Annual Safety Performance Review for Ireland 2021

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Foreword

Welcome to the Irish Aviation Authority's (IAA's) Annual Safety Performance Review (ASPR) for 2021, a year where the Covid-19 pandemic stubbornly continued to strangle-hold the many attempts globally to return human activity to some degree of pre-Covid normality.

In Ireland, 2021 was a year of two halves; in the first half re-start attempts succumbed to the different COVID-19 variants that circumnavigated the globe, while in the second half the benefits of mass vaccination programs and the EU digital Covid Certificate yielded more success. The integration of safety risk management and collaboration were fundamental in the sporadic recovery attempts by organisations within the aviation industry in the management of such dynamic and extreme changes.

This ASPR provides an aggregated summary safety performance of organisations divided into aviation sectors, based on types of operation and level of activity. It is in line with the layout of previous years to facilitate analysis of annual trends.

The Irish civil aviation industry experienced only a partial recovery in 2021. There was a modest 27% increase in Commercial Air Transport (CAT) movements in 2021 compared to 2020 but this only equated to 49% of 2019's movements. Similarly, the level of Irish ATC controlled flight hours, while up 18% on 2020, remained at only 48% of the level of activity recorded in 2019. The number of aircraft on the Irish register decreased with a record number of aircraft in storage.

Globally the accident rate involving scheduled commercial flights on airplanes above 5.7 tonne fell from 3.7 per million departures in 2020 to 0.57 in 2021. EASA Member States' operators did not experience any CAT fatal accidents. In Ireland there were no fatalities in 2021 and the main statistics for accidents and serious incidents in commercial aviation don't reveal any Covid-19 related issues and show reducing trends in many areas.

As the industry endeavours to build back up in 2022 amid some positive signs like the pent-up demand for air travel and less harmful later Covid-19 variants, regrettably other disruptors have appeared on the horizon such as the Russian invasion of the Ukraine, rising fuel costs, disrupted supply chains, climate change concerns and cyber security threats. The intensive risk management skills gained over the past two pandemic years will be required in the monitoring of hazards and mitigation of risks in a fragile recovering industry over the coming year.

The safety performance data presented here forms one element of the safety intelligence inputs that are employed to ensure an ever-vigilant risk monitoring and management system for the Irish state safety programme. As ever, a healthy safety occurrence reporting culture is required in order to gain the most accurate indication of how that sector or organisation is performing. The IAA encourages and welcomes the active participation of all involved in any aspect of civil aviation to report safety concerns to their organisation or to the IAA at (https://www.iaa.ie/safety/safety-reporting) so that lessons can be learnt and safety levels continuously improved.

Thank you for taking the time to read this review.

Diarmuid Ó Conghaile, Aviation Regulator and CEO Designate

Executive summary

This Annual Safety Performance Review for Ireland is compiled by the Safety Regulation Division (SRD) of the Irish Aviation Authority (IAA) and is the 13th consecutive year of publication. It presents the safety performance of Irish civil aviation to the end of 2021 along with the main safety issues as identified by the IAA. This review is prepared using State Annex 13 data and occurrence reporting data collected in accordance with EU 376/2014 along with safety information provided at EU (e.g. EASA) and global (e.g. ICAO) levels.

The report presents the safety performance information under the following four main sectors of Irish civil aviation, which are defined by their primary type of operation and consequent similarity in terms of risk exposure:

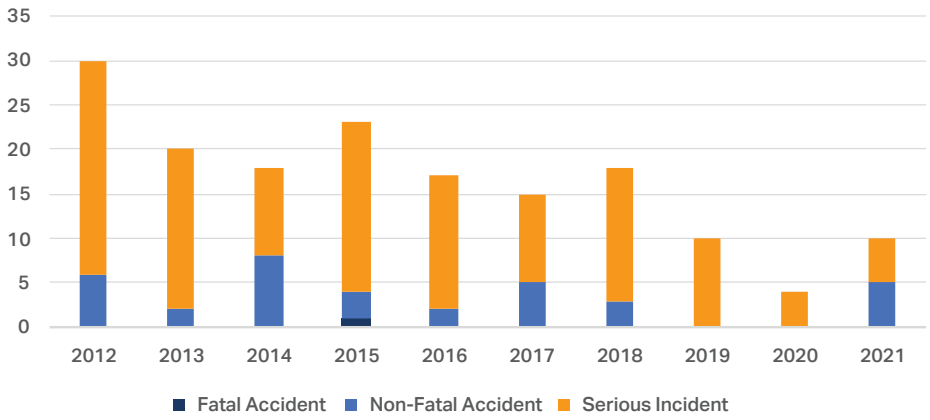
- The Irish Fixed-Wing Commercial Air Transport Sector
- The Irish Commercial Helicopter Sector
- Air Navigation Services and Aerodromes in Ireland
- General Aviation in Ireland

The initial Infographics provide an overview of the main performance statistics for each of these sectors. Further details on the supporting information is presented within the associated chapters on a tiered basis, with Annex 13 data, occurrence reporting charts and analysis of the associated safety issues.

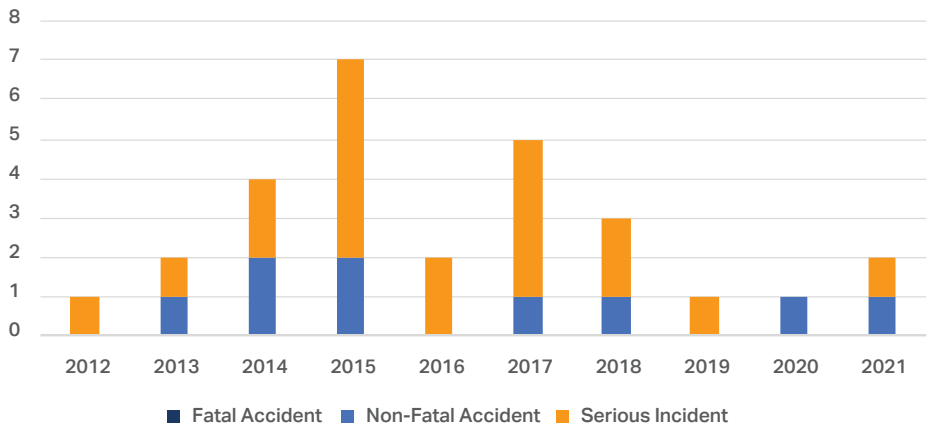
As the pandemic continued to exert it's influence over the aviation industry throughout 2021 this year's review presents additional graphs that enable a comparative analysis of safety performance during the Covid years (2020-2021) vis-à-vis the pre-Covid years (2017-2019). This approach has been adopted to enable a determination of any peculiar outcomes from the risks posed during the pandemic. Also given the scarcity of data in each of the years 2020 and 2021 an analysis of the data for those similarly unique years combined should highlight more meaningful directly associated results.

Ten Year Charts

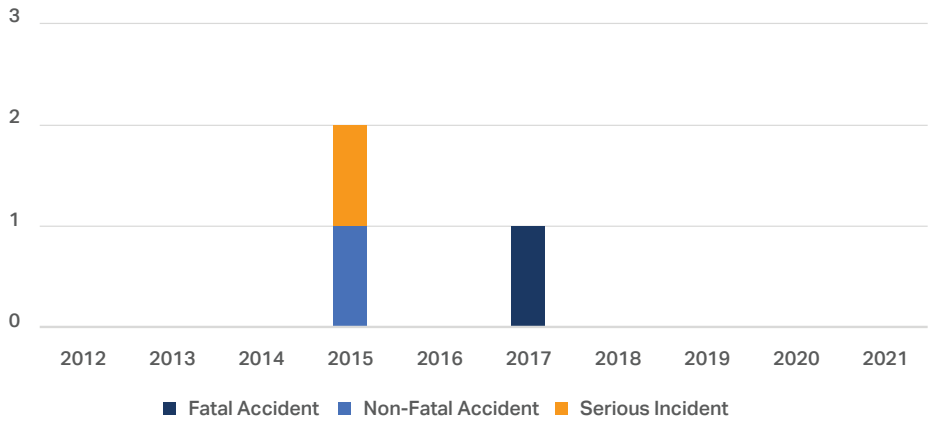
Commercial Air Transport - Fixed Wing



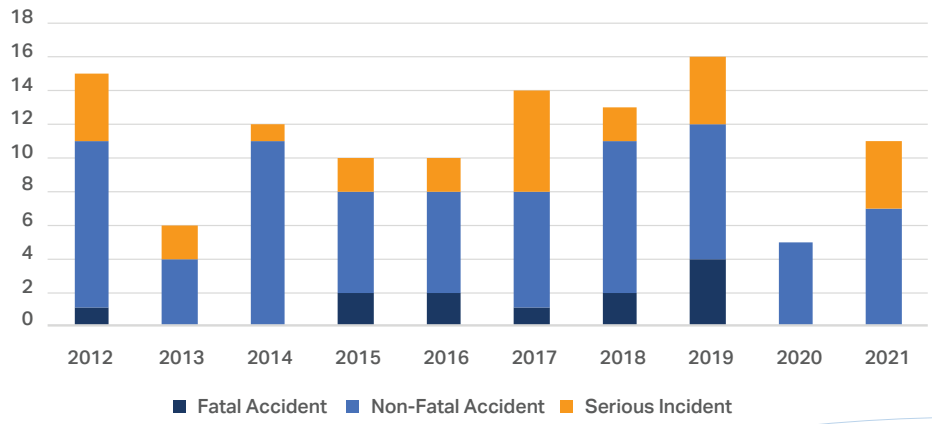
Commercial Air Transport at Irish Certified/licenced Aerodromes with ATS



Commercial Helicopter



General Aviation



Irish Air Fixed-Wing Commercial Air Transport Sector

Irish fixed-wing aircraft engaged in CAT were involved in 13 accidents between 2017 and 2021. During 2021 there were no fatal accidents and 5 non-fatal accidents. The categories most commonly applied by the Safety Investigation Authority (SIA) over this five year period were:

Ground Handling

Turbulence Encounter

Ground Colllision

There were 44 serious incidents between 2017 and 2021, 5 of which occurred in 2021. The categories most commonly applied by investigating SIAs to serious incidents were:

System failure or malfunction

Airprox/near midair collision

Runway Incursion (non-animal)

During the pandemic years, 2020 & 2021, Irish AOC holders submitted 7,354 MORs. Between 2017 and 2020 they submitted 28,346 MORs. The categories most commonly assigned by the IAA to these MORs were:

Cabin Safety

System failure or malfunction

Medical

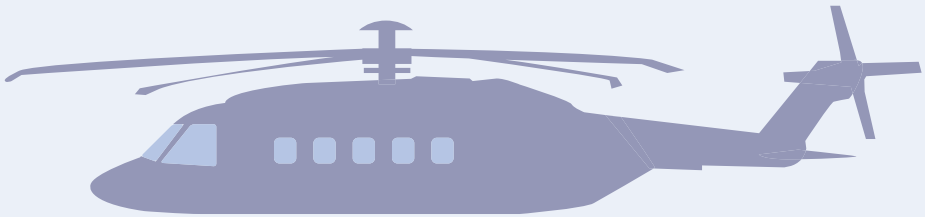
Pre-covid, between 2017 and 2019, 25,364 MORs were submitted by Irish AOC holders. The categories most commonly assigned by the IAA to these MORs were:

System failure or malfunction

Birdstrike

Ground Handling

The Irish Commercial Helicopter Sector



The accident and serious incident figures provided cover helicopter operators who hold an AOC issued by the IAA and helicopter aviation activity carried out in Irish territory by Operators conducting CAT and declared activities.

Between 2017 and 2021 these operators experienced 1 fatal accident which occurred in 2017 and was categorised as 'Controlled Flight into Terrain'.

During 2020 and 2021, helicopter operators who hold an AOC issued by the IAA submitted 76 MORs. The categories most commonly applied to these MORs were.

Other

System failure or malfunction

Ground Handling

Between 2017 and 2019, helicopter operators who hold an AOC issued by the IAA submitted 136 MORs. The three most commonly applied categories to these MORs were.

Other

System failure or malfunction

Navigation Errors

Air Navigation Services and Aerodromes in Ireland

Between 2017 and 2021 there were 4 non-fatal accidents and 8 serious incidents involving CAT aircraft at Irish certified/licenced aerodromes that provide ATC services. During 2021 there was no fatal accidents, 1 non-fatal accident and 1 serious incidents.

The ATS providers submitted 1,786 MORs between 2020 and 2021. The three occurrences categories most commonly assigned to these MORs were:

Navigation Errors

Air traffic management

Windshear Thunderstorm

Between 2017 and 2019, ATS providers submitted 4,829 MORs. The three most commonly assigned occurrence categories were:

Air traffic management

Navigation Errors

System failure or malfunction

Between 2020 and 2021, Aerodrome operators submitted 770 MORs, the three most commonly assigned occurence categories were:

Aerodromes

Ground Handling

Navigation Errors

Between 2017 and 2019, Aerodrome operators submitted1,543 MORs, the three most commonly assigned occurence categories were:

Ground Handling

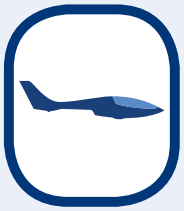
Other

Aerodromes

General Aviation in Ireland 2017 - 2021

Aeroplanes over 2,250 kg
1 Fatal Accident
2 Non-Fatal Accidents
1 Serious Incident

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



Sailplanes and Powered Sailplanes
0 Fatal Accidents
2 Non-Fatal Accidents
0 Serious Incident

Aeroplanes under 2,250 kg
3 Fatal Accidents (incl 1 homebuilt)
19 Non-Fatal Accidents (incl 4 homebuilt)
13 Serious Incidents (incl 2 homebuilt)

Helicopters under 2,250 kg
0 Fatal Accidents
2 Non-Fatal Accidents
0 Serious Incidents

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

Microlight
2 Fatal Accidents
7 Non-Fatal Accidents
0 Serious Incidents

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

Paragliders, Powered Paragliders and Powered Parachutes
1 Fatal Accident
3 Non-Fatal Accidents
2 Serious Incident

SECTION A

INTRODUCTION

The global pandemic that initially manifested itself in 2020 continued to heavily impact all aspects of our lives in 2021, but especially the aviation industry as it grappled with the fallout from the disease itself and the implementation of containment strategies while attempting to restart operations. Hopes and plans of a prompt return to normal operations were routinely dashed as variant waves turned a sprint into an ongoing marathon.

Resilience was the order of the day in trying to maintain a steady course through the risks posed in these unchartered waters. The second half of the year provided signs of a more sustainable recovery with variants becoming less harmful and vaccination programs enabling the safer movement of people. It is essential to gauge how the industry performed from a safety perspective in this atypical year so that the lessons learnt can assist in addressing any future similar threats.

The IAA Safety Regulatory Division (SRD) is responsible for ICAO Annex 19 functions of safety performance monitoring in the State. In addition to the regulatory oversight of the Irish civil aviation industry, SRD monitors safety performance of the industry through the collection, analysis and exchange of safety data. The collection and analysis of occurrence reports in accordance with Regulation (EU) No 376/2014 enables enhanced safety intelligence that allows for the identification and optimisation of safety measures that can target the areas of greatest risk.

This annual report presents an aggregated summary of the main safety intelligence derived from safety performance monitoring at State level. In addition, tailored reviews of pertinent safety issues are conducted with individual regulated organisations.

The data sources for this report include the independent Irish Air Accident Investigation Unit for accident and serious incident investigations as well as the analysis of occurrence reports submitted to the IAA. In accordance with regulations the statistical information is presented in an aggregated manner so that individuals involved are not identified.

While there were no fatalities in Irish civil aviation in 2021, sadly, the report addresses a small number of fatal accidents in previous years and the IAA offers sincere sympathies to family and friends of the deceased in these cases. The IAA, in conjunction with all the stakeholders in the civil aviation sector in Ireland, has implemented safety risk management processes to try to prevent fatalities in aviation, and sharing the lessons learned from such tragic accidents is a vital part of the process.

Covid-19

The protracted nature and impact of the pandemic is evident in the following figures. Total Irish air traffic levels increased a modest 18% in 2021 on 2020 levels but were still down 51% when compared to 2019. The situation is even more stark for commercial terminal movements which only increased 2% in 2021 year on year and remained at only 59% of 2019 levels. Undoubtedly the sustained financial impacts will lead to long-term challenges.

This novel risk environment has become the new normal with the extension of this pandemic into a second year. As part of its Safety Risk Management (SRM) process the IAA has been working with EASA Advisory Bodies and Network of Analysts to help identify the key risks impacting all operations, including the specific risks identified due to COVID-19.

The decreased level of activity has also led to a resultant reduction in occurrence data, and this has created an anomaly in determining year on year trends. Consequently, parts of this review have adopted a pre-Covid-19 (2017-2019) versus Covid-19 (2020-2021) comparative analysis to assist in discerning any Covid-19 related safety issues.

Occurrence Reports

Aviation safety is supported by a robust regulatory framework that includes strict regulations on occurrence reporting. The regulations include mandatory provisions for who should report safety occurrence and the type of occurrences that must be reported. They also require organisations and States to establish appropriate systems to facilitate the collection and analysis of such reports and provide follow up details on the results of the investigation of these reports. The regulations also provide for voluntary reporting systems to enable any person to report occurrences to address any safety concern. For further details on how to report to the IAA see https://www.iaa.ie/safety/safety-reporting

Occurrence reports are subject to investigation and analysis by regulated organisations and the IAA, and both entities are required to ensure that any safety concerns are addressed in a manner commensurate with the level of safety risk identified. To achieve this objective, each occurrence report is subjected to a risk classification that is used to target the higher risk occurrence for more immediate safety action. Only a very small proportion of occurrences reported to the IAA concern an accident or a serious incident.

The IAA uses an EU developed aviation risk classification methodology, Airline Risk Management Solutions (ARMS), that is used to assign a risk score to each individual occurrence. The methodology includes a risk matrix with associated traffic light colour scheme, whereby green represents low risk, amber represents medium risk and red represents high risk. Where relevant, statistical charts on occurrences provided in this review include this risk classification colour scheme. The vast majority of occurrence reports to IAA were classified as low risk, however it remains important to monitor these events to ensure they remain under control.

The IAA, in common with all other aviation authorities across the world, receives thousands of occurrence reports each year that are subject to safety analysis. To support this analysis, ICAO has endorsed an occurrence reporting "Common Taxonomy" which facilitates the categorisation of events using standardised terminology to improve the aviation community's capacity worldwide to focus on common safety issues. The ICAO taxonomy for occurrence category is used throughout this report. The same occurrence category may be assigned to an occurrence involving an actual accident e.g. LOC-I (Loss of Control – Inflight) or to a precursor event that has been identified previously as part of the chain of events leading to a LOC-I accident, such as aircraft stall warning.

