REVIEW OF AVIATION SAFETY PERFORMANCE IN IRELAND

DURING 2017

IAA

Front cover: An Aer Lingus Airbus 330 being prepared for flight at Dublin airport. Photographer Paul Kolbe-Hurley.

This page: The DJI Inspire being displayed at the Bray International Airshow in July 2017. Photographer Jason Phelan.

Contents

Foreword

Welcome to the IAAs' 2017 Annual Safety Performance Review (ASPR), which is now in its ninth year. Every year we strive to increase its relevance to the aviation industry by providing greater detail on individual sectors of the industry or adding information on a sector which has not previously been included. This year we are delighted to include statistics relating to ground handling activities and services for the first time and look forward to providing updates for this area in future editions.

On the 13th Dec. 2017 the IAA issued Scandinavian Airlines Ireland an Air Operators Certificate (AOC). This certificate grants an Operator permission to fly aircraft for the purposes of providing Commercial Air Transport (CAT) services. Prior to issuing one we, as the National Aviation Authority, must be satisfied the Operator has the personnel, assets and systems in place to ensure the safety of its employees and the general public. This was the third consecutive year in which the IAA issued an AOC to a new Operator and brings the number of Operators under the IAAs regulatory remit to fifteen.

There were two fatal aviation accidents in Ireland during 2017. The first accident occurred on 14th March at Blackrock, Co Mayo and involved a Sikorsky S92A aircraft, registered to CHC Ireland DAC. The aircraft and its four crew members were lost while engaged on a Search and Rescue mission off the Irish West Coast. The staff of the IAA would like to extend our sincerest sympathies to their families and friends. The accident remains under investigation by the Air Accident Investigation Unit (AAIU), who at time of publication have issued preliminary and interim reports, both of which contain safety recommendations. The IAA will endeavour to ensure these, and any other, safety recommendations the AAIU issues are promptly and completely implemented. The second fatal accident occurred on the 27th March and involved a general aviation single occupant aircraft during an emergency landing following engine failure. It has been investigated by the AAIU, who published their investigation report in Dec. 2017. The staff of the IAA extends our deepest sympathies to the pilots' family and friends.

As well as meeting our on-going requirements under EU/EASA legislation and participating in EASA working groups and safety projects, during 2017 the IAA led a survey of mandatory occurrence report (MOR) rates for CAT across 19 EASA Member States and the 162 Operators they regulate. The key findings were that there was a statistically significant increase in the MOR rates from 2015 to 2016 and, from the IAAs perspective, that Irish AOC holders have a strong reporting culture. During 2018 the IAA will continue to ensure Ireland's aviation system is ready for the future and that safety is always the primary concern of our industry.

Ralph James,
Director Safety Regulation Division.

Executive summary for 2017

Between the Irish lease fleet and the Irish AOC holders there were 881 aeroplanes on the Irish aircraft register that were engaged in Commercial Air Transport (CAT) on the 31st December 2017. This is the largest number of aircraft in this category over the five-year period considered. During 2017 these aeroplanes were involved in 5 non-fatal accidents and 10 serious incidents.

The Irish AOC holders operating fixed-wing aircraft are Aer Lingus, Airlink Airways, ASL Airlines Ltd., CityJet, Gain Jet Ireland, Galway Aviation Services (AOC issued as Aer Arann Islands), National Flight Centre, Norwegian Air International, Ryanair, SAS Ireland (AOC issued as Scandinavian Air Services Ireland), Stobart Air and WestAir Aviation. During 2017 these AOC holders conducted 1,018,827 flights and submitted 6,697 MORs. Over 90% of the MORs described incidents where all the safety barriers were effective and there was no safety risk to the aircraft or those on-board.

On 31st December 2017 there were 14 helicopters on the lease fleet or on the Irish aircraft register conducting Specialised Operations, Search and Rescue, Helicopter Emergency Medical Services or CAT services under a Permission and/or Approval and/or Authorisation issued by the IAA. These helicopters were involved in one accident during 2017, as a result of which the aircraft and its four crew members were lost. At the close of 2017 the Operators conducting CAT under an AOC issued by the IAA were Babcock Mission Critical Services (Ireland), CHC Ireland DAC and Executive Helicopters. They conducted 6,569 flights and submitted 34 MORs during 2017.

There are two types of licenced aerodrome in Ireland, those that are licenced for public use, of which there were 13 in 2017, and those that are licenced for private use, of which there were 11. There were 273,440 arrivals and departures at the 9 aerodromes which provide an ATC service and are licenced for public use. During 2017 they experienced 1 non-fatal accident and 4 serious incidents involving CAT. Over the same timeframe, 311,715 flight hours of ATC services were provided by the ANSPs, with 1,372 MORs submitted; however over 93% of these MORs were not associated with any safety risk. At the 13 aerodromes which are licenced for public use, there were 288,400 arrivals and departures. These aerodromes submitted 500 MORs, over 97% of which were not associated with any safety risk, relating to ground handling services and activities.

General Aviation (GA) covers all civil aviation other than CAT or Aerial Work. At the end of 2017 there were 438 aircraft used for GA activity on the Irish aircraft register. During 2017 aircraft engaged in GA, which were on the Irish aircraft register, were involved in 1 fatal accident, 5 non-fatal accidents and 2 serious incidents. Aircraft engaged in GA, which were on a foreign aircraft register, were involved in 2 non-fatal accidents and 4 serious incidents.

Small Unmanned Aircraft (SUA), also called drones, have become increasingly prevalent in Ireland over the last two years. Under SI 563 of 2015 ‘Small Unmanned Aircraft (Drones) and Rockets Order, 2015’ all drones and model aircraft over 1 kg, including the weight of the battery and all attached equipment, must be registered with the IAA by their owner. Owners of drones that weigh less the 1 kg may also register their aircraft with the IAA; however there is no regulatory requirement to do so. On 31st Dec 2017 there were 8,563 drones on the Irish drone register.

Irish Air Fixed-Wing Commercial Air Transport Sector

Between 2013 and 2017 fixed-wing aircraft on the IAAs Aircraft Register engaged in CAT were involved in 21 accidents, 5 of which occurred during 2017. The categories most commonly applied by the investigating Safety Investigation Authority (SIA) were:

Ground collision | **Turbulence encounter** | **Ground handling**

There were 76 serious incidents between 2013 and 2017, 10 of which occurred during 2017. The categories most commonly applied by the investigating SIA to serious incidents were:

Airprox / near midair collision | **System failure of malfunction** | **Fire / smoke (non-impact)**

During 2017 the Irish AOC holders submitted 6,697 MORs. The categories most commonly applied by SRD Inspectors to risk-bearing MORs were:

System failure or malfunction | **Medical** | **Cabin safety incidents**

Between 2013 and 2016 they submitted 24,955 MORs. The categories most commonly applied by SRD Inspectors to risk-bearing MORs were:

System failure or malfunction | **Passenger illness or injury** | **Ground handling**

Air Navigation Services and Aerodromes in Ireland

Between 2013 and 2017 there were 7 non-fatal accidents and 16 serious incidents involving CAT at aerodromes licenced for public use in Ireland where an ATC service is available. One of these non-fatal accidents and 4 of these serious incidents occurred during 2017.

The ATS providers submitted 1,372 MORs during 2017. The three occurrences categories most commonly assigned by SRD Inspectors were:

Air traffic management

System failure or malfunction

Consequential event

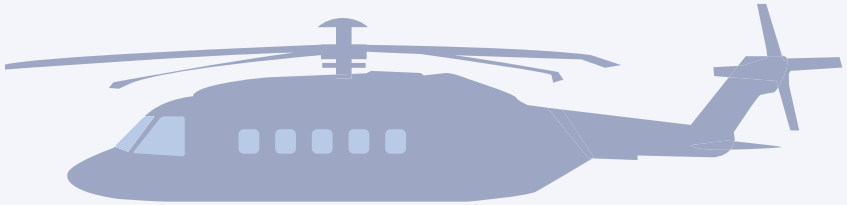
The Aerodrome managers submitted 500 MORs during 2017. The three most commonly assigned occurrences categories were:

Ground handling

Aerodromes

System failure or malfunction

The Irish Commercial Helicopter Sector



The accident and serious incident figures provided cover helicopter operators who hold an AOC issued by the IAA or helicopter aviation activity carried out in Irish territory by Operators conducting CAT and declared activities. The IAA monitors the latter type of aviation activity in accordance with Regulation (EU) 965/2012 requirements.

Between 2013 and 2017 these operators experienced a fatal accident during 2017 and 2 non-fatal accidents. As the AAIUs investigation is ongoing the fatal accident is presently categorised as 'Unknown or Undetermined'. The non-fatal accidents were categorised as 'Abnormal runway contact' and 'Controlled flight into or toward terrain' by the investigating Safety Investigation Authority (SIA).

Over the same timeframe they experienced 2 serious incidents, both of which were categorised as 'Other' by the investigating SIA.

During 2017 helicopter operators that hold an AOC issued by the IAA submitted 34 MORs. The categories most commonly applied by SRD Inspectors to risk-bearing MORs were:

Other

System failure or malfunction

Shining of lasers at aircraft

Between 2013 and 2016 they submitted 277 MORs. The categories most commonly applied by SRD Inspectors to risk-bearing MORs were:

System failure or malfunction

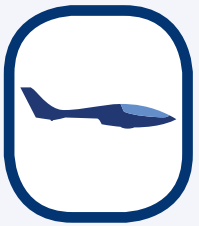
Other

Engine failure or malfunction

General Aviation in Ireland

Aeroplanes under 2,250 kg
3 Fatal Accidents
21 Non-Fatal Accidents
10 Serious Incidents

Helicopters under 2,250 kg
0 Fatal Accidents
4 Non-Fatal Accidents
1 Serious Incident



Sailplanes and Powered Sailplanes
0 Fatal Accidents
0 Non-Fatal Accidents
0 Serious Incidents

Aeroplanes over 2,250 kg
1 Fatal Accident
1 Non-Fatal Accident
0 Serious Incidents

Helicopters over 2,250 kg
0 Fatal Accidents
1 Non-Fatal Accident
0 Serious Incidents

Gyrocopters
0 Fatal Accidents
1 Non-Fatal Accident
0 Serious Incidents

Microlight
0 Fatal Accidents
4 Non-Fatal Accidents
1 Serious Incident

Paragliders, Powered Paragliders and Powered Parachutes
1 Fatal Accident
1 Non-Fatal Accident
0 Serious Incidents

Hot Air Balloons
0 Fatal Accidents
0 Non-Fatal Accidents
0 Serious Incidents


swan
PLANT HIRE
456
HYUN

Laying of new overlay pavement on Runway 10 / 28.

SECTION A

Safety in the Irish Aviation Industry

The nosewheel of a Ryanair Boeing 737 aeroplane at Marseilles airport, France. Photographer Eva Szabadfi

The Irish Aviation Authority

The Irish Aviation Authority (IAA) is a limited liability company wholly owned by the Irish State. The Safety Regulation Division (SRD) of the IAA is responsible for Ireland's regulatory and safety oversight functions within the civil aviation industry. As part of its role as a regulator IAA SRD analyses and monitors the safety of organisations and aircraft under its remit. One of the ways SRD fulfils this aspect of its role is through the analysis of safety occurrences it receives from those involved in civil aviation or from the general public.

Regulation (EU) 376/2014

Occurrence reporting in civil aviation in Europe has been subject to Regulation (EU) 376/2014 since the 15th November 2015. This regulation includes provisions for persons involved in civil aviation to submit Mandatory Occurrence Reports (MORs) and Voluntary Occurrence Reports (VORs) to the competent authority in their State.

MORs may be submitted to a States competent authority either directly or through their approved organisation's Safety Management System. The European Commission has listed the types of occurrences, which are subject to mandatory reporting to the competent authority of each EU Member State, in Commission Implementing Regulation (EU) 2015/1018. All of the commercial stakeholders under the IAA's remit have taken steps to ensure they are compliant with the legislation. The IAA is responsible for ensuring an appropriate investigation into these incidents has taken place and suitable follow-up actions were implemented. For further information see https://www.iaa.ie/commercial-aviation/safety-reporting-1.

