



Annual Safety Performance Review for Ireland 2022



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Foreword

Welcome to the Irish Aviation Authority's (IAA's) Annual Safety Performance Review (ASPR) for 2022, the year when the Covid-19 pandemic finally relinquished its grip on the world, thanks to mass vaccination programs and the waning virulence of later variants of the disease.

This all paved the way for the lifting of travel restrictions and summer 2022 saw a welcome return towards normal operations. This pent-up demand for travel exceeded expectations and, in some instances, operators struggled to reactivate their personnel and systems in time to meet the demands. Throughout this phase safety of flight was always considered the highest priority.

The Irish civil aviation industry experienced a steady recovery in 2022. There was a 96% increase in Commercial Air Transport (CAT) movements in 2022 compared to 2021. Similarly, the level of Irish ATC controlled flight hours was up 86% on 2021, and remained only 10% down on the level of activity recorded in 2019. The number of aircraft on the Irish register increased in 2022 with a slight decrease in the number of aircraft in storage.

Globally the fatal accident rate in the commercial aviation industry flights reduced from 0.27 per million sectors in 2021 to 0.16 for 2022. In Ireland there were no CAT fatalities in 2022. The main statistics for accidents and serious incidents in commercial aviation haven't revealed any pandemic related issues in recent years and show continuing reducing trends into the post pandemic recovery era.



Regrettably there were 2 fatalities in General Aviation (GA) in Ireland in 2022 and the IAA offers sincere sympathies to family and friends of the deceased in these cases. The IAA works with the experts in general aviation to facilitate the sharing of the lessons learned from accidents and serious incidents in order to help prevent fatalities in this domain.

Looking forward, as the industry endeavours to build back up on 2022's recovery, challenges such as geopolitical uncertainty, rising fuel and living costs, disrupted supply chains, climate change concerns and cyber security threats loom large on the horizon. The risk management skills gained over the pandemic era will be required more than ever to monitor hazards and mitigate risks in a safety critical industry aiming to regain lost ground.

The safety performance data presented here forms one element of the safety management process in the Irish state safety programme. It would not be possible to develop and share this intelligence without a healthy safety occurrence reporting culture. 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.

A handwritten signature in black ink that reads "Declan Fitzpatrick". The signature is written in a cursive, flowing style.

Declan Fitzpatrick, IAA CEO

Executive Summary

The Irish Aviation Authority (IAA) herewith presents its Annual Safety Performance Review for Ireland for 2022. This is the 14th consecutive year of publication which presents the safety performance of Irish civil aviation to the end of 2022 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.

Safety performance information is aggregated and presented under the following four primary sectors of Irish civil aviation, which are defined by their principal type of operation and resultant similarity in terms of risk exposure:

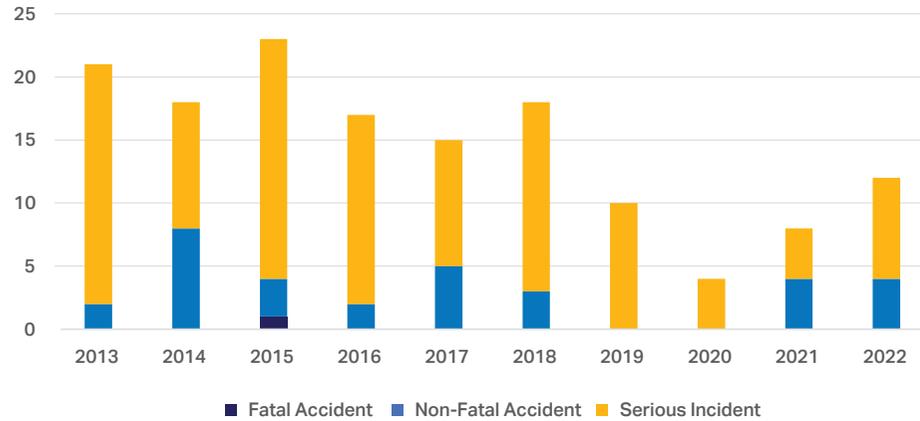
- The Irish Fixed-Wing Commercial Air Transport Sector
- The Irish Commercial Helicopter Sector
- Air Navigation Services and Aerodromes in Ireland
- General Aviation in Ireland

Opening Infographics provide a summary of the main performance statistics for each of these sectors. More detail on the supporting analysis is presented within the associated chapters on a tiered basis, with Annex 13 data, occurrence reporting charts and a breakdown of the associated safety issues.

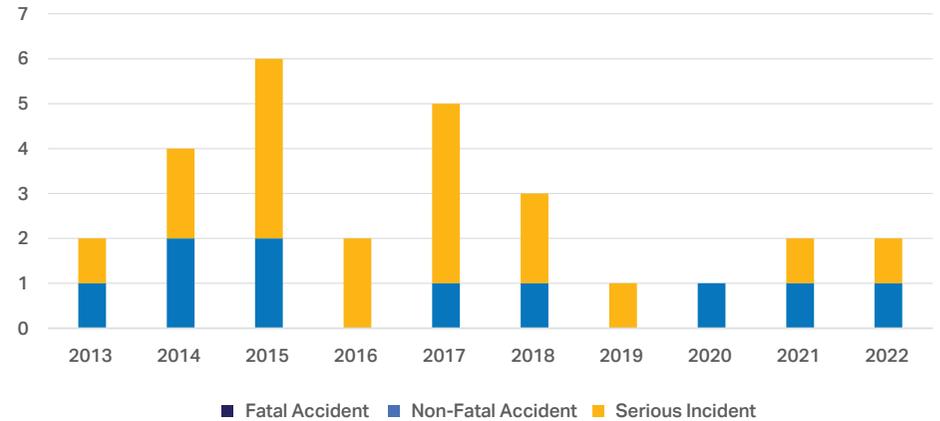
As 2022 progressed the Covid pandemic's influence over the aviation industry waned, with aviation operations making a welcome return to levels approaching those of pre-Covid by year end. This year's review differs from previous years with the occurrence reporting graphs separated into three timeframes, pre-Covid (2017-2019), Covid (2020-2021) and post Covid (2022). The intention is to enable a comparative analysis of safety performance between those periods, identify any peculiarities in the risks posed during the pandemic and observe any similarities between pre-Covid patterns and the return to the new normal.

Ten Year Charts

Commercial Air Transport - Fixed Wing



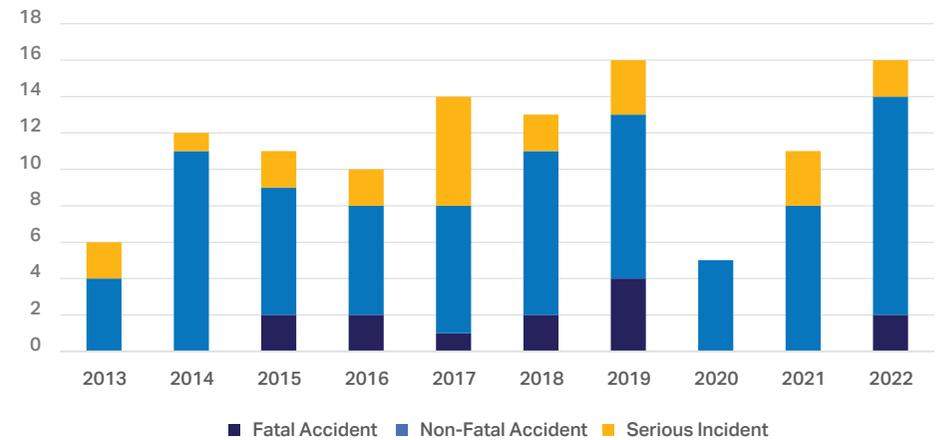
Commercial Air Transport at Irish Certified/licenced Aerodromes with ATS



Commercial Helicopter



General Aviation



Irish Air Fixed-Wing Commercial Air Transport Sector

During 2022 Irish fixed-wing aircraft engaged in CAT were involved in 4 non-fatal accidents and no fatal accidents. Between 2018 and 2022 there were 11 non-fatal accidents and no fatal accidents. The categories most commonly applied by the Safety Investigation Authority (SIA) to accidents over this 5 year period were:



Ground Handling



Ground Collision



Turbulence Encounter



System failure or malfunction



Birdstrike



Cabin Safety

There were 42 serious incidents between 2018 and 2022, 8 of which occurred in 2022. The categories most commonly applied by investigating SIAs to serious incidents were:



System failure or malfunction



Airprox/near midair collision



Runway Incursion (non-animal)



System failure or malfunction



Birdstrike



Ground Handling

Irish AOC holders submitted 7,532 MORs in 2022. The categories most commonly assigned by the IAA to these MORs were:

During the pandemic years, 2020 & 2021, Irish AOC holders submitted 7,337 MORs. The categories most commonly assigned by the IAA to these MORs were:



The Irish Commercial Helicopter Sector

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

Between 2018 and 2022, these operators experienced 1 non-fatal accident which occurred in 2022 and was categorised as 'Loss of control- inflight'.

Helicopter operators who hold an AOC issued by the IAA submitted 37 MORs in 2022. The categories most commonly applied to these MORs were:



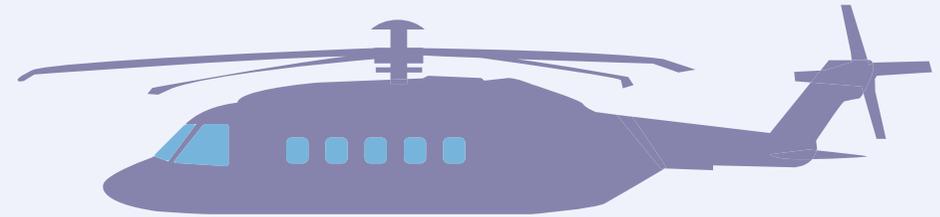
**System failure
or malfunction**



Other



**Air traffic
management**



Between 2020 and 2021, helicopter operators who hold an AOC issued by the IAA submitted 73 MORs. The three most commonly applied categories to these MORs were:



**System failure
or malfunction**



Other



**Ground
Handling**

Air Navigation Services and Aerodromes in Ireland

Between 2018 and 2022, there were 4 non-fatal accidents and 5 serious incidents involving CAT aircraft at Irish certificated/licenced aerodromes that provide ATC services. During 2022, there was 1 non-fatal accident, no fatal accident and 1 serious incident.

The ATS providers submitted 1,712 MORs in 2022. The three occurrence categories most commonly assigned to these MORs were:



Navigation Errors



Air traffic management



Security Related



Ground Handling



Navigation Errors



Birdstrike

Between 2020 and 2021, ATS providers submitted 1,767 MORs. The three most commonly assigned occurrence categories were:



Navigation Errors



Air traffic management



Windshear Thunderstorm



Aerodromes



Ground Handling



Birdstrike

Aerodrome operators submitted 642 MORs in 2022, the three most commonly assigned occurrence categories were:



Between 2020 and 2021, Aerodrome operators submitted 747 MORs, the three most commonly assigned occurrence categories were:

General Aviation in Ireland 2018-2022



Aeroplanes over 2,250 kg

1 Fatal Accident
4 Non-Fatal Accidents
0 Serious Incidents



Helicopters over 2,250 kg

0 Fatal Accidents
0 Non-Fatal Accidents
0 Serious Incidents



Sailplanes and Powered Sailplanes

0 Fatal Accidents
3 Non-Fatal Accidents
0 Serious Incidents



Aeroplanes under 2,250 kg

2 Fatal Accidents (incl. 1 homebuilt)
18 Non-Fatal Accidents (incl. 5 homebuilt)
10 Serious Incidents (incl. 2 homebuilt)



Helicopters under 2,250 kg

1 Fatal Accident
1 Non-Fatal Accident
0 Serious Incidents



Hot Air Balloons

0 Fatal Accidents
0 Non-Fatal Accidents
0 Serious Incidents



Microlight

2 Fatal Accidents
8 Non-Fatal Accidents
0 Serious Incidents



Gyrocopters

0 Fatal Accidents
1 Non-Fatal Accident
0 Serious Incidents



Paragliders, Powered Paragliders and Powered Parachutes

2 Fatal Accidents
6 Non-Fatal Accidents
0 Serious Incidents

SECTION A

INTRODUCTION



The long-awaited post pandemic recovery arrived in 2022. While the year commenced with one of the final variants, Omicron, it proved to be less impactful than earlier variants and by the second quarter travel restrictions were lifting across different countries thus allowing aviation to restart and meet the pent-up demand for travel, be it for business or pleasure.

While the return to normal operations was welcome and anticipated its rapidity caught operators off guard, especially airport operators who faced the challenge of staff shortages and system capacity in all areas but especially in ground handling and security. As with any complex system the whole aviation infrastructure requires time to properly gear up.

The shock invasion of Ukraine by Russia piled on further pressure with airspace closures in Ukraine and neighbouring countries impacting traffic flows for Air Navigation Service Providers (ANSPs). The invasion also resulted in a sizeable number of foreign leased Irish registered aircraft being unlawfully appropriated by Russian authorities and these aircraft continue to remain in this legal limbo with a high degree of uncertainty around recovery of these assets to operations outside of Russia.

The IAA itself underwent significant restructuring in 2022. The ANSP and Safety Regulatory Division (SRD) subsections separated into two completely independent corporate entities; the newly incorporated AirNav Ireland delivering the ANSP functions and the IAA expanding its regulatory remit with the merging of the Commission for Aviation Regulation (CAR) economic and consumer protection functions.

The IAA 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, it 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.

Sadly, there were 2 fatal accidents in Irish civil aviation in 2022 and the report addresses these and a number of fatal accidents in previous years, the IAA offers sincere sympathies to family and friends of the deceased in all 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.

The overall theme of 2022 was steady recovery as evidenced in the following Irish air traffic facts. Total airspace movement levels in 2022 increased 94% on 2021 levels and were only down 10% when compared to 2019. The pattern was similar for Aerodrome movements with 2022 registering a 123% increase on 2021 and remaining only 12% down on 2019 levels.

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 of 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 level 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



Introduction

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 (12 fixed-wing operators at the end of 2022).
- 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'.

As of the 31st of December 2022, there were 701 land aeroplanes on the Irish aircraft register engaged in CAT operations for both Irish AOC holders and foreign AOC operators with the Irish lease fleet. This included 119 aircraft in storage, down slightly on last year's 128 which was the highest number ever recorded.

Part-NCC (non-commercial operations with complex aircraft) operations increased throughout the year, primarily for private business jet activities. 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.

As 2022 commenced Covid-19 lockdown restrictions were still in place, fortunately these were gradually lifted when the Omicron variant wave was deemed to have passed by the end of January 2022. The pent-up demand for travel after two years of lockdown steadily materialised through the remainder of the year with progressively increasing passenger numbers. By summer airports were experiencing congestion due to the greater than anticipated speed of the recovery along with a shortage of staff in aviation organisations. The steady trajectory of the recovery was maintained to the end of the year as each month's movements closed the gap on 2019's pre-Covid travel levels. This resulted in a total increase of 96% in CAT movements in 2022 compared to 2021, however overall, this was still 42% lower than the levels observed in 2019.

As with the impact of Covid, the recovery characteristics have varied in different sectors. Dedicated cargo operations continued to see positive growth in 2022, albeit not to the same extent as seen in 2021 when the growth in e-commerce, supply chain demands caused by the global health crisis and the decreased belly-hold capacity of passenger aircraft all drove increased demand.

While the industry utilised the risk management capability of their safety management systems (SMS) as an integral business tool to successfully negotiate a pathway through the risks associated with the return to the new normal as the pandemic waned, new unforeseen threats resulting from the Russian invasion of Ukraine started to impact the recovery. Russian sanctions had the most grievous impact on aircraft lessors that had aircraft on lease to Russian carriers. At the time of Russia's invasion of Ukraine, around 500 aircraft owned by foreign lessors were operating in the country with an estimated market value of US\$10 billion. Sanctions imposed by the EU and the US prohibited leasing assets into Russia, and all insurance policies were cancelled.

The 'Effectiveness of safety management (SI-0041)' is one of the safety issues listed in the European Plan for Aviation Safety (EPAS) 2023-2025 for CAT A (Commercial air transport - aeroplanes). 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 (2023-2025) includes actions to help enhance the effectiveness of safety management at the levels of both the regulator and the regulated organisations in Ireland.

