FLIGHT SAFETY FOUNDATION

2022 Safety Report

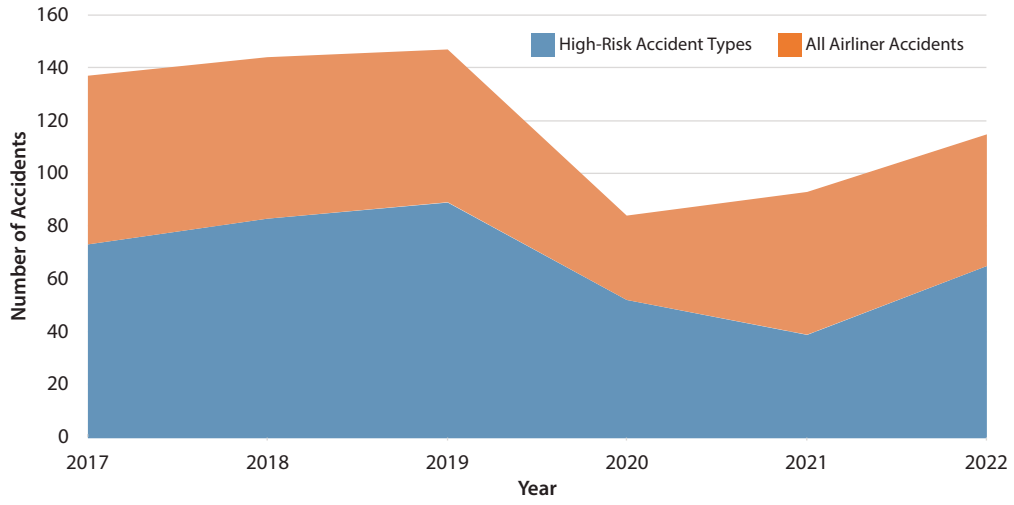
Flight Safety Foundation

March 2023

Introduction

Five high-risk accident types accounted for 56 percent of airliner[1] accidents in 2022 and in the six years since 2017, according to an analysis of data drawn from Flight Safety Foundation's Aviation Safety Network (ASN) database (Figure 1). Over the past several years, runway excursions often have been the most common accident type, but in 2022, turbulence-related accidents were the most frequent, followed by excursions and ground damage accidents (Figure 2, p. 2). This is one of the recent shifts in the overall aviation safety picture. With its annual review and analysis of accidents and safety priorities, the Foundation works to identify changes that might indicate progress or emerging threats.

Figure 1
Airliner Accidents, 2017–2022

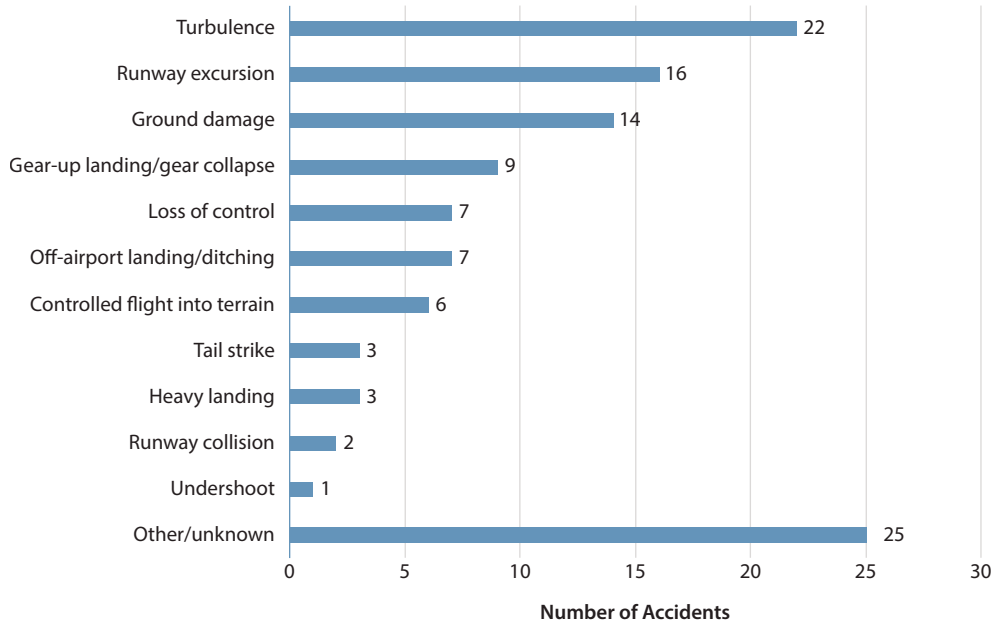


In its analysis, the Foundation reviewed data on airliner and corporate accidents[2] that occurred in 2022 and compared it to data from the prior five-year period (2017–2021). Among airliners, we looked at passenger and cargo operations only; accidents that occurred in training and ferry flights are not included in the analysis. When it came to corporate jet accident analysis, however, we looked at all types of operations.