VORs capture three different scenarios: firstly, safety issues an individual or organisation would like to bring to the attention of the competent authority which are not subject to mandatory provisions. Secondly, they highlight safety issues not listed in Commission Implementing Regulation (EU) 2015/2018 and finally they may be from individuals who feel their own organisation is not fully addressing their safety concern. VORs may be submitted using the following link to a portal the European Commission developed for the purposes of submitting MORs and VORs: http://www.aviationreporting.eu. Prior to the introduction of the EU regulatory framework, the IAA had established a voluntary reporting system, which will be maintained for non-aviation professionals who wish to submit a VOR and find the technical aspects of doing so through the EU portal overly complex.

Mandatory Occurrence Reports

The statistics on MORs that are provided in this report have been compiled using the IAA's database. It is a live database in that MORs may be updated as investigations into occurrences yield further information and new MORs are continuously submitted. Freezing a database is standard practice when managing a live database and describes taking a copy of it for an analysis. To facilitate this analysis the MOR database was frozen on the 23rd January 2018 for occurrences submitted by the AOC holders or the lease fleet and frozen again on the 2nd February 2018 for those submitted by ATC and airside service providers. Freezing the database twice ensures the information provided in this document is as mature as possible when analysed. Future editions of the Annual Safety Performance Review will capture changes made after these dates.

Voluntary Occurrence Reporting

The statistics on VORs that are provided in this report were compiled using the IAA's database. The number of VORs submitted has risen from 63 in 2012 to 102 in 2017 and were submitted by all sectors of the aviation industry and the general public. The IAA would like to see the GA community making more use of the VOR system and so the IAA, in conjunction with GASCI, will continue to promote voluntary reporting in areas not covered under the EU regulatory framework, such as pilots of uncertified light sports aircraft, drone operators, etc.

The IAA appreciates the efforts of all those who voluntarily submit reports that may help improve aviation safety and is especially thankful to those reporters who have kindly provided permission to the IAA to contact them. Reporters should not be concerned if the IAA does not contact them, it may be that the report provided is comprehensive enough for the IAA to investigate without further information or that the report concerns a known issue the IAA is already investigating. If this is the case the IAA still welcomes the report as it will provide information on the recurrence rate and may contain additional details.

Categorisation of MORs and VORs

Once an MOR or VOR is submitted to the IAA an SRD Inspector uses the CAST/ICAO occurrence reporting taxonomy to categorise it. The purpose of the taxonomy is to group events under standardised descriptors to improve the aviation community's capacity to focus on common safety issues. The definitions and usage notes for the Common Taxonomy can be found at: http://www.intlaviationstandards.org/Documents/OccurrenceCategoryDefinitions.pdf.

ARMS methodology

The primary method the IAA's SRD Inspectors use to assess the safety risk associated with an occurrence is the Airline Risk Management Solutions (ARMS) methodology. Its purpose is to identify occurrences associated with an elevated safety risk so that the area may be targeted.

The ARMS matrix assigns a risk score by assessing the effectiveness of the remaining barriers between what transpired and the most credible accident outcome if the incident had escalated. All types of potential outcomes are considered, from those with no potential injury to people or damage to the aircraft, to those with multiple fatalities or the loss of the aircraft. Figure A.1 demonstrates how a score is assigned.

The risk matrix assigns one of thirteen possible risk scores to the occurrence. A score between 1 and 10 indicates there was a low safety risk, a score of between 20 and 102 indicates there was an elevated safety risk and a score of 500 or over indicates it was a high-risk occurrence.

Figure A.1: The ARMS matrix quantifies risk associated with safety occurrences

Question 1			
What was the effectiveness of the remaining barriers between this event and the most credible accident outcome?			
Effective	Limited	Minimal	Not effective
50	102	502	2,500
10	21	101	500
2	4	20	50
1			

Question 2	
If this event had escalated into an accident outcome what would have been the most credible outcome?	
Catastrophic accident	Loss of aircraft or multiple fatalities (3 or more)
Major accident	1 or 2 fatalities, multiple serious injuries, major damage to aircraft
Minor injuries or damage	Minor injuries, minor damage to aircraft
No accident outcome	No potential damage or injury could occur

Safety Investigation Authorities

Safety Investigation Authorities (SIAs) are responsible for investigating aviation accidents and serious incidents. The purpose of their investigation is to ascertain the reason(s) the occurrence took place so that similar events can be prevented in the future. ICAO made it a requirement for all States to have a designated SIA by November 2016. Ireland has had a dedicated SIA, the Air Accident Investigation Unit (AAIU), for many years. It is a specialised and independent unit within the Department of Transport, Tourism and Sport.

The AAIU investigates civil aviation accidents and serious incidents that take place in Ireland, regardless of whether the Operator was flying under an AOC issued by the IAA or a National Aviation Authority (NAA) based abroad, or which NAA the aircraft was registered with. Occurrences involving an Irish AOC holder or an Irish registered aircraft that took place outside of Ireland may be investigated by a foreign SIA or they may delegate the investigation fully or in part to the AAIU.

If an SIA based in another State is investigating an occurrence involving an Irish Registered aircraft or Irish AOC holder the AAIU always appoints an Accredited Representative to provide assistance. Formal notification processes ensure the AAIU and other stakeholders are informed of the investigation and its findings.

ICAO Annex 13 definition of an accident and serious incident

The definition of an aviation accident and serious incident is set out in ICAO Annex 13. In brief it defines an accident as an occurrence associated with the operation of an aircraft in which:

- A person is fatally or seriously injured as a result of being in the aircraft or in direct contact with any part of the aircraft, including exposure to jet blast;
- The aircraft sustains damage or structural failure which adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component;
- The aircraft is missing or is completely inaccessible.

Annex 13 defines a serious incident as an occurrence involving circumstances indicating that an accident nearly occurred. It states the difference between an accident and a serious incident lies only in the result.

Annex 13 states that, in the case of a manned aircraft, an accident or serious incident can only take place between the time the first person boards an aircraft with the intention of flight and the time all such persons have disembarked.

During the investigation into the accident or serious incident it may transpire that the classification was not appropriate. Under these circumstances the investigating SIA will revise it and assign the appropriate classification. Only the SIA investigating the occurrence has the authority to make this change. Once the investigation is complete an investigation report is published and made publicly available.

Data sources used in this report

The statistics on accidents and serious incidents presented within this document have been compiled using the accident and serious incident data provided by the AAIU. All accidents and serious incidents the AAIU have been formally notified of are included in this report, even if the investigation itself is ongoing and the formal investigation report has not been finalised. There may be minor differences between consecutive Annual Safety Performance Reviews. This is due to the reclassification of an occurrence during the course of the SIAs investigation.

Irish Aircraft Register

The IAA is responsible for the registration of civil aircraft in Ireland and the maintenance of the Irish civil aircraft register. This register meets the requirements of ICAO Annex 7 (Aircraft Nationality and Registration Marks) of the Chicago Convention. The 'Nationality and Registration of Aircraft Order' S.I.107 of 2015 provides detailed information on the aircraft that can be registered in Ireland, the format and location of registration markings on the aircraft and the conditions that must be met for continued registration. Ireland has two nationality marks for the Irish civil aircraft register 'EI' and 'EJ' – only 'EI' is currently used.

State Safety Plan

The purpose of the Annual Safety Performance Review is to provide a summary of safety performance in the civil aviation system, using accidents, serious incidents and incidents broken into different sectors of the civil aviation system in Ireland as safety indicators. This report of the safety performance data is not intended to provide details of the on-going actions to address deficiencies in safety performance.

This safety performance information is used as part of the safety risk management process in the IAA, along with other safety related information that derives from the European Plan for Aviation Safety, the IAA safety oversight process, industry consultation, and other global safety priorities (eg GASP) etc. The outcome of the safety risk management process is a set of mitigating actions to address the areas of greatest concern in the State and this information is recorded in the State Safety Plan.

SECTION B

The Irish Fixed-Wing Commercial Air Transport Sector

The wheels of a Boeing 777 retracting during take-off at Dublin airport.
Photographer Paul Kolbe-Hurley

Introduction

The Irish fixed-wing Commercial Air Transport (CAT) industry consists of two types of commercial organisations.

The first type of organisation are operators who hold an Air Operators Certificate (AOC) issued by the IAA. An AOC grants an Operator permission to fly an aeroplane or a helicopter for the purposes of CAT. The Irish AOC holders who provide CAT services are Aer Lingus, Airlink Airways, ASL Airlines Ltd. (formerly Air Contractors), CityJet, Gain Jet Ireland (AOC issued 31st August 2016), Galway Aviation Services (AOC issued as Aer Arann Islands), National Flight Centre, Norwegian Air International (AOC issued 12th February 2014), Ryanair, SAS Ireland (AOC issued 13th December 2017 as Scandinavian Air Services Ireland), Stobart Air (formerly Aer Arann) and WestAir Aviation. In previous ASPRs data for these AOC holders was summarised according to whether they provide scheduled or unscheduled (corporate) commercial flights in two separate sections. The back-data provided in this section for 2013, 2014, 2015 and 2016 has been updated to reflect that the fixed-wing AOC holders are now presented as a single group.

The second type of organisation are those who place aeroplanes on the Irish aircraft register, which they then lease to an operator that holds an AOC issued by the IAA or by a foreign State. As per Article 83 bis of the Chicago Convention, when an operator holds a foreign AOC, Ireland retains responsibility for oversight of the aircrafts airworthiness under an agreement with the Operators State. Within this analysis, aircraft subject to the agreement are referred to as the 'Irish lease fleet'.

Between the Irish lease fleet and the Irish AOC holders there were 881 aeroplanes on the Irish aircraft register that were engaged in CAT on the 31st December 2017. This is the largest number of aircraft in this category over the five-year period considered.

Number of accidents and serious incidents

Over the last five years' aeroplanes operated by the Irish AOC holders or on the Irish lease fleet were involved in 21 accidents, 5 of which occurred during 2017. A summary of these accidents, none of which resulted in fatalities, is provided below:

- A passenger sustained serious injuries as a result of a fall from the aircraft steps;
- A cabin crew member sustained serious injuries due to a catering cart being left unsecured during landing;
- Cabin crew sustained serious injuries due to turbulence on two different flights;
- A wheel detached during take-off.

Over the last five years' this part of the Irish aviation industry was involved in 76 serious incidents, 10 of which occurred during 2017.

Table B.1: Accidents and serious incidents involving Irish registered aeroplanes engaging in CAT

Year	No. on Irish aircraft register	Accidents			Serious incidents
		Non-fatal	Fatal	Total	
2013	751	2	-	2	18
2014	722	8	-	8	10
2015	740	3	1	4	20
2016	793	2	-	2	18
2017	881	5	-	5	10
Total	-	20	1	21	76

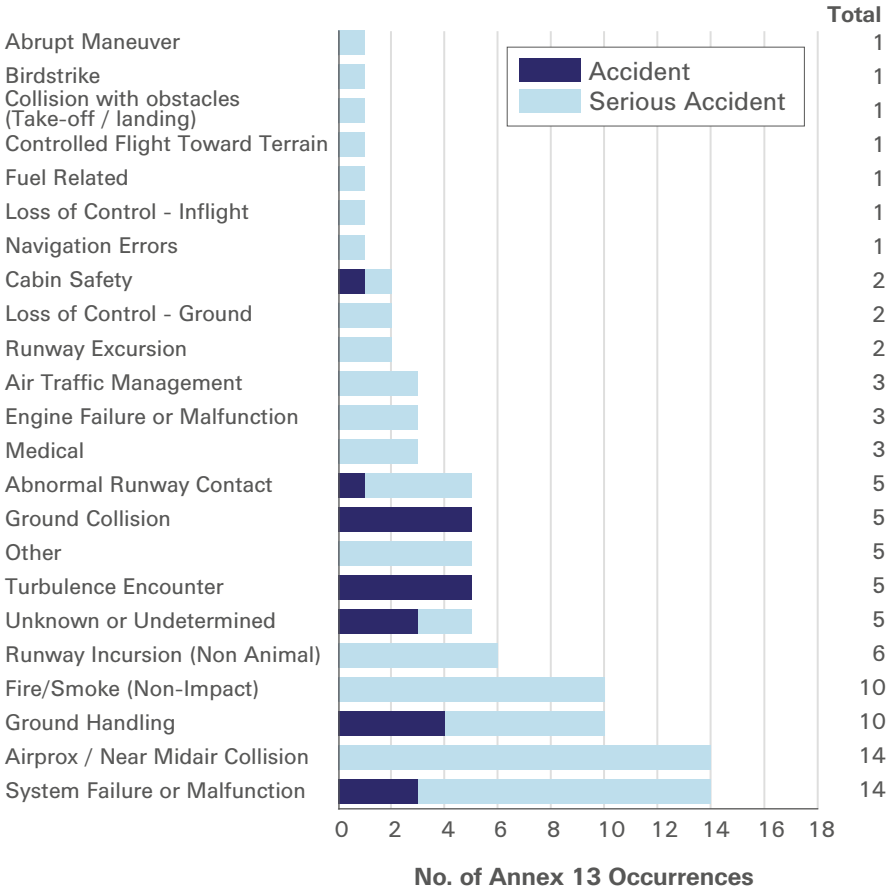
During October 2015 a foreign AOC holder operating an Irish registered aircraft experienced a fatal accident, which tragically resulted in the loss of 224 lives. It remains under investigation by the Egyptian Ministry of Civil Aviation. The Egyptian investigation statement of 17th March 2016 notes 'the Committee received on 14 March 2016 an official report from the Russian Federation Investigative Committee. After studying this report, which suggests suspected criminal activity, the Committee has referred the matter to the Attorney General of the Arab Republic of Egypt'. The IAA and AAIU provided assistance to the Egyptian Ministry of Civil Aviation at the time of the accident and will continue to cooperate with any requests made over the course of their investigation.