The occurrence reporting rate throughout the two Covid-19 years (2020-2021) was higher than in the preceding three years pre-covid. While this stronger reporting rate decreased slightly post covid in 2022, it was still significantly stronger than that recorded pre-covid. These increased reporting rates indicate that CAT operators' SMSs continue to deliver a maturing reporting culture despite the challenges experienced by aviation staff in the return to new normal operations.

There was a twofold increase in occurrence reports in 2022 compared to 2021 for the Irish lease fleet, however this still only represented 38% of the number of reports received in 2019. While there is currently no exposure data for this sector the pattern in occurrence reports appears to be reflective of industry outline reports such as PWC's 2023 Aviation Industry Review & Outlook and in line with the number of Irish aircraft still 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 (4 in 2022) and 44 serious incidents (8 in 2022) 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	
2018	927	3	0	3	15
2019	815	0	0	0	10
2020	683	0	0	0	4
2021	660	5	0	5	5
2022	701	3	0	3	8
Total		11	0	11	42

There were no fatal accidents, 4 non-fatal accidents and 8 serious incidents in 2022. The 4 non-fatal accidents all related to passengers suffering an injury during disembarkation. There were 3 serious incidents categorised as mid-air collision (MAC) due to loss of separation and 2 serious incidents categorised as fire smoke non-impact (F-NI). There was 1 serious incident categorised as air traffic management (ATM) involving an Irish registered aircraft and an aircraft from another jurisdiction. There was also 1 serious incident categorised as significant component failure – non-powerplant (SCF-NP) and a serious incident categorised as both a runway excursion (RE) and loss of control on the ground (LOC-G).

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

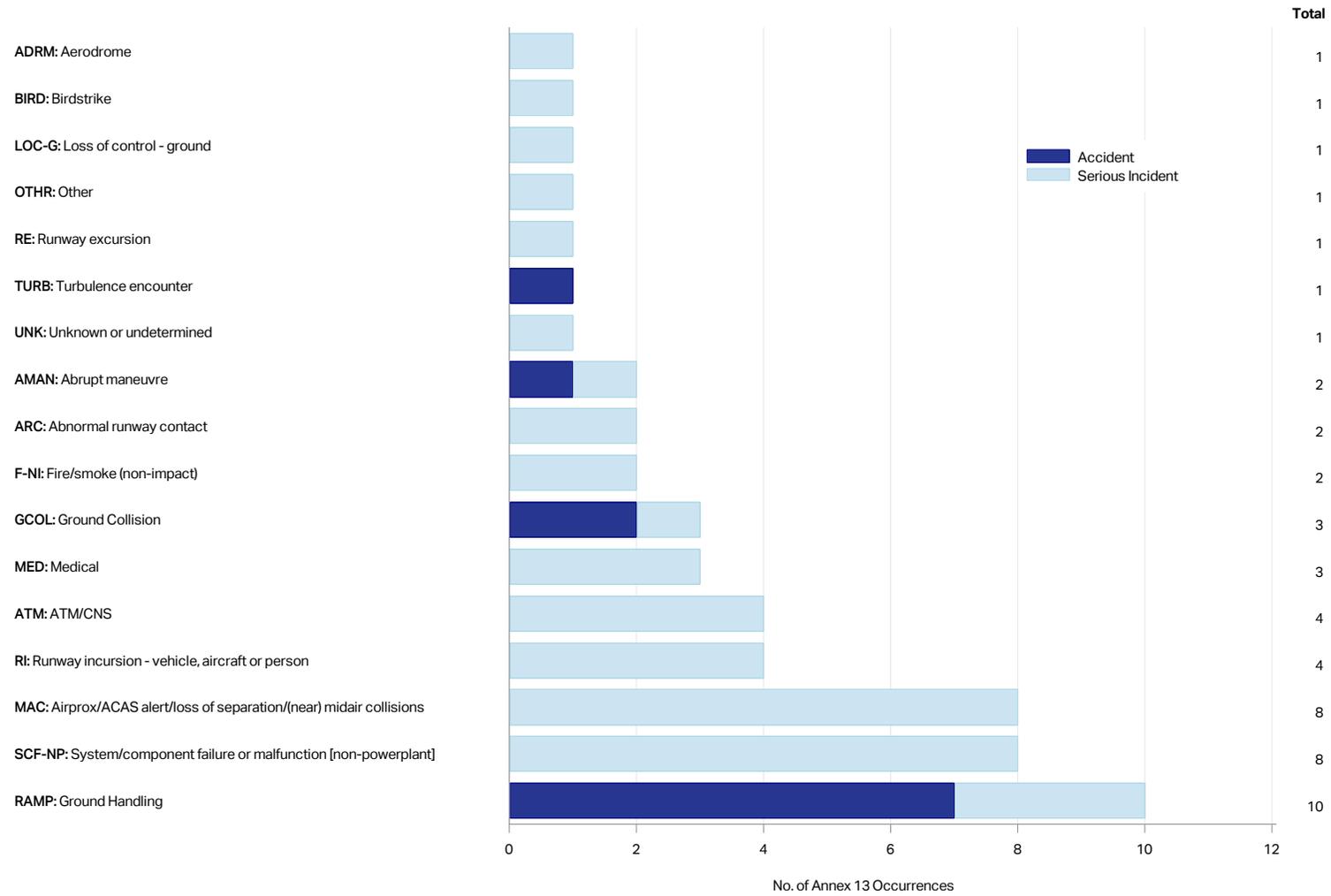


Figure B.1: Categorisation assigned by the investigating SIA to the Annex 13 occurrences

Occurrences

Overall, the rate of aircraft accidents and serious incidents involving Irish commercial air operators provides a Tier 1 Safety Performance Indicator (SPI) for the State Safety Program (SSP). In addition, 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 provides the Tier 2 SPI and 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.

As the industry grappled with its emergence from various pandemic lockdowns and the challenges posed in restarting operations with depleted resources both in monetary and human experience terms the chances of being on a flight operated by an Irish AOC Holder that experienced a safety occurrence remained very low. In 2022 Irish AOC Holders flew 614,899 flights and submitted 7,532 occurrence reports. While this represented a significant 96% increase in movements compared to 2021, it was still down 51% on 2019. Over 98% 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 2022 there were zero fatalities associated with Irish CAT operations.

The same common occurrence category taxonomy is used by the AAIU and the IAA. Analysis of reported mandatory occurrences by the IAA takes into further consideration factors that could be assessed to be 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 presented in the following 3 graphs, Figures B.2(a), B.2(b) and B.2(c). The first graph Figure B.2(a) presents the data for 2017 to 2019 (pre-Covid), the second graph Figure B.2(b) presents that data for 2020 and 2021 combined (Covid years) with the third graph Figure B.2(c) presenting the data for 2022 (post Covid). The intention is to enable a comparison of any emerging pattern of predominant occurrence categories pre-Covid (2017-2019), during Covid (2020-2021) and post-Covid (2022).

The most reported occurrence categories largely remain the same through all three time-frames with the exception of MED (medical) which dropped considerably during Covid years due to reduced passenger numbers and has remained low in 2022 as passenger numbers returned to normal.

Birdstrike moved from the 4th most common occurrence pre-covid to 2nd both during the pandemic and post-Covid, it was 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 2022 as outlined in Figure B.3 which provides more granularity with the top event types reported to the IAA from the CAT aeroplane sector for 2022. The 2nd most common event type reported in 2022 was 'difficult/unruly passengers' which is one of the topics mentioned in the EASA SIB 2023-05: "Possible Risks Emerging During Summer 2023" and also forms part of the focus of EASA's 2023 Ready to Fly Campaign.

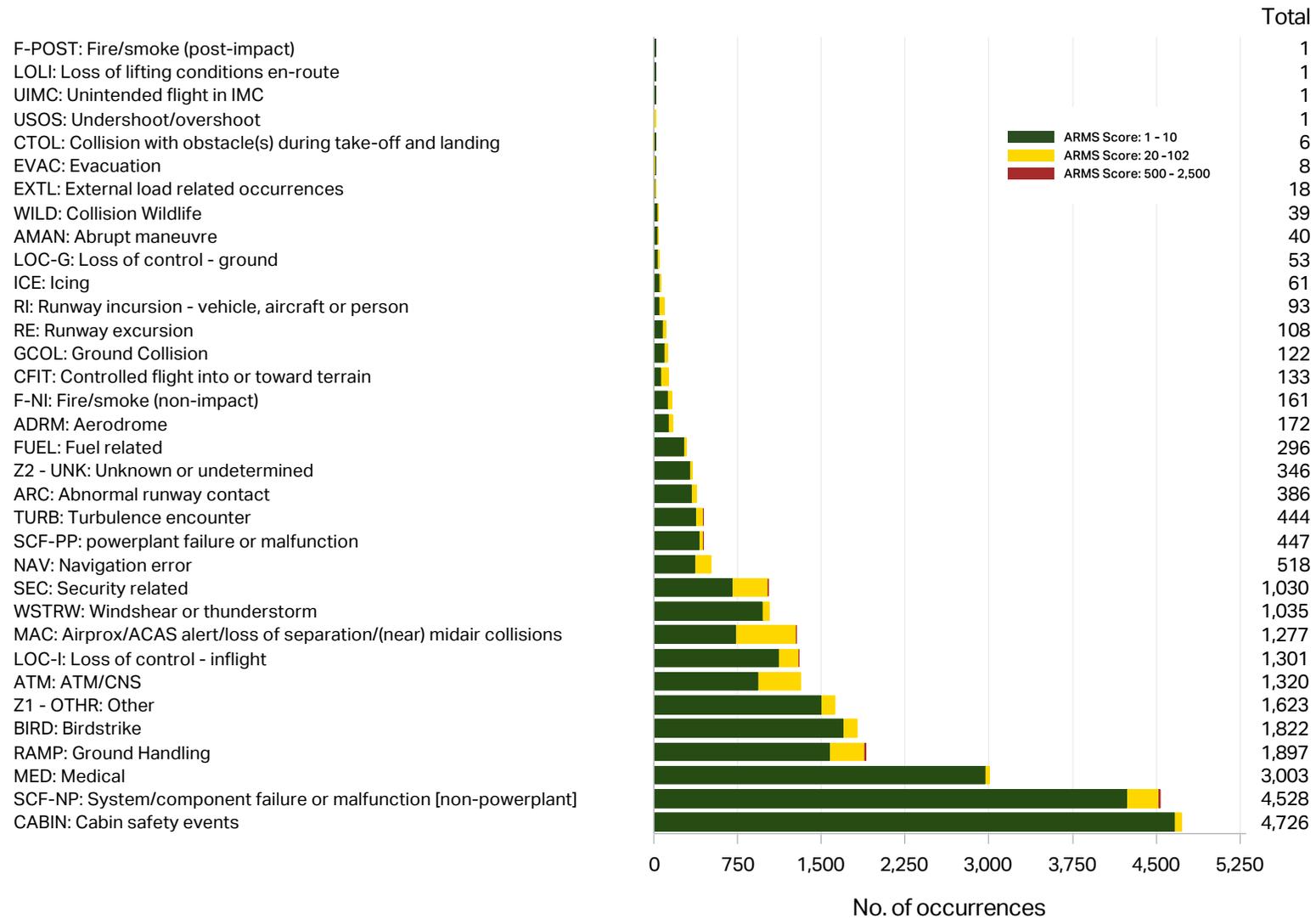


Figure B.2(a): Categorisation of MORs Involving Irish CAT Fixed-wing Aeroplanes during 2017-2019 (pre-Covid)

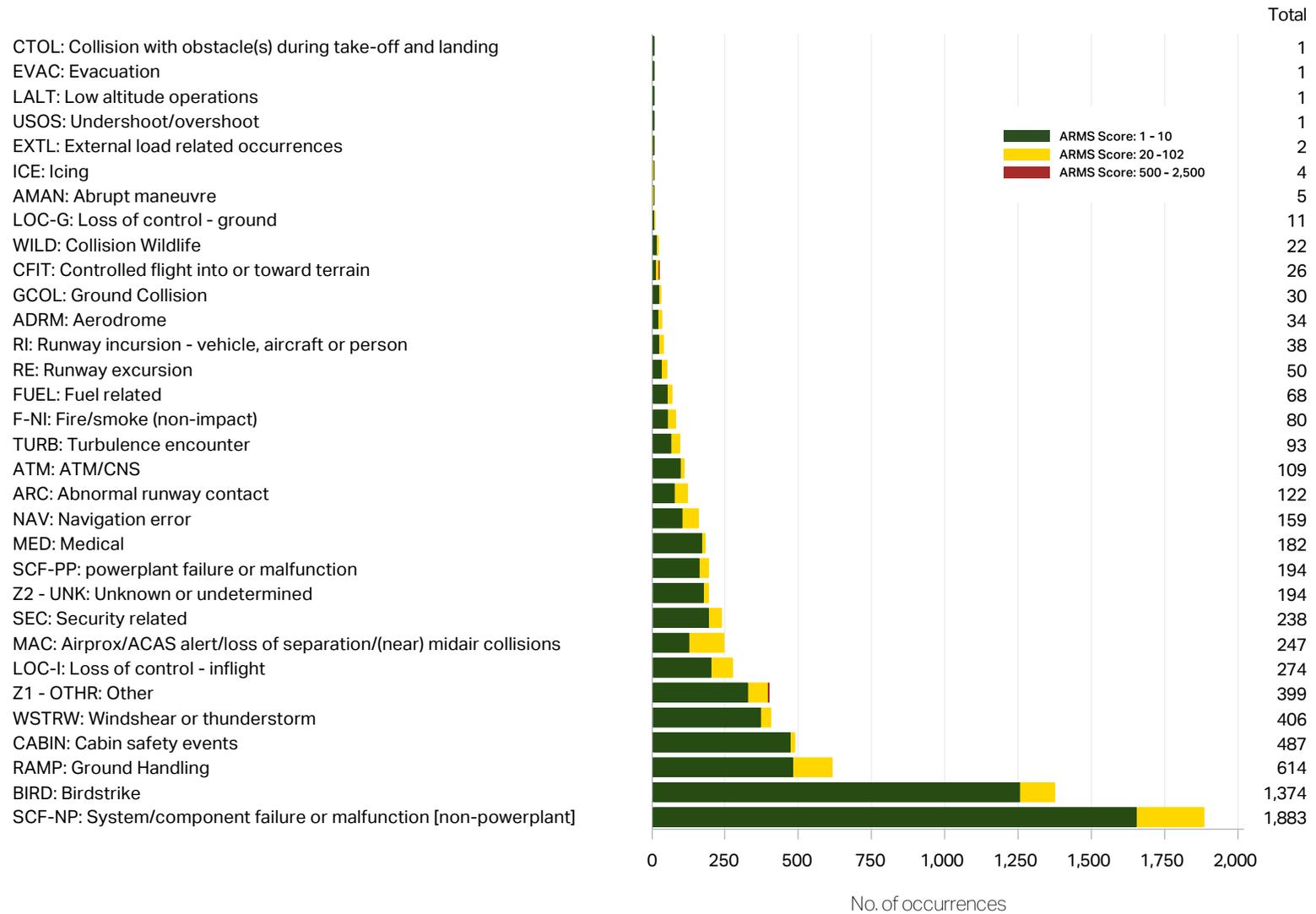


Figure B.2.(b): Categorisation of MORs Involving Irish CAT Aeroplanes during 2020 -2021(during Covid)