[1] In the ASN database, airliners are defined as aircraft originally certificated to carry 14 or more passengers. For this analysis we focused on scheduled and nonscheduled passenger flights and cargo operations.

[2] The International Civil Aviation Organization (ICAO) defines an accident as an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which a person is fatally or seriously injured as a result of being in the aircraft or in direct contact with any part of the aircraft or has direct exposure to jet blast, or the aircraft sustains serious damage or structural failure. The complete definition is available here.

Figure 2
2022 Airliner Accidents by Category



Unlike other safety reports and accident analyses, the Foundation's analysis is not intended to show whether the annual accident rate is improving or not. Our objective is to focus on the types of accidents that occurred during the review period, to describe some of the more common circumstances and contributing factors, and to make recommendations to the industry.

ASN Accident Dashboard

The Foundation has created a multi-page, interactive dashboard where data on the accidents that occurred in 2022 and in the previous five years can be found. The dashboard, which covers airliner and corporate jet accidents, enables users to examine the data and do their own research. It also includes links to the relevant accident entries in ASN. The dashboard can be found here.

Accident Data Overview

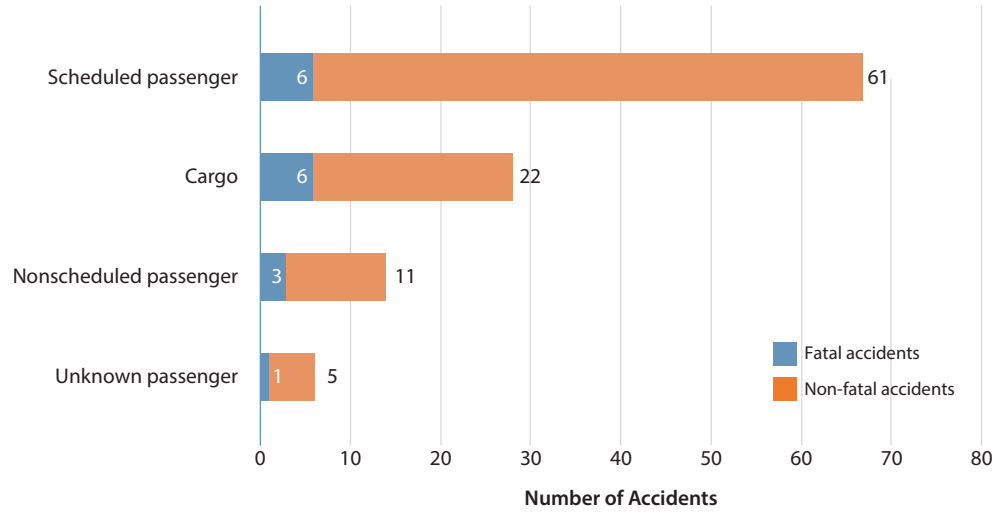
Airliners were involved in 115 accidents in 2022, according to the ASN database. The majority of the accidents (67 accidents, or nearly 58.3 percent) occurred during scheduled passenger operations. Twenty-seven occurred during cargo operations, 14 during nonscheduled passenger operations, and in seven events, it could not be determined from the available information whether the accident occurred during a scheduled or nonscheduled passenger flight (Figure 3, p. 3).

Of the 115 total accidents, 16 were fatal accidents resulting in 233 fatalities among passengers and crew. There were also four fatalities among people on the ground. Six of the fatal accidents were in scheduled passenger operations, six in cargo operations, three in unscheduled passenger operations, and one in unknown operations.

The year's worst fatal accident occurred on March 21, when a China Eastern Airlines Boeing 737-800 on a domestic flight from Kunming to Guangzhou crashed in Guangxi. All 132 passengers and crew were killed. The accident is still under investigation.

