ICAO

SAFETY

Safety Report

2021 Edition

A Coordinated, Risk-based Approach to Improving Global Aviation Safety

The air transport industry plays a major role in global economic activity and development. One of the key elements to maintaining the vitality of civil aviation is to ensure safe, secure, efficient and environmentally sustainable operations at the global, regional and national levels.

A specialized agency of the United Nations, the International Civil Aviation Organization (ICAO) was established in 1944 to promote the safe and orderly development of international civil aviation throughout the world.

ICAO promulgates Standards and Recommended Practices (SARPs) to facilitate harmonized regulations in aviation safety, security, efficiency and environmental protection on a global level. Today, ICAO manages over 12 000 SARPs across 19 Annexes and five Procedures for Air Navigation Services (PANS) to the Convention on International Civil Aviation (Chicago Convention), many of which are constantly evolving in tandem with latest developments and innovations. ICAO also serves as the primary forum for cooperation in all fields of civil aviation among its 193 Member States.

Improving the safety of the global air transport system is ICAO's guiding and most fundamental strategic objective. The Organization works constantly to address and enhance global aviation safety through the following coordinated activities:

- Policy and standardization;
- Monitoring of key safety trends and indicators;
- Safety analysis;
- Specific programmes to address safety issues; and
- Implementation support.

The ICAO Global Aviation Safety Plan (GASP) presents the strategy in support of the prioritization and continuous improvement of aviation safety. The GASP sets the goals and targets, and outlines key safety enhancement initiatives (SEIs) aimed at improving safety at the international, regional and national levels.

This edition of the safety report provides accident statistics and analysis for the year of 2020 as well as the updates on safety indicators associated with the goals and targets set in the GASP. Results of analysis from the 2016–2020 reports are used as benchmarks for comparison, however it should be noted that data presented in this report may not exactly match earlier editions due to updates during the intervening period.

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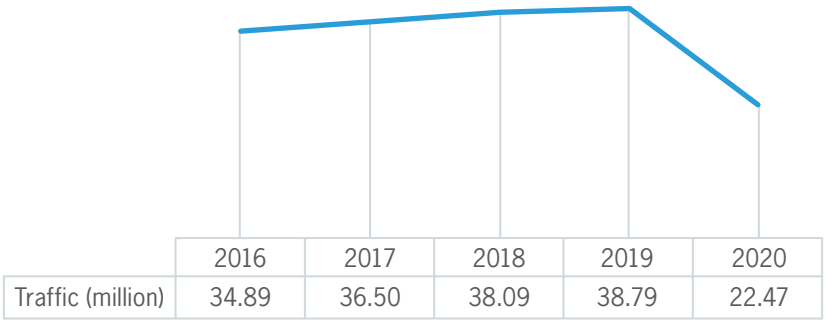
Note: The ICAO regional aviation safety group (RASG) regions are used in the report and are listed in Appendix 1. This document focuses primarily on scheduled commercial flights. The scheduled commercial flights data was based on the Official Airline Guide (OAG) combined with internal ICAO preliminary estimates.

Contents

Executive Summary

The COVID-19 pandemic has posed unprecedented challenges to international air transport. ICAO reports that passenger totals plunged by 60 per cent with just 1.8 billion passengers taking to the air during 2020, the first year of the pandemic, compared to 4.5 billion in 2019. As indicated in Chart 1, the traffic of flight departures for scheduled commercial operations dropped by 42 per cent with around 22.5 million departures in 2020, compared to more than 38 million in 2019.



	2016	2017	2018	2019	2020
Traffic (million)	34.89	36.50	38.09	38.79	22.47

Chart 1. | Global traffic of flight departures : 2016–2020 scheduled commercial operations

Yearly accident statistics indicate a decrease in both the total number of accidents as well as the global accident rate in 2020. From 2019 to 2020, there was a 58 per cent decrease in the total number of accidents, as reported by States. The global accident rate of 2.14 accidents per million departures in 2020 also decreased by 27 per cent from the 2019 rate of 2.94 accidents per million departures. The accidents used for these statistics were reviewed and validated by the ICAO Occurrence Validation Study Group (OVSG), formerly Safety Indicators Study Group (SISG), and involved scheduled commercial operations of aircraft with a certified maximum take-off weight (MTOW) of over 5 700 kg as defined in ICAO Annex 13 — *Aircraft Accident and Incident Investigation*.

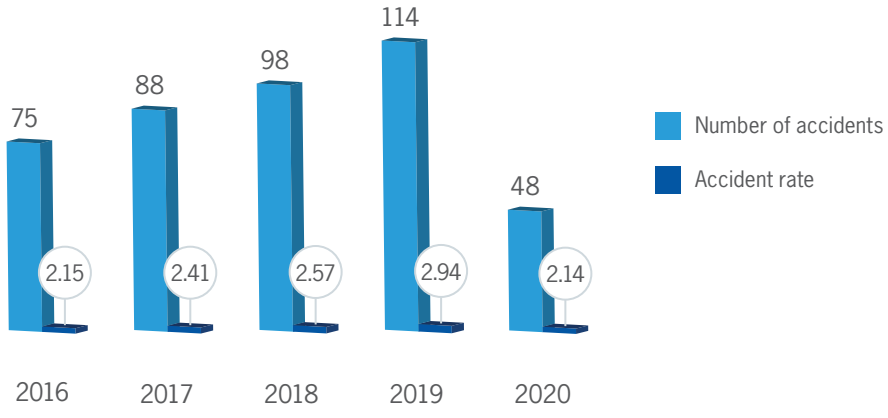


Chart 2. | Accident records: 2016–2020 scheduled commercial operations

In 2020, scheduled commercial air transport accidents resulted in 298 fatalities representing an increase from 239 in 2019. The number of fatal accidents decreased from six in 2019 to four in 2020. Figure 1 shows the number of fatal accidents by ICAO Regional Aviation Safety Group (RASG) region. Charts 3 and 4 present data related to accidents of scheduled commercial operations.

