EASA
European Aviation Safety Agency

Annual Safety Review

2014

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Disclaimer

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Photocredits

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Foreword by the Executive Director

In our previous edition, we noted with satisfaction that 2013 was the safest year ever for aviation in the world and in Europe. By contrast, 2014 has been a very challenging year for the European Aviation Safety Agency (EASA) and for aviation safety in general. The disappearance of Malaysia Airlines MH370, the dramatic loss of MH17, the crash of Air Asia QZ8501 and the radar interferences over central Europe have reminded us that the safety of passengers can never be taken for granted.

In 2014, EASA initiated fundamental changes in the way it operates in order to allow for a more proportionate and performance-based approach to safety. In particular, EASA adopted a new approach to simplify and lighten the way General Aviation is regulated and overseen in Europe. This approach focuses on safety culture, safety promotion and, lastly, common sense. It should also be seen as the precursor of a better, lighter approach to aviation regulation in Europe, with the ultimate goal of increasing the level of safety.

EASA has also reviewed its organisational structure in 2014 to prepare itself for the many challenges that it will face in the next 10 years, including new opportunities to enhance its role. A new Strategy and Safety Management Directorate was created to develop a single, more transparent, evidence-based and data-driven strategy, which will drive the Agency's work programme. The rulemaking activities were incorporated into 'operational' directorates, in order to increase synergies and to benefit from a better and direct operational feedback.

Over the past year, EASA introduced Operational Suitability Data rules, where aircraft manufacturers are required to establish certain data that is considered important to fly the aircraft safely. This data will be approved by the Agency and will then be used by operators and training organisations. The Agency also published the Flight Time Limitations and Third Country Operators rules and finalised the AIR OPS Regulation, as well as publishing an Opinion on flight recorders and underwater location devices in response to recent safety recommendations. In the ATM domain a common regulatory framework was finalised, as a basis for the implementation of the Single European Sky. In particular, common rules on Air Traffic Controller licensing were adopted.

Furthermore, EASA is committed to continually improving aviation safety and made a number of concrete proposals in 2014:

A proposal to build a European alerting system to help airlines perform their risk-assessment when flying over conflict zones,
A technical analysis of the controller-pilot communication via Data-link, identifying the sources of current operational problems and proposing a way forward.

This year's Annual Safety Review includes changes to the content, which include more detailed analyses of the causes of safety occurrences that help to link the review to the EASp. In addition, EASA, with the involvement of a number of external groups and industry stakeholders[1], is developing a set of safety risk portfolios that cover the different aviation activities.

As demonstrated by the events of 2014, the pursuit of safety in aviation is a task that requires our constant vigilance and effort.

Patrick Ky
Executive Director

1 Network of Analysts (NoA), the European Strategic Safety Initiative (ESSI)

Executive Summary

In addition to presenting key statistics relating to worldwide and European aviation safety, this document contains for the first time safety risk portfolios for European commercial air transport aeroplanes and offshore helicopter operations. These portfolios link safety issues to their associated potential consequences or risk areas. They are live documents that will continually evolve, on the basis of further safety analysis and the changing aviation system. The most recent versions will be made available through the EASA website.

Worldwide Aviation Safety

- In 2014, 16 fatal accidents occurred involving Commercial Air Transport aeroplanes. This is compared with 14 fatal accidents in the previous year. The number of fatal accidents in 2014 was still significantly below the average number of fatal accidents for the previous 10 years (2004-2013).

- The biggest change in 2014 was the increase in fatalities when compared with 2013. In 2014 there were 648 fatalities in Fixed Wing Commercial Air Transport compared with 185 in 2013. The 2014 increase in fatalities was the result of accidents involving larger aircraft carrying more passengers than those in 2013. In 2013 no single accident involved more than 50 fatalities. The number of fatalities in 2014 was 1.5% higher than the average for the previous 10 years.

European Commercial Air Transport Aeroplanes

There was 1 fatal accident involving EASA Member State aircraft during 2014. This was the Swiftair operated Air Algerie Flight 5017 accident in Mali on 24 July 2014 resulting in 116 fatalities. There were 26 non-fatal accidents in 2014, an increase of 22 from 2013 figures. However, there was a reduction in serious incidents from 74 down to 66. The top 5 safety risk areas that will be the main focus of activity under the European Aviation Safety Plan (EASp) in the area of Commercial Air Transport are assessed as:

1. Loss of control in flight

This is the most critical risk area for fatal accidents, both in Europe and worldwide. From the analysis performed by the Agency the top contributing safety issues for loss of control are the implementation of management systems and oversight, communication and decision making, knowledge of aircraft systems and associated procedures, crew awareness and the management of adverse weather conditions. These safety issues will be the focus of further risk assessment activities to ensure that the necessary actions are in place.

2. System component failure

Technical failure is the most frequent cause of accidents and serious incidents. Excluding post-crash fires it is also the 2^{nd} highest cause of fatal accidents.

3. Mid-air collision/airprox

Although there has been no major mid-air collision in Europe in recent years, AIRPROX related occurrences are the 2^{nd} most critical risk area for all non-fatal accidents and serious incidents in Europe.

	4. Abnormal runway contact/runway excursions Abnormal runway contact is often a pre-cursor for runway excursions, and together they comprise the most critical risk area for non-fatal accidents.
	5. Ground collisions/ground handling Ground handling occurrences are the 4th most frequent risk area for fatal accidents. This risk area also leads to significant damage to aircraft and equipment, highlighting the need for greater safety efforts in ground operations.

Commercial Air Transport Helicopters

2014 was a better year for the safety of Commercial Air Transport Helicopters. There was 1 fatal accident in 2014 resulting in 2 fatalities. This is compared with 3 fatal accidents in 2013,resulting in 11 fatalities. There was also a 34% reduction in the number of non-fatal accidents and a 71% reduction in serious incidents compared with the 10 year average.

The key risk areas in Commercial Air Transport Helicopters

	Loss of Control – In flight (LOC-I)		Collisions during Take-off and Landing (CTOL)
	System or Component Failure (SCF)		Abnormal Runway (Landing Area) Contact (ARC)/Excursions from helicopter landing areas
	Controlled Flight into or Toward Terrain (CFIT)		

General Aviation

	2014 has also been a positive year for General Aviation safety, with a 20% reduction in the number of fatal accidents and an 18% reduction in the number of fatalities when compared with the 10 year average. However, there were still 173 fatalities in General Aviation, highlighting the importance of the continued safety improvement efforts.

The key risk areas in Fixed Wing General Aviation

The key risk areas identified in 2014 will also be the key priorities of EASA work on General Aviation safety in 2015.

	Abnormal Runway Contact (ARC) and Runway Excursion (RE)
	Loss of Control – Ground (LOC-G).In addition, Loss of Control – In flight (LOC-I)
	System or Component Failure (SCF)

Chapter 1

Introduction

Background

EASA has produced the Annual Safety Review since 2005 in line with the Agency's obligations under the EASA Basic Regulation to provide an overview of the general level of aviation safety in Europe. In 2012, the Agency also published the first version of the European Aviation Safety Plan (EASp), which gathered information from a wide range of sources to outline the safety priorities for aviation in Europe. As the EASp has evolved, the time has come to modify the Annual Safety Review in order to provide a closer link between the analysis of safety data and the plan. The 2014 version of Annual Safety Review marks the first phase in the transition towards a document that is wholly linked to the needs of the EASp.

Content of the Review

With the continuing requirement to provide an overview of the level of safety as part of the Agency's requirement under the Basic Regulation and the need to link the data analysis to the EASp, this Review will be produced in 2 formats:

- **Summary Document:** A short document providing an overview of safety in the main aviation sectors for the use of the general public.
- **Technical Document:** A more detailed, technical document to provide information on the safety risk areas in all aviation sectors and following the development of a new safety risk management process, initial details of the key safety issues in the sectors of Commercial Air Transport – Fixed Wing, Offshore Helicopters and General Aviation – Balloons.

As the EASp continues to develop, a number of detailed Sector Safety Risk Portfolios will be developed to capture the key risk areas and associated safety issues. How these safety issues are tackled will then form the actions that are contained in the EASp. As the Safety Risk Portfolios develop, they will be made available through the EASA website, along with associated analysis reports, so as to enable others in the European Aviation Community to use them in their own safety management activities.

Navigation icons

EASA has developed sets of icons that are aligned with the ECCAIRS taxonomy. Many of these icons have been used throughout this review in order to describe operations and risk areas in aviation. Within the document, they are also used to navigate quickly to particular areas of the review. The navigation is driven by the individual operation type. To navigate using operation types, readers should click on a square-shaped operation icon. This function enables the reader to navigate directly to the next section containing information on the chosen operation type.

These icon sets will be further expanded over time and will be used extensively in the Agency's publications and analysis summaries so as to allow readers to understand at a glance information that is contained within a given document.

Operations

	Aerial Work – Advertising		Aerial Work – Survey
	Aerial Work – General Rotorcraft		Aerial Work – Agriculture
	Aerial Work – Construction Logging		Aerial Work – General
	Aerial Work – Firefighting		Aerial Work – Parachute Drop
	Aerial Work – Photography		Aerial Work – Towing Glider Launch

Aerodrome	Air Ground Communication
ATM Air Traffic Managment	CAT – Business Commercial Air Transport – Business Aviation
CAT – CARGO Commercial Air Transport – Cargo	CAT – Passenger Commercial Air Transport – Passenger
CAT – Passenger Helicopter Commercial Air Transport – Passenger Helicopter	OFF-SHORE Commercial Aviation Transport – Off-Shore Helicopter Operations
EMS Emergency Medical Service	BALLOON Balloon Transport
GA – FIXED-WING General Aviation – Leisure Fixed-Wing Aeroplane	GA – GENERAL General Aviation - General
GA – GLIDER General Aviation	GA – Helicopter GA – Leisure Helicopter
GA – RPAS General Aviation – Remote Piloted Aerial Systems	GA – TRAINING General Aviation - Training
GA – Ultralight General Aviation – Ultralight/Microlight	

Risks

	BIRD Birdstrike		CFIT Controlled Flight Into or Towards Terrain
	CTOL Collision with Objects on Take-off or Landing		FIRE
	GCOL Ground Collision		LOC-I Loss of Control – In-flight
	MAC Mid-Air Collision		Medical
	RAMP Ground Handling		RE/ARC Runway Excursion/Abnormal Runway Contact
	RI Runway Incursion		SCF System Component Failure
	Wake Vortex Turbulence		Weather

Future of the Review

As the safety risk management process that supports the EASp develops further, so the Annual Safety Review will evolve to provide full Safety Risk Portfolios for all sectors of the aviation industry. Future versions of this review will provide a great deal more focus on the causal and contributory factors behind accidents and other occurrences to enable a clear link to be identified between the safety challenges and the actions in the EASp. Access to the best possible safety data is a pre-requisite for the development of the Safety Risk Portfolios. The implementation of Regulation (EU) 376/2014 in November 2015 provides a sound basis to improve the collection of occurrence data from the aviation industry to enable a more pro-active approach to safety.

Chapter 2

Safety Analysis and the European Aviation Safety Plan

Background

In previous editions of the Annual Safety Review, the safety data and analysis has been presented and discussed on its own to highlight safety trends and potential safety issues without providing a clear link to the European Aviation Safety Plan (EASp). In contrast, throughout the 2014 review, the analysis seeks to identify the key strategic safety issues in each of the aviation domains. In addition, the recent introduction of a new Safety Risk Management process at the European level enables us to provide the results of more detailed analyses in the form of Safety Risk Portfolios for the domains of Commercial Air Transport, Offshore Helicopters and Balloons. The purpose of this chapter is to provide some initial background to the EASp, the new Safety Risk Management process and the role of safety analysis as an enabler in the identification and assessment of safety issues. Moreover, this chapter will also provide information on the various groups and activities that support the analysis process as well as outlining some of the new ways safety analysis information will be provided to the European Aviation Community.

What is the European Aviation Safety Plan?

The EASp describes the risks and establishes the priorities for aviation in the European region. The EASp is the documented output of an evidence-based, data-driven approach to safety risks. It provides the reader with a risk picture of the European aviation safety system, whilst also supporting the management of safety priorities at the European level by complementing existing safety regulations and investigations. Despite the long term reduction in worldwide fatal accidents, the increase in fatalities in 2014 highlights that there is no room for complacency. Air Traffic is expected to almost double by 2030. Although the average annual rate of fatal accidents in scheduled passenger operations in the European Union has remained relatively stable for the past few years, this anticipated traffic increase makes it necessary to complement existing and successful safety measures in order to produce further safety improvements in aviation. This commitment to improving safety in a systematic manner is the driver behind the EASp.

A Safety Management System at a European Level

Europe continues to implement a Safety Management System (SMS) to improve the ability of the system to proactively identify hazards. This system complements the existing activities of developing safety regulations, monitoring compliance, and investigating accidents and serious incidents when they occur. One of the key elements of an SMS is managing safety risk. That means identifying safety issues, assessing risk, and deciding upon the best course of action to mitigate identified risk. Industry organisations and States are also required to do this. This risk management process is fundamental to the EASp.

At the European level, this process is carried out in coordination with States and industry because they are parts of the one aviation system, whose risks are documented in the EASp. The Plan identifies the different aviation domains where coordinated actions would make a difference in terms of avoiding accidents and serious incidents, which is the shared goal that links all of the activities together. Correspondingly, the safety analysis that is carried out at the European level and summarised in this publication has also been split into the different aviation domains and activities. In this way, the risks identified as a result of the analysis may be described in the EASp, together with appropriate actions, in a linked-up manner.

Objectives of the Safety Risk Management Process

The EASp is a continually developing document that reflects the reality of the changing aviation environment. Behind the EASp is a revised safety risk management process that has the following strategic objectives to:

- Ensure that adequate coordination is carried out with stakeholders in EASA, the Competent Authorities and industry to enable the identification and assessment of safety issues.
- Use a data-driven approach to identify and prioritise the safety actions that are most efficient in reducing risk levels as part of a coordination programme of safety improvement.
- Provide transparency on why the Agency takes certain actions.

To achieve these objectives, existing processes have been strengthened to establish more structured links between safety intelligence processes and safety action related processes across the European aviation community.

Safety Risk Management Methodology

The Safety Risk Management Methodology consists of a number of coordinated tasks that are managed by EASA and involves a wide range of external stakeholders across collaborative activities. The main tasks are:

- **Data Enhancement.** A data-driven approach to safety can only occur if the data used is of the best possible quality. Therefore, a key part of the process involves the enhancement of safety data to ensure that any analysis is based on solid foundations. This task involves the continuing development and implementation of the taxonomies used to collect and store data in ECCAIRS databases in EASA and at the competent authorities. The application of these taxonomies is improved through the appropriate training of staff who encode occurrence information to standardise the implementation of data quality rules.

- **Identification of Safety Issues.** The primary way to identify safety issues is the analysis of occurrence data from both accidents and serious incidents that have been investigated by Safety Investigation Authorities together with occurrences reported by operators as a result of Mandatory Occurrence Reporting Schemes (MOR). Other useful sources of information used to identify safety issues include safety recommendations, existing safety studies and information collected as a result of operational experience through the various collaborative fora.

- **Risk Assessment.** Safety issues are assessed so as to identify the most effective mitigating actions. The assessment covers a number of considerations such as:

  1. The aviation sector affected, the type of operation and phase of flight;
  2. The causal and contributory factors;
  3. The potential consequences;
  4. The risk controls already in place and how effective they are;
  5. The overall level of risk associated with the safety issue.

The safety issues identified are stored together in the Safety Risk Portfolio for the sector, along with the types of occurrence in which the identified issues can result. There are different safety risk portfolios for the different aviation domains and, for the first time in the Annual Safety Review, three safety risk portfolios are provided for commercial air transport: aeroplanes, offshore helicopters and balloons. These portfolios are regarded as live documents and are regularly updated based on new information. The versions presented here will continue to develop and the latest updates will be made available on the EASA website.

- **Definition and Programming of Safety Actions.** Safety actions can be defined and programmed within the scope of the core processes of the aviation safety system in Europe. This includes rulemaking, certification, focused oversight, standardisation, safety promotion and corrective action in reaction to safety problems. Safety actions can be further coordinated with Competent Authorities at the National Level via State Safety Plans (SSp) and with industry through SMS. The link between the safety issues and associated safety actions will be established in the Safety Risk Portfolios. To assist decision makers to identify the most cost-effective actions an impact assessment is performed by the Agency.

- **Safety Performance.** For each safety issue, Safety Performance Indicators (SPIs) will be defined to measure trends that can be directly or indirectly related to each specific issue, or to monitor the effectiveness of actions that have been implemented.

The analysis provided in the EASA Annual Safety Review provides a summary of the initial output from the revised safety risk management process. This information provides the safety intelligence required to support decision making when formulating the EASp.

Collaborative Activity with NAAs and Industry

Both the analysis and risk management process cannot be performed by EASA in isolation. As has been described already in this chapter, the process relies on closely coordinated collaborative activities involving NAAs and industry via dedicated fora. The main groups involved in the process are:

- **European Network of Aviation Safety Analysts (NoA):** The NoA was established in 2011 as a partnership between EASA, the European Commission, Eurocontrol and the Safety Analysis Departments of the Competent Authorities. The implementation of Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation will formalise the role of the NoA in performing safety analysis at the European level in support of the EASp and the SSp(s) of the EASA MS.

- **European Strategic Safety Initiative (ESSI):** The ESSI consists of the 3 groups that provide the link between EASA and the industry in different sectors of aviation. These groups are the European Civil Aviation Safety Team (ECAST), the European Helicopter Safety Team (EHEST) and the European General Aviation Safety Team (EGAST).

- **European Human Factors Partnership (EHFP):** The European Human Factors Partnership is an evolution of the European Human Factors Advisory Group (EHFAG), which brings together Human Factors specialists from across the European Aviation Community.

- **Collaboration and Analysis Groups (CAGs):** Specialised CAGs for each of the different aviation domains have recently been established. Membership is drawn from the regulatory and operational communities of each aviation domain. Each CAG is tasked with validating the results of safety analysis. This improves the identification of safety issues and supports the safety risk assessment process. The work of the CAGs will also be focussed on developing practical solutions to the wide range of safety issues identified in the Safety Risk Portfolios.

Sharing the Results of the Safety Risk Management Process

This Chapter has provided an overview of the strategic safety activity that includes both the safety analysis and risk management processes. For the first time, this Review will provide the initial links between the data and the EASp. The chapter has also outlined the risk management process that will lead to the better identification and assessment of safety risks. In the longer term, the individual safety issues in the Safety Risk Portfolios provided in the Review will be further developed. An essential part of performing the work as described is ensuring it being shared with and used by the organisations and people at the heart of the aviation system. Future versions of the EASA Annual Safety Review will provide further detail on the results of the safety risk management process and how this relates to the EASp. Outside this Review, the EASA website will be used to publish detailed information that can be used by those wishing to improve safety irrespective of their role in the world of aviation.

A list of acronyms and definitions can be found in Appendix 1.

Chapter 3

Worldwide Safety

Scope

This chapter covers fatal accidents worldwide that involved aeroplanes with a mass greater than 5,700 kg conducting passenger and cargo operations. The data covers a ten year period, providing both perspective and relevance to the modern operating environment. Fatalities relating to security issues are covered separately in Chapter 14 - Emerging Issues.

Review of Fatal Accidents in 2014

Although there were fewer fatal accidents worldwide in 2014 than the average for the last ten years, the number of fatalities was close to the average and higher than in recent years.

Table 1: World-wide safety number of fatal accidents and fatalities 2004-2014

	Fatal Accidents	Fatalities
2014	16	648
2004-2013 Average	23	638

In 2014 there were 16 fatal accidents and 648 fatalities, while in 2013 there were 14 fatal accidents and 185 fatalities. The biggest change in 2014 was the increase in fatalities when compared with 2013. In 2014 there were 648 fatalities in Fixed Wing Commercial Air Transport compared with 185 in 2013. The 2014 increase in fatalities was the result of accidents involving larger aircraft carrying more passengers than those in 2013. In 2013 no single accident involved more than 50 fatalities. The number of fatalities in 2014 was 1.5% higher than the average for the previous 10 years. 517 of the 648 fatalities that occurred in 2014 resulted from just 3 accidents:

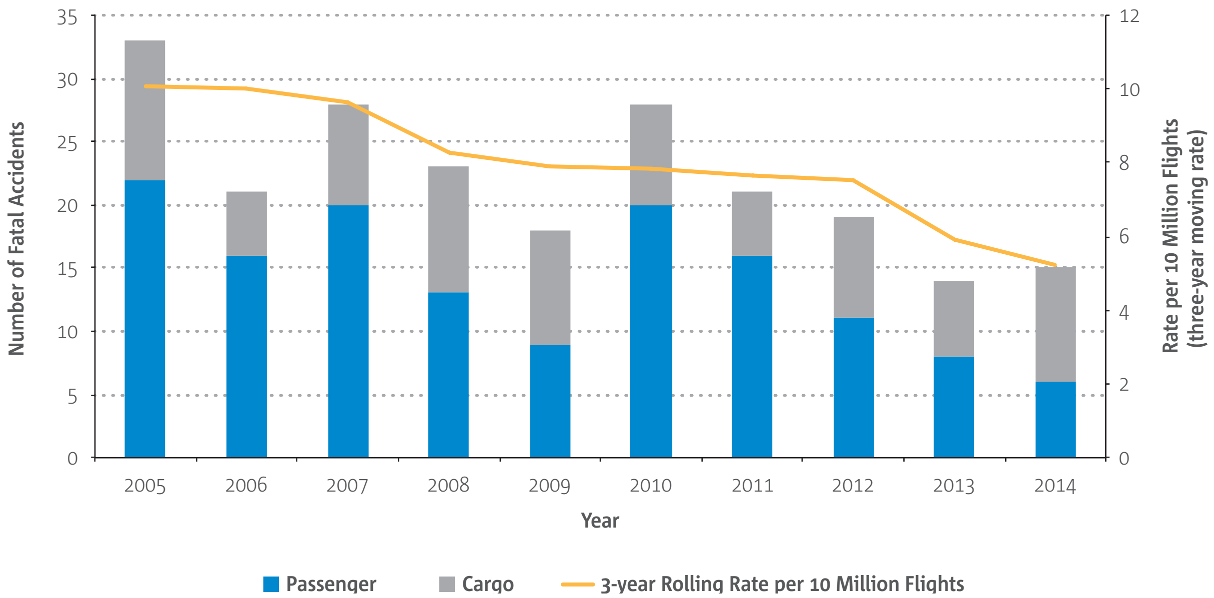
- **8th March** – Malaysian Airlines flight MH370. B777 missing, presumed crashed in southern Indian Ocean (239 fatalities);
- **24th July** – Air Algerie flight 5017, operated by Swiftair. MD83 stalled and crashed during a night flight in thunderstorm conditions, with turbulence and icing (116 fatalities). Swiftair is an EASA MS Operator;
- **28th December** – Air Asia flight 8501. A320 impacted the sea and was destroyed while flying from Surabaya to Singapore(162 fatalities).

Presently, the loss of Malaysian Airlines Flight MH17 in Ukraine is excluded from the data as this occurrence is considered to be a hostile action, which is outside the scope of the ICAO Annex 13 definition of an accident. This occurrence and work on aviation safety for aircraft overflying conflict zones is covered in more detail in Chapter 14. Were MH17 to be included in the accident figures, the number of fatalities would increase to 946.

Number and Rate of Fatal Accidents Worldwide

Over the past decade, there has been a gradually decreasing trend in the number and rate of worldwide fatal accidents. This decrease has mainly been in the number of fatal passenger accidents. However, the number of cargo accidents, although lower in number, has been much more variable. Despite a perception that 2014 was a bad year for aviation safety, the rate of fatal accidents, both world-wide and in the EASA Member States, continues to decrease.

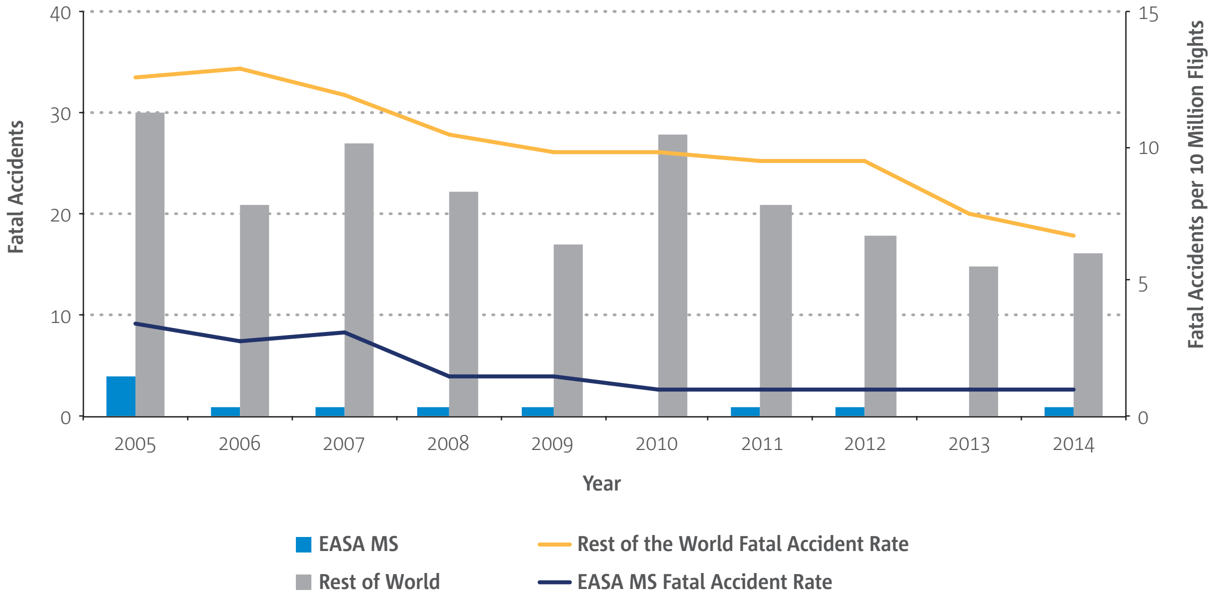
Figure 1: Worldwide fatal accidents involving passenger and cargo operations, maximum take-off mass above 5,700 kg



EASA Member States Comparison with the Rest of the World

The fatal accident rate of EASA Member States compared to that of the rest of the world is shown in Figure 2. The fatal accident rate for EASA Member States (Lower Line) compares favourably with that for the rest of the world (Upper Line), highlighting the continued high level of safety in European aviation. In the EASA Member States, not more than one fatal accident per year in Commercial Air Transport has occurred since 2005 and no fatal accidents occurred in 2010 and 2013.

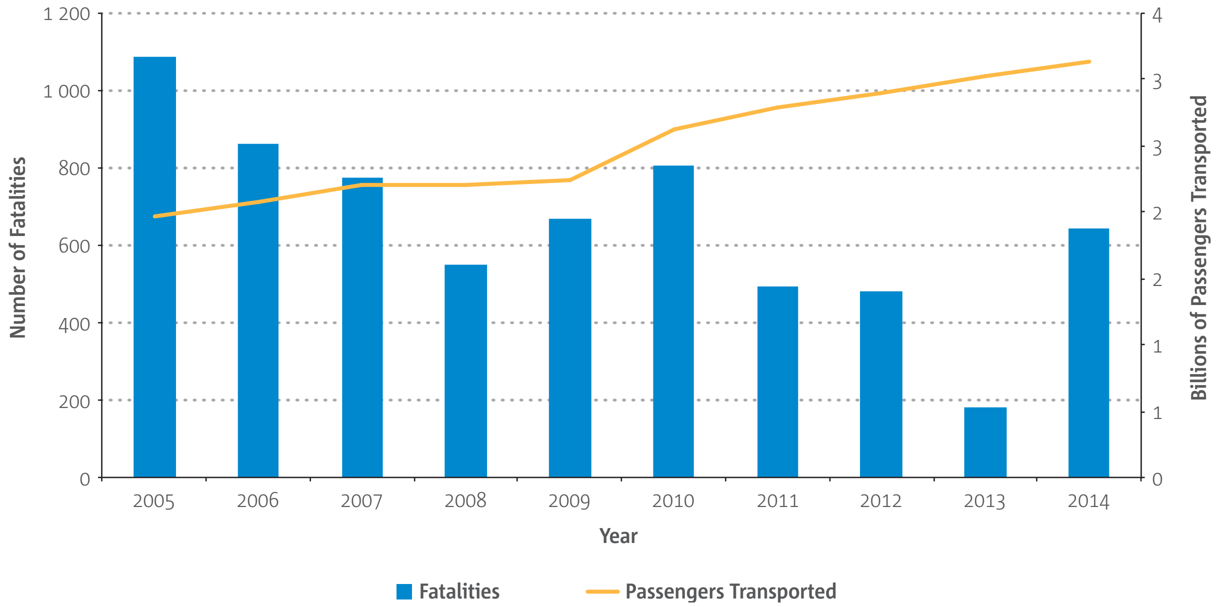
➨ **Figure 2:** Number and rate of fatal accidents worldwide, involving passenger and cargo operations, maximum take-off mass above 5,700 kg, comparing EASA MS with the rest of the world, 2005-2014



Passenger Safety

The number of fatalities and the number of passengers transported by airlines worldwide are shown in Figure 3 below. The overall decreasing trend in the number of fatalities between 2005 and 2013 has been reversed in 2014. Accident records show that the number of fatalities per year is variable and is highly dependent on a small number of catastrophic accidents, which individually result in hundreds of fatalities. In 2013, there were no individual fatal accidents with more than 50 fatalities, while there have been three in 2014, each resulting in over 100 fatalities.

Figure 3: Worldwide fatalities involving passenger and cargo operations compared with the number of passengers transported, maximum take-off mass above 5,700 kg



Occurrence Categories

The most commonly applied occurrence categories for worldwide fatal accidents are shown in Figure 4. Although these show the types of fatal accident that occur worldwide, more than one category can be applied to each occurrence and the categories are a mix of causes, events and outcomes. It is therefore unsurprising that post-crash fire is the most commonly applied fatal accident category, since in a serious accident a fire is likely to break out after impact.

Loss of control in flight is the second most commonly applied fatal accident category. This is where the flight crew lose control of an otherwise controllable aircraft. However, these events tend to occur during complex high-workload situations such as those following a technical failure or in extreme weather. The causes of loss of control in flight for European operators are analysed in detail in the commercial air transport chapter.

Figure 4: Occurrence categories applied to fatal accidents worldwide, passenger and cargo operations, maximum take-off mass above 5,700 kg

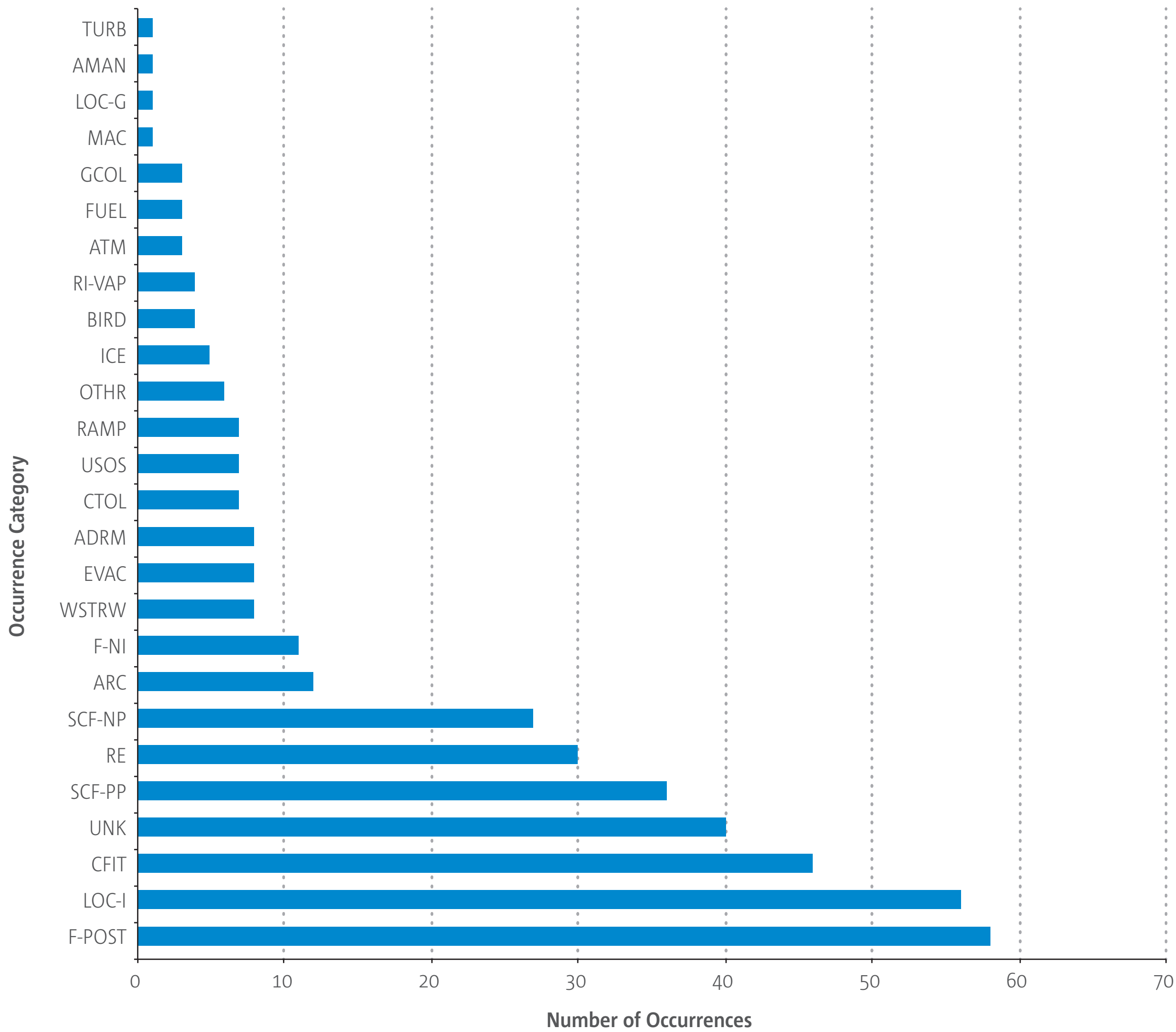


Table 2: World-wide CAT passenger and cargo accidents, maximum take-off mass above 5,700 kg

Date	Aircraft Type	Location	Operator Country	Fatalities	Description
17/02/2014	HS 748	Sudan	Kenya	1	Aircraft veered off the runway on landing and collided with parked vehicles. The aircraft was carrying aid.
08/03/2014	B777	Gulf of Thailand	Malaysia	239	Radar and radio contact lost with the aircraft 40 minutes into the flight and while transferring between air traffic control centres. The aircraft is still missing and believed to be in the southern Indian Ocean, west of Australia.
08/05/2014	DC3	Colombia	Colombia	5	Aircraft crashed at 6,000 feet in mountainous terrain.
02/07/2014	F27	Kenya	Kenya	4	Aircraft crashed shortly after take-off in a built up area.
17/07/2014	B737	Gabon	United Arab Emirates	1	Aircraft struck a person on the runway on landing.
23/07/2014	ATR72	Taiwan	Taiwan	48	The aircraft crashed during a go-around, following a VOR approach that was the second attempt to land in poor weather.
24/07/2014	MD83	Mali	Spain	116	Aircraft stalled and crashed during a night flight in thunderstorm conditions, with turbulence and icing.
10/08/2014	AN140	Iran	Iran	39	Shortly after take-off the crew requested a right turn, instead of turning left as per the standard departure. The aircraft then lost height, crashed and caught fire.
23/08/2014	L410	DR Congo	Democratic Republic of Congo	4	The aircraft crashed approximately 10 minutes after take-off and caught fire. The wreckage was located approximately 30km from the departure airfield.
30/08/2014	AN12	Algeria	Ukraine	7	The aircraft, carrying oil equipment from Scotland to Equatorial Guinea, crashed shortly after take-off from Tamanrasset, DR Congo. It was found burnt-out approximately 30km from the airport.
31/08/2014	F27	Tanzania	Kenya	3	Contact lost with aircraft during cruise. Wreckage located the following day.
29/10/2014	SD360	Netherlands Antilles	United States	2	Aircraft crashed into the Caribbean sea shortly after take-off
14/11/2014	HS 748	South Sudan	Kenya	2	Aircraft carrying aid crashed short of the runway during its second attempt to land. Several houses were destroyed but there were no reported fatalities on the ground.
28/12/2014	A320	Indonesia	Indonesia	162	impacted the sea and was destroyed while flying from Surabaya to Singapore
28/12/2014	AN26	DR Congo	Georgia	6	Aircraft hit the slope of Mt Kafinda while en-route at night, crashing in a densely wooded area.

