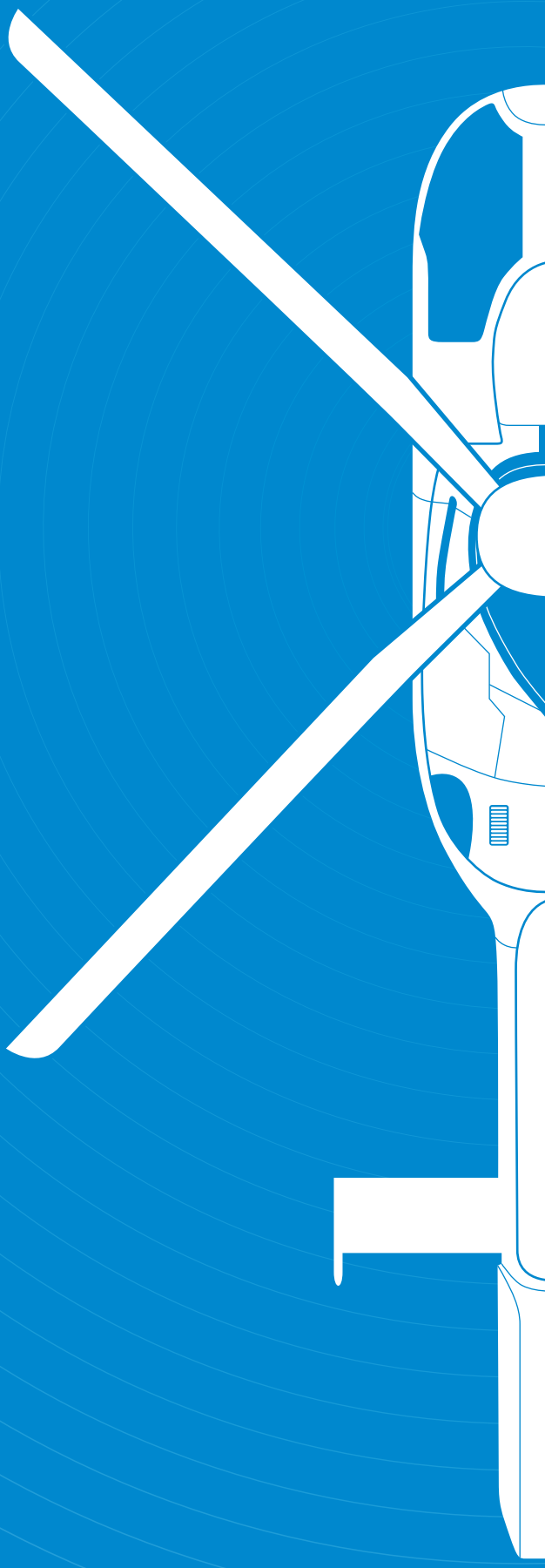
EASA
European Aviation Safety Agency



Annual Safety Review 2016

Disclaimer

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Acknowledgements

The authors wish to acknowledge the contribution made by the Member States and Eurocontrol to thank them for their support in the conduct of this work and in the preparation of this report.

Photocredits

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Contents

Foreword by the Executive Director

In 2015, the tragic events of Germanwings flight 9525 and Metrojet flight 9268 showed that Aviation safety is being challenged by new threats and emerging risks. To address these new risks the aviation community must continuously review and adjust the way it operates accordingly and promptly.

In July 2015, the EASA led Germanwings Taskforce delivered recommendations highlighting the need to look more closely at pilot assessment and to develop better support systems for pilots and aeromedical examiners.

Safety levels in Europe are also influenced by events in countries outside the European Union. We have increased our technical support to non-EU states so that the same safety principles delivered by the EASA system can be shared with others, particularly with authorities in economically emerging countries.

Conflicts around the world continue to challenge aviation authorities in their efforts to ensure the safe transport of passengers. The new threats highlight the need to further strengthen the links with security agencies. Towards this direction, EASA appointed a special military advisor to assist in the assessment of risks and to formulate appropriate mitigations.

However, safety and security risks are taking new forms through cybersecurity weaknesses and threats. The European Commission and the Member States through the EASA Management Board have endorsed the Agency's Cybersecurity strategy which is currently being implemented.

Due to the increasing population of unmanned aircraft systems (drones), EASA has been very active in this field, having proposed a flexible regulatory scheme to ensure the operation of drones does not affect the safety of the rest of the aviation system. Also, the Agency together with manufacturers and scientists is assessing the risk of collisions between drones and other aircraft.

The dynamic nature of aviation also means that the framework in which the Agency operates is reviewed and expanded. Updating the EASA Basic Regulation will further strengthen our ability to better address future challenges and continue to ensure the safety of aviation and that of EU citizens.

Patrick Ky
Executive Director

Introduction to the Annual Safety Review 2016

EASA is pleased to present the 2016 version of its Annual Safety Review. The Review has been published since 2005 and the content of the document continues to evolve. Safety Risk Portfolios are now provided for 10 different operational domains. For the first time analysis is provided on Remotely Piloted Aircraft System (RPAS) operations, otherwise known as drones. More than ever before, the analysis provided in this review aims to provide both a statistical summary of aviation safety in the EASA Member States (EASA MS) and to identify the most common safety issues that lead to accidents in the different operational domains of aviation. The safety risk portfolios provide the data-driven input to the decision-making process that supports the European Plan for Aviation Safety (EPAS). With respect to the safety risk portfolios, event types in the ECCAIRS/ADREP Taxonomy have been matched as closely as possible to the different safety issues however, a perfect match was not possible in all cases. Therefore, the numbers should on be taken as indicative of the general number of occurrences that relate to each safety issue.

How is the Annual Safety Review Produced?

The data used in the EASA Annual Safety Review comes from two specific data sources:

EASA's Occurrence Database: The main source of data is the Agency's own occurrence database, which collects accidents and serious incidents reported to the Agency by Accident Investigation Authorities world-wide and which is augmented by other information collected by the Agency. For operations involving commercial air transport aeroplanes, the basic categorisation of accidents and serious incidents is agreed at a global level in February each year within the ICAO Safety Indicator Study Group (SISG). In all domains, the data and its quality are also checked with the EASA MS through the Network of Analysts (NoA). EASA is grateful for the support of the safety analysis teams in the EASA MS in the development of the Review.

European Central Repository: The additional source of data is the European Central Repository (ECR) that is the central database of all occurrences reported to the competent authorities of the EASA MS. This is the primary source of information on incidents, which for the first time is integrated into the analysis in the Annual Safety Review in the different operational domains.

Overview of the Different Analysis Chapters of the Annual Safety Review

The Annual Safety Review is split into a number of chapters, each covering the different operational domains in the European Aviation System. There are no major changes in the approach taken in this Review compared with previous years. The Chapter on Commercial Air Transport Aeroplanes covers the full scope of worldwide operations. In the other chapters (and corresponding Safety Risk Portfolios) the scope is limited to the EASA MS, either as state of operator or state of registry. For the Aerodrome and ATM chapters this scope is limited to the EASA MS as state of occurrence. The Chapters of this Review cover the following areas:

Overview of the Information Provided in Each Chapter of the Annual Safety Review

Each chapter begins with a definition of the scope of the analysis performed. This includes definitions of the ECCAIRS Taxonomy areas used for the analysis, such as covering aircraft category, operation type, geographic boundaries etc. The information provided in each chapter includes key statistics and the top key risk areas for each operational domain that has been covered in this review.

Key Statistics.

Non-Commercial Helicopters. Non-commercial helicopter operations had the fifth-highest number of fatalities, which was a reduction of more than 50% when compared with the 10-year annual average.

The first part of analysis within each chapter provides the following key overview statistics.

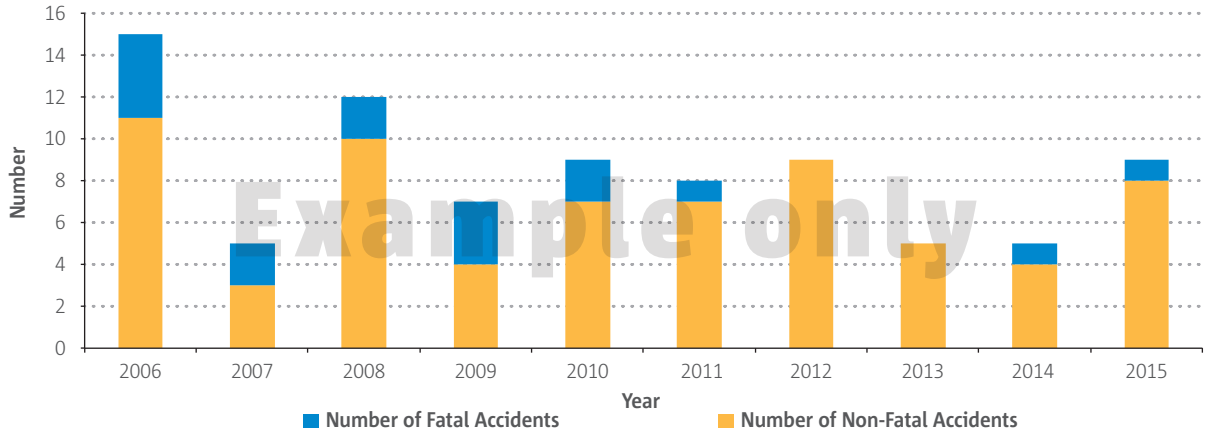
Number of Fatal Accidents, Accidents and Serious Incidents: A table is provided outlining the total number of fatal accidents, non-fatal accidents and serious incidents that occurred in the scope of each chapter in 2015 compared with the 10 year average for the period 2006 to 2015. The non-fatal accidents is the total number of accidents minus the fatal accidents. For some chapters where data is not available for the full 10 year period, this timescale in reduced to the 5 year period between 2011 to 2015.

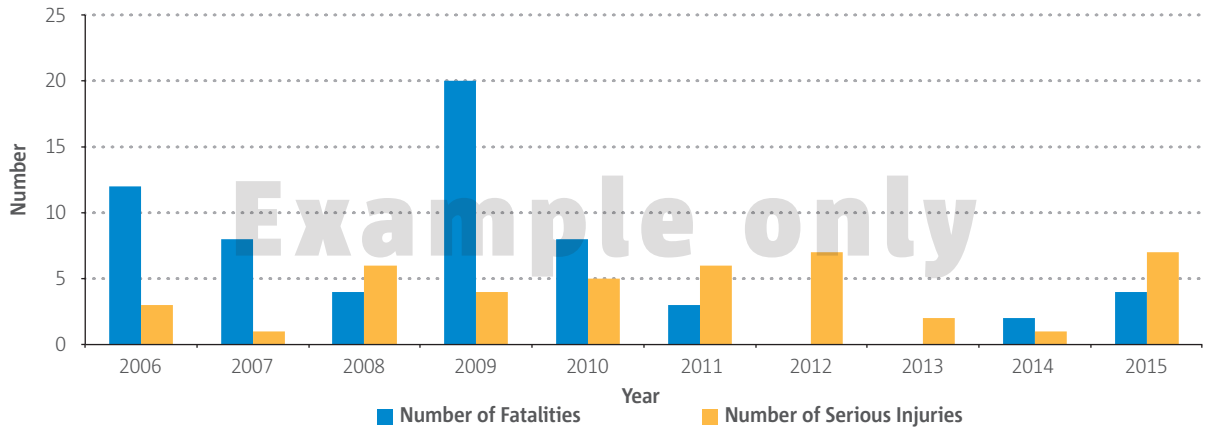
	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 average	Example (10.5)	Example (23.5)	Example (4.3)
2015	Example (10)	Example (22)	Example (6)

Number of Fatalities, Serious Injuries: A further table compares the number of fatalities and serious injuries in 2015 with either the 10 year average for 2006 to 2015 or the 5 year average for 2011 to 2015.

	Fatalities	Serious Injuries
2005-2014 average	Example (11.3)	Example (5.6)
2015	Example (23)	Example (15)

Domain Safety Performance – Past 10 Years: The next part of the analysis provides 2 timeline graphs. The first shows the change in the number of Fatal Accidents and Non-fatal Accidents over the past 10 years, the other covers the number of fatalities and serious injuries.





Additional Domain Statistical Information: Depending on the relevance in each domain, additional analysis is then provided that covers the following areas:

Phase of Flight: In most chapters a graphic is provided to highlight in which phases of flight the different accidents and serious incidents occurred.

Operation Type: In chapters that cover a range of different operation types a further analysis of the different operation types where accidents and serious incidents occurred.

Propulsion Type: The final analysis offered for some domains provides information on the number of accidents and serious incidents in the different propulsion types involved in a particular domain. For example in commercial air transport aeroplanes an analysis of Turbofan and Turboprop occurrences is included.

Safety Risk Portfolios: The key part of the analysis for each chapter results in the provision of the Domain Safety Risk Portfolio. As previously mentioned, in the Safety Risk Portfolios during the analysis the Event Types in the ECCAIRS/ADREP Taxonomy have been matched as closely as possible to the different Safety Issues but this was not a perfect match in all cases and therefore the numbers should on be taken as indicative of the general number of occurrences related to each Safety Issue. In the absence of meaningful data or a zero value a - has been inserted. An explanation of its structure is provided below:

Key Risk Areas (Horizontally along the top): The key risk areas provide information on the most frequent outcomes for each operational domain both in terms of the percentage of fatal and non-fatal accidents. For most Domain Safety Risk Portfolios this analysis covers a 10 year period from 2006 to 2015. Where data is not available for this full period, this analysis covers only a 5 year period from 2011 to 2015. This provides the initial prioritisation of the key risk areas for each operational domain.

Safety Issues (Vertically on left hand side): Safety Issues are the areas of safety concern that may cover one or more identified safety deficiencies that may lead to an accident. The Safety Issues are defined following an analysis of the causal and contributory factors involved in occurrences, using neutral language for the wording of the issue. Within each Safety Risk Portfolio the Safety Issues are grouped into the areas of Operational, Technical, Human and Organisational. They are then ordered by the number of fatal accidents, accidents, serious incidents and incidents (taken from the ECR) in which those Safety Issues are seen to be present or involved. This ordering is then used to support initial prioritisation of follow up analysis. In the Safety Risk Portfolios, Event Types in the ECCAIRS/ADREP Taxonomy have been matched as closely as possible to the different Safety Issues but this was not a perfect match in all cases and therefore the numbers should be taken as indicative of the general number of occurrences related to each Safety Issue.

Main Domain Priorities - Top Key Risk Areas and Safety Issues

The final part of the analysis tries to identify the main safety priorities for each operational domain in terms of the key risk areas and Safety Issues. The priorities are largely based on data but there are also other elements that are considered. The assessment takes into consideration the involvement of a particular safety issue in occurrences that occurred within the EASA MS or involving EASA MS operators, involvement in occurrences in the wider world-wide context where a Safety Issue could be expected to manifest itself within the European aviation system, and expert judgement. This final component is derived following discussions between EASA, Member States and industry in groups such as the Network of Analysts (NoA) and the Domain-specific Collaborative Analysis Groups (CAGs).

Overview of Aviation Safety in the EASA MS

1

This chapter provides a general overview of aviation safety in the EASA MS. It compares the number of fatal accidents and fatalities in each operational domain in 2015 with the annual average for the past 10 years.

The top 5 operational domains in terms of the number of fatalities in 2015 were:

CAT Aeroplanes: In 2015 the domain with the highest number of fatalities was CAT Aeroplanes. This involved a single fatal accident, which was the Germanwings accident that occurred on 24 March 2015. In 2014, there were 2 fatal accidents and there has not been more than 2 fatal accidents in CAT Aeroplanes since 2005. This operational domain is the greatest focus of EASA's safety activities and the reorganisation of the collaborative groups and advisory bodies will help the Agency to learn more about the safety challenges faced by airlines and manufacturers.

Non-Commercial Aeroplanes: In terms of fatal accidents, the second highest number occurred in non-commercial operations with aeroplanes. This domain also had the second highest number of fatalities with 65, which is less than the 10-year annual average of 79. The General Aviation Roadmap is key to the Agency's strategy for non-commercial aeroplanes and the establishment of a Collaborative Analysis Group (CAG) in this area to support the work of the current General Aviation Sub-Safety Consultative Committee will help to identify the most effective safety actions.

Gliders/Sailplanes: The domain of glider/sailplane operations had the 3rd highest number of fatalities with 27 and the 2nd highest number of fatal accidents, of which there were 24. Both the number of fatalities and the number of fatal accidents were slightly higher than the 10-year annual average.

Aerial Work/Part SPO Aeroplanes: In 2015, there were 2 major accidents involving aerial work/Part SPO operations with aeroplanes. They were an airborne collision between 2 LET-410 aircraft taking part in parachuting operations in Slovakia, which led to 7 fatalities, and the Shoreham Airshow accident in the United Kingdom where there were 11 ground fatalities. These 2 accidents led to a much higher number of fatalities compared with the 10-year annual average despite there being the same number of fatal accidents. Following the Shoreham accident, the UK CAA completed a review of public air display arrangements and produced an associated actions report. In addition, EASA is currently performing specific analysis on parachuting operations to understand more about the risks and consider how improvements can be made with experts from this domain.

Non-Commercial Helicopters: non-commercial helicopter operations had the 5th highest number of fatalities, which was a reduction of more than 50% when compared with the 10-year annual average.

Table 1: Overview fatal accidents and fatalities 2015 Vs 10 year average

	Domain	Fatal Accidents 2015	Fatal Accidents Annual 10 Year Average	Fatalities 2015	Fatalities Annual 10 Year Average
	**CAT Aeroplanes**	1	1.3	150	64.2
	**Offshore**	0	0.4	0	3
	**CAT Helicopters**	1	2	4	9.1
	**Aerial Work/Part SPO Aeroplanes**	7	7	23	11.3
	**Aerial Work/Part SPO Helicopters**	2	4.3	4	8.5
	**Non-Commercial Aeroplanes**	41	42.2*	65	79*
	**Non-Commercial Helicopters**	6	8.2*	7	14.5*
	**Balloons**	2	0.6*	3	1.8*
	**Gliders**	24	22.3*	27	25.9*
	**RPAS**	0	0*	0	0

*Annual average is 5 years only from 2011-2015

Commercial Air Transport Aeroplanes

2

This Chapter covers the scope of commercial air transport operations involving aeroplanes over 5700 kg MTOM and operated by an EASA MS Air Operators Certificate (AOC) holder/airline. The use of the state of operator is pertinent only to the chapters on commercial air transport. This chapter provides the key statistics, the safety risk portfolio and discusses the key safety strategic priorities at the European level.

Key Statistics

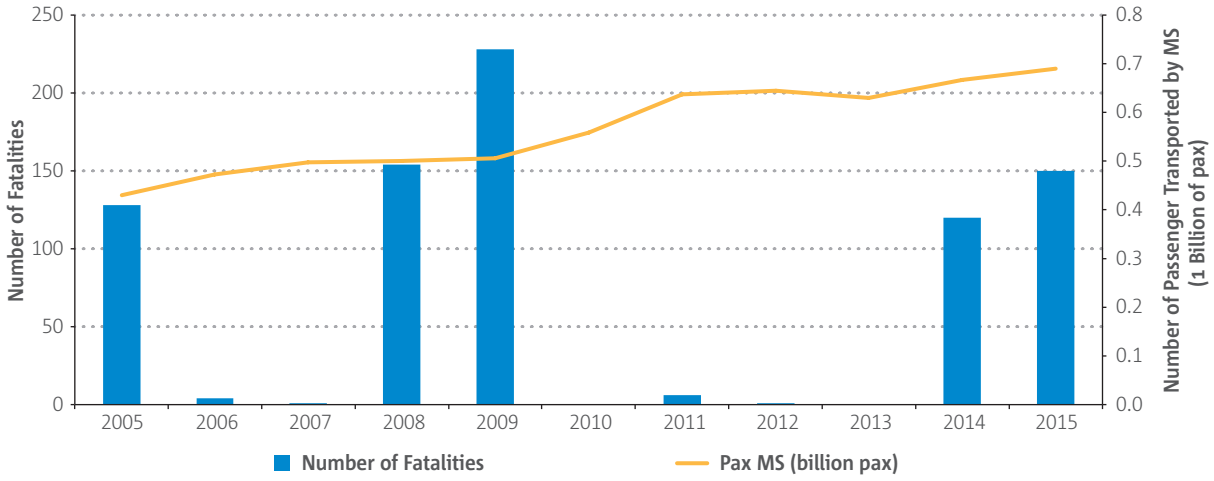
The key domain statistics are in the tables below and include the accidents and serious incidents invovling EASA MS AOC holders. The only fatal accident in CAT aeroplanes involving an EASA MS operator in 2015 was the Germanwings accident on 24 March 2015. It can be observed that there was a higher number of non-fatal accidents involving EASA MS operators in 2015 than the 10-year average, with 24 compared to the average of 21.8 over the previous 10 years. At the same time, there was a 24% reduction in the number of serious incidents over the same period with a total of 58 serious incidents compared with the average of 75.8. In terms of fatalities, the single fatal accident resulted in 150 fatalities, which is higher than the 10 year average. There was also a slight increase in serious injuries with 11 compared with 9.2 over the previous 10 years.

Table 2: Key statistics CAT aeroplanes

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	1.3	21.8	75.8
2015	1	24	58

	Fatalities	Serious Injuries
2005-2014 Annual average	64.2	9.2
2015	150	11

Figure 1: CAT aeroplane fatalities per billion passengers transported 2005-2015

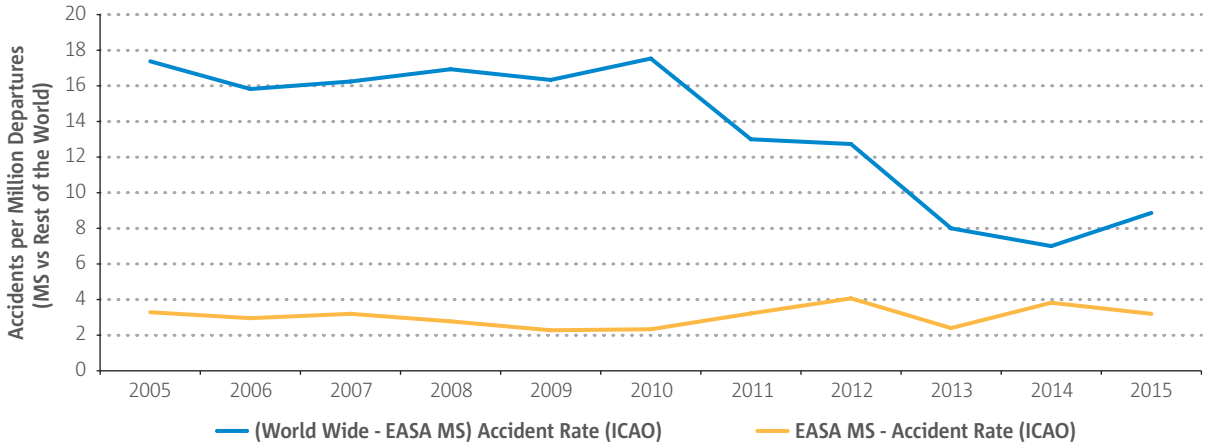


EASA MS AOC holders show a lower rate of fatal accidents per one million departures than the rest of the world. The rate has remained well below 0.5 fatal accident per million departures since 2006.