The total number of accidents in 2022 represents an increase from both 2020, when there were 84 accidents, and 2021 (93 accidents), but year-to-year comparisons are difficult because there

Figure 3
2022 Airliner Accidents by Operation Type



were fewer overall operations in both those years because of the COVID-19 pandemic.[3] The 2022 total is below the 2017–2021 average of 121 accidents per year. In 2019, the last pre-pandemic year, there were 147 airliner accidents.

In the five-year 2017–2021 period, there were 605 accidents, of which 75 were fatal accidents, or an average of 15 per year. As a result of those fatal accidents, there were 1,397 fatalities among passengers and crew and 43 ground fatalities.

The Foundation also analyzed corporate jet accidents contained in the ASN database. In 2022, there were 35 corporate jet accidents. In 2021, there were 40 corporate jet accidents, and the average during the 2017–2021 period was 31.6 per year. Ten accidents recorded in 2022 occurred during private operations, seven in executive operations, five in ferry/positioning operations and five in nonscheduled passenger operations. The majority (20) of corporate jet accidents occurred during the landing phase of flight.

Five of the 35 corporate jet accidents in 2022 were fatal accidents, resulting in 17 fatalities among passengers and crew and one ground fatality. The year's worst fatal accident occurred on June 22, when a Learjet 55C crashed while on approach to Charallave-Óscar Machado Zuloaga Airport in Venezuela. Six passengers and crew were killed in the accident.

In the five-year 2017–2021 period, corporate jets were involved in 158 accidents. Of that total, 35 were fatal accidents resulting in 132 fatalities among passengers and crew and two people on the ground. The worst fatal accident in the period occurred on May 5, 2019, when a Canadair CL-600-2B16 Challenger 601-3A crashed in desert terrain during a flight from Las Vegas, Nevada, U.S., to Monterrey, Mexico. All 13 passengers and crew were killed.

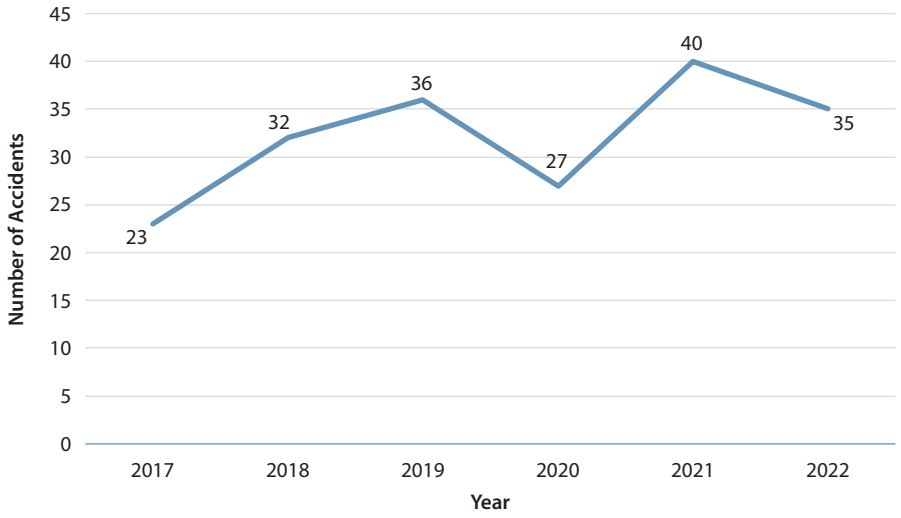
In the six years from 2017 through 2022, 108 of the corporate jet accidents, or more than 55 percent, occurred during the landing phase of flight (Figure 4, p. 4)

Airliner Accident Categories

The Foundation's analysis of the ASN airliner data focused on five primary accident categories. The categories — turbulence, runway excursions, controlled flight into terrain (CFIT), loss of

[3] In February 2023, ICAO said that air passenger demand in 2022 had recovered to about 74 percent of pre-pandemic levels. Passenger boardings in 2022 increased an estimated 47 percent from 2021 levels. The World Economic Forum, using International Air Transport Association (IATA) data, estimates that industry-wide passenger boardings in 2021 were about 47 percent of passenger boardings in 2019, the last pre-pandemic year.

Figure 4
Corporate Jet Accidents, 2017–2022



control (LOC) and ground damage — accounted for nearly 67 percent of all airliner accidents in 2022 and more than 69 percent of airliner accidents from 2017 through 2021.

After the data was aggregated, it was distributed to more than two dozen safety experts drawn from the Foundation's advisory committees. The following analysis is based on Foundation staff research and the input received from those experts.

