

“Causes of the Abnormal Increase in Aviation Accidents” (A Case Study of Aviation Accidents During 2024-2025)

Researcher:

Colonel Pilot Sultan Saleh Rifan Al-Salloum

Master's Program in Crisis and Disaster Management

February 2025

Received: 15/07/2026 | Revised: 16/07/2026 | Accepted: 23/08/2026 | Published: 02/08/2026

before and during flights. Rare incidents involving collisions with obstacles or unexpected landmarks accounted for 4% of the cases, while 8% of the accidents remain without clearly identified causes. These ambiguous cases require in-depth investigations using advanced analytical tools to uncover the underlying factors (WMO, 2024; ICAO, 2024).

The results also reflect deeper and interconnected factors beyond the immediate operational environment. Economic pressures arising from intense competition, rising operating costs, and the economic effects of the COVID-19 pandemic have driven some airlines to reduce expenditure on maintenance and training. The technological complexity of modern aircraft, which rely on advanced electronic systems, also requires regular updates and continuous integration of new technology. Differences in safety standards and regulation between countries, together with weak government oversight in some cases, further undermine the effective implementation of international safety rules (Journal of Air Transport Management, 2024; ICAO, 2024).

In light of these findings, the study recommends a comprehensive set of measures to enhance aviation safety. These include adopting AI-supported predictive maintenance, updating aircraft systems and equipment, developing specialized training

Abstract:

The study indicates a serious escalation in the rate of aviation accidents during the period from January 2024 to January 2025, with 28 documented incidents revealing an interconnection of several key factors contributing to these disasters. Approximately 43% of these accidents were caused by mechanical and technical failures related to weak maintenance procedures and outdated systems and equipment. This finding underscores the urgent need for a comprehensive reassessment of regular inspection processes and the adoption of predictive maintenance technologies supported by artificial intelligence for early fault detection. Conversely, human errors accounted for about 29% of the accidents, with fatigue, insufficient training, and poor decision-making during emergencies playing significant roles. This situation calls for the development of advanced training programs that utilize simulation and virtual reality techniques to enhance crew proficiency and improve responses under critical conditions (Aviation Safety Network, 2024; ICAO, 2024; Forbes, 2025).

Extreme weather conditions contributed to around 18% of the accidents, as climate change and sudden storms created challenges in controlling aircraft during takeoff and landing. This highlights the need for improved weather-forecasting systems that provide accurate and updated information to crews

review of aviation safety strategies to reduce risks and protect lives and property amid the continuing growth of global air traffic (ICAO, 2024; FAA, 2024; IATA, 2023).

programs based on advanced simulation and virtual reality, regularly reviewing regulatory frameworks, standardizing safety requirements internationally, improving weather forecasting, and strengthening international cooperation and the exchange of expertise between regulatory authorities and airlines. Overall, the study calls for a holistic and integrated

How to Cite This Article

Al-Salloum, S. S. R. (2026). Causes of the abnormal increase in aviation accidents: A case study of aviation accidents during 2024-2025. *Arab Journal for Scientific Publishing (AJSP)*, 9(94), (500-520).

AJSP | Vol. 9 | Issue 94 | DOI: <https://doi.org/10.36571/ajsp.94>AJSP ORCID: <https://orcid.org/0009-0005-8048-2082>**Abstract - Original English Version**

The study indicates a serious escalation in the rate of aviation accidents during the period from January 2024 to January 2025, with 28 documented incidents revealing an interconnection of several key factors contributing to these disasters. Approximately 43% of these accidents were caused by mechanical and technical failures related to weak maintenance procedures and outdated systems and equipment. This finding underscores the urgent need for a comprehensive reassessment of regular inspection processes and the adoption of predictive maintenance technologies supported by artificial intelligence for early fault detection. Conversely, human errors accounted for about 29% of the accidents, with fatigue, insufficient training, and poor decision-making during emergencies playing significant roles. This situation calls for the development of advanced training programs that utilize simulation and virtual reality techniques to enhance crew proficiency and improve responses under critical conditions (Aviation Safety Network, 2024; ICAO, 2024; Forbes, 2025).

Extreme weather conditions contributed to around 18% of the accidents, as climate change and sudden storms created challenges in controlling aircraft during takeoff and landing. This highlights the need for improved weather-forecasting systems that provide accurate and updated information to crews before and during flights. Rare incidents involving collisions with obstacles or unexpected landmarks accounted for 4% of the cases, while 8% of the accidents remain without clearly identified causes. These ambiguous cases require in-depth investigations using advanced analytical tools to uncover the underlying factors (WMO, 2024; ICAO, 2024).

The results also reflect deeper and interconnected factors beyond the immediate operational environment. Economic pressures arising from intense competition, rising operating costs, and the economic effects of the COVID-19 pandemic have driven some airlines to reduce expenditure on maintenance and training. The technological complexity of modern aircraft, which rely on advanced electronic systems, also requires regular updates and continuous integration of new technology. Differences in safety standards and regulation between countries, together with weak government oversight in some cases, further undermine the effective implementation of international safety rules (Journal of Air Transport Management, 2024; ICAO, 2024).

