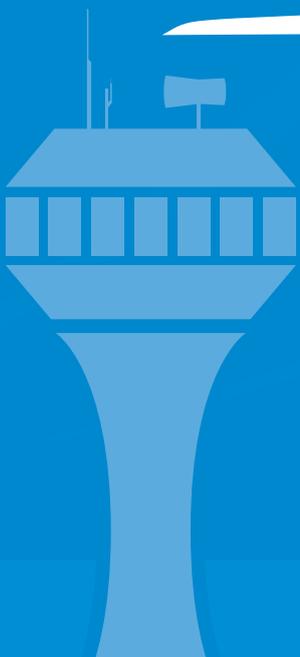




EASA
European Aviation Safety Agency

ANNUAL SAFETY REVIEW 2017



SUMMARY

Disclaimer

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Foreword by the Executive Director

2016 has brought continued improvements in safety across almost every operational domain. It was the lowest year in terms of fatalities in airline operations in aviation history. However, the fatal accident involving a cargo flight in Sweden that took place in January highlighted the complex nature of aviation safety and the significance of addressing human factor aspects in further reducing accidents. Additionally, the tragic accident involving an EC225 helicopter in Norway in April 2016 shows the importance of joining forces and together maintaining safety as an aviation community.

During the past year EASA has advanced and developed key strategic activities across a diverse range of new and emerging issues. The Agency has recently published the notice of proposed amendment on the regulatory framework for the operation of drones. With the emergence of new and more sophisticated cyber threats, EASA has commenced the implementation of the European Centre for Cyber Security in Aviation. The Agency continues to work with partners in Europe and at a global level to monitor the threat of conflict zones and provide rapid advice to civil aviation.

Over the past year, the Agency has further refined the way in which it applies Safety Risk Management principles. In particular, the collaborative analysis groups, which bring together expertise from authorities and industry stakeholders have proved to be successful tools in further underpinning a data-driven approach to managing safety, which is now also reflected in the latest edition of the European Plan for Aviation Safety (EPAS). These various efforts will help to ensure our continued vigilance and help improve safety for today and into the future.

Patrick Ky
Executive Director



Introduction

EASA would like to welcome you to the summary version of the 2017 EASA Annual Safety Review. This summary version provides a high level overview of aviation safety in Europe across all aviation domains. It then provides the key summary of the main aviation domains. The development of the European Safety Risk Management (SRM) process, and in particular the valuable input from the Network of Analysts (NoA) and Collaborative Analysis Groups (CAGs), means that the analysis in this year's review provides not just a statistical summary of aviation safety in the EASA Member States (MS) but also identifies the most important safety challenges faced by European aviation today. This analysis will drive the development of safety actions for the next version of the European Plan for Aviation Safety (EPAS) and harnesses the experience of both the EASA Member States (EASA MS) and industry to connect the data with the current and future priorities of the Agency.





What is the European Plan for Aviation Safety and why do we need it?

The EPAS seeks to continuously improve aviation safety throughout Europe. The Plan looks at aviation safety in a systemic manner and is based on available evidence of causal factors to accidents and incidents. Moreover, the Plan addresses emerging safety issues in order to ensure our high level of safety is maintained in the future.

The EPAS is a key component of our integrated Safety Management System (SMS) at the European level, and is constantly being reviewed and improved. As an integral part of the EASA Work Programme, the Plan is developed by the Agency in consultation with the Member States and industry through the SRM process. The Member States are committed to the implementation of the Plan through their State programmes and plans. The current EPAS edition covers the 5-year period from 2017 to 2021.

The 3 key-issue categories addressed in the EPAS are:

Systemic Issues: Such problems affect aviation as a whole and play a role in accidents and incidents. As they may affect operational issues, improvements can have an implicit effect on operational causes. An example of a systemic issue is the potential danger that can occur if tasks and responsibilities are not properly distributed among operational staff.

Operational Issues: These issues are closely related to events reported during operations and are brought to light through data analysis. The operational issues are split into 2 parts, which form the basis of the safety risk portfolios that are provided in this review:

- **Key Risk Areas:** The key risk areas are the accident outcomes that the EPAS seeks to stop from happening. Examples of these are aircraft upset (loss of control), runway excursions or runway collisions.
- **Safety Issues:** These are the causal and contributory factors that lead to the key risk areas (accident outcomes). Examples of safety issues are icing in flight, or pilot awareness and decision making.

Emerging Issues: These are suspected problems that are to be expected or anticipated in the future. Examples of emerging issues include new cybersecurity threats or risks associated with flying over conflict zones.

How the EPAS is developed through the European safety risk management process

The EPAS is developed through the European SRM process, which is defined in 5 clear and specific steps as described below.

► **Figure 1** The European Safety Risk Management Process



Identification of Safety Issues: While the identification of safety issues is the first step in the SRM process, because it is a closed loop process the main input comes from the safety performance measurement step at the end of the process. Candidate safety issues are taken from the results of EASA's safety analysis activities as well from the members of the collaborative groups (NoA and the CAGs). The members of these groups are encouraged to raise safety issues that are not currently captured in safety risk portfolios. These candidate safety issues are formally captured by the Agency and are then subject to a preliminary safety assessment. This assessment then informs the decision making process as to whether a candidate safety issue should be included formally within the relevant safety risk portfolio or be subject to other actions. Advice is taken from the NoA and CAGs. The output of this step in the process is the different domain safety risk portfolios. Within the portfolios, both the key risk areas and safety issues are prioritised.

Assessment of Safety Issues: Once a safety issue is identified and captured within the safety risk portfolio, it is subject to a formal safety assessment. These assessments are prioritised within the portfolio. The assessment process is led by EASA and is supported by the NoA and CAGs. These collaborative groups are always involved in the review of each assessment's terms of reference and the results of the assessment. In addition, group members are encouraged to participate in the assessment itself; this external support is vital in achieving the best possible results. The result of the assessment is the production of scenario-based bow tie models that help to identify weak controls for which potential actions can be identified. Together this forms the Safety Issue Assessment (SIA), which provides potential actions for the EPAS. This is followed by the Preliminary Impact Assessment (PIA), which assesses the wider implications and benefits of the proposed actions and makes recommendations on the actions to be implemented in the EPAS.

