CIRIUM ascend consultancy

AIRLINE SAFETY & LOSSES

ANNUAL REVIEW

2024

CIRIUM aviation analytics

2024 – a disappointing year, but only if compared to 2023[1]

The tragic loss of two jet airliners, one believed accidentally shot down, in the closing days of 2024, resulting in the death of 217 passengers and crew, underlines the potentially catastrophic nature of the industry. These two losses changed 2024 from being a "good" year, into the worst for loss of life since 2018. However, this does not mean that air travel has somehow suddenly become less safe. There are fortunately very few fatal airline accidents these days and, as we have seen in 2024, one loss with high loss of life can make all the difference to the headline numbers and, indeed, to the headlines.

Last year (2024), was disappointing when compared to 2023, which was one of the safest years ever. There were nine fatal accidents during the year compared to only three in 2023 but, despite that, 2024's fatal accident rate at one per 5.12 million flights made it, on this basis, the second safest year since the start of commercial aviation.

The number of passenger and crew fatalities recorded in 2024, at 275, as noted above, was the highest in any year since 2018 but 179 of these deaths occurred in a single accident, the Jeju Air crash at Muan, South Korea on 29 December. If this accident had not happened or happened just three days later, the headline above would likely have read "2024 – another good year".

Airline safety, if measured by the number of fatal accidents, fatalities, fatal accident rates etc, has improved very considerably in recent years and, depending on the metric used, can now be said to be three, four or even five times safer than only 10 or 15 years ago. Last year fits within this trend and is only "disappointing" if compared to the "fluke" result for 2023.

Airline safety has been improving globally for many years and, generally, has been improving faster than the industry has been expanding.

[1] The accident statistics in this report are for commercially-operated jet or turboprop-powered airliners or commuters of more than 14 passengers or their cargo equivalent. The report excludes operations by piston engine aircraft, helicopters or smaller jet or turboprop aircraft or "airliners" in the fleets/control of non-commercial operators, manufacturers, lessors, banks etc.

While 2024 should probably be considered as a more typical year than 2023, which could be seen as a single exceptionally good year, there is, unfortunately, always the chance of an exceptionally "bad" year in the future. There are so few fatal accidents nowadays that the results from any one year are not very meaningful by themselves and it would be better to consider longer term trends. The long-term trend for the fatal accident rate currently stands at about one per 5.5 million flights and that for the passenger fatality rate at around one per 30 million carried.

Insurance – all-risk

The year 2024 appears to have been a poor one for airline all-risk insurers, with the estimated cost of incurred hull and liability claims exceeding written net premium estimates by at least $200 million.

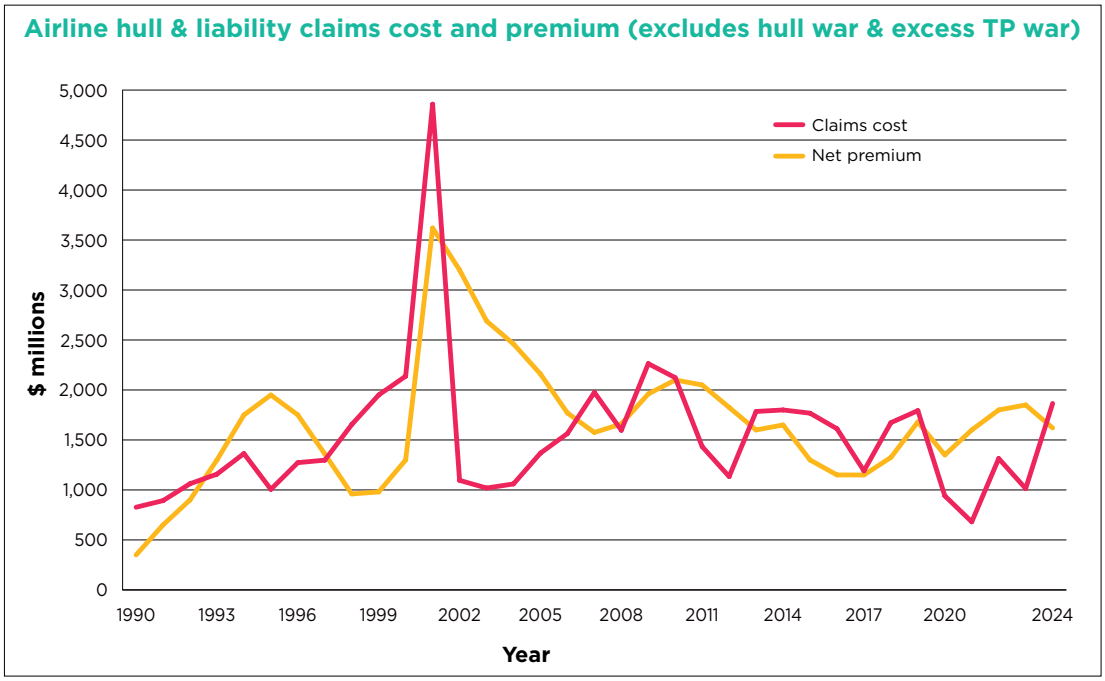
We understand that, with a relatively benign claims environment, the airline all-risk market softened through 2024 with "double digit" rate reductions for "good" risks becoming increasingly common as the year progressed. This was somewhat mitigated by growth in exposure so premiums did not decrease as much as it might have. Current estimates suggest that the global net written premium in 2024 totalled about $1.62 billion. This is some 12% down on the estimated $1.85 billion written in 2023. Estimated written premium in 2022 was $1.80 billion, in 2021 $1.60 billion and in 2020 $1.35 billion.

We currently estimate that the cost of incurred all-risk airline hull and legal liability claims in 2024 was almost $1.9 billion. (However, this assumes that the cost of "minor" liability losses and incurred but not reported (IBNR) losses in the year were generally in line with passenger numbers.) Last year's estimated incurred claims costs were considerably worse than in 2023 when we estimated claims cost the market just over $1.0 billion, and the highest figure recorded since 2010 when claims costs totalled over $2.1 billion.

Airline 'all-risk' hull and liability claims costs and written premium 2015-2024 ($m)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024P
Net premium	1,300	1,150	1,150	1,325	1,680	1,350	1,600	1,800	1,850	1,620
Hull cost	718	790	509	829	755	535	291	611	258	747
Liability cost	425	172	7	144	313	131	15	53	6	318
Minor liability	625	650	675	700	725	275	375	650	750	800
Total cost	**1,768**	**1,612**	**1,191**	**1,673**	**1,793**	**941**	**681**	**1,314**	**1,014**	**1,865**

Figures are broad estimates.



Russia/Ukraine – elephant still in the room

This review only considers aircraft loss events where there is physical damage to the aircraft and/or death or serious injury to passengers or crew members. It does not cover alleged theft or confiscation events. That said, we do have to acknowledge the elephant in the room, the large number of aircraft leased to Russian airlines that have not been returned to their lessors and are apparently the subject of potential theft and/or confiscation claims.

This writer is not competent to comment on the merit or otherwise of any claims that may arise as the result of the alleged detention of aircraft in Russia; however, the sums potentially involved and the prospect of years of litigation must hang like a dark cloud over the insurance market.

Accidents (airline operations)

With the airline industry now having almost completely recovered from the impacts of Covid-19, 2024 might be considered more of a typical year. The number of fatal accidents during 2024, at nine, was markedly up on the three recorded in 2023, but was more in line with the years immediately pre-Covid. There were nine fatal accidents in 2022, 10 in 2021 and five in 2020. The annual average over the last five years was 7.2. The average for the last decade (2010-2019) was 15.3, that for the previous decade, 27.4 and for the 1990s, 37.9.

As might be expected, with considerably more fatal accidents in 2024 than in 2023, the number of passenger and crew fatalities also increased markedly, going from just 88 in 2023 to 275 last year, although most of last year's fatalities arose from just one accident, the Jeju Air loss on 29 December that killed all but two of the 181 passengers and crew on board. There were 199 fatalities in 2022, 130 in 2021 and 133 in 2020. The annual average for the last five years was 165. The annual average for the last decade (2010-2019) was 363, that for the previous decade was nearly 793 and the average during the 1990s was 1,135.

On a more restrictive basis, there were four fatal accidents where a passenger was killed on a revenue passenger flight during 2024. There were just two such accidents in 2023, five in 2022, four in 2021 and three in 2020. The annual average for the last five years was 3.6. The annual average for the last decade (2010-2019) was 8.6, that for the previous decade 14.7 and the average in the 1990s was 24.3.

A total of 238 passengers were killed in the four fatal accidents involving revenue passengers in 2024. There were 80 revenue passenger fatalities in 2023, 169 in 2022, 89 in 2021 and 111 in 2020. The annual average over the last five years was 137. This compares to an annual average of 304 during the last decade (2010-2019), 680 during the previous decade (2000-2009) and 962 during the decade of the 1990s.

The passenger fatality rate in 2024 was one per 21.4 million passengers carried. The average rate over the last five years was one per 27.1 million passengers carried. The rate for the last decade was one per 12.9 million carried, for the previous decade (2000-2009), one per 3.5 million and for the 1990s one per 1.8 million.