Turbulence: For the second year in a row in 2022, turbulence-related accidents were the most frequent accident type. There were 22 turbulence-related airliner accidents last year, up from 13 in 2021, when there were fewer overall operations. In the five-year 2017–2021 period, there were 82 turbulence-related accidents, or an average of 16.4 per year. The worst year for turbulence- related airliner accidents was 2019, when there were 24. None of the reported turbulence-related accidents was a fatal accident, but all of them involved serious injuries to passengers and/or crewmembers.

During the period under review (2017–2022), turbulence events were more evident in North America and Asia and less evident in Europe and Africa. North America accounts for 42 percent of all accidents, but accounts for 56 percent of all turbulence events. Asia accounts for 16 percent of all accidents but 27 percent of all turbulence events. The United States had the most turbulence-related accidents, with 55, and there were 16 in Japan. Together, these two countries accounted for 69 percent all turbulence accidents during the review period.

Turbulence has long been a leading cause of injuries to airplane occupants in non-fatal accidents, and incidences of turbulence are expected to increase as a result of climate change, the International Air Transport Association (IATA) said in 2018 when launching its Turbulence Aware program. In a Safety Research Report[4] published in 2021, the U.S. National Transportation Safety Board (NTSB) said that from 2009 through 2018, turbulence-related accidents accounted for more than one-third of all accidents involving U.S. scheduled airlines.

The incidences of turbulence-related accidents are far higher among Part 121 (scheduled operations) carriers than among Part 135 (commuter and on-demand) operators, and flight attendants are the most likely people on board airliners to be seriously injured, the NTSB report said.

[4] "Preventing Turbulence-Related Injuries in Air Carrier Operations Conducted Under Title 14 Code of Federal Regulations Part 121," Safety Research Report, NTSB/SS-21/01 PB2021-100927, Adopted Aug. 10, 2021.

Of the 22 turbulence-related airliner accidents in 2022 that were captured in the ASN database, all occurred during scheduled passenger operations and all but two involved commercial jetliners. The jetliners involved were a mix of narrowbody and widebody aircraft. The other two turbulence-related accidents involved commercial passenger turboprops. Most of the 82 turbulence-related accidents between 2017 and 2021 also involved large commercial jetliners, and all but one occurred during scheduled passenger operations. Of note, 98 percent of all those injured were not restrained at the time of the encounter, including a significant proportion who were unrestrained despite the seat belt light being illuminated.

The Foundation's analysis also showed that, among the accidents reviewed, crewmembers were injured more frequently than were passengers, often while conducting cabin checks following a seat belt warning, or during the descent and approach phases of flight, per their company standard operating procedures (SOPs).

Many turbulence encounters, even severe ones, may not rise to the level of an accident if no serious injuries or significant aircraft damage are reported. Turbulence accidents are much more common in airliner operations than corporate jet operations because of the greater number of passengers and crew that usually are on board airliners.

In its 2021 report, the NTSB identified a number of turbulence-related safety issues to be addressed, such as improving the submission and dissemination of turbulence observations, developing a shared awareness of turbulence risks, and mitigating the circumstances of common turbulence-related injuries with robust procedures, such as requiring cabin crew to take their seats and fasten their seat belts early during descent. Wearing a seat belt reduces the risk of serious injury for all aircraft occupants. The report also recommends enhancements to automatic dependent surveillance–broadcast (ADS-B) technical standard orders and that aircraft flown in Part 121 air carrier operations be retrofitted with weather-capable ADS-B equipment.

The major suppliers of weather radar have made significant strides in improving the turbulence-detection capability of weather radars, including increasing the range of detection and depicting turbulence levels (e.g., moderate and severe) on the navigation display. In addition, suppliers continue to add weather hazard inference capability to radars, which will help mitigate turbulence-related accidents.

Runway Excursions: The ASN database shows there were 16 runway excursion accidents involving airliners in 2022, which is a reduction compared with 2017–2021, when there were an average of just over 20 per year. There were 25 runway excursion accidents in 2020, during which much of the commercial aviation industry was shut down due to the pandemic, but only six in 2021, as the industry began to recover.

Runway excursions occur frequently, but usually are not fatal. In 2022, of 16 runway excursion events, there was one fatal accident (when a passenger died after a British Aerospace Jetstream 32EP overran the runway during takeoff from an airport in Peru. Since 2017, there have been eight fatal runway excursion accidents, and all but the one in Peru last year occurred during the landing phase of flight. The worst fatal runway excursion accident during the period occurred in March 2018 when a US-Bangla Airlines de Havilland Dash 8 veered off the runway while landing at Kathmandu, Nepal, resulting in 51 fatalities among the 71 passengers and crewmembers.