Definition and Programming of Safety Actions: Using the combined SIA/ PIA, formal EPAS action proposals are then made to the advisory bodies. Once discussed and agreed upon, the actions are then included in the next version of the EPAS. Prior to publication, the EPAS is approved by the EASA Management Board.



Implementation and Follow Up: The next step in the process involves the implementation and follow-up of the actions that have been included within the EPAS. There are a number of different types of action within the EPAS. These include focussed oversight, research, rulemaking and safety promotion.

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





Cross-Domain Safety Overview

This chapter provides a general overview of aviation safety in the EASA Member States (MS). It compares the number of fatal accidents and fatalities in each operational domain for 2016 with the annual average for the past 10 years. For the purposes of this overview, Aerodromes/ Ground Handling and ATM/ANS are not included. With reference to the Safety Risk Management (SRM) process, as outlined in the introduction, and the safety performance framework, this overview serves as the Tier 1 Safety Performance Indicators (SPIs).

Key Cross-Domain Statistical Overview

One of only two domains with an increase in fatalities in 2016 was Offshore Helicopters, where there was one accident with 13 fatalities. This is the first year that a fatal accident has been recorded in this domain since 2013. The second domain recording an increase was Other CAT Helicopters, where there were 2 HEMS accidents that resulted in 8 fatalities. For the other domains, there has been a reduction in both the number of fatal accidents and fatalities. Due to the low number of fatal accidents in CAT Aeroplanes, the median average is introduced to highlight that while the mean average number of fatalities is high, this is largely due to a small number of large accidents.

Table 1: Overview of fatal accidents and fatalities 2016 vs 10-year average (2006-2015)

Domain	Fatal Accidents 2016	Fatal Accidents Annual 10 Year Mean	Fatalities 2016	Fatalities Annual 10 Year Mean	Fatalities Annual 10 Year Median
CAT Aeroplanes					
Airline (Passenger/Cargo)	1	0.8	2	66.0	5.0
Other	0	1.4	0	6.4	2.0
SPO Aeroplanes	6	10.7	12	18.6	16.5
CAT Helicopters					
Offshore	1	0.4	13	3.0	0.0
Other	2	0.9	8	2.8	3.5
SPO Helicopters	0	4.1	0	7.4	6.0
Non-Commercial and Other					
NCO Aeroplanes	46	51.4	78	94.4	95.5
NCO Helicopters	9	10.0	11	17.5	17.0
Balloons*	1	2.2	1	4.0	3.0
Gliders	19	26.5	20	31.1	31.0
RPAS	0	0.0	0	0.0	0.0

*Balloon data compares 2016 with the average for the five year period 2011-2015.

The top 5 operational domains in terms of the annual average of the number of fatalities for the past 10 years (2007-2016) number of fatalities are:

Non-Commercial Aeroplanes: In terms of the average number of fatalities over the past 10 years, this domain has the highest with 94.4. In 2016, it was also the domain with the highest number of fatalities and fatal accidents, being 78 fatalities and 46 fatal accidents. In both cases, the figures for 2016 are lower than the 10 year average.



CAT Aeroplanes Airline (Passenger/Cargo): The second highest average number of fatalities over the past 10 years is in CAT Aeroplanes Airline (Passenger/Cargo) with 66.0 per year. In 2016, there was one fatal accident, which led to 2 fatalities. This accident involved West Air Sweden Flight 294, a cargo flight using a Bombardier CRJ200 that crashed in Sweden on 8 January 2016. The final report for this accident was published by the Swedish Accident Investigation Board in December 2016¹.

Gliders/ Sailplanes: In terms of the average number of fatalities, the gliding/sailplanes domain has the 3rd highest total with 31.1. It was also the domain that had the 2nd highest number of both fatalities and fatal accidents in 2016, with 20 fatalities and 19 fatal accidents. Again, in both cases this represents a reduction from the previous year and is lower than the 10 year average.

SPO Aeroplanes: In 2016, part-SPO aeroplane operations recorded 6 fatal accidents. These accidents led to a total of 12 fatalities. In both cases, this is lower than the 10 year average and is also lower than the previous year.

NCO Helicopters: Non-commercial helicopter operations had the 5th highest average number of fatalities over the past 10 years. In 2016, there was a total of 11 fatalities, which came from 9 fatal accidents. Again in both cases both are below the 10 year average.



1 <http://www.havkom.se/en/investigations/civil-luftfart/olycka-i-lapland-med-flygplanet-se-dux-av-typen-canadair-crj-200?cookie=ok>



Commercial Air Transport Aeroplanes – Airline and Other Operations

This part of the summary covers Commercial Air Transport (CAT) airline passenger/cargo and other operations with aeroplanes having a maximum take-off weight above 5700 kg.

Key Statistics

The key domain statistics are in the tables below and include the accidents and serious incidents involving EASA MS CAT airline operators and other CAT operations. This split provides a better focus for the analysis and a fairer grouping for the assessment of actions.

The only fatal accident in CAT aeroplane airline operations in 2016 that involved an EASA MS operator was the accident of a Bombardier CRJ-200 performing a cargo flight on 8 January 2016. From the analysis, it can be observed that there was a lower number of non-fatal accidents involving EASA MS operators in 2016 than the 10-year average, with 16 accidents compared to the average of 23.1 over the previous 10 years. At the same time, there was a 36% increase in the number of serious incidents over the same period resulting in a total of 106 serious incidents compared with the average of 78.2. In terms of fatalities, the single fatal accident resulted in 2 fatalities (the flight crew, the only occupants of the aeroplane), which is much lower than the 10 year average. There was also a slight decrease in serious injuries with 9 serious injuries compared with 10 over the previous 10 years.

Table 2 Key statistics CAT Aeroplane

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2006-2015 average	0.8	23.1	78.2
2016	1	16	106
% of change	25%	-31%	35%

	Fatalities	Serious Injuries
2006-2015 average	66	10
2016	2	9
% of change	-97%	-10%

In the domain of other CAT aeroplane operations involving an EASA MS operator, there were 3 non-fatal accidents and 5 serious incidents.