Categorization of accidents and serious incidents

To assist in identifying safety issues, the investigating SIA assigns a CAST / ICAO common taxonomy category to all Annex 13 accidents and serious incidents. Some of these categories indicate the end-result in a chain of events rather than the cause of the event. Figure B.2 summarises the categories assigned to the 21 accidents and 76 serious incidents that took place between 2013 and 2017.

The fatal accident experienced by an Operator utilising an aeroplane on the Irish aircraft register and flying under an AOC holder issued by a foreign State has been categorised as 'Unknown or undetermined'. This may be revised on a later date by the Egyptian Ministry of Civil Aviation, who, as the investigating authority, hold sole responsibility for doing so.

Figure B.2: Categorisation assigned by the investigating SIA to the Annex 13 occurrences



The two most frequently assigned categories to accidents and serious incidents were respectively 'Ground collision' (GCOL) and 'Turbulence encounter' (TURB) and 'Airprox / near midair collision' (MAC) and 'System failure and malfunction' (SCF-NP).

Over the five-year period considered 5 accidents were categorised as 'Ground collision' (GCOL). This category describes a collision involving at least one aircraft that was taxiing to or from a runway which is in use. The collision can involve a second aeroplane, people, animals, ground vehicles, obstacles, buildings or structures such as lighting poles. It excludes collisions that occur on the runway. It was the second most common accident category listed for CAT in the 2016, 2015, 2014 and 2013 ASPRs.

During the same timeframe 5 accidents were also categorised as 'Turbulence encounter' (TURB). This category includes wake vortex encounters as well as encounters with turbulence in clear air, mountain wave, mechanical, cloud-associated turbulence or when operating around buildings, structures and objects. During 2017 two unrelated accidents were categorised as TURB due to the serious injuries sustained by cabin crew members. This is the first year in which it has been among the two most frequently assigned categories to accidents.

The category most frequently assigned to serious incidents was 'Airprox / near midair collision' (MAC). It occurs when there is a significant loss of separation between two or more airborne aeroplanes. Occurrences of this nature that escalate into an accident are very rare within Europe and an Irish AOC holder has never been involved in an accident caused by an Airprox. It was listed as the second most frequently assigned category to serious incident in the 2016 and 2015 ASPRs and the most frequently assigned category in the 2014 and 2013 ASPRs.

'System failure or malfunction' (SCF-NP) describes the failure or malfunction of components on-board the aeroplane that were not associated with the engine. It was listed as the most frequently assigned category for serious incident in the 2016 and 2015 ASPR and the second most frequently assigned category in the 2014 and 2013 ASPRs.

Number and rate of MORs: 2013 - 2017

This subsection provides information on the number and rate of MORs submitted by the Irish AOC holders.

Between 2013 and 2017 the Irish AOC holders submitted 31,652 MORs. Of these, 1,857 were assigned a risk-bearing ARMS score, indicating that 94% of MORs described incidents where all the safety barriers were effective. On an annual basis the number of MORs submitted annually fluctuated between 5,631 and 7,571 while the number of operations the AOC holders conducted annually increased steadily every year from 696,491 to 1,018,827.

To remove the effect of the increasing number of flights on the number of safety events experienced, an MOR rate based on the number of movements conducted was calculated. This allows a comparison across years by normalising the data. The reporting rate across the five-year period was 77.60 MORs per 10,000 movements and fluctuated between 65.73 and 86.46 MORs per 10,000 movements.

Table B.3: Statistics on MORs submitted by the Irish AOC holders who operate aeroplanes
(MOR rates were calculated per 10,000 flights)

Year	Sectors flown	Total		ARMS: 1-10		ARMS: 20-102		ARMS: 500 - 2,500	
		Number	Rate	Number	Rate	Number	Rate	Number	Rate
2013	696,491	6,022	86.46	5,664	81.32	355	5.10	3	0.04
2014	710,172	5,631	79.29	5,466	76.97	164	2.31	1	0.01
2015	762,855	5,731	75.13	5,445	71.38	283	3.71	3	0.04
2016	890,542	7,571	85.02	7,156	80.36	412	4.63	3	0.03
2017	1,018,827	6,697	65.73	6,064	59.52	630	6.18	3	0.03
Total	4,078,887	31,652	77.60	29,795	73.05	1,844	4.52	13	0.03

Comparison of MOR, accident and serious incident rate with European counterparts

During 2017 the IAA, with the support of the Network of Analysts (NoA) and EASA, conducted a survey of 2016 accident and serious incident rates as well as 2015 and 2016 MOR rates. It was open to Operators who conducted more than 1,000 movements during either year and hold an AOC issued by an EASA Member State. A total of 162 AOC holders from 19 States participated in the survey. The findings from the analysis, two of which are summarised here, have been fed back to all participants in the survey through a detailed report.

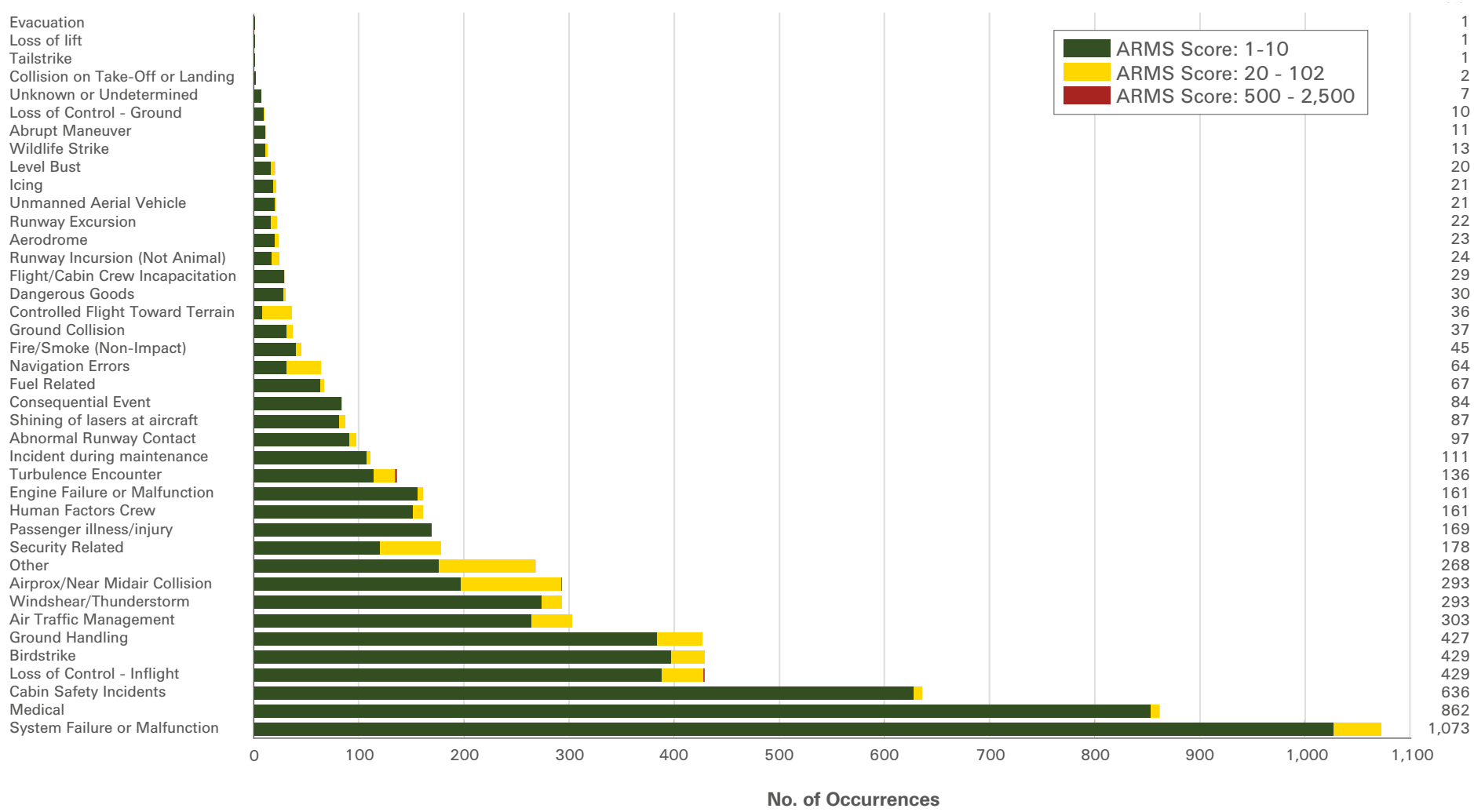
One of the key findings was that there was a statistically significant increase in the MOR rates from 2015 to 2016. The analysis didn't seek to establish why the increase occurred, but it was by an average of 2.39 MORs per 1,000 movements. From the IAAs' perspective another key finding was that the Irish AOC holders have a strong reporting culture. This indicates they have mature Safety Management Systems (SMS) in place.

Projects such as these are instrumental in developing the industries understanding of how safety indicators behave across a spectrum of Operators and how dependent they are on each other. The IAA hopes to run this survey again in a few years and develop it further.

Occurrence categories and ARMS score assigned to MORs: 2017

As well as assigning an ARMS score to MORs SRDs' Inspectors assign an occurrence category. The purpose of this is to assist in identifying emerging safety concerns. Figure B.4 summarises the categorisation and ARMS score assigned by the Inspectors.

Figure B.4: Summary of the 6,697 occurrence reports submitted by Irish AOC holders during 2017
(The AOC holders conducted 1,018,827 flights over this period)



During 2017 the two most commonly reported occurrence categories were 'System failure or malfunction' (SCF-NP) and 'Medical' (MED). Risk bearing occurrences are those which were assigned a score of 20 or higher using the ARMS methodology. The most commonly reported risk bearing occurrences were 'Airprox / near Mid-Air Collision' (MAC) and 'Other' (OTHR).

The most common type of incident reported was 'System failures or malfunctions' (SCF-NP). As explained earlier in this section it describes the failure or malfunction of components on-board the aircraft that are not associated with the powerplant. Over 95% of these MORs were low risk and assigned an ARMS score of 10 or lower, which reflects that critical aircraft systems have been designed with built-in duel, or even triple, redundancy to prevent component failures from compromising the safety of the flight. SCF-NP was also the most frequently assigned category to MORs in this sector during 2016 and 2015.

The second most commonly reported type of incident was 'Medical' (MED). 'Medical' describes situations where there was a medical emergency or illness involving any person on board the aircraft or a crew member was unable to perform their duties due to illness. The vast majority of these occurrences were minor in nature.