Figure 2: CAT aeroplane fatal accident rate per million departures world-wide vs EASA MS

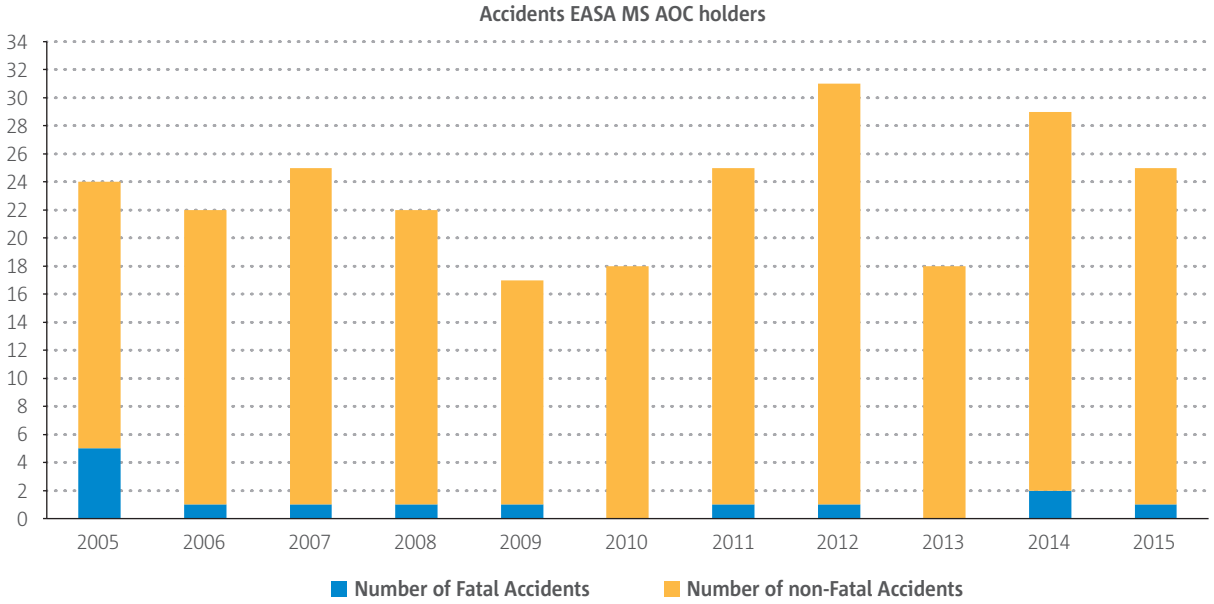
In terms of accidents, EASA MS operators are also below the worldwide rate, with a rate lower than 5 accidents per million departures since 2005.

Figure 3: CAT aeroplane accident rate per million departures world-wide vs EASA MS



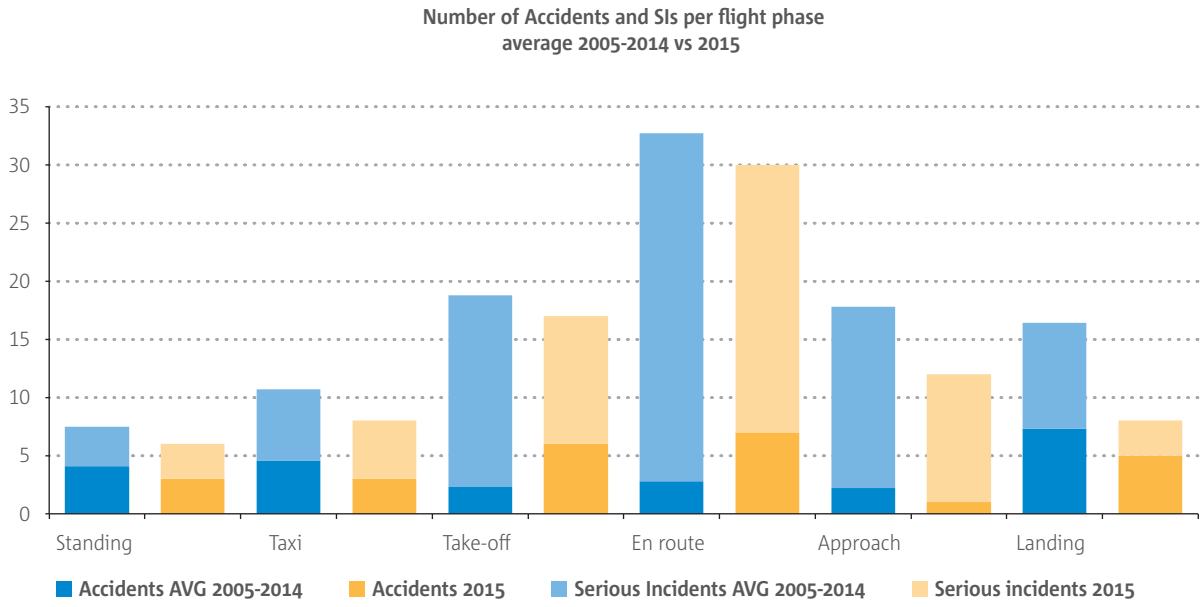
The actual number of accidents in the previous 10-year series varies from the lowest in 2009 with 17 accidents to a maximum of 31accidents in 2012. In 2015 there were 25 accidents, which is within the average of the historical series.

Figure 4: CAT aeroplane accidents EASA MS AOC holders



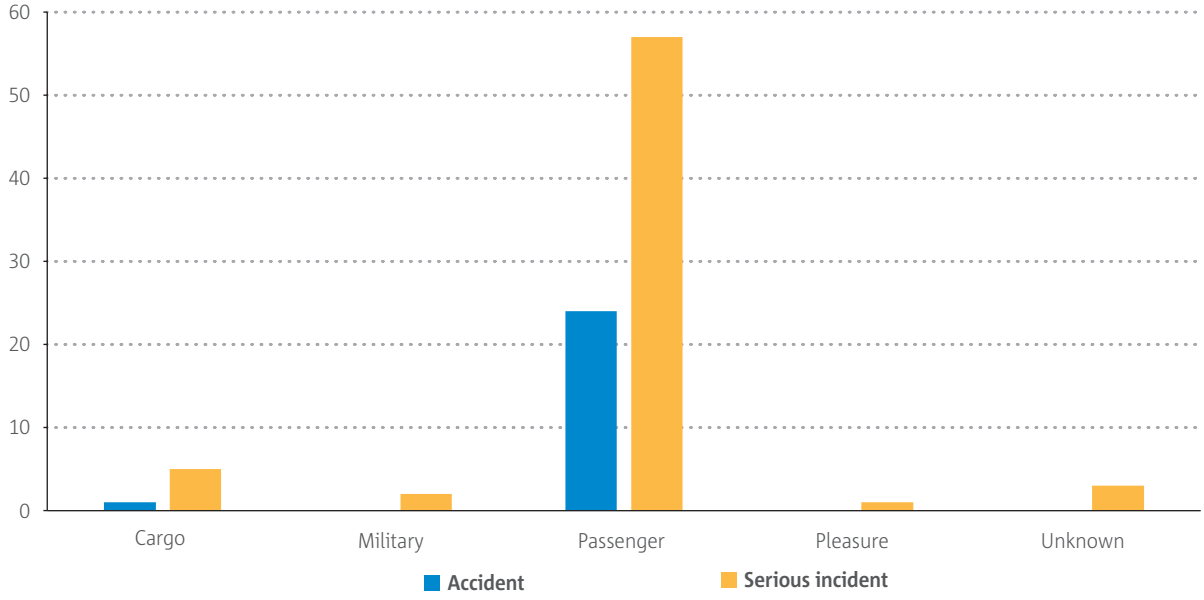
Phase of Flight: The majority of accidents and serious incidents are still taking place during the en-route phase, followed by the take-off, approach and landing. The comparison of the ten-year average per flight phase with the actual figures for 2015 shows an overall decrease across all flight phases. The same comparison particularised for accidents shows an increase in en-route and take-off phases. The type of accidents in these two phases are en-route turbulence encounter and aircraft technical issues at take-off.

Figure 5: CAT aeroplane accidents and serious incidents per phase of flight 2005-2015



Cargo vs Passenger: The split in terms of operation type of the aircraft involved in accidents or serious incidents in 2015 shows passenger or cargo commercial transport the main player and the presence of other operation types such as military operations or pleasure flights where they have interacted with CAT aeroplane operations in occurrences. These two last ones being part of near mid-air collisions.

Figure 6: CAT aeroplane accidents and serious incidents by operation



Turbofan vs Turbofan: The distribution per propulsion aircraft type shows a significant difference between the ratio of accidents and serious incidents for turbofans and turboprops. This is most likely due to the fact that there are more turbofan aircraft flying rather than any difference in the level of safety. Higher figures for turbofan include accidents involving en-route turbulence at high flight levels resulting in injuries to passengers or crew that are not present in turboprop aircraft that fly at lower altitudes.

Figure 7: CAT aeroplane accidents and serious incidents by propulsion

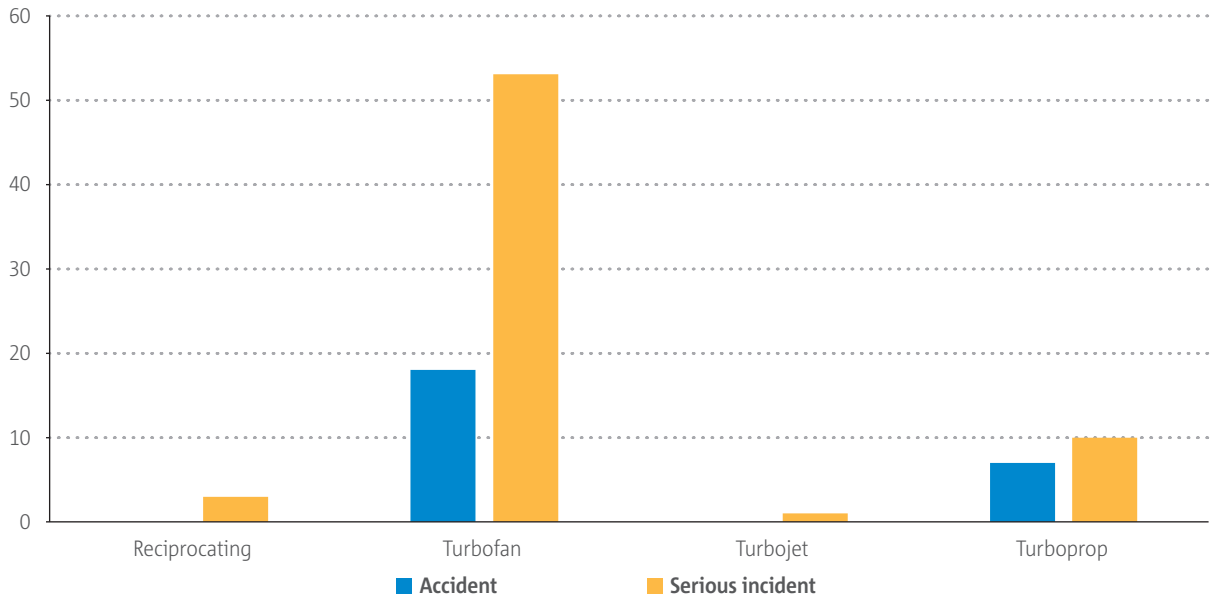


Table 3: CAT aeroplanes safety risk portfolio

Commercial air transport - aeroplanes

Outcome Percentage of Fatal Accidents (2006-2015)		11				64%	45%	27%	18%	18%	9%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2006-2015)		283				7%	22%	36%	30%	5%	1%	5%	0%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes and precursors)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	System Failure	Ground Collisions and Ground Handling	Abnormal Runway Contact and Excursions	Terrain Conflict	Runway Incursions	Fire	Airborne Conflict
Operational	Detection, recognition and recovery of deviation from normal operations	569	22	12	2	■		■	■	■			
	Operation in adverse weather conditions	9 209	37	33	1	■	■	■	■	■	■		■
	Ground handling operations	10 697	8	7	1	■		■	■	■	■	■	■
	Maintaining adequate separation between aircraft on the ground and in the air	10 001	43	8	—	■	■	■					■
	Pre-flight preparation/ planning and in-flight re-planning	2 535	7	2	—	■		■	■	■	■		■
	Aircraft maintenance	1 318	7	1	—	■	■	■	■	■	■	■	■
	Fuel management	30	9	—	—	■	■			■			
	Birdstrikes	11 421	3	—	—	■	■	■	■			■	
	Calculation and entry of take-off and landing parameters into aircraft system	3	3	—	—	■		■	■				
	Handling and execution of go-arounds	2	4	—	—	■			■	■			■
	Prevention and resolution of conflict with aircraft not fitted with transponders	95	2	—	—								■
	Dangerous goods handling	4	—	—	—			■				■	

Commercial air transport - aeroplanes

Outcome Percentage of Fatal Accidents (2006-2015)		11				64%	45%	27%	18%	18%	9%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2006-2015)		283				7%	22%	36%	30%	5%	1%	5%	0%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes and precursors)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	System Failure	Ground Collisions and Ground Handling	Abnormal Runway Contact and Excursions	Terrain Conflict	Runway Incursions	Fire	Airborne Conflict
Technical	Handling and operation of the aircraft following a technical failure	564	15	12	1	■	■	■	■	■	■	■	
	False or disrupted ils signal capture	202	4	—	—	■			■	■			
	Contamination of controls or critical surfaces	177	2	—	—	■		■	■			■	
	Damage tolerance to RPAS collisions	6		—	—	■	■		■			■	■
Consequences	Suitability of recording devices	19	3	5	2	■	■		■	■		■	■
	Survivability and evacuation	18	2	6	1	■	■	■	■	■	■	■	
Human	Personal readiness and crew impairment	1 718	40	1	1	■	■	■	■	■	■	■	■
	Flight crew perception and awareness/ decision making and planning	34	11	5	—	■	■	■	■	■	■		■
	CRM and communication	3 083	17	5	—	■	■	■	■	■	■	■	■
	Monitoring of flight parameters and automation modes	—	5	—	—	■		■	■	■			■
	Knowledge of aircraft systems and use of associated procedures	—	2	—	—	■	■	■	■	■	■	■	■
Organisational	Implementation of reporting systems and safety management	—	2	—	—	■	■	■	■	■	■	■	■
	Oversight of organisations	—	—	—	—	■	■	■	■	■	■	■	■

CAT Aeroplanes Safety Risk Portfolio

The CAT Aeroplanes Safety Risk Portfolio is shown above, which provides the full picture of the key risk areas and safety issues in this domain.

The portfolio is the result of the identification of safety issues through the analysis of safety data (historical occurrence data), and includes the joint expert judgment of the Agency, the Member States and industry, through the Network of Analysts (NoA) and the Collaborative Analysis Group in the Commercial Air Transport domain (CAT CAG), respectively. In terms of timeframe, the data populating safety issues covers a 5 year period (2011-2015), while for the safety issues risk areas the data covers 10 years. This is to increase the representativeness of the data for risk areas that are mainly associated with accidents, which are less frequent in the CAT aeroplane domain.

CAT Aeroplane – Key Risk Areas

CAT Aeroplane Key Risk Area 1 – Aircraft Upset in Flight (Loss of Control): A total of 64% of fatal accident outcomes involve loss of control, which has been the most frequent fatal accident type during the last 10 years. This risk area also includes events that are direct precursors to a loss of control event, such as a deviation from flight path, abnormal airspeed or triggering of stall protections. Below are the actions currently ongoing in the European Plan for Aviation Safety (EPAS) that are related to this key risk area.

Table 4: CAT aeroplane key risk area 1 – aircraft upset in flight (loss of control)

EPAS Actions	**Rulemaking**	**RMT.0647**	Loss of control or loss of flight path during go-around or climb
	Rulemaking	**RMT.0397**	Unintended or inappropriate rudder usage — rudder reversals
	Rulemaking	**RMT.0581**	Loss of control prevention and recovery training
	Rulemaking	**RMT.0116**	Real weight and balance of an aircraft
	Rulemaking	**RMT.0118**	Analysis of on-ground wings contamination effect on take-off performance degradation
	Rulemaking	**RMT.0581**	Loss of control prevention and recovery training
	Action on Member States	**MST.004**	Include loss of control in flight in national SSPs
	Safety Promotion	**SPT.012**	Promote the new European provisions on pilot training
	Research project	**RES.005**	Startle effect management

CAT Aeroplane Key Risk Area 2 – Aircraft System Failure: With 45% of fatal accidents involving technical failures in some way during the past 10 years, this is both a major accident outcome and a precursor to other types of accident. Specific analysis work is ongoing to identify the systemic, safety issues that may be present in the domains of airworthiness, maintenance and production.

Table 5: CAT aeroplane key risk area 2 – aircraft system failure

EPAS Actions	Rulemaking	RMT.0049	Specific risk and standardised criteria for conducting aeroplane-level safety assessments of critical systems
	Rulemaking	RMT.0217	CAMOs' and Part-145 organisations' responsibilities
	Rulemaking	RMT.0393	Maintenance check flights (MCFs)
	Rulemaking	RMT.0453	Ditching parameters without engine power
	Rulemaking	RMT.0521	Airworthiness review process
	Rulemaking	RMT.0586	Tyre pressure monitoring system
	Rulemaking	RMT.0588	Aircraft continuing airworthiness monitoring — Review of key risk elements
	Rulemaking	RMT.0671	Engine bird ingestion
	Rulemaking	RMT.0686	HP rotor integrity and loss-of-load (due to shaft failure)

CAT Aeroplane Key Risk Area 3 - Ground Collisions and Ground Handling: This key risk area refers to the collision of the aircraft with other aircraft, obstacles or vehicles while the aircraft is moving on the ground, either under its own power or being towed. It also includes all ground handling related issues (aircraft loading, refuelling, etc.). Over the last 10 years, 27 % of fatal accidents involved ground collision and other associated ground events. There has been an increasing trend in this area and the subject has featured highly in discussion with Member States at the NoA and industry at the CAT CAG. A dedicated analysis task will be carried out during 2016 in order to complete the identification of safety issues leading to this type of outcome.

Table 6: CAT aeroplane key risk area 3 - ground collisions and ground handling

EPAS Actions	Rulemaking	RMT.0116	Real weight and balance of an aircraft
	Rulemaking	RMT.0118	Analysis of on-ground wings contamination effect on take-off performance degradation
	Action on Member States	MST.018	Include ground safety in national SSPs
	Action on Member States	RES.001	Erroneous weight or centre of gravity
	Research project	RES.004	Transport of lithium battery by air

CAT Aeroplane Key Risk Area 4 – Terrain Conflict (CFIT): It includes the controlled collision with terrain together with undershoot or overshoot of the runway during approach and landing phases. It comprises those situations where the aircraft collides or nearly collides with terrain while the flight crew has control of the aircraft. It also includes occurrences which are the direct precursors to the fatal outcome, such as descending below weather minima, undue clearance below radar minima, etc. This risk area is the second in contribution to fatal accidents in the last 10 years with 18% of those accidents.

Table 7: CAT aeroplane key risk area 4 – terrain conflict (CFIT)

EPAS Actions	Rulemaking	RMT.0371	TAWS operation in IFR and VFR and TAWS for turbine-powered aeroplanes under 5 700 kg MTOM able to carry six to nine passengers
	Action on Member States	MST.006	Include CFIT in national SSPs

CAT Aeroplane Key Risk Area 5 - Runway Incursions: It refers to the incorrect presence of an aircraft, vehicle or person on an active runway or in its areas of protection. In the last 10 years, 18% of fatal accidents within the EASA MS involve Runway Incursions. More detailed analysis of this key risk area is planned for later in 2016 together with the development of the ATM and Aerodrome Risk Portfolio.

Table 8: CAT aeroplane key risk area 5 - runway incursions

EPAS Actions	Action on Member States	MST.014	Include runway incursions in national SSPs
	Action on Member States	MST.011	Runway safety teams
	Action on Member States	MST.018	Include ground safety in national SSPs

CAT Aeroplane Key Risk Area 6 - Abnormal Runway Contact and Excursions: This key risk area covers the risk of runway excursions, including the direct precursors such as hard landings, high speed landing, landings following an unstabilised approach. It also includes the tail, wing, engine nacelle strike during take-off or landing. This risk area represents 9% of the fatal accidents in the last 10 years.

Table 9: CAT aeroplane key risk area 6 - abnormal runway contact and excursions

EPAS Actions	Rulemaking	RMT.0296	Review of aeroplane performance requirements for CAT operations
	Rulemaking	RMT.0369	Prediction of wind shear for aeroplane CAT operations (IRs)
	Rulemaking	RMT.0570	Reduction of runway excursions
	Rulemaking	RMT.0116	Real weight and balance of an aircraft
	Rulemaking	RMT.0118	Analysis of on-ground wings contamination effect on take-off performance degradation
	Action on Member States	MST.007	Include runway excursions in national SSPs
	Action on Member States	MST.011	Include ground safety in national SSPs
	Action on Member States	MST.018	Promoting EAPPRE
	Research project	RES.001	Erroneous weight or centre of gravity
	Safety Promotion	SPT.075	Runway safety teams

CAT Aeroplane Key Risk Area 7 - Airborne Conflict: It refers to the potential collision of two aircraft in the air. It includes direct precursors such as separation minima infringements, genuine TCAS resolution advisories or airspace infringements. Although there have been no CAT aeroplane airborne collision accidents in recent years within the EASA MS, this key risk area has been raised by a number of Member States at the NoA and also by some airlines, specifically in the context of the collision risk with aircraft without transponders in uncontrolled airspace. This is one specific Safety Issue that is a main priority in this key risk area.

Table 10: CAT aeroplane key risk area 7 - airborne conflict

EPAS Actions	Rulemaking	RMT.0376	Carriage of ACAS II equipment on aircraft other than aeroplanes in excess of 5 700 kg or 19 pax
	Rulemaking	RMT.0445	Technical requirements and operational procedures for airspace design, including procedure design
	Rulemaking	RMT.0464	Requirements for air traffic services
	Rulemaking	RMT.0477	Technical requirements and operational procedures for aeronautical information services and aeronautical information management
	Action on Member States	MST.010	Include MACs in national SSPs
	Action on Member States	MST.024	Loss of separation between civil and military aircraft
	Safety Promotion	SPT.052	Promote the deployment of ground-based safety nets
	Safety Promotion	SPT.053	Study the performance and promote safe operations of airborne safety nets
	Safety Promotion	SPT.070	Ground-based ATM safety nets

CAT Aeroplane Key Risk Area 8 - Fire: While there were no fatal accidents involving EASA MS operators in the last 10 years involving fires, there have been occurrences in other parts of the world that make it an area of concern within the EPAS.

Table 11: CAT aeroplane key risk area 8 - fire

Rulemaking Programme	Requirements	RMT.0071	Additional airworthiness specifications for operations: Thermal/acoustic insulation material
EPAS Actions	Action on Member States	MST.005	Include fire, smoke and fumes in national SSPs
	Safety Promotion	SPT.069	Transportation of lithium batteries
	Research project	RES.002	Research study on toxicity
	Research project	RES.003	Research study on cabin Air quality
	Research project	RES.004	Transport of lithium battery by air

CAT Aeroplanes Main Domain Priorities - Top Safety Issues

The top safety priorities for CAT aeroplanes in terms of the specific safety issues are outlined below. As previously described, these are based on both data analysis and expert judgement:

Operational Safety Issues

CAT Aeroplane – Operational Safety Issue 1 - Detection, Recognition and Recovery from Normal Operations. This is the top safety issue in CAT aeroplanes. For aircraft upset, this involves ability of flight crew to identify potential loss of control situations and to take the correct recovery action. In terms of the prevention of abnormal runway contact events and runway excursions, the risk assessment of this safety issue is will look in more detail at landing scenarios involving unstabilised approaches. It will also consider other pre-cursors that rely on early identification of undesirable aircraft states and subsequent correct recovery action.

CAT Aeroplane – Operational Safety Issue 2 - Operation in Adverse Weather Conditions: this safety issue is defined as the ability and/or capability of the flight crew to manage the flight in adverse weather conditions. It covers flight planning, availability of meteorological information, aircraft dispatch, ground de-icing, aircraft systems, flight crew decision making and tools or procedures that assist the crew. Specifically, adverse weather is considered as atmospheric conditions that might normally be encountered during CAT operations and

not necessarily extreme conditions. For the assessment a number of scenarios are considered such as icing on ground, icing on flight, turbulence, wind-shear, cross-winds and heavy precipitation.

CAT Aeroplane – Operational Safety Issue 3 - Calculation and Entry of Take-Off and Landing Parameters into Aircraft Systems[1]: Following a number of serious incidents in other parts of the world as well as a number of incidents in the EASA MS, work in ongoing on this Safety Issue to reduce the likelihood of it leading to both aircraft upset and also runway excursions.

CAT Aeroplane – Operational Safety Issue 4 – Handling and Operation of the Aircraft Following a Technical Failure: A specific Safety Issue already identified associated with technical failure is the handling and operation of the aircraft by flight crew following a technical failure.

CAT Aeroplane – Operational Safety Issue 5 - Maintaining Adequate Separation with Aircraft (In the Air and on the Ground)[2]: The most common safety issue in this key risk area that will now be subject to a full assessment with regards to the risk of ground collisions is the maintenance of adequate separation with aircraft, both between aircraft on the ground and between aircraft and vehicles/ground equipment. The safety issue also covers the prevention of mid-air collisions.

