EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

ANNUAL SAFETY REVIEW 2010

easa.europa.eu

Overview and key facts 2010

Total number of accidents and fatal accidents for EASA MS operators – commercial air transports

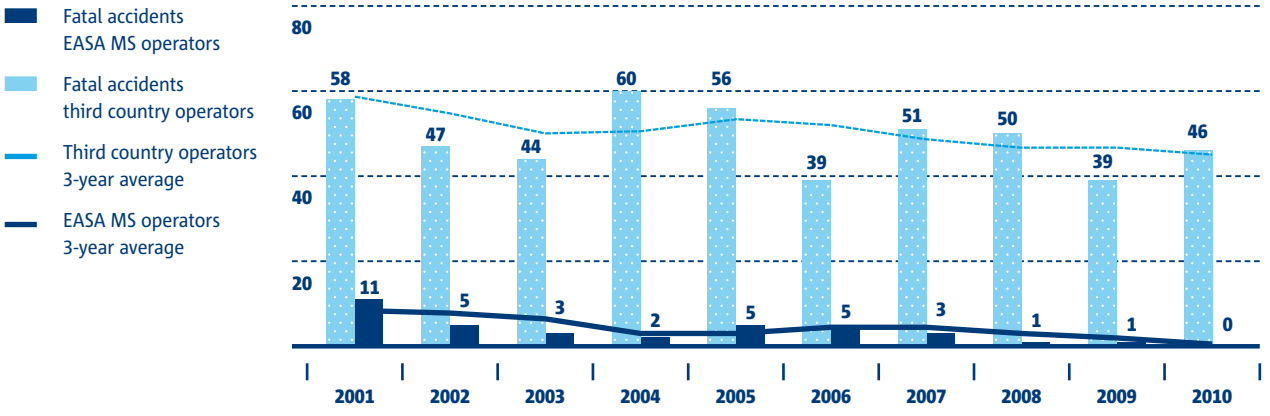
Aeroplanes

Period	Number of accidents	Fatal accidents	Fatalities on board	Ground fatalities
1999–2008 (average)	32	5	78	1
2009 (total)	20	1	228	0
2010 (total)	26	0	0	0

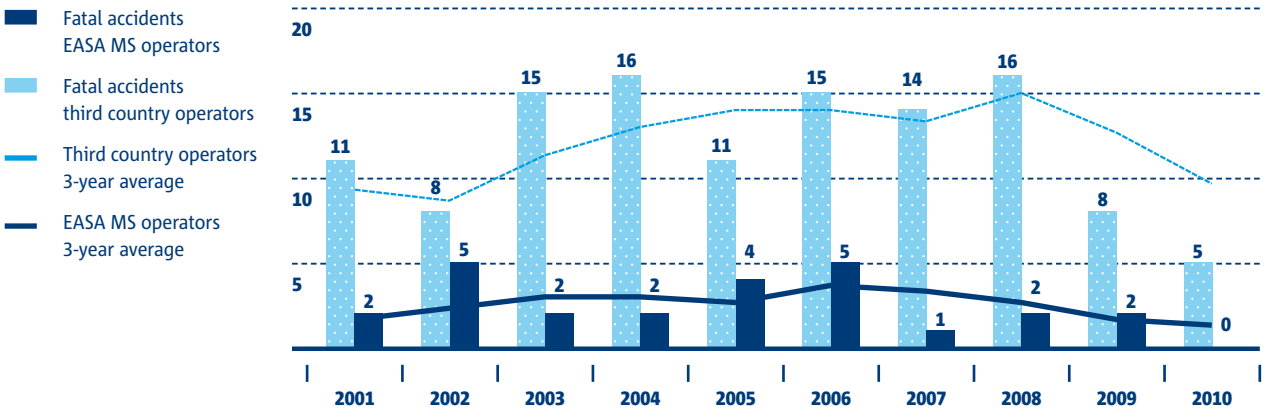
Helicopters

Period	Number of accidents	Fatal accidents	Fatalities on board	Ground fatalities
1999–2008 (average)	9	3	11	0
2009 (total)	5	2	18	0
2010 (total)	2	0	0	0

Fatal accidents in commercial air transport – EASA MS and third country operated aeroplanes



Fatal accidents in commercial air transport – EASA MS and third country operated helicopters

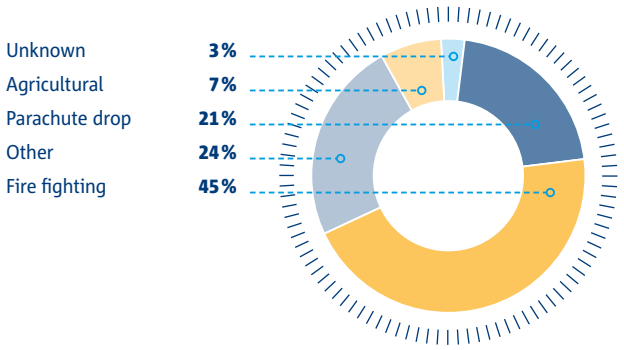


Overview of total number of accidents and fatal accidents by aircraft category – EASA MS registered aircraft with MTOM below 2 250 kg

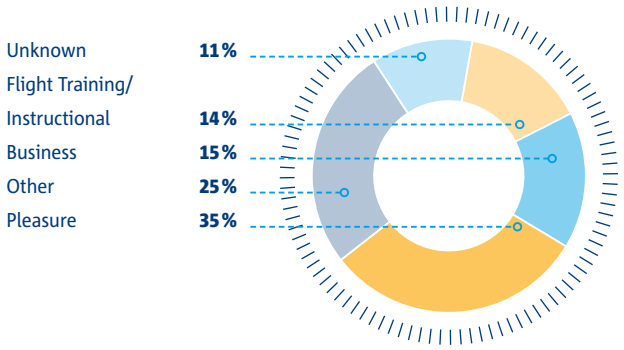
Aircraft category	Period	Number of all accidents	Fatal accidents	Fatalities on board	Ground fatalities
Balloon	2006–2009 (average)	22	0	0	0
	2010 (total)	14	0	0	0
Aeroplane	2006–2009 (average)	533	65	122	1
	2010 (total)	449	53	95	1
Glider	2006–2009 (average)	188	18	21	0
	2010 (total)	165	17	21	0
Gyroplane	2006–2009 (average)	10	3	3	0
	2010 (total)	9	0	0	0
Helicopter	2006–2009 (average)	84	10	21	2
	2010 (total)	70	10	28	0
Microlight	2006–2009 (average)	209	33	48	0
	2010 (total)	207	34	49	0
Other	2006–2009 (average)	73	13	15	1
	2010 (total)	85	10	11	0
Motorgliders	2006–2009 (average)	61	11	15	0
	2010 (total)	82	9	11	0
Average	**2006–2009**	**1180**	**153**	**244**	**4**
Total	**2010**	**1047**	**129**	**210**	**1**
Difference (%)		**– 11.3 %**	**– 15.5 %**	**– 14.0 %**	**– 71.4 %**

Fatal accidents by type of operation – EASA MS registered aeroplanes with MTOM above 2 250 kg (2001–2010)

Distribution by type of Aerial Work



Distribution by type of General Aviation











EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

ANNUAL SAFETY REVIEW

2010

easa.europa.eu

Table of Contents

Executive Summary

2010 was a very good year for aviation safety in Europe. It was the first year that no fatal accident in commercial air transport operations occurred in the history of aviation in Europe both for helicopter and aeroplane operations. Also, the fatal accident rate of scheduled passenger operations with aeroplanes was significantly lower in Europe than in the rest of the world.

In other world regions the number of fatal accidents increased from 39 to 46. In 2010 for those regions the rate of fatal accidents in scheduled operations has increased. It appears that the overall level of safety has reached a plateau.

In Europe, the number of fatal accidents for General Aviation and Aerial Work operations with aeroplanes and helicopters, with 'Maximum Take-Off Mass' (MTOM) over 2 250 kg, increased. 'Loss of control in flight' (LOC-I) is the most frequent accident category for this type of operation. Technical issues appear to play a much smaller role than LOC-I.

For the fifth year, the Agency collected from EASA Member States data for light aircraft with certificated MTOM below 2 250 kg. In comparison to 2009, in 2010 the number of accidents reported decreased by 16%. However, the data received was not complete as some Member States did not report all accidents. The Agency continues to cooperate with the Member States to further improve harmonization of data collection and to facilitate data sharing.

The ANNUAL SAFETY REVIEW provides, for the second year, information regarding the European Central Repository for occurrences (ECR). The number of reports and the fact that all Member States are reporting is encouraging for the future usability of the Repository. Improvements have been made to the quality of the data but accessibility of some of the data elements remains an issue.

The Air Traffic Management domain has a small contribution, either direct or indirect, to accidents and incidents in the overall aviation system. However, efforts are still required to continuously improve ATM safety.

1.0 Introduction

1.1 Background

Air transport is one of the safest forms of travel. Nevertheless, it is essential to continuously improve that level of safety for the benefit of European citizens. The European Aviation Safety Agency (EASA) is the centrepiece of the European Union's strategy for aviation safety. The Agency develops common safety and environmental rules at European level. Also, it monitors the implementation of standards through inspections of the Member States and provides the necessary technical expertise, training and research. The Agency works hand in hand with national authorities which continue to carry out many operational tasks, such as certification of individual aircraft or pilot licensing.

This document is published by EASA to inform the public of the general safety level in the field of civil aviation. The Agency provides this review on an annual basis as required by Article 15(4) of Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008. Analysis of information received from oversight and enforcement activities may be published separately.

1.2 Scope

This ANNUAL SAFETY REVIEW presents statistics on European and worldwide civil aviation safety. The statistics are grouped according to type of operation, for instance commercial air transport, and aircraft category, such as aeroplanes, helicopters and gliders.

The Agency had access to accident and statistical information collected by the International Civil Aviation Organisation (ICAO). States are required, according to ICAO Annex 13 'Aircraft accident and incident investigation', to report to ICAO information on accidents and serious incidents to aircraft with a MTOM over 2 250 kg. Therefore, most statistics in this review concern aircraft above this mass. In addition to the ICAO data, a request was made to the EASA Member States (EASA MS) to obtain light aircraft accident data for the years 2006–2010. Furthermore, data on the operation of aircraft for commercial air transport was obtained from both ICAO and the NLR Air Transport Safety Institute (The Netherlands).

The ANNUAL SAFETY REVIEW (ASR) is based on the data that were available to the Agency on 15th April 2011. Any changes after that date are not included. ***Note:*** Much of the information is based on initial data. That data is updated when results of investigations become available. As investigations may take several years, data from previous years may need to be updated. This occasionally leads to differences between data reported in this ASR when compared to that of previous years.

In this review the terms 'Europe' and 'EASA Member States' are considered as the 27 EU Member States plus Iceland, Liechtenstein, Norway and Switzerland. The region is assigned based on the State of the Operator of the accident aircraft for commercial air transport operations. For all other operations, the region is assigned based on the State of Registry.

Within the statistics, special attention is given to fatal accidents. In general these accidents are internationally well documented. Figures including non-fatal accident numbers are also presented. It is recognised that additional information could be presented by using advanced statistical tests, however this would add complexity to the document.

1.3 CONTENT OF THE REPORT

Due to the extension of EASA's remit in the ATM field, a new Chapter has been introduced in this ANNUAL SAFETY REVIEW. **Chapter 7** provides statistics on ATM related occurrences. This Chapter has been developed in close cooperation with EUROCONTROL.

Chapter 2 presents an overview of the historical development of commercial aviation safety. Statistics on commercial air transport operations are provided in **Chapter 3**. **Chapter 4** provides data on General Aviation and Aerial Work. **Chapter 5** covers light aircraft accidents in EASA MS. **Chapter 6** gives a summary of the data in the European Central Repository of occurrences. **Chapter 8** provides an overview of aviation safety measures taken in the different EASA Directorates.

A list of definitions used and acronyms as well as extra information on the accident categories used can be found in **Appendix 2: Definitions and acronyms**.

2.0 Historical development of aviation safety

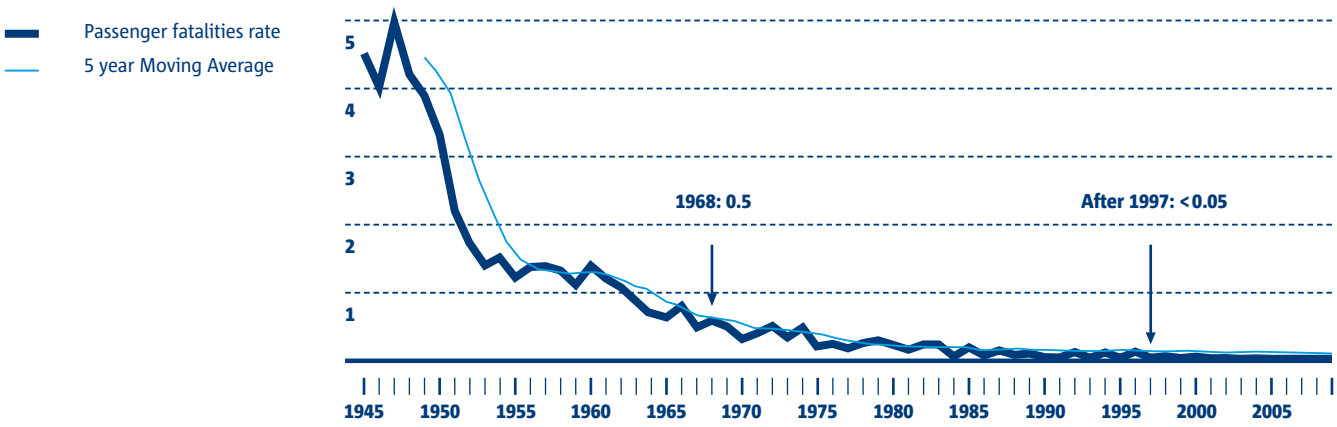
From 1945 and until 2009, ICAO has been publishing accident rates for accidents involving passenger fatalities (excluding acts of unlawful interference with civil aviation) for scheduled commercial transport operations. The figures below are based on accident rates published in the last ANNUAL REPORT OF THE COUNCIL of ICAO. The rates for the year 2010 are based on preliminary estimates.

The data in **FIGURE 2-1** show that the safety of aviation has improved from 1945 onwards. Based on the measure of passenger fatalities per 100 million passenger miles flown, it took some 20 years (1948 to 1968) to achieve the first 10-fold improvement from 5 to 0.5. Another 10-fold improvement was reached in 1997, almost 30 years later, when the rate had dropped below 0.05. For the year 2010 this rate is estimated[1] to have stayed at 0.01 fatalities per 100 million miles flown.

The accident rate in this figure appears to have been flat over recent years. This is the result of the scale used to reflect the high rates in the late 1940s.

FIGURE 2-1

GLOBAL PASSENGER FATALITIES PER 100 MILLION PASSENGER MILES, SCHEDULED COMMERCIAL AIR TRANSPORT OPERATIONS, EXCLUDING ACTS OF UNLAWFUL INTERFERENCE



Note: [1]The number may change once details on the traffic in 2010 become available.

Until 2009, the ANNUAL REPORT OF THE COUNCIL, ICAO also produced accident rates for accidents involving passenger fatalities. The progress of this rate over the past 20 years is shown in **FIGURE 2-2**. The data shown for 2010 are based on preliminary estimates.

From 1993 the rate of accidents involving passenger fatalities in scheduled operations (excluding acts of unlawful interference) per 10 million flights dropped continuously until 2003, when it reached its lowest value of 3. In recent years the rate of fatal accidents has not improved significantly, averaging between 4 and 5 fatal accidents per 10 million flights. Also, the 5 year moving average rate has remained almost constant since 2004. It should be noted that the accident rate for scheduled operations differs significantly per world region **(FIGURE 2-3)**.

FIGURE 2-2

GLOBAL RATE OF ACCIDENTS INVOLVING PASSENGER FATALITIES PER 10 MILLION FLIGHTS, SCHEDULED COMMERCIAL AIR TRANSPORT OPERATIONS, EXCLUDING ACTS OF UNLAWFUL INTERFERENCE

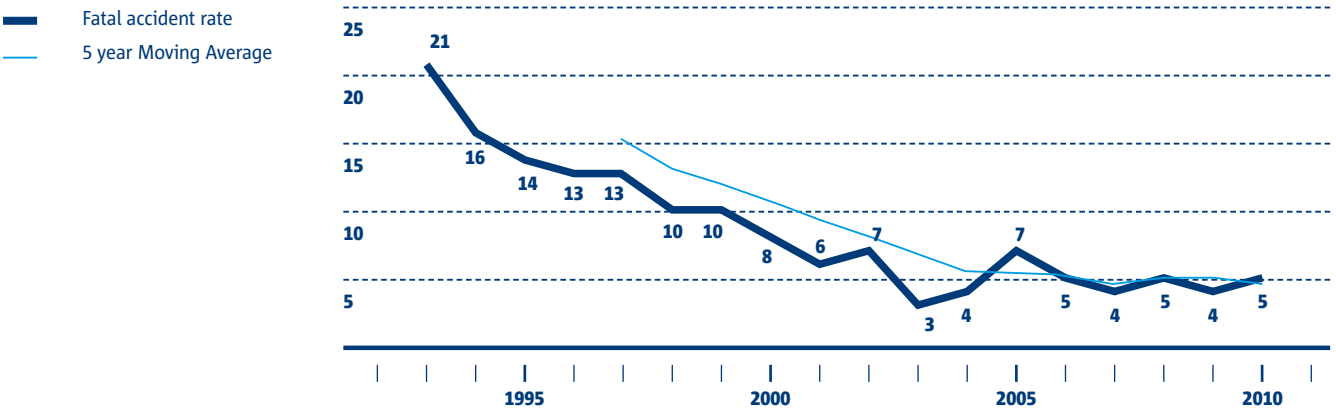
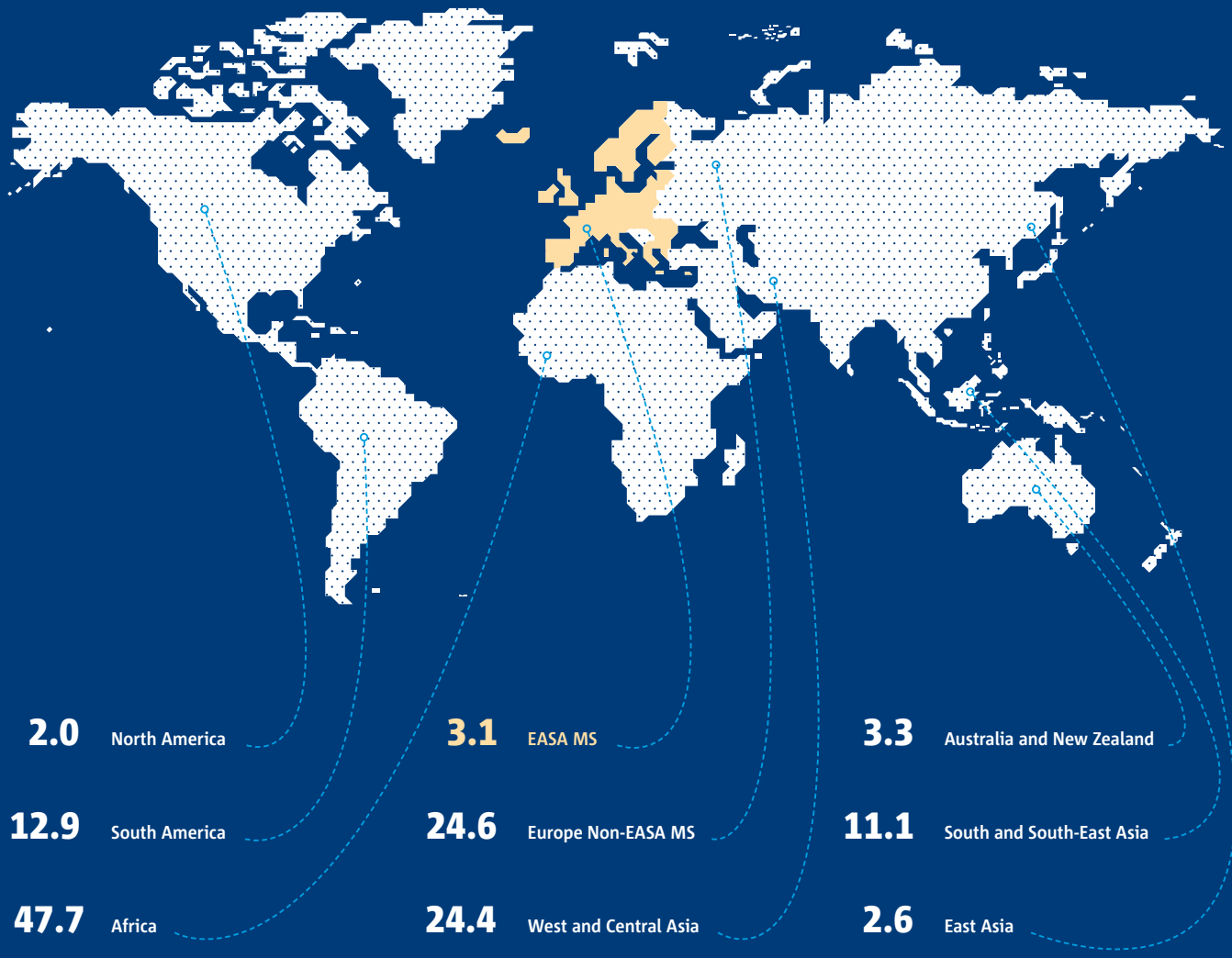


FIGURE 2-3 **RATE OF FATAL ACCIDENTS PER 10 MILLION FLIGHTS PER WORLD REGION (2001–2010, SCHEDULED PASSENGER AND CARGO OPERATIONS)**



The regions of North America, East Asia and EASA MS have the lowest rates of fatal accidents in the world. The region of South America includes Central America and the Caribbean.