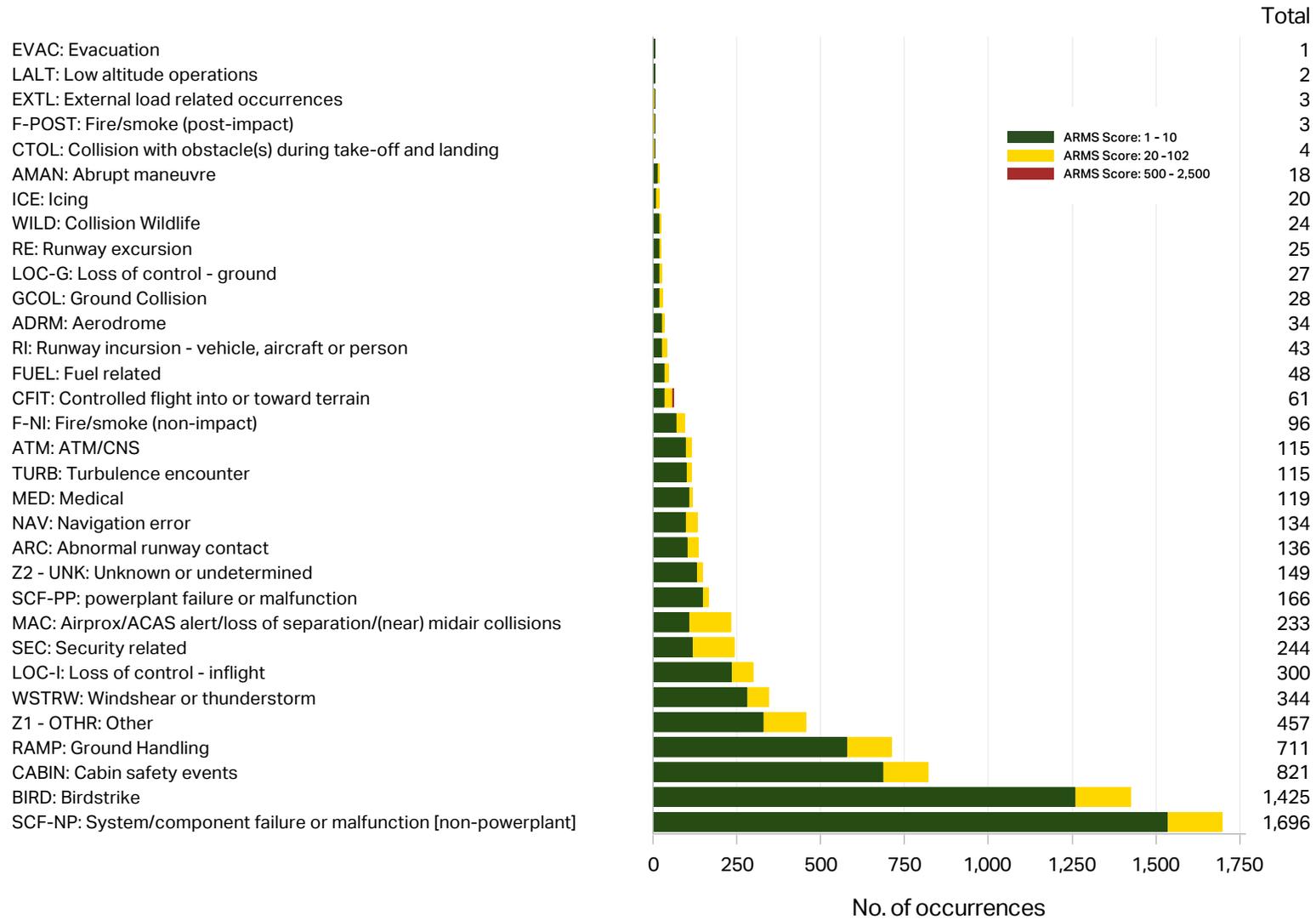


Figure B.2.(c): Categorisation of MORs Involving Irish CAT Aeroplanes during 2022 (post Covid)

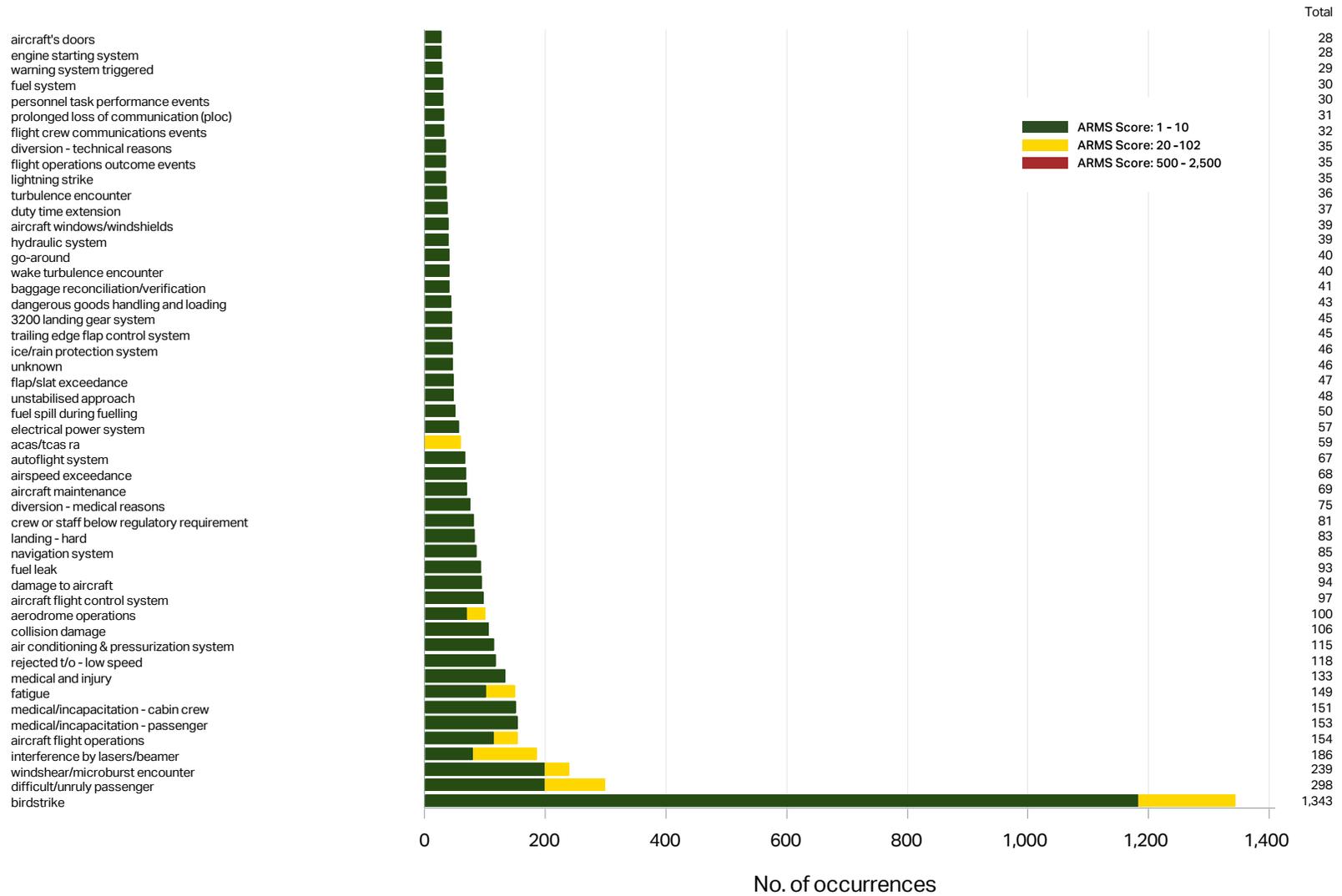


Figure B.3: Top Event Types Involving Irish CAT Fixed-wing Aeroplanes during 2022

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 CAT aeroplane operations. The first sub-section focuses on the key safety areas identified across the globe as the main caus-

es 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.

KEY SAFETY AREA	SAFETY ISSUES
Mid-Air Collision (MAC)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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

Key Safety Areas:

EASA's Air Ops Risk Review for 2022 states that there were 11 fatal accidents worldwide in CAT operations with large aeroplanes with a maximum take-off mass greater than 5,000 kg. The number of fatal accidents in 2022 was the same as the previous 2 years. There have not been any fatal accidents involving an EASA Member State (MS) operator since 2016. Except for the accident to the Chinese Boeing 737 in March 2022, in which 132 people lost their lives, most of the accidents in 2022 relate to known types. These include hard landings, tail strikes, runway excursions and controlled flight into terrain. Regrettably, 5 accidents involved fatalities on the ground. These included ground staff ingested into an engine, struck by a propeller, injured during pushback, and two collisions on the runway - one with a motorcycle in Guinea and one with a fire truck in Peru. EASA's SIB No 2022-06 on the Risks Emerging During Ramp-up of Aviation Activities recommended that aerodrome operators should increase collaboration with ground handling service providers, air operators, security services providers and State agencies.

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 13 serious incidents in the following key safety areas: 8 categorised as MAC, 4 categorised as RI and 1 categorised as RE. MAC was attributed to 3 serious incidents in 2022, all of which occurred outside of the Irish state. Another airprox event involving a late go-around and departing aircraft was categorised as ATM. ICAO Doc 10161 Global Aviation Safety Roadmap recommends safety enhancement initiatives for MAC such as the identification of additional contributing factors, e.g., traffic conditions - traffic density, complexity, mixture of aircraft types and capabilities, etc.

Figures B.2.(a), B.2.(b) and B.2.(c) demonstrate that occurrence reports of precursor events categorised as MAC and LOC-I continued to be similarly placed in the top 10 of the most reported occurrence categories in the three timeframes presented i.e., pre-Covid (2017-2019), during Covid (2020 and 2021) and post Covid (2022). 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 underlie the occurrence categories for 2022 with Birdstrikes the top event type reported.

Detailed analysis of all these events in conjunction with follow-up information from the reporting organisation has identified the following safety issues that have been tabulated below with their corresponding key safety area.

Other Safety Areas:

The following table summarises other safety areas outside of the key risk areas discussed above.

SAFETY AREA	SAFETY ISSUES
Ground Operations	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Management of difficult/unruly passengers

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.

Ramp: ground handling was ascribed to 7 accidents and 3 serious incidents over the past five years up to and including 2022. This represents an increase when compared to the five years up to and including 2021 when the categorisation was applied to 3 accidents and 1 serious incident, see Figure B.1. However, this may in part be accounted for by the rapid return to new normal operations throughout 2022. 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 2018-2022, 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 were 3 serious incidents categorised as medical emergency between 2018-2022. A comparison between Figures B.2.(a) (b) and (c) highlights that MED (Medical) dropped from the 3rd most reported occurrence category pre-Covid (2017-2019) to 12th in 2020-2021 and 14th in 2022. CABIN (Cabin Safety) reports were the most reported occurrence category pre-Covid (2017-2019), dropping to 4th most common during Covid (2020-2021) and 3rd most common in 2022. RAMP (Ground Handling) continued to be a significantly reported category similarly placed across all three timeframes. Difficult/unruly passengers has come to the fore in 2022 being the 2nd most reported event category, compared to pre-Covid when it was the 7th most reported event type (see

ASPR for 2020). The conspicuous emergence of this issue on the ramp up of operations post Covid has been observed by other member states and EASA, culminating in the EASA hosting a Ready to Fly - Unruly Passenger Campaign 2023 in June 2023.

While the number of MORs received from operators of the 'Irish lease fleet' increased significantly in 2022 compared to 2021, the numbers do not support the identification of any emerging trends for 2022. The increase was likely commensurate to the post Covid return to operations; however, 119 commercial land aeroplanes were in storage at the end of 2022. 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 (AWS) inspectorate with operational issues being referred to the State of Operation in accordance with the ICAO Article 83 bis agreement. All were scored as being low risk bearing. In the main, the same key safety areas and safety issues previously outlined remain applicable to these operations in the long term.

Occurrence reporting rates

CAT activity increased a significant 96% in 2022 compared to 2021, but this was still down 51% on 2019. The occurrence reporting rate during the two Covid-19 years (2020-2021) was higher than in the preceding three years. This stronger reporting rate was maintained post covid in 2022 as demonstrated in table B.2, which provides data on the number of sectors flown annually between 2017 and 2022 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	6,806	66.81
2018	1,096,104	8,614	78.59
2019	1,068,939	9,938	92.97
2020	305,513	3,320	108.67
2021	313,572	4,017	128.10
2022	614,899	7,532	122.49
Total/average	4,417,715	40,227	99.60

Part NCC

NCC declarations increased in 2022, consisting mainly of ferry flights and maintenance check flights. The current level of NCC activity does not support insightful independent statistical analysis. EASA's ASR 2022, the latest publication available currently states that, 'during 2021, for the second year in a row there were no accidents involving an EASA MS registered NCC business aeroplane. They also note that there is a low number of lower risk occurrences and that this is likely due to the low reporting in the NCC domain, where only high-risk accidents and serious incidents, normally very visible and with severe outcomes, are reported and thus able to be 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 a relatively small sector in comparison to the fixed-wing CAT operations domain. 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 had 3 helicopter Air Operator Certificate (AOC) holders operating 12 helicopters in commercial air transport (CAT) during 2022. 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 helicopter operators, as they are exposed to the same risks even though their approval and oversight regime differs. During 2022, 9 Irish registered helicopters operated under the provisions of Article 83 bis of the Chicago Convention on foreign issued AOCs.

Overall, the influence exerted by the pandemic on the Irish commercial helicopter sector was not as impactful as in the case of the fixed wing CAT sector due to the essential nature of the majority of Irish commercial helicopter operations such as SAR and HEMS. In 2022 the effects of the pandemic waned after the first quarter as the Omicron variant failed to materialise compared to previous variants. Within this sector, Search and Rescue (SAR), HEMS and SPO services saw a slight increase in sectors flown in 2022 versus 2021.

Accidents and serious incidents

Over the last five years helicopter operators in this sector were involved in 1 non-fatal accident which occurred in 2022. There were no 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	
2018	16	0	0	0	0
2019	20	0	0	0	0
2020	20	0	0	0	0
2021	19	0	0	0	0
2022	22	1	0	1	0
Total	-	1	0	1	0

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, according to occurrence category and ARMS Risk Classification Band is presented in Figure C.1 below for 2017 - 2019. Similar datasets have been produced separately for 2020 and 2021 in Figure C.2 and 2022 in Figure C.3, to enable a comparison of the pattern of predominant occurrence categories between the pre-covid years (2017-2019) versus the Covid years (2020-2021) and post-Covid (2022).

The top reported categories pre-Covid (2017-2019), during Covid (2020-2021) and post-Covid largely remained the same with "SCF (system component failure or malfunction)", and "Other" being the most common. All the SCF occurrences in 2020-2021 and 2022 were low risk which indicates minor failures or failure of redundant systems that had little effect on operations.

Many of these operations are undertaken in harsh environments which can affect on-board systems. The categorisation of "Other" has decreased over the years which may indicate better application of the ADREP taxonomy in the helicopter domain. However, the usage of category "Other" in the helicopter domain may be necessary when 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. There were no appreciable trends in occurrence categories in 2022 as compared with the years prior to Covid (2017-2019) which saw Navigation errors (NAV) and Security issues (SEC) more commonly reported.