CAT Aeroplane – Operational Safety Issue 6 - Ground Handling Operations: Closely related to the prevention of ground collisions and other ground handling events is the safety issue of ground handling operations, which has an influence on a number of different safety outcomes. For example, incorrect loading that might lead to loss of control.

CAT Aeroplane – Operational Safety Issue 7 - Prevention and Resolution of Conflict with Aircraft Not Fitted With Transponders. This safety issue covers 2 specific scenarios. The first scenario involves airborne conflict risks between CAT aeroplanes and light aviation in uncontrolled airspace. This specifically relates to the situation where the light aircraft is not fitted with a transponder. EASA continually monitors the development of new technological solutions and has started a further internal investigation, which will examine all possible affordable actions to reduce the number of airprox and potential mid-air collisions in uncontrolled airspace. The second scenario involves airborne conflict risks with RPAS. This is especially relevant during departure and approach flight phase. Various initiatives are in progress including the study of potential use of geo-fencing to prevent RPAS being able to fly into certain areas of airspace and improving the knowledge of RPAS users on airspace structure and associated operating rules.

1 The data for this Safety Issue is specifically taken from the Level 4 Event Type of Data Entry Error.

2 The data for this Safety Issue covers Event Types related to Collision, Near Collision and Separation related events both on the ground and in the air, hence the large number of occurrences, most of which were of a low risk.

Human Factors Safety Issues

CAT Aeroplane – Human Factors Safety Issue 1 – Personal Readiness and Crew Impairment: This safety issue is a priority analysis area, especially in relation to crew impairment in response to the French BEA's safety recommendations on the Germanwings accident. This safety issue includes the personal readiness aspects such as flight crew knowledge and training as well as crew impairment due to a range of causes including fatigue, medical or psychological factors.

CAT Aeroplane – Human Factors Safety Issue 2 - Flight Crew Perception and Awareness: During the initial analysis of aircraft upset, perception of aircraft attitude and awareness of aircraft status and automation modes were identified as key factors and on which further analysis is underway.

CAT Aeroplane – Human Factors Safety Issue 3 - CRM and Communication: The final priority safety issue in the area of HF is related to crew resource management (CRM) and communication. There have recently been changes to CRM training developed under RMT.0411 and the implementation needs further promotion and continual monitoring.

Organisational Safety Issues

CAT Aeroplane – Organisational Safety Issue 1 – Implementation of Reporting Systems and Safety Management: Implementation of an effective safety management system (SMS) is vital for all organisations in aviation and this safety issue will enable this subject to be included within the EPAS. Following the entry into force of Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, this Safety Issue will also enable further work to improve reporting processes, occurrence investigation at organisational level and also the continued development of integrated data collection taxonomies.

CAT Aeroplane – Organisational Safety Issue 2 – Oversight of Organisations: The final priority Safety Issue covers the broad area of organisational oversight and this refers to a recurrent concern about the lack of qualified NAA resources for the oversight of organisations.

Commercial Air Transport Helicopters

3

Introduction: This chapter covers commercial air transport operations involving helicopters and it is split into two different parts in this review. The first of these covers offshore helicopters, which provides the key statistics, the safety risk portfolio and discusses the key strategic safety priorities at the European level that have been developed with the Offshore Helicopter CAG. The other part of the chapter covers all other CAT Helicopter operations. In the next phase of the analysis for the EPAS a specific safety risk portfolio for Helicopter Emergency Medical Services (HEMS) operations will be developed. In both parts of the chapter the scope is helicopter operations by an EASA MS AOC holder.

Offshore Helicopter Operations

Key Statistics

The key statistics in Offshore Helicopters, involving EASA MS AOC holders are provided below. There were no accidents in this domain during 2015 and only 1 serious incident. In addition, there were no fatalities or serious injuries in 2015. The past 2 years has seen no fatal accidents in offshore helicopters and there has been a continual improvement since 2006 when there were 3 fatal accidents and 5 non-fatal accidents. There have been no fatalities or serious injuries in offshore helicopters over the past 2 years.

Table 12: Key statistics CAT helicopter off-shore operations

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	1.3	2.2	1.8
2015	0	1	0

	Fatalities	Serious Injuries
2005-2014 Annual average	7,2	1.9
2015	0	0

Figure 8: CAT helicopter off-shore operations fatal and non-fatal accidents 2006-2015

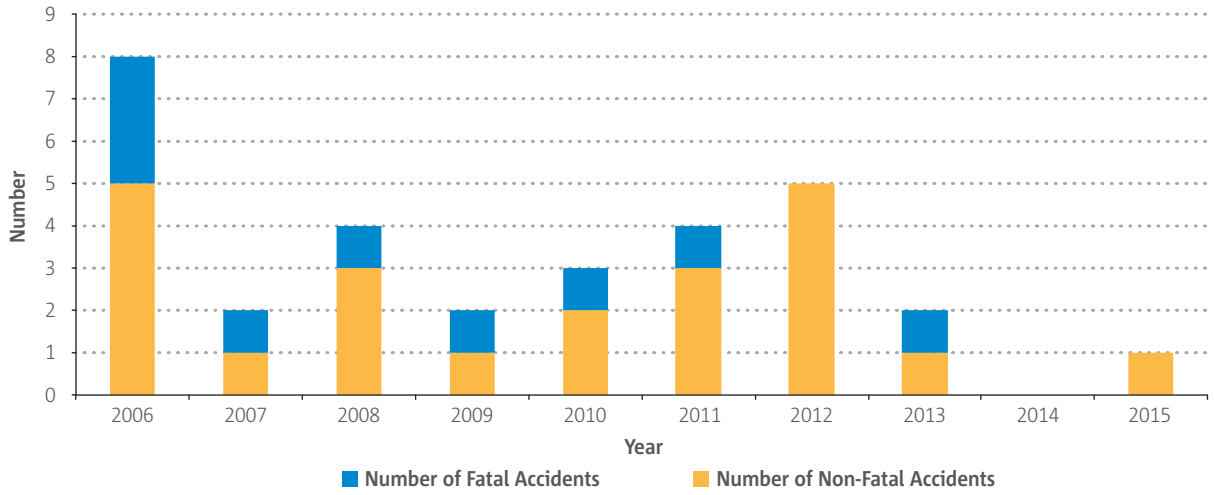


Table 13: CAT helicopter off-shore operations safety risk portfolio

Offshore helicopters

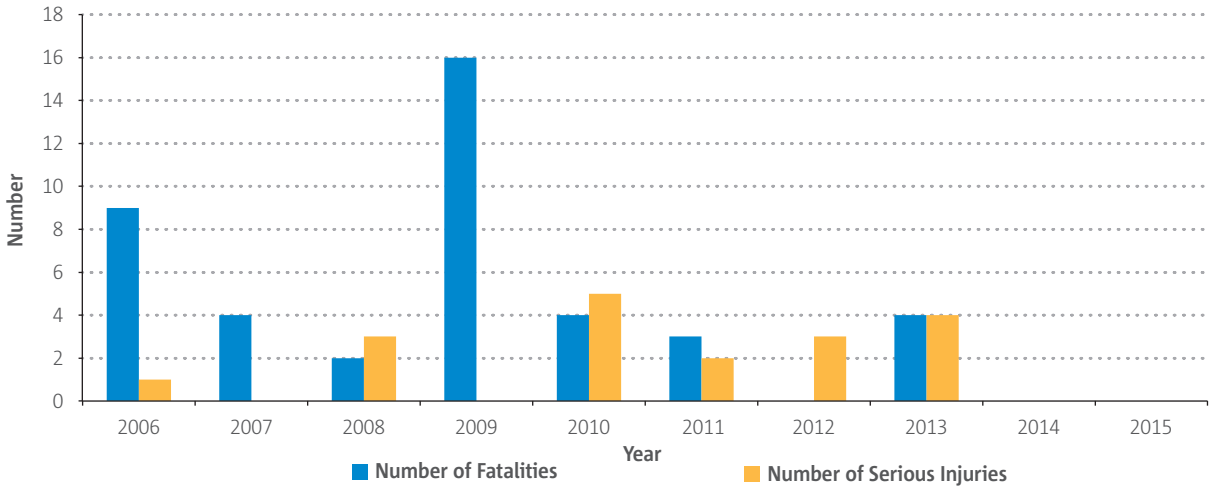
Outcome Percentage of Fatal Accidents (2011-2015)		2				50%	50%	0%	0%	0%	0%	0%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		3				33%	0%	66%	0%	0%	0%	0%	0%	0%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)								
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	System Failure	Aircraft Upset in Flight	Abnormal Landing Area Contact and Excursions	Fire	Air-borne Conflict	Terrain Conflict	Ground Collisions and Ground Handling	Ob-stacle Conflict	Incursions and Wrong Deck Landings
Technical	Diagnosis (and Tolerance) of System Failures	1.203	5	2	1	■	■	■			■			
	System Reliability	1.203	5	2	1	■	■	■	■		■			
Operational	Operation in Adverse Weather Conditions	73	—	2	1	■	■	■		■	■		■	■
	Detection, Recognition and Recovery of Deviation from Normal Operations	8	1	1	1		■	■		■	■		■	
	Pre-Flight Preparation/ Planning and In-Flight Re-Planning	67	—	1	1	■	■	■		■	■		■	■
	Ground/Helideck Operations	117	—	—	—			■				■		■
	Aircraft Maintenance	33	—	—	—	■	■	■	■	■	■	■	■	■
	Helicopter Landing Environment	13	—	—	—			■			■	■	■	■
	Control and Management of the Static Operating Environment	11	—	—	—		■	■			■		■	
	Control and Management of the Dynamic Operating Environment	11	—	—	—		■	■			■		■	
	Control of the Helicopter Flight Path and Use of AFCS Capabilities	—	—	—	—		■	■		■	■		■	
	In-Flight Fuel Management	—	—	—	—	■	■				■			
	Obstacle Clearance	—	—	—	—			■			■	■	■	

Offshore helicopters

Outcome Percentage of Fatal Accidents (2011-2015)		2				50%	50%	0%	0%	0%	0%	0%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		3				33%	0%	66%	0%	0%	0%	0%	0%	0%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)								
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	System Failure	Aircraft Upset in Flight	Abnormal Landing Area Contact and Excursions	Fire	Air-borne Conflict	Terrain Conflict	Ground Collisions and Ground Handling	Ob-stacle Conflict	Incursions and Wrong Deck Landings
Human	Flight Crew Perception and Awareness, Decision Making and Planning	—	—	1	1	■	■	■		■	■	■	■	■
	Use and Adequacy of Rules and Procedures	—	—	1	1	■	■	■		■	■	■	■	■
	CRM and Communications	45	—	—	—	■	■	■	■	■	■	■	■	■
	Personal Readiness	—	—	—	—	■	■	■		■	■	■	■	■
	Knowledge and Competency of Individuals	—	—	—	—	■	■	■		■	■	■	■	■
Organisational	Management of Personnel	—	—	—	—	■	■	■	■	■	■	■	■	■
	Safety Leadership and Culture	—	—	—	—	■	■	■	■	■	■	■	■	■
	SMS Implementation	—	—	—	—	■	■	■	■	■	■	■	■	■
	Regulation and Oversight	—	—	—	—	■	■	■	■	■	■	■	■	■
Consequences	Survival and Egress	—	1	3	2	■	■	■	■		■	■	■	■
	Forced Landings	—	—	—	—	■	■	■	■	■	■	■	■	■

There have been no fatalities or serious injuries in Offshore Helicopters over the past 2 years.

Figure 9: CAT helicopter off-shore operations fatalities and serious injuries 2006-2015



Offshore Helicopter Operations Safety Risk Portfolio

The offshore helicopters safety risk portfolio is shown above, which provides the full picture of the key risk areas and safety issues. This document is the most developed of the safety risk portfolios because it has been developed in conjunction with the Offshore Helicopter CAG, which has membership from the 2 main NAAs with offshore operations (Norway and UK), manufacturers (Airbus Helicopters and Leonardo), operators (Heli Offshore and various operators) and representatives from the oil and gas Companies. The Offshore Helicopter Safety Risk Portfolio has been used to align the strategic safety priorities of all the organisations in this operating community.

Offshore Helicopter Operations – Key Risk Areas

Offshore Helicopter – Key Risk Area 1 - System Failure: The top key risk area in CAT Helicopters was related to the involvement of system/technical failures, which was the cause or contributor to 2 of the 4 fatal accidents in the past 10 years.

Offshore Helicopter – Key Risk Area 2 - Aircraft Upset (Loss of Control): This type of accident outcome is other main type of fatal accident in the last 10 years, which was the case in the other 2 fatal accidents. It is also one the main types of accident in non-fatal accidents.

Offshore Helicopter Main Domain Priorities - Top Safety Issues

The main domain priorities for offshore helicopters is provided in terms of the safety issues are:

Operational Safety Issues

Offshore Helicopter – Operational Safety Issue 1 - Detection, Recognition and Recovery from Normal Operations: The top safety issue is related to the prevention of loss of control accidents and work has already started within the Offshore Helicopter CAG on the Safety Risk Assessment in this area. In particular, there is a focus on improvement in equipment, procedures, flight crew knowledge and training to support early identification and recovery from situations where, for example, the helicopter energy might not support safe flight.

Offshore Helicopter – Operational Safety Issue 2 - Control of the Helicopter Flight Path and Optimal Operational Use of AFCS Capabilities: This Safety Issue is another key priority area related to the prevention of aircraft upset events by enabling improved control of the helicopter flight path and optimal use of AFCS capabilities through effective use of automation (FCOM, Automation Policy, Training), development of stabilised approach criteria and potential implementation of fully coupled approaches.

Offshore Helicopter – Operational Safety Issue 3 - Operation in Adverse Environmental Conditions: Another priority Safety Issue is related to the prevention of both aircraft upset and obstacle conflict events through improved understanding of the specific environmental challenges found in offshore operations. This includes the ability of flight crew to ensure safe flight in challenging and changing environmental conditions such as bad weather, strong winds or low visibility. It also supports better understanding of specific risks such as cold-flaring (ingestion of flammable gas) and hot gas ingestion (affecting engine performance).

Offshore Helicopter – Operational Safety Issue 4 – In-Flight Fuel Management: This safety issue relates to the challenges of fuel management during the flight itself. In particular the goal is to ensure flight crew have a better understanding of effective ways to manage fuel load in flight, especially in changing environmental conditions (e.g. fixed reserves, variable reserve).

Offshore Helicopter – Operational Safety Issue 5 - Ground/Helideck Operations: Within this safety issue the goal is to ensure improved quality assurance of the supply of services for flight operations (e.g. fuel supply management, loading, helideck management (control of unsecured items, ground support systems). In addition it covers the quality assurance of the operational landing environment (regulation, training etc.) to manage the operating space, reduce obstacles, ensure effective handling of fuels and control of unsecure items.

Offshore Helicopter – Operational Safety Issue 6 - Pre Flight Preparation/Planning and In-flight Re-Planning: Prevention of various types of accidents is enabled by effective pre-flight preparation/planning and in-flight re-planning through improved flight planning systems to ensure the provision of accurate information, such as weather information, heliport/deck status and navigational data to flight crew.

Offshore Helicopter – Operational Safety Issue 7 - Control and Management of the Static Operating Environment: The goal is to improve the control and management of the static operating environment to reduce the obstacles and enable early identification and resolution of conflicts. Another activity in the Offshore Helicopter CAG is to help progressing the implementation of new HTAWs algorithms that provide for increased warning time of obstacles. In addition, work on this safety issue will help ensure appropriate Helideck Design and Management by Helideck operators and oil companies is coordinated at European Level.

Offshore Helicopter – Operational Safety Issue 8 - Control and Management of the Dynamic Operating Environment: The goal in this safety issue is to improve the control and management of the dynamic operating environment to reduce the risk of conflict with obstacles, particularly cranes and other moveable objects that might impact the helicopter approach or departure path. Good coordination between those involved in aviation operations and the business of the offshore installation is vital to ensure good Helideck management.

Technical Safety Issues

Offshore Helicopter – Technical Safety Issue 1 - Diagnosis and Management of System Failures: Within the Offshore Helicopter CAG discussion has already started on improved ways of sharing information between operators on how pilots can best handle specific technical failures. In addition, the early prediction of failures can be enhanced through continual improvement in the effectiveness of Helicopter Usage Monitoring Systems (HUMS).

Offshore Helicopter – Technical Safety Issue 2 - System Reliability: Likewise, system reliability is another important safety issue. In particular, the goal is to reduce the probability of catastrophic single point failures through possible concepts such as mitigating or limiting single engine flights, implementing Performance Class 1 equivalent performance, reducing the number of and time available for land immediately events and increasing run dry gear box times.

Consequences Safety Issues

Offshore Helicopter – Consequences Safety Issue 1 – Forced Landings: The first consequential safety issue is related to the execution of safe forced landings in the event of an emergency situation. This safety issue covers both the forced landing decision making aspects and training on performing forced landings.

Offshore Helicopter – Consequences Safety Issue 2 – Survival and Egress: The second safety issue is specifically related to safe survival and egress following a ditching or other emergency situation. This is specifically related to Rulemaking Task RMT.0120 covering helicopter ditching and water impact occupant survivability.

Human Factors Safety Issues

Offshore Helicopter – Human Factors Safety Issue 1 – Management of Personnel: A key issue is the effective management of personnel in the offshore helicopter operational environment. This includes improvement of operational staff competency frameworks (for pilots, maintainers, supervisors, etc.) and includes selection, experience, personnel readiness, training and use of evidence based training to support the prevention of accidents. Such areas under development include the use of data to tailor training to operational needs and provide evidence of its effect (Evidencebased training) and improvements to the standard and quality of supervisory roles, instruction and training facilities.

Organisational Safety Issues

Offshore Helicopter – Organisational Safety Issue 1 – Safety Leadership and Culture: Discussion has already taken place at the Offshore Helicopter CAG on this safety issue where all parties involved agreed that it was important to ensure effective safety leadership, clarity of leadership roles with regards to safety, the interface between safety management and the operation and how that cascades through the organisation and its stakeholders.

Offshore Helicopter – Organisational Safety Issue 2 – SMS Implementation and Use/Sharing of Data: It is important to ensure that each organisation has an established hazard identification and risk assessment process that also helps to identify safety actions and monitors safety performance.

Other commercial air transport helicopters

Key Statistics

The key statistics in other commercial helicopters are provided below. There were 1 fatal and 8 non-fatal accidents in this domain during 2015 and only 1 serious incident. The fatal accident, a HEMS flight in Slovakia, involved 4 fatalities. In addition, a total of 7 serious injuries have been reported in non-offshore CAT helicopter operations in 2015. The numbers of non-fatal accidents and serious injuries were above the averages of the preceding 10-year period.

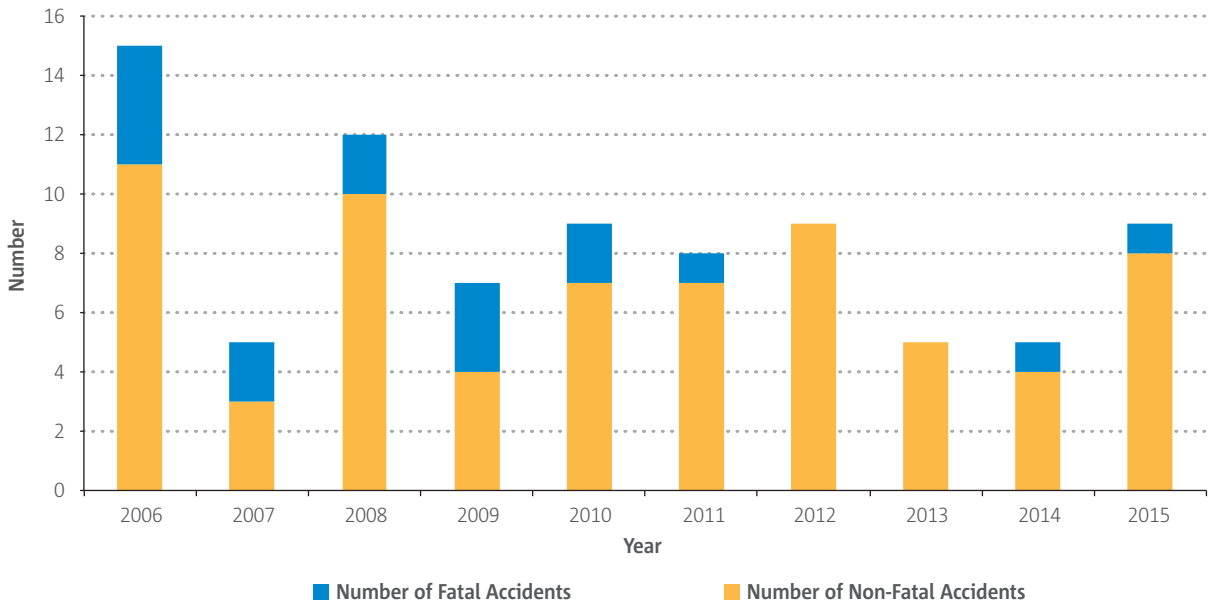
Table 14: Key statistics other commercial air transport helicopter

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	2	6.9	2.4
2015	1	8	1

	Fatalities	Serious Injuries
2005-2014 Annual average	9.1	4.1
2015	4	7

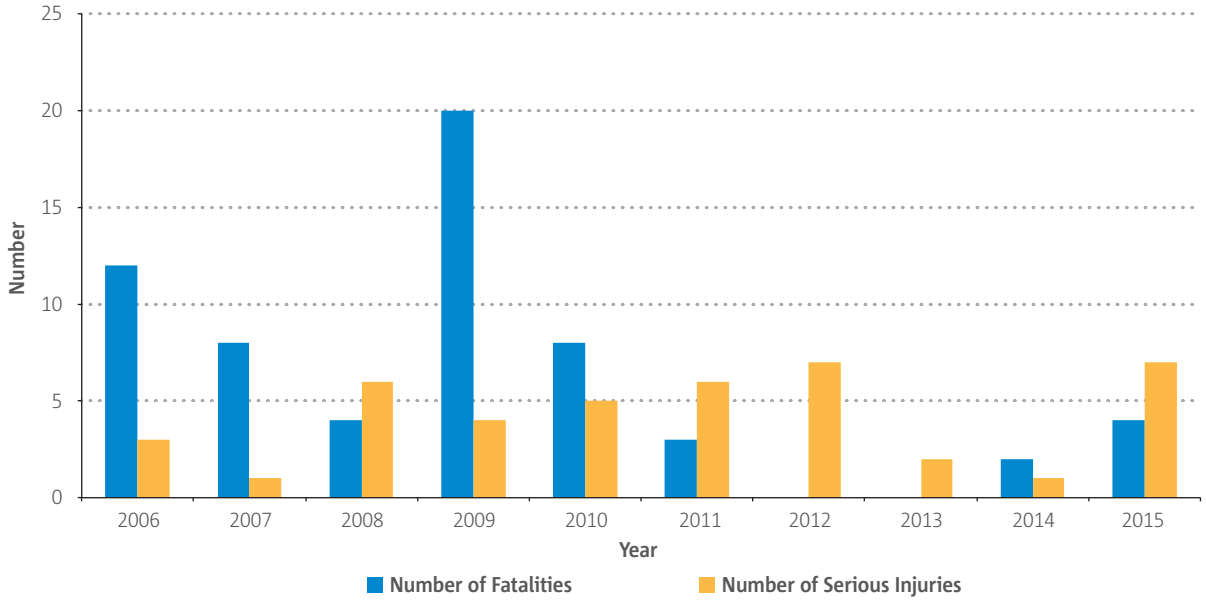
There was 1 fatal accident in other CAT helicopters in 2015, which was the same as the previous year. There has been an improvement in the number of fatal accidents and non-accidents since 2006, however there has not been as significant improvement since 2008.

Figure 10: Other CAT helicopter fatal accidents and non-fatal accidents 2006-2015



Whilst the number of fatalities in other CAT helicopters was higher in 2015 than previous years there is still an improvement compared with the period 2006 to 2010.