Chapter 4

EASA Member State Overview

Scope

This section provides a summary of the number and rate of accidents involving Air Operator Certificate (AOC) holders per EASA MS. Within the data, AOC holders have been assigned to the State that granted the AOC. The purpose of this chapter is to consider, in an anonymous way, the safety level of operators and states. The information in this chapter will also enable states and individual AOC holders to assess their high-level safety performance against those of other EASA-MS AOC holders.

For the purposes of this chapter, the accident rate has been calculated using the number of accidents and the number of movements that each AOC holder has conducted using fixed-wing aircraft for the period 2011 to 2014.

It is also worth clarifying two relevant agreements in force between EASA-MS relating to the issuance of an AOC to assist in the understanding of this analysis. The agreements and manner in which accidents have been allocated with respect to these EASA-MS was calculated is as follows:

- An agreement between Liechtenstein and Switzerland allows Switzerland to issue an AOC on behalf of Liechtenstein. As a result, AOC holders who were licenced under this agreement have been included in Liechtenstein's data and not that of Switzerland;

- Only those occurrences that have been classified as accidents as defined in ICAO Annex 13 have been included in this part of the analysis. Furthermore, accident and movement data on aeroplanes owned by an AOC holder from one of the EASA MS that were leased to an AOC holder operating under an AOC from a non-EASA MS have been excluded. All of the AOC holders included within the EASA-MS accident rate operated at least 1,000 flights over the period under consideration.

This is the first time that this depth of analysis has been presented in the Annual Safety Review. It could not have been completed without the assistance of the Network of Analysts in providing missing movement and flight data for approximately 40 percent of AOC holders who experienced accidents. This assistance reduced the gap to around 11% and has ensured the accuracy of the accident rates presented in this chapter.

Number of accidents according to State

This analysis covers a total of 209 EASA MS-licensed AOC holders with data allocated by AOC State of issuance. The total number of accidents involving AOC holders within each State was then calculated, which is summarised in Table 3. These figures do not take into account an AOC holder's exposure to accidents in relation to the number of flight hours or the number of movements they flew.

Table 3: Number of accidents experienced by AOC holders within each State

No. of States	No. of accidents involving AOC holders in each EASA MS
8 States	Licence AOC holders who were not involved in any accidents
9 States	Licence AOC holders who were collectively involved in 1 accident
6 States	Licence AOC holders who were collectively involved in 2 accidents
3 States	Licence AOC holders who were collectively involved in 3, 4, or 5 accidents
6 States	Licence AOC holders who were collectively involved in more than 5 accidents

The key points from the table are:

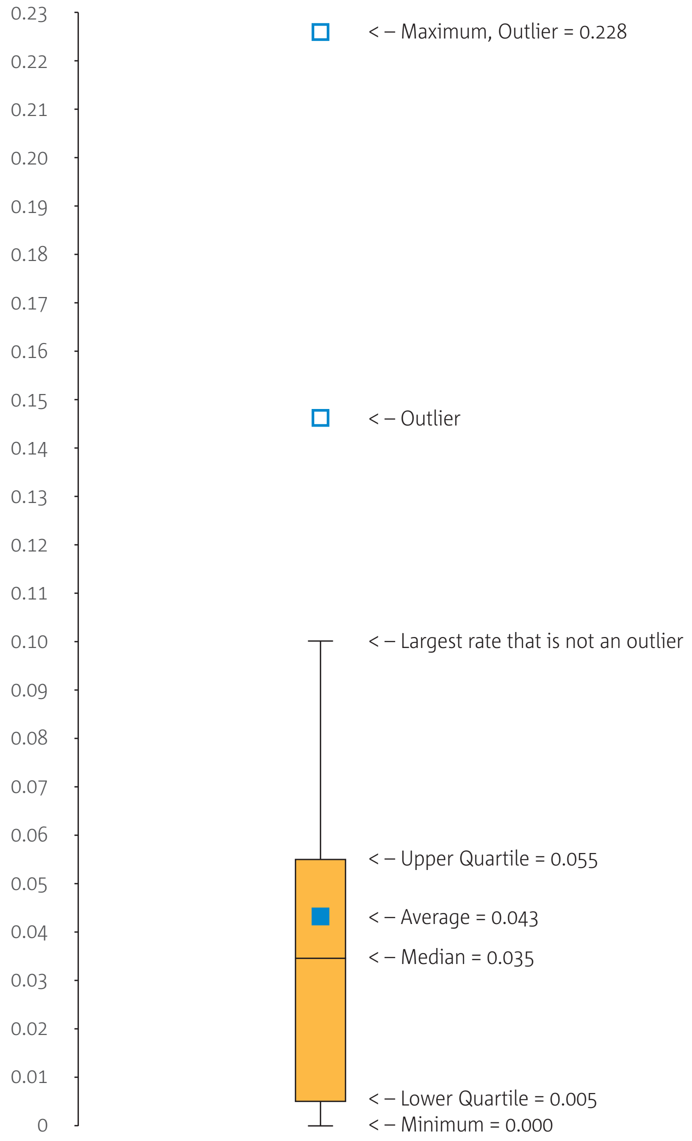
- Of the 32 EASA MS, there were 24 States where at least one AOC holder experienced an accident – this equates to 74% of the EASA MS;
- The AOC holders of 6 EASA MS experienced more than 5 accidents. The actual number of accidents for these states were 6, 8, 10, 14 or 21 accidents respectively. While these numbers of accidents appear to be high, the States in question are those whose AOC holders fly the largest number of movements; collectively over 1.5 Million movements. It highlights the importance of the later analysis in this chapter where the comparison with flight movements has been included.
- Nine States licence an AOC holder who has experienced 1 accident.
- Eight of the 32 States licence AOC holders that were not involved in any accidents over the period considered; 2011 to 2014. Seven of those eight States regulate AOC holders who collectively conducted the smallest number of movements; less than 88,000. The eighth State regulates AOC holders who between them conducted 190,682 movements, being the twelfth smallest.

Accident rate per 10,000 movements for each State

The accident rate per 10,000 movements for each EASA-MS was calculated by taking the total number of accidents involving AOC holders licenced by each State, dividing it by the total number of movements conducted by those AOC holders, and multiplying it by 10,000. Figure 2 summarises the States accident rate using a box plot. Box plots are helpful because they help to summarise a number of statistics in one image. In this figure, it provides information on the following: the average, the median, the lower quartile, the upper quartile, minimum and the presence or absence of outliers. Each of these statistics is explained and provided in the text beneath Figure 2.

The purpose of providing these statistics is to provide an understanding of the safety picture of both States and AOC holders. It also enables States and AOC holders to compare their accident rates with the statistics provided here. Information on how to do this is provided in the next subsection.

Figure 5: Summary of the 32 EASA MS accident rates per 10,000 movements



The main statistics and key points from the graph are:

- The **average** (sometimes called the mean) accident rate is a measure of central tendency. This was calculated by totalling the 32 accident rates and dividing by 32. The average was calculated as 0.043 accidents per 10,000 movements and is represented in Figure 5 by a solid black dot in the centre of the upper yellow box.
- The **median** is another measure of central tendency. It is the mid-point in the data where the accident rates have been arranged in order from smallest to largest; effectively the middle point of the data. In Figure 2, it is shown as a black line that splits the yellow box into two parts. The median accident rate was 0.035 accidents per 10,000 movements, which is very close to the average accident rate.
- The **minimum** is the lowest value in the dataset and was 0.00 accidents per 10,000 movements. This means some States regulate AOC holders who did not have any accidents.

- The bottom perimeter line of the yellow box indicates the **lower quartile** value. This line shows the value below which 25% of the accident rates lie when the rates are arranged in order from smallest to largest. In this case the value is 0.005 per 10,000 movements.

- In conjunction with the minimum value, this indicates that 25% of States had an accident rate between 0.000 and 0.005 accidents per 10,000 movements.

- In conjunction with the median value, this indicates that a further 25% of States had an accident rate between 0.005 and 0.035 accidents per 10,000 movements;

- The upper perimeter line of the yellow box indicates the positioning of the **upper quartile.** This line shows the value above which 25% of the accident rates lie when the figures are arranged in order from smallest to largest. In this case, the value is 0.035 per 10,000 movements;

- In conjunction with the median value this indicates that 25% of States had an accident rate between 0.035 and 0.055 accidents per 10,000 movements;

- Two states had accident rates that were identified as outliers. **Outliers** are observations that are numerically distant from the rest of the data and are identified using a formula. The two States concerned both regulated AOC holders who each experienced a single accident and performed a relatively low number of movements; 87,639 and 135,634 respectively by state. These flight movement numbers were the eighth and eleventh smallest numbers of movements among the 32 States;

- Many of the higher accident rates were associated with States whose AOC holders conducted a small proportion of the overall movements and experienced either one or two accidents;

- Where movements are considered as the measurement of size, the State that regulated the largest share of the aviation industry has the eleventh lowest accident rate and the AOC holders it regulates have experienced 21 accidents;

- The differences between accident rates of individual States are not statistically significant.

Using this information

The purpose of providing these statistics is to allow States and AOC holders to compare their accident rates with the statistics provided here at a European Level.

For example, where AOC holders in a given State have conducted 600,000 movements over the last 4 years and experienced 3 accidents, their accident rate per 10,000 movements is 0.050. (Calculation is 3/600,000*10,000). This indicates that the accident rate for that State, or AOC holder, lies between the median and upper quartile. Similarly, that State's accident rate is lower than 25% of all accident rates and higher than 50% of all accident rates.

Conclusion

The key points that can summarised from this analysis are:

- During the period 2011 to 2014, 25% of EASA MS regulate AOC holders who experienced no accidents. However, 75% of EASA MS regulate AOC holders who did experience at least one accident during the period 2011 to 2014, highlighting the importance of continual safety efforts;

- The accident rate of an individual State is not proportional to the size of the industry that it regulates. The States with a higher accident rate than others had AOC holders that were involved in a small number of accidents and conducted a small number of movements;

- By contrast, some States with the highest number of accidents, have a low accident rate due to the high number of movements carried out;

- The only outliers in this analysis involved two small States whose AOC holders perform a little less than 1% of the total number of European movements, which demonstrates the overall high level of safety in the European system.

Chapter 5

Commercial Air Transport

Fixed-wing Aeroplanes

Scope

Commercial Air Transport (CAT) operations using fixed-wing aeroplanes includes the carriage of passengers, mail or cargo for remuneration. This chapter gives an aggregated view of all accident and serious incidents that occurred in 2014 and involved fixed-wing aircraft engaged in CAT operations with a maximum take-off weight above 5,700 kg that were operated by an Air Operator Certificate (AOC) holder approved in EASA MS. The overview is complemented by the contextual data of the last 10 year period (2004-2013).

Despite the continuing low number of fatal accidents in CAT Fixed Wing (FW) in Member States, accidents of an operational nature still occur. This serves as a reminder that there is still much to do in making European aviation transport an even safer mode of transport. In order to more efficiently achieve this outcome, the Agency is currently reviewing its safety risk management process to ensure a systematic and structured assessment of the most relevant safety issues and their subsequent remedial actions. The output of this assessment is the Safety Risk Portfolio for CAT FW (SRP CAT FW) to be found later in this chapter.

The SRP CAT FW has been initiated around the analysis in the risk area of loss of control in flight, the highest area of concern in this domain. However, the SRP CAT FW has also been extended to enable the holistic assessment of the safety issues in other risk areas and this will be subject to further detailed analysis as the portfolio matures.

Key Statistics Aeroplanes

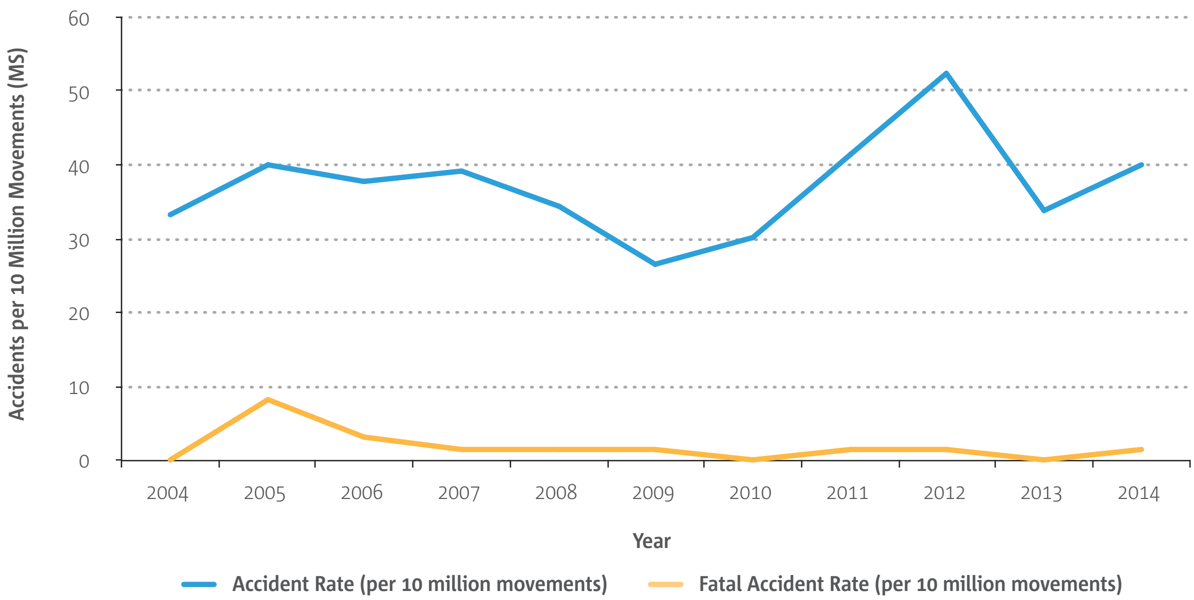
The fatal accident rate has remained stable across the ten-year period and one fatal accident occurred in 2014 that involved an EASA AOC holder. Despite the stability of the data, the operational nature of this tragic event should remind all stakeholders, especially the front-line organisations and the aviation safety regulators, of their key role in ensuring and improving aviation safety.

Table 4: EASA MS CAT accidents per occurrence category

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	1	26	66
2004-2013 average	1.2	22.6	78.1

The number of fatal accidents in 2014 remains below the ten-year average, although the number of non-fatal accidents in 2014 is slightly above the average for the same ten-year period. The number of serious incidents recorded in 2014 is more than 15% lower than the ten-year average, decreasing from around 78 to 66. The 2014 figure is located in the lower part of the historical range of between 60 to 100 serious incidents a year.

Figure 6: Evolution of the accident rates for MS over the last 11 years



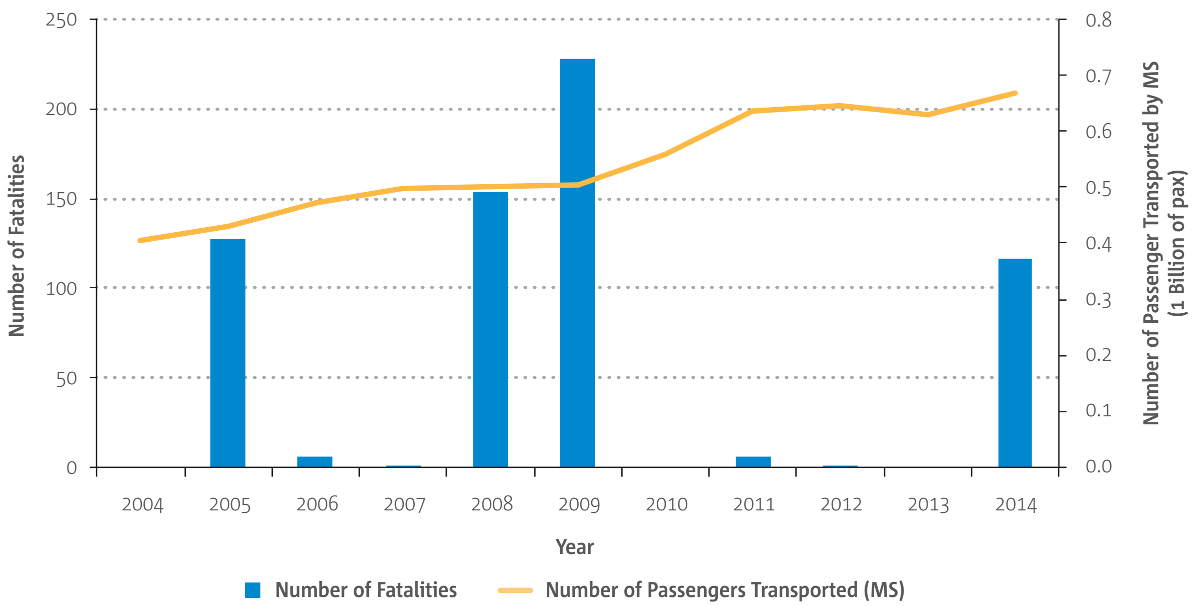
The accident (non-fatal) rate has increased over the last 4 year period, though the rate of fatal accidents is stable over the same time period.

Table 5: EASA MS CAT number of fatalities and serious injuries

	Fatalities	Serious Injuries
2014	116	11
2004-2013 average	52.4	8.6

In terms of fatalities, 2014 has resulted in a total of 116 persons being fatally injured, all of them in the only fatal accident that occurred. Eleven serious injuries were recorded during 2014 with the majority of these caused by turbulence encountered in flight. Despite increasing passenger figures, the number of fatalities remains reasonably stable with an average of 50 fatalities per year. Although the number of fatalities recorded in 2014 is significantly higher than the average number of fatalities during the period 2004-2013, the increase does not signify a deterioration in the level of safety but demonstrates the variability in terms of fatalities between individual accidents.

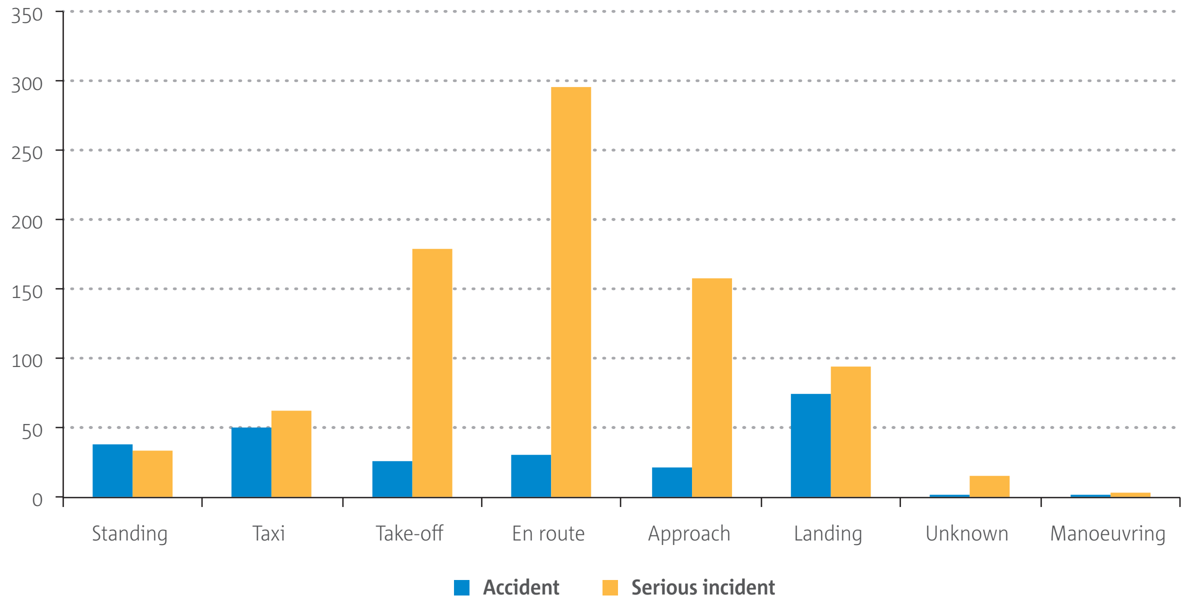
Figure 7: Evolution of number of fatalities for MS over the last 11 years



Phase of Flight

The Figure 8 shows the distribution of accidents and serious incidents across the different phases of flight. The majority are concentrated en route, which correlates with majority of the exposure time and the link to injuries during turbulence. It is worth highlighting that the similarity between the numbers of accidents and serious incident for standing, taxi and landing is mainly due to the severity of the damage caused to the aircraft during these flight phases and not to high level of injuries to the persons on board (i.e., damage caused by collapsed landing gear, by the collision during taxiing with parked aircraft or by a ground vehicle during ground servicing).

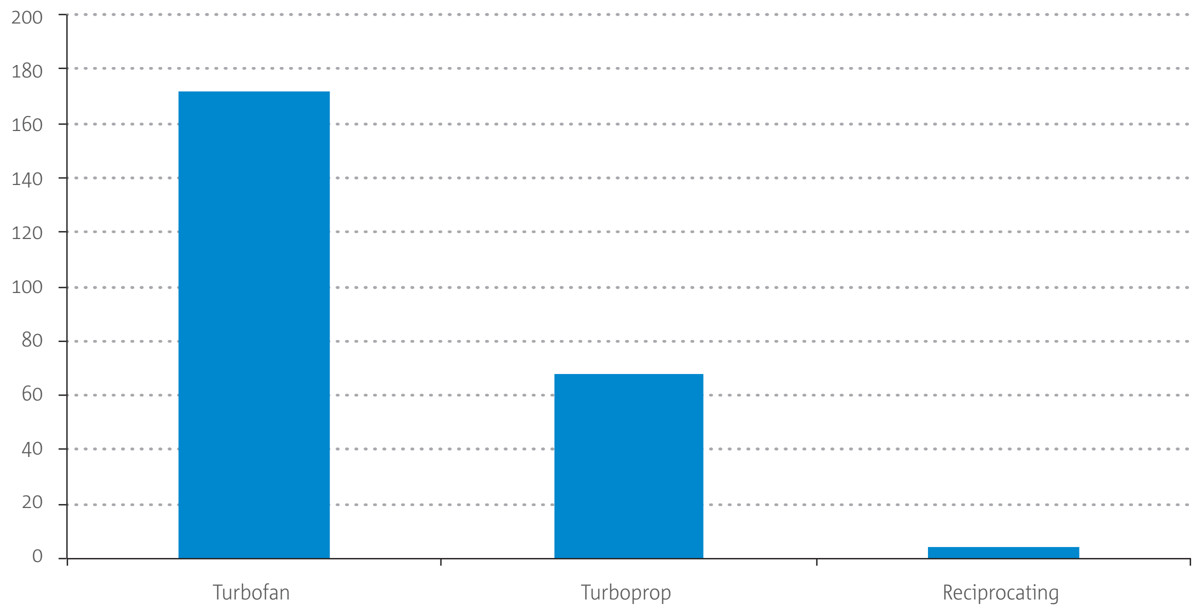
➨ **Figure 8:** Distribution of accidents and serious incidents 2005-2014 per phase of flight



Propulsion Type

Figure 9 shows the spread of accidents or serious incidents by the type of propulsion of the aircraft. The majority of the occurrences involved Turbofan powered aircraft, but this is to be expected as this type of engine powers the more aircraft in the commercial fleet than either turboprop or reciprocating engines.

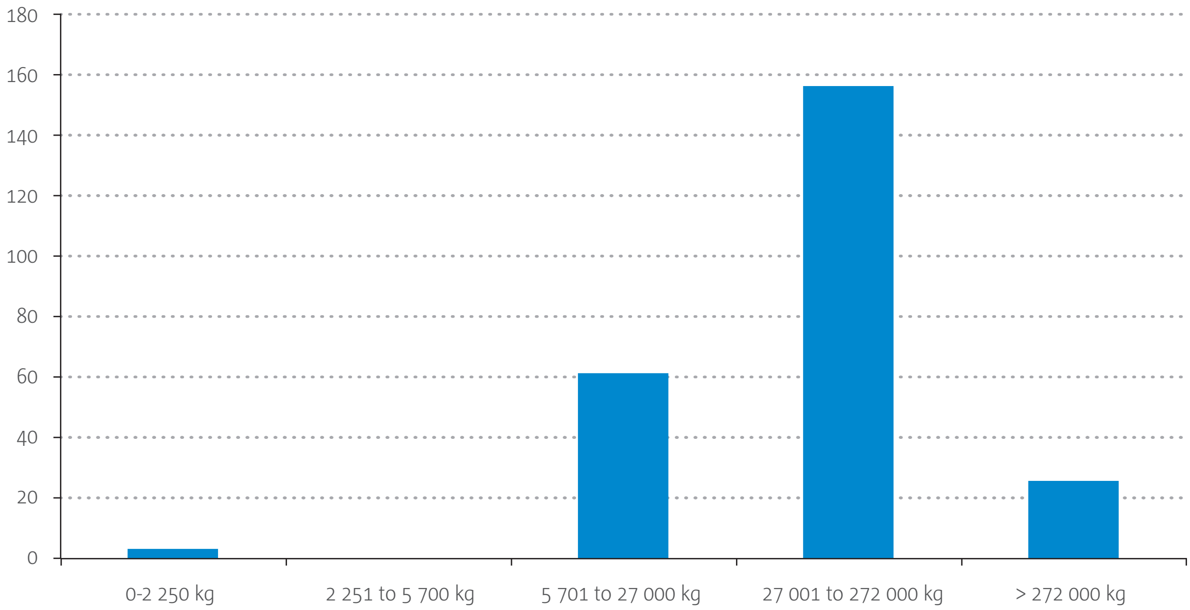
➨ **Figure 9:** Distribution of accidents and serious incidents 2004-2015 per aircraft propulsion type involved



Mass Group

Figure 10 shows the number of accidents and serious incidents by the different mass groups of the aircraft. Due to the fact that events may involve more than one aircraft, the picture shows a mass group not considered within the scope of the this chapter (i.e., 2250 kg, corresponding to events involving a CAT FW aircraft and an aircraft below 5700 kg, most likely in a MAC event). Again, the number of accidents correlates with the spread of the commercial aircraft fleet in Europe. Medium-sized jet powered aircraft such as the Airbus A320 and Boeing 737 form the mainstay of many airline fleets and these fall into the 27001 to 272000 kg mass group.

Figure 10: Distribution of accidents and serious incidents 2005-2014, per aircraft mass group involved



Occurrence Categories

The assignment of an accident under a single or multiple occurrence categories assists in the identification of particular safety risk areas. Occurrence categories were assigned to accidents and serious incidents in the scope of this chapter based on the definitions of the CAST-ICAO Common Taxonomy Team (CICTT). The CICTT have developed a common taxonomy for the classification of occurrences for accident and incident reporting systems. Further information about the categories used in this report can be found in Appendix 1: Definitions and Acronyms. An accident may have more than one category, depending on the circumstances contributing to the accident.

Table 6 provide details of the number of accidents and fatal accidents associated with each occurrence category in 2014 and the average over a ten-year period (2004-2013). This information is also shown graphically in Figure 10. Loss of control in-flight (LOC-I) remains the top safety risk area with six fatal accidents recorded in the last eleven-year timeframe, including the one occurred in 2014[2]. LOC-I is also the safety risk area resulting in the biggest number of fatalities in Commercial Air Transport, not only within the European context but also world-wide. For this reason, this chapter includes a more detailed analysis on this safety risk area.

During the period 2004-2013, there were 4 fatal accidents involving fire post-impact (F-POST) and three fatal accidents involving the failure or malfunction of one of the non-poweplant systems of the aircraft (SCF-NP). All F-POST occurrences involved situations where the fire developed as a consequence of the impact, leading to a reduction in the likely survivability of the crew and passengers on board. F-POST is not considered a safety risk area in its own right but is considered in with the safety issue of survivability an evacuation. Regarding the 3 fatal accidents categorised as SCF-NP, it is important to highlight that in all 3 accidents the aircraft system failure was not the only cause of the accident but one of the contributors in the chain of events.

The most frequent risk areas for non-fatal accidents were abnormal runway contact (ARC), ground handling (RAMP) and failure or malfunction of aircraft system components (SCF), respectively. ARC includes hard, fast, off-centred or overweighed landings, tail or wing strikes during landing or take-off, and wheels-up landing. ARC excludes the collapse of the landing gear during take-off or landing. All the ARC non-fatal accidents were classified as such due to the substantial damage caused to the aircraft. In the cases of the RAMP non-fatal accidents this involved either ground personnel being seriously injured and/or the aircraft being substantially damaged during the ground handling of the aircraft. In the case of SCF-NP, most of the accidents relate to problems with the landing gear that occurred during landing.

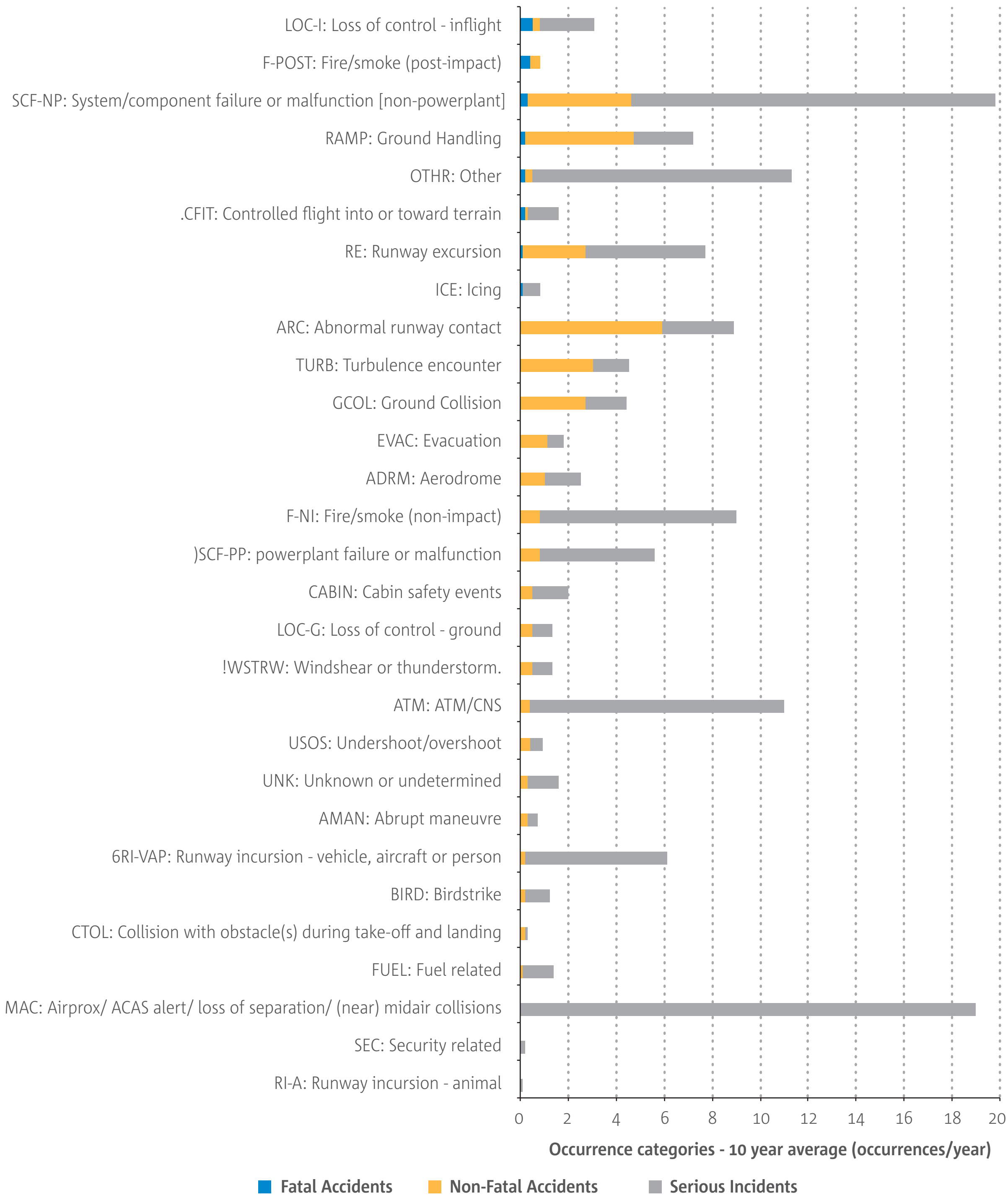
MAC/Airprox (MAC) was by far the most significant risk area for serious incidents, which involved the significant loss of separation between two aircraft posing a potential risk of collision. In addition, SCF-NP also featured as a key risk area with the previously mentioned landing gear problems, depressurisation and technical issues with the flight controls being the most frequent types of event.

2 Accident MD-80 EC-LTV in Mali. Although the Investigation is still on-going there is sufficient evidence to qualify the accident as a loss of control in-flight (LOC-I).

➨ Table 6: Accidents and serious incidents per occurrence category (CICTT)

	Serious Incidents		Non-Fatal Accidents		Fatal Accidents	
Occurrence Category	2004-2013 average	2014	2004-2013 average	2014	2004-2013 average	2014
LOC-I: Loss of control - inflight	2.3	2	0.3	0	0.5	1
F-POST: Fire/smoke (post-impact)	0	0	0.4	0	0.4	0
SCF-NP: System/component failure or malfunction [non-powerplant]	15.2	20	4.3	3	0.3	0
RAMP: Ground Handling	2.5	3	4.5	7	0.2	0
OTHR: Other	10.8	4	0.3	0	0.2	0
CFIT: Controlled flight into or toward terrain	1.3	1	0.1	0	0.2	0
RE: Runway excursion	5	6	2.6	2	0.1	0
ICE: Icing	0.7	1	0	0	0.1	0
ARC: Abnormal runway contact	3	3	5.9	8	0	0
TURB: Turbulence encounter	1.5	2	3	6	0	0
GCOL: Ground Collision	1.7	1	2.7	2	0	0
EVAC: Evacuation	0.7	1	1.1	0	0	0
ADRM: Aerodrome	1.5	0	1	0	0	0
F-NI: Fire/smoke (non-impact)	8.2	9	0.8	0	0	0
SCF-PP: powerplant failure or malfunction	4.8	5	0.8	0	0	0
CABIN: Cabin safety events	1.5	0	0.5	0	0	0
WSTRW: Windshear or thunderstorm.	0.8	5	0.5	2	0	0
LOC-G: Loss of control - ground	0.8	1	0.5	0	0	0
ATM: ATM/CNS	10.6	5	0.4	0	0	0
USOS: Undershoot/overshoot	0.5	0	0.4	0	0	0
UNK: Unknown or undetermined	1.3	0	0.3	0	0	0
AMAN: Abrupt maneuvre	0.4	0	0.3	0	0	0
RI-VAP: Runway incursion - vehicle, aircraft or person	5.9	8	0.2	0	0	0
BIRD: Birdstrike	1	0	0.2	0	0	0
CTOL: Collision with obstacle(s) during take-off and landing	0.1	0	0.2	0	0	0
FUEL: Fuel related	1.3	1	0.1	0	0	0
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	19	9	0	0	0	0
SEC: Security related	0.2	0	0	0	0	0
RI-A: Runway incursion - animal	0.1	0	0	0	0	0

Figure 11: Occurrence categories sorted by fatal accidents (10-year average)



Key Safety Risk Areas for Commercial Air Transport Aeroplanes

Through analysing the occurrence categories, the key safety risk areas for commercial air transport fixed wing operations were identified using the data provided in Figure 11. These form the basis for the Safety Risk Portfolio and the further analysis of each risk area is then used to identify the specific safety issues. These key risk areas are[3]:

- **Loss of control – in flight (LOC-I):** the most frequent risk area for fatal accidents, both in Europe and worldwide.
- **System Component Failure (SCF):** the 3rd most frequent risk area for fatal accidents and the most frequent risk area for all accidents and serious incidents.
- **MAC/Airprox (MAC):** the 2nd most frequent risk area for all accidents and serious incidents.
- **Runway excursion/abnormal runway contact (RE/ARC):** ARC is often a pre-cursor to RE occurrences, therefore for the purpose of considering safety issues they have been combined. ARC is the most frequent risk area for non-fatal accidents.
- **Ground collisions/Ground handling (GCOL/RAMP):** RAMP is the 4th most frequent risk area for fatal accidents and is combined with GCOL as both involve occurrences in and around an aerodrome.
- **Controlled flight into or toward terrain (CFIT):** whilst the installation of Ground Proximity Warning Systems has greatly reduced the risk of fatal CFIT accidents in recent years, it remains the final type of fatal accident in this analysis and still poses a threat in some circumstances.
- **Fire/Smoke Non-Impact (FIRE):** FIRE is the 5th most frequent risk area for all accidents and serious incidents.
- **Runway incursion (RI):** RI is the 6th most frequent risk area for all accidents and serious incidents.