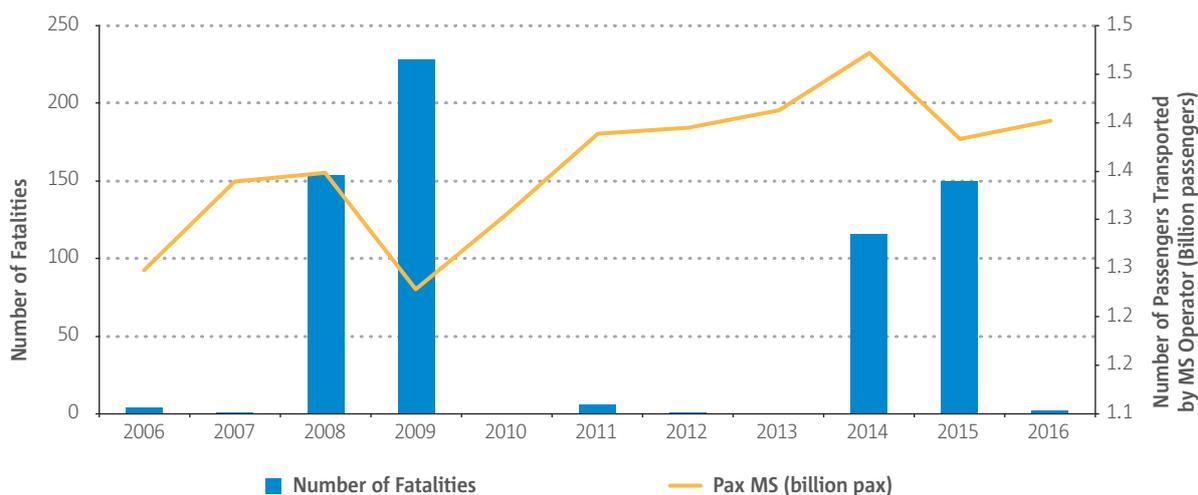


Commercial Air Transport Aeroplane – Airlines

The analysis focuses on the CAT aeroplane airline operations, which encompasses passenger and cargo. This domain covers the bulk of the commercial air transport activity.

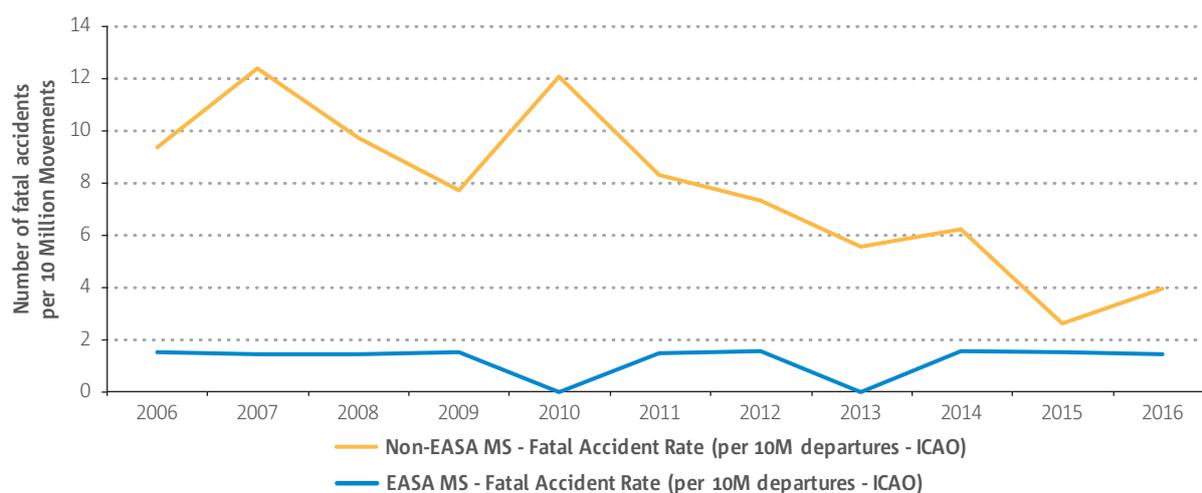
Figure 4 shows that in 2016 there was only one fatal accident resulting in 2 fatalities, who were both flight crew members on-board a cargo flight.

► **Figure 4** CAT Aeroplane Airline fatalities and passengers transported 2006-2016



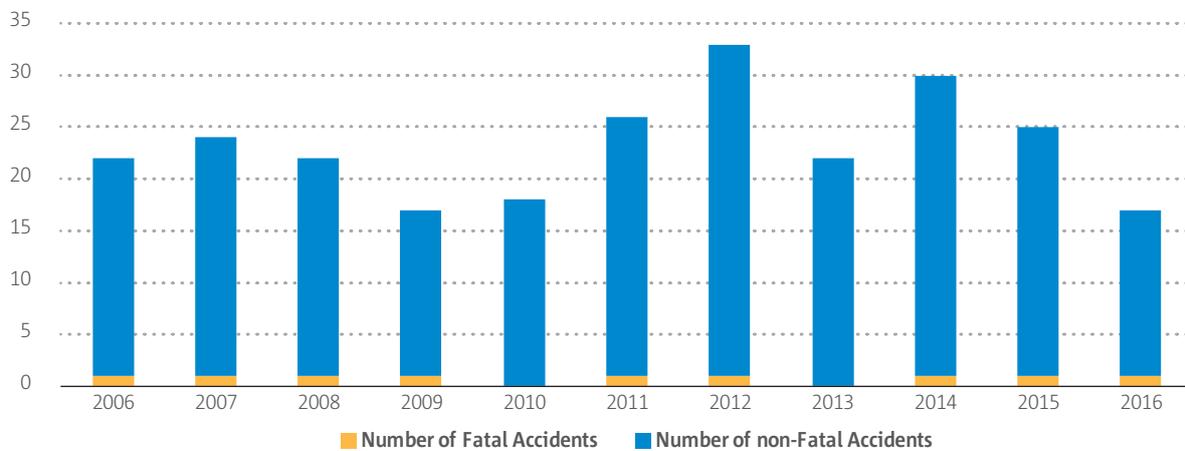
As can be seen in Figure 5, EASA MS Aircraft Operators Certificate (AOC) holders were involved in a lower rate of fatal accidents per ten million departures than the rest of the world. This rate has remained below 2 fatal accidents per ten million departures since 2006.