Figure 11: Other CAT helicopters fatalities and serious injuries 2006-2015



Phase of Flight: In terms of phase of flight, there were no accidents or serious incidents in the standing or take-off phases in 2015. In the taxi, manoeuvring, approach and unknown phases the 2015 numbers were higher than the average of the preceding 10-year period, in the other phases the numbers were below the average.

Table 15: Other CAT helicopters accidents and serious incidents per phase of flight 2005-2015

Phase of Flight	Accidents and Serious Incidents	
	2005-2014 average	2015
Standing	0.5	0
Taxi	0.3	1
Take-off	1.4	0
En route	3.9	2
Manoeuvring	0.8	3
Approach	1.2	3
Landing	3	1
Unknown	0	1

Table 16: Other cat helicopters safety risk portfolio

Other CAT Helicopters												
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)						
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	System Failure	Terrain and Obstacle Conflict	Aircraft Upset in Flight	Abnormal Landing Area Contact and Excursions	Ground Collisions and Ground Handling	Fire	Airborne Conflict
Operational	Detection, Recognition and Recovery of Deviation from Normal Operations	15	1	14	2		■	■	■			■
	Operation near Wires	10	1	6	2		■	■				
	Operation in Adverse Weather Conditions	69	1	6	1	■	■	■	■			■
	Maintaining Adequate Separation Between Aircraft on the ground and in the air	293	1	3	—			■				■
	Birdstrikes	87	—	1	—	■		■	■	■	■	
	Aircraft Maintenance	66	1	—	—	■	■	■	■	■	■	■
Consequences	Forced Landings	8	—	3	—	■	■	■	■	■	■	■
Technical	Handling and Operation of the Aircraft Following a Technical Failure	5	1	1	—		■	■	■			■
Human	Flight Crew Perception and Awareness/ Decision Making and Planning	—	—	1	1		■	■	■	■		■

The safety risk portfolio for other CAT helicopters (excluding offshore helicopters) is at its current stage purely based on occurrence data from the EASA occurrence database for accidents and serious incidents, and the European Central Repository (ECR) for Incidents. Initially this safety risk portfolio covers all the various operation types in CAT Helicopters except offshore operations. In the coming months, it is intended to develop a specific safety risk portfolio for Helicopter Emergency Medical Services (HEMS) operations.

Other CAT Helicopters – Key Risk Areas

Other CAT Helicopter – Key Risk Area 1 - System Failure: The top key risk area in CAT helicopters involves system/technical failures which was the cause of 1 of the 3 fatal accidents and the largest percentage of the non-fatal accidents.

Other CAT Helicopter – Key Risk Area 2 - Terrain and Obstacle Conflict: The other priority area for other CAT helicopters that has been identified is terrain and obstacle conflict.

Operational Safety Issues

Other CAT Helicopter – Operational Safety Issue 1 - Detection, Recognition and Recovery from Normal Operations: This specific safety issue plays a significant role in loss of control accidents. In particular, there is a focus on improving the ability of flight crew to recognise when undesirable aircraft states occur and ensure that they are trained and able to then take the correct action.

Other CAT Helicopter – Operational Safety Issue 2 - Operation near Wires: Operation near wires is an identified safety issue in CAT helicopter operations. In some cases the wires were known but the clearance was mis-judged and in other cases the wires were unknown to the pilot prior to a wirestrike or near-miss.

Other CAT Helicopter – Operational Safety Issue 3 - Operation in Adverse Weather Conditions: In terms of loss of control this is specifically related to pilots understanding the risks of changing weather conditions and the handling of the aircraft when conditions get more challenging.

Table 17: Commercial Air Transport Helicopter – Related Safety Actions

EPAS Actions	**Requirements**	**RMT.0119**	Yawing conditions
	Requirements	**RMT.0120**	Helicopter ditching and water impact occupant survivability
	Requirements	**RMT.0127**	Pilot compartment view
	Requirements	**RMT.0608**	Helicopter gearbox lubrication
	Action on Member States	**MST.015**	Helicopter Safety Events Review
	Safety Promotion	**SPT.028**	In cooperation with IHST, promote safety by developing risk awareness and training material (standing task).
	Safety Promotion	**SPT.039**	Weather threats
	Safety Promotion	**SPT.056**	Improve helicopter safety in Europe

Aerial Work/Part SPO Aeroplanes

4

This chapter covers all aerial work/Part SPO operations involving aeroplanes (except gliders/sailplanes) of all mass groups with an EASA MS state of registry. This covers a wide range of different operational activities including aerial advertising, aerial patrol, agricultural, air shows, parachuting and towing (with Glider operations). Key statistics and an occurrence data based safety risk portfolio are presented.

Key Statistics

The key domain statistics are in the tables below. There were the same number of fatal accidents in 2015 compared to the 10-year average and there were also a slightly lower number of non-fatal accidents. However, the numbers of fatalities and serious injuries in 2015 were significantly higher than the averages for the preceding decade. There was an airborne collision between 2 LET-410 aircraft involved in Parachuting operations in Slovakia, which led to 7 fatalities and the Shoreham Air Show accident in the United Kingdom led to 11 ground fatalities.

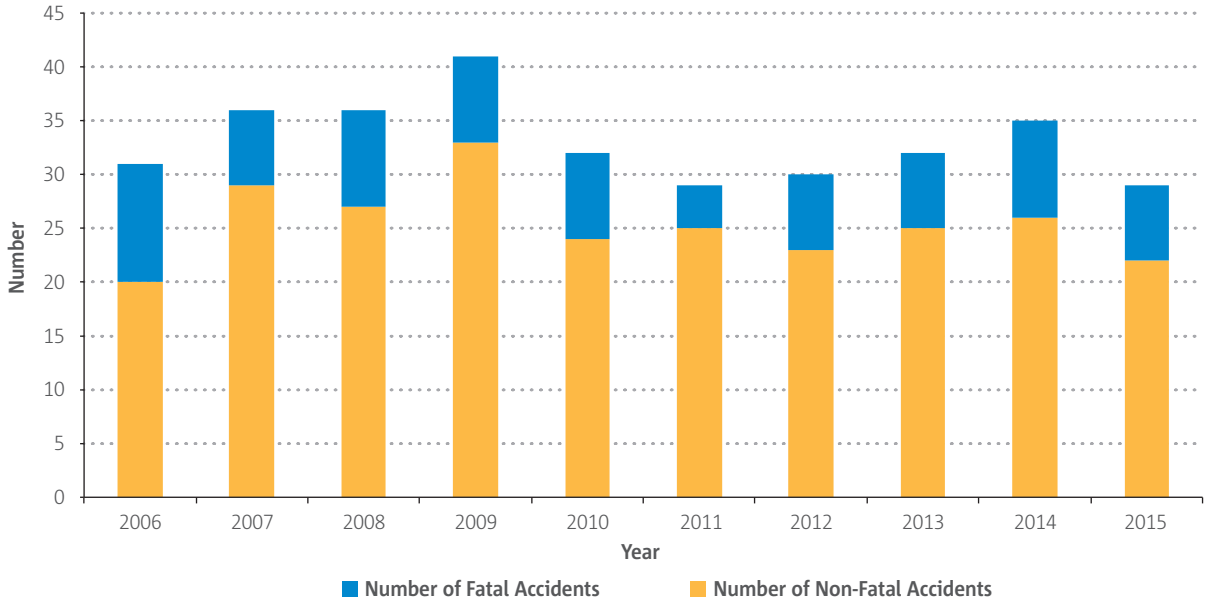
Table 18: Key statistics aerial work/part SPO aeroplanes 2005-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	7	23.5	4.3
2015	7	22	6

	Fatalities	Serious Injuries
2005-2014 Annual average	11.3	5.6
2015	23	15

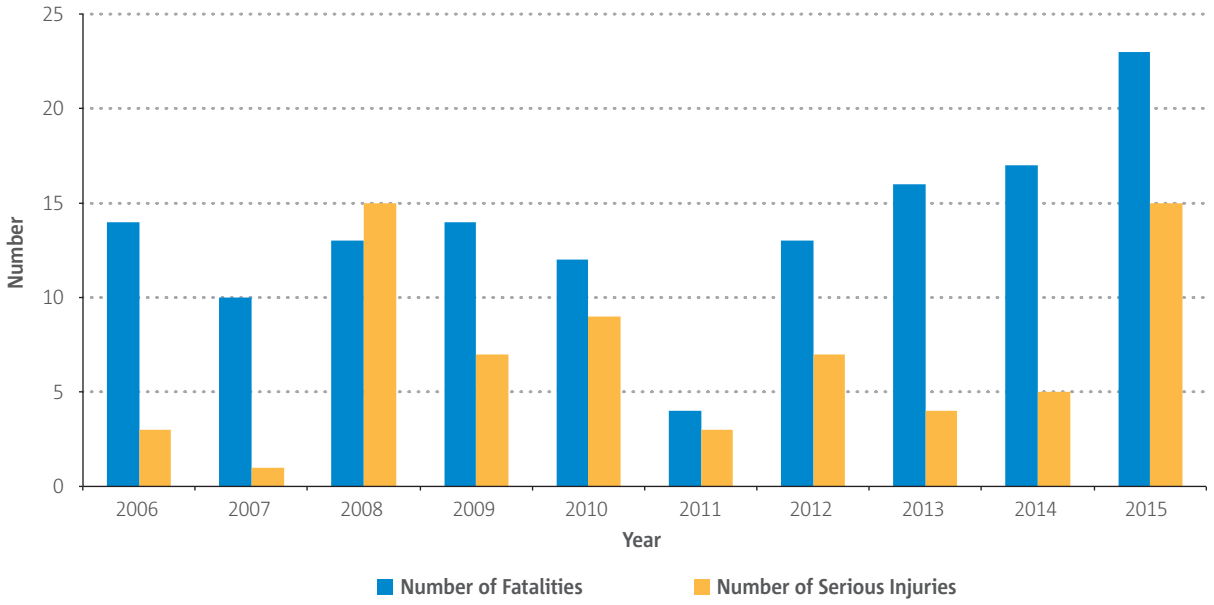
In aerial work/Part SPO operations with aeroplanes, there were 7 fatal accidents, which is the same as the 10-year average. The number of non-fatal accidents is slightly lower than the 10-year average.

Figure 12: Aerial work/part SPO aeroplanes number of fatal and non-fatal accidents 2006-2015



Following 2 fatal accidents in aerial work/Part SPO operations involving aeroplanes in 2015, the number of fatalities was at its highest level since 2008.

Figure 13: Aerial work/part SPO aeroplane fatalities and serious injuries 2006-2015



Phase of Flight: In terms of flight phase, the numbers for 2015 were similar to those for the average of the previous decade.

Table 19: Aerial work/part SPO aeroplane accidents and serious incidents per phase of flight 2005-2015

Phase of Flight	Accidents and Serious Incidents	
	2005-2014 average	2015
Standing	0,6	1
Taxi	2	1
Take-off	8,3	9
En route	6,5	7
Manoeuvring	8	9
Approach	3,2	2
Landing	7	6
Post-impact	0	0
Unknown	0,2	3

Operation Type: In some operation types, namely aerial observation, aerial patrol, aerial survey and photography, there were no accidents or serious incidents in 2015. In parachute drop and towing there were more accidents and serious incidents in 2015 compared to the previous decade average. For the remaining operation types the numbers were similar to previous years.

In each of the previous 3 years there has been an accident with multiple fatalities in parachuting operations and this operation type will be subject to specific analysis during 2016 that will involve the EASA MS through the NoA.

Table 20: Aerial work/part SPO aeroplane accidents and serious incidents per operation type 2005-2015

Operation Type	Accidents and Serious Incidents	
	2005-2014 average	2015
Aerial Advertising	0,8	1
Aerial Observation	0,2	0
Aerial Patrol	0,2	0
Aerial Survey	0,2	0
Agricultural	4,1	4
Airshow/Race	7,6	7
Parachute drop	7,9	11
Photography	1	0
Towing	8,6	10
Other	1,7	2

Table 21: Aerial work/part SPO aeroplanes safety risk portfolio

Aerial work/ Part SPO – Aeroplanes

Outcome Percentage of Fatal Accidents (2011-2015)		34				50%	21%	4%	2%	2%	2%	2%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		121				11%	8%	17%	19%	8%	6%	2%	17%	17%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)								
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Airborne Conflict	Engine Failure	Other System Failure	Obstacle Conflict	Glider Towing	Terrain Conflict	Abnormal Runway Contact and Runway Excursions	Aircraft Upset on Ground
Operational	Detection, recognition and recovery of deviation from normal operations	5	2	39	17	■	■			■	■	■	■	■
	Maintaining adequate separation between aircraft on the ground and in the air	132	9	35	11		■							
	Safe forced landings	11	4	32	1	■	■	■	■	■	■	■	■	

Aerial work/ Part SPO – Aeroplanes

Outcome Percentage of Fatal Accidents (2011-2015)		34				50%	21%	4%	2%	2%	2%	2%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		121				11%	8%	17%	19%	8%	6%	2%	17%	17%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)								
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Airborne Conflict	Engine Failure	Other System Failure	Obstacle Conflict	Glider Towing	Terrain Conflict	Abnormal Runway Contact and Runway Excursions	Aircraft Upset on Ground
Operational	Control of manual aircraft flight path	—	—	2	1	■	■			■		■	■	■
	Intentional low flying	—	—	2	1	■				■		■	■	
	Operation in adverse weather conditions	15	3	9	—	■		■		■	■		■	■
	Aircraft maintenance	4	1	4	—	■	■	■	■	■	■	■	■	■
	Pre-flight preparation/ planning and in-flight re-planning	5	—	4	—	■	■	■	■	■	■	■	■	■
	Fuel management	—	—	2	—	■		■	■	■	■	■	■	
	Birdstrikes	15	1	—	—	■		■	■				■	
Technical	Handling and operation of the aircraft following a technical failure	1	—	6	1	■		■	■	■		■	■	■
	Management of landing gear system malfunctions	31	2	21	—	■			■				■	■
	Engine reliability	3	1	8	—	■		■						
Human	Flight crew perception and awareness decision making and planning	—	—	5	2	■	■			■		■	■	■
	Use and adequacy of rules and procedures	—	1	1	1	■	■	■	■	■	■	■	■	■
	Personal readiness and crew impairment	19	1	3	—	■	■	■	■	■	■	■	■	■
	Knowledge and competency of individuals	—	—	1	—	■	■	■	■	■	■	■	■	■

Aerial Work/Part SPO Aeroplanes Safety Risk Portfolio

The Aerial Work/Part SPO Aeroplanes Safety Risk Portfolio is at its current stage purely based on occurrence data from the EASA occurrence database for accidents and serious Incidents, and the European Central Repository (ECR) for incidents. The safety issues have been identified based on the events taxonomy and mapped into the safety issues. Some of the safety issues identified are discussed in the next section.

Aerial Work/Part SPO Aeroplanes – Key Risk Areas

SPO Aeroplanes – Key Risk Area 1 - Aircraft Upset: This type of accident outcome is the most significant type of fatal accident in Part SPO aeroplanes over the last 5 years with 50% of the total number of fatal accidents for aerial work operations with aeroplanes.

SPO Aeroplanes – Key Risk Area 2 - Airborne Conflict: This 2nd most frequent type of accident outcome in Part SPO aeroplanes over the last 5 years is airborne conflict with 21% of all fatal accidents in this domain. Airborne conflict accidents have taken place in both air shows and parachuting operations.

Aerial Work/Part SPO Aeroplanes Main Domain Priorities - Top Safety Issues

The main domain priorities for aerial work/Part SPO aeroplanes are:

Operational Safety Issues

SPO Aeroplanes – Operational Safety Issue 1 - Detection, Recognition and Recovery from Normal Operations: In Part SPO operations with aeroplanes this safety issue has the greatest involvement in fatal accidents. It is specifically related to the ability of pilots to identify potential loss of control situations and to take the correct recovery action.

SPO Aeroplanes – Operational Safety Issue 2 - Maintaining Adequate Separation Between Aircraft: In aerial work operations, the fact that flight crew are likely to have to focus on both flying the aircraft and performing other tasks makes it more challenging to have the necessary situational awareness of other aircraft.

SPO Aeroplanes – Operational Safety Issue 3 - Operation in Adverse Weather Conditions: In terms of loss of control this is specifically related to pilots understanding the risks of changing weather conditions and the handling of the aircraft when conditions get more challenging. The safety risk assessment will consider a range of different situations.

Human Factors Safety Issues

SPO Aeroplanes – Human Factors Safety Issue 1 – Planning, Personal Readiness and Crew Impairment: The first HF priority area identified in the analysis has been related to personal readiness and crew impairment.

SPO Aeroplanes – Human Factors Safety Issue 2 - Flight Crew Perception and Awareness: This safety issue is linked to a number of different types of accident, especially in terms of awareness of the aircraft's energy state leading to loss of control and also awareness of both the geographical position of the aircraft and its position in relation to other aircraft.

Table 22: Aerial work/part SPO aeroplanes related safety actions

EPAS Actions	**Rulemaking**	**RMT.0340**	Standard operating procedures and specific requirements/alleviations for specialised operations

Aerial Work/Part SPO Helicopters

5

This Chapter covers aerial work/Part SPO operations involving helicopters of all mass groups with an EASA MS state of registry. This covers an even wider range of different operational activities than the equivalent aeroplanes chapter that also adds construction/sling load operations and logging to the categories already mentioned.

Key Statistics

The key Domain statistics are in the tables below. There were 2 fatal accidents in Part SPO helicopter operations in 2015 resulting in 4 fatalities, both of which are significantly below the preceding 10-year average. There was also a lower number of non-fatal accidents.

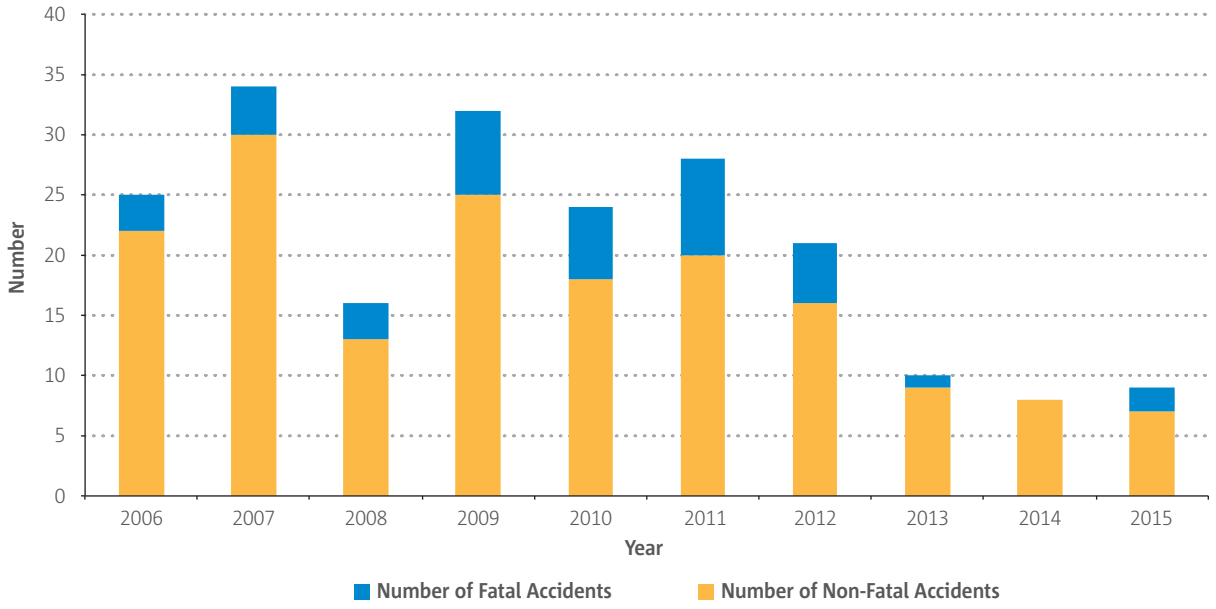
Table 23: Key statistics aerial work/part SPO helicopters 2005-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	4.3	18.0	1.4
2015	2	7	0

	Fatalities	Serious Injuries
2005-2014 Annual average	8.5	6.2
2015	4	3

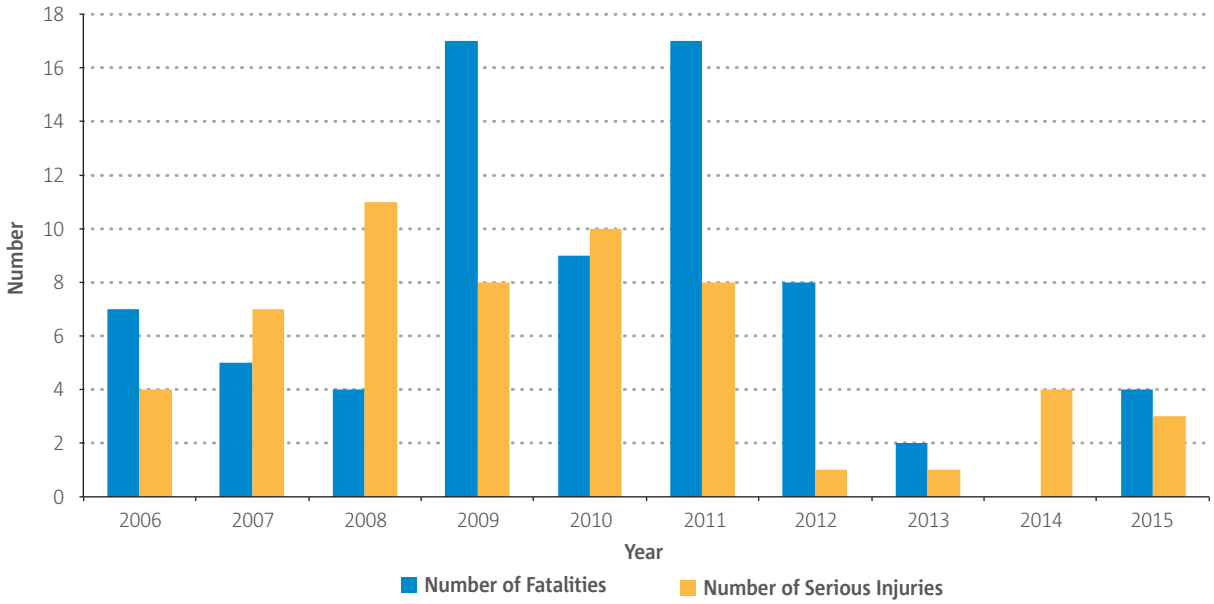
In aerial work/Part SPO operations with helicopters, there were 2 fatal accidents, which although the highest for 3 years it is still over half the 10-year average. The number of non-fatal accidents is also significantly lower than the 10-year average.

Figure 14: Aerial work/part SPO helicopters fatal and non-fatal accidents 2006-2015



There were 4 fatalities in Aerial Work/Part SPO Operations with Helicopters, which was the highest for 3 years but still significantly lower than the 10-year average.

Figure 15: Aerial work/part SPO helicopters fatalities and serious injuries 2006-2015



In terms of flight phase, manoeuvring is the most common flight phase in 2015, which is coherent with the preceding 10-year period, although the number in 2015 is significantly lower than the average of the preceding 10 years. In the standing, taxi, take-off and approach phases there were no accidents or serious incidents in 2015, whereas for all other phases the numbers for 2015 were lower than the average of 2005-2014.

Table 24: Aerial work/part SPO helicopters accidents and serious incidents per phase of flight 2005-2015

Phase of Flight	Accidents and Serious Incidents	
	2005-2014 average	2015
Standing	0,5	0
Taxi	0	0
Take-off	3,7	0
En route	3,6	2
Manoeuvring	10,6	5
Approach	1	0
Landing	3,3	1
Unknown	0,5	1

Operation Type: In aerial advertising, aerial observation, aerial survey, agricultural, air show/race, towing and logging there were no accidents or serious incidents in 2015.