Independent Air Accident Investigation

The Irish Air Accident Investigation Unit (AAIU) is responsible for investigating the more serious occurrences that have resulted in an aviation accident or a serious incident as defined by Annex 13 to the International Civil Aviation Organisation Convention, REGULATION (EU) No 996/2010 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, and Statutory Instrument No. 460 of 2009.

The AAIU investigates civil aviation accidents and serious incidents that occur in Ireland. Occurrences involving an Irish AOC holder or an Irish registered aircraft that occur outside of Ireland may be investigated by a foreign safety investigation authority (SIA) or that SIA may delegate the investigation fully or in part to the AAIU. The AAIU maintains a register of all accidents and serious incidents of concern to Ireland, including those investigated by AAIU and those investigated by a foreign SIA. It operates independently from the IAA.

The statistics on accidents and serious incidents presented within this document have been compiled using the data provided by the AAIU. All accidents and serious incident investigations the AAIU have initiated, or have been notified of, are included in this report, even if the investigation itself is ongoing and the final investigation report has not been finalised. The classification of an occurrence (i.e. accident, serious incident, incident) is subject to change until the completion of the investigation, and consequently this may lead to minor differences in the details provided between consecutive Annual Safety Performance Reviews.

Layout of annual safety performance review

This report is divided into four sections to address:

- commercial air transport aeroplane operations
- commercial helicopter operations
- aerodromes and air navigation services
- general aviation

In each section the main statistics of safety performance of the Irish civil aviation system are presented for accidents, serious incidents and occurrences. The report then focuses on identifying the main safety issues that emerge from the analysis of the data.

The vast majority of reports submitted to the IAA come from organisations who must investigate and analyse their own reports and identify risks and risk mitigating actions as part of their safety management systems. The role of the IAA, and this review in particular, is to share safety information and highlight the cross-sector safety issues that emerge from analysis of the safety performance of multiple organisations operating within that sector.

Aviation is a global business, and the IAA does not depend solely on the performance of the Irish civil aviation industry to identify safety issues. The European Aviation Safety Agency (EASA) produces an annual safety review of the safety performance of civil aviation across all EU Member States (including Ireland) and ICAO produces similar safety performance information on a global basis.

The IAA participates in the EU risk management processes through the EASA Advisory Bodies and Network of Analysts and takes due cognisance of the safety priorities identified at both European and global levels in the analysis of safety performance in this report.

As part of the risk management processes in the IAA, the safety issues are recorded in sector-based registers where they are subjected to a risk assessment to prioritise the areas of greater safety concern and to plan the relevant actions to mitigate the risk identified.

A summary of the actions that emerge from this process is provided in the State Plan for Aviation Safety (see www.iaa.ie/statesafetyplan)

SECTION B

THE IRISH FIXED WING COMMERCIAL AIR TRANSPORT SECTOR

Accidents and Serious Incidents

The Irish fixed-wing Commercial Air Transport (CAT) industry considered here incorporates two types of commercial organisations:

- operators who hold an Irish Air Operators Certificate (AOC) issued by the IAA (13 fixed- wing operators at the end of 2021).
- operators who operate an Irish registered aircraft on an AOC issued by a foreign State under Article 83 bis of the Chicago Convention, hereafter referred to as the 'Irish lease fleet'.

There were 660 land aeroplanes on the Irish aircraft register engaged in CAT operations for Irish AOC holders and foreign AOC operators on the Irish lease fleet, as of the 31st December 2021. This included 128 aircraft in storage, the highest number ever recorded.

The level of Part-NCC (non-commercial operations with complex aircraft) operations largely remained in line with the previous year 2020, with the exception of a notable increase in the number of ferry flights later in the year. Although such operations are not commercial, they are included within this section, as they are subject to a similar risk profile as commercial operators and both have commonalities in their safety issues and key risk areas.

CAT operations continued to feel the negative impacts of the Covid-19 pandemic throughout 2021. While there was a modest 27% increase in CAT movements in 2021 compared to 2020 it was still a 51.1% decline in 2019's movements. Attempts to restart the aviation industry were hampered by waves of new Covid variants as they circumnavigated the globe. The year started with the industry hindered by the significant government lockdown restrictions imposed after Christmas 2020. The successful execution of the mass vaccination program and the implementation of the EU digital yielded a partial summer recovery which was halted by the onset of the delta variant in the autumn.

In addition to the uneven nature of the recovery timeline throughout the year, the impacts on different sectors also varied. Cargo operators with dedicated freighters have fared better in 2021 than even in 2019, with the growth in e-commerce, difficulties elsewhere in the global supply chain and the continued shortfall in passenger aircraft cargo capacity all driving increased demand.

The complexity and intricacies of the recovery is highlighted by Eurocontrol who note that low-cost operators had the agility to recover quicker over the summer than the traditional carriers while flights from Europe to North America and other long-haul destinations trailed as ongoing regional restrictions deterred travellers. The recovery in the number of passengers in 2021 (-60% vs. 2019) continued to lag the recovery of flights (-44%). Business aviation grew its market share.

Irrespective of the industry sector, operators recognised the risk management capability of their safety management systems (SMS) as an integral business tool enabling them to successfully negotiate a pathway through the emerging and ever evolving risks associated with the ongoing pandemic. Sources for guidance included the COVID-19 Safety Risk Portfolio developed by EASA in conjunction with its safety partners, in particular the National Aviation Authorities of the EU Member States, including the IAA.

The risks identified along with the appropriate mitigations were grouped into areas such as Management Systems, Human Performance, Financial Impacts on Safety, as well as Training, Checking and Recency. Prime examples included the rapid storage and de-storage of aircraft, the impact of maintenance practices during fleet groundings, the management of wildlife hazards due to the reduced amount of aviation activity, and the degradation of skills and knowledge of aviation personnel caused by their reduced flying. Adherence to the Aviation Health Safety Protocol established by EASA and the European Centre for Disease Prevention and Control (ECDC) set out health safety measures to protect industry staff and crew. Multi-agency and multi-disciplinary collaboration came to the fore in providing guidance when faced with such challenges and uncertainty.

The European Plan for Aviation Safety (EPAS) 2022-2026 has identified the effectiveness of safety management system as a Safety Issue (SI-2026). This safety issue covers the regulatory requirements and promotion of SMS principles, on both aviation authorities and organisations, and the capability to detect and anticipate new emerging threats and associated challenges. Similarly, the Irish State Plan for Aviation Safety (2021-2024) includes actions to help enhance the effectiveness of safety management at the levels of both the regulator and the regulated organisations in Ireland.

The reporting rate for Irish CAT operators in 2021 was only down slightly on the average for the previous 4 years, and this marginal reduction in reporting rate indicates that the operators SMS's were well managed despite the challenges imposed on aviation staff by COVID-19 related health restrictions. There were 80% fewer reports in 2021 compared to 2019 for the Irish lease fleet (or 49% fewer reports compared to 2020). While there is currently no exposure data for this sector the decline in reports appears to be in line with the record number of aircraft in storage.

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 13 accidents (5 in 2021) and 44 serious incidents (5 in 2021) as summarised in Table B.1 below.

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	
2017	881	5	0	5	10
2018	927	3	0	3	15
2019	815	0	0	0	10
2020	683	0	0	0	4
2021	660	5	0	5	5
Total	-	13	0	13	44

There were no fatal accidents, 5 non-fatal accidents and 5 serious incidents in 2021. These included 3 non-fatal accidents and 1 serious incident related to passengers suffering an injury during disembarkation while 1 non-fatal accident involved a cabin crew member and passenger being injured during turbulence (TURB). There was 1 non-fatal accident categorised as Ground Collision (GCOL) and 4 serious incidents categorised as Significant Component Failure – Non-powerplant (SCF-NP).

Figure B.1 outlines the categories assigned to the accidents and serious incidents that occurred in the past five years.

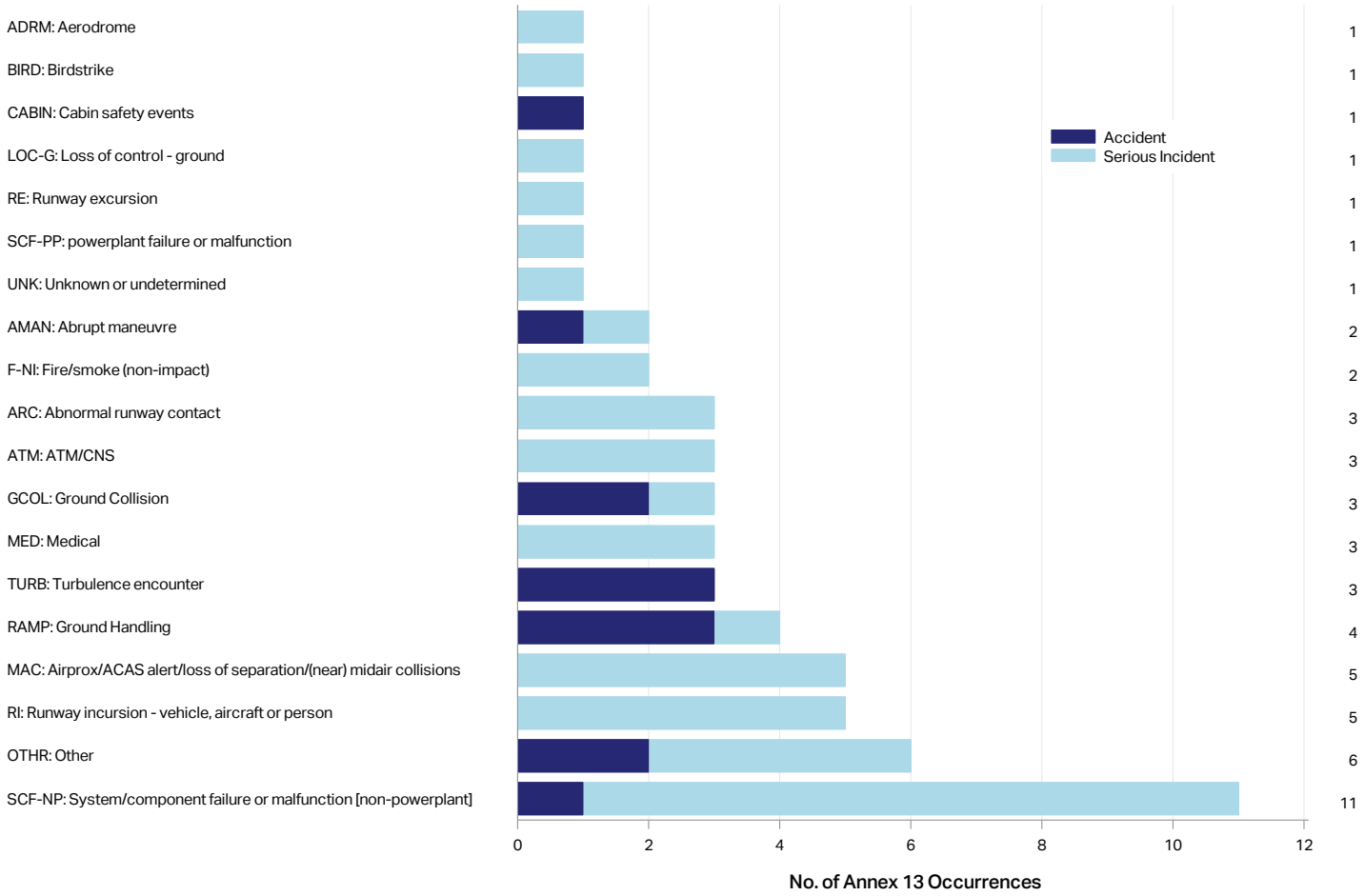


Figure B.1: Categorisation assigned by the investigating SIA to the Annex 13 occurrences.

Occurrences

Accident investigation is instrumental in determining the root cause and contributory factors of accidents without apportioning blame. It ensures that past mistakes are not repeated, and the lessons learnt are shared. The insight gained from safety occurrence reports adds another layer of intelligence that enables a proactive and predictive element in the timely detection of operational hazards and system deficiencies. This additional awareness can help focus resources towards the areas most in need of mitigation in order to promptly improve aviation safety performance.

Notwithstanding the challenges posed by the pandemic, the chances of being on a flight operated by an Irish AOC Holder that experienced a safety occurrence remained very low. In 2021 Irish AOC Holders flew just over 550,000 flights and submitted just over 4,000 occurrence reports. This represented a 51% drop in movements compared to 2019 but a 27% increase compared to 2020. Over 99% of these flights passed off without any safety occurrence that required reporting to the IAA and over 99.99% of these flights passed off without being involved in an accident or serious incident. In 2021 there were zero fatalities associated with Irish CAT operations.

The IAA categorises occurrences using the same common taxonomy as used by the AAIU, however in the case of reported mandatory occurrences the analysis includes consideration of factors that could be regarded as precursors to accidents and/or serious incidents.

A breakdown of the top occurrences submitted by Irish AOC Holders involved in CAT operations by occurrence category and risk classification band (ref Section A) is shown in Figure B.2(a) below for 2017 to 2019. Data for 2020 and 2021 combined has been produced separately this year in Figure B.2.(b) to enable a comparison of the pattern of predominant occurrence categories pre-covid (2017-2019) versus the pandemic years (2020-2021). Notwithstanding the pandemic the trends pre-Covid and during Covid remain predominately similar.

The five most reported occurrence categories were the same except for MED (medical) and WSTRW (Windshear or thunderstorm). MED dropped from 3rd in 2017-2019 to the 12th in 2020-2021. This may in part be due to the decreased number of passengers travelling and passengers with underlying health conditions may have elected not to travel. WSTRW moved from 10th in 2017-2019 to the 5th in 2020-2021, the weather being a constant environmental factor when other categories were affected by reduced traffic levels e.g. MAC, ATM.

Birdstrike moved from 5th pre-covid to 2nd most common occurrence during the pandemic and is one of the emerging risks identified in the COVID-19 Safety Risk Portfolio, "increased presence of wildlife on aerodromes." It is also the most common event type for 2021 as outlined in Figure B.4 which provides more granularity with the top event types reported to the IAA from the CAT aeroplane sector for 2021. The 2nd most common event type reported was 'difficult/unruly passengers' which is another of the emerging COVID-19 risks identified.

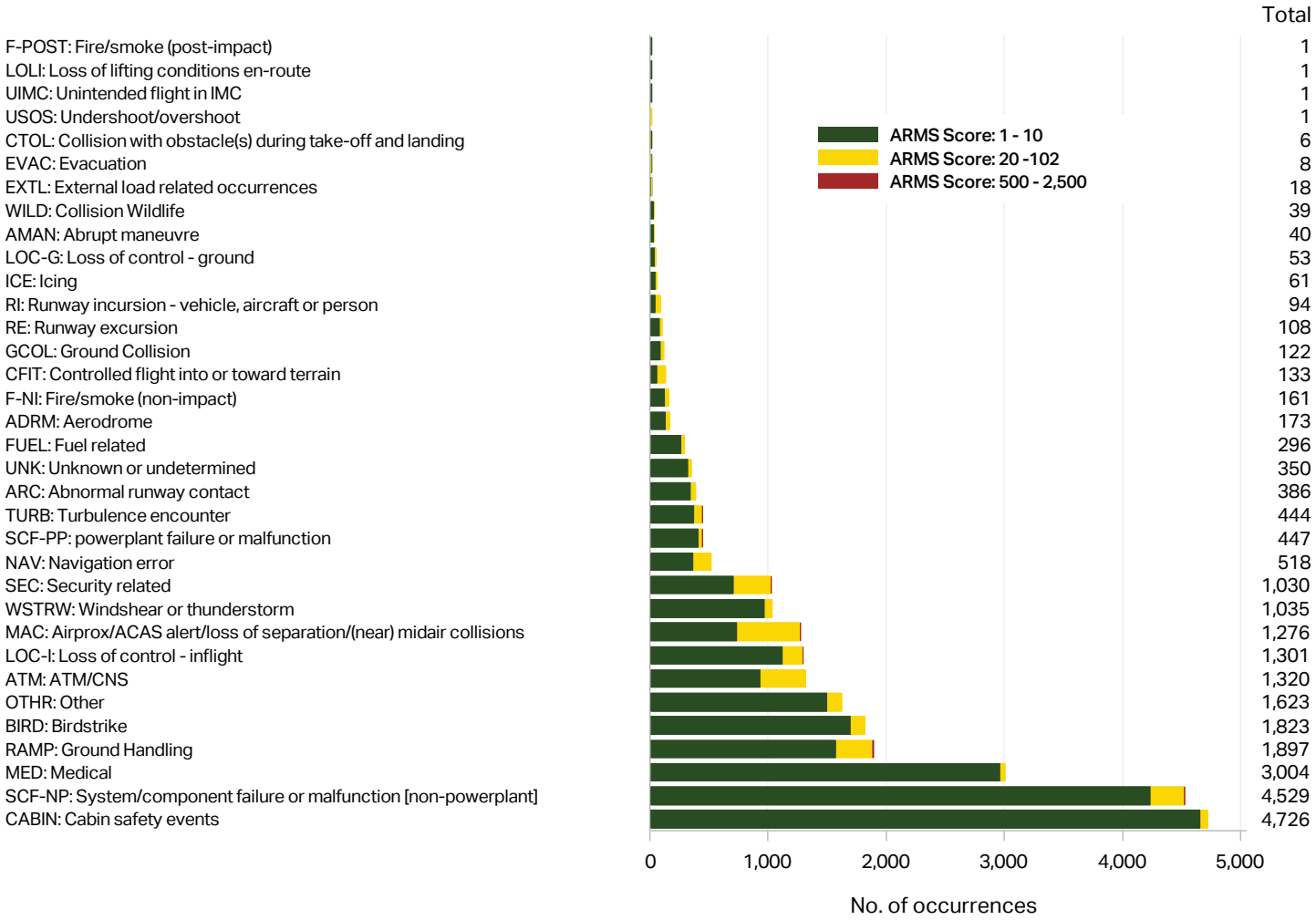


Figure B.2(a) Categorisation of MORs Involving Irish CAT Fixed-wing Aeroplanes during 2017-2019

