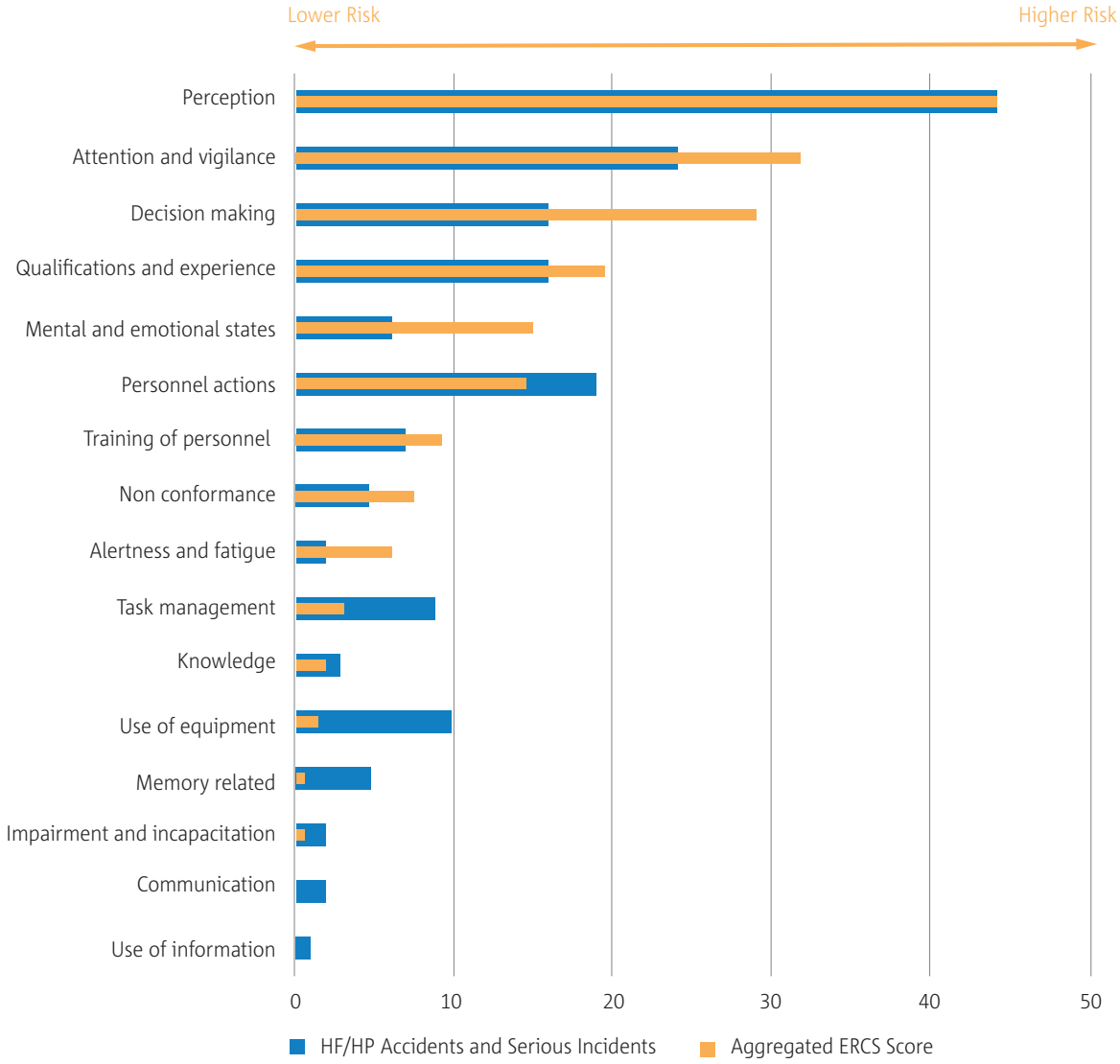


Figure 59 Detailed human factors and human performance event codes by aggregated ERCS score and number of accidents and serious incidents involving all helicopter operations



3.2 Commercial air transport helicopters

The scope of this section covers the key safety statistics for certified helicopters performing commercial air transport and operated by an EASA MS AOC holder.

European CAT helicopter fleet

Figure 60 and Figure 61 show the size of the helicopter commercial air transport sector in the EASA Member States and its evolution over the period 2015-2020. A slight decrease in the number of helicopter air operator certificate holders can be observed over the last 3 years, whereas the number of helicopters performing commercial air transport remained relatively stable at around 2400 helicopters. The average number of helicopters per AOC holders in 2020 is between 8 and 9.

Figure 60 Number of helicopter air operator certificate (AOC) holders in the EASA Member States

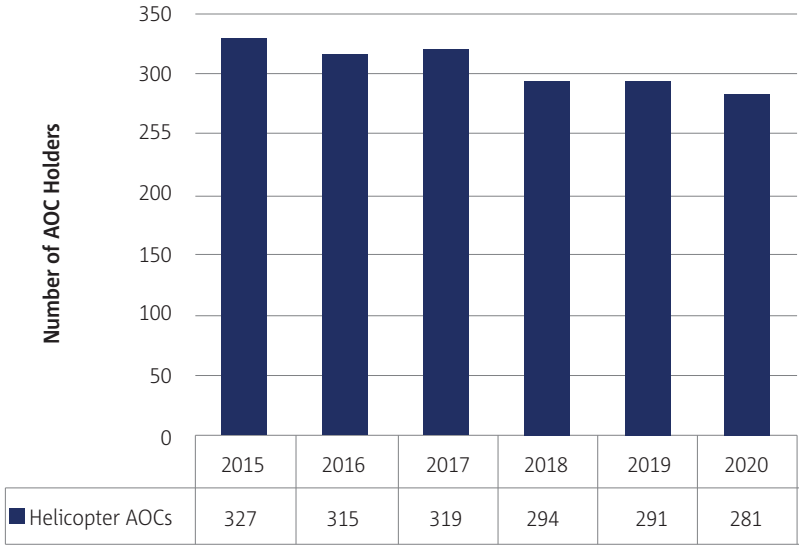
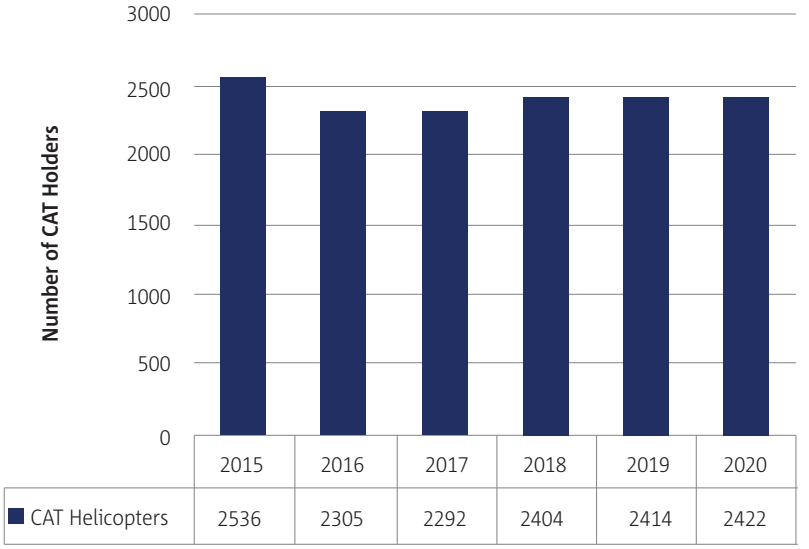


Figure 61 Number of helicopters performing commercial air transport in the EASA Member States



Key statistics

The key statistics for this domain are in Table 16 and Table 17, which include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe.

The number of accidents, fatalities and serious injuries in 2020 were significantly lower than the average of the preceding decade.

The numbers of accidents and serious incidents per year are shown in Figure 62. The total number of accidents and serious incidents in 2020 has decreased of 50% compared to 2019. The only fatal accident in 2020 occurred in Italy during an air taxi operation for heliskiing when a skier remained hooked with the helicopter's utility basket on take-off and fell to the ground.

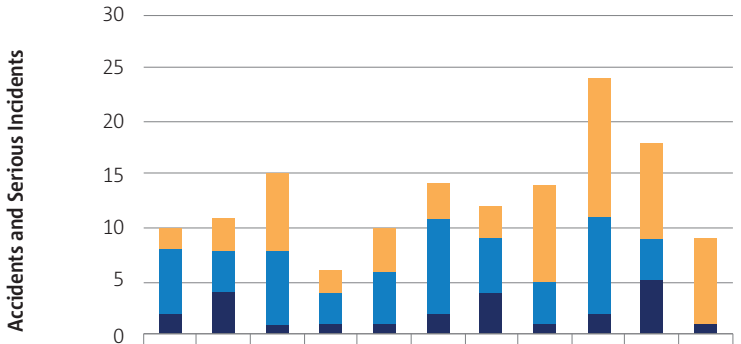
Table 16 Key statistics for commercial air transport helicopters

2010-2019 TOTAL	TIMESPAN	2020	2020 VS 2010-2019
23	Fatal accidents	1	↓
56	Non-fatal accidents	0	↓
55	Serious incidents	8	↑

Table 17 Fatalities and serious injuries involving commercial air transport helicopters

	FATALITIES	SERIOUS INJURIES
2010-2019 total	95	40
2010-2019 max.	22	7
2010-2019 min.	2	0
2020	1	0

Figure 62 Fatal accidents, non-fatal accidents and serious incidents per year involving commercial air transport helicopters

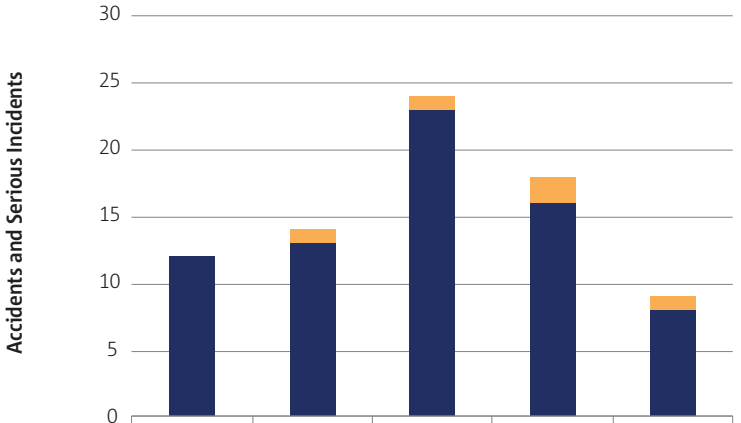


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	2	3	7	2	4	3	3	9	13	9	8
Non-Fatal Accidents	6	4	7	3	5	9	5	4	9	4	0
Fatal Accidents	2	4	1	1	1	2	4	1	2	5	1

Figure 63 shows occurrences that have been risk scored using the ERCS methodology and divided into higher and lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to the review. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern from the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal to or even exceed the risk of some accidents.

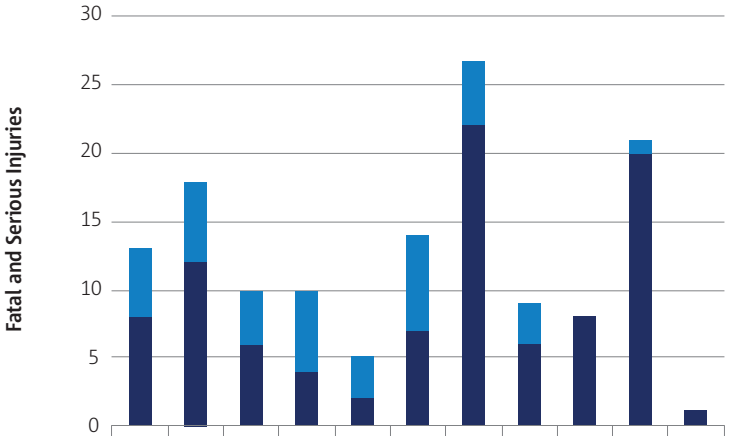
The numbers of fatalities and serious injuries per year are shown in Figure 64. With 1 fatality and no serious injuries, 2020 presents the lowest figures observed in the past 11 years.

Figure 63 ERCS higher and lower risk occurrences per year involving commercial air transport helicopters



	2016	2017	2018	2019	2020
Lower Risk (ERCS)	0	1	1	2	1
Higher Risk (ERCS)	12	13	23	16	8

Figure 64 Fatal and serious injuries per year involving commercial air transport helicopters

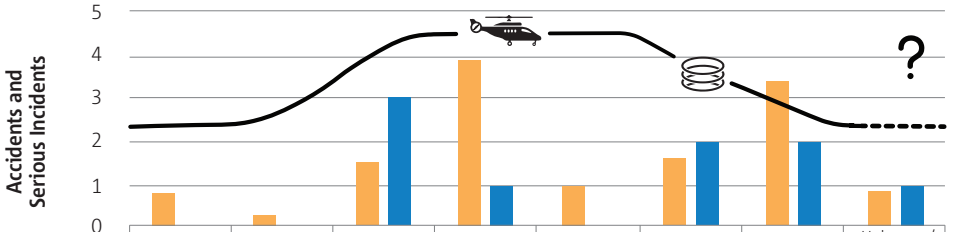


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	5	6	4	6	3	7	5	3	0	1	0
Fatalities	8	12	6	4	2	7	22	6	8	20	1

Phase of flight

Figure 65 shows the distribution of accidents and serious incidents by flight phase. Whereas the number of occurrences occurring during the en route and landing phases decreased in 2020, when compared to the last 10-year period average, the numbers increased for the take-off and approach phases.

Figure 65 Accidents and serious incidents by phase of flight involving commercial air transport helicopters

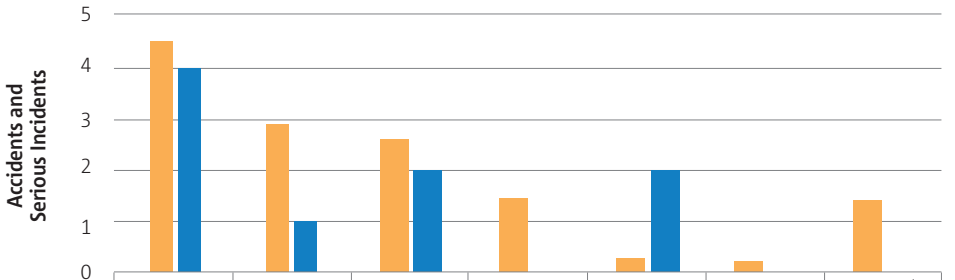


	Standing	Taxi	Take-off	En route	Manoevring	Approach	Landing	Unknown/ blank
Average 2010-2019	0.8	0.3	1.5	3.9	1	1.6	3.4	0.9
2020	0	0	3	1	0	2	2	1

Operation type

Figure 66 shows the numbers of accidents and serious incidents per type of operation. For HEMS and Offshore operations, the numbers are slightly lower than the previous decade average, whereas for air taxi and sightseeing flights, the decrease was more significant. The increase of the number of occurrences involving air ambulance flights in 2020 is also noticeable, although the number of occurrences is small.

Figure 66 Accidents and serious incidents by operation type involving commercial air transport helicopters



	HEMS	Air Taxi	Offshore	Sightseeing	Air Ambulance	Airline	Other/ Unknown
Average 2010-2019	4.5	2.9	2.6	1.5	0.3	0.2	1.4
2020	4	1	2	0	2	0	0

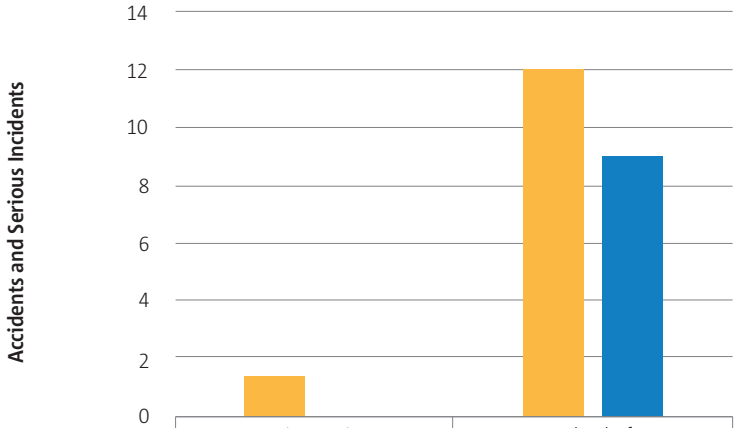
Propulsion type

Figure 67 shows the numbers of accidents and serious incidents per propulsion type. In 2020, all accidents and serious incidents in commercial air transport helicopters operations involved turboshaft helicopters.

Helicopter certification specification (CS27/CS29)

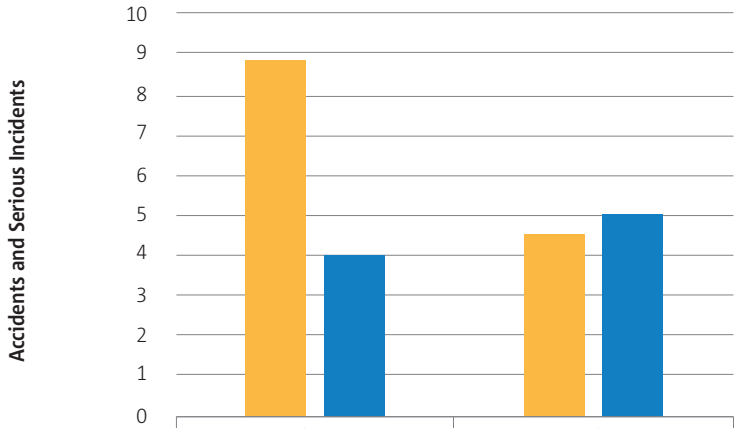
Figure 68 shows the numbers of accidents and serious incidents per type of certified product (CS27 or CS29). Whereas the number of occurrences involving CS27 helicopters was half as many in 2020 compared to the preceding decade average, the number remained equivalent for CS29 helicopters.

Figure 67 Accidents and serious incidents by propulsion type involving commercial air transport helicopters



	Reciprocating	Turboshaft
Average 2010-2019	1.4	12
2020	0	9

Figure 68 Accidents and serious incidents by certification specification (CS27/CS29) for commercial air transport operations



	CS27	CS29
Average 2010-2019	8.9	4.5
2020	4	5

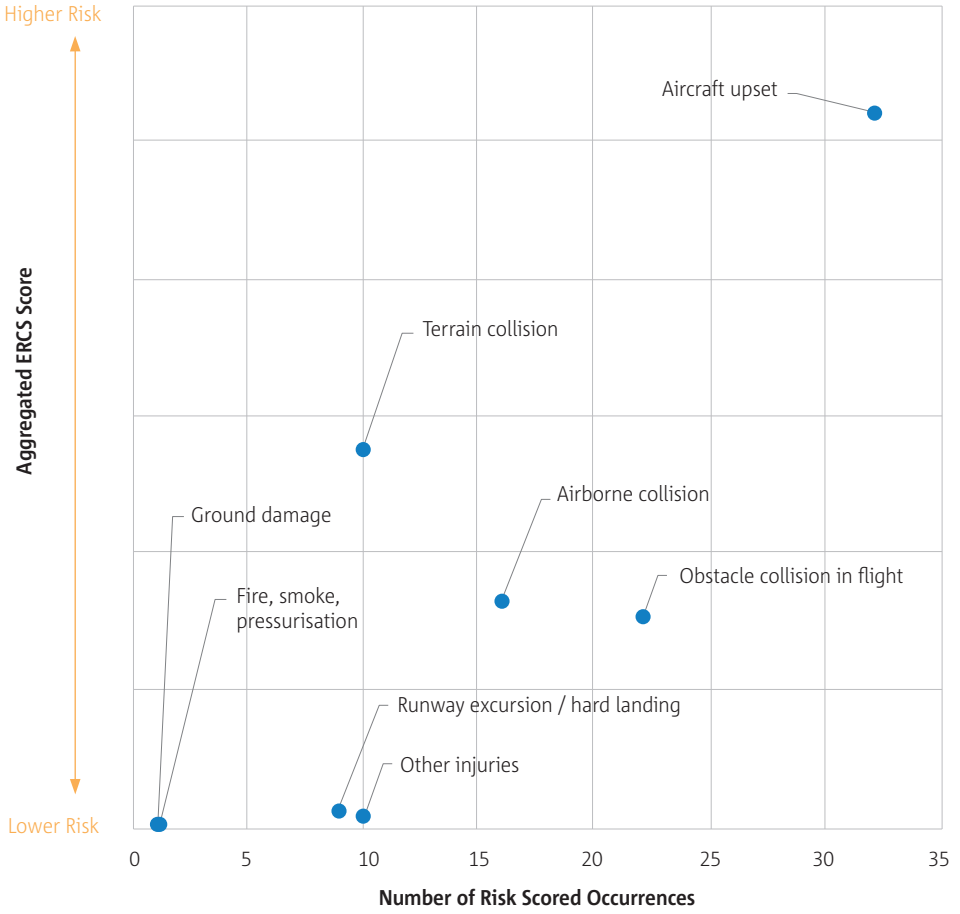
Safety risks for commercial air transport helicopters

The safety risks for commercial air transport helicopters are derived from accident and serious incident data from the EASA occurrence repository and the European Central Repository, covering the 5-year period 2016-2020 (77 occurrences).

The relative comparison between key risk areas for this domain is highlighted in Figure 69. The key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Also, one single occurrence can be associated with more than one key risk area.

From the data, it can be observed that the aircraft upset accident scenario is still the top key risk area, both in terms of numbers of occurrences and aggregated risk. Terrain collisions, airborne collisions, and obstacle collisions in flight form the other main key risk areas of the commercial air transport helicopters domain.

Figure 69 Key risk areas by aggregated ERCS score and number of risk-scored occurrences, involving commercial air transport helicopters



When looking at the previous 5 years, aircraft upset and terrain collision present the highest cumulative risk. However, if only the previous 3 (2018-2020) years are considered, airborne collision becomes the top key risk area due to the increase in attributed fatalities; 2018 (4 fatalities) and 2019 (10 fatalities).

The key risk area 'other injuries' includes the occurrence scenarios that do not fit in to other key risk areas, but which can still cause actual or potential injury. Other injuries includes those due to turbulence encounters, ground operators' injuries, particularly persons being injured on the ground from falling loads, or from any part falling from an aircraft in flight.

Figure 70 lists the safety issues identified from the occurrence data and shows a comparison between the numbers of occurrences per safety issue and their aggregated ERCS score. A yellow bar in the graph that is considerably longer, when compared with the underlying blue bar, indicates a low number of occurrences contributing to a high risk.

The data portfolio shown in Table 18 links the safety issues with the key risk areas to which they contribute. The key risk areas are listed at the top of the table and are prioritised from left to right based on the aggregated ERCS-risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues.

Figure 70 Safety issues by aggregated ERCS score and number of accidents and serious incidents involving commercial air transport helicopters

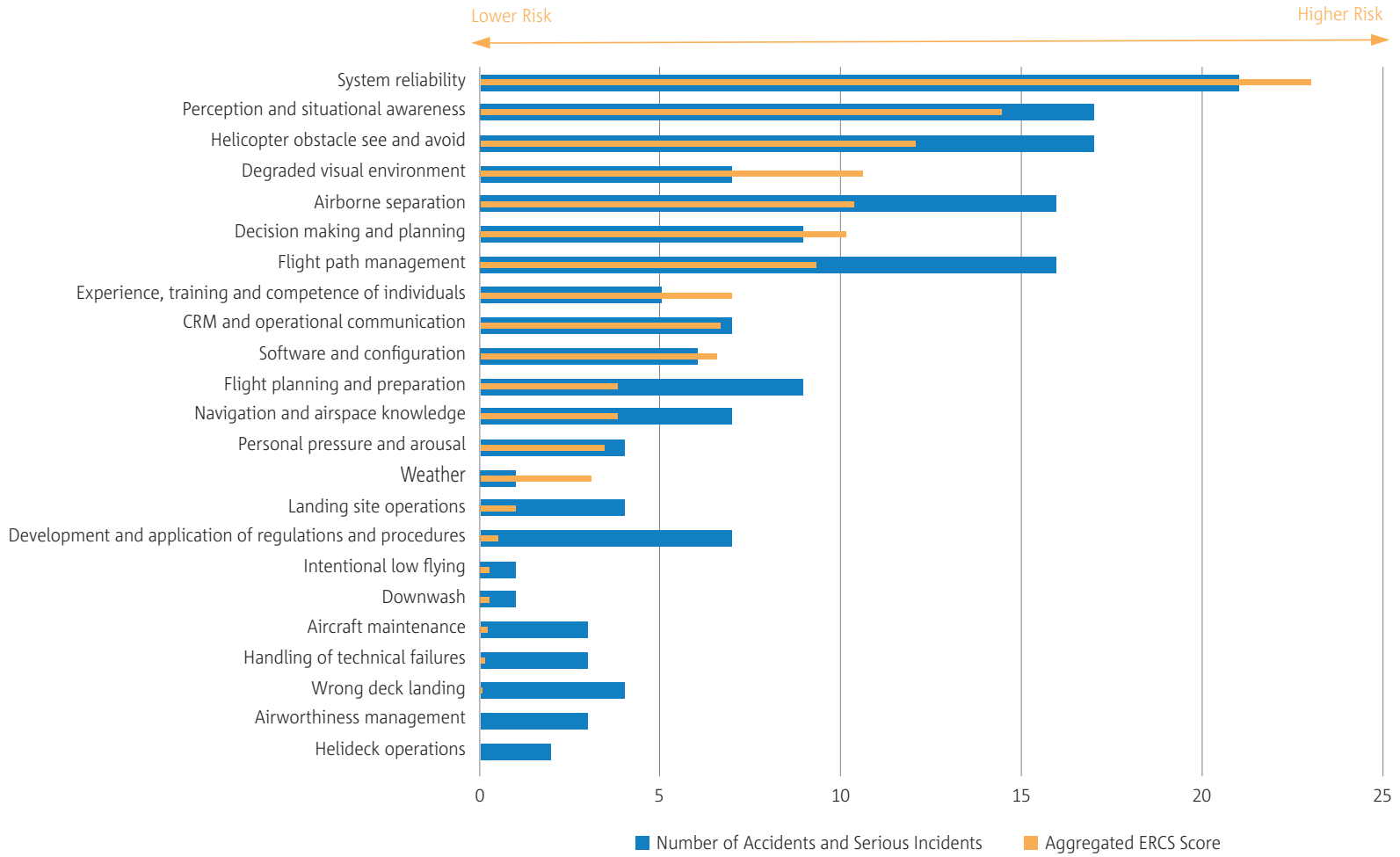


Table 18 Data portfolio for commercial air transport helicopters

SAFETY ISSUE	KEY RISK AREAS (ERCS)							
	AIRCRAFT UPSET	TERRAIN COLLISION	AIRBORNE COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION /HARD LANDING	OTHER INJURIES	FIRE, SMOKE AND PRESSURISATION	GROUND DAMAGE
System reliability	x	o	o	o	o	o	o	o
Perception and situational awareness	x	x	o	x	o	o		o
Helicopter obstacle see and avoid	x	o		x		o		
Degraded visual environment	x	o		o				
Airborne separation	o		x					
Decision making and planning	x	o		x	o			
Flight path management	x	o		x	o			
Experience, training and competence of individuals	o	o		o	o		o	
CRM and operational communication	o	o		o	o			
Software and configuration	o	o		o	o			
Flight planning and preparation	o	o		x	o			
Navigation and airspace knowledge	o	o		x	o			
Personal pressure and arousal	o	o		o	o			
Weather	o	o		o				

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)							
	AIRCRAFT UPSET	TERRAIN COLLISION	AIRBORNE COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION /HARD LANDING	OTHER INJURIES	FIRE, SMOKE AND PRESSURISATION	GROUND DAMAGE
Landing site operations	o	o		o	o	o		
Development and application of regulations and procedures	o			o	o	o	o	o
Downwash	o			o	o	o	o	o
Intentional low flying						o		
Aircraft maintenance		o		o				
Handling of technical failures	o			o				
Wrong deck landing	o							
Airworthiness management				o	o			
Helideck operations	o					o		
Bird/wildlife strikes				o	o			

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

3.3 Specialised operations helicopters

This section covers the main safety statistics for certified helicopters performing specialised operations with an EASA MS as state of operator or state of registry.