Since 2017, 80 percent of the 117 excursion accidents recorded in the ASN database have occurred during landing, with more veer offs than overruns. Unstable approaches and failure to go around were the most common factor. Other contributing factors included flight crew handling errors (speed and directional control), contaminated runways, crosswinds, late or inaccurate runway or weather reports, mechanical failures or gear collapses and failure to reject takeoff before V_1.[5]

[5] V_1 is the maximum speed at which a rejected takeoff can be initiated in an emergency.

In the analysis period (2017–2022), runway excursion accidents occurred disproportionately more often in Asia, Africa and South America and were less prominent in Europe and North America. Asia, Africa and South America account for 36 percent of all accidents, but 56 percent of all runway excursion accidents. The are 10 countries with four or more excursion accidents during the five-year period.

Because of the complexity of risk factors involved in runway excursions — such as stability of the approach, stability of the landing, condition of the runway, capabilities of the aircraft and instructions from air traffic control, among others — prevention requires coordination among numerous stakeholders, including operators, airports, air navigation service providers, manufacturers and regulators. In 2021, the Foundation and Eurocontrol, working with more than 100 aviation professionals from 40 organizations, published the Global Action Plan for the Prevention of Runway Excursions (GAPPRE), which provides recommendations and guidance materials to a variety of stakeholders. The Foundation's 2017 Go-Around Decision-Making and Execution (GADM&E) Project report also contains valuable data and recommendations.

Ground Damage: There were 14 ground damage airliner accidents in 2022, which was up from the 10 recorded in 2021 and seven in 2020, but still below the average of 17.8 per year that occurred during the 2017–2021 period. In the five-year period, there were 89 ground damage accidents, including a high of 26 in 2019. The decline in 2020 and 2021 likely is the result of reduced operations caused by the pandemic. No fatal ground damage accidents were reported during the period studied.

Analysis of the 2017–2021 accidents shows that more than half of the events were aircraft-to-aircraft collisions, as were four of the events that occurred in 2022. Ground-driven vehicles, such as tugs, fuel trucks and baggage loaders, were involved in about two dozen of the 2017–2021 accidents. The remainder of accidents in the five-year period involved gear collapses, aircraft collisions with ground infrastructure such as light poles or jet bridges, and engine fires. Five of the reported 2022 accidents involved collisions with airport infrastructure, such as light poles and passenger boarding bridges.

In the analysis period (2017–2022), ground damage accidents are more evident in North America and Europe and less evident in Asia, Africa and South America, which could be related to the operational pace in North America and Europe. North America accounts for 42 percent of all accidents, but accounts for 54 percent of all ground damage events, while Europe accounts for 17 percent of all accidents but 30 percent of all ground damage accidents. There were 55 accidents in the United States and Canada spread across 19 airports, and 30 in Europe spread across 13 airports. Together, the United States, Canada and Europe account for 84 percent of all ground damage accidents.

Ground damages represent a significant portion of insurance claims for airlines and airports. Even in the worst years, the number of ground damage events that are categorized as serious injury/fatality and/or major aircraft damage are a small percentage of the total number of occurrences. At least part of the reason is that ground damage may occur when there are no passengers or crew aboard an aircraft, such as when an aircraft is being towed to the ramp after maintenance.

The "IATA Ground Damage Report: The Case for Enhanced Ground Support Equipment," released in December 2022, estimates that the annual cost of ground damage could double to nearly $10 billion by 2035 unless preventive action is taken. The study found that most aircraft ground damage that occurs after the aircraft is stationary is caused by motorized ground support equipment striking the fuselage. The study also found that while the widebody aircraft ground damage rate is 10 times higher than the narrowbody rate, regional jets, turboprop aircraft and narrowbodies are 30 percent more prone to severe ground damage. Belt-loaders, cargo-loaders,

passenger stairs and passenger boarding bridges cause 40 percent of total incidents, according to the IATA ground damage database.

Loss of Control (LOC): In 2022, there were seven airliner LOC accidents, of which three were fatal accidents resulting in 20 fatalities among passengers and crew. The worst of the three fatal accidents occurred on Sept. 4 when a de Havilland Canada DHC-3T Turbine Otter crashed in Mutiny Bay, Washington, U.S., and sank. The pilot and nine passengers were killed. According to the NTSB's preliminary accident investigation report, witnesses near the accident site reported that the airplane was in level flight before it entered a slight climb and then pitched down in a near-vertical descent.