► **Figure 5** CAT Aeroplane Airline fatal accident rate for EASA MS Operators and non-EASA MS, period 2006-2016





► **Figure 6** CAT Aeroplane Airline, evolution of fatal and non-fatal accidents, period 2006-2016



Safety Risk Portfolio

The safety risk portfolio for the CAT aeroplane airline domain provides a summary of the past performance of this part of the aviation system. With reference to the safety performance framework, it covers the Tier 2 (Key Risk Areas) and Tier 2+ (Safety Issues). Within the portfolio, the top risk areas and priority safety issues are identified, interlinked and prioritised. The portfolio is used to prioritise the assessment of safety issues, to target analysis activities over key risk areas and to establish the interdependencies of safety actions.

In the upper part of the safety risk portfolio, the total number of fatal and non-fatal accidents for the past 10 years has been spread across the different key risk areas shown in columns. A key risk area includes both the undesired outcome (accident) and immediate precursors to those outcomes. In rows, the SRP shows the main safety issues and its negative contribution to the safety performance of the system in the last 5 years (fatal accidents, non-fatal accidents, serious incidents and incidents, displayed in columns before the risk areas). The dotted grid establishes the relation between safety issues and key risk areas – it identifies which safety issues may lead to which accident outcomes. Dots come from occurrence data and expert judgement.

The initial prioritisation is done by the contribution to fatal accidents, non-fatal accidents, serious incidents and then incidents.



COMMERCIAL AIR TRANSPORT - AEROPLANES, AIRLINES

Outcome					75%	13%	13%	0%	0%	0%	0%	0%	0%	0%	
Percentage of Fatal Accidents (2007-2016)	8														
Outcome					19%	30%	0%	26%	2%	1%	1%	1%	0%	4%	
Percentage of Non-Fatal Accidents (2007-2016)	226														
Safety Issues	Total number of occurrences in 2012-2016 per safety issue														
	Incidents (ECR data)	Serious Incidents	Non-Fatal Accidents	Fatal Accidents	Aircraft Upset	Runway Excursion	Non-Safety Security/non-Safety	Ground Damage	Terrain Collision	Obstacle Collision in Flight	Runway Collision	Airborne Collision	Taxiway/ Apron Excursion	Unsurvivable Aircraft Environment	
Operational															
Handling of Technical Failures	288	14	5	2	●	●					●	●	●	●	
Icing in Flight	277	6	0	1	●										
Turbulence	2 936	5	20	0	●	●			●						
Approach Path Management	2 658	13	5	0	●	●			●	●					
Flight Planning and Preparation	3 687	11	5	0	●	●			●		●		●		
Windshear	3 919	2	5	0	●	●			●	●					
Crosswind	224	5	2	0	●	●			●	●					
Hail	17	1	2	0	●	●		●							
Icing on Ground	116	0	2	0	●	●		●					●	●	
Airborne Separation	2 667	42	0	0								●			
False or Disrupted ILS Signal Capture	314	8	0	0	●	●			●	●					
Handling and Execution of Go-Arounds	219	8	0	0	●	●			●			●			
Deconfliction with Aircraft Not Using Transponders	192	4	0	0			●					●			
Entry of Aircraft Performance Data	50	3	0	0	●	●			●		●				



 COMMERCIAL AIR TRANSPORT - AEROPLANES, AIRLINES													
Outcome													
Percentage of Fatal Accidents (2007-2016)	8				75%	13%	13%	0%	0%	0%	0%	0%	0%
Percentage of Non-Fatal Accidents (2007-2016)	226				19%	30%	0%	26%	2%	1%	1%	1%	4%
Safety Issues	Total number of occurrences in 2012-2016 per safety issue												
	Incidents (ECR data)	Serious Incidents	Non-Fatal Accidents	Fatal Accidents	Aircraft Upset	Runway Excursion	Non-Safety Security/non-Safety	Ground Damage	Terrain Collision	Obstacle Collision in Flight	Runway Collision	Airborne Collision	Taxiway/ Apron Excursion
Bird/ Wildlife Strikes	13 003	2	0	0	●			●					
Taxi Speed and Directional Control	12	1	0	0	●	●		●		●		●	
Dangerous Goods Handling and Lithium Batteries	719	0	0	0	●			●					●
Wake Vortex	1 092	0	0	0	●			●					
Security													
Laser Illumination Effects (Not all Illuminations)	35	1	0	0			●						
Disruptive Passengers	2 505	0	0	0			●						
Technical													
Aircraft Maintenance	1 866	9	5	0	●	●		●				●	●
UAS Strikes	0	0	0	0	●						●		
Human													
Perception and Situational Awareness	1 393	27	12	2	●	●		●	●	●	●	●	●
CRM and Operational Communication	4 822	26	8	1	●	●		●	●	●	●	●	●
Mental Health	0	0	0	1	●	●	●	●	●	●	●	●	●
Decision Making and Planning	450	10	4	0	●	●		●	●	●	●	●	●