Table 25: Aerial work/part SPO helicopters accidents and serious incidents by operation type 2005-2015

Operation Type	Accidents and Serious Incidents	
	2005-2014 average	2015
Aerial Advertising	0	0
Aerial Observation	1,3	0
Aerial Patrol	1	1
Aerial Survey	0,8	0
Agricultural	5,7	0
Airshow/Race	0,3	0
Photography	1,9	1
Towing	0,1	0
Construction/Sling load	5	2
Logging	1,3	0
Other	3	1

Table 26: Aerial work/part SPO helicopters safety risk portfolio

Aerial work / Part SPO - Helicopters

Outcome Percentage of Fatal Accidents (2011-2015)		17				24%	18%	0%	0%	18%	0%	6%	0%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		60				26%	2%	3%	12%	19%	19%	3%	10%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Terrain Conflict	Other System Failure	Abnormal Landing Area Contact and Excursions	External Load	Engine Failure	Obstacle Collision	Fuel
Operational	Operation near Wires	5	2	12	7		■				■		
	Operation in Adverse Weather Conditions	14	1	8	4	■	■		■	■		■	
	Detection, Recognition and Recovery of Deviation from Normal Operations	4	1	21	3	■		■	■	■	■		
	External Load Operation	133	1	14	3	■		■	■	■	■	■	
	Maintaining Adequate Separation Between Aircraft on the ground and in the air	100	—	6	1	■				■		■	
Consequences	Safe Forced Landings	—	1	12	—	■		■	■	■	■	■	■
Technical	Handling and Operation of the Aircraft Following a Technical Failure	—	—	2	—	■	■		■	■		■	
Human	Flight Crew Perception and Awareness, Decision Making and Planning	—	1	1	—	■	■	■	■	■	■	■	■

Aerial Work/Part SPO Helicopters Safety Risk Portfolio

The Aerial Work/Part SPO Helicopters Safety Risk Portfolio is at its current stage purely based on occurrence data from the EASA occurrence database for accidents and serious incidents, and the European Central Repository (ECR) for incidents. The safety issues have been identified based on the events taxonomy and mapped into the safety issues. Some of the safety issues identified are discussed in the next section.

Aerial Work/Part SPO Helicopter Operations – Key Risk Areas

SPO Helicopter – Key Risk Area 1 - Aircraft Upset: Fatal accidents in Part SPO Helicopter operations fell into only 2 categories, the first of these was aircraft upset.

SPO Helicopter – Key Risk Area 2 - Airborne Conflict: This type of accident outcome is the other fatal accident outcome in the last 5 years.

Aerial Work/Part SPO Helicopter Operations Main Domain Priorities - Top Safety Issues

The main domain priorities for aerial work/Part SPO helicopters are:

Operational Safety Issues

SPO Helicopter – Operational Safety Issue 1 - Operation near Wires. The top safety issue for aerial work operations with helicopters is related to operation near wires. In some cases the wires were known but the clearance was mis-judged and in other cases the wires were unknown to the pilot prior to a wirestrike or near-miss.

SPO Helicopter – Operational Safety Issue 2 - Operation in Adverse Weather Conditions. In terms of loss of control this is specifically related to pilots understanding the risks of changing weather conditions and the handling of the aircraft when conditions get more challenging.

SPO Helicopter – Operational Safety Issue 3 - Detection, Recognition and Recovery from Normal Operations. This specific safety issue is one of the priority safety issues in the prevention of loss of control accidents. In particular, there is a focus on improvement in the ability of pilot's recognise when deviations from normal operations are occurring as early as possible and to then take the correct action.

SPO Helicopter – Operational Safety Issue 4 – External Load Operation. The extended complexity of flying with different types of External Loads is a safety issue that is specific to aerial work/SPO operations with helicopters. A number of scenarios related to the external load coming in contact with parts of the helicopter or with obstacles will be considered in the assessment of the safety issue.

SPO Helicopter – Operational Safety Issue 5 - Maintaining Adequate Separation Between Aircraft: In aerial work operations, the fact that a pilot is likely to have to focus on both flying the aircraft and performing other tasks make it more challenging to have the necessary situational awareness of other aircraft.

Human Factors Safety Issues

SPO Helicopter – Human Factors Safety Issue 1 - Flight Crew Perception and Awareness: This safety issue is related to both fatal accident outcomes, either in their perception of the energy state of the helicopter or in relation to terrain or obstacles.

Table 27: Aerial work/part SPO helicopters related safety actions

EPAS Actions	Rulemaking	RMT.0340	Standard operating procedures and specific requirements/alleviations for specialised operations
	Rulemaking	RMT.0374	Review the suitability of single-engined helicopters engaged in aerial work
	Action on Member States	MST.015	Helicopter Safety Events Review
	Safety Promotion	SPT.028	In cooperation with IHST, promote safety by developing risk awareness and training material (standing task).
	Safety Promotion	SPT.039	Weather threats
	Safety Promotion	SPT.056	Improve helicopter safety in Europe

Non-Commercial Operations Aeroplanes

6

This chapter covers non-commercial operations involving fixed-wing aeroplanes where the state of registry was an EASA MS. It also covers flight training and other non-commercial activities. In the beginning of autumn 2016 a Collaborative Analysis Group (CAG) will be established for Non-Commercial Operation Aeroplanes. Once established the CAG will support the continued identification of safety issues as well support the Agency in performing Safety Risk Assessments on the identified safety issues in the Portfolio.

Key Statistics

The key domain statistics are in the tables below. The number of fatal accidents were slightly below the 10-year average, whilst the number of non-fatal accident was significantly lower. In terms of fatalities, there were 13 fewer fatalities than the 10-year average and also a lower number of serious injuries.

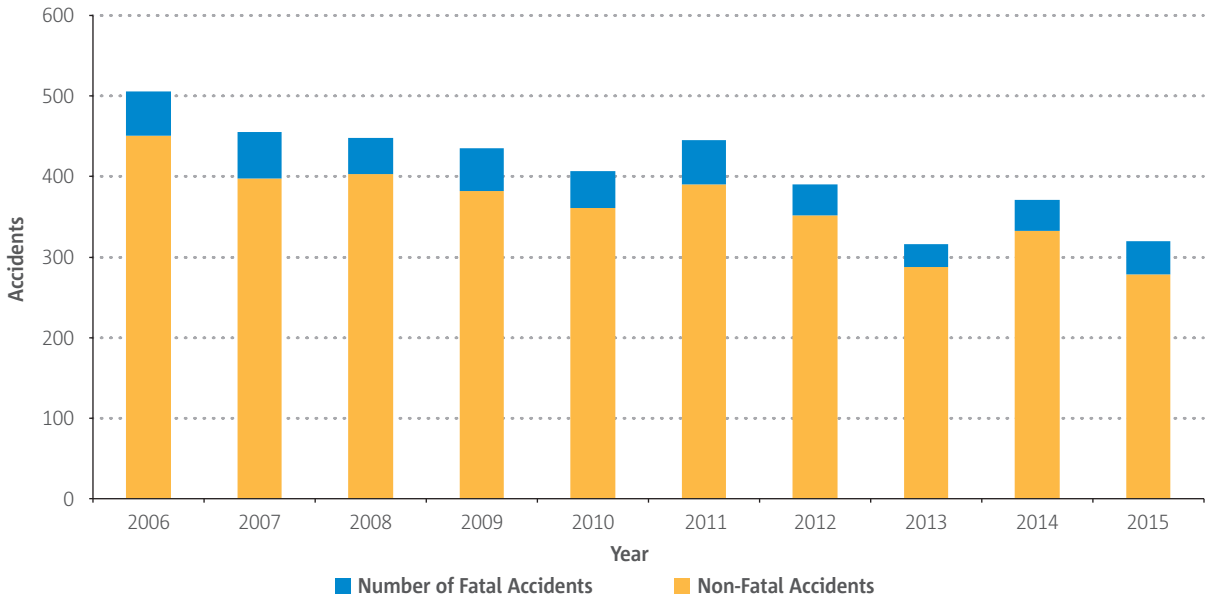
Table 28: Key statistics non-commercial operations aeroplanes

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	42.2	338.0	21.7
2015	41	279	18

	Fatalities	Serious Injuries
2005-2014 Annual average	79	43.9
2015	65	36

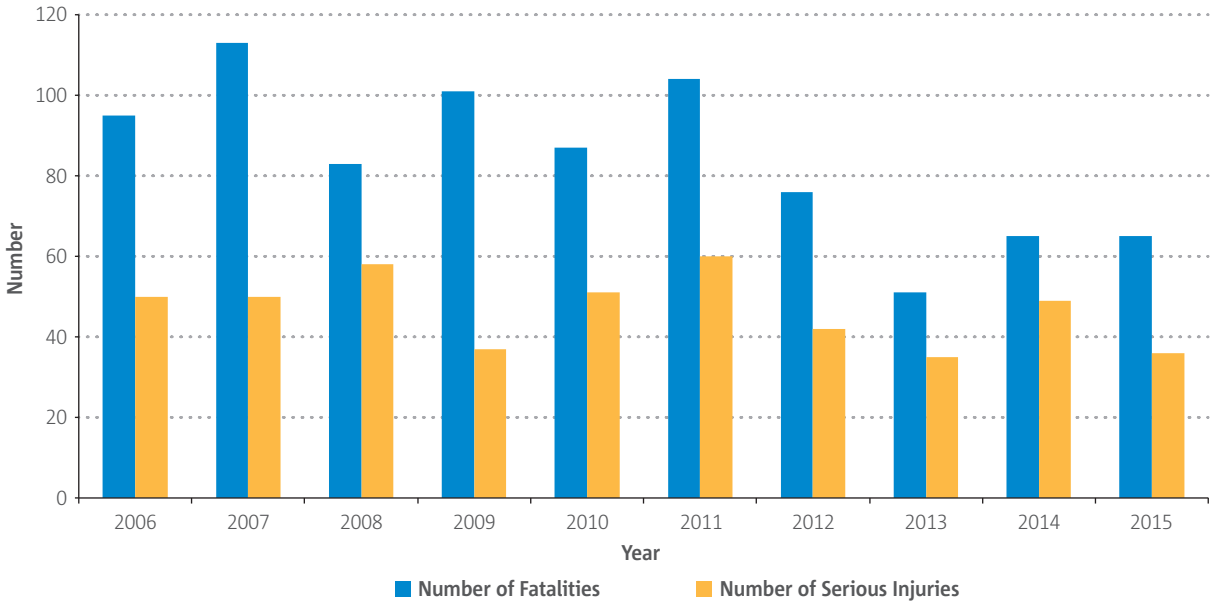
In non-commercial operations with aeroplanes, there were 41 fatal accidents, which continues the downward trend and is lower than the 10-year average.

Figure 16: Non-commercial operations aeroplanes fatal and non-fatal accidents 2006-2015



There were 65 fatalities in non-commercial operations with aeroplanes, which was the same as the previous year and lower than the 10-year average.

Figure 17: Non-commercial operations aeroplanes fatalities and serious injuries 2006-2015



Phase of Flight: In terms of flight phase in GA fixed wing aeroplanes accidents it can be seen that most of the accidents occur during take-off, approach and landing phases of flight. In fact far most of them take place during the landing phase of the flight. It can be seen that 2015 had fewer accidents compared to the 10 year average.

Table 29: Non-commercial operations aeroplanes accidents and serious incidents per phase of flight 2005-2015

Phase of Flight	Accidents and SIs	
	2005-2014 average	2015
Standing	10.7	5
Taxi	24	21
Take-off	70.1	59
En route	63	45
Manoeuvring	14.3	7
Approach	37.1	39
Landing	180.4	151
Post-impact	0	0
Unknown	2.6	12

Table 30: Non-commercial operations aeroplanes safety risk portfolio

Non-commercial operations - Aeroplanes													
Outcome Percentage of Fatal Accidents (2006-2015)		199				47%	15%	9%	6%	3%	3%	1%	1%
Outcome Percentage of Non-Fatal Accidents (2006-2015)		1.643				8%	1%	17%	2%	19%	4%	25%	12%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Terrain Conflict	Engine Failure	Airborne Conflict	Other System Failures	Obstacle Conflict	Abnormal Runway Contact and Excursions	Aircraft Upset on Ground
Operational	Detection, Recognition and Recovery of Deviation from Normal Operations	45	10	372	84	■	■				■	■	■
	Maintaining Adequate Separation Between Aircraft on the ground and in the air	1.347	32	308	26	■			■				
	Operation in Adverse Weather Conditions	120	7	190	24	■	■	■	■	■	■	■	■
	Intentional Low Flying	16	1	18	11	■	■				■		
	Pre-Flight Preparation/ Planning and In-Flight Re-Planning	72	3	44	8	■	■	■	■	■	■	■	■
	Aircraft Loading and Balance	—	—	4	2	■						■	
	Hard landings due to incorrect action and perception of the situation	46	5	225	1	■					■	■	■
	Unstabilised Approach	8	2	39	1	■	■				■	■	■
	Aircraft Maintenance	21	3	11	1	■	■	■	■	■	■	■	■
	Prevention and Resolution of Conflict with Aircraft Not Fitted With Transponders	26	2	2	1	■			■				
	Control of Manual Aircraft Flight Path	—	—	29	—	■	■		■		■	■	■
	Birdstrikes	112	1	12	—	■		■		■		■	■
Technical	Diagnosis and Management of Engine Failures in Flight	25	4	25	2	■	■	■		■		■	■
	Management of Landing Gear System Malfunctions	374	16	385	—					■		■	■

Non-commercial operations - Aeroplanes

Outcome Percentage of Fatal Accidents (2006-2015)		199				47%	15%	9%	6%	3%	3%	1%	1%
Outcome Percentage of Non-Fatal Accidents (2006-2015)		1.643				8%	1%	17%	2%	19%	4%	25%	12%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Terrain Conflict	Engine Failure	Airborne Conflict	Other System Failures	Obstacle Conflict	Abnormal Runway Contact and Excursions	Aircraft Upset on Ground
Human	Flight Crew Perception and Awareness Decision Making and Planning	—	4	59	7	■	■	■	■	■	■	■	■
	Use and Adequacy of Rules and Procedures (incl. Checklists)	—	1	12	1	■	■	■	■	■	■	■	■
	Knowledge and Competency of Individuals	—	—	22	—	■	■	■	■	■	■	■	■
	Pressure during operation	—	—	3	—	■	■	■	■	■	■	■	■
	Navigation during operation	53	2	—	—		■		■		■		

Non-Commercial Operations Aeroplanes Safety Risk Portfolio

The Non-Commercial Operations Aeroplanes Safety Risk Portfolio is provided above and provides the full picture of the key risk areas and safety issues. This portfolio is the result of the identification safety issues from the analysis of safety data (historical occurrence data) and has been consolidated by the expert judgment of the agency and the member states through the Network of Analysts.

Non-Commercial Operations Aeroplanes – Key Risk Areas

Non-Commercial Aeroplane – Key Risk Area 1 - Aircraft Upset (Loss of Control): With 47%, loss of control is the most common type of accident outcome in the last 10 years for non-commercial operations with aeroplanes. Loss of control is the area of greatest focus for future work in this domain of operations.

Non-Commercial Aeroplane – Key Risk Area 2 - Terrain Conflict (CFIT): CFIT was the 2nd most common accident outcome in the last 10 years with 14.7% and continues to present a significant safety challenge in this domain of operations.

Non-Commercial Aeroplane – Key Risk Area 3 – Engine Failure: This is the 3rd most frequent type of fatal accident outcome in the last 10 years with 9.1% of all fatal accidents in this domain.

Non-Commercial Aeroplane – Key Risk Area 4 - Airborne Conflict: This is the 4th most common type of fatal accident outcome in the last 10 years with 5.5%. As well as the specific operational safety issue identified below, there are also HF safety issues that are closely related to airborne conflict that are further outlined later.

Non-Commercial Operations Aeroplanes Main Domain Priorities - Top Safety Issues

The main domain priorities for non-commercial operations aeroplanes is provided in terms of the safety issues are:

Operational Safety Issues

Non-Commercial Aeroplane – Operational Safety Issue 1 - Detection, Recognition and Recovery from Normal Operations. In non-commercial operations with aeroplanes this safety issue has the greatest involvement in fatal and non-fatal accidents. It is specifically related to the ability of pilots in identifying potential loss of control situations and to take the correct recovery action. The main area of initial analysis is loss of control during approach and landing, specifically during first turn after take-off or final turns to land when speed is particularly low.

Non-Commercial Aeroplane – Operational Safety Issue 2 - Operation in Adverse Weather Conditions: In terms of loss of control this is specifically related to pilot planning to understand the risks of changing weather conditions prior to take-off and then the handling of the aircraft when weather increases the workload on pilots, potentially beyond their level of experience. This safety issue is also related to CFIT accidents and a typical scenario involves worsening weather leading to inadvertent flight into IMC conditions resulting in a collision with terrain.

Non-Commercial Aeroplane – Operational Safety Issue 3 - Maintaining Adequate Separation Between Aircraft: The main safety issue for airborne conflict for non-commercial operations aeroplanes involves pilot situational awareness leading to loss of separation between aircraft.

Non-Commercial Aeroplane – Operational Safety Issue 4 - Pre-Flight Preparation/Planning and In-Flight Re-Planning. Flight preparation, planning and in-flight re-planning is a safety issue that frequently leads to CFIT accidents, particularly when worsening weather leads to the need for in-flight re-planning which then considerably tests a pilot's ability to also fly the aircraft.

Human Factors Safety Issues

Non-Commercial Aeroplane – Human Factors Safety Issue 1 - Flight Crew Perception and Awareness: This safety issue is linked to a number of different types of accident, especially in terms of awareness of the aircraft's energy state leading to loss of control and also awareness of both the geographical position of the aircraft and its position in relation to other aircraft. Rulemaking task RMT.0677 will enable pilots to have easier access to an IFR rating which should significantly reduce the risk of unintended flights into clouds and enable private pilots to fly safer in critical weather.

Non-Commercial Aeroplane – Human Factors Safety Issue 2 - Use and Adequacy of Rules and Procedures: Another HF safety issue identified in the analysis has been the use, availability and adequacy of rules and procedures. Because non-commercial operations involve private pilots it is vital that they are provided with clear, simple information and are able to continually improve their knowledge and application of rules. Rulemaking task RMT.0657 on training outside of ATOs is designed to help provide more clarity to both pilots, instructors and examiners as well as the NAAs with the intention to make it easier for those stakeholders to adopt the rules and procedures in their daily flying experience.

Non-Commercial Aeroplane – Human Factors Safety Issue 3 - Knowledge and Competency of Individuals: The final HF priority area is related to the knowledge and competency of individuals. In recent NoA analysis of airborne conflict, the complexity of airspace structures was identified as one example where the complicated nature of the aviation system makes things challenging especially for private pilots. The safety risk assessment in this area will specifically consider ways to provide clear, simple information to help pilots have the right information to perform flights as safely as possible. Rulemaking task RMT.0678 is designed to aid pilots in their theoretical aviation knowledge. This task also considers a modular LAPL(A)/(S) training and a review of the mountain rating.

Table 31: Non-commercial operations aeroplanes related safety actions

EPAS Actions	**Rulemaking**	**RMT.0498**	Reorganisation of Part 23 and CS-23
	Rulemaking	**RMT.0547**	Task force for the review of Part-M for General Aviation
	Rulemaking	**RMT.0657**	Training outside ATOs
	Rulemaking	**RMT.0677**	Easier access of General Aviation pilots to IFR flying
	Rulemaking	**RMT.0678**	Addressing other FCL GA issues
	Action on Member States	**MST.016**	Airspace infringement risk in General Aviation
	Action on Member States	**MST.017**	Safety of transportation of dangerous goods in GA
	Safety Promotion	**SPT.044**	Improve General Aviation safety in Europe through risk awareness and safety promotion.

Non-Commercial Helicopter Operations

7

This chapter covers non-commercial operations involving both helicopter and gyrocopters where the state of registry was an EASA MS.

Key Statistics

The key Domain statistics are in the tables below. There were 6 fatal accidents in 2015, compared with the 10-year average of 8.2. There were also a lower number of non-fatal accidents than the 10-year average. The number of fatalities in 2015 was half the 10-year average, while there was also a lower number of serious injuries.

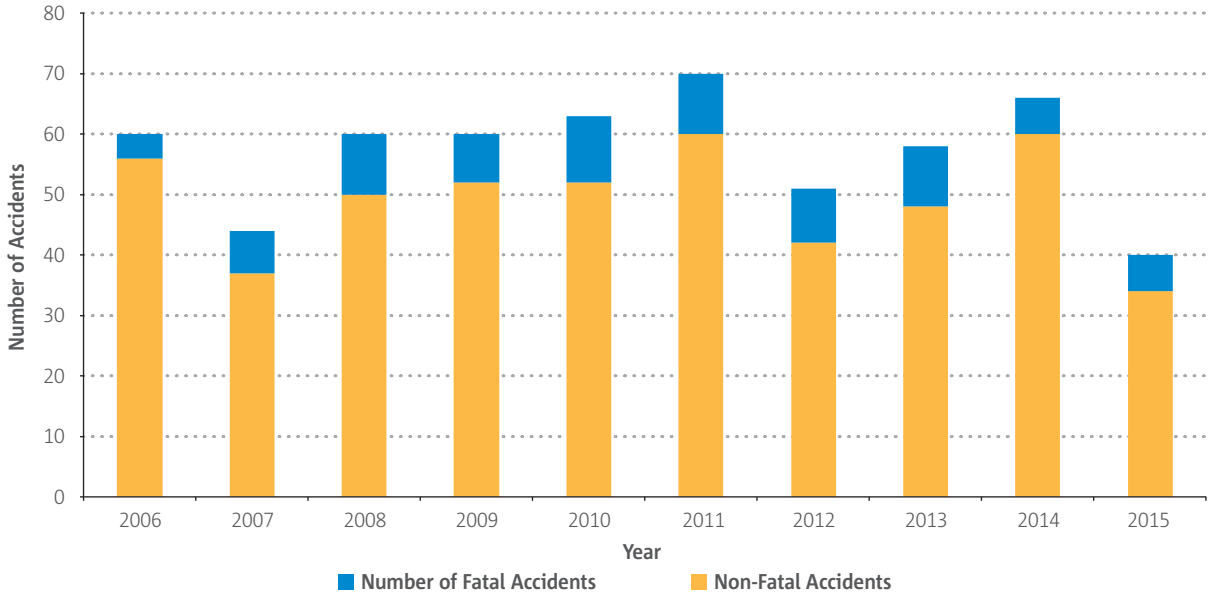
Table 32: statistics non-commercial operations helicopters 2005-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	8.2	47.1	0.7
2015	6	34	2

	Fatalities	Serious Injuries
2005-2014 Annual average	14.5	8.6
2015	7	5

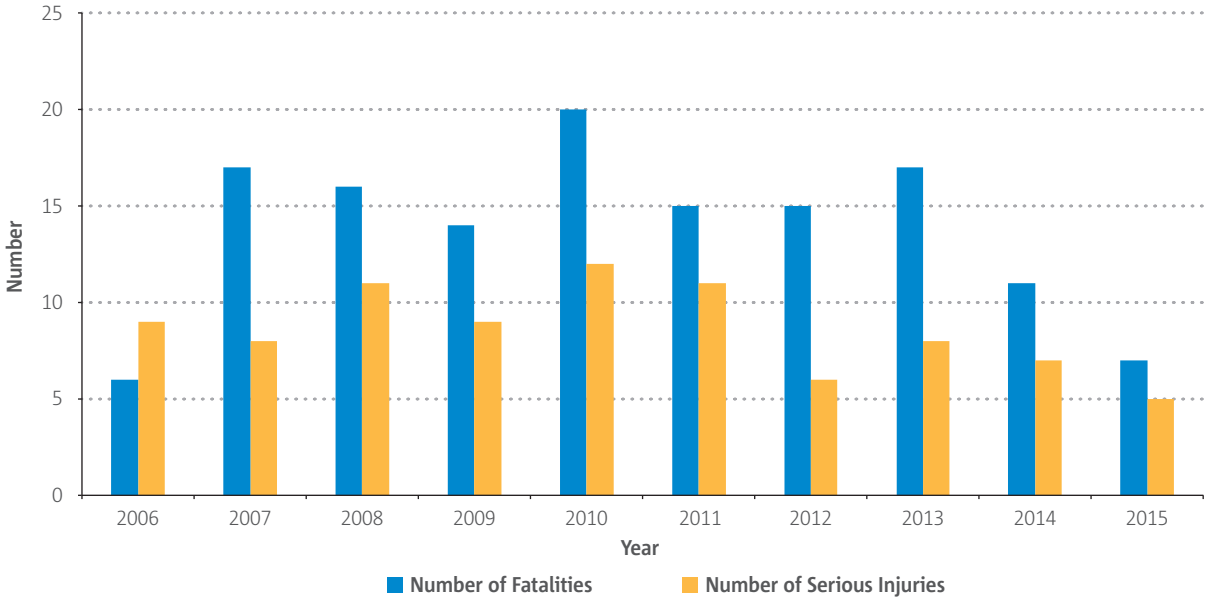
In Non-Commercial helicopter operations, there were 6 fatal accidents, which is 25% less than the 10-year average. There was also a reduction in the number of non-fatal accidents.