In light of these findings, the study recommends a comprehensive set of measures to enhance aviation safety. These include adopting AI-supported predictive maintenance, updating aircraft systems and equipment, developing specialized training programs based on advanced simulation and virtual reality, regularly reviewing regulatory frameworks, standardizing safety requirements internationally, improving weather forecasting, and strengthening international cooperation and the exchange of expertise between regulatory authorities and airlines. Overall, the study calls for a holistic and integrated review of aviation safety strategies to reduce risks and protect lives and property amid the continuing growth of global air traffic (ICAO, 2024; FAA, 2024; IATA, 2023).

Introduction

In a world where dependence on air transport is accelerating as a lifeline for the global economy and a bridge between cultures and peoples, aviation safety stands out as an indispensable element. It is not merely a technical luxury; it is an urgent necessity that protects lives, supports social and economic stability, and ensures continued growth in an era in which the interests of nations and individuals are interconnected across borders (ICAO, 2024).

Nevertheless, the period from 2024 to January 2025 witnessed an unprecedented increase in aviation accidents, exceeding familiar normal levels and becoming one of the most severe crisis periods of the current century. The rate began to rise in late 2023 and reached its peak during the period under review, when approximately 28 notable accidents were recorded. These included the South Korea crash that killed 179 people and a midair collision in Europe involving two small aircraft, in addition to other events that raised broad international concern about the effectiveness of existing preventive measures (Aviation Safety Network, 2024; Forbes, 2025).



Figure 1. Wreckage from the South Korea aviation accident, showing the extensive damage (CNN Arabic, 2024).

These incidents were not isolated events or mere coincidences. They served as an alarm that requires careful scientific examination of the interconnected root causes behind the sudden increase. Despite sustained efforts by organizations such as ICAO and by airlines to improve aviation-safety standards, earlier studies did not sufficiently address the factors responsible for this exceptional rise (ICAO, 2024; Journal of Air Transport Management, 2024).

Previous research often focused on individual accidents or broader periods rather than this critical interval, which represented a qualitative change in both the nature and frequency of accidents. The importance of this study therefore lies in addressing that knowledge gap through a comprehensive analysis of patterns and underlying factors (Journal of Air Transport Management, 2024).

The study uses a methodology based on collecting and analyzing information from reliable sources, including reports from the International Civil Aviation Organization (ICAO), the Aviation Safety Network, official investigation records, and detailed case studies of major accidents during the period. It seeks to identify technical factors such as equipment failure, human factors such as operational error, environmental factors such as severe weather, and regulatory factors related to weak policy or oversight. The ultimate purpose is to contribute new insights, develop a scientific and practical roadmap, and propose effective solutions for safer skies (ICAO, 2024; Aviation Safety Network, 2024).

Research Problem

Since the beginning of 2024, the aviation sector has experienced a noticeable increase in air disasters. The study records 28 accidents during the year, with the rate peaking at more than 15 accidents within only two months (December 2024-January 2025). The research problem is therefore to determine the reasons behind this critical rise by examining recent accidents and the circumstances surrounding them (Aviation Safety Network, 2024; Reuters, 2024).

Major Aviation Accidents in 2024



Figure 2. Major aviation accidents reported during 2024; the original visual layout was retained and its Arabic text was translated into English (Erem News, 29 December 2024).

Research Objectives

Based on the problem of the abnormal increase in aviation accidents from 2024 to January 2025, the study aims to:

1. Monitor and document major aviation accidents during the recent period, with attention to their temporal and geographic details.
2. Analyze accident scenarios and the circumstances surrounding each event in order to identify recurring patterns and causal sequences.
3. Evaluate the results of official investigations and draw lessons from the adequacy of existing responses.
4. Identify the root and underlying causes of the sharp increase, whether technical, human, environmental, or regulatory.
5. Develop practical and scientific insights that support preventive strategies and assist decision-makers at local and international levels.

Significance of the Research

The significance of the study lies in identifying the main reasons behind the abnormal increase in aviation accidents during the period from 2024 to January 2025, which witnessed unprecedented air-safety crises in the current century. Through accident analysis and practical recommendations, the research seeks to strengthen aviation safety and support decision-makers in airlines and regulatory bodies in reducing risk, protecting passengers and crews, and maintaining the sustainability of air transport (ICAO, 2024; FAA, 2024).

The practical value of the research extends beyond academic analysis. Its recommendations are intended to be usable by airline managers, civil-aviation authorities, and international organizations when improving safety

policies and developing innovative preventive strategies. A deeper understanding of the factors behind the increase is necessary not only to protect life, but also to preserve a sector that has become a vital artery of the global economy (ICAO, 2024; IATA, 2023).

First: Theoretical Framework

International Civil Aviation Organization (ICAO)



The International Civil Aviation Organization (ICAO) was established on 4 April 1947 as a specialized agency of the United Nations. Its headquarters are located in Montreal, Canada. ICAO develops and plans the principles and techniques of international air navigation and works to foster the secure, safe, and orderly growth of international air transport (ICAO, 2017).

ICAO assigns four-letter location indicators to airports around the world and three-letter designators to airlines. These codes differ from those used by the International Air Transport Association (IATA). In the United States, an ICAO airport code often corresponds to the IATA code with the letter K added at the beginning (for example, LAX becomes KLAX). Canada commonly uses a C prefix (YEG becomes CYEG). Elsewhere, ICAO and IATA codes may have no direct relationship; for example, Paris Charles de Gaulle Airport uses the ICAO code LFPG and the IATA code CDG. ICAO also facilitates international navigation, border crossing, regulatory compliance, and the establishment of systems for investigating aviation accidents (ICAO, 2024).