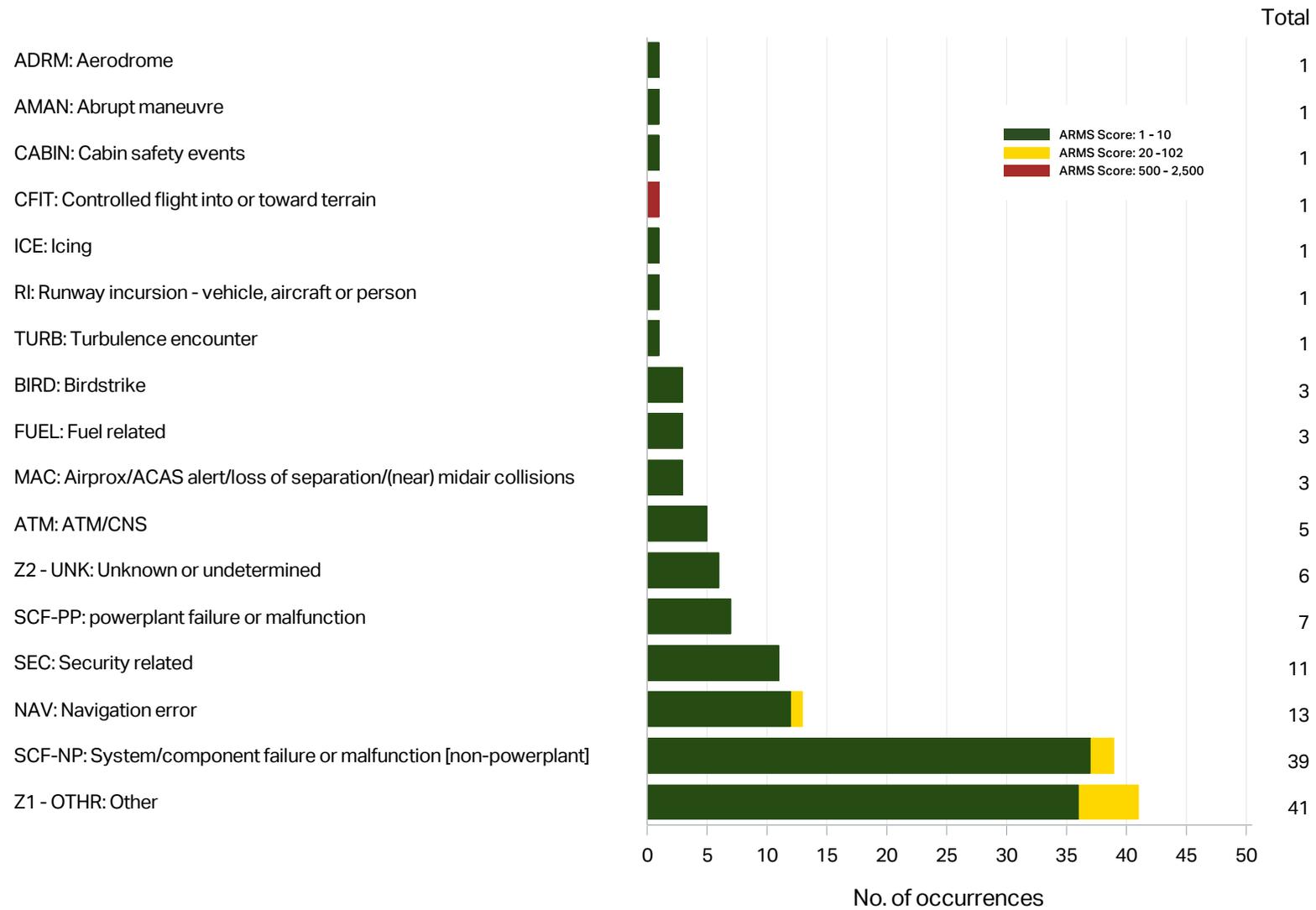


Figure C.1: Categorisation of MORs Commercial and Declared Helicopter Operation 2017-2019 (pre-Covid)

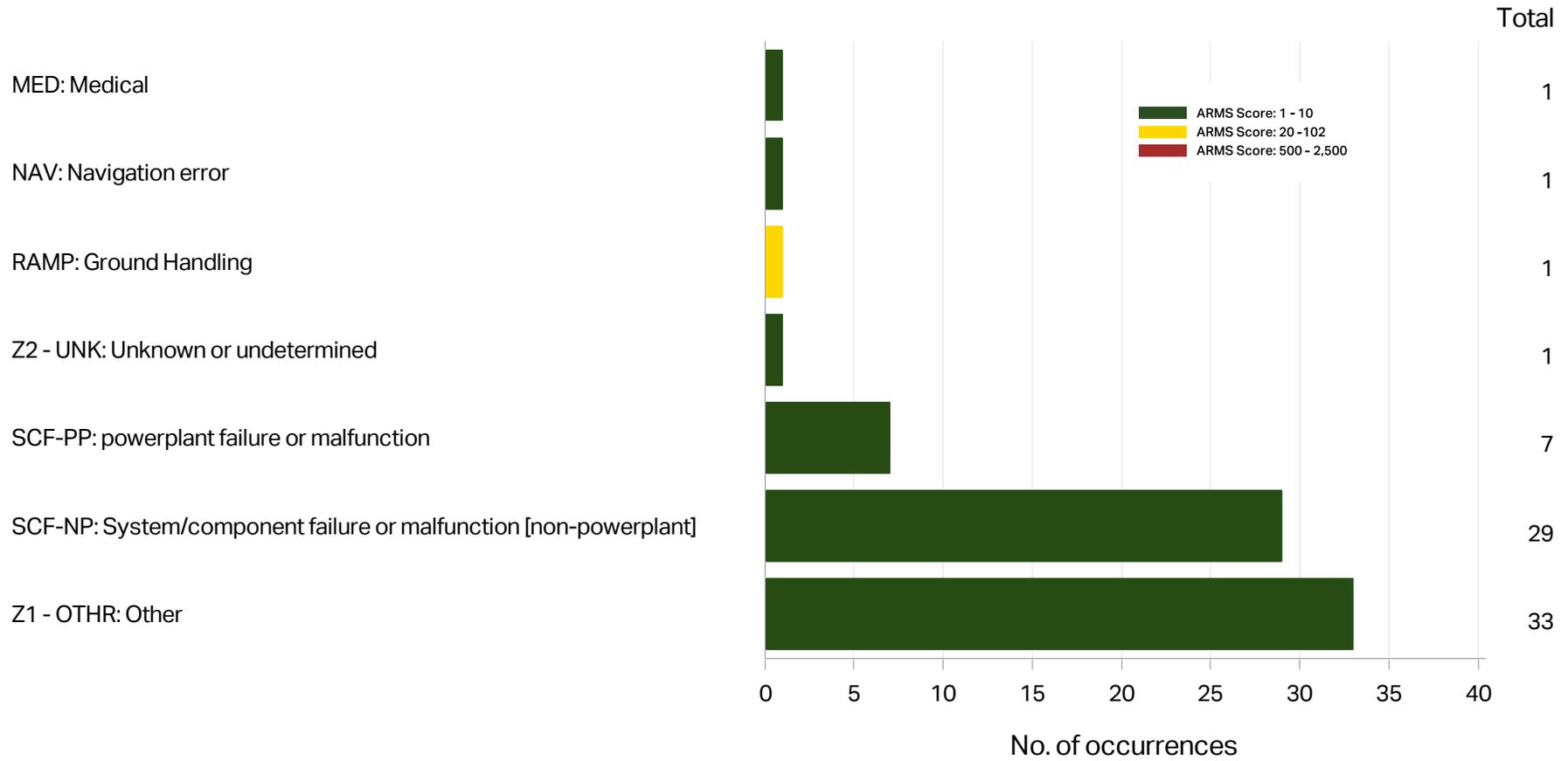


Figure C.2: Categorisation of MORs Commercial and Declared Helicopter Operation 2020-2021(during Covid)

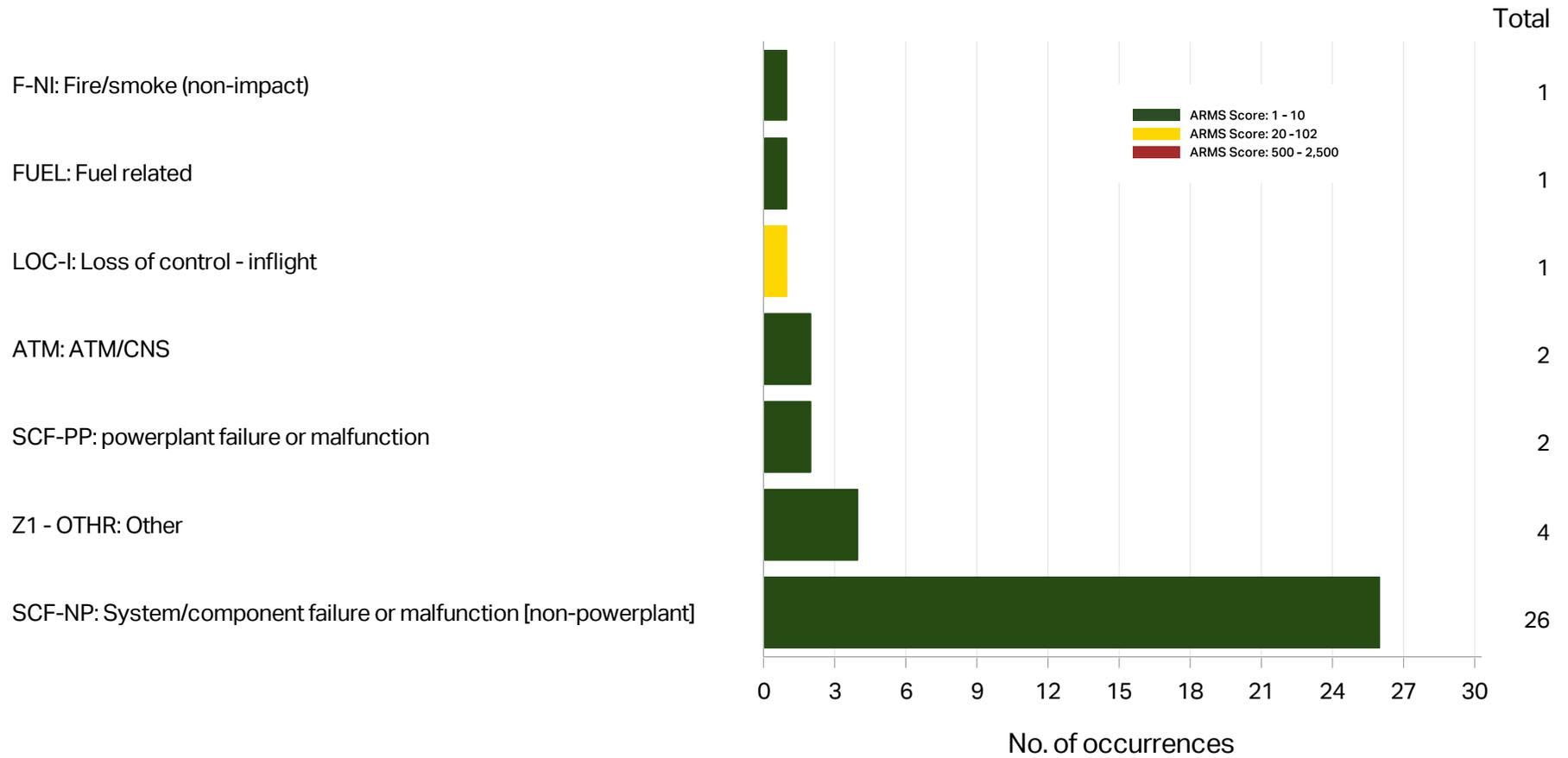


Figure C.3: Categorisation of MORs Commercial and Declared Helicopter Operation 2022 (post Covid)

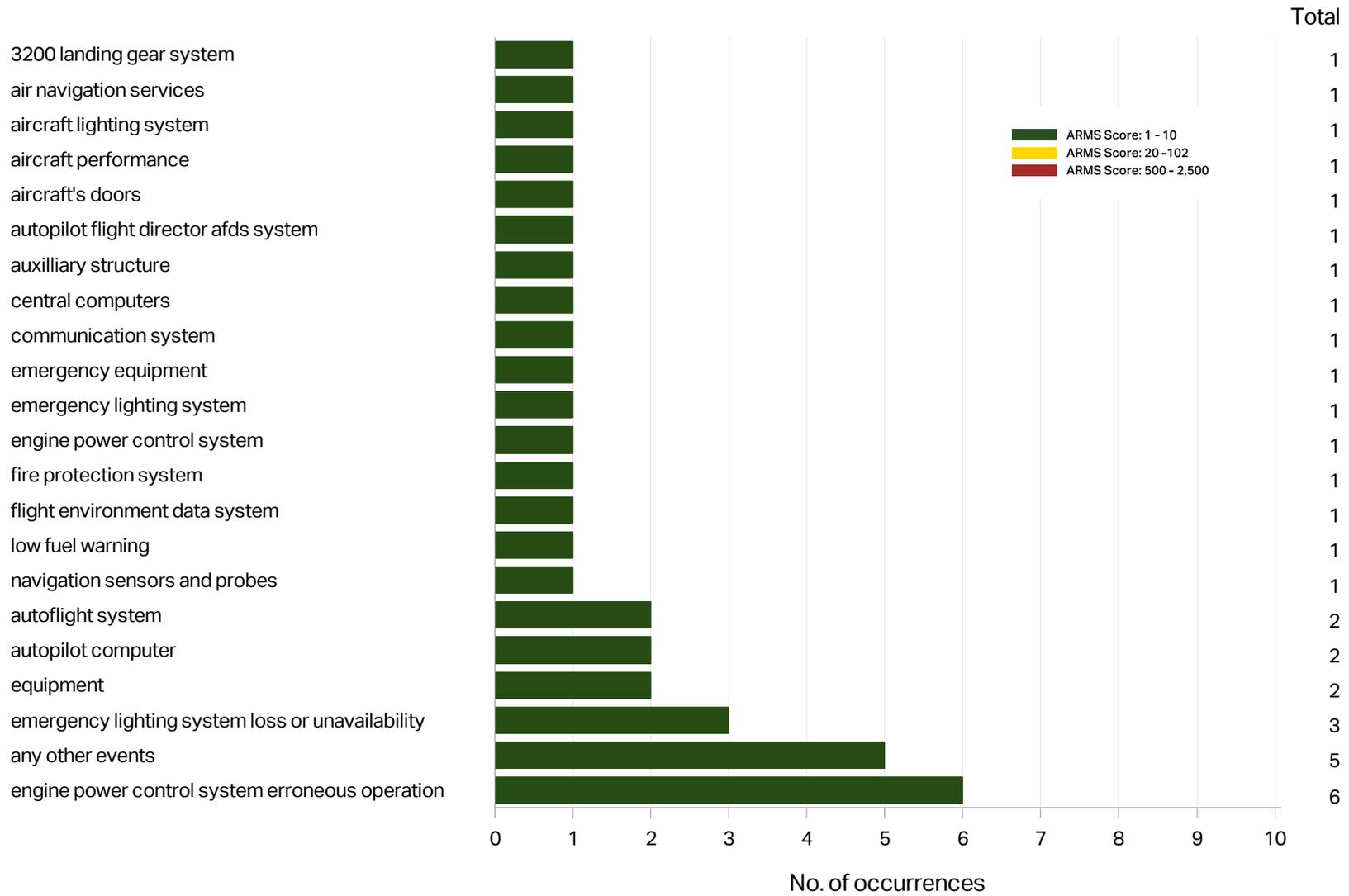


Figure D: Top Event Types – Commercial and Declared Helicopter Operations 2022

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. This 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 and damage to helicopters.

Key Safety Areas:

Detailed analysis of helicopter 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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
Mid-Air Collision (MAC)	<ul style="list-style-type: none"> • Potential conflict with non-transponder equipped general aviation aircraft • Potential conflict with drones

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.

Figure D gives more insight into the events that led to the occurrence reports in 2022 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).

Over the past five years there was 1 non-fatal accident which occurred in 2022 which was classified as loss of control-inflight (LOC-I). This incident is also noted in Figure C.3 which shows that there was 1 risk bearing occurrence (loss of control-inflight (LOC-I) in 2022.

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. There were 3 low risk reports pre-Covid (2017-2019), none during Covid (2020-2021) or post Covid (2022). 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.

Other 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://European Plan for Aviation Safety \(EPAS\) 2023-2025 | EASA \(europa.eu\)](https://European Plan for Aviation Safety (EPAS) 2023-2025 | EASA (europa.eu) for more details) for more details)

The other categories reported in 2022 were Fire/smoke non-impact (F-NI) and Fuel with 1 report each and ATM with 2 reports. These low numbers are not ample to indicate a trend, but it would be prudent to continue monitoring these areas in future years for any discernible trends.

The EPAS (2023-2025) Vol III presents an elevated priority index for Rotorcraft which includes Inadequate obstacle clearance during low-altitude operation, take-off and landing (SI-8031), Poor pre-flight planning and preparation (SI-8017) and Helicopter-maintenance-related-issues (SI-8005). In addition, the 2022 Annual Safety Review states that the Agency is currently taking action to address the recurrent challenge of evaluating the level of helicopter flying activity in Europe within a specific stream of the rotorcraft safety roadmap. The ASR also notes that 52% of all accidents and serious incidents involved certified helicopters performing non-commercial operations and for which an EASA MS was either the state of operator or state of registry and 27% of all accidents and serious incidents involved certified helicopters performing specialised operations and for which an EASA MS was either the state of operator or state of registry.

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>.

Number and rate of MORs

The following table provides data on the number of sectors flown annually over the last six years with the corresponding MOR rates per 1,000 flights. The number of movements decreased by 14% in 2022 compared to 2021, partly due to the cessation of one of the Irish Helicopter AOCs in summer 2021. 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 and the post-Covid (2022) reporting rate of 5.93. The reporting rate for 2022 shows some recovery towards pre-Covid reporting 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	37	5.11
2022	6,236	37	5.93
Total/average	44,885	244	5.48

An aerial photograph of an airport terminal and surrounding landscape. The terminal is a large, white, rectangular building with a flat roof, situated on a paved area. Several small, white, propeller-driven aircraft are parked on the tarmac in front of the terminal. To the left of the terminal is a parking lot filled with cars. A river flows through the landscape, crossing a bridge. The background shows a residential area with houses and green fields. A large, white, horizontal plume of smoke or steam is visible in the upper right portion of the image, extending across the sky. The overall scene is a mix of urban, industrial, and natural elements.

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 take-off or landing by aircraft carrying passengers or goods for hire or reward is being undertaken. These are known as nationally licensed – public use aerodromes.