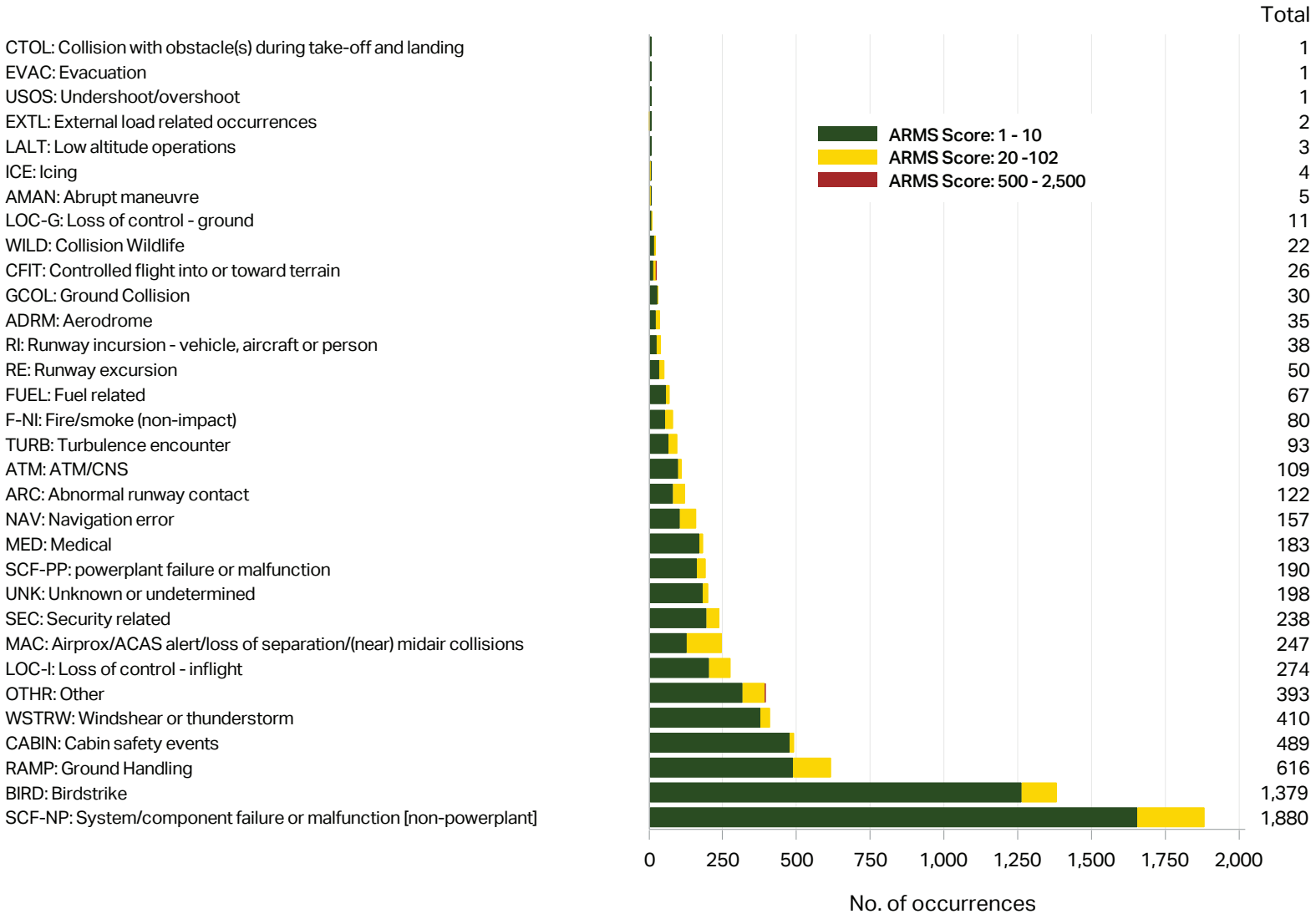


Figure B.2.(b) Categorisation of MORs Involving Irish CAT Aeroplanes during 2020 -2021

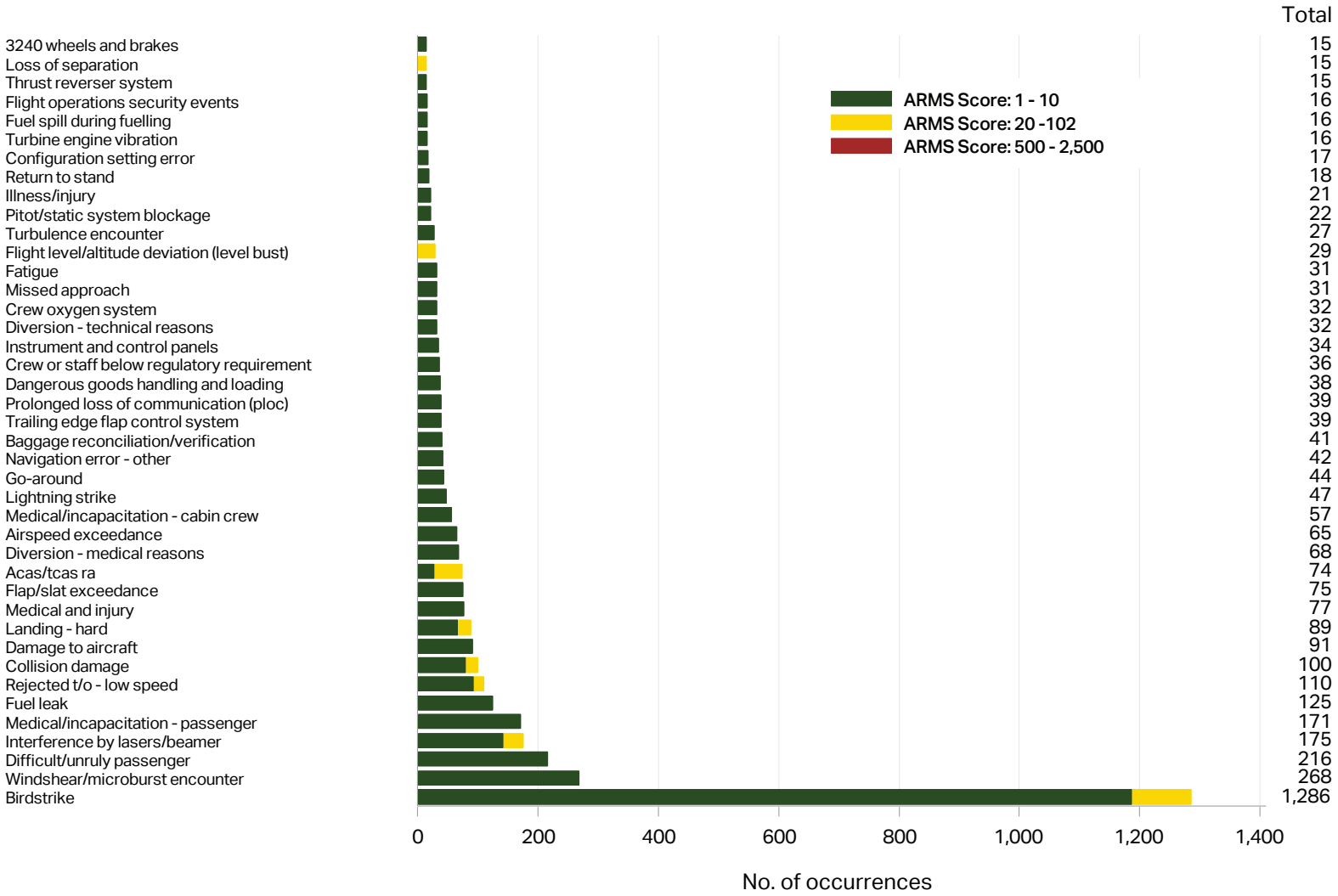


Figure B.3 Top Event Types Involving Irish CAT Fixed-wing Aeroplanes during 2020 - 2021

Safety Issues

This section first introduced in the ASPR for 2019 provides a summary of the main safety issues that emerge as a result of the analysis of the safety performance statistics for CAT aeroplane operations. The first sub-section focuses on the key safety areas identified across the globe as the main causes of fatalities in aviation, and the second sub-section focuses on the other safety areas where the likelihood of fatalities is low but where high severity occurrences could lead to costly damage to aircraft or major inconvenience to aircraft occupants. Despite the exceptional latent conditions experienced by the commercial aviation sector during 2020-2021 the key safety areas identified prior to the Covid-19 pandemic remain relevant and may become even more pertinent as the return to new normal operations becomes established. Given the dearth and uniqueness of data generated during the pandemic it is worthwhile adopting a dual approach, keeping a watchful eye on both the previously identified safety areas along with the more recent emergent risks.

Key Safety Areas:

ICAO and EASA analysis of aviation safety data on a worldwide basis has identified the following categories: controlled flight into terrain (CFIT), loss of control-inflight (LOC-I), mid-air collision (MAC) and runway incursions (RI) and excursions (RE) as the main contributors to accidents with a high number of fatalities in commercial aeroplane operations. CFIT, MAC and LOC-I accidents often have catastrophic results with very few, if any, survivors. Although statistically very few runway incursions result in collisions, there is a high fatality risk associated with these events. Runway excursions remain predominant in terms of number of occurrences with the majority of runway excursions survivable, however the fatality risk remains significant.

Figure B.1 shows that over the past five years there were no accidents in these occurrence categories involving the Irish AOC holders and Irish lease fleet operators. However, there were 11 serious incidents in the following key safety areas: 5 categorised as MAC, 5 categorised as RI and 1 categorised as RE. Although there were no accidents or serious incidents categorised as LOC-I, it is noted that there were 3 accidents due to turbulence encounters causing aircraft upset during flight.

Figures B.2.(a) and B.2.(b) demonstrate that occurrence reports of precursor events categorised as MAC and LOC-I continued to be in the top 10 of the most reported occurrence categories during 2020-2021 as they had been in the years 2017-2019 prior to the pandemic. Analysis of these reports firstly shows that the majority were classified as being low risk (green band) and secondly enables the identification of weaknesses and trends in the sector that can be used to inform appropriate mitigations. The CFIT category has proportionally fewer related occurrences and most of these relate to activation of TAWS alerts due to momentary breach of protection envelopes, which demonstrates the effectiveness of this technological mitigation. There are fewer reports from CAT aeroplane operators in the high-risk occurrence categories of RI and RE. In addition to the insight gained from their analysis as a sector they highlight the need to address safety risks from a cross domain perspective, such as flight operations, aerodrome operators and air navigation services provision, in order to maximise the effectiveness of safety barriers.

Figure B.3 provides more insight into the types of events that lie beneath the occurrence categories for 2020/2021 with Birdstrikes the top event type reported. The IAA conducted a statistical analysis of the level of Birdstrikes in Irish airports in 2020 that showed that even as the level of aircraft movements reduced dramatically during the pandemic, there was a statistically significant increase in the rate of Birdstrikes experienced. This analysis supports the general assessment across the EU that reduced aircraft operations has led to increased bird (and other wildlife) activity around airports.

Detailed analysis of these events in conjunction with follow-up information from the reporting organisation has identified the following safety issues that are included in the related sector-based risk register.

KEY SAFETY AREA	SAFETY ISSUES
Mid-Air Collision (MAC)	• Airborne conflict with non-transponder equipped aircraft (e.g. airspace infringement into controlled airspace or flight by CAT aircraft in un-controlled airspace) • Integration of drone operations into air traffic system
Aircraft Upset (LOC-I/AMAN)	• Monitoring of flight parameters to prevent loss of situational awareness, and/or warning system activation, and/or aircraft upset, and/or unstable approach. • Management of technical failures to prevent aircraft upset • Avoidance of flight into convective weather or icing conditions which could cause aircraft upset • Management of Birdstrike or laser attack to prevent aircraft upset • Recognition and recovery from aircraft upset • Optimum state of wellbeing and fitness for flight
Runway Excursion (RE)	• Management of approach path • Avoidance of flight into convective weather, microbursts or windshear • Management of crosswind landings and unstable approach • Recognition of runway condition for take-off or landing • Reliability of critical equipment (e.g. landing gear, wheels, brakes, thrust revers and spoilers)
Runway Incursion (RI)	• Awareness or response to the unauthorised presence of other aircraft or vehicles on the runway • Deviation from ATC clearances by Flight Crew
Controlled Flight into Terrain (CFIT)	• Implementation of APV approach procedures to replace Non-Precision Approach • Implementation of advanced ATS services in terminal maneuvering area (ref SESAR Solutions Catalogue) • Management and monitoring of altitude setting procedures, awareness of blunder error • Optimum state of wellbeing and fitness for flight

Additional Safety Areas:

The key safety areas discussed above address the main causes of fatalities in CAT operations, however there are other areas worthy of consideration, while they do not generally contribute to fatal accidents, they can sometimes be associated with serious injury to persons or damage to aircraft. The areas of focus in this review are ground operations, fire, cabin safety and medical emergency.

Figure B.1 shows a slight improvement on last year's review in which ground operations related activities contributed to 5 accidents and 2 serious incidents during the past five years. However, this may be accounted for by the reduced level of operation during 2020-2021. Due to the nature of their operation i.e. slow speed whilst moving on the ramp or taxiway, the most credible accident outcome in this domain is less catastrophic than other categories such as mid-air collisions. However, there is still a potential risk of some casualties, the loss of revenue due to damaged aircraft and passenger anxiety due to delayed flights. Undetected errors in aircraft loading and non-reporting of aircraft damage by ground vehicles present a higher level of threat as they could lead to further difficulties for the operation of the flight once the aircraft becomes airborne.

There was a reduction of fire/smoke/fumes related serious incidents from 4 over the five years between 2016-2020 to 2 over the five years between 2017-2021, all of which were resolved satisfactorily by the crews. Again, this may be reflective of the lower level of operations. On-board fire is an event that must be dealt with promptly and effectively, using aircraft design and operational procedures to prevent a fire from starting in the first instance or from escalating to a loss of control of the aircraft. The unique fire hazard characteristics of lithium-ion batteries and their proliferation in commonly used electronic devices pose a significant safety risk that must be effectively mitigated and managed.

Figure B.1 illustrates that there was 1 accident and 3 serious incidents due to cabin safety or medical emergency between 2017-2021. A comparison between Figure B.2.(a) and Figure B.2.(b) highlights that MED (Medical) dropped from the 3rd most reported category in 2017-2019 to 12th in 2020-2021. CABIN (Cabin Safety) also demonstrated a decrease albeit not to the same extent. RAMP (Ground Handling) continued to be a significantly reported category during Covid-19 2020-2021 versus pre-covid 2017-2019. FIRE related reports remained at a lower level in 2020-2021, similarly placed when compared to pre-Covid but are highlighted here due to the potential severity of their intrinsic risk. The majority of these occurrences were classified as low risk, indicating that there were robust barriers preventing the occurrence from resulting in a severe outcome.

The number of MORs received from operators of the 'Irish lease fleet' remained significantly low in 2021 and so do not support the identification of any emerging trends for 2020-2021.This reduction in reporting is most likely linked to reduced levels of operations with a record number of aircraft in storage in 2021. The main categories reported were similar to those observed in the CAT Aeroplanes domain, with 'Significant component failure – non-powerplant' (SCF-NP) being the most common. As the State of Registry these were addressed by the Airworthiness Standards Department (AWSD) inspectorate with operational issues being referred to the State of Operation in accordance with the ICAO Article 83 bis agreement. In the main, the same key safety areas and safety issues previously outlined remain applicable to these operations in the long term.

A summary of the main safety issues identified from the analysis of the safety data in these safety areas is outlined below:

SAFETY AREA	SAFETY ISSUES
Ground Operations	• Adherence to aircraft loading procedures (e.g. passengers, baggage and cargo, fuel) and accurate calculation of mass and balance • Adherence to aircraft ground handling procedures (incl. towing, de-icing, refueling etc.) • Reporting of damage to aircraft during ground operations • Oversight of ground operations subcontracted activities
FIRE	• Lithium batteries or other material presenting a fire hazard in cargo or cabin baggage • Placing of intended passenger carry-on baggage in the aircraft hold at the departure gate
CABIN/MED	• Management of difficult/unruly passengers

COVID-19

With the pandemic lingering into 2021 the emerging safety issues arising from the Covid-19 pandemic as identified by EU Member States in conjunction with EASA as part of the European Safety Risk Management (SRM) process were reviewed and updated. These safety issues were published in the "Review of Aviation Safety Issues Arising from the COVID-19 Pandemic," which was updated in April 2021 and is available on the EASA COVID-19 resources website.

There was no clear manifestation of the COVID-19 specific safety issues in terms of accidents or serious incidents in CAT in 2021. One of the safety issues, "the rapid storage and de-storage of aircraft may lead to technical failures" continues to be noteworthy considering the record number of aircraft that remained in storage throughout this year. System Component Failure (SCF) has already been one of the more significant occurrence categories both prior to and during covid.

Another safety issue highlighted was the "Prevention and treatment of unruly passengers in the context of COVID-19". During 2020 EASA and the European Centre for Disease Prevention and Control (ECDC) developed guidelines on an aviation health safety protocol to ensure the health and safety of passengers, as well as the staff and crew who serve them, by maintaining safe and secure operations whilst minimising the risk of virus transmission. While the implementation of these procedures may have led to increased stress for all concerned there wasn't an appreciable increase in unruly passenger events, this may have been influenced by the reduced numbers of passengers travelling. However, as the 'return to normal operations' did not proceed as hoped for in 2021 it is likely that this may become more pertinent in 2022. The importance of this issue is recognised and a 'Ready for Summer - Be Nice' EU safety promotion campaign is being planned to address disruptive passengers.

The unrelenting nature of this pandemic across all sectors of society and the aviation industry has resulted in a need to dig deep in order to endure what has become a marathon rather than a sprint. There have been many sources of stress in the current environment, they include the significant health risks presented by the virus itself, the consequent economic threat to livelihoods and/or the prolonged isolation from family, friends and colleagues. The requirement to perform to the highest of standards in a safety critical industry despite the stresses brought about by this global disease has been universally recognised. ICAO and EASA have outlined Human Performance considerations and risks. In response EASA in collaboration with other stakeholders have formed the Wellbeing hub https://www.easa.europa.eu/community/content/wellbeing In October 2021, the IAA hosted a webinar on Wellbeing Among Aviation Professionals, a recording of the event is available here https://youtu.be/rSitU89uAsQ.

The purpose of this review is to assess the performance of aviation safety in Ireland in 2021 and while it does not present any evidence of accidents, incidents or occurrences directly caused by the pandemic, the impact of COVID-19 has become an overarching latent condition that has to be mitigated against in order to prevent the manifestation of any undesired outcomes. Due to its pervasive nature, it has the potential to act as a contributing factor in all the safety areas and safety issues identified and discussed. Throughout the pandemic organisations have recognised and actively sought the guidance of the SMSs to determine their pertinent risks and formulate appropriate mitigation strategies. This positive engagement and integration by all stakeholders in the safety risk management process is a welcome development from the pandemic.

Occurrence reporting rates

CAT activity increased slightly during 2021, up 27% on 2020 levels but still down 51% on 2019. The occurrence reporting rate during the two Covid-19 years (2020-2021) whilst down slightly, remains in line with the average over the past 5 years as demonstrated in table B.2 below, which provides data on the number of sectors flown annually between 2017 and 2021 along with the corresponding MOR rates.