Historical Background

The International Commission for Air Navigation (ICAN) is regarded as a predecessor of ICAO. Its first conference was held in Berlin in 1903, but the eight participating states did not reach agreement on specific mechanisms. A second conference was held in Berlin in 1906 with delegates from twenty-seven countries. At the third conference, held in London in 1912, the first aircraft call signs were allocated. ICAN continued its work until 1945 (United Nations, 2017).

The Convention on International Civil Aviation, also known as the Chicago Convention, was signed by 52 states in Chicago on 7 December 1944. Under its provisions, the Provisional International Civil Aviation Organization (PICAO) was established until a permanent organization could take effect after ratification by twenty-six states. PICAO began operating on 6 June 1945. The twenty-sixth state ratified the Convention on 5 March 1947, and ICAO formally began operations on 4 April 1947. In October 1947, it became a specialized agency of the United Nations linked to the Economic and Social Council (Clark, 2017; Registrations, 2011).

Aviation Accidents in 2024

The recent period witnessed an unusual number of accidents and crises. The research found that 2024 recorded a marked rise in aviation deaths. Forbes reported 318 deaths in aviation accidents during 2024, while Bloomberg data described the total for commercial-aircraft accidents as the highest in six years. The figure was significantly higher than the 23 deaths reported in 2023 and represented the highest level since 2018, when 516 deaths were recorded (Forbes, 2025; Aviation Safety Network, 2024).



Figure 3. Commercial-aircraft deaths since 2018 (Asharq, based on Bloomberg data, 2024) (Forbes, 2025).

The accident rate reached its peak in December 2024. Major events included the following:

Brazil: On 11 August, a Voepass ATR 72 operating a domestic flight crashed in Vinhedo, killing all 62 people on board. The aircraft was flying from Cascavel to Sao Paulo (Reuters, 2024; Aviation Safety Network, 2024).

Brazil: On 22 December, a twin-engine Piper PA-42 private aircraft crashed into shops in central Gramado. All ten occupants died and 17 people on the ground were injured (Reuters, 2024; Aviation Safety Network, 2024).

Kazakhstan: On 25 December, an Azerbaijan Airlines Embraer E190 operating international flight J2-8243 crashed near Aktau. Thirty-eight people were killed and 29 survived. The flight was travelling from Baku to Grozny (Reuters, 2024; Aviation Safety Network, 2024).

Nepal: On 24 July, a small CRJ200 passenger aircraft operated by a Nepalese airline crashed and caught fire during takeoff from Kathmandu for Pokhara. Eighteen people died and only the pilot survived (Reuters, 2024; Aviation Safety Network, 2024).

Malawi: On 10 June, Vice President Saulos Klaus Chilima and nine others, including former First Lady Shanil Dzimbiri, were killed when their military aircraft crashed while travelling from Lilongwe to Mzuzu under unclear circumstances (Reuters, 2024; Aviation Safety Network, 2024).

South Korea: On 29 December, Jeju Air international flight 7C2216 crashed, killing 175 passengers and four of the six crew members. The aircraft had departed Bangkok for Seoul (Reuters, 2024; Aviation Safety Network, 2024).

Thailand: On 23 August, a Cessna Caravan C208B operating domestic flight TFT209 crashed about 100 kilometres southeast of Bangkok, killing all nine people on board. It was flying from Suvarnabhumi to Trat (Reuters, 2024; Aviation Safety Network, 2024).

Iran: On 19 May, a U.S.-built Bell 212 helicopter crashed in mountainous terrain near Varzaqan, close to the Azerbaijani border. President Ebrahim Raisi, senior officials, and the flight crew were killed (Reuters, 2024; Aviation Safety Network, 2024).

Canada: On 23 January, a Northwestern Air aircraft carrying Rio Tinto mine workers crashed near Fort Smith in the Northwest Territories. Four passengers and two crew members were killed, while one passenger survived (Reuters, 2024; Aviation Safety Network, 2024).

Japan: On 2 January, a Japan Airlines Airbus A350-941 collided with a smaller Coast Guard aircraft on the runway at Tokyo Haneda Airport. All 379 occupants of the passenger aircraft escaped the subsequent fire, while five of the six crew members on the smaller aircraft were killed (Reuters, 2024; Aviation Safety Network, 2024).

General Causes of Aviation Accidents

There is no single cause common to every aviation accident. However, several major categories recur, including technical failures, severe weather and environmental conditions, and poor decisions by operating crews. The following subsections review these causes in greater detail (Al-Hamoud, 2022; ICAO, 2024).

Technical Failures

Mechanical problems may involve undetected faults in the airframe or in a critical component. New or replacement parts may also be installed without sufficient crew familiarization. Such problems are cited as contributing to approximately 20% of aviation accidents in the general literature, although aircraft design and maintenance standards have continued to improve over time (Al-Hamoud, 2022; FAA, 2024).

Weather Problems

Lightning may interfere with aircraft systems, while strong winds, heavy rain, snow, and turbulence can make an aircraft difficult to control. More than two-thirds of accidents attributed to poor weather have reportedly been fatal, and adverse weather is also a major source of delays and cancellations (Al-Hamoud, 2022; WMO, 2024).