The seven LOC accidents in 2022 are slightly below the 7.4 per year average seen during the 2017–2021 period.

LOC is considered a high-risk accident category because these accidents often are fatal. During the 2017–2021 period, there were 37 LOC accidents, and 27 of them, or 73 percent, were fatal accidents. The 27 LOC fatal accidents during the five-year period resulted in 1,054 fatalities among passengers and crew and seven ground fatalities. Two of the three worst fatal LOC accidents since 2017 were the Boeing 737 MAX crashes in Indonesia and Ethiopia, which together resulted in 346 fatalities. Also included in the total is the accidental January 2020 shootdown of a Ukraine International Airlines Boeing 737-800 near Tehran by Iranian air defense forces, which resulted in 176 fatalities.

Ten of the accidents in 2017– 2021 involved aerodynamic stalls, some because of icing conditions and others because of excessive pitch and slow airspeeds. Improper response to downdrafts, wind shear or crosswinds was noted in six of the accidents, and four involved excessive maneuvers. Other conditions included loss of situational awareness in severe weather, inadvertent activation of go-around mode and engine failure.

Controlled Flight Into Terrain (CFIT): Like LOC accidents, CFIT accidents are a high-risk category because of the likelihood of fatalities. The ASN database includes six CFIT accidents in 2022, four of which occurred in the en route phase of flight and two on approach. Four of the accidents were fatal accidents resulting in 28 fatalities among passengers and crew. The worst CFIT accident of the year occurred on May 29 when a de Havilland Canada DHC-6 Twin Otter 300 operated by Tara Air struck a mountainside while on a domestic flight in Nepal. All 22 passengers and crew were killed.

During the 2017–2021 period, there were 27 CFIT accidents, or an average of 5.4 per year. Sixteen of the accidents during the five-year period were fatal, resulting in 129 fatalities among passengers and crew, and 35 ground fatalities. One of the worst accidents during the period occurred on July 6, 2021, when an Antonov An-26B-100 being operated by Kamchatka Aviation Enterprise on a scheduled domestic flight in Russia struck a cliff while on approach to Palana Airport on the Kamchatka Peninsula. Twenty-eight passengers and crew were killed in the accident.

The worst CFIT accident during the period in terms of total fatalities occurred on Jan. 16, 2017, when a Boeing 747-400 freighter being operated by ACT on a cargo flight struck terrain near Bishkek-Manas International Airport in Kyrgyzstan. All four crewmembers and 35 people on the ground were killed.

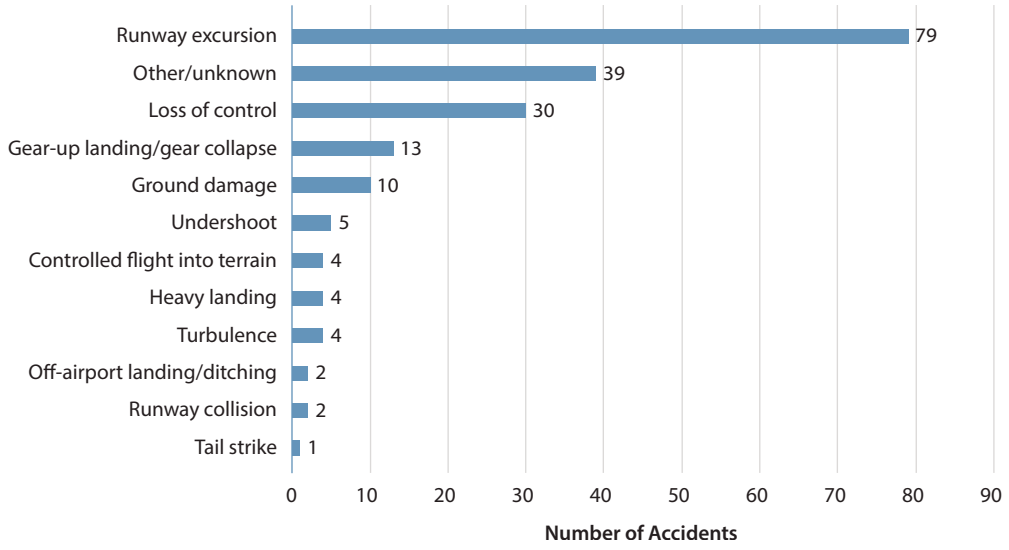
Most of the CFIT accidents that occurred during the 2017–2021 period involved adverse weather conditions, such as low visibility and ceilings, fog and snow. Many happened in mountainous terrain. In addition, the majority of accidents involved operational shortcomings of some kind, including visual flight rules flights in instrument meteorological conditions, descent below established minimums, deviations from established routes and late or improper go-arounds. Many of the deviations and descents below minimums could be characterized as intentional noncompliance, a factor that some believe may be under-recognized in accident investigations.