Table B.2: Statistics on MORs submitted by the Irish AOC holders who operate aeroplanes (MOR rates were calculated per 10,000 flights)

YEAR	SECTORS FLOWN	TOTAL	
		NUMBER	RATE
2017	1,018,688	6,807	66.82
2018	1,105,310	8,616	77.95
2019	1,128,335	9,941	88.10
2020	434,510	3,318	76.36
2021	552,206	4,036	73.09
Total/average	4,239,049	32,718	77.18

Part NCC

NCC activity continued to be low in 2021 except for ferry flights and maintenance check flights. The current level of NCC activity does not support insightful independent statistical analysis. EASA's ASR 2021, the latest publication available at this time states that, 'during 2020, there were no fatal and non-fatal accidents involving an EASA MS registered NCC business aeroplane. The number of serious incidents has significantly decreased in comparison with the average of the previous 10-year period although the level of traffic of NCC business aeroplanes remained at 75% of 2019 level according to the European Business Aviation Association, EBAA.' The ASR also takes note of the low number of lower risk occurrences and believes that this is likely due to the low reporting in this domain, where only high-risk accidents and serious incidents, normally very visible and with severe outcomes, are being reported and investigated. The IAA continues to work with organisations to advocate for improvement in the reporting culture to improve safety management processes in this sector.

SECTION C

THE IRISH COMMERCIAL HELICOPTER SECTOR

Introduction

This section addresses the commercial helicopter services sector in Ireland, which is relatively small in comparison to the level of fixed-wing CAT operations. It includes helicopter commercial air transport (CAT) operators, helicopter commercial specialised operators (SPO) and operations of non-commercial air operations with complex motor-powered helicopters (NCC).

Ireland has 3 helicopter Air Operator Certificate (AOC) holders operating 11 helicopters in commercial air transport (CAT). One operator is approved to undertake helicopter emergency services (HEMS) and search and rescue operations (SAR).

Commercial SPO flights, such as surveying or photography, require that a helicopter operator declare its capabilities to the Irish Aviation Authority. Two of the above helicopter operators have also declared their capabilities to undertake commercial SPO activities operating 10 of the above helicopters in the SPO role.

To undertake non-commercial air operations with complex motor-powered helicopter (NCC) flights a helicopter operator must declare its capabilities to the Irish Aviation Authority. Two operators have declared their capabilities to undertake NCC activities operating 1 foreign registered and 2 Irish registered helicopters.

The Irish helicopter lease fleet are included here with the Irish CAT operators, as they are exposed to the same risks even though their approval and oversight regime differs. During 2021 there were 6 Irish registered helicopters operating on a foreign issued AOC using the provisions of Article 83 bis of the Chicago Convention.

Covid-19

The pandemic continued to exert it's influence over this domain throughout 2021, as Covid-19 variant waves and their associated public health restrictions made it difficult for commercial operations to gain any meaningful recovery in their operations. However, within the Irish commercial helicopter sector, Search and Rescue (SAR), HEMS and SPO services bucked the trend with an 18% increase in sectors flown in 2021 compared to 2020. All operators had the challenge of conducting operations while adhering to the applicable Covid-19 health control measures.

The IAA has been working with EASA Advisory Bodies and Network of Analysist to help identify the key risks impacting helicopter operations, including the specific risks identified due to COVID-19. COVID-19 related risks identified included; the effect of disinfection (biocides) on aircraft systems and structural components, decreased wellbeing of aviation professionals during shutdown and aviation personnel fatigue. Recognising this, EASA in collaboration with other stakeholders have formed the Wellbeing hub https://www.easa.europa.eu/community/content/wellbeing-and-caring-our-people. In October 2021, the IAA hosted a webinar on Wellbeing Among Aviation Professionals, a recording of the event is available here https://youtu.be/rSitU89uAsQ

As the threats posed by these risks now appears to be receding it is worthwhile to note that if and when the need arises again EASA has issued numerous Safety Information Bulletins (SIBs), guidelines and resource materials which are centrally located on the COVID-19 portal https://www.easa.europa.eu/the-agency/coronavirus-covid-19

Accidents and Serious Incidents

Over the last five years helicopter operators in this sector were involved in 1 fatal accident which occurred in 2017. There were no non-fatal accidents or serious incidents during this time. Table C.1 below provides the details.

Table C.1: No. of accidents, fatal accidents and serious incidents involving helicopters engaged in CAT, Part-NCC and Part-SPO operations.

YEAR	NO. ON IRISH AIRCRAFT REGISTER	ACCIDENTS			SERIOUS INCIDENTS
		NON-FATAL	FATAL	TOTAL	
2017	14	0	1	1	0
2018	16	0	0	0	0
2019	20	0	0	0	0
2020	20	0	0	0	0
2021	19	0	0	0	0
Total	-	0	1	1	0

The fatal accident involved the collision of the helicopter with terrain. The AAIU published the final report (Ref. No. 2021-008) during 2021 and it is publicly available on their website www.aaiu.ie. The complex final report into this fatal accident that resulted in the tragic loss of four lives, made 42 Safety Recommendations, 5 of which were addressed to, and fully accepted by the IAA.

Occurrences

The IAA categorises helicopter occurrences using the same common taxonomy as discussed in Section B. A breakdown of the top occurrences submitted by Irish Helicopter AOC holders and NCC/SPO declared operators between 2017 and 2019, according to occurrence category and ARMS Risk Classification Band is presented in Figure C.1 below. The data for 2020 and 2021 has been produced separately this year in Figure C.2 to enable a comparison of the pattern of predominant occurrence categories pre-covid (2017-2019) versus the pandemic years (2020-2021).

The top reported categories pre-Covid (2017-2019) and during Covid (2020-2021) were “SCF (system component failure or malfunction)”, and “Other”. Many of these operations are undertaken in harsh environments which can affect on-board systems. Most of the SCF occurrences were low risk which indicates minor failures or failure of redundant systems that had little effect on operations. The high usage of category “Other” in the helicopter domain reflects the fact that the ADREP taxonomy does not fully account for helicopter low level SPO operations. Occurrences categorised as “other” include for example, failure of Part SPO role equipment and accuracy of aeronautical charts. Navigation errors (NAV) were much less frequently reported during Covid (2020-2021) compared to the years prior to Covid (2017-2019). Similarly, Security issues (SEC) only featured prior to Covid (2017-2019). These trends are understandable in the context of the quieter operating environment during the pandemic.

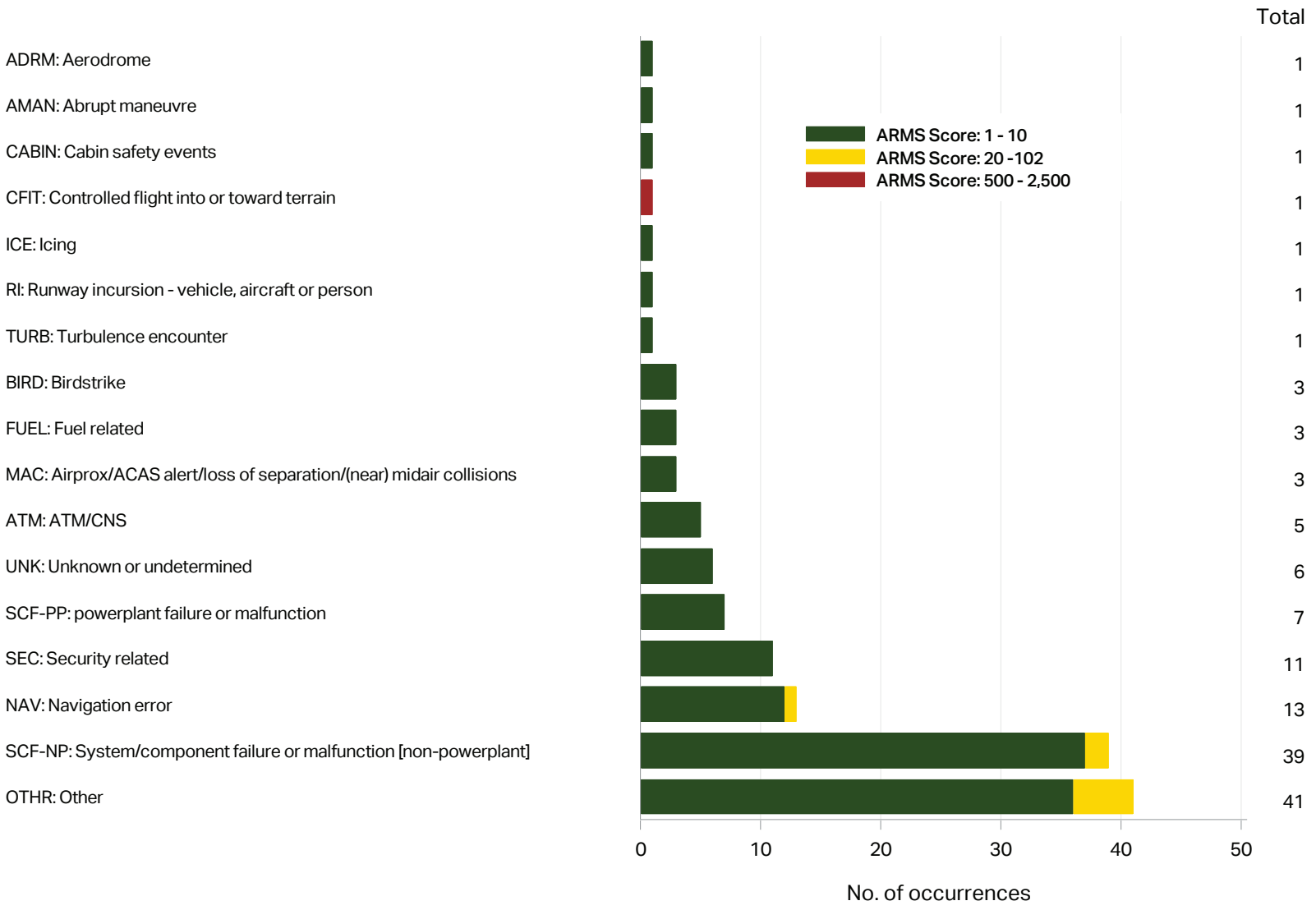


Figure C.1 Categorisation of MORs Commercial and Declared Helicopter Operation 2017-2019

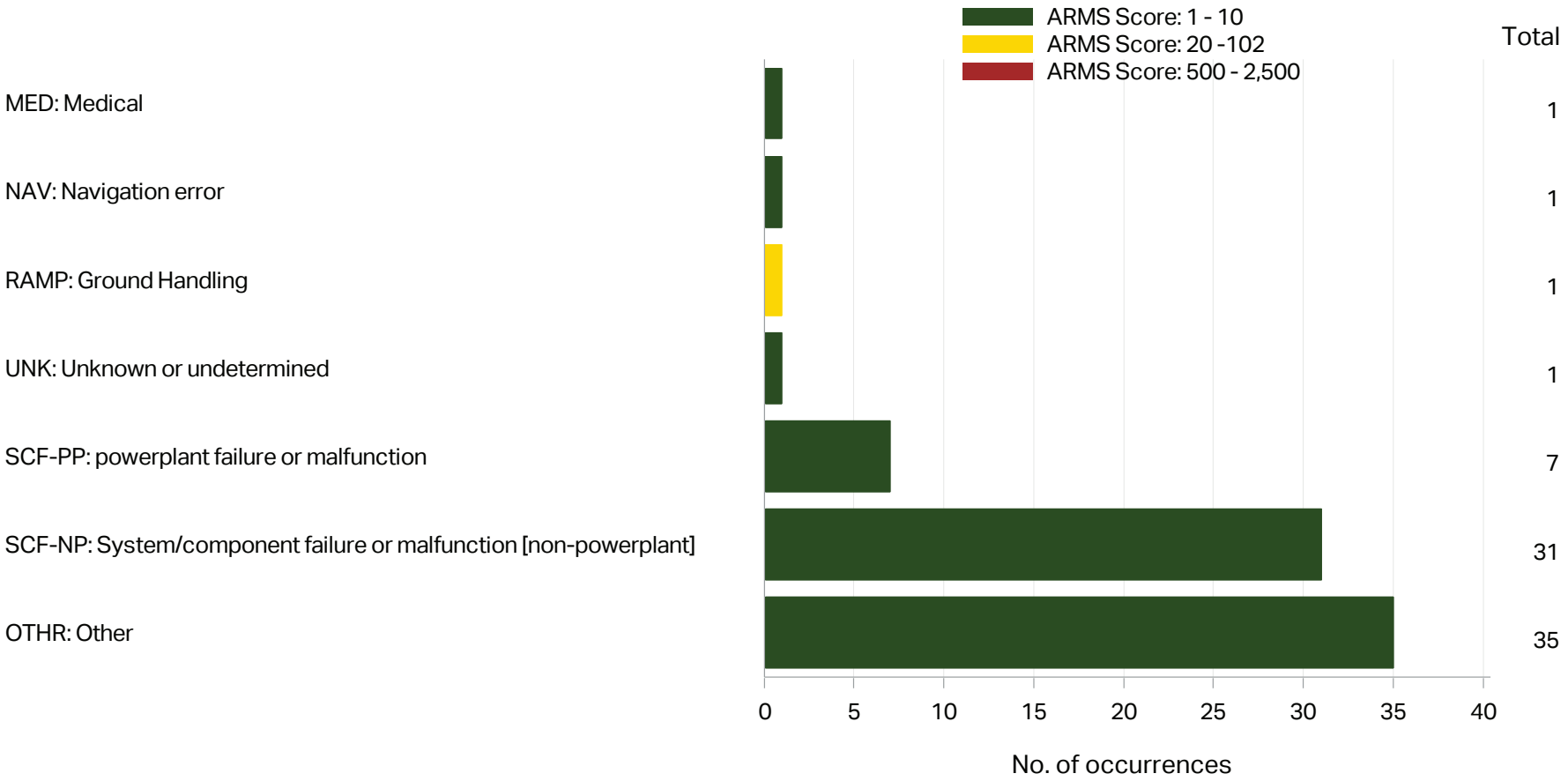


Figure C.2 Categorisation of MORs Commercial and Declared Helicopter Operation 2020-2021

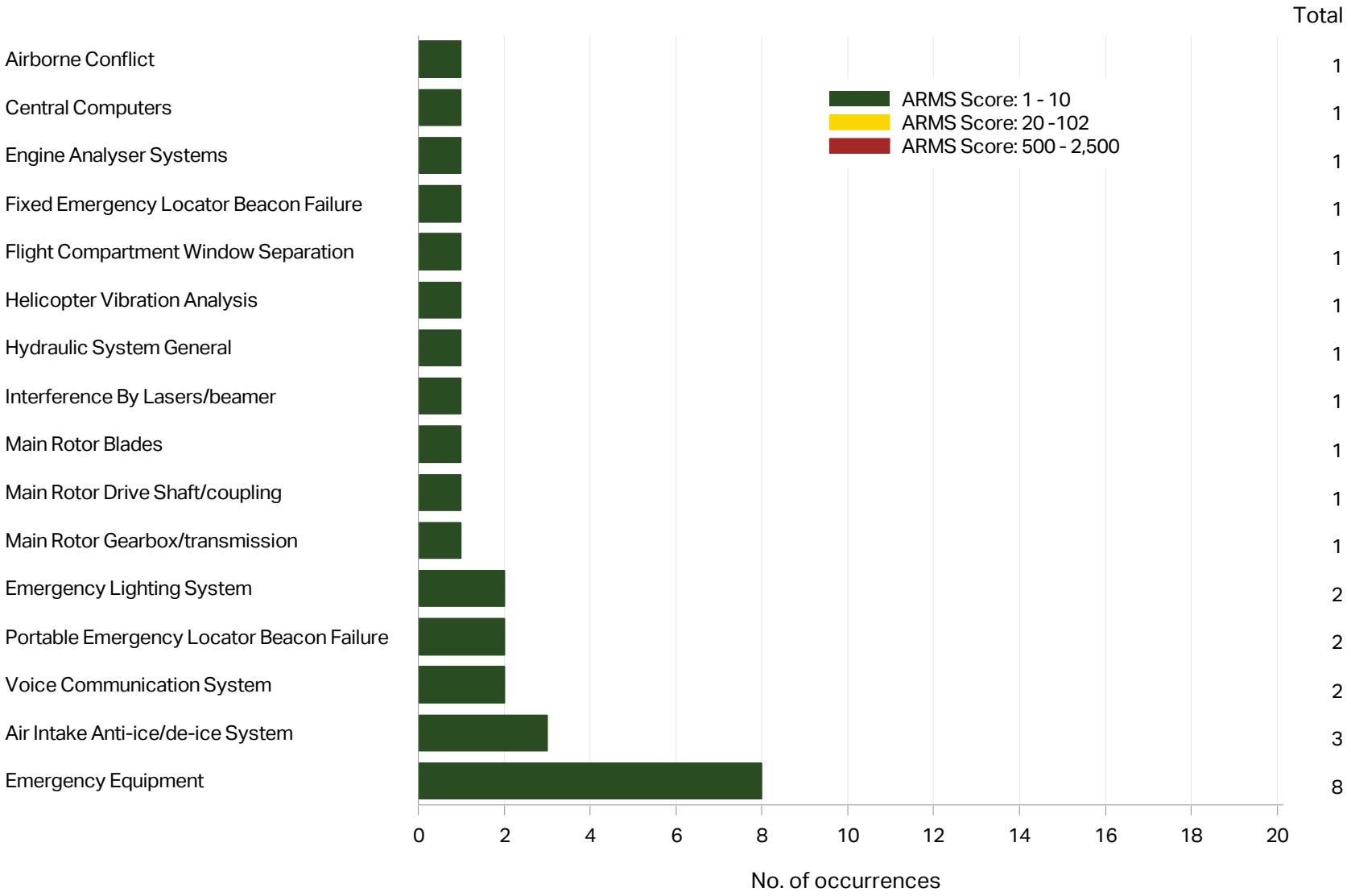


Figure C.3 Top Event Types – Commercial and Declared Helicopter Operations 202-2021

Safety Issues

This section provides a summary of the main safety issues that emerge as a result of the analysis of these safety performance statistics for commercial and declared helicopter operations. The first sub-section focuses on the key safety areas identified across Europe as the main causes of fatalities in helicopter operations, and the second sub-section focuses on the other safety areas where the likelihood of fatalities is low but where high severity occurrences could lead to injuries to occupants or damage to helicopters.

Key Safety Areas:

Due to the relatively low activity level of commercial and declared operations in Ireland and consequently the relatively low levels of safety occurrences reported, it is challenging to identify the key risk areas from the analysis of the Irish safety information alone. However, the analysis performed by EASA of the safety performance of this sector across the EU (including Ireland) can support the IAA efforts in this regard. EASA has identified the key risk areas based on analysis of helicopter accidents and serious incidents in this sector across Europe as aircraft upset/loss of control, obstacle collision in flight, airborne collision and CFIT.