Figure 18: Non-commercial operations helicopters fatal and non-fatal accidents 2006-2015



There were 7 fatalities in non-commercial helicopter operations, which was 4 less than in 2014 and is 50% less than the 10-year average.

Figure 19: Non-commercial operations helicopters fatalities and serious injuries 2006-2015



Phase of Flight: In terms of flight phase the number of accidents in 2015 was similar to the 10-year average. It can be seen that most critical parts of the helicopter flights are during take-off and landing phases of the flight.

Table 33: Non-commercial operations helicopter accidents and serious incidents per phase of flight 2005-2015

Phase of Flight	Accidents and SIs	
	2005-2014 average	2015
Standing	1.4	0
Taxi	4.1	1
Take-off	12.4	12
En route	11	4
Manoeuvring	6.6	5
Approach	4.7	5
Landing	14.1	13
Post-impact	0	0
Unknown	1.5	2

Table 34: Non-commercial helicopter operations safety risk portfolio

Non-commercial operations - Helicopters													
Outcome Percentage of Fatal Accidents (2006-2015)		42				44%	10%	10%	9%	9%	4%	3%	0%
Outcome Percentage of Non-Fatal Accidents (2006-2015)		243				34%	2%	2%	14%	10%	5%	2%	14%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue				Key Risk Areas (Outcomes)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Terrain Conflict	Engine Failure	Other system failures	Abnormal Runway Contact and Excursions	Obstacle Conflict	Airborne Conflict	Aircraft Upset on Ground
Operational	Detection, Recognition and Recovery of Deviation from Normal Operations	10	1	122	14	■	■			■	■	■	■
	Operation in Adverse Weather Conditions	6	—	44	12	■	■	■	■	■	■	■	■
	Intentional Low Flying	—	—	23	8	■					■		
	Maintaining Adequate Separation Between Aircraft on the ground and in the air	128	3	35	4	■						■	
	Wirestrikes	—	—	15	4	■	■				■		
	Safe Forced Landings	6	—	30	3	■	■	■	■	■	■	■	■
	Handling and Operation of the Aircraft Following a Technical Failure	—	—	3	2	■	■			■	■	■	●
	Pre-Flight Preparation/ Planning and In-Flight Re-Planning	7	—	5	2	■	■	■	■	■	■	■	
	Control of Manual Aircraft Flight Path	—	—	3	—	■	■			■	■		■
	Aircraft Maintenance	—	—	1	—	■	■	■	■	■	■	■	■
Technical	Diagnosis and Management of Engine Failures in Flight	—	—	2	—	■	■	■	■	■	■	■	
Human	Personal Readiness and Crew Impairment	58	—	17	2	■	■	■	■	■	■	■	●
	Knowledge and Competency of Individuals	—	—	3	1	■	■	■	■	■	■	■	■
	Flight Crew Perception and Awareness Decision Making and Planning	—	—	2	1	■	■			■	■	■	■

Non-Commercial Helicopter Operations Safety Risk Portfolio

The Non-Commercial Helicopters Operations Safety Risk Portfolio is provided on the previous page, which provides the full picture of the key risk areas and safety issues. This Portfolio has been developed specifically as part of the analysis for this year's Annual Safety Review and is the result of an initial analysis to identify the key risk areas and safety issues from the analysis of safety data (historical occurrence data) both from accidents and serious incidents reported to the agency as well as from the ECR.

Non-Commercial Helicopter Operations – Key Risk Areas

Non-Commercial Helicopter – Key Risk Area 1 - Aircraft Upset (Loss of Control): With 44%, loss of control is also the most common type of accident outcome for non-commercial operations with helicopters. As by far the most significant type of fatal accidents in this domain, loss of control will be the main focus for more detailed analysis.

Non-Commercial Helicopter – Key Risk Area 2 -Terrain Conflict (CFIT): This type of accident outcome is the 2nd most significant type of fatal accident in the last 10 years and occurred in 10% of fatal accidents.

Non-Commercial Helicopter – Key Risk Area 3 -Engine Failures: This type of accident outcome is the 3rd most frequent outcome in the last 10 years with 9%. Likewise, as described below for other system failures, this is also monitored on a routine basis.

Non-Commercial Helicopter – Key Risk Area 4 – Other System Failures: This type of accident outcome is the 4th most common type of fatal accident in the last 10 years with 9%.

Non-Commercial Helicopter Operations Main Domain Priorities - Top Safety Issues

Operational Safety Issues

The main domain priorities for Non-Commercial Operations Helicopters provided in terms of the safety issues are:

Non-Commercial Helicopter – Operational Safety Issue 1 - Detection, Recognition and Recovery from Normal Operations. In non-commercial operations with helicopters this safety issue also has the greatest involvement in accidents, as with other domains. It is specifically related to the ability of pilots in identifying potential loss of control situations and to take the correct recovery action, potentially more challenging in helicopter operations.

Non-Commercial Helicopter – Operational Safety Issue 2 - Operation in Adverse Weather Conditions: In terms of loss of control this is specifically related to both the planning of flight crew and their ability to understand the risks of changing weather conditions prior to take-off and then the handling of the aircraft when weather increases the workload on pilots, potentially beyond their level of experience. The safety risk assessment will consider a range of different situations. This safety issue is also related to CFIT accidents and a typical scenario involves worsening weather leading to inadvertent flight into IMC conditions resulting in a collision with terrain. The assessment of this safety issue will cover CFIT scenarios. Rulemaking task RMT.0677 is designed to provide the private pilots with easier access to an IFR rating. This will hopefully provide higher level of safety also in non-commercial helicopter flying.

Non-Commercial Helicopter – Operational Safety Issue 3 - Intentional Low Flying: Specifically within helicopter operations, intentional low flying was identified as a priority Issue requiring further risk assessment.

Human Factors Safety Issues

Non-Commercial Helicopter – Human Factors Safety Issue 1 - Personal Readiness and Crew Impairment: The first HF priority area identified in the analysis has been related to personal readiness and crew impairment.

Non-Commercial Helicopter – Human Factors Safety Issue 2 - Knowledge and Competency of Individuals: The next HF safety issue concerns the knowledge and competency of individuals. The safety risk assessment in this area will specifically consider ways to provide clear, simple information to help pilots have the right information to perform flights as safely as possible. Rulemaking task RMT.0678 will address the theoretical knowledge syllabus in the pilot training which is hoped to deliver stronger theoretical knowledge as a basis for a better outcome from future occurrences.

Non-Commercial Helicopter – Human Factors Safety Issue 3 - Flight Crew Perception and Awareness: The final HF priority for helicopters is linked to a number of different types of accident, especially in terms of management and awareness of the aircraft's energy state and manual flight control leading to loss of control and dynamic rollover. It also includes awareness of both the geographical position of the aircraft and its position in relation to other aircraft.

Table 35: Non-commercial operations helicopters – related safety actions

EPAS Actions	**Rulemaking**	**RMT.0547**	Task force for the review of Part-M for General Aviation
	Rulemaking	**RMT.0657**	Training outside ATOs
	Rulemaking	**RMT.0677**	Easier access of General Aviation pilots to IFR flying
	Rulemaking	**RMT.0678**	Addressing other FCL GA issues
	Action on Member States	**MST.016**	Airspace infringement risk in General Aviation
	Action on Member States	**MST.017**	Safety of transportation of dangerous goods in GA
	Safety Promotion	**SPT.044**	Improve General Aviation safety in Europe through risk awareness and safety promotion.

Balloons

8

This chapter covers balloon operations where the state of registry was an EASA MS, in this chapter there was minimal data in the ECR for incidents so this has not been included in the safety risk portfolio. The Balloon Collaborative Analysis Group (BCAG) was the first CAG to be established. It has already proven the concept of CAGs. The group has reviewed all the fatal accidents and to some extent the non-fatal accidents last five years. The group is combination of industry, manufacturer and NAAs providing an excellent source of inside knowledge and expertise for the deeper analysis of the accidents. The identified safety issues in relation to the available data are seen to give an accurate picture of the safety within the hot air ballooning industry today. The future work of the CAG will be to risk assess the balloon accidents and further support the EASAs SRM process.

Key Statistics

The key domain statistics are in the tables below. The balloon domain has a very small number of occurrences and this affects statistical analysis. The 10 year average is skewing the picture as reliable balloon accident data is only available from 2012. A 5 year average is therefore used in this section. In 2015 there were 2 fatal accidents in balloons, leading to 3 fatalities, both of which were higher than the 5-year average. There was also an increase in the number of non-fatal accidents and serious injuries.

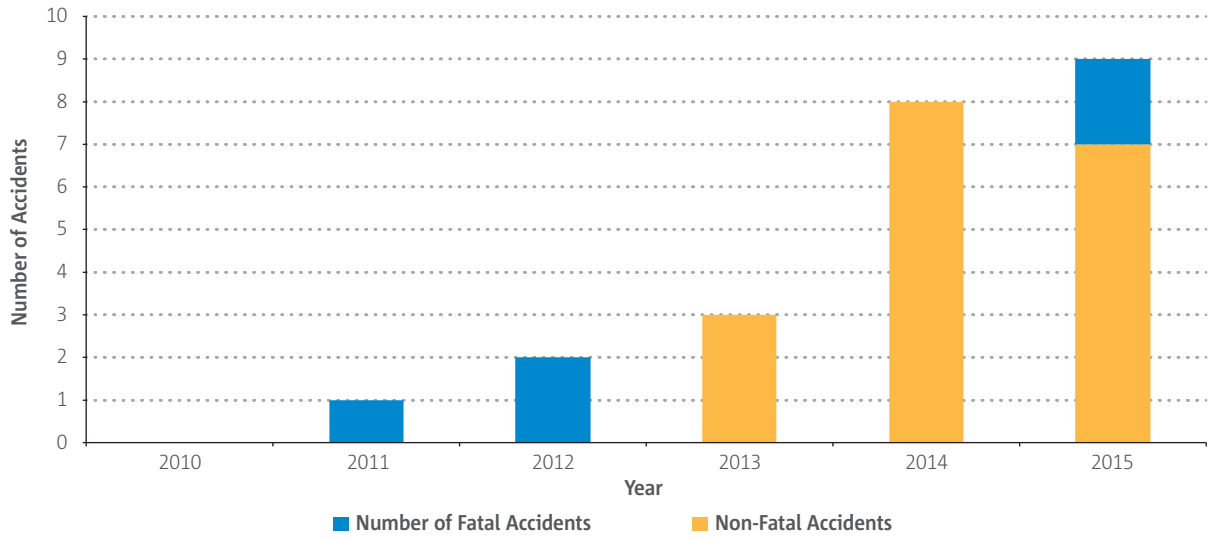
Table 36: Key statistics balloons 2010-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2010-2014 Annual average	0.6	2.2	0.6
2015	2	7	1

	Fatalities	Serious Injuries
2010-2014 Annual average	1.8	4.2
2015	3	8

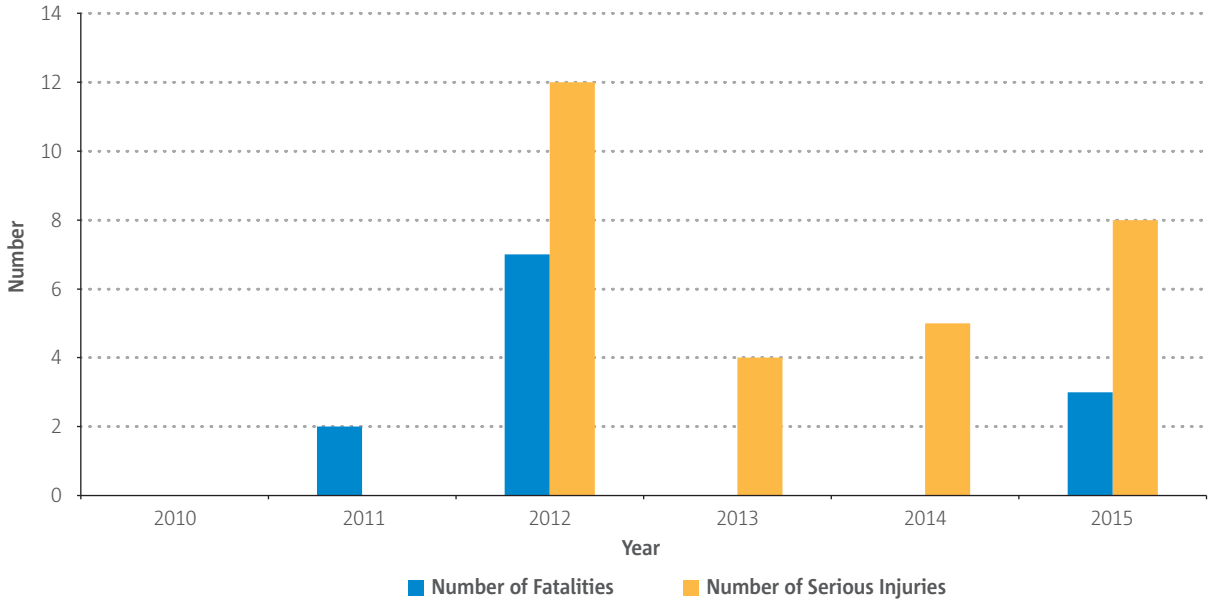
There were 2 fatal balloon accidents, compared with none in the past 2 years. The number of non-fatal accidents was also increased compared with the 10-year average.

Figure 20: Balloons fatal and non-fatal accidents 2010-2015



There were 3 fatalities in balloons in 2015. This the highest number since 2012, there was also an increase in the number of serious incidents.

Figure 21: Balloons fatalities and serious injuries 2010-2015



Phase of Flight: In terms of flight phase it can be seen that most accidents within the balloon domain happen during approach and landing. The root causes for balloon accidents are late detection of obstacles like power lines and incorrect balloon control due to the lack of knowledge of balloon inertia. Both hard and bounced landings caused most of the injuries.

Table 37: Balloons accidents and serious incidents per phase of flight 2010-2015

Phase of Flight	Accidents and SIs	
	2010-2014 average	2015
Standing	0.2	0
Taxi	0	0
Take-off	0.4	0
En route	0.6	1
Manoeuvring	0.2	1
Approach	0.2	4
Landing	1.8	4
Post-impact	0	0
Unknown	0	0

Table 38: Balloons safety risk portfolio

Balloons										
Outcome Percentage of Fatal Accidents (2011-2015)		11			36%	27%	27%	18%	9%	9%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		101			36%	15%	11%	5%	3%	2%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue			Key Risk Areas (Outcomes)					
		Incidents (ECR data)	Serious Incidents	Total Accidents	Aircraft Upset in Flight	Terrain Conflict	Glider Towing Events	Other System Failures	Airborne Conflict	Abnormal Runway Contact and Excursions
Operational	Control of manual flight path through control of balloon inertia	2	27	9	■	■	■	■	■	
	Weather planning	2	39	4			■		■	
	Use or presence of Pilot restraints	—	5	4						■
	Loss of separation – Particularly during mass balloon launches	—	2	2					■	
Technical	Propane system fire	—	2	2					■	■
	Exterior Colour Schemes and Markings – Visibility of Balloon Registration	—	2	2					■	
Human	Perception, Decision making and planning	4	55	10	■	■	■	■	■	
	Commercial and competitive pressure to initiate flights	—	7	5	■	■	■			
	Pilot knowledge of balloon physics	—	12	3	■	■	■	■	■	
	Communication and situational awareness during mass balloon launches	—	2	2		■			■	
Organisational	Passenger safety knowledge	—	3	4	■		■			
	Availability of operational documentation – e.g. Map Marking with Power Wires	—	5	3	■	■				

The balloons safety risk portfolio is provided above, which provides the full picture of the key risk areas and safety issues. This Portfolio has been developed in conjunction with NAAs and the balloon community through the Balloon CAG, which last met in March 2016 to review the balloon accidents in 2015.

Balloons – Key Risk Areas

Balloon – Key Risk Area 1 -Hard Landings. Hard landings is the most significant type of fatal accident outcome for balloons in the last 5 years with 36.4%. Hard landing can lead to serious injuries and in a small number of accidents pilots were ejected as they were not restrained in the basket.

Balloon – Key Risk Area 2 - Obstacle Conflict During Take-Off and Landing. This type of accident outcome is the 2nd most significant over the last 5 years with 27.3%. The safety issues for this key risk area are the same as for Hard Landings.

Balloons Main Domain Priorities - Top Safety Issues

The main safety issues for balloons are:

Operational Safety Issues

Balloon – Operational Safety Issue 1 - Control of Manual Flight Path Through Control of Balloon Inertia: During balloon operations, the most significant safety issue in terms of fatal accidents has been the pilot's control of the manual flight path. Management of inertia of a balloon as it flies is a particular challenge and further assessment will be carried out to identify which type of safety promotion actions would benefit the balloon community.

Balloon – Operational Safety Issue 2 - Weather Planning: Hard landings are often related to changing weather conditions and a number of accidents have been related to weather that could have been anticipated through better pre-flight planning.

Balloon – Operational Safety Issue 3 – Use or Presence of Pilots Restraints: In the Balloon CAG Meeting, the review of 2015 accidents identified occurrences where the use of pilot restraints would have prevented the pilot from being ejected from the basket. Use of pilot restraints is becoming more common, especially where the pilot has his own compartment in the basket and further work will be carried to promote the use of restraints in this situation. In open baskets this is not so easy because of the risk of restraints interfering with passengers.

Human Factors Safety Issues

Balloon – Human Factors Safety Issue 1 - Perception, Decision Making and Planning: The first HF priority area covers a number of general areas including perception, decision making and planning. These are all important human factors areas and the goal will be to provide practical information for balloon pilots.

Balloon – Human Factors Safety Issue 2 -Commercial and Competitive Pressure to Initiate Flights: Because balloon flying involves elements of commercial flying and private people flying sponsored balloons, coupled with the fact that it is arguably more weather dependent than other types of aviation, there have been a number of occurrences where the commercial and competitive pressure to initiate flights has led to a balloon flight that might or should not have otherwise taken place.

BALL – Human Factors Safety Issue 3 - Pilot Knowledge of Balloon Physics: The third HF area for balloon involves improving the knowledge, understanding and application of balloon physics as it flies through the air.

In terms of actions, the main task will be to work on the content of safety promotion actions that will address the top issues. In addition, from a more general perspective EASA has published an Opinion on operational rules for ballooning in January 2016. Rulemaking task RMT.0654 is being launched addressing the licencing requirements for ballooning.

Table 39: Balloon operations related safety actions

EPAS Actions	**Rulemaking**	**RMT.0654**	Revision of the balloon licensing requirements
	Rulemaking	**RMT.0674**	Revision of the European operational rules for balloons
	Safety Promotion	**SPT.044**	Improve General Aviation safety in Europe through risk awareness and safety promotion.

Gliders

9

This chapter covers glider/sailplane operations where the state of registry is an EASA MS.

Key Statistics

The key domain statistics are in the tables below. For gliders, there was a slightly higher number of fatal accidents and fatalities in 2015 with 24 fatal accidents and 27 fatalities. The number of non-fatal accidents was slightly lower than the 10-year average with 156. There was a slight increase in the number of serious injuries with 36.

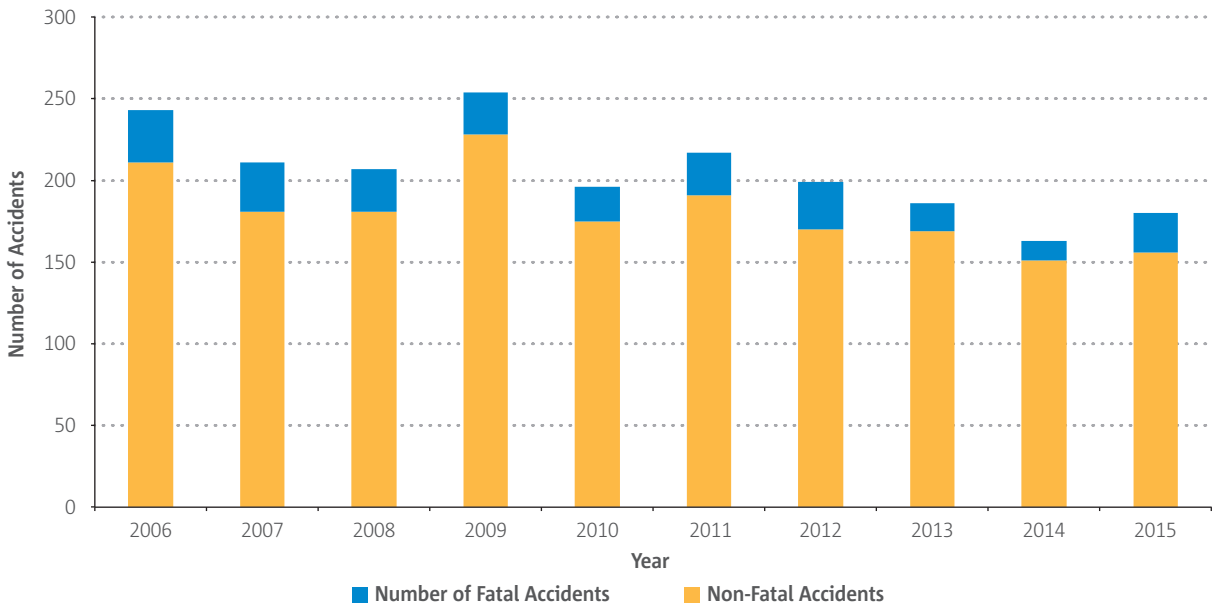
Table 40: Key statistics gliders 2005-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	22.3	166.0	1.3
2015	24	156	2

	Fatalities	Serious Injuries
2005-2014 Annual average	25.9	27.5
2015	27	36

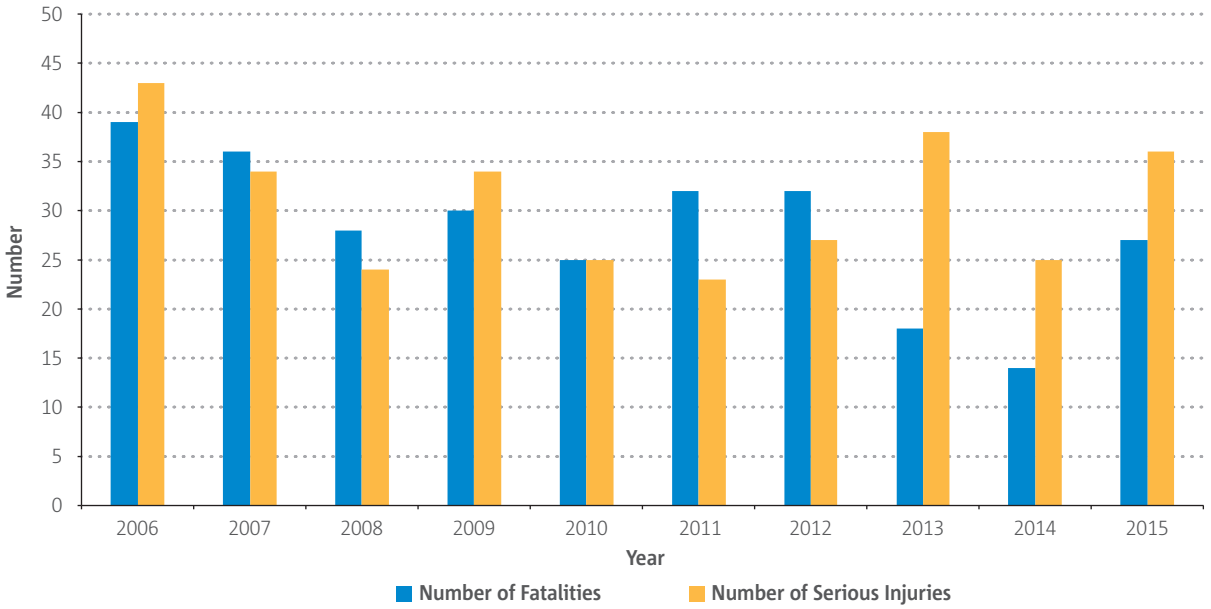
There was a slightly higher number of fatal accidents in Glider/Sailplanes in 2015 with 24, compared with the 10-year average. The number of non-fatal accidents was however reduced.