Key statistics

The key statistics for this domain are in Table 19 and Table 20, which include a comparison of the number of fatal and non-fatal accidents and serious incidents for the 10-year period (2010-2019) compared with 2020. It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe.

Table 19 Key statistics for specialised operations helicopters

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
31	Fatal accidents	1	↓
121	Non-fatal accidents	9	↓
27	Serious incidents	3	↑

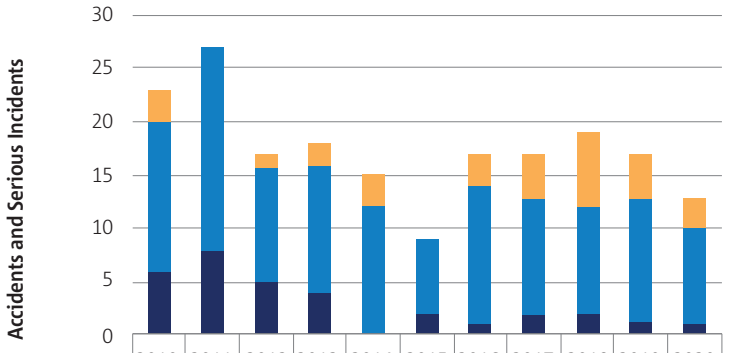
Table 20 Fatalities and serious injuries involving specialised operations helicopters

	FATALITIES	SERIOUS INJURIES
2010-2019 total	53	49
2010-2019 max.	17	9
2010-2019 min.	0	1
2020	2	0

The number of accidents in 2020 was lower than the average of the preceding 10-year period, whereas the number of serious incidents remained similar to the average for the same period. The numbers of fatalities and serious injuries are also below the average figures of the preceding decade.

The numbers of accidents and serious incidents per year is shown in Figure 71. The total number of occurrences in 2020 is the second lowest since 2010, only 2015 presented a smaller number. The only fatal accident in 2020 was the crash of a light helicopter during a power line inspection flight in Spain.

Figure 71 Fatal accidents, non-fatal accidents and serious incidents per year involving specialised operations helicopters

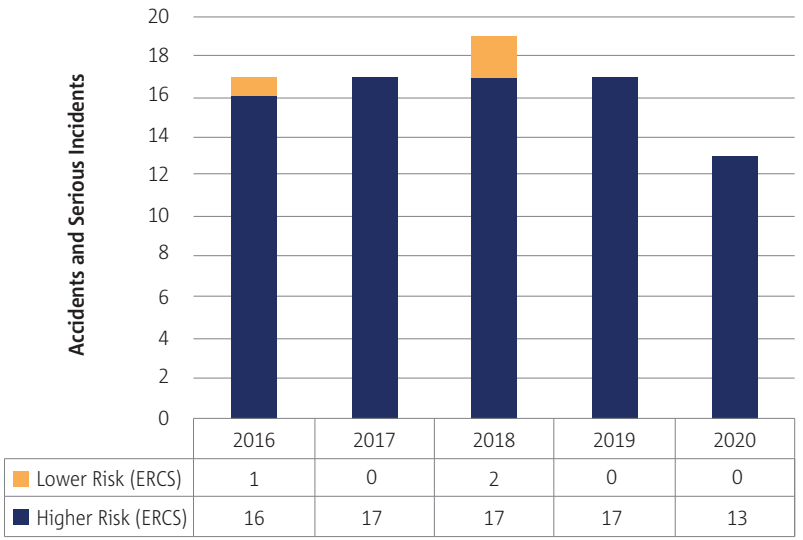


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	3	0	1	2	3	0	3	4	7	4	3
Non-Fatal Accidents	14	19	11	12	12	7	13	11	10	12	9
Fatal Accidents	6	8	5	4	0	2	1	2	2	1	1

Figure 72 shows occurrences that have been risk scored using the ERCS methodology and categorised as higher or lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to the review. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern from the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal or even exceed the risk of some accidents. There were no lower risk occurrences reported in 2019 and in 2020 and very few in the last five years.

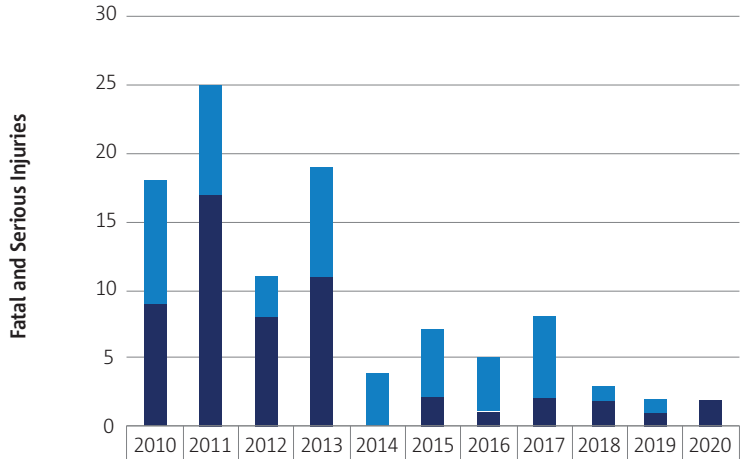
The numbers of fatalities and serious injuries per year are shown in Figure 73. The number of fatalities in 2020 has remained in the same range observed since 2015. 2020 is the first year in the considered period where no serious injuries were reported.

Figure 72 ERCS higher and lower risk occurrences per year involving specialised operations helicopters



	2016	2017	2018	2019	2020
Lower Risk (ERCS)	1	0	2	0	0
Higher Risk (ERCS)	16	17	17	17	13

Figure 73 Fatal and serious injuries per year involving specialised operations helicopters

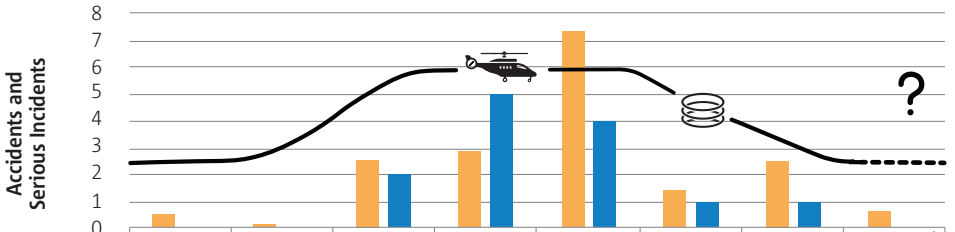


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	9	8	3	8	4	5	4	6	1	1	0
Fatalities	9	17	8	11	0	2	1	2	2	1	2

Phase of flight

Figure 74 shows the distribution of accidents and serious incidents by flight phase. As with the average of the preceding 10-year period, the highest number of accidents and serious incidents happens during the en route and manoeuvring phases.

Figure 74 Accidents and serious incidents by phase of flight involving specialised operations helicopters

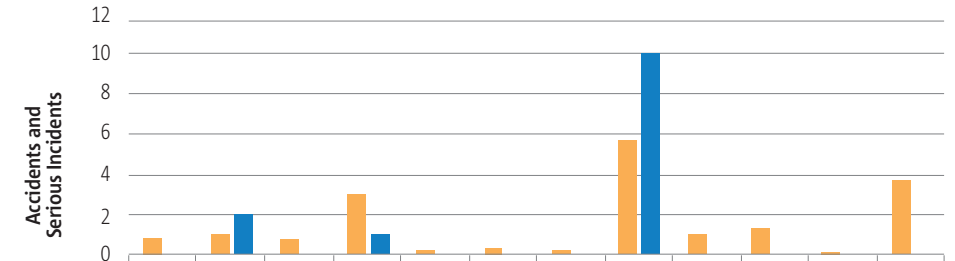


	Standing	Taxi	Take-off	En route	Manoevring	Approach	Landing	Unknown/ blank
Average 2010-2019	0.5	0.1	2.6	2.9	7.3	1.4	2.5	0.6
2020	0	0	2	5	4	1	1	0

Operation type

Figure 75 shows the numbers of accidents and serious incidents per type of operation. In 2020 construction and sling-load operations were, once again, by far the most impacted. The other identified operation types involved in an occurrence in 2020 were aerial patrol and agricultural operations.

Figure 75 Accidents and serious incidents by operation type involving specialised operations helicopters

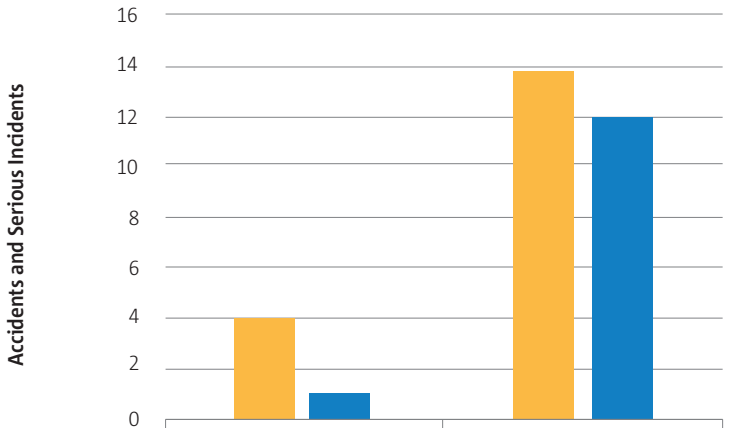


	Aerial Obser-vation	Aerial Patrol	Aerial Survey	Agricul-tural	Airshow/ Race	Animal Herding/ Mustering	Calibration	Construc-tion Sling/Load	Logging	Photo-graphy	Towing	Other/ Unknown
Average 2010-2019	0.7	1	0.7	3	0.2	0.3	0.2	5.6	0.9	1.4	0.1	3.8
2020	0	2	0	1	0	0	0	10	0	0	0	0

Propulsion type

Figure 76 shows the numbers of accidents and serious incidents per propulsion type. The 2020 results reveal that the decrease in the number of occurrences was more pronounced for reciprocating engines helicopters than for turboshaft helicopters.

Figure 76 Accidents and serious incidents by propulsion type involving specialised operations helicopters

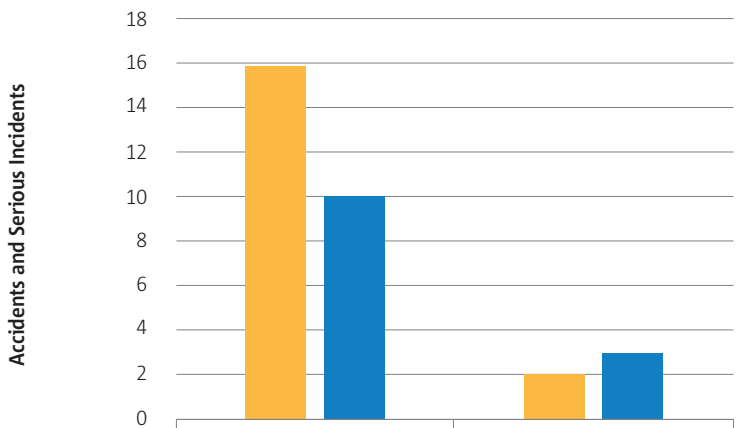


	Reciprocating	Turboshaft
Average 2010-2019	4	13.9
2020	1	12

Helicopter certification specification (CS27/CS29)

Figure 77 shows the numbers of accidents and serious incidents per type of certified product (CS27 or CS29). While the number of occurrences involving CS27 helicopters decreased in 2020 when compared to the preceding decade average, the numbers for CS29 helicopters slightly increased.

Figure 77 Accidents and serious incidents by certification specification (CS27/CS29) for specialised operations



	CS27	CS29
Average 2010-2019	15.8	2.1
2020	10	3

Safety risks for specialised operations helicopters

The safety risks for specialised operations helicopters are derived from accident and serious incident data from the EASA occurrence repository and the European Central Repository, covering the 5-year period 2016-2020 (83 occurrences).

The relative comparison between key risk areas for this domain are highlighted in Figure 78. The key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Note that one single occurrence can be associated with more than one key risk area.

From the data, it can be observed that the aircraft upset accident scenario is the top key risk area, both in terms of the number of occurrences and the aggregated risk. Terrain collisions and obstacle collisions in flight are the other main key risk areas of the specialised operations helicopters domain.

Figure 78 Key risk areas by aggregated ERCS score and number of risk-scored occurrences, involving specialised operations helicopters

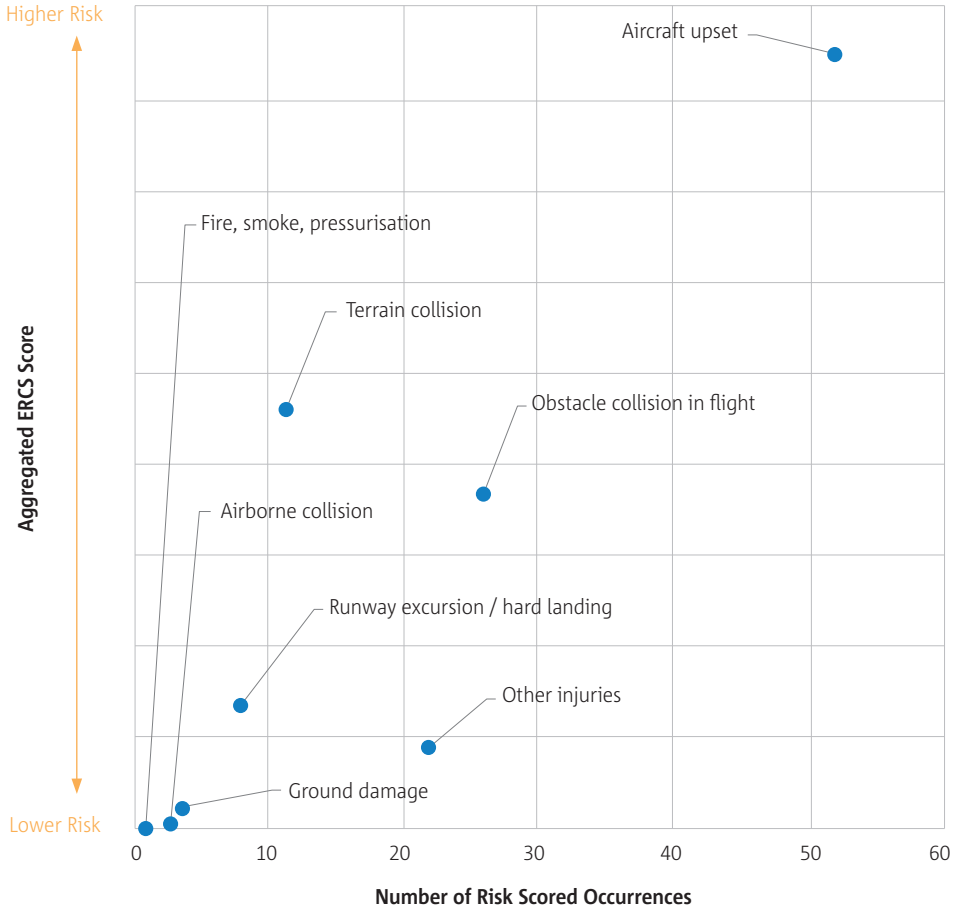
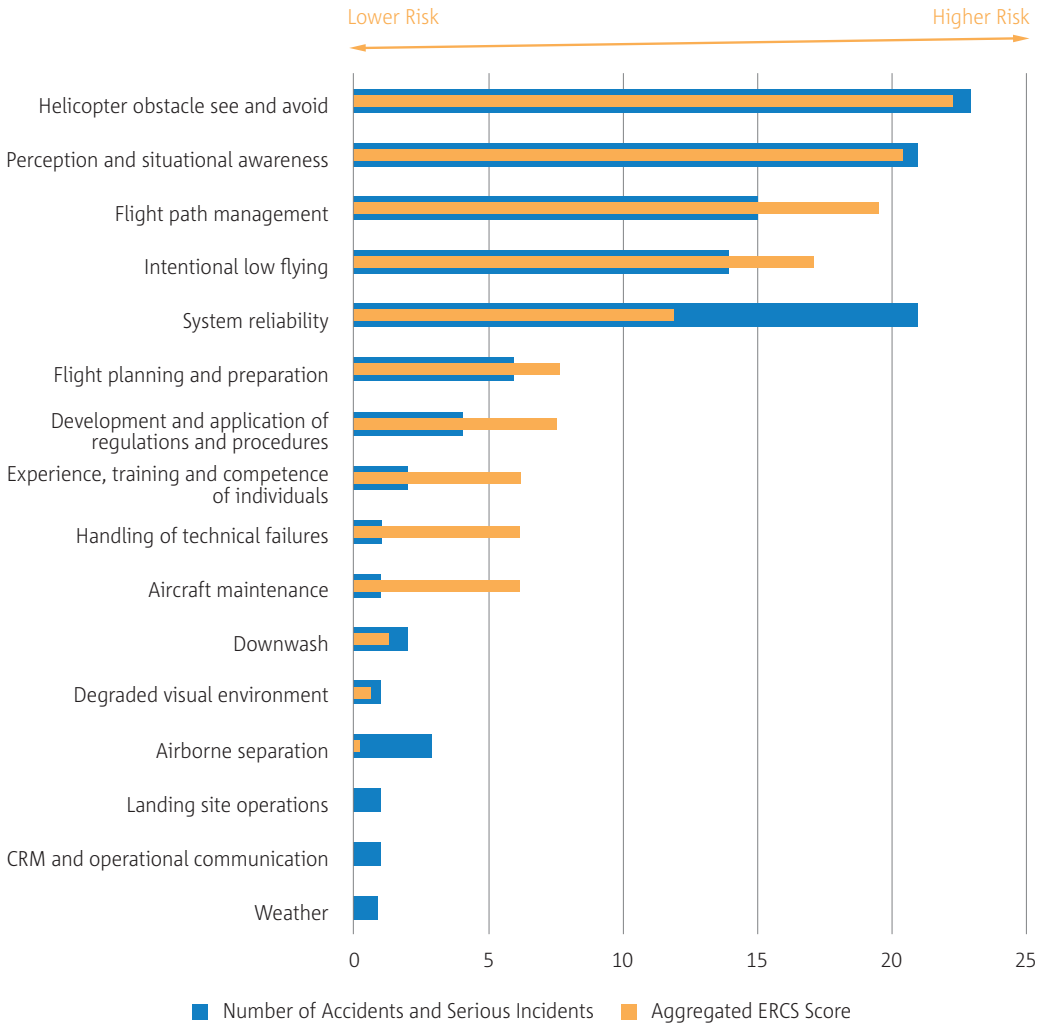


Figure 79 lists the safety issues identified from the occurrence data and shows a comparison between the number of occurrences per safety issue and the accompanying aggregated ERCS score. A yellow bar in the graph that is considerably longer when compared to the underlying blue bar indicates a low number of occurrences contributing to a high risk.

Figure 79 Safety issues by aggregated ERCS score and numbers of accidents and serious incidents involving specialised operations helicopters



The data portfolio shown in Table 21 links the safety issues with the key risk areas to which they contribute. The key risk areas are listed at the top of the table and are prioritised from left to right based on the aggregated ERCS-risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote group safety issues from high to low risk.

Table 21 Data portfolio for specialised operations helicopters

SAFETY ISSUE	KEY RISK AREAS (ERCS)							
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION/ HARD LANDING	OTHER INJURIES	GROUND DAMAGE	AIRBORNE COLLISION	FIRE, SMOKE AND PRESSURI-SATION
Helicopter obstacle see and avoid	x	x	x	o	o			
Perception and situational awareness	x	x	x	o	o	o	o	
Flight path management	x	o	x		o			
Intentional low flying	x	o	x	o	o			
System reliability	x	o	o	o	o			o
Flight planning and preparation	o	o	o	o		o		
Development and application of regulations and procedures	o	o	o			o		
Experience, training and competence of individuals	o				o			
Aircraft maintenance	o							
Handling of technical failures	o							
Downwash					o			
Degraded visual environment	o	o			o			
Airborne separation					o		o	
CRM and operational communication	o		o	o				
Landing site operations	o					o		
Weather	o				o			

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

3.4 Non-commercially operated helicopters

This section covers the main safety statistics for certified helicopters performing non-commercial operations with an EASA MS as state of operator or state of registry.

Key statistics

The key statistics for this domain are in Table 22 and Table 23, which include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe.

Table 22 Key statistics for non-commercial operations helicopters

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
48	Fatal accidents	2	↓
345	Non-fatal accidents	15	↓
51	Serious incidents	7	↑

Table 23 Fatalities and serious injuries involving non-commercial operations helicopters

	FATALITIES	SERIOUS INJURIES
2010-2019 total	108	53
2010-2019 max.	22	14
2010-2019 min.	2	0
2020	6	3

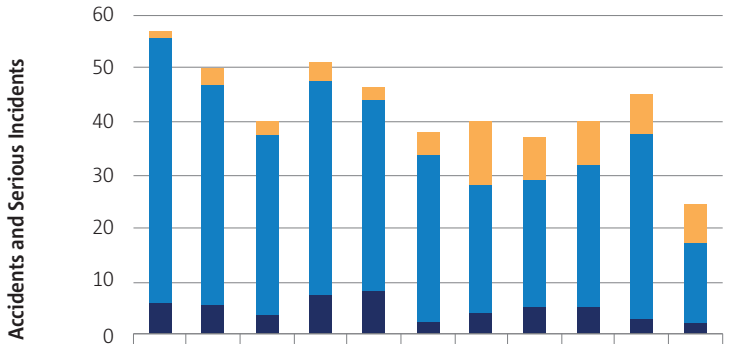
The number of accidents in 2020 was more than 50% lower than the average of the preceding decade, whereas the number of serious incidents was slightly higher than the average. The number of fatalities and serious injuries were lower than the 10-year period average, although not the lowest observed since 2010. In parallel to these observations, it should be highlighted that among all helicopter operations, non-commercial operations have been the most impacted by the COVID-19 pandemic and the lockdown measures. Therefore, the decreasing trend in number of accidents in 2020 should be tempered by the decrease of activity, although the drop in traffic is difficult to precisely evaluate.

HELICOPTERS

The numbers of accidents and serious incidents per year are shown in Figure 80. The total number of accidents and serious incidents in 2020 has decreased by almost 50% compared to 2019. The 2 fatal accidents in 2020 were the loss of control of a light helicopter shortly after take-off followed by a collision with the ground in Italy, and the crash of a light helicopter performing a training flight in a mountainous area in France.

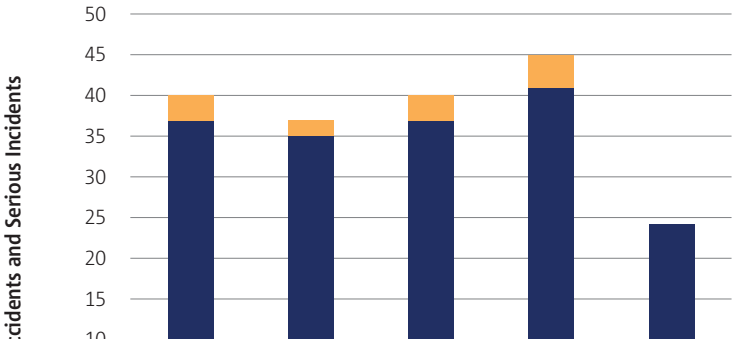
Figure 81 shows occurrences that have been risk scored using the ERCS methodology and divided into higher and lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to the review. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern from the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal or even exceed the risk of some accidents.

Figure 80 Fatal accidents, non-fatal accidents and serious incidents per year involving non-commercial operations helicopters



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	1	3	3	3	2	4	12	8	8	7	7
Non-Fatal Accidents	50	42	34	41	36	32	24	24	27	35	15
Fatal Accidents	6	5	3	7	8	2	4	5	5	3	2

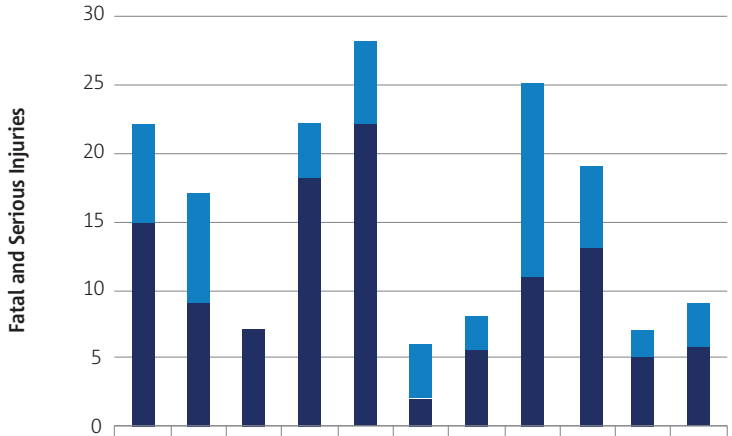
Figure 81 ERCS higher and lower risk occurrences per year involving non-commercial operations helicopters



	2016	2017	2018	2019	2020
Lower Risk (ERCS)	3	2	3	4	0
Higher Risk (ERCS)	37	35	37	41	24

The numbers of fatalities and serious injuries per year are shown in Figure 82. Despite the number of accidents observed in 2020 being the lowest over the last 10 years, the number of fatalities in 2020 slightly increased compared to 2019. The number of serious injuries in 2020 also slightly increased compared to 2019. This trend is mainly due to the EC135 fatal accident which caused 5 fatalities and 1 serious injury.

Figure 82 Fatal and serious injuries per year involving non-commercial operations helicopters

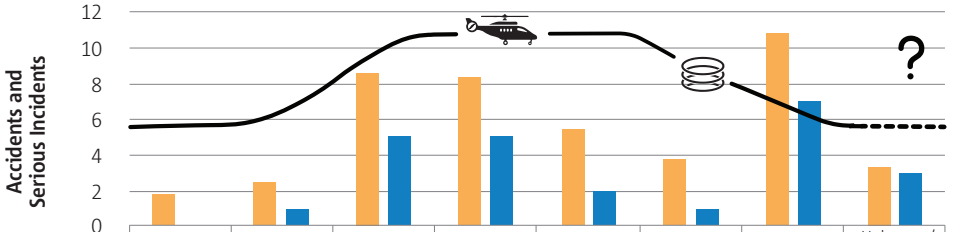


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	7	8	0	4	6	4	2	14	6	2	3
Fatalities	15	9	7	18	22	2	6	11	13	5	6

Phase of flight

Figure 83 shows the distribution of accidents and serious incidents by flight phase. The landing phase was when most accidents or serious incidents occurred in 2020, followed by the take-off and en route phases. These distributions are close to the ones observed over the previous 10-year period.

Figure 83 Accidents and serious incidents by phase of flight involving non-commercial operations helicopters

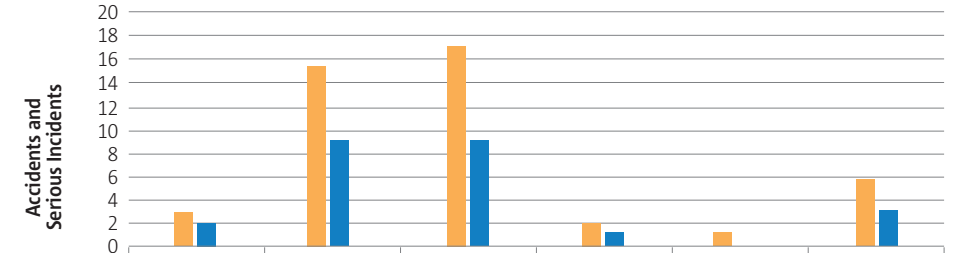


	Standing	Taxi	Take-off	En route	Manoevring	Approach	Landing	Unknown/ Blank
Average 2010-2019	1.8	2.4	8.6	8.4	5.5	3.8	10.8	3.4
2020	0	1	5	5	2	1	7	3

Operation type

Figure 84 shows the numbers of accidents and serious incidents per type of operation. In 2020, as in the previous decade, the highest number of occurrences for which the type of operation was identified were in flight training/instructional operations and in pleasure flights. Nevertheless, it should be highlighted that the exact nature of the operation is unknown at this stage for some occurrences.