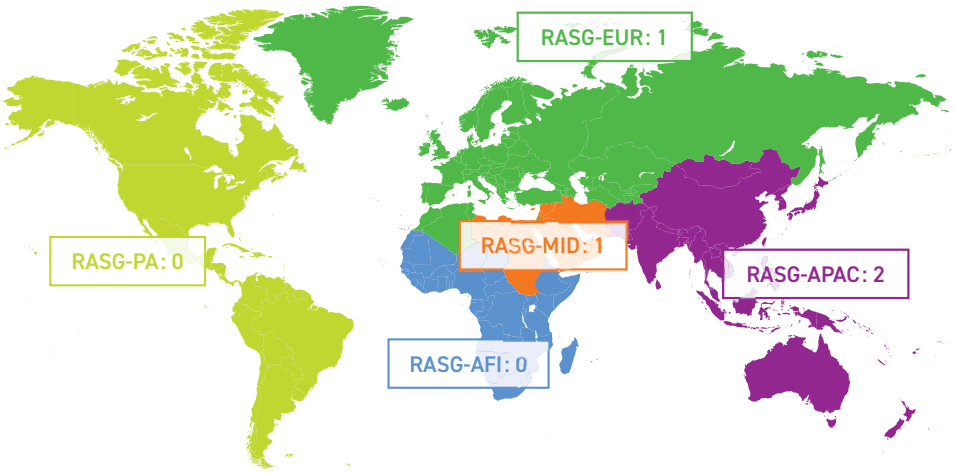


Figure 1. | Number of fatal accidents by RASG region in 2020

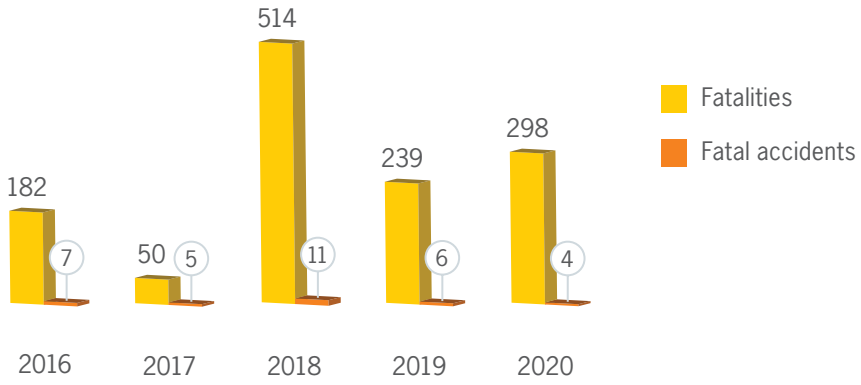


Chart 3. | Fatal accident records: 2016–2020 scheduled commercial operations

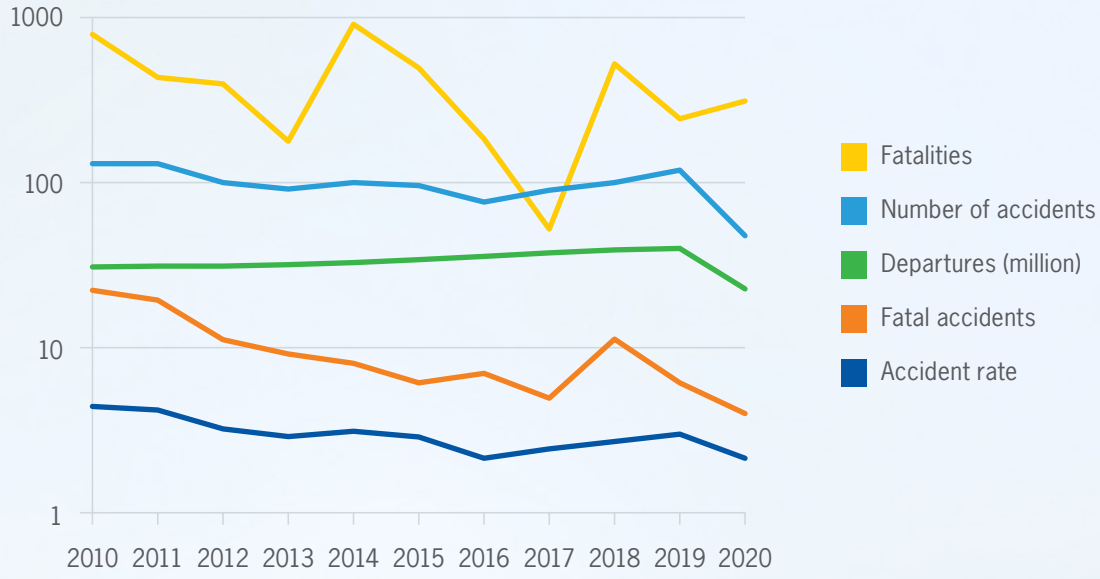


Chart 4. | Historical trends for scheduled commercial operations

Accident Statistics and Analysis – Scheduled Commercial Air Transport

Overall Safety Performance Indicator – Global Accident Rate

ICAO's global accident rate provides an overall indicator of safety performance for air transport operation. The accident rate is based on scheduled commercial operations involving fixed-wing aircraft with a maximum take-off weight (MTOW) above 5 700 kg. Aircraft accidents are reviewed and validated by the ICAO Occurrence Validation Study Group (OVSG) using definitions provided in Annex 13.

Data on departures is collated by ICAO's Air Transport Bureau and comprises scheduled commercial operations that involve the transportation of passengers, cargo and mail for remuneration. Estimates are made where data has not been provided by States, and as new data is provided to ICAO, it will be incorporated into the database. It is worth noting that this may cause small changes to the calculated rates from year to year.

Chart 5 below shows the global accident rate trend (per million departures) over the previous five years, with 2020 having an accident rate of 2.14 accidents per million departures, a decrease of 27 per cent from the previous year.

Scheduled commercial accidents in 2020 are listed in Appendix 2.