3.0 Commercial air transport

This Chapter reviews the aviation accident data for commercial air transport operations. These operations involve the transportation of passengers, cargo and mail for remuneration or hire. The accidents concerned involve at least one aircraft with a certificated maximum take-off mass (MTOM) over 2 250 kg. Aircraft accidents are aggregated by the State in which the aircraft operator was registered in. Accidents and fatal accidents are identified as such using the definitions of ICAO Annex 13 'Aircraft accident and incident investigation'. This chapter is divided into two main sections: one for aeroplanes and another one for helicopters.

3.1 Aeroplanes

In terms of fatal accidents, the year 2010 has been one of the best years in aviation safety for EASA MS in commercial air transport history. As shown in **Table 3-1**, this was the first year during which no fatal accidents were recorded for this category of operations. The number of non-fatal accidents, although higher than in 2009, has been within the decade average. The survivability rate of all accidents involving EASA MS operated aircraft in the decade of 2001 to 2010 has been 95 % for all persons aboard.

Table 3-1 **Overview of total number of accidents and fatal accidents for EASA MS operators (aeroplanes)**

Period	Number of all accidents	Fatal Accidents	Fatalities on board	Ground fatalities
1999 – 2008 (average)	32	5	78	1
2009 (total)	20	1	228	0
2010 (total)	26	0	0	0

FIGURE 3-1

FATAL ACCIDENTS IN COMMERCIAL AIR TRANSPORT – EASA MS AND THIRD COUNTRY OPERATED AEROPLANES

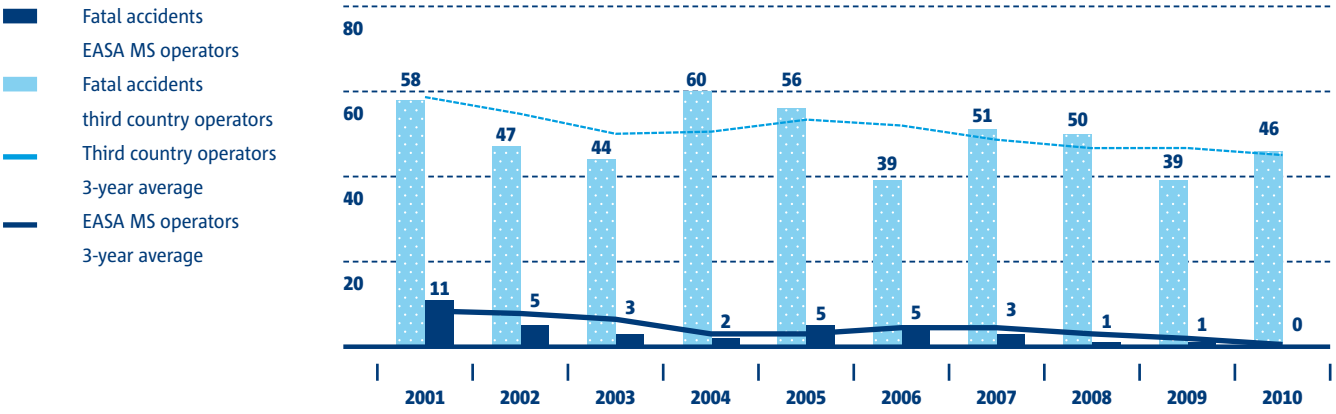


FIGURE 3-2

RATE OF FATAL ACCIDENTS IN SCHEDULED PASSENGER OPERATIONS – EASA MS AND THIRD COUNTRY OPERATED AEROPLANES (FATAL ACCIDENTS PER 10 MILLION FLIGHTS)

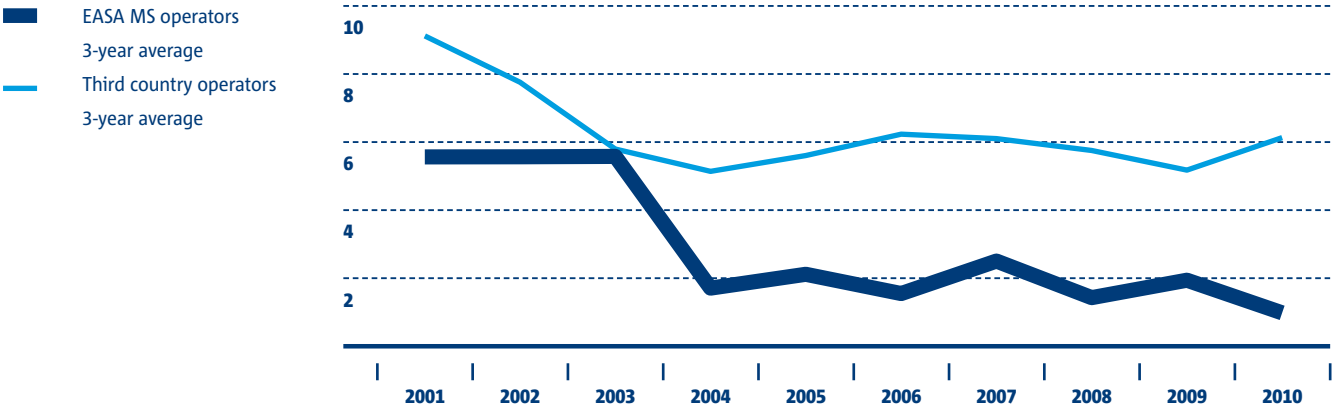


FIGURE 3-1 presents the number of accidents for aeroplanes operated by EASA MS and third country (non-EASA MS) operators within the decade 2001 to 2010. The number of fatal accidents for third country operated aeroplanes has increased from 39 in 2009 to 46 in 2010. The trend for the decade indicates that the number of fatal accidents worldwide has overall reached a plateau.

3.1.1 FATAL ACCIDENT RATES FOR SCHEDULED PASSENGER FLIGHTS

The number of accidents alone describes only part of the safety level for a given period. In order to derive more meaningful conclusions, the absolute number of accidents is combined with the number of flights. The resulting rates allow the development of safety trends, by taking into account changes in the level of traffic. **FIGURE 3-2** provides the fatal accident rate per 10 million scheduled passenger flights averaged over three-year periods for scheduled commercial air transport flights only (2010 traffic is based on estimates). The overall decrease in the average rate of fatal accidents for EASA MS in the past decade has continued in 2010. For third country operated aircraft the average rate increased in 2010 to reach the level of 2006.

FIGURE 3-3

FATAL ACCIDENTS BY TYPE OF COMMERCIAL AIR TRANSPORT OPERATION – THIRD COUNTRY OPERATED AEROPLANES

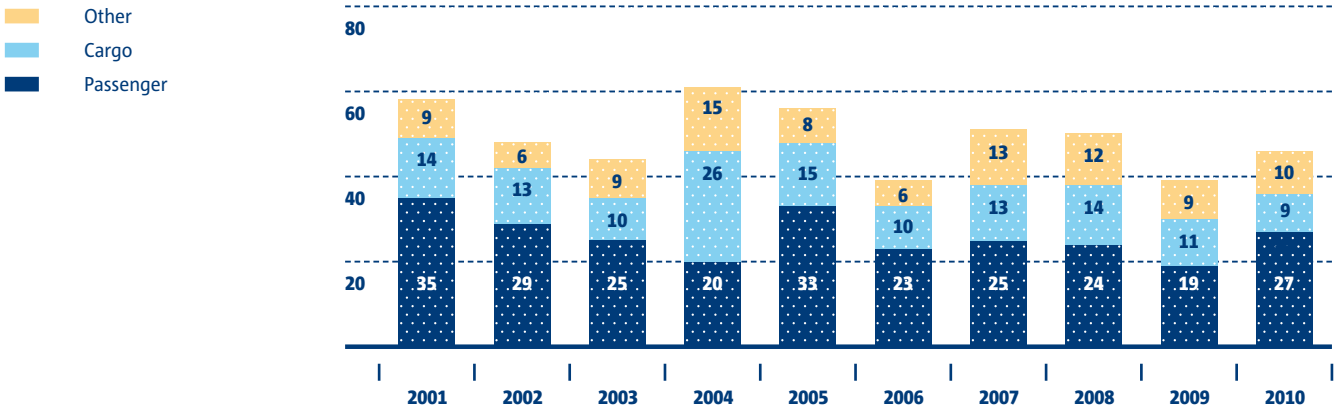
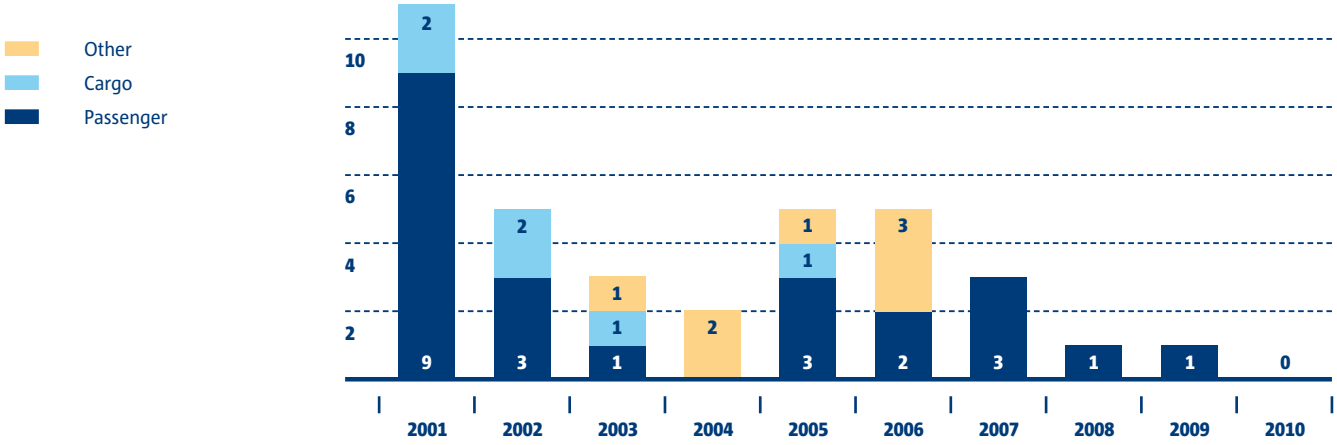


FIGURE 3-4

FATAL ACCIDENTS BY TYPE OF COMMERCIAL AIR TRANSPORT OPERATION – EASA MS OPERATED AEROPLANES



3.1.2 FATAL ACCIDENTS PER TYPE OF OPERATION

More details emerge when accidents are divided by type of operation. **FIGURE 3-3** shows that worldwide (excluding EASA MS) passenger air transport operations appear to represent the highest number of fatal accidents, compared to other types of operation. It is worth noting that the proportion of accidents in the category 'Other' is significantly higher than the proportion of aircraft conducting such operations. Information on the number of flights per type of operation is not available.

For EASA MS, the number of fatal accidents per type of operation is presented in **FIGURE 3-4**. Although there is a steadily decreasing number of accidents, historically the majority of fatal accidents concern passenger air transport operations.

3.1.3 ACCIDENT CATEGORIES

The assignment of accidents under one or multiple categories assists in identifying particular safety issues. Fatal and non-fatal accidents involving EASA MS operated aeroplanes which occurred during commercial air transport operations were assigned to accident categories.

These categories are based on the definitions developed by the CAST-ICAO Common Taxonomy Team (CICTT)[2]. An accident may be assigned more than one category depending on the circumstances contributing to the accident.

FIGURE 3-5 shows the number of accidents per category for all accidents involving aeroplanes operated by EASA MS airlines in the decade 2001–2010. The categories which included a high number of fatal accidents were, amongst others, LOC-I ('Loss of control in-flight') and SCF-PP ('System or component failure or malfunction related to the engine').

Events assigned under LOC-I involve the momentary or total loss of control of the aircraft by the crew. This loss of control might be the result of reduced aircraft performance or because the aircraft was flown outside its capabilities for control. The LOC-I accident category has the highest number of fatal accidents for the past decade. SCF-PP involves the malfunction of a single or of multiple engines which might have led to a complete or partial loss of engine power.

Additional observations can be made if the trends of some accident categories in the past decade are used. **FIGURE 3-6** presents the share in percentages of some accident categories in the total number of accidents. In recent years the proportion of accidents which included the categorisation of ARC ('Abnormal runway contact') has overall increased. Such accidents usually involve long, fast or hard landings. Often during such accidents the landing gear or other parts of the aircraft are damaged. Also increasing is the percentage of accidents involving RAMP ('Ground handling') events. These accidents involve damage to the aircraft by vehicles or ground equipment or the incorrect loading of an aeroplane. Accidents attributed as CFIT ('Controlled flight into terrain') appear to have an overall decreasing percentage. These accidents involve the collision or near collision of an aircraft with terrain, most often under circumstances of limited or significantly reduced visibility.

Note: [2] The CICTT developed a common taxonomy for the classification of the occurrences for accident and incident reporting systems. Further information may be found in Appendix 2: Definitions and acronyms.

FIGURE 3-5

ACCIDENT CATEGORIES FOR FATAL AND NON-FATAL ACCIDENTS – NUMBER OF ACCIDENTS BY EASA MS OPERATED AEROPLANES (2001 – 2010)

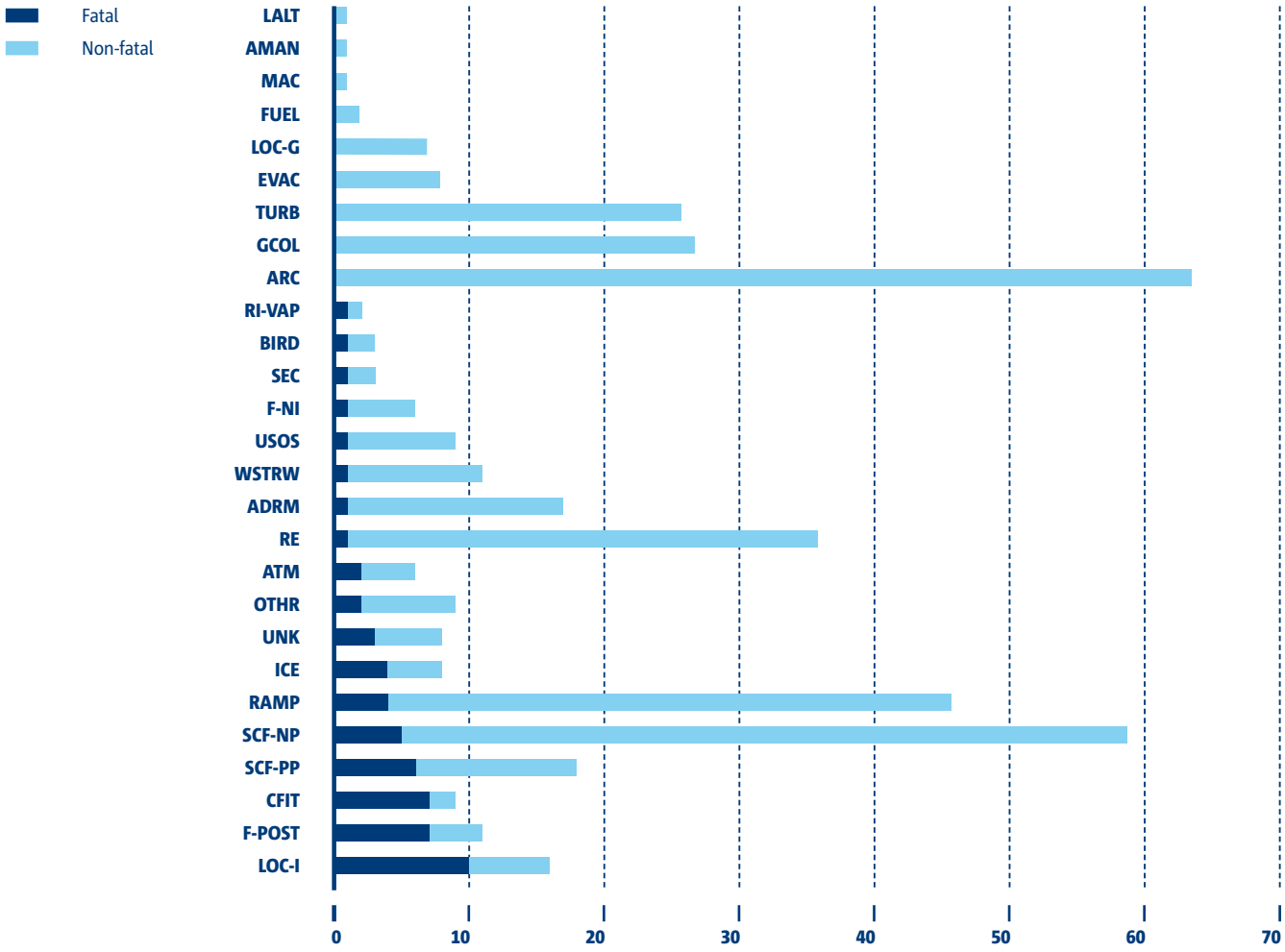
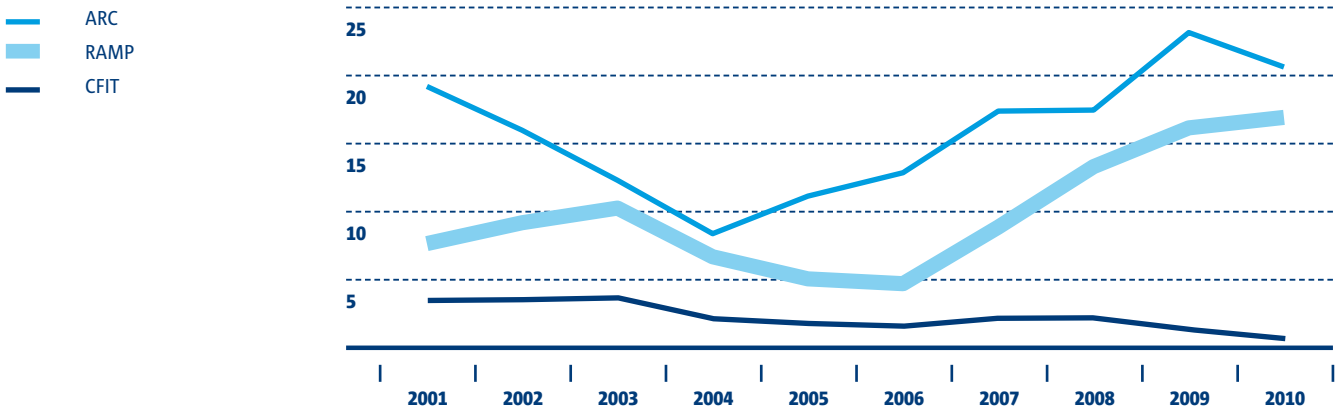


FIGURE 3-6

ANNUAL PROPORTION FROM ALL ACCIDENTS IN PERCENTAGE OF ARC, RAMP AND CFIT ACCIDENT CATEGORIES – AEROPLANES OPERATED BY EASA MS REGISTERED AIRLINES



3.2 HELICOPTERS

The following section provides an overview of accidents in helicopter commercial air transport operations (MTOM over 2 250 kg). Comprehensive usage data (e.g. flying hours) was not available for this report.