Use of ERCS for risk comparison

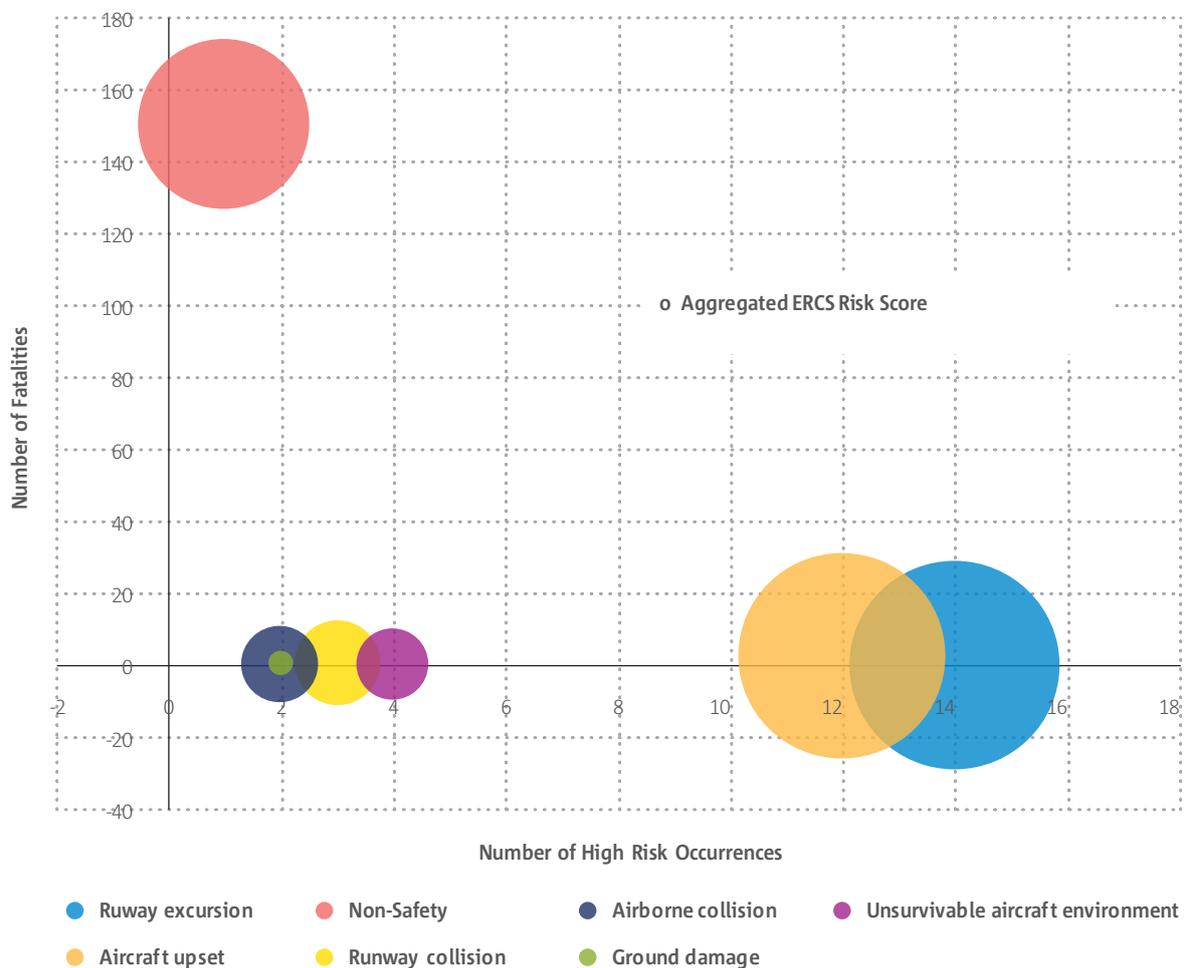
The European Risk Classification Scheme or ERCS is the methodology being developed by a group of experts who have been nominated by the European Commission in order to meet the requirement of the Regulation (EU) 376/2014 to risk score all occurrences. The obligation is on organisations and authorities, though, while organisations can decide on any methodology to risk score occurrences, the authorities shall use a common risk classification at European level, that being ERCS.

The objective of ERCS is to facilitate the identification of high risk occurrences and the identification of areas of concern in the aviation system. For this second purpose, one of the possible strategies is to aggregate the risk score of the individual occurrences. The indicator obtained by this addition is not a risk estimation per se, but a parameter that reflects how far those occurrences were from the worst possible outcome, thus allowing a common reference point for comparison.

The aggregation of individual ERCS risk scores helps to perform a comparison between key risk areas. The comparison is a relative indicator measuring the past performance of the system, showing the risk areas where barriers were penetrated either more often and/or to a greater extent, therefore resulting in a higher aggregated risk score. However, this indicator cannot be translated in terms of risk (severity X probability).

Figure 7 shows the key risk areas plotted by the number of high risk occurrences (x-axis), the number of fatalities (y-axis) and the aggregated risk score of the individual high risk occurrences (diameter of the bubble) associated to each risk area. As can be seen, depending on the parameter used (fatalities, frequency of occurrence or aggregated risk score) the prioritisation of Key Risk Areas may be significantly different.

► **Figure 7** Aggregated Risk Score for Accidents and Serious Incidents Involving EASA MS operators 2015-2016 by Key Risk Areas





Priority Key Risk Areas

Taking into consideration the last 10 years of fatal and non-fatal accidents, and the representation of the aggregated ERCS score, the priority key risk areas are:

 Aircraft Upset	Number 2 ERCS Score 6 Fatal Accidents	Aircraft upset or loss of control is the most common accident outcome for fatal accidents in CAT aeroplanes operations, accounting for 75% of them. It includes uncontrolled collisions with terrain, but also occurrences where the aircraft deviated from the intended flight path or aircraft flight parameters, regardless of whether the flight crew realised the deviation and whether it was possible to recover or not.
 Runway Excursion	Number 1 ERCS Score 1 Fatal Accident	Materialised runway excursions, both high and low speed and occurrences where the flight crew had difficulties maintaining the directional control of the aircraft or of the braking action during landing, where the landing occurred long, fast, off-centred or hard, or where the aircraft had technical problems with the landing gear (not locked, not extended or collapsed) during landing. This accounts for 13% of the fatal accidents in CAT aeroplane operations involving airline/cargo operations in the past decade.
 Non-Safety	Number 3 ERCS Score 1 Fatal Accident	Non-Safety accident outcomes includes intended actions. Included, is the intention to cause harm or damage, or to disrupt the normal operation of the aircraft. It also includes all terrorist or conflict related actions, as well as any other situation where there was a clear intention to cause harm, damage or disruption to the flight, regardless of the motivation to do so. It includes cases of hijacking, bomb-threat, shoot-downs, intended laser interference, disruptive passengers, etc.
 Runway Collision	Number 4 ERCS Score 3 Non-Fatal Accidents	Runway collisions have been the outcome in 1% of fatal accidents in the past decade. Despite the low percentage, the ERCS evaluation demonstrates that the risk was very real.
 Airborne Collision	Number 5 ERCS Score 3 Non-Fatal Accidents	Airborne collisions are collisions between aircraft where both (all) aircraft were airborne. Although this outcome has not occurred in the past 10 years, the risk scoring of accident and serious incidents highlights the continued risk of this type of accident.
 Ground Damage	Number 6 ERCS Score 59 Non-Fatal Accidents	Ground collisions and ground damage occur on the ramp and this key risk area does not include collisions on the runway. While it was not the accident outcome for any fatal accidents, the risk score warrants its inclusion in the priority key risk areas list.