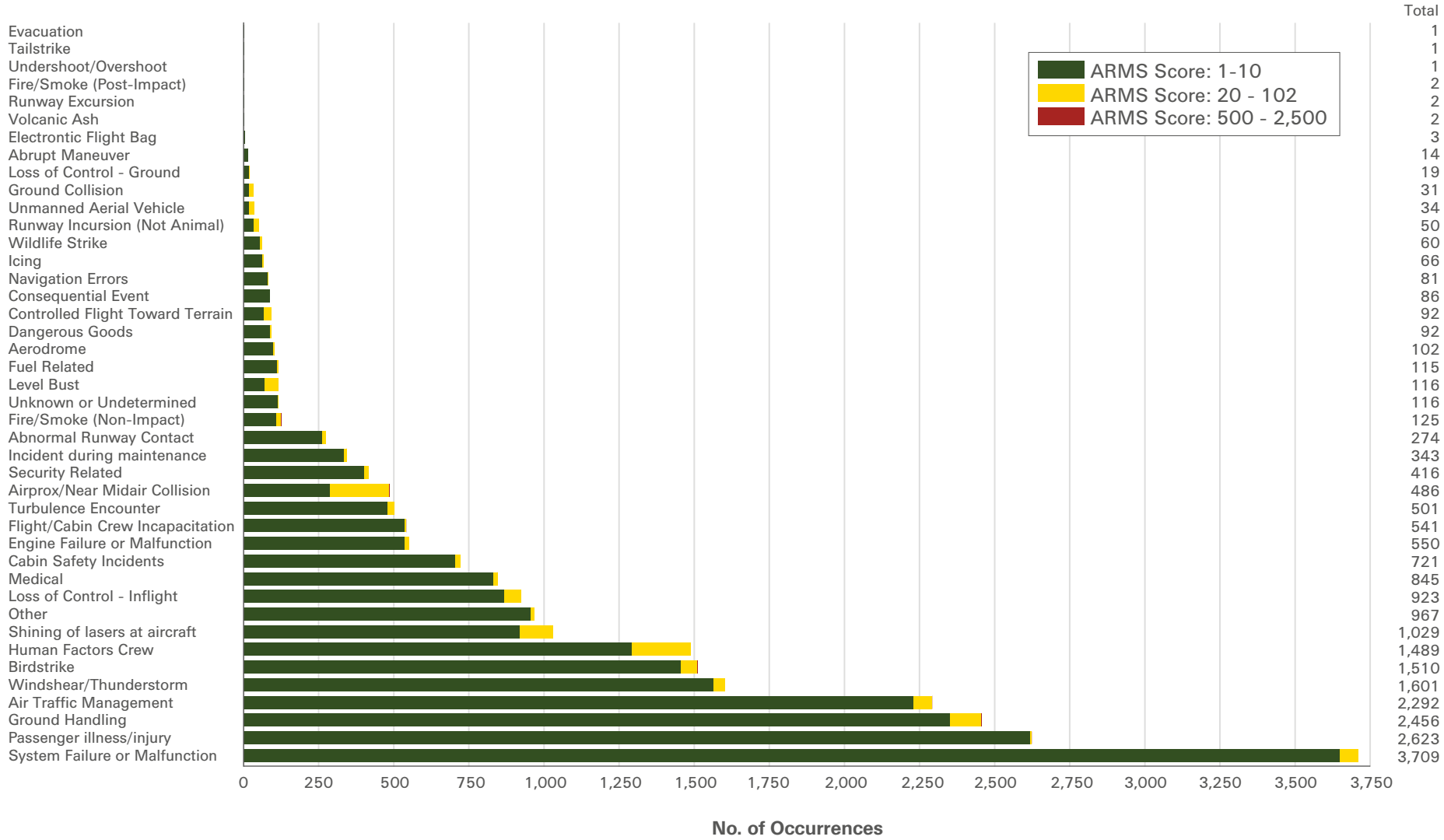
The most common type of risk-bearing occurrence was 'Airprox / near Mid-Air Collision' (MAC). It was also the most frequently assigned category to risk-bearing MORs in this sector during 2016 and the second most frequently assigned during 2015. Most commercial aircraft are equipped with electronic traffic collision avoidance systems and these systems trigger alerts and guidance on avoiding actions for flight crews to help resolve traffic conflicts. For the technology to be effective all aircraft involved in the conflict must be suitably equipped, which is not always the case, e.g. conflicts between commercial and general aviation aircraft. Higher risk MAC events may occur in airspace with higher traffic density and resolving the conflict may increase the flight crews' workload.

The second most common type of risk-bearing occurrence reported by Irish AOC holders was 'Other' (OTHR). It describes an occurrence not covered under another category.

For comparison with 2017: Occurrence categories and ARMS score assigned to MORs between 2013 - 2016

Between the 1st Jan. 2013 and the 31st Dec. 2016 inclusive the Irish AOC holders submitted 24,955 MORs and conducted over 3.06 million flights. Figure B.5 summarises the categories and ARMS scores assigned to these MORs.

Figure B.5: Summary of MOR reports during 2013, 2014, 2015 and 2016 for the Irish AOC holders
(Irish AOC holders conducted over 3.06 million flights during this period)



When MORs received during this timeframe were pooled the most commonly reported occurrences were 'System failure or malfunction' (SCF-NP) and 'Passenger illness or injury' (CABIN: PAX. ILL). The most commonly reported risk bearing occurrences were 'Human factors crew' (HF CREW) and 'Airprox / near midair collision' (MAC).

Information on 'System failure or malfunction' was provided earlier in this section. 'Passenger illness or injury' (CABIN: PAX. ILL) describes situations where a passenger became unwell. The majority of both of these types of occurrences were minor in nature.

'Human factors crew' (HF-CREW) describes occurrences initiated through crew error, for example procedural or handling errors. It is a common safety concern within the EU and further afield. All of the Irish AOC holders have human factors principles as part of their crew training programmes.

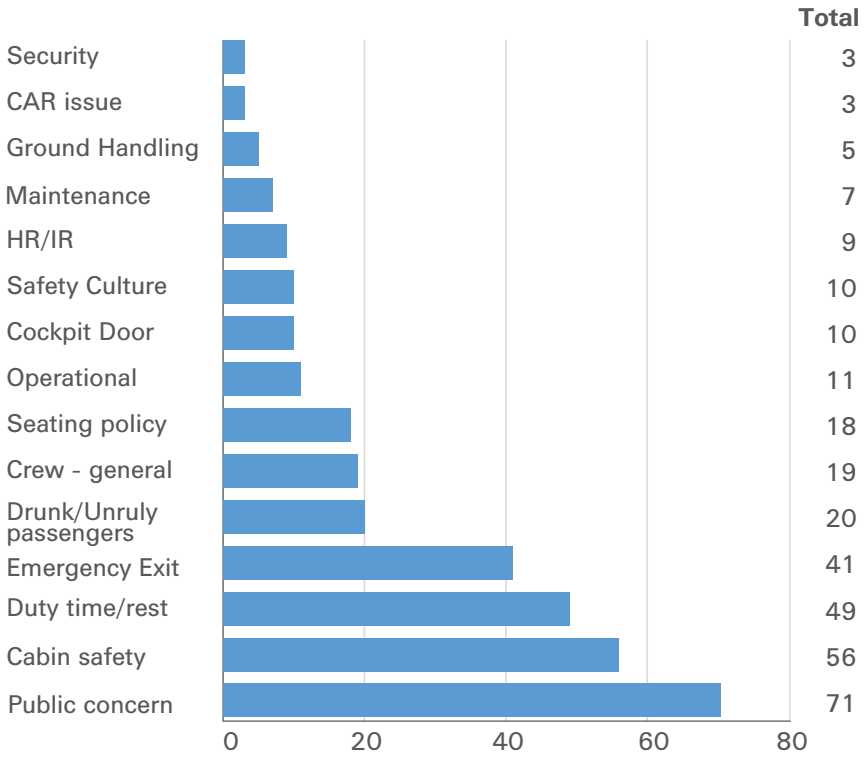
The second most common type of risk-bearing occurrence was 'Airprox / near Mid-Air Collision' (MAC). As already mentioned most commercial aircraft are equipped with electronic collision avoidance systems and these systems trigger alerts and guidance on avoiding actions to flight crews to help resolve traffic conflicts.

Voluntary occurrence reporting

The IAA reviews all VORs to identify any safety hazards or concerns that may be emerging or were previously unidentified. All reports received are investigated fully in conjunction with the operator or persons involved, and appropriate actions are taken to try to prevent recurrence.

Since its launch in 2012 a total of 332 VORs relating to CAT have been submitted to SRD. A breakdown of the type of events reported to the IAA concerning Irish AOC holders is provided in Figure B.6.

Figure B.6: Summary of the types of events reported to the IAA through the VOR system



It is worth noting that the two most common event types address concerns raised by aircraft passengers or the general public. However there has been an increase in the number of reports received from CAT professionals over the period considered, particularly during the last three years. Consequently, the safety concerns of aviation professionals that are not addressed under the MOR provisions of Regulation (EU) 376/2014 are becoming clearer.

The event type that has the highest number of reports is 'Public concern'. This category captures reports from passengers or the public on occurrences where they felt their safety was compromised (e.g. proximity to other aircraft, rough landings, low flying large aircraft etc).

'Cabin safety' had the second highest number of reports. It captures damaged or inaccessible safety equipment, passengers not seated while fasten seatbelt light was on, inaudible safety announcements etc.

SECTION C

The Irish Commercial Helicopter Sector

S92 R115 on a recent tasking to Galway Hospital on behalf the Irish Coast Guard.Photographer: David McGrath

Introduction

An Air Operators Certificate (AOC) facilitates the provision of Commercial Air Transport (CAT) services. Babcock Mission Critical Services (Ireland) (formerly Bond Air Services Ireland), CHC Ireland DAC (formerly CHC Ireland) and Executive Helicopters all hold AOCs issued by the IAA and fly helicopters. During 2015 Irish Helicopters Limited and Starlite Aviation Ireland, who also provided CAT services, surrendered their AOCs. Accidents, serious incidents and MORs involving or submitted by these former AOC holders are included in this analysis up to the date they surrendered their AOCs.

Ireland also retains airworthiness oversight responsibility of organisations who place helicopters on the Irish aircraft register, which they then lease to an Operator that holds an AOC issued by a foreign State. This is done utilising an agreement with the State of Operator as per Article 83 bis of the Chicago Convention. Within the Irish aviation industry aircraft subject to the agreement are referred to as the 'Irish lease fleet'.

The IAA monitors helicopter operations carried out in Irish territory by Operators conducting CAT and declared activities (commercial SPO and NCC) in accordance with Regulation (EU) 965/2012 requirements. The CAT certificate and / or authorisation may be issued by another EASA Member State. In the case of non-EASA Member State Operators conducting aerial work, the IAA issues an aerial work permission.

Accidents and serious incidents

On 31st December 2017 there were 14 helicopters engaged in CAT on the Irish aircraft register. This is an increase of 3 helicopters in the year since 31st December 2016. The accident and serious incident figures provided in Table C.1, covers all the previously discussed aviation activity. In previous ASPRs helicopter activity carried out in Irish territory by Operators conducting CAT and declared activities was included within the GA section. The back-data provided in this section for 2013, 2014, 2015 and 2016 has been updated to reflect the change.

There was one fatal accident between the 1st Jan 2013 and 31st Dec 2017. It occurred on the 14th March 2017 when a CHC helicopter was operating in the role of 'Support SAR Helicopter' during a SAR mission. As a result of the accident the lives of all four crew members were lost. The AAIU have published a preliminary report (Ref. No. 2017-006) and an interim report (Ref. No. 2018-004), which are publicly available on their website. On completion of their investigation the AAIU will publish their findings in a formal, final report which will also be made publicly available on their website. As the AAIUs investigation is ongoing they have categorised this accident as 'Unknown or Undetermined' (UNK). This CAST / ICAO Common Taxonomy category includes those occurrences in which there is not enough information at hand to classify the occurrence or additional information is expected in due course to better classify it. On completion of their investigation the AAIU will assign the most appropriate category.

There were two non-fatal accidents over the period considered, one during 2015 and another during 2016. These were respectively categorised as 'Abnormal runway contact' (ARC) and 'Controlled flight into or toward terrain' (CFIT) by the investigating SIA. There were also two serious incidents, both of which were categorised as 'Other' (OTHR) by the investigating SIA.