3 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Loss of Control In-flight (LOC-I)

LOC-I remains the top risk area leading to the largest number of fatal accidents and fatalities in the CAT fixed wing. LOC-I involves the momentary or total loss of control of the aircraft, usually involving a significant deviation from the intended flight path. This might be the result of reduced aircraft performance or because the aircraft was flown outside its capabilities for control.

The analysis for LOC-I was carried out to support the development of the Agency's CAT FW Safety Risk Portfolio, which will support to the European Aviation Safety Plan (EASp) and facilitate the management of safety issues in the Agency as previously described in Chapter 2. The main goal of the analysis was to identify the most relevant safety issues present in LOC-I events.

The analysis covers a six-year time frame, from 2009 to 2014 and involved 65 occurrences that were categorised as LOC-I. For the analysis, the definition of LOC-I was openly applied with the aim of capturing all the relevant safety issues leading to the upset of the aircraft in the first place and then to its subsequent loss of control.

Figure 12 shows the distribution of the 65 events by occurrence class as per Regulation (EU) 996/2010 and ICAO Annex 13.

Figure 12: Distribution of LOC-I occurrences by occurrence class

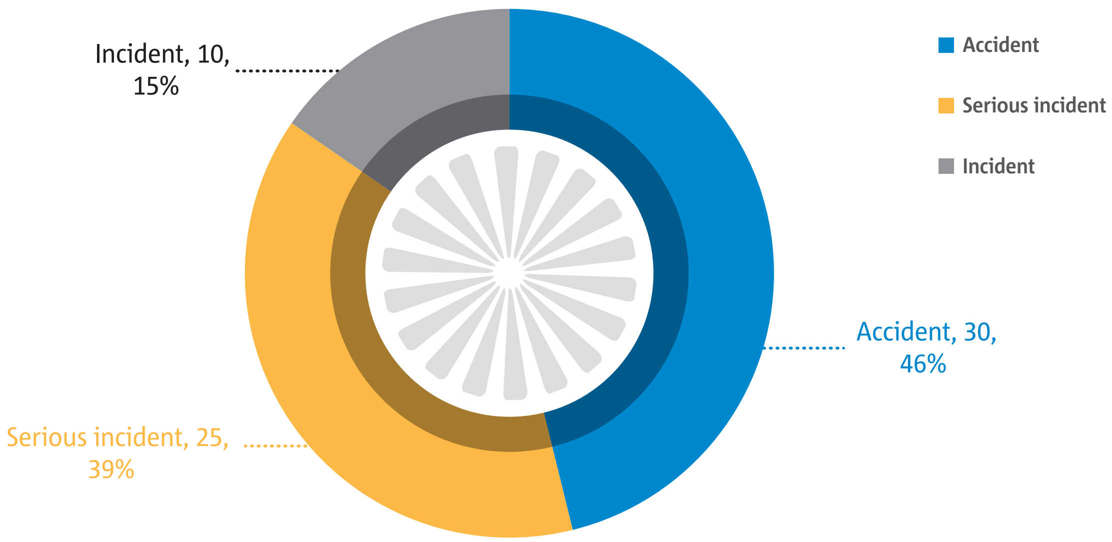


Figure 13 shows the result of the analysis in terms of the most recurrent causal and contributory factors in LOC-I accidents. These factors are populated based on the event type taxonomy within Version 2.5.0.0 of the ECCAIRS Aviation Taxonomy.

The top six factors were:

- **Use of policy/procedures:** the flight crew did not use the applicable procedure or policy, or did not applied it properly, either intended or unintendedly.

- **Monitoring of equipment/instruments:** the flight crew did not monitor properly or was unable to monitor adequately the indications of aircraft equipment or instruments. This is normally associated to the monitoring of the attitude, altitude or airspeed of the aircraft, or to the position of aircraft flight controls.

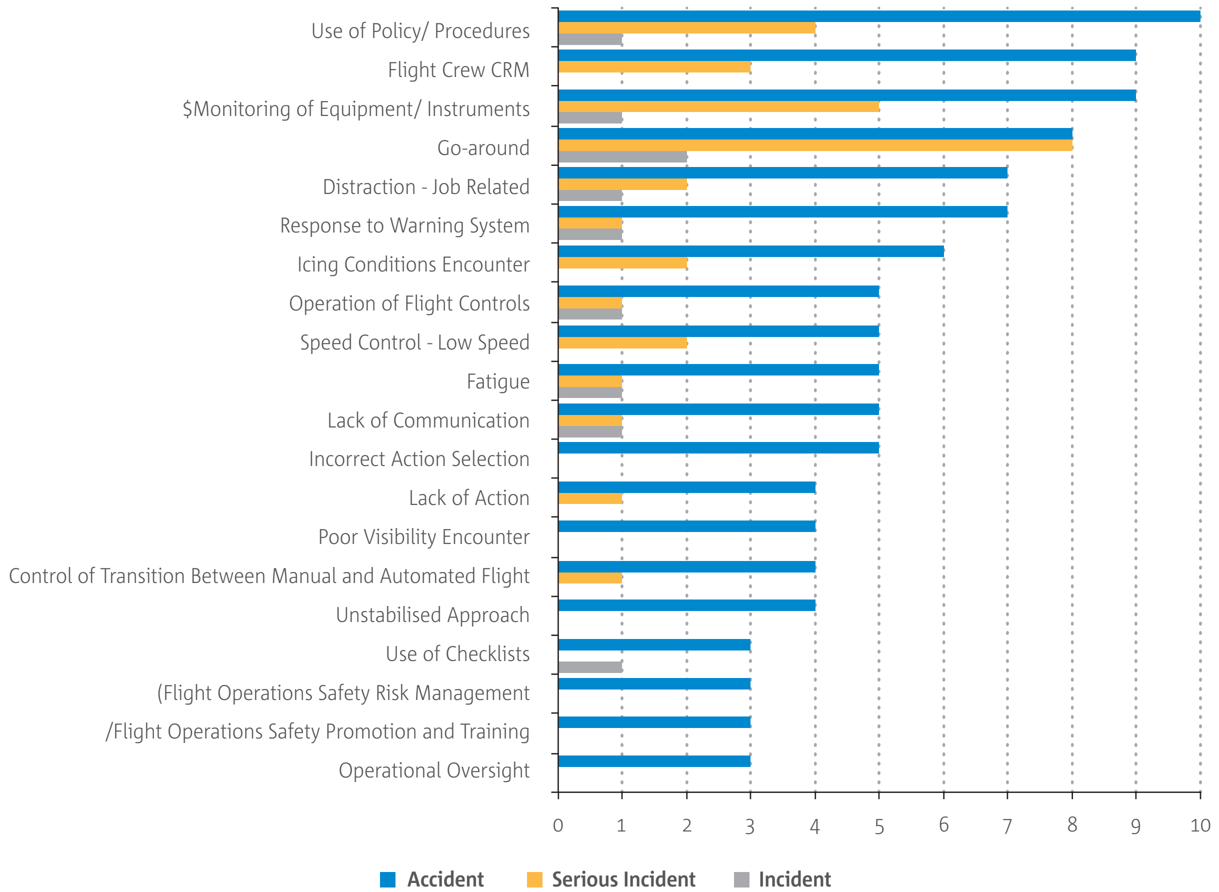
- **Flight crew CRM:** lack of, inadequate or inefficient Cockpit Resource Management (CRM). An event related to the CRM and Human Factors interaction between flight crew.

- **Handling of the go-around:** inadequate handling of the go-around by the flight crew.

- **Response to warning system:** inadequate, erroneous or insufficient response to a warning system by the flight crew. This is normally associated to the response to stall warnings, unreliable airspeed indications or flight control failures.

- **Distraction:** job related – Events where the flight crew is distracted for job related reasons. The distraction is normally caused by unexpected warnings or meteorological conditions.

Figure 13: Contributing factors/events sorted by most frequently present in LOC-I accidents



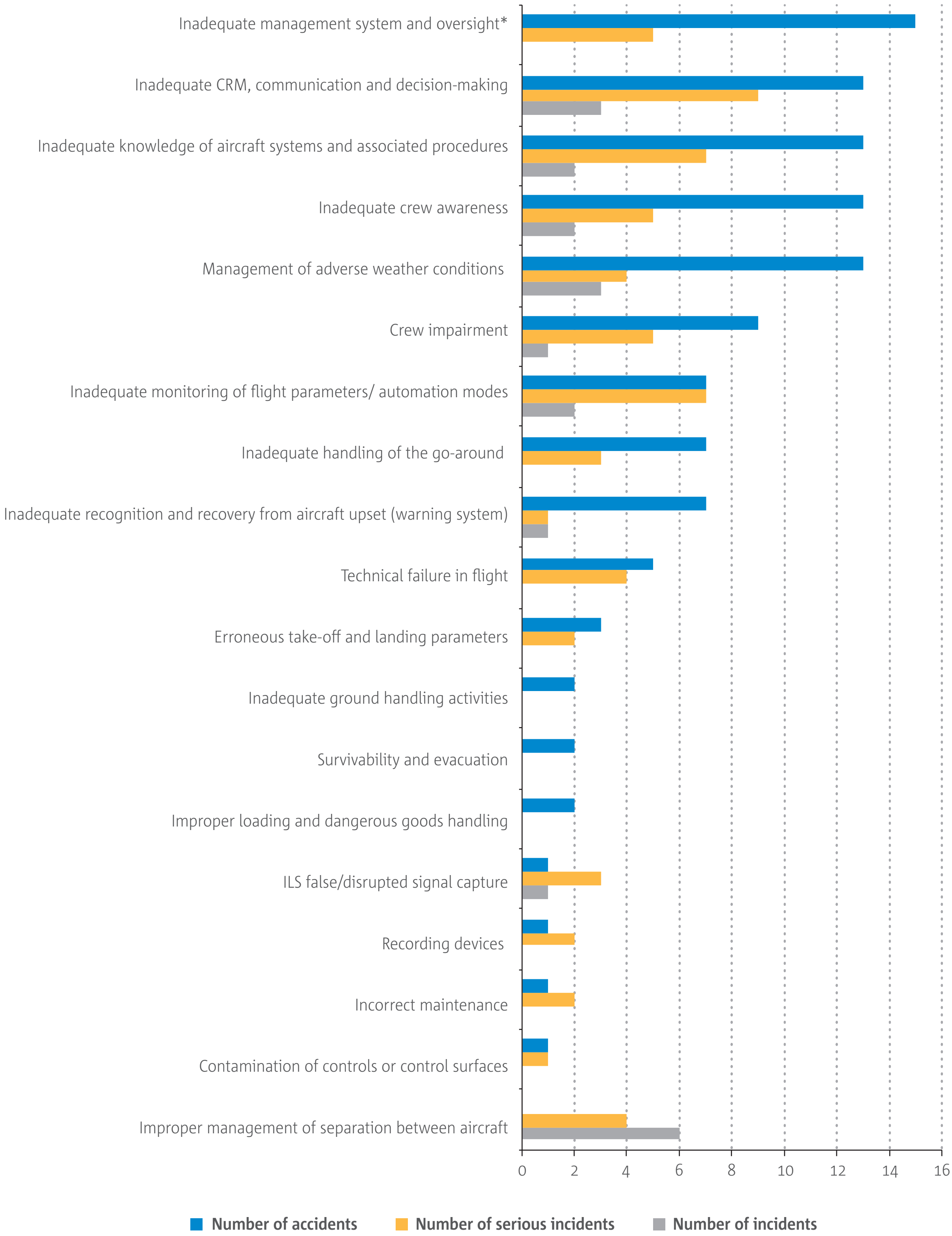
The analysis on LOC-I was then completed by combining the analysis with expert judgement to define a full list of safety issues for the Agency's initial Safety Risk Portfolio. Figure 14 then further refines this analysis by ranking the safety issues according to their involvement in accidents, serious incidents and incidents.

The top five safety issues are:

1. Inadequate management system and oversight[4]
2. Inadequate CRM, communication and decision-making
3. Inadequate knowledge of aircraft systems and associated procedures
4. Inadequate crew awareness
5. Management of adverse weather conditions

4 Later split in two: inadequate management system and inadequate oversight

Figure 14: Safety issues sorted by number of accidents where present



CAT Aeroplane Safety Risk Portfolio

Following the LOC-I analysis described above, a further analysis was carried out covering the other risk areas to identify additional safety issues and to support their prioritisation. The Agency's Safety Risk Portfolio for CAT FW Aeroplane presented in Table 7 provides a framework to address the identified safety issues in a systematic and structured manner. At this stage the detailed analysis of what are the contributing safety issues has been completed for LOC-I only and further detailed analysis will be performed to further develop the Portfolio. Over time, a risk assessment will be completed for each safety issues through the development of relevant scenarios, together with an evaluation of on-going mitigating actions to identify the need for further EASp actions and to establish standardisation performance monitoring mechanisms.

Table 7: Initial safety risk portfolio, CAT fixed wing aeroplane

	CAT – Fixed Wing Aeroplane	SYS	Risk Areas							
	Safety Issue		LOC-I	SCF	MAC	RE/ ARC	GCOL/ RAMP	FIRE	CFIT	RI
Operational	Management of adverse weather conditions		■			■	■		■	■
	Erroneous take-off and landing parameters		■	■		■				
	Inadequate handling of Go-Arounds		■			■			■	
	Inadequate recognition and recovery from aircraft warning system operation		■		■	■			■	
	Improper management of separation between aircraft		■		■		■			
	Improper fuel management		■	■		■			■	
	Incorrect maintenance		■	■	■	■	■	■	■	■
	Improper loading and dangerous goods handling		■	■		■	■	■		
	Inadequate ground handling activities (e.g. de-icing and servicing)		■				■			■
	Birdstrikes		■		■					
	Survivability and Evacuation		■			■	■	■	■	■
Technical	Technical failure in flight		■	■	■	■		■	■	
	Contamination of controls or critical surfaces		■	■		■				
	ILS false/disrupted signal capture		■	■		■				
	Unsuitability of Recording devices	■								
Human	Inadequate crew situational awareness	■	■		■	■	■	■	■	■
	Inadequate crew resource management (CRM), communication and decision-making	■	■		■	■	■		■	■
	Inadequate knowledge of aircraft systems and associated procedures	■	■		■	■			■	
	Inadequate monitoring of flight parameters/automation modes		■		■	■			■	
	Crew impairment	■	■		■		■	■	■	■
Organisat.	Improper oversight	■								
	Inadequate management system (incl. procedures)	■								

Business Aviation

Business Aviation

Scope

Business aviation operations present some very different challenges to other areas of aviation operations. This Chapter covers the safety of fixed wing aircraft operations that broadly fit into three separate categories:

- **Air Taxi Operations:** aircraft flown for business purposes involving the short notice carriage of passengers or cargo by an operator having an Air Operators Certificate.
- **Corporate Business Operations:** non-commercial operations involving professional flight crew employed to fly and aircraft on behalf of a business or organisation.
- **Owner Operated Business Operations:** aircraft flown for business purposes and is flown by the owner of the business.

In this context and within Europe, there are over 800 business aviation operators flying in excess of 4,000 aircraft and over 160,000 aviation professional are involved in the sector. Business aviation involves operations using both jet and turboprop aircraft and the sector undertakes a significant percentage of the annual aviation movements in Europe. One of the key differences between business aviation and commercial airline operations is the flexibility that it offers to those who choose to use this type of service. For example, 70% of business aviation flights take off and land at smaller airports that handle fewer than 100 departures per day[5]. That means that business aviation operations also involve more flight in uncontrolled airspace. Together, these factors present the sector with some specific safety challenges and this section provides an analysis of the key types of safety occurrences involving business aviation and considers some of the specific safety risks these operators face and manage on a day-to-day basis.

5 Source – European Business Aviation Association.

Key Statistics Business Aviation

Table 8: Business aviation fixed wing aeroplane fatal and non-fatal accidents and serious incidents last year compared to the 10 year average, all mass categories

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	1	2	3
2004-2013 average	0.3	1.2	3.3

Table 9: Business aviation fixed wing aeroplane fatalities, serious injuries and minor injuries last year compared to the 10 year average, all mass categories

	Fatalities	Serious Injuries	Minor Injuries
2014	4	0	2
2004-2013 average	0.4	0.4	0.5

Table 8 provides a breakdown of the number of accidents, fatal accidents and serious incidents in Business Aviation during 2014 compared to the previous 10 years. There was a single fatal accident in 2014. Given that there have only been 3 fatal accidents in business aviation in the past 10 years it can be said that the level of safety is already high, making it difficult to make meaningful comparisons with previous years. There was an increase in accidents in 2014 compared to the 10 year average and there was a slight reduction in the number of serious incidents. Table 9 covers the numbers of fatalities and injuries, with the same comparison with the past 10 years. The fatal accident in 2014 led to 4 fatalities and there was also an increase in the number of serious and minor injuries. However, given the size of the business aviation sector and low number of occurrences and therefore low amounts of available occurrence data, one accident has the ability to significantly influence the analyses. It is therefore difficult to draw any specific conclusions from the data due to the low numbers involved, but the increases in accidents, fatalities and injuries compared to the 10 year average shows that there is never room for complacency.

Phase of Flight

Figure 15: Business aviation fixed wing aeroplane accidents and serious injuries by phase of flight 2005-2014, all mass categories

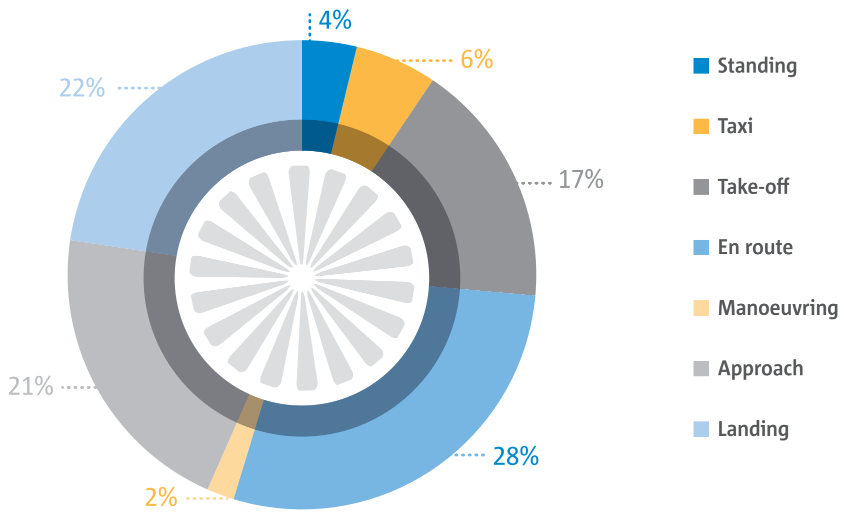


Figure 15 provides information on the phase of flight during which the accidents and serious incidents in business aviation occurred. The largest group (28%) concerns en route phase occurrences, with landing, approach and take-off phase occurrences being 22, 21 and 17 percent respectively. These four main flight phases account for 88% of the data.

Propulsion Type

Figure 16: Business aviation fixed wing aeroplane accidents and serious injuries by propulsion type 2004-2014, all mass categories

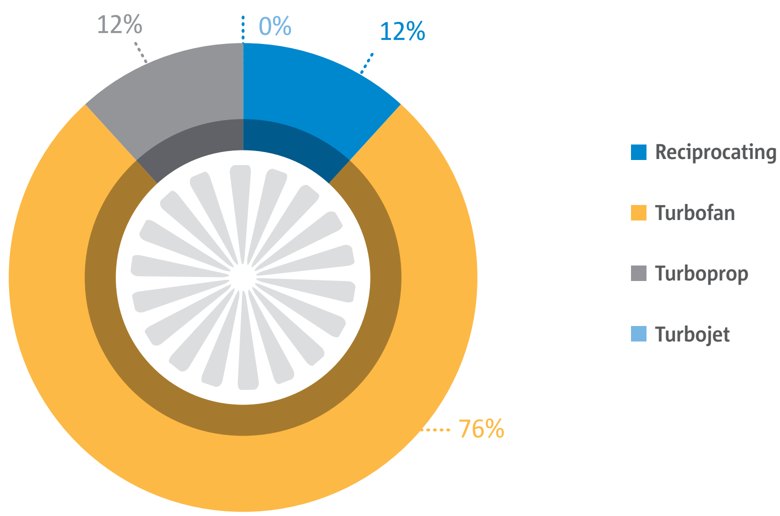


Figure 16 provides details of the types of engine powering aircraft that were involved in accidents over the last 10 years. The vast majority involved Turbofan powered aircraft, which matches the relative size of this type of aircraft in the European business aviation fleet.

Occurrence Categories

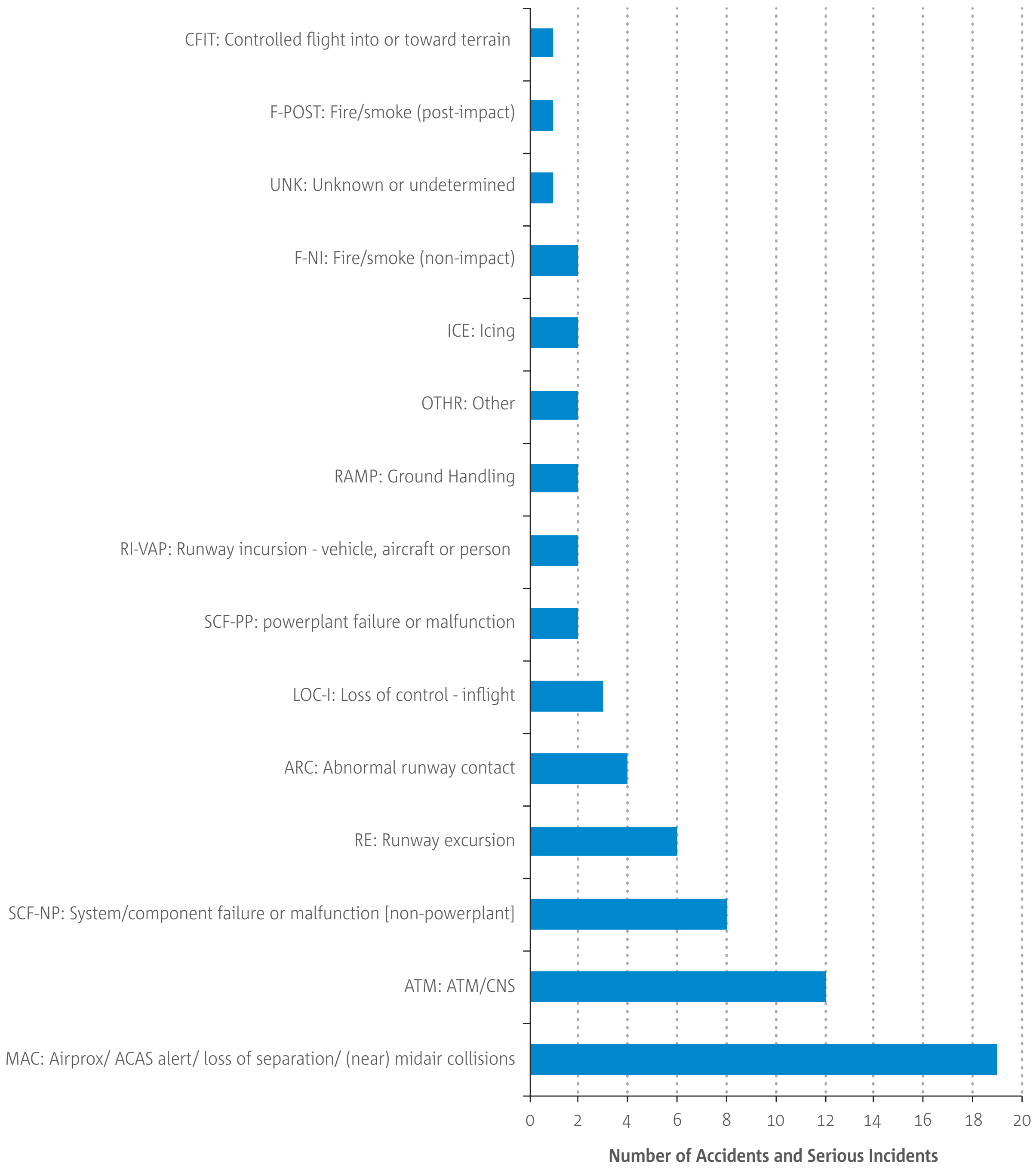
In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to business aviation accidents involving EASA MS operators. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

Table 10 shows the number of accidents and serious incidents per Occurrence Category. Where no occurrences were recorded against a particular occurrence category that category was excluded from the list. The main occurrence category for business aviation is MAC/Airprox (MAC), which includes loss of separation and near mid-air collisions. Closely linked to this is the high prevalence of ATM occurrences. System component failure non-powerplant (SCF-NP) was the 3rd most common occurrence category, whilst abnormal runway contact (ARC) and loss of control in-flight (LOC-I) also featured in the analysis.

Table 10: Business aviation – number of accidents and serious incidents 2005-2014 per occurrence category

Occurrence Category	Number of Accidents and Serious Incidents 2005-2014 per Occurrence Category
MAC: airprox./ACAS alert/loss of separation/(near) mid-air collisions	19
ATM: ATM/CNS	12
SCF-NP: system/component failure or malfunction [non-power plant]	8
RE: runway excursion	6
ARC: abnormal runway contact	4
LOC-I: loss of control - inflight	3
SCF-PP: power plant failure or malfunction	2
RI-VAP: runway incursion - vehicle, aircraft or person	2
RAMP: ground handling	2
OTHR: other	2
ICE: icing	2
F-NI: fire/smoke (non-impact)	2
UNK: unknown or undetermined	1
F-POST: fire/smoke (post-impact)	1
CFIT: controlled flight into or toward terrain	1

Figure 17: Business aviation number of accidents and serious incidents 2005–2014 per occurrence category



Key Safety Risk Areas for Business Aviation

One of the main messages from the analysis of business aviation is that the high level of safety in this sector has continued to be maintained in 2014. From the analysis, there are a number of key safety risk areas for business aviation that will form the main areas of the safety improvement strategy for this sector in the EASp. In the coming months a full safety risk portfolio for business aviation will be developed with the involvement of industry stakeholders. The major safety risk areas are:

- **MAC/Airprox - ATM:** the business aviation sector routinely carries out significant amounts of flying in uncontrolled airspace and such aircraft regularly use smaller airports. This exposes business aviation operators to a potentially greater risk of airborne collision compared to airline operations. Work on MAC/Airprox will be taken forward within the EASp through further risk assessment involving a wide range of industry Stakeholders.

- **SCF-NP:** from a technical point of view, non-powerplant component failures continue to feature in accidents and this remains an area of focus for future safety activities.

- **Runway Excursion:** a significant number of business aviation occurrences take place in the landing phase and runway excursions continue to feature as a safety risk. At a worldwide level, around a third of accidents involve runway excursions, making the situation in Europe significantly better than that at the global level.

- **Abnormal Runway Contact:** the occurrence category of abnormal runway contact includes a number of different types of events including hard landings, tail strikes and long landings. Often these are pre-cursors to runway excursions and in many cases are influenced by poor weather and other environmental factors.

- **Loss of Control - In-Flight:** while loss of control accidents rarely occur, the accident often result in fatalities. Therefore, understanding and controlling the risks leading to a loss of control will be an area of specific focus within the business aviation sector.

These key issues match closely the safety priorities developed by various representatives bodies and trade groups from the business aviation sector at both the global and European levels.

Helicopters

Helicopters

Scope

Commercial Air Transport Helicopter operations comprise the carriage of passengers or cargo for remuneration. This chapter involves EASA MS registered helicopters in Commercial Air Transport operations.

Key Statistics Helicopters

Compared to the 10-year average, 2014 was a good year and the related data may be found in Table 11 and Table 12.. Only one fatal accident occurred that resulted in two fatalities. These numbers are well below the average for the preceding decade of 2.6 and 11.6 respectively. The numbers of non-fatal accidents and serious incidents were also below the decade average in 2014.

Table 11: EASA MS operators (helicopters) total number of fatal accidents, non-fatal accidents, and serious incidents.

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	1	5	1
2004-2013 average	2.6	7.6	3.4

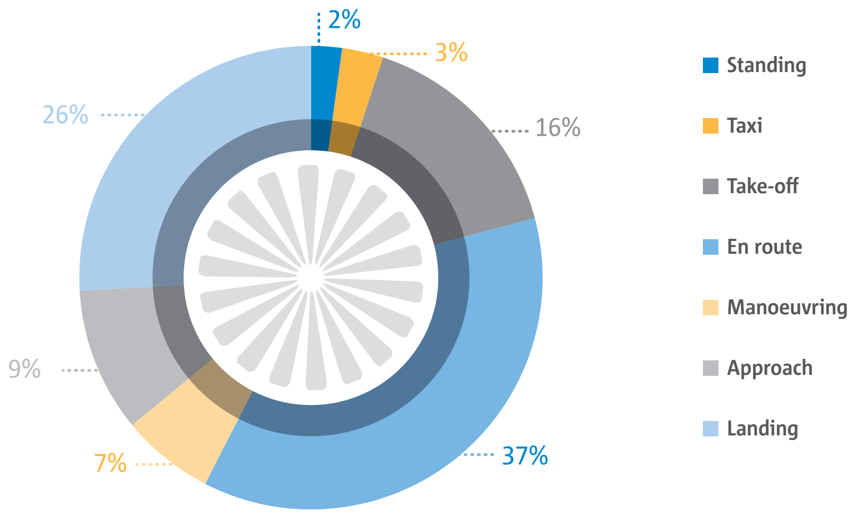
Table 12: EASA MS operators (helicopters) total numbers of fatalities, serious injuries and minor injuries.

	Fatalities	Serious Injuries	Minor Injuries
2014	2	3	3
2004-2013 average	11.6	5.4	8.2

Phase of Flight

Figure 18 shows the distribution of accidents and serious incidents by phase of flight. Most CAT Helicopter accidents and serious incidents occur in the en route phase (37%), followed by the landing and take-off phases at 26% and 16% respectively. Only 7% of the accidents and serious incidents take place in the manoeuvring phase, which is chiefly because CAT Helicopter operations are generally characterised as flying from point A to point B. In addition, manoeuvring is generally a short phase of flight, hence it not surprising that this features in only 7% of occurrences.

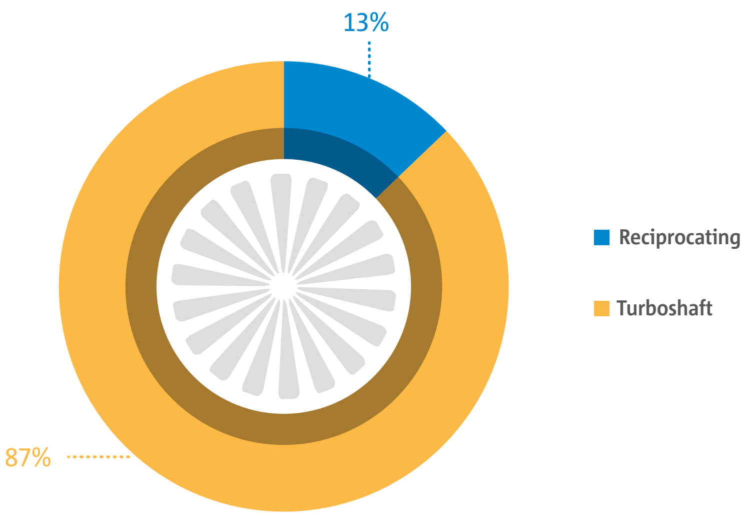
Figure 18: CAT helicopter number of accidents and serious incidents 2005-2014 per phase of flight



Propulsion Type

Figure 19 shows the distribution of accidents per propulsion type. The vast majority of accidents (87%) involved helicopters that were powered by turboshaft engines. The majority of helicopters performing CAT operations are powered by this type of powerplant.

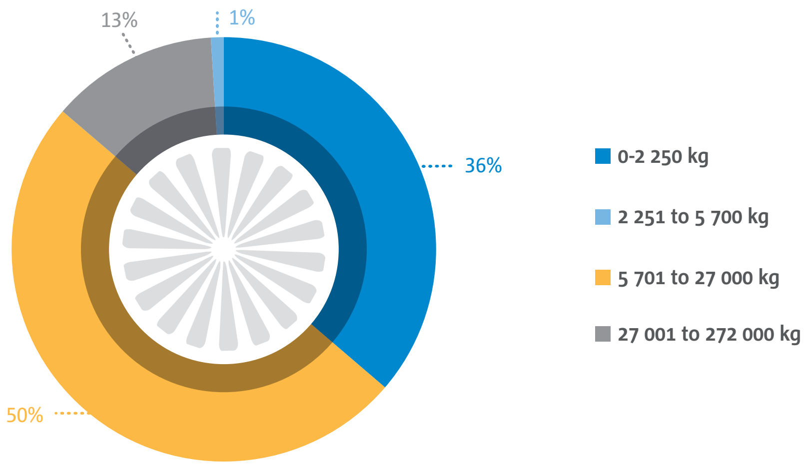
Figure 19: CAT helicopter number of accidents 2005–2014 per propulsion type



Mass Group

Figure 20 shows the distribution of accidents per mass group. Half of all accidents (50%) involved helicopters within the 2251-5700 kg mass group. This is to be expected as most CAT helicopter operations are performed by helicopters within this mass group.