Figure 84 Accidents and serious incidents by operation type involving non-commercial operations helicopters

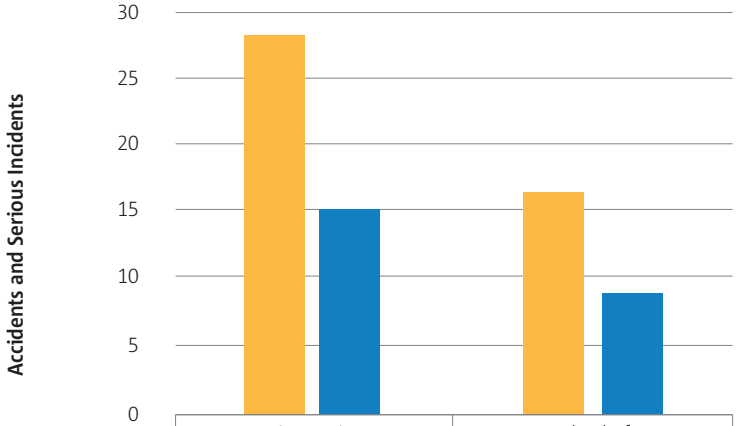


	Business	Flight Training/ Instructional	Pleasure	Relocation	Test Flight	Other/ Unknown
Average 2010-2019	2.9	15.6	17.3	2.1	1.1	5.7
2020	2	9	9	1	0	3

Propulsion type

Figure 85 shows the numbers of accidents and serious incidents per propulsion type. In 2020, the relative distribution between reciprocating engine helicopters and turboshaft helicopters remained close to that observed during the previous decade, although the figures decreased in absolute values.

Figure 85 Accidents and serious incidents by propulsion type involving non-commercial operations helicopters

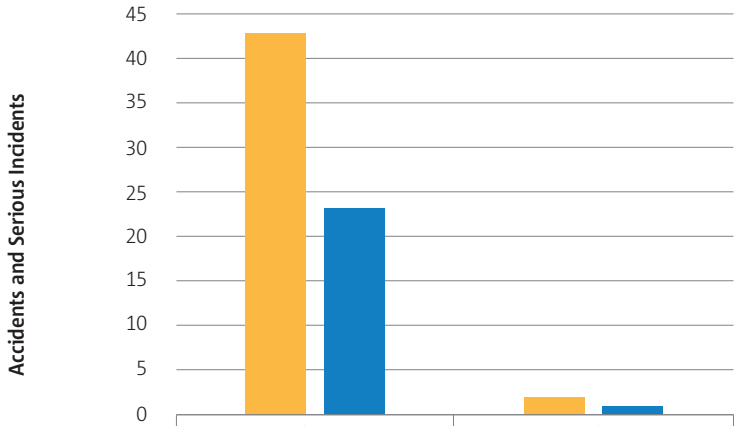


	Reciprocating	Turboshaft
Average 2010-2019	28.1	16.5
2020	15	9

Helicopter certification specification (CS27/CS29)

Figure 86 shows the numbers of accidents and serious incidents per type of certified product (CS27 or CS29). Almost all helicopters involved in non-commercial operations occurrences were CS27 products. A similar split was also observed in 2020.

Figure 86 Accidents and serious incidents by certification specification (CS27/CS29) for non-commercial operations



	CS27	CS29
Average 2010-2019	42.8	1.9
2020	23	1

Safety risks for non-commercially operated helicopters

The safety risks for non-commercial operations helicopters are derived from accident and serious incident data from the EASA occurrence repository and the European Central Repository, covering the 5-year period 2016-2020 (186 occurrences).

The relative comparison between key risk areas for this domain is highlighted in Figure 87. The key risk areas are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Note that one single occurrence can be associated with more than one key risk area.

From the data, it can be observed that the aircraft upset accident scenario is by far the top key risk area, both in terms of the number of occurrences, and the aggregated risk. Terrain collisions, obstacle collisions in flight and runway excursions / hard landings are also forming the other main key risk areas of the non-commercial operations helicopters' domain.

Figure 87 Key risk areas by aggregated ERCS score and number of risk-scored occurrences involving non-commercial operations helicopters

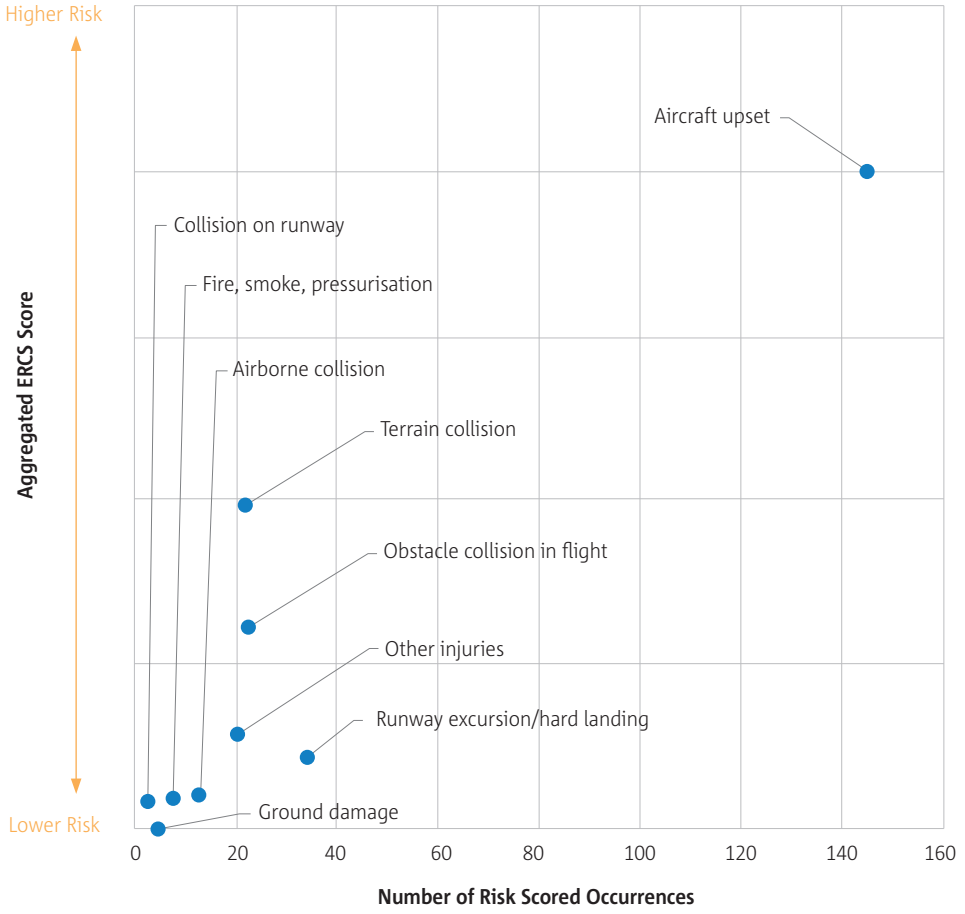
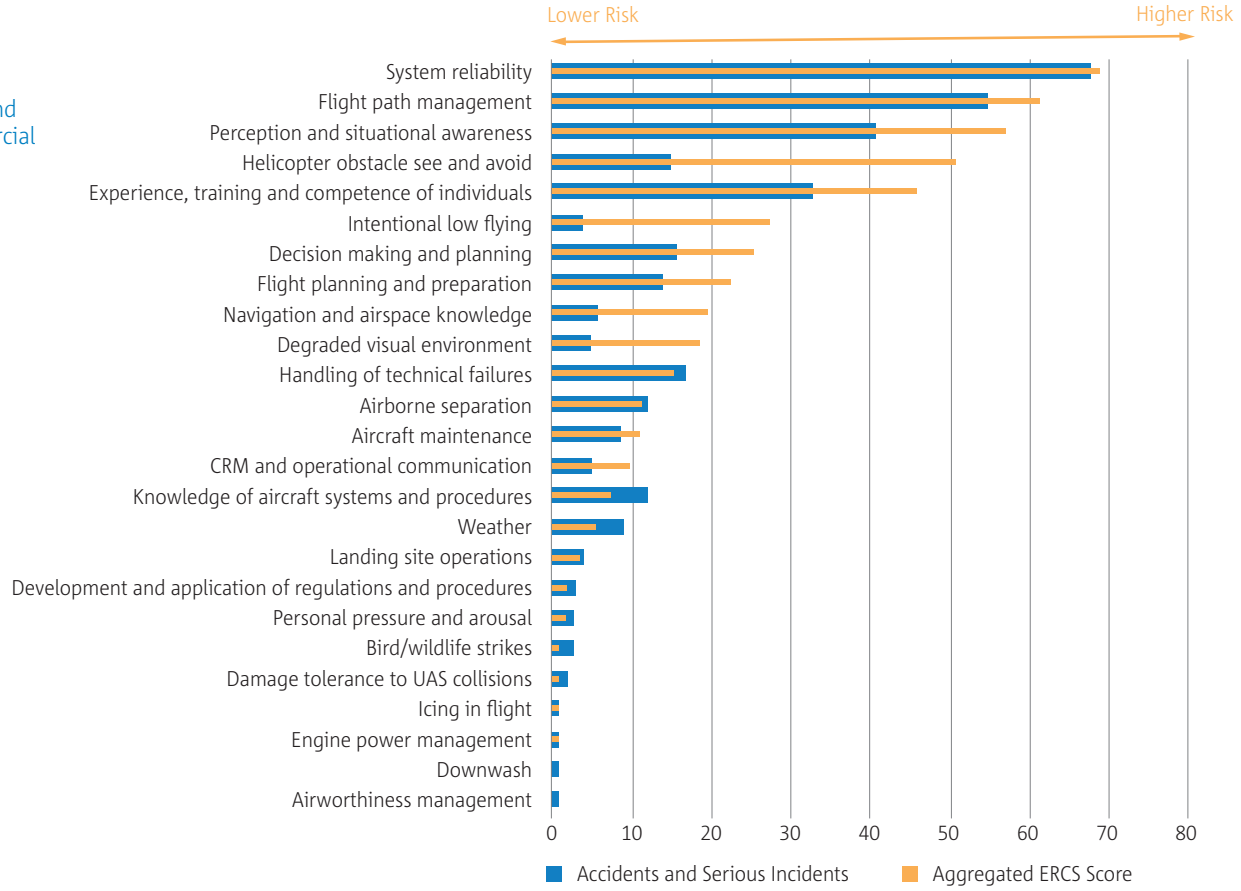


Figure 88 lists the safety issues identified from the occurrence data and shows a comparison between the number of occurrences per safety issue and their aggregated ERCS score. A yellow bar in the graph that is considerably longer when compared with the underlying blue bar indicates a low number of occurrences contributing to a high risk.

Figure 88 Safety issues by aggregated ERCS score and numbers of accidents and serious incidents involving non-commercial operations helicopters



The data portfolio shown in Table 24 below links the safety issues with the key risk areas to which they contribute. The key risk areas are listed at the top of the table and are prioritised from left to right based on the aggregated ERCS risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk for the safety issues.

Table 24 Data portfolio for non-commercial operations helicopters

SAFETY ISSUE	KEY RISK AREAS (ERCS)								
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	OTHER INJURIES	RUNWAY EXCURSION /HARD LANDINGS	AIRBORNE COLLISION	FIRE, SMOKE AND PRESSURISATION	COLLISION ON RUNWAY	GROUND DAMAGE
System reliability	x	o	o	x	x		x		o
Flight path management	x	o	x	x	x	o			
Perception and situational awareness	x	o	x	o	x	o	o	o	o
Helicopter obstacle see and avoid	o	o	x			o			o
Experience, training and competence of individuals	x	o	o	x	x				
Intentional low flying	o		o						
Decision making and planning	x	o	o	o	o				o
Flight planning and preparation	x	o		o					
Navigation and airspace knowledge	o	o		o	o	o		o	

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)								
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	OTHER INJURIES	RUNWAY EXCURSION /HARD LANDINGS	AIRBORNE COLLISION	FIRE, SMOKE AND PRESSURISATION	COLLISION ON RUNWAY	GROUND DAMAGE
Degraded visual environment	o	o	o	o					
Handling of technical failures	x	o	o	o	o		o		
Airborne separation	o		o			x			
Aircraft maintenance	x		o	o	o		o		o
CRM and operational communication	o		o		o	o		o	
Knowledge of aircraft systems and procedures	x	o		o	o				
Weather	x	o		o	o		o		
Landing site operations	o	o			o				
Development and application of regulations and procedures	o	o							
Personal pressure and arousal	o				o		o		o
Bird/wildlife strikes	o								
Damage tolerance to UAS collisions	o					o			
Engine power management	o								
Icing in flight	o								
Airworthiness management	o								
Downwash									o

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

CHAPTER 4

Balloons

The scope of this chapter covers hot air balloon operations where the state of registry is an EASA Member State. The data presented is based on the accidents and serious incidents collected by the Agency under Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, and through actively searching for those events from other official sources.

The chapter provides the key statistics for balloon operations and a data portfolio, which provides an overview of the main safety risks for these types of operations at the European level, based on occurrence data.

The list of fatal accidents associated with the scope of this chapter is provided in Appendix 1 of this document.

Key statistics

The key statistics for this domain are in Table 25 and Table 26 and include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe.

Table 25 shows an increase in fatal accidents compared to the 10-year average. There were 3 fatal accidents in 2020. However, the non-fatal accidents and serious incidents decreased compared to the 10-year average.

Table 26 presents the number of fatalities and serious injuries. The 3 fatalities in 2020 are an increase compared to the 10-year average. The number of serious injuries, however, reduced in comparison.

Table 25 Key statistics for balloons

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
12	Fatal accidents	3	↑
188	Non-fatal accidents	16	↓
25	Serious incidents	2	↓

Table 26 Fatalities and serious injuries involving balloons

	FATALITIES	SERIOUS INJURIES
2010-2019 total	21	204
2010-2019 max.	10	34
2010-2019 min.	0	12
2020	3	19

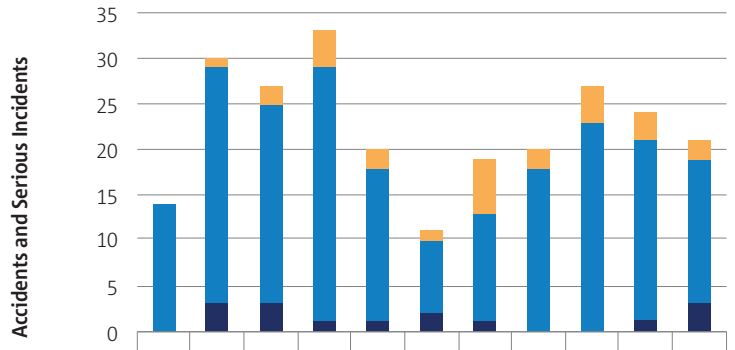
BALLOONS

A better understanding of the level of balloon safety in EASA Member States would be achieved were exposure data showing number of flights available. EASA encourages all balloon operators to collect and share such data for the benefit of all.

Figure 89 shows that after a period of no fatal accidents in 2017 and 2018, the number of fatal accidents in 2019 and 2020 has increased. When looking at all accidents and serious incidents, a downward trend can be observed for the last 3 years, but overall, there has been no improvement in these figures since 2010.

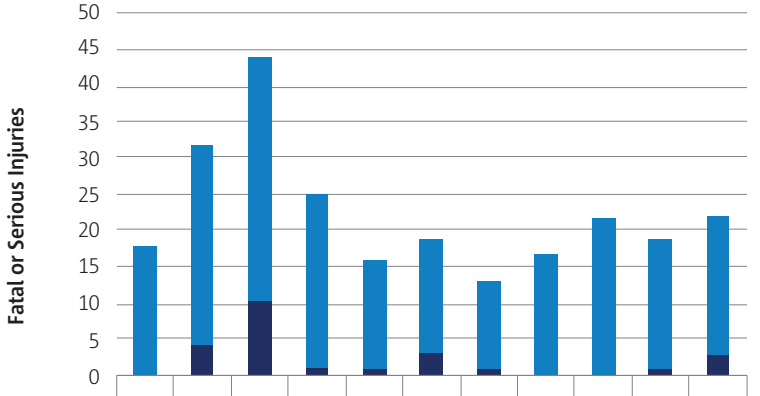
Figure 90 shows the annual distribution of fatalities and serious injuries from 2010 to 2020. Since 2013, the number of fatalities and serious injuries has plateaued, with no significant change during the last 5 years.

Figure 89 Fatal accidents, non-fatal accidents and serious incidents per year involving balloons



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	0	1	2	4	2	1	6	2	4	3	2
Non-Fatal Accidents	14	26	22	28	17	8	12	18	23	20	16
Fatal Accidents	0	3	3	1	1	2	1	0	0	1	3

Figure 90 Fatalities and serious injuries involving balloons

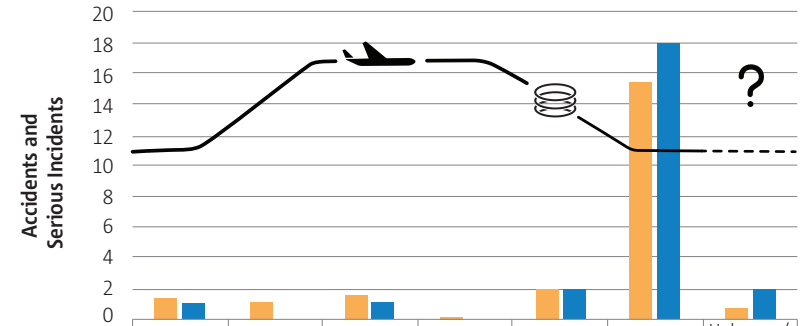


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	18	28	34	24	15	16	12	17	22	18	19
Fatalities	0	4	10	1	1	3	1	0	0	1	3

Phase of flight

Most balloon accidents and serious incidents occur during the landing phase of the flight, as shown in Figure 91. This holds true for both 2020 and the average of the preceding decade. All three fatal accidents occurred during landing. A 14% increase in landing accidents was evident in 2020 compared to the 10-year average. There were no accidents or serious incidents in the take-off and manoeuvring phases in 2020.

Figure 91 Accidents and serious incidents involving balloons, by phase of flight

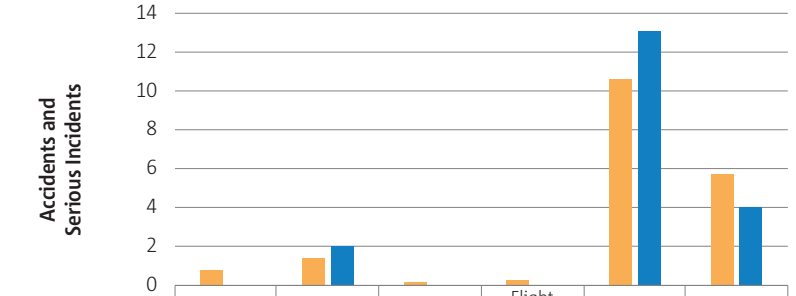


	Standing	Take-off	En route	Manoevring	Approach	Landing	Unknown/ blank
Average 2010-2019	1.2	1.2	1.5	0.2	2	15.4	0.8
2020	1	0	1	0	2	18	2

Operation type

Most balloon accidents and serious incidents are related to passenger and pleasure flights, as shown in Figure 92. There have been accidents and serious incidents in relation to flights conducted for the purposes of airshow/race, demonstration, and training/instructional flights. However, such instances are few and there were no accidents and serious incidents relating to these types of flights in 2020.

Figure 92 Accidents and serious incidents involving balloons, by operation type



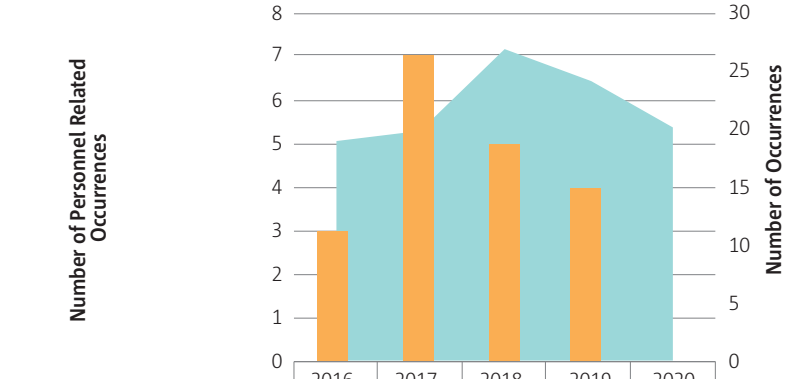
	Airshow/ Race	Business	Demon-stration	Flight Training/ Instructional	Passenger	Pleasure
Average 2010-2019	0.8	1.4	0.2	0.2	10.5	5.7
2020	0	2	0	0	13	4

Human factors and human performance

A sixth of accidents and serious incident reports involving balloons identify human factors (HF) or human performance (HP) issues, these are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. Looking at the figures for the past five years, the number of identifiable HF or HP issues is low but stable, particularly taking into account the fact that many of these issues are identified following more detailed investigations – meaning that the figures for 2020 are likely to increase once final investigation reports are published.

The application of HF or HP codes at a high level can be seen in Figure 94. Issues relating to situational awareness and sensory events, as well as task performance events, seem to be more commonly experienced, reported or discernible following an accident or serious incident than the factors that cause them.

Figure 93 Human factors and human performance accidents and serious incidents involving balloon operations



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	19	20	27	24	20
HF/HP Accidents and Serious Incidents	3	7	5	4	0

Figure 94 High level human factors and human performance event codes applied to accidents and serious incidents involving balloon operations

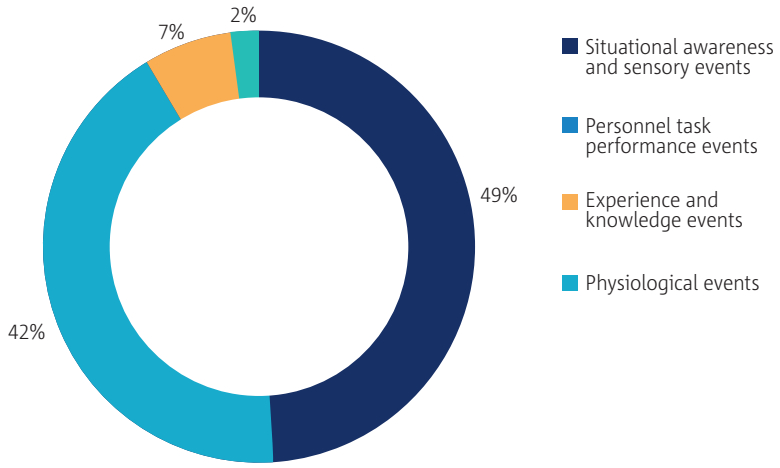
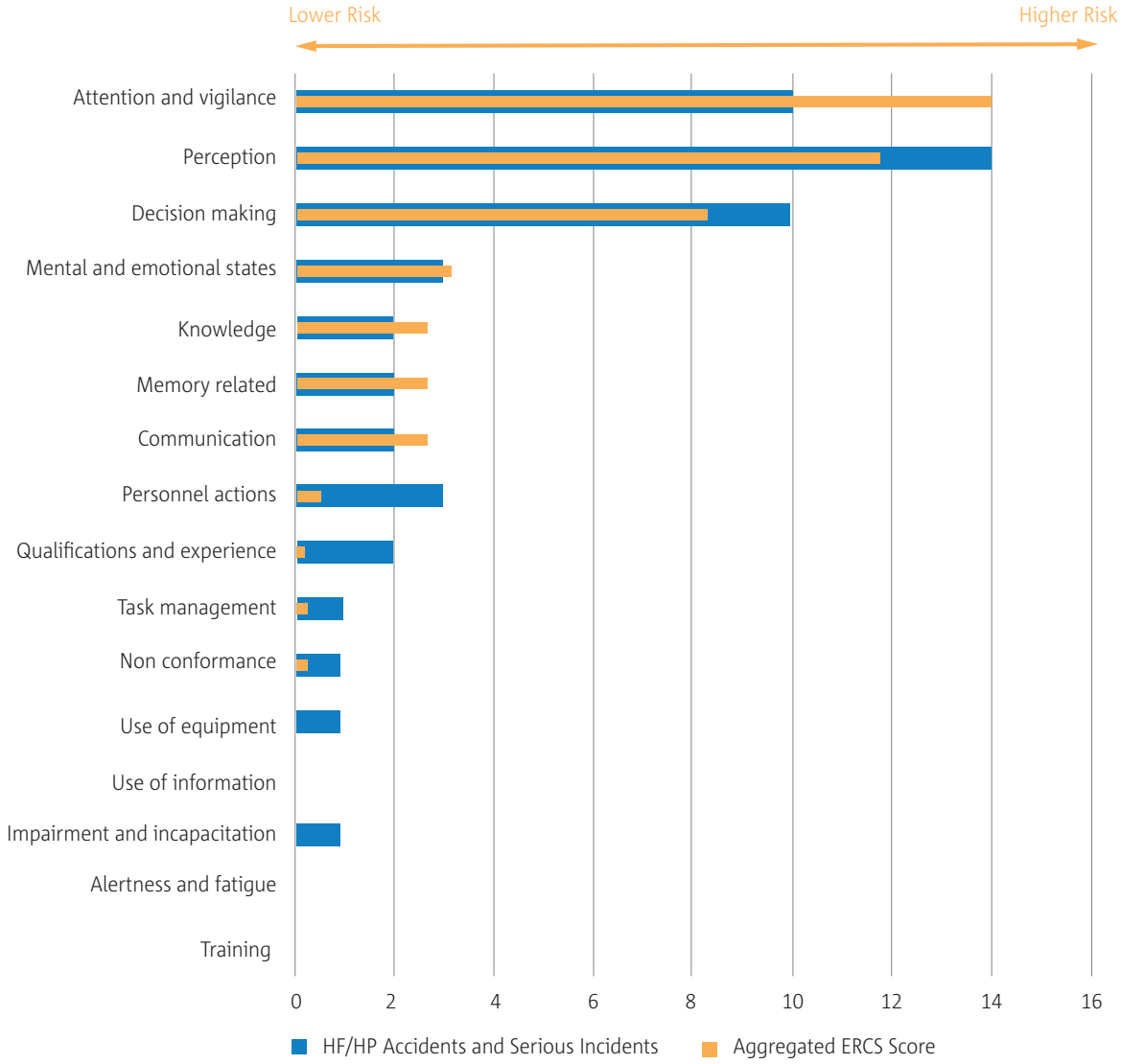


Figure 95 compares the number of accidents and serious incidents with the aggregated ERCS risk score of those occurrences, using detailed HF and HP event codes. It can be seen that some types of event have a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents.

Figure 95 Detailed human factors and human performance event codes by aggregated ERCS score and number of accidents and serious incidents involving all helicopter operations



Safety risks for balloons

The safety risks for balloons are derived from accident and serious incident data from the EASA occurrence repository and the European Central Repository, covering the 5-year period 2016-2020 (85 occurrences).

The main key risk areas for this domain are highlighted in Figure 96 and are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Note that one single occurrence can be associated with more than one key risk area.

Figure 96 shows that the key risk areas bearing the highest risk are obstacle collision in flight and balloon landings. The analysis of data from accidents and serious incidents confirms that collisions with power lines and hard landings are events with a higher likelihood to cause injuries, and potentially fatalities, in ballooning operations. Obstacle collisions in flight includes both powerline collisions as well as collisions with buildings, trees or other objects. Many of these collisions occur during landing or while flying very low. The causes of power line collisions are mainly lack of information, the position of the sun making it difficult to see the lines, fog, and wind gusts. Many of these accidents would not have occurred if the pilots had respected the minimum safety altitude.

The main causes of hard balloon landings and results in injuries are unexpected wind gusts or downdrafts, and the pilot´s control of the balloon inertia during the landing phase. A side-effect of such landings is that passengers may not be prepared for the second impact, which is often harder than the first, and often results in excessive loads on joints and feet. After the first impact, passengers tend to go out of their safety position and release their grip of the handles, as they are not expecting another impact. This significantly increases the risk of injuries.