Table C.1: No. of accidents, fatal accidents and serious incidents involving helicopters engaged CAT.

Year	Total registered in Ireland	Accidents			Serious incidents
		Non-fatal	Fatal	Total	
2013	19	-	-	-	-
2014	12	-	-	-	1
2015	10	1	-	1	1
2016	11	1	-	1	-
2017	14	-	1	1	-
Total	-	2	1	3	2

Number and rate of MORs

This section provides information on the number and rate of MORs submitted by the Irish AOC holders flying helicopters.

A helicopter flight is defined as a departure and a landing, irrespective of where they took place. A helicopter departing an airfield and landing on an off-shore oil rig is considered to be one flight and a subsequent flight to another oil rig or the return flight to the airfield is an additional flight. Over the five-year period considered the three AOC holders conducted 41,570 flights, 6,569 of which took place during 2017.

Between 2013 and 2017 the helicopter AOC holders submitted 311 MORs. The ARMS methodology is used to assess the safety risk associated with the MORs submitted to SRD. Of the 311 MORs submitted SRD Inspectors identified 4 as being risk bearing and assigned them an ARMS score of 500 or more.

To account for annual fluctuations in the number of flights conducted an MOR rate per 1,000 flights was calculated. Over the period considered the occurrence reporting rate has fluctuated between 4.15 to 10.62 MORs per 1,000 flights.

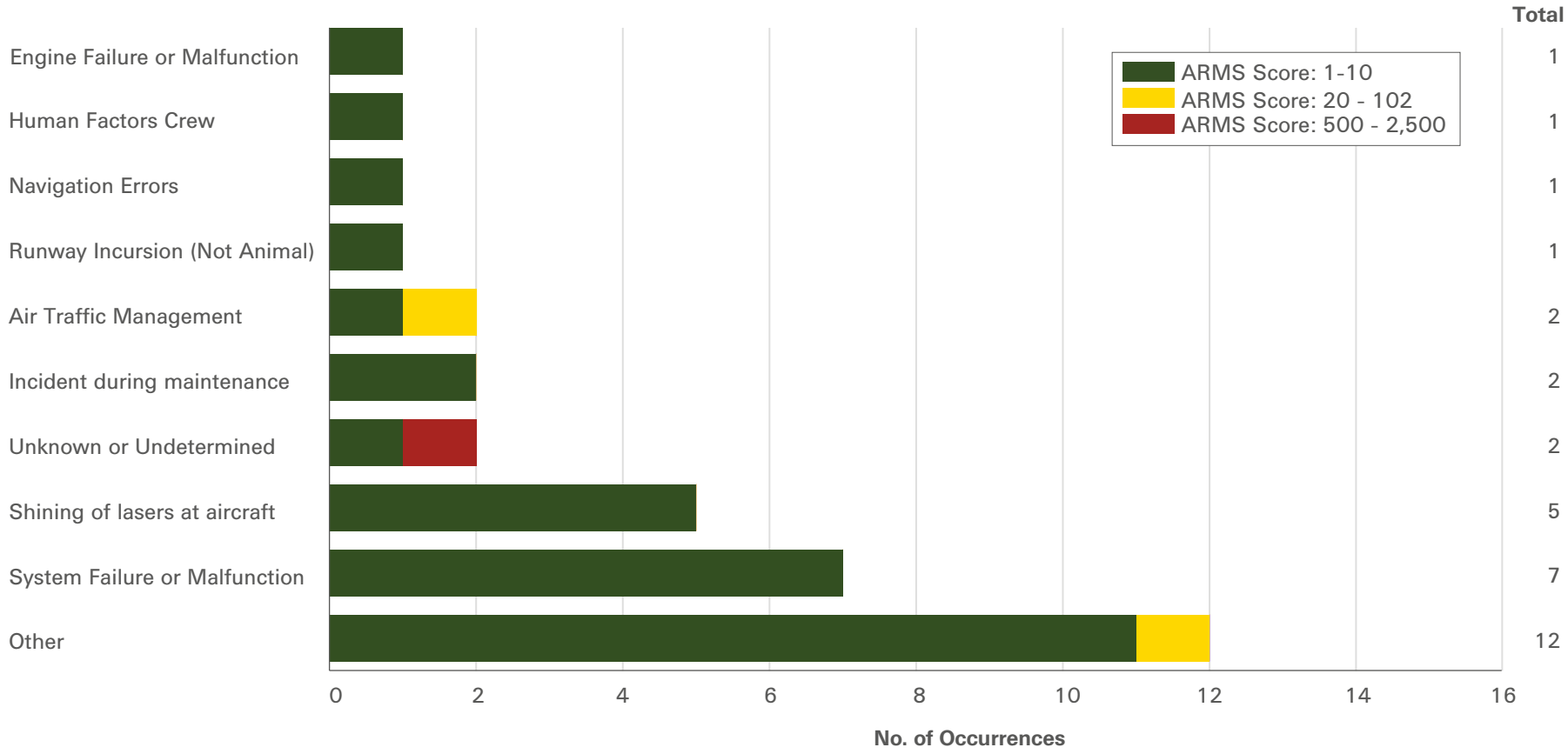
Table C.2: Statistics for MORs submitted by the Irish AOC holders operating helicopters

Year	Sectors flown	Total		ARMS: 1 - 10		ARMS: 20 - 102		ARMS: 500 – 2,500	
		Number	Rate	Number	Rate	Number	Rate	Number	Rate
2013	9,514	101	10.62	100	10.51	-	-	1	0.11
2014	9,974	105	10.53	105	10.53	-	-	-	-
2015	8,761	43	4.91	43	4.91	-	-	-	-
2016	6,752	28	4.15	28	4.15		-	-	-
2017	6,569	34	5.18	31	4.72	2	0.30	1	0.15
Total	41,570	311	7.48	307	7.39	2	0.05	2	0.05

Occurrence categories and ARMS score: 2017 MORs

When an AOC holder submits an MOR, an SRD Inspector categorises the type of occurrence that took place for the purposes of identifying and monitoring emerging safety concerns. Figure C.3 summarises the categorisation and ARMS score assigned by SRDs Inspectors to the 34 MORs the helicopter AOC holders submitted during 2017.

Figure C.3: Categorization of MORs that occurred during 2017 for AOC holders operating helicopter



The two occurrence categories most commonly applied to the MORs were 'Other' (OTHR) and 'System failure or malfunction' (SCF-NP).

The category most frequently assigned to MORs during 2017 was 'Other' (OTHR). This category describes occurrences not covered under another category. Of the 12 occurrences where OTHR was assigned, 11 were information errors on the VFR Aeronautical charts, these are used primarily for basic visual navigation purposes. Before 2017 there were no MORs where errors on the maps were reported.

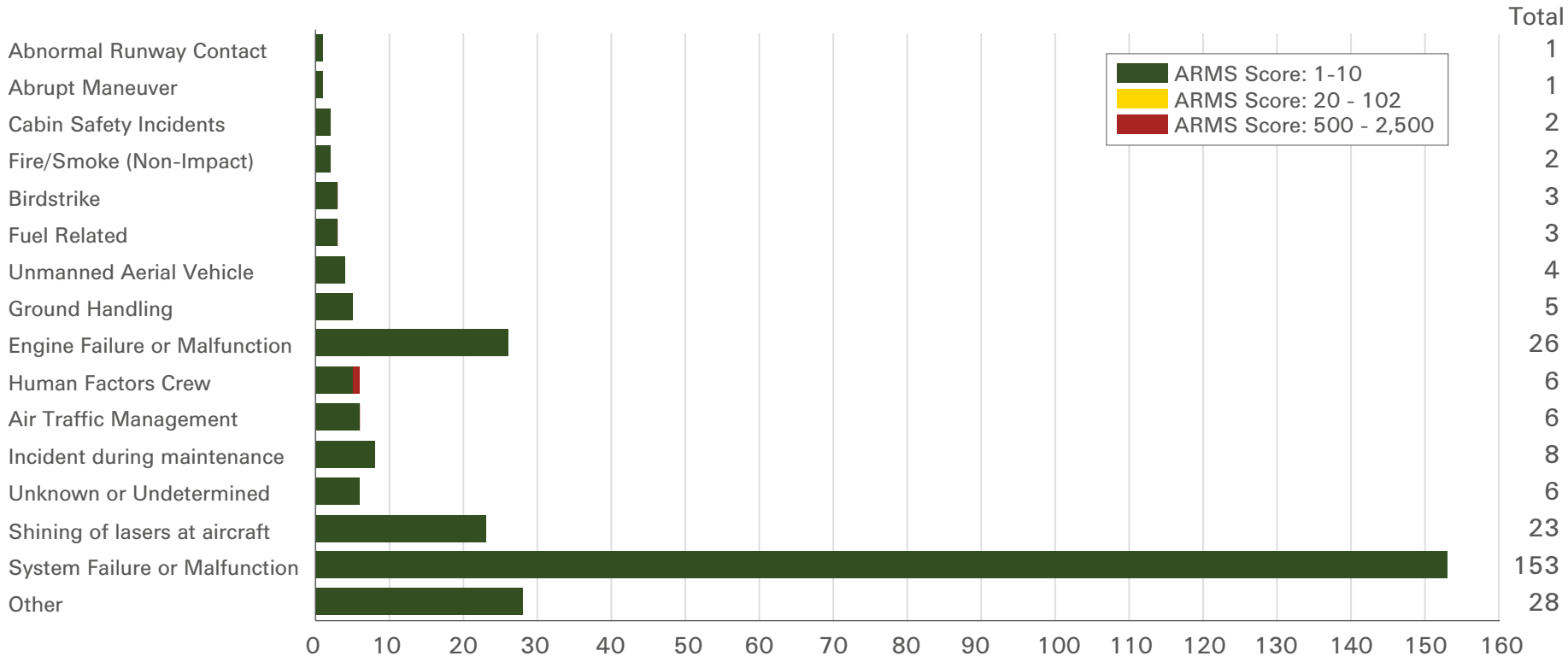
'System failure or malfunction' (SCF-NP) was the second most frequently assigned category to helicopter MORs during 2017. Since 2013 it has been either the most or second most frequently assigned category to helicopter MORs. It captures the failure or malfunction of components on-board the helicopter that are not associated with the engine. None of these occurrences received an ARMS score of greater than 10, indicating there were no circumstances under which the system failure could jeopardise the safety of the aircraft or those on-board.

Three occurrences were assigned an ARMS score that was greater than 10. One of these was categorised as 'Unknown or Undetermined' (UNK) and assigned an ARMS score of between 500 to 2,500, the highest of the risk bands. One risk-bearing MOR was categorised as 'Air Traffic Management' (ATM). This category captures occurrences involving the failure or degradation of ATM services, communication, navigation services and surveillance services; as an example, a NAVAID outage would be categorised as ATM. One of the occurrences classified as 'Other' (OTHR) was also classified as risk-bearing. This category describes occurrences not covered under another category.

For comparison with 2017: Previous occurrence categories and ARMS score assigned to MORs

Between the 1st Jan. 2013 and the 31st Dec. 2016 inclusive the Irish AOC holders opetrating helicopters conducted 35,001 flights and submitted 277 MORs during the same timeframe. The categories assigned to the MORs are summarised in Figure C.4. To illustrate how the types of occurrences are changing over time the order of the categories along the vertical axis reflects that of Figure C.3.

Figure C.4: Categorization of MORs involving helicopter AOC holders that occurred between 2013 and 2016



The two occurrence categories most commonly applied to MORs during this period were 'System failure or malfunction' (SCF-NP) and 'Other' (OTHR). Information on 'System failure or malfunction' was provided earlier in this section. 'Other' (OTHR) captures occurrences that do not fit under an alternative category.

There was one risk-bearing occurrence over the period considered, it was classified as 'Human factors crew' (HF-CREW), a category which describes occurrences initiated through crew error, for example procedural or handling errors.

SECTION D

Air Navigation Services and Aerodromes in Ireland

Construction of surface water drainage channel for Runway 10 / 28 at Dublin airport. Copyright Lagan Clare JV, Photographer Leo Hillier Photography.