Top Safety Issues

As for the key risk areas, it is possible to establish a ranking of safety issues based on the past performance of the system by counting high risk occurrences, or the number of fatalities or through the aggregated risk score.

- Perception and situational awareness
- Icing in flight
- Handling of technical failures
- Turbulence
- Airborne conflict
- Flight planning
- Decision making and planning
- Experience, training and the competence of individuals
- Wind-shear
- Flight-path management
- Mental health





Performed Safety Issue Assessments and identified actions

Continuing with the SRM, the Collaborative Analysis Group for CAT aeroplanes, composed of industry stakeholders, Member States and the Agency representatives, is currently working on several safety assessments on safety issues that were identified during 2016.

Crew Resource Management: The assessment concluded that the performed regulatory actions (revision of AMC and GM on Crew Resource Management (CRM) training) was sufficient, but that there was a need to support its implementation with additional safety promotion material so as to provide operators and training organisations with the best practices available. In November 2016, the Agency organised a dedicated workshop on CRM where different stakeholders presented their approach to CRM implementation. The Agency will collect and publish a list of best practices for CRM implementation (SPT.079).

Entry of Erroneous Take-Off Parameters: The assessment of the safety issue and the later review of the data obtained via a targeted survey showed that the issue was more common than initially estimated. Therefore, the Agency, together with the main stakeholders, decided to publish a Safety Information Bulletin to raise the awareness of the operators and flight crews and to encourage the monitoring of the issue through FDM programmes. The Agency will launch a further survey to gauge the efficiency of the actions launched and the need for follow-up initiatives.

Ice On-Ground and In-Flight: As part of the former safety issue on “flying in adverse weather conditions”, the CAT Aeroplane CAG launched a detailed assessment of two icing-related scenarios, on-ground and in-flight. The ice-on-ground assessment put forward a number of recommendations for safety actions ranging from the improvements to the regulatory framework for de-icing providers, research on the means to estimate precipitation intensity, to the assessment of technical solutions that estimate the degradation of aircraft performance during the take-off run. All the proposed safety actions are being assessed under the Preliminary Impact Assessment (PIA) process so as to determine the most efficient actions to be implemented. The assessment of in-flight icing is in its final stage. In the same manner, the assessment will identify the areas of improvement and draft possible safety actions, which will be fed into the PIA process.

Flight Crew Awareness: The assessment team reviewed recent accident investigations with a view to modelling those situations where flight crew awareness was a factor. The assessment established two main scenarios: The flight crew failed to properly react to an automation disconnection or un-commanded mode transition and to properly manage the aircraft attitude, energy or flight path and; the flight crew being surprised by an event that they normally should have anticipated as part of managing the flight or should have detected through active monitoring. The assessment team is finalising the evaluation of both scenarios and their impact on the performance of the flight crew. The assessment will offer conclusions addressing the need for further actions beyond those ones already launched.

Inadequate Handling of Go-Around: The assessment team is finalising the analysis, which will be based on a data review of accidents and serious incidents that were investigated over the past 10 years and involved an inadequate handling of the go-around manoeuvre. Per the SRM process, safety actions proposed in the assessment report will feed the PIA process.



Main Action Areas in the EPAS

There is a wide range of different EPAS actions that already cover many of the key risk areas that have been outlined in this chapter. Owing to the number of those actions, it is difficult to summarise them here. However, the action areas at the operational level are split into the strategic key risk areas of aircraft upset and runway safety, covering excursions and collisions.

Aircraft Upset: The main EPAS actions include RMT.0397 on unintended or inappropriate rudder usage (rudder reversals), RMT.0581 concerning loss of control - prevention and recovery training and RMT.0647 on loss of control or loss of flight path during go-around or climb. There are also a number of safety promotion tasks covering this key risk area.

Runway Safety: For the key risk areas of runway collisions and runway excursions, EPAS actions include RMT.0296 on the review of aeroplane performance requirements for CAT operations, RMT.0369 concerning the prediction of wind shear for aeroplane CAT operations (IRs), and RMT.0570 on the reduction of runway excursions.





Non-Commercial Operations – Aeroplanes

This chapter covers general aviation non-commercial operations (GA NCO) involving aeroplanes in mass groups below 5700 kg and having an EASA MS State of Registry.

Key Statistics

The key domain statistics are in the tables below. There were fewer fatal accidents in 2016 compared to the 10-year average and there was also a significantly lower number of non-fatal accidents. The numbers of fatalities and serious injuries in 2016 were significantly lower than the averages for the preceding decade. In GA NCO aeroplanes, there were 46 fatal accidents, which continues the downward trend from the previous year and is lower than the 10-year average. The number of fatalities has also been significantly reduced (78) compared to the 10-year average.

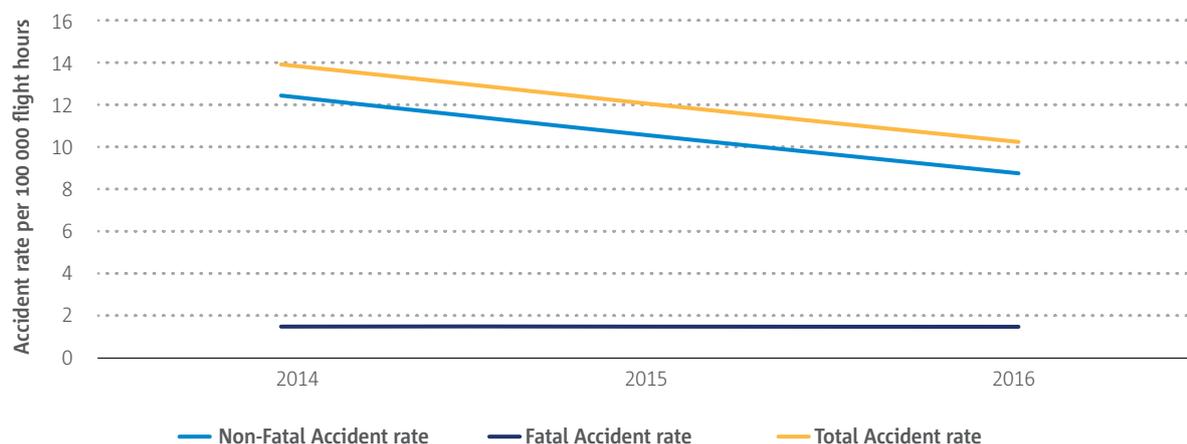
Table 3 Key statistics Non-commercial operations aeroplanes