Figure 4. Thousands of flights were disrupted by a severe storm in the southern United States (Kurdistan Net, 2024).

Human Error

Human error may involve air-navigation personnel, design engineers, airline management, or flight crews. Air-traffic controllers must warn pilots when takeoff and landing traffic is congested and maintain adequate separation between aircraft. Airlines must also avoid exerting operational pressure that encourages risky approaches or landings merely to reduce paperwork or schedule disruption (Al-Hamoud, 2022; FAA, 2024).

Flight-Crew Error and Sabotage

Pilot error is frequently placed among the leading causes of aviation accidents and is cited in the source material as accounting for approximately 43% of accidents. A pilot is responsible for checking fuel, reviewing mechanical and technical conditions, diverting around storms, and conducting takeoff and landing safely. A small mistake in any of these responsibilities may have catastrophic consequences. Pilot error may arise from inadequate training, prolonged fatigue, or limited experience. Responsibility does not rest solely with the pilot; poor baggage stowage, failures in crew coordination, or accidental movement of a control can also create serious hazards (Al-Hamoud, 2022; ICAO, 2024).

Sabotage refers to deliberate damage or interference by terrorist groups, hijackers, or other parties seeking to benefit from disruption. The source material estimates that this category accounts for approximately 9% of aviation accidents (Al-Hamoud, 2022).

Reasons for the Increase in Aviation Accidents

Aviation accidents increased markedly during the last decade, but the most noticeable rise occurred in 2024, when accident rates exceeded their familiar normal levels and attracted the attention of specialists and the public. Experts attribute the recent increase to several factors (ICAO, 2024; Journal of Air Transport Management, 2024).

- **Growth in air traffic:** The expansion of the aviation industry and the number of flights increases exposure and therefore the statistical possibility of accidents (ICAO, 2024).
- **Human error:** Despite strict safety procedures and intensive training, human error remains a major cause of aviation accidents (ICAO, 2024; FAA, 2024).
- **Maintenance problems:** Failure to comply with periodic maintenance standards may lead to technical defects and, ultimately, tragic accidents (FAA, 2024; ICAO, 2024).
- **Terrorist attacks and security breaches:** Deliberate attacks, security violations, and other hostile acts can contribute to aviation disasters (ICAO, 2024).
- **Economic factors:** Financial pressure may lead some airlines to reduce costs at the expense of maintenance, training, and general safety (Journal of Air Transport Management, 2024).

Deeper Reasons for the Increase

The recent increase may also be associated with broader economic, political, technological, organizational, and cultural contexts. The study identifies the following deeper factors (ICAO, 2024; Journal of Air Transport Management, 2024).

1. Economic pressure on airlines

- Intense competition may encourage airlines to reduce costs in ways that affect maintenance quality or crew training (Journal of Air Transport Management, 2024).
- Rising fuel and maintenance costs may lead some companies to postpone periodic maintenance or use lower-quality spare parts (Journal of Air Transport Management, 2024).
- The COVID-19 pandemic caused major financial losses and may have encouraged reductions in safety expenditure (Journal of Air Transport Management, 2024).

2. Technological challenges

- Modern aircraft depend on complex electronic systems; software or hardware failure can contribute to accidents (ICAO, 2024; FAA, 2024).
- Some operators may not update technological systems regularly, increasing the risk of malfunction (ICAO, 2024; FAA, 2024).
- Crews may not receive adequate training on new technological systems (ICAO, 2024; FAA, 2024).

3. Environmental and climatic factors

- Climate change may produce more extreme and unpredictable conditions, including severe storms and turbulence (WMO, 2024).
- Air pollution may affect engine performance and increase the likelihood of technical problems (WMO, 2024).

4. Regulatory and political issues

- In some states, regulators may lack resources or independence to enforce safety standards rigorously (ICAO, 2024).
- Safety standards differ between countries, creating variations in maintenance and training quality (ICAO, 2024).
- Political conflict can lead to neglect or sabotage of aviation infrastructure (ICAO, 2024).

5. Cultural and organizational challenges within airlines

- A weak safety culture may cause potential hazards to be ignored (IATA, 2023; ICAO, 2024).
- Poor communication between crews and air-traffic controllers, or within the crew itself, can generate errors (IATA, 2023; ICAO, 2024).

- Fatigue and psychological pressure caused by long working hours may impair the performance of pilots and cabin crews (IATA, 2023; ICAO, 2024).

6. Global challenges

- The aviation industry is growing rapidly, especially in developing states, while infrastructure may not expand at the same pace (ICAO, 2024).
- Some regions face shortages of sufficiently trained personnel, increasing the likelihood of human error (ICAO, 2024).

7. Rapid development of the aviation industry

- The growing use of unmanned aircraft, artificial intelligence, and smart systems creates new safety challenges (ICAO, 2024).
- Experiments with alternative fuels may introduce risks that are not yet fully understood (ICAO, 2024).

8. Security challenges

- Greater dependence on digital systems makes aviation increasingly exposed to cyberattacks (IEEE, 2024).
- Terrorism remains a threat to aviation safety in some regions (ICAO, 2024).