Introduction

Aerodromes in Ireland can be broken into two broad categories, those that are either certified or licenced for public use and those that are for private use only. Depending on the nature of the activities undertaken at a private use aerodrome, they may be licensed or unlicensed. Aerodromes licensed for private use accept aircraft engaging in Aerial Work (AW) and other aviation activities, such as General Aviation (GA) or flight training, but not aircraft engaged in Commercial Air Transport (CAT). Aerodromes licensed for public use accept aircraft engaged in CAT and AW as well as those engaged in other aviation activities such as GA flight training. As of the 1st Jan 2017, there were 24 licenced aerodromes in Ireland, 11 for private use and 13 for public use.

Safety requirements for aerodromes are not based around the type of licence held; rather they are in proportion to the type of aircraft that use it and other considerations, such as whether night or low visibility operations are permitted there. The principal difference between the two types of aerodrome is that using a private aerodrome is subject to the prior permission of the licensee while those with a licence for public use must be available to all aircraft on equal terms and conditions and must be open during promulgated hours.

The licenced aerodromes that offered ATC services over this period were Cork, Donegal, Dublin, Galway (until the 8th November 2013), Ireland West, Kerry, Shannon, Sligo, Waterford and Weston aerodromes. The aerodromes licenced for public use over this period consists of the aforelisted aerodromes and expands to include Connemara, Inis Mor, Inis Maan and Inis Oirr, none of which provide ATC services.

Accidents and serious incidents

This section discusses flight hours, departures, accidents and serious incidents involving aircraft engaged in CAT at aerodromes licenced for public use in Ireland where there is an ATC services available. The aircraft involved may be on the Irish or a foreign States aircraft register or hold an AOC issued by the IAA or a foreign NAA. Accidents and serious incidents involving aircraft engaged in GA are not included unless there was a second aircraft involved in the same occurrence that was providing CAT services.

The number of flight hours rose during 2017. Flight hours for every aircraft that enters Irish airspace are calculated from the flight plan as the time difference between when the aircraft enters and exits the controlled airspace of the flight trajectory. It includes en-route traffic, which passes through Irish airspace but does not land (overflight traffic) as well as aircraft that land or depart from an Irish airport (terminal traffic). The number of flights describes the number of aircraft that land and depart at an aerodrome. These fell slightly during 2017.

There were 7 accidents, none of which resulted in fatalities, over the five-year period considered and 16 serious incidents. The non-fatal accident that occurred in 2017 happened when a passenger fell from the aircraft steps and sustained serious injuries as a result.

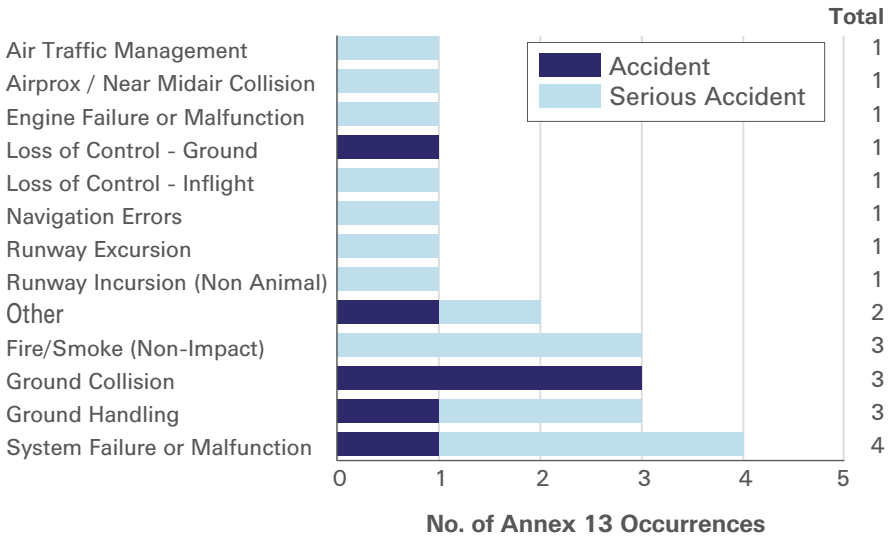
Table D.1: Non-fatal accidents and serious incidents involving CAT at Irish aerodromes that are licenced for public use and provide ATC services

Year	2013	2014	2015	2016	2017	Total
No. flights at Irish airports	229,983	240,728	253,223	274,058	273,440	-
No. flight hours in Irish airspace	267,860	276,584	287,659	309,693	311,715	-
Non-fatal accidents	1	2	2	1	1	7
Serious incidents	2	2	5	3	4	16

Categorization of accidents and serious incidents

Based on the findings of their investigation the AAIU assigns one of the CAST/ICAO common taxonomy categories to the occurrence. The categories may describe the outcome of the occurrence and do not necessarily identify an aspect within the causal chain. Figure D.2 summarises the categories assigned to the 7 accidents and 16 serious incidents that took place between 2013 and 2017.

Figure D.2: Categorisations of Annex 13 occurrences involving CAT that took place at Irish aerodromes that are licenced for public use and provide ATC services



The most common classification applied to accidents was 'Ground collision' (GCOL); it was applied to 3 of the 7 accidents. The categories most commonly applied to serious incidents were 'System failure or malfunction' (SCF-NP) and 'Fire / Smoke (Non-Impact)' (F-NI).

'Ground collision' (GCOL) describes a collision involving an aircraft while taxiing to or from a runway that is in use. It can involve two aeroplanes or one aeroplane and a person, animal, ground vehicle, building or structures such as lighting poles etc. It was also listed as the most commonly assigned accident category in the 2016, 2015 and 2014 ASPRs. During 2017 SRD reviewed occurrences which took place on aerodome apron areas and a report on the analysis, which includes recommendations, has been disseminated to all Stakeholders.

'System failure or malfunction' (SCF-NP) describes the failure or malfunction of components on-board the aeroplane that were not associated with the engine. SCF-NP was listed as the most frequently assigned category to serious incidents in the 2016, 2015 and 2014 ASPRs.

'Fire / Smoke (Non-Impact)' (F-NI) describes occurrences where there was fire or smoke in or on the aircraft that was not the result of impact. It can be assigned to occurrences that took place while the aircraft was in flight or on the ground. It includes fire due to a combustive explosion from an accidental ignition source and from system / component failures / malfunctions in the cockpit, passenger cabin or cargo area.

Number and Rate of ATS MORs: 2016 and 2017

Between the 1st Jan 2016 and the 31st Dec 2017 the ATS providers at the principal aerodromes submitted 2,612 MORs to SRD. All MORs submitted were categorised by an SRD Inspector and the associated risk assessed using the ARMS methodology. Of the 2,612 MORs assessed 185 were identified as being risk-bearing and 11 of these were assigned a score of 500 or greater, indicating they were high-risk events.

To remove the effect of the increasing number of flight hours on the number of MORs submitted, an MOR rate based on the number of flight hours was calculated. This allows a comparison across years by normalising the data. During 2016 and 2017 the Irish ATS providers reported 4.00 and 4.40 MORs per 1,000 flight hours respectively. MOR rates are one indicator of the maturity of an organisations Safety Management System (SMS).

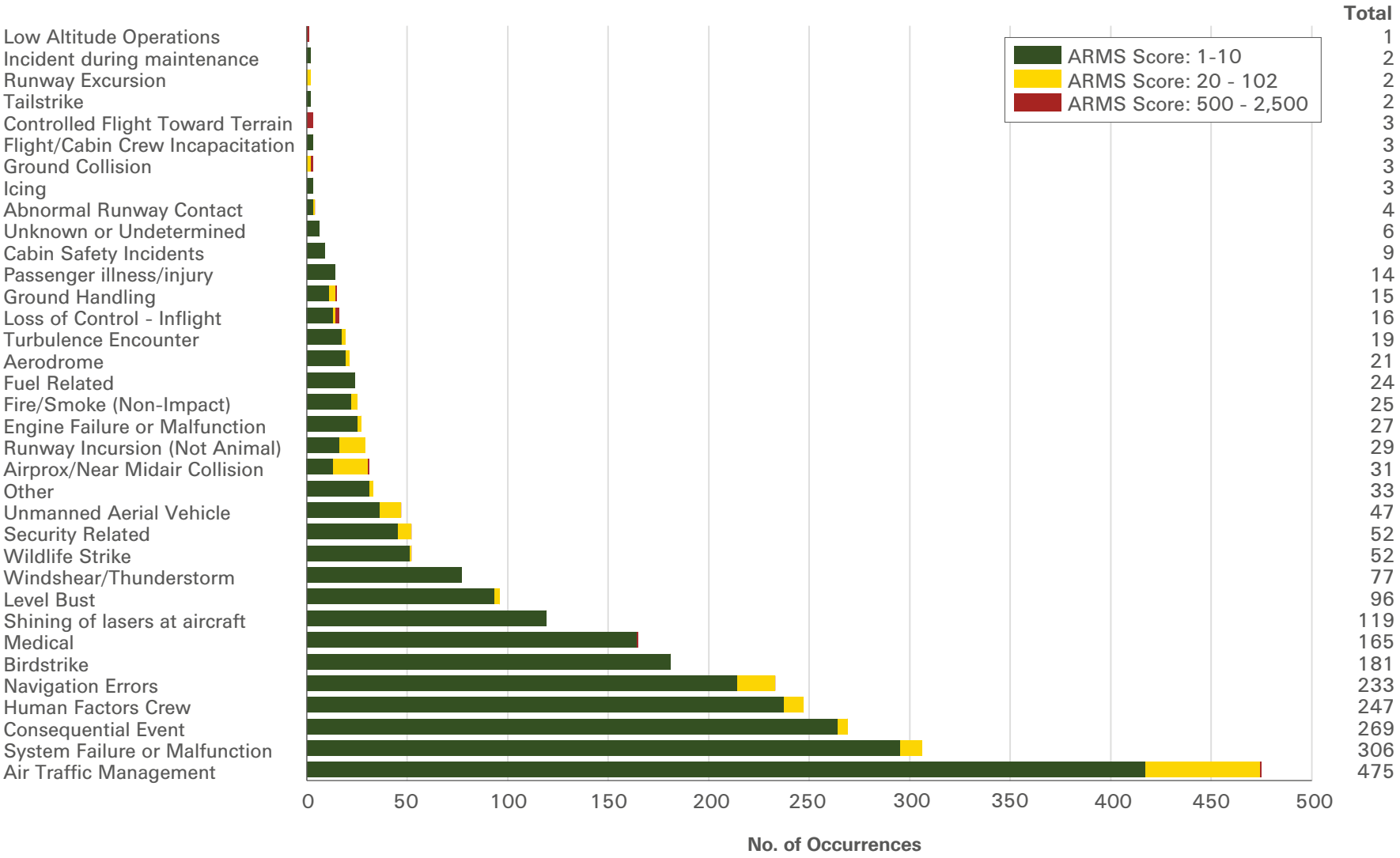
Table D.3: No. and rate of MORs according to ARMS score during 2016 and 2017

Year	Flight hours	Total		ARMS: 1-10		ARMS: 20-102		ARMS: 500 – 2,500	
		Number	Rate	Number	Rate	Number	Rate	Number	Rate
2016	309,693	1,240	4.00	1,150	3.71	89	0.29	1	<0.01
2017	311,715	1,372	4.40	1,277	4.10	85	0.27	10	0.03

2016 and 2017 ATS MORs: Categorisation and ARMS score assigned

As well as assessing the safety risk of MORs using ARMS, the SRD Inspectors assigns it a category that captures the type of event that took place. Figure D.4 summarises this information for MORs that occurred during 2017.

Figure D.4: ARMS score and category assigned to MORs that occurred during 2017



The category most commonly assigned to ATC MORs by SRD Inspectors was 'Air traffic management' (ATM). This is also the category with the largest number of risk-bearing MORs. The second most frequently assigned category was 'System Failure or malfunction' (SCF-NP). The category with the second largest number of risk-bearing MORs was 'Navigation Errors' (NAV).

'Air traffic management' (ATM) captures occurrences involving the failure or degradation of ATM services, communication, navigation services and surveillance services; for example, a NAVAID outage, a controller error or a deficient ATC procedure would all be categorised as ATM. All ATC systems at Irish aerodromes are installed and maintained to international standards and procedures and were developed in accordance with safety management principles. This helps ensure high standards of safety performance, which, as a minimum, meet the provisions of safety regulatory requirements. Due to the safety critical nature of ATM, resilience is built into the system. This takes the form of multiple layers of redundancy and robust contingency plans in the event of a full system failure.