	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2006-2015 average	51.4	388.1	25.9
2016	46	265	36
% of change	-10% ↓	-32% ↓	39% ↑

	Fatalities	Serious Injuries
2006-2015 average	94.4	50.8
2016	78	36
% of change	-17% ↓	-29% ↓

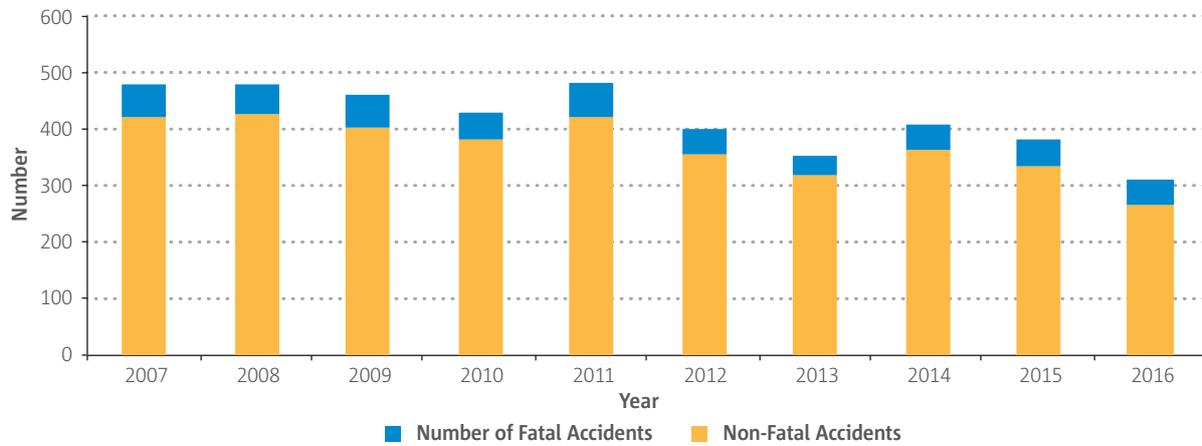
For the first time, the Agency has been able to collect sufficient GA exposure data to create initial accident rates for this domain. The exposure data was collected via a survey of the EASA Member States (MS) and through merging data that was kindly provided by GAMA. The fatal accident rate reduced between 2014 and 2015, however, despite the lower number of accidents the rate increased in 2016. The rate of non-fatal accidents has reduced by over 40% between 2014 and 2016.

► **Figure 8** Fatal and Non-Fatal Accident Rates for NCO Aeroplanes 2014-2016

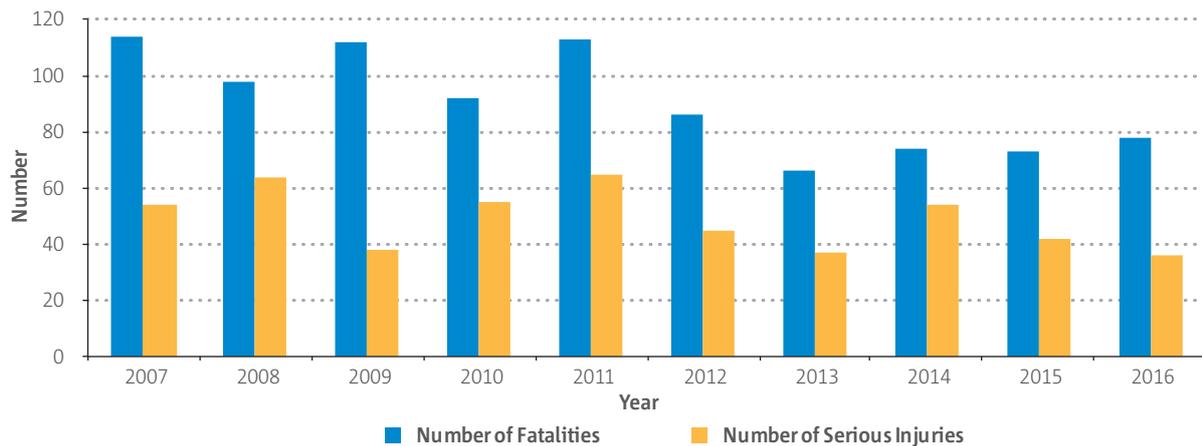




► **Figure 9** Non-commercial operations aeroplanes fatal and non-fatal accidents 2007-2016



► **Figure 10** Non-commercial operations fatalities and serious injuries 2007-2016



Safety Risk Portfolio

The GA NCO aeroplanes safety risk portfolio is provided below and identifies the key risk areas and safety issues. This portfolio comprises safety issues that have been identified through analysing safety occurrence data. The portfolio has initially been developed by the Agency and then adjusted following discussion at a GA Safety Workshop held in October 2016. This work was further developed in the Network of Analysts. A GA NCO CAG will continue the work and meets for the first time in May 2017.



NON COMMERCIAL OPERATIONS - AEROPLANES

Outcome	496			47%	23%	9%	8%	3%	1%	0%	
Percentage of Fatal Accidents (2007-2016)											
Outcome	4 425			24%	5%	7%	3%	47%	2%	4%	
Percentage of Non-Fatal Accidents (2007-2016)											
Safety Issues	Total number of occurrences in 2012-2016 per safety issue				Key Risk Areas (Outcomes and precursors)						
	Incidents (ECR data)	Serious Incidents	Non-fatal Accidents	Fatal Accidents	Aircraft Upset	Terrain Collision	Obstacle Collision in Flight	Airborne Collision	Runway Excursion	Unsurvivable Aircraft Environment	Ground Damage
Operational											
Flight Planning and Preparation	1 988	5	49	18	●	●	●	●	●	●	
Intentional Low Flying	13	1	12	18	●	●	●			●	
Airborne Separation	347	15	56	10				●			
Handling of Technical Failures	33	4	13	8	●	●	●		●	●	
Icing in Flight	26	2	53	3	●					●	
Bird/ Wildlife Strikes	275	2	18	3			●			●	
Approach Path Management	18	3	37	2	●		●	●	●		
Control of Manual Flight Path	5	-	5	2	●	●	●	●	●	●	
Deconfliction with Aircraft Not Using Transponders	101	3	1	1				●			
Crosswind	23	2	64	-	●				●		
Turbulence	25	-	14	-	●	●	●		●		
Icing on Ground	6	-	2	-	●	●	●			●	
Baggage and Cargo Loading	1	-	-	-	●		●			●	
Technical											
System Reliability	3 497	79	770	58	●	●		●	●	●	
Aircraft Maintenance	84	7	10	2	●				●	●	
UAS Strikes	1	2	-	-	●		●	●		●	