9. Future challenges

- Electric and hybrid aircraft may present technical and regulatory challenges that are not yet known (ICAO, 2024).
- Increasing airspace congestion raises the probability of operational errors or collisions (ICAO, 2024).

These factors overlap. An accident may involve a technical malfunction made worse by severe weather, economic pressure that affects maintenance, or human decisions made under operational stress. Effective prevention therefore requires an integrated approach rather than a single corrective measure (ICAO, 2024; Journal of Air Transport Management, 2024).

Summary of Major Aviation Accidents During 2024-2025

N o.	Aircraft / Flight	Probable Cause	Deaths	Location	Date
1	Coast Guard Dash 8	Human error	5	Japan	January 2024
2	Northwestern Air 738	Technical failure	6	Canada	January 2024
3	Ilyushin Il-76M	Mechanical / technical failure	15	Russia	January 2024
4	Robinson helicopter	Mechanical / technical failure	2	Chile	February 2024
5	Hop-A-Jet Flight 823	Technical failure	2	United States	February 2024
6	Safarilink Dash 8	Human error	2	Kenya	March 2024
7	Military helicopter	Human error	10	Kenya	April 2024
8	Military helicopter	Human error	10	Malaysia	April 2024
9	Bell 212 helicopter	Severe weather	9	Iran	May 2024
10	Beechcraft T-34	Human error	1	U.S. border region	June 2024
11	Dornier 228	Mechanical failure	10	Malawi	June 2024
12	Sukhoi Superjet 100	Technical failure	3	Russia	July 2024

13	CRJ200ER	Severe weather	18	Nepal	July 2024
14	Voepass Flight 2283	Mechanical failure	62	Brazil	August 2024
15	Cessna Caravan C208B	Mechanical / technical failure	9	Thailand	August 2024
16	Mil Mi-8	Severe weather	22	Russia	August 2024
17	Ilyushin Il-76T	Mechanical / technical failure	5	Sudan	October 2024
18	Honda HA-420	Collision with obstacle	5	Arizona, USA	November 2024
19	Bombardier Challenger 300	Human error	2	Argentina	December 2024
20	Piper PA-42	Severe weather	10	Brazil	December 2024
21	Jeju Air Boeing 737	Severe weather	179	South Korea	December 2024
22	Azerbaijan Airlines Embraer E190	Undetermined cause	38	Kazakhstan	December 2024
23	Cessna 208 Caravan 675	Mechanical / technical failure	3	Australia	January 2025
24	Cessna S550 Citation Jet CJ1+	Engine failure	1	Brazil	January 2025
25	Beechcraft 1900D	Technical failure	20	Sudan	January 2025
26	Cessna S550 Citation	Human error	3	Venezuela	January 2025
27	Passenger aircraft and military helicopter	Undetermined cause	67	United States	January 2025
28	Learjet 55	Human error	7	United States	January 2025

Table 1. Selected aviation accidents during 2024-2025, compiled from the Aviation Safety Network, the National Transportation Safety Board, ICAO, and news reports (Aviation Safety Network, 2024; ICAO, 2024).

Analysis of the Main Causes of Recent Accidents - Table 1

Total number of analyzed accidents: 28.

1. Human Error

Number of accidents: 8. Approximate proportion: 29%.

This category includes accidents attributed to crew decisions, navigation mistakes, or operational procedures (Aviation Safety Network, 2024; ICAO, 2024).

Examples in the table:

- Accident 1: collision at Haneda Airport.
- Accident 6: Safarilink Dash 8 midair collision.
- Accident 7: military-helicopter crash.
- Accident 8: military-helicopter collision / crash.
- Accident 10: Beechcraft T-34 accident.
- Accident 19: runway overrun involving a Bombardier Challenger 300.
- Accident 26: Cessna S550 Citation accident.
- Accident 28: Learjet 55 accident.

Common factors:

- Fatigue: intensive schedules may reduce concentration and situational awareness (ICAO, 2024; IATA, 2023).
- Insufficient training for rare scenarios: weak simulation of critical situations may lead to incorrect decisions (ICAO, 2024; IATA, 2023).
- Inadequate reactions: in some cases, crews did not respond effectively to accompanying technical failures (ICAO, 2024; IATA, 2023).

Conclusion: The proportion attributed to human error demonstrates the importance of continuous training, improved standard operating procedures, fatigue management, and stronger crew-resource management (ICAO, 2024; IATA, 2023).

2. Mechanical and Technical Failures

Number of accidents: 12. Approximate proportion: 43%.

This category includes failures in engines, electrical and control systems, fuel systems, and structural or mechanical components (Aviation Safety Network, 2024; FAA, 2024).

Examples in the table:

- Accident 2: technical failure involving Northwestern Air 738.
- Accident 3: mechanical / technical failure involving an Ilyushin Il-76M.
- Accident 4: mechanical failure involving a helicopter.
- Accident 5: technical failure involving Hop-A-Jet Flight 823.
- Accident 11: mechanical failure involving a Dornier 228.
- Accident 12: technical failure involving a Sukhoi Superjet 100.
- Accident 14: mechanical failure involving Voepass Flight 2283.
- Accident 15: mechanical failure involving a Cessna Caravan C208B.
- Accident 17: mechanical failure involving an Ilyushin Il-76T.
- Accident 23: mechanical failure involving a Cessna 208 Caravan.
- Accident 24: engine failure involving a Cessna Citation Jet CJ1+.
- Accident 25: technical failure involving a Beechcraft 1900D.