In general, helicopter operations differ from aeroplane operations. Helicopters often operate close to terrain and take-off or land in areas other than aerodromes, such as helipads, private landing sites and natural landing sites. Also, a helicopter has different aerodynamic and handling characteristics from aeroplanes. All this is reflected in the different accident characteristics.

As shown in **TABLE 3-2**, for 2010, there were no fatal accidents recorded involving commercial air transport helicopters operated by EASA MS operators. In addition, the number of non-fatal accidents was below the decade average.

TABLE 3-2 OVERVIEW OF TOTAL NUMBER OF ACCIDENTS AND FATAL ACCIDENTS – EASA MS OPERATORS (HELICOPTERS)

Period	Number of all accidents	Fatal accidents	Fatalities on board	Ground fatalities
1999–2008 (average)	9	3	11	0
2009 (total)	5	2	18	0
2010 (total)	2	0	0	0

3.2.1 FATAL ACCIDENTS

FIGURE 3-7 presents the number of fatal helicopter accidents for EASA MS and third country operators. Between 2001 and 2010, 25 fatal accidents involving an EASA MS operator occurred compared to 119 fatal accidents involving helicopters operated by third-country operators. Overall, fatal accidents involving EASA MS operators represent 17% of the total number of accidents worldwide. For third country operators, the number of fatal accidents in 2010 was low (5 accidents) compared to the average for the decade 2001–2010 (12 accidents).

When looking at the three-year moving averages, it appears that both the average number of fatal helicopter accidents worldwide and for EASA MS operators has decreased over recent years.

3.2.2 FATAL ACCIDENTS PER TYPE OF OPERATION

FIGURE 3-8 presents the number of fatal accidents by type of commercial air transport operation. When reviewing the type of operation involved in fatal accidents, a difference can be observed between EASA MS and third country operators.

Passenger transport is the main type of operation involved in fatal accidents of third country operators. Most fatal accidents of EASA MS aircraft (14) involved helicopter emergency medical

FIGURE 3-7

FATAL ACCIDENTS IN COMMERCIAL AIR TRANSPORT – EASA MS AND THIRD COUNTRY OPERATED HELICOPTERS

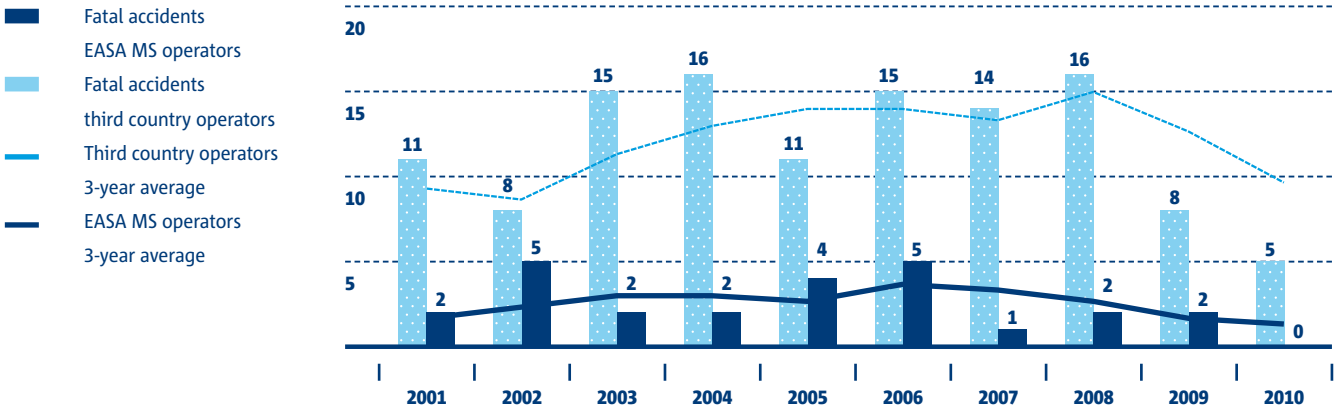
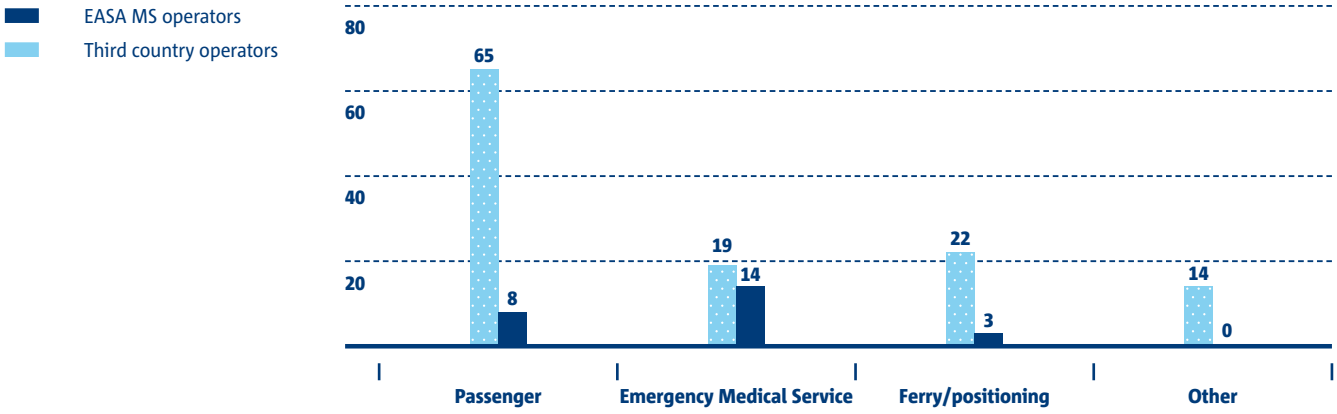


FIGURE 3-8

FATAL ACCIDENTS BY TYPE OF OPERATION – EASA MS AND THIRD COUNTRY OPERATED HELICOPTERS (2001 – 2010)



services (HEMS[3]). This represents 42 % of the total number of fatal accidents for helicopter EMS operations worldwide. The category 'Other' includes cargo and air taxi operations.

In the last decade 22 helicopters involved in fatal accidents worldwide were performing an offshore flight (flights to or from an offshore installation). These accidents are included in **FIGURE 3-8**, under all the categories, depending on the type of operation.

Note: [3] HEMS flights facilitate emergency medical assistance, where immediate and rapid transportation of medical personnel, medical supplies or injured persons is essential.

3.2.3 Accident categories

In order to assist in the identification of particular safety issues, one or multiple accident categories were assigned to the helicopter accidents involving EASA MS operators.

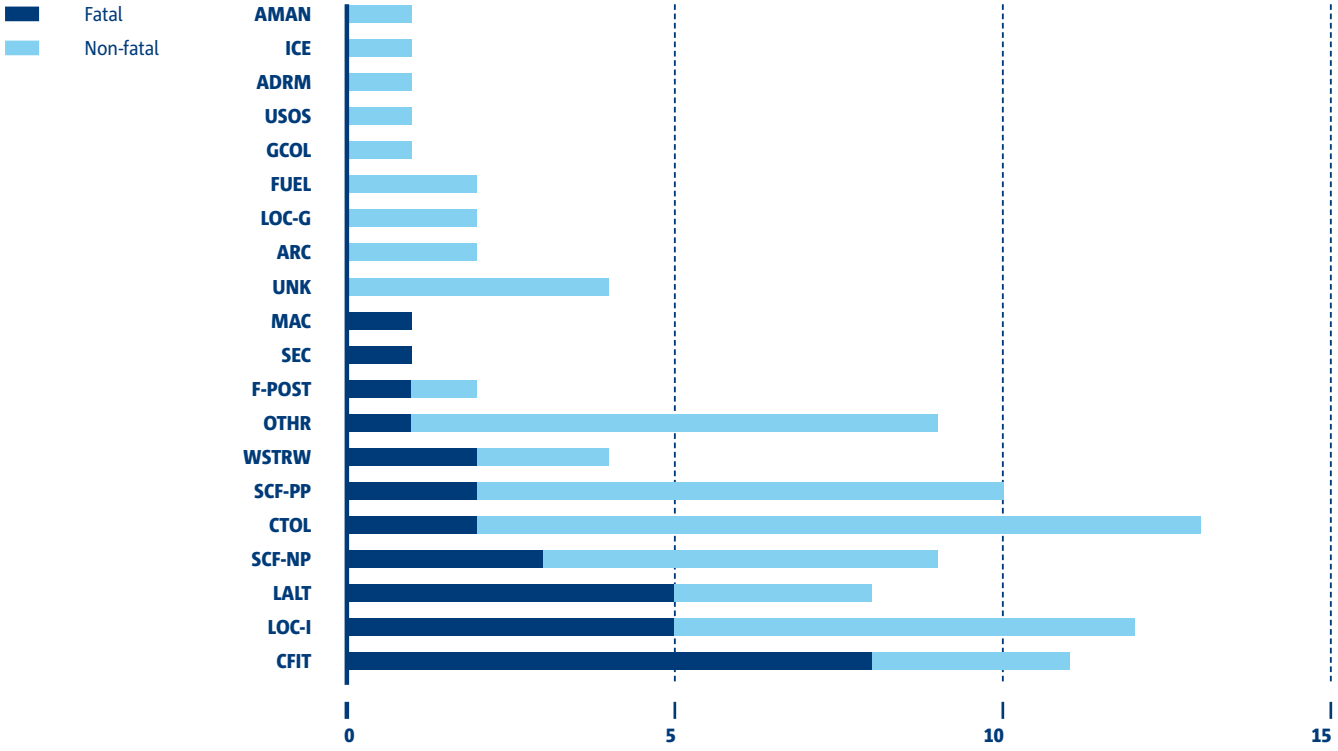
These categories are based on definitions developed by the CAST-ICAO Common Taxonomy Team (CICTT). Recently, the list of categories was updated to better cover helicopter operations. Amongst others, the category 'Collisions with obstacles during take-off and landing' (CTOL) was added. In previous Annual Safety Reviews, the accidents in this category were covered under 'Other' (OTHR).

The category with the highest number of fatal accidents assigned is 'Controlled flight into terrain' (CFIT). In most cases adverse weather circumstances were prevalent, such as reduced visibility due to mist or fog. Also, several flights had taken place at night or in mountainous or hilly terrain.

'Loss of control in flight' (LOC-I) has the second highest number of fatal accidents assigned and also the second highest number of total accidents assigned.

'Low altitude' (LALT) accidents are collisions with terrain and objects that occurred while intentionally flying close to the surface, excluding take-off and landing phases.

Figure 3-9 Accident categories for fatal and non-fatal accidents — Number of accidents by EASA MS operated helicopters (2001–2010)



The ‘Other’ (OTHR) category is assigned when the accident is not covered under another category. In several accidents in this category the powerful rotor downwash resulted in serious injuries to persons on the ground or caused loose objects to damage the helicopter.

The two categories addressing system or component failures and malfunctions are SCF-NP and SCF-PP, for respectively non-engine and engine failures or malfunctions. The accidents in these categories mainly involve engine, main rotor system, tail rotor system or flight control failures or malfunctions.

The accidents in the category ‘Collisions with obstacles during take-off and landing’ (CTOL) involve all accidents during take-off and landing phases where the main or tail rotor collided with objects on the ground. Helicopters often operate in confined areas close to obstacles.

4.0 General Aviation and Aerial Work

This chapter provides data on accidents to aircraft with MTOM above 2 250 kg involved in General Aviation and Aerial Work operations. The information provided in this chapter is based on data obtained from ICAO. According to ICAO definition, 'Aerial Work' is an aircraft operation in which an aircraft is used for specialised services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement.

'General Aviation' means all civil aviation operations other than a commercial air transport operation or an Aerial Work operation. The distribution of fatal accidents by type of operation is shown in **FIGURE 4-1** for the decade 2001–2010.

FIGURE 4-1 **FATAL ACCIDENTS BY TYPE OF OPERATION – EASA MS REGISTERED AEROPLANES WITH MTOM ABOVE 2 250 KG (2001–2010)**

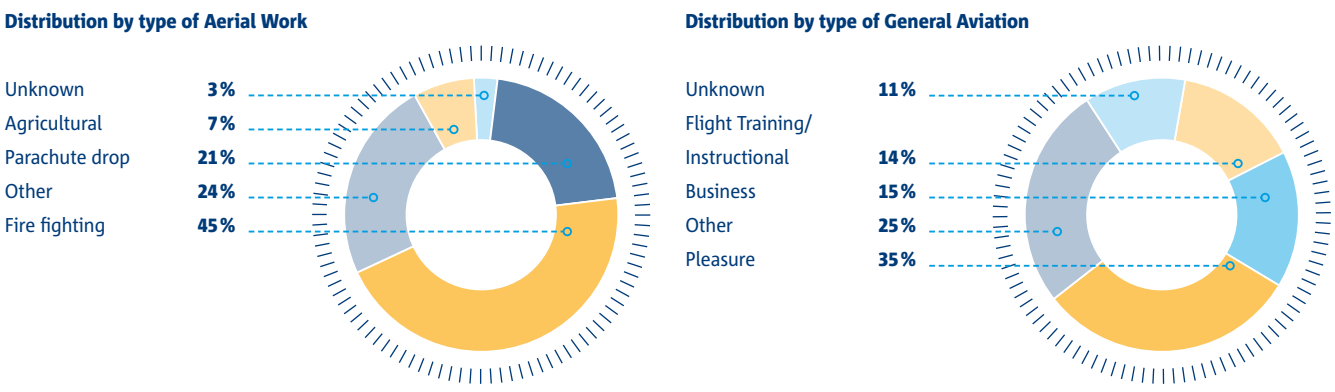
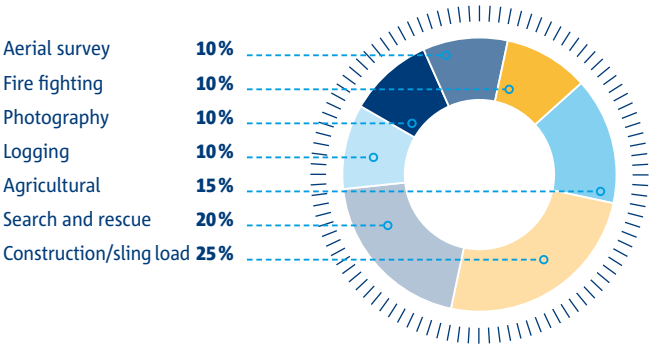
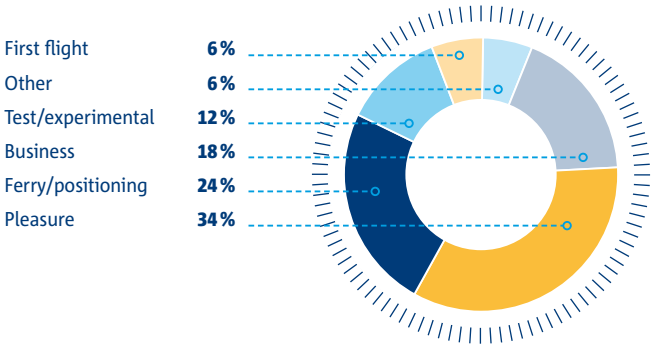


FIGURE 4-2 **FATAL ACCIDENTS BY TYPE OF OPERATION – EASA MS REGISTERED HELICOPTERS WITH MTOM ABOVE 2 250 KG (2001–2010)**

Distribution by type of Aerial Work



Distribution by type of General Aviation



In **TABLE 4-1** the time period presented extends from 1999–2010, showing the number of accidents for 2010 and 2009 as well as the average for the decade preceding these years.

TABLE 4-1 **OVERVIEW OF NUMBER OF ALL ACCIDENTS AND FATAL ACCIDENTS BY TYPE OF OPERATION AND TYPE OF AIRCRAFT – EASA MS REGISTERED AIRCRAFT WITH MTOM ABOVE 2 250 KG**

Aircraft category	Operation type	Date	Number of all accidents	Fatal accidents	Fatalities on board	Ground fatalities
Aeroplanes	General Aviation	1999–2008 (average)	17	5	13	1
		2009	13	5	9	0
		2010	13	3	6	0
Aeroplanes	Aerial Work	1999–2008 (average)	6	2	4	0
		2009	3	1	2	0
		2010	4	0	0	0
Helicopters	General Aviation	1999–2008 (average)	5	1	3	0
		2009	2	2	3	0
		2010	5	0	0	0
Helicopters	Aerial Work	1999–2008 (average)	6	1	2	0
		2009	1	1	4	0
		2010	9	3	8	0

4.1 Accident categories – Aeroplanes

It was observed that not all General Aviation accidents obtained from ICAO had been classified in terms of accident categories. Consequently, the numbers presented provide a low estimate of the frequency of the accident categories. All data refer to the decade 2001–2010.

Figure 4-3 shows that 'Loss of control in flight' (LOC-I) is the most important category regarding fatal accidents. There were several fatal accidents with 'Unknown' (UNK) accident category indicating that there was insufficient data to permit classification. 'Abnormal runway contact' (ARC), 'Runway excursions' (RE) and 'System component failures not related to the engine' (SCF-NP) are the most important non fatal accident categories. It means that technical issues played a role but the accident outcome was often less severe.

For Aerial Work, there is a particular problem in obtaining data related to accidents in this type of operation. One of the most hazardous types of Aerial Work operation in this regard is related to fire fighting. This activity may be performed by commercial operators but also by State organisations (e.g. the Air Force) as 'State Flights'. 'State Flights' were not included in this review.