Figure 22: Glider fatal and non-fatal accidents 2006-2015



There were 27 fatalities in gliders/sailplanes in 2015. This the highest number since 2012, however it is still a reduction on the period 2006-2012.

Figure 23: Glider fatalities and serious injuries 2006-2015



Phase of Flight: In terms of flight phase the majority of the Glider accidents occur during take-off or landing. During take-off it is often a wing touching ground during a winch launch and during landing it is mostly perception of the situation which causes hard landings and/or ground loops.

Table 41: Glider accidents and serious incidents per phase of flight 2005-2015

Phase of Flight	Accidents and SIs	
	2005-2014 average	2015
Standing	1.9	2
Taxi	3.4	2
Take-off	37.6	37
En route	25.2	26
Manoeuvring	13.2	5
Approach	25.1	17
Landing	79.8	81
Post-impact	0.1	1
Unknown	1.6	6

Table 42: Glider safety risk portfolio

Gliders

Safety Issues		Total number of accidents in 2011-2015 per safety issue				Key Risk Areas (Outcomes)							
		Incidents (ECR data)	Serious Incidents	Total Accidents	Fatal Accidents	Aircraft Upset in Flight	Terrain Conflict	Glider Towing Events	Other System Failures	Airborne Conflict	Abnormal Runway Contact and Excursions	Obstacle Conflict	Aircraft Upset on Ground
Outcome Percentage of Fatal Accidents (2011-2015)		121				52%	8%	7%	6%	4%	3%	0%	0%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		963				11%	3%	8%	8%	2%	32%	0%	0%
Operational	Forced landings	318	16	1 010	105	■	■	■	■	■	■	■	■
	Detection, recognition and recovery of deviation from normal operations	25	3	257	61	■	■	■			■	■	■
	Maintaining adequate separation between aircraft on the ground and in the air	123	6	168	16	■		■		■			
	Operation in adverse weather conditions	13	1	59	7	■	■	■		■	■	■	■
	Intentional low flying	—	1	21	4	■	■				■	■	
	Handling and operation of the aircraft following a technical failure	—	2	14	2	■	■	■	■		■	■	■
	Birdstrikes	—	—	4	1	■					■		■
	Control of manual aircraft flight path	—	—	5	—	■	■				■	■	■
	Pre-flight preparation/ planning and in-flight re-planning	9	—	5	—	■	■	■		■	■	■	
	Aircraft maintenance	—	1	2	—	■	■	■	■	■	■	■	■
Technical	Tow rope disconnects and launch cable failures	—	1	21	4	■		■					
	Management of landing gear system malfunctions	—	—	7	—				■		■		■
Human	Personal readiness and crew impairment	38	—	22	4	■	■	■	■	■	■	■	■
	Flight crew perception and awareness/ decision making and planning	—	—	16	4	■	■	■		■	■	■	■
	Use and adequacy of rules and procedures	—	—	4	1	■	■	■	■	■	■	■	■
	Knowledge and competency of individuals	—	—	5	—	■	■	■	■	■	■	■	■

Glider Operations Safety Risk Portfolio

The Gliders Safety Risk Portfolio provides the full picture of the key risk areas and safety issues in this domain.

Glider Operations – Key Risk Areas

Glider – Key Risk Area 1 - Aircraft Upset (Loss of Control): This type of accident outcome is by far the most significant type of fatal accident over the past 10 years with 54 %. This is key priority area for Gliders.

Glider Operations Main Domain Priorities - Top Safety Issues

The main domain priorities for Gliders is provided in terms of the safety issues are:

Operational Safety Issues

Glider – Operational Safety Issue 1 - Unstabilised Approaches: The most frequent safety issue identified for Gliders is unstabilised approaches leading to loss of control and also terrain collisions. This was somewhat of a surprise in the ASR 2016 analysis and further analysis will be carried out with Glider experts to understand more about the problem.

Glider – Operational Safety Issue 2 - Detection, Recognition and Recovery from Normal Operations: As with many other domains, detection, recognition and recovery from normal operations was identified as another priority safety issue requiring further work to understand the typical scenarios leading to loss of control occurrences.

A Rulemaking task RMT.0698 has been launched to revise the operational rules for sailplanes. EASA Opinion will be published in 2017. In addition, there will also be work to identify the most appropriate safety promotion actions for the priority safety issues.

Table 43: Glider operations related safety actions

EPAS Actions	**Rulemaking**	**RMT.0698**	Revision of the operational rules for sailplanes
	Safety Promotion	**SPT.044**	Improve General Aviation safety in Europe through risk awareness and safety promotion.

Remotely Piloted Aircraft Systems

10

This chapter covers Remotely Piloted Aircraft Systems (RPAS) Operations that occurred in EASA Member States. EASA has initiated work on various aspects of RPAS operation. The number of drones within the EU has multiplied over the last 2 years. EASA has already introduced a technical opinion to initiate the definition of the regulatory framework required at EU level. Most of the occurrences in this RPAS analysis were related to either airspace infringements which occasionally lead to a near collision with an aircraft.

Key Statistics

Analysis of RPAS occurrences in the European Central Repository identified 584 occurrences of all severity levels, of which 37 accidents had been classed as accidents, none of the accidents involved fatalities and there were only four minor injuries reported in the period since 2010. The collection of data on RPAS occurrences is still in its infancy and there is still work to be done to ensure the correct application of taxonomy terminology related to RPAS. The application of the definition of accident in relation to RPAS has improved since new definitions were provided in ICAO Annex 13. However the data in ECR covers a period before this and therefore the definition of accident may not have been correctly captured in some of the older data.

Table 44: Key statistics RPAS 2010-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2010-2014 Annual average	0	37.0	5.4
2015	0	34	5

	Fatalities	Serious Injuries
2010-2014 Annual average	0	0
2015	0	0

Figure 24: RPAS occurrences 2011-2015

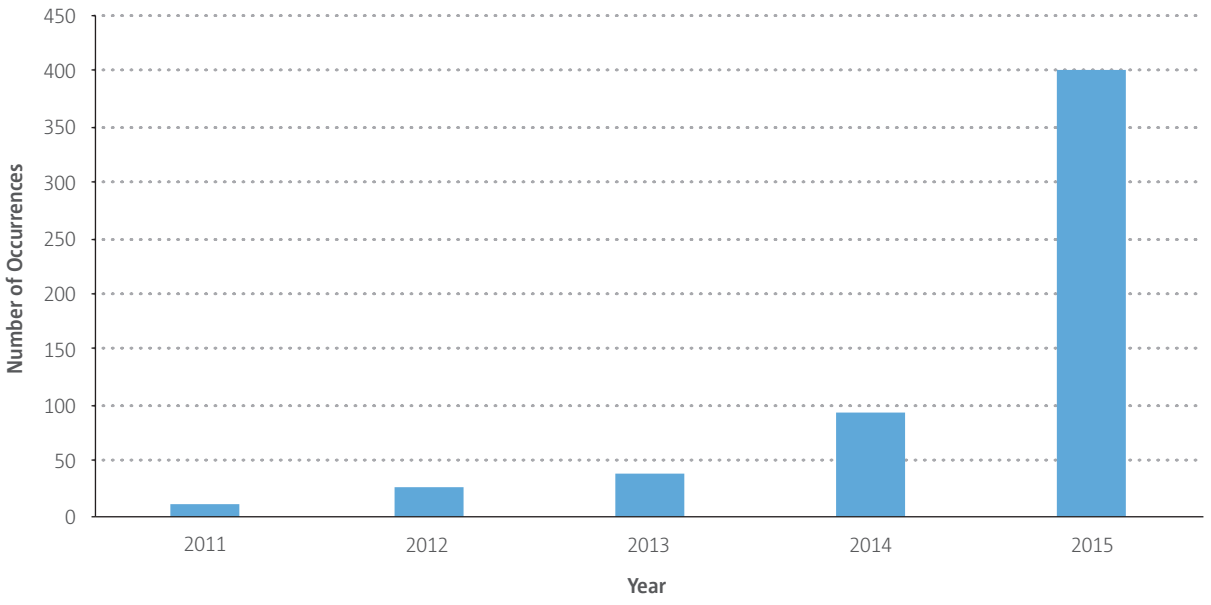


Figure 25: RPAS occurrence class

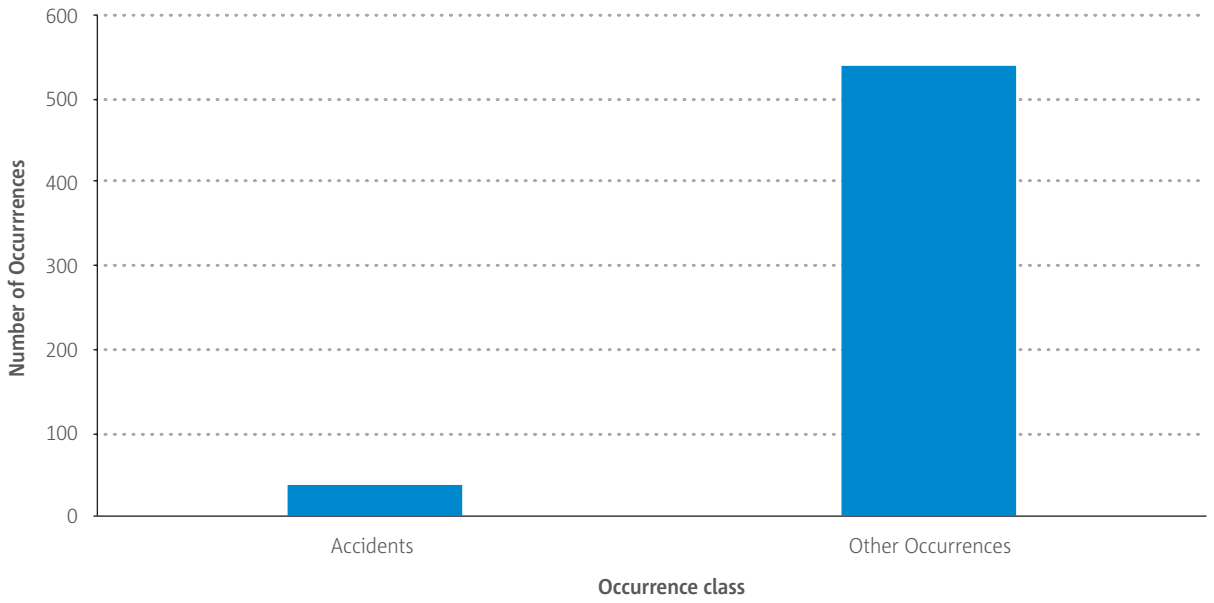


Table 45: RPAS safety risk portfolio

RPAS									
Outcome Percentage of Fatal Accidents (2011-2015)		121			52%	8%	7%	6%	4%
Outcome Percentage of Non-Fatal Accidents (2011-2015)		963			11%	3%	8%	8%	2%
Safety Issues		Total number of occurrences in 2011-2015 per safety issue			Key Risk Areas (Outcomes)				
		Incidents	Serious Incidents	Accidents	Airborne Conflict	Other System Failures	Aircraft Upset	Engine Failure	Third Party Conflict
Operational	Detection, Recognition and Recovery of Deviation from Normal Operations	2	2	5			■		■
	RPAS Handling and Flight Path Management	1	—	3	■		■		■
	RPAS Infringement of Controlled Airspace	72	2	—	■				■
	RPAS Proximity with Other Aircraft in Uncontrolled Airspace	45	1	—	■				
Technical	Failure of Guidance and Control System	3	—	3	■	■	■		■
	Failure of Propulsion System	2	—	2				■	
	Failure of Power Sources	0	—	2		■			
Human	Pre-Flight Planning and Prepration	13	—	—	■	■	■	■	■
	RPAS Operator Knowledge of Aviation System	—	—	—	■	■	■	■	■
	Maintenance/ manufacuring	—	—	—	■	■	■	■	■

RPAS Safety Risk Portfolio

The initial RPAS Safety Risk Portfolio is shown above, which provides the full picture of the key risk areas and safety issues. Further analysis is ongoing with the NoA and the CAT Aeroplanes CAG as part of an EASA task force created to assess the risk of collision between drones and aircraft. The task force will:

Review all relevant occurrences including the occurrences collected by the European Member States.

Analyse the existing studies on the subject of impact between drones and aircraft.

- Study the vulnerabilities of aircraft (windshields, engines, and airframe) taking into account the different categories of aircraft (large aeroplanes, general aviation, and helicopters) and their associated design and operational requirements.

- Consider the possibility to do further research and perform actual tests (for example on windshields).

The regulatory framework for the safe operations of drones in Europe currently being developed by EASA already addresses the issue of collision between drones and aeroplanes. A combination of measures are envisaged such as: operate in visual line of sight, fly under 150 m height above ground, be equipped with identification and geo-limitation functions and be registered. Any operation of drones close to aerodromes would require a specific authorization from the national aviation authority based on a risk assessment.

RPAS – Key Risk Areas

RPAS – Key Risk Area 1 - Airborne Conflict: In terms of occurrences, the highest number of occurrences reported so far have involved potential airborne collisions, there have been no reporting collisions between RPAS and commercial aircraft in the EASA MS, however the situation is continually monitoring with the EASA MS.

RPAS – Key Risk Area 2 - Other System Failures: A small number of occurrences have been reported concerning failures of guidance and control systems for RPAS.

The main domain priorities for RPAS is provided in terms of the safety issues are:

Operational Safety Issues

RPAS – Operational Safety Issue 1 - RPAS Infringement of Controlled Airspace. The first safety issue in RPAS involves the risk of an RPAS infringing controlled airspace and colliding with an aircraft during approach or take-off. Work is already investigating the use of geo-fencing to prevent RPAS flying into controlled airspace in the first place. This safety issue is also linked to the HF safety issues on RPAS operator knowledge of the aviation system.

Human Factors Safety Issues

RPAS – Human Factors Safety Issue 1 - Pre-Flight Planning and Preparation: The first HF safety issue for RPAS involves the need for good pre-flight planning and preparation so that an RPAS operator conducts any flight in a safe manner. Because RPAS operations involve many people not familiar with the aviation system, safety promotion will be important to make operators aware of good practices that they can easily follow.

RPAS – Human Factors Safety Issue 2 - RPAS Operator Knowledge of the Aviation System: The second HF priority area is to ensure that anyone operating RPAS who is new to aviation is able to easily learn about the aviation regulatory framework as it applies to RPAS operations.

Table 46: RPAS operations related safety actions

EPAS Actions	**Rulemaking**	**RMT.0230**	Implementing rules for remotely piloted aircraft systems (RPAS)
	Task Force		RPAS Task Force to assess the risk of collision between drones and aircraft.

Aerodromes

11

This chapter covers aerodrome operations, specifically in this Chapter the scope involves the EASA Member States as State of Occurrence taken from the EASA database. It is worth noting that the accidents and serious incidents in this Chapter are those related to Aerodrome operations in a general context, which means that the Aerodrome itself may or may not have had a contribution to the given occurrence, but it may have a role in preventing similar occurrences in the future. Among them, there are occurrences where an occurrence was classified with either the Occurrence Categories "ADRM" or "RAMP", or with event types in the ECCAIRS taxonomy related to aerodrome operations.

Key Statistics

In 2015 there were no fatal accidents in EASA MS aerodrome operations and 15 non-fatal accidents, which is significantly lower than the average of the preceding 10-year period. A full safety risk portfolio for aerodromes is currently under development and more detailed analysis and discussion on specific safety issues for both aerodrome and ground handling will take place in the CAG.

Table 47: Key statistics aerodromes 2005-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	1.6	34.7	6.7
2015	0	15	5

	Fatalities	Serious Injuries
2005-2014 Annual average	2.8	4.5
2015	0	2

Figure 26: Aerodromes fatal and non-fatal accidents 2006-2015

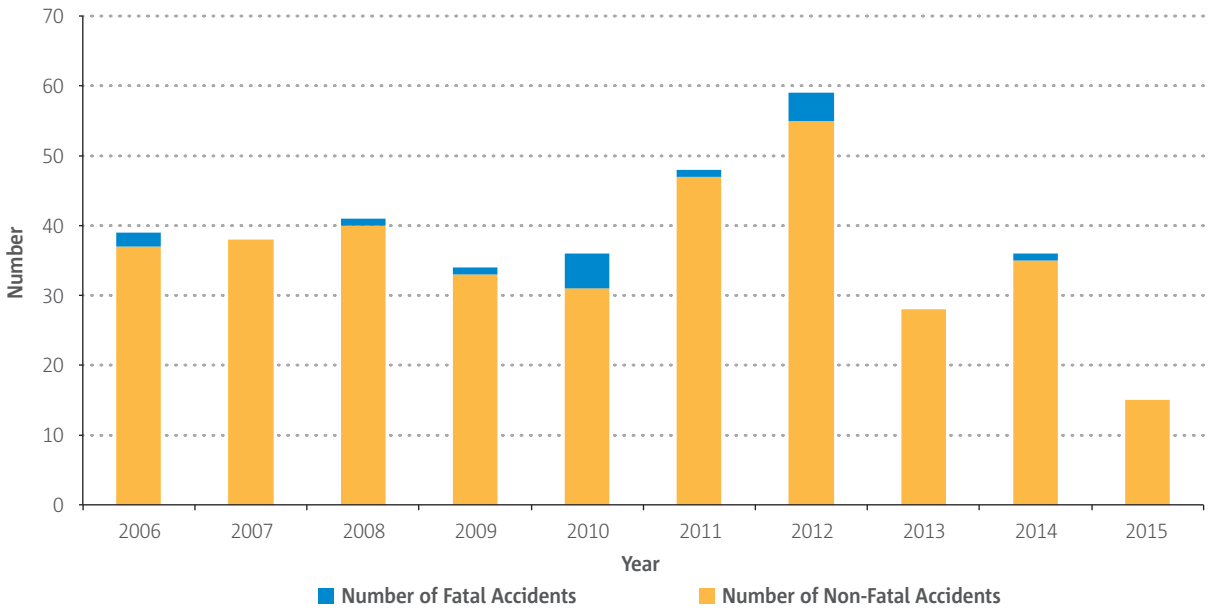
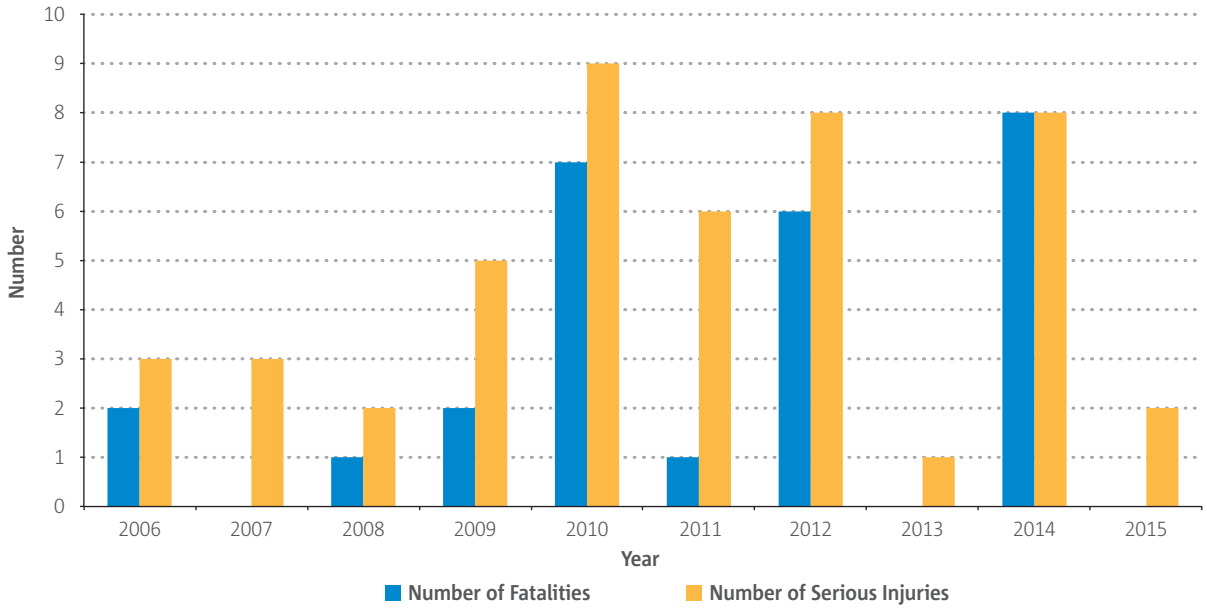


Figure 27: Aerodromes fatalities and serious injuries 2006-2015



Aerodrome – Key Risk Areas

Aerodrome – Key Risk Area 1 - Abnormal Runway Contact and Runway Excursions: One of the main priority outcomes related to aerodromes is runway excursions. This is currently addressed in the European Action Plan for the Prevention of Runway Excursions (EAPPRE), and further analysis will be carried out in the coming months to identify specific Aerodrome related safety issues however from the detailed analysis already carried out, the key priority safety issue is expected to be the management of the runway conditions to minimise the excursion risk.

Aerodrome – Key Risk Area 2 - Ground Collisions: The 2nd priority key risk area for aerodromes is the prevention of ground collisions, this is related both to aircraft collisions with other aircraft and also with vehicles and ground equipment.

Aerodrome – Key Risk Area 3 - Runway Incursions: The final key priority area is runway incursions and the prevention of collisions specifically on the runway.

Table 48: Aerodrome operations related safety actions

EPAS Actions	**Rulemaking**	**RMT.0570**	Reduction of runway excursions
	Rulemaking	**RMT.0591**	Maintaining aerodrome rules
	Action on Member States	**MST.007**	Include runway excursions in national SSPs
	Action on Member States	**MST.014**	Include runway incursions in national SSPs
	Action on Member States	**MST.011**	Runway safety teams
	Action on Member States	**MST.018**	Include ground safety in national SSPs
	Safety Promotion	**SPT.075**	Promoting EAPPRE

ATM

12

This chapter covers accidents and serious incidents related to the provision of ATM/ANS services in the EASA Member States taken from the EASA database. The analysis of this ATM chapter includes accidents and serious incidents which occurred within an EASA MS as state of occurrence, involving at least one CAT, fixed wing aircraft with MTOM of 2250 kg or above.

It is worth noting that the accidents and serious incidents in this chapter are those related to ATM, which means that the ATM system may or may not have had a contribution to the given occurrence, but it may have a role in preventing similar occurrences in the future. Among these related ATM/ANS related events, there are occurrences with "ATM/ANS contribution" where the ATM/ANS provision of services was a factor contributing to the occurrence, or at least one ATM/ANS factor potentially increased the level of risk, or it played a role in the occurrence encountered by the aircraft.

Currently there is an ongoing work to develop an ATM/ANS safety risk portfolio in order to identified key risk areas and main safety issues in relation to the ATM/ANS provision of services. In addition, the safety issues will also serve to prioritise actions included in the European Plan for Aviation Safety (EPAS).

Key Statistics

There were no accidents related to ATM/ANS operations provided in an EASA MS in 2015, following the trend of 2014, and while the total number of non-fatal accidents was similar to the preceding ten-year average, the number of serious incidents decreased over the average of that ten-year period. The number of serious injuries is slightly higher than the average of the ten-year period.