The nine fatal accidents in 2024 were:

1) The **Jetways Airlines** Fokker 50 (5Y-JWG) on 18 January that overran the runway on landing at El Barde, Somalia and collided with a house, killing one of the four crew on board. The accident happened in daylight and in VMC. The aircraft was operating a cargo flight from Mogadishu, Somalia.

2) The **Northwestern Air** Jetstream Super 31 (C-FNAA) on 23 January that was destroyed by impact and post impact fire when it lost height shortly after take-off from Runway 30 at Fort Smith, Northwest Territories, Canada and collided with treetops 3,075ft (937m) beyond the end of the runway. It continued forward for about another 1,000ft, before coming to rest close to the Slave River. The two crew and four of the five passengers on board died in the crash. The accident happened in darkness and in IMC; weather, wind 290˚/3kt (5.5km/h), visibility 2sm in snow, cloud, overcast at 7,300ft, temperature -19˚C and dew point -22˚C. The aircraft was operating a flight to Rio Tinto's Diavik Diamond Mine.

3) The **Gazpromavia** UAC Superjet 100 95LR (RA-89049) on 12 July that was destroyed by impact and post-impact fire, killing all three crew on board, when it crashed in a forest near Kolomna, Moscow Oblast shortly after take-off from Runway 28 at Lukhovitsy-Tretyakovo Airport, Moscow Oblast, Russia. The point of impact was about 20km north-northeast of the airfield. The accident happened in daylight and in VMC. The aircraft was operating a ferry flight to Vnukovo International Airport, Moscow following maintenance. MAK reported that the aircraft's autothrottle had been engaged prior to take-off and the autopilot at a height of 550ft shortly after take-off. About 5min into the flight, at an altitude of 5,160ft with a pitch attitude of 5˚ to 6˚ nose-up and recorded an AOA of 10˚ to 11˚, the aircraft entered descent with the pitch attitude changing to 4˚ nose-down. At the start of the descent the IAS was 200kt, increasing, and the flaps and slats were synchronously retracted to a fully retracted position. The autopilot and autothrottle disengaged and the crew initiated manual control of the aircraft using the sidestick and engines. The aircraft descended to an altitude of 4,500ft before climbing to 4,750ft. In the sixth minute of flight, at a IAS of 320kt, the overspeed aural warning activated and the aircraft began to descend again. The crew was unable to arrest the descent with full aft sidestick.

4) The **Saurya Airlines** CRJ200LR (9N-AME) on 24 July that was destroyed by impact and post-impact fire when it crashed shortly after take-off from Runway 02 at Tribhuvan International Airport, Kathmandu, Nepal, coming down about 200m to the right of the runway. Video footage shows the aircraft descending in a right-wing low attitude before it struck the ground, immediately bursting into flames. Officials have confirmed that out of the 19 occupants, "only the captain is reported to have survived". The accident happened in daylight, in VMC, and calm winds. The aircraft was reportedly "carrying technical staff for maintenance work" on another aircraft at Pokhara domestic airport in Nepal. The aircraft had been grounded for 34 days before the accident flight. After an apparently normal take-off run on rotation, the aircraft pitched "excessively" nose up at up to 8.6˚-per-second (As per the aircraft's flight manual, a take-off pitch rate exceeding 3˚-per-second is considered excessive). The aircraft climbed to about 100ft agl while rolling right through about 90˚. It then rolled back to the left before rolling right again. Height was lost and the aircraft crashed to the right of the runway. Both stick shakers switched

between "Active" and "Not Active" multiple times during the short flight.

5) The **VoePass** ATR 72 500 (PS-VPB) on 9 August that was totally destroyed by impact and post impact fire, killing the four crew and 58 passengers on board, when it crashed among houses in the Capela district of Vinhedo, Sao Paulo, Brazil towards the end of a flight to Guarulhos International Airport, Sao Paulo. The accident site is about 70km north northwest of Guarulhos International Airport. The aircraft was operating a flight from Cascavel, Parana and appears to have been in normal cruise flight at FL170 as it approached Sao Paulo. At 1620L ATC cleared the aircraft to turn right towards Sanpa position and to expect descent clearance "in 2min". The aircraft began the turn, but then seems to have stalled and entered an increasingly tight descending right turn. Control was not regained and it crashed. The accident happened in daylight (1322L) and in IMC. There were Sigmet warnings of "severe icing" between FL120 and FL210 valid at the time covering the area where the aircraft crashed.

6) The **Ameriflight** Beech C99 (N130GP) on 17 October that entered a descending left turn, which continued until impact with the ground, shortly after take-off from Runway 20 at Norfolk regional airport in Nebraska. The aircraft appeared to be in a flat, near wings-level attitude at impact. The point of impact was about 585m (1,920ft) southeast of the departure end of the runway. The pilot, the only person on board, was killed in the crash. The accident happened in darkness (1939L) but in VMC-CAVOK; wind 160˚/6kt, temperature 15˚C and dew point 13˚C. The aircraft was operating a cargo flight to Omaha, Nebraska.

7) The **SAM Air** Viking Air Twin Otter 300 (PK-SMH) on 20 October that was destroyed when it crashed in a large open area of fishponds/ rice paddies while reportedly on approach to Runway 27 at Bandara Panua Pohuwato airport, Gorontalo province, Sulawesi, Indonesia, killing the three crew and one passenger on board. Last contact with the flight, which is believed to have been routine, was at 0720L and the aircraft is believed to have crashed shortly afterwards. There was no distress call. The accident happened in daylight (about 0725L) but in "cloudy weather". The aircraft was operating a flight from Gorontalo.

8) The **European Air Transport/Swiftair (DHL)** Boeing 737-400SF (EC-MFE) on 25 November that was destroyed by impact and post-impact fire when it lost height and crashed into the courtyard of a two-storey apartment block, some 1.3km short of Runway 19 of Vilnius international airport in Lithuania during the final stage of an ILS approach. One of the four crew on board was killed and the other three sustained serious injuries in the accident; however, the 12 residents of the apartment block were reportedly evacuated safely. The accident happened in darkness and in IMC: wind 180˚ at 17kt, visibility 10km or more, clouds: overcast at 700ft, temporarily overcast at 500ft, temperature 1˚C, dewpoint -1˚C. The aircraft was operating a flight from Leipzig Halle airport in Germany.

9) The **Jeju Air** Boeing 737-800 (HL8088) on 29 December that was destroyed by impact and post-impact fire, killing four of the six crew and all 175 passengers on board, when it overran and impacted the ILS localiser installation during a belly landing on Runway 19 at Muan international airport, South Korea. The accident happened in daylight (0903L) and in VMC; wind 110˚/2kt, visibility 9,000m, cloud, few at 4,500ft, temperature 2˚C and dew point 0˚C. Runway 19 is 2,800m long. The aircraft was operating a scheduled service from Bangkok, Thailand.

Events not defined as "fatal accidents":

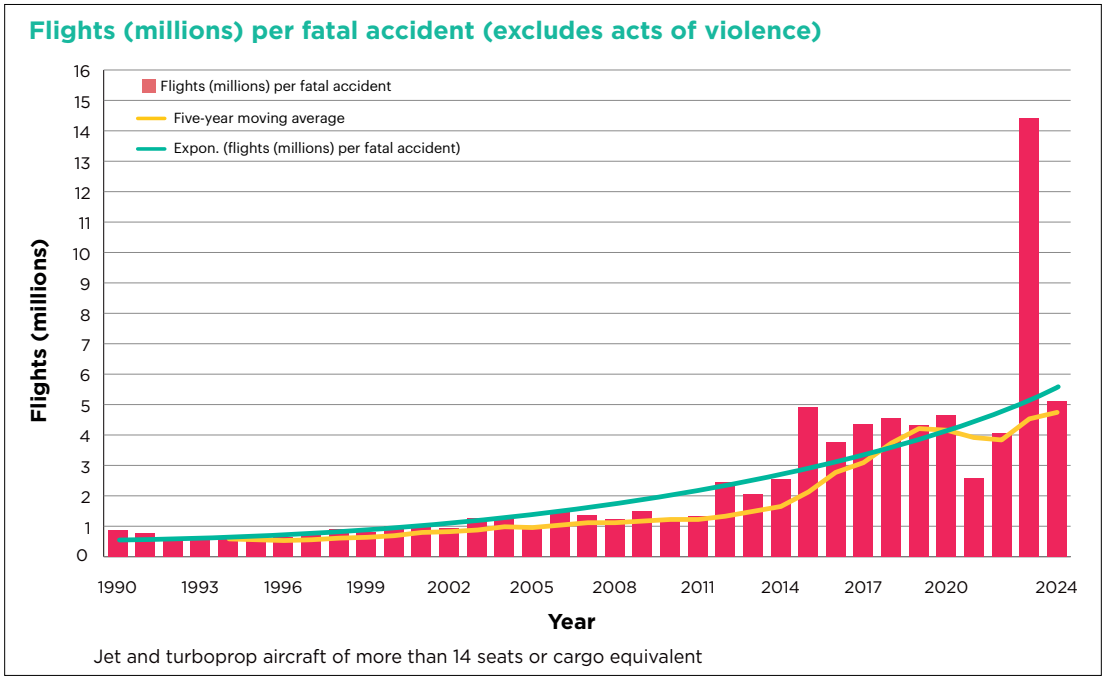
1) The **Alaska Air Fuel** Douglas DC-4 (N3054V) on 23 April that suffered an "explosion" on its No 1 engine shortly after take-off from Runway 20R at Fairbanks international airport, Alaska, went out of control and crashed on the banks of the Tanana River, about 12km southwest of the airport, killing the two crew on board. The accident happened in daylight and in VMC-CAVOK. The aircraft was operating a flight to Kobuk, Alaska, with a cargo of heating oil.