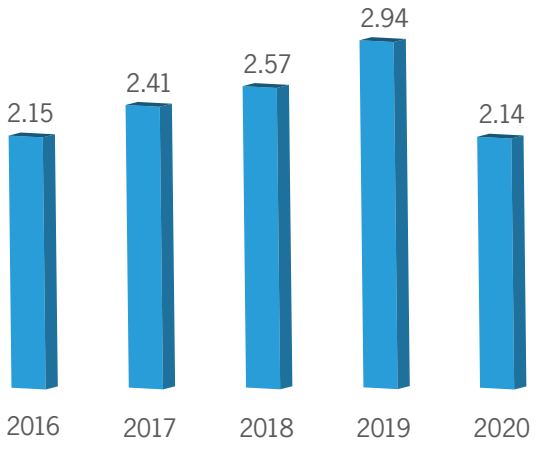


Chart 5. | Global accident rates (accidents per million departures)

Accident and Fatality Trend

The number of worldwide accidents and fatal accidents on scheduled commercial flights during the 2016–2020 period are shown in Chart 6.

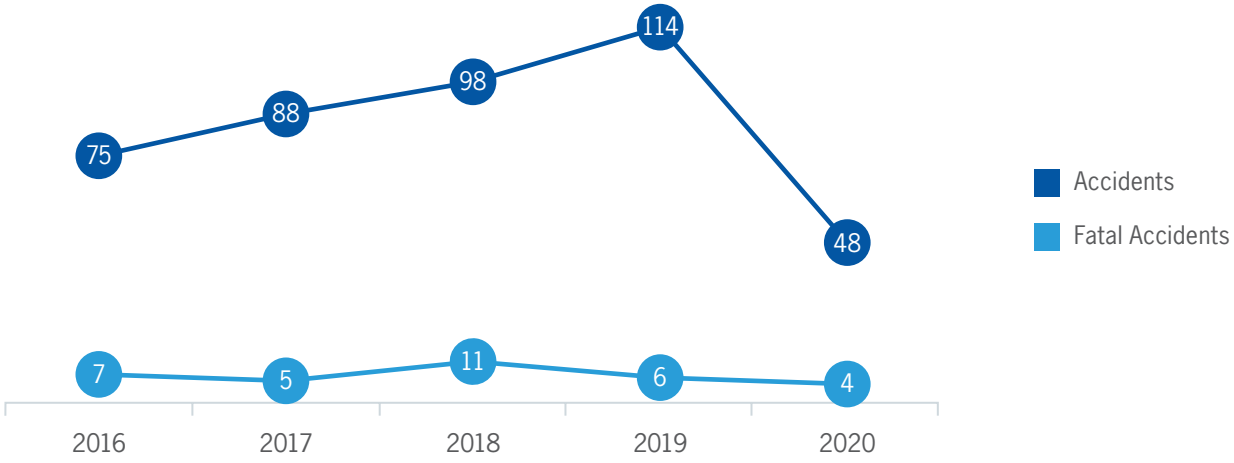


Chart 6. | Accident trend

Between the years 2016 to 2019, the trend of the annual number of accidents has increased. The lowest count recorded was 75 accidents in 2016 and the highest was 114 in 2019. Compared to the previous year, the number of accidents significantly decreased in 2020 while the traffic of air transport plummeted 42 per cent due to the COVID-19 pandemic. The number of fatal accidents per year decreased from six in 2019 to four in 2020. Chart 7 shows the number of fatalities associated with the above-mentioned fatal accidents, which increased from 239 in 2019 to 298 in 2020.

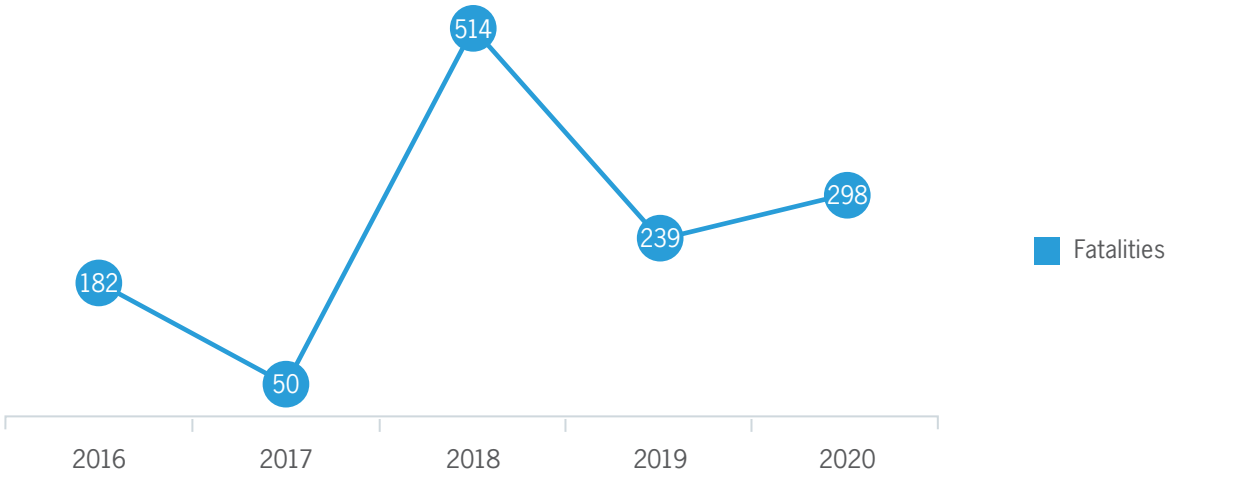


Chart 7. | Fatalities trend

Accidents Overview by Occurrence Category

ICAO Member States are required to report accidents and serious incidents in accordance with Annex 13 through the ICAO Accident/Incident Data Reporting (ADREP) system. The OVSG validates and categorizes the accidents for commercial operations, including scheduled and non-scheduled, involving aircraft with MTOW over 5 700 kg using the Commercial Aviation Safety Team (CAST)/ICAO Common Taxonomy Team (CICTT) taxonomy for occurrence categories. Detailed information about the CICTT occurrence category can be found in Appendix 2.