Figure 20: CAT helicopter number of accidents 2005-2014 per mass group



Occurrence Categories

In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to helicopter accidents involving EASA MS operators. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

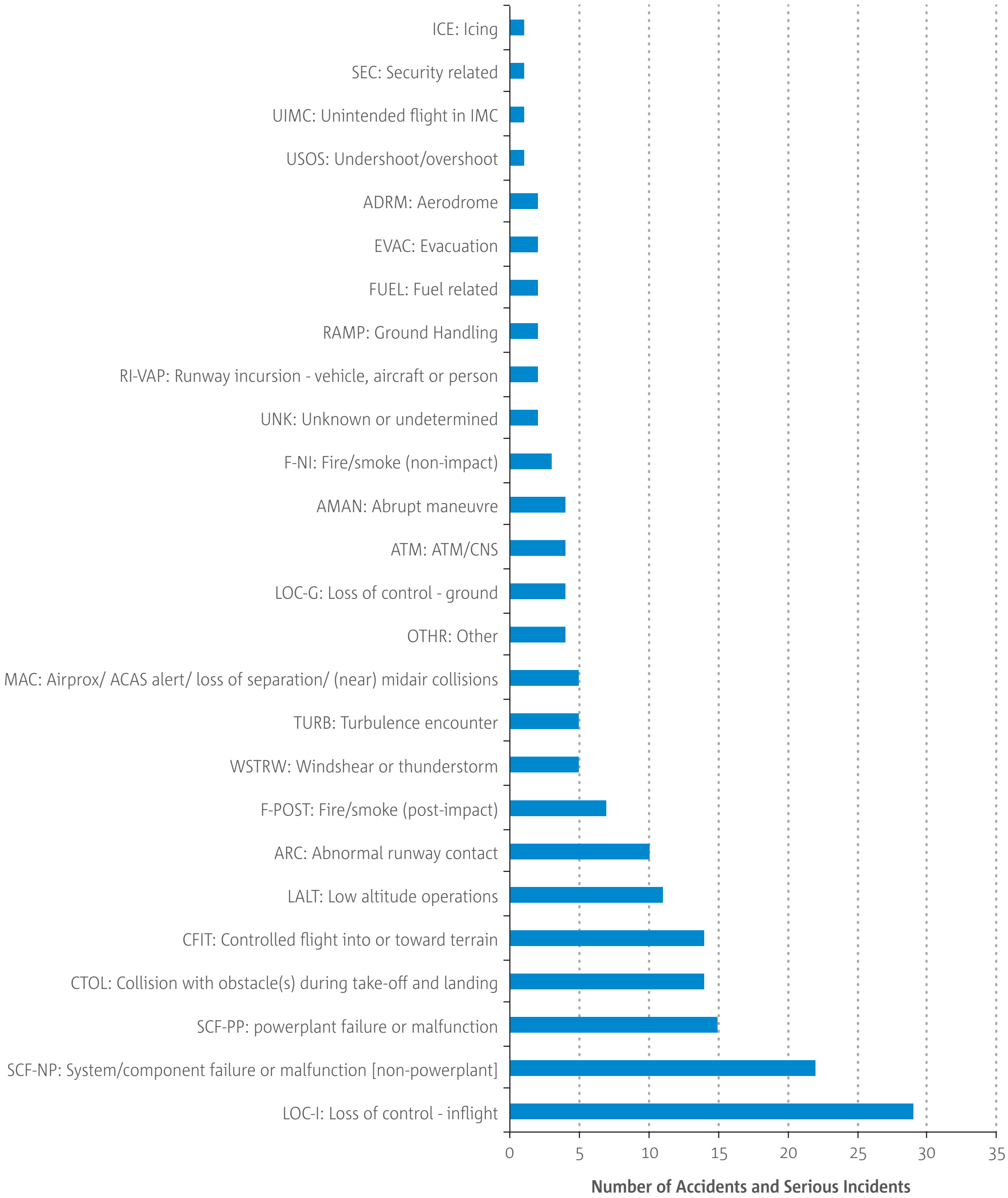
Table 13 shows the number of accidents and serious incidents per occurrence category. The 2014 numbers have been compared to the yearly average of the preceding decade. In 2014, there were no LOC-I occurrences. In addition, when compared to the average of the preceding decade only abnormal runway contacts (ARC) had a significantly higher number in 2014.

➨ Table 13: CAT helicopter occurrence categories – Accidents and serious incidents

Occurrence Category	Accidents and SIs	
	2004-2013 average	2014
LOC-I: Loss of control - inflight	2.9	0
SCF-NP: System/component failure or malfunction [non-powerplant]	2.2	1
SCF-PP: powerplant failure or malfunction	1.5	1
CTOL: Collision with obstacle(s) during take-off and landing	1.4	1
CFIT: Controlled flight into or toward terrain	1.4	0
LALT: Low altitude operations	1.1	1
ARC: Abnormal runway contact	1	3
F-POST: Fire/smoke (post-impact)	0.7	0
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	0.5	0
TURB: Turbulence encounter	0.5	0
WSTRW: Windshear or thunderstorm.	0.5	0
LOC-G: Loss of control - ground	0.4	1
AMAN: Abrupt maneuvre	0.4	0
ATM: ATM/CNS	0.4	0
OTHR: Other	0.4	0
F-NI: Fire/smoke (non-impact)	0.3	1
ADRM: Aerodrome	0.2	0
EVAC: Evacuation	0.2	0
FUEL: Fuel related	0.2	0
RAMP: Ground Handling	0.2	0
RI-VAP: Runway incursion - vehicle, aircraft or person	0.2	0
UNK: Unknown or undetermined	0.2	0
ICE: Icing	0.1	0
SEC: Security related	0.1	0
UIMC: Unintended flight in IMC	0.1	0
USOS: Undershoot/overshoot	0.1	0

Figure 21 shows the number of accidents and serious incidents per Occurrence Category in a graphical format. The most common risk areas for accidents and serious incidents were Loss of Control In-flight (LOC-I), followed by System/Component Failure – Non-Powerplant (SCF-NP) and System/Component Failure – Powerplant (SCF-PP).

Figure 21: CAT helicopter number of accidents and serious incidents 2005-2014 per occurrence category



Key Safety Risk Areas for Commercial Air Transport Helicopters

The key risk areas for CAT Helicopters have also been cross-referenced from the top Occurrence Categories as provided in Table 13 of this analysis and have also been used below in the Offshore Helicopter Safety Risk Portfolio. The key risk areas are based on their ranking in overall terms through aggregating the number of accidents and serious incidents[6]:

- **Loss of control – In flight (LOC-I).**
- **System Component Failure (SCF).**
- **Controlled flight into or toward terrain (CFIT)/Collisions during take-off and landing (CTOL).**

In some types of helicopter operations, these risk areas are closely related, therefore for the purpose of considering safety issues they have been combined.

- **Runway excursion/Abnormal Runway Contact (RE/ARC):** Abnormal Runway (Landing Area) Contact (ARC)/Excursions from helicopter landing areas
- **MAC/Airprox (MAC).**
- **Fire/Smoke Non-Impact (FIRE).**

6 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Safety Risk Portfolio – Offshore Helicopters

Safety Risk Portfolios will be carried out to cover the different sectors of CAT Helicopter operations. The first Safety Risk Portfolio to be developed covers the sector of Offshore Helicopter Operations. This portfolio results from the work performed by the Helicopter Accident Data Collaboration and Analysis Group (HADCAG).

The Safety Risk Portfolio for Offshore Helicopter Operations is displayed in Table 14. Within the table, the safety issues listed were identified following the detailed analysis of 14 Offshore Helicopter Accidents performed by the Offshore HADCAG as a response to a recommendation[7] from the UK CAA in their CAP 1145 report on Offshore Helicopter Safety. The Safety Risk Portfolio for Offshore Helicopter Operations is displayed in Table 14.

7 Reference to CAP1145 and Recommendation R1

➨ **Table 14:** Initial safety risk portfolio, CAT off-shore helicopter

	Offshore Helicopters		Risk Areas					
	Safety Issue	SYS	LOC-I	SCF	CFIT/ CTOL	RE/ ARC	MAC	FIRE
Operational	Ditching, water impact, survivability and evacuation (Including failure of Emergency Locator Transmitter (ELT) beacon)	■						
	Inadequate recognition and recovery following operation of aircraft warning system		■		■	■	■	
	Inadequate management of the automatic flight control system or automated flight path		■		■	■	■	
	Incorrect control of the aircraft flight path		■		■	■	■	
	Management of moving deck, vessel,platform, (P,R,Y) and dimensions		■		■	■		
	Inadequate clearance between helicopter and obstacles		■		■	■		
	Management of adverse weather conditions (loss of visual references)		■		■	■	■	
	Management of flight situations (Gas Exhaust, Hot Gas Turbulences, Main Structures Effects)		■		■	■		
	Incorrect illumination of helideck, vessel,platform,		■		■	■		
	Improper fuel management		■		■	■		
	Inadequate flight planning and preparation				■		■	
	Incorrect maintenance		■	■	■	■	■	■
Technical	Automatic flight control system failures		■	■	■	■		
	Gearboxes and transmission system failures		■	■	■	■		■
Human	Incorrect perception of situations by flight crew (e.g. Disorientation, visual illusions by day and night)		■		■	■	■	
	Incorrect or inadequate flight crew actions		■		■	■	■	
	Inadequate CRM, communication and decision-making		■		■	■	■	
	Inadequate monitoring of flight parameters/automation modes		■		■	■		
	Inadequate knowledge of aircraft systems and associated procedures		■	■	■	■		
	Incorrect application of rules and procedures		■	■	■	■	■	■
Organisational	Inadequate Operational Procedures, Current Practices and Oversight	■						
	Inadequate Operational Leadership and Supervision	■						

Chapter 6

Aerial Work Fixed Wing Aeroplane

Aerial Work – Fixed Wing Aeroplane

Scope

This chapter covers flights operated under Aerial Work or Special Operations (Part-SPO) regulations. When compared to the preceding decade, 2014 showed little change from previous years.

Key Statistics Aerial Work Fixed Wing Aeroplane

The number of fatal accidents was slightly above the average for the preceding ten years, whilst the number of non-fatal accidents and serious incidents was slightly below the average. The number of fatalities in Aerial Work operations was significantly higher in 2014 when compared to the preceding decade. The difference was largely due to a single parachuting accident resulting in eight fatalities.

Table 15: Aerial work aeroplane number of accidents and serious incidents

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	5	19	4
2004-2013 average	4.4	20.1	3

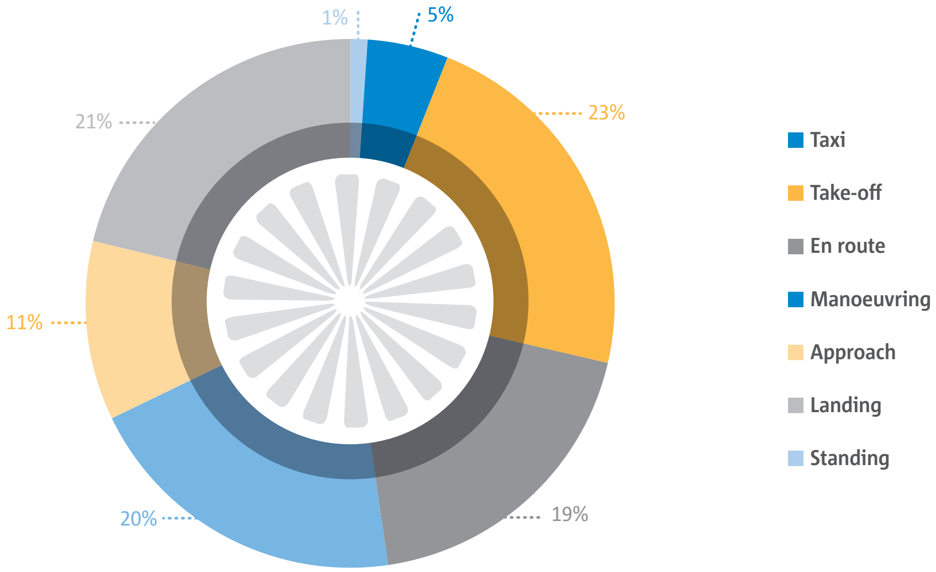
Table 16: Aerial work aeroplane number of fatalities and injuries

	Fatalities	Serious Injuries	Minor Injuries
2014	15	5	4
2004-2013 average	7.9	4.1	4

Phase of flight

Figure 22 depicts the distribution of accidents and serious incidents in Fixed Wing Aerial Work operations by phase of flight. There is quite an even split across the four main flight phases. Most Aerial Work occurrences took place during take-off phase, closely followed by the landing, manoeuvring and en route phases. Of particular note in the Aerial Work sector is the increasing proportion of occurrences in the manoeuvring phase when compared to the other types of operation. A commonality across the many different types of aerial work is that critical activities often take place in this flight phase. Due to the large variety of operations within aerial work, Safety Risk Portfolios will be developed for each of the Aerial Work sectors to enable the specific safety issues to be identified.

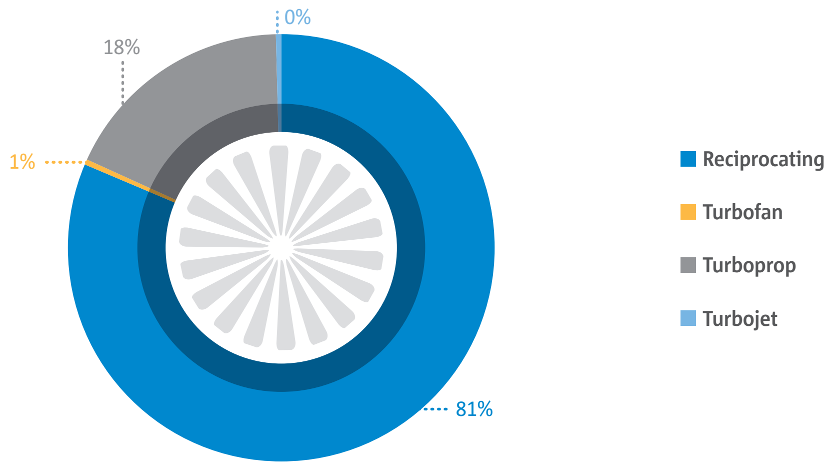
Figure 22: Aerial work fixed wing percentage of accidents and serious incidents 2005-2014 per phase of flight



Propulsion Type

Figure 23 shows the distribution of accidents per propulsion type. More than 80% of the reported accidents involved aircraft powered by reciprocating engines, which is in line with the aircraft used in aerial work operations.

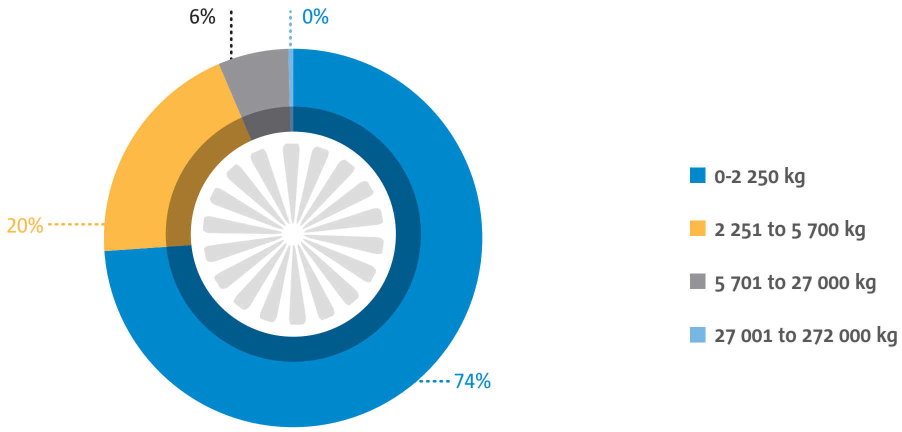
Figure 23: Aerial work fixed wing – percentage of accidents and serious incidents 2005-2014 by propulsion type



Mass Group

Figure 24 shows the number of accidents per mass group. As most Aerial Work operations are performed by small aircraft, it is not surprising that almost 75% of the accidents that occur involve aircraft in the 0-2250 kg mass group.

Figure 24: Aerial work fixed wing – percentage of accidents and serious incidents 2005-2014 by mass group



Occurrence Categories

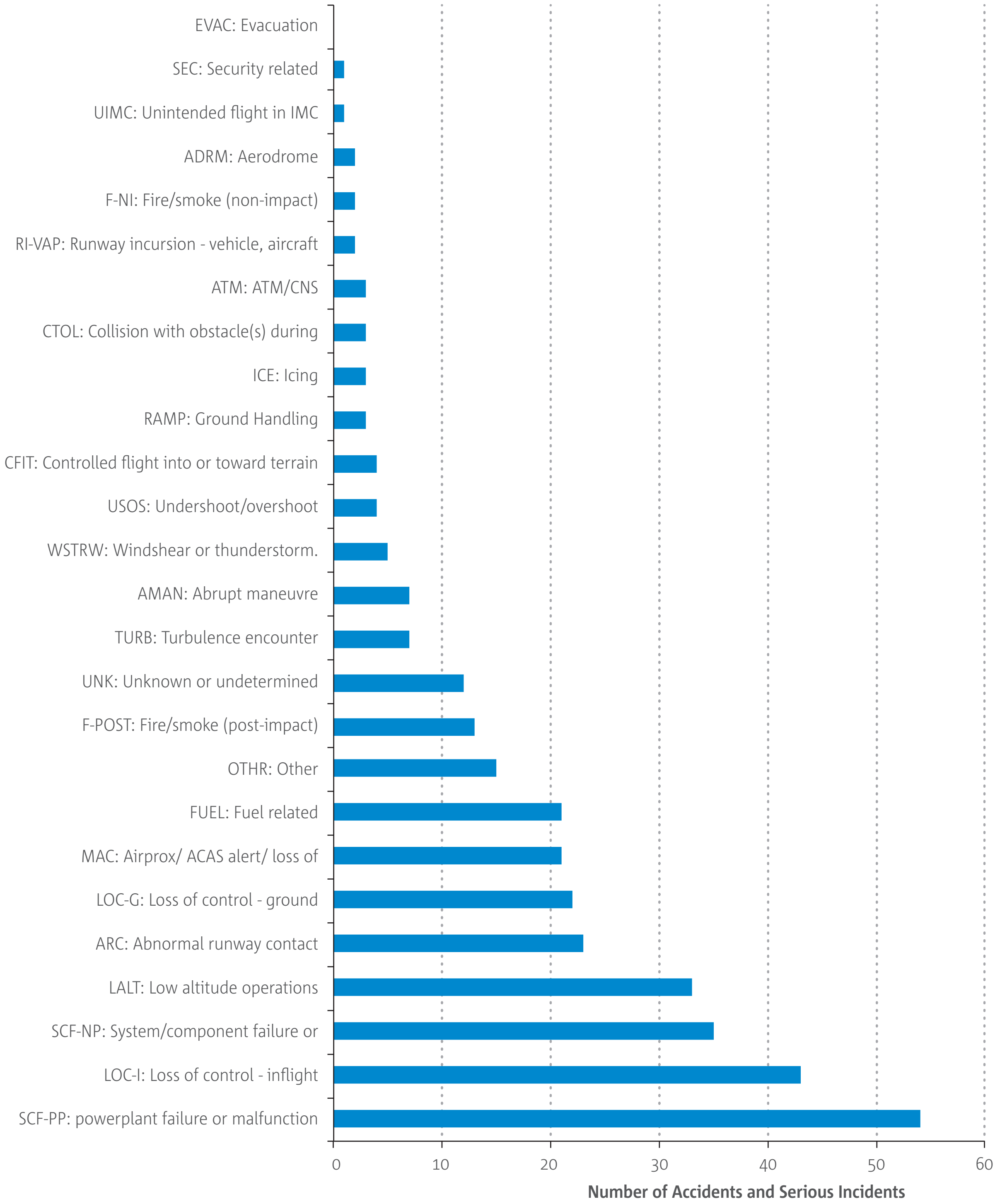
In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to Aerial Work Aeroplane accidents involving EASA MS operators. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

Table 17 shows the accidents and serious incidents per occurrence category. In 2014, there was an unusually high number of Post Impact Fires (F-POST) and Collisions during Take-Off or Landing (CTOL) when compared to the preceding decade. In addition, Low Altitude operations features as a risk area within Aerial Work Fixed Wing Aeroplane, again due to the unusual nature of some of the activities in the different sectors. Analysis of the occurrence categories provides a basic overview of the risk areas for Aerial Work in general but a more detailed analysis will be carried out for each of the different sectors to enable the development of specific Safety Risk Portfolios.

Table 17: Aerial work fixed wing accidents and serious incidents per occurrence category

Occurrence Category	Accidents and SIs	
	2004-2013 average	2014
SCF-PP: Powerplant failure or malfunction	5.4	6
LOC-I: Loss of control - inflight	4.3	5
SCF-NP: System/Component Failure or malfunction [non-Powerplant]	3.5	3
LALT: Low Altitude operations	3.3	1
ARC: Abnormal Runway Contact	2.3	4
LOC-G: Loss of Control - Ground	2.2	1
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	2.1	2
FUEL: Fuel related	2.1	0
OTHR: Other	1.5	1
F-POST: Fire/smoke (Post-Impact)	1.3	6
UNK: Unknown or undetermined	1.2	1
TURB: Turbulence encounter	0.7	1
AMAN: Abrupt Manoeuvre	0.7	0
WSTRW: Wind shear or Thunderstorm.	0.5	0
CFIT: Controlled Flight into or Toward terrain	0.4	0
USOS: Undershoot/Overshoot	0.4	0
CTOL: Collision with obstacle(s) during Take-Off and Landing	0.3	3
ATM: ATM/CNS	0.3	0
ICE: Icing	0.3	0
RAMP: Ground Handling	0.3	0
ADRM: Aerodrome	0.2	0
F-NI: Fire/smoke (Non-Impact)	0.2	0
RI-VAP: Runway Incursion - vehicle, aircraft or person	0.2	0
SEC: Security related	0.1	0
UIMC: Unintended flight in Instrument Meteorological Conditions	0.1	0

Figure 25: Number of Accidents and Serious Incidents 2005-2014 by occurrence category



Key Safety Risk Areas for Aerial Work Fixed Wing

The key risk areas for Aerial Work Fixed Wing have been taken from the top Occurrence Categories as provided in Figure 25. The key risk areas are based on the overall ranking of aggregated accidents and serious incidents[8]:

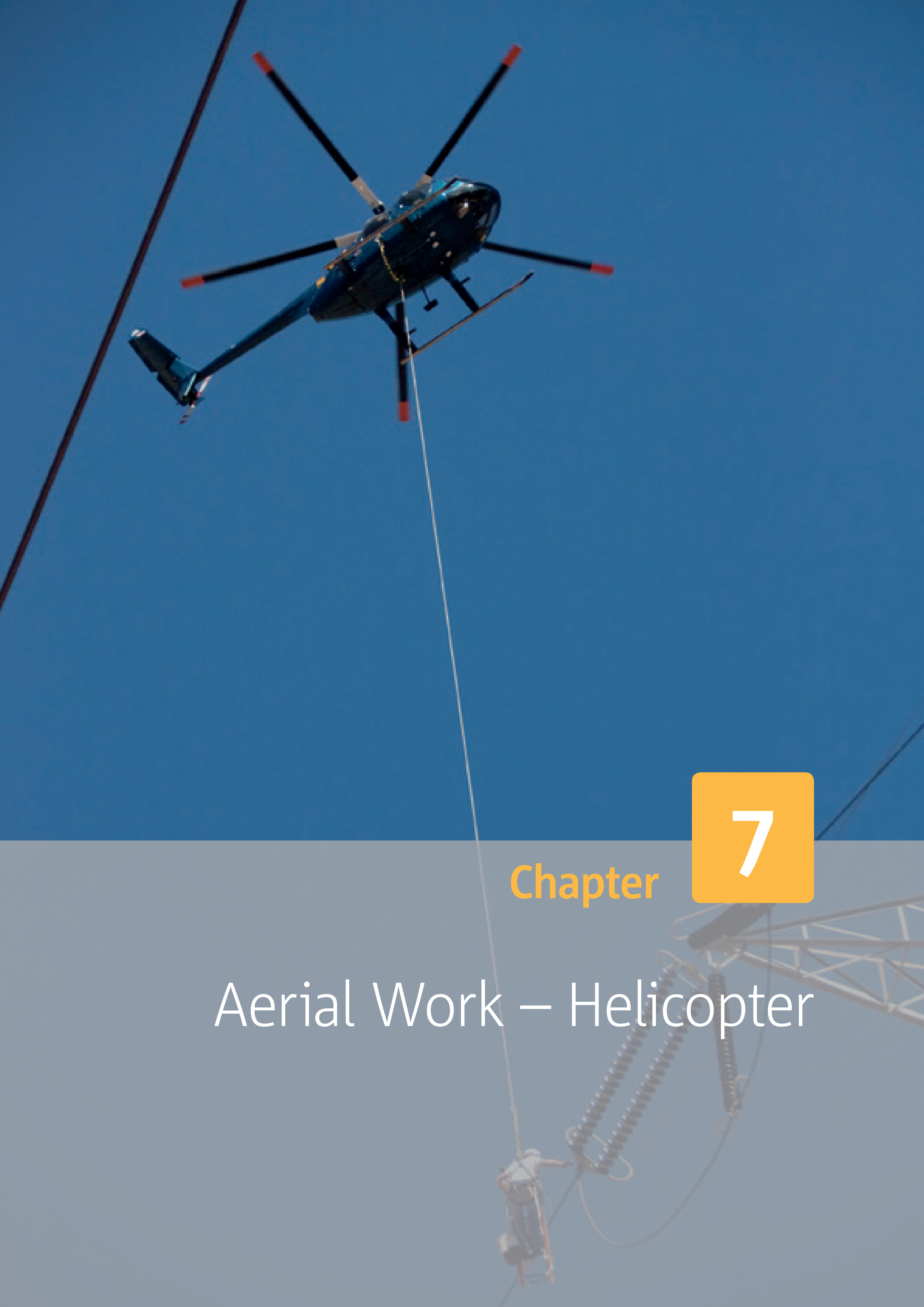
- **System Component Failure (SCF)**
- **Loss of Control – In flight (LOC-I)**
- **Low Altitude Operations (LALT)**
- **Abnormal Runway Contact/Runway Excursion/Loss of Control-ground (ARC/LOC-G):** ARC is often a pre-cursor to LOC-G occurrences, therefore for the purpose of considering safety issues they have been combined.
- **MAC/Airprox (MAC)**
- **Fuel Related Occurrences (FUEL)**

8 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Aerial Work – Fixed Wing Operational Sectors

The future development of Safety Risk Portfolios for Aerial Work operations will be carried out on a sector basis. From the data, the top five Aerial Work sectors involving the highest number of accidents are:

	Aerial Work – Towing Glider Launch		Aerial Work – Parachute Drop
	Aerial Work – Agriculture		Aerial Work – Firefighting
	Aerial Work – Advertising		



Chapter 7

Aerial Work – Helicopter

Aerial Work – Helicopter

Scope

This chapter covers rotorcraft flights operated under Aerial Work or Special Operations (Part-SPO) regulations. In terms of safety, 2014 was a good year for the Helicopter Aerial Work domain.

Key Statistics Aerial Work Helicopter

The number of accidents, both fatal and non-fatal, as well as the number of fatalities and injuries, were well below the average of the preceding decade. There was, however, a higher number of serious incidents when compared to the average over the same period.

Table 18: Aerial work Number of accidents and serious per occurrence class

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	2	9	4
2004-2013 average	5.5	21	2

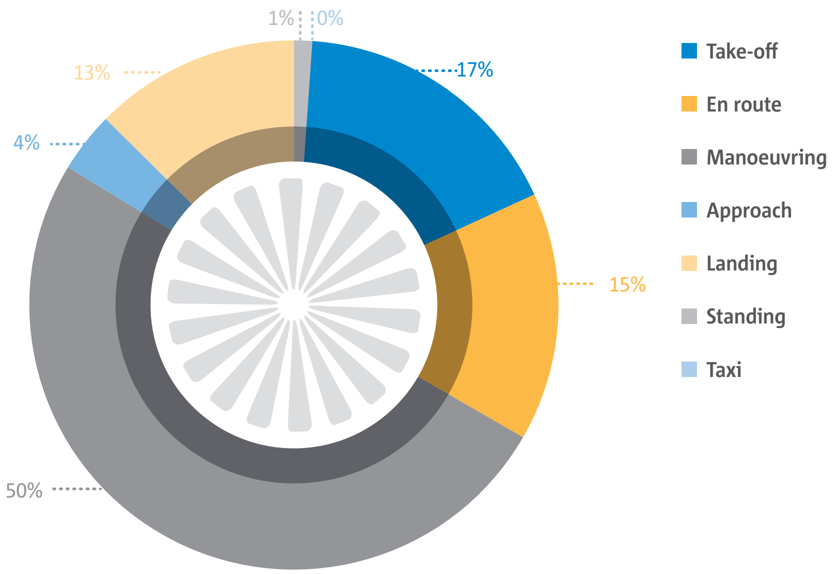
Table 19: Aerial work number of injuries

	Fatalities	Serious Injuries	Minor Injuries
2014	4	6	2
2005-2014 average	10.9	8.1	9.1

Phase of Flight

Figure 26 shows the distribution of accidents and serious incidents per phase of flight. Most accidents and serious incidents occur in the Manoeuvring phase. This is not surprising due to the manner in which many Aerial Work operations are conducted. Typical examples of these operations are powerline inspections, external load operations and animal herding, all of which are predominantly performed in the Manoeuvring phase and close to the operational limits of the aircraft. It again highlights the importance of developing Safety Risk Portfolios for each sector in order to identify the specific risk areas and safety issues.

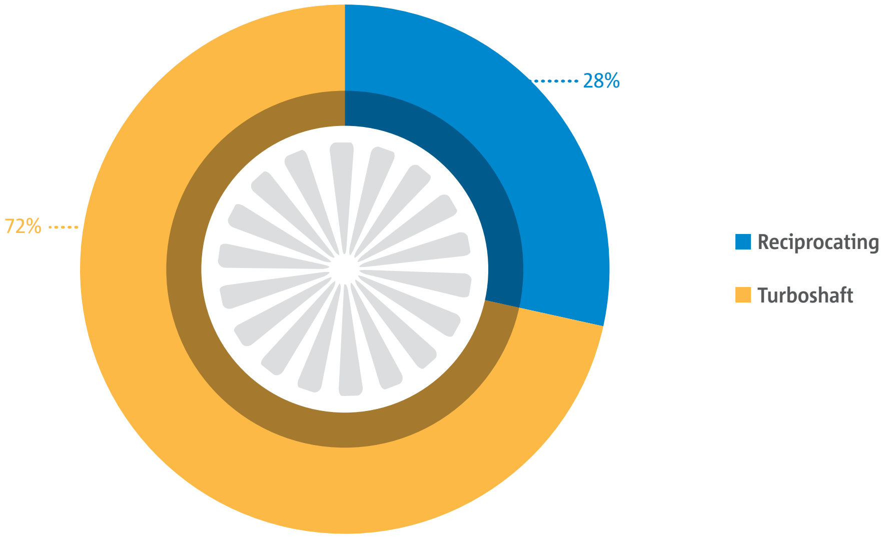
Figure 26: Aerial work helicopter percentage of accidents and serious incidents 2005-2014 per phase of flight



Propulsion Type

Figure 27 shows the number of accidents per propulsion type. The majority (72%) of accidents that occurred involved turboshaft-powered helicopters. This is in line with the types of helicopters used when performing aerial work operations.

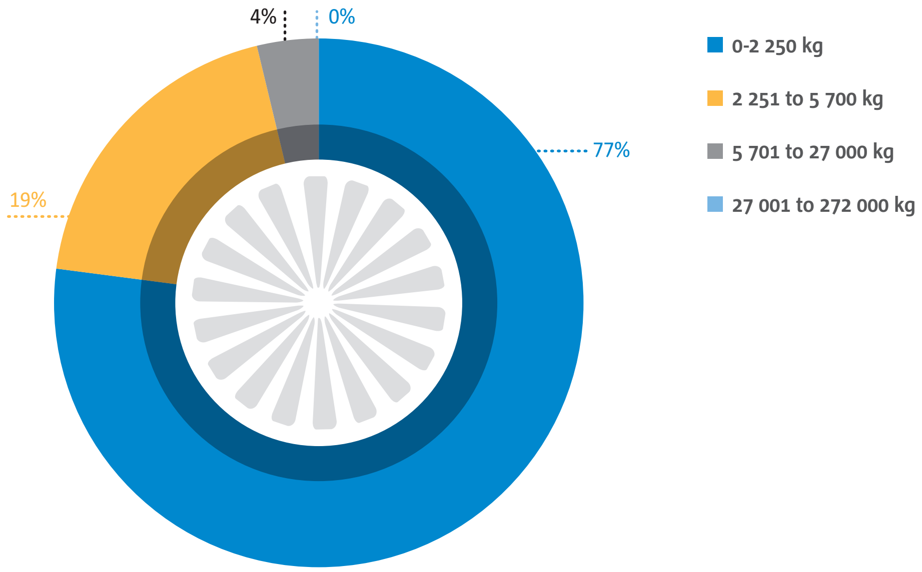
Figure 27: Aerial work helicopter percentage of accidents and serious incidents 2005-2014 per propulsion type



Mass Group

Figure 28 shows the distribution of accidents per mass group. More than 75% of the accidents that occurred involved helicopters from the 0-2250 kg mass group. This is in line with the composition of fleets employed in Aerial Work operations.

Figure 28: Aerial work helicopter percentage of accidents and serious incidents 2005-2014 per mass group



Occurrence Categories

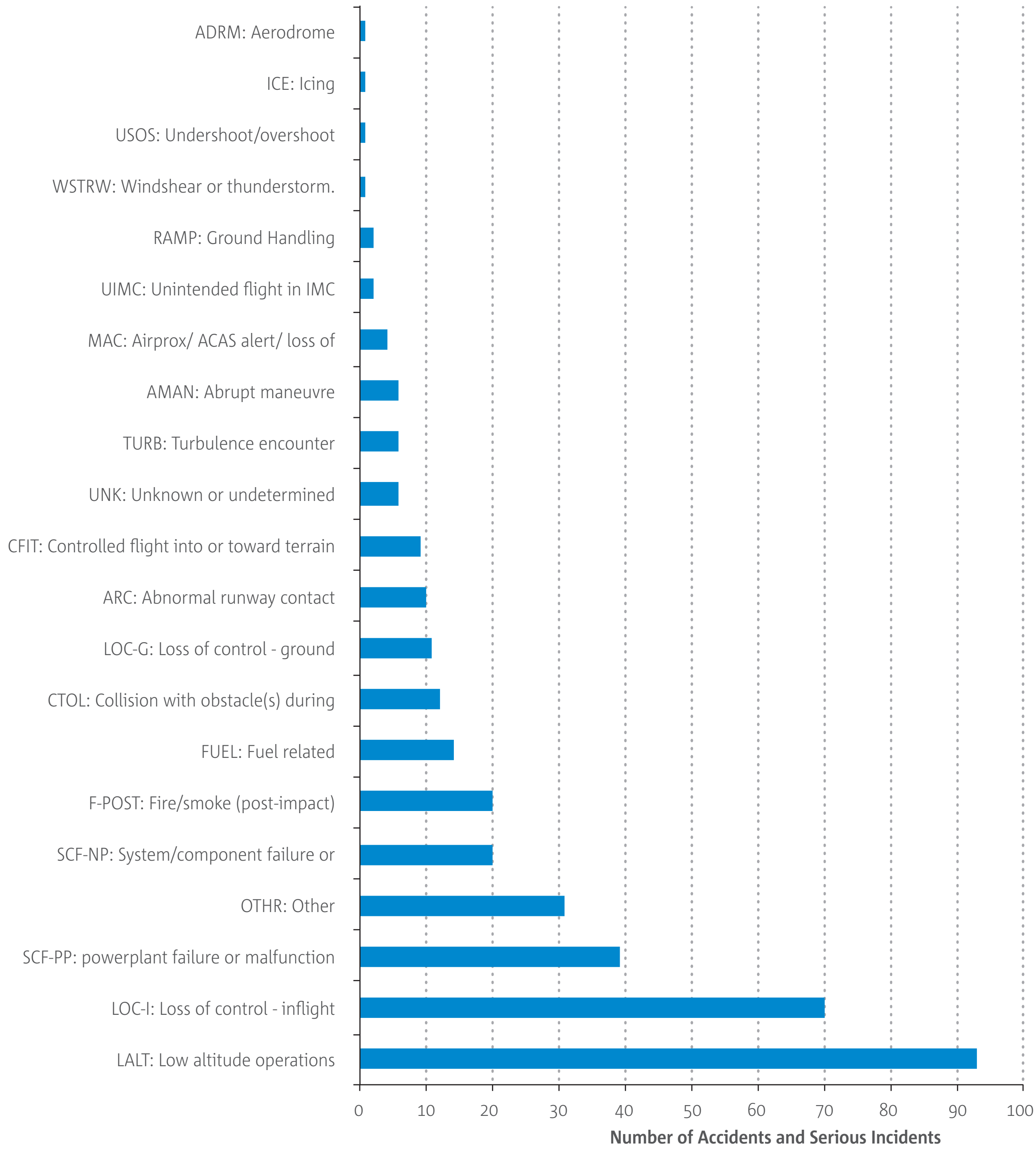
In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to Aerial Work Helicopter accidents involving EASA MS and is shown in Table 20. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

Figure 29 shows the distribution of accidents and serious incidents per occurrence category. In general, the numbers in 2014 were lower than the average of the preceding decade. As with Aerial Work Fixed Wing, low altitude operations (LALT) also features as a risk area within Aerial Work Helicopter, again due to the unusual nature of some of the activities in the different operational sectors. This analysis by occurrence category provides a basic overview of the risk areas attached to Aerial Work Helicopters, however a more detailed analysis of the different sectors will be carried out to enable the development of sector-specific safety risk portfolios.