 NON COMMERCIAL OPERATIONS - AEROPLANES												
Outcome												
Percentage of Fatal Accidents (2007-2016)	496					47%	23%	9%	8%	3%	1%	0%
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	Incidents (ECR data)	Serious Incidents	Non-fatal Accidents	Fatal Accidents	Aircraft Upset	Terrain Collision	Obstacle Collision in Flight	Airborne Collision	Runway Excursion	Unsurvivable Aircraft Environment	Ground Damage	
Human												
Perception and Situational Awareness	429	10	104	12	●	●	●	●			●	
Decision Making and Planning	47	3	54	9	●	●	●	●	●		●	
Experience, Training and Competence of Individuals	45	4	42	6	●		●	●	●			
Navigation and Airspace Knowledge	1 078	8	1	2	●		●	●	●			
Personal Pressure and Alertness	14	3	12	1	●	●	●	●	●	●	●	
CRM and Operational Communication	1 151	3	9	1	●	●	●	●	●	●	●	
Knowledge of Aircraft Systems and Procedures	14	1	8	-	●	●	●	●	●	●	●	
Organisational												
Development and Application of Regulations and Procedures	5	-	-	-	●	●	●	●		●		



Priority Key Risk Areas

 <p>Aircraft Upset</p>	<p>232 Fatal Accidents</p> <p>1061 Non-Fatal Accidents</p>	<p>At 47%, aircraft upset is the most common type of accident outcome in the last 10 years during non-commercial operations with aeroplanes. Aircraft upset is the area of greatest focus for future work in this domain.</p>
 <p>Terrain Collision</p>	<p>112 Fatal Accidents</p> <p>202 Non-Fatal Accidents</p>	<p>Terrain Collision was the second most common accident outcome in the last 10 years, accounting for 23% of accidents, and continues to present a significant safety challenge.</p>
 <p>Obstacle Collision</p>	<p>46 Fatal Accidents</p> <p>320 Non-Fatal Accidents</p>	<p>Obstacle collision in flight is the third most frequent type of accident outcome. It accounts for 9% of all the fatal accidents over the last 10 years.</p>
 <p>Airborne Collision</p>	<p>42 Fatal Accidents</p> <p>115 Non-Fatal Accidents</p>	<p>The fourth key risk area is airborne collision, which accounts for 8% of all the fatal accident outcomes in the last 10 years.</p>
 <p>Runway Excursion</p>	<p>13 Fatal Accidents</p> <p>2060 Non-Fatal Accidents</p>	<p>Runway excursion is the fifth most frequent type of fatal accident outcome in the last 10 years, accounting for 3% of all fatal accidents in this domain. This risk area is quite common but carries low number of fatalities.</p>

Top Safety Issues and Associated Actions

The top identified safety issues in the non-commercial operations aeroplanes domain are:

Operational Safety Issues:

Flight Planning and Preparation: This is a safety issue that frequently results in CFIT accidents, particularly when worsening weather leads to the need for in-flight re-planning, which considerably tests a pilot's ability to concurrently fly the aircraft. EPAS action SPT.044, a safety promotion task to improve GA safety in Europe through risk awareness and safety promotion, will have a specific focus on risk awareness to enhance the planning and preparation of the pilot.

Intentional Low Flying: This issue affects the pilot's decision making process. When either through self-made or external pressures, effects such as marginal weather then lead some pilots to try to reach the planned destination instead of waiting for the current weather situation to improve. This safety issue is recurrent in loss of control accidents where stall or spin occurs while flying in low altitudes or entering IMC weather.



Airborne Separation: This safety issue is the 3rd highest when it comes to fatalities over the last 5 years. Pre-flight planning and knowledge of complex airspace structures are common factors related to this safety issue. In addition, situational awareness and the ability for inexperienced pilots to communicate effectively with ATC have also been identified as causal factors. The EPAS action, SPT.044 will also help to support this safety issue through specific targeting of strategies to prevent mid-air collisions. This action has specifically been chosen as the first collaborative task for the European Safety Promotion Network (SPN).

Handling of Technical Failures: After a technical failure during flight the pilot's workload increases significantly. There is evidence of accidents occurring due to the pilot being too focused on the problem rather than flying the aircraft. This in turn creates situations where the accident outcome becomes significantly worse than it could have been had the technical failure been handled appropriately. SPT.044 will provide the pilot with tools to better assess the encountered risk.

Human Factor Safety Issues

Perception and Situational Awareness: This safety issue is linked to a number of different types of accidents, especially a pilot's awareness of the aircraft's energy state that may lead to a 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 more safely in critical weather. Follow up action SPT.088 involves a safety promotion campaign that promotes instrument flying for GA pilots.

Decision Making and Planning: The decision making and planning process varies between persons. This process feeds directly into the pilot's actions, which then provides the basis for the end result. It is therefore very important that the correct information is available to the pilot when decisions are made so as to facilitate the best possible outcome of any encountered scenario. The safety promotion task SPT.012 promotes the new European provisions on pilot training, while rulemaking task RMT.0581, related to a loss of control prevention and recovery training, will further help the decision making of pilots.

Experience, Training and Competence of Individuals: The final HF priority area is related to the knowledge, training and competency of individuals. Through the analysis of airborne conflict performed by the NoA, the complexity of airspace structures was identified as one example where the complex 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 so as to perform flights as safely as possible. Rulemaking task RMT.0678 is designed to aid pilots in their theoretical aviation knowledge and the previously mentioned task SPT.044 is also important in supporting work on this safety issue. The former task also considers a modular LAPL(A)/(S) training and a review of the mountain rating.





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