There was one fatal accident in Ireland in the past five years categorised as collision into terrain (CFIT). The AAIU report into this accident provides detailed conclusions including findings, probable causes, and contributory causes. Operational safety issues identified including, challenging environmental conditions, the adequacy of the FMS company routes and associated onboard displays and user guides, the appropriate use of aeronautical charts, inadequacy of the TAWS database and inadequate cockpit lighting for night-time operations, are addressed in the helicopter sector risk register.

Figures C.1 and C.2 show that there was one aircraft upset related occurrence (i.e. abrupt manoeuvre) but no loss of control inflight related category events.

Figure C.3 gives more insight into the events that led to the occurrence reports and although the specific circumstances of these reports did not lead these events to be categorised in the key risk areas they could in other circumstances or in combination with other events, contribute to an aircraft upset or collision with terrain or obstacles (e.g. critical equipment failures, aeronautical chart errors, birdstrike, laser attack).

Detailed analysis of these events in conjunction with follow-up information from the reporting organisations has identified the following safety issues that are included in the sector-based risk register.

KEY SAFETY AREA	SAFETY ISSUES
Aircraft upset (e.g. LOC-I, AMAN)	• Monitoring of flight parameters to prevent loss of situational awareness, and/or warning system activation, and/or aircraft upset. • Management of flight path • Management of technical failures to prevent aircraft upset • Avoidance of flight into convective weather or icing conditions which could cause aircraft upset • Reaction to birdstrike or laser attack to prevent aircraft upset • Recognition and recovery from aircraft upset • Optimum state of wellbeing and fitness for flight
Collision with terrain or obstacle (e.g. CFIT, CTOL, LALT)	• Intentional low-level operations • Operations in degraded visual environments • Maintenance of situational awareness by crews • Use of helicopter see and avoid • Use of take-off and landing sites outside of airports/heliports • Accuracy and appropriate use of aeronautical charts and terrain and obstacle databases • Use of company routes • Adequacy of TAWS database for low level helicopter operations • Adequacy of cockpit lighting for the required operational conditions • Increased number of Windfarms • Optimum state of wellbeing and fitness for flight

The IAA works with Helicopter operators through oversight activities (e.g. SMS oversight) and safety promotion to ensure these safety issues are being addressed by helicopter operators, as appropriate to them. Refer also to the latest edition of the IAA State Plan for Aviation Safety, https://www.iaa.ie/safety/state-safety-plan

Additional Safety Areas

The highest number of reports submitted by this sector concern system component failure. Most of these events were classified as low risk which means that the failures had little impact on the safe operation of the aircraft (e.g. due to built-in system redundancy). By its very nature, helicopter operations present a challenging environment for aircraft equipment, and EASA as competent authority for aircraft design in Europe, has identified a number of mitigating actions to address the main safety concerns arising from helicopter equipment failures in the European Plan for Aviation Safety.

(Refer to https://www.easa.europa.eu/docment-library/general-publications/european-plan-aviation-safety-2022-2026 for more details)

The risk of mid-air collision is another safety area for helicopter operators, notwithstanding the fact that there are very few reports from this sector concerning this risk area (i.e. three low risk reports in three years). Many helicopter operations occur outside of controlled airspace where a wide variety of general aviation aircraft freely operate, and many of these aircraft are not equipped (nor required to be equipped) with transponder equipment. Therefore, helicopter must rely on flight planning, situational awareness and see and avoid procedures to avoid airborne conflict. There is also the new threat of drone operations to consider, especially important for low level helicopter operations.

SAFETY AREA	SAFETY ISSUES
Mid-Air Collision (MAC)	• Potential conflict with non-transponder equipped general aviation aircraft • Potential conflict with drones

Number and rate of MORs

The following table provides data on the number of sectors flown annually over the last five years with the corresponding MOR rates per 1,000 flights. The number of movements decreased by 21% in 2021 compared to 2020, partly due to the cessation of one of the Irish Helicopter AOCs in summer 2021. While the occurrence reporting rate in this sector appears to have significantly increased year on year, a greater proportion of the activity was undertaken in the SAR, HEMS, SPO segment. Overall, the Covid period (2020-2021) reporting rate is slightly lower at 4.83 when compared to the pre-Covid (2017-2019) reporting rate of 6.04, however 2021 reporting rate has shown some recovery towards pre-Covid levels.

Table C.2: Statistics for MORs submitted by the Irish AOC holders operating helicopters (MOR rates were calculated per 1,000 flights)

YEAR	SECTORS FLOWN	TOTAL	
		NUMBER	RATE
2017	6,887	35	5.08
2018	7,206	40	5.55
2019	8,144	61	7.49
2020	9,176	34	3.71
2021	7,236	43	5.94
Total/average	38,649	213	5.51

SECTION D

AIR NAVIGATION SERVICES AND AERODROMES IN IRELAND

Introduction

Aerodromes within Ireland which are open to public use, serve commercial air transport and have a paved runway of 800m or more or exclusively serve helicopters with instrument procedures, are certified by the IAA in accordance with EU Regulation No. 139 of 2014. These are known as certified aerodromes.

Under national aviation law, those aerodromes which are not within the scope of the European regulation require licensing if landing or departure by aircraft carrying passengers or goods for hire or reward is being undertaken. Generally, these are known as nationally licensed – public aerodromes.

Additionally, under national aviation law, an aircraft shall not take-off from or land at any place in the State save at an aerodrome licensed under S.I. 355 of 2008 – Aerodromes and Visual Ground Aids Order. Generally, where flight training is being undertaken, there is a requirement for licensing, and these are known as nationally licensed – private aerodromes.

Currently, there are 8 certified aerodromes within Ireland, 5 nationally licensed public aerodromes and 9 nationally licensed private aerodromes. Details of the current certificated and licensed aerodromes are published in AIP Ireland, AD Section 1.5 – Status of Certification of Aerodromes. In limited circumstances, a declaration can also be made to the Authority to allow for the use of an unlicensed aerodrome by aircraft engaged in instruction in flying, there are currently 5 airfields where such a declaration is in place.

Covid-19

The pandemic continued to exert its effects on the Air Navigation and Aerodrome sector into 2021 where the level of ATC controlled flight hours was up 18% on 2020 but still remained at only 48.4% of the level of activity recorded in 2019. This included traffic overflying Irish airspace as well as aircraft that land or depart from an Irish airport (terminal traffic). Similarly, the number of flights at Irish airports in 2021 increased a modest 2% on 2020 representing 41% of the activity observed in 2019. A flight in this instance refers to an aircraft movement be it a landing or a departure at an Irish aerodrome.

The reduced levels of air travel caused by the Covid-19 pandemic has been unevenly felt across Europe from a geographical perspective, with northern European countries tending to be more adversely affected than their southern counterparts. According to Eurocontrol, Ireland fared worst in Europe with a traffic loss of 62%, in part due to its critical reliance on flights to/from the UK.

As the long-awaited return to the new normal appears to be gaining momentum there is a need to continue using the toolkit afforded by Safety Management Systems in monitoring and managing both emerging and pre-existing risks. The financial impact of two lean Covid years along with the challenges of conducting fully integrated emergency response plan exercises must be managed to ensure that safety performance is not affected including the effective handling of emergencies.

Among the Safety Issues arising from the COVID-19 Pandemic documented by EASA in collaboration with the IAA and other stakeholders, is the malfunction or failure of communication, navigation and surveillance (CNS) equipment after low usage. At an individual level there may be a skills and knowledge degradation due to lack of recent practice or the need to hire new personnel.

Hazards associated with aerodromes being closed or partially closed for long periods will need mitigations against risks such as ground support equipment (GSE) malfunctions due to long periods of disuse and a lack of maintenance or technical issues relating to the recommencement of aircraft fuelling after a long break.

The vigilant management and cooperation at the interface between operators, ground handling companies and ground controllers will be essential in such instances as the rapid de-storage of aircraft. Another recognised hazard from the reduced traffic at aerodromes is the increased presence of wildlife habitation at aerodromes. This carries the risk not only of birds and insects nesting in stored aircraft and equipment, but also bird strikes to aircraft once airborne.

Accidents and Serious Incidents

This section discusses flight hours, departures, accidents and serious incidents involving aircraft engaged in Commercial Air Transport (CAT) at certified and licenced aerodromes in Ireland where there is an ATC service available. Those aerodromes are Dublin, Cork, Shannon, Ireland West, Kerry, Donegal, Sligo, Waterford and Weston. The aircraft involved may be registered in Ireland or abroad and hold an AOC issued by the IAA or a foreign NAA. Accidents and serious incidents involving aircraft engaged in General Aviation (GA) are not included in this section (refer to Section E below), unless there was a second aircraft involved in the same occurrence that was providing commercial services.

There were 4 accidents, none of which resulted in fatalities, and 8 serious incidents over the five-year period considered. In 2021 there was 1 non-fatal accident categorised as Ground Collision (GCOL) involving a taxiing aircraft and a parked aircraft. There was also 1 serious incident when a passenger was injured during disembarkation.

Table D.1: Non-fatal accidents and serious incidents involving CAT at Irish certificated and licenced aerodromes which provide ATC services

YEAR	2017	2018	2019	2020	2021	TOTAL
No. flights at Irish airports	283,374	293,961	284,555	114,483	116,793	1,093,166
No. flight hours in Irish airspace	311,715	315,776	319,775	131,296	154,877	1,233,439
Non-fatal accidents	1	1	0	1	1	4
Serious incidents	4	2	1	0	1	8

Based on the findings of their investigation the AAIU assigns one of the CAST/ICAO common taxonomy categories (the same taxonomy as discussed in the preceding Sections B and C) to the occurrence. Figure D.1 summarises the categories assigned to the 4 accidents and 8 serious incidents that took place between 2017 and 2021.

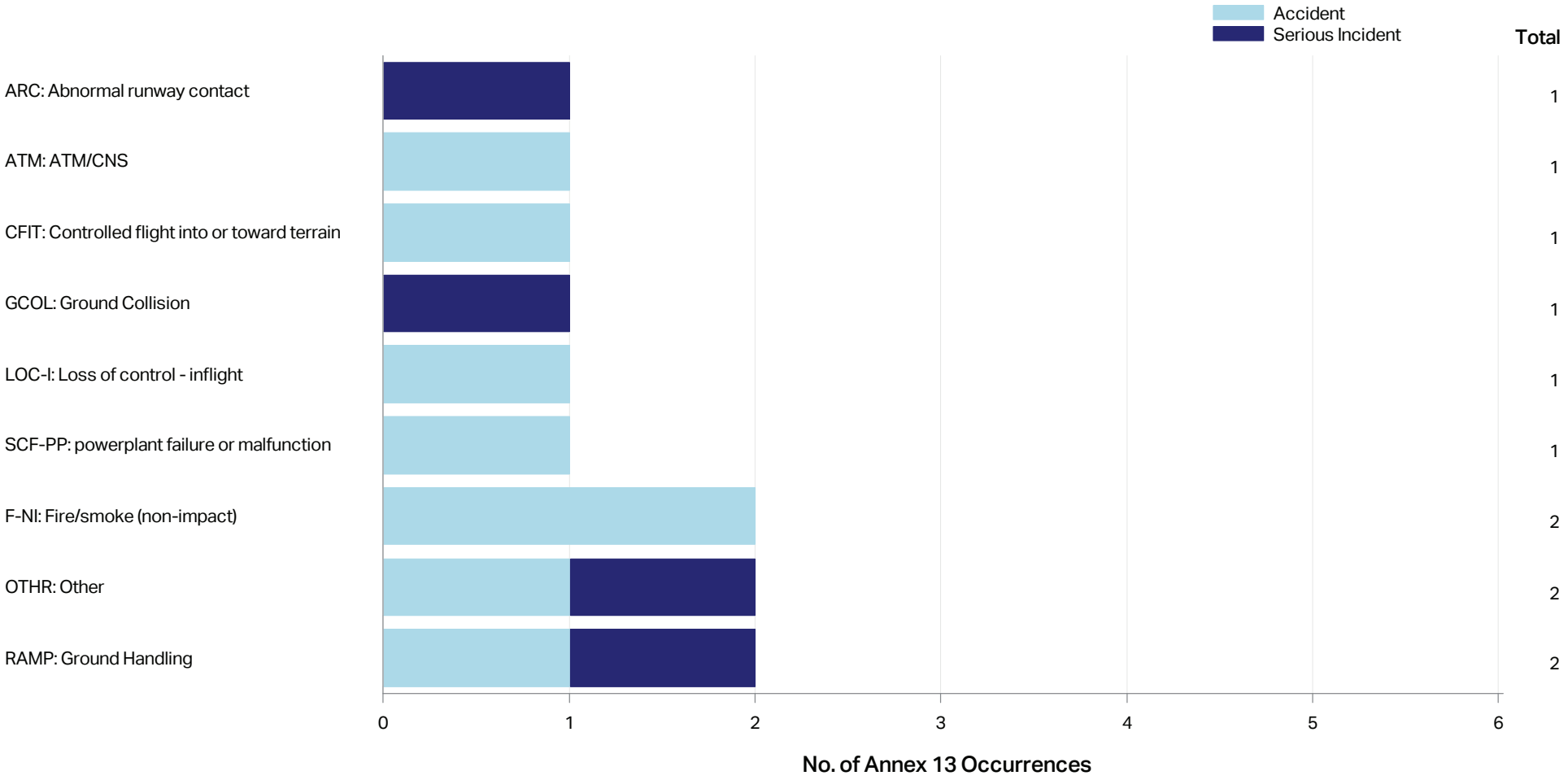


Figure D.1: Figure D.1 summarises the categories assigned to the 4 accidents and 8 serious incidents that took place between 2017 and 2021.

Occurrence Reports

This section is divided into two functional sub-sections, the first presents an overview of occurrences reported by air navigation services providers and the second sub-section presents a synopsis of occurrences reported by aerodrome operators. Given the coexistent nature of their service provision a significant number of occurrences at an aerodrome may be reported by both the air navigation services provider and the aerodrome operator. However, it is important that these occurrences are reviewed and assessed independently as the risk severity and mitigation strategies may differ in the different domains.

Sub-section 1: Air Navigation Service Provision

The IAA receives occurrence reports from ANS providers that occur in Irish airspace, including enroute operations, terminal operations and ground operations where ATC services are provided. Figure D.2.(a) below provides a breakdown of the occurrences submitted pre-covid (2017-2019) by occurrence category along with the ARMS Risk Classification Band. Figure D.2.(b) presents the same data for the covid years (2020-2021) which facilitates a comparison between the years prior to covid and the pandemic years. Figure D.3 provides a breakdown of the top event types reported during 2020-2021 that underlie these occurrence categories and in some instances are precursor events to the more high-profile occurrence categories.

The most commonly reported occurrence categories in 2020-2021 largely remained unchanged from the preceding three years. These top categories included ATM occurrences (e.g. aircraft separation issues, aircraft go around, ATM equipment problems etc) and Navigation error (e.g. taxiway errors, level bust, ATC clearance issues). Windshear or thunderstorm (WSTRW) was more frequently reported than other categories throughout 2020-2021 compared to the preceding three years. Rather than interpret this as indicating a deterioration in the weather it may demonstrate how the reduced levels of traffic led to a relative decrease in other categories such as medical (MED) and Significant Component Failure – Non-powerplant (SCF-NP).