Charts 8 to 11 provide an accidents overview for scheduled commercial operations by CICTT occurrence categories in 2020. The occurrence category of turbulence encounter (TURB) accounted for the most accidents that caused 14 serious injuries to aircrews or passengers. All the fatal accidents involved the following categories: abnormal runway contact (ARC) with total ten accidents, 98 fatalities, five serious injuries, nine aircraft with substantial damage and one aircraft destroyed; runway excursion (RE) with total nine accidents, 24 fatalities, 77 serious injuries, six aircraft with substantial damage and three aircraft destroyed; and security related (SEC) with 176 fatalities and 1 aircraft destroyed.

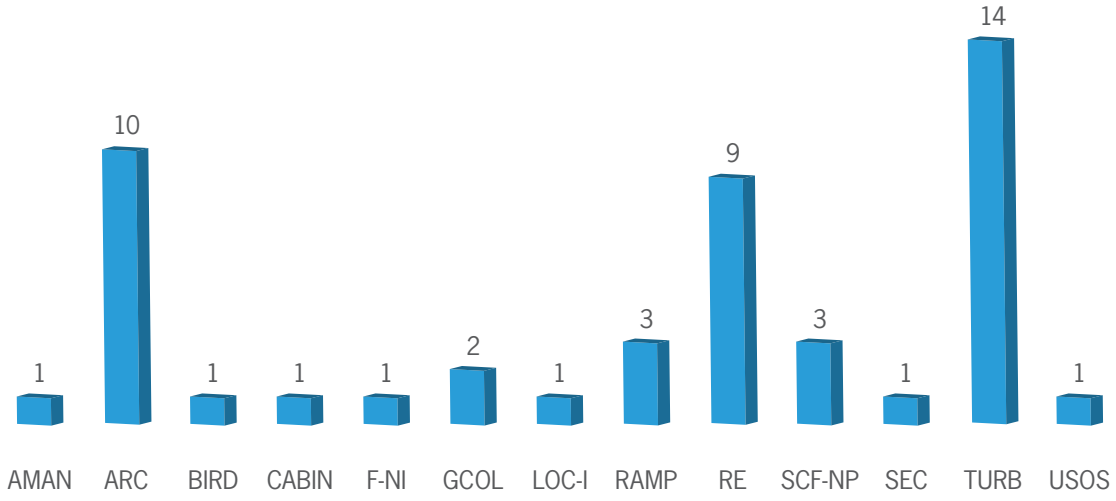


Chart 8. | Total accidents by occurrence category

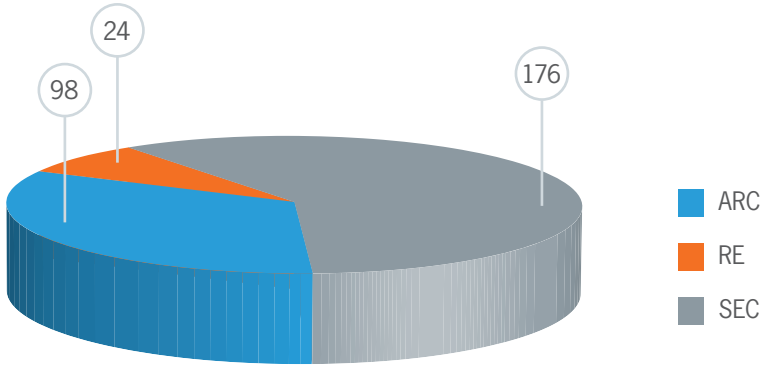


Chart 9. | Total fatalities by occurrence category

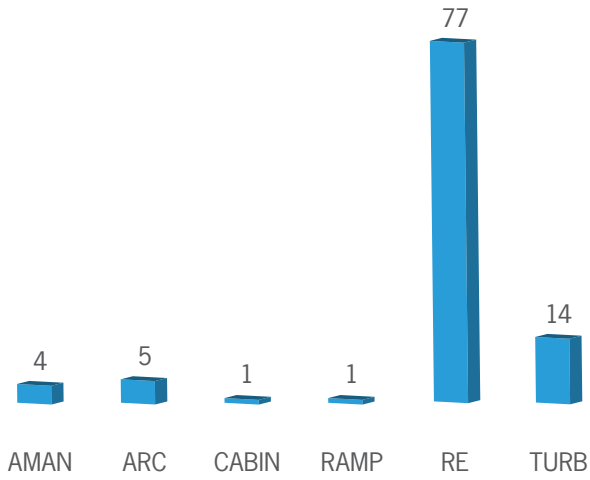


Chart 10. | Total serious injuries by occurrence category

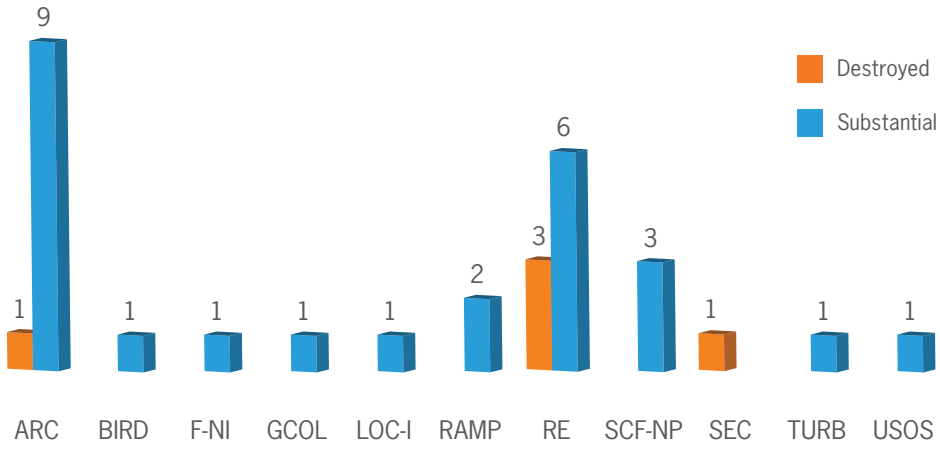


Chart 11. | Aircraft damage by occurrence category

High-risk Categories of Occurrences

ICAO has identified five high-risk categories of occurrences (HRCs) as global safety priorities in the 2020–2022 edition of the Global Aviation Safety Plan (GASP, Doc 10004):

a) controlled flight into terrain (CFIT);
b) loss of control in-flight (LOC-I);
c) mid-air collision (MAC);
d) runway excursion (RE); and
e) runway incursion (RI).