Figure 96 Key risk areas by aggregated ERCS score and number of risk-scored occurrences involving balloons

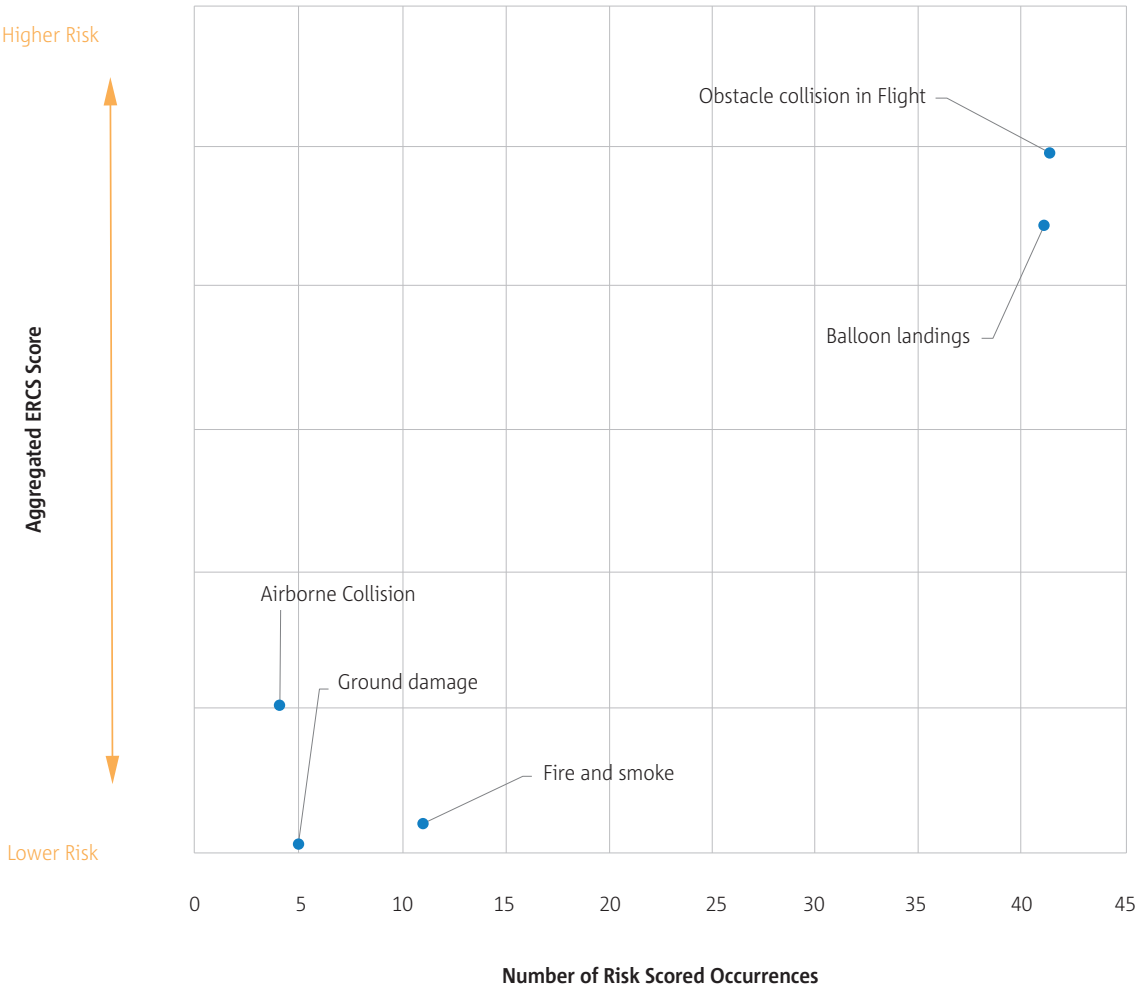
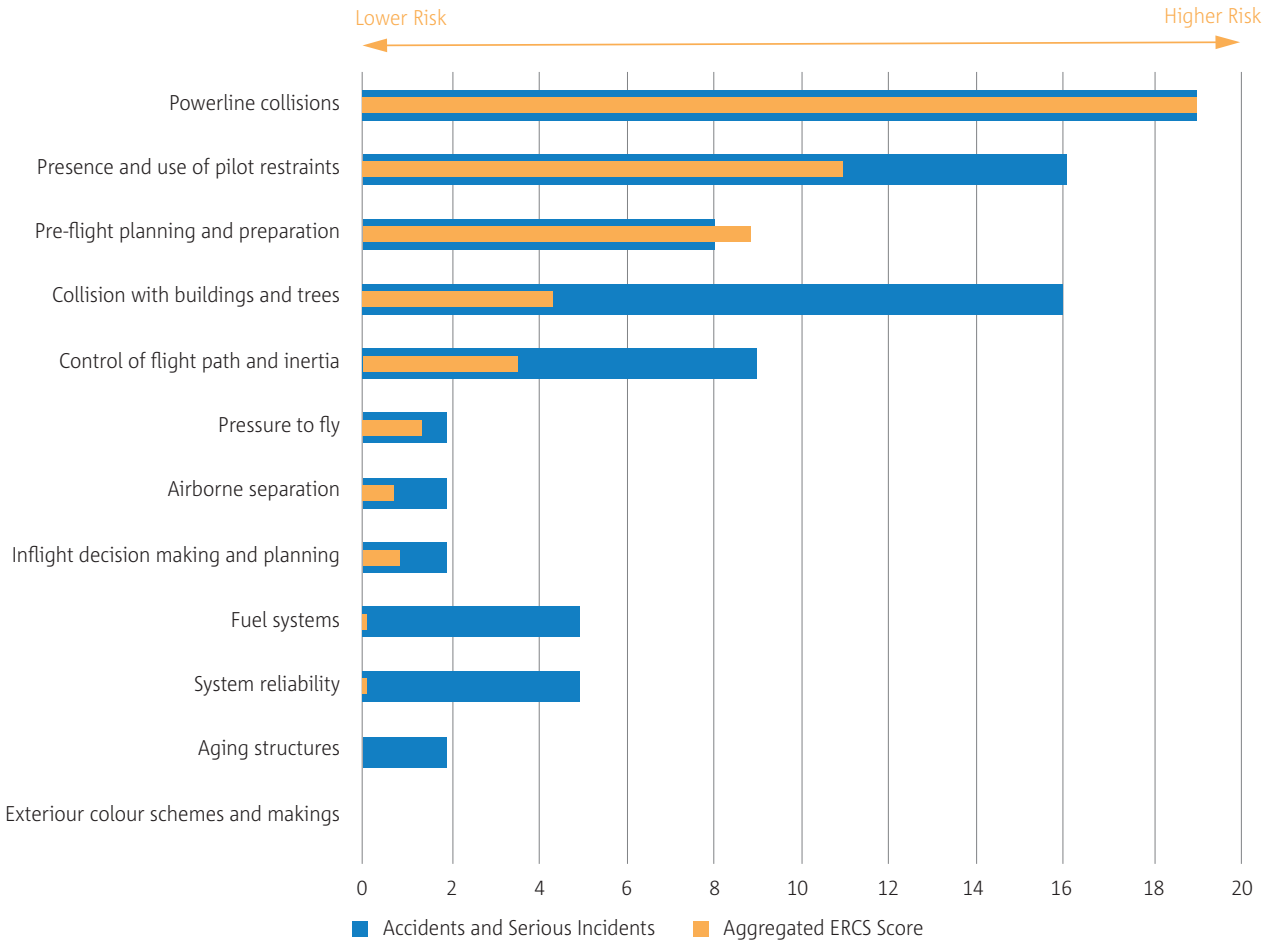


Figure 97 lists the safety issues identified from the occurrence data and shows a comparison between the number of occurrences per safety issue and their aggregated ERCS score. A yellow bar in the graph that is considerably long when compared with the underlying blue bar indicates a low number of occurrences contributing to a high risk.

It is worth noting that the safety issue 'collision with powerlines' is the highest with respect to the number of occurrences and aggregated risk. The danger of electric shock and fire is much higher when colliding with powerlines. The safety issue 'presence and use of pilot restraints' indicates clearly that if the pilot would have used the available restraint or if it was installed, the severity of injuries would have been minimised. If, however, the pilot is not using the restraint, the risk of the pilot being ejected from the basket during the landing is significant and hence increases the risk of injuries for the remaining persons on board as the balloon has lost control and its landing is left to chance.

'Pre-flight planning and preparation' shows the risk of flying in marginal weather or not being able to see the course ahead due to such issues as sun glare. Lack of preparation regarding weather, geography of the overflown area, time of day and complacency can easily ruin a good day. 'Inflight decision making and planning' as well as 'pre-flight planning and preparation' encourages both better flight planning and awareness of the pressure to fly in marginal weather.

Figure 97 Safety issues by aggregated ERCS score and numbers of accidents and serious incidents involving balloons



The data portfolio shown in Table 27 links the safety issues with the key risk areas to which they contribute. The key risk areas are listed at the top of the table and are prioritised from the left to right based on the aggregated ERCS risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues.

Table 27 Data portfolio for balloons

	KEY RISK AREAS (ERCS)				
SAFETY ISSUE	**OBSTACLE COLLISION**	**BALLOON LANDINGS**	**FIRE AND SMOKE**	**AIRBORNE CONFLICT**	**GROUND DAMAGE**
Presence and use of pilot restraints	o	x			o
Pre-Flight planning and preparation	o	o			
Powerline collisions	x	o	o	o	
Collision with buildings and trees	x				o
Control of flight path and inertia	x	o	o		
Pressure to fly	o	o		o	
Inflight decision making and planning	o	o			
Airborne separation				o	
System reliability		o			o
Fuel systems			o		
Aging structures					
Exterior colour schemes and markings					

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

CHAPTER 5

Sailplanes

The scope of this chapter covers sailplanes where the state of registry of the aircraft is an EASA Member State. The data presented are based on the accidents and serious incidents collected by the Agency under Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, and through actively searching for those events from other official sources. The chapter provides the key statistics for sailplanes and a data portfolio, which provides an overview of the main safety risk for these types of operations at the European level based on occurrence data.

Sailplanes is a unique domain within aviation, largely due to how gliding is performed. Unlike other domains where aircraft are powered by engines, sailplane operations depend on teamwork and safe towing into the air for the flight to commence. This added operational complexity has fostered a collaborative team spirit and cohesive atmosphere for safety within the gliding community. The gliding community, with the leadership of the European Gliding Union (EGU), has been actively involved in EASA's work on the newly implemented Sailplane Air Operations (OPS) and Flight Crew Licensing (FCL) rules, and in providing EASA with valuable input and insight into sailplane operations. The Agency's analysis in this chapter is supported by the EGU and the British Gliding Association (BGA), and aims to provide an in-depth analysis that gives an insight into the pertinent safety risks how they should be labelled so as to maximise their applicability and use in the gliding community.

The list of fatal accidents associated with the scope of this chapter is provided in Appendix 1 of this document.

Key statistics

The key statistics for this domain are in Table 28 and Table 29 and include a comparison of the number of accidents (fatal and non-fatal) and serious incidents for the 10-year period (2010-2019) and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe. There was a significant decrease (42%) in fatal accidents and a 4% decrease in non-fatal accidents. However, the number of reported serious incidents closed to doubled in 2020 compared to the 10-year average.

Table 28 Key statistics for sailplanes

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
243	Fatal accidents	14	↓
1822	Non-fatal accidents	175	↓
121	Serious incidents	23	↑

Table 29 Fatalities and serious injuries involving sailplanes

	FATALITIES	SERIOUS INJURIES
2010-2019 total	278	329
2010-2019 max.	40	47
2010-2019 min.	21	21
2020	16	34

SAILPLANES

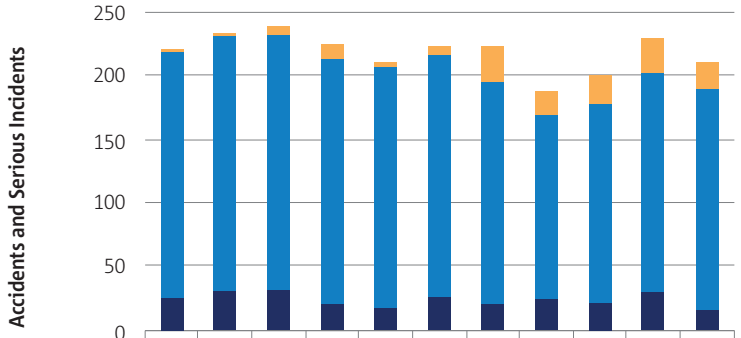
There were 16 fatalities in sailplane operations in 2020. This is a significant decrease when compared to the 10-year average. The number of serious injuries is, however, a bit higher than the 10-year average.

The COVID-19 pandemic has significantly affected sailplane operations. Specifically, during the period from March to May 2020, the flight operations were significantly reduced. The European Gliding Union has estimated that in general, sailplane operations were reduced by approximately 18-20% within the EU and competition flying was negligible in 2020.

Figure 98 provides an overview of both fatal and non-fatal accidents and serious incidents from 2010 to 2020. The figure shows a reduction in fatal and accidents in 2020. The number of reported serious incidents has been stable over the last 5 years.

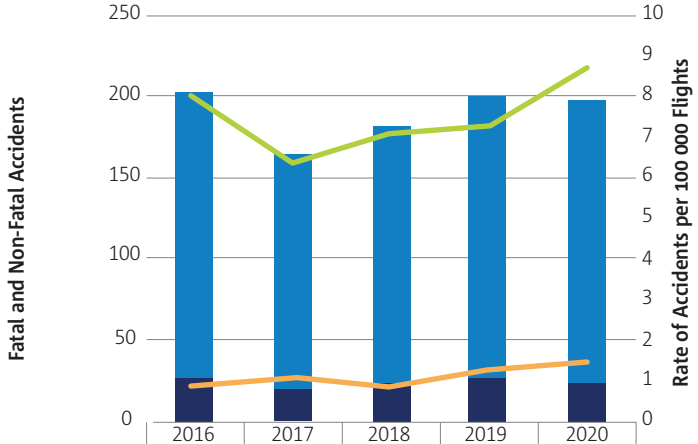
Figure 99 provides an overview of both fatal and non-fatal accidents and estimated rates during the period 2016-2020. As the availability of exposure data is sparse, an estimation was made using the last year´s estimation and reduced, as mentioned earlier, the number of flights by 18%.

Figure 98 Fatal and non-fatal accidents and serious incidents per year involving sailplanes



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	2	1	5	11	2	6	28	19	21	26	23
Non-Fatal Accidents	194	202	202	193	189	190	175	144	159	174	175
Fatal Accidents	25	30	30	20	18	26	20	25	20	29	14

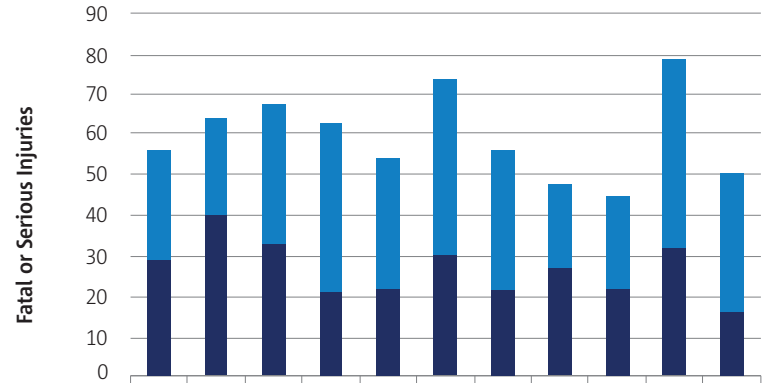
Figure 99 Numbers and rates of fatal and non-fatal accidents per year involving sailplanes



	2016	2017	2018	2019	2020
Non-Fatal Accident	175	144	159	174	175
Fatal Accident	28	19	21	26	23
Fatal Accident Rate	0.91	1.11	0.88	1.22	1.4
Non-Fatal Accident Rate	7.97	6.38	7.02	7.32	8.64

Figure 100 shows that 34 persons were seriously injured in 2020, compared to 47 in 2019. Fatalities also decreased in 2020, to 16 fatalities from 32 in 2019. This is a reduction by 50% but any tangible trend should be based on a multi-year observation.

Figure 100 Fatal and serious injuries per year involving sailplanes



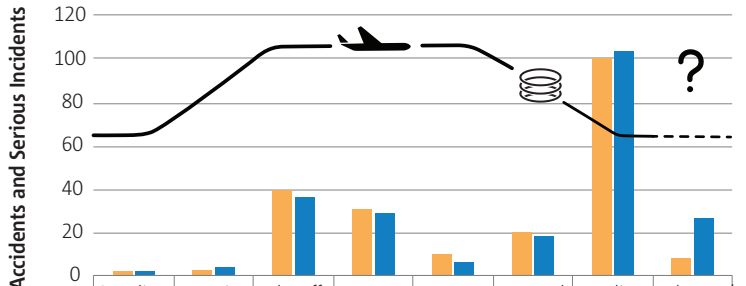
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	27	24	35	42	32	44	34	21	23	47	34
Fatalities	29	40	33	21	22	30	22	27	22	32	16

Phase of flight

The nature of gliding creates a different set of challenges for sailplane pilots compared to flights using motorised aircraft. This includes both a different means of take-off and the need for the sailplane pilot to frequently plan for possible landing areas during the flight. Figure 101 provides an overview of the accidents and serious incidents per phase of flight.

Occurrences during take-off include both winch launches and the towing of sailplanes with motorised aircraft. The en route and manoeuvring accidents include collisions with hills or other types of terrain. The approach and landing accidents largely reflect hard landings and obstacle collisions during the approach and landing, mostly result in substantial damage.

Figure 101 Accidents and serious incidents by phase of flight involving sailplanes

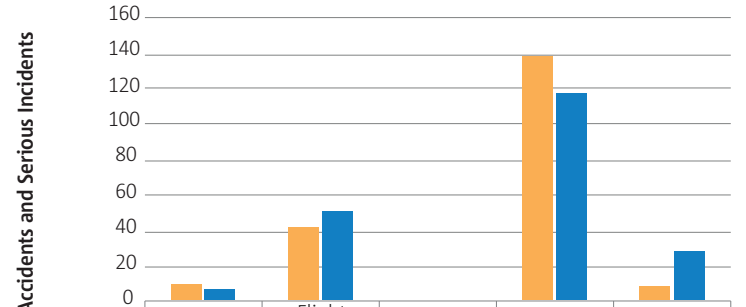


	Standing	Taxi	Take-off	En route	Man-oevring	Approach	Landing	Unknown/ blank
Average 2010-2019	2.1	3.1	39.7	30.9	10.5	19.6	100.5	8.3
2020	2	4	37	29	7	19	103	27

Operation type

Most sailplane accidents and serious incidents occurred during pleasure/ private flights. Instructional or training flight occurrences amount to 21% of the total occurrences recorded during the 10-year period. It should be noted that many of the unknown/blank phases of flight have not been categorised due to a lack of information as these accidents are still being investigated by the national Safety Investigation Authorities.

Figure 102 Accidents and serious incidents by operation type involving sailplanes



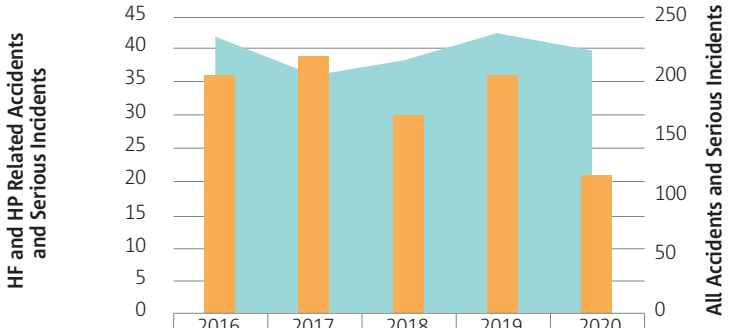
	Airshow/ Race	Flight Training/ Instructional	Towing	Pleasure	Unknown/ blank
Average 2010-2019	10.6	42.3	0.4	137.3	8.9
2020	7	51	0	118	29

Human factors and human performance

Approximately 15% of sailplane accident and serious incident reports identify human factors (HF) or human performance (HP) issues, which are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. The proportion of accidents and serious incidents identifying HF or HP issues was stable between 2016 and 2017. However, the figures for 2018 and 2020 should be viewed as preliminary and likely to increase as HF or HP issues are often not recorded within accident and serious incident reports until the final report has been published.

The application of HF or HP codes at a high level can be seen in Figure 104. As with many of the domains in this review, personnel task performance, and situational awareness and sensory events are the most commonly coded high-level HF and HP event types.

Figure 103 Human factors and human performance accidents and serious incidents involving sailplanes



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	234	201	215	235	221
HF/HP Accidents and Serious Incidents	36	39	30	36	21

Figure 104 High level human factors and human performance event codes applied to accidents and serious incidents involving sailplanes

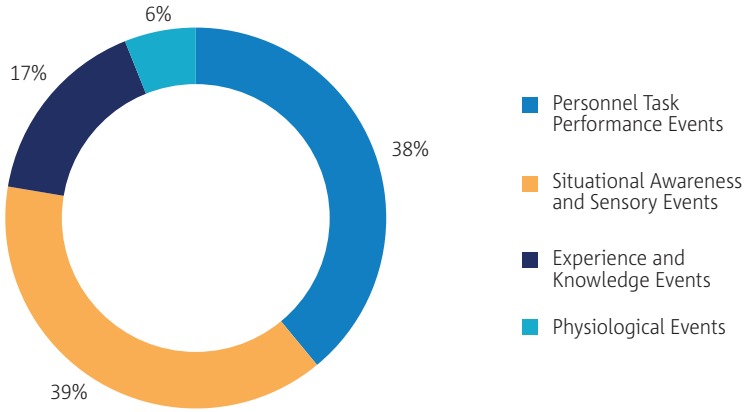
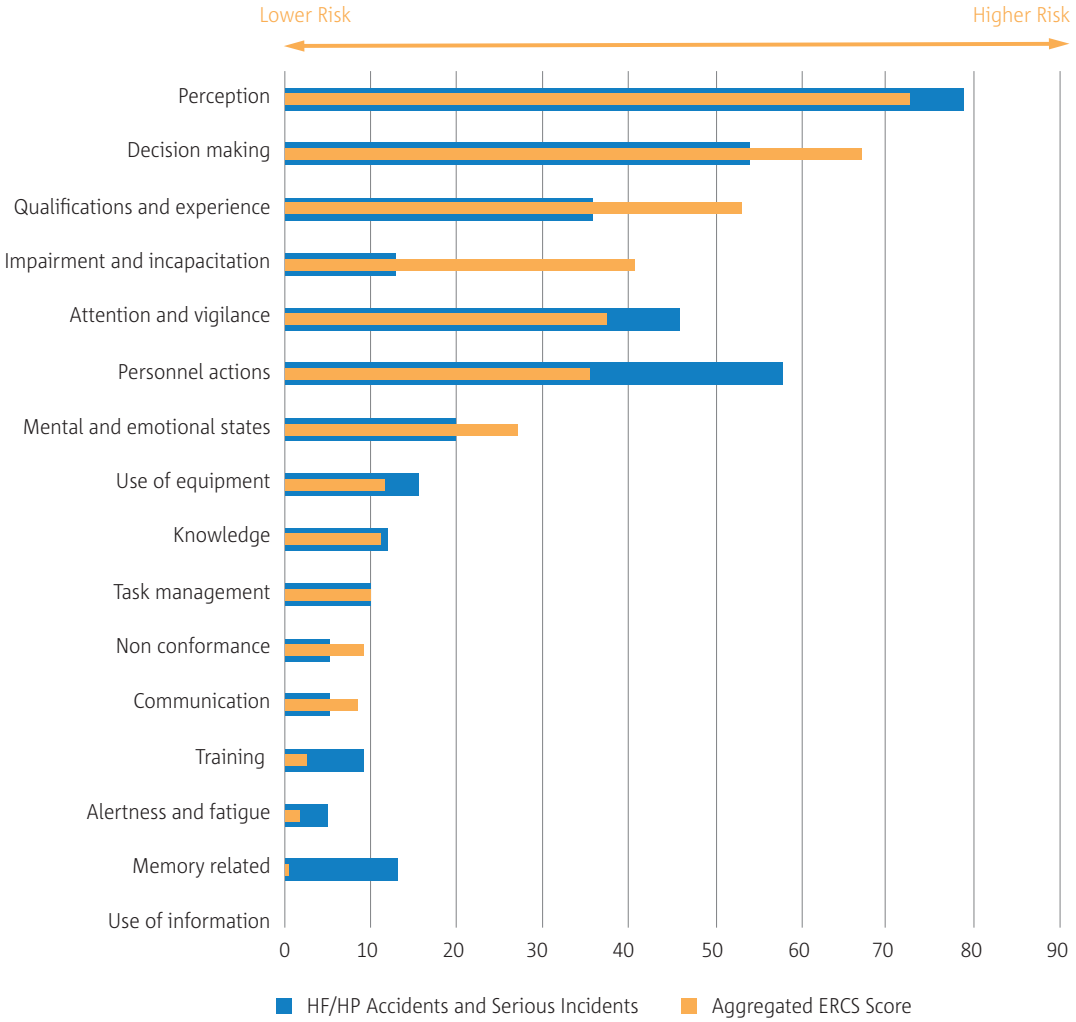


Figure 105 compares the numbers of accidents and serious incidents with the aggregated ERCS risk score of those incidents, using detailed HF and HP event codes. It can be seen that some events have a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents. Qualifications and experience, as along with decision making stand out as the HF event types having the highest aggregated risk score.

Figure 105 Detailed human factors and human performance event codes by aggregated ERCS score and numbers of accidents and serious incidents involving sailplanes



Safety risks for sailplanes

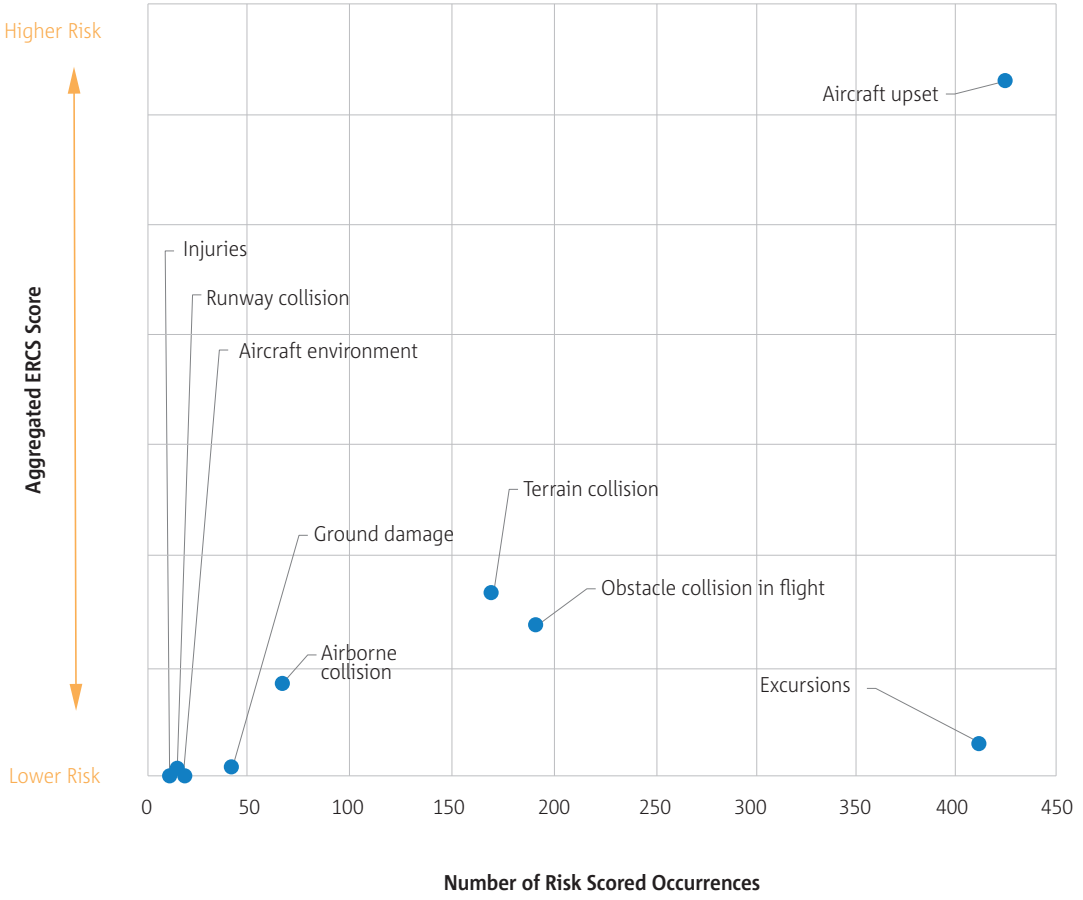
The safety risks for sailplanes have been identified by EASA in collaboration with the European Gliding Union (EGU). They are derived from accident and serious incident data from the EASA occurrence repository, covering the 5-year period 2016-2020 (1082 occurrences). The following paragraphs refer to accidents and serious incidents that have been risk scored using the ERCS methodology and divided into higher and lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to this annual review.