Figure 4-3 Accident categories for fatal and non-fatal accidents in General Aviation – EASA MS registered aeroplanes with MTOM above 2 250 kg (2001–2010)

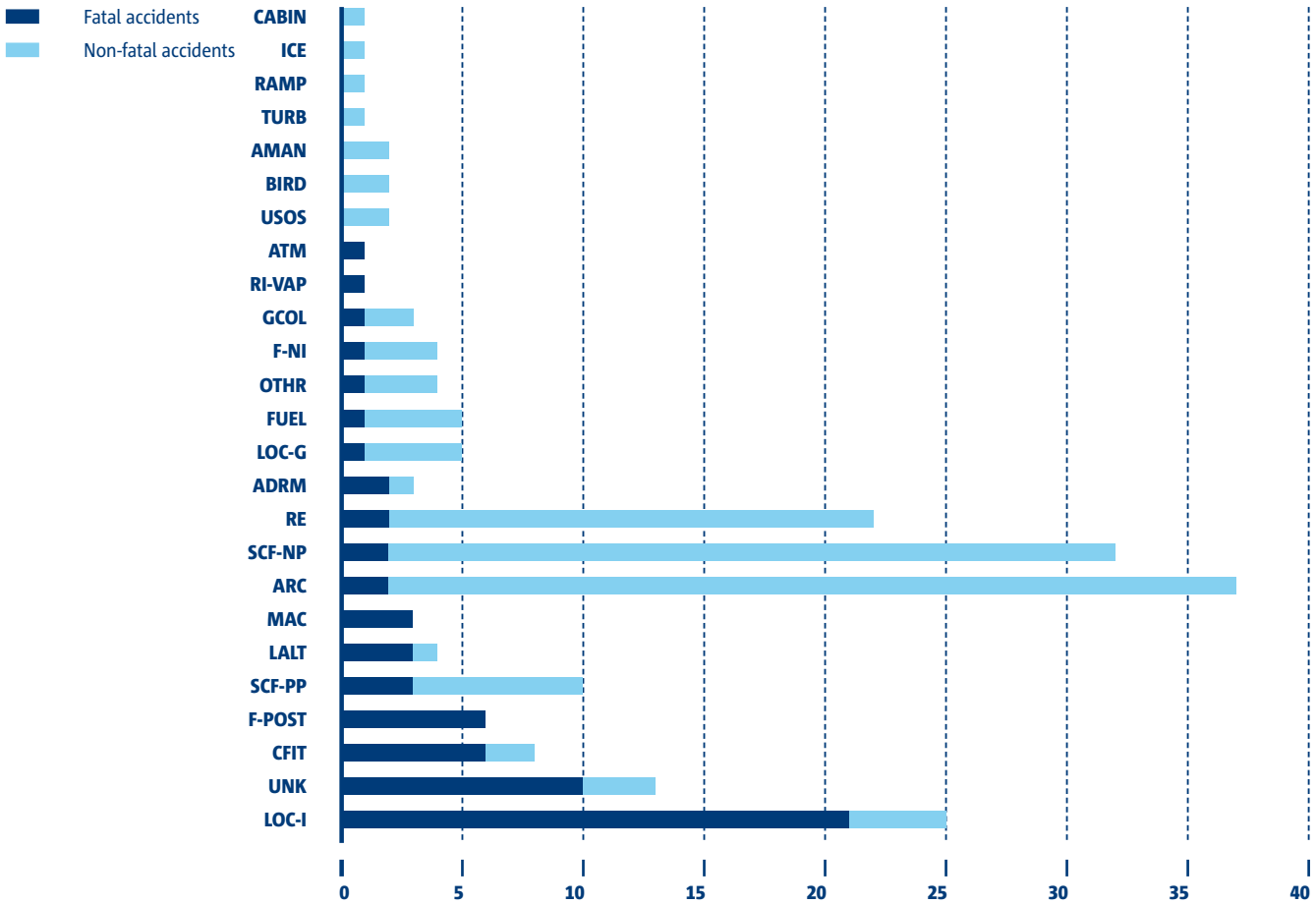


FIGURE 4-4 ACCIDENT CATEGORIES FOR FATAL AND NON-FATAL ACCIDENTS IN AERIAL WORK – EASA MS REGISTERED AEROPLANES WITH MTOM ABOVE 2 250 KG (2001 – 2010)

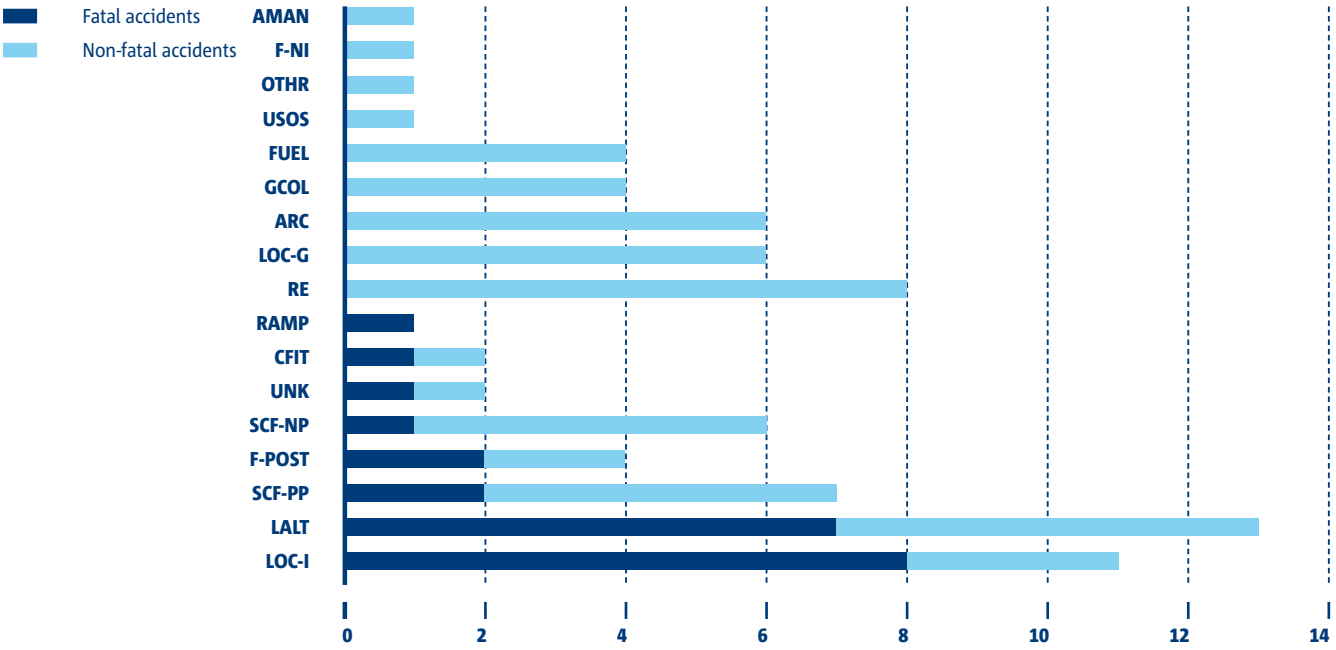


FIGURE 4-4 presents 'Loss of control in flight' (LOC-I) as the most important fatal accident category, which is immediately followed by 'Low altitude operations' (LALT) and then by system-component failure related to the engine (SCF-PP) and 'Fire post impact' (F-POST). 'Runway excursion' (RE) was the most important Aerial Work accident category for non fatal accidents.

4.2 ACCIDENT CATEGORIES – HELICOPTERS

Fewer accidents have occurred involving helicopters in both General Aviation and Aerial Work, in comparison to aeroplanes. This is likely to be related to the significantly smaller fleet size of helicopters as well as the different tasks helicopters have to complete in both types of operation. As with aeroplanes, there are no statistics available on helicopter operations.

FIGURE 4-5 shows that 'Loss of control in flight' (LOC-I) and 'Controlled flight into terrain' (CFIT) were the two most frequent occurrence categories regarding fatal accidents in helicopter operations. The category LOC-I also represents one of the highest number of non-fatal accidents in General Aviation, highlighting that issues related to helicopter handling remain a concern.

In Aerial Work operations, helicopters are used for a variety of roles which involve 'Manoeuvring at low altitude' (LALT) and the 'Carriage of external load' (EXTL). Under such conditions any safety issue such as an error in handling or a 'System or component failure related to an engine' may result in a 'Loss of control in flight' (LOC-I). **FIGURE 4-6** shows that such safety issues concern the majority of fatal accidents and also that a relatively high number of helicopter accidents were categorised with 'Unkown' (UNK). This is probably because accident investigation has not yet been completed or that the causes or circumstances of these accidents remain undetermined.

FIGURE 4-5

ACCIDENT CATEGORIES FOR FATAL AND NON-FATAL ACCIDENTS IN GENERAL AVIATION – EASA MS REGISTERED HELICOPTERS WITH MTOM ABOVE 2 250 KG (2001–2010)

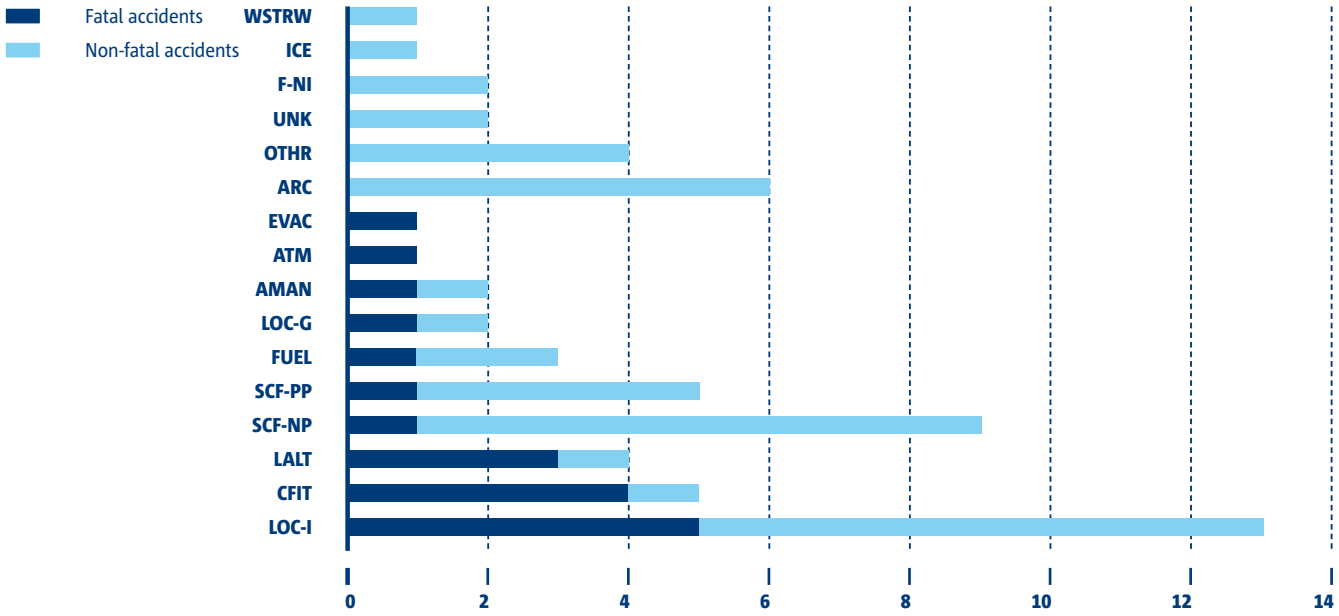
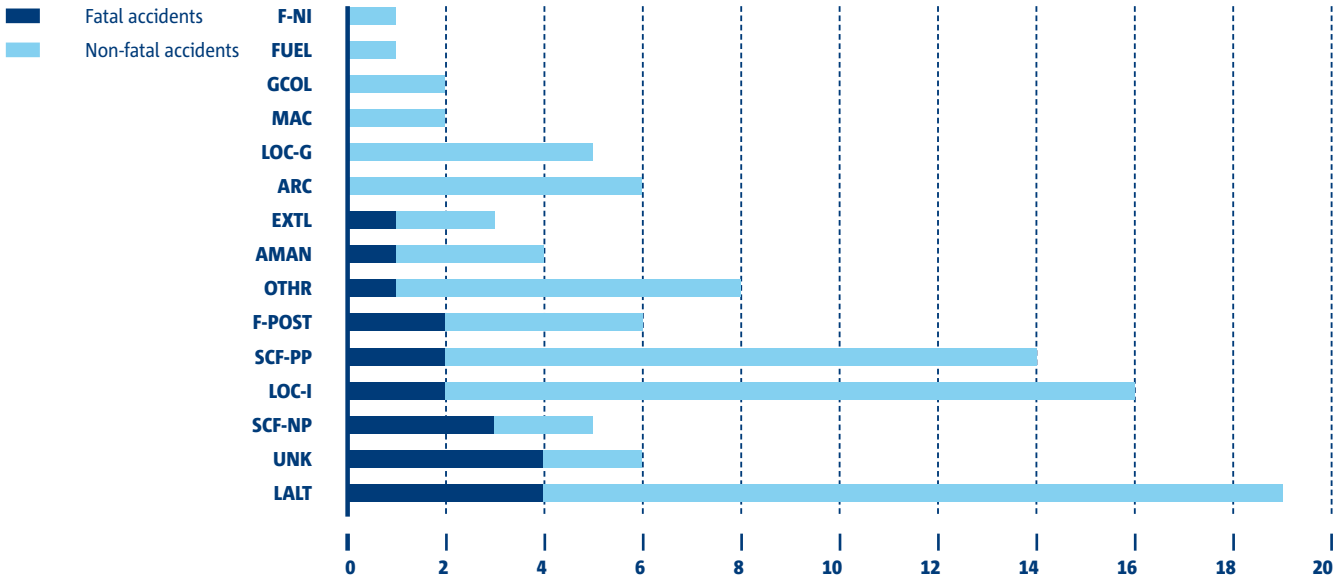


FIGURE 4-6

ACCIDENT CATEGORIES FOR FATAL AND NON-FATAL ACCIDENTS IN AERIAL WORK – EASA MS REGISTERED HELICOPTERS WITH MTOM ABOVE 2 250 KG (2001–2010)



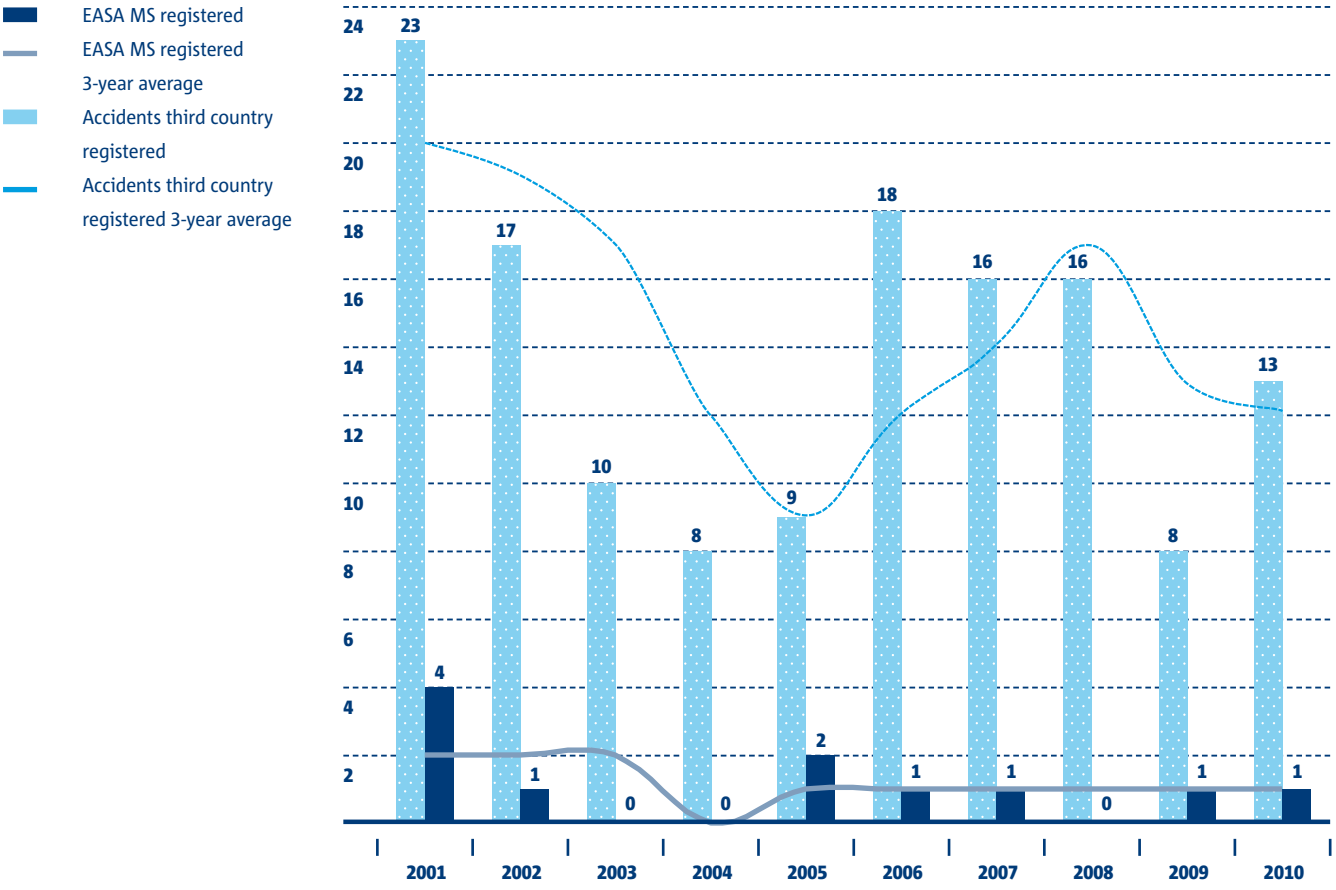
4.3 Business aviation

According to ICAO, 'Business aviation' is considered a subset of General Aviation operations. The data on 'Business aviation' are presented in this document in light of the importance of this sector.

In recent years, there was one accident each year in EASA MS. Worldwide, the number of fatal accidents has been overall decreasing in the last decade. In 2009 a very low number of accidents occurred. This might be related to the drop in business aviation operations in that year. However, there are no data available for worldwide business aviation operations to calculate rates.

Figure 4-7

Fatal accidents in business aviation – EASA MS and third country registered aeroplanes




RAISE
FOR
CABLE
CUT
CABLE METER
OUT
CAUTION
EL
OVERHEAT

5.0 Light aircraft, aircraft below 2 250 kg MTOM

The data included in this analysis includes only accidents reported by EASA Member States and occurring in these States with aircraft whose MTOM is below 2 250 kg. State Flights are not included. Data on light aircraft accidents was requested from EASA Member States in January 2011. Data was not provided from Romania.

The level of quality of coding varied among the Member States. Although some States still have some data quality issues, overall, a general improvement on the quality and the completeness of the data could be observed for the data reported in 2010 compared to data of previous years.

The number of accident reports received for the period 2006–2010 was 4,383. Some States reported activities outside the remit of this Annual Safety Review, for example para-motors or hang-gliders. This data was not taken into consideration in this review.

For 2010, three States, Estonia, Liechtenstein and Malta reported that no accidents occurred. The remaining States reported 1,047 accidents, of which 129 were fatal. The number of fatalities was reported as being 189 onboard aircraft and a single one on the ground. Some accidents published by the national aviation authorities or other organisations were not reported to EASA. This data is not included in this review and therefore the number of accidents presented here is lower than the one that actually occurred.

The number of accidents, fatal accidents and fatalities presented in **TABLE 5-1** compare the data for 2010 with the average number of previous years for which data is available (2006–2009).