ICAO uses these HRCs as a baseline in its safety analysis to achieve a continuous reduction of operational safety risks (Goal 1) and its linked targets and indicators, as presented in the GASP.

Chart 12 below shows that in 2020, the five HRCs for scheduled commercial air transport operations represented 8.1 per cent of all fatalities, 50 per cent of fatal accidents, 20.8 per cent of the total number of accidents and 32.3 per cent of the accidents that destroyed or caused substantial damage to aircraft.

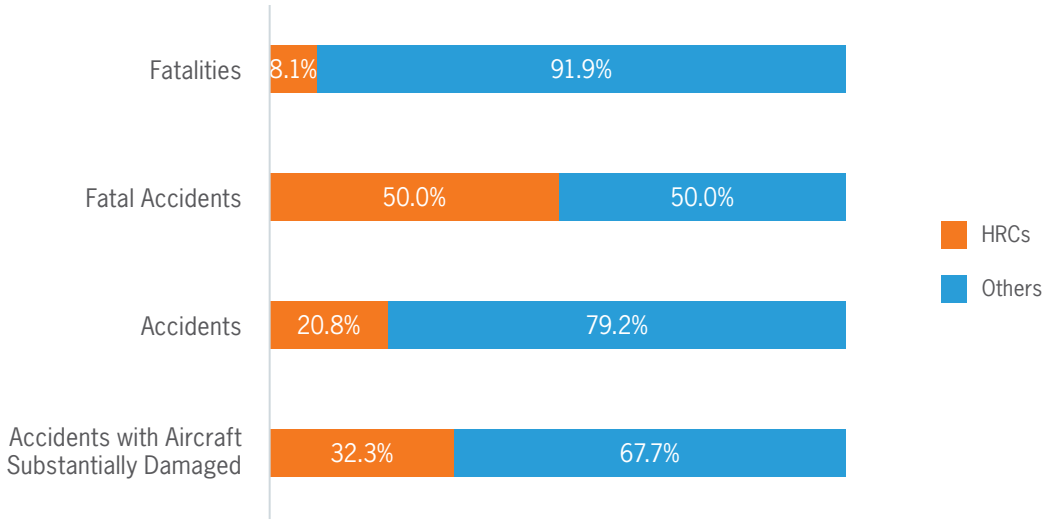


Chart 12. | HRC accident distribution

A breakdown of the five HRCs in 2020 and the respective distribution of fatalities, fatal accidents and accidents are shown in Chart 13 below. Accidents related to runway excursion (RE) accounted for 18.8 per cent of all accidents and 29 per cent of accidents with aircraft substantially damaged or destroyed in 2020. They also represented half of all fatal accidents with 24 fatalities. There was one accident related to LOC-I that represented 2.1 per cent of total accidents with no fatalities. There were no accidents related to controlled flight into terrain (CFIT), mid-air collision (MAC) and runway incursion (RI) in 2020.

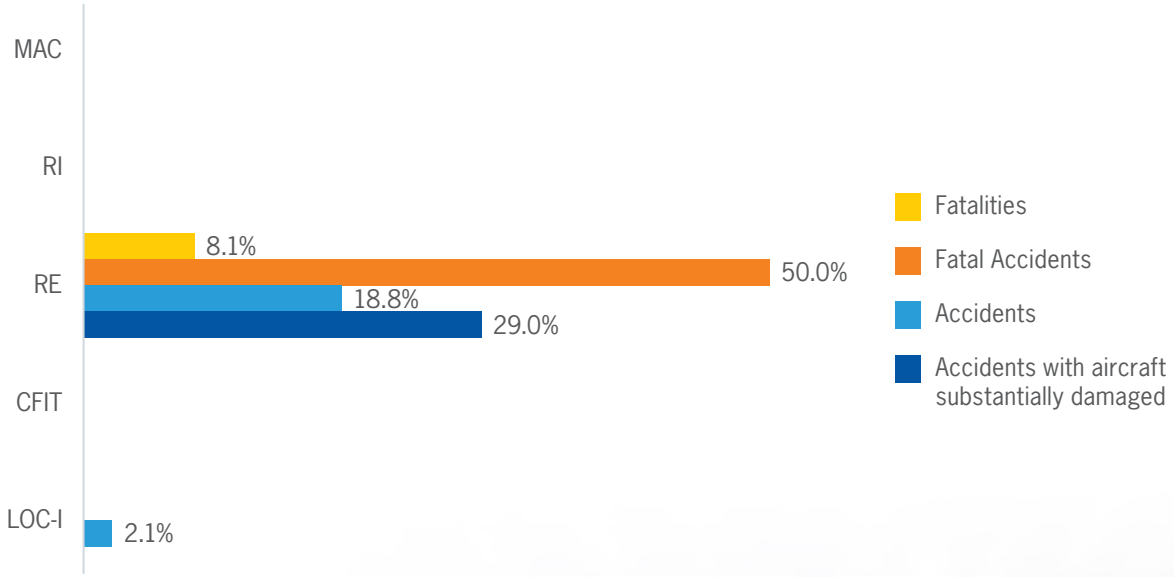


Chart 13. | High-risk category accident overview

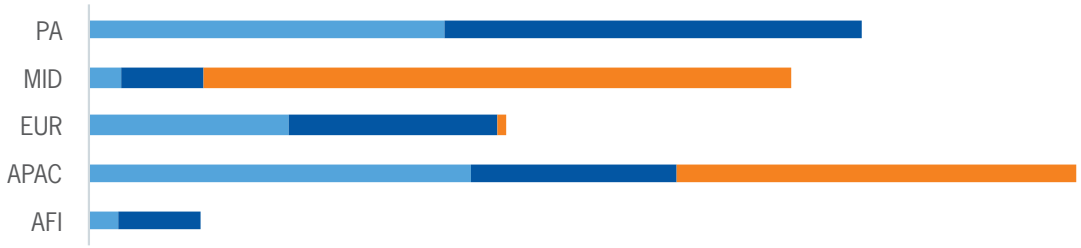
Regional Accident Statistics

To further analyze the state of aviation safety, the accident data for scheduled commercial air transport operations is categorized according to RASG region, by State of Occurrence. Table 1 and Chart 14 provide details on the state of aviation safety in different RASG regions for 2020 in the context of global outcomes. The States included in each RASG region used in this report can be found in Appendix 1.