The main key risk areas for this domain are highlighted in Figure 106 and are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Note that one single occurrence can be associated with more than one key risk area.

Figure 106 is similar to Figure 107 but it shows the key risks from the perspective of the sailplane pilot. It provides the key risk areas that are highly relevant for sailplane operations. Again, it can be seen that loss of control has the highest risk with 414 high risk occurrences over the last 5 years.

Many of these accidents occur during approach and landing, where the pilot's workload is the highest. Accidents involving terrain collisions

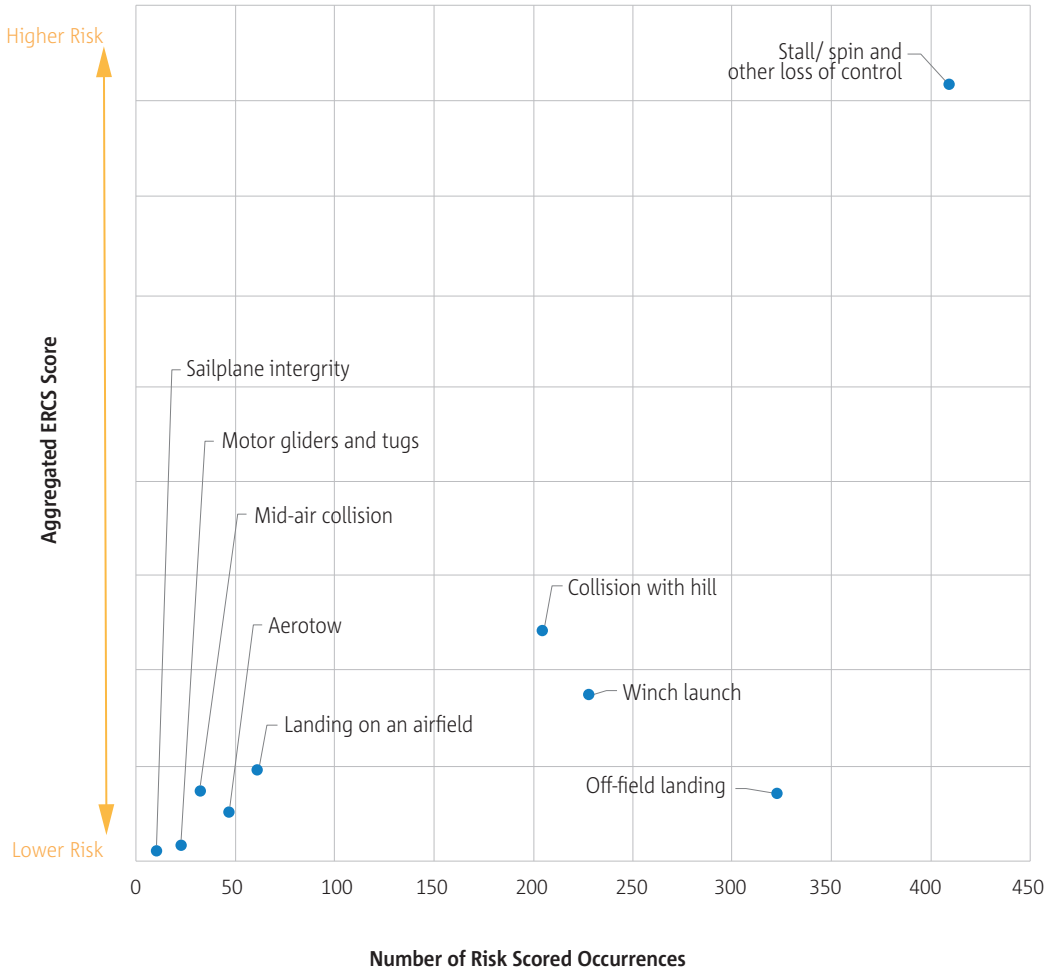
Figure 106 Key risk areas by aggregated ERCS score and number of risk-scored occurrences involving sailplanes



(collision with hill) cause many fatalities for sailplanes compared with other aviation domains, this is because it is common for sailplanes to seek lifting conditions in mountainous areas. The winch launch method also shows a significant risk. The main causes of accidents are the wing tip hitting the ground during the take-off run, climbs that are too steep, and incomplete winch launches. Such launches force the sailplane to land outside the airfield or lead to pilots attempting to return to the airfield after a failed launch, using too steep turns while flying too slow.

Other risk areas worth noting are the off-field landings and landings on the airfield. The landings on the airfield are either hard landings or runway excursions. The damage during off-field landings is mostly caused by hitting objects like trees, bushes or other high vegetation during touch down with the landing roll resulting in a ground loop. Motor gliders and tugs are separated into one area as they are aircraft with engines, and frame the technical aspects related to motorised aircraft. Sailplane integrity, however, covers shortcomings in preparing the sailplane for flight. These are typically rigging errors, unlocked canopies or airbrakes not having been locked. Other aspects such as maintenance, design, assembly and equipment failures are not included. However, a deficiency within the database taxonomy has been identified that makes it difficult to fully exclude such event types.

Figure 107 Sailplane risk groups by aggregated ERCS score and number of risk-scored occurrences involving sailplanes



Greater effort is required to better capture sailplane integrity occurrences with necessary change within the taxonomy and a subsequent update of the data.

Figure 108 provides information on each identified safety issue phrased in agreement with the EGU. It shows the number of occurrences behind each safety issue in a blue bar superimposed by the aggregated ERCS score displayed in yellow. A yellow bar in the graph that is considerably longer in comparison with the underlying blue bar indicates a low number of occurrences contributing to a high risk.

The definitions of some safety issues in sailplane operations have been revised. In the previous edition a specific 'stall/spin' issue was established along with 'loss of control – other'. 'Collision with hill' has also been recognised as a safety issue as can be seen in Figure 108. However, these three issues are in fact outcomes, meaning, a key risk area. The safety issues leading to a loss of control and a collision with hill are therefore important to capture. An attempt has been made to achieve this in Figure 109, where the safety issues alone have been presented.

Figure 108 Sailplane safety issues/risk areas useful for sailplane operation

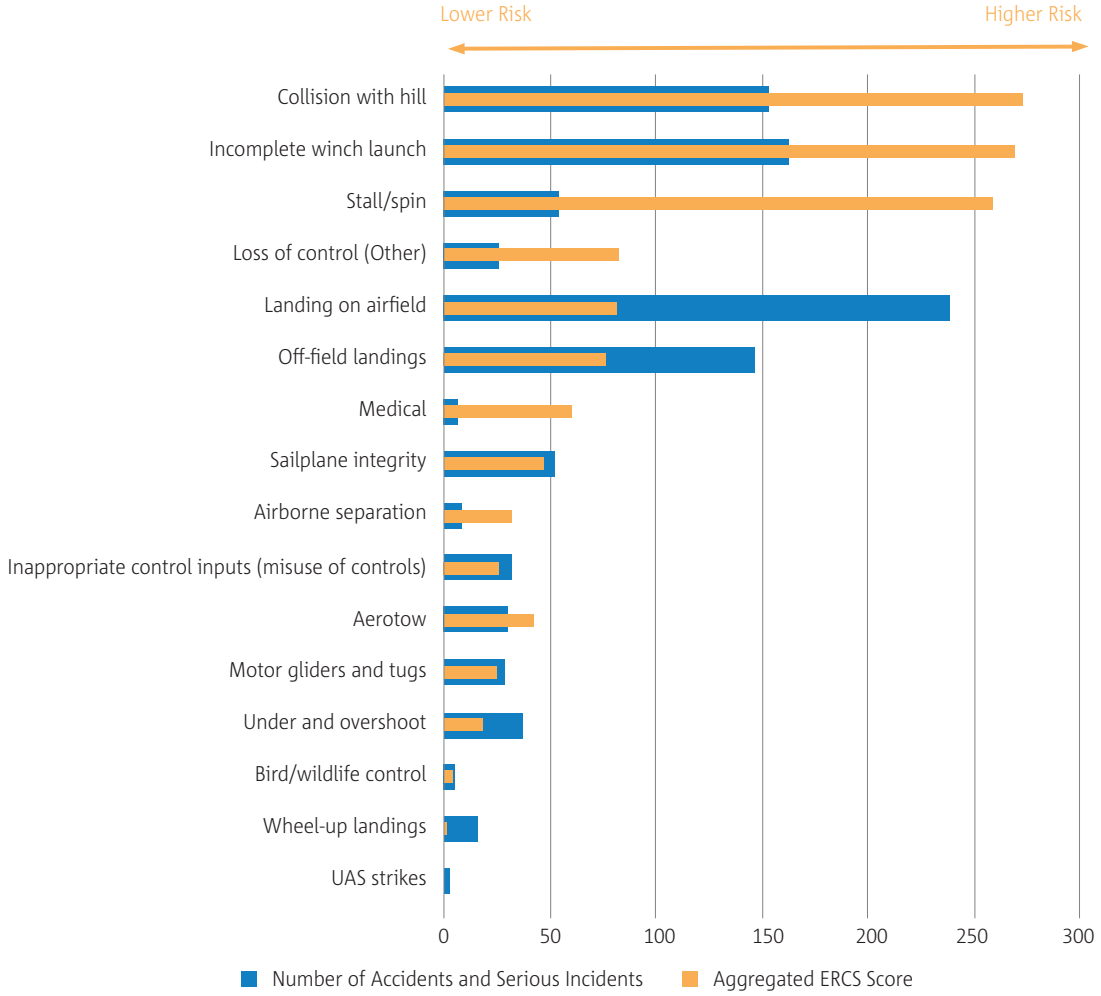
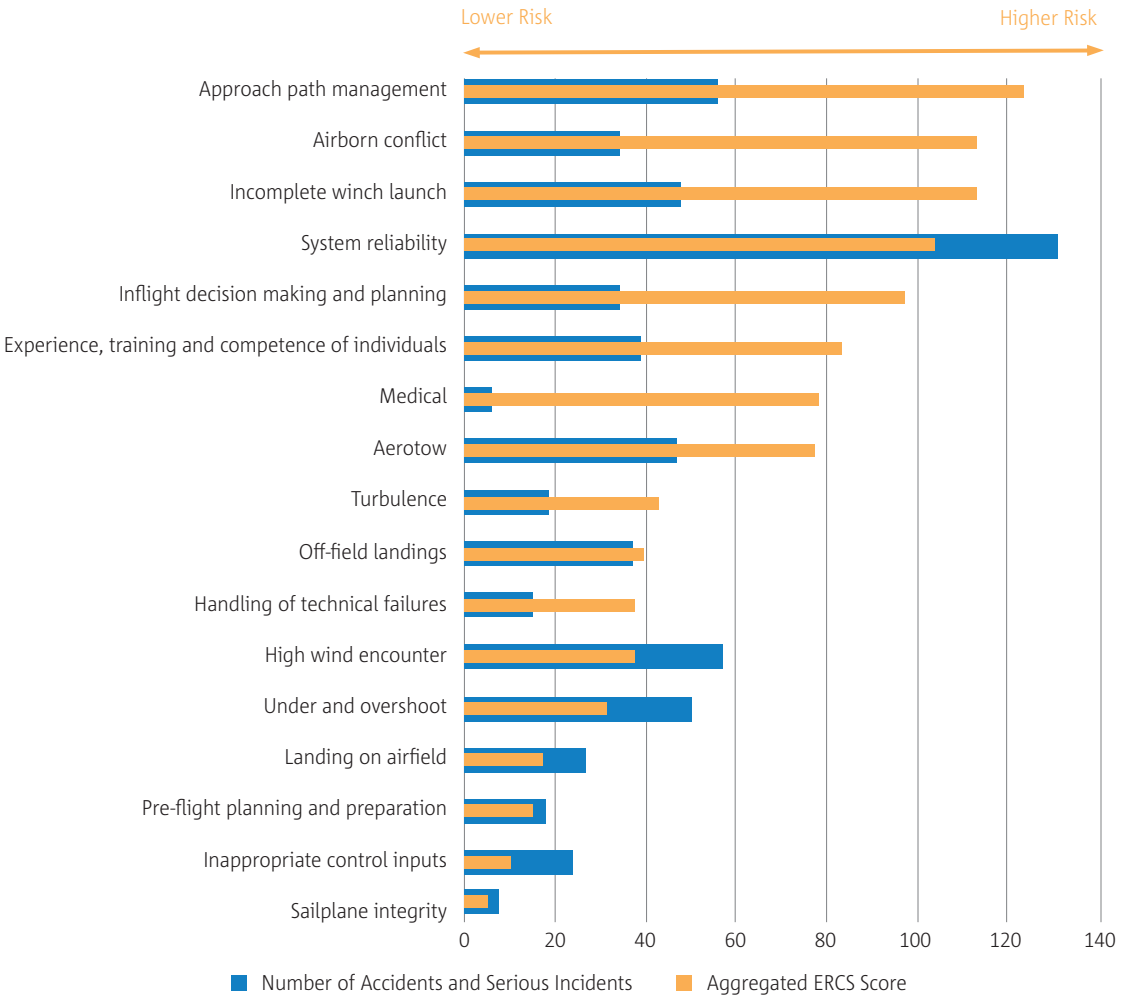


Figure 109 depicts the difference between the number of occurrences vs the aggregated risk. Some of the safety issues shown have a significantly higher risk than the number of occurrences. Those safety issues should be further assessed, since although they may be less frequent, they are higher risk when they do occur. Examples include approach path management, airborne conflict and incomplete winch launch.

The safety issue 'system reliability' has a lower risk compared to the number of occurrences. This is understandable as many of the occurrences are landing gear problems that provide a low level of risk by nature. However, 'system reliability' also captures occurrences where there are flight control or engine issues, specifically in self-launched sailplanes. Self-launched sailplanes have an engine on board that enables sailplanes to take off by themselves, with the engine then being retracted into the fuselage.

'High wind encounter', 'under/overshoot', 'landing on airfield' and 'inappropriate control inputs' are all issues that usually enable the pilot to react and recover from the situation. Therefore, the risk is lower for those issues.

Figure 109 Safety Issues by aggregated ERCS score and number of accidents involving sailplanes



The data portfolio presents the main key risk areas and their connections to the identified safety issues. All occurrences in the data are risk scored using the European Risk Classification Scheme (ERCS). The key risk areas are sorted by the aggregated ERCS score from left to right and the safety issues are sorted by the aggregated ERCS score from top to bottom. The different colour bands denote high to low risk for the safety issues.

Table 30 Data portfolio for sailplanes

	KEY RISK AREAS (ERCS)					
SAFETY ISSUE	**AIRCRAFT UPSET**	**TERRAIN COLLISION**	**OBSTACLE COLLISION IN FLIGHT**	**AIRBORNE COLLISION**	**LANDINGS**	**FIRE AND SMOKE**
Approach path management	x	x	x		x	o
Airborne conflict	o			x		
Incomplete winch launch	x	x	x		o	
System reliability	x	o			x	o
Inflight decision making and planning	x	x	x	o	x	o

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAILPLANES

SAFETY ISSUE	KEY RISK AREAS (ERCS)					
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	AIRBORNE COLLISION	LANDINGS	FIRE AND SMOKE
Experience, training and competence of individuals	x	x	x		x	
Medical	o	o				
Aerotow	x	x	x		o	
Turbulence	x	o	o		o	
Off-field landings	o	x	x		x	
Handling of technical failures	x	o	o		o	
High wind encounter	x	x	x		x	
Under/overshoot	x	x	x		x	
Landing on airfield	o	x	x		x	
Pre-flight planning and preparation	x	o	o	o	o	
Inappropriate control inputs	x	x	x	o	x	
Glider integrity	x		o			

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

CHAPTER 6

Aerodromes and ground handling

The scope of this chapter covers aerodrome and ground handling operations in EASA Member States. The data presented is based on the accidents and serious incidents collected by the Agency under Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, and through the active search of those events from other official sources.

It is worth noting that the accidents and serious incidents in this chapter are those related to aerodrome and ground handling operations in a general context. This means that the aerodrome infrastructure, aerodrome operations or ground handling operation itself may or may not have contributed to a given occurrence but could have a role in preventing similar occurrences in the future. Accidents relating to occupational health and safety with no element of aviation safety, are not included.

In addition to key statistics for the domain, a data portfolio for aerodrome and ground handling operations is also provided.

The list of fatal accidents associated with the scope of this chapter is provided in Appendix 1 of this document.

Key statistics

The key statistics for this domain are shown in Table 31 and Table 32. This includes accidents and serious incidents related to aerodrome infrastructure, aerodrome procedures and ground handling operations at aerodromes that are located in the EASA Member States. There were no fatal accidents related to aerodromes and ground handling in 2020, and the number of non-fatal accidents was less than half of the average of the preceding decade. The number of serious incidents was almost the same as the average of the previous 10 years, which, taking into account the downturn in traffic in 2020, should be considered as being high. The number of serious injuries in 2020 was also in line with the average of 2010-2019.

Table 31 Key statistics for aerodromes and ground handling

2010-2019 TOTAL	TIMESPAN	2020	2020 VS 2010-2019
8	Fatal accidents	0	↓
471	Non-fatal accidents	23	↓
127	Serious incidents	11	↓

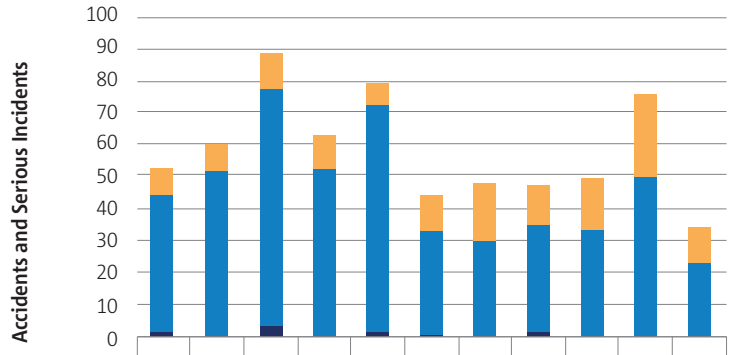
Table 32 Fatalities and serious injuries for aerodromes and ground handling operations

	FATALITIES	SERIOUS INJURIES
2010-2019 total	18	43
2010-2019 max.	8	6
2010-2019 min.	0	1
2020	0	4

Figure 110 shows the number of accidents and serious incidents per year. There have been no fatal accidents since 2017, and the number of non-fatal accidents in 2020 was lower than any year in the preceding decade. Despite the downturn in traffic in 2020, the number of serious incidents in 2020 was higher than or equal to the number in all years prior to 2016.

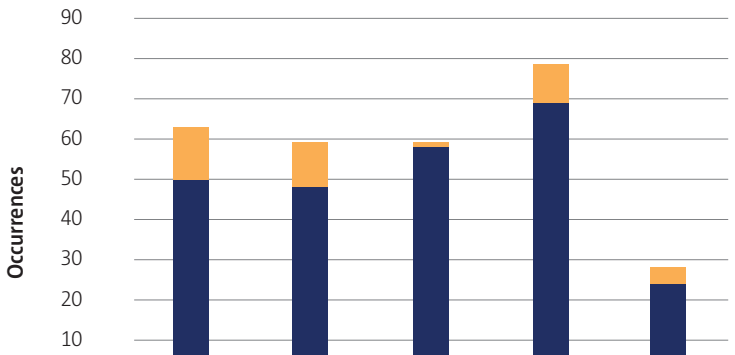
In the aerodromes and ground handling domain, EASA has reviewed the accidents and serious incidents for 2016-2020 with regard to risk. All accidents and serious incidents within the scope have been risk assessed using the European Risk Classification Scheme (ERCS) methodology and have been assigned an ERCS score. An explanation of the ERCS and why it is useful is provided in the introduction to this annual review. The numbers of accidents and serious incidents per year, together with the associated ERCS score, is shown in Figure 111. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern than the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal or even exceed the risk of some accidents.

Figure 110 Fatal accidents, non-fatal accidents and serious incidents per year involving aerodromes and ground handling



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	9	8	11	10	7	11	18	12	16	25	11
Non-Fatal Accidents	43	52	74	53	71	32	30	33	33	50	23
Fatal Accidents	1	0	3	0	1	1	0	2	0	0	0

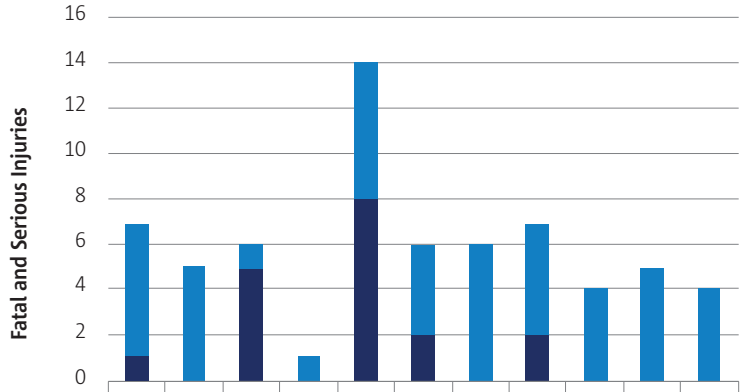
Figure 111 Numbers of ERCS higher risk and lower risk occurrences per year involving aerodromes and ground handling



	2016	2017	2018	2019	2020
Lower risk (ERCS)	13	11	1	9	4
Higher risk (ERCS)	50	48	58	69	24

The number of fatalities and serious injuries per year is shown in Figure 112. The number of serious injuries has remained between 4 and 6 per year since 2014.

Figure 112 Fatal and serious injuries per year involving aerodromes and ground handling

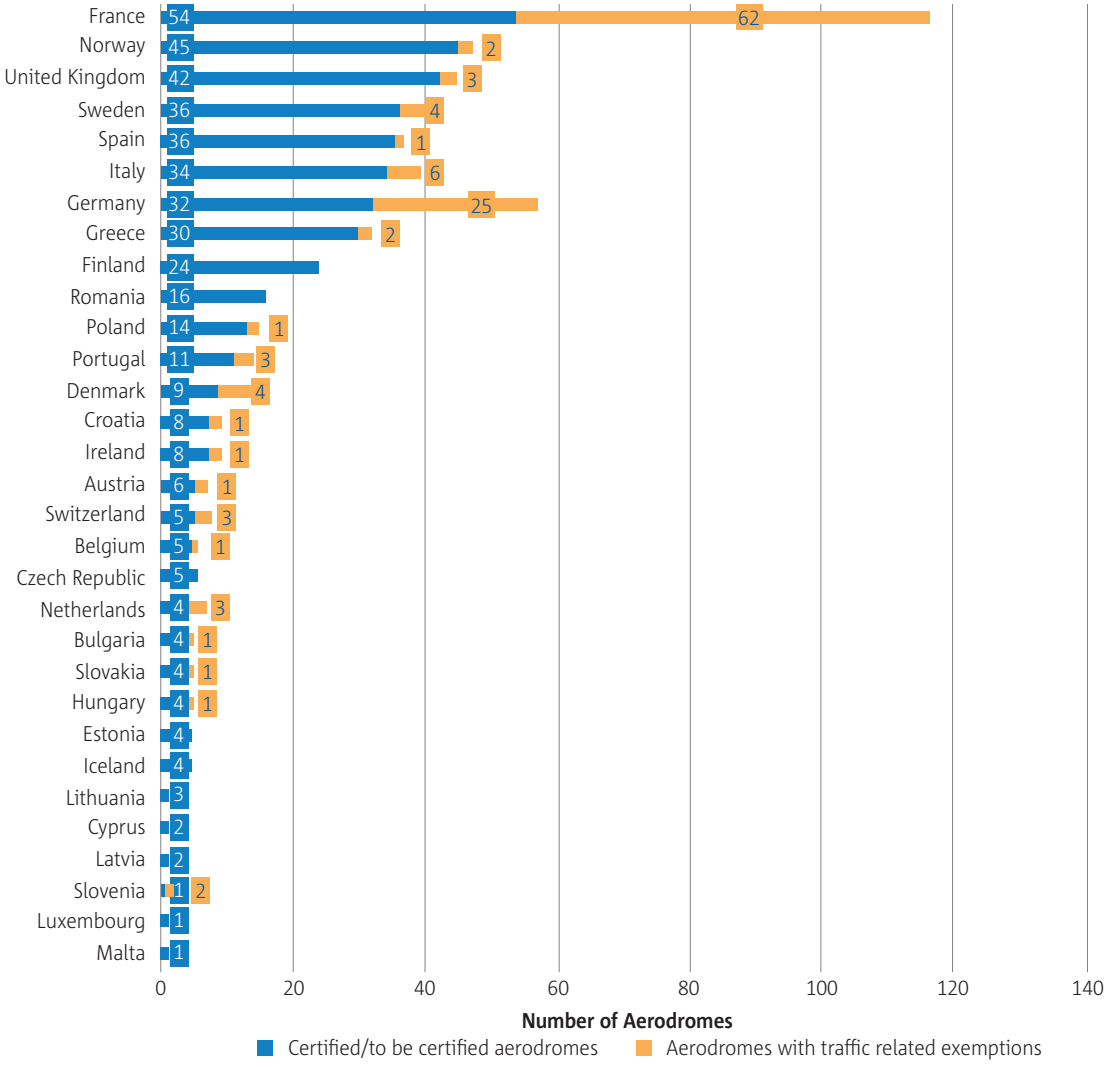


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Injuries	6	5	1	1	6	4	6	5	4	5	4
Fatalities	1	0	5	0	8	2	0	2	0	0	0

Number of EASA MS certified aerodromes

Regulation (EU) 139/2014 lays down the requirements for the certification of aerodromes in the EASA Member States. As of 31 December 2020, 567 aerodromes were within the scope of the regulation (including 45 aerodromes in the United Kingdom). Of which, 454 have been certified or are in the process of being certified, while 113 aerodromes have been granted an exemption in accordance with Article 2(1)(e) of Regulation (EU) 2018/1139 (the EASA Basic Regulation). Figure 113 shows the number of aerodromes per EASA Member State. It should be noted that although ground handling service provision is regulated through the EASA Basic Regulation, the delegated acts laying down the detailed rules are yet to be adopted.

Figure 113 Aerodromes within the scope of Regulation (EU) 139/2014 by EASA Member State

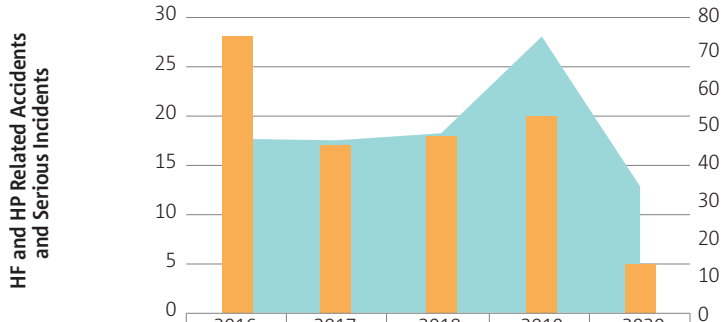


Human factors and human performance

Over a third of accident and serious incident reports in this domain identify human factors (HF) or human performance (HP) issues. Both HF and HP issues are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. Looking at the figures for the past five years, there is an apparent increase in 2016. The figure for 2020 should be viewed as preliminary and is likely to increase, since HF or HP issues are often not recorded within accident and serious incident reports until the final investigation report has been published.