Table 20: Aerial work occurrences, accidents and serious incidents per occurrence category

Occurrence Category	Accidents and SIs	
	2004-2013 average	2014
LALT: Low altitude operations	9.3	3
LOC-I: Loss of control - inflight	7.0	4
EXTL: External load related occurrences	4.2	2
SCF-PP: Powerplant failure or malfunction	3.9	1
OTHR: Other	3.1	1
SCF-NP: System/component failure or malfunction [non-powerplant]	2.0	1
F-POST: Fire/smoke (post-impact)	2.0	0
FUEL: Fuel related	1.4	0
CTOL: Collision with obstacle(s) during take-off and landing	1.2	1
ARC: Abnormal runway contact	1.0	2
LOC-G: Loss of control - ground	1.1	0
CFIT: Controlled flight into or toward terrain	0.9	0
UNK: Unknown or undetermined	0.6	1
AMAN: Abrupt maneuvre	0.6	0
TURB: Turbulence encounter	0.6	0
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	0.4	0
RAMP: Ground Handling	0.2	1
GCOL: Ground Collision	0.3	0
UIMC: Unintended flight in IMC	0.2	0
WSTRW: Windshear or thunderstorm.	0.1	1
ADRM: Aerodrome	0.1	0
BIRD: Birdstrike	0.1	0
ICE: Icing	0.1	0
USOS: Undershoot/overshoot	0.1	0

Figure 29: Number of accidents and serious incidents 2004-2013 per occurrence category



Key Safety Risk Areas for Aerial Work Helicopter

The key risk areas for Aerial Work Helicopter have been taken from the top occurrence categories as provided in Figure 29. The key risk areas are based on their overall ranking in terms of aggregated accidents and serious incidents[9]:

- **Low Altitude Operations (LALT)**
- **Loss of control – in flight (LOC-I)**
- **System Component Failure (SCF)**
- **Fuel Related Occurrences (FUEL)**
- **Collisions during take-off and landing (CTOL)**
- **Runway excursion/Loss of control - ground (ARC/LOC-G)**: ARC is often a pre-cursor to LOC-G occurrences, therefore for the purpose of considering safety issues they have been combined.
- **Controlled flight into terrain (CFIT)**

9 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Aerial Work Helicopter Operational Sectors

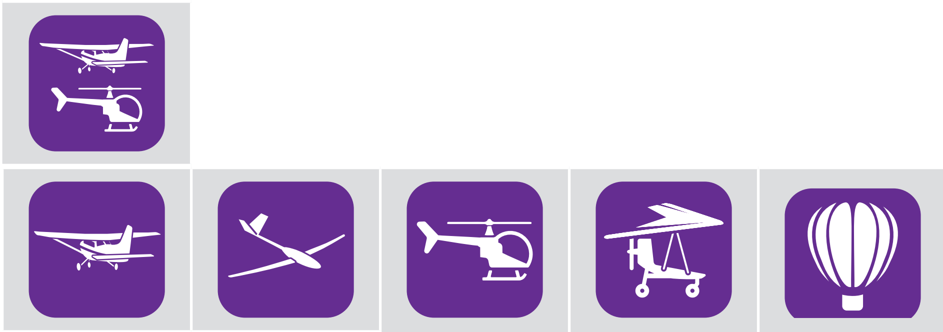
The future development of Safety Risk Portfolios for Aerial Work operations will be carried out on a sector basis. The top five Aerial Work sectors by the number of accidents are:

	Aerial Work - Construction/Sling Load/Logging		Aerial Work - Fire-Fighting
	Aerial Work - Photography		

Chapter 8

General Aviation

General Aviation



Scope

The General Aviation (GA) Sector is extremely broad, covering many different types of air vehicles from traditional aircraft and helicopters to balloons, gliders, and other types of aviation. To aid in the operations of this type of aviation, EASA has initiated the GA Roadmap project with the aim of developing lighter, simpler and better rules. At the centre of the GA Roadmap is a safety analysis and risk management process that will be carried out in partnership with individuals and organisations from the different GA sectors. With respect to the Hot Air Balloon Sector, work identifying the key risk areas and the associated safety issues has already begun. Work of a similar type, but involving the GA Fixed Wing Sector, will soon commence. A key task supporting the GA Roadmap is the collection of flight usage data that will allow for a more accurate calculation of the accident and incident rates. This information is vital to set the safety analysis in the context of any growth or contraction of the different sectors and help achieve the goals of the GA Roadmap to simplify and improve rules for GA. A short questionnaire will be used to collect this data directly from clubs and individuals.

The data in in this chapter is laid out in a similar way to previous reviews by covering the General Aviation as a whole before considering each constituent sector in more detail. For each sub-sector in GA the key risk areas are identified and for Hot Air Ballooning a full Safety Risk Portfolio is provided covering the main safety issues. The safety risk management process will be used to develop similar Safety Risk Portfolios for all the different parts of the GA sector. The Safety Risk Portfolios and the supporting information on safety risks will be publicised as widely as possible across the GA community so keep an eye on the EASA website for more information.

The data used in this Chapter of the review covers accidents involving aircraft not exceeding 2,250 kg MTOM that have been provided to EASA by the EASA MS through the Network of Analysts. For 2014 data was only missing from one EASA MS, Bulgaria. In this case, the data already provided through accident notifications from the Bulgarian AIB have been used as the main source of information. For the year 2014, one State; Liechtenstein reported zero accidents in its territory. Three countries, France, Germany and the UK reported 60% of all the accidents in the EASA MS in 2014.

Key Statistics General Aviation

Table 21 and Table 22 show that the number of fatal accidents and the numbers of fatalities and injuries were lower in 2014 than the five-year average for the period 2009 to 2013. Whilst this reduction is certainly a positive step, the lack of detailed flight usage data for the GA sector makes it difficult to identify whether this is a real improvement in safety or whether it is due to a reduction in the number of flights carried out. This data collection gap can only be filled through the widespread participation of the GA community in the various surveys and other activities that will be used to collect flight and usage data. An increased level of information will support the Agency in making decisions aimed at improving safety and simplifying rules as part of the GA Road Map[10].

➨ **Table 21:** All GA fatal and non-fatal accidents and serious incidents last year compared to 5 year average

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	112	789	41
2009-2013 average	139.4	863.2	27.2

➨ **Table 22:** All GA fatalities and injuries last year compared to 5 year average

	Fatalities	Serious Injuries	Minor Injuries
2014	173	161	159
2009-2013 average	211.4	170.6	186.2

10 http://easa.europa.eu/easa-and-you/aviation-domain/general-aviation/general-aviation-road-map

Key Statistics General Aviation Fixed-wing Aeroplane

There has been a reduction in the number of accidents, fatalities and injuries within the GA fixed wing aeroplane sector, which is shown in Table 23 and Table 24. The reduction in the number of fatalities and injuries is extremely positive but the fact that 88 people were killed in GA fixed wing accidents highlights the importance of the GA Roadmap and the associated efforts to further improve safety.

Table 23: GA fixed-wing aeroplane fatal and non-fatal accidents and serious incidents last year compared to 5 year average

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	53	368	31
2009-2013 average	54.8	387	23.8

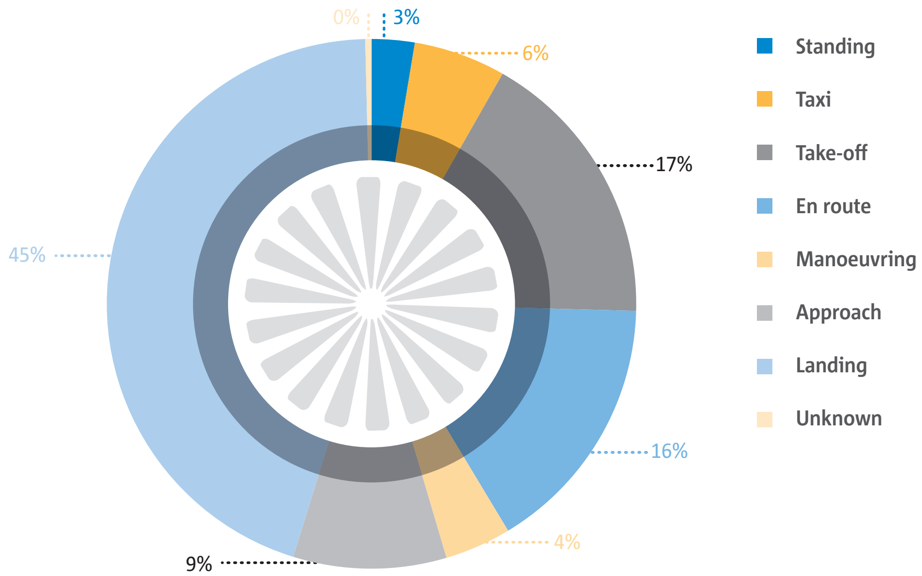
Table 24: GA fixed-wing aeroplane fatalities and injuries last year compared to 5 year average

	Fatalities	Serious Injuries	Minor Injuries
2014	88	52	59
2009-2013 average	100.6	54.2	87.4

Phase of Flight

When considering accidents in GA fixed-wing aeroplane by phase of flight, as shown in Figure 30, it can be seen that the most critical phase was during landing, where 45% of the accidents occurred. Of the other flight phases, 17% of the accidents occurred during the take-off phase and 16% occurred en route.

Figure 30: GA fixed-wing aeroplane accidents and serious incidents per phase of flight



Aeroplane Occurrence Categories

In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to GA fixed-wing accidents involving EASA MS registered aircraft. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

When exploring the occurrence categories in relation to GA fixed-wing aeroplane aviation, Abnormal Runway Contact (ARC) and Runway Excursions (RE) are the main safety risk areas. Both of these risk areas are closely related to each other with ARC often being a pre-cursor of RE accidents. However, it is worth noting that these types of accidents are rarely fatal. In terms of fatal accidents, Loss of Control – In flight (LOC-I) is the most numerous occurrence category.

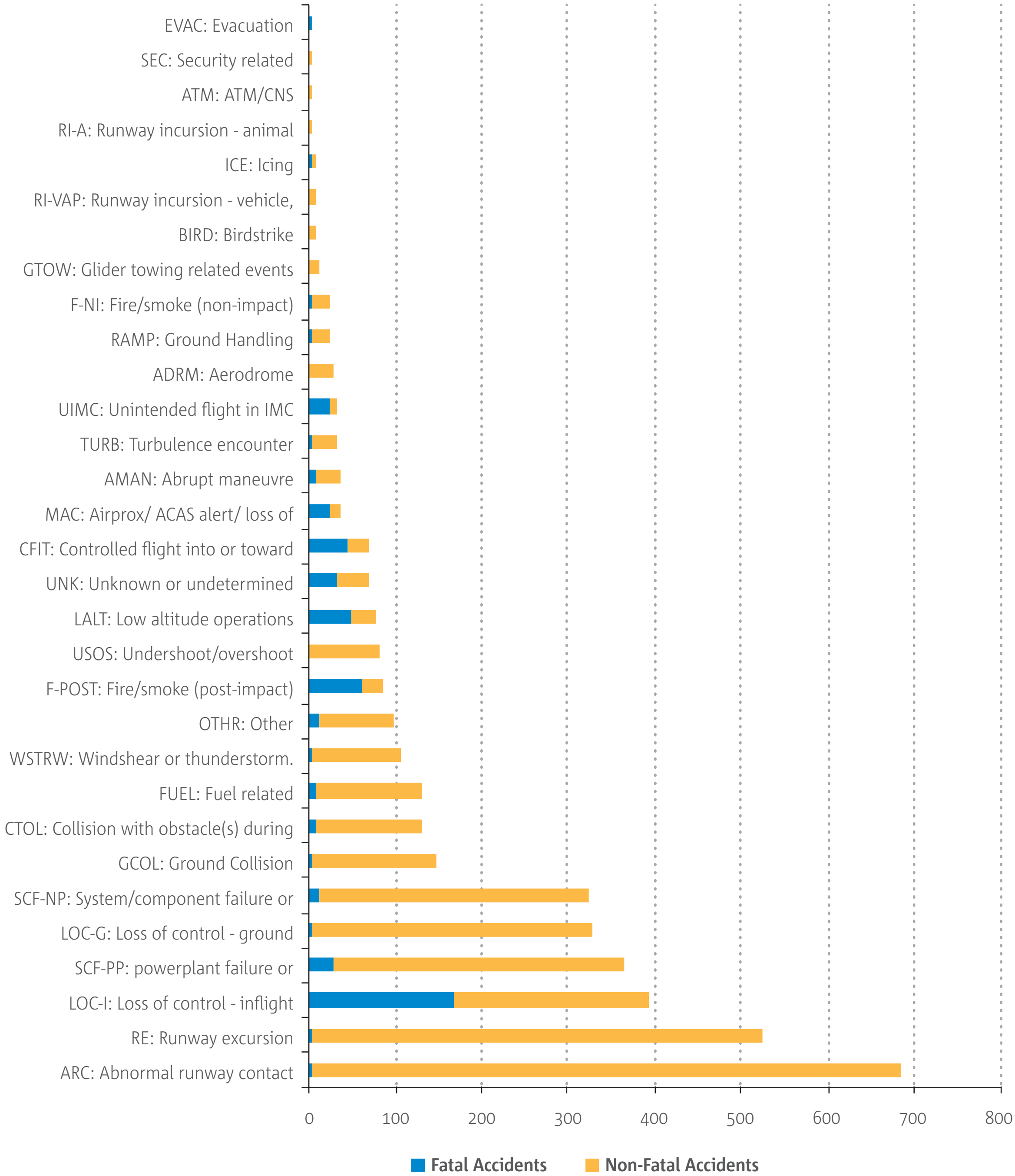
➡ Table 25: Fixed-wing occurrence categories accidents – 5 year average compared to 2014 [11]

Occurrence Category	Non-Fatal Accidents		Fatal Accidents	
	2009-2013 average	2014	2009-2013 average	2014
LOC-I: Loss of control - inflight	39.4	31	28.2	25
F-POST: Fire/smoke (post-impact)	3.8	5	9.4	12
UNK: Unknown or undetermined	4.8	13	4.6	9
SCF-PP: Powerplant failure or malfunction	55.2	59	3.8	8
LALT: Low altitude operations	3.8	8	8.8	5
CFIT: Controlled flight into or toward terrain	4	2	8.4	4
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	2	1	4	4
SCF-NP: System/component failure or malfunction [non-powerplant]	51.4	53	1.6	4
AMAN: Abrupt manoeuvre	4.4	5	0.6	4
UIMC: Unintended flight in IMC	1	2	4.4	2
OTHR: Other	13.6	17	2.6	0
FUEL: Fuel related	22.2	9	1.8	0
CTOL: Collision with obstacle(s) during take-off and landing	20	22	1.4	0
WSTRW: Wind shear or thunderstorm.	20	2	1	0
RE: Runway excursion	86.4	89	0.8	0
F-NI: Fire/smoke (non-impact)	3.2	3	0.6	0
ARC: Abnormal runway contact	117	98	0.4	0
LOC-G: Loss of control - ground	54.2	55	0.4	0
RAMP: Ground Handling	4.4	1	0.4	0
EVAC: Evacuation	0	0	0.2	0
GCOL: Ground Collision	23	32	0.2	0
ICE: Icing	0.8	1	0.2	0
TURB: Turbulence encounter	5.6	3	0.2	0
USOS: Undershoot/overshoot	13.2	14	0	0
ADRM: Aerodrome	4.6	3	0	0
BIRD: Birdstrike	1.2	3	0	0
RI-A: Runway incursion - animal	0.2	3	0	0
GTOW: Glider towing related events	2.4	1	0	0
ATM: ATM/CNS	0.6	0	0	0
RI-VAP: Runway incursion - vehicle, aircraft or person	1.4	0	0	0
SEC: Security related	0.6	0	0	0

11 Occurrence categories missing from the table were deliberately deleted as they showed no data.

As can be seen in Figure 31, Loss of Control In-flight (LOC-I) accounted for 32% of fatal accidents. LOC-I was also the greatest contributor to fatalities in 2014. Of the 397 fatal accidents involving fixed-wing aeroplanes, 135 were attributed to Loss of Control In-flight in the preceding five-year period 2009-2013. F-POST, which commonly accompanies LOC-I was the second most numerous occurrence category related to fatal accidents. This was followed by SCF-PP and LALT. LALT is often attributed as a cause where, for example, a stall has occurred and the low altitude flying restricts the pilot reacting in a timely manner.

Figure 31: Fixed-wing aeroplane fatal and non-fatal accidents per occurrence category 2009-2014



Key Safety Risk Areas for General Aviation Fixed Wing Aeroplane

The key risk areas for GA Fixed-Wing Aeroplane have been taken from the top Occurrence Categories as provided in Figure 31. The key risk areas are based on their overall ranking in terms of the number of accidents[12]:

- **Abnormal runway contact/Loss of control ground/Runway excursion (ARC/LOC-G/RE)**: ARC is often a pre-cursor to LOC-G and RE occurrences in GA fixed-wing aviation, therefore for the purpose of considering safety issues all three safety risk areas have been combined.
- **Loss Of Control – In flight (LOC-I)**
- **System Component Failure (SCF)**
- **Ground Collision (GCOL)**
- **Low Altitude Operations (LALT)**
- **Fuel related occurrences (FUEL)**
- **Controlled Flight Into Terrain (CFIT)**

12 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Key Statistics General Aviation Gliders

Table 26 and Table 27 show that there has been a reduction in the numbers of fatal and non-fatal accidents within the GA Glider sector. When compared with the five year average 2009-2013, the number of glider accidents in 2014 has decreased by 16%, whilst the number of fatal accidents has decreased by 33%.

There has also been a reduction in the numbers of fatalities and serious injuries, whilst the number of minor injuries is comparable with the average over the five-year period 2009-2013.

Table 26: Glider accidents fatal and non-fatal - 5 year average vs 2014

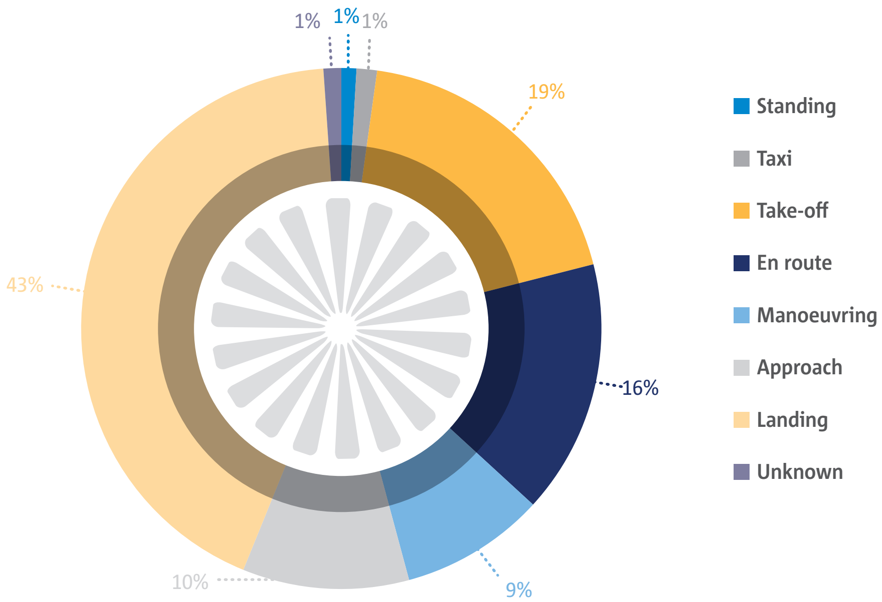
	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	18	177	2
2009-2013 average	28	204.4	2.4

Table 27: Glider fatalities and injuries - 5 year average vs 2014

	Fatalities	Serious Injuries	Minor Injuries
2014	22	29	34
2009-2013 average	32.8	33	34.4

Figure 32 shows that 43% of accidents occur during the Landing phase of the flight, which is similar to the situation in GA fixed-wing aviation. Take-off and en route phases together account for 35% of accidents.

Figure 32: Glider accidents per phase of flight



Occurrence Categories General Aviation Glider

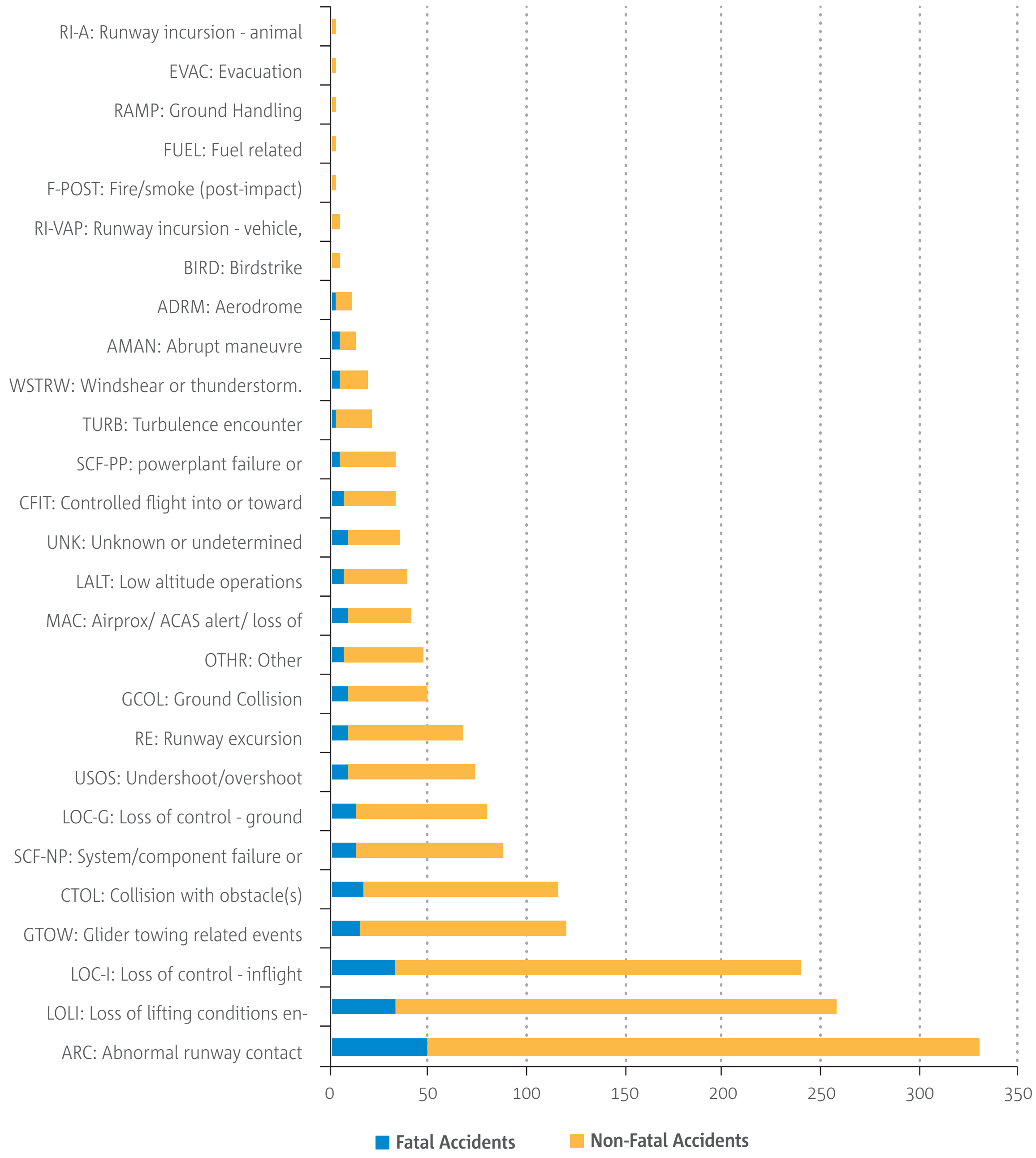
In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to GA Glider accidents involving EASA MS registered aircraft and this information is shown in Table 28. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

Table 28: Glider accidents per occurrence category - 5 year average vs 2014[13]

Occurrence Category	Non-Fatal Accidents		Fatal Accidents	
	2009-2013 average	2014	2009-2013 average	2014
LOC-I: Loss of control - inflight	24.2	22	17	11
GTOW: Glider towing related events	19	12	2	3
SCF-NP: System/component failure or malfunction [non-powerplant]	13.6	9	1.6	3
AMAN: Abrupt maneuvre	1.4	3	0.2	1
ARC: Abnormal runway contact	56.2	48	0.2	1
CFIT: Controlled flight into or toward terrain	3.4	5	2	1
LALT: Low altitude operations	4.6	5	2.2	1
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	4.8	7	2	1
UNK: Unknown or undetermined	2.8	8	2.6	1
LOLI: Loss of lifting conditions en-route	43	34	1.8	0
CTOL: Collision with obstacle(s) during take-off and landing	19	17	0.8	0
TURB: Turbulence encounter	3	3	0.6	0
BIRD: Birdstrike	0.6	0	0.4	0
F-POST: Fire/smoke (post-impact)	0	1	0.4	0
GCOL: Ground Collision	7.8	9	0.2	0
RE: Runway excursion	11.8	8	0.2	0
USOS: Undershoot/overshoot	12.6	9	0.2	0
WSTRW: Windshear or thunderstorm.	2.6	4	0.2	0
ADRM: Aerodrome	1.6	2	0.2	0
LOC-G: Loss of control - ground	13.6	12	0	0
OTHR: Other	8.4	6	0	0
SCF-PP: powerplant failure or malfunction	5.8	4	0	0
FUEL: Fuel related	0.4	1	0	0
RI-VAP: Runway incursion - vehicle, aircraft or person	0.8	0	0	0
RAMP: Ground Handling	0.4	0	0	0
EVAC: Evacuation	0.2	0	0	0
RI-A: Runway incursion - animal	0.2	0	0	0

13 Occurrence categories missing from the table were deliberately deleted as they showed no data.

Figure 33: Glider accidents and occurrence categories 2009-2014



Key Safety Risk Areas for the GA Glider Sector

The key risk areas for the Glider sector have been taken from the top Occurrence Categories as provided in Figure 33. The key risk areas are based on their overall ranking in terms of the number of accidents within the sector[14]:

- **Abnormal runway contact/Loss of control ground/Runway excursion (ARC/LOC-G/RE)**: ARC is often a pre-cursor to LOC-G and RE occurrences in GA fixed wing aviation, therefore for the purpose of considering safety issues all three safety risk areas have been combined.
- **Loss of lifting conditions en route (LOLI)**
- **Loss of control – in flight (LOC-I)**
- **Glider towing related occurrences (GTOW)**
- **Collisions during take-off and landing (CTOL)**

14 For a complete list of CICTT occurrence categories, refer to Appendix 1.

GA Rotorcraft

GA Rotorcraft forms a small but important part of the GA community. In general, most small rotorcraft activity is involved in aerial work operations. This section, however, focuses on rotorcraft flights that can be considered either as Pleasure flying or as Flight training. It is worth noting that Rotorcraft includes both Helicopter and Gyroplanes.

From Table 29 and Table 30 it can be seen that the numbers of fatal accidents and fatalities have decreased in 2014 when compared to the average over the five-year period 2009-2013. However, there has been an increase in the numbers of non-fatal accidents, serious and minor injuries.

➨ **Table 29:** GA rotorcraft accidents fatal and non-fatal - 5 year average vs 2014

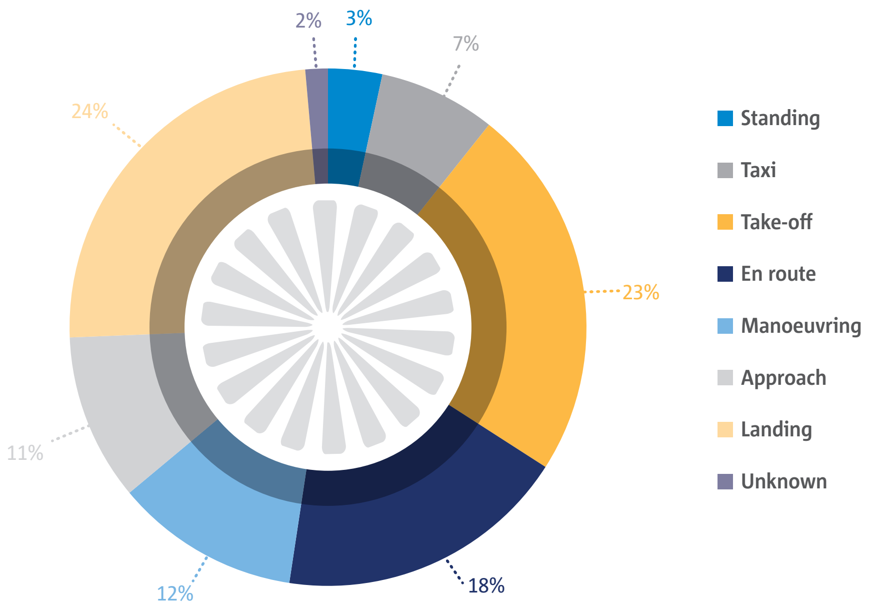
	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	9	64	2
2009-2013 average	12.2	57.4	0.8

➨ **Table 30:** GA rotorcraft fatalities and injuries - 5 year average vs 2014

	Fatalities	Serious Injuries	Minor Injuries
2014	16	12	22
2009-2013 average	21.2	10.2	22.4

As can be seen in Figure 34, GA Rotorcraft accidents occur most frequently during the Take-off and Landing phases of the flight, where figures are comparable. The en route phase is the third most dangerous flight phase with 18%.

Figure 34: GA rotorcraft accidents per phase of flight 2009-2014



Occurrence Categories General Aviation Rotorcraft

In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to GA rotorcraft accidents involving EASA MS registered aircraft and this information is shown in Table 31. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

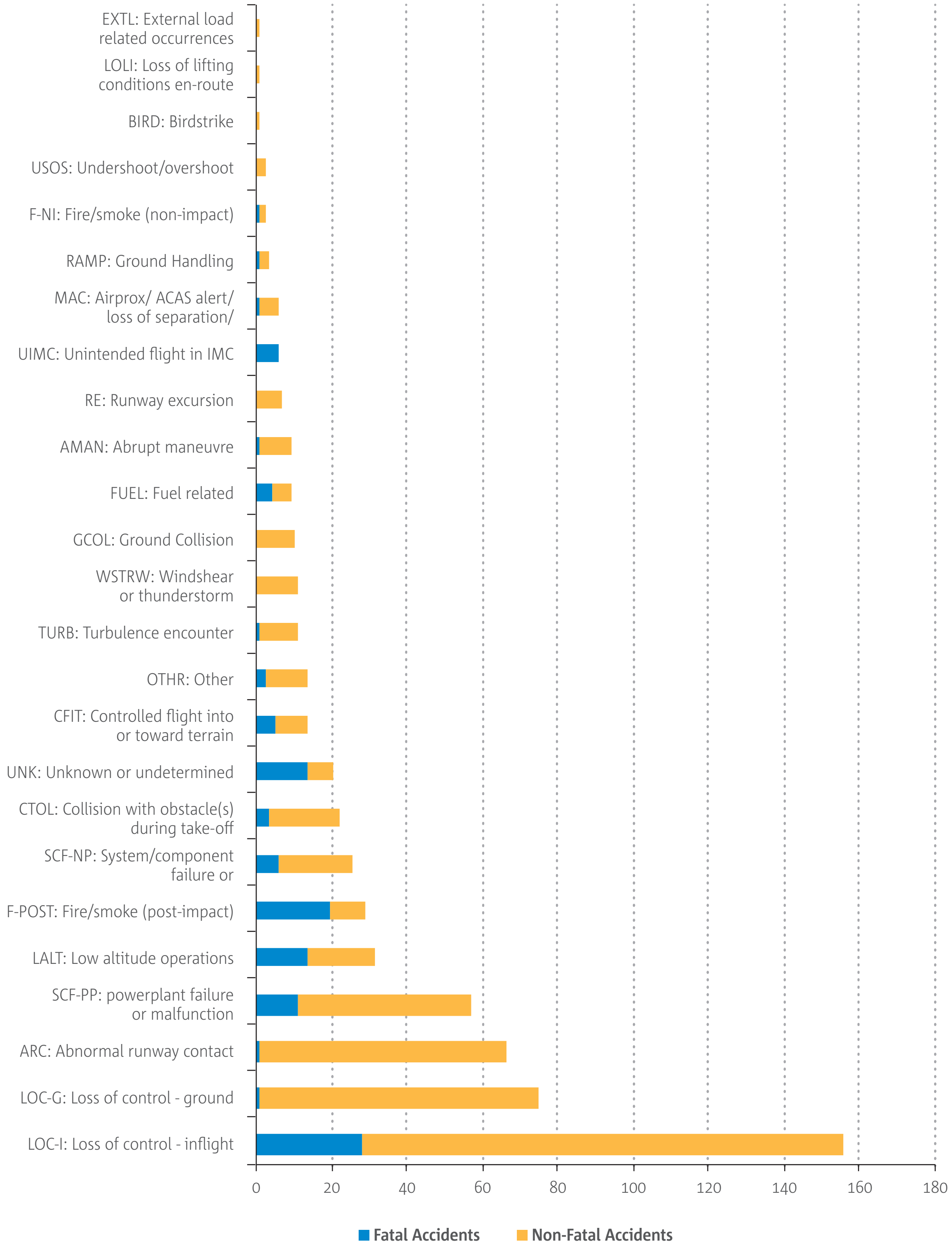
The occurrence category analysis reveals that LOC-I is the most type of GA Rotorcraft accident. The categories of LOC-G and ARC also feature highly.

Table 31: GA rotorcraft occurrence categories number of accidents 2009-2014[15]

Occurrence Category	Accidents and SIs	
	2009-2013 average	2014
LOC-I: Loss of control – inflight	25.8	22
LOC-G: Loss of control – ground	12.4	15
ARC: Abnormal runway contact	10.8	13
SCF-PP: powerplant failure or malfunction	9	9
SCF-NP: System/component failure or malfunction [non-powerplant]	4.8	9
LALT: Low altitude operations	5	4
UNK: Unknown or undetermined	4	4
CFIT: Controlled flight into or toward terrain	2.4	3
RE: Runway excursion	1.4	3
F-POST: Fire/smoke (post-impact)	5	2
CTOL: Collision with obstacle(s) during take-off and landing	3.8	2
OTHR: Other	2.2	2
AMAN: Abrupt manoeuvre	1.6	2
FUEL: Fuel related	1.6	2
GCOL: Ground Collision	1.8	1
WSTRW: Windshear or thunderstorm.	1.4	1
UIMC: Unintended flight in IMC	1.2	1
BIRD: Birdstrike	0.2	1
LOLI: Loss of lifting conditions en-route	0.2	1
TURB: Turbulence encounter	1.6	0
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	1.2	0
F-NI: Fire/smoke (non-impact)	0.4	0
RAMP: Ground Handling	0.4	0
USOS: Undershoot/overshoot	0.2	0

15 Occurrence categories missing from the table where deliberately deleted as they showed no data.

Figure 35: Rotorcraft occurrence categories - accidents only 2009-2014



Key Safety Risk Areas for GA Rotorcraft

The key risk areas for GA rotorcraft have been taken from the top Occurrence Categories as provided in Figure 35. The key risk areas are based on their ranking in terms overall number of accidents and serious incidents[16]:

- **Loss of control – in flight (LOC-I)**
- **Abnormal Runway Contact/Loss of Control - Ground (ARC/LOC-G)**: ARC is often a pre-cursor to LOC-G occurrences, therefore for the purpose of considering safety issues they have been combined.
- **System Component Failure (SCF)**
- **Low Altitude Operations (LALT)**
- **Collision during Take-off and Landing**
- **Controlled Flight into Terrain**

16 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Key Statistics General Aviation Microlight

For the first time, the Annual Safety Review provides a high level overview of the GA microlight sector, although most microlights do not fall within the EASA remit as they are normally defined as Annex II aircraft. As a key part of the GA community however, it is important that this sector be included in our analysis.

In Table 32 and Table 33 it can be seen that the numbers of fatal accidents and fatalities are decreasing. As with other sectors of the GA the necessary exposure data is not available to reveal the European safety picture. Table 33 shows also that even though fatalities are getting fewer the number of serious and minor injuries are slightly increasing.