2) The **Singapore Airlines** Boeing 777-300ER (9V-SWM) on 21 May that apparently encountered an area of turbulence while in normal cruise flight at FL370 over the Andaman Sea, south of Myanmar, and was briefly upset. Control was quickly regained but one passenger was killed and some 30 others variously injured in the event. The aircraft diverted to Suvarnabhumi airport, Bangkok, Thailand and landed safely. The accident happened in daylight. The aircraft was operating a flight (SQ321) from London to Singapore. The passenger who died is said to have been a 73-year-old British man "with a history of heart disease". The man is apparently suspected of having suffered a "heart attack".

3) The **KLM Cityhopper** Embraer E190ST (PH-EZL) on 29 May when a "ramp worker" was ingested into the aircraft's left engine and killed following pushback at Schiphol Airport, Amsterdam, Netherlands. The accident happened in daylight and in VMC. The aircraft was operating a flight to Billund, Denmark. It is apparently suspected that the worker may have committed suicide.

4) The **Varesh Airlines** Boeing 737-500 (EP-VAF) on 2 July when an engineer was ingested into the aircraft's right engine while it was undergoing engine maintenance at Konarak Airport, Chabahar, Iran. It was reported that the engineer had been working on the engine, but realised he had left some of his tools near the running engine. According to witnesses, he ran across to retrieve the tools but accidentally entered the safety exclusion zone and was pulled into the engine intake.

5) The **Swiss** Airbus A220-300 (HB-JCD) on 23 December. When cruising at FL400 on a flight from Henri Coanda international airport, Bucharest, Romania to Zurich, Switzerland, smoke entered the cockpit and cabin. The crew elected to divert to Graz, Austria, where the aircraft landed safely. It was stopped on the runway and an emergency evacuation was carried out. Press reports indicate that 13 passengers and two crew subsequently required medical attention for injuries. One of the two crew members who required medical attention later died. The specific circumstances leading to the cabin attendant's death have not been reported. The accident happened in daylight (about 1733L).



There were nine fatal accidents during 2024, a disappointingly high number after 2023, when there were only three such accidents, but more in line with other recent years. There were nine fatal accidents in 2022 and 10 in 2021. Four of the nine fatal accidents in 2024 resulted in passenger deaths on revenue passenger flights.

The annual average number of fatal accidents over the last five years was 7.2. The average for the last decade (2020-2019) was 15.3, mainly reflecting the poor results in the early part of the period. The annual average for the period 2000-2009 was 27.4 while the 1990s' average was 37.9. The annual averages for the 1980s and 1970s were 33.1 and 40.0 respectively.

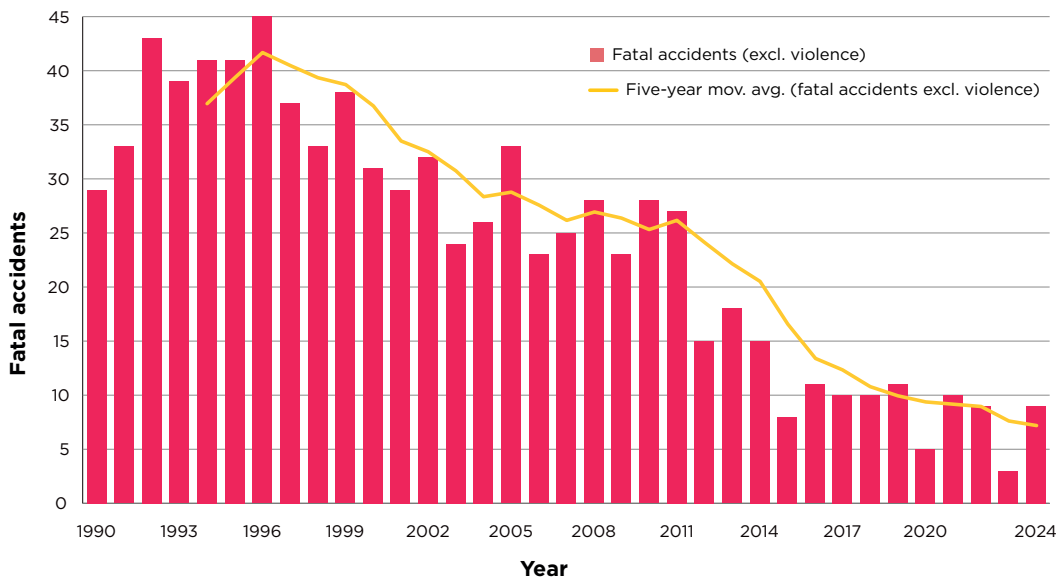
Annual fatal accidents (jet and turboprop aircraft) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents	8	11	10	10	11	5	10	9	3	9

Fatal accidents (jet and turboprop aircraft) – decade averages

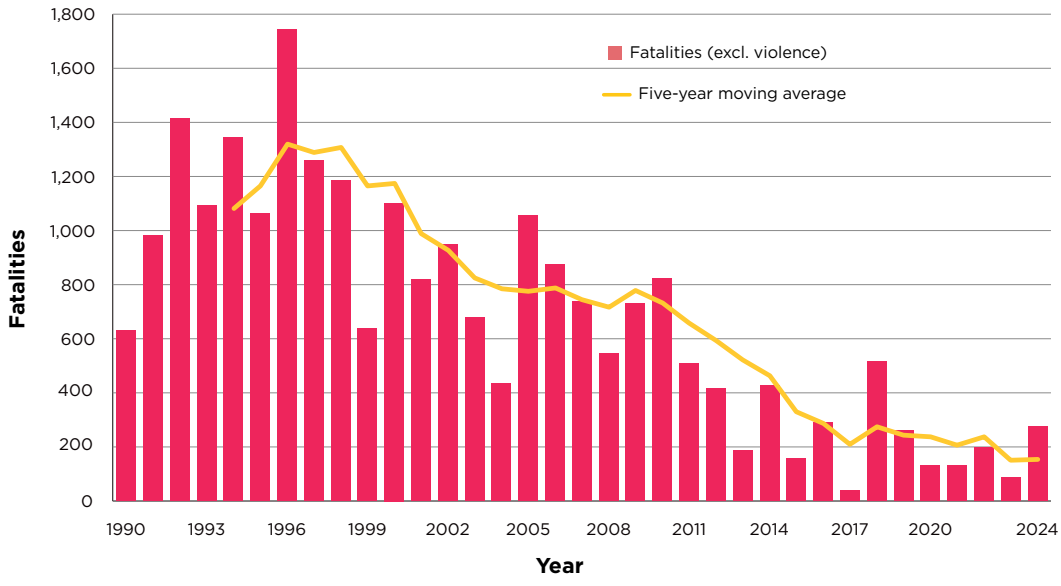
Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	40.0	33.1	37.9	27.4	15.3

Annual airline fatal accidents (excludes acts of violence)



Jet and turboprop aircraft of more than 14 seats or cargo equivalent

Airline annual passenger and crew fatalities (excludes acts of violence)



Jet and turboprop aircraft of more than 14 seats or cargo equivalent

The number of passenger and crew fatalities last year, 275, was the highest recorded in any year since 2018 when 515 people were killed. There were 88 fatalities in 2023, 199 in 2022, 130 in 2021 and 133 in 2020.

Most of the fatalities in 2024 resulted from two accidents, the crash of the Jeju Airlines Boeing 737-800, which killed 179 passengers and crew, and that of the VoePass ATR72, which killed 62.

The annual average number of passenger and crew fatalities over the last five years was 165. The annual average for the period 2010-2019 was 363, for the previous decade (2000-2009), 793 and that for the 1990s was 1,135.

Although the number of deaths in 2024 was disappointing when compared to recent years, there are now, fortunately, so few fatal airline accidents that just one accident involving high loss of life can turn an otherwise "good" year into a "bad" one. Last year was a good example of this. If the Jeju Air loss had not happened or had happened a few days later, there would only have been 96 passenger and crew fatalities in the year and 2024 would have been another "good" year instead of a "disappointing" one.