It can be observed that all the figures in 2010 are of the same order of magnitude as the average of the four previous years. The total number of accidents, fatal accidents and fatalities generally decreased in 2010 when compared with the average of the previous years.

Individually, the number of accidents decreased in 22 Member States and increased in 8 States. The number of accidents reported in 2010 is the lowest for the period from 2006 to 2010. Although from 2006 the number of accidents had been increasing until 2009, in 2010 the number of accidents decreased by almost 16 %. Some of this decrease may be attributed to the incomplete reporting by some Member States.

TABLE 5-1 **OVERVIEW OF TOTAL NUMBER OF ACCIDENTS AND FATAL ACCIDENTS BY AIRCRAFT CATEGORY – EASA MS REGISTERED AIRCRAFT WITH MTOM BELOW 2 250 KG**

Aircraft category	Period	Number of all accidents	Fatal accidents	Fatalities on board	Ground fatalities
Balloon	2006–2009 (average)	22	0	0	0
	2010 (total)	14	0	0	0
Aeroplane	2006–2009 (average)	533	65	122	1
	2010 (total)	449	53	95	1
Glider	2006–2009 (average)	188	18	21	0
	2010 (total)	165	17	21	0
Gyroplane	2006–2009 (average)	10	3	3	0
	2010 (total)	9	0	0	0
Helicopter	2006–2009 (average)	84	10	21	2
	2010 (total)	70	10	28	0
Microlight	2006–2009 (average)	209	33	48	0
	2010 (total)	207	34	49	0
Other	2006–2009 (average)	73	13	15	1
	2010 (total)	85	10	11	0
Motorgliders	2006–2009 (average)	61	11	15	0
	2010 (total)	82	9	11	0
Average	**2006–2009**	**1180**	**153**	**244**	**4**
Total	**2010**	**1047**	**129**	**210**	**1**
Difference (%)		**– 11.3 %**	**– 15.5 %**	**– 14.0 %**	**– 71.4 %**

5.1 Fatal accidents

Figure 5-1 shows that the vast majority of fatal accidents of light aircraft in EASA Member States, involved General Aviation (95 %). About 4 % of fatal accidents involved Aerial Work and only 1% commercial air transport operations.

Figure 5-2 shows the distribution of fatal accidents per aircraft category. The majority (43 %) of light aircraft involved in fatal accidents between 2006 and 2010 were aeroplanes, followed by microlight aircraft (22 %) and by gliders (19 %), (motorgliders are included). Balloons are seldom represented in fatal accidents; in fact there was just one case reported between 2006 and 2009.

Figure 5-1 Fatal accidents by type of operation – EASA MS registered aircraft with MTOM below 2 250 kg (2006 – 2010)

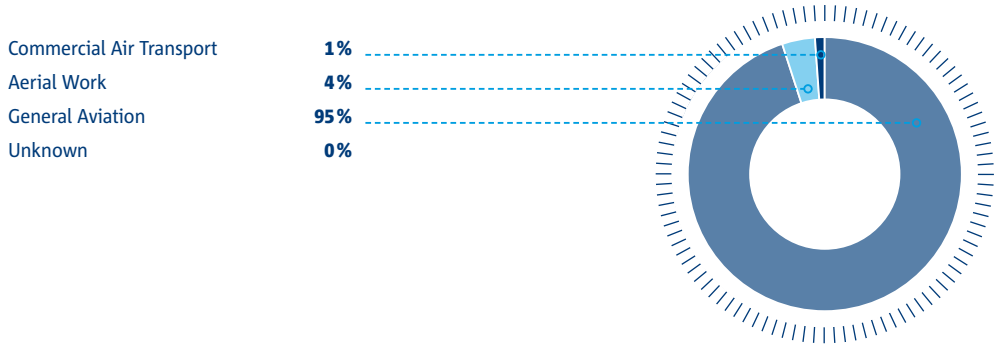
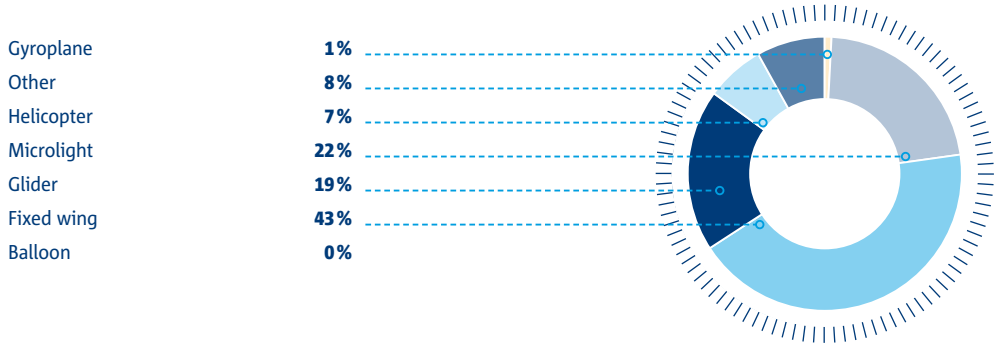


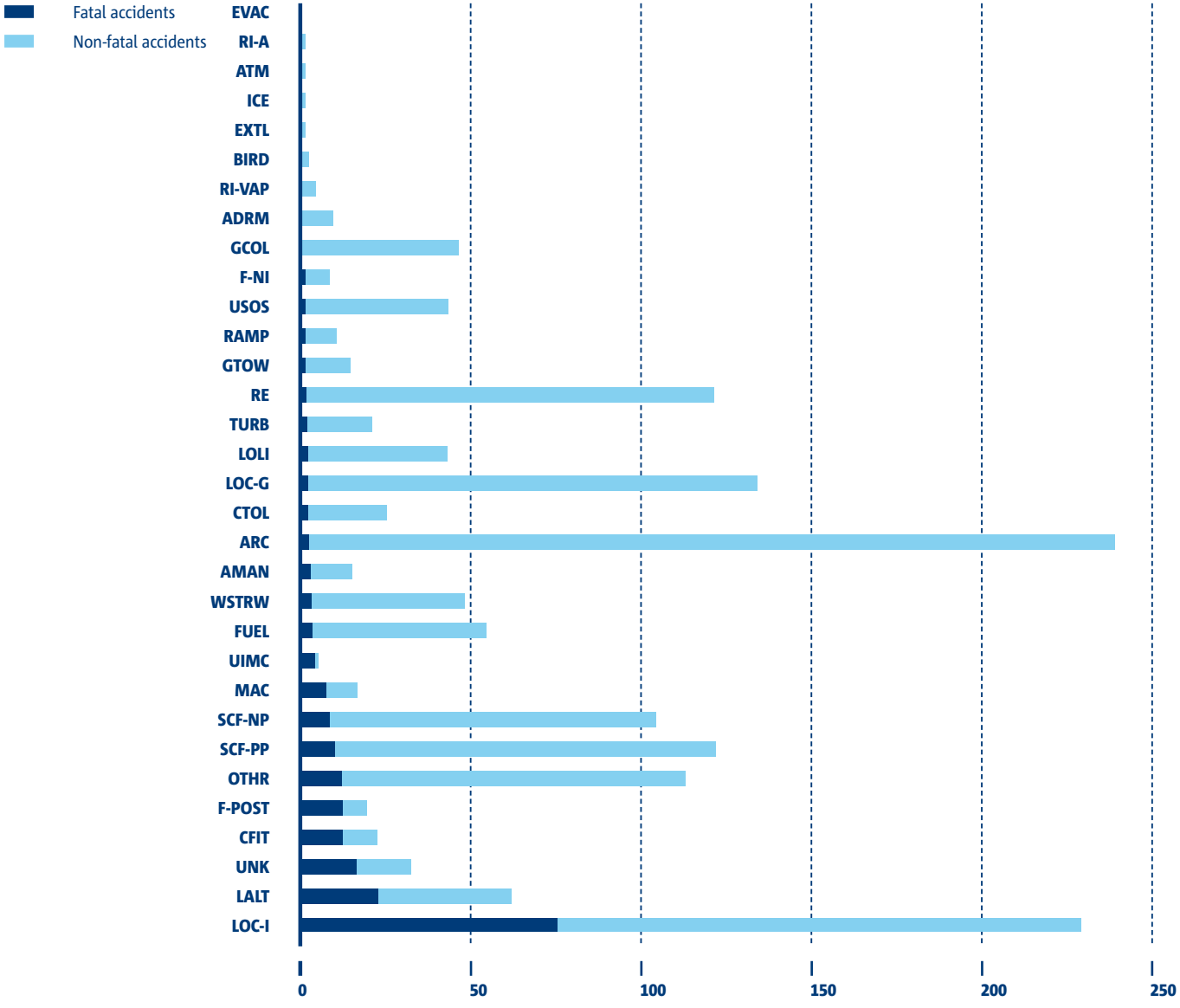
Figure 5-2 Fatal accidents by aircraft category – EASA MS registered aircraft with MTOM below 2 250 kg (2006 – 2010)



5.2 Accident categories

The CICTT accident categories were applied by the reporting EASA MS to the set of light aircraft data accidents for the period 2006–2010. The accident categories had been historically developed to permit the tracing of the safety efforts for fixed wing air transport operations. Additional categories, more appropriate for General Aviation operation and adequate for light aircraft, rotary wing and gliders, were recently introduced and appear for the first time in this ANNUAL SAFETY REVIEW[4]. The new categories were mainly coded in the 2010 records but were only occasionally considered in updates to previous records. An effort was made by EASA to address any obvious editorial issues.

Figure 5-3 Accident categories for fatal and non-fatal accidents – Aircraft below 2 250 kg, EASA MS registered (2006–2010)



Note: [4]These are CTOL, GTOW, LOLI and UIMC (see definitions in Appendix 2).

The largest number of fatal accidents were categorized as LOC-I 'Loss of control in flight' and LALT 'Low altitude'. LOC-I is also one of the most important categories in non-fatal occurrences. The LOC-I and LALT categories also show a high proportion of fatal accidents relative to the total number of accidents in the respective category.

The UNK 'Unknown' category is the third most frequent category in fatal accidents. These may be accidents for which the category could not be determined after the investigation or the investigation was not yet completed. The UNK category represents about 8% of the fatal accidents.

As in previous years, data on traffic for light aircraft was unavailable. The number of hours flown by light aeroplanes and helicopters is not recorded by the national aviation authorities in the great majority of the Member States. Data regarding gliders, balloons and aircraft like the so-called "homebuilt" are also not recorded, or are, in several States, entrusted to associative organizations and not retrieved by the authorities. An accurate estimate of flight hours or flights is needed to allow a meaningful analysis of data, in order to identify whether the variation in the number of accidents corresponds to a change in safety.

The Agency together with its Member States will continue its efforts to improve data collection for light aircraft in order to help the aviation community identify priority actions towards enhancing safety further.


OXYGEN
TOULOUSE-BLAGNAC
LFBO TLS
MAP DATA
ARPT SEL
STATUS
ACTIVE ATC :
NEXT ATC :
DISCONNECT
OFF
OFF

6.0 The European central repository

This Chapter contains information on the European Central Repository. The majority of occurrences in this repository are incidents reported by EASA Member States.

For approximately 20 years, the European Commission has been developing the concept of a centralised aviation safety data collection system, which is known as the European Coordination Centre for Accident and Incident Reporting Systems (ECCAIRS). Under this system, all safety occurrences from EASA Member States are collected in a centralised database – the European Central Repository (ECR). EC Directive 42/2003 on occurrence reporting in civil aviation placed an obligation on Member States to make 'all relevant safety-related information' stored in their databases available to the competent authorities of other Member States and the European Commission and to ensure that their databases were compatible with software developed by the European Commission (i.e. ECCAIRS software). Furthermore, Member States were obliged to integrate their occurrence data into the ECR according to Commission Regulation (EC) No 1321/2007. By the end of 2010, 29 of the 30 States had commenced integrating their data. It is expected that within 2011 all Member States will be integrating data.

The integration of occurrences is vital in providing the widest possible source of pan-European safety data, which enables EASA and its Member States to better understand the safety issues of the Aviation Community. Although the ECR is still in its infancy, the increase in both the amount of information it holds and the improvement in the quality of the data means that the ECR is already beginning to show great promise as a credible and vital safety resource. In this Chapter, there are some key statistics available from the ECR that can provide guidance to those whose task is to improve safety further still.

6.1 THE ECR AT A GLANCE

At the end of 2010 the ECR contained 418,009 occurrences, an increase of more than 140,000 over the previous year. This improvement is not due to an increase in safety occurrences over the past 12 months, but is largely due to the endeavours of States in integrating their occurrence data for the past years into the ECR. The distribution of occurrences per year is presented in **FIGURE 6-1**. It is worth bearing in mind that some States have provided their historical data[5] while others are integrating only the occurrence data reported after the date the integration was started. This is why the number of occurrences for this year increased compared to the number reported in the ANNUAL SAFETY REVIEW OF 2009.

FIGURE 6-2 provides a breakdown of the occurrences in the ECR by operation type. Whilst just over 50 % of occurrences currently in the ECR have no information regarding the operation type, the amount of missing information in 2010 concerning operation type was 50.2 % compared to 57 % 2009. Where information was available, the vast majority, 42.7 %, related to commercial air transport whilst 5.3 % related to General Aviation and the remainder was split between Aerial Work and State Flights.

FIGURE 6-1 DISTRIBUTION OF OCCURRENCES IN THE ECR PER YEAR

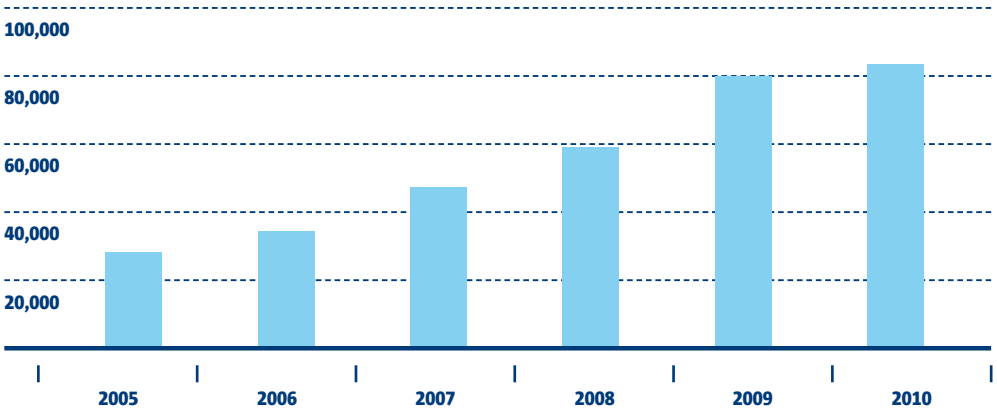
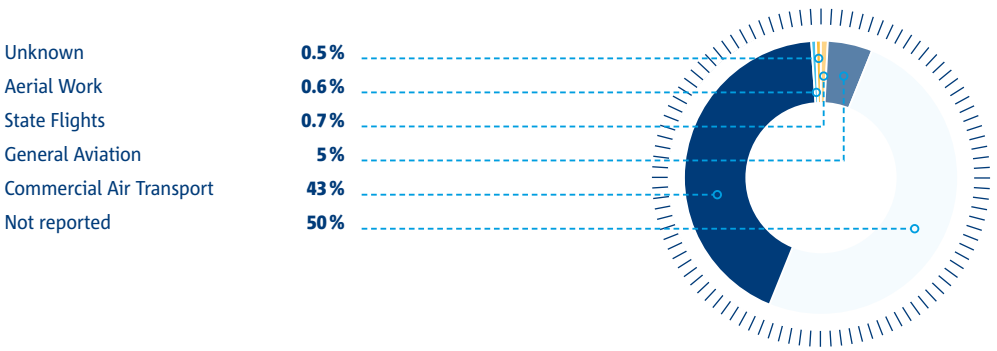


FIGURE 6-2 DISTRIBUTION OF OCCURRENCES BY TYPE OF OPERATION IN THE ECR



Note: [5]The date of occurrence is before the actual date of the commencement of the data integration process.

FIGURE 6-3 shows the distribution of aircraft categories in the ECR. The majority of the occurrences concern aeroplanes, 36.9 % which amounts to over 175,000 occurrences. Helicopters are the second most frequent aircraft category with 2.1 %. The white slice indicates the records where the aircraft category was not reported. At the end of 2009, 65 % of the occurrences had no aircraft category reported, but at the end of 2010 this had reduced to 56.4 %.

Within the ECR, the reporting of the severity of occurrences has also improved as the share of non recorded data reduced from 30 % in 2009 to 18 % in 2010. The majority of occurrences are classified as incidents, 62 % and only 2 % of the data relates to accidents. A breakdown of the top 10 occurrence categories, where this information was available, according to the ECR data, as shown in **FIGURE 6-5**, provides an understanding of the types of occurrences that lead to accidents and incidents in aviation.

FIGURE 6-3 **DISTRIBUTION OF OCCURRENCES BY AIRCRAFT CATEGORY IN THE ECR**

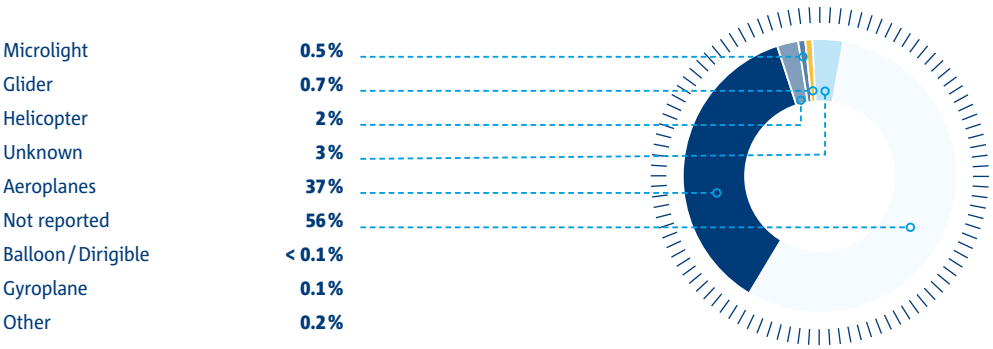
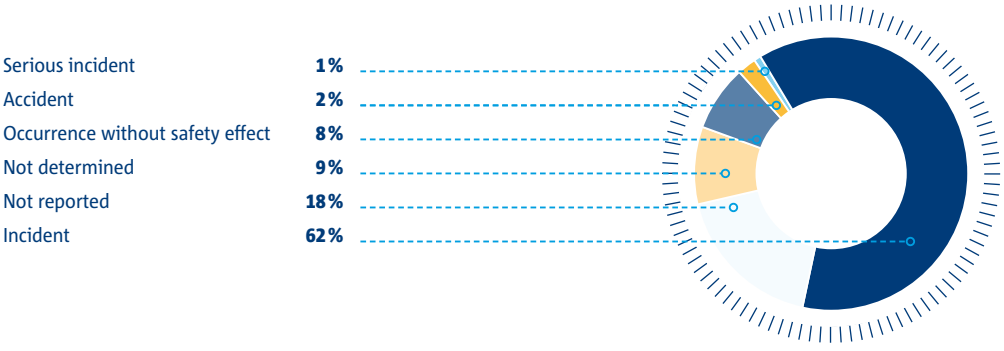


FIGURE 6-4 **DISTRIBUTION OF OCCURRENCES BY CLASS IN THE ECR**



The majority of occurrences were classified as 'Other', which highlights the importance of initiatives to improve the classification process to minimise the use of 'Unknown' or 'Other' categories. 'ATM/CNS' and 'System/component failure or malfunction not related to the engine' (SCF-NP) were next most numerous occurrence categories found in the ECR.