➨ **Table 32:** Microlight accidents fatal and non-fatal - 5 year average vs 2014

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	30	174	6
2009-2013 average	42.2	189.2	3.6

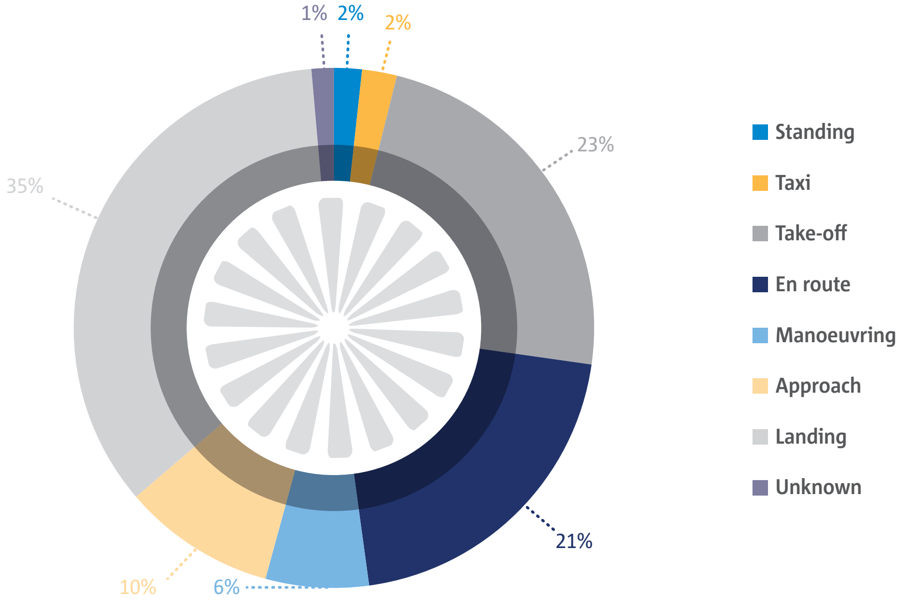
Table 33 shows also that even though fatalities are reducing the number of serious and minor injuries increased slightly.

➨ **Table 33:** Microlight fatalities and injuries - 5 year average vs 2014

	Fatalities	Serious Injuries	Minor Injuries
2014	46	48	45
2009-2013 average	60.2	44.4	39.6

Figure 36 provides details of the phase of flight where microlight accidents occur. As with other GA domains, landing is the most dangerous flight phase with 35% of the accidents. A further 23% occurred during take-off and 21% during the en route phase.

Figure 36: Microlight accidents per phase of flight



Occurrence Categories General Aviation Microlight

In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to GA Microlight accidents involving EASA MS operators and this information is shown in Table 34. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

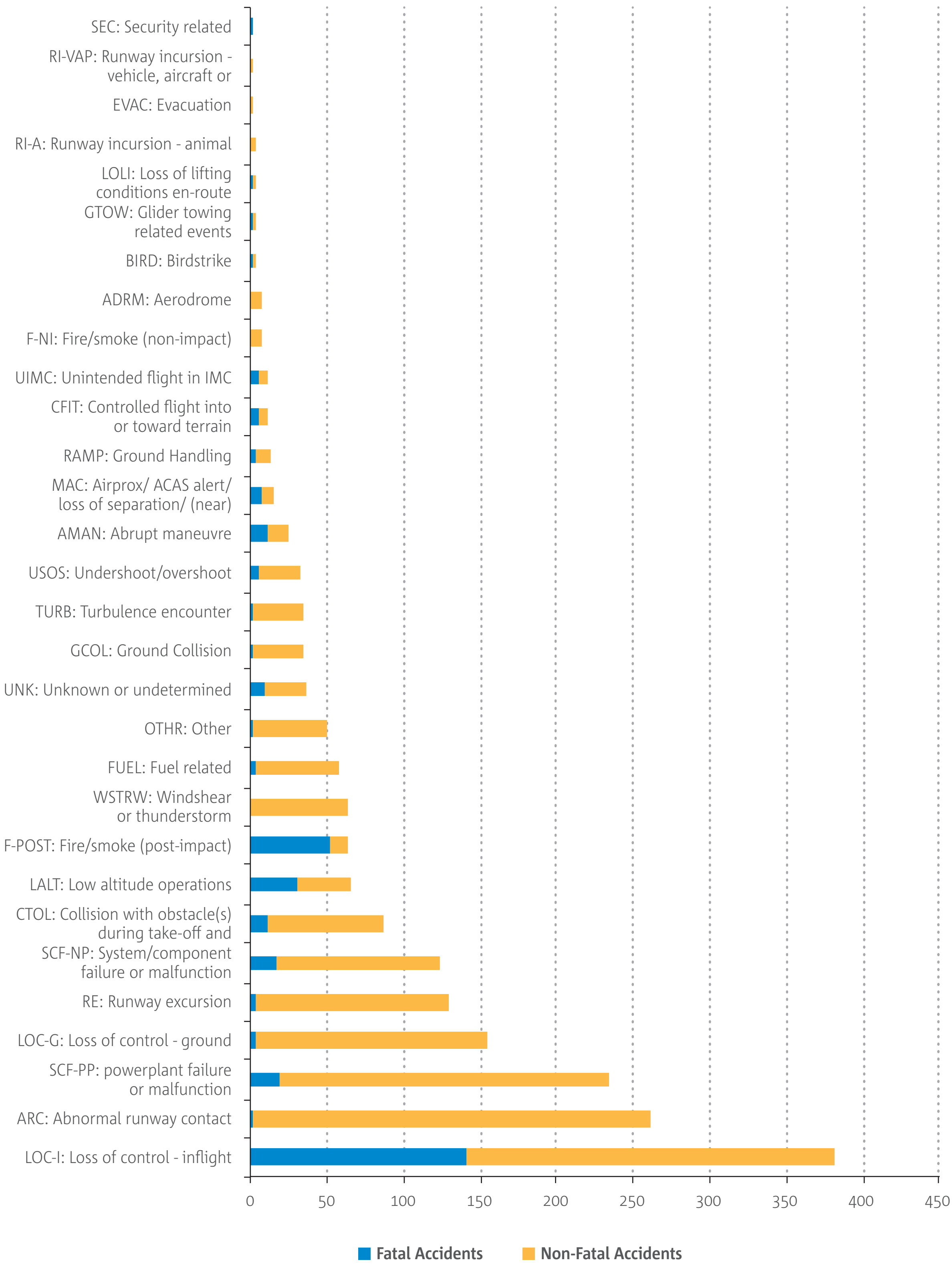
The occurrence categories reveal that LOC-I, LALT, AMAN and CTOL are the most common causes of microlight fatal accidents. As of non-fatal accidents are concerned SCF-NP, SCF-PP and LOC-G score the highest. Further analysis will be carried out in this Sector as part of the development of the Sector Safety Risk Portfolios.

Table 34: Microlight occurrence categories - 5 year period vs 2014[17]

Occurrence Category	Non-Fatal Accidents		Fatal Accidents	
	2009-2013 average	2014	2009-2013 average	2014
LOC-I: Loss of control - inflight	42.8	26	25.6	14
F-POST: Fire/smoke (post-impact)	1.6	3	8.6	10
UNK: Unknown or undetermined	5.4	9	7.2	8
LALT: Low altitude operations	6	5	5.4	4
AMAN: Abrupt maneuvre	2.2	2	1.8	3
CTOL: Collision with obstacle(s) during take-off and landing	12.2	15	1.6	3
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	0.8	3	1.2	2
SCF-NP: System/component failure or malfunction [non-powerplant]	16.8	22	3.4	1
RE: Runway excursion	22	16	0.4	1
GCOL: Ground Collision	5.4	5	0.2	1
USOS: Undershoot/overshoot	5.4	6	0	1
GTOW: Glider towing related events	0.6	0	0	1
SCF-PP: powerplant failure or malfunction	35.2	39	4	0
CFIT: Controlled flight into or toward terrain	1	1	1.2	0
UIMC: Unintended flight in IMC	1.2	1	1	0
LOC-G: Loss of control - ground	25.6	24	0.6	0
FUEL: Fuel related	9.8	6	0.6	0
RAMP: Ground Handling	2.2	0	0.6	0
ARC: Abnormal runway contact	44	39	0.4	0
OTHR: Other	7.6	10	0.4	0
BIRD: Birdstrike	0.4	1	0.2	0
LOLI: Loss of lifting conditions en route	0.2	1	0.2	0
WSTRW: Windshear or thunderstorm.	12.6	0	0.2	0
TURB: Turbulence encounter	6.6	0	0.2	0
SEC: Security related	0	0	0.2	0
F-NI: Fire/smoke (non-impact)	1.4	1	0	0
EVAC: Evacuation	0	1	0	0
RI-VAP: Runway incursion - vehicle, aircraft or person	0	1	0	0
ADRM: Aerodrome	1.4	0	0	0
RI-A: Runway incursion - animal	0.6	0	0	0

17 Occurrence categories missing from the table where deliberately deleted as they showed no data

Figure 37: Microlight occurrence categories 2009-2014



Key Safety Risk Areas for Microlights

The key risk areas for the Microlight sector is taken from the top Occurrence Categories as provided in Figure 37. The key risk areas are based on their ranking in terms overall number of accidents and serious incidents[18]:

- **Loss of control – in flight (LOC-I)**
- **Abnormal runway contact/Loss of control – ground/Runway excursions (ARC/LOC-G/RE)**: ARC is often a pre-cursor to LOC-G and RE occurrences, therefore for the purpose of considering safety issues they have been combined.
- **System Component Failure (SCF)**
- **Collisions during take-off and landing (CTOL)**
- **Low altitude operations (LALT)**

18 For a complete list of CICTT occurrence categories, refer to Appendix 1.

Key Statistics General Aviation Balloons

Balloon accidents within EASA MS have been slowly increasing for the last 5 years, but a lack of flight usage data makes it difficult to assess whether this is due to an increase in flying or a reduction in the level of safety. This increase is one of the main reasons why the initial work on the development of a Safety Risk Portfolio in the GA Sector was initially focussed on Balloon operations. In 2014 there were not balloon fatal accidents, but the number of non-fatal accidents and serious incidents increased. In addition the number of serious injuries and minor injuries also increased.

Table 35: Balloon accidents fatal and non-fatal - 5 year average vs 2014

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	0	11	2
2009-2013 average	0.6	8.6	0.6

Table 36: Balloon fatalities and injuries - 5 year average vs 2014

	Fatalities	Serious Injuries	Minor Injuries
2014	0	11	10
2009-2013 average	1.2	6	6.2

Occurrence Categories General Aviation Balloon

In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to GA Balloon accidents involving EASA MS operators and this information is shown in Table 37. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

Table 37: GA balloon occurrence categories – 5 year period vs 2014

Occurrence Category	Accidents and SIs	
	2009-2013 average	2014
ARC: Abnormal runway contact	5.2	9
CTOL: Collision with obstacle(s) during take-off and landing	2.4	2
F-NI: Fire/smoke (non-impact)	0.2	1
LOC-I: Loss of control - inflight	0.6	1
MAC: Airprox/ACAS alert/loss of separation/(near) midair collisions	0.4	1
SCF-NP: System/component failure or malfunction [non-powerplant]	0.4	1
UNK: Unknown or undetermined	0.2	1
OTHR: Other	1.8	0
WSTRW: Windshear or thunderstorm.	1.2	0
F-POST: Fire/smoke (post-impact)	0.8	0
CFIT: Controlled flight into or toward terrain	0.4	0
EVAC: Evacuation-	0.2	0
GCOL: Ground Collision	0.2	0
LALT: Low altitude operations	0.2	0
LOC-G: Loss of control - ground	0.2	0

Figure 38: Balloon occurrence categories 2010-2014

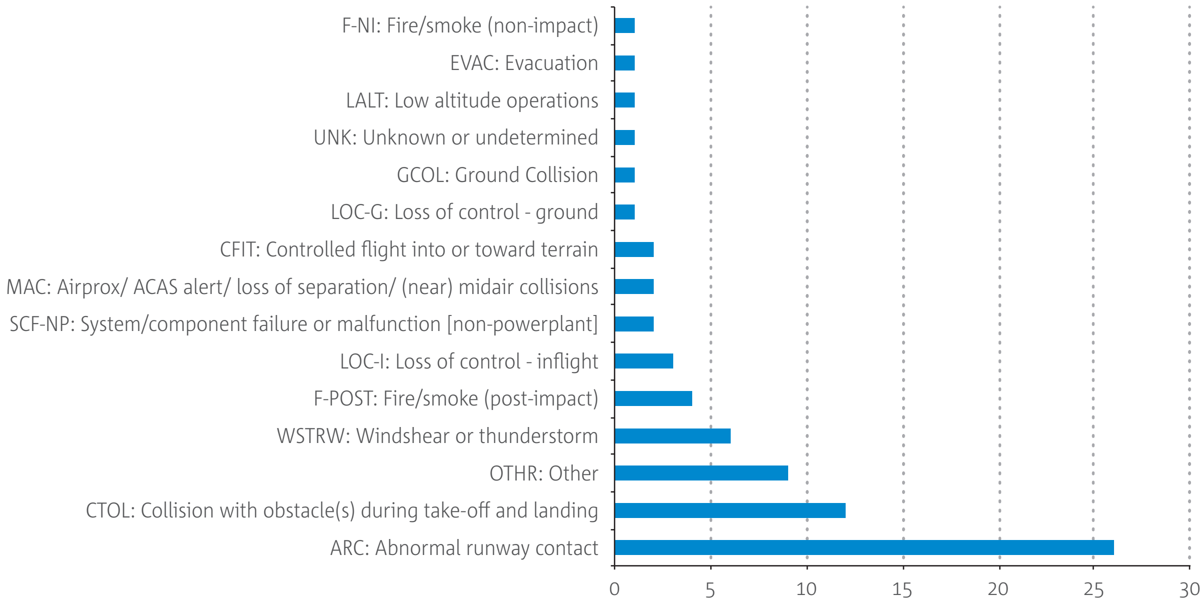
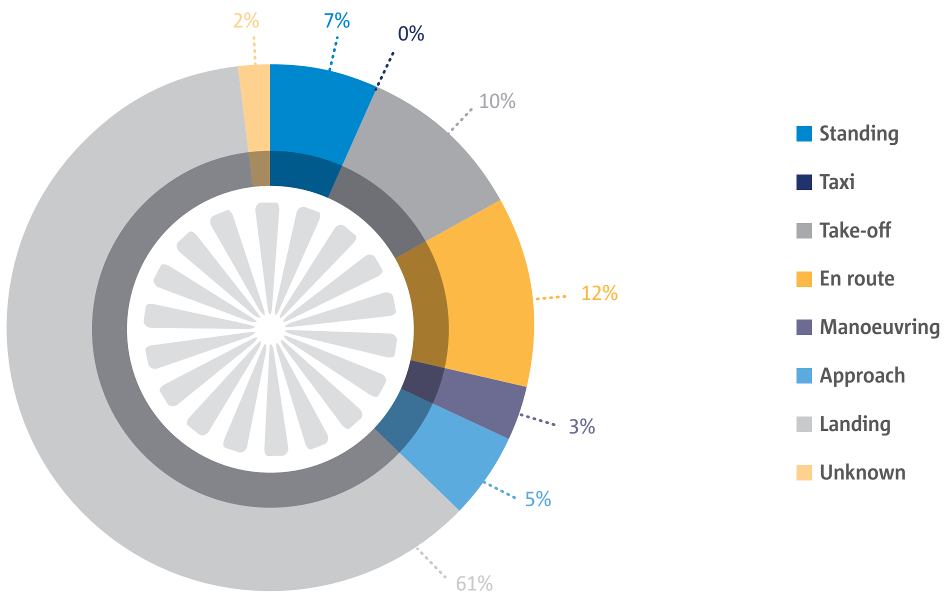


Figure 39: Balloon accidents per phase of flight



As can be seen in Figure 38 and Figure 39, the highest number of Balloon accidents occurs during the landing phase of the flight. In the tables below These accidents are shown according to the events which occurred during those accidents. When examining these four tables it can be seen that the main causes are Hard landings due to Aircraft handling and Collisions with obstacles which in many cases are power lines or other objects on ground.

Key Safety Risk Areas for Balloons

The key risk areas for Aerial Work Helicopter have been taken from the top Occurrence Categories as provided in Figure 38. The key risk areas are based on their ranking in terms overall number of accidents and serious incidents[19]:

- **Abnormal runway contact (ARC)**
- **Collisions during take-off and landing (CTOL)**
- **Loss of control – in flight (LOC-I)**
- **MAC/Airprox (MAC)**
- **Fire related occurrences (FIRE)**

19 For a complete list of CICTT occurrence categories, refer to Appendix 1.

General Aviation Hot-Air Balloon Safety Risk Portfolio

Following the identification of the risk areas, the Hot Air Balloon Safety Risk Portfolio was developed by the Balloon Accident Data Collaboration and Analysis Group (BADCAG) that used the Balloon fatal accident data available, to identify the safety main safety risks which need to be addressed to improve the safety level. The safety issues will be subject to detailed risk assessments in close partnership with the members of the balloon community in the BADCAG. The Safety Risk Portfolio for the Balloon Sector and the associated analysis will be shared through the EASA website and discussed as widely as possible with the Balloon community.

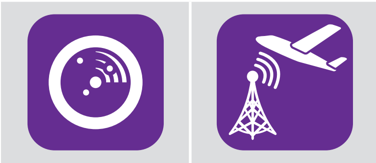
Table 38: Balloon safety risk portfolio

	GA – Hot-Air Balloons	Risk Areas				
	Safety Issue	ARC	CTOL	LOC-I	MAC	FIRE
Operational	Insufficient or poor weather planning	■	■	■	■	
	Incorrect control of manual flight path through control of balloon inertia	■	■	■		
	Loss of separation – Particularly during mass balloon launches				■	
Technical	Propane system fire					■
	Exterior colour schemes and markings – Insufficient visibility of balloon registration leading to communication problems during mass launches				■	
Human	Insufficient pilot knowledge of balloon physics	■	■	■	■	
	Commercial and competitive pressure to initiate flights	■	■	■		
	Incorrect decision making and planning	■	■	■	■	
	Insufficient or poor communication – Leading to insufficient situational awareness during mass launches			■	■	
Organisational	Insufficient passenger safety knowledge	■	■	■	■	
	Insufficient availability of operational documentation – e.g. Map marking with power wires	■	■			

Chapter 9

ATM

Air Traffic Management



Scope

This chapter reviews safety data for the European Air Traffic Management (ATM) system. In some cases, incident data is included in addition to accidents and serious incidents. This is provided by Eurocontrol and is collected via the Annual Summary Template (AST) mechanism. The definitions and categories used in this section therefore align with the taxonomy in use for the AST mechanism instead of the CICTT occurrence categories that are used in other parts of the Annual Safety Review.

Although the AST mechanism has been in place for a number of years, there was a significant increase in reporting from 2008 onwards. For this reason, the data covers a five-year period from 2010-2014.

The analysis in the ATM chapter includes accidents which occurred within an EASA MS Flight Information Region (FIR) involving at least one aircraft with MTOM of 2250 kg and above; and incidents that occurred within an EASA MS FIR with no MTOM restrictions.

Key Statistics ATM

As shown in Table 39, there were no fatal accidents involving ATM in 2014 and the total number of non-fatal accidents and serious incidents was close to the average for the preceding 10-year period 2004-2013. The number of serious injuries was slightly higher than the average, as can be seen in Table 40.

➨ **Table 39:** EASA MS ATM numbers of occurrences per occurrence class

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	0	9	23
2004-2013 Average	0.7	4.9	35.2

➨ **Table 40:** EASA MS ATM numbers of fatalities and injuries

	Fatalities	Serious Injuries	Minor Injuries
2014	0	9	5
2004-2013 Average	2.8	2.7	1.9

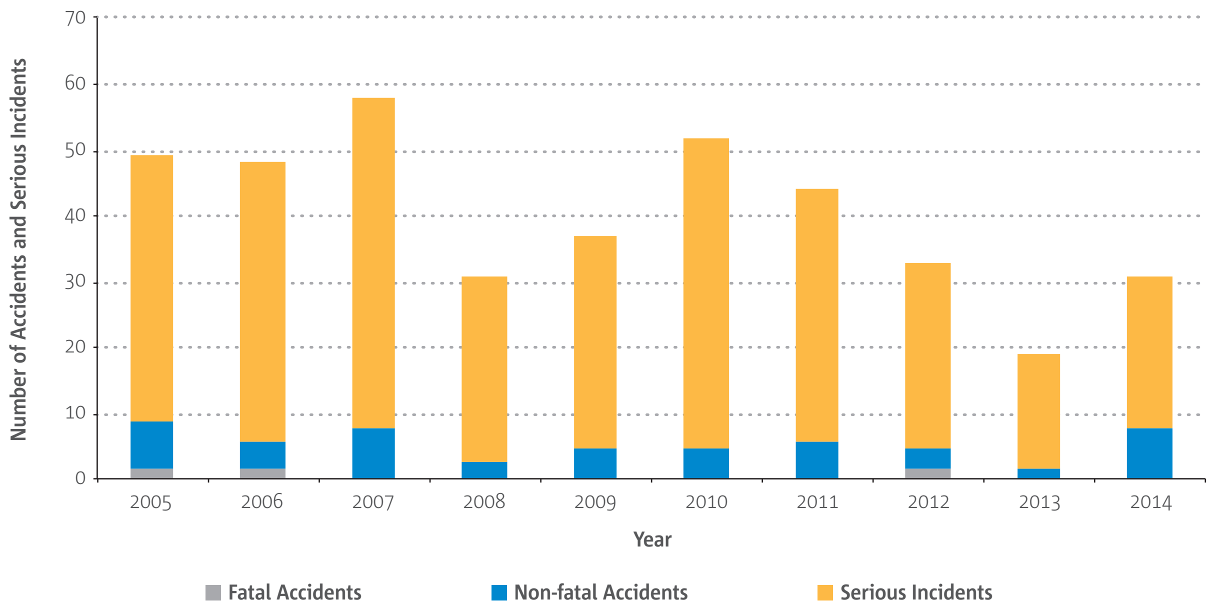
Phase of Flight

Table 41 shows that the total number of accidents and serious incidents was close to the average of the preceding ten-year period of 2004-2013. In comparing 2014 with the 2004-2013 average, differences can be seen in the en route and landing phases of flight. While en route accidents and serious incidents approximately halved in comparison with the preceding ten-year period, landing accidents and serious incidents almost doubled.

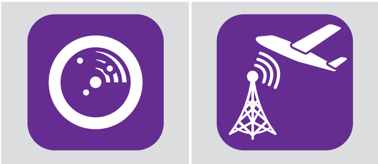
Table 41: EASA MS ATM accidents and serious incidents per phase of flight detection

Phase of Flight	Accidents and Serious Incidents	
	2004-2013 Average	2014
Standing	0.7	0
Taxi	6.0	7
Take-off	8.8	7
En route	15.6	8
Manoeuvring	0.4	0
Approach	12.9	15
Landing	3.7	8
Post-impact	0.0	0
Unknown	1.7	2

Figure 40: Number of ATM accidents and serious incidents per year, 2005-2015



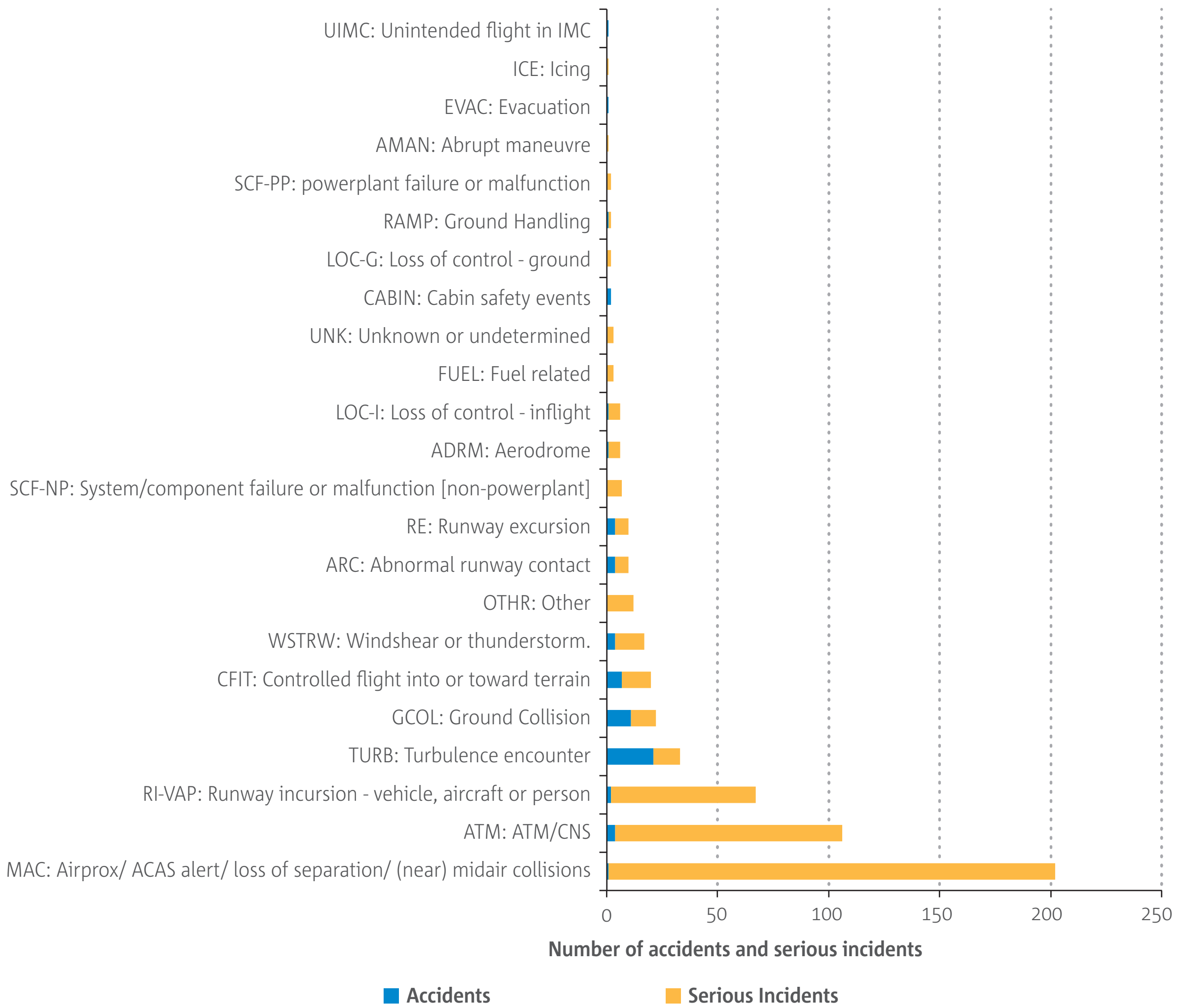
Occurrence Categories ATM



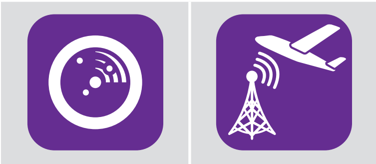
In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to ATM accidents and serious incidents involving the EASA MS ATM system. This was done using the CICTT occurrence categories, which are listed in Appendix 1.

Considering the subject of the chapter, the presence of ATM as the second most commonly assigned occurrence category is not surprising. However, that MAC, RI-VAP, TURB and GCOL all appear in the top five indicates that these, along with ATM, are the key risk areas for occurrences that commonly involve ATM/CNS. This information is shown in Figure 41.

Figure 41: Number of Accidents and Serious Incidents per Occurrence Category, 2005-2014

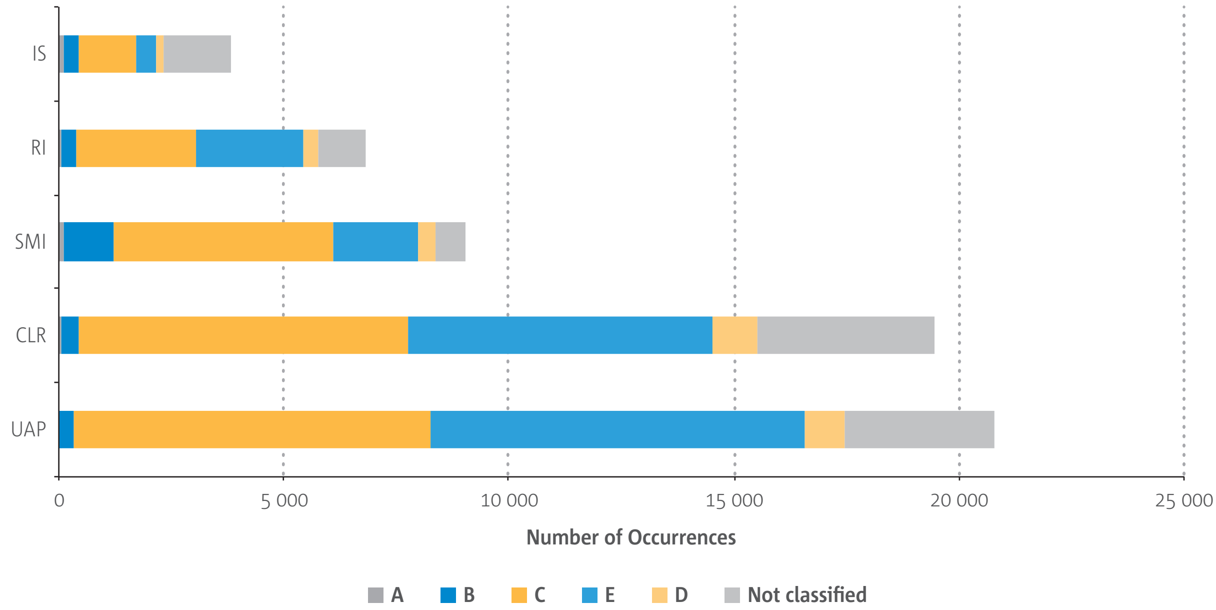


ATM Occurrences



Occurrences are defined as accidents, serious incidents and incidents. The most common types of ATM related occurrence are: Unauthorised Airspace Penetration (UAP), Aircraft Deviation from ATC Clearance (CLR), Separation Minima Infringements, Runway Incursions (RI) and Inadequate Aircraft Separation (IS). Occurrences can be classified under more than one category, for example a CLR could lead to an SMI. The numbers of these over the period examined are shown in Figure 42, along with the severity classification applied using the Risk Analysis Tool (RAT) methodology. The severity classes are Serious Incidents (A), Major Incidents (B), Significant (C), No Safety Effect (E), and Not Determined (D).

Figure 42: Number of ATM-related occurrences by occurrence category and severity grade in EASA MS FIRs, 2010 – 2014



Occurrence Rates ATM

Comparing the number of incidents with the level of traffic can provide meaningful results in terms of safety trends. The trends shown by the figures are the rate of incidents reported per million flight hours independent of their severity, and the rate of risk bearing incidents (severity A and B). For the incident category of Runway Incursions, a rate per million aircraft movements (departures/arrivals) is being used.

Figure 43: Rate of ATM-related occurrences per year in EASA MS FIRs, 2010-2014

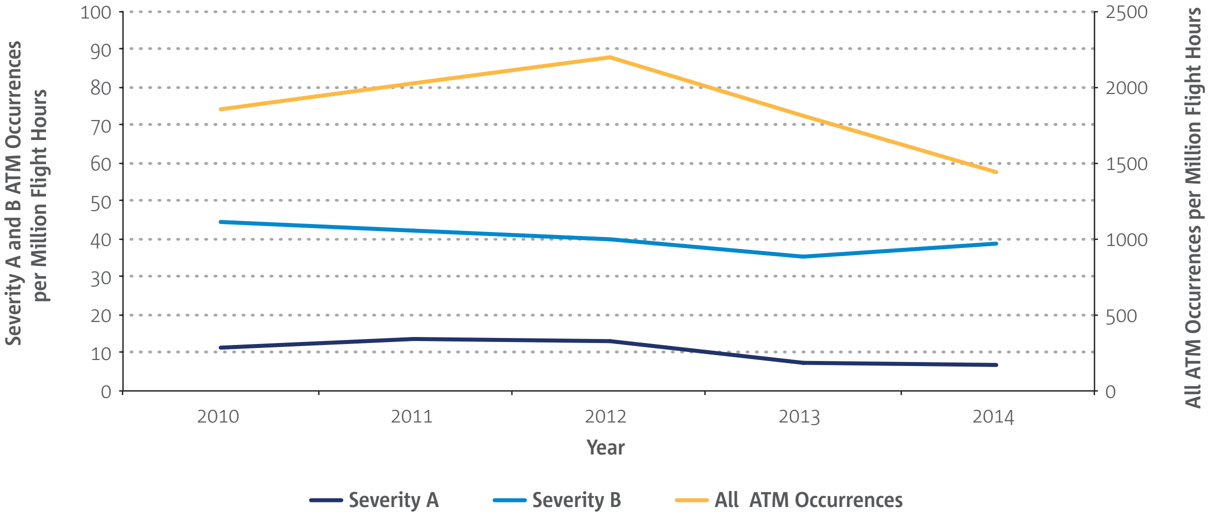


Figure 44 shows the rate of Runway Incursions per million flights. It is useful to calculate the rate using the number of movements or flights as this represents the frequency with which a runway is being used. The European Aviation Safety Plan (EASp) identifies Runway Incursions as being one of the five operational safety risks for Commercial Air Transport (CAT) aircraft.

Figure 44: Rate of runway incursions per million flights in EASA MS FIRs, 2010-2014

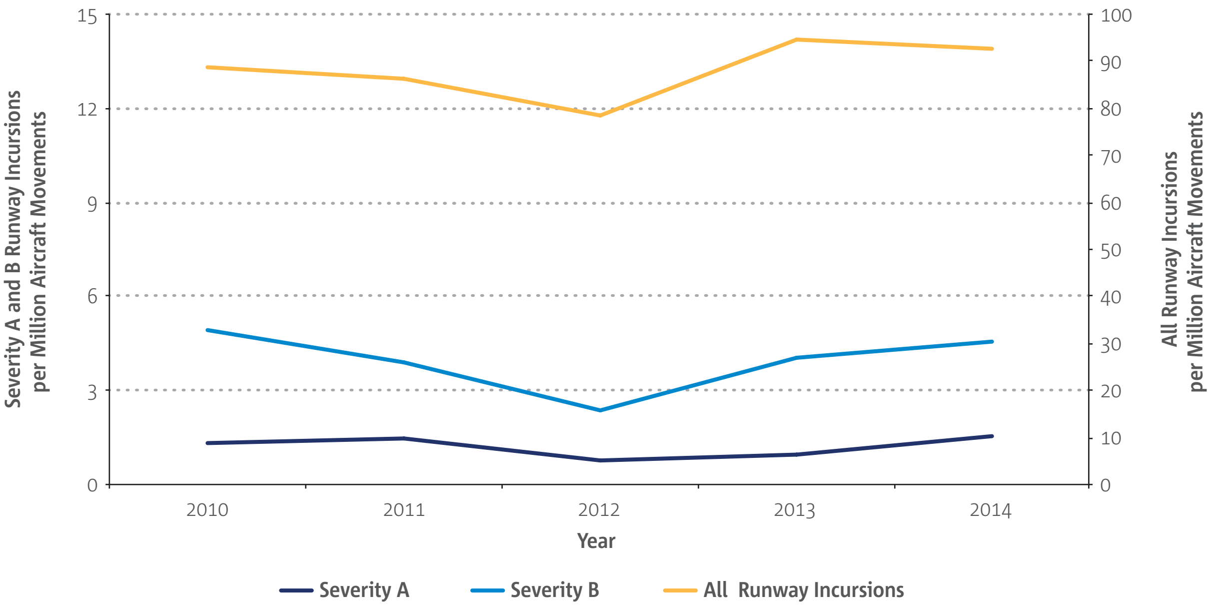


Figure 45 shows the rate of Separation Minima Infringements per million flight hours. It is useful to calculate this rate using the number of flight hours as this best represents the timeframe during which the airspace is actually being used by an aircraft. A Separation Minima Infringement occurrences infers that the minimum separation between aircraft has been lost.