Common factors:

- Aging fleets: continued use of older aircraft without adequate periodic maintenance (FAA, 2024; ICAO, 2024).
- Maintenance pressure: post-pandemic demand may have reduced the interval available for inspections (FAA, 2024; ICAO, 2024).
- Interaction with other factors: a mechanical defect can become more serious during severe weather (FAA, 2024; ICAO, 2024).

Conclusion: This is the largest category in the study. It requires comprehensive review of maintenance and inspection systems and the use of advanced diagnostic and predictive techniques to detect potential defects at an early stage (FAA, 2024; Al-Salam, 2021).

3. Severe Weather

Number of accidents: 5. Approximate proportion: 18%.

These accidents were linked to unsuitable weather conditions that contributed to loss of control or serious disturbance during flight (Aviation Safety Network, 2024; WMO, 2024).

Examples in the table:

- Accident 9: severe weather in the Bell 212 helicopter crash.
- Accident 13: severe weather in the CRJ200ER crash.
- Accident 16: weather conditions in the Mil Mi-8 crash.
- Accident 20: weather conditions in the Piper PA-42 crash.
- Accident 21: weather conditions in the Jeju Air accident.

Common factors:

- Climate change and sudden storms may make aircraft control more difficult during takeoff and landing (WMO, 2024; ICAO, 2024).
- Inaccurate or late warnings may expose crews to unexpected conditions (WMO, 2024; ICAO, 2024).
- Weather may amplify the consequences of a concurrent technical failure or human error (WMO, 2024; ICAO, 2024).

Conclusion: This category highlights the importance of better weather monitoring, more accurate forecasting, real-time information, and stronger crew decision-making in critical conditions (WMO, 2024; ICAO, 2024).

4. Collision with an Obstacle

Number of accidents: 1. Approximate proportion: 4%.

This category concerns collisions with unexpected obstacles or structures during takeoff, approach, or landing. The example is Accident 18, involving a Honda HA-420. Prevention requires review of airport environments, obstacle clearance, navigation aids, and aircraft guidance during critical phases of flight (Aviation Safety Network, 2024; ICAO, 2024).

5. Undetermined Cause

Number of accidents: 2. Approximate proportion: 8%.

Two accidents were classified as having undetermined causes because investigations had not established a clear primary explanation. These were Accident 22, involving an Embraer E190 during an attempted emergency landing, and Accident 27, involving a passenger aircraft and a military helicopter (Aviation Safety Network, 2024).

Potential shared factors include:

- Undetected technical vulnerabilities in electronic control systems (IEEE, 2024).
- External interference, including a possible cyberattack or an unusual environmental phenomenon (IEEE, 2024; WMO, 2024).
- Insufficient data or the absence of final investigation reports (Aviation Safety Network, 2024).

Conclusion: These cases require precise, transparent, and scientifically rigorous investigations so that lessons can be identified and incorporated into future prevention (ICAO, 2024).

Distribution of Principal Accident Causes (2024-2025)

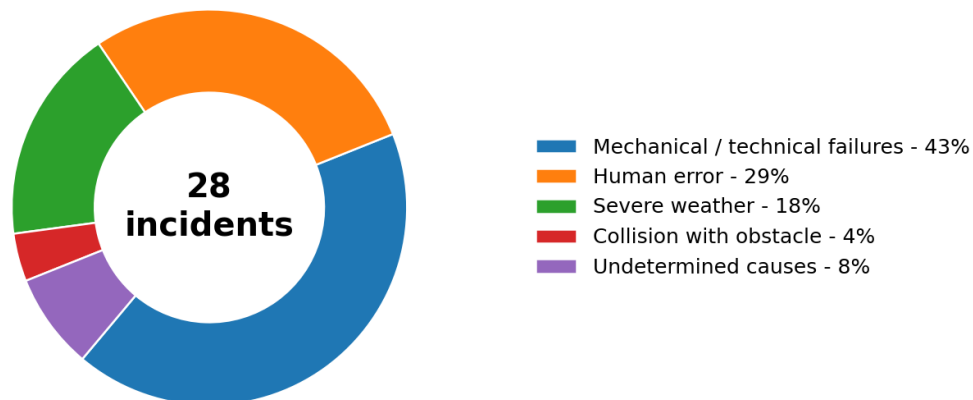


Figure 5. Distribution of the principal causes of the 28 accidents analyzed for 2024-2025 (Aviation Safety Network, 2024).

Method Used to Calculate the Percentages

Statistical calculations were used to determine the frequency of accidents in each category during the selected time period and to analyze the distribution of accident trends. The following formula was applied (Aviation Safety Network, 2024).

$$\text{Percentage} = (\text{Number of accidents in the category} / \text{Total number of accidents}) \times 100$$

Although some accidents may contain more than one possible contributing factor, the principal reported cause was selected for each event to maintain consistency (Aviation Safety Network, 2024).