Critical events during the occurrence are reported based on coding of the 'Event type' and in chronological order in which the actual events took place. Distribution by the first event in the sequence of events is presented in **Figure 6-6**. The majority of first event type is 'Aircraft operation general', 'Aircraft/system/component', and 'Air navigation services'.

Despite the fact that there continue to be reports in which essential information is missing, it is encouraging that the ECR is starting to become a meaningful source of information that can be used for analysis. For example, using the information in **Figure 6-6** concerning the events involving 'Aircraft operation general', this information can be further analysed in more

Figure 6-5 **The top 10 occurrence categories in the ECR**

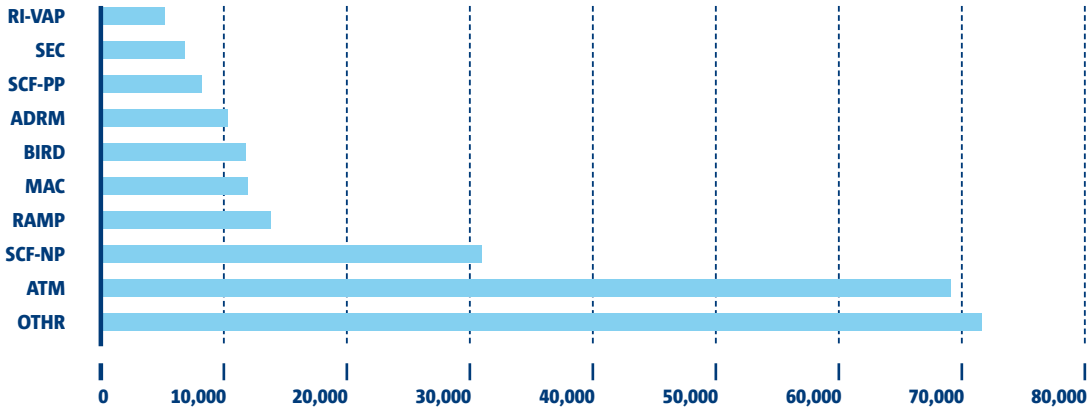


Figure 6-6 **Distribution by the first event in each occurrence in the ECR**

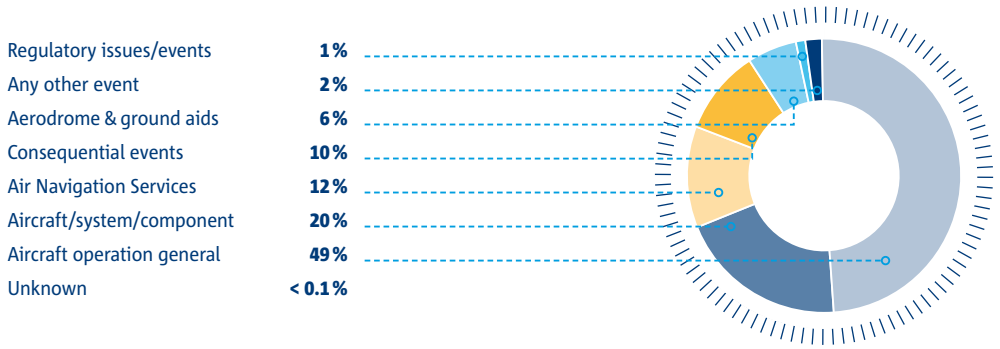
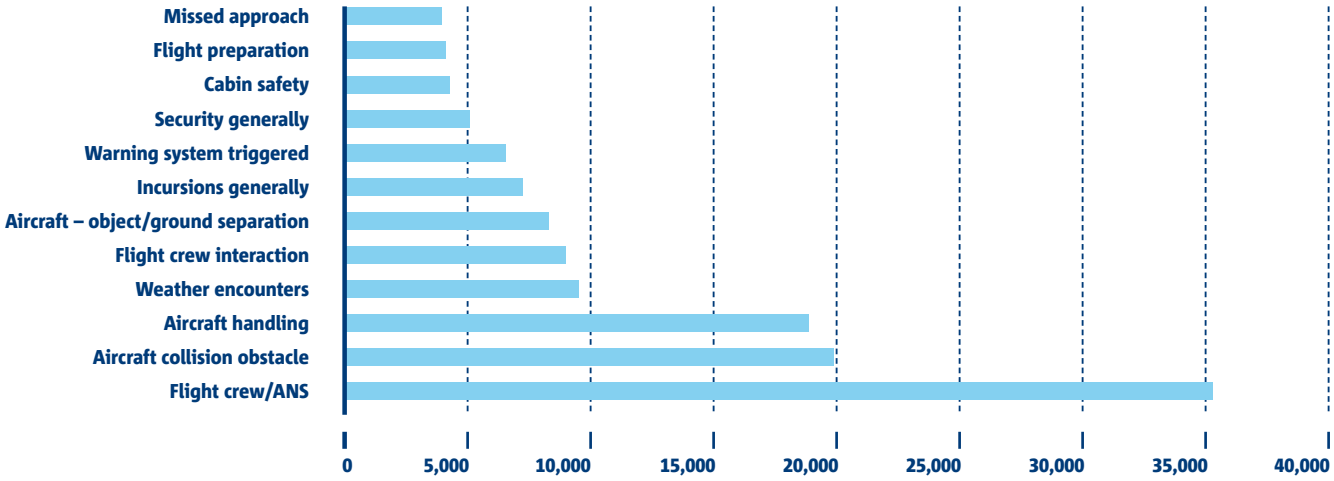


FIGURE 6-7 **DISTRIBUTION OF OCCURRENCE EVENTS IN THE CATEGORY OF AIRCRAFT OPERATION RELATED EVENTS**

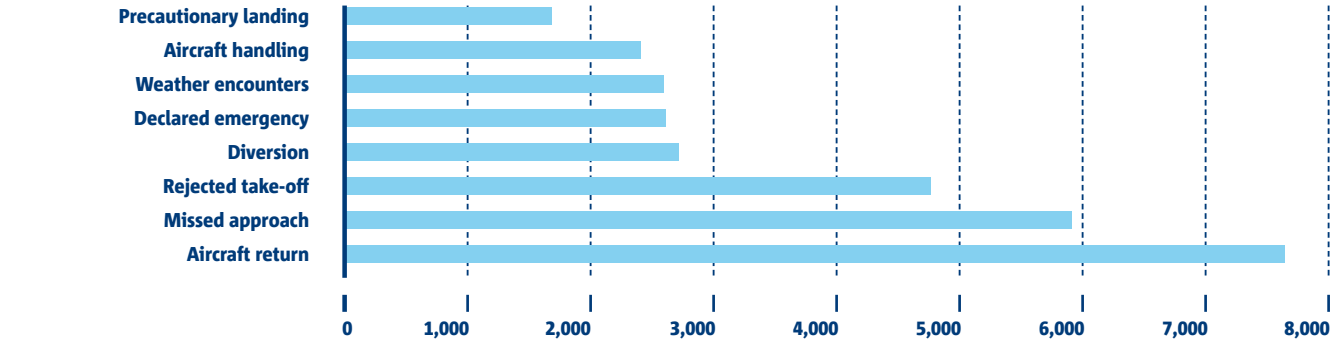


detail. As can be seen from **FIGURE 6-7**, the major events affecting aircraft operation are Flight Crew interaction with 'Air navigation services', 'Aircraft collisions with obstacles', which contain any collisions including those with birds (bird strikes) and 'Aircraft handling'.

6.2 CONSEQUENCES OF OCCURRENCES

The ECR is also able to provide information concerning the consequences of safety occurrences, which is shown in **FIGURE 6-8**. Of the data within the ECR, only 6 % of occurrences resulted in any type of consequence being reported. Where occurrences did lead to any consequences, the most prevalent were 'Aircraft return' (turning back to their point of departure), 'Missed approaches' and 'Rejected take-offs'.

FIGURE 6-8 **DISTRIBUTION OF OCCURRENCE EVENTS IN THE ECR WHICH WERE CONSEQUENCES OF OTHER EVENTS**



6.3 Conclusions

The integration of occurrence data from all EASA Members States is almost complete. It is vital that there continues to be a major focus on improving the quality of data. For the ECR to provide the best possible information to the whole European Aviation Community the data within it must be of the greatest possible detail. As more States have added their data to the ECR the quality of the data has improved over the past 12 months. The task to improve data will continue over the coming years and the establishment of a European Network of Safety Analysts, lead by EASA and involving the national aviation authorities of Member States will provide the benefit of a structured network through which to support this vital activity. Efforts will also continue to resolve any access restrictions to the narratives and notes information within the ECR. This will greatly improve the effective use of the data by enabling activities such as the verification of occurrence classification as well as text mining.

This year, the original concept of the ECR of providing a pool of meaningful data across Europe has begun to come to fruition. The far greater number of occurrences available for analysis in the ECR compared to those of any one State alone, enables a greater understanding of the safety challenges the community faces.


B7X
24
B7X
23
FWD

7.0 Air Traffic Management (ATM)

The Air Traffic Management (ATM) system comprises of airborne and ground-based functions (air traffic services, airspace management and air traffic flow management) to ensure the safe and efficient movement of aircraft during all phases of flight operations. The provision of safe Air Traffic Services, as part of the ATM system in the pan-European environment, remains one of the main objectives of Member States and Air Navigation Service Providers. For the first time, a specific Chapter on ATM has been incorporated in the EASA Annual Safety Review, based on safety data provided by EASA Member States through the EUROCONTROL reporting mechanism called the Annual Summary Template (AST).

This Chapter contains information on accidents and incidents in relation to ATM. The sources of the data, as well as the occurrence category definitions, differ from those of other chapters in this Review. Instead of CICTT categories, in similar figures of this report, this chapter uses occurrence categories developed specifically for ATM since 2000. The analysis in the ATM chapter includes accidents and incidents which occurred within an EASA MS and involved at least one aircraft with MTOM of 2 250 kg and above.

The data used in this chapter are obtained from the mandatory safety data reported to EUROCONTROL by its 39 Member States. For the purpose of this report, the analysis is limited to the Member States of EASA only.

The Safety Analysis Function EUROCONTROL and associated Repository '(SAFER)' system is EUROCONTROL's principal tool in its safety data analysis work, and consists of a European ATM Safety Data Repository based on mandatory and voluntary safety data reports. SAFER is designed to provide the ATM component of the European Commission's (EC) aviation-wide reporting system, based on ECCAIRS.

7.1 ATM RELATED ACCIDENTS

FIGURE 7-1 depicts the distribution of the accidents between ATM related accident categories in 2010. Of these accidents only one was fatal. The most significant accident category in terms of number of accidents is the 'Collision between aircraft moving on the ground and vehicle/person/obstruction(s)'. In 2010 no accidents occurred involving aircraft airborne (near the ground) with objects on the ground.

During the investigation process, two levels of ATM involvement may be allocated: Direct contribution – where the ATM event or item was judged to be directly in the causal chain of events and Indirect contribution– where the ATM event potentially increased the level of severity.

FIGURE 7-2 presents the number of accidents where ATM is indicated as having a contribution (i.e. at least one ATM contributory factor was in the chain of events). Since 2006, the number of such accidents has decreased. As mentioned earlier, the definition of these categories differs from those of other Chapters. For 2010 preliminary data are reported.

FIGURE 7-1 ACCIDENT CATEGORIES FOR ATM RELATED ACCIDENTS IN EASA MS (2010)

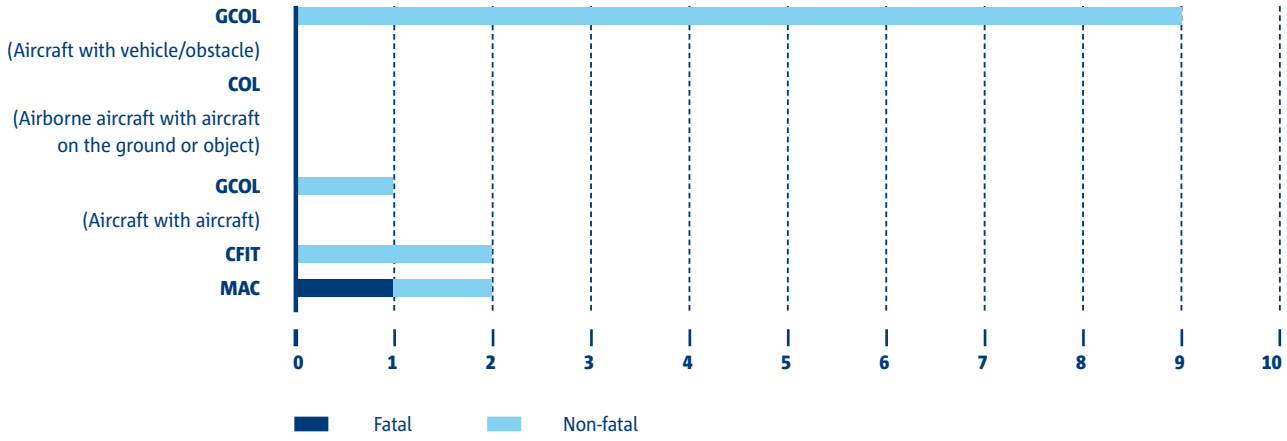
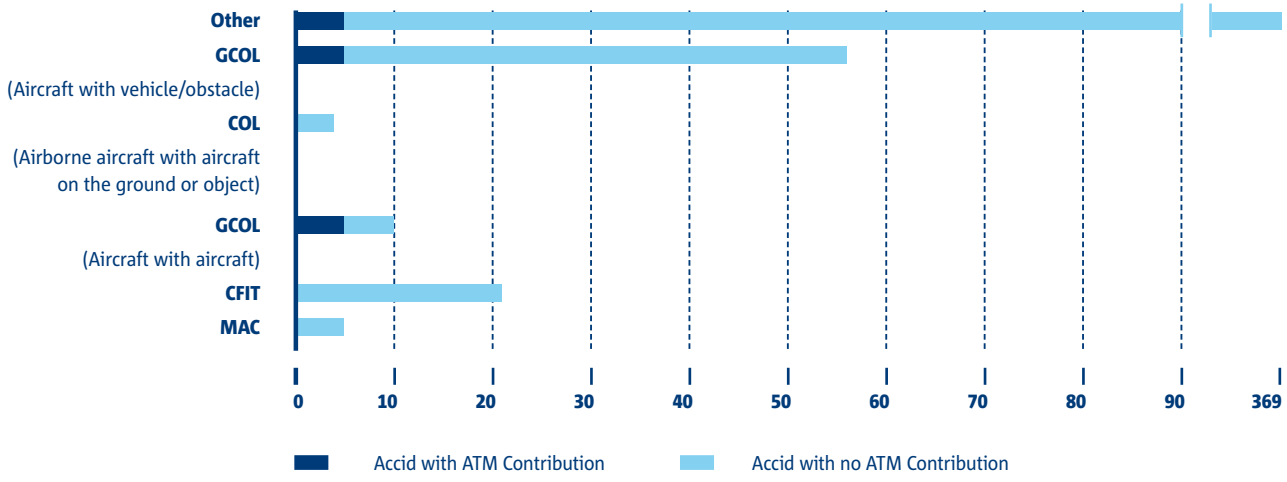


FIGURE 7-2 ACCIDENT CATEGORIES FOR ATM RELATED ACCIDENTS IN EASA MS (2005 – 2010)



Out of the 15 accidents where ATM was indicated as having a contribution, five are in the category of 'Ground collision' (GCOL) between aircraft, five GCOL between an aircraft and a vehicle or obstacle and five in the category 'Other'. In the same period a total number of 467 accidents were reported to EUROCONTROL.

7.2 ATM related incidents

7.2.1 Incident categories

An ATM related incident means that it is relevant to ATM, however it does not necessarily have an ATM contribution. A short overview of the number of incidents reported in each category since 2005 is presented in the **Figure 7-3**. An incident can be classified in more than one category (e.g. an incident classified as a Runway Incursion can also be categorised as a deviation from an Air Traffic Control clearance).

Incident categories that are reported in large numbers are: 'Unauthorised penetration of airspace' (UAP), (also known as Airspace Infringements), 'Aircraft deviation from ATC clearance' (CLR), (which includes the Level Busts), 'Separation minima infringement' (SMI) and 'Runway incursions' (RI). Incidents involving 'inadequate aircraft separation' are categorised under 'IS'. The two latter categories are discussed in more detail in the next section. **Figure 7-4** shows that only a fraction of the ATM related incidents are having an ATM contribution in the chain of events.

Figure 7-3 Incident categories of ATM related incidents (2005 – 2010)

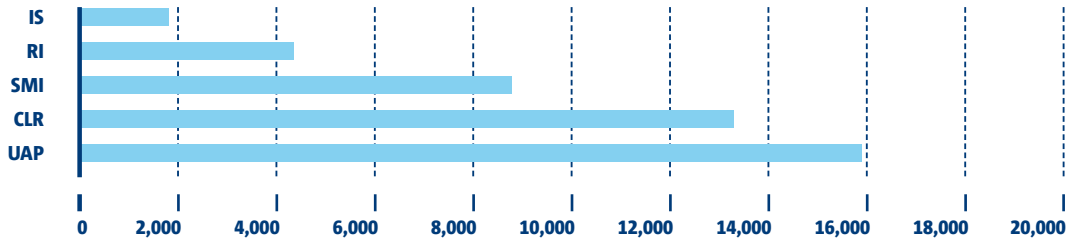
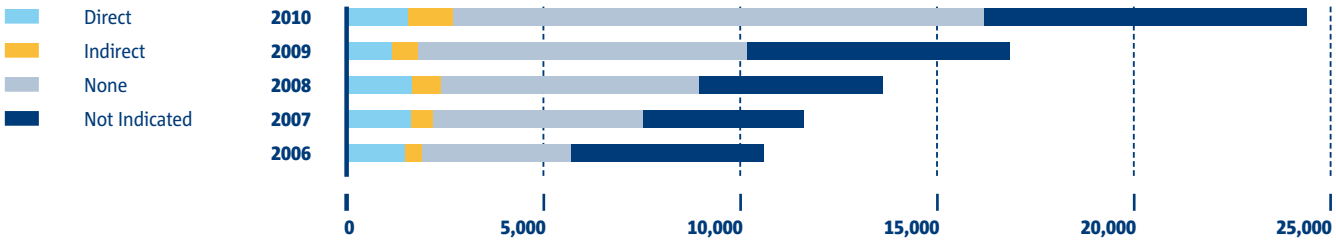


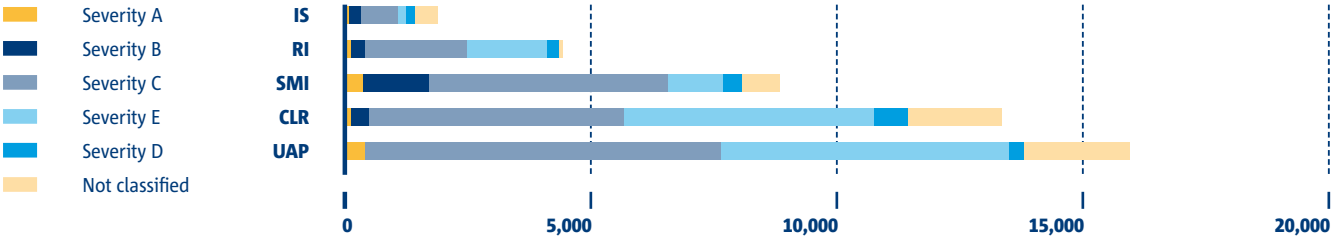
Figure 7-4 Number of ATM related incidents in which there was an ATM contribution



For each ATM related incident the associated risk is required to be assessed and classified. Risk is defined as the combination between the severity posed by the incident and its likelihood to re-occur[6].