Figure 45: Rate of separation minima infringements per million flight hours per year in EASA MS FIRs, 2010-2014

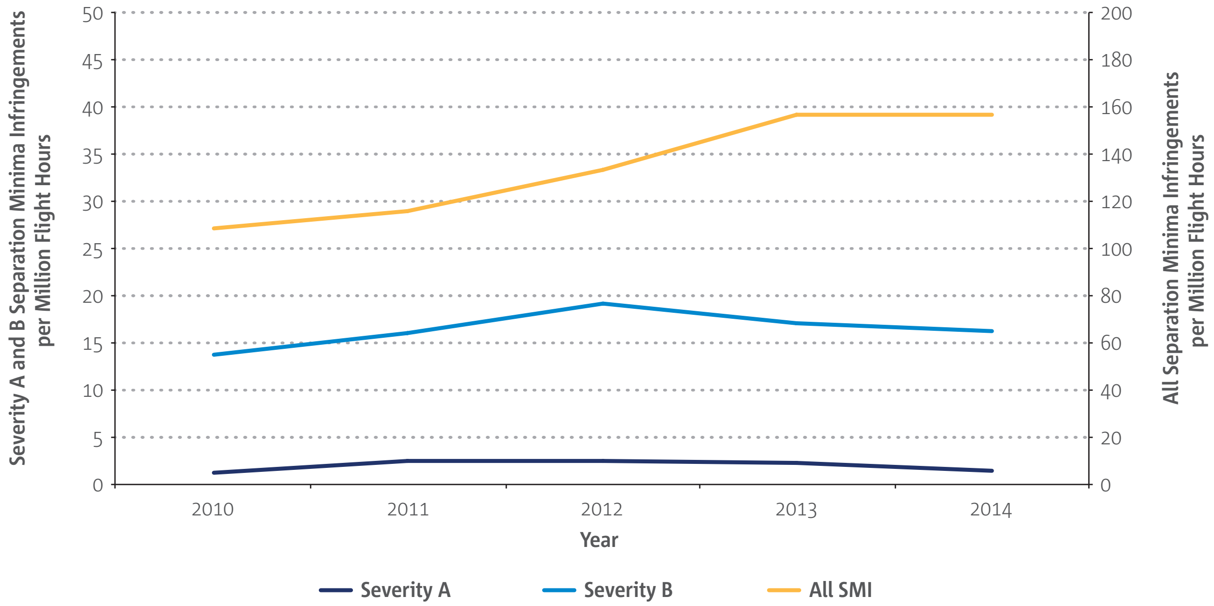


Figure 46 shows the rate of reported Airspace Infringements for the period 2003-2012 and indicates that the overall reporting rate of this type of incident has remained steady over the five year period. It also shows that the rate of occurrences that have been RAT Severity classified as A or B has remained relatively steady.

Figure 46: Rate of airspace infringements per million flight hours in EASA MS FIRs, 2010-2014

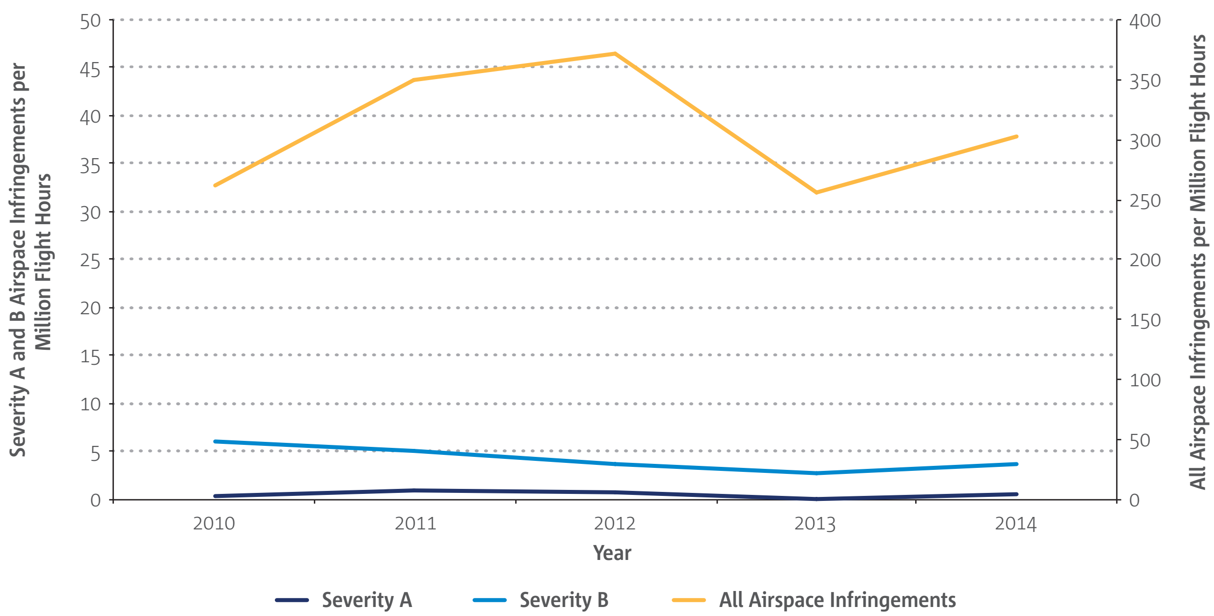
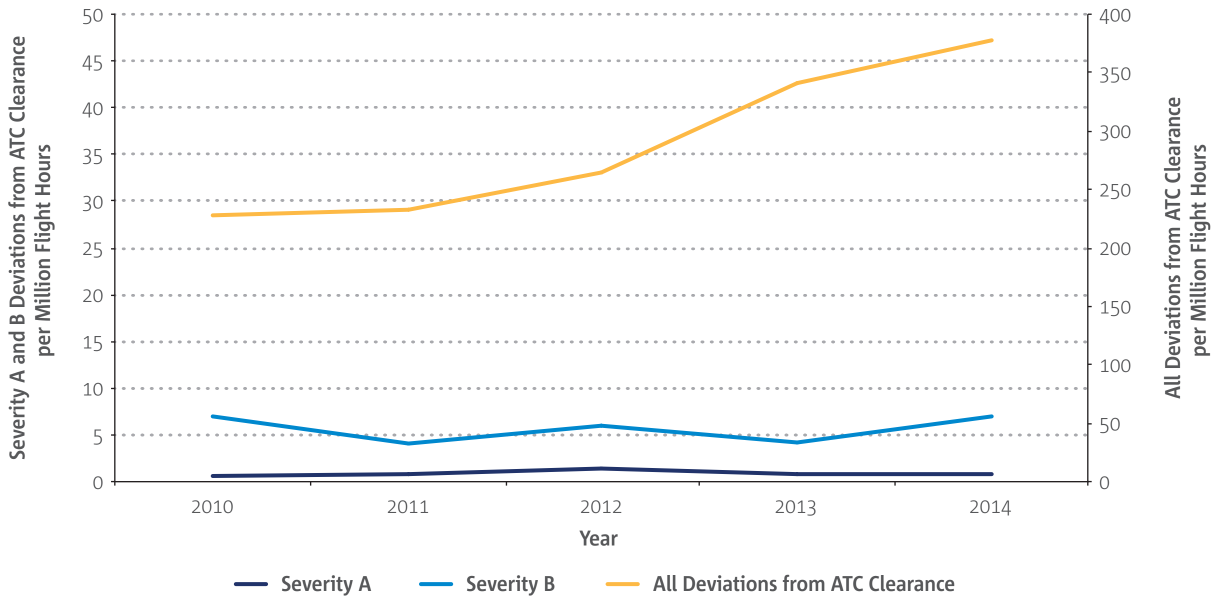


Figure 47 shows the rate of deviations from ATC clearances and the increase in reporting rate is clearly observable. The rate of major incidents has also increased while the rate of serious incidents has decreased.

Figure 47: Rate of deviations from ATC clearance per million flight hours in EASA MS FIRs, 2010-2014



Chapter 10

Aerodromes in EASA MS

Aerodromes in EASA MS

Scope

The Aerodromes chapter examines accidents and serious incidents at aerodromes in EASA Member States.It must be noted that many events occur at or near an aerodrome without the aerodrome being involved and therefore are not included the scope of this chapter. This chapter includes accidents and serious incidents that relate to the aerodrome itself or are related to a service supplied at an aerodrome.

Key Statistics Aerodromes

There were no fatal accidents in 2014 involving EASA MS Aerodrome safety. The number of non-fatal accidents and serious incidents was close to the average for the preceding five-year period 2009-2013.

Table 42: Number of occurrences involving EASA MS aerodrome and safety per occurrence class

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2014	0	37	7
2009-2013 Average	0.4	28	14.4

Table 43: Numbers of fatalities and injuries involving EASA MS aerodrome and safety

	Fatalities	Serious Injuries	Minor Injuries
2014	0	1	4
2009-2013 Average	0.4	2	11

➨ **Table 44:** EASA MS aerodrome and safety numbers of occurrences per phase of flight detection

Phase of Flight	Accidents and SIs	
	2009-2013 Average	2014
Standing	6.4	7
Taxi	11.4	13
Take-off	7.2	5
En route	0.8	0
Manoeuvring	0	0
Approach	0.6	0
Landing	26	20
Post-impact	0	0
Unknown	0.2	1

Aerodrome Accidents and Serious Incidents

Aerodrome accidents and serious incidents are defined as those involving aerodrome design or functionality issues that are associated with runways, taxiways, ramp areas, parking areas, buildings and structures, fire and rescue services, obstacles on the aerodrome, lighting, markings, signage, procedures, policies, and standards. Such accidents are assigned the occurrence category ADRM. Examples of which include aerodrome lighting failures, ambiguous or incorrect signage and the effects of aerodrome design.

In the period 2010-2014, there were nine accidents and serious incidents within the occurrence category ADRM.

➨ **Table 45:** Number of occurrences per Year at EASA MS aerodromes per occurrence class 2010-2014

Year	Accident	Serious Incident	Total
2010	1	2	3
2011	1	2	3
2012	0	0	0
2013	3	0	3
2014	0	0	0

Occurrence Categories

In order to assist in the identification of particular safety issues, one or multiple occurrence categories were assigned to ATM accidents and serious incidents involving the EASA MS Aerodromes. This was done using the CICTT occurrence categories, which are listed in Appendix 1. The occurrence categories, in addition to ADRM, that were assigned to Aerodrome accidents and serious incidents are shown in Table 46.

Table 46: Aerodrome occurrences per occurrence category, 2010-2014

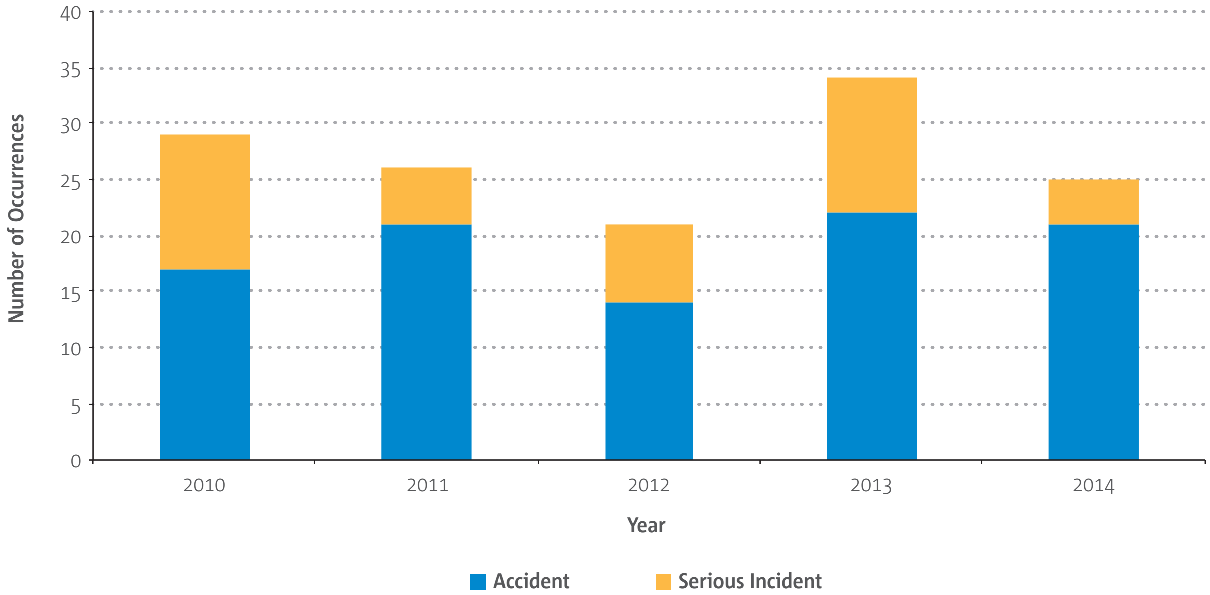
Occurrence category	Number of occurrences
LOC-G: Loss of control - ground	4
RE: Runway excursion	4
GCOL: Ground Collision	2
CTOL: Collision with obstacle(s) during take-off and landing	2
SCF-PP: powerplant failure or malfunction	1
RI-A: Runway incursion - animal	1
BIRD: Birdstrike	1
OTHR: Other	1

Runway Excursions

A Runway Excursion is defined as an aircraft veering off the side or overrunning the end of the runway surface during take-off or landing. The European Aviation Safety Plan (EASp) identifies Runway Excursions as being one of the key operational safety risks for Commercial Air Transport (CAT) aircraft. While figures for Runway Excursions at EASA MS Aerodromes are shown here, figures for runway excursions involving CAT Aeroplanes are to be found in Chapter 5.

In total, there were 135 Runway Excursion accidents and serious incidents at EASA MS Aerodromes between 2010 and 2014, with 25 of these occurring in 2014. Figure 48 shows the total number of Runway Excursions per year, broken down by occurrence class. Unlike Table 46, Figure 48 includes Runway Excursions where the Aerodrome occurrence category has not been assigned. It can therefore be assumed that the Runway Excursion did not relate to the aerodrome but more probably to factors involving aircraft operations or air traffic control.

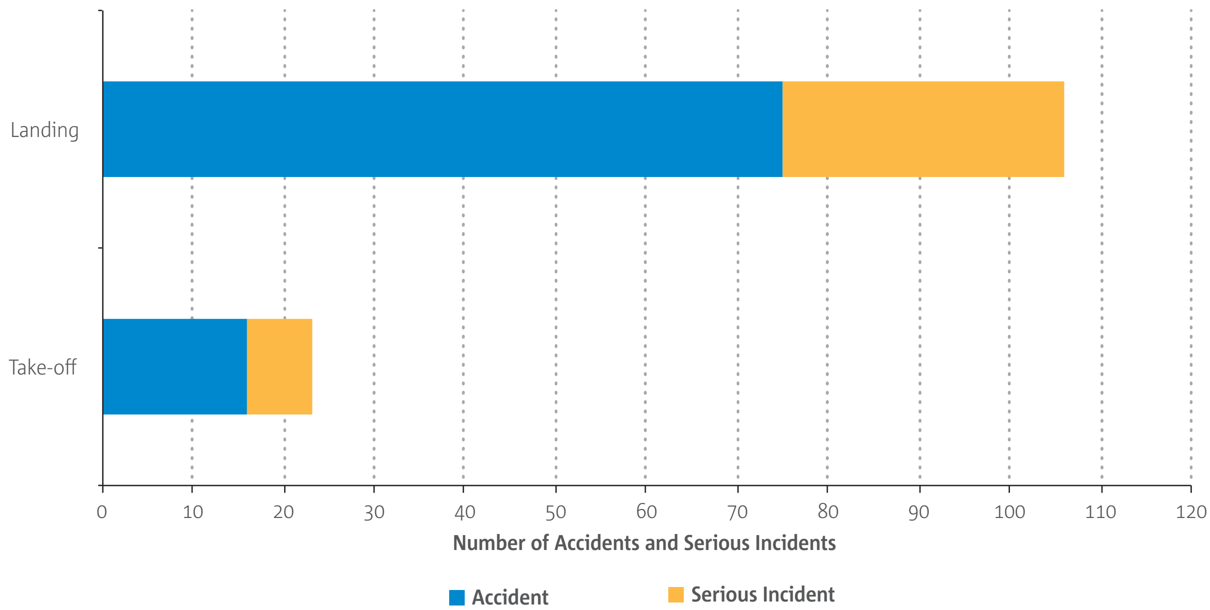
Figure 48: Number of runway excursion accidents and serious incidents per year at EASA MS aerodromes, 2010-2014



Phase of Flight

82 percent of Runway Excursion accidents and serious incidents occurred during landing while 18 percent occurred during take-off.

Figure 49: Runway excursions at EASA MS aerodromes by phase of flight, 2010-2014

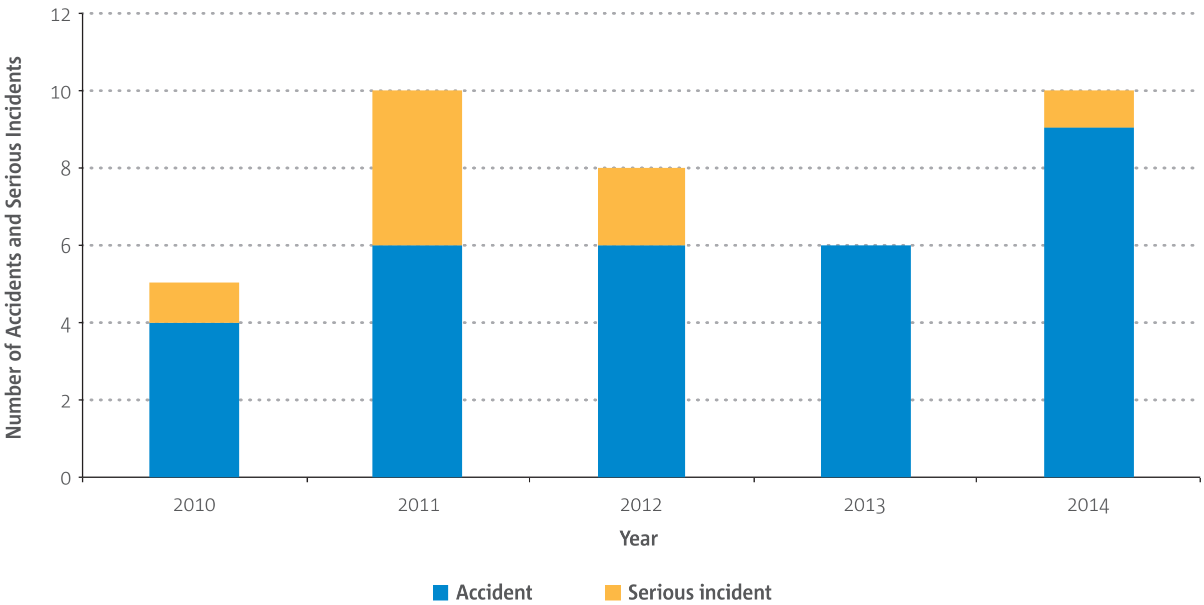


Ground Collisions

Ground Collisions (GCOL) are defined as collisions involving at least one aircraft and either another aircraft, or vehicle, or person or object during taxi. The EASp identifies ground collisions as another of the key operational safety risks for Commercial Air Transport aircraft. The number of ground collisions per year at EASA MS Aerodromes is shown in Figure 50. Figures for ground collisions involving CAT Aeroplanes are shown in Chapter 5, while figures for ground collisions at EASA MS Aerodromes are shown in Figure 51.

In total, there were 39 ground collision accidents and serious incidents at EASA MS aerodromes between 2010 and 2014, ten of which occurred in 2014.

Figure 50: Number of ground collision accidents and serious incidents per year at EASA MS aerodromes, 2010-2014



Ramp Accidents and Serious Incidents

The Ramp environment can be considered as distinct from the rest of the aerodrome environment as the companies involved in ground handling operations are often contracted by the aircraft operator rather than the aerodrome itself. Ramp events are those that occur during or as a result of Ground Handling operations. Examples of this type of occurrence include but are not limited to Loading, Pushback, Refuelling or De-icing errors. The number of Ramp accidents and serious incidents is shown in Figure 51. The most common types of Ramp accidents and serious incidents involve collisions with aircraft that are either parked or being towed,with ground objects, and with operational vehicles and or equipment. Two of the ramp accidents included in this chapter were fatal. One resulted in a baggage handler being killed while loading an aircraft, while the other fatality occurred when a service vehicle collided with the wingtip of an aeroplane, killing the driver. Both of these accidents occurred in 2012.

Figure 51: Number of ramp accidents per year at EASA MS aerodromes, 2010-2014

Chapter 11

Internal Occurrence Reporting System

Scope

The Agency, as competent authority, receives occurrence reports from several stakeholders. The internal occurrence reporting systems provides for the closed-loop processing of all incoming occurrence reports. This closed-loop system focuses on the individual assessment of those reports together with the applicable actions[within the remit of the Agency, such as the issuance of an EASA SIB. When such actions fall outside the EASA remit, the information is coordinated with the competent authority. The centralised IORS database is an important source of information for many EASA tasks, such as safety analysis and trend monitoring. It enables data-driven, safety-related decision making, while taking into account the limitations of the data set.

Who shall report?

- Holders of a type-certificate, restricted type-certificate, supplemental type-certificate, ETSO authorisation, major repair design approval or any other relevant approval deemed to have been issued under Commission Regulation (EU) No 748/2012 unless where bilateral agreements specify different provisions[20];
- Holders of a production organisation approval issued under Commission Regulation (EU) No 748/2012;
- Organisations approved under Commission Regulation (EU) No 1321/2014 Part 145, for whom the competent Authority is the Agency;
- Organisations approved under Commission Regulation (EU) No 1321/2014 Part M, for whom the competent Authority is the Agency;
- Training Organisations approved under Commission Regulation No 290/2012 for whom the competent Authority is the Agency;
- Air Navigation Service providers approved under Commission Regulation No 1035/2011 for whom the competent Authority is the Agency.

In addition to this mandatory reporting, the Agency receives many voluntary reports from various sources. This is the first time that IORS has been included in the Agency's Annual Safety Review.

Occurrence Reports

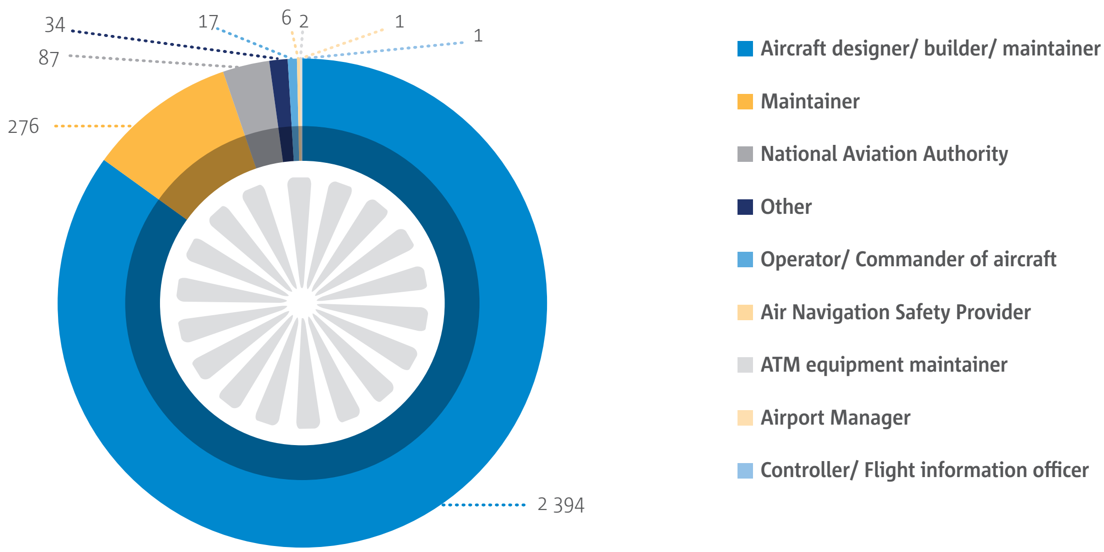
The data shown in Figure 53 provides an overview of the incoming reports to IORS reflecting the number of reports received by month, by type of reporting organisation, by aircraft category and aircraft mass group. They also reflect the level of occurrence reporting. The data presented should only be read as a statistical overview and depicts the most common occurrence profile that is reported to the Agency.

20 Current bilateral agreements exist with the USA, Brazil and Canada.

Figure 52: Number of IORS reports per month Jan 2013 – Dec 2014

Figure 52 shows the number of reports recorded in the Agency's IORS system for the years 2013 and 2014 by month. Typically the summer and winter holiday months are the periods with the highest aviation activity and this is reflected in the increased number of reports received during these times.

Figure 53: Number of IORS reports by reporting entity, 2013-2014



Occurrences are reported to the Agency by the organisations for which the Agency is the competent authority. The majority of occurrences come from Design Approval Holders (Aircraft designer/builder/maintainer) and Foreign Maintenance organisations as can be seen in Figure 53.

Figure 54: Number of IORS reports by aircraft category

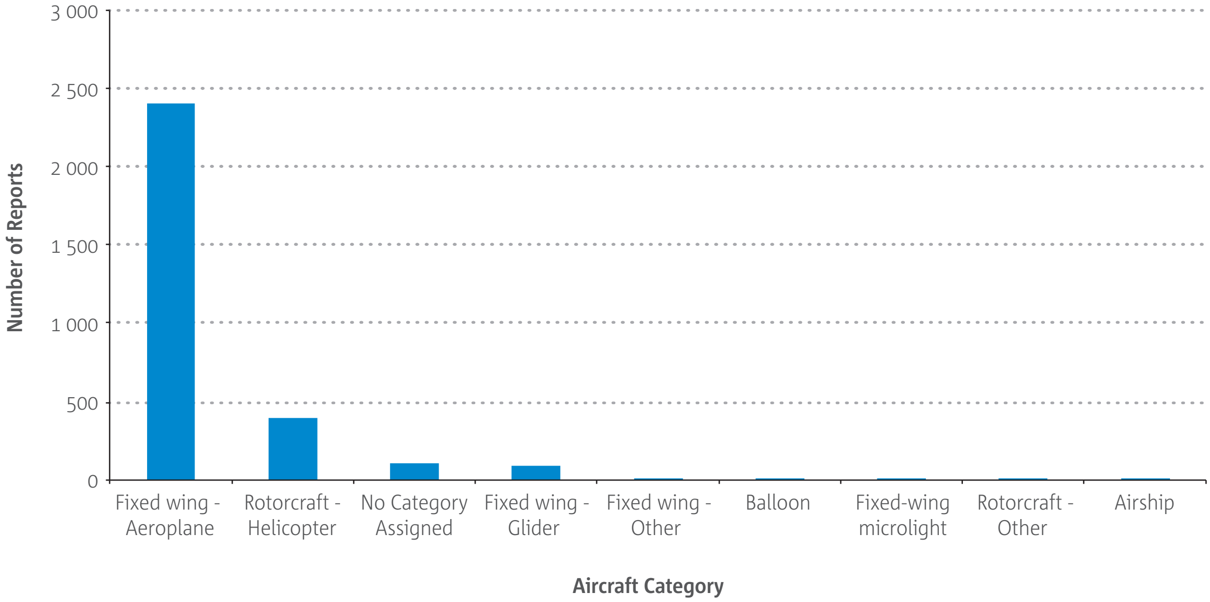


Figure 54 shows the number of IORS reports by aircraft category. The dominance of fixed-wing aeroplanes reflects the relative proportion of such aircraft as the subject of reports submitted by organisations that report to IORS. However, the precise proportions cannot be ascertained.

Figure 55: Number of IORS reports by aircraft mass group

Figure 55 shows the number of occurrences distributed by aircraft mass group, the largest number of occurrences reported to IORS relate to aircraft in the 27001 – 272000 kg mass group, followed by 5701 – 27000 kg mass group.

Chapter 12

Emerging Issues

Emerging Issues

Scope

This chapter covers some of the recent and emerging safety issues, which are outside the normal scope of the EASA Annual Safety Review. A number of new and emerging challenges for the aviation safety community have become apparent during the course of 2014. The loss of MH17 highlighted the risks that an unstable and unpredictable world represent to global air travel. This chapter will outline some of the work that has been done to consider the improved provision of information to the aviation community on the applicable level of risk in overflying conflict zones. In addition, this chapter will highlight the findings of the technical investigations into occurrences over the high seas involving military aircraft and on radar detection losses over Central Europe in June 2014. Finally, given the increasing use of Remotely Piloted Aircraft (RPAS), the chapter will consider the preparatory work that has been carried out to support the future analysis of this sector of aviation.

Risks to Civil Aviation in Conflict Zones

Following the loss Malaysia Airlines flight MH17, there has been a general consensus that states shall share their information on conflict zones and risk.Numerous initiatives have been taken to inform the airlines about the risks posed to their international flights. At the global level, in April 2015, ICAO launched a central repository that provides a means by which information on conflict zones and risks to aviation that is voluntary reported by States may be recorded. This database already contains a number of notifications and its operation and usefulness will be evaluated by the end of 2015.

Within the EU Member States, there is high-level commitment to cooperate and share information resulting from risk assessments performed at the national level. The European Parliament has encouraged the European Commission to support and coordinate these efforts. There is also a clear expectation from the aviation community that they be informed in a qualified manner concerning possible risks associated with their flight routes.

Since the summer of 2014, EASA has taken up this challenge by issuing specialised Safety Information Bulletins (SIBs). These bulletins contain operations related information or recommendations on the potential risks existing in different conflict zones (RCZ) of the world.

These non-binding bulletins are based on information coming from the Civil Aviation Authorities of France, the United Kingdom and the United States of America. Before issuing such bulletins, EASA cross-checks the appropriateness and relevance of any such EU initiative with its NAA network of focal points assigned to Risks to Civil Aviation in Conflict Zone (RCZ), with the Network Manager nominated by the European Commission, and with the aviation industry.

Occurrences Over the High Seas Involving Military Aircraft in 2014

In 2014, safety concerns were expressed by some EU Member States which had reported an increase in occurrences (e.g. AIRPROX, airspace infringements) involving civil and military aircraft and an increase in non-cooperative military traffic[21] over the high seas. While similar occurrences have been reported by several EU Member States over the last years, it seems that the most affected EU Member States in 2014 were the Baltic States. Taking this situation into account, together with the any possible hazard to civil aviation safety, the European Commission mandated EASA to launch a technical analysis of these reported occurrences and to report its conclusions and recommendations.

The aim of the technical analysis was to assess the severity of the situation in general terms by analysing the reported occurrences and, in particular, the most serious ones. In addition, and taking into account the current operational scenario (e.g. traffic density and complexity of the airspace over the Baltic Sea), an assessment of the safety risk to civil aviation and its evolution was conducted.

Based on the results of the technical analysis, the Agency made the following conclusions:

- Over the past years, there has been a significant increase in ‘non-cooperative’ military activity and an increase in the total number of military flights over the Baltic Sea.
- The number of safety occurrences involving civil and non-cooperative military aircraft over the high seas, and in particular over the Baltic Sea, significantly increased in 2014, when compared with past years.

21 Non-cooperative military traffic/flight/aircraft in this report means military traffic/flight/aircraft with no flight plan in the ATM system, and no communication with civil ATC, and no active transponder, or no coordination with civil ATC.

- The risk assessment conducted using the ARMS[22] method concluded that the risk to civil aviation is high and indicates the need for mitigating measures in order to reduce risk to an acceptable level.

- Aggravating factors to the increase in safety risk are the lack of situation awareness of civil Air Traffic Control (ATC) units and of civil aircraft, and the increased complexity of the airspace due in particular to new operational concepts (e.g. free route airspace).

On the basis of the technical investigation, the Agency made eight recommendations designed to support risk reduction associated with this type of occurrence. In addition, the issue of safety occurrences involving civil and non-cooperative military traffic has been recently discussed at the ICAO fora, the European Air Navigation Planning Group (EANPG) and the High-Level Safety Conference (HLSC). These discussions resulted in two additional conclusions addressed to Contracting States that emphasise the need to enhance civil-military coordination so as to effectively mitigate the identified safety risk. The Agency fully agreed with these two conclusions as it considers that they support the actions required to mitigate the safety risk.

Technical Investigation on Radar Detection Losses in June 2014

On the 5th and 10th of June 2014, occurrences documenting the loss of radar from ATC displays in central Europe were reported. The affected ACCs were located in Vienna, Prague, Bratislava, Karlsruhe, Munich, Warsaw and Budapest. This loss of radar caused capacity to be reduced in some of the affected ATC sectors, the introduction of flow measures, and in delays. As these types of events may also have a serious impact on safety, EASA was mandated by the Commission to perform a technical investigation and propose recommendations.

The aim of the technical investigation was to better understand the events from a technical point of view, to explain what occurred, to assess the impact on safety and to evaluate the need for enduring preventative actions. The Agency commenced the technical investigation by first obtaining the factual information and collecting a consistent set of data from the safety investigation authorities, ANSPs and NSAs of the affected Member States, the Network Manager and other industry stakeholders.

The results of the investigation led the Agency to conclude that:

- The source of the interference was a system or installation, which over-interrogated the transponders on board aircraft and in so doing interrogated two specific transponders types, Honeywell TRA-67A and Rockwell Collins TDR-94D, at rates both beyond their requirements and beyond design limits;

22 ARMS (Aviation Risk Management Solutions) method for Operational Risk Assessment (ORA).

- While the two most affected transponders are designed in accordance with Minimum Operational Performance Standards (MOPS), their design specifications were deemed to more susceptible to this type of over-interrogation and;

- In the affected area, there are a high number of ground based interrogators, which are over-soliciting airborne components, resulting in a situation whereby the 1030 MHz frequency is approaching saturation.

The Agency was able to derive the approximate location of the transmitting source, which was found to be in an area of 60 NM radius East-southeast of Prague. The analysis further concluded that this over interrogation of the 1030 MHz frequency was most probably caused by a system or installation that was either in test or in an unusual operational mode. Furthermore, it has been concluded that it is very unlikely that the events were caused by weather phenomena or other natural causes, military exercises or security threats.

On the basis of the technical investigation, the Agency made seven recommendations of high priority and four recommendations of secondary priority. In addition, the Agency has initiated joint work with the FAA in order to assess the design specifications of the most affected transponders and to understand the behaviours of different transponders to over interrogation.

Remotely Piloted Aircraft

In 2014, EASA has taken a more active role in RPAS regulation, with EASA chairing the Joint Authorities for Rulemaking on Unmanned Systems (JARUS). JARUS is a global grouping of authorities that are developing and proposing regulations for Remotely Piloted Aircraft. JARUS has agreed to a concept of operations that defines how and when these new types of aircraft should be regulated. This concept provides for a flexible and proportionate approach to regulating RPAS. For example, the simplest aircraft and their operations would not to be regulated at all. JARUS has created a secretariat to support their work, which will be hosted by the EASA Brussels office. JARUS is also involved in increasing involvement of industry and to actively support the work of ICAO in the field of RPAS.

EASA has, through its role as chair of the ECCAIRS Taxonomy Working Group, facilitated updates to the taxonomy used in the ECCAIRS system. This system enables EASA and the EASA MS to record accident and occurrence information involving RPAS and for this data to be analysed in greater detail. It follows that this will enable the safety risk management process, as described in Chapter 2, to be applied to the RPAS Sector so that safety risks can be identified in a timely manner and included in the EASp where appropriate.

Chapter 13

Implementation of Regulation (EU) 376/2014 and the European Central Repository

Safety Data at the Heart of Decision-Making

Improving aviation safety by preventing accidents and serious incidents relies on the availability of ample safety information on which the right decisions on safety actions can be made. Thanks to the high-level of safety already present in the European Aviation system, collecting such data only at a National Level is no longer able to provide the detail needed. Therefore it is vital that occurrence information is collected in a centralised manner, from a variety of sources, in a standardised and compatible format.