It is worth noting these statistics are based on ADREP data reported by the State of Occurrence in 2020. Partly due to the small number of departures, some regions experience a large fluctuation in the accident rate from year to year. For this reason, these numbers should be considered in relation to the total number of accidents to gain an overall perspective.

RASG Region	Estimated departures	Number of accidents	Accident rate (per million departures)	Fatal accidents	Fatalities
Africa-Indian Ocean (AFI)	659 502	4	6.07	nil	nil
Asia Pacific (APAC)	8 590 721	10	1.16	2	119
Europe (EUR)	4 504 203	10	2.22	1	3
Middle East (MID)	694 941	4	5.76	1	176
Pan America (PA)	8 021 215	20	2.49	nil	nil
WORLD	22 470 582	48	2.14	4	298

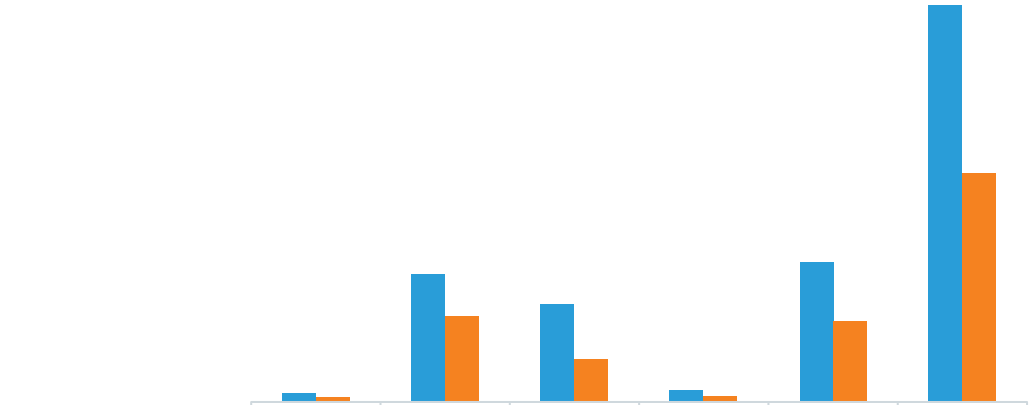
Table 1. | Departures, accidents and fatalities by RASG region based on State of Occurrence



	AFI	APAC	EUR	MID	PA
Traffic (%)	2.9	38.2	20.0	3.1	35.7
Accidents (%)	8.3	20.8	20.8	8.3	41.7
Fatalities (%)	0.0	39.9	1.0	59.1	0.0

Chart 14. | Share of traffic, accidents and fatalities by RASG region based on State of Occurrence

It is also worth noting that the traffic of flight departures in 2020 significantly decreased from 2019 for all ICAO RASG regions due to the COVID-19 pandemic as indicated in Chart 15.



	AFI	APAC	EUR	MID	PA	WORLD
Departures (2019)	1,130,861	12,663,222	9,826,990	1,311,340	13,856,870	38,789,283
Departures (2020)	659,502	8,590,721	4,504,203	694,941	8,021,215	22,470,582

Chart 15. | Traffic of flight departures 2019–2020

Accidents by RASG Region

Chart 16 below shows the percentage of accidents and related fatalities for each ICAO RASG region based on State of Occurrence for scheduled commercial operations in 2020. States included in each RASG region are listed in Appendix 1.