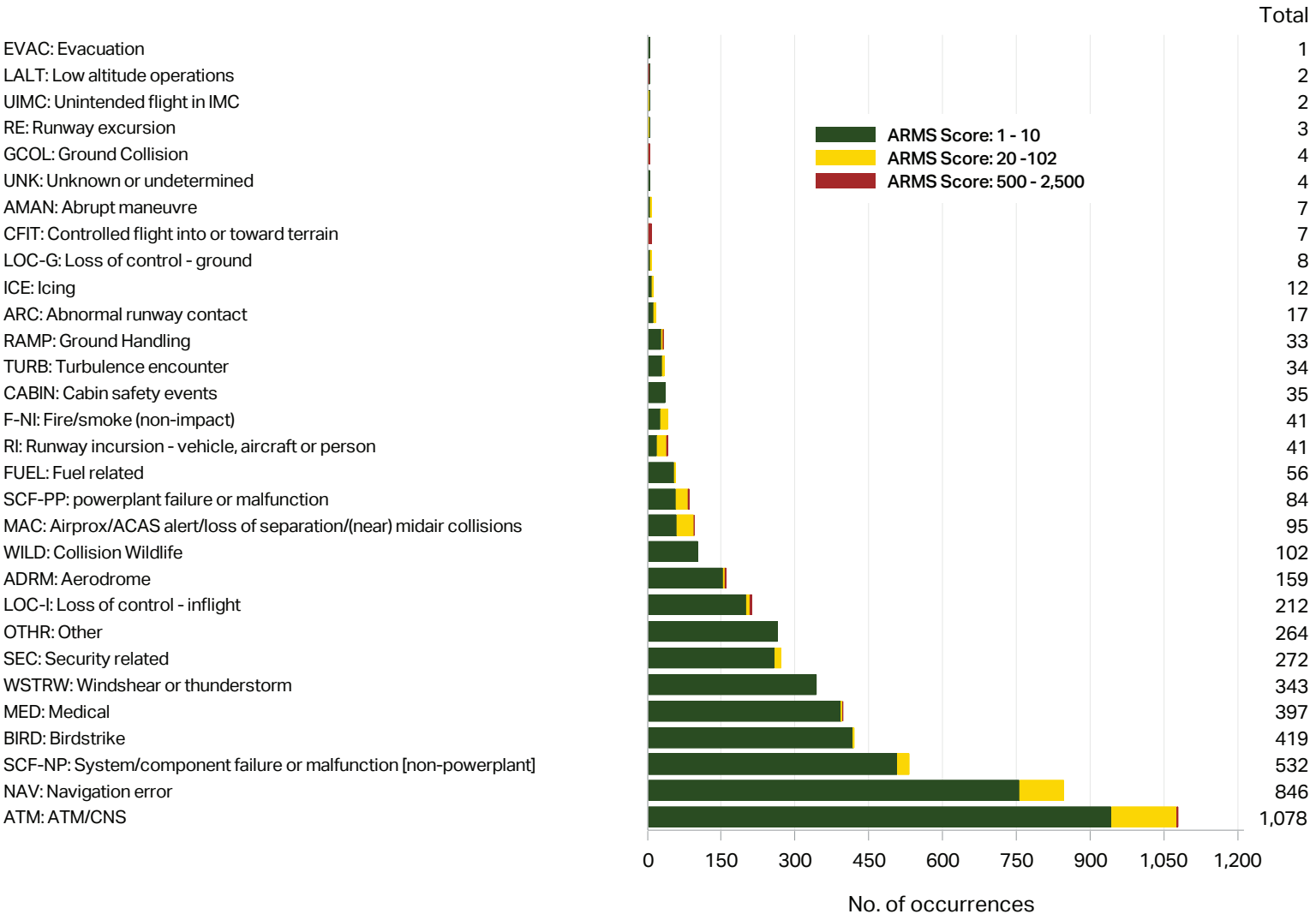


Figure D.2.(a) ATC Occurrence Reports 2017 - 2019

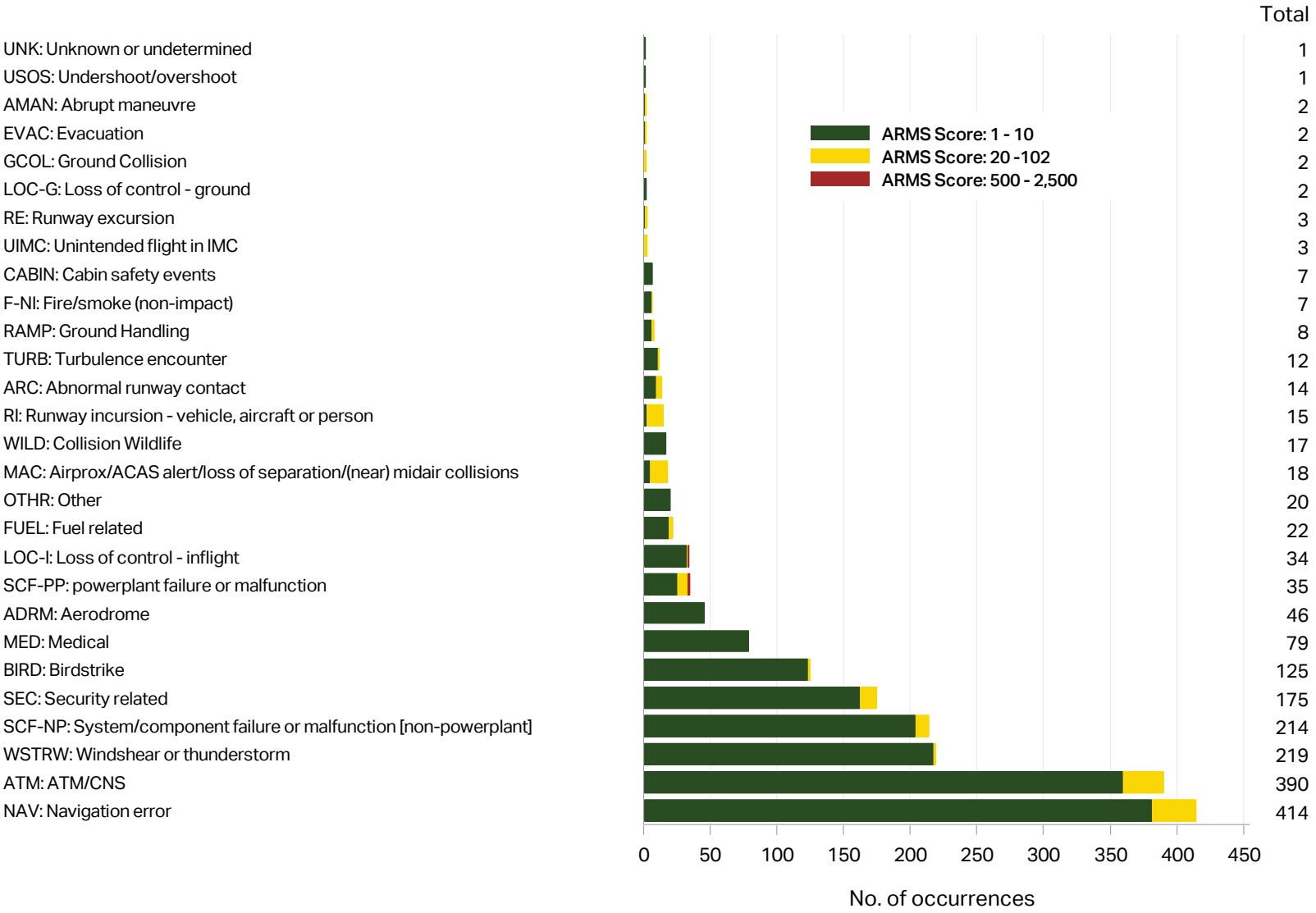


Figure D.2.(b) ATC Occurrence Reports 2020-2021

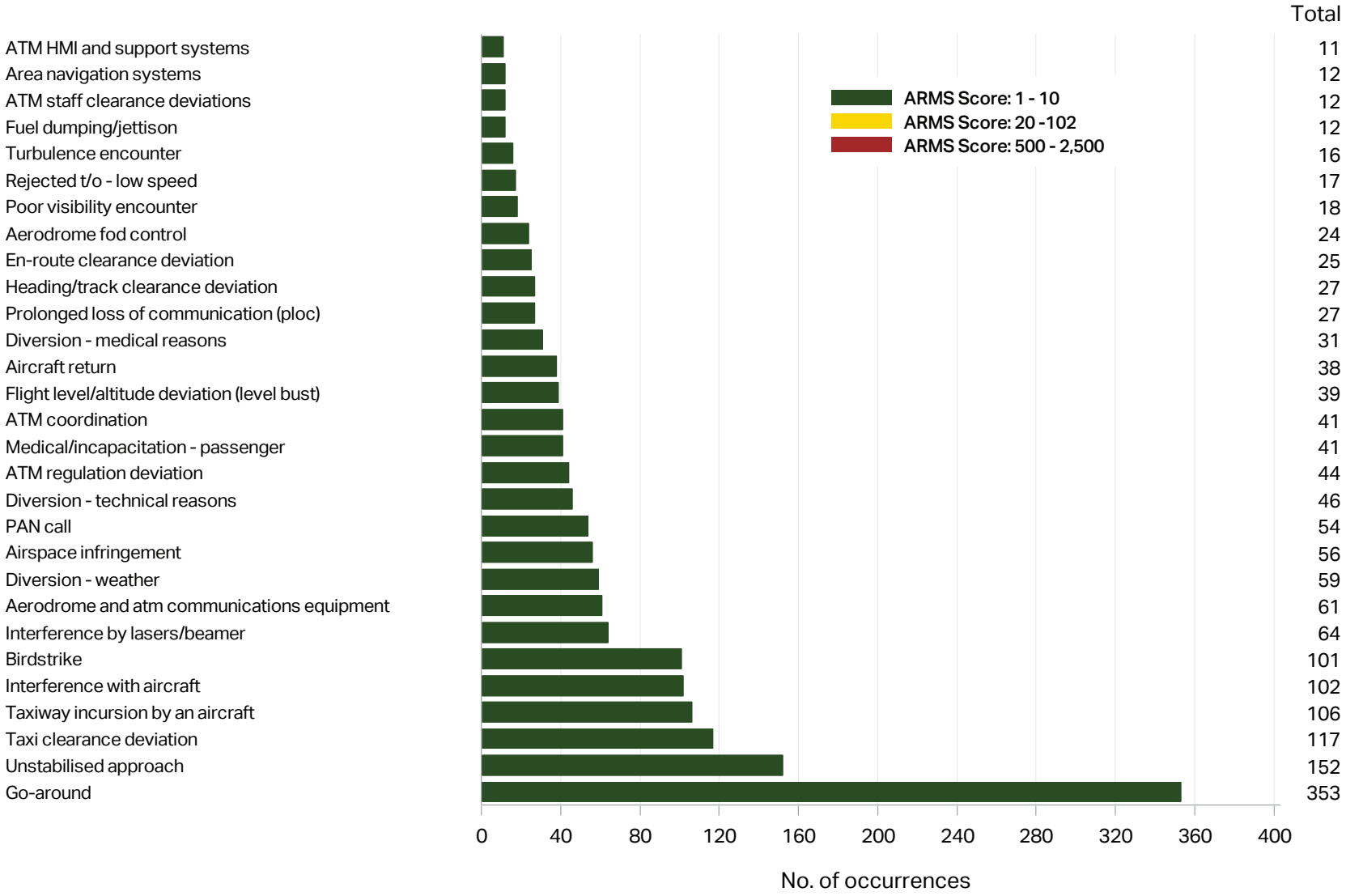


Figure D.3 Top Event Types – ATC 2020 - 2021

As required by Implementing Regulation (EU) 2017/373, the competent authority (CA) monitors and assesses the safety performance of ATM/ANS service providers under its oversight. Safety performance is monitored through the following set of safety performance indicators (SPIs)

SPI-1; SMI - Separation Minima Infringement

SPI-2; RI - Runway Incursion

SPI-3; AD - Aircraft Deviation from Clearance, Procedures or Regulation

Sub-categorised as:

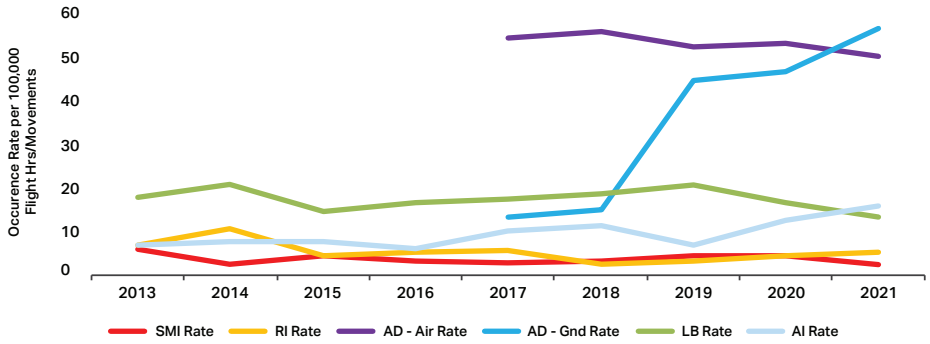
- **AD - Air (Airborne Deviation)**
- **AD - Gnd (Ground-based Deviation)**

SPI-4; LB - Level Bust

SPI-5; AI - Airspace Infringement

Nationally, SPIs are measured as a rate per 100,000 flight hours for airborne occurrences. Ground-based aircraft deviations (AD-Gnd) and runway incursions (RI) are measured as a rate per 100,000 movements.

Table D.2 ATM Annual National SPI Rates, 2013 – 2021



Separation minima infringements (SMI) and runway incursions (RI) are considered to be the two most significant SPIs, as they are generically considered to be closer to the accident scenario than the other nominated SPI categories. Indeed, aircraft deviations, level busts and airspace infringements can sometimes be precursors to separation minima infringements and runway incursions. This position is substantiated by results of the ANSD event risk classifications (ERC) that are done for all SPI occurrences, where SMI and RI occurrences average a significantly higher risk classification than those other occurrence categories. The ERC methodology includes an assessment of the effectiveness of remaining barriers between an occurrence and its most credible accident outcome.

Since 2013, the rates of SMI and RI have continuously remained at 10 or less per 100,000 flight hours and movements, as applicable. Whilst the consistency of this performance is noted, these SPIs will always generate the most scrutiny. The rate of RI increased in 2021, and it is observed that the RI rate has been increasing annually since a 2018 low. The rate of SMI in 2021 was at its lowest rate since 2013.

In 2017, SPI-3: 'aircraft deviations' was sub categorised into 'airborne deviations' and 'ground-based deviations' to facilitate more relevant measurement of these occurrences (i.e. against flight hours for airborne deviations, and against movements for ground-based deviations).

Since 2017, the rate of ground-based deviations (AD-Gnd) has significantly increased. The rate of airborne deviations (AD-Air) reduced slightly in 2021 and has maintained between 50 and 56 per 100,000 flights hours since 2017.

In 2021, a decrease in the rate of Level Busts (LB) has been observed, and it stands at its lowest rate since 2013.

The rate of Airspace Infringements (AI) has increased over the two 'covid' years, from 7 to 16 per 100,000 flights hours.

These SPI's and related trends are subject to ongoing review at the relevant airport Local Runway Safety Teams, which includes inputs from stakeholders across the relevant domains to identify and address the main safety issues under-lying the safety performance data.

Safety Issues – Air Navigation Service Provision

This section provides a summary of the main safety issues that emerge as a result of the analysis of these safety performance statistics for air navigation service provision.

Key Safety Areas:

ICAO and EASA analyses of aviation safety data on a worldwide basis has identified that two of the main contributors to accidents with a high number of fatalities in commercial aeroplane operations are mid-air collision (MAC) and runway incursions (RI). Whereas the ANS providers may not always contribute to the cause of these type of accidents, they can play an important role in their prevention.

Figure D.1 shows that there were no accidents or serious incidents in the key safety areas of MAC or RI over the past 5 years. Figures D.2.(a) and D.2.(b) combined show that over the past five years ANS providers reported 113 MAC related occurrences and 56 RI related occurrences. In 2021 there was 1 non-fatal accident categorised as 'Ground Collision' (GCOL) and 1 serious incident categorised as 'Other' when a passenger fell from a forward airstairs during disembarkation.

Table D.2 shows the trends 2013-2021 for key ANS related safety performance indicators. Separation minimum infringements, airspace infringements and level bust events could be part of the causal chain of events that could lead to a MAC related occurrence, albeit there are other safety nets available (e.g. collision avoidance systems, ATC intervention etc) that add further protections in this regard. Deviation from ATC clearance can be associated with a MAC occurrence or with a runway incursion.

Detailed analysis of the safety information in conjunction with follow-up information from the reporting organisations has identified the following safety issues that are included in the ANS sector-based risk register.

KEY SAFETY AREA	SAFETY ISSUES
Mid-Air Collision (MAC)	• Identification and response to airspace infringement • Control of traffic flow to prevent separation minima infringement • Recognition and response to deviation from ATC clearance • Adherence to standard phraseology in ATC communications • Adherence to ATC communication procedures (e.g. readback/hearback) • Management of declared emergencies • Anticipation and response to aircraft go-around • Reaction to drone infringements into controlled airspace
Runway Incursion (RI)	• Recognition and response to deviation from ATC clearance by aircraft and ground vehicles • Protection of runway operations • Control of ground movements in low visibility operations • Adherence to standard phraseology in ATC communications • Adherence to ATC communication procedures (e.g. readback/hearback)

Number and Rate of ANS MORs: 2017 to 2021

Table D.3 provides a comparison between the number of flight hours flown and the corresponding MOR rates per 10,000 flight hours from 2017 to 2021. This table shows an 18% increase in the number of flight hours in 2021 compared to 2020. The reporting rate during 2020-2021 was higher at 62.74 when compared to 50.92 during 2017-2019, indicating that the organisations SMS's were well managed, despite the challenges for ANS staff due to the pandemic.

Table D.3: No. and rate of MORs according to flight hours from 2017 to 2020

YEAR	FLIGHT HOURS	TOTAL	
		NUMBER	RATE
2017	311,715	1,404	45.05
2018	315,776	1,733	54.88
2019	319,775	1,692	52.91
2020	131,296	877	66.80
2021	154,877	909	58.69

Sub-section 2: Aerodrome Operations

A breakdown of the occurrences submitted between 2017 and 2019 by occurrence category and ARMS Risk Classification Band is shown in Figure D.4 (a) below, followed by a comparative chart for 2020-2021 in Figure D.4 (b).