In 1993, the Joint Research Centre (JRC), at the request of the Directorate General VII (Transport) of the European Commission launched, as part of a study, the pilot implementation of a project called, "European Coordination Centre for Accident and Incident Reporting System" or ECCAIRS. The main objective was the pilot implementation of an automated incident reporting system to enable the collection of information from various existing, incompatible sources and to offer a solution to those

Changes Introduced by Regulation (EU) 376/2014 and Impact on Safety Data and the ECR

Mandatory Occurrence Reporting (MOR) is currently regulated, inter alia, by Directive 2003/42/EC. As of November 2015, the directive will be replaced by Regulation (EU) 376/2014 on the reporting,analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council. While some of the basic existing elements of the current MOR scheme are maintained there are some key differences.

Reporting

With regard to reporting, the new Regulation introduces two types of reporting systems; mandatory and voluntary occurrence reporting. Despite the differences between the two, both will be run in much the same way, use the same process and all occurrence reports will be provided to the relevant competent authority and reported to the ECR. The types of occurrences listed in the Implementing Regulation to Regulation (EU) 376/2014 fall under the Mandatory Reporting System.

Occurrence Reporting Processes and ECCAIRS/ADREP Compatibility

The process of occurrence reporting is simplified through the standardisation of the different types of occurrence report used across the European Union. Moreover, the Regulation introduces the concept of ECCAIRS/ADREP compatibility to make it easier for organisations with Safety Management IT systems to electronically transmit occurrences to their competent authorities. Information on both the methods of reporting and ECCAIRS/ADREP is being coordinated through the NAAs of the EASA Member States and will also be made available through a European Occurrence Reporting Website.

Just Culture

Reporting of occurrences is encouraged through the implementation of Just Culture in the Regulation. This provides protection for reporters and persons named in any occurrence report. It also requires individual organisations to adopt an internal Just Culture policy. To support this key area of the Regulation, the European Commission will host a high-level Just Culture conference in Brussels on 1 October 2015[23].

Follow-up and Analysis

One of the main improvements in the provision of aviation safety data is the introduction of follow-up reporting to competent authorities on completion of analysis and investigation of occurrences by aviation organisations. This will lead to a significant improvement in the information available on why occurrences have happened, this is vital to feed the accompanying analysis process. The Regulation also supports improve analysis of safety issues at organisational, National and European levels through the Network of Analysts.

Data Quality

Annex 1 of the Regulation includes mandatory fields that shall be provided for all occurrence reports to help improve the general quality of data available for analysis. The introduction of these mandatory fields will help to further improve the data quality in the ECR.

Information Exchange

The role of the ECR is strengthened significantly with the implementation of the Regulation. All reports collected under the Regulation will be transferred from the competent authorities to the ECR, including voluntary reports. For the first time, EASA, NAAs and Safety Investigation Authorities (SIAs) will be provided with full access to the ECR. However, information collected under this Regulation is protected so that it can only be used for the purposes of safety and not for any other purpose.

23 http://ec.europa.eu/transport/modes/air/events/2015-10-01-just-culture_en.htm

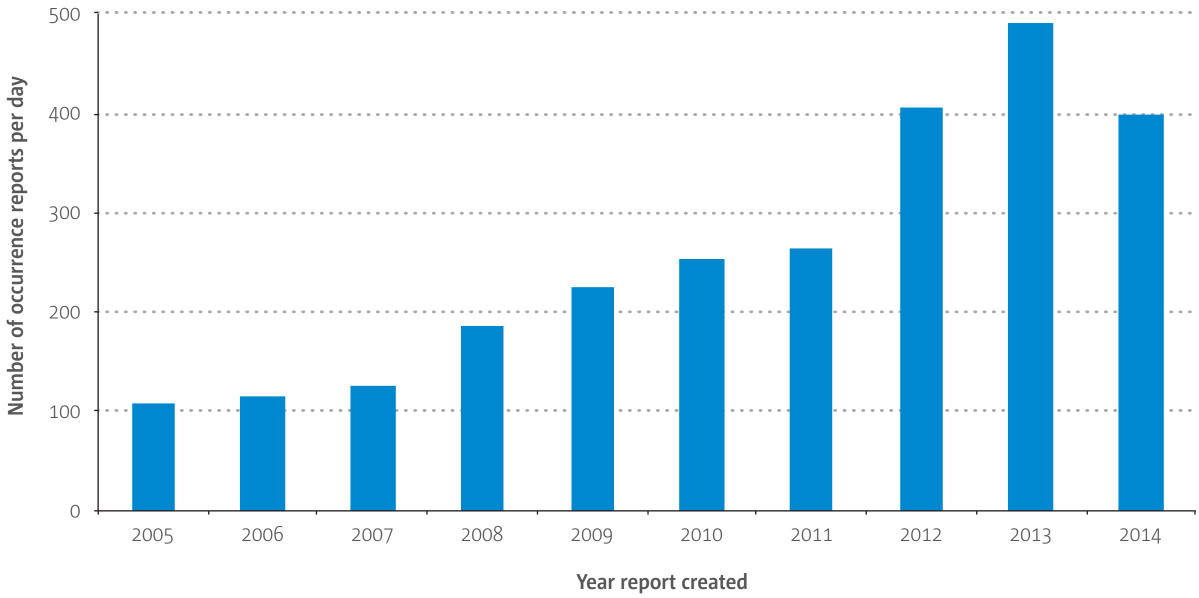
The provision of the Regulation will many challenges with respect to the current system and the ECR. It will also better enable EASA and Member States in their efforts to improve aviation safety through the identification of safety trends and the analysis of safety issues. The remainder of this chapter provides an analysis of the current situation concerning the data contained in the ECR.

Growth of the ECR

At the end of 2014, a total of 953,633 occurrence reports had been integrated into the ECR. In Figure 56 information is provided on the average number of occurrence reports that were integrated into the ECR between 2000 and 2014. We can see that following the entry into force of the European Directive 2003/42/EC, the average number of occurrence reports that were being integrated into the ECR almost tripled from 6.6 occurrences per day in 2003 to 21.4 occurrences per day in 2004 and that this rate continued to increase reaching an average of 127 occurrence reports per day in 2007.

In 2012, almost one year after all Member States had begun integrating their safety data into the ECR, 407 occurrence reports were being integrated daily into the ECR. In 2014, the average number of occurrence reports that were being integrated daily into the ECR by Member States was 398; being very close to the value recorded in 2012 but less than the value recorded in 2013.

Figure 56: Average number of occurrence reports integrated daily in the ECR

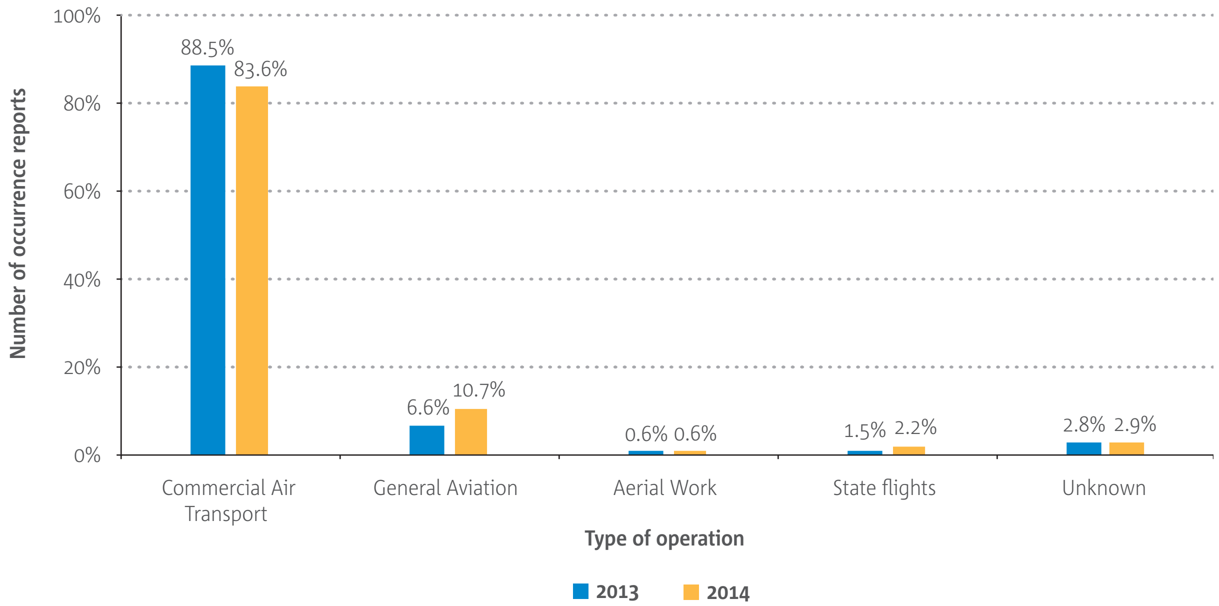


The performance of the occurrence reporting system varies across EASA MS and is highly dependent on factors related to the implementation of safety culture and safety promotion policies at an organisational level. In addition, it depends on the level of harmonisation of the national regulations with the European regulatory framework related to occurrence reporting, and on the availability of various reporting channels at the State level to enable the collection of a high number of occurrence reports.

Type of Operation

Figure 57 provides details on the number of occurrence reports per operation type that were integrated into the ECR during the period 2013 – 2014. Records where the operation type attribute had not be filled were excluded from the data. Commercial Air Transport is the leading operation type in the ECR and accounted for 83.6 percent of the occurrence reports in 2014, down from 88.5 percent in 2013. General Aviation accounted for 10.7 percent of the occurrence reports in 2014, up from a value 6.6 percent in 2013. There were no changes in percentage of Aerial Work, which accounted for 0.6 percent of the occurrence reports in 2014 and 2013. State Flights accounted for 2.2 % of the occurrence reports in 2014, up from a slight increase than in 2 1.5% in 2013. Finally, the use of the unknown attribute accounted for in 2.9 percent of the occurrence reports in 2014, which is a slight increase when compared with the previous year.

➨ **Figure 57:** Distribution of occurrence reports integrated in the ECR by type of operation

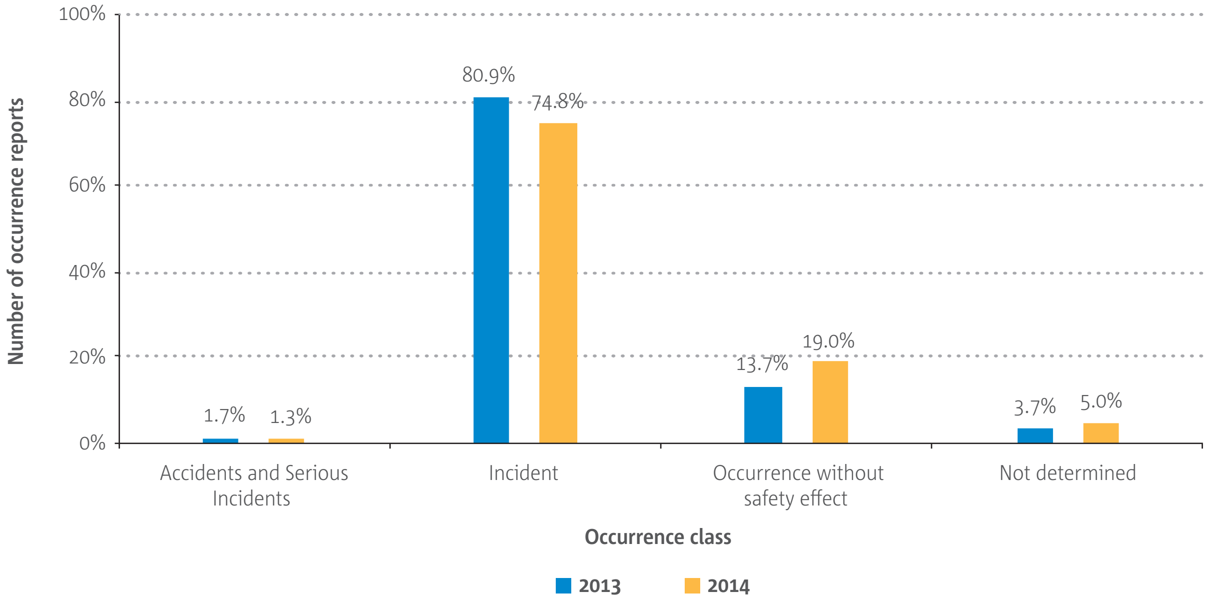


Occurrence Class

Figure 58 provides information on the occurrence reports that were integrated into the ECR in 2013 and 2014 based on the occurrence class attribute. Records where the occurrence class attribute had not be filled were excluded from the data.

The largest class in 2014 was that of “Incident” which accounts for 74.8% of the occurrence reports integrated into the ECR in 2014. Occurrence Without Safety Effect accounted for 19% of the occurrence reports that were integrated into the ECR in 2014. “Not determined” accounted for 5% of the occurrence reports up from 3.7% in 2013. The “Accident” and ”Serious Incident” occurrence classes, which are an important source of safety information for aviation community, accounted for 1.69% of the occurrences that were integrated into the ECR in 2014. This represents a slight decrease when compared with the previous year.

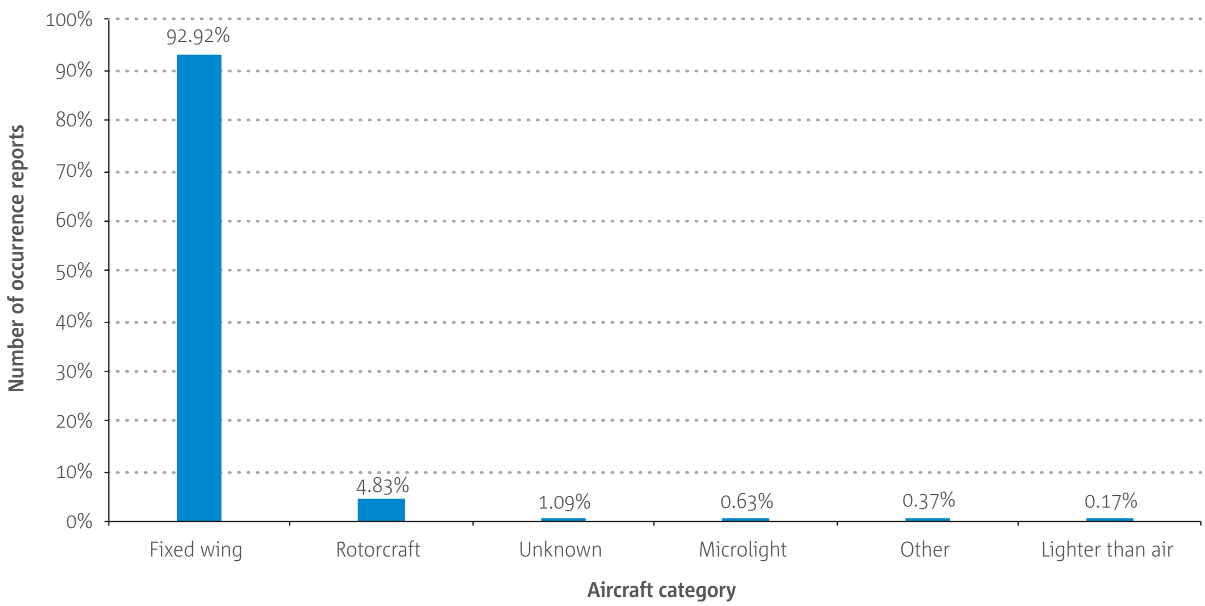
Figure 58: Distribution of occurrence reports integrated in the ECR by occurrence class



Aircraft Category

Figure 58 provides information on the occurrence reports that were integrated into the ECR in 2013 and 2014 based on the occurrence class attribute. Records where the occurrence class attribute had not be filled were excluded from the data.

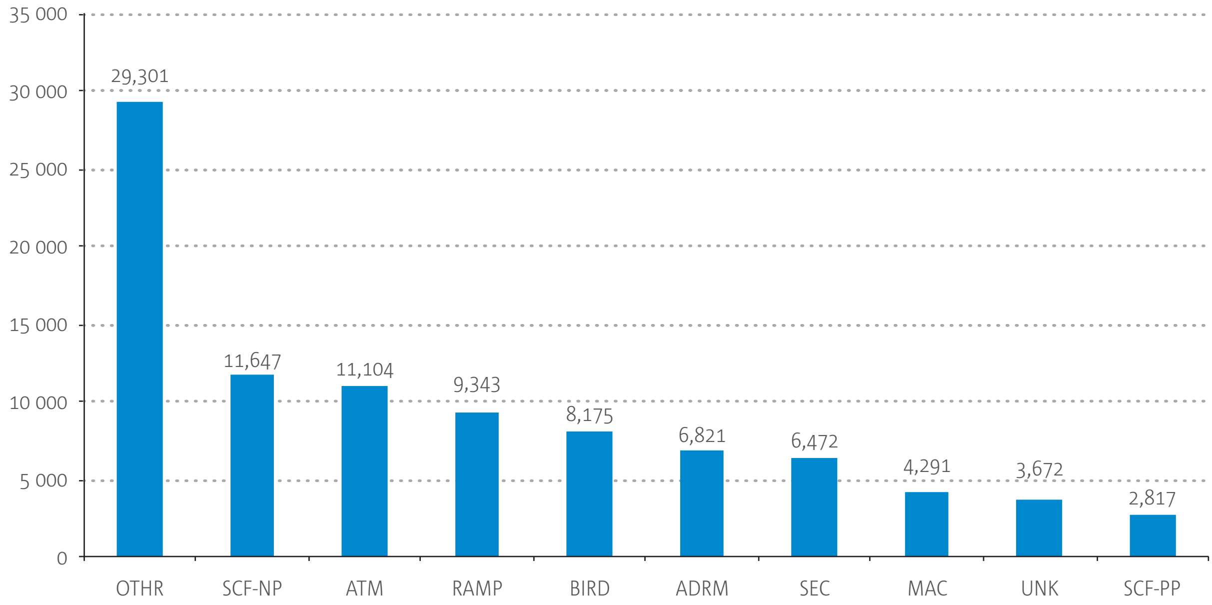
Figure 59: Distribution of occurrence reports integrated in the ECR in by aircraft category



Occurrence Categories

As shown in Figure 60, the Other occurrence category remained the largest occurrence category in the ECR in 2014. System/Component Failure Non-Powerplant (SCF-NP) is the second most prevalent occurrence category under,followed by ATM/CNS, Ramp and Birdstrikes.

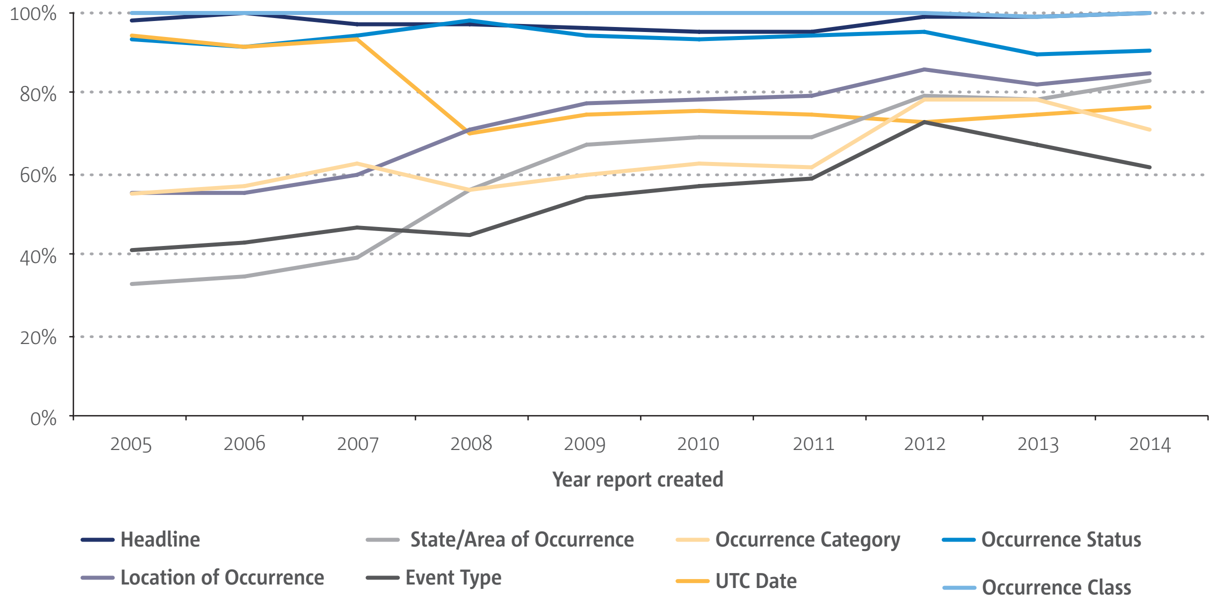
Figure 60: Top 10 occurrence categories within the ECR



ECR Data Quality

Figure 61 provides information on the attribute usage trends within the ECR with respect to the common mandatory data fields as listed in Reg. (EU) 376/2014 and covers the ten-year period 2005-2014. State/Area of Occurrence is the data field that had a significant increase in usage up from 32.5% in 2005 to 82.8% in 2014. During the same period, Location of Occurrence usage rose from 55.4 percent in 2005 to 85 percent in 2014, and Event Type usage rose from 41.1% in 2005 to 62.1% in 2014. At the other end, use of the data field UTC date attribute fell significantly from 94.7% in 2005 to 77% in 2014.

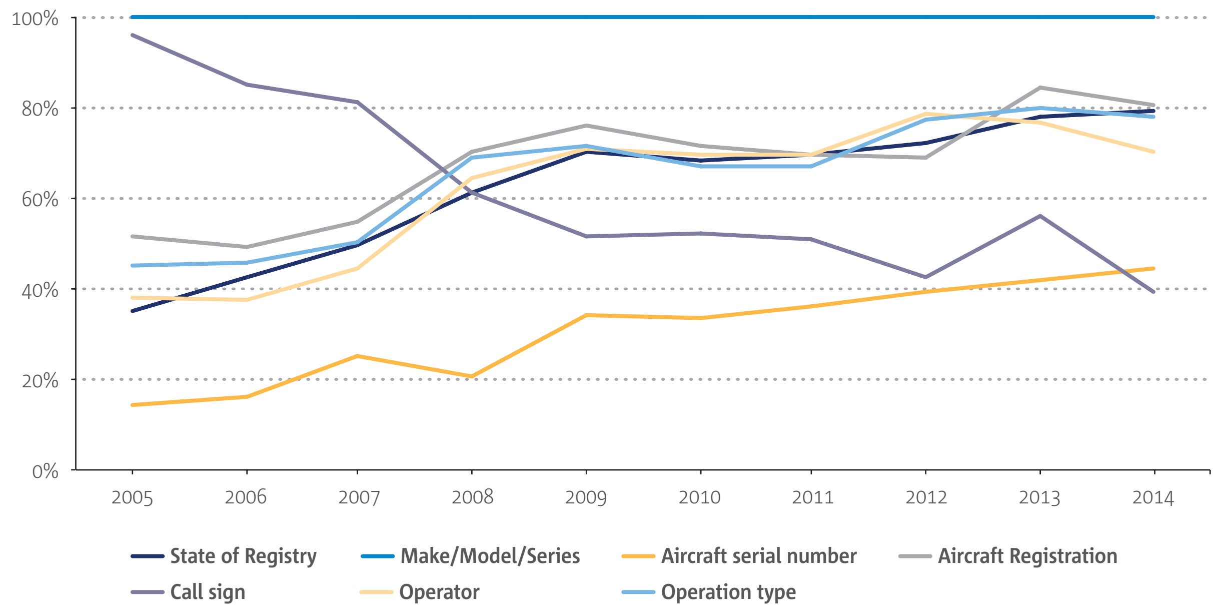
Figure 61: Usage trends within the ECR of R376/2014 common mandatory data fields



Figures 62 provides information on the attribute usage trends within the ECR of the R376/2014 aircraft related attribute fields for the ten-year period 2005-2014. In this instance, the Make/Model/Series data field was taken as a reference point against which the other attribute fields were compared.

Since 2007, use of the State of Registry, Aircraft Serial Number, Aircraft Registration, Operator and Operation Type attribute fields have all increased by around 30 percent. In contrast, use of the Call Sign attribute decreased more than 50 percent over the ten-year period falling from 98 percent to 39 percent.

Figure 62: Usage trends within the ECR of R376/2014 aircraft related data fields (part 1)



As Figure 63 provides information on attribute fields not already dealt with in Figure 62, the Make/Model/Series data field was taken as the reference point against which the other attribute fields were compared.

A significant usage increase of more than 30% over the than ten-year period can be seen for attribute fields Mass Group, Propulsion Type, Flight phase and Aircraft Category. In contrast, use of the attribute fields Last Departure Point and Planned Destination decreased by 10% during the same period 2005-2014. Use of the Weather Relevant attribute field increased significantly from 4.7% in 2005 to 26.8% in 2014.

Figure 63: Usage trends within the ECR of R376/2014 aircraft related data fields (part 2)

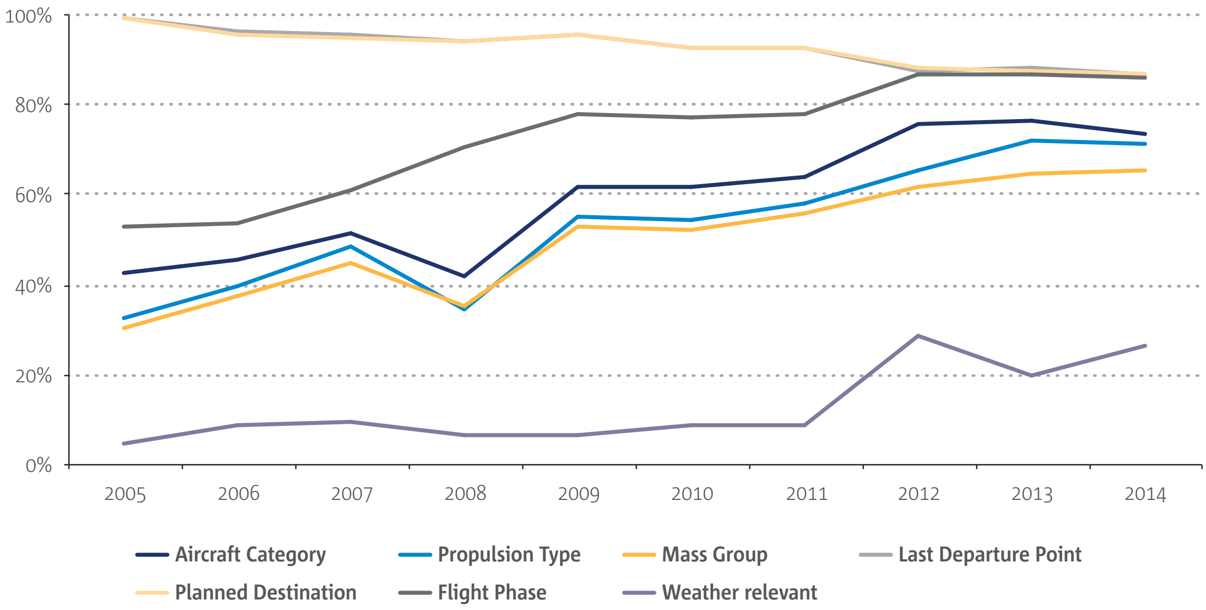
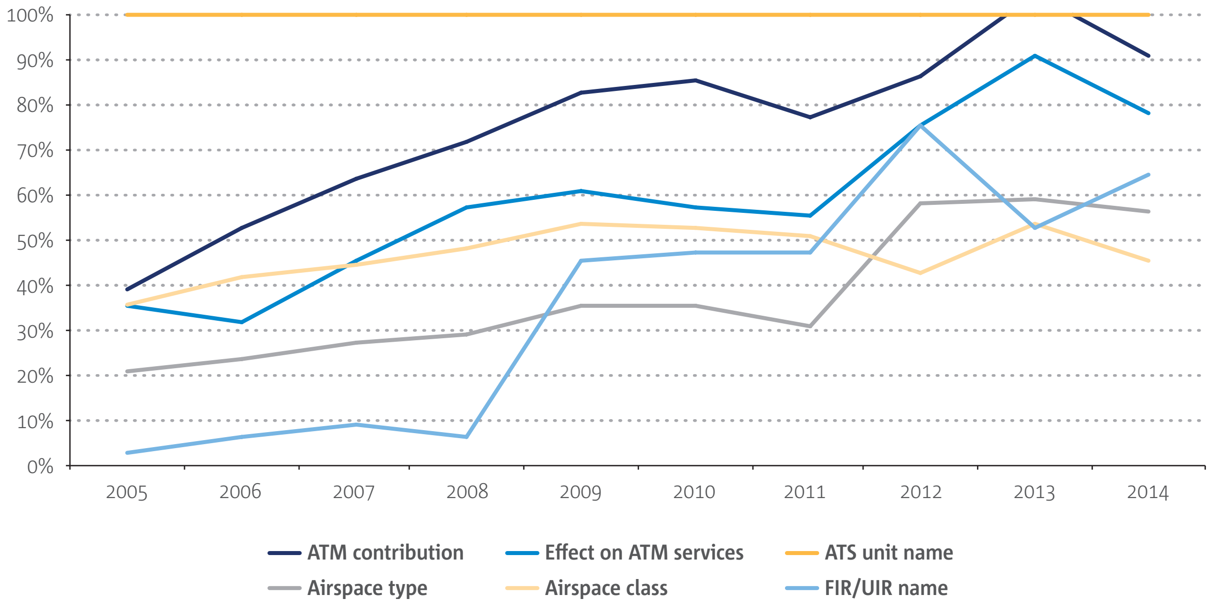


Figure 64 provides information on use of attribute fields related to air navigation services. In this instance, the ATS Unit Name attribute field was taken as a reference point against which the other attribute fields were compared.

Use of the FIR/UIR Name and ATM Contribution attribute fields increased more than 60% over the ten-year period 2005-2014 rising from three percent in 2005 to 65% in 2014 and from 38.9% in 2005 to 90.9% 2014 respectively. Important changes were noticed also in Airspace type and Airspace class attribute fields rising from 20.6% to 56.6% in 2014 and from 35.8% in 2005 to 45.5% respectively in 2014.

Figure 64: Usage trends within the ECR of R376/2014 air navigation services related data fields



Conclusion

Although it can been seen that there has been an increase in the use of most of the mandatory attribute fields over the ten-period 2005-2014 there is still room for significant improvement. The implementation of Regulation (EU) 376/2014 in November 2015 will introduce the requirement for reporting organisations and individuals to provide mandatory data. Undoubtedly the existence of such a large number mandatory fields as laid down in Regulation (EU) 376/2014 will in part stimulate work in this area. There are however other data quality aspects that will need to be addressed. This is particularly relevant when considering further improvements to standardised coding. EASA will seek the assistance of the Network of Analysts to extend this improvement work to the EASA MS. Improving data quality will directly benefit safety as it will permit more detailed and reliable analyses to be performed. This is essential when one considers that the data in question needs to support the safety risk management process that underpins the EASp. It must be remembered that improving data quality can only be achieved in a cooperative manner. As the ECR continues to improve, the task of analysing the data within it will fall to the European Network of Aviation Safety Analysts (NoA) This group brings together the safety analysis teams from the competent authorities of the EASA MS. The value of augmenting accident and serious incident data with incident data from the ECR will bring enormous benefits to the identification of safety issues. Every occurrence report is important and the establishment of Just Culture principles in the new Regulation will help to protect anyone who reports occurrences further.

Appendix 1

Acronyms and Definitions

Accident	An occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which: a) a person suffers a fatal or serious injury as a result of: being in or upon the aircraft; direct contact with any part of the aircraft, including parts which have become detached from the aircraft; or direct exposure to jet blast; except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or b) the aircraft sustains damage or structural failure which: adversely affects the structural strength, performance or flight characteristics of the aircraft; and would normally require major repair or replacement of the affected component; except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tyres, brakes, fairings, small dents or puncture holes in the aircraft skin; or c) the aircraft is missing or is completely inaccessible. *Source: ICAO Annex 13*
Aerial work (AW)	An aircraft operation in which an aircraft is used for specialised services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, or aerial advertisement.
ANS	Air Navigation Services
ASR	EASA Annual Safety Review
AST	Annual Summary Template
ATC	Air Traffic Control
ATM	Air Traffic Management
Commercial Air Transport (CAT)	An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.
CAST	Commerical Aviation Safety Team
CICTT	CAST-ICAO Common Taxonomy Team
CNS	Communications, Navigations and Surveillance
EASA	European Aviation Safety Agency
EASA MS	European Aviation Safety Agency Member States. These States are the 27 European Union Member States plus Iceland, Liechtenstein, Norway and Switzerland.
EASp	European Aviation Safety Plan
ECCAIRS	European Co-Ordination Centre for Aviation Incident Reporting Systems
EC	European Commission
ECR	European Central Repository for occurrences
EU	European Union

Fatal Accident	An accident that resulted in at least one fatality, flight crew and/or passenger or on the ground, within 30 days of the accident. (*Source:* ICAO Annex 13)
Fatal Injury	An injury which is sustained by a person in an accident and which results in his death within 30 days of the date of the accident. *Source: ICAO Annex 13*
FIR	Flight Information Region
General aviation (GA)	An aircraft operation other than a commercial air transport operation or an aerial work operation.
HEMS	Helicopter Emergency Medical Service
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
Light Aircraft	Aircraft with a maximum certificated take-off mass below 2 251 kg.
MTOM	Maximum certificated take-off mass
NAA	National Aviation Authorities
Occurrence	An accident, serious incident or incident
Scheduled air service	An air service open to use by the general public and operated according to a published timetable or with such a regular frequency that it constitutes an easily recognisable systematic series of flights which are open to direct booking by members of the public.
Serious Incident	An incident involving circumstances indicating that an accident nearly occurred. *Source: ICAO Annex 13*
Serious Injury	An injury which is sustained by a person in an accident and which: a) requires hospitalisation for more than 48 hours, commencing within seven days from the date the injury was received; b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; d) involves injury to any internal organ; e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or f) involves verified exposure to infectious substances or harmful radiation.
SMS	Safety Management System
Third-country operated aircraft	An aircraft which is not used or operated under control of a competent authority of an EASA Member State.

Occurrence Categories

Occurrence categories can be used to classify occurrences at a high-level to permit analysis of the data. The CICTT has developed the occurrence categories used in this Annual Safety Review. For further details on this team and the occurrence categories see the website **(http://intlaviationstandards.org/index.html)**

ARC	Abnormal runway contact
AMAN	Abrupt manoeuvre
ADRM	Aerodrome
ATM/CNS	Air Traffic Management/Communication Navigation Surveillance
BIRD	Collision/near Collision with bird(s)
CABIN	Cabin safety event
CFIT	Controlled flight into or toward terrain
CTOL	Collision with obstacle(s) during take-off and landing
EVAC	Evacuation
EXTL	External load related occurrence
F-NI	Fire/smoke (non-impact)
F-POST	Fire/smoke (post-impact)
FUEL	Fuel related
GCOL	Ground collision
GTOW	Glider towing related event
RAMP	Ground handling
ICE	Icing
LOC-G	Loss of control — Ground
LOC-I	Loss of control — In-flight
LOLI	Loss of lifting conditions en-route
LALT	Low altitude operation
MAC	Airprox/TCAS alert/loss of separation/near midair collisions/midair collision
OTHR	Other
RE	Runway excursion
RI-A	Runway incursion — Animal
RI-VAP	Runway incursion — Vehicle, aircraft or person
SEC	Security related
SCF-NP	System/component failure or malfunction (non-powerplant)
SCF-PP	System/component failure or malfunction (powerplant)
TURB	Turbulence encounter

UIMC	Unintended Flight in IMC
USOS	Undershoot/overshoot
UNK	Unknown or undetermined
WSTRW	Windshear or thunderstorm

ATM Accident Categories Acronyms

Accident categories can be used to classify occurrences at a high level to permit analysis of the data. The CICTT has developed the accident categories used in this Annual Safety Review. For further details on this team and the accident categories please see the website **(http://intlaviationstandards.org/index.html).**

CLR	Deviation of ATC Clearance
IS	Inadequate Separation
MAC	Mid-Air Collision
SMI	Separation Minima Infringement
UAP	Unauthorised Penetration of Airspace
RI	Runway Incursion is an occurrence 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.
COL	Collision with a vehicle, person or aircraft, while an aircraft is on the ground

Appendix 2

List of Figures and Tables

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TO-AD-15-001-EN-N

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