Annual passenger & crew fatalities (jet and turboprop aircraft) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities	158	291	39	515	262	133	130	199	88	275

Passenger & crew fatalities (jet and turboprop aircraft) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual Average	1,467.4	1,072.2	1,135.0	792.5	363.0

Nevertheless, and despite the occasional "disappointing" year, air safety continues to improve and is now so considerably better than, say, 20 or 30 years ago, it is almost impossible to comprehend. To try to put these improvements into perspective, consider that during 2010-2019, over 4,000 fewer passengers and crew were killed in airline accidents than in the previous decade, almost 8,000 fewer than in the 1990s and over 10,000 fewer than in the 1970s. If the average annual number of fatalities remains at around 165 for the whole of the current decade (2020-2029), there will be some 2,000 fewer fatalities during the period than during the 2010-2019 decade. However, hopefully, continued improvements in safety will actually result in even fewer fatalities.

On a more restrictive basis, the four fatal accidents involving passenger deaths on revenue passenger flights in 2024 was a relatively poor result when compared to 2023 when there were only two such accidents. However, there were five such accidents in

2022, four in 2021, three in 2020, five in 2019 and nine in 2018. The five-year moving annual average (2020-2024) is 3.6.

The annual average for the last decade (2010-2019) was 8.6. The annual average for the decade 2000-2009 was 14.7. The annual average number of fatal accidents involving revenue passengers for the 1990s was 24.3, which was almost the same as for the 1980s, 24.6, and only slightly better than the 1970s.

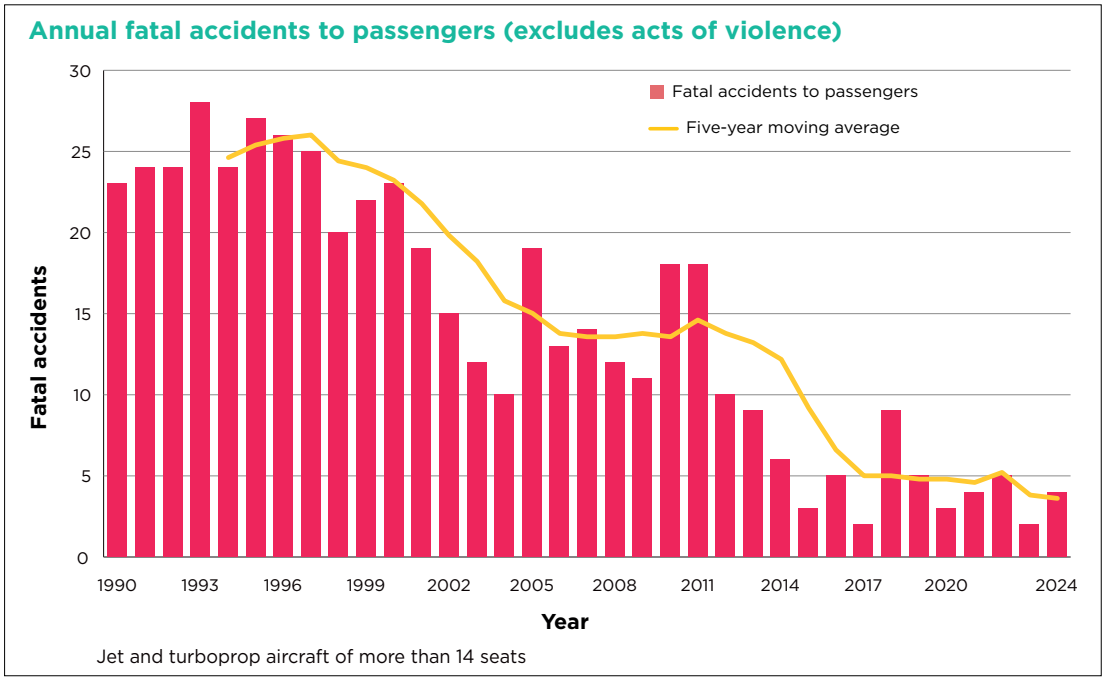
Despite the very large increase in the number of flights over the last 50 years, we are currently seeing about six times fewer fatal accidents to revenue passengers per year than during the 1970s, 1980s or 1990s and less than half as many as in the 2010-2019 decade.

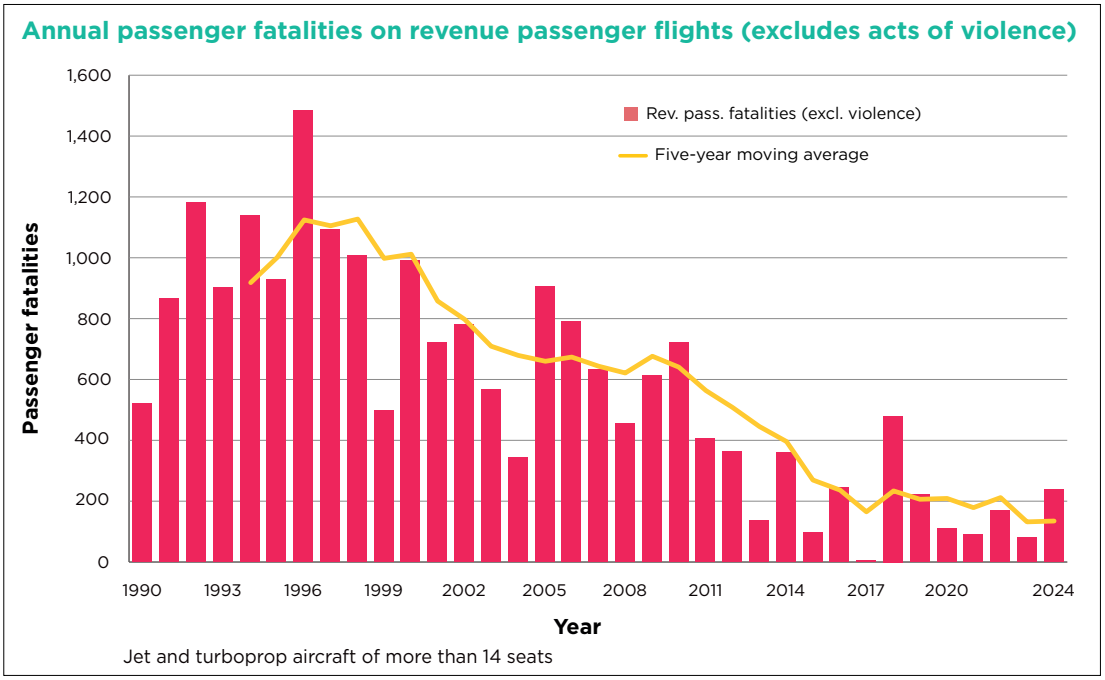
Annual fatal accidents to passengers (jet and turboprop aircraft) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents	3	5	2	9	5	3	4	5	2	4

Fatal accidents to passengers (jet and turboprop aircraft) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	28.8	24.6	24.3	14.7	8.6





The four fatal accidents in 2024 during revenue passenger operations resulted in 238 passenger deaths compared to 80 in 2023, 169 in 2022, 89 in 2021 and 111 in 2020. There were 221 passenger fatalities in 2019 and 480 in 2018. The best year ever was 2017 when only five passengers were killed.

The five-year moving average for annual passenger fatalities is 137.4. The annual average number of passenger fatalities for the last decade (2010-2019) was 303.5. The average for the previous decade was 680.4, and that for the 1990s, 962.0. The average for the 1980s was 945.0 while that for the 1970s was 1,289.3.

Annual passenger fatalities on revenue passenger flights (jet and turboprop aircraft) 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities	96	244	5	480	221	111	89	169	80	238

Passenger fatalities on revenue passenger flights (jet and turboprop aircraft) decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	1,289.3	945.0	962.0	680.4	303.5