As previously explained, 'System failures or malfunctions' (SCF-NP) describes the failure or malfunction of components on-board the aircraft that are not associated with the powerplant. Over 96% of these MORs were low risk and assigned an ARMS score of 10 or lower.

'Navigation Errors' (NAV) is assigned to occurrences involving the incorrect navigation of aircraft on the ground or in the air. It includes lateral navigation errors caused by using an improper navaid or improper programming of aircraft navigation systems and failure to follow clearances or restrictions while operating on the surface of an aerodrome. It does not include deviations from assigned altitude or course to avoid other aircraft as a result of visual detection or complying with a TCAS RA.

Number and rate of aerodromes MORs during 2016 and 2017

Between 1st Jan 2016 and 31st Dec 2017 SRD received 828 MORs relating to ground handling activities and services and although over 96% of MORs were not associated with any safety risk, 30 were identified as being risk-bearing.

To remove the effect of a different number of aircraft arriving at the Irish aerodromes each year on the number of MORs submitted, an MOR rate based on the number of movements conducted was calculated. This allows a comparison across years by normalising the data. During 2016 and 2017 the Irish airside service providers reported 1.12 and 1.73 MORs per 1,000 movements respectively.

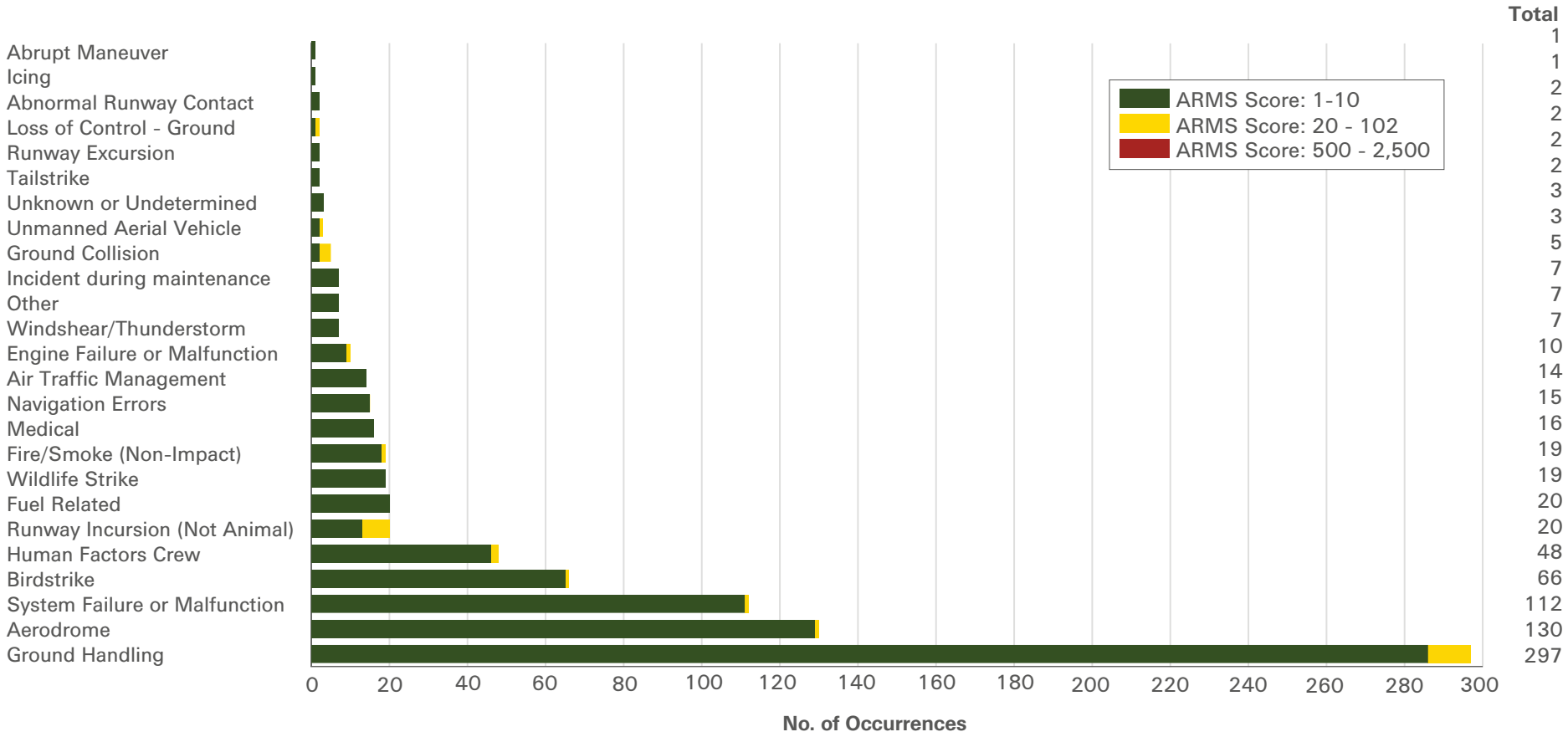
Table D.5: No. and rate of MORs according to ARMS score during 2016 and 2017

Year	Movements	Total		ARMS: 1-10		ARMS: 20-102		ARMS: 500 – 2,500	
		Number	Rate	Number	Rate	Number	Rate	Number	Rate
2016	292,708	328	1.12	312	1.07	16	0.05	-	-
2017	288,400	500	1.73	486	1.69	14	0.05	-	-

2016 and 2017 Aerodrome MORs: Categorisation and ARMS score assigned

All of the MORs submitted by airside service providers have been assigned a category that captures the type of event that took place and the associated safety risk has been assessed using ARMS. Figure D.6 summarises this information for MORs that occurred during 2016 and 2017.

Figure D.6: ARMS score and category assigned to MORs that occurred during 2016 and 2017



'Ground handling' (RAMP) had the largest number of MORs and risk-bearing MORs. During the same years 'Aerodrome' (ADRM) had the second highest number of MORs and 'Runway incursion (Not animal)' (RI-VAP) the second highest number of risk-bearing MORs.

'Ground handling' (RAMP) describes a wide variety of occurrences that may take place during, or as a result of, ground handling operations. Occurrences categorised as such include issues relating to snow / frost / ice removal from the aircraft, pushback / powerback / towing errors and aircraft external preflight configurations errors. During 2017 SRD reviewed occurrences which took place on aerodome apron areas. A report on the analysis, which includes recommendations, has been disseminated to all Stakeholders.

'Aerodrome' (ADRM) describes occurrences involving aerodrome design, service or functionality issues and they do not necessarily involve an aircraft. All Irish aerodromes are maintained to international standards. This helps ensure high standards of safety performance, which, as a minimum, meet the provisions of safety regulatory requirements.

ICAO define a 'Runway incursion (Not animal)' (RI-VAP) as being 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. They are one of the IAAs Key Safety Performance Indicators (KSPIs) and the number and rate of RI-VAPs is closely monitored by the IAAs SRD.

SECTION E

General Aviation

Built in Kansas in 1942 the Spirit of Tipperary was first flown in Europe during the closing years of WWII. Today it is based at the Lyons estate in Co. Kildare and can still be seen flying in Irish skies. Photographer Paul Kolbe - Hurley.

Scope of Analysis and Sources of Data

General Aviation (GA) covers all civil aviation other than CAT (Commercial Air Transport) or AW (Aerial Work). This section summarises information on Voluntary Occurrence Reports (VORs) as well as accidents and serious incidents involving aircraft engaged in GA according to the type of aircraft being flown. Irish and foreign civil aircraft registers were used to determine the type of aircraft involved in the accidents and serious incidents. In previous ASPRs helicopter activity carried out in Irish territory by Operators conducting CAT and declared activities was included within the GA section. The back-data provided in this section for 2013, 2014, 2015 and 2016 has been updated to reflect the change.

Voluntary Occurrence Reporting

Since its launch in 2012 a total of 52 VORs (11%) relating to GA have been submitted to SRD. Of these 26 related to light aircraft operations, 16 to drone operations and 10 were submitted by the general public, mainly to report annoying or hazardous flying in their vicinity. The VORs submitted by GA pilots and drone operators addressed operational hazards experienced during flight as well as light aircraft technical failures. VORs concerning drone operations have become more prevalent in the last two years reflecting the significant growth in drone activity during this period.

The IAA would like to see more use of the voluntary reporting system by the General Aviation industry and the IAA, in conjunction with the General Aviation Safety Council of Ireland (GASCI), will continue to promote voluntary reporting.

General Aviation: Aeroplanes

This section provides fatal accident, non-fatal accident and serious incident statistics for fixed-wing aeroplanes involved in GA activity according to whether the aircraft had an Maximum Take-Off Mass (MTOM) less than or greater than 2,250 kg.

The data is further broken down according to whether the aircraft was registered on the Irish civil aircraft register or on the civil aircraft register of a foreign State. The number of Irish registered aircraft in each category is also provided. There is no information available on the number of aeroplanes permanently based in Ireland and listed on a foreign aircraft register.

Aeroplanes with an MTOM below 2,250 kg

Between the 1st Jan. 2013 and the 31st Dec. 2017 the number of aeroplanes registered with the IAA that have an MTOM below 2,250 kg fell slightly from 186 to 181.

Over the same period there were 24 accidents, 6 of which involved aeroplanes on a foreign aircraft register and 18 involving aircraft on the Irish aircraft register. Of these, 3 accidents resulted in fatalities. They occurred during 2015, 2016 and 2017.

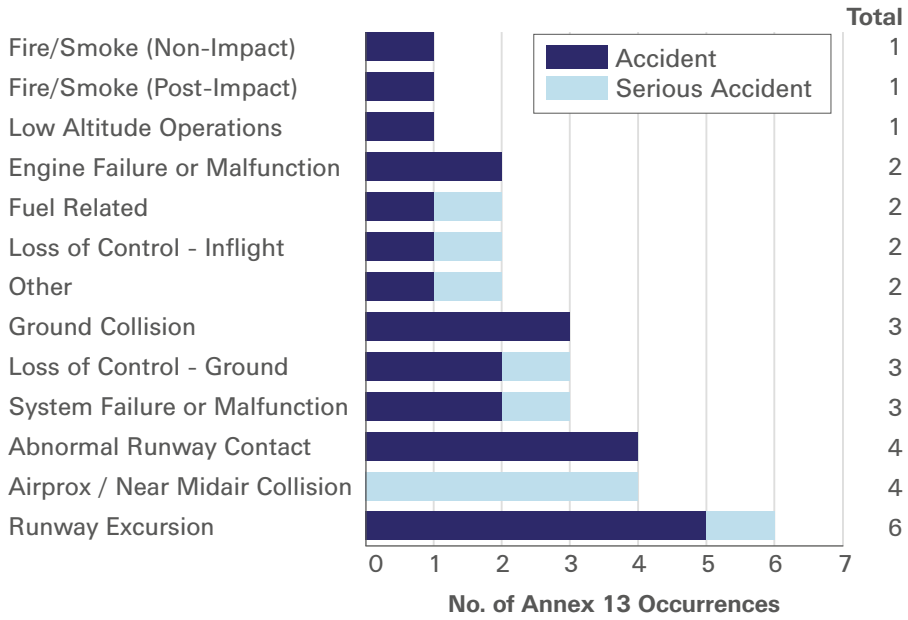
During the same period 10 serious incidents occurred. Given the number of accidents this is a surprisingly low number, a rough rule of thumb used in CAT is there are three serious incidents for every accident.

Table E.1: No. of accidents, fatal accidents and serious incidents involving GA aeroplanes with an MTOM below 2,250 kg

Year	Registered with IAA	Irish reg. accidents		Foreign reg. accidents		Total accidents	Serious incidents		
		Non-fatal	Fatal	Non-fatal	Fatal		Irish reg.	Foreign reg.	Total
2013	186	3	-	-	-	3	1	1	2
2014	184	3	-	3	-	6	-	-	-
2015	182	3	1	1	-	5	1	-	1
2016	182	3	-	-	1	4	-	1	1
2017	181	4	1	1	-	6	2	4	6
Total	-	16	2	5	1	24	4	6	10

During the course of its' investigation the AAIU assigns one of the CAST / ICAO common taxonomy categories to the accident or serious incident. The purpose of this is to assist in identifying safety issues. In some cases' the category describes the end-result in a chain of events rather than the cause.