The application of HF or HP codes at a high level can be seen in Figure 115. Situational awareness and sensory events are the most common category of HF or HP issue applied to accidents and serious incidents involving aerodromes and ground handling, followed by personnel task performance. These may be more easily discernible in an investigation than the factors that cause them.

Figure 114 Human factors and human performance accidents and serious incidents involving aerodromes and ground handling



	2016	2017	2018	2019	2020
Accidents and Serious Incidents	48	47	49	75	34
HF/ HP Accidents and Serious Incidents	28	17	18	20	5

Figure 115 Human factors and human performance accidents and serious incidents involving aerodromes and ground handling

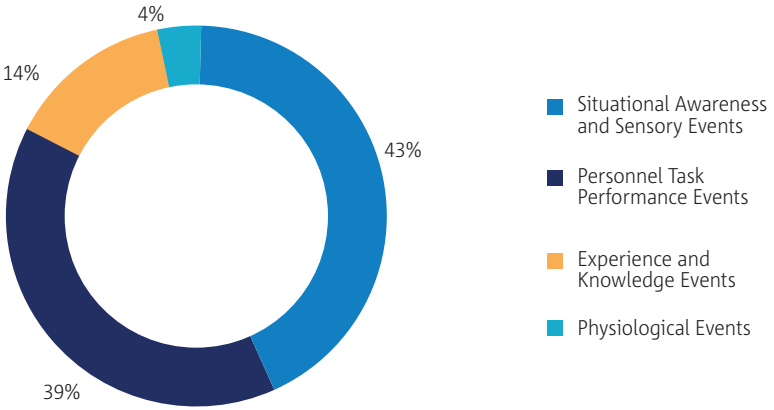
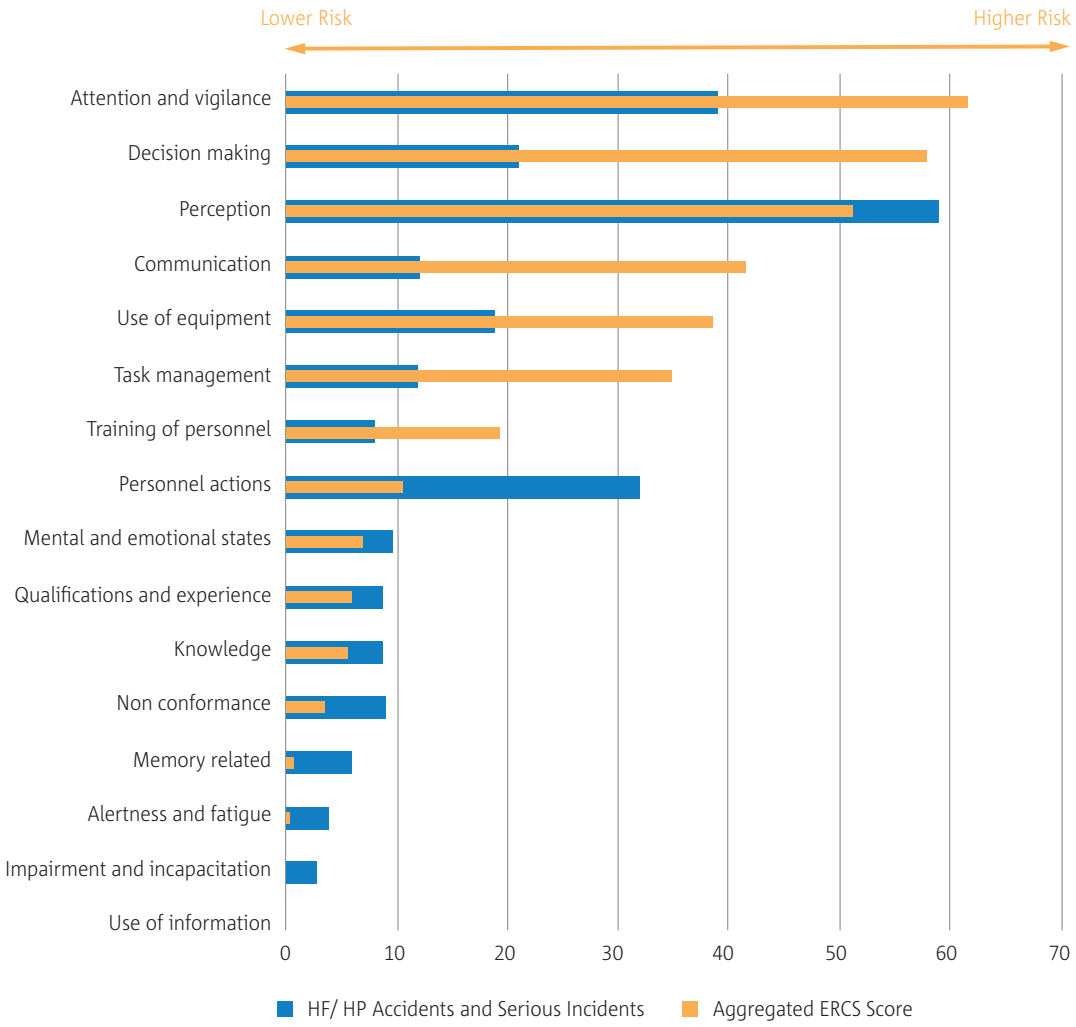


Figure 116 compares the numbers of accidents and serious incidents with the aggregated ERCS risk score of those occurrences, using detailed HF and HP event codes. Some events carry a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents.

Figure 116 Detailed human factors and human performance event codes by aggregated ERCS score and number of accidents and serious incidents involving aerodromes and ground handling



Safety risks for aerodromes and ground handling

The safety risks for aerodromes and ground handling are derived from accident and serious incident data from the EASA occurrence repository and the European Central Repository, covering the 5-year period 2016-2020 (363 occurrences).

The main key risk areas for this domain are highlighted in Figure 117 and are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Note that one single occurrence can be associated with more than one key risk area.

The most frequent key risk area for aerodrome and ground handling related accidents and serious incidents is ground damage, followed by aircraft upset and runway excursions. In terms of aggregated risk, ground damage and aircraft upset are on a similarly high level of aggregated risk, followed by runway collision.

Figure 117 Key risk areas by aggregated ERCS score and number of risk-scored occurrences involving aerodromes and ground handling

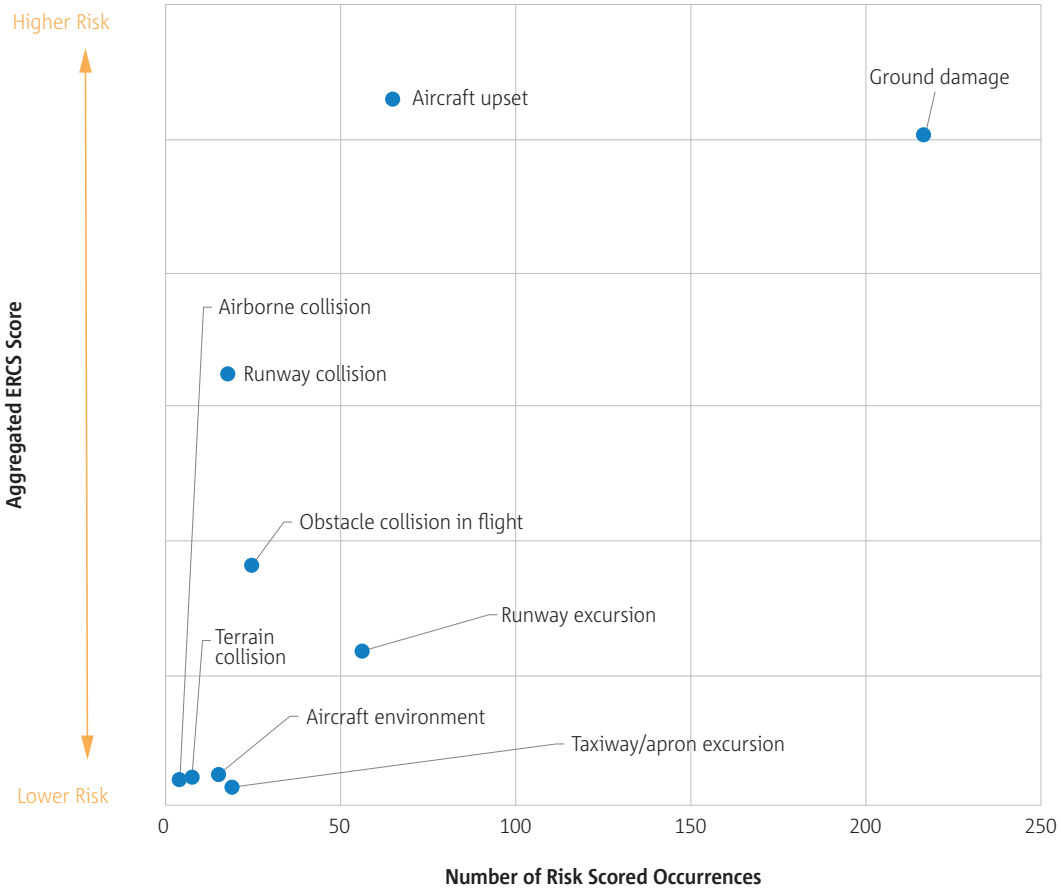
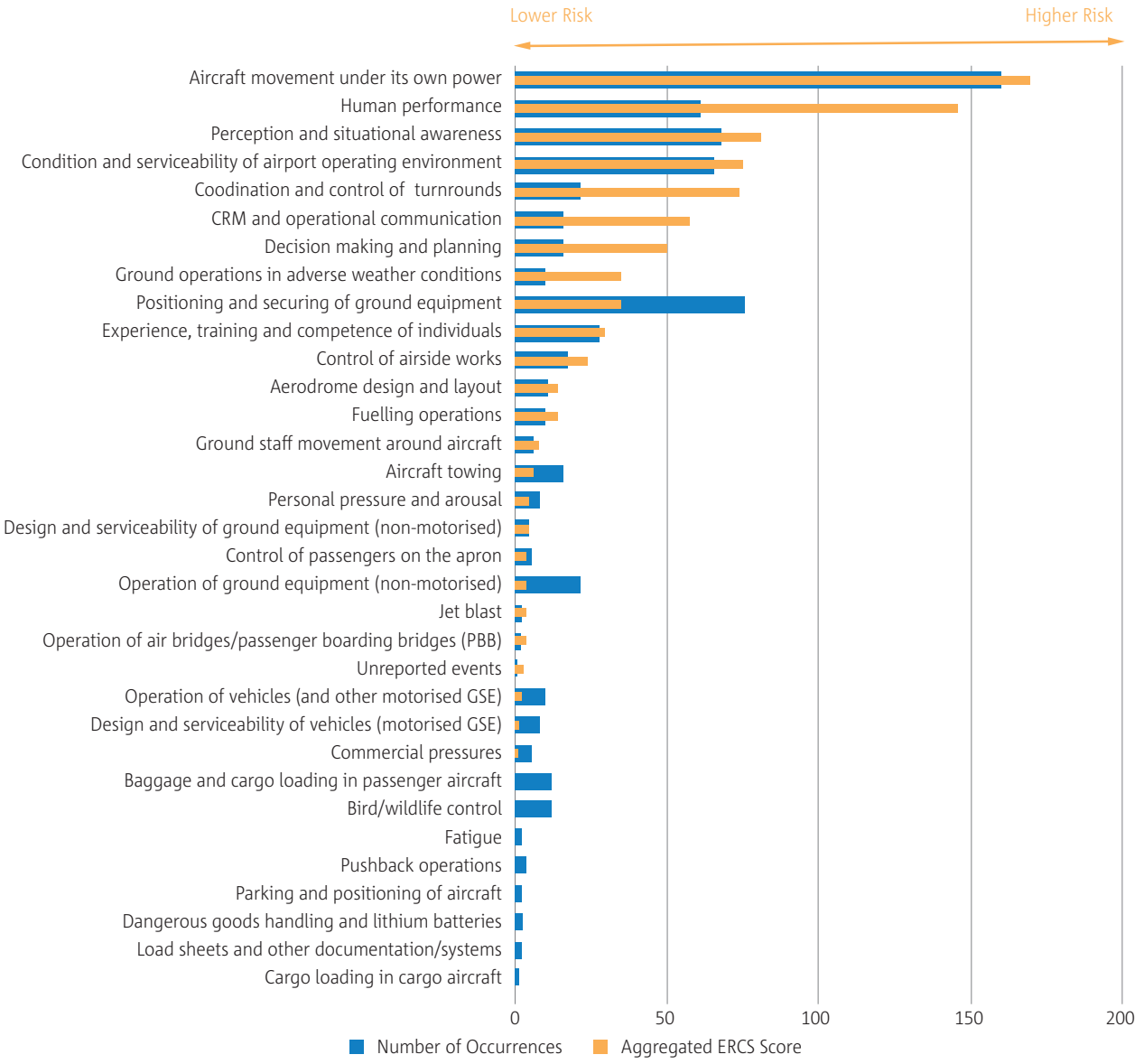


Figure 118 shows a comparison between the number of occurrences per safety issue and their aggregated ERCS score. A yellow bar in the graph that is considerably longer in comparison with the underlying blue bar indicates a low number of occurrences contributing to a high risk.

Figure 118 Safety issues by aggregated ERCS score and numbers of occurrences involving aerodromes and ground handling



The data portfolio is shown in Table 33 and links the safety issues with the key risk areas to which they contribute. The key risk areas are listed at the top of the table and are prioritised from left to right based on the aggregated ERCS-risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues.

From the data, the safety issue with the highest aggregated risk contribution is aircraft movement under its own power. This safety issue has been identified in occurrences as contributing to 6 different key risk areas. The safety issue contributing to the highest number of key risk areas is control of airside works, which is associated with all 9 key risk areas. The safety issue identified as a strong contributor to the most key risk areas is condition and serviceability of airport operating environment, which is a strong contributor to 5 of the 9 key risk areas.

Table 33 Data portfolio for aerodromes and ground handling

SAFETY ISSUE	AIRCRAFT UPSET	GROUND DAMAGE	RUNWAY COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION	FIRE, SMOKE AND PRESSURISATION	TERRAIN COLLISION	AIRBORNE COLLISION	TAXIWAY/APRON EXCURSION
Aircraft movement under its own power	o	x	x	o	x				x
Human performance	o	o	o		o				
Perception and situational awareness	o	o	o		o				
Condition and serviceability of airport operating environment	x	x	o	x	x	o	o		x
Coordination and control of turnarounds	x	x		o	o	o			

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

AERODROMES AND GROUND HANDLING

SAFETY ISSUE	AIRCRAFT UPSET	GROUND DAMAGE	RUNWAY COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION	FIRE, SMOKE AND PRESSURISATION	TERRAIN COLLISION	AIRBORNE COLLISION	TAXIWAY/APRON EXCURSION
CRM and operational communication	o	x	o		o	o	o		
Decision making and planning	x	o	o	o	x		o		
Ground operations in adverse weather conditions	o	x			o	o			o
Positioning and securing of ground equipment	o	o	o		o				
Experience, training and competence of individuals	x	x	o	o	x		o	o	
Control of airside works	o	o	o	o	x	o	o	o	o
Aerodrome design and layout	o	o		o	x		o	o	
Fuelling operations	x			o	o	o	o		
Ground staff movement around aircraft	o	o	o		o				
Aircraft towing		x							o
Personal pressure and arousal	o	o	o		o				
Design and serviceability of ground equipment (non-motorised)		o							
Control of passengers on the apron						o			

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	AIRCRAFT UPSET	GROUND DAMAGE	RUNWAY COLLISION	OBSTACLE COLLISION IN FLIGHT	RUNWAY EXCURSION	FIRE, SMOKE AND PRESSURISATION	TERRAIN COLLISION	AIRBORNE COLLISION	TAXIWAY/APRON EXCURSION
Operation of ground equipment (non-motorised)	o	o	o		o				
Jet blast	o	o	o		o				
Operation of air bridges/passenger boarding bridges (PBB)	o	o	o		o				
Unreported events	o	o	o		o				
Operation of vehicles (and other motorised GSE)	o	o	o		o				
Design and serviceability of vehicles (motorised GSE)		x							
Commercial pressures	o	o			o		o		
Baggage and cargo loading in passenger aircraft	x					o			
Bird/wildlife control	x			o	o	o			
Fatigue	o	o						o	o
Pushback operations	o	o	o		o				
Parking and positioning of aircraft	o	o	o		o				
Dangerous goods handling and lithium batteries						o			
Load sheets and other documentation/systems	o	o	o		o				
Cargo loading in cargo aircraft	o								

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

CHAPTER 7

ATM/ANS

The scope of this chapter covers accidents and serious incidents related to the provision of air traffic management/ air navigation services (ATM/ANS) in EASA Member States (MS). The data are based on the accidents and serious incidents collected by EASA under ICAO Annex 13 and Regulation (EU) 996/2010 on accident and serious incident investigation and Regulation (EU) 376/2014 on occurrence reporting, analysis and follow-up. Accident and serious incidents in this chapter involve at least one commercial air transport (CAT) aircraft, either fixed-wing aeroplanes with a maximum take-off mass of at least 2250 kg, or small (CS-27) or large (CS-29) helicopters, which occurred in an EASA MS.

Accidents and serious incidents reviewed in this chapter are related to the provision of ATM/ANS services, henceforth referred to as ATM/ANS related occurrences. Occurrences in which the ATM system may or may not have contributed to the given occurrence but may have played a role in preventing or mitigating similar occurrences in the future are considered.

Within ATM/ANS related occurrences lies a subset known as ATM/ANS contribution. ATM/ANS contribution comprises occurrences where the provision of services by the ATM/ANS was a contributing factor in the occurrence or played a role in aggravating the occurrence encountered by the aircraft.

The chapter introduces the key statistics on ATM/ANS occurrences and concludes with the data portfolio, providing an overview of the main safety risks in the ATM/ANS domain from a data perspective.

The list of fatal accidents associated with the scope of this chapter is provided in Appendix 1 of this document.

Key statistics

The key statistics for this domain are in Table 34 and Table 35 and include a comparison of the number of fatal and non-fatal accidents and serious incidents for the 10-year period 2010-2019 and the last year (2020). It also includes a comparison of the fatalities and serious injuries sustained in those accidents during the same timeframe. In 2020, no ATM/ANS related fatal accidents and 3 ATM/ANS related non-fatal accidents occurred in EASA MS as shown in Table 34. This is a slight decrease compared to 2019 when 1 ATM/ANS related fatal accident and 8 ATM/ANS related non-fatal accidents occurred. In the last 10 years, there have been no fatal accidents with ATM/ANS contribution. The numbers of non-fatal accidents and serious incidents in 2020 were lower than those of the previous years, with no non-fatal accidents and 4 serious incidents recorded.

As shown in Table 35, no ATM/ANS related fatalities and no fatalities with ATM/ANS contribution were recorded in 2020. While 2 ATM/ANS related serious injuries were observed, no serious injuries with ATM/ANS contribution were reported for 2020.

Table 34 Key statistics for ATM/ANS

2010-2019 TOTAL	TIMESPAN	2020	2020 vs 2010-2019
8	ATM/ANS related	0	↓
	Fatal accidents		
0	ATM/ANS contribution	0	=
57	ATM/ANS related	3	↓
	Non-fatal accidents		
10	ATM/ANS contribution	0	↓
356	ATM/ANS related	16	↓
	Serious incidents		
135	ATM/ANS contribution	4	↓

Table 35 Number of fatalities and serious injuries involving ATM/ANS

	FATALITIES		SERIOUS INJURIES	
	ATM RELATED	ATM CONTRIBUTION	ATM RELATED	ATM CONTRIBUTION
2010-2019 total	36	0	52	3
2010-2019 max.	8	0	13	2
2010-2019 min.	0	0	1	0
2020	0	0	2	0

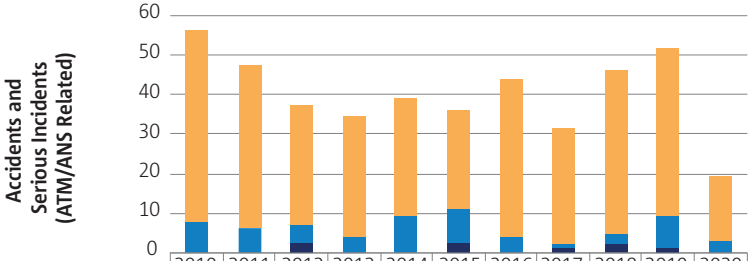
Figure 119 shows the numbers of accidents and serious incidents for the period 2010-2020. In the last 10 years, 8 ATM/ANS related fatal accidents have occurred. These accidents mainly involved helicopters, and none was related to an occurrence where ATM/ANS was a contributing or aggravating factor. The last ATM/ANS related accident that involved a CAT aeroplane occurred in 2012.

Figure 120 shows that the rate of ATM/ANS related fatal accidents in the EASA MS[6] has remained between 0 and 0.2 accidents per million IFR flights over the past 5 years. While the rate of ATM/ANS related non-fatal accidents decreased from 2016 to 2017, the rate has been on an upward trend since and decreased only slightly in 2020. The rate of serious incidents plateaued in 2019, after a slight increase from 2017 to 2018 and dropped in 2020. These reductions are observed in the context of the COVID-19 pandemic, which impacted overall 2020 traffic levels, dropping to around the 45% compared to 2019 traffic levels. This traffic drop has led to less congested aerodromes and airspace, which probably resulted in a reduction of accidents and serious incidents.

Figure 121 shows that there were no fatal accidents in 2020 and the preceding period 2010-2019, where ATM/ANS was a contributing or aggravating factor. The number of serious incidents with ATM/ANS contribution has decreased to 4 in 2020, when compared to the previous 10 years. There were no non-fatal accidents in 2020. This stabilised the already noted improvement in 2019, as the number of non-fatal accidents fluctuated between 0 and 2 from 2010 to 2018. The rate of serious incidents with ATM/ANS contribution, as seen in Figure 122, decreased after 2016 but plateaued in 2017 and 2018, followed by a slight drop in 2019 and a slight increase in 2020.

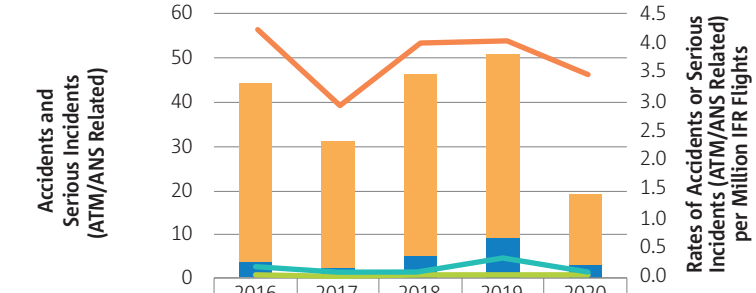
6 Source: EUROCONTROL

Figure 119 Accidents and serious incidents per year (ATM/ANS related)



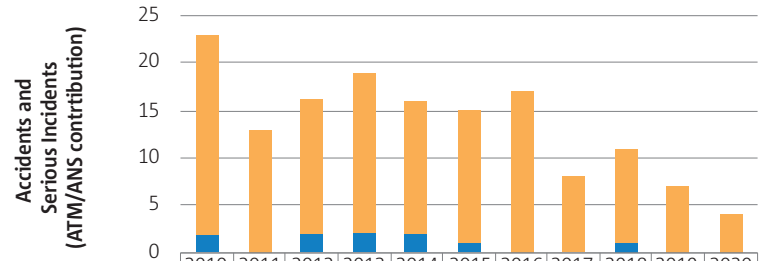
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	48	41	30	30	30	25	40	29	41	42	16
Non-Fatal Accidents	8	6	5	4	9	9	4	1	3	8	3
Fatal Accidents	0	0	2	0	0	2	0	1	2	1	0

Figure 120 Numbers and rates of accidents and serious incidents per year (ATM/ANS related)



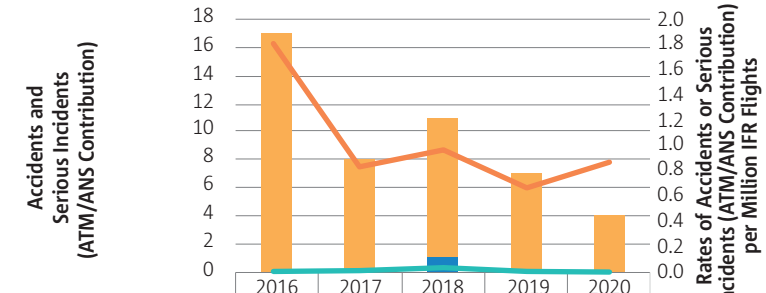
	2016	2017	2018	2019	2020
Serious Incidents	40	29	41	42	16
Non-Fatal Accidents	4	1	3	8	3
Fatal Accidents	0	1	2	1	0
Fatal Accident Rates	0	0.0	0.1	0.0	0.0
Non-Fatal Accident Rate	0.2	0.0	0.1	0.3	0.1
Serious Incident Rate	4.2	2.9	4.0	4.1	3.5

Figure 121 Accidents and serious incidents per year (ATM/ANS contribution)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Serious Incidents	21	13	14	17	14	14	17	8	10	7	4
Non-Fatal Accidents	2	0	2	2	2	1	0	0	1	0	0
Fatal Accidents	0	0	0	0	0	0	0	0	0	0	0

Figure 122 Numbers and rates of accidents and serious incidents per year (ATM/ANS contribution)



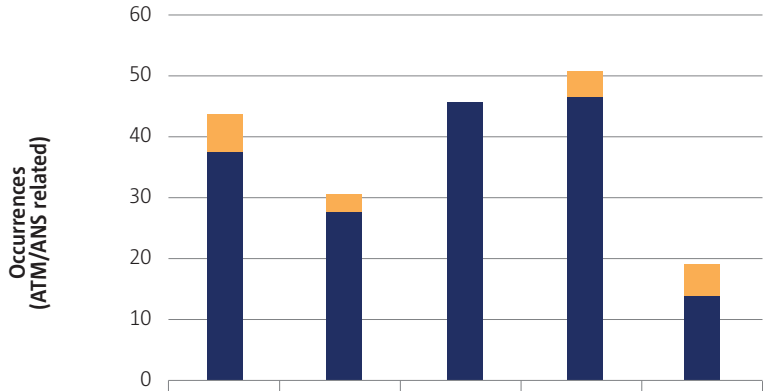
	2016	2017	2018	2019	2020
Serious Incidents	17	8	10	7	4
Non-Fatal Accidents	0	0	1	0	0
Fatal Accidents	0	0	0	0	0
Fatal Accident Rate	0.0	0.0	0.0	0.0	0.0
Non-Fatal Accident Rate	0.0	0.0	0.0	0.0	0.0
Serious Incident Rate	1.8	0.8	1.0	0.7	0.9

The following paragraphs refer to accidents and serious incidents that have been risk scored using the ERCS methodology and divided into higher and lower risk. An explanation of the ERCS and why it is useful is provided in the introduction to this annual review. The aggregated ERCS scores by higher risk and lower risk occurrences show a different pattern from the representation of accidents and serious incidents. This is because some occurrences classified as serious incidents have inherent risk profiles that may be equal or even exceed the risk of some accidents.

Figure 123 and Figure 124 show the distribution of aggregated higher and lower risk for ATM/ANS related events and occurrences with ATM/ANS contribution respectively in the last 5 years.