Table 49: Key statistics ATM 2005-2015

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2005-2014 Annual average	0.6	5.7	36.4
2015	0	6	20

	Fatalities	Serious Injuries
2005-2014 Annual average	2.2	3.6
2015	0	5

Figure 28: ATM/ANS related accidents per year 2005-2015

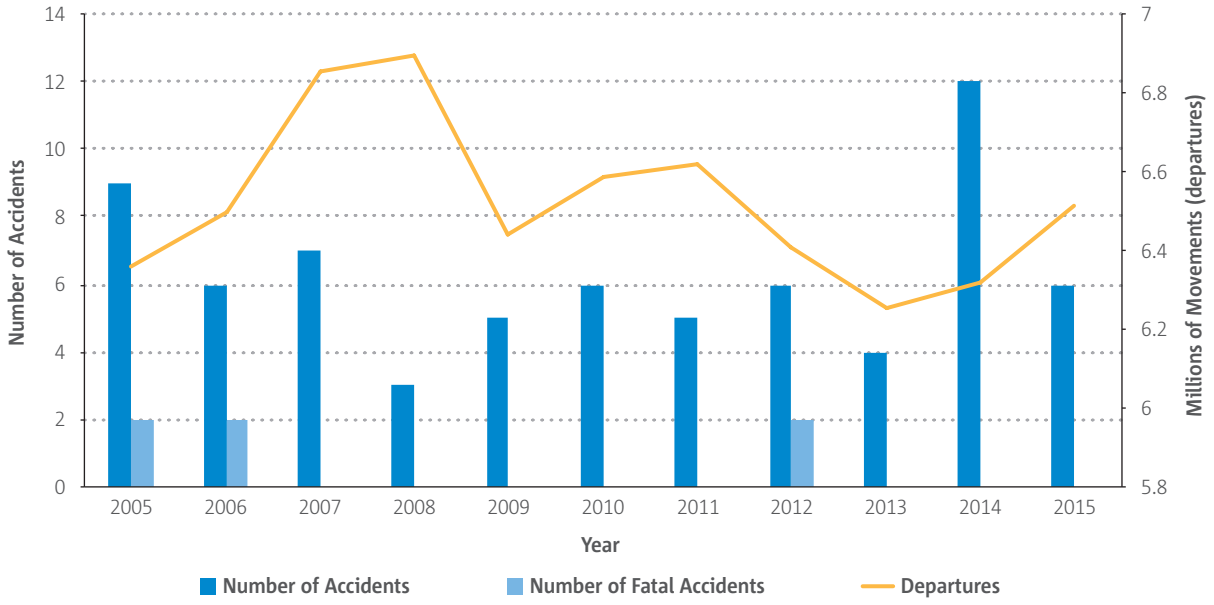
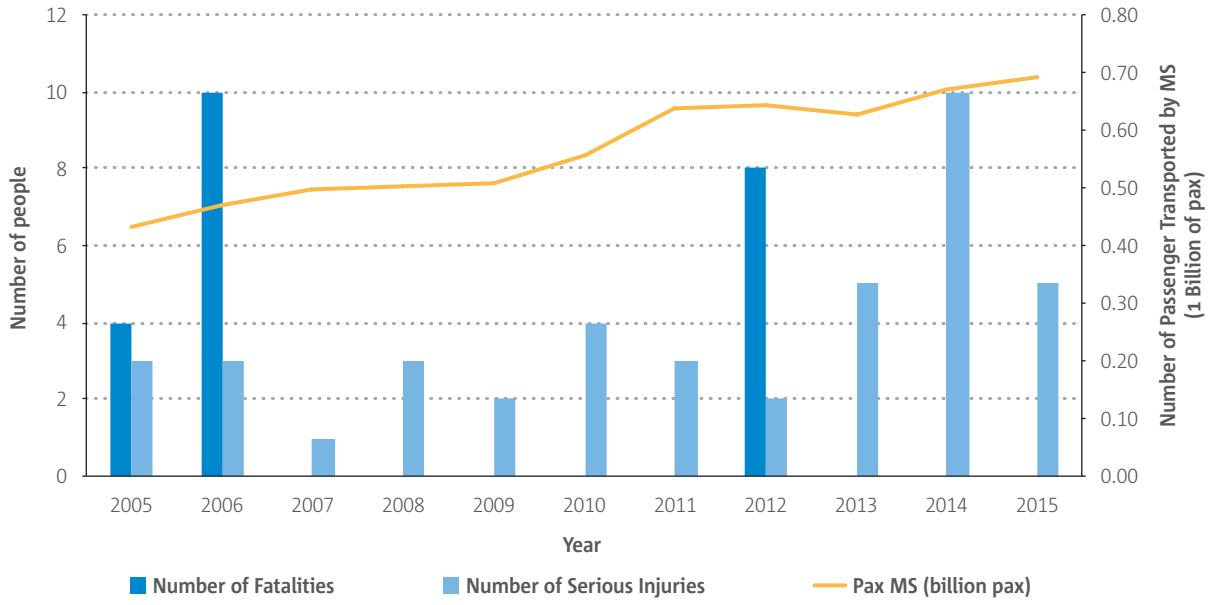


Figure 29: ATM/ANS related accidents fatalities and serious injuries per year 2005-2015



Phase of Flight: In terms of flight phase, the majority of accidents and serious incidents in ATM/ANS related accidents took place during the en-Route and Approach phases. Other accidents took place during taxi, and take-off. In comparing the 2015 data with the 2005-2014 average, differences can be seen in almost all phases. While accidents and serious incidents in taxi and approach phases halved in comparison with the preceding ten-year period, in take-off and landing phases were reduced by three quarters.

Table 50: ATM related accidents and serious incidents 2005-2015

Phase of Flight	Accidents and SIs	
	2005-2014 average	2015
Standing	0.5	0
Taxi	6	3
Take-off	9	2
En route	15	11
Manoeuvring	0	0
Approach	13	7
Landing	4	1
Post-impact	0	0
Unknown	2	3

ATM – Key Risk Areas

In order to assist in the identification of key risk areas, the frequency of occurrence categories of accidents and serious incidents involving the EASA MS ATM system were identified in the last ten-year period and this is provided in the graph below. From the graph it can be seen that ATM/ANS is the second most frequently applied category however this defines more the involvement of the ATM system and is therefore not a key risk area in itself.

ATM – Key Risk Area 1 - Airborne Conflict: From an ATM perspective, Airborne Conflict (MAC) is the first safety priority. Analysis of MAC/Airprox occurrences with the EASA MS in the NoA identified a number of specific HF related safety issues such as controllers situational awareness, use of standard phraseology, conflict detection and resolution and clearance provision. The safety issues will be subject to individual Safety Risk Assessment with the different ATM safety partners.

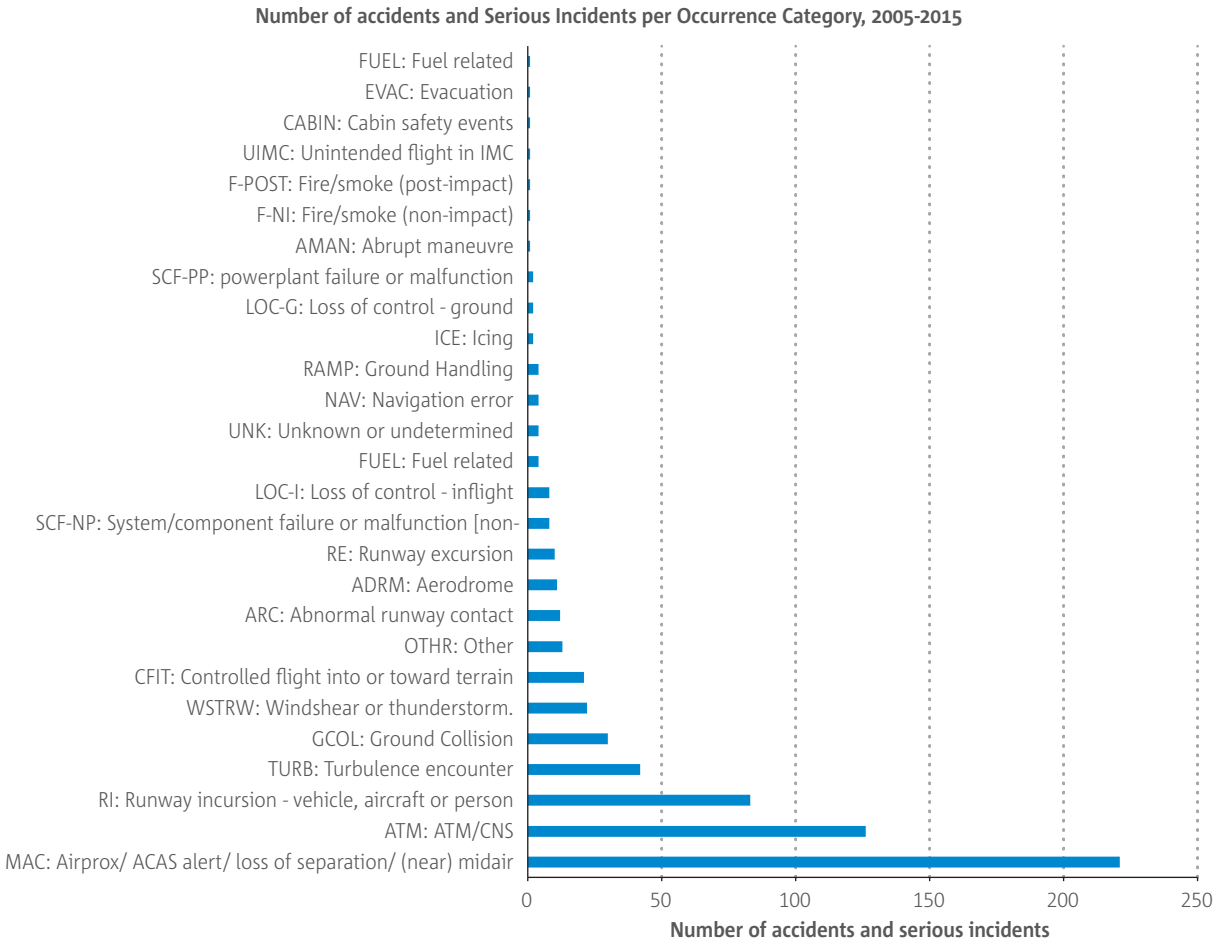
ATM – Key Risk Area 2 - Runway Incursions: The second safety priority for ATM is the prevention of runway incursions and ultimately collisions on the runway.

ATM – Key Risk Area 3 – Ground Collisions: The third safety priority for ATM is the prevention of ground collisions on the other operating areas of the airport or aerodrome. This area is closely related to ground handling operations that has been mentioned in more detail in the CAT Aeroplanes chapter.

ATM Main Domain Priorities - Top Safety Issues

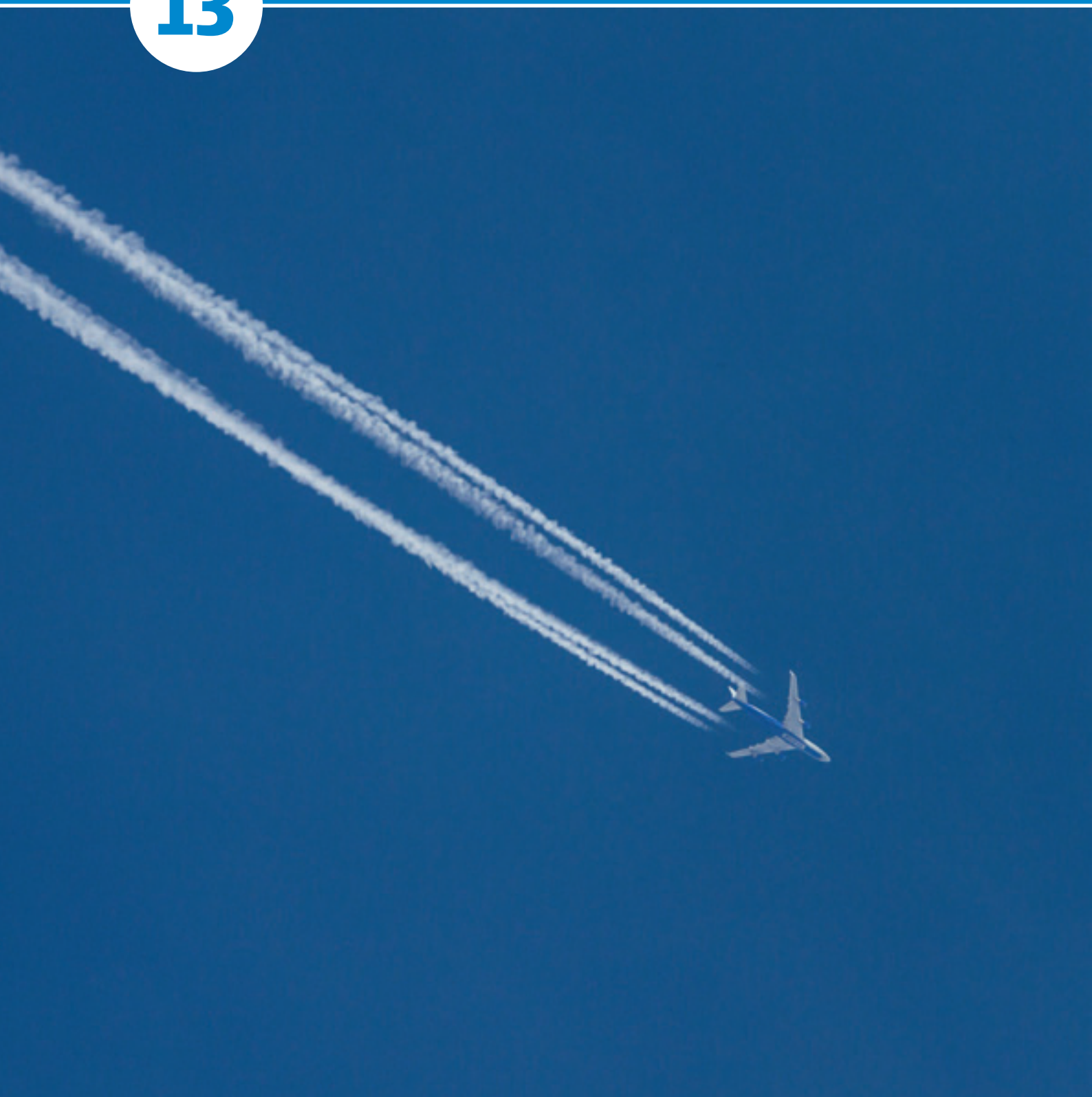
The elaboration of safety issues is under development and it is premature to present the top safety issues in this domain until the analysis has been completed and a first version of the ATM safety risk portfolio is issued later in 2016.

Figure 30: ATM/ANS related accidents and serious incidents per occurrence category 2005-2015



Emerging Issues

13



This chapter covers the subject of emerging issues, which provides a way to look ahead to some of the future challenges in the aviation system making sure that safety issues are considered as early as possible so that pro-active actions can be in place before problems actually arise. An emerging issue is a completely new or previously known safety issue that is developing and may evolve in unexpected ways with unanticipated consequences.

Emerging issues usually share one or more of the following characteristics:

- Their significance may be uncertain or not well understood;
- They are difficult to quantify due to lack of data and/or volatility;
- Their consequences and implications may be difficult to establish;
- Interactions with other risks can be complex;
- They may be outside of organisational control.

Identifying emerging safety issues is not something new. The information in this chapter comes from work that has already been done, such as the list of areas of change (AoC) by the Future Aviation Safety Team (FAST) and from internal EASA expert advice or analysis work.

Ongoing Work on Emerging Issues Already Identified

There are a number of emerging issues that have previously been identified and for which work is ongoing, these include:

- **Conflict Zones**. Since the tragic event of the downing of Malaysian Airlines flight MH17 there is a general consensus that States shall share their information about possible risks in conflict zones. Numerous initiatives have been taken to inform the airlines about the risks on their international flights. At global level, in April 2015 ICAO launched a central repository where each State can notify on a voluntary basis its information about a particular risks in conflict zones.

In Europe, Member States are cooperating with the European Commission and the European External Action Services to share intelligence information on risks arising from conflict zones. A high level meeting was co-organised by EASA and CAA Romania on 29 September 2015, which triggered the setting up of a European High Level Task Force on conflict zones under the chairmanship of former ICAO Secretary-General Raymond Benjamin. The Task Force handed over its final report to Mrs Violeta Bulc, European Commissioner for Transport on 17 March 2016 and this is available here (http://www.easa.europa.eu/system/files/dfu/208599_EASA_CONFLICT_ZONE_CHAIRMAN_REPORT_no_B_update.pdf).

All information provided by EASA on conflict zones is available on the EASA Website, including Safety Information Bulletins and the task force report. (https://www.easa.europa.eu/easa-and-you/air-operations/information-on-conflict-zones)

- **Cyber Security**. A number of high profile activities are underway in the area of cyber security and a cyber-security roadmap has been developed by EASA in coordination with the European Commission. The roadmap proposes an approach to aviation cyber-security in Europe by identifying strategic objectives, enablers in the domains of regulation and standards, research and cybersecurity promotion initiatives. In particular, the Aviation Computer Emergency Response Team (AV-CERT) is currently in the process of being established by the Agency.

Safety Risk Management, Annual Safety Review and the European Plan for Aviation Safety

14

In order to improve aviation safety in Europe it is vital that the output of the safety analysis process is used to support the data-driven approach to the identification and prioritisation of actions of the European Plan for Aviation Safety (EPAS). The safety risk portfolios described in the Introduction of this Annual Safety Review are the result of the analysis process and highlight both the key risk areas (Outcomes) and safety issues within each operational domain. These safety risk portfolios are the analysis output of the Safety Risk Management (SRM) process that involves not just EASA but also the Member States and industry through a range of advisory and collaborative group activities. This first chapter of the Annual Safety Review describes the EPAS itself, the supporting SRM process and the various groups involved in the analysis and decision making process.

What is the European Plan for Aviation Safety and Why Do We Need It?

Despite Europe's excellent aviation safety record, recent events remind us of the need to always remain vigilant and constantly search for system weaknesses before they can manifest in an accident.

The EPAS seeks to further improve aviation safety throughout Europe. The plan is the document that collates all the strategic safety actions, taking input from the analysis of data on accidents and incidents carried out within the safety risk management process. The analysis considers not only the direct accident outcomes but also the underlying or hidden causes behind safety occurrences. Moreover, the plan takes a longer term view into the future and covers the 5-year period from 2016-2020, which is updated annually.

Introducing the European Safety Risk Management Process

The Safety Risk Management (SRM) process aims to establish a clear framework that supports the EPAS. The resulting actions on the safety issues that are identified in the SRM process will translate into rulemaking activities, focused oversight, research activities, safety promotion and potentially also in actions for Member States.

Figure 31: Safety risk management cycle

The 5 steps of the Safety Risk Management Cycle include:

1. The identification of safety issues (or hazards) that affect the European aviation system;

2. The assessment of safety issues (or hazards), which aims at assessing the risks associated with the consequences of the safety issues (or hazards) identified in the previous phase;

3. The definition and programming of safety actions seeking to identify strategies (or mitigation actions) to address those issues (or hazards) whose level of risk cannot be tolerated following the assessment;

4. The implementation and follow-up of safety actions aimed at tracking the status of and report on the agreed strategies; and

5. Safety Performance aimed at reviewing identified risk areas to assess if the risks previously identified have been mitigated and to compare them with safety performance indicators.

Role of the Collaborative, Advisory Groups and Other Groups in Supporting the Safety Risk Management Process

The implementation of the Safety Risk Management process is not something EASA can nor should do in isolation to the rest of the European Aviation Community. There are a number of collaborative and advisory groups through which the Agency is able to actively engage with both the competent authorities of the EASA Member States and industry in order to assist in the various steps in the process. Naturally, there are different roles for different groups and the general summary of the different groups and their involvement in the process is described below:

Collaborative Groups.

- **Collaborative Analysis Groups (CAGs)**: CAGs operate at a domain level to enable EASA to work with both the EASA MS and industry on the tasks of identifying safety issues, safety risk assessment and the monitoring of safety performance. The CAGs provide a mechanism for external engagement with industry and the Member States' NoA Representatives on the safety risk portfolios, which are used to ensure agreement on the key risk areas and safety issues in each domain. CAGs have already been established for CAT aeroplanes, offshore helicopters and balloons. Over the coming year, further groups will be established to cover the other operational domains.

- **Network of Analysts (NoA)**: The NoA was established in 2011 to provide a collaborative framework for the EASA MS to work together on safety analysis activities. The NoA was formalised within European Regulation (EU) 376/2014 and has a role in analysing the European Central Repository of mandatory occurrences to support both the EPAS and the State Safety Programmes of the EASA MS. The NoA works closely with the CAGs in the identification of safety issues, safety risk assessment and the monitoring of safety performance.

- **Safety Promotion Network:** The Safety Promotion Network is a newly established group to enable EASA, the MS and industry to exchange and disseminate safety promotion material as widely as possible across the European aviation community as well as measuring the effectiveness of safety promotion actions.

Advisory Bodies.

- **Stakeholder Technical Bodies (STeBs)**: In the recent restructuring of the advisory bodies, the STeBs replace the sub-committees of the Safety Standards Consultative Committee (SSCC) and they are responsible for reviewing and committing to concrete actions that address the specific safety issues at the Domain level.

- **Stakeholder and Member State Advisory Bodies (SAB/MAB)**: The SAB and MAB replace the Safety Standards Consultative Committee (SSCC) and the Rulemaking Advisory Group (RAG). Within the Safety Risk Management process the SAB/MAB are responsible for reviewing and discussing the strategic safety activities in the Rulemaking Plan and the EPAS.

Implementation Groups (For the implementation of specific safety actions)

- **Rulemaking Groups:** The Rulemaking Groups support the Agency in the development of new rulemaking tasks.

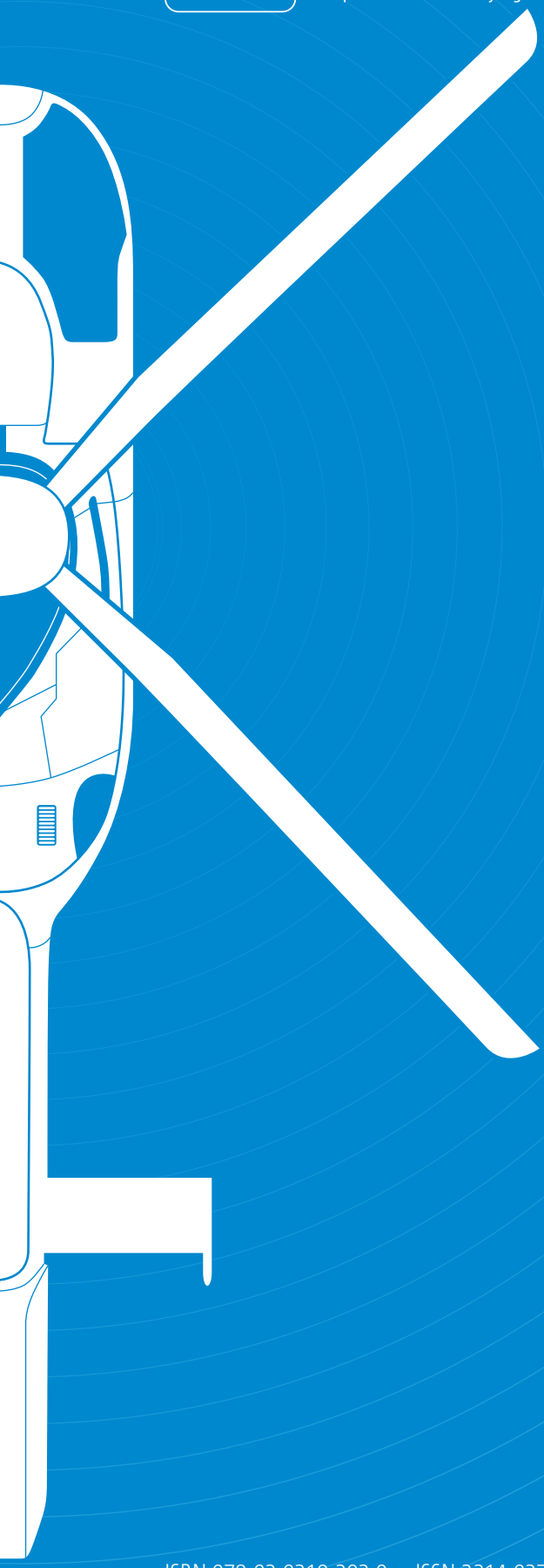
- **Safety Task Groups:** The Safety Promotion Task Groups are similar to the Rulemaking Groups for this safety promotion activity and are responsible for the development of safety promotion material on specific safety issues.

Appendix of Tables and Figures

Figures

Tables

EASA
European Aviation Safety Agency



TO-AA-16-002-EN-N

ISBN 978-92-9210-202-9 ISSN 2314-9272 doi: 10.2822/541561