Additionally, under national aviation law, where instruction in flying is being undertaken, there is a requirement under S.I. 355 of 2008 – Aerodromes and Visual Ground Aids Order for the aerodrome to be licensed. These are known as nationally licensed – private use aerodromes. In limited circumstances, an unlicensed aerodrome may be prescribed as suitable by the Authority dependent on the complexity of infrastructure and volume of instruction in flying activity taking place. A declaration can be made to the Authority to allow for the use of such an unlicensed aerodrome for instruction in flying.

During 2022, there were 8 certified aerodromes within Ireland, 5 nationally licensed public use aerodromes and 9 nationally licensed private use aerodromes. Details of the current certificated and licensed aerodromes are published in AIP Ireland, AD Section 1.5 – Status of Certification of Aerodromes. There were 5 unlicensed aerodromes where such a declaration is in place.

The influence exerted by the covid pandemic on the Air Navigation and Aerodrome sector gradually waned through 2022 as traffic levels steadily recovered month by month to near 2019 levels by year end. The level of ATC controlled flight hours in 2022 was up 86% on 2021 but remained 9.9% lower than 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 2022 increased a significant 123% on 2020 levels but was still 12% down on the level of 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 unexpected Russian invasion of Ukraine in February 2022 caused unavailability of airspace and impacted traffic flows throughout Europe. Later in the year the speed of the summer recovery saw staff and capacity shortages across the Air Traffic sector which resulted in delays and punctuality across the European network which were worse than in 2019. Unanticipated staffing and capacity shortages at airlines, airports and ground handlers brought about cancellations, substantial delays and uncertainty for passengers transiting major airports.

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 non-fatal accidents and 5 serious incidents over the five-year period between 2018 and 2022 inclusive. In 2022 there was 1 non-fatal accident categorised as loss of control-inflight (LOC-I) and 1 serious incident categorised as medical (MED).

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

YEAR	2018	2019	2020	2021	2022	TOTAL
No. flights at Irish airports	293,961	301,124	114,483	118,861	264,924	1,093,353
No. flight hours in Irish airspace	315,776	319,775	131,296	154,877	288,262	1,209,986
Non-fatal accidents	1	0	1	1	1	4
Serious incidents	2	1	0	1	1	5

Based on the findings of their investigation the AAIU assigns a CAST/ICAO common taxonomy category (sometimes more than one taxonomy may be assigned). Figure D.1 summarises the categories assigned to these 4 accidents and 5 serious incidents that took place between 2018 and 2022.



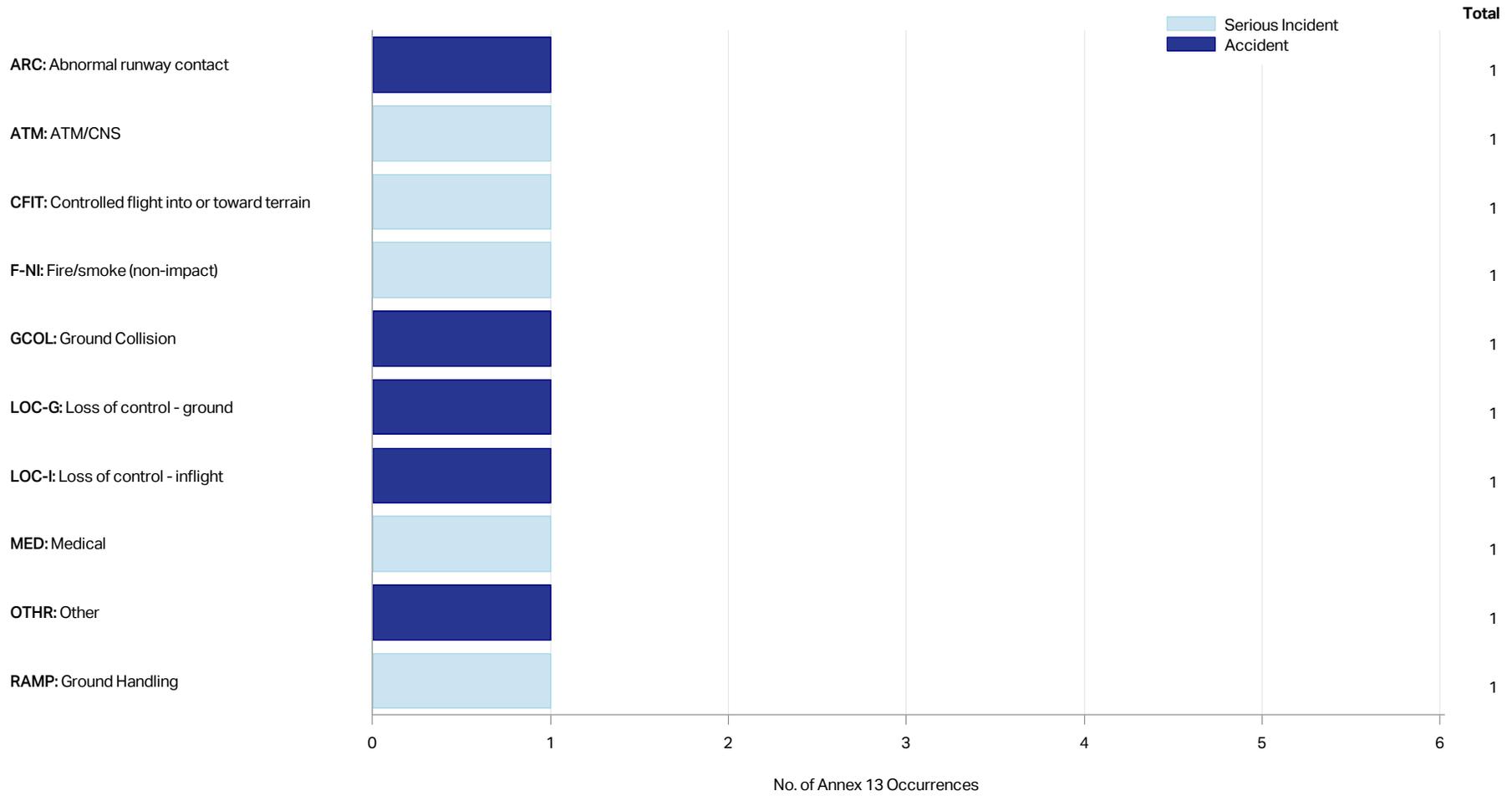


Figure D.1: Categorisations of Annex 13 occurrences involving CAT that occurred at Irish certificated/licenced aerodromes that provide ATC services

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 to 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) while Figure D.2.(c) shows the data for 2022. This facilitates a comparison of the predominant occurrence categories between the pre-covid years (2017-2019) versus the Covid years (2020-2021)

and post-Covid (2022). Figure D.3 provides a breakdown of the top event types reported during 2022 that underlie these occurrence categories and in some instances are precursor events to the more high-profile occurrence categories.

The most reported occurrence categories across the three timeframes i.e., pre-Covid (2017-2019), during Covid and post Covid (2022) largely remained unchanged. 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).

SEC Security related (SEC) was the 7th most reported category pre-Covid, becoming the 5th most reported category during Covid and the 3rd most reported category post Covid. Interference with aircraft was an event type that significantly contributed to this category, it includes interference by disruptive passengers and laser attacks.

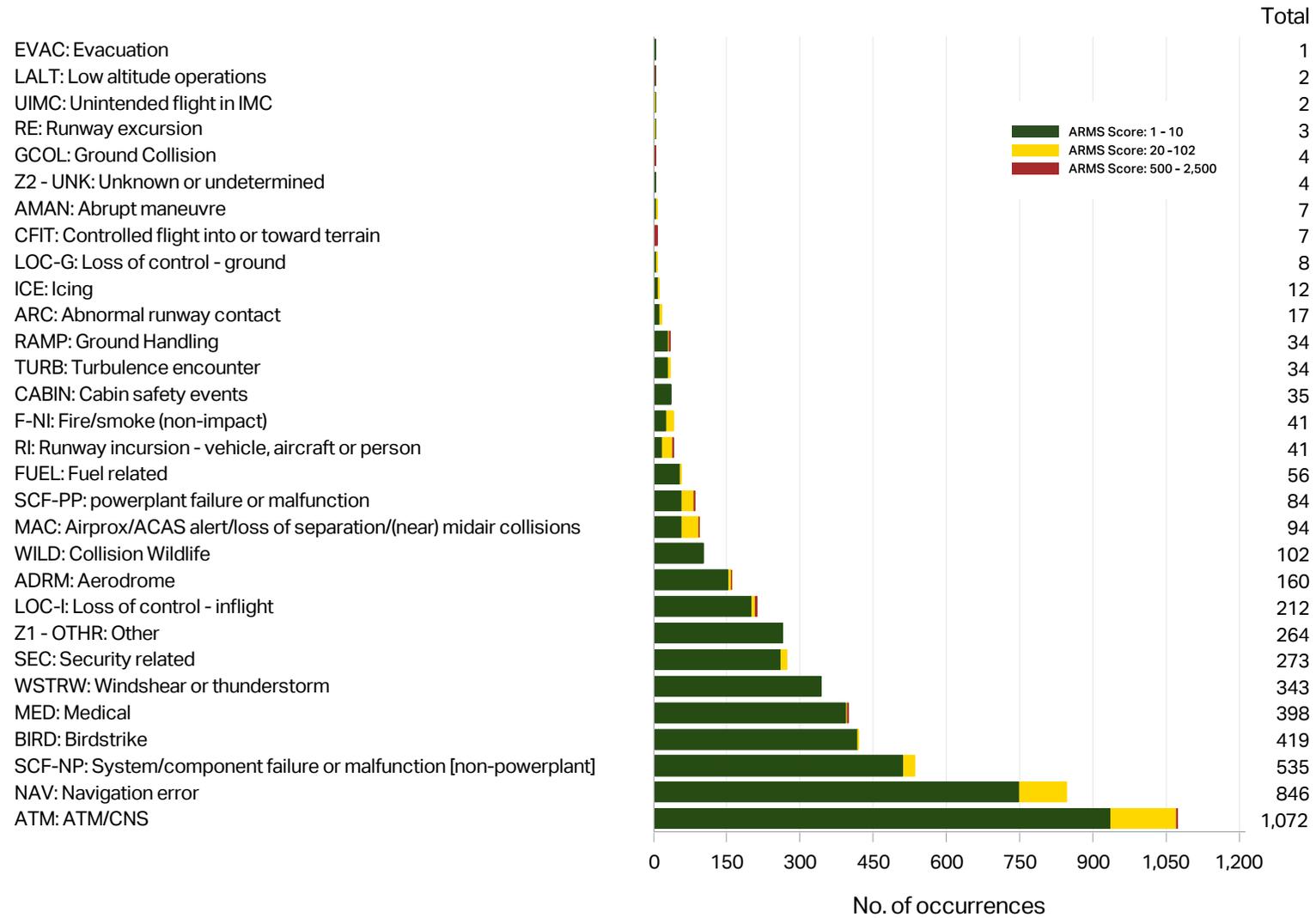


Figure D.2(a): ATC Occurrence Reports pre-Covid (2017-2019)

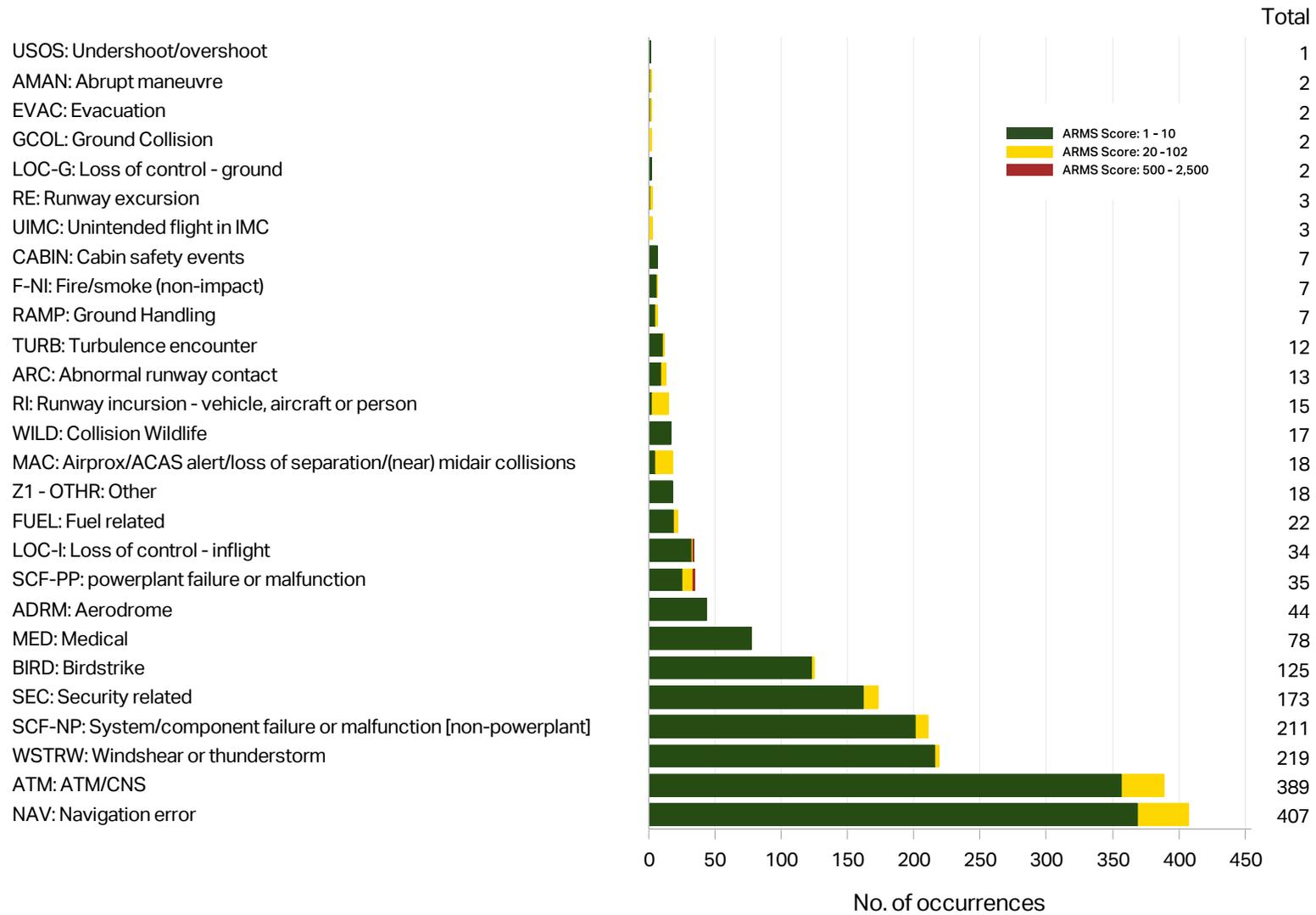


Figure D.2.(b): ATC Occurrence Reports during Covid (2020-2021)