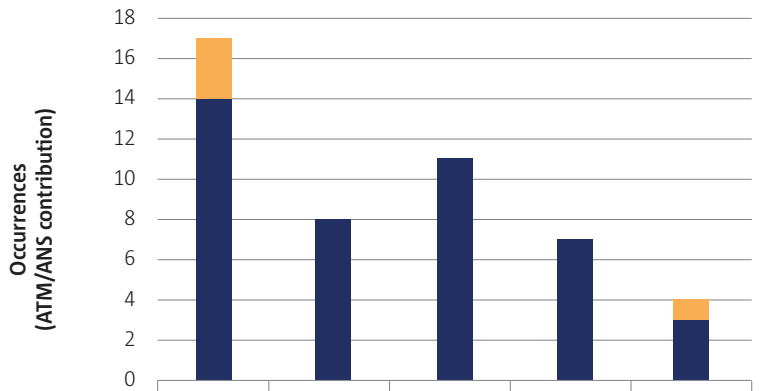
The risk levels for ATM/ANS related occurrences have decreased in 2020 after an increase in 2018 and 2019. The same decrease in 2020 is observable for occurrences with ATM/ANS contribution.

Figure 123 ERCS higher and lower risk occurrences per year (ATM/ANS related)



	2016	2017	2018	2019	2020
Lower risk (ERCS)	6	3	0	4	5
Higher risk (ERCS)	38	28	46	47	14

Figure 124 ERCS higher and lower risk occurrences per year (ATM/ANS contribution)



	2016	2017	2018	2019	2020
Lower risk (ERCS)	3	0	0	0	1
Higher risk (ERCS)	14	8	11	7	3

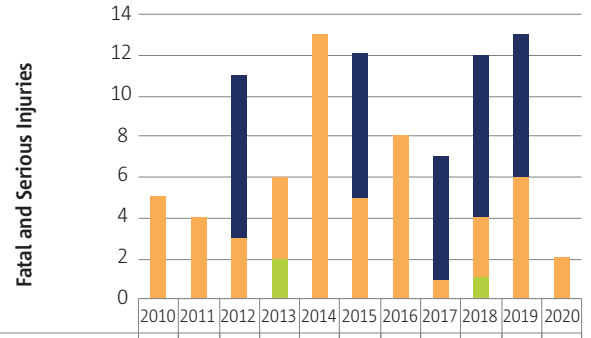
The number of fatalities per year in ATM/ANS related accidents does not follow a clear pattern as shown in Figure 125, as it is highly dependent on the size of the aircraft involved in the accidents that occurred. In 2020, there were no ATM related occurrences nor occurrences with ATM contribution that resulted in fatalities.

Phase of flight

The majority of the ATM/ANS related accidents and serious incidents in 2020 took place during the approach phase, followed by take-off, landing, taxi and en-route phase, as shown in Figure 126.

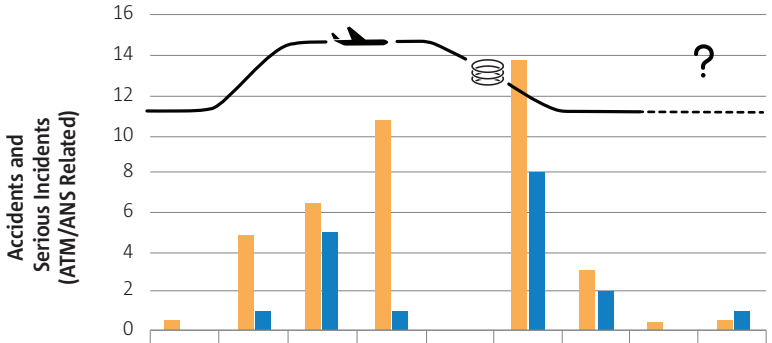
Comparing the numbers in 2020 with the average of the preceding 10-year period, reveals multiple differences. The decreasing traffic numbers are also reflected in the numbers of occurrences per flight phase. Additionally, a notable decrease of occurrences was recorded in the en-route phase of flight, moving it from the second most affected flight phase to the fourth flight phase in sequence in relation to ATM/ANS related number of accidents and serious incidents. In 2020 only one ATM related occurrence took place in the en route phase while the average for the previous 10 years is 13.8.

Figure 125 Fatalities and serious injuries (ATM/ANS related and ATM/ANS contribution)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fatalities (ATM Related)	0	0	8	0	0	7	0	6	8	7	0
Fatalities (ATM Contribution)	0	0	0	0	0	0	0	0	0	0	0
Serious Injuries (ATM Related)	5	4	3	4	13	5	8	1	3	6	2
Serious Injuries (ATM Contribution)	0	0	0	2	0	0	0	0	1	0	0

Figure 126 ATM/ANS related accidents and serious incidents, by phase of flight



	Standing	Taxi	Take-off	En route	Man-oevring	Approach	Landing	Tow	Unknown/ blank
Average 2010-2019	0.5	4.8	6.5	10.7	0.0	13.8	3.1	0.4	0.5
2020	0	1	5	1	0	8	2	0	1

Airborne collisions and near collisions involving unmanned aircraft

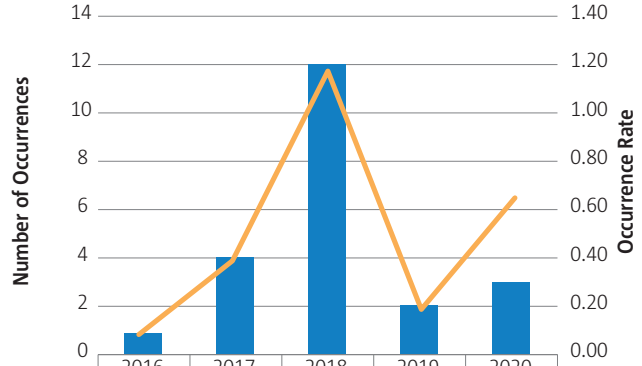
It is important to note that UAS-related reports are mainly provided by the CAT aeroplanes and ATM/ANS domains. As soon as reports from UAS operators become more common, the issues relating to this type of aircraft will become clearer.

The potential for an airborne collision between UAS and other aircraft is an area of growing safety concern, due to the increasing accessibility of UAS. In 2019, the Commission Implementing Regulation (EU) 2019/947 setting out the rules and procedures for the operation of unmanned aircraft was published.

Figure 127 shows a slight increase in the number of UAS-related airborne collision and near collision occurrences in 2020, but from 2018 to 2019 a clear drop of UAS-related airborne collisions and near collisions that can be observed. The occurrence rate is calculated taking the number of IFR flights in the MS area and the number of UAS occurrences into account. The decrease of the number of IFR flights is reflected in the increase of the occurrence rate.

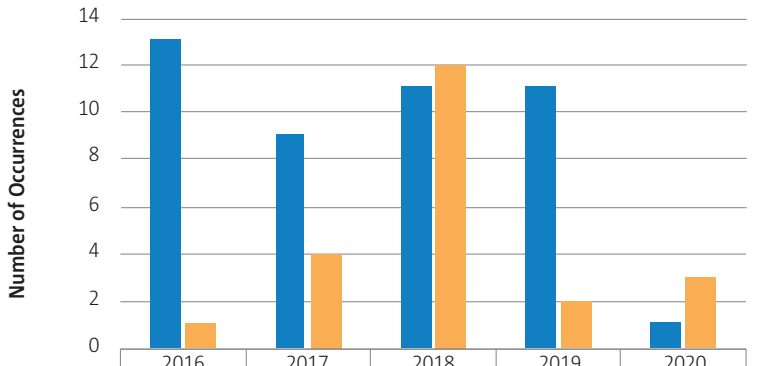
Figure 128 compares UAS and other aircraft involved in airborne collisions and near collisions. Following the decrease in 2018 to 2019, a slight increase in the number of occurrences involving drones was recorded. The difference becomes more apparent with the drop in the number of near-collisions and collisions involving other aircraft.

Figure 127 Number and rate of drone collisions and near collisions rate



	2016	2017	2018	2019	2020
Number of Occurrences	1	4	12	2	3
Occurrence Rate	0.11	0.41	1.17	0.19	0.65

Figure 128 Airborne collisions and near collisions, involving drones and other aircraft



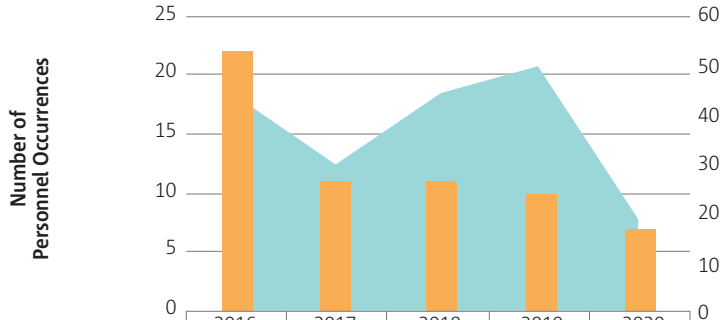
	2016	2017	2018	2019	2020
Other Aircraft	13	9	11	11	1
UAS	1	4	12	2	3

Human factors and human performance

Nearly one third of ATM/ANS accident and serious incident reports identify human factors (HF) or human performance (HP) issues, these are labelled as 'personnel occurrences' in the ECCAIRS taxonomy. Looking at the figures for the past five years, there is an apparent increase in 2016. The figure for 2020 should be viewed as preliminary and is likely to increase, since HF or HP issues are often not recorded within accident and serious incident reports until the final investigation report is published.

The application of HF or HP codes at a high level can be seen in Figure 130. Clearly, task performance issues are more easily discernible following an accident or serious incident than the factors that cause them.

Figure 129 Human factors and human performance accidents and serious incidents involving ATM/ANS



	2016	2017	2018	2019	2020
All Occurrences	44	30	44	50	19
Personnel Occurrences	22	11	11	10	7

Figure 130 High level human factors and human performance event codes applied to accidents and serious incidents involving ATM/ANS

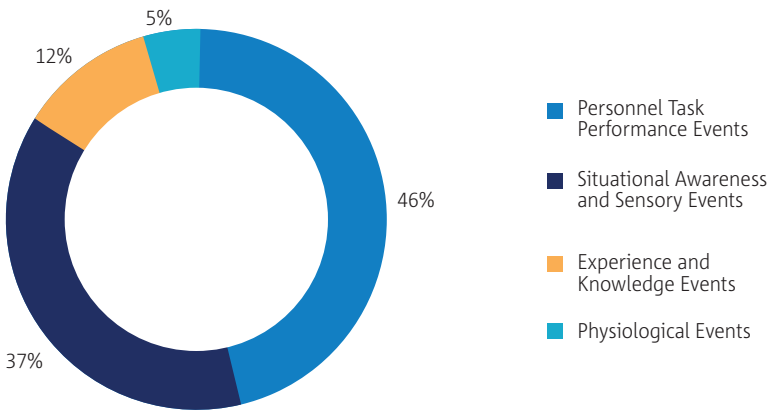
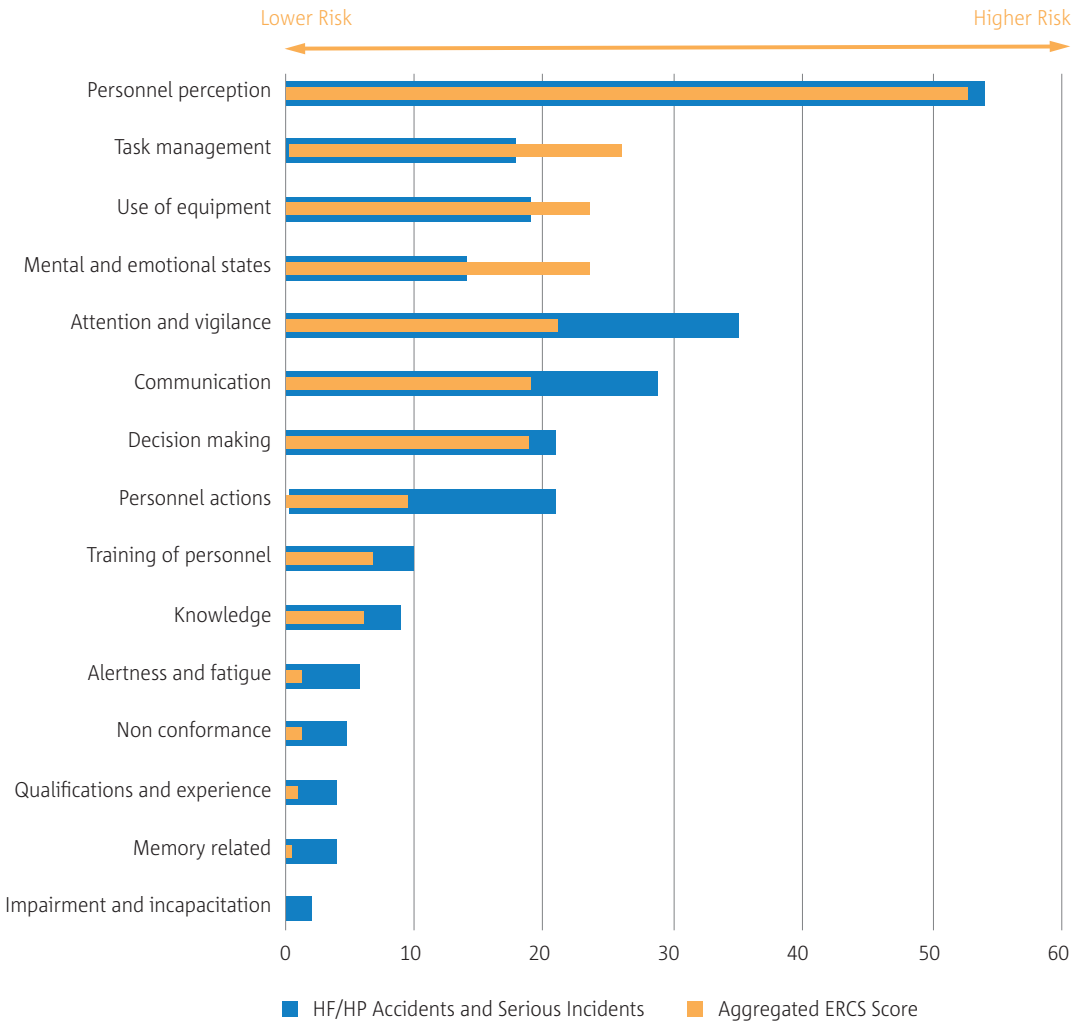


Figure 131 compares the numbers of accidents and serious incidents with the aggregated ERCS risk score of those occurrences, using detailed HF and HP event codes. It can be seen that some types of event have a greater risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents. In particular, task management, use of equipment and mental and emotional states stand out as HP event types with higher aggregated risk scores than the number of occurrences would normally suggest.

Figure 131 Detailed human factors and human performance event codes by aggregated ERCS score and number of accidents and serious incidents involving ATM/ANS



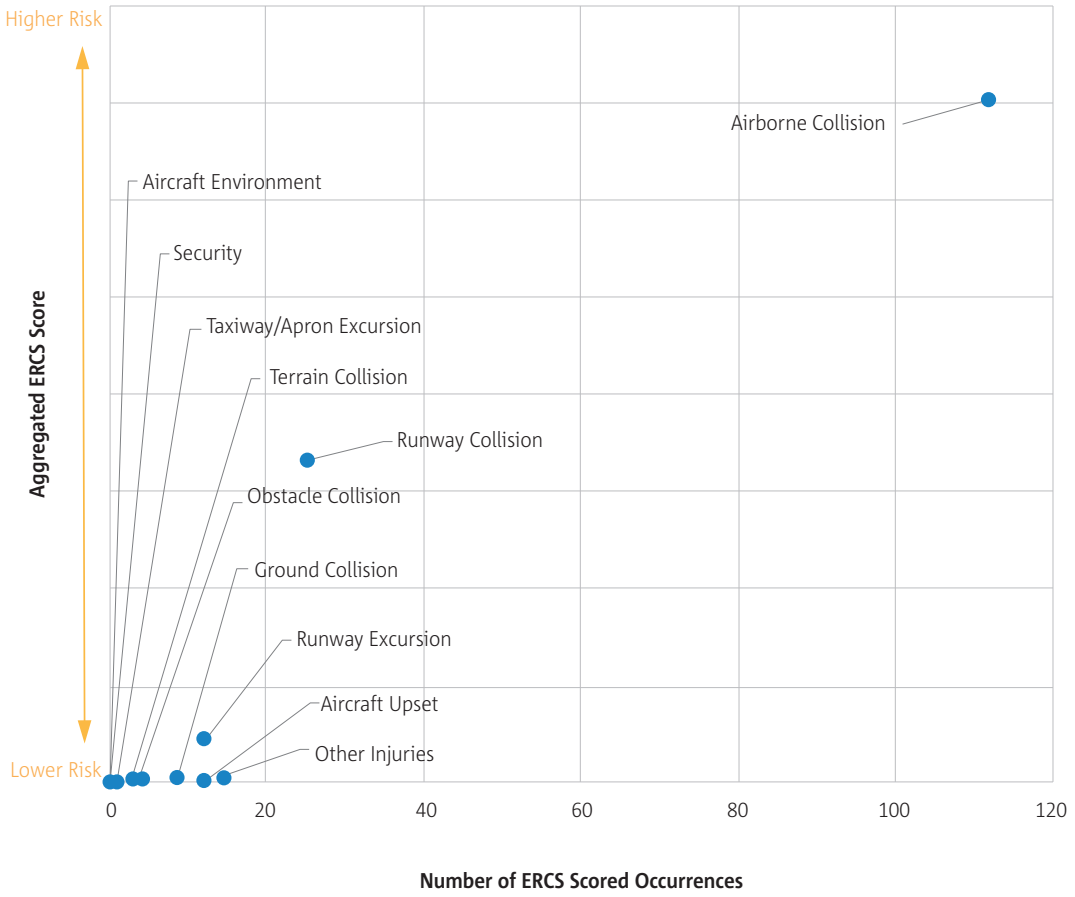
Safety risks for ATM/ANS

The safety risks for ATM/ANS are derived from accident and serious incident data from the EASA occurrence repository and the European Central Repository, covering the 5-year period 2016-2020 (216 high risk occurrences).

The main key risk areas for this domain are highlighted in Figure 132 and are defined by their potential accident outcome and by the immediate precursors of that accident outcome. Note that one single occurrence can be associated with more than one key risk area.

To identify the top key risk areas in the ATM/ANS domain, the ERCS risk scores of ATM/ANS related accidents and serious incidents in the past 5 years were assessed and aggregated. ERCS risk scores are used as a proxy of the risk associated with the safety issue, based exclusively on the occurrences reported and linked to these safety issues. The result of this review is illustrated in Figure 132. The X-axis represents the aggregation of the number of accidents and serious incidents per key risk area, while the Y-axis represents the aggregation of the ERCS risk scores for the aforementioned events per key risk area.

Figure 132 Key risk areas by aggregated ERCS score and number of risk-scored ATM/ANS occurrences



The top key risk areas in the ATM/ANS domain are airborne collision and runway collision reflecting the role of ATM/ANS in guiding and separating aircraft.

The top key risk areas the ATM/ANS domain are defined as:

Airborne collision includes occurrences involving actual or potential airborne collisions between aircraft, and occurrences involving an aircraft and other controllable airborne objects, such as drones, thereby excluding birds. Therefore, it includes all separation-related occurrences regardless of the cause. It does not include false TCAS/ACAS alerts caused by equipment malfunctions or loss of separation with at least one aircraft on the ground, which may be coded as runway or movement area collision if the occurrence meets the criteria.

Runway collision includes all occurrences involving actual or potential runway collisions between an aircraft and another aircraft, vehicle or person that occur on the runway of an aerodrome or other designated landing area. This includes occurrences involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft. It does not include occurrences involving wildlife on the runway.

In addition to identifying the top key risk areas, key safety issues in the ATM/ANS domain were also identified from the data. To generate the data portfolio, the accidents and serious incidents in the data set were mapped to the list of safety issues, along with their associated ERCS score. A yellow bar in the graph that is considerably longer in comparison with the underlying blue bar indicates a low number of occurrences contributing to a high risk. The results of this mapping exercise can be found in Figure 133.

The safety issues with higher risk scores identified in Figure 133, based on the data, are:

Deconfliction of IFR and VFR flights with one or more traffic uncontrolled: Involves ineffective deconfliction of IFR and VFR flights in airspace classes where one or more traffic could be uncontrolled (i.e., class D, E, and G), potentially resulting in AIRPROX events and airborne collisions;

Undetected occupied runway involves runway incursions by an aircraft landing or taking-off on an already occupied runway. This could be due to air traffic controller monitoring, aerodrome design or other organisational factors;

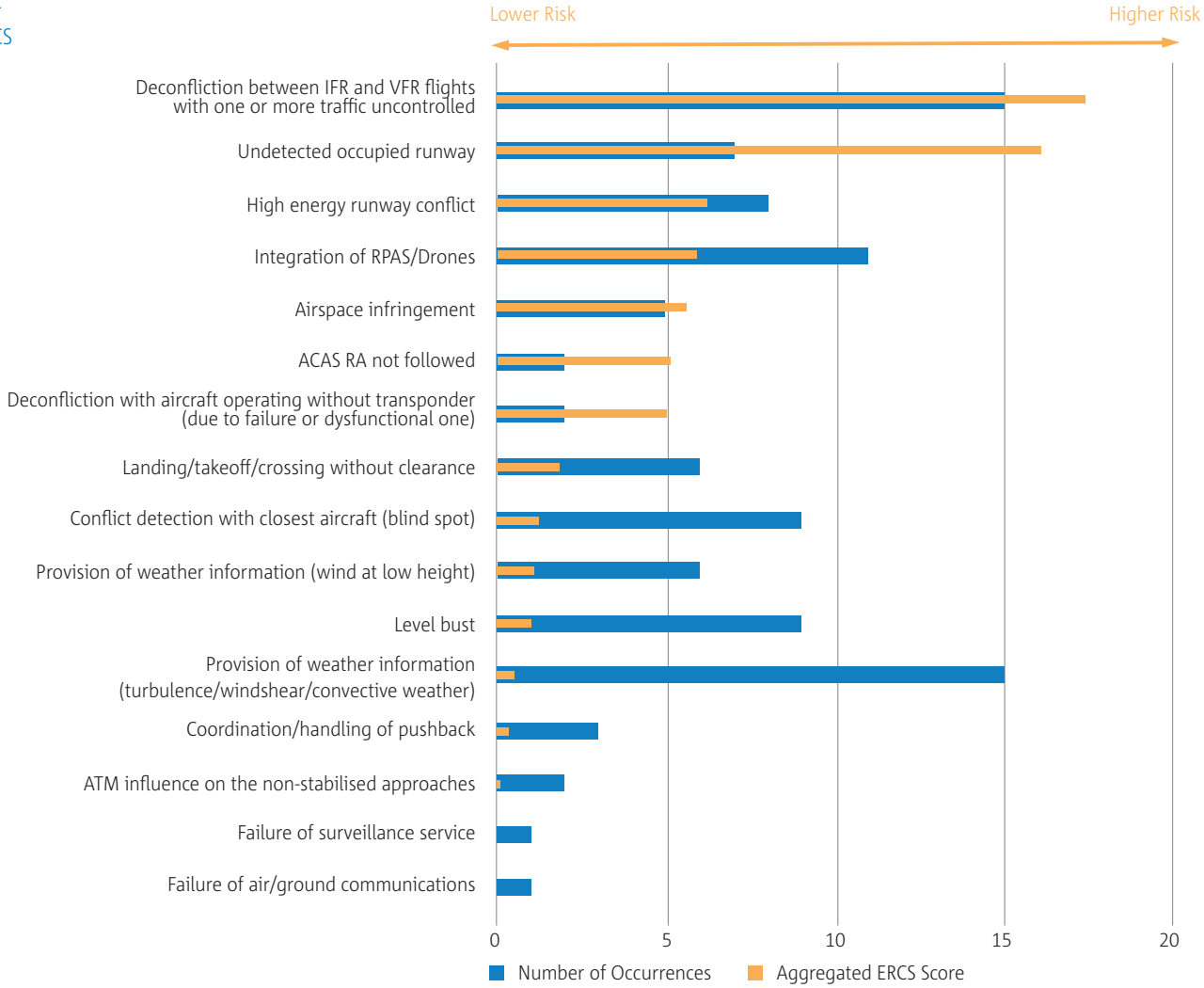
High energy runway conflict covers runway incursions where the aircraft has already reached a high level of kinetic energy when ATC becomes aware of the runway conflict, and the time available to the air traffic controller to prevent the collision is very short. This includes instances where the landing aircraft is close to the runway threshold or is already lined-up, in case of taking-off;

Airspace infringement involves both unauthorised entry into notified airspace by aircraft which did not request nor obtain clearance from the controlling authority of that airspace, and entry under conditions that were not contained in the clearance;

ACAS RA not followed refers to encounters where one or both of the aircraft's flight crew did not follow the instruction given by the ACAS resolution advisory (RA) to resolve the conflict and avoid a potential mid-air collision;

Deconfliction with aircraft operating without transponder (due to failure or malfunction) refers to occurrences involving an aircraft with no-operative transponder or a dysfunctional one operating in an airspace where aircraft must be equipped with secondary surveillance radar (SSR) transponder.

Figure 133 Comparison of number of occurrences and aggregated ERCS score for ATM/ANS safety issues



The data portfolio shown in Table 36 links the safety issues with the key risk areas to which they contribute. The key risk areas are listed at the top of the table and are prioritised from left to right based on the aggregated ERCS risk score. The safety issues are listed on the left of the table and are also sorted from the top by decreasing aggregated ERCS risk score. The different colour bands denote high to low risk of the safety issues.

Table 36 Data portfolio for ATM/ANS

	KEY RISK AREAS (ERCS)								
SAFETY ISSUE	AIRBORNE COLLISION	RUNWAY COLLISION	RUNWAY EXCURSION	TERRAIN COLLISION	OTHER INJURIES	OBSTACLE COLLISION IN FLIGHT	GROUND COLLISION	AIRCRAFT UPSET	TAXIWAY/APRON EXCURSION
Deconfliction between IFR and VFR flights with one or more traffic uncontrolled	x								
Undetected occupied runway		x							
High energy runway conflict	o	x	o	o					
Integration of RPAS/Drones	x								
Airspace infringement	o								
ACAS RA not followed	o								
Deconfliction with aircraft operating without transponder (due to failure or malfunction)	o								

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

SAFETY ISSUE	KEY RISK AREAS (ERCS)								
	AIRBORNE COLLISION	RUNWAY COLLISION	RUNWAY EXCURSION	TERRAIN COLLISION	OTHER INJURIES	OBSTACLE COLLISION IN FLIGHT	GROUND COLLISION	AIRCRAFT UPSET	TAXIWAY/APRON EXCURSION
Landing/takeoff/crossing without clearance	o	o							
Conflict detection with closest aircraft (blind spot)	x								
Provision of weather information (wind at low height)	o						x	o	
Level bust	x			o		o			
Provision of weather information (turbulence/windshear/convective weather)	o				x			o	
Coordination/handling of pushback			o				o		
ATM influence on the non-stabilised approaches			o	o					
Failure of surveillance service	o								
Failure of air/ground communications	o								
Failure of navigation service									

x = stronger contributor to the key risk area
o = weaker contributor to the key risk area.

Priority 1 Priority 2 Priority 3 Priority 4

CHAPTER 8

Occurrence reporting rates

This chapter intends to measure the volume of occurrence reports collected in the European Central Repository (ECR) under Regulation (EU) 376/2014 since 2015, and to put the changing levels of occurrence reporting in perspective with changes to the level of aviation activity in Europe.

This chapter has been developed by the safety performance indicators working group (SPI WG), under the Network of Aviation Safety Analysts (NoA), which is established under Article 14 of Regulation (EU) 376/2014.

Occurrence reporting rates are important to monitor as they are an indicator of the changes to safety culture in Europe. A large number of reports can be regarded as a sign of a good safety culture. In this respect, whereas in the rest of the annual safety review a higher number of accidents and serious incidents may be viewed in the negative, in this chapter an increase in overall occurrence reporting, which include incidents, can be viewed as a positive development.