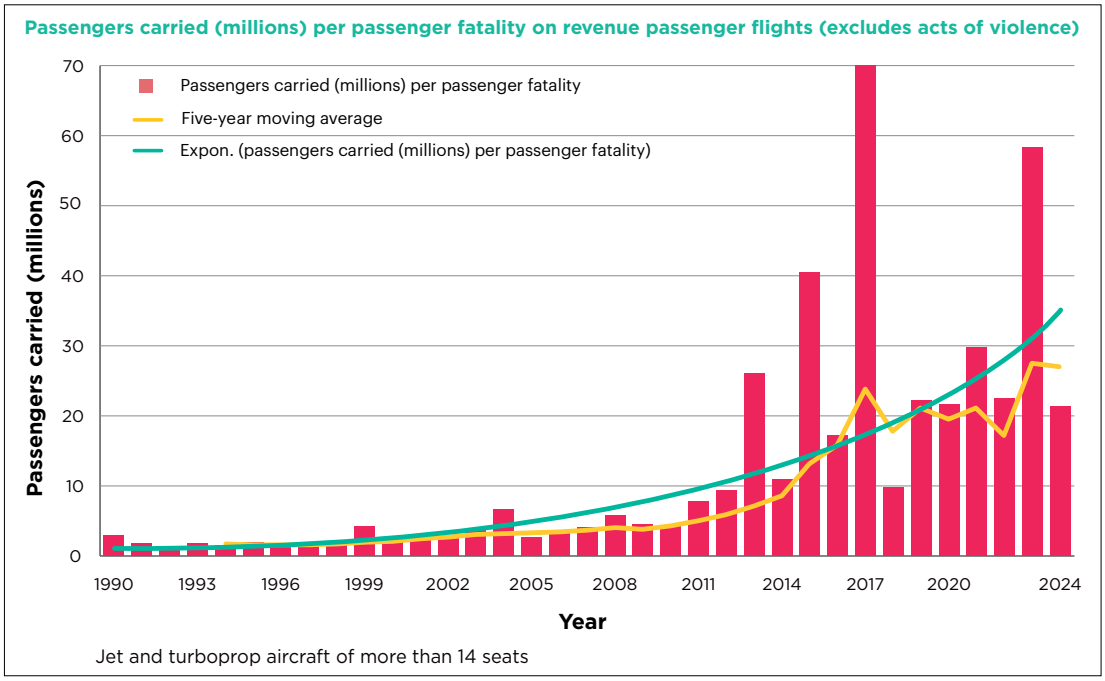
With a total of 238 revenue passengers being killed in 2024, this gives an estimated passenger fatality rate of just over one per 21 million passengers carried. This was a disappointment after the good result in 2023 when, with only 80 passenger fatalities, the passenger fatality rate was one per 58 million carried, but very similar to 2022 when the rate was one per 22.5 million carried. However, with so few fatal accidents and fatalities in any one year nowadays, annual numbers are of little value and a better guide would be the five-year moving average. The passenger fatality rate for the five years to the end of 2024 was about one per 27 million carried.

On average, from the point of view of passengers, the airline industry, as a whole, over the last five years was more than three times safer than it was as recently as 10 years ago and 15 times safer in the 1990s.

As noted earlier, the rate of improvement in airline safety seems to have accelerated in the last few years, with the fatality rate now being markedly better than in previous decades. The passenger fatality rate for the last decade was one per 12.9 million carried, for the previous decade (2000-2009), one per 3.5 million and for the 1990s, one per 1.8 million.

Passenger fatality rate

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Passengers carried (millions) per passenger fatality	-	-	1.8	3.5	12.9



Western-built jets

During 2024, Western-built jets, which carry most of the world's traffic, suffered three fatal accidents. The class suffered no fatal accidents in 2023 and only one in both 2022 and 2021. There were three fatal accidents in 2020.

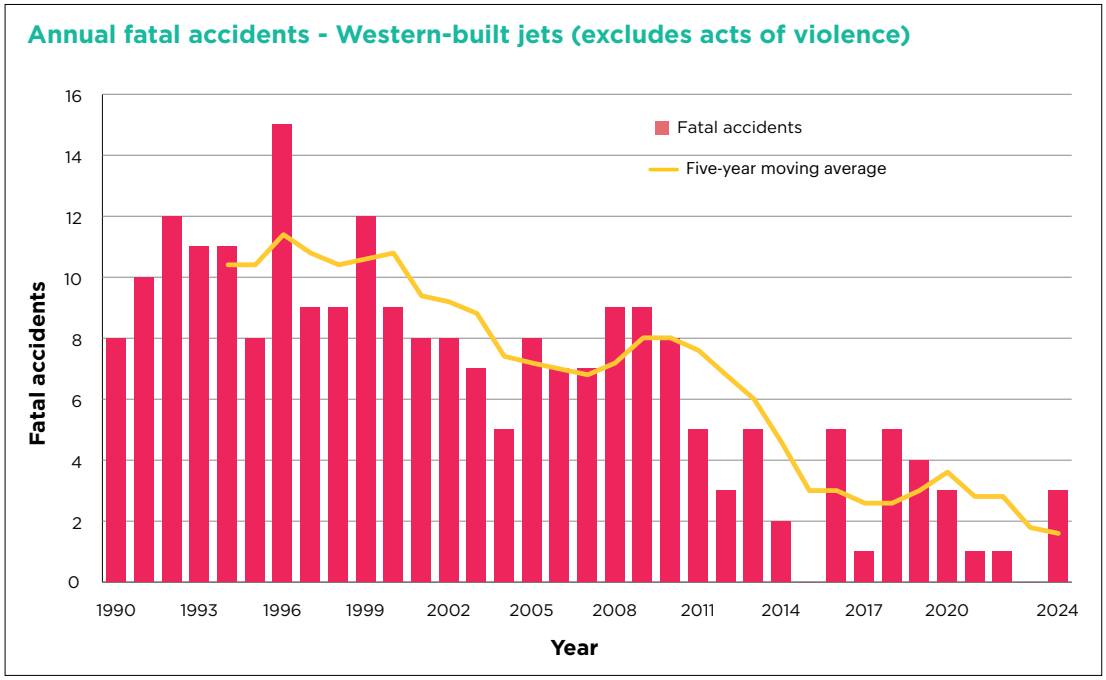
The annual average number of fatal accidents to this class of aircraft over the last five years was 1.6. The annual average for 2010-2019 was 3.8. The average for the previous decade was 7.7 and that for the 1990s, 10.5. On average there were half as many fatal accidents in the last five years as 10 years ago and more than five times fewer than in the 1990s.

Annual fatal accidents (Western-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents	0	5	1	5	4	3	1	1	0	3

Fatal accidents (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	12.1	10.5	10.5	7.7	3.8



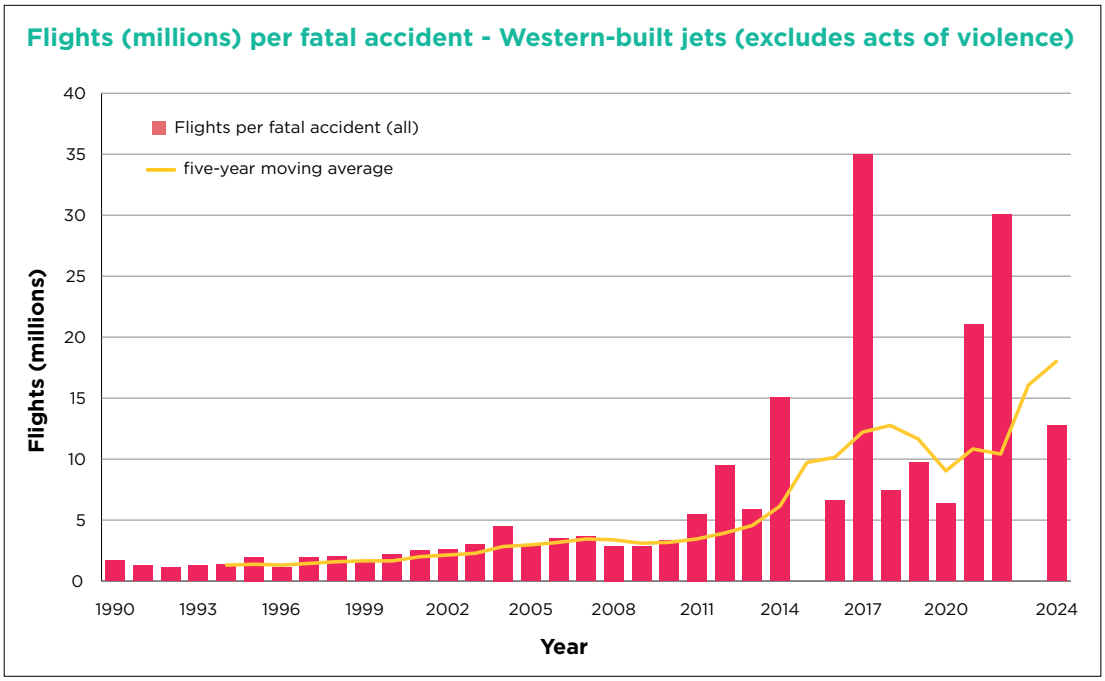
Western-built jets are estimated to have made some 38 million flights in 2024, an improvement on the estimated 36 million in 2023, and have now almost recovered to the 39 million flights in 2019. The class suffered three fatal accidents during the year, giving a fatal accident rate of one per 12.7 million flights.

The overall fatal accident rate for the last five years for this class of aircraft stands at about

one per 18 million flights. The fatal accident rate for the last decade (2010-2019) is one per 8.3 million flights and for the 2000-2009 decade it was one per 3.0 million flights. On this basis, worldwide, Western-built jet operations are now more than twice as safe as during the last decade, six times safer than in the 2000-2009 decade, more than 10 times safer than in the 1990s, 18 times safer than in the 1980s and more than 25 times safer than in the 1970s.

Fatal accident rate (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Flights (millions) per fatal accident	0.67	1.05	1.49	3.0	8.3



During 2024, 198 passengers and crew were killed in the three fatal accidents, the highest number since 2018 when 304 died. The annual average number of fatalities over the last five years was 102.6. The annual average for passenger and crew fatalities for the last decade (2010-2019) was 210.4, that for the previous decade, 511.6 and the average for the 1990s was 657.8.