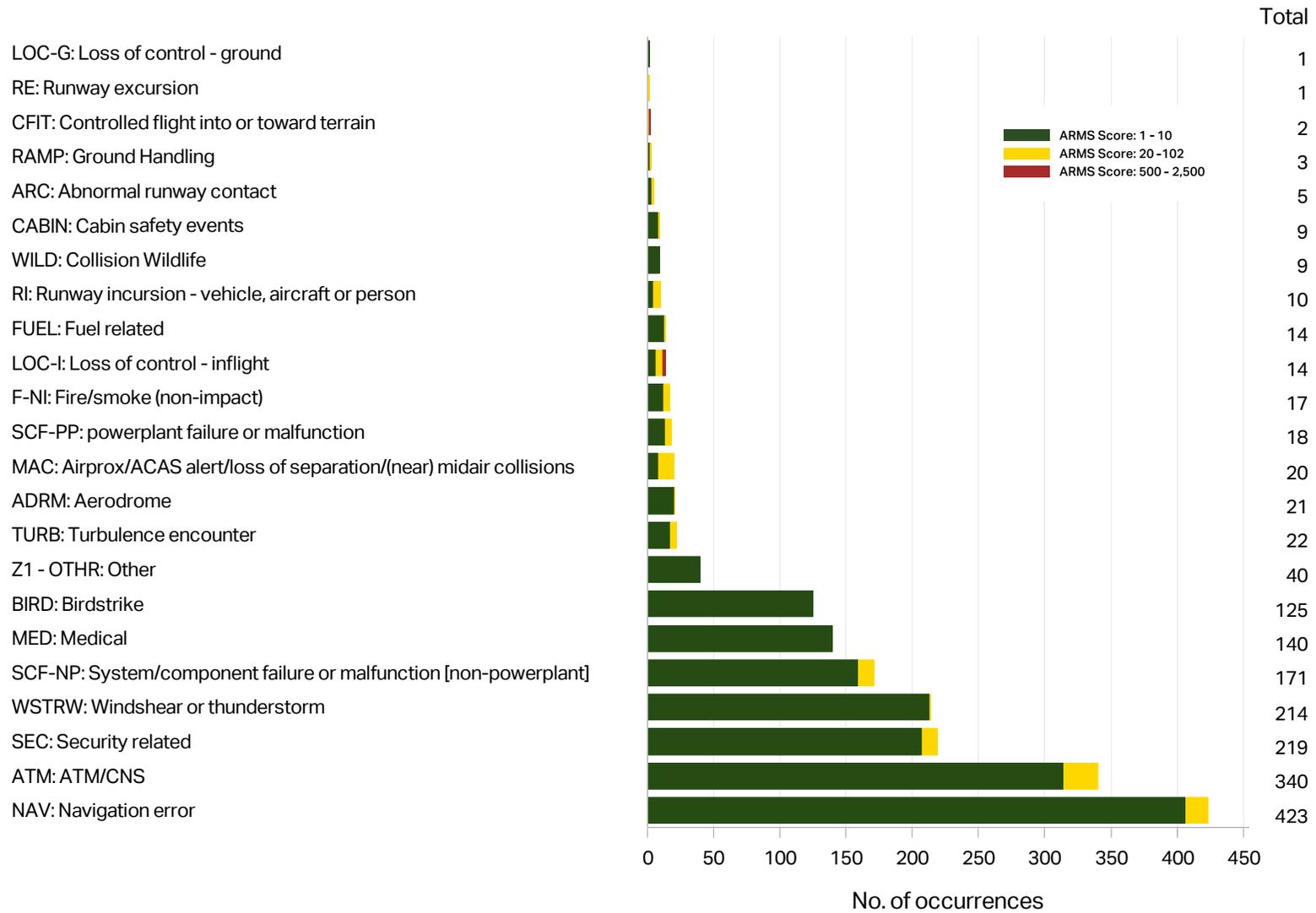


Figure D.2.(c): ATC Occurrence Reports post Covid (2022)

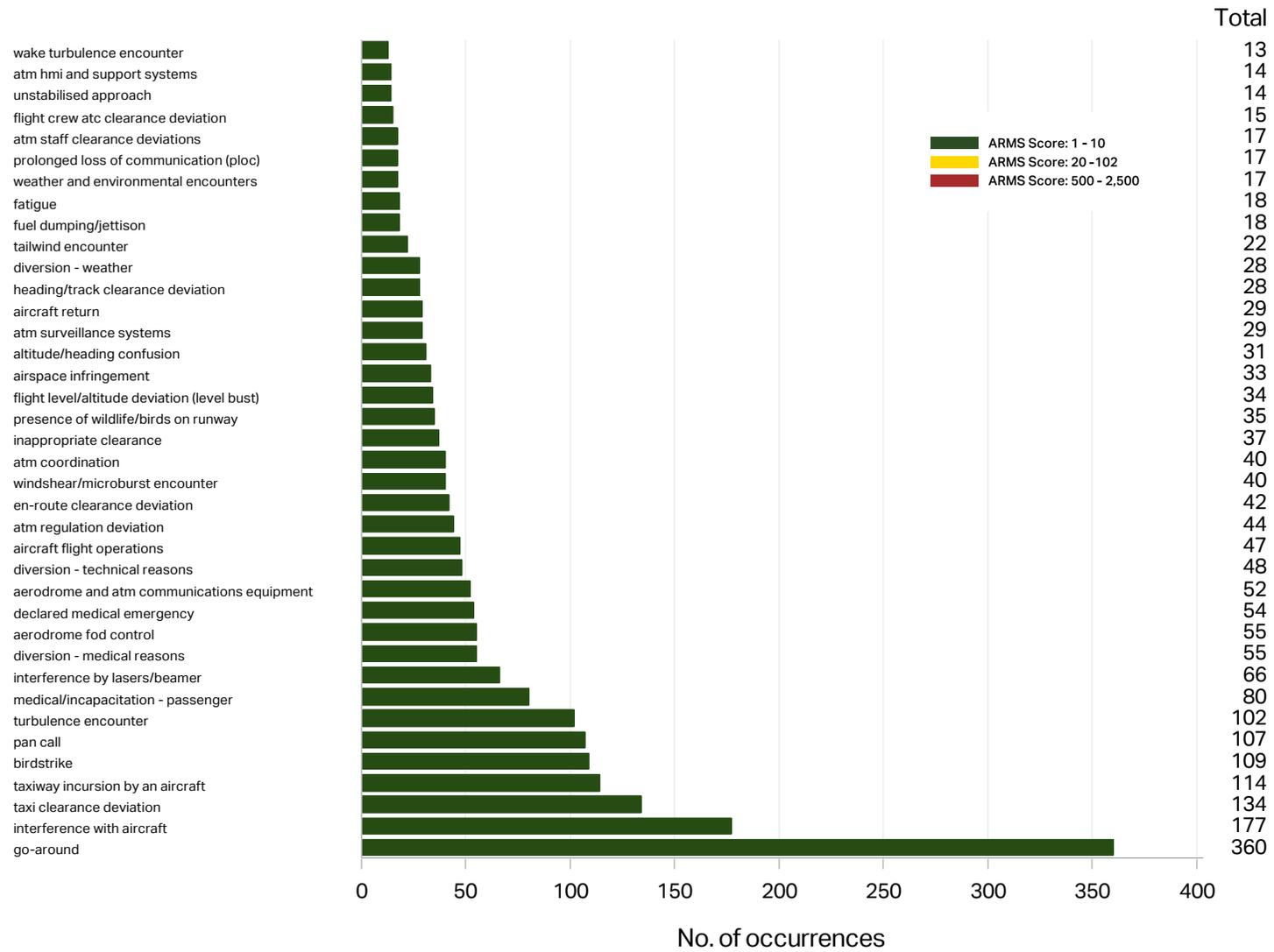


Figure D.3: Top Event Types – ATC 2022

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.

Separation minima infringements (SMI) and runway incursions (RI) are considered to be the two most significant SPIs, as they are inherently closer to the accident scenario than the other SPI categories of, aircraft deviations, level busts and airspace infringements which can sometimes be precursors to SMI and RI.

Since 2013, the rates of SMI and RI have continuously remained at 10 or less per 100,000 flight hours and movement respectively.

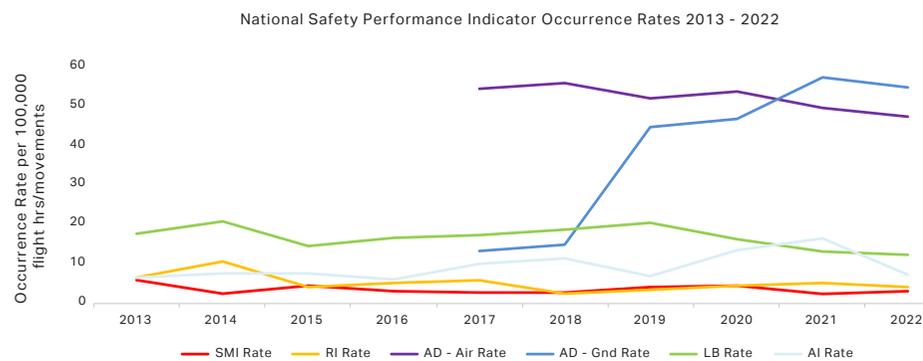
In 2017, SPI-3: 'aircraft deviations' was sub categorised into 'airborne deviations' and 'ground-based deviations' to facilitate more relevant measurement of these occurrences (i.e. against flight hours for airborne deviations, and against movements for ground-based deviations).

In 2018, the annual rate of ground-based deviations (AD-Gnd) significantly increased and remains high. The annual rate of airborne deviations (AD-Air) has remained stable between 48 and 56 per 100,000 flights hours since 2017.

In 2022, Level Busts (LB) stands at its lowest annual rate since 2013.

In 2022, the annual rate of Airspace Infringements (AI) has decreased to 7 per 100,000 flights hours, from a ten year high rate of 17 in 2021.

Table D.2: ATM Annual National SPI Rates, 2013 – 2022



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 AREA	SAFETY ISSUES
Mid-Air Collision (MAC)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)

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), D.2.(b) and D.2.(c) combined show that over the past five years ANS providers reported 132 MAC related occurrences and 66 RI related occurrences. In 2022, there was 1 non-fatal accident dually categorised as 'loss of control – inflight' (LOC-I) and 'loss of control on the ground' (LOC-G) and 1 serious incident categorised as 'medical' (MED) when a crew member became incapacitated.

Table D.2 shows the trends from 2013 to 2022 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.

Number and Rate of ANS MORs: 2017 to 2022

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 2022. This table shows an 86% increase in the number of flight hours in 2022 compared to 2021, which represents a 90% recovery to 2019 levels. The average reporting rate pre-Covid (2017–2019) was 50.92, which rose to 62.74 during Covid (2020-2021) and was maintained at 59.39 post-Covid (2022), indicating that the organisations SMSs were well managed, despite the challenges for ANS staff due to the pandemic and the recovery there of.

Table D.3: No. and rate of MORs according to flight hours from 2017 to 2022

Year	Sectors Flown	Total	
		Number	Rate
2017	311,715	1,404	45.04
2018	315,776	1,733	54.89
2019	319,775	1,692	52.91
2020	131,296	876	66.72
2021	154,877	888	57.34
2022	288,262	1,712	59.39

Sub-section 2: Aerodrome Operations

A breakdown of the occurrences submitted between 2017 and 2019 (pre-Covid) by occurrence category and ARMS Risk Classification Band is shown in Figure D.4 (a) below, followed by comparative charts for 2020-2021 (during Covid) in Figure D.4 (b) and 2022 (post-Covid) in Figure D.4 (c).

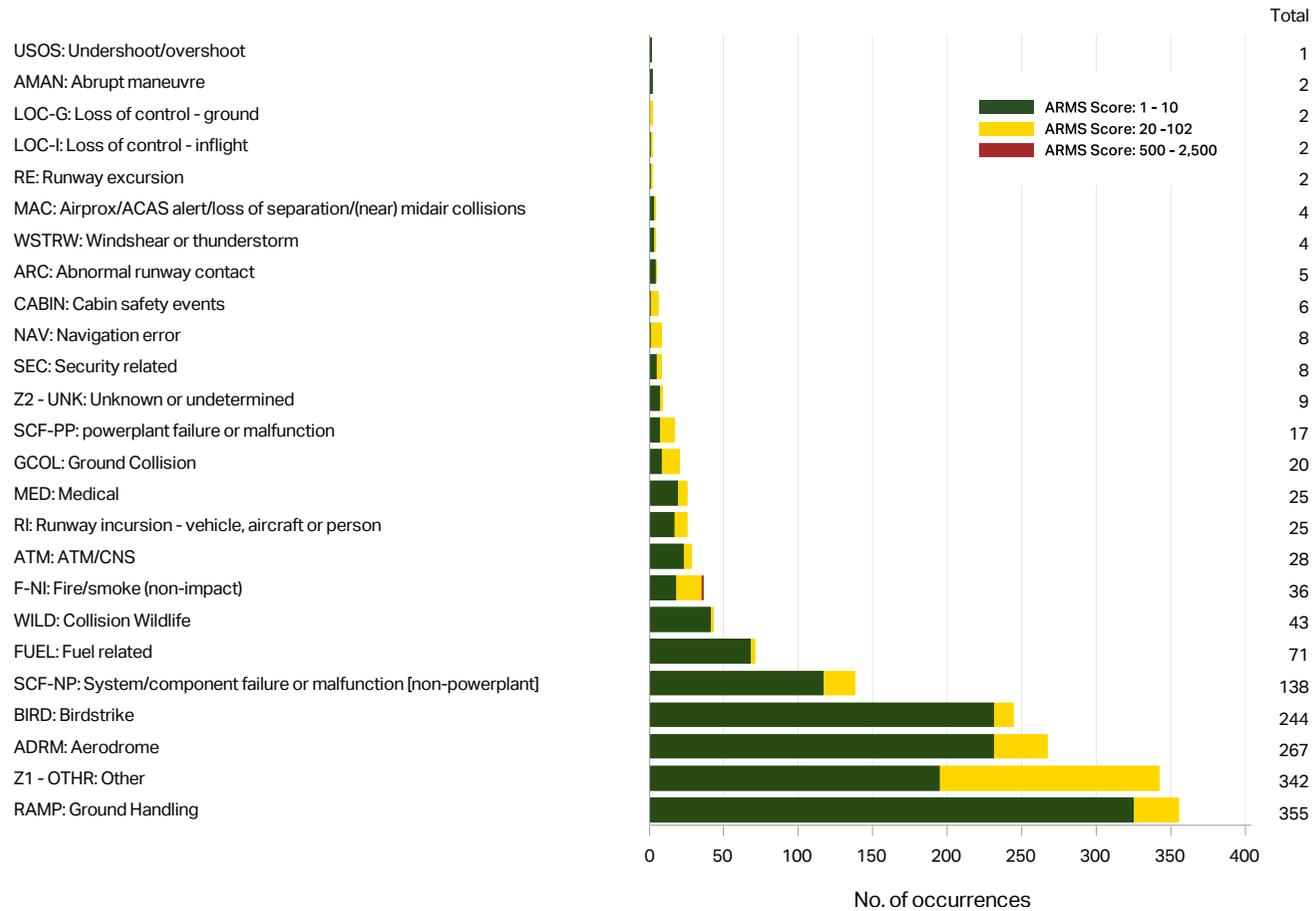


Figure D.4 (a): Aerodrome Occurrence Reports 2017-2019 (pre-Covid)

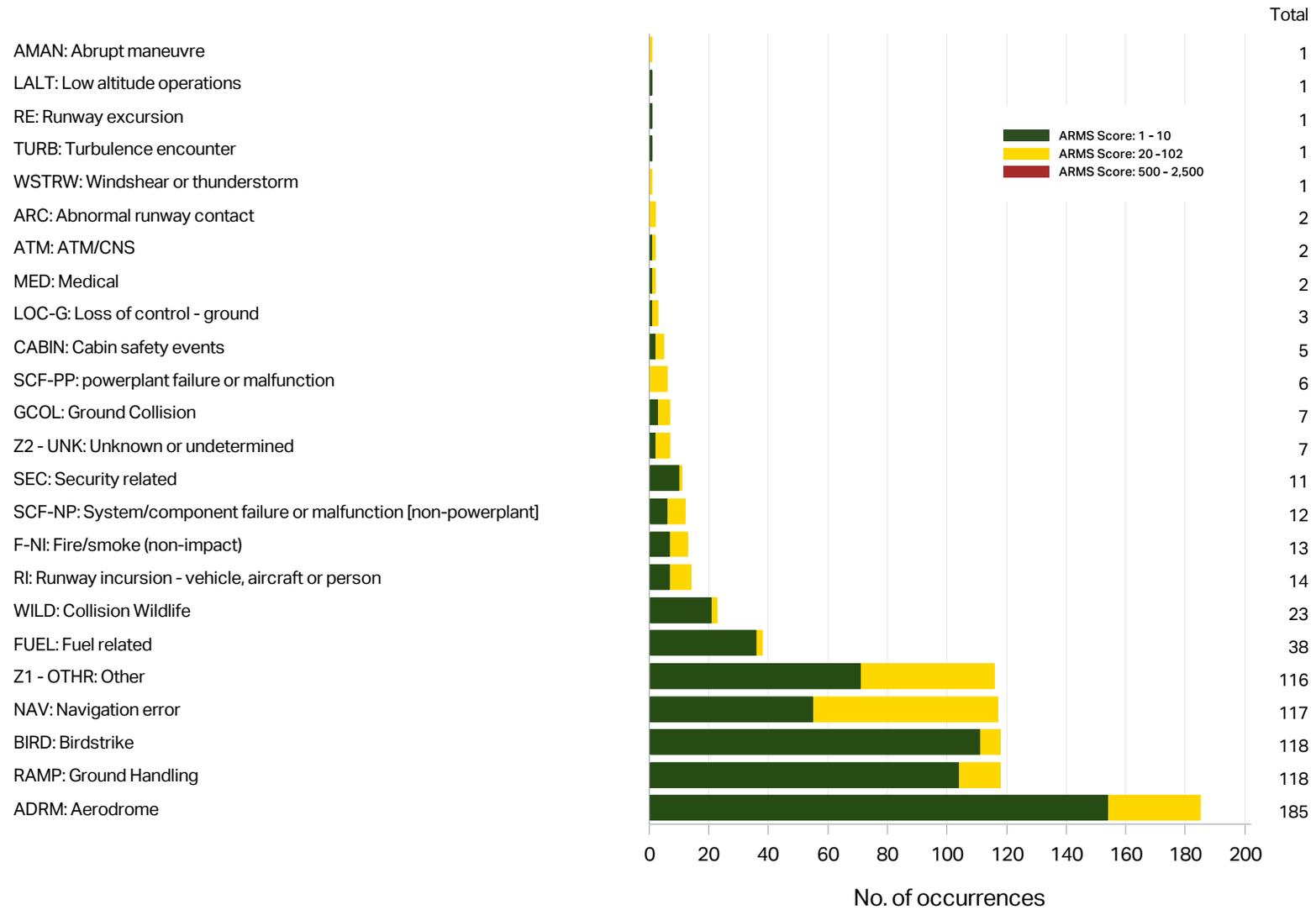


Figure D.4 (b): Aerodrome Occurrence Reports 2020-2021(during Covid)