The risk bearing incidents are considered as those with the highest severity classes: 'Serious incidents' (severity A) and 'Major incidents' (severity B). The other severity classes are: 'Significant' (severity C), 'Not determined' (D), 'No safety effect' (E). **FIGURE 7-5** shows the number of incidents by severity and incident category.

FIGURE 7-5 **NUMBER OF ATM RELATED INCIDENTS BY CATEGORY AND SEVERITY (2005 – 2010)**



The category that has the largest proportion of risk bearing incidents (severity A and B) is the 'Separation minima infringements' (SMI). This category refers to occurrences in which the defined minimum separation between aircraft has been lost. Many of the incidents that have resulted in a loss of separation and categorised as risk bearing are also categorised as Deviation from ATC Clearance or Unauthorised Penetration of Airspace, also known as Airspace Infringements.

7.2.2 INCIDENT RATES AND TRENDS

The reporting of ATM related incidents is improving. The main incident categories have shown a stable trend of similar or decreasing severity over recent years.

Comparing the number of incidents with the level of traffic can give meaningful results on the safety trends. The figures in this section show two trends: The rate of incidents reported, per million flight hours independently of their severity; and the rate of risk bearing incidents (severity A and B). For runway incursions a rate per million aircraft movements – departures / arrivals is used.

Based upon the preliminary data reported for 2010, **FIGURE 7-6** shows a continuous increase in the total number of incidents reported, both in absolute numbers and their rate (against the traffic levels, expressed in flight hours). The increase in the rate of all incidents reported is a positive step forward, in the sense of a "Just Culture"[7] environment, including a reporting culture, which should enable a better view of the underlying safety issues affecting ATM.

The rate of serious incidents (severity A) shows an overall decrease. The major incidents (severity B), have shown a stable trend since 2005 but for 2010 show a considerable increase.

Note: [6] methodology: http://www.eurocontrol.int/src/gallery/content/public/documents/deliverables/esarr2_awareness_package/eam2gui5_e10_ri_web.pdf (Risk Analysis Tool as mentioned in the EC Reg. 691/2010)

[7] "Just Culture" means a culture in which front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated. Commission Regulation (EU) No 691/2010

FIGURE 7-6

RATE OF ATM RELATED INCIDENTS BY SEVERITY (INCIDENTS PER 1 MILLION FLIGHT HOURS) 2010 BASED ON PRELIMINARY DATA REPORTED

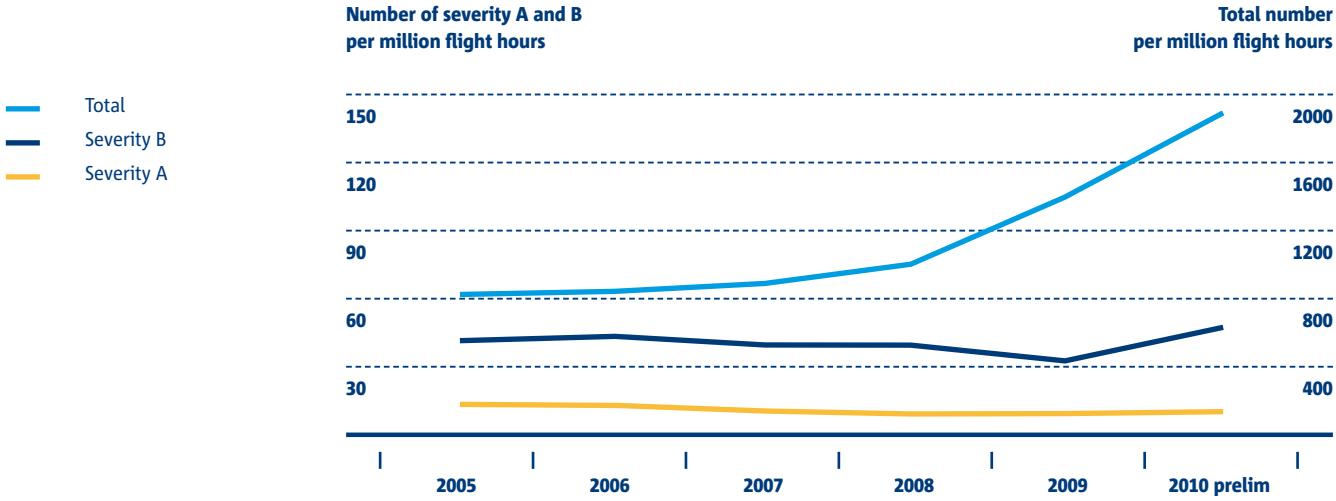


FIGURE 7-7

RATE OF SEPARATION MINIMA INFRINGEMENTS BY SEVERITY (INCIDENTS PER 1 MILLION FLIGHT HOURS) – 2010 BASED ON PRELIMINARY DATA REPORTED

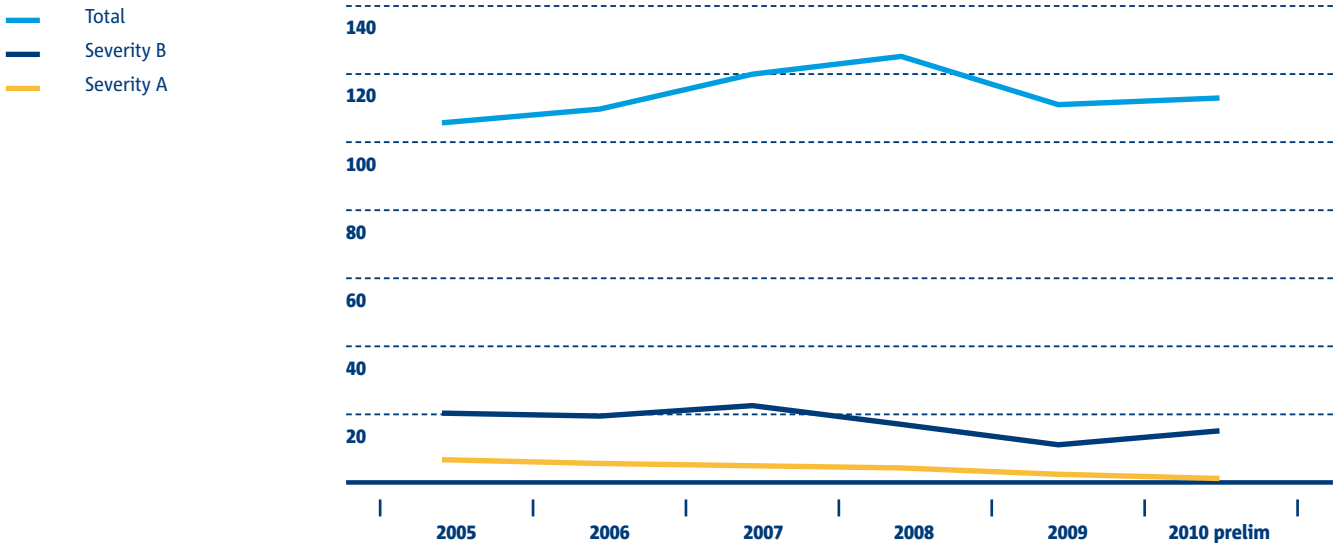


FIGURE 7-7 shows the rate of 'Separation minima infringements' (SMI) per million flight hours. For SMI it is useful to calculate the rate using the number of flight hours, as this best represents the time during which the airspace is occupied by an aircraft.

SMI refer to occurrences in which defined minimum separation between aircraft, has been lost. Overall the total number of incidents reported in this category is increasing every year, with the exception of 2009. Amongst all types of incidents, SMI typically take the longest time to be investigated, and consequently their number may change in the future. The SMI under severity A have a decreasing trend in the last four years. However a significant increase in severity B is indicated in the preliminary data of 2010.

FIGURE 7-8

RATE OF RUNWAY INCURSIONS BY SEVERITY (INCIDENTS PER 1 MILLION AIRCRAFT MOVEMENTS) – 2010 BASED ON PRELIMINARY DATA REPORTED

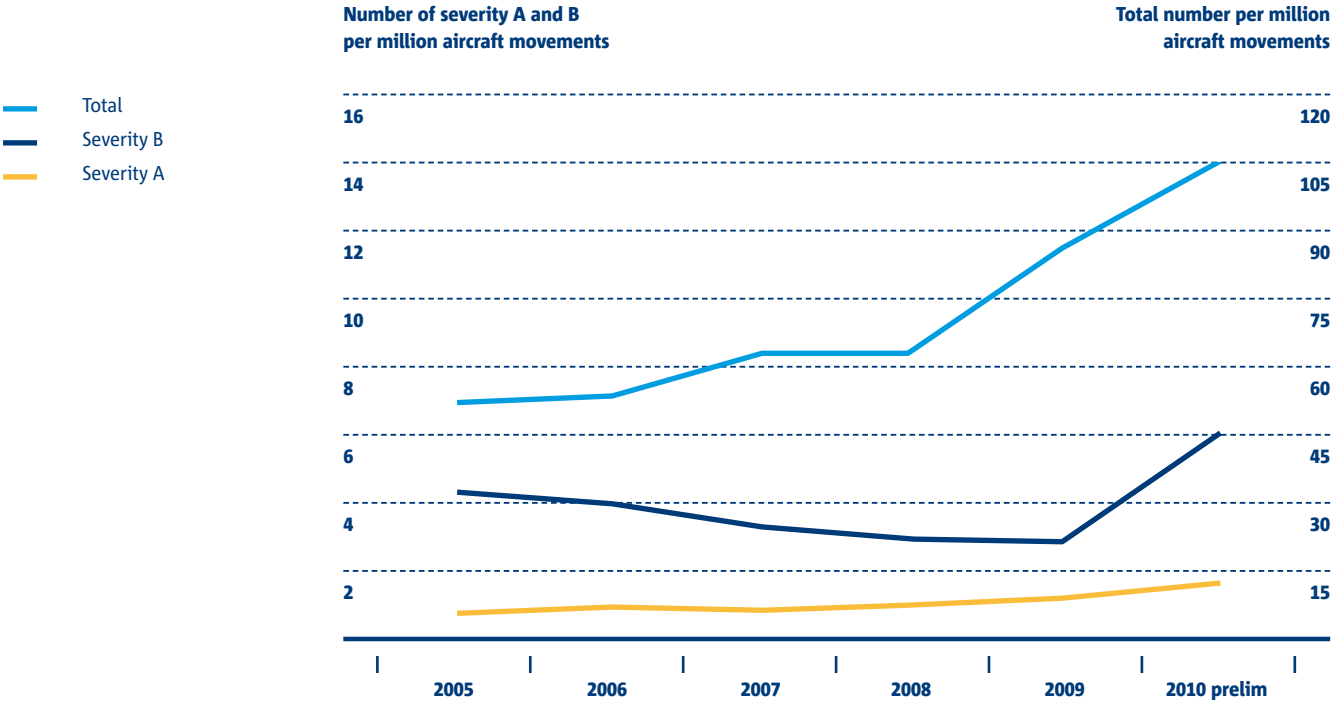


FIGURE 7-8 shows the rate of runway incursion incidents reported has an overall increasing trend. For runway incursions it is useful to calculate the rate using the number of movements as this represents the frequency a runway is used.

For aviation and ATM a key indicator is the number of runway incursions. The number of incursions reported in Europe increased over the years, especially due to improved awareness after the publication of the European Action Plan for the Prevention of Runway Incursions in 2003. In addition, the change of the ICAO definition of runway incursion effectively enlarged the scope of occurrences included in this definition. The rate of serious incidents (severity A) is either at the same level or shows a slight increase over time.

The rate of risk bearing runway incursions varies in the last years. The rate of major incidents (severity B) decreased until 2009, but the preliminary data for 2010 show a considerable increase of 25% for such incidents over the previous year This increase is explained by improved reporting in general and by some Member States in particular.

7.3 CLOSING REMARKS

This Chapter provided an overview on reporting and analysis of ATM related accidents and incidents. For more specific ATM Safety information and analysis please refer to the EUROCONTROL website in general and to the SRC website in particular:

http://www.eurocontrol.int/src/public/subsite_homepage/homepage.html.

8.0 Agency's safety actions

8.1 Approvals and Standardisation

The Agency's standardisation inspections performed during 2010 further confirmed the maturity of the standardisation process. The working methods established by Commission Regulation (EC) No 736/2006 were successfully adopted across all technical domains, namely Initial and Continuing Airworthiness, Air Operations, Flight Crew Licensing and Flight Simulation Training Devices.

The Agency is entitled to perform Standardisation inspections in 41 European States, either on the basis of the Basic Regulation or in accordance with bilateral agreements and/or specific working arrangements. In 2010 EASA performed a total of 111 standardisation inspections in 33 States; the results confirmed the positive trend of the past years, although some NAAs still need to make significant efforts in order to achieve a satisfactory level of uniform implementation and enforcement of the relevant requirements.

The Agency continued to put emphasis on a pro-active standardisation approach. The involvement of NAAs' experts in inspections has been further promoted: in 2010, 95 Team Members were provided by seconded inspectors from national aviation authorities (NAA). Another related initiative is the organisation of Standardisation Meetings in each domain, as a means to achieve a higher level of common understanding and interpretation of the requirements; the 10 meetings organised in 2010 were attended by 448 NAA representatives.

A new "Continuous Monitoring Approach" (CMA) concept, entailing a risk-based planning tool, is under development; this approach will allow EASA to tailor the size of the teams, the scope, the depth and the frequency of standardisation inspections to identified risks, thereby optimising the process and the use of resources.

In the domain of technical training, EASA has consolidated its initiative to identify common qualification criteria and to satisfy common training needs for all types of NAAs' inspectors. A dedicated permanent group meets at regular intervals. The Agency's courses on EU regulations are open to all NAAs and to third countries' Authorities.

The organisation approvals activity in the domain of Design, Production and Continuing Airworthiness has developed further in 2010. The number of approvals has increased: the Agency now ensures surveillance of 265 Design Organisations and 222 Holders of Alternative Procedures to DOA, 267 Maintenance Organisations and 41 Maintenance Training Organisations outside Europe, 17 Production Organisations outside Europe and the EASA Single Production Organisation Approval of Airbus in Europe and China. In addition, the Agency ensures the continued validity of 1348 EASA Maintenance Organisations in the US and 163 EASA Maintenance Organisations in Canada.

Finally, the Directorate coordinates all SAFA (Safety Assessment of Foreign Aircraft) activities. The analysis of the SAFA data has been delivering important indicators concerning the overall safety level of airlines operating in Europe, which helps identifying potential risk factors and direct qualitative targeting. Furthermore, the SAFA Standardisation programme and the issuance of detailed guidance material for ramp inspections ensure a high degree of harmonisation among the participating States.

8.2 Certification

The Certification Directorate actively promotes aviation safety by conducting the product design certification activities leading to the EU-wide approval of aeronautical products, parts and appliances on the highest possible safety level. In summary, the Agency issued about 4000 design related certificates in 2010. In addition, the Certification Directorate performs, on request by Industry, operational evaluations in order to provide data and information for the safe operation of certified products

Another main task of the Certification Directorate is to actively monitor the continuing airworthiness of aeronautical products, parts and appliances during their entire lifecycle and thus ensuring that they comply with the airworthiness requirements in force and are in a condition for safe operations. The Agency has established an integrated safety monitoring and corrective/preventive actions system, based on occurrence reporting and aiming at preventing accidents and incidents.

The Agency´s instrument to correct potential safety issues and to provide a high level of continuing airworthiness is the issuance of 'Airworthiness Directives' (ADs) and 'Emergency ADs'. ADs and Emergency ADs are a reaction to safety issues becoming known only after the release of initial airworthiness certificates. In 2010, the Agency mandated 284 ADs and 58 Emergency ADs.

By launching the creation of an "Internal Occurrence Reporting System" (IORS) in March 2010, the Agency strives towards a further improvement of its continuing airworthiness process and the broader analysis of available occurrence data.

In 2010, the Certification Directorate was confronted with some major safety issues. Following the eruption of Volcano Eyjafjallajökull (Iceland) in April 2010, which caused enormous disruption to air travel across western and northern Europe, the Certification Directorate together with the other directorates in the Agency devoted substantial effort to setting up appropriate measures to promote safe continuation of flight operations. To this end, a Safety Information Bulletin (SIB) was issued with recommendations for operators of turbine-powered aeroplanes and helicopters operated into, or approaching airspace that was known or suspected to be contaminated with volcanic ash. In addition, collaboration started with the International Civil Aviation Organisation (ICAO) on the establishment of new certification standards for volcanic ash.

With regard to the aspects of the falsification of seat test result by Koito Industries Ltd (Japan) in early 2010, EASA worked very closely with its American counterpart, the FAA in developing their respective mandatory actions culminating in harmonised content of the relevant EASA PAD/FAA NPRM. Before the publication of the final rules, two industry briefing sessions were arranged to facilitate the commenting period.

During the year the Directorate was actively involved in the investigation and analysis of accidents and major incidents, including the accident of an Airbus A380 aircraft, operated by Qantas Airlines, in November 2010.

8.3 RULEMAKING

The Agency's Rulemaking Directorate contributes to the production of all EU legislation and implementation material relating to the regulation of civil aviation safety and environmental compatibility. It submits opinions to the European Commission and must be consulted by the Commission on any technical question in its field of competence. It is also in charge of the related international cooperation activities. Below follows a list of Rulemaking Decisions, Opinions and Notices of Proposed Amendment (NPA).