Of the total of 33 CFIT accidents since 2017, 17 occurred during cargo operations, including five of the six recorded in 2022.

Corporate Jet Accident Categories

The Foundation's analysis of corporate jet accident data focused on five categories, which accounted for approximately 70 percent of the accidents during the six-year period under review (Figure 5).

Figure 5
Corporate Jet Accidents by Type, 2017–2022



Runway Excursions: Runway excursions were, by far, the most common accident type in corporate jet operations in 2022 and throughout the period under review. In 2022, 17 of the 35 accidents involved runway excursions. One of the 17 was a fatal accident. In October, a Cirrus SF50 Vision Jet G2 suffered an excursion after a rejected takeoff at Santa Marta-Simón Bolívar Airport in Colombia. One person on the ground suffered fatal injuries.

During the 2017–2021 period, five of the 62 runway excursion accidents recorded were fatal accidents, resulting in 17 fatalities among passengers and crew. The worst of the five fatal accidents occurred on March 29, 2020, when an Israel Aerospace Industries 1124A Westwind II crashed following an aborted takeoff from Runway 24 at Manila-Ninoy Aquino International Airport, Philippines, and burst into flames. The eight passengers and crew were killed.

Runway excursions are far more prevalent after landing than during the takeoff phase. Of the 79 corporate jet runway excursions that occurred from 2017 through 2022, 66 occurred during landing and 13 during takeoff.

Loss of Control (LOC): After runway excursions, LOC accidents usually are the most common accident type. There were only two corporate jet LOC accidents in 2022, but in the five-year 2017–2021 period, there were 28, or an average of 5.6 per year. Both LOC accidents last year were fatal and resulted in a total of 10 fatalities.

In the five-year 2017–2021 period, there were 28 LOC accidents, of which 20 were fatal, with 90 fatalities among passengers and crew. The worst year for fatalities was 2021, when five accidents resulted in 27 fatalities. The worst fatal LOC accident was the Challenger 601 crash cited earlier in this report.

Aerodynamic stall remains a leading cause of LOC accidents, and about 25 percent of the accidents involved stalls. More specifically, a stall during a circling approach remains a significant factor in LOC accidents. Another contributor is spatial disorientation.

Gear-Up/Collapse Landing: There were two gear-up/gear collapse landing accidents in 2022, neither of which was fatal. In the previous five-year period, there were 11 gear-up/collapse landing accidents, or an average of 2.2 per year. None of the accidents during the period was fatal.

In two of the accidents during the five-year period, the crew did not lower the landing gear, and in two other events, a part failed, causing the gear to collapse. In two additional cases, improper maintenance had been performed on the gear, and one case involved a runway excursion and gear collapse following a rejected takeoff.

Ground Damage: There was one ground damage accident in 2022. A taxiing Bombardier Challenger 300 struck the rudder of a Pilatus PC-12. In the previous five years, there were nine accidents, one of which was fatal.

Four of the nine events in 2017–2021 involved aircraft-to-aircraft collisions, while others involved collisions with airport infrastructure or ground vehicles.

Turbulence: There were no reported turbulence accidents in 2022, and just four were recorded in the previous five years. Given that corporate jets generally carry fewer passengers and often are not staffed by flight attendants, the likelihood of a person on board an aircraft being seriously injured because of a turbulence encounter is far less than in airliner operations.

Call to Action

The aviation industry has made significant safety progress over the decades, but the Foundation and other industry stakeholders are continually in pursuit of greater improvement. Technology has had a positive impact on the decline in the number of midair collisions, CFIT and, to a lesser extent, LOC and runway excursions. Safety is also improved by changes to processes and behavioral norms. As safety performance improvement has slowed in recent years, there is often an even greater need to strengthen SOPs and weak links in the chain of events leading to an accident. The Foundation believes there is still much to learn from the worldwide accident record about prioritizing accident-reduction efforts in the accident categories discussed in this report.