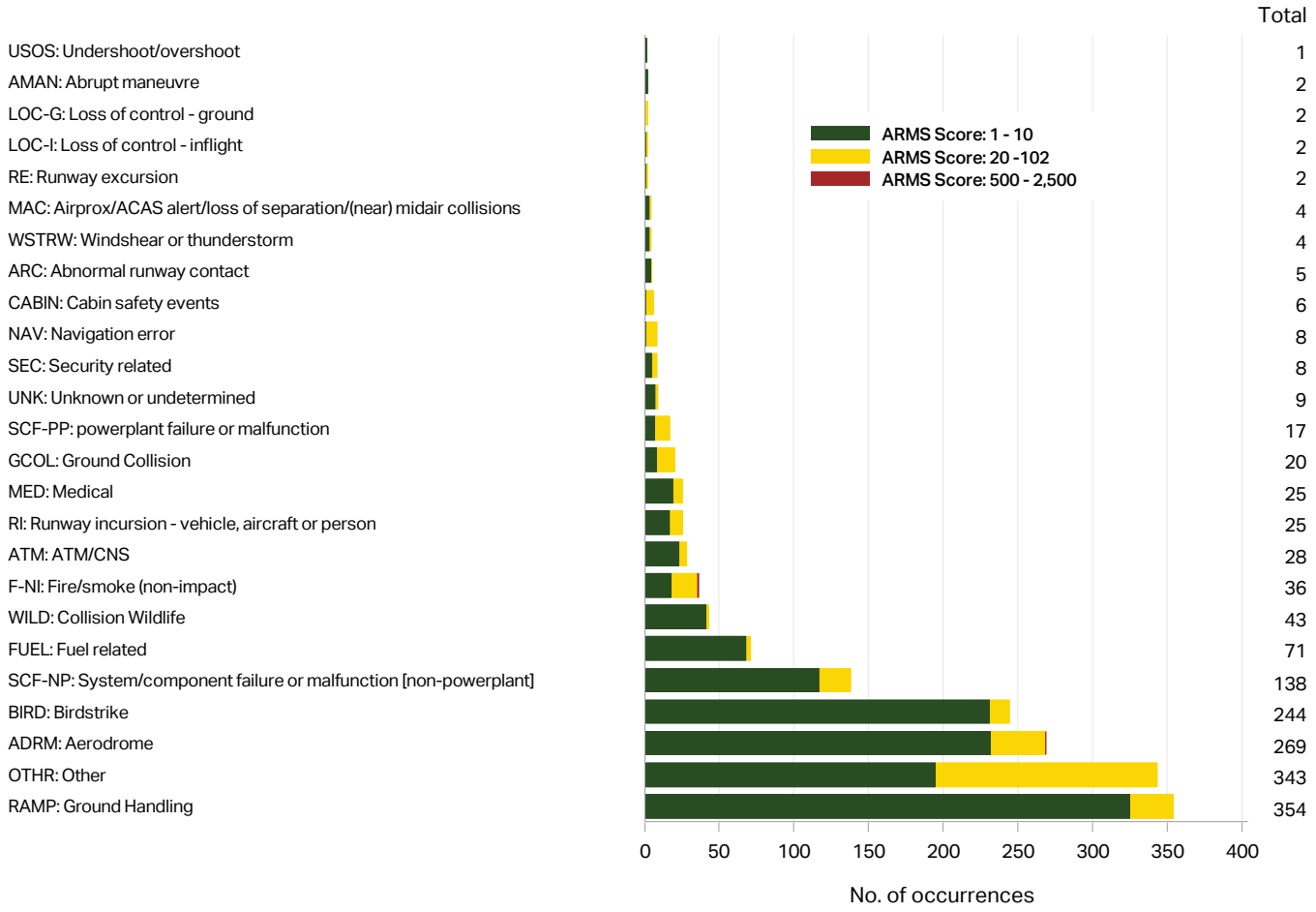


Figure D.4 (a) Aerodrome Occurrence Reports 2017-2019

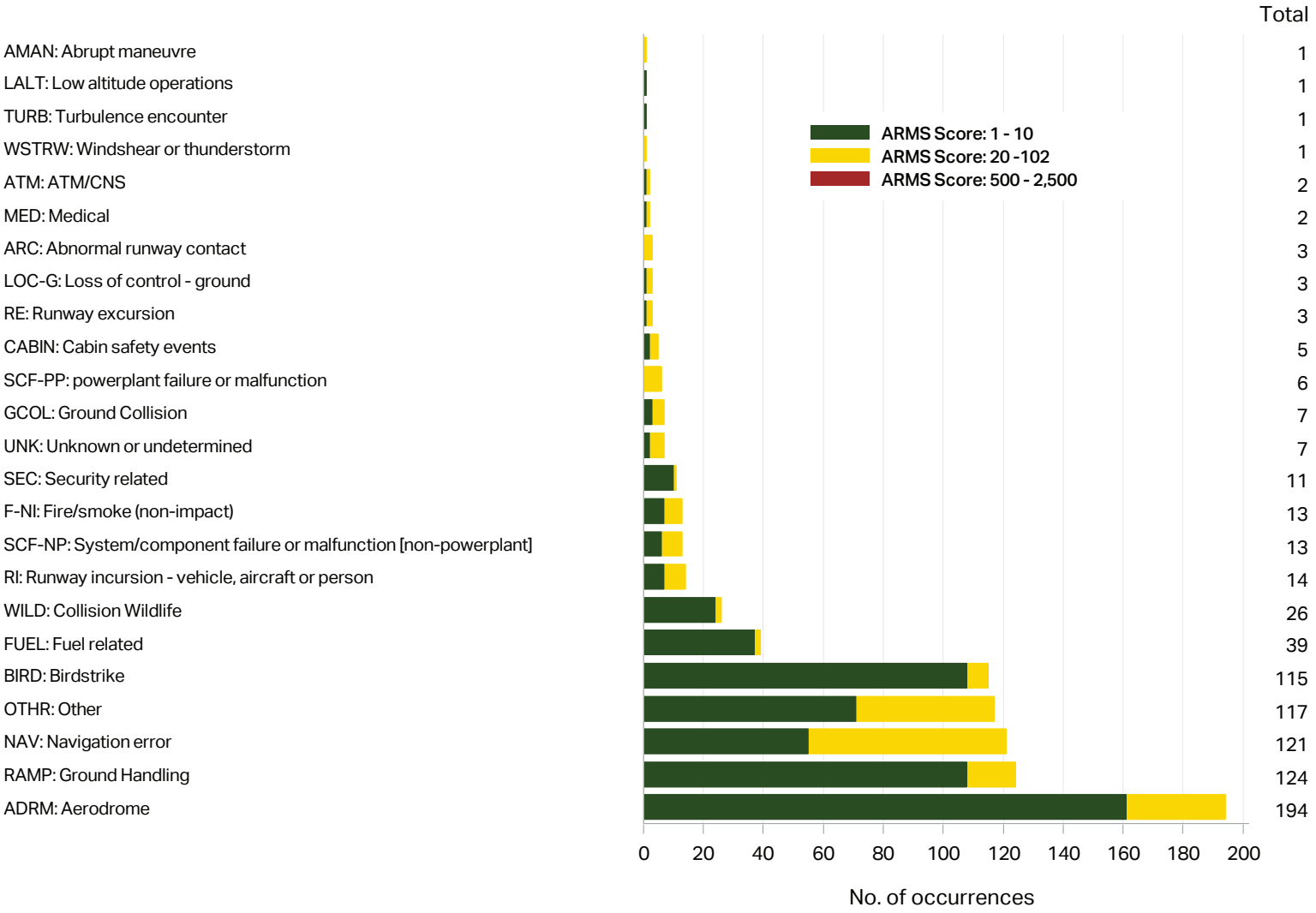


Figure D.4 (b) Aerodrome Occurrence Reports 2020-2021

The most commonly reported occurrence categories largely remained the same when comparing pre-covid trends to those observed during covid years, with the following exceptions. NAV was relatively a more commonly reported category in 2020-2021 than in previous years. MED was less frequent in 2020-2021 compared to previous years, this could possibly be due to the lower level of aircraft movements and decreased number of passengers. Figure D.5 provides a list of the top event types recorded and so gives more detail as to the events that populate these categorisations.

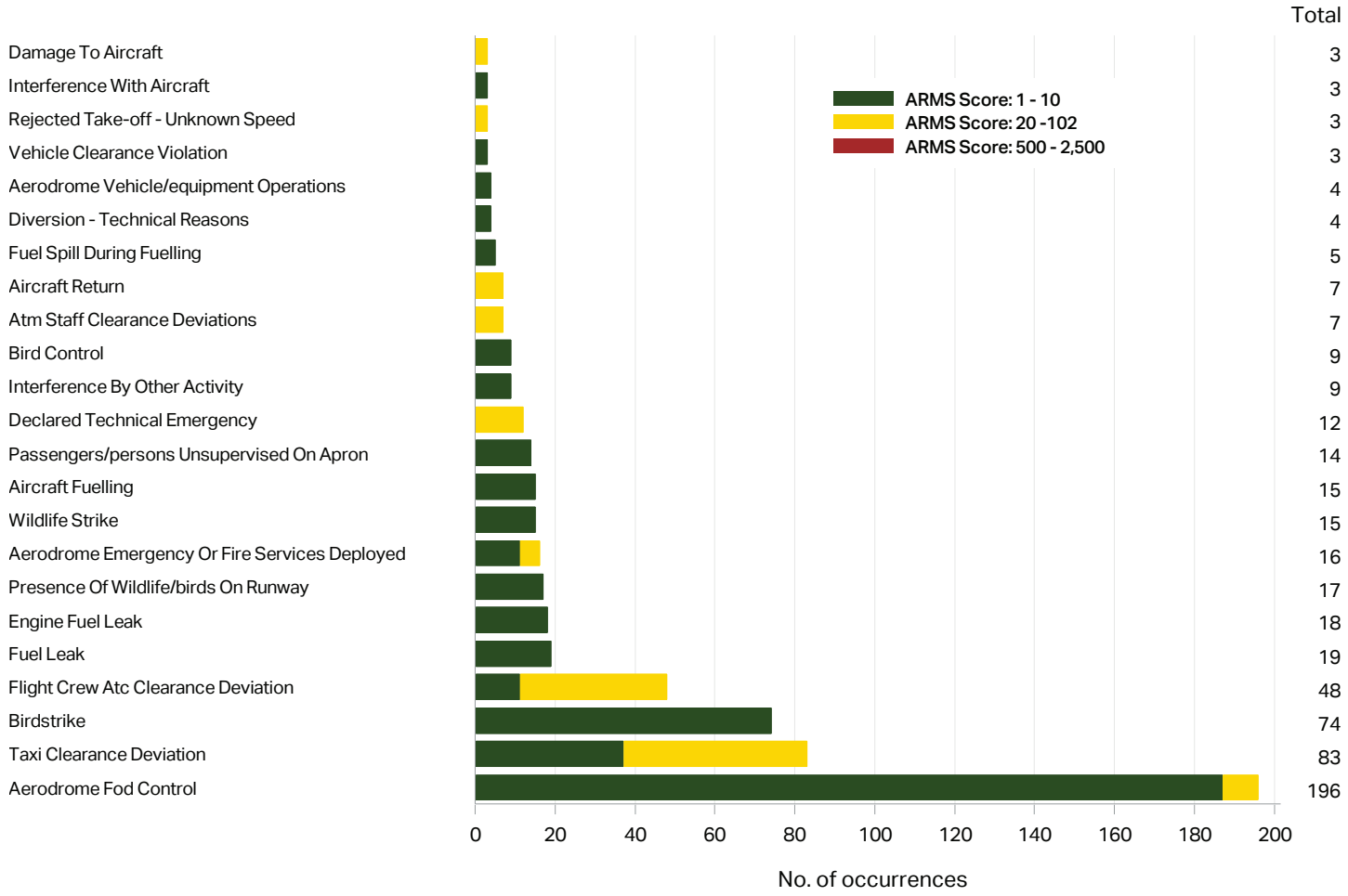


Figure D.5 Top Event Types – Aerodrome 2020- 2021

Safety Issues:

This section provides a summary of the main safety issues that emerge as a result of the analysis of these safety performance statistics for aerodrome operations.

Key Safety Areas:

Runway incursion (RI), runway excursion (RE) and aircraft upset/loss of control - inflight (LOC-I) are key safety areas identified globally where aerodrome operations could have a bearing. Runway incursion events could be attributed to the unauthorised presence of ground vehicles on the runway, or the presence of wildlife, both of which could present a serious risk to an aircraft during take-off or landing. The condition of the runway surface itself, or failure to report this condition accurately, could contribute to the risk of a runway excursion. An aerodrome operator may also provide ground handling services some of which (e.g. aircraft loading or unreported aircraft damage) could in exceptional circumstances lead to flight control difficulties.

Figure D.1 shows that 1 accident and 1 serious incident were attributed to ground handling activities in the past five years. Figures D.4.(a) and (b) show that ground handling (e.g. loading, towing, fuelling of aircraft etc) and aerodrome related (including occurrences relating to the design and servicing of aerodrome facilities and equipment) were among the most common occurrence categories reported by aerodrome operators equally during covid and pre-covid. While there was no accident or serious incident categorised as runway incursion Figures D.4. (a) and (b) show that there were 39 runway incursions reported by aerodrome operators in the past five years, 13 of these were due to unauthorised presence of ground vehicles on the runway. Figure D.5 shows that the top event types reported during 2020-2021 were 'aerodrome fod control', 'taxi clearance deviation', 'birdstrike' and 'flight crew atc clearance deviation'. These events are in line with some of the safety issues identified as part of the Covid-19 risk portfolio; "Increased presence of wildlife on aerodromes", "Hazards associated with aerodromes being closed or partially closed for long periods" and "Skills and knowledge degradation due to lack of recent practice".

Detailed analysis of the safety information in the Aerodrome domain in conjunction with follow-up information from the reporting organisations has identified the following safety issues that are included in the Aerodrome sector-based risk register.

KEY SAFETY AREA	SAFETY ISSUES
Runway Excursions (RE)	• Removal of runway contamination (e.g. snow, ice, foreign objects) • Maintenance of runway surface condition • Reporting on runway surface condition
Runway Incursion (RI)	• Management of ground movements in low visibility conditions • Deviation from ATC clearance by ground vehicles • Adherence to standard phraseology in ATC communications • Adherence to ATC communication procedures (e.g. readback/hearback)
Aircraft Upset (LOC-I)	• Adherence to aircraft loading procedures (e.g. passengers, baggage and cargo, fuel) and accurate completion of aircraft loadsheets when provided by aerodrome operator • Adherence to aircraft ground handling procedures (e.g. de-icing, dangerous goods) • Reporting of damage to aircraft during ground operations • Wildlife strike hazard management in the vicinity of airports • Awareness of LOC-I risk among ground handling agents

Additional Safety Areas

Many of the Ground Handling occurrences reported reflect events that do not affect the key safety areas but could nonetheless result in injury to passengers or aerodrome staff, and aircraft damage with potentially lengthy delays to passengers.

Aerodrome operators have primary responsibility for protection of the airport from drone infringements, including the temporary suspension of operations in case of an occurrence.

The following safety issues are also included in the Aerodrome sector-based risk register.

SAFETY AREA	SAFETY ISSUES
Safety of persons on the apron	• Routing of passengers from gate to aircraft steps • Condition of aircraft steps • Movement of ground operations personnel on the apron • Management of ground vehicle traffic in proximity to aircraft • Protection of personnel from jet-blast or propeller wash • Perception and situational awareness, especially during bad weather conditions and at nighttime • Experience, training and competence of individuals
Prevention of aircraft damage	• Co-ordination and control of turnarounds between various agencies • Ground vehicles approaching and positioning around aircraft and different aircraft types • Adherence to aircraft marshalling, pushback and towing procedures • Management of ground movements in low visibility conditions • Adherence to positioning, securing and decongestion procedures for ground service equipment on the apron
Drone infringements	• Management of aerodromes operations in the event of drone infringement, including suspension and re-activation of flight operations as required • Prohibition of drone flying in close proximity to an aerodrome

Number and rate of aerodromes MORs from 2017 to 2021

The following table provides a comparison between the number of movements and the corresponding MOR rates per 10,000 movements from 2017 to 2021. The number of movements in 2021 made a modest 2% increase on 2020, while the reporting rate also increased. The improved reporting rate over the pandemic years 2020-2021 may be due to the greater focus by industry on Safety Management Systems in their endeavours to monitor risks posed by the Covid-19 pandemic. It may also reflect a greater maturation of Safety Management Systems and their reporting cultures. In any event this increase in reporting rate indicates a well-managed SMS despite the challenges to aerodrome staff due to the pandemic.

Table D.9: No. and rate of MORs according to movements from 2017 to 2021

YEAR	MOVEMENTS	TOTAL	
		NUMBER	RATE
2017	283,374	510	18.00
2018	293,961	462	15.72
2019	284,555	571	20.07
2020	114,483	367	32.06
2021	116,793	403	34.50

SECTION E

GENERAL AVIATION IN IRELAND

Introduction

General Aviation (GA) in Ireland is defined as any aviation activity not categorised as Commercial Air Transport (CAT). It includes aviation activities regulated under European law such as.

- specialised operations (Part SPO) such as aerial photography and parachute support operations; and
- non-commercial operations using non-complex aircraft (Part NCO) such as private flying, pilot training, introductory flights, and cost-sharing flights.

Aviation activities subject to Irish national law in accordance with Basic Regulation (EU) 2018/1139 Annex I, such as historic, amateur built (sometimes referred to as homebuilt), specific categories of helicopters, sailplanes, powered parachutes and balloons etc. are also included. Please refer to Regulation (EU) 2018/1139 Annex I for a more detailed break-down of the criteria for aircraft in these categories.

Due to the diverse range of GA activities in Ireland this section has initially been divided into two sections; EASA certified and non-EASA certified (Annex I), followed by a more detailed review on the safety performance of each subsector.

GA EASA Regulated Aircraft

All aircraft, certified and non-certified, which are not included in Annex 1 to 2018/1139 including:

- Aeroplanes with a maximum take-off mass (MTOM) of 2,250 kg and above and less than 5700kg.
- Aeroplanes with an MTOM less than 2,250 kg,
- Helicopters – with an MTOM of 2,250 kg and above.
- Helicopters – with an MTOM of less than 2,250 kg.
- Hot Air Balloons.
- Sailplanes and powered sailplanes - with rigid wings and undercarriage.

GA Non-EASA Regulated Aircraft; Aircraft subject to Irish national legislation (Annex I Aircraft)

- Historic Aircraft
- Amateur Built (Homebuilt) Aircraft
- Microlight aircraft – typically aeroplanes with MTOM less than 450 kg and flex-wing aircraft.
- Gyrocopters.
- Paragliders, powered paragliders (paramotors) and powered parachutes.

Note

Performance data for Part-NCC operations (i.e. involving complex aircraft) have been included in the commercial operations sections; refer to Section B: The Irish Fixed-wing Commercial Air Transport Sector and Section C: The Irish Commercial Helicopter Sector.

COVID-19

As with all the other aviation domains, the Covid-19 pandemic continued to impact GA activity in 2021, although it was not to the same extent as experienced in 2020 when initial Government imposed health restrictions severely curtailed most activities. While the welcome gradual phased unlocking in 2021 was later than the traditional springtime return to the VFR season, it did benefit the peak summer-autumn season. Even though exposure data isn't readily available for this sector there is reason to believe that the level of activity in 2021 was up on 2020, albeit down on pre-Covid years.

Unfortunately, private pilots do not have the benefit of a safety management system (SMS) in their day to day flying once they leave the environs of training organisations (ATOs and DTOs). Strong safety promotion networks are the most readily available safety tool that can assist GA pilots in strengthening their resilience by better equipping them to address the challenges of identifying hazards and developing the ability to mitigate against the associated risks. The General Aviation Safety Council of Ireland (GASCI) continued to provide excellent safety promotional material throughout 2021 including the awareness of the increased risk from a prolonged spell of inactivity. "Skills and knowledge degradation due to lack of recent practice," was one of the pertinent Covid-19 risks identified for GA.

Accidents and Serious Incidents:

There were no fatal accidents in GA in Ireland in 2021. There were 7 non-fatal accidents, which included 5 related to Microlights and 1 concerning an Annex 1 aeroplane. There were 4 Serious Incidents; 2 related to EASA certified Fixed Wing aeroplanes < 2250kg, 1 concerning a Paraglider and 1 involving a Homebuilt aeroplane.

An overall summary of the safety performance of this sector in respect of accidents and serious incidents in 2021 compared to the previous 4 years (2017-2020) is provided in Table E.1 below. It has been subdivided into EASA certified and non-EASA certified (Annex I) aircraft, as these two subdivisions are subject to differing regulatory regimes and oversight procedures.

Charts outlining the categorisation of accidents and serious incidents are provided. These include all General Aviation accidents and serious incidents that occurred in Ireland, whether the aircraft was registered in Ireland, or registered abroad (e.g. visiting aircraft or foreign registered aircraft based in Ireland).

Table E.1 Summary of GA Accidents and Serious Incidents.

	GA SUB-SECTOR	NO. OF FATAL ACCIDENTS (FATALITIES) 2021	TOTAL NO. OF FATAL ACCIDENTS 2017-2020 WITH (TOTAL FATALITIES)	NO. OF NON-FATAL ACCIDENTS 2021	TOTAL NO. OF NON-FATAL ACCIDENTS 2017-2020	NO. OF SERIOUS INCIDENTS 2021	TOTAL NO. OF SERIOUS INCIDENTS 2017-2020
EASA Certified Aircraft	Aeroplanes >2250 ≤5700 kg	0 (0)	1 (2)	1	1	0	1
	Aeroplanes ≤2250 kg	0 (0)	0 (0)	0	11	2	7
	Helicopters > 2250 kg	0 (0)	0 (0)	0	0	0	0
	Helicopters ≤ 2250 kg	0 (0)	0 (0)	0	2	0	0
	Sailplanes	0 (0)	0 (0)	0	2	0	0
	Balloons	0 (0)	0 (0)	0	0	0	0
Annex I Aircraft	Annex 1 Aeroplanes ≤2250 kg	0 (0)	2 (3)	1	3	0	2
	Homebuilt ≤2250 kg	0(0)	1 (2)	0	4	1	1
	Microlight aircraft	0 (0)	2 (2)	5	2	0	0
	Gyrocopters	0 (0)	0 (0)	0	0	0	0
	Glider, powered paragliders, paragliders, and powered parachutes	0 (0)	1 (1)	0	3	1	1

Land Aeroplanes - with an MTOM > 2,250 kg ≤ 5,700kg.