Annual passenger & crew fatalities (Western-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities	0	206	4	304	187	121	62	132	0	198

Passenger & crew fatalities (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	761.5	587.0	657.8	511.6	210.4

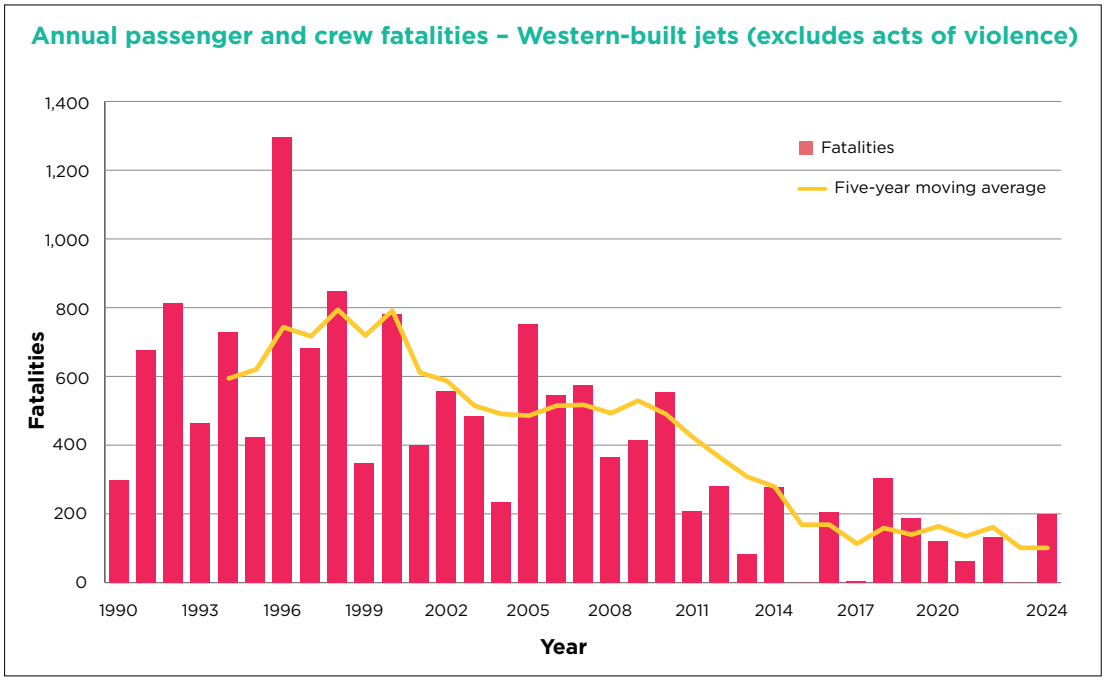
Average passenger & crew fatalities per fatal accident (Western-built jets) 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Average fatalities	-	41.2	4	60.8	46.8	40.3	62.0	132.0	-	66

Passenger & crew fatalities per fatal accident (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Average fatalities	62.9	55.9	62.6	66.5	55.4

Annual passenger and crew fatalities – Western-built jets (excludes acts of violence)



There was one fatal accident in 2024 involving passenger fatalities on revenue passenger flights operated by Western-built jets. There were no fatal accidents involving revenue passengers in 2023, only one in 2022 and 2021, and three in 2020. There were two such accidents in 2019 and five in 2018, although three of the 2018 accidents resulted in only one passenger fatality each. A total of 175 passengers died in the 2024 fatal accident. There were no revenue passenger fatalities in 2023, 123 in 2022, 56 in 2021, 111 in 2020 and 161 in 2019 while the five fatal accidents in 2018 gave rise to 290 passenger fatalities.

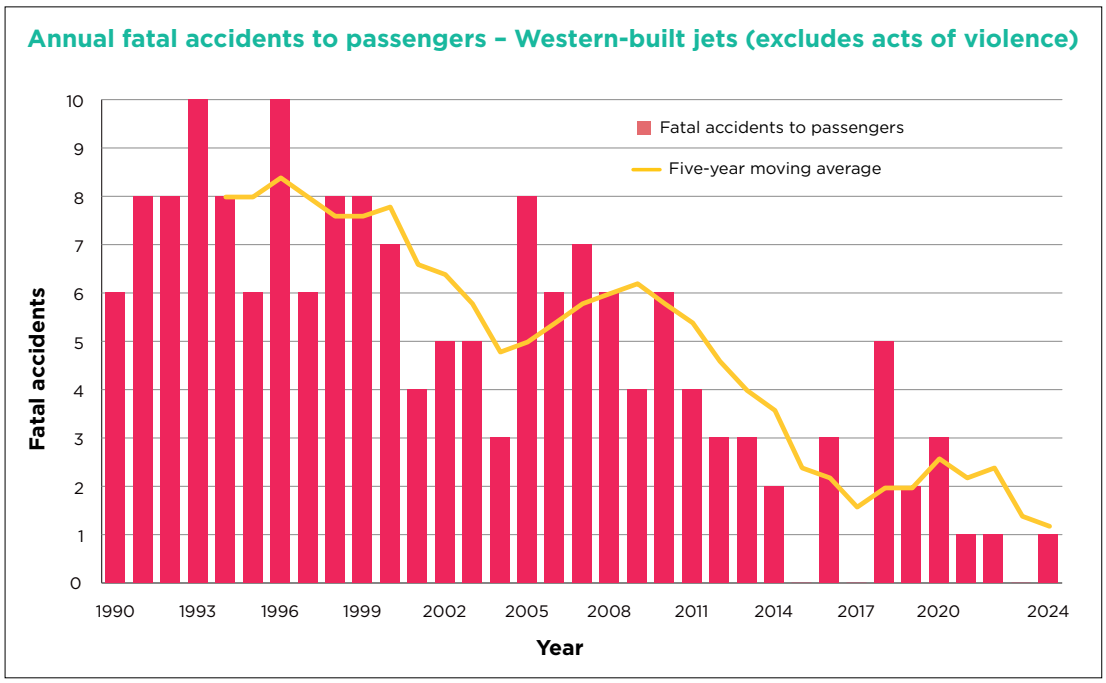
Annual fatal accidents to passengers (Western-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents	0	3	0	5	2	3	1	1	0	1

Fatal accidents to passengers (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	9.1	8.5	7.8	5.5	2.8

The average annual number of fatal accidents to passengers over the last five years is 1.2. That for the last decade (2010-2019), 2.8, for the 2000-2009 decade, 5.5, and that for the 1990s, 7.8.



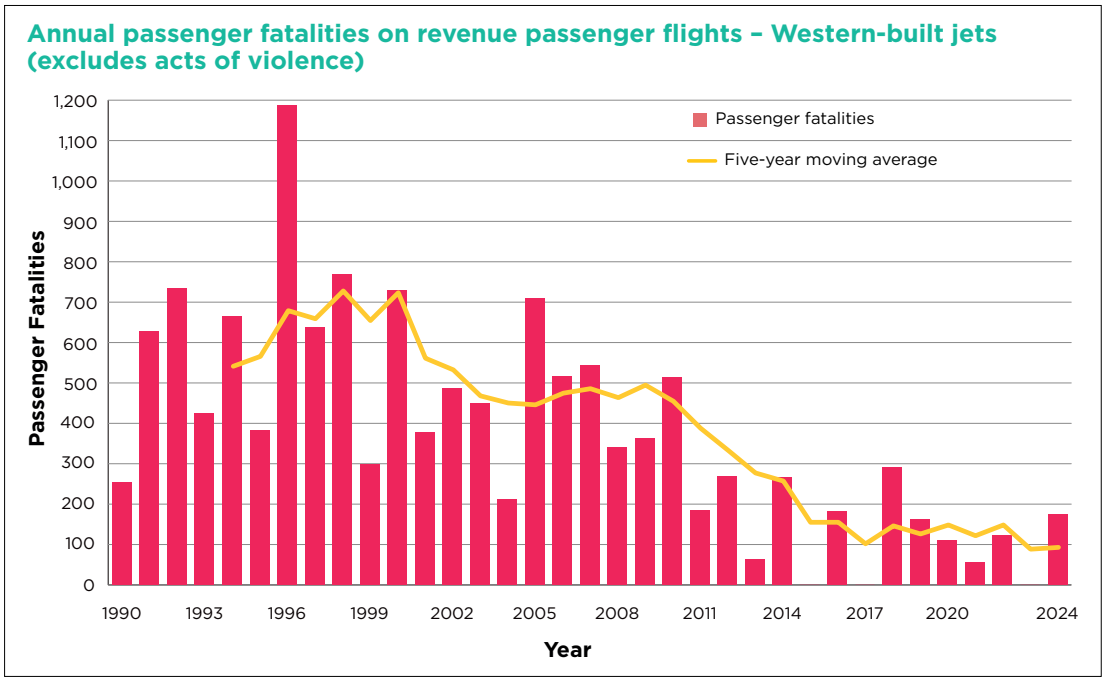
The average annual number of passenger fatalities over the last five years is 93. The annual average for the last decade (2010-2019) was 192.8 and that for the 2000-2009 decade, 472.6. The annual average for the 1990s was 598.