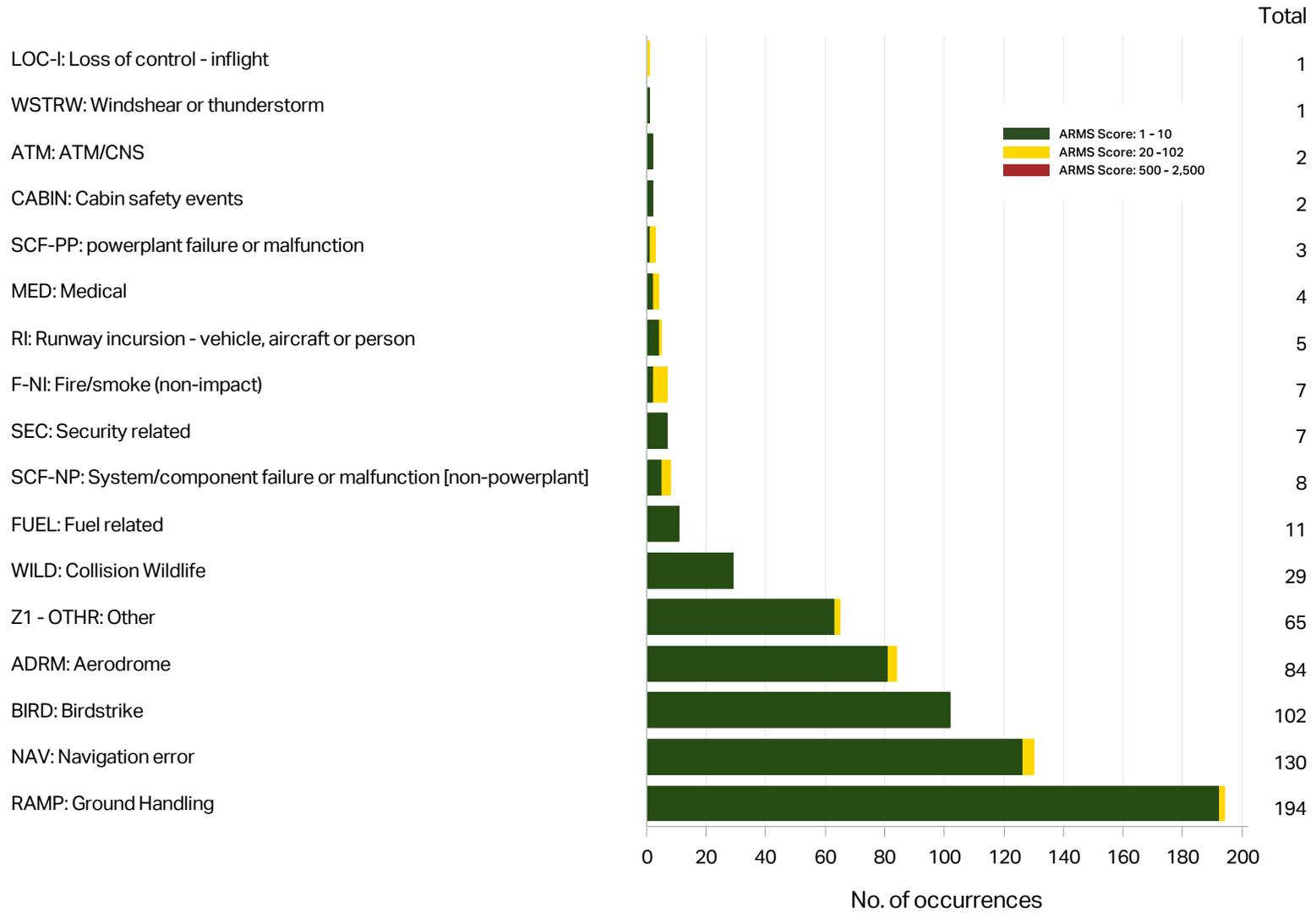


Figure D.4 (c): Aerodrome Occurrence Reports 2022 (post Covid)

The most reported occurrence categories largely remained the same when comparing pre-Covid, Covid and post-Covid time periods. However, RAMP was the number 1 occurrence category pre-Covid and is so again post Covid (2022) having dropped to 5th place during Covid (2020-2021). This is probably reflective of the busier ramp environment post Covid which is comparable to the pre-Covid levels of activity and aligns with the huge drop off in ramp movements that occurred during Covid. NAV has become a more commonly reported category both post-Covid and during Covid (2020-2021) than in previous years pre-Covid.

Figures D.4.(a), (b) and (c) show that ramp 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 across all three timeframes examined i.e., pre-Covid (2017-2019), during Covid (2020-2021) and post Covid (2022).

The navigation error category which includes 'flight crew atc clearance deviation', 'taxi clearance deviation' and 'atm regulation deviation' was more commonly reported post and during Covid than it had been pre-Covid.

Figure D.5 shows that the top event types reported during 2022 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". These appear to have remained pertinent issues in the immediate aftermath of Covid through 2022.

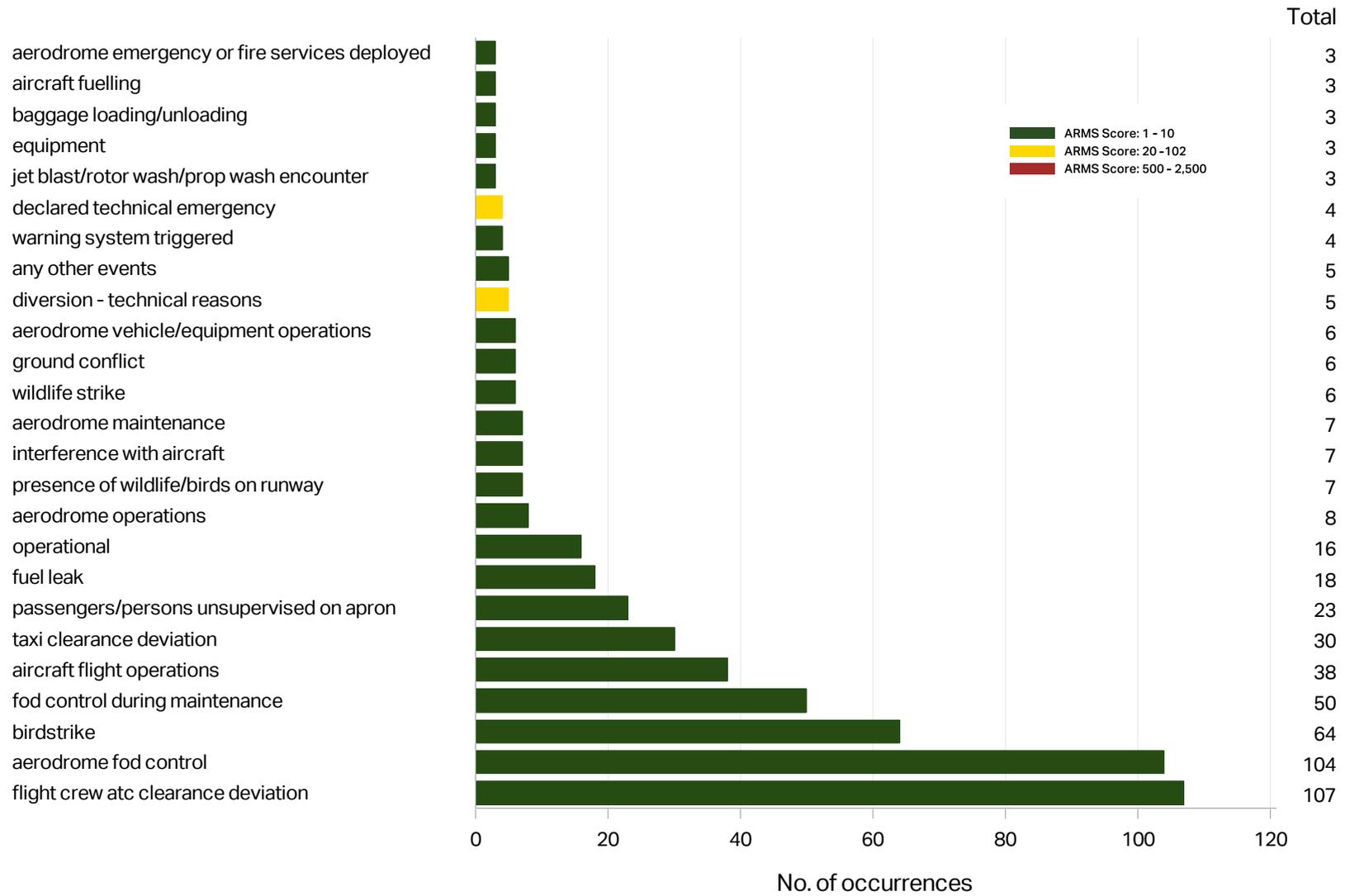


Figure D.5: Top Event Types – Aerodrome 2022

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. This detailed analysis of 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)	<ul style="list-style-type: none"> • Removal of runway contamination (e.g. snow, ice, foreign objects) • Maintenance of runway surface condition • Reporting on runway surface condition
Runway Incursion (RI)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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

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.

Over the past five years there have been no accidents or serious incidents categorised as runway incursion (RI) or runway excursion (RE), see Figure D.1 There was 1 non-fatal accident dually categorised as 'loss of control – inflight' (LOC-I) and 'loss of control on the ground' (LOC-G), this accident is still under investigation. While there was no accident or serious incident categorised as runway incursion Figures D.4. (a), (b) and (c) show that there were 44 runway incursions reported by aerodrome operators between 2017 and 2022.

Other 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.

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

KEY SAFETY AREA	SAFETY ISSUES
Safety of persons on the apron	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 2022

The following table outlines the number of movements along with the corresponding MOR rates per 10,000 movements annually from 2017 to 2022. The number of movements in 2022 more than doubled on 2021 levels, registering a 123% increase. However, the reporting rate decreased. The average reporting rate during the Covid years (2022-2021) of 32.00 was higher than the average pre-Covid (2017-2019) rate of 17.55 and the post-Covid (2022) rate of 24.23. 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.

Table D.4: No. and rate of MORs according to movements from 2017 to 2022

YEAR	MOVEMENTS	TOTAL	
		NUMBER	RATE
2017	283,374	510	18.00
2018	293,961	462	15.72
2019	301,124	570	18.93
2020	114,483	360	31.45
2021	118,861	387	32.56
2022	264,924	642	24.23

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 breakdown 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

Accidents and Serious Incidents:

Covid 19's waning grip on Irish society in early 2022 coincided with the traditional reopening of the Irish VFR season. The arrival of the omicron variant in the first quarter of the year had been less impactful than previous variants, likely due to the effectiveness of mass vaccinations programs and the virus's declining severity with each subsequent variant. Unlike CAT operations, there are no official movement figures for GA, however 2022 saw a resumption of the normal calendar of fly-ins and social gatherings, not experienced since pre-Covid.

Regrettably there were 2 fatal accidents in GA in Ireland in 2022 which resulted in 2 fatalities. One of these accidents involved a certified helicopter less than 2250kg and the other a powered paraglider. The aviation community is always deeply saddened by loss of any of its members and we extend our sympathy to the family, colleagues and friends experiencing this loss.

There were 8 non-fatal accidents, across most genres of general aviation, including EASA certified fixed wing and helicopters, as well as Annex 1 aircraft such as homebuilts, microlight and gyrocopter. There were 2 serious incidents, both of which involved EASA certified Fixed Wing aeroplanes < 2250kg.

While the primary objective in accident investigation is the prevention of accidents and incidents, it is a crude means of learning lessons and improving safety, which is why it behoves all of us as stakeholders to endeavour to raise the safety bar by all means possible in order to avoid catastrophic outcomes. This includes the implementation and use of safety occurrence reporting systems as well as safety promotion initiatives to promulgate safety information on lessons learnt hazard identification and risk mitigation.

A tabulated summary of the safety performance of this sector in respect of accidents and serious incidents in 2022 compared to the previous 4 years (2018-2021) 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

	GA SUB-SECTOR	NO. OF FATAL ACCIDENTS (FATALITIES) 2022	TOTAL NO. OF FATAL ACCIDENTS 2018-2021 WITH (TOTAL FATALITIES)	NO. OF NON-FATAL ACCIDENTS 2022	TOTAL NO. OF NON-FATAL ACCIDENTS 2018-2021	NO OF SERIOUS INCIDENTS 2022	TOTAL NO. OF SERIOUS INCIDENTS 2018-2021
EASA Certified Aircraft	Aeroplanes >2250 ≤5700 kg	0 (0)	1 (2)	1	3	0	0
	Aeroplanes ≤2250 kg	0 (0)	0 (0)	2	9	2	5
	Helicopters > 2250 kg	0 (0)	0 (0)	0	0	0	0
	Helicopters ≤ 2250 kg	1 (1)	0 (0)	1	0	0	0
	Sailplanes	0 (0)	0 (0)	0	3	0	0
	Balloons	0 (0)	0 (0)	0	0	0	0
Annex I Aircraft	Annex 1 Aeroplanes ≤2250 kg	0 (0)	1 (2)	0	2	0	1
	Homebuilt ≤2250 kg	0(0)	1 (2)	2	3	0	2
	Microlight aircraft	0 (0)	2 (2)	1	7	0	0
	Gyrocopters	0 (0)	0 (0)	1	0	0	0
	Glider, powered paragliders, paragliders, and powered parachutes	1 (1)	1 (1)	3	3	0	0

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

There were 4 land aeroplanes with an MTOM > 2,250 kg ≤ 5,700kg Irish aircraft register at the end of 2022.

There were no fatal accidents, 1 non-fatal accident, and no serious incidents involving land aeroplanes in this category in 2022. The non-fatal accident involved a foreign registered aeroplane and categorised as 'Abnormal Runway Contact' (ARC).

Over the previous four years (2018-2021) there was 1 fatal accident, 3 non-fatal accidents and no serious incidents. 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 accidents included 2 Irish and 1 foreign registered aircraft, 2 were categorised as 'Abnormal Runway Contact' (ARC) and 1 categorised as 'Significant Component Failure - Powerplant' (SCF-PP).

EASA Regulated Land Aeroplanes - MTOM ≤ 2,250 kg

There were 114 EASA certified land aeroplanes with an MTOM ≤ 2,250 kg on the Irish aircraft register at end of 2022.

In 2022 there were no fatal accidents, 2 non-fatal accidents and 2 serious incidents in this sub-sector. Both non-fatal accidents were categorised as 'Runway Excursion' (RE). One serious incident was categorised as 'Runway Excursion' (RE) while the other was categorised as Fire/smoke non-impact (F-NI).

During the previous 4 years (2018-2021) there were no fatal accidents, 9 non-fatal accidents and 5 serious incidents. 'Abnormal Runway Contact' (ARC) was the most commonly assigned categorisation to these events 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), and 'Significant Component Failure - Non Powerplant' (SCF-NP) also being assigned categorisations. Among the 5 serious incidents 4 concerned foreign registered aircraft.

Annex I Land Aeroplanes MTOW ≤ 2250 kgs.