There were 5 land aeroplanes with an MTOM > 2,250 kg ≤ 5,700kg Irish aircraft register at the end of 2021.

There were no fatal accidents, 1 non-fatal accident, and no serious incidents involving land aeroplanes in this category in 2021.

Over the previous four years (2017-2020) there was 1 fatal accident, 1 non-fatal accident and 1 serious incident. The fatal accident occurred in 2018, involving a foreign registered aircraft while operating in accordance with Part-SPO (Specialised Operations), resulting in two fatalities and was categorised as 'Loss of Control - Inflight' (LOC-I). The non-fatal accident and serious incident both occurred in 2019, involving Irish registered aircraft and were both categorised as 'Abnormal Runway Contact' (ARC).

EASA Regulated Land Aeroplanes - MTOM ≤ 2,250 kg

There were 103 EASA certified land aeroplanes with an MTOM ≤ 2,250 kg on the Irish aircraft register at end of 2021.

In 2021 there were no fatal accidents, no non-fatal accidents and 2 serious incidents in this sub-sector. Both serious incidents involved foreign registered aircraft, with one categorised as 'Abnormal Runway Contact' (ARC) and the other categorised as 'Significant Component Failure – Powerplant' (SCF-PP).

During the previous 4 years (2017-2020) there were no fatal accidents and 11 non-fatal accidents, 2 of which related to foreign registered aircraft. 'Abnormal Runway Contact' (ARC) is the most commonly assigned categorisation with 'Runway Excursion' (RE), 'Fuel' (FUEL), 'Significant Component Failure – Powerplant' (SCF-PP), 'Loss of Control - Inflight' (LOC-I), 'Collision with obstacles during take-off and landing' (CTOL), 'Ground Collision' (GCOL), 'Loss of control on the ground' LOC-G and 'Significant Component Failure – Non Powerplant' (SCF-NP) also being assigned categorisations. There were 7 serious incidents involving 4 foreign aircraft.

Annex I Land Aeroplanes MTOW ≤ 2250 kgs.

In 2021 there were no fatal accidents, 1 non-fatal accident and no serious incidents involving aircraft in this sub-sector.

Over the previous four years (2017-2020), aeroplanes in this sub-sector were involved in 2 fatal accidents resulting in 3 fatalities. Both fatal accidents involved Irish registered aircraft. There was 1 fatal accident with 2 fatalities in 2019, categorised as 'Significant Component Failure - Non-Powerplant' (SCF-NP) The AAIU investigation of this accident is ongoing. There was 1 fatal accident in 2017 with 1 fatality, involving an Irish registered aircraft, categorised as 'Ground Collision' (GCOL). There were 3 non-fatal accidents and 2 serious incidents in this four-year period involving two foreign registered aircraft. The categorisations assigned to these accidents were 'Abnormal Runway Contact' (ARC), 'Fire/smoke post-impact' (F-POST) and 'Runway Excursion' (RE).

The AAIU assigned occurrence categories for accidents and serious incidents involving Land Aeroplanes MTOM ≤ 2,250 kg (EASA Regulated and Annex 1 aircraft) in the last five years are shown in Figure E.2.

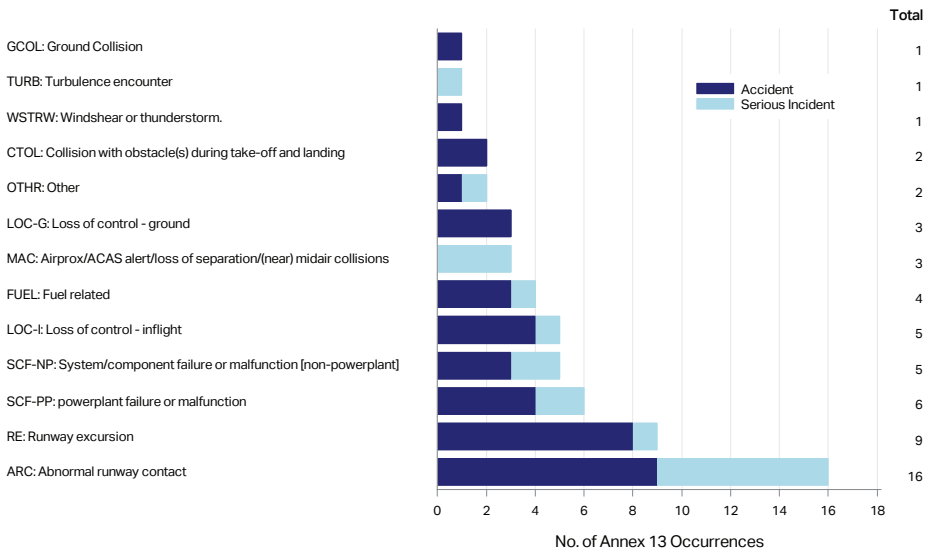


Figure E.2: Occurrence categories assigned to accidents and serious incidents involving GA aeroplanes with an MTOM below 2,250 kg (2017-2021). Note: some events have been assigned more than one categorisation.

Rotorcraft

There were 5 complex rotorcraft and 19 non-complex rotorcraft registered in Ireland at the end of 2021.

There were no fatal accidents, non-fatal accidents or serious incidents involving GA rotorcraft operations in 2021.

During the previous four years (2017–2020) there were 2 non-fatal accidents involving GA helicopters, both relating to foreign registered non-complex helicopters. These accidents were categorised by the AAIU as, 'Loss of control on the ground' (LOC-G) and 'Loss of control in flight' (LOC-I).

Homebuilt aeroplanes

There were 74 homebuilt aeroplanes on the Irish aircraft register at end of 2021 in this sub-sector.

There were no fatal accidents, no non-fatal accidents and 1 serious incident involving homebuilt aeroplanes in 2021.

During the previous four years (2017–2020) there was 1 fatal accident with 2 fatalities which occurred in 2019, involving a foreign registered aircraft and was categorised as 'Loss of Control- Inflight' (LOC-I). In addition, there was 4 non-fatal accidents involving 3 Irish registered aircraft and 1 foreign registered aircraft. The non-fatal accidents were categorised by the AAIU as; 'Abnormal Runway Contact' (ARC), 'Runway Excursion' (RE), 'Collision with obstacles during take-off and landing' (CTOL), 'Loss of control on the ground' (LOC-G) and Windshear or thunderstorm (WSTRW). There was 1 serious incident involving a foreign registered aircraft.

Microlight aircraft

At the end of 2021, there were 166 microlights on the Irish aircraft register.

There were no fatal accidents, 5 non-fatal accidents and no serious incidents involving Microlight aircraft in 2021.

During the previous four years (2017-2020) there were 2 fatal accidents, 2 non-fatal accidents and no serious incidents. Regarding the 2 fatal accidents; 1 occurred in 2019 involving a foreign registered microlight with 1 fatality, categorised as 'Collision with obstacles during take-off and landing' (CTOL) and 1 occurred in 2018 involving an Irish registered microlight with 1 fatality, categorised as 'Loss of Control – Inflight' (LOC-I). The non-fatal accidents involving 1 Irish registered aircraft and 1 foreign registered aircraft, were categorised as 'Abnormal Runway Contact' (ARC) and 'Loss of Control- Inflight' (LOC-I).

Sailplanes

There were 31 sailplanes, including 2 powered sailplanes and 1 homebuilt sailplane on the Irish aircraft register at the end of 2021.

There were no fatal accidents, non-fatal accidents, or serious incidents involving sailplanes in 2021.

Over the previous four years there were 2 non-fatal accidents, 1 accident involved an Irish registered aircraft, categorised as 'Collision with obstacles during take-off and landing' (CTOL) and 1 accident involved a foreign registered aircraft, categorised 'Glider Towing related event' (GTOW).

Gyrocopters

At the end of 2021, there were 21 gyrocopters, including 3 homebuilt gyrocopters on the Irish aircraft register.

There were no fatal accidents, non-fatal accidents or serious incidents involving Gyrocopters over the past five years.

Paragliders, powered paragliders and powered parachutes

At the end of 2021 there were 19 powered paragliders registered in Ireland.

There were no fatal accidents, non-fatal accidents or serious incidents involving powered paragliders in 2021.

During the previous four years (2017-2020) there was 1 fatal accident involving an Irish registered paraglider, with 1 fatality which was classified as 'Unknown' (UNK). In addition, there were 2 non-fatal accidents categorised as 'Collision with obstacle(s) during take-off and landing' (CTOL) and 'Loss of Control – Inflight' (LOC-I). There was also 1 serious incident categorised as 'Controlled Flight into Terrain' (CFIT).

GA Flight Training

Currently there are 28 organisations in Ireland providing flight training in general aviation. There was only 1 serious incident involving flight training in 2021, related to a paraglider. The main categories assigned to GA flight training over the past five years are presented in Figure E.3 below.

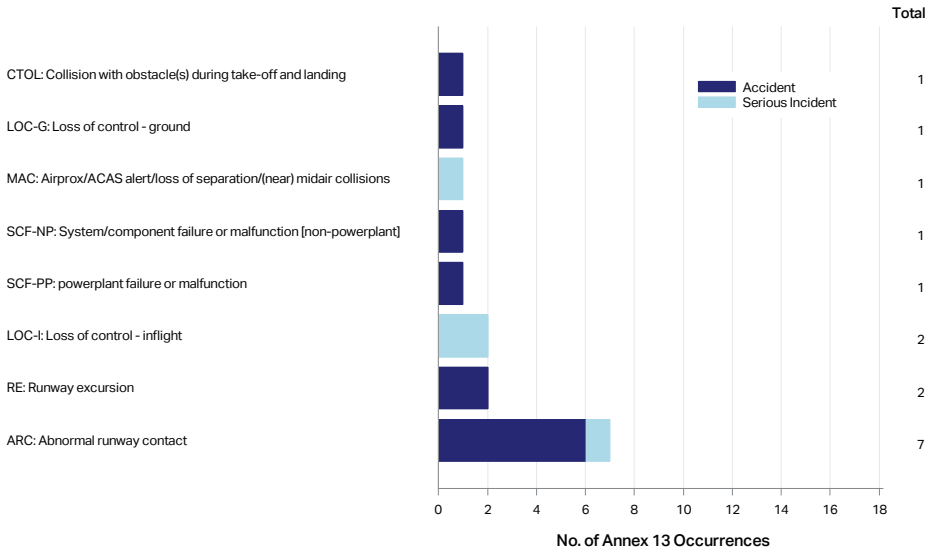


Figure E.3 Categories of accidents and serious incidents involving GA aeroplanes while flight training (2017-2021) Note: some events have been assigned more than one categorisation

Occurrence Reports

Private pilots flying general aviation EASA type certified aircraft are required to submit mandatory occurrence reports in accordance with Regulation (EU) No 376/2014. Even though many of the aircraft involved in this sector are not type certified, it is possible for the pilots of these aircraft to report occurrences on a voluntary basis using the same systems. The IAA website https://www.iaa.ie/safety/safety-reporting provides guidance on occurrence reporting requirements as well as the links necessary to submit reports to the IAA. In support of the just culture principle, the regulations contain provisions concerning confidentiality, protection of reporters and appropriate use of information contained in occurrence reports.

Despite the impact of the Covid-19 pandemic on operations the level of occurrence reporting from Flight Crew Training Organisations (FCTO) showed an increasing trend in 2021. Navigational error, Abnormal Runway Contact, and Engine failure were the top 3 known categories identified in the submitted mandatory occurrence reports.

The number of reports from GA pilots remains too low to support statistical analysis, this may be partly explained by the reduced opportunity for flying due to Covid-19. This lack of reports means that the lower-level occurrences that could lead to accidents and serious incidents (in other circumstances) are not being reported by this sector for the benefit of all. The IAA continues to promote safety occurrence reporting in general aviation with the sole objective to support the sharing of safety information among the GA community through safety promotion activities.

The General Aviation Safety Council of Ireland (GASCI), whose membership includes general aviation clubs, societies, training organisations, drone organisations, the IAA and the AAIU, provides the platform for many of the safety promotion activities in Ireland. Safety information derived from aviation occurrences in Ireland and abroad are reviewed by GASCI and the lessons learned form the basis for GASCI safety promotion actions. GASCI shares safety information on it's website (gasci.weebly.com) and twitter account (@Gasci_ie) and hosts very informative and well attended safety evenings, held over zoom in 2021 due to Covid-19 health restrictions. GASCI has also established its own reporting site where those involved in GA activities can voluntarily share safety information https://gasci.weebly.com/report-an-incidentcontact-us.html.

Voluntary Occurrence Reports

Regulation (EU) NO 376/2014 imposes a legal obligation on organisations and competent authorities (Article 5) to establish voluntary occurrence reporting systems (VORS), this enables the reporting of any occurrence or safety related information by individuals which are not subject to mandatory reporting and encourages the reporting of any safety relevant occurrence. This proactive process enables the collection of information about safety concerns, issues and hazards, which otherwise will not be revealed by the mandatory reporting system.

Table E.2 below outlines the numbers of VORs reported by individuals over the past four years according to totals and ARMS Risk Classification Band.

The main types of events reported concerned; drone operations, reports from individuals on safety issues in their organisations, and GA safety issues reported by pilots and/or members of the public. These reports do not include VORs submitted by persons through their own organisational voluntary reporting systems, which are addressed by organisations themselves under their SMS. Persons who feel that their organisation is not sufficiently addressing their concerns, may report directly to the IAA.

Table E.2 VORs submitted by Individuals to the IAA

YEAR	TOTAL	LOW RISK	MEDIUM RISK	HIGH RISK
2018	46	42	3	0
2019	39	35	4	0
2020	23	19	4	0
2021	46	41	5	0

Safety Issues

The detailed analysis of the main causes of the accidents and serious incidents helps identify the main safety areas and related safety issues for general aviation. The IAA is greatly assisted in this regard by GASCI, from their insight and interaction with membership across the sector.

Covid-19

The Covid-19 pandemic continued to maintain its grip on all aspects of life including GA throughout 2021 as the lifecycles of different variants of the disease were endured. Fortunately, as the evolving COVID variants tended to be less severe so too did the related Government imposed restrictions and consequently GA had a better opportunity to function while adhering to guidelines such as the "Recommendations for General Aviation Operations during the COVID-19 Pandemic" issued by EASA on behalf of EU Member States. It could be reasoned that the increased level of activity, concentrated into time periods when restrictions and movement were temporarily eased, posed a threat as pilots endeavoured to restore recency and familiarity. It could in part explain the increased numbers of accidents and serious incidents in 2021.

Decreased wellbeing caused by the anxiety, stress, and uncertainty brought about by the pandemic has been an issue for individuals in all sectors. Therefore, in October 2021 the IAA hosted a webinar on "Wellbeing Among Aviation Professionals" with leading researchers in this area. The careful resumption of flying and interaction with friends and fellow enthusiasts could be viewed as a welcome reprieve from some of the stressors of the pandemic. The return to flight instruction by some professional pilots could be viewed as a positive given the wealth of their professional experience in the commercial environment. Safety risk management tools such as monitoring, mitigation and the promulgation of safety material became instrumental throughout the pandemic in determining a safe means to navigate through the uncertainty trust upon all aspects of aviation. They will continue to be essential indicators as we journey through the unpredictability of this post pandemic era which may manifest previously unidentified risks.

GA Specific Safety Issues

The justifiable focus on risks associated with the Covid-19 pandemic does not mean that safety issues previously identified in more normal pre-Covid times no longer exist, which is why the following table outlining safety issues identified from the analysis of accidents and serious incidents has been retained in this year's review. These safety issues have also been included in the IAA GA sector-based risk register and may become more pertinent as we enter the post pandemic era that becomes more predictable. The GA risk register is not only informed by the Irish experience, but it includes the pan-EU safety issues identified in the EASA Annual Safety Review and European Plan for Aviation Safety.

"Damage tolerance to UAS collisions" "Deconfliction between IFR and VFR traffic", "Engine system reliability" and "Approach path management on GA aeroplanes" are among the issues highlighted in both the European Plan for Aviation Safety and the Irish State Plan for Aviation Safety.

EASA ASR 2021 also outlines how EASA has reviewed the accidents and serious incidents involving non-commercially operated small aeroplanes for 2016-2020 with regard to risk and that "while runway excursions are common, there is a low risk of fatal or serious injuries associated with them". In Ireland, RE was the second most common occurrence category assigned to accidents and serious incidents involving GA aeroplanes with an MTOM below 2,250 kg (2017-2021), see Figure E.2.

SAFETY AREA	SAFETY ISSUES
Loss of Control -Inflight	• Recognition and recovery from aircraft upset • Awareness of flight attitude • Decision making and control of aircraft, following engine failure • Recognition of, and response to, carburetor icing • Operations of light aircraft within recommended mass and balance limits • Proficiency in practiced forced landings • Awareness of performance differences between different GA aircraft types
Collision with terrain or obstacle	• Inadvertent flight into degraded visual environments • Flight below minimum safe altitude (e.g. for weather avoidance) • Pre-flight planning • Situational awareness during flight • Use of advanced technologies • Use of aeronautical charts and terrain and obstacle databases
Mid-Air Collision	• Use of see and avoid • Good communications to aid in overall situational awareness • Safety Management at Club fly-ins and airshows • Conflict with Drones • Use of advanced technologies
Take-off and Landing	• Runway excursion or heavy landing following aircraft handling or environmental issues • Take-off and landing from hard/soft airstrips • Collision with obstacles
Specialised Operations	• Aircraft upset caused by system failure or a lapse in perception and situational awareness • The intrinsic risks of intentional low flying require mitigations such as training, experience and competence
Human Factors	• Threat and error management for GA • Decision Making Single Pilot CRM
Other	• Safety of ground operations during club fly-ins • Overall an awareness of and mitigation against degraded proficiency after prolonged spells of inactivity such as the return to VFR flying after the winter

Safety Promotion continues to be the primary means of highlighting awareness around safety issues and providing guidelines on how best to mitigate against the risks concerned. The State Plan for Aviation Safety in Ireland includes specific actions to develop safety promotion material for general aviation in conjunction with GASCI.

The following websites contain existing safety promotion guidance that may be of interest to those involved in general aviation:

https://www.iaa.ie/general-aviation/safety-information

https://gasci.weebly.com/

https://www.easa.europa.eu/easa-and-you/safety-management/safety-promotion

https://www.easa.europa.eu/community/content/wellbeing

https://www.easa.europa.eu/community/ga

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Disclaimer

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