Annual passenger fatalities on revenue passenger flights (Western-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities	0	182	0	290	161	111	56	123	0	175

Passenger fatalities on revenue passenger flights (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	695.3	539.6	598.0	472.6	192.8



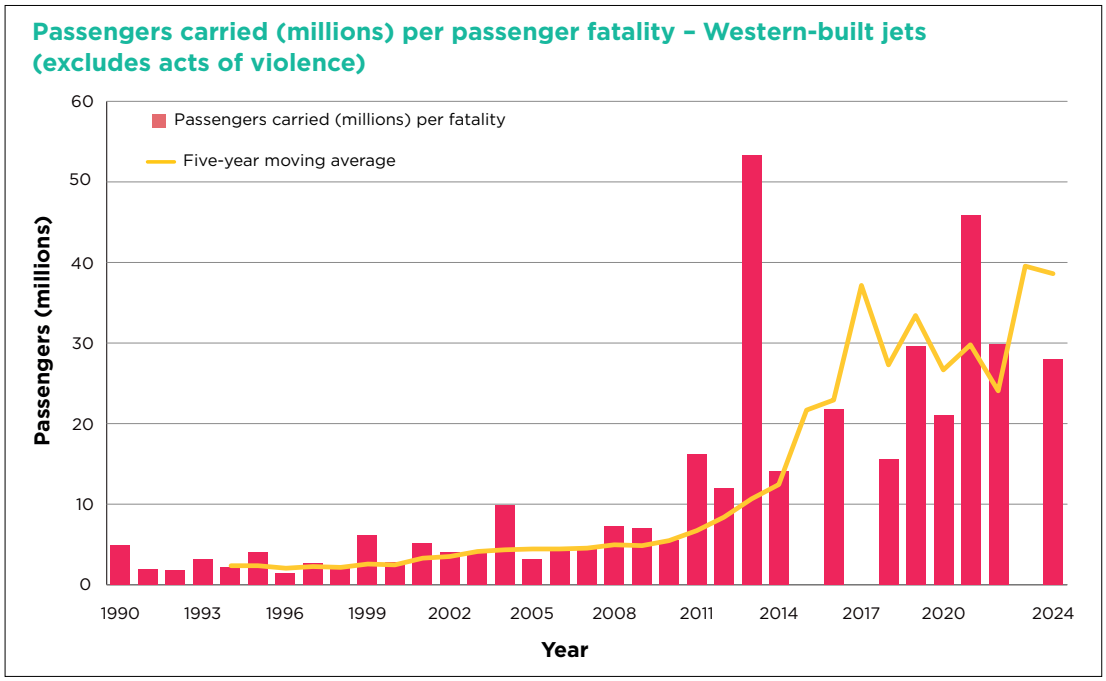
It is estimated that some 4.9 billion passengers were carried on Western-built jets in 2024. This was an improvement on the estimated 4.5 billion passengers who flew in 2023 and now exceeds the estimated 4.8 billion carried in 2019 before Covid-19. As noted earlier, in 2024, the class suffered only one fatal accident where revenue passengers were killed. A total of 175 passengers were killed in that accident. However, with so few fatal accidents and passenger fatalities now, looking at a single year, where one major accident more or less can make a very big difference to the numbers, is of little use and it is better to consider longer periods.

The passenger fatality rate for the last five years was one per 39 million carried.

The passenger fatality rate for the last decade (2010-2019) was one per 19.4 million passengers carried while that for the period 2000-2009 was one per 4.8 million and for the 1990s, one per 2.5 million. In the 1970s the rate was one per million passengers carried. This suggests that, on this basis, passengers on Western-built jet flights over the last five years, with a passenger fatality rate of one per 39 million carried, were twice as safe as during the last decade, about eight times safer than in the 2000s, nearly 16 times safer than during the 1990s, about 20 times safer than in the 1980s and almost 40 times safer than in the 1970s.

Passenger fatality rate (Western-built jets)

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Passengers carried (millions) per passenger fatality	1.05	2.0	2.5	4.8	19.4



At the time of writing, Western-built jets are understood to have suffered 14 operational all-risk insurance total losses during 2024. This is the highest number since 2018 when there were 20 operational total losses. There was only one total loss in 2023, eight in 2022, four in 2021 and six in 2020. There were two non-operational total losses in 2024.

The average annual number of operational total losses for the last five years was 6.6. The 2010-2019 decade average was 13.3. For the 2000-2009 decade, it was 17.7 and for the 1990s, 20.9. There are, on average, about three times fewer all-risk, Western-built jet total losses now than there were 20 or 30 years ago.

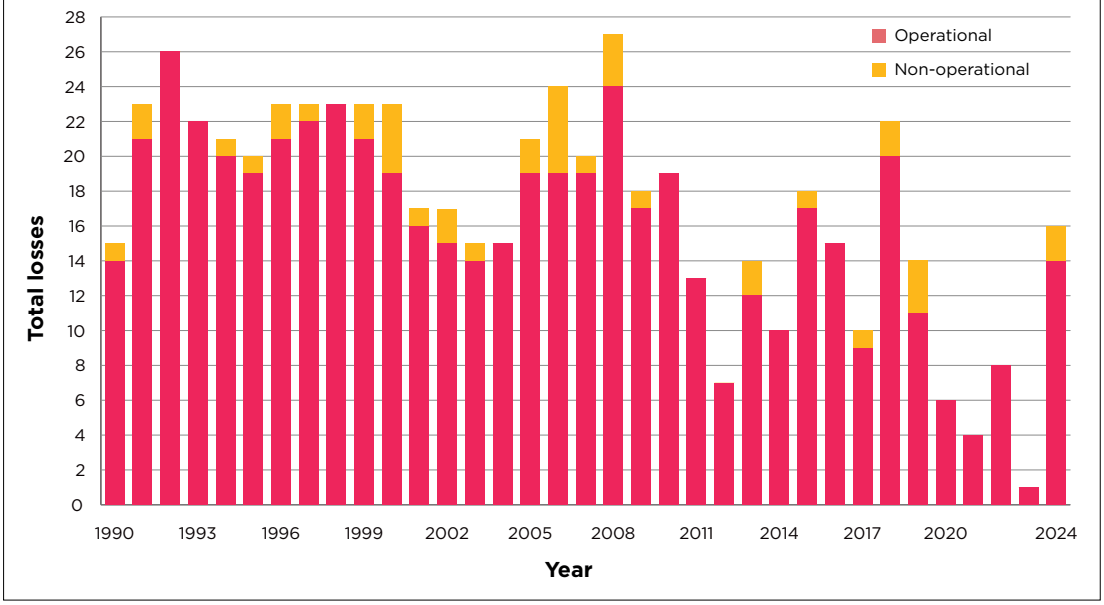
Annual all-risk total losses (Western-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operational	17	15	9	20	11	6	4	8	1	14
Non-operational	1	0	1	2	3	0	0	0	0	2
All	**18**	**15**	**10**	**22**	**14**	**6**	**4**	**8**	**1**	**16**

All-risk total losses (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average operational	17.6	16.5	20.9	17.7	13.3
Annual average all	18.1	17.4	21.9	19.7	14.2

Annual total losses – Western-built jets (excludes acts of violence)



The cost of Western-built jet hull claims (total and partial losses) in 2024 is provisionally estimated at $660 million. This is the highest total since 2018 when we estimate that incurred hull claims came to almost $750 million. We estimate the cost of hull claims in 2023 was only $236 million, $568 million in 2022, $253 million in 2021 and $430 million in 2020. Yet again, the cost of partial losses exceeded total losses during the year.

The average annual cost of Western-built jet hull claims over the last five years is about $430 million and that for the last decade (2010-2019) was $600 million. That for the previous decade (2000-2009) was $581 million and for the 1990s, $618 million. Despite the large increase in fleet values and in the number of higher valued hulls in the airline fleet, on average, there has been no sustained increase in the total cost of hull claims over the last 30 years, rather, these numbers suggest that the annual cost of hull claims is gradually falling. However, during this time, the percentage of the total claims cost represented by partial losses has increased, especially in recent years.