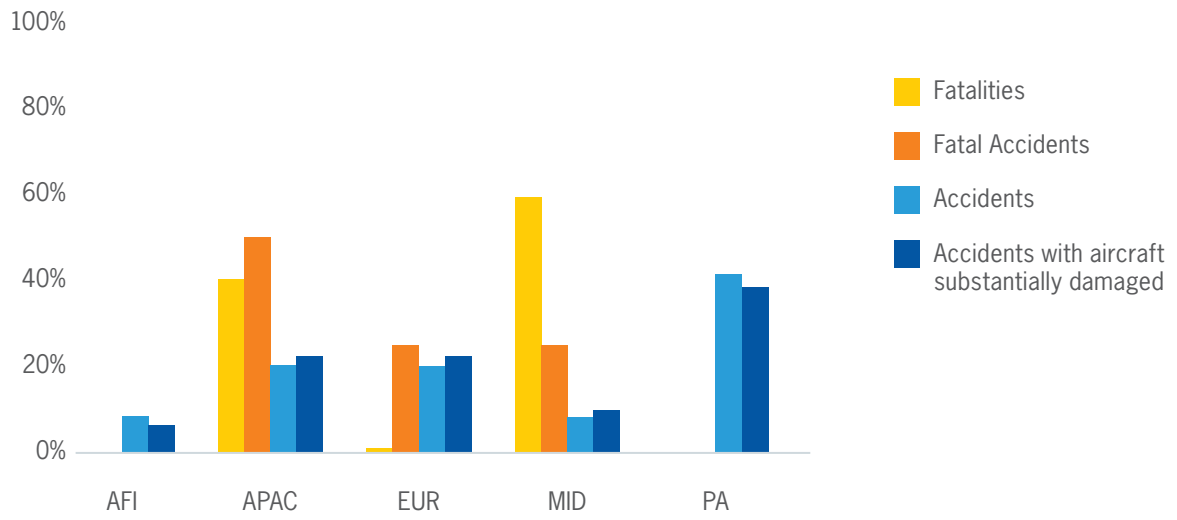


Chart 16. | Accident overview by RASG region

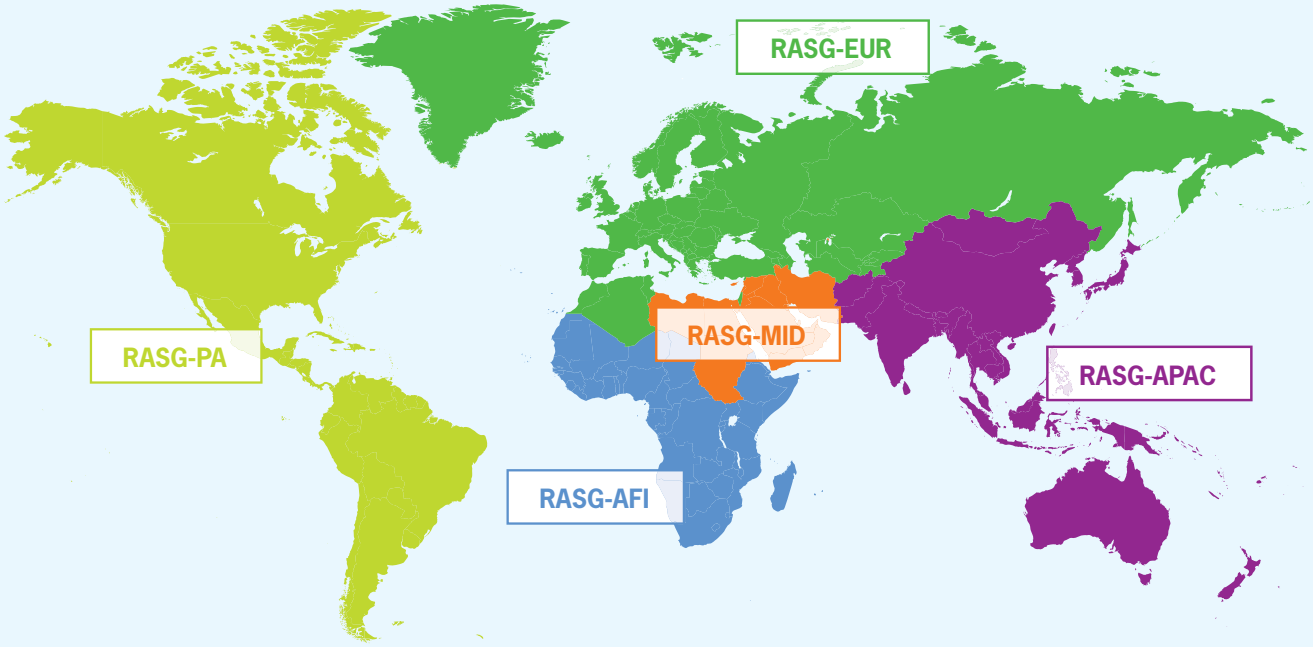
In 2020, the Africa-Indian Ocean (RASG-AFI) and Pan American (RASG-PA) Regions did not experience fatal accidents. One fatal accident with three fatalities occurred in the European (RASG-EUR) Region. The Asia Pacific (RASG-APAC) Region experienced two fatal accidents resulting in more than one third of the total fatalities. One security related fatal accident occurred in the Middle East (RASG-MID) Region, which caused nearly 60 per cent of the total fatalities for scheduled commercial operations involving aircraft with MTOW over 5 700 kg.

The RASG-PA Region experienced the most accidents and the highest number of accidents with aircraft substantially damaged or destroyed.

Appendix 1

Regional Aviation Safety Group (RASG) Regions

The assignment of States to RASG regions is based on their membership and is adopted in this report for statistical convenience and does not imply any assumption regarding political or other affiliation of States by ICAO.



RASG-AFI (48)

Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cabo Verde
Central African Republic
Chad
Comoros
Congo
Côte d'Ivoire
Democratic Republic of the Congo
Djibouti
Equatorial Guinea
Eritrea
Eswatini
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
South Sudan
Togo
Uganda
United Republic of Tanzania
Zambia
Zimbabwe

Appendix 1

RASG-APAC (39)

- Afghanistan
- Australia
- Bangladesh
- Bhutan
- Brunei Darussalam
- Cambodia
- China
- Cook Islands
- Democratic People's Republic of Korea
- Fiji
- India
- Indonesia
- Japan
- Kiribati
- Lao People's Democratic Republic
- Malaysia
- Maldives
- Marshall Islands
- Micronesia (Federated States of)
- Mongolia
- Myanmar
- Nauru
- Nepal
- New Zealand
- Pakistan
- Palau
- Papua New Guinea
- Philippines
- Republic of Korea
- Samoa
- Singapore
- Solomon Islands
- Sri Lanka
- Thailand
- Timor-Leste
- Tonga
- Tuvalu
- Vanuatu
- Viet Nam

RASG-EUR (56)

- Albania
- Algeria
- Andorra
- Armenia
- Austria
- Azerbaijan
- Belarus
- Belgium
- Bosnia and Herzegovina
- Bulgaria
- Croatia
- Cyprus
- Czechia
- Denmark
- Estonia
- Finland
- France
- Georgia
- Germany
- Greece
- Hungary
- Iceland
- Ireland
- Israel
- Italy
- Kazakhstan
- Kyrgyzstan
- Latvia
- Lithuania
- Luxembourg
- Malta
- Monaco
- Montenegro
- Morocco
- Netherlands
- North Macedonia
- Norway
- Poland
- Portugal
- Republic of Moldova
- Romania
- Russian Federation
- San Marino
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- Tajikistan
- Tunisia
- Turkey
- Turkmenistan
- Ukraine
- United Kingdom
- Uzbekistan

RASG-MID (15)

- Bahrain
- Egypt
- Iraq
- Iran (Islamic Republic of)
- Jordan
- Kuwait
- Lebanon
- Libyan Arab Jamahiriya
- Oman
- Qatar
- Saudi Arabia
- Sudan
- Syrian Arab Republic
- United Arab Emirates
- Yemen