In 2022 there were no fatal accidents, non-fatal accidents or serious incidents involving aircraft in this sub-sector.

Over the previous four years (2018-2021), aeroplanes in this sub-sector were involved in 1 fatal accident with 2 fatalities, involving an Irish registered aircraft which was categorised as 'Significant Component Failure - Non-Powerplant' (SCF-NP). There were also 2 non-fatal accidents and 1 serious incident in this four-year period, all involving Irish registered aircraft. The categorisations assigned to these accidents were 'Abnormal Runway Contact' (ARC) and 'Loss of control on the ground' (LOC-G).

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.

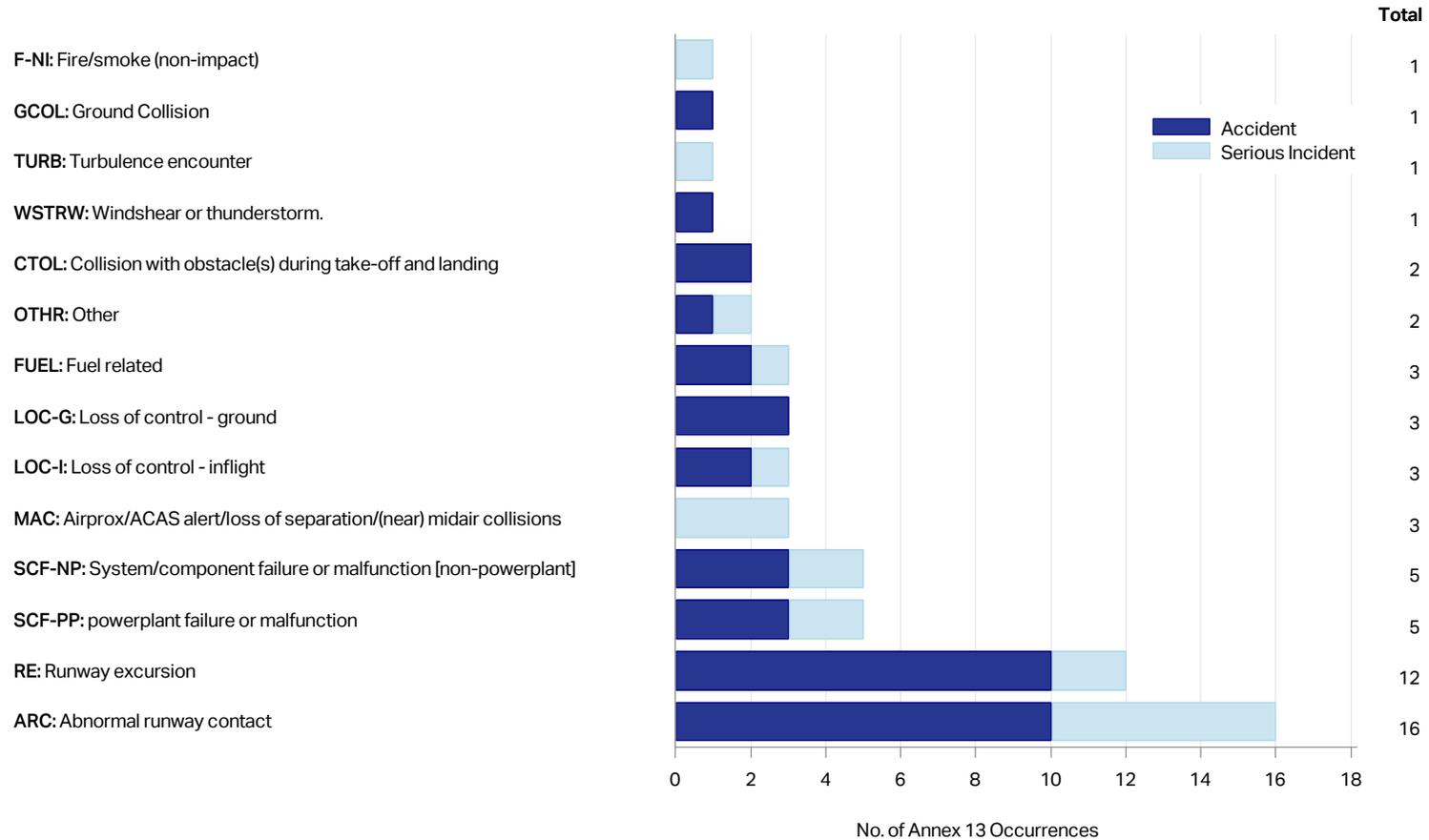


Figure E.2: Occurrence categories assigned to accidents and serious incidents involving GA aeroplanes with an MTOM below 2,250 kg (2018-2022).

Note: some events have been assigned more than one categorisation.

Rotorcraft

There were 6 complex rotorcraft and 17 non-complex rotorcraft registered in Ireland at the end of 2022.

In 2022, there was 1 fatal accident involving a foreign registered non-complex rotorcraft with 1 fatality, initially categorised as 'Loss of control in flight' (LOC-I). The AAIU investigation of this accident is ongoing. There was 1 non-fatal accident involving a foreign registered non-complex rotorcraft, initially categorised as 'Loss of control in flight' (LOC-I). There were no serious incidents in this sector in 2022.

During the previous four years (2018–2021) there were no fatal accidents, non-fatal accidents or serious incidents involving GA helicopters.

Homebuilt aeroplanes

There were 74 homebuilt aeroplanes on the Irish aircraft register at end of 2022 in this sub-sector.

There were no fatal accidents, 2 non-fatal accidents, both categorised as ARC and no serious incident involving homebuilt aeroplanes in 2022.

During the previous four years (2018–2021) 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 3 non-fatal accidents involving 2 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 were 2 serious incidents, 1 involving a foreign registered and 1 involving an Irish registered aircraft. These events were categorised as 'Abnormal Runway Contact' (ARC), 'Significant Component Failure - Non-Powerplant' (SCF-NP) and 'Turbulence encounter' (TURB).

Microlight aircraft

At the end of 2022, there were 168 microlights on the Irish aircraft register.

There were no fatal accidents, 1 non-fatal accident and no serious incidents involving Microlight aircraft in 2022.

During the previous four years (2018–2021) there were 2 fatal accidents, 7 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 5 Irish and 2 foreign registered aircraft were categorised as 'Significant Component Failure – Powerplant' (SCF-PP), 'Windshear or thunderstorm' (WSTRW), 'Loss of Control – Inflight' (LOC-I), 'Collision with obstacles during take-off and landing' (CTOL), 'Abnormal Runway Contact' (ARC) and 'Runway Excursion' (RE).

Sailplanes

There were 29 sailplanes, including 2 powered sailplanes and 1 homebuilt sailplane on the Irish aircraft register at the end of 2022.

There were no fatal accidents, non-fatal accidents, or serious incidents involving sailplanes in 2022.

Over the previous four years (2018–2021) 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 2022, there were 22 gyrocopters, including 3 homebuilt gyrocopters on the Irish aircraft register.

In 2022 there were no fatal accidents, 1 non-fatal accident involving an Irish registered gyrocopter and no serious incidents. There were no fatal accidents, non-fatal accidents, or serious incidents over the previous four years (2018-2021).

Paragliders, powered paragliders and powered parachutes

At the end of 2022 there were 30 powered paragliders registered in Ireland.

There was 1 fatal accident, 3 non-fatal accidents and no serious incidents in this sector in 2022. 'Loss of Control – Inflight' (LOC-I) is the assigned categorisation in 3 of these accidents with 'Controlled Flight into Terrain' (CFIT) assigned to the fourth accident.

During the previous four years (2018-2021) there was 1 fatal accident involving an Irish registered paraglider, with 1 fatality which was classified as 'Unknown' (UNK). In addition, there were 3 non-fatal accidents categorised as 'Loss of Control – Inflight' (LOC-I), 'Loss of control on the ground' (LOC-G) and 'Collision with obstacle(s) during take-off and landing' (CTOL). There were no serious incidents during that timeframe.

GA Flight Training

Currently there are 24 organisations in Ireland providing flight training in general aviation. There was 1 non-fatal accident involving flight training in 2022, categorised as 'Abnormal Runway Contact' (ARC). The categories assigned to GA flight training incidents over the past five years are presented in Figure E.3. 'Abnormal Runway Contact' (ARC) is the most commonly assigned categorisation in recent years in this sector. A large part of GA flight training is based on honing the skills and motor memory in the real environment which can be challenging in the early stages of practical training.

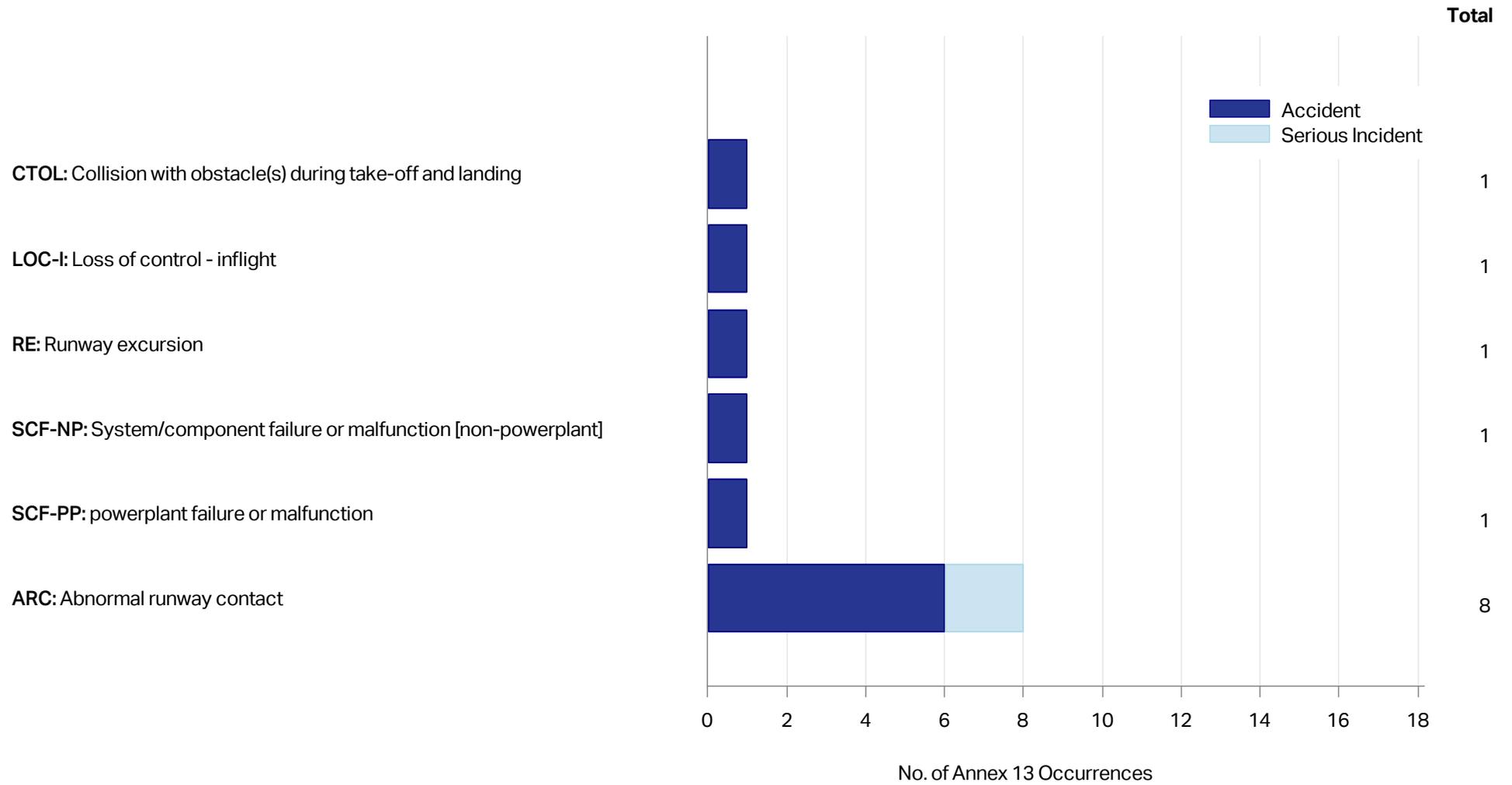


Figure E.3: Categories of accidents and serious incidents involving GA aeroplanes while flight training (2018-2022)

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.

Occurrence reporting levels from Flight Crew Training Organisations (FCTO) recovered in 2021 and 2022. System Component Failure, Navigational Error and Abnormal Runway Contact, and were the top 3 known categories identified in the submitted mandatory occurrence reports during 2022.

The number of reports from GA pilots continues to remain too low to support statistical analysis. The accepted relationship between serious accidents, minor accidents and near misses known as Heinrich's law or the accident pyramid supports the understanding that this lack of reports results in the awareness gained from lower-level occurrences that could later present as accidents and serious incidents (in other circumstances) is not being captured. Unfortunately, this also results in only high-risk accidents and serious incidents, normally very visible and with severe outcomes, are being reported and investigated. 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 AAU, 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 its website (gasci.weebly.com) and twitter account (@Gasci_ie) and hosts very informative and well attended safety evenings. 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>



tent 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.

Figure E.4 below outlines the numbers of VORs reported by individuals over the past five years according to totals and ARMS Risk Classification Band.

The top three types of events reported concerned: RPAS/drone operations, reports from individuals on organisational management safety issues in their organisations, and aircraft related safety issues. 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.

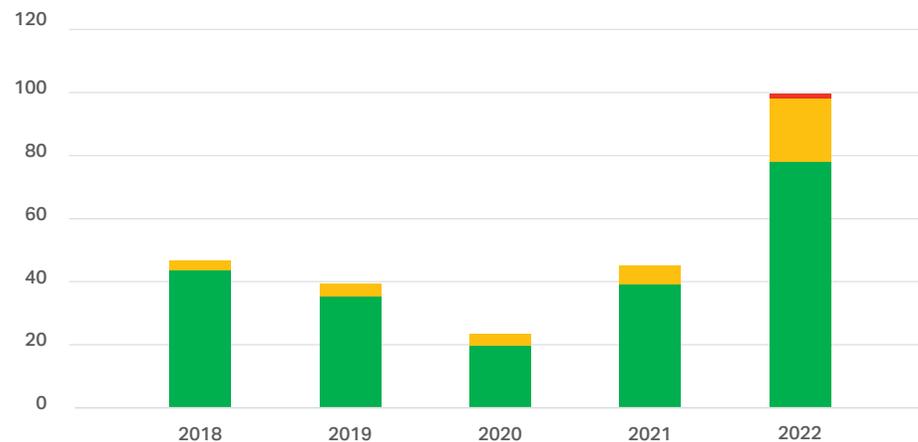


Table E.4: VORs submitted by Individuals to the IAA

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.

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 continued to be essential indicators during the return to normal operations post pandemic.

GA Specific Safety Issues

The following table outlines safety issues identified from the analysis of accidents and serious incidents and are included in the IAA GA sector-based risk register. 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.

“Poor pre-flight planning and preparation”, “Damage tolerance to UAS collisions”, “Airborne separation”, “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 2022 also outlines how EASA has reviewed the accidents and serious incidents involving non-commercially operated small aeroplanes (<5700kg MTOM) for 2017-2021, excluding non-certified aircraft (Annex I to Regulation (EU) 2018/1139). The KRA (key risk area) with the highest risk is aircraft upset, while runway excursion is a more common KRA, while runway excursion is a more common KRA, there is a lower risk of fatal or serious injuries associated with it. 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 (2018-2022), see Figure E.2.

SAFETY AREA	SAFETY ISSUES
Loss of Control -Inflight	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Runway excursion or heavy landing following aircraft handling or environmental issues • Take-off and landing from hard/soft airstrips • Collision with obstacles
Specialised Operations	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Threat and error management for GA • Decision Making Single Pilot CRM
Other	<ul style="list-style-type: none"> • 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

In contrast to the CAT environment, 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 2022 with a welcome return to in-person events post Covid. Topics presented on and discussed included, single pilot

CRM/TEM, winter operations, carburettor icing and crosswind landings. This complements the State Plan for Aviation Safety in Ireland 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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Scope and Content of the Report

The Annual Safety Review provides statistics on safety in the Irish aviation industry. Information relating to the safety activity the IAA has undertaken or intends to undertake is presented in the IAAs State Safety Plan. The IAA has published its 2023-2025 State Safety Plan which is available on the IAA website www.iaa.ie along with previous editions of the State Safety Plan.

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