- **Turbulence —** Turbulence-related accidents are on the increase, and climate change may be a contributing factor. Airline passengers need to recognize the importance of adhering to crew instructions to fasten their seat belts, whether those instructions are delivered verbally or through illumination of the seat belt sign. Passengers should also habitually keep their seat belts fastened whenever seated. Operators should consider ways of bringing the risk associated with failing to wear a seat belt to the attention of all passengers and cabin crew. Additionally, operators should review their SOPs to ensure that the balance between cabin or galley checks and self-protection for cabin crewmembers is included in the threat and error management processes for flight and cabin crews. The industry must continue to improve its ability to detect areas of turbulence, particularly clear air turbulence, and to share information about areas of turbulence. The NTSB study referenced in this report has several recommendations that deserve consideration not just in the United States but around the world.
- **Runway excursions —** Excursions are a significant risk for all sectors of aviation. The Foundation strongly encourages the implementation of recommendations made in the GAPPRE and GADM&E reports. In advance of the coming European Union Aviation Safety Agency mandate that large aircraft operated in commercial air transport be equipped with a runway overrun awareness and alerting system, some manufacturers are already equipping their fleets. The technology has not been in the fleet long enough to get a measure of its effectiveness, but the Foundation believes this technology has potential to reduce excursions and equipage should be encouraged.

- **Runway incursion —** The Foundation also is concerned about the ongoing risk of runway incursions, particularly in light of the incursion events reported since the start of2023, and believes it is important to raise awareness of this safety risk. The Foundation and its international partners in January began work on the Global Action Plan for the Prevention of Runway Incursions, which is expected to be completed later this year.
- **Ground damage —** The risk of a ground collision and damage is present, regardless of whether it results in an accident. Precautions must be part of regular procedures in flight operations, ground operations, maintenance and elsewhere. As the industry recovers from the disruptions caused by the COVID-19 pandemic and onboards a large number of new, inexperienced personnel, the interfaces between operational areas can experience risks that may have been handled much better with seasoned professionals. The Foundation highly recommends that operators, maintenance and ground handling organizations reinforce safety norms and proper procedures among front-line workers when daily activities are conducted across all operational departments. Investment in proper training also is critical. In addition, the Foundation also supports the practical use of technology solutions, such as anti-collision systems, to reduce ground damage occurrences.
- **Loss of Control —** Data show little improvement in this area, which needs significant attention and better compliance with checklist procedures. When pressures to meet schedules clash with SOPs, operators need to practice healthy crew resource management efforts and recognize that risk must be managed within the boundaries of an acceptable process. If the process is not serving the needs of flight crewmembers, it must be revisited and revised accordingly. Operators and regulators must ensure that the training of flight crewmembers is carried out in the spirit of International Civil Aviation Organization Annex 6 Part 1 Chapter 9 Para 9.3.1, which covers training in knowledge and skills related to human performance.
- **CFIT —** Despite improvement, risks persist, with loss of situational awareness in instrument meteorological conditions one of the most common occurrences in this accident category. As with LOC, ensuring the quality of flight crew training is paramount. If aircraft are equipped with terrain warning systems, operators should regularly monitor adherence and response to these warnings, and if aircraft are not equipped with these systems, operators should ensure additional precautions are part of their SOPs. It is also important that operators ensure that the most up-to-date terrain database is being used and, where possible, the global positioning system should be used as the source of position information.

The other accidents that occurred in 2022 but are not included in the main body of the analysis include tail strike, off-airport landing, heavy landing, undershoot, runway collision and midair collision. Together, the accidents in these categories total slightly more than the number of runway excursions. Other accidents have not yet been categorized because of a lack of available information. If and when that information becomes available, the ASN database will be updated.

The Foundation chose to focus on accident categories that are sizeable and relevant around the world. Making significant safety progress requires focusing on the circumstances and causes of accidents in the categories that account for the majority of all accidents and more than 90 percent of all fatalities. Technology improvements likely will continue to address some of the causes of these accidents, but human attention to details, revising processes to ensure the highest confidence of safe outcomes and applying the necessary lessons learned from the mistakes of the past also play an important role and will require actions on several fronts. As we have noted in our analysis, not every region of the world or every sector is experiencing similar results and solutions may need to be focused on unique experiences and challenges. The Foundation will continue to look for opportunities to improve the overall risk picture for the industry, and undoubtedly improvements will require great collaboration among stakeholders.