RASG-PA (35)

- Antigua and Barbuda
- Argentina
- Bahamas
- Barbados
- Belize
- Bolivia (Plurinational State of)
- Brazil
- Canada
- Chile
- Colombia
- Costa Rica
- Cuba
- Dominica
- Dominican Republic
- Ecuador
- El Salvador
- Grenada
- Guatemala
- Guyana
- Haiti
- Honduras
- Jamaica
- Mexico
- Nicaragua
- Panama
- Paraguay
- Peru
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- Suriname
- Trinidad and Tobago
- United States
- Uruguay
- Venezuela (Bolivarian Republic of)

Appendix 2

List of Scheduled Commercial Accidents in 2020

Local date	Model	State of Occurrence	ICAO Region	Fatalities	Occurrence category
2020-01-07	Boeing 737-800	Turkey	EUR/NAT		RE
2020-01-08	Boeing 737-800	Iran, Islamic Republic of	MID	176	SEC
2020-01-08	Boeing 737-800	United States	NACC		RAMP
2020-01-10	Airbus A320-200	United States	NACC		TURB
2020-01-12	Boeing 737-800	Japan	APAC		TURB
2020-01-13	Airbus A320-200	Finland	EUR/NAT		RAMP
2020-01-16	Airbus A380-800	Mozambique	ESAF		TURB
2020-01-19	Fairchild SA-227-AC	Canada	NACC		LOC-G, RE
2020-01-20	Boeing 767-200	Italy	EUR/NAT		RAMP
2020-01-20	De Havilland DHC8-300	Canada	NACC		ARC
2020-01-27	Boeing MD-83	Iran, Islamic Republic of	MID		RE, ARC, EVAC
2020-01-28	Boeing 737-700	Canada	NACC		GCOL
2020-01-28	Boeing 737-600	Canada	NACC		GCOL
2020-01-31	De Havilland DHC8-400	Canada	NACC		RE
2020-02-01	Boeing 747-400F	Saudi Arabia	MID		ARC
2020-02-01	Airbus A380-800	United States	NACC		TURB
2020-02-02	Boeing 767-300	Spain	EUR/NAT		SCF-NP, SCF-PP
2020-02-05	Boeing 737-800	Turkey	EUR/NAT	3	RE
2020-02-07	Mitsubishi CRJ-900LR	United States	NACC		TURB
2020-02-07	Boeing 757-200	Iceland	EUR/NAT		SCF-NP
2020-02-09	Boeing 737-500	Russian Federation	EUR/NAT		USOS
2020-02-24	Fairchild SA-227-DC	Canada	NACC		LOC-G, RE
2020-02-27	Airbus A321-200	Turkey	EUR/NAT		ARC
2020-03-21	Boeing 757-200	United States	EUR/NAT		ARC
2020-04-12	Boeing 737-800	Japan	APAC		TURB
2020-05-19	Boeing 737-800	United States	NACC		SCF-NP
2020-05-22	Airbus A320-200	Pakistan	APAC	98	ARC
2020-06-14	Airbus A320-200	India	APAC		TURB
2020-07-09	Embraer ERJ170-200	United States	NACC		TURB

List of Scheduled Commercial Accidents in 2019 (continued)

Local date	Model	State of Occurrence	ICAO Region	Fatalities	Occurrence category
2020-07-09	Airbus A319-100	Brazil	SAM		TURB, AMAN
2020-07-14	Boeing 737-800	South Africa	ESAF		TURB
2020-07-22	Boeing 777-200F	China	APAC		F-NI
2020-07-23	Airbus A310-300	Syrian Arab Republic	MID		AMAN, MAC
2020-08-07	Boeing 737-800	India	APAC	21	ARC, RE
2020-08-12	Airbus A320-200	Spain	NACC		TURB
2020-08-18	ATR72-200	Senegal	WACAF		ARC
2020-08-29	Boeing 737-800	Japan	APAC		Bird
2020-09-30	Boeing 777-200	United States	NACC		TURB
2020-10-14	Airbus A320-200	Germany	EUR/NAT		TURB
2020-10-16	Airbus A321-200	Vietnam	APAC		ARC
2020-10-23	De Havilland DHC8-400	Japan	APAC		ARC
2020-10-24	Embraer ERJ-145	Bahamas	NACC		RE
2020-11-14	Mitsubishi CRJ-700ER	United States	NACC		CABIN
2020-11-16	ATR72-200	India	APAC		ARC
2020-11-26	ATR42-300	Canada	NACC		RE
2020-11-28	Embraer EMB110	Bahamas	NACC		ARC
2020-12-02	Boeing 737-500	Somalia	ESAF		LOC-I, WSTRW, USOS
2020-12-23	Airbus A320-200	United States	NACC		TURB

CICTT Occurrence Categories

Code	Description
ADRM	Aerodrome
AMAN	Abrupt Maneuver
ARC	Abnormal runway contact
BIRD	Bird
CABIN	Cabin safety events
CFIT	Controlled flight into/towards terrain
CTOL	Collision with obstacles during takeoff and landing
EVAC	Evacuation
F-NI	Fire/smoke (non-impact)
F-POST	Fire/smoke (post-impact)
GCOL	Ground collision
ICE	Icing
LOC-I	Loss of control in-flight
LOC-G	Loss of control-ground
MAC	Airprox/ ACAS alert/ loss of separation/ (near) mid-air collisions
OTHR	Other
RAMP	Ground handling
RE	Runway excursion
SCF-NP	System/component failure (non-powerplant)
SCF-PP	System/component failure (powerplant)
TURB	Turbulence encounter
UNK	Unknown or undetermined
USOS	Undershoot/overshoot
WILD	Wildlife
WSTRW	Wind shear or thunderstorm

More information about the CICTT occurrence categories can be found at http://www.intlaviationstandards.org/apex/f?p=240:3:9817194220294::NO::P3_X:OC.

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