How this chapter was developed

In order to assess the level of aviation safety reporting in Europe, the SPI WG has developed a set of indicators based on ECR occurrences and other safety related information and on traffic data. The working group, which is composed of 7 EASA Member States, EASA and Eurocontrol, started work in 2020 on a first set of reporting rate indicators. These indicators were tested on the data of 2019, which was then further developed this year to provide the figures for the overall period 2015-2020, as published in this chapter.

The following figures are based on the occurrence data from the ECR as it was on 14 December 2020, before the database was transferred to the new ECCAIRS 2.0 (E2) software. Therefore, the statistics provided in the chapter for the year 2020 omit December 2020. In addition, the quality of the ECR data was further enriched through amendments made by the NoA, in particular to improve the level of completeness of the "reporting entity" information initially not included in some records.

For all figures in this chapter, the number of reports should be interpreted as the number of reports from distinct reporting entities. This means that for a single occurrence record, if more than one report is reported by the same reporting entity, as would be the case if there were follow-up reports, the record will be counted as 1. However, if there are reports from two different reporting entities about the same occurrence, then the record will be counted as 2. The traffic data used in this chapter were provided by Eurocontrol. The geographical scope is 31 of the 32 EASA MS, since Eurocontrol does not collect data for Iceland. The IFR traffic data used in this report includes both EU and Non-EU operators.

Once the SPIs had been specified, the big data platform of the Data4Safety programme was used to integrate both ECR data and traffic data, in order to compute all the results shown in this chapter.

It should be highlighted that the figures shown in this chapter are highly dependent on the quality and completeness of the coding of the occurrences collected in the ECR, in particular on the attribute "Reporting Entity".

In order to reach more accurate figures from which more solid interpretations can be built, it is important that reporting organisations and competent authorities continue their effort to improve the coding quality of occurrence records submitted under Regulation (EU) 376/2014.

8.1 Overall levels of occurrence reporting and levels of traffic

This section gives a high-level quantitative analysis of the total number of reports collected in the ECR since 2015, in parallel with the evolution of the level of traffic in Europe. A specific comparison between 2020 and 2019 is also shown, to better quantify the impact of the COVID-19 pandemic both on traffic and on safety reporting levels.

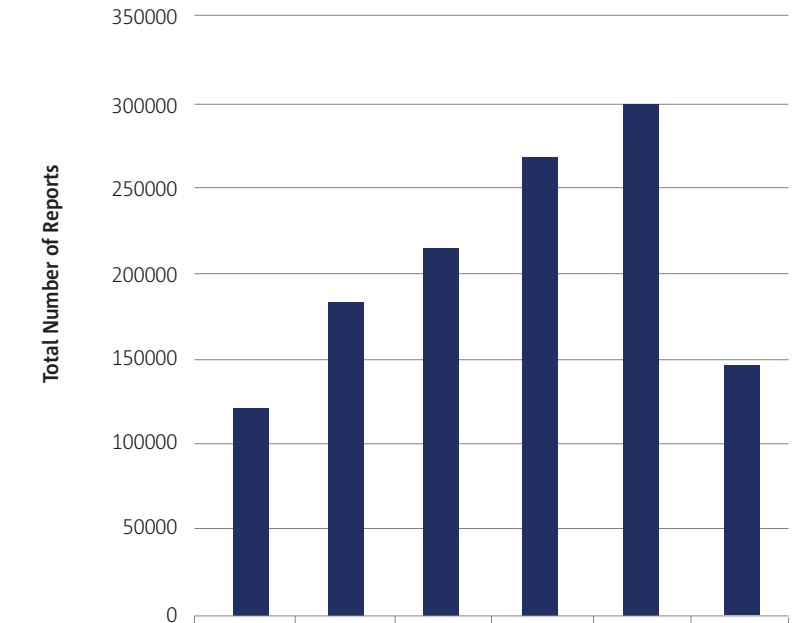
Annual evolution over the period 2015-2020

The total number of reports collected in the ECR since 2015 is shown in Figure 134, and the number of cumulated IFR flights hours and aerodrome movements in Europe for the same time period is illustrated respectively in Figure 135 and Figure 136.

The number of reports in the ECR steadily increased from 2015 to 2019, with the figure for 2019 being 2.5 times higher than that of 2015. By contrast, the level of traffic in Europe increased at a much slower pace, with +15% of IFR flight hours in 2019 compared to 2015. It can therefore be concluded that the overall reporting rate substantially increased over the period following the entry into force of Regulation (EU) 376/2014 in November 2015.

In 2020, the COVID-19 pandemic caused a dramatic decrease in the level of traffic. The total number of reports also dropped substantially. A comparison between 2019 and 2020 can be found later in this section.

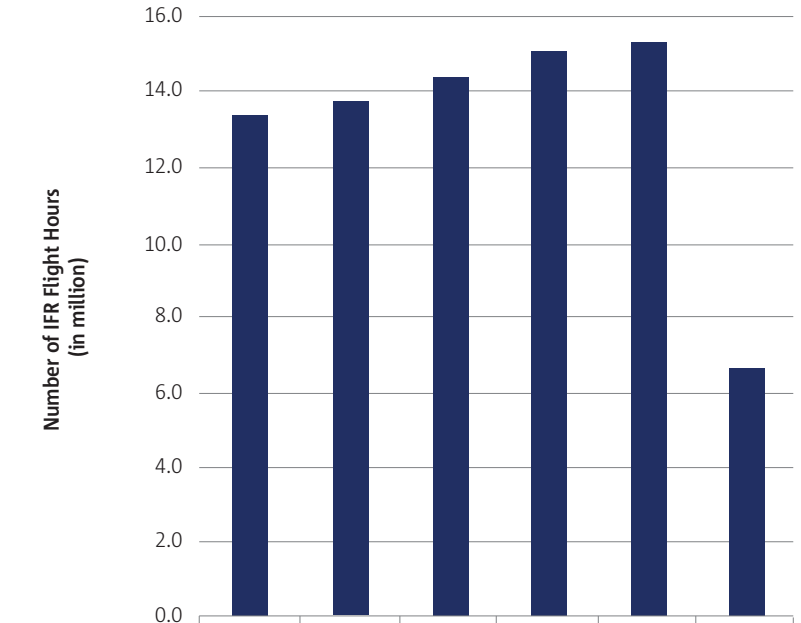
Figure 134 Number of reports collected in the European Central Repository (ECR) per year (2015-2020)



	2015	2016	2017	2018	2019	2020
Total Number of Reports	121095	182137	215289	267694	299541	142513

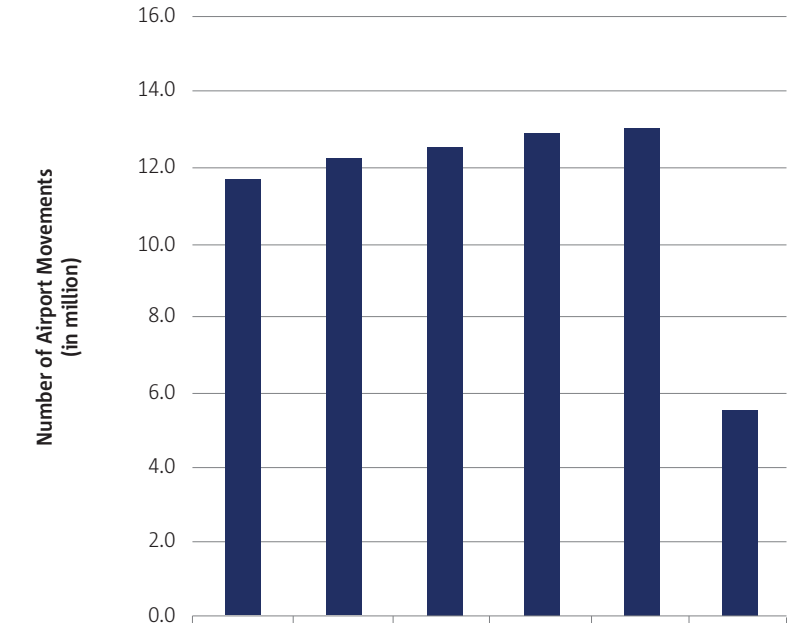
OCCURRENCE REPORTING RATES

Figure 135 Number of IFR flight hours per year, for all EASA MS (except Iceland)



	2015	2016	2017	2018	2019	2020
Number of IFR Flight Hours	13.2	13.7	14.3	15.0	15.3	6.6

Figure 136 Number of airport movements per year, for all EASA MS (except Iceland)



	2015	2016	2017	2018	2019	2020
Number of Airport Movements	11.7	12.1	12.5	12.9	13.0	5.5

Monthly variation for each year over the period 2015-2020

Figure 137 shows the number of reports by month for each year since 2015. For the years 2015-2019, a seasonal variation can be observed with a peak in the summer months, which follows the same pattern as the traffic seasonality shown in Figure 138. The steady increase of reporting levels is also clearly visible. 2020 shows a very different profile, with a substantial drop in the number of reports from March 2020, which coincides with the even more pronounced drop of traffic, as shown in Figure 138.

Figure 137 Number of reports collected in the ECR per month per year (2015-2020)

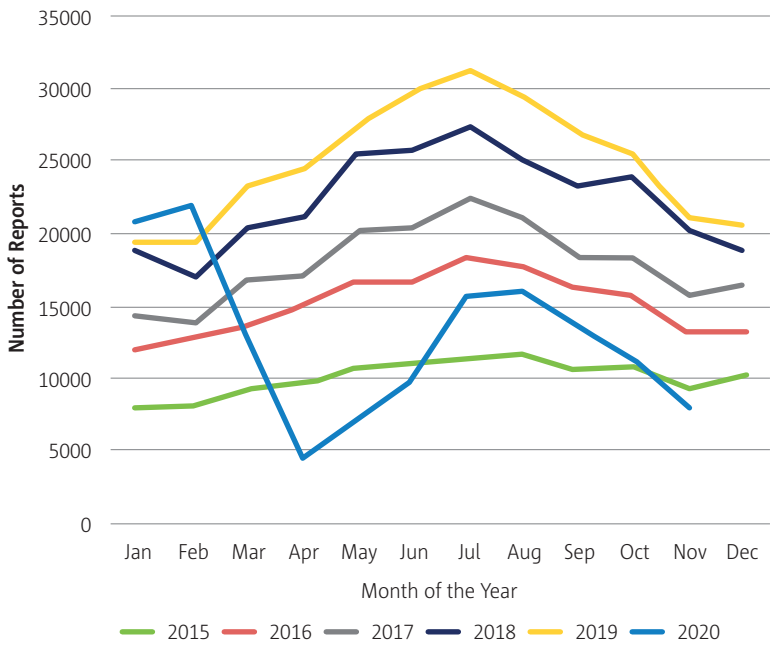
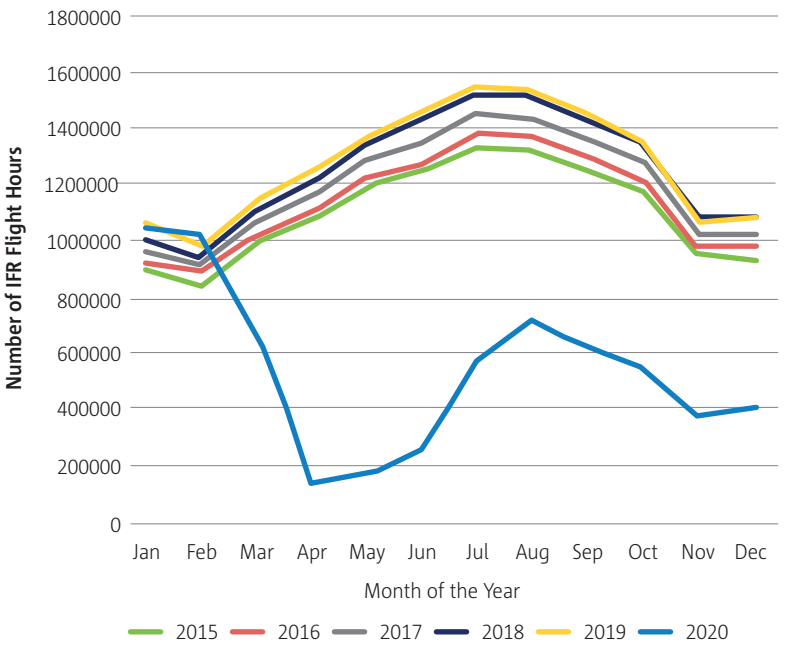


Figure 138 Number of IFR flight hours per month per year (2015-2020), for all EASA MS (except Iceland)



Focused comparison between 2019 and 2020

In order to better quantify and evaluate the impact of the COVID-19 pandemic on the aviation industry, the two following figures provide a comparison of 2020 and 2019.

As shown in Figure 139, 2020 started with a similar profile as the preceding years, with a total number of reports still increasing compared to 2019 during the first two months of the year. However, from March 2020, the decrease in the volume of reporting was significant, reaching the lowest point in April 2020, and with figures barely recovering back to half of the 2019 levels in the remainder of the year.

The reporting levels in 2020 follow a similar pattern to the traffic levels shown in Figure 140. However, it can be observed that although substantial, the drop in reporting levels in 2020 was less pronounced than the decrease in traffic. As a consequence, reporting rates increased, especially in the second quarter of the year. This increase of rate is shown in the next section of this chapter.

Figure 139 Monthly number of reports collected in the ECR in 2020 in comparison with 2019

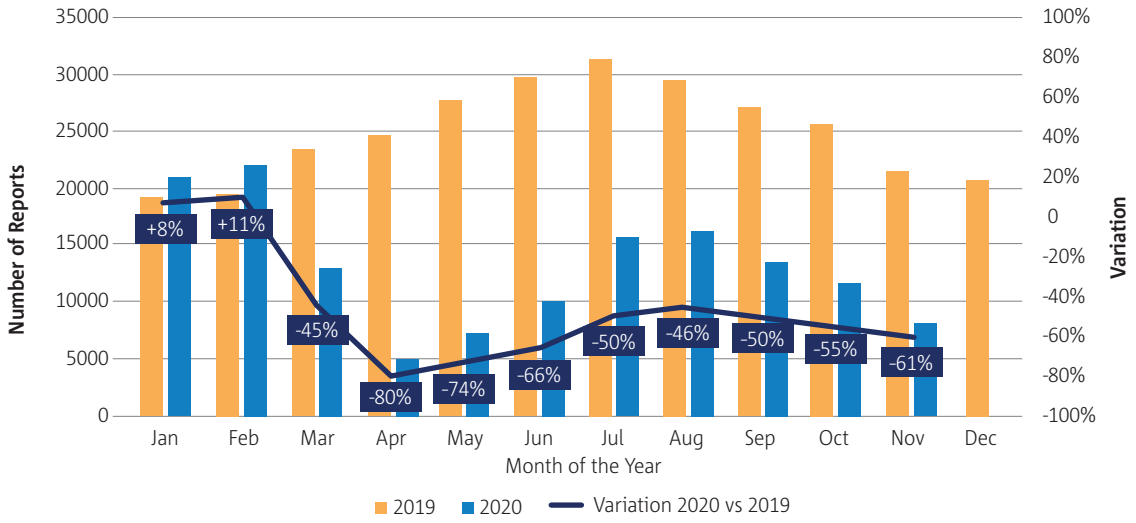
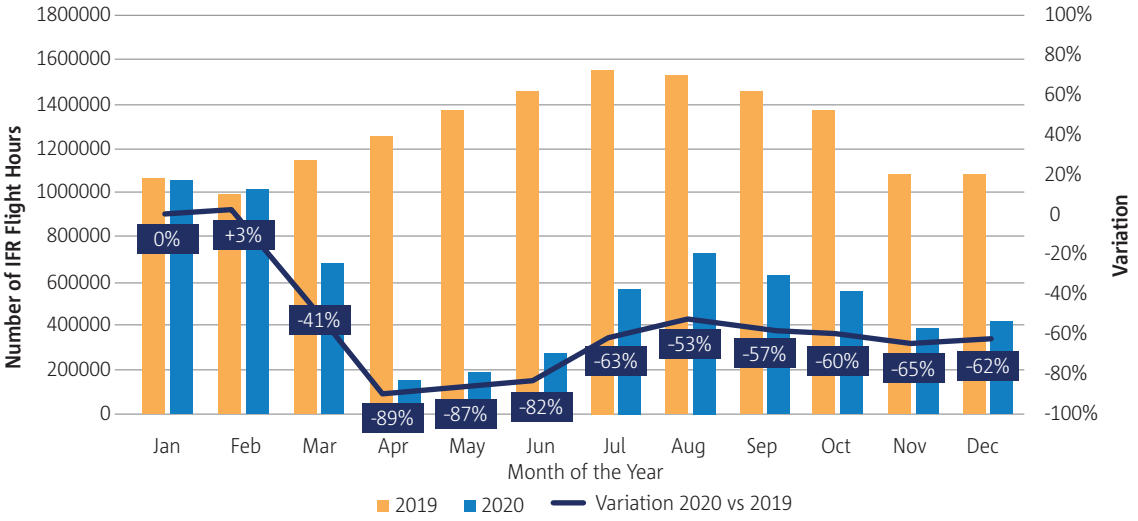


Figure 140 Monthly number of IFR flight hours in 2020 in comparison with 2019, for all EASA MS (except Iceland)



8.2 Volumes and rates of reporting for the main type of organisations

This section provides data split by the main type of reporting organisations, to better identify who are the main contributors to safety occurrence reporting and evaluate how their relative contributions have evolved since 2015.

Comparison of volume of reporting

In Figure 141, the total number of reports was split in 5 main categories of reporting organisations, using the ECR attribute "Reporting Entity". These 5 categories are as follows:

- Aircraft operators
- Air navigation service providers (ANSPs)
- Aerodrome operators
- Others type of reporting entities, such as design organisations, maintenance organisations, ground handling organisations, production organisations, individuals
- Unknown: the reports for which the "Reporting Entity" value was not completed.

For the 3 main types of organisations, the number of reports increased from 2015 to 2019. Over this period, the total number of reports from aircraft operators increased to three times the original amount, from aerodrome operators by six times the original amount, and for ANSPs by 1.6 times the original amount.

Figure 142 brings an additional perspective on the trend in occurrence reporting, by showing the relative proportion of reports for the 5 categories defined in Figure 141.

Figure 141 Number of reports collected in the ECR per type of reporting organisation (2015-2020)

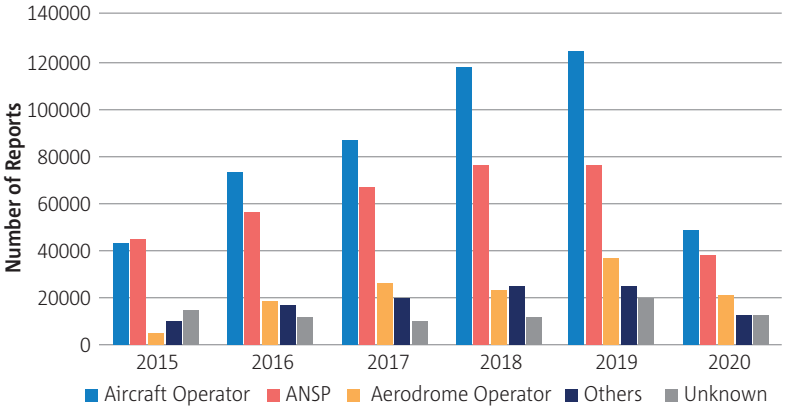
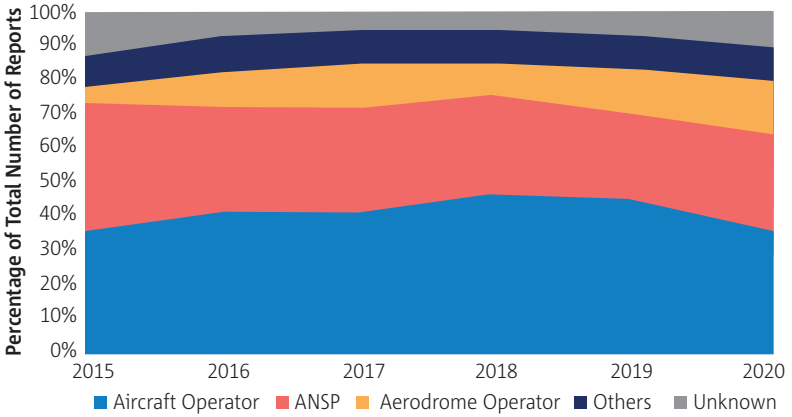


Figure 142 Proportion of reports (in % of the total number of reports) per type of reporting organisation (2015-2020)



OCCURRENCE REPORTING RATES

From 2015 to 2019, the proportion of reports from aircraft operators increased from 34% to 44 %, whereas this proportion decreased from 37% to 25% for ANSPs. For aerodrome operators, this proportion increased from 5% to 12% over this same period.

In 2020 these proportions changed again, with a decrease in the proportion of reports from aircraft operators and an increase of the proportion of ANSPs reports. The proportion of aerodrome reports continued to increase in 2020 to reach 15% of the overall reports.

It is important to highlight that the accuracy of the figures and trends described here are affected by the proportion of reports for which the type of reporting entity is unknown. Although a review of the data by NoA members was conducted, to improve the level of completeness of the "reporting entity" attribute, this group of reports still represents between 5% and 12% of reports each year over the time period considered. Before this review, the number of reports in the ECR with no reporting entity value, represented between 10 and 20% of the reports for each year.

Reporting rates

For the 3 main types of reporting organisations (aerodromes, aircraft operators and ANSPs), reporting rates were calculated by normalising the volumes of reports with the most relevant exposure data which were available to EASA. The rate for December 2020 was not calculated as the available ECR data does not fully cover this month.

- For aircraft operators and ANSPs, the number of reports was divided by the number of IFR flight hours in all EASA MS, excluding Iceland.
- For aerodrome operators, the number of reports was divided by the number of airport movements in all EASA MS, excluding Iceland.

Figure 143, Figure 144 and Figure 145 show the monthly reporting rate calculated respectively for aircraft operators, ANSPs and aerodrome operators, from 2015 to 2020.

Between 2015 and 2019 the rate increased for the 3 main types of reporting organisations:

- From approximately 3 reports per 1000 IFR flight hours to more than 8 reports per 1000 IFR flight hours for aircraft operators;
- From approximately 3 reports per 1000 IFR flight hours to 5 reports per 1000 IFR flight hours for ANSPs;
- From approximately 0.5 reports per 1000 airport movements to almost 3 reports per 1000 airport movements for aerodrome operators.

For this same period, no particular seasonal variation could be observed when looking at the data per month.

In 2020, for all 3 main type of organisations, the rate was atypical compared to the preceding 5 years, with a clear peak in reporting rates observed from April to June. This peak coincides with the period of the first lockdown measures applied over Europe following the outbreak of the COVID-19 pandemic. As illustrated earlier in the chapter in Figure 139 and Figure 140, whereas the number of reports decreased substantially from March 2020, the traffic faced an even more substantial decrease, which therefore caused the reporting rate to increase.

This sudden increase of the reporting rate can be the result of many combined factors:

- Some existing types of occurrences decreased by less than the activity level, for example maintenance-related occurrences happen in proportion to the amount of maintenance activity rather than the number of flights;
- new types of occurrences appeared in relation to the extraordinary circumstances in which aviation professionals were operated, for example the carriage of medical equipment in passenger cabins;
- The available traffic data used to build the rates includes all IFR traffic including both European operators and non-European operators. However, many occurrences involve VFR flights and so the use of IFR flights only to normalise the number of reports may lead to a slight over-estimation of the rates for this period.

Overall, it can be highlighted that the reporting rates were not negatively affected by this unprecedented and sudden period of low activity of the aviation sector in 2020. This positive trend will have to be further monitored in 2021, especially to evaluate how the levels of reporting will change if a rapid increase of commercial air transport takes place.

OCCURRENCE REPORTING RATES

Figure 143 Aircraft operators reporting rate (number of reports/1000 IFR flight hours) per month and year (2015-2020)

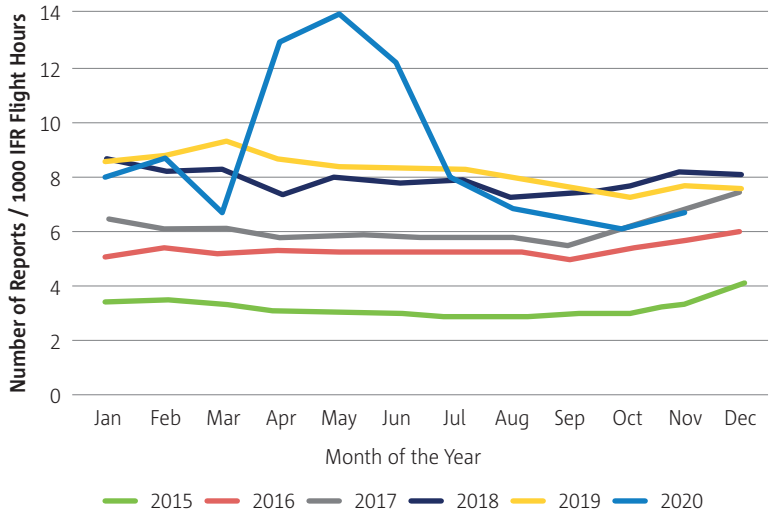


Figure 144 Air Navigation Service Providers reporting rate (number of reports/1000 IFR flight hours) per month and year (2015-2020)

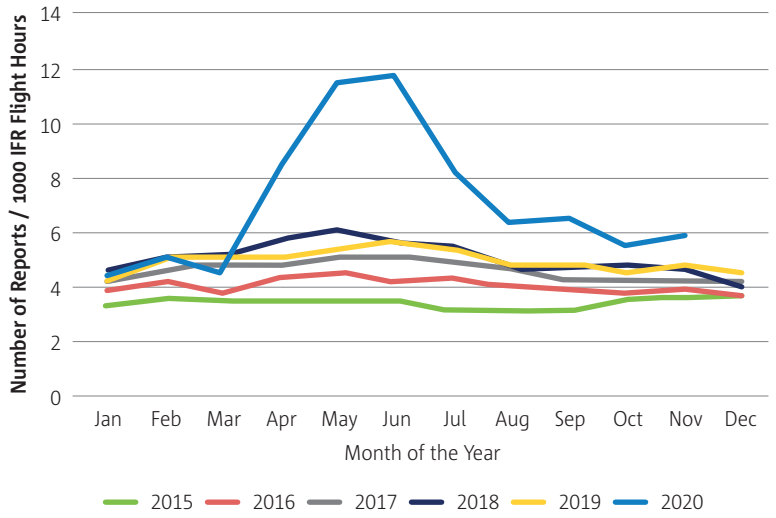
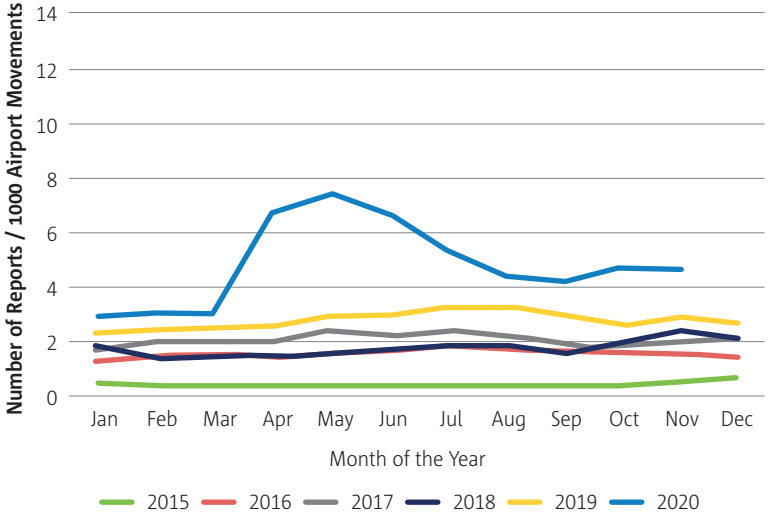


Figure 145 Aerodrome operators reporting rate (number of reports/1000 airport movements) per month and year (2015-2020)



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