- **Mechanical and technical failures:** 12 accidents, approximately 43% of the total. This category includes engine failures, electrical-system defects, fuel leaks, and other mechanical faults, emphasizing the importance of periodic maintenance and comprehensive inspection (Aviation Safety Network, 2024; ICAO, 2024).
- **Human error:** 8 accidents, approximately 29%. This includes pilot error and navigational misjudgment and underscores the need for stronger training and better working conditions to reduce fatigue (Aviation Safety Network, 2024; ICAO, 2024).
- **Severe weather:** 5 accidents, approximately 18%. This reflects the effect of extreme weather and rapidly changing conditions on aircraft control during takeoff and landing (Aviation Safety Network, 2024; ICAO, 2024).
- **Collisions with obstacles:** 1 accident, approximately 4%. This category includes collision with objects, terrain, or other obstacles and highlights the importance of navigation and air-traffic management (Aviation Safety Network, 2024; ICAO, 2024).
- **Loss of control / undetermined causes:** 2 accidents, approximately 8%. These cases had not been fully explained and require further investigation (Aviation Safety Network, 2024; ICAO, 2024).

The percentages may change when investigations are completed, particularly for accidents whose causes remain undetermined (Aviation Safety Network, 2024).

Distribution of Aviation Accident Causes

Principal Cause	No. of Accidents	Percentage	Notes
Mechanical and technical failures	12	42.7%	Includes engine, electrical, and other system failures.
Human error	8	29%	Errors by flight crews or in navigation.
Severe weather	5	18%	Effects of storms, strong winds, and difficult weather.
Airborne collision or collision with obstacles	1	4%	Midair, terrain, or obstacle collision.

Loss of control / undetermined cause 2 8% Unspecified causes requiring additional investigation.

Table 2. Distribution of aviation accident causes from January 2024 to January 2025 (Aviation Safety Network, 2024).

Results and Recommendations

First: Results

1. High proportion of mechanical and technical failures: Technical failures represented approximately 43% of the accidents. The findings show that mechanical defects and inadequate maintenance played an important role, confirming the need for periodic inspection, proactive maintenance, updated technology, and strict compliance with maintenance standards (Aviation Safety Network, 2024; FAA, 2024).

2. Increase in human-error accidents: Human error represented approximately 29% of the total. Fatigue, insufficient training, poor supervision, and weak decision-making under pressure were recurring concerns. Some airlines may also have been too lenient in applying safety rules while facing operational pressure and increased traffic (Aviation Safety Network, 2024; ICAO, 2024).

3. Effect of extreme weather: Severe weather represented approximately 18% of the accidents, emphasizing the need for improved forecasting and better management of flights in difficult conditions (Aviation Safety Network, 2024; WMO, 2024).

Extreme storms, severe winds, and other climate-related conditions may affect aircraft control during takeoff and landing. Unusual environmental phenomena may also exist that have not yet been sufficiently studied (WMO, 2024).

4. Weak application of aviation-safety systems in some cases increased the consequences of accidents, demonstrating the importance of strict compliance with international regulations and global standards (ICAO, 2024).

5. Repeated training using simulated emergency scenarios can significantly reduce the probability of accidents or limit their escalation (ICAO, 2024; IATA, 2023).

6. Modern technology, including artificial intelligence for aircraft monitoring and maintenance-data analysis, can improve aviation safety (Al-Salam, 2021; FAA, 2024).

7. Weak coordination between regulatory authorities and airlines contributed to failures in applying safety standards effectively (ICAO, 2024).

8. The continuing growth in the number of flights places substantial pressure on crews and operating systems and adds to the burden on maintenance and monitoring (ICAO, 2024).

9. The undetermined category may indicate additional hidden factors, such as vulnerabilities in electronic systems. Increased dependence on digital technology may expose navigation systems to interference or manipulation. Additional investigation using artificial intelligence and big-data analysis is therefore needed (IEEE, 2024; ICAO, 2024).

Second: Recommendations

1. Strengthen maintenance and technical inspection. Because mechanical and technical failures account for the largest category, airlines and authorities should adopt AI-supported predictive maintenance, modernize aircraft technical infrastructure and digital-control systems, establish advanced regional maintenance centers, train specialized technical staff using virtual reality, create independent compliance oversight, increase maintenance investment, and cooperate with manufacturers to improve components based on accident-data analysis (FAA, 2024; Al-Salam, 2021; ICAO, 2024).
2. Develop training and preparation programs for pilots in both civil and military sectors. Training should use advanced simulation, emphasize emergency scenarios, and strengthen decision-making under pressure (ICAO, 2024; IATA, 2023).
3. Update regulations and systems. Civil-aviation authorities should review safety regulations regularly to keep pace with technological development and international practice (ICAO, 2024).
4. Strengthen safety culture within airlines through awareness workshops and incentive programs that encourage pilots and crews to report hazards without fear of unfair blame (IATA, 2023).
5. Improve coordination between regulators and airlines by creating effective channels for rapid exchange of safety information (ICAO, 2024).
6. Use modern technology to monitor flights. Artificial intelligence and Internet of Things (IoT) systems can track aircraft performance in flight and detect technical problems at an early stage (Al-Salam, 2021; IEEE, 2024).
7. Support scientific research on the causes of aviation accidents and the development of proactive solutions (ICAO, 2024).
8. Strengthen government oversight, ensure airline compliance with safety standards, and impose firm penalties when companies fail to apply required procedures (ICAO, 2024).
9. Improve weather-forecasting systems and provide pilots with accurate information before and during flight (WMO, 2024).
10. Strengthen international cooperation, exchange expertise, improve global safety standards, and establish an international accident database for analyzing shared causes and developing effective solutions (ICAO, 2024).