TABLE 8-1 RULEMAKING RELATED DECISIONS

Decision	Task number	Subject
Decision 2010/001/R	21.001	POA for navigation database suppliers
	21.002	Approved organisations certificate number
	21.003	Cleaning up of Part 21 and AMC/GM
	21.023(c)	Permit to Fly: privilege for Continuing Airworthiness Management Organisations
	MDM.007	Authorised Release Certificate
Decision 2010/002/R	21.023(c)	Permit to Fly: privilege for Continuing Airworthiness Management Organisations
	66.001	Correction of editorial errors contained in Part-66 and the associated AMC
	145.001	Correction of editorial errors contained in Part-145 and the associated AMC
	147.001	Correction of editorial errors contained in Part-147 and the associated AMC
	M.001	Correction of editorial errors contained in Part-M and the associated AMC
	MDM.007	Authorised Release Certificate
Decision 2010/003/R	MDM.034	Composites
Decision 2010/005/R	25.040	TYPE III EXITS (access and ease of operation)
	25.057	Security related design standards
	MDM.034	Composites
Decision 2010/006/R	MDM.054	De-icing/Anti-icing AMC and GM following A-NPA 2007-11
Decision 2010/007/R	MDM.034	Composites
Decision 2010/008/R		
Decision 2010/010/R	ETSO.007	Systematic review and transposition of existing FAA TSO for parts and appliances into EASA ETSO
Decision 2010/012/R	MDM.001	ETOPS/LROPS
Decision 2010/013/R		
Decision 2010/014/R		
Decision 2010/015/R		
Decision 2010/016/R	21.042	Part-21 other party supplier control
	ETSO.007	Systematic review and transposition of existing FAA TSO for parts and appliances into EASA ETSO
	MDM.001	ETOPS/LROPS

TABLE 8-2 RULEMAKING RELATED OPINIONS

Opinions	Task number	Subject
Opinion 01/2010	21.024(a)	Subpart J, Design Organisation Approval
Opinion 02/2010	ATM.001 (FAST TRACK)	Extension of the EASA system to safety regulation of Air Traffic Management (ATM) and Air Navigation Services (ANS) - development of rules on Requirements for Air Navigation Service Providers
	ATM.004 (FAST TRACK)	Extension of the EASA system to safety regulation of Air Traffic Management (ATM) and Air Navigation Services (ANS) - development of rules on competent authorities
Opinion 03/2010	ATM.003 (FAST TRACK)	Extension of the EASA system to safety regulation of Air Traffic Management (ATM) and Air Navigation Services (ANS) - development of rules on Air Traffic Controller licensing
Opinion 04/2010	FCL.001	Part-FCL. Extension of the Basic Regulation to Flight Crew Licensing
Opinion 05/2010	ATM/ANS.002	Introduction of TCAS II software Version 7.1
Opinion 06/2010	145.012	Part-145 Single and multiple release
Opinion 07/2010	FCL.001	Part-MED Extension of the Basic Regulation to Flight Crew Licensing

TABLE 8-3 RULEMAKING RELATED NPAS

NPA	Task number	Subject
NPA 2010-01	21.042	Other party supplier control
NPA 2010-02	21.018	Improvement of GM to 21A.101
NPA 2010-03	ATM/ANS.002	Introduction of ACAS II software version 7.1
NPA 2010-04	27&29.002	Damage Tolerance and Fatigue Evaluation of Composite Rotorcraft Structures
NPA 2010-05	66.025	Appendix 1 Aircraft type ratings for Part-66 aircraft maintenance licence
NPA 2010-06	27&29.002	Damage Tolerance and Fatigue Evaluation of Metallic Rotorcraft Structures
NPA 2010-07	M.022	Amend AMC M.A.706(e) to cover additional cases for the competent authority to accept that the nominated post holder in the operator/Part-M Subpart G organisation be employed by the contracted Part-145 organisation
NPA 2010-08	145.022	Control of contracted maintenance personnel
NPA 2010-09	M-014	Contracting of continuing airworthiness management activities
NPA 2010-10	MDM.047	Alignment of Regulation (EC) No 2042/2003 with Regulation (EC) No 216/2008 and with ICAO Annex 6 requirement for human factor principles to be observed in the design and application of the aircraft maintenance programme
NPA 2010-11	25.039	Passenger emergency exits, emergency features and escape routes - Harmonisation with FAA
NPA 2010-12	27&29.019	Vibration Health Monitoring
NPA 2010-13	21.059	Environmental protection - classification of changes to a type design
NPA 2010-14	OPS.055	Implementing Rules on Flight and Duty Time Limitations and rest requirements for commercial air transport (CAT) with aeroplanes

8.4 European Strategic Safety Initiative (ESSI)

The European Strategic Safety Initiative (ESSI) is a voluntary, privately funded and non-legally binding safety partnership aiming to further enhance aviation safety in Europe and for citizens worldwide. Facilitated but not owned by EASA it brings together aviation authorities and the industry and international partners like ICAO and the FAA. In 2010, the ESSI contributed to developing the first edition of the European Aviation Safety Plan (EASP). Administrated by EASA, the ESSI is now managed in compliance with the ISO 9001:2008 requirements.

The ESSI has three Safety Teams:

8.4.1 European Commercial Aviation Safety Team (ECAST)

ECAST is the fixed-wing commercial air transport component of ESSI. It counts more than 75 organisations and is co-chaired by EASA and IATA. It cooperates with United States CAST and the ICAO COSCAP programme.

In 2010, ECAST addressed Safety Management Systems (SMS) and Safety Culture, Ground Safety, and Runway Safety. The Runway Safety activity includes cooperation with EUROCONTROL and the Ground Safety activity with IATA. ECAST encourages adoption in Europe of the IATA Safety Audit for Ground Operations (ISAGO) and IATA Ground Operations Manual (IGOM) programmes. ECAST supported a research on Human Factors in Ramp Safety performed by the NLR for the Civil Aviation Authority of the Netherlands, and launched a European Operators Flight Data Monitoring Forum (EOFDM).
http://www.easa.europa.eu/essi/ecastEN.html

8.4.2 European Helicopter Safety Team (EHEST)

EHEST is the helicopter component of ESSI. Co-chaired by EASA, Eurocopter, and the European Helicopter Operators Committee (EHOC), the EHEST counts more than 50 organisations. EHEST is also the European component of the International Helicopter Safety Team (IHST), a United States-based combined government and industry effort launched in 2005 to reduce the helicopter accident rates by 80 per cent by 2016 worldwide.

EHEST has published in 2010 an analysis report of 311 helicopter accidents occurred in Europe between 2000 and 2005. Four implementation teams addressed Operations and SMS, Training, Regulatory aspects, and Maintenance. EHEST also supported the development of a helicopter compatible version of the International Standard for Business Aircraft Operations (IS-BAO) by the International Business Aviation Council (IBAC).

The International Helicopter Safety Seminar (IHSS) 2010 was organised in Europe.
http://easa.europa.eu/essi/ehestEN.html

8.4.3 European General Aviation Safety Team (EGAST)

EGAST addresses fixed-wing General Aviation (GA). The objective is to further improve safety through safety promotion, education and sharing of good practices. Building on existing initiatives at national level or within GA organisations, EGAST is co-chaired by EASA, the European Airshow Council (EAC) and the European Council for General Aviation Support (ECOGAS) and counts more than 50 organisations. At international level, EGAST cooperates with the FAA Safety Team (FAAST) and with Transport Canada.

EGAST is organised in four activities: safety promotion, data collection and analysis, proactive safety (addressing today the risks of tomorrow), and link to research.

In 2010, ECAST published several safety leaflets and videos and a Guide to Phraseology for the GA pilots. **http://easa.europa.eu/essi/egast/.**


300
33

Appendix 1: General remarks on data collection and quality

The data presented is not complete. For light aircraft, information from one EASA Member State is missing. Without prompt availability of investigation results and without complete or timely provision of data by States, the Agency cannot present a complete picture of all aspects of the safety of civil aviation in Europe.

The Agency will continue to make efforts to obtain light aircraft accident data for future ANNUAL SAFETY REVIEWS and expects better data coverage as the reporting systems and awareness of lack of data matures in EASA MS.

For larger aircraft, the data is as complete as States have reported accident data to ICAO in accordance with Annex 13. Checks have revealed that not all States report in full and in time to ICAO.

Appendix 2: Definitions and acronyms

A2-1: General

Aerial Work (AW)	An aircraft operation in which an aircraft is used for specialised services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, or aerial advertisement.
ANS	Air Navigation Services
ASR	EASA Annual Safety Review
AST	Annual Summary Template
ATC	Air Traffic Control
ATM	Air Traffic Management
Commercial air transport (CAT)	An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.
CICTT	CAST-ICAO Common Taxonomy Team
CNS	Communications, Navigations and Surveillance
EASA	European Aviation Safety Agency
EASA MS	European Aviation Safety Agency Member States. These States are the 27 European Union Member States plus Iceland, Liechtenstein, Norway and Switzerland.
ECCAIRS	European Co-Ordination Centre for Aviation Incident Reporting Systems
ECR	European Central Repository for occurrences
Fatal accident	An accident that resulted in at least one fatality, flight crew and/or passenger or on the ground, within 30 days of the accident. (Source: ICAO Annex 13)
General Aviation (GA)	An aircraft operation other than a commercial air transport operation or an Aerial Work operation.
HEMS	Helicopter Emergency Medical Service
ICAO	International Civil Aviation Organisation
Light aircraft	Aircraft with a maximum certificated take-off mass below 2 250 kg.
MTOM	Maximum certificated take-off mass
SAFER	Safety Analysis Function Eurocontrol and associated Repository
Scheduled air service	An air service open to use by the general public and operated according to a published timetable or with such a regular frequency that it constitutes an easily recognisable systematic series of flights which are open to direct booking by members of the public.
SMS	Safety Management System
Third country operated aircraft	An aircraft which is not used or operated under control of a competent authority of an EASA Member State.

A2-2: Accident categories acronyms

ARC	Abnormal runway contact
AMAN	Abrupt manoeuvre
ADRM	Aerodrome
ATM/CNS	Air Traffic Management/Communication Navigation Surveillance
BIRD	Collision / near Collision with bird(s)
CABIN	Cabin safety events

CFIT	Controlled flight into or toward terrain
CTOL	Collision with obstacle(s) during take-off and landing
EVAC	Evacuation
EXTL	External load related occurrence
F-NI	Fire/smoke (non-impact)
F-POST	Fire/smoke (post-impact)
FUEL	Fuel related
GCOL	Ground collision
GTOW	Glider towing related event
RAMP	Ground handling
ICE	Icing
LOC-G	Loss of control — Ground
LOC-I	Loss of control — In-flight
LOLI	Loss of lifting conditions en-route
LALT	Low altitude operation
MAC	Airprox/TCAS alert/loss of separation/near midair collisions/midair collision
OTHR	Other
RE	Runway excursion
RI-A	Runway incursion — Animal
RI-VAP	Runway incursion — Vehicle, aircraft or person
SEC	Security related
SCF-NP	System/component failure or malfunction (non-powerplant)
SCF-PP	System/component failure or malfunction (powerplant)
TURB	Turbulence encounter
UIMC	Unintended Flight in IMC
USOS	Undershoot/overshoot
UNK	Unknown or undetermined
WSTRW	Windshear or thunderstorm

Accident categories can be used to classify occurrence at a high level to permit analysis of the data. The CICTT has developed the accident categories used in this ANNUAL SAFETY REVIEW. For further details on this team and the accident categories see the website **http://intlaviationstandards.org/index.html** .

A2-3: ATM Accident categories acronyms

CLR	Deviation of ATC Clearance
IS	Inadequate Separation
MAC	Mid-Air Collision
SMI	Separation Minima Infringement
UAP	Unauthorised Penetration of Airspace
RI	Runway Incursion is an occurrence involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft.
COL	Collision with a vehicle, person or aircraft, while an aircraft is on the ground

Appendix 3: List of figures and tables

A3-1: List of figures

A3-2: LIST OF TABLES

Appendix 4: List of fatal accidents (2010)

The following tables contain a listing of fatal accidents in 2010 with commercial air transport operations with aeroplanes over 2 250 kg maximum certificated take-off mass.

Aircraft operated by EASA MS operators

Date	State of occurrence	Aircraft type	Type of operation	Fatalities on board	Ground fatalities	CICTT Categories
None						

Aircraft operated by third country operators

Date	State of occurrence	Aircraft type	Type of operation	Fatalities on board	Ground fatalities	CICTT Categories
05/01/2010	United States	Learjet 35	Ferry/positioning	2		LOC-I: Loss of control – in-flight
18/01/2010	United States	Mitsubishi MU-2B-60 (Marquise)	Passenger	4		LOC-I: Loss of control – in-flight
21/01/2010	United States	Beechcraft 1900	Cargo	2		LOC-I: Loss of control – in-flight UNK: Unknown or undetermined
24/01/2010	Turkey	Airbus A340-300	Passenger		1	GCOL: Ground Collision
25/01/2010	Brazil	Embraer 110 Bandeirante	Passenger	2		SCF-PP: Powerplant failure or malfunction
25/01/2010	Lebanon	Boeing 737-800	Passenger	90		UNK: Unknown or undetermined
13/04/2010	Mexico	Airbus A300-B4	Cargo	5	1	UNK: Unknown or undetermined
21/04/2010	Philippines	Antonov An -12	Cargo	3		F-NI: Fire/smoke (non-impact)
12/05/2010	Libyan Arab Jamahiriya	Airbus A330-200	Passenger	103		UNK: Unknown or undetermined

Date	State of occurrence	Aircraft type	Type of operation	Fatalities on board	Ground fatalities	CICTT Categories
15/05/2010	Suriname	Antonov An-28	Passenger	8		UNK: Unknown or undetermined
17/05/2010	Afghanistan	Antonov An-24	Passenger	44		CFIT: Controlled flight into or toward terrain
22/05/2010	India	Boeing 737-800	Passenger	158		RE: Runway excursion
13/06/2010	Mexico	Cessna 208 Caravan I	Passenger	9		LOC-I: Loss of control – in-flight
						UNK: Unknown or undetermined
15/06/2010	Australia	Piper PA-31P-350 (Mojave)	Emergency Medical Service	2		SCF-PP: Powerplant failure or malfunction
						UNK: Unknown or undetermined
19/06/2010	Congo, the Democratic Republic of	CASA 212-100	Passenger	11		UNK: Unknown or undetermined
23/06/2010	Canada	Beechcraft King Air 100	Air taxi	7		F-POST: Fire/smoke (post-impact)
						SCF-PP: Powerplant failure or malfunction
04/07/2010	United States	Cessna 421B	Emergency Medical Service	5		UNK: Unknown or undetermined
16/07/2010	Canada	De Havilland DHC2 MK I Beaver	Air taxi	4		UNK: Unknown or undetermined
23/07/2010	United States	De Havilland DHC2 MK I Beaver	Air taxi	1		UNK: Unknown or undetermined
24/07/2010	Canada	De Havilland DHC2 MK I Beaver	Air taxi	2		LOC-I: Loss of control – in-flight
28/07/2010	Pakistan	Airbus A321	Passenger	152		CFIT: Controlled flight into or toward terrain
01/08/2010	United States	Fairchild C-123K Provider	Cargo	3		F-POST: Fire/smoke (post-impact)
						UNK: Unknown or undetermined
03/08/2010	Russian Federation	Antonov An-24	Passenger	12		CFIT: Controlled flight into or toward terrain
						F-POST: Fire/smoke (post-impact)
05/08/2010	Saint Vincent and the Grenadines	Cessna 402	Passenger	1		UNK: Unknown or undetermined
16/08/2010	Colombia	Boeing 737-700	Passenger	2		ARC: Abnormal runway contact
						WSTRW: Windshear or thunderstorm.
21/08/2010	United States	De Havilland DHC2 MK I Beaver	Air taxi	4		UNK: Unknown or undetermined
24/08/2010	China	Embraer 190	Passenger	42		CFIT: Controlled flight into or toward terrain
						F-POST: Fire/smoke (post-impact)
24/08/2010	Nepal	Dornier 228-100	Passenger	14		LOC-I: Loss of control – in-flight
						SCF-NP: System/component failure or malfunction [non-powerplant]

Date	State of occurrence	Aircraft type	Type of operation	Fatalities on board	Ground fatalities	CICTT Categories
25/08/2010	Congo, the Democratic Republic of	Let L410VP-E	Passenger	20		LOC-I: Loss of control – in-flight
31/08/2010	Papua New Guinea	Cessna Citation II	Passenger	4		RE: Runway excursion
03/09/2010	United Arab Emirates	Boeing 747-400	Cargo	2		F-NI: Fire/smoke (non-impact)
13/09/2010	Venezuela	ATR 42-300	Passenger	17		LOC-I: Loss of control – in-flight
						SCF-NP: System/component failure or malfunction [non-powerplant]
05/10/2010	Bahamas	Cessna 402	Passenger	8		SCF-PP: Powerplant failure or malfunction
06/10/2010	Mexico	Cessna Citation I	Air taxi	8		CFIT: Controlled flight into or toward terrain
12/10/2010	Afghanistan	Lockheed L-100-20	Cargo	8		CFIT: Controlled flight into or toward terrain
21/10/2010	Congo, the Democratic Republic of	Let L410UVP	Cargo	2		SCF-PP: Powerplant failure or malfunction
						UNK: Unknown or undetermined
25/10/2010	Canada	Beechcraft King Air 100	Passenger	1		F-POST: Fire/smoke (post-impact)
						LOC-I: Loss of control – in-flight
04/11/2010	Cuba	ATR 72-200	Passenger	68		ICE: Icing
						LOC-I: Loss of control – in-flight
05/11/2010	Pakistan	Beechcraft 1900	Passenger	21		SCF-PP: powerplant failure or malfunction
10/11/2010	Kuwait	Airbus A300-600	Passenger	1		EVAC: Evacuation
						SCF-NP: System/component failure or malfunction [non-powerplant]
11/11/2010	Sudan	Antonov An-24	Passenger	2		ARC: Abnormal runway contact
						F-POST: Fire/smoke (post-impact)
28/11/2010	Pakistan	Ilyushin Il-76	Cargo	8	4	UNK: Unknown or undetermined
04/12/2010	Russian Federation	Tupolev Tu-154	Passenger	2		ARC: Abnormal runway contact
						RE: Runway excursion
						SCF-PP: Powerplant failure or malfunction
14/12/2010	Bahamas	Beechcraft TC-45	Cargo	1	0	LOC-I: Loss of control – in-flight
14/12/2010	Canada	Cessna 310	Air taxi	1		UNK: Unknown or undetermined
15/12/2010	Nepal	De Havilland DHC-6 Twin Otter 300	Passenger	22		CFIT: Controlled flight into or toward terrain

Disclaimer

The accident data presented is strictly for information purposes only. It is obtained from Agency databases comprised of data from ICAO and the aviation industry. It reflects knowledge at the time the report was generated.

Whilst every care has been taken in preparing the content of the report to avoid errors, the Agency makes no warranty as to the accuracy, completeness or currency of the content. The Agency shall not be liable for any kind of damages or other claims or demands incurred as a result of incorrect, insufficient or invalid data, or arising out of or in connection with the use, copying, or display of the content, to the extent permitted by European and national laws. The information contained in the report should not be construed as legal advice. For any further information or clarifications on this document please do not hesitate to contact EASA Communications & External Relations Department **(communications@easa.europa.eu)** using the information provided below.

Acknowledgements

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

Photocredits

Cover: *mbbirdy (2011 Stockphoto LP.)* / Inside front cover: *Image provided courtesy of Bombardier Inc.; Eurocopter; Ilias Maragakis; ETW; GEFA-FLUG; Image provided courtesy of Bombardier Inc.; Eurocopter; Vasco Morao; Rolls-Royce plc 2010* / Page 6: *Vasco Morao* / Page 8: *ETW* / Page 14: *Vasco Morao* / Page 24: *Eurocopter* / Page 31: *Eurocopter* / Page 32: *Alexander Schleicher* / Page 38: *Thales (Alexis Frespuech)* / Page 45: *Image provided courtesy of Bombardier Inc.* / Page 46: *Eurocontrol* / Page 53: *Eurocontrol* / Page 54: *Vasco Morao* / Page 61: *Rolls-Royce plc 2010* / Page 62: *Rolls-Royce plc 2010* / Inside back cover: *Diamond Aircraft Industies GmbH* / Backcover, flapper (from left to right): *Eurocontrol; ExecuJet Aviation Group; Eurocopter; Eurocopter; Eurocopter; EASA; Hawk Beechcraft; Image provided courtesy of Bombardier Inc.*

Design

Thomas Zimmer, Mittelstraße 12 – 14, 50672 Cologne, Germany

EUROPEAN AVIATION SAFETY AGENCY
Safety Analysis and Research Department
Ottoplatz 1, D-50679 Cologne
Tel. +49 (221) 89 99 00 00
Fax +49 (221) 89 99 09 99
E-mail: asr@easa.europa.eu

ISBN 978-92-9210-097-1 (Second edition)

Information on the European Aviation Safety Agency is available on the Internet (**www.easa.europa.eu**).

For further information about aviation safety and more EASA publications visit our website **easa.europa.eu** or simply scan the QR-Code below:

EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

Postal address
Postfach 10 12 53
50452 Cologne
Germany

Visiting address
Ottoplatz 1
50679 Cologne
Germany

Tel. +49_221_89990-000
Fax +49_221_89990-999
Mail info@easa.europa.eu
Web www.easa.europa.eu

ISBN 978-92-9210-097-1

An Agency of the European Union.