Figure E.2: Categorisations applied to accidents and serious incidents involving GA aeroplanes with an MTOM below 2,250 kg



'Runway excursion' (RE) was applied to 5 accidents and 1 serious incident involving GA aeroplanes with an MTOM below 2,250 kg. This was the largest number of times a category was applied to Annex 13 occurrences within this area. The most commonly assigned category to serious incidents was 'Airprox / near midair collision' (MAC), which was applied 4 times.

Aeroplanes with an MTOM above 2,250 kg

On the 31st Dec. 2017 there were 9 aeroplanes on the Irish aircraft register with an MTOM greater than 2,250 kg that are being used for GA activity. None of these aircraft were involved in an accident or serious incident over the period.

Table E.3: No. of GA aeroplanes with an MTOM above 2,250 kg on the Irish aircraft register

(There were no accidents or serious incidents over the period considered)

Year	2013	2014	2015	2016	2017	Total
Registered with IAA	9	8	8	8	9	-
Foreign reg. non-fatal accidents	-	1	-	-	-	1
Foreign reg. fatal accidents	-	-	1	-	-	1

Since 1st January 2013 2 aeroplanes on foreign NAAs aircraft registers experienced accidents, 1 of which resulted in fatalities. The non-fatal accident occurred in 2014 and was categorised as 'Runway excursion' (RE). The fatal accident occurred in 2015 and was categorised as 'Controlled flight into terrain' (CFIT).

General Aviation: Helicopters

This section provides fatal accident, non-fatal accident and serious incident statistics for helicopters involved in GA activity according to whether the aircraft had an MTOM less than or greater than 2,250 kg.

The data is further broken down according to whether the aircraft was registered with the IAA or foreign register. The number of Irish registered aircraft in each category is also provided. There is no information available on the number of helicopters that are listed on a foreign aircraft register and permanently based in Ireland.

Helicopters with an MTOM below 2,250 kg

The number of helicopters with an MTOM below 2,250 kg that are on the IAA aircraft register has fallen slightly from 24 in 2013 to 19 in 2017. None of the aircraft on the Irish aircraft register in this category were in an accident or a serious incident over the period considered.

There were 4 non-fatal accidents in Ireland involving aircraft on a foreign aircraft register between 1st Jan. 2013 and 31st Dec. 2017. They were categorised by the AAIU as 'Collision with obstacles during take-off and landing' (CTOL, 2 accidents), 'Loss of control in flight' (LOC-I, 1 accident) and 'Loss of control on the ground' (LOC-G, 1 accident).

There was 1 serious incident over the same period and it was categorised as 'Airprox / near midair collision' (MAC, 1 serious incident).

Table E.4: No. of accidents and serious incidents involving GA helicopters with an MTOM below 2,250 kg
(There were no fatal accidents over the period covered)

Year	2013	2014	2015	2016	2017	Total
Registered with IAA	24	22	18	21	19	-
Foreign reg. non-fatal accidents	-	1	2	1	-	4
Foreign reg. serious incidents	-	-	1	-	-	1

Helicopters with an MTOM above 2,250 kg

On the 31st Dec. 2017 there were 5 helicopters on the Irish aircraft register that were above 2,250 kg and used for GA activity. Over the period considered this figure has remained fairly static. There were no accidents or serious incidents involving these aircraft over the time frame considered.

During 2017 a helicopter on a foreign aircraft register experienced a non-fatal accident in Ireland. It has been classified as 'Loss of control in flight' (LOC-I) by the AAIU.

Table E.5: No. of GA helicopters with an MTOM above 2,250 kg on the Irish aircraft register
(No accidents or serious incidents over the period considered involving Irish reg. aircraft in this category)

Year	2013	2014	2015	2016	2017	Total
Registered with IAA	6	5	6	5	5	-
Foreign reg. non-fatal accident	-	-	-	-	1	1

General Aviation: Microlights

Between 1st Jan. 2013 and the 31st Dec. 2017 the number of microlights on the Irish civil aircraft register has increased from 133 to 161.

Over the same period there were 4 microlight accidents in Ireland, 1 of which occurred during 2017. None of the accidents resulted in fatalities. Of these accidents 3 involved microlights that were on a foreign States aircraft register and 1 involved a microlight that was on the Irish aircraft register. The categories assigned to accidents were Abnormal Runway Contact (ARC), Fuel Related (FUEL), Low Altitude Operations (LALT) and Loss of Control - Inflight (LOC-I).

Over the same period a microlight that was on a foreign States aircraft register was involved in 1 serious incident. It occurred during 2016 and was classified as 'Engine Failure or Malfunction' (SCF-PP).

Table E.6: No. of accidents and serious incidents involving microlight aircraft
(There were no fatal accidents over the period considered)

Year	Reg. with IAA	Non-fatal accidents			Serious incidents		
		Irish reg.	Foreign reg.	Total	Irish reg.	Foreign reg.	Total
2013	133	-	1	1	-	-	-
2014	138	-	1	1	-	-	-
2015	149	-	-	-	-	-	-
2016	153	-	1	1	1	-	1
2017	161	1	-	1	-	-	-
Total	-	1	3	4	1	-	1

General Aviation: Paragliders, Powered Paragliders and Powered Parachutes

A paraglider is a wide canopy resembling a parachute that is attached to a person's body by a harness in order to allow them to glide through the air after jumping from or being hauled to a height. Powered paragliding, also known as paramotoring, is a form of aviation where the pilot wears a motor on their back to provide enough thrust to take-off using an adapted paraglider wing. Powered parachuting utilises a self-powered flying parachute equipped with a motor. Paragliders and powered parachutes are not included on the Irish civil aircraft register, however powered paragliders are since 2016.

There were 2 accidents involving paragliders, powered paragliders and powered parachutes between 2013 and 2017 in Ireland. One of these accidents resulted in fatalities. The AAIU categorised both accidents as 'Loss of control in flight' (LOC-I). There were no serious incidents during this timeframe.

Table E.7: No. of accidents involving paragliders, powered paragliders and powered parachutes
(There were no serious incidents over the period covered)

Year	2013	2014	2015	2016	2017	Total
Fatal acc. (reg. with foreign NAA)	-	-	-	1	-	1
Non-fatal accidents (Irish reg.)	-	1	-	-	-	1
Reg. with IAA	Owners not required to register powered paragliders until 2016			5	11	-

General Aviation: Sailplanes and Powered Sailplanes

A sailplane is a type of glider aircraft with rigid wings and an undercarriage. Powered sailplanes have motors that can be used for take-off or to allow the pilot to fly for an extended period. Some gliders may be launched by a tug aircraft or vehicle. The EASA basic regulation does not apply to Annex II (g) gliders with a maximum empty mass of no more than 80 kg when single seater or 100 kg when two-seater, including those which are foot launched.

On the 31st Dec. 2017 there were 24 sailplanes / powered sailplanes on the Irish aircraft register. The number of these aircraft types on the Irish aircraft register has remained close to static over the five-year period considered. This category of aircraft was not involved in any accidents or serious incidents over the five years considered.

Table E.8: No. of serious incidents involving sailplanes and powered sailplanes
(There were no accidents or serious incidents over the period covered)

Year	2013	2014	2015	2016	2017	Total
Reg. with IAA	27	27	25	24	24	-

General Aviation: Gyroplane

A gyroplane is a type of rotorcraft which uses an unpowered rotor in autorotation to develop lift, and an engine-powered propeller, similar to that of a fixed-wing aircraft, to provide thrust. Single and two-seater gyroplanes with a maximum take-off mass not exceeding 560 kg are regulated through Ireland's national legislation. Larger gyroplanes are regulated by EASA.

On the 31st Dec. 2017 there were 18 gyroplanes on the Irish aircraft register. This figure has remained almost static over the five-year period considered. Gyrocopters were involved in 1 non-fatal accident, categorised as 'Loss of control in flight' (LOC-I), during 2014.

Table E.9: No. non-fatal accidents and serious incidents involving gyroplanes
(There were no fatal accidents or serious incidents over the period covered)

Year	2013	2014	2015	2016	2017	Total
Registered with IAA	15	17	16	18	18	-
Non-fatal acc. (Irish reg.)	-	1	-	-	-	1

General Aviation: Hot Air Balloon Aircraft

A hot air balloon consists of an envelope, which is capable of containing heated air, suspended above a gondola or wicker basket, which carries people and a source of heat such as an open flame. The heated air inside the envelope makes it buoyant and allows the aircraft to become airborne.

There have been 10 hot air balloons on the Irish aircraft register for the last five years. There were no reports of any accidents involving balloons between 2013 and 2017 in Ireland.

Table E.10: Total no. of accidents involving sailplanes and powered sailplanes
(There were no accidents or serious incidents over the period covered)

Year	2013	2014	2015	2016	2017	Total
Reg. with IAA	10	10	10	10	10	-

General Aviation: Parachuting

Parachuting is distinguished from the para-gliding / motoring activities discussed earlier in this section by the fact that the parachute flight commences from an airborne aircraft and they return to earth using only gravity. The rate of descent is slowed during the last part of the jump using a parachute or other means, such as a wing suit.

The figures in this subsection relate solely to accidents and serious incidents to parachutists after they exited the aircraft and were clear of the aircraft. Not all of the injuries sustained by parachutists as a result of jump resulted in the incident being classified by the AAIU as an accident or a serious incident. Accidents or serious incidents involving aircraft engaged in parachuting activity are included in the subsections on fixed-wing aircraft engaging in GA activity. Over the 5 years considered there was 1 accident. It occurred during 2015 when the main parachute became entangled around the right-hand side horizontal stabiliser of the aircraft. There were no serious incidents.

Small Unmanned Aircraft

A Small Unmanned Aircraft (SUA) also called a drone, an RPAS or UAV, is an unmanned aircraft and their use is becoming increasingly prevalent in Ireland. Currently operators are not required to obtain a licence to fly a drone within the restrictions of the legislation; however the IAA recommends that everybody who intends to do so undertakes a course of safety training.

Under SI 563 of 2015 'Small Unmanned Aircraft (Drones) and Rockets Order, 2015' all drones and model aircraft over 1 kg, including the weight of the battery and all attached equipment, must be registered with the IAA by their owner. Owners of drones that weigh less the 1 kg may also register their aircraft with the IAA; however there is no regulatory requirement to do so. Owners can register the aircraft via the IAA website at www.iaa.ie/drones. This facility was made available during December 2015. On the 31st December 2017 there were 8,563 drones on the Irish drone register.

Reports and complaints applying to drones

If a drone has been operated in an unsafe manner, involved in a safety incident or operated in such a way contrary to SI 563 of 2015, it should be reported into the IAA via the Voluntary Occurrence Reporting (VOR) system. The safety implications of all reported incidents may be investigated by an SRD Inspector. Further information on how to use the VOR system is provided in Section A. If the concern relates to breaches of privacy the incident should report to the Data Commissioners. They have issued guidelines on their website, which may be accessed via the following address: www.dataprotection.ie/docs/Guidance-on-the-use-of-Drone-Aircraft/1510.htm For more detailed information on drones please see the following section on the IAAs website: www.ie/general-aviation/drones.

This page: The Patrouille Tranchant, a French civic aerobatic team, at the Bray International Airshow in July 2017. Photographer Jason Phelan.

Back page: S92 R115 pictured during a winching phase. Photographer Pat Flynn.

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Disclaimer

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Photography enthusiasts who work within the Irish aviation industry or enjoy flying recreationally around Ireland provided most of the images that appear within this document. We would like to take this opportunity to thank everyone who granted us permission to use his or her work. The IAA would like to continue using photographs showing different aspects of Irish aviation and its support systems within future Annual Safety Performance Reviews. If you took a photograph you are willing to let us use, please send it to us at Kathleen.Cussen@IAA.ie with some information for the photo caption.

Scope and Content of the Report

The Annual Safety Performance Review provides statistics on safety in the Irish aviation industry. Information relating to the safety activity the IAA has undertaken or intends to undertake is presented in the IAAs State Safety Plan. The IAAs intends to publish its 2018 – 2021 State Safety Plan during Q2 2018. Previous editions of the State Safety Plan are available on the IAAs website.

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