Conclusion

From January 2024 to January 2025, and especially during the volatile period from December to January, the aviation world faced an unprecedented challenge: approximately 28 accidents were recorded. These events were

not merely statistics in technical reports; they revealed deep vulnerabilities in the aviation-safety systems on which society depends every day (Aviation Safety Network, 2024; Forbes, 2025).

Detailed analysis presents a clear picture of the main causes. Mechanical failures accounted for approximately 43%, demonstrating the urgent need to reassess periodic maintenance and improve technical inspection. Human error accounted for about 29%, suggesting that current training may not be sufficient for increasingly complex challenges and that stricter, more comprehensive programs are required. Severe weather accounted for approximately 18%, reinforcing the need for modern forecasting systems, including artificial intelligence. The accidents whose causes remained undetermined require deeper investigation and the use of advanced data-analysis tools (Aviation Safety Network, 2024; WMO, 2024).

Improving aviation safety requires a shared commitment. Governments must establish rigorous standards for operation and maintenance, while airlines must recognize that safety is not a luxury but a non-negotiable duty. AI can support continuous aircraft-condition monitoring and early fault detection. Weather systems should be integrated more effectively into flight planning. At the human level, substantial investment is required not only in technical skills but also in judgment under pressure, because every second may separate safety from disaster (ICAO, 2024; FAA, 2024; IATA, 2023).

At the international level, organizations such as ICAO must lead these efforts through unified global protocols and stronger cooperation between states in sharing expertise, data, and technology (ICAO, 2024).

Ultimately, this study has attempted not only to identify the causes of the accidents analyzed, but also to propose a roadmap out of the crisis. Aviation safety is a shared human and ethical responsibility. Every aircraft in the sky carries the dreams, hopes, and families of the people on board (ICAO, 2024).

Sources and References:

- United Nations. (2017). Funds, Programmes, Specialized Agencies and Others. <https://www.un.org/en/about-us/un-system>
- Clark, C. (2017). Disgruntled Arab states look to strip Canada of UN agency. The Globe and Mail. <https://www.theglobeandmail.com/news/world/disgruntled-arab-states-look-to-strip-canada-of-un-agency/article11672346/>
- Forbes. (2025). Airline deaths more than doubled in 2024, according to the Aviation Safety Network. <https://www.forbes.com/sites/michaelgoldstein/2025/01/15/airline-deaths-more-than-doubled-in-2024/>
- Al-Obaidi, Mustafa. (2022). Risk analysis in the aviation industry and its impact on air safety. University of Sharjah Journal of Economic and Social Sciences.
- Al-Hamoud, Nisreen. (2022). Causes of aviation accidents. Al-Musafir, 18 January 2022.
- Federal Aviation Administration (FAA). (2024). Aviation Safety Report 2024. Washington, D.C. https://www.faa.gov/data_research/safety
- IEEE. (2024). Cybersecurity threats in aviation systems. IEEE Xplore. <https://ieeexplore.ieee.org/document/10324567>
- Al-Khudair, Adel. (2023). Crisis management in the aviation sector: A case study. University of Sharjah Journal of Humanities and Social Sciences.

International Civil Aviation Organization (ICAO). Archived copy dated 9 May 2017.
<https://web.archive.org/web/20170509000000/http://www.icao.int/about-icao>

International Civil Aviation Organization (ICAO). (2024). Annual Aviation Safety Report. Montreal.

Al-Salam, Fahad. (2021). The effect of AI-supported predictive maintenance on reducing aviation accidents. University of Sharjah Journal of Technology and Engineering.

International Civil Aviation Organization (ICAO). (2024). History of ICAO. <https://www.icao.int/about-icao/History/Pages/default.aspx>

Journal of Air Transport Management. (2024). Trends in aviation safety: A 2024 review. Elsevier.

International Air Transport Association (IATA). (2023). Safety management systems in aviation. Geneva: IATA.

Aviation Safety Network. (2024). Aviation accident database. <https://aviation-safety.net/>

Reuters. (2024). The biggest aviation accidents of 2024. <https://www.reuters.com/world/biggest-aviation-accidents-2024-2024-12-30/>

World Meteorological Organization (WMO). (2024). State of the Climate 2024. Geneva: WMO.

CNN Arabic. (2024). Coverage and image of the South Korea aviation accident.

Erem News. (2024). Major aviation accidents in 2024. 29 December 2024.

Kurdistan Net. (2024). Thousands of flights disrupted by a winter storm in the southern United States.

Bloomberg. (2024). Commercial-aircraft fatality data for 2024.

Aviation Safety Network accident database.

Forbes article on aviation fatalities in 2024.

FAA accident and incident data page.

ICAO aviation-safety reports.

WMO State of the Global Climate report.

National Transportation Safety Board accident database.

The Globe and Mail article on the dispute concerning the UN aviation agency.

United Nations page on funds, programmes, and specialized agencies.

IEEE Xplore document on cybersecurity in aviation systems.

IATA safety-management-systems material.

Archived ICAO information page from 2017.

ICAO history page.

Journal of Air Transport Management article on post-COVID aviation safety.

Reuters article on the largest aviation accidents of 2024.

Golden Years of Aviation civil-aircraft