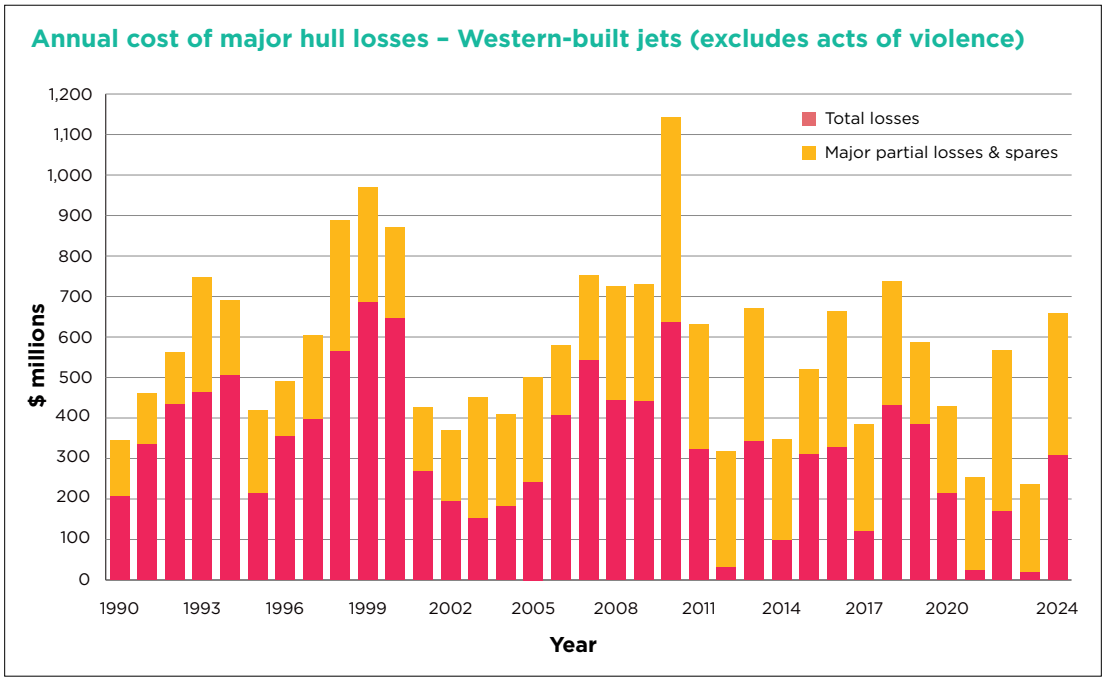
Annual cost of major hull claims $m (Western-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total losses	310	328	119	431	384	214	23	168	18	307
Major partial	211	335	265	308	203	216	230	400	218	352
Spares*	0	0	0	0	0	0	0	0	0	1
Total	**521**	**663**	**384**	**739**	**587**	**430**	**253**	**568**	**236**	**660**

** Spares – significant losses falling on the airline's hull policy only.*

Cost of major hull losses $m (Western-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average total losses	121.0	194.2	415.6	351.6	299.9
Annual average major partial	31.1	92.6	202.1	227.6	300.4
All (including spares)	152.1	286.8	617.7	580.7	600.3



Western-built turboprops

There were five fatal accidents to Western-built turboprops during 2024, two more than in 2023, one more than in 2022 and two more than in 2021. This class of aircraft did not suffer any fatal accidents in 2020.

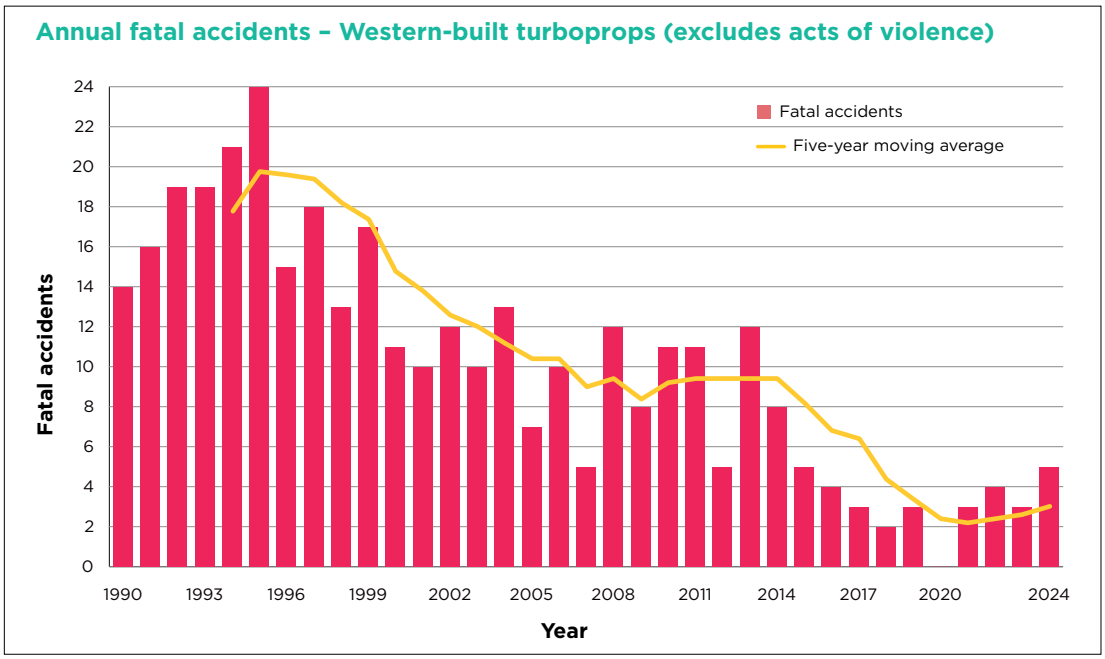
The average annual number of fatal accidents to Western-built turboprops over the last five years was 3.0. In 2010-2019 it was 6.4, while the average for the previous decade was 9.8. The annual average for the 1990s was 17.6.

Annual fatal accidents (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents	5	4	3	2	3	0	3	4	3	5

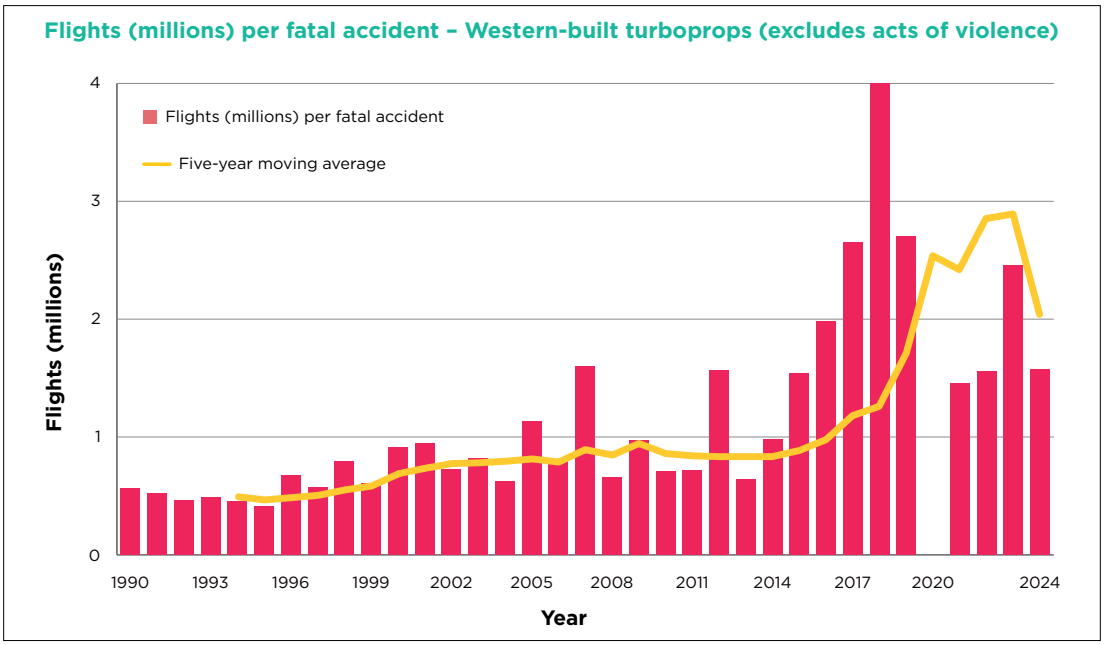
Fatal accidents (Western-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	15.8	15.1	17.6	9.8	6.4



With the number of flights made by this class in 2024 now having recovered following the impact of Covid-19, the fatal accident rate for the year works out to about one per 1.6 million flights. This was a disappointing result when compared to 2023 when the rate was one per 2.5 million flights but broadly similar to the rates achieved in 2022 and 2021. The fatal accident rate for the last five years stands at about one per 2.0 million flights.

Although last year's result was disappointing when compared to 2023, during recent years, there has been a marked improvement in the safety of this class of aircraft. Nevertheless, it still falls a long way behind that of the Western-built jets. Until about 2014, there had been no significant sustained improvement in the fatal accident rate for this class, which, on average, had been at around one per 0.8 or 0.9 million flights since about the end of the 1990s.



There were 74 passenger and crew fatalities during 2024. This was better than in 2023 when 88 passengers and crew were killed, but still a disappointing result when compared to recent years, and the second highest annual number of fatalities since 2018 when 117 people were killed. There were 53 fatalities in 2022, nine in 2021, none in 2020 and 26 in 2019. The annual average for passenger and crew deaths on this class of aircraft over the last five years is 44.8. The average for the last decade (2010-2019) was 88.2, similar to the annual average for the previous decade of 86.1. The average for the 1990s was 197.1, for the 1980s, 199.1, and for the 1970s, 258.9.

Annual passenger & crew fatalities (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities	114	75	10	117	26	0	9	53	88	74

Passenger & crew fatalities (Western-built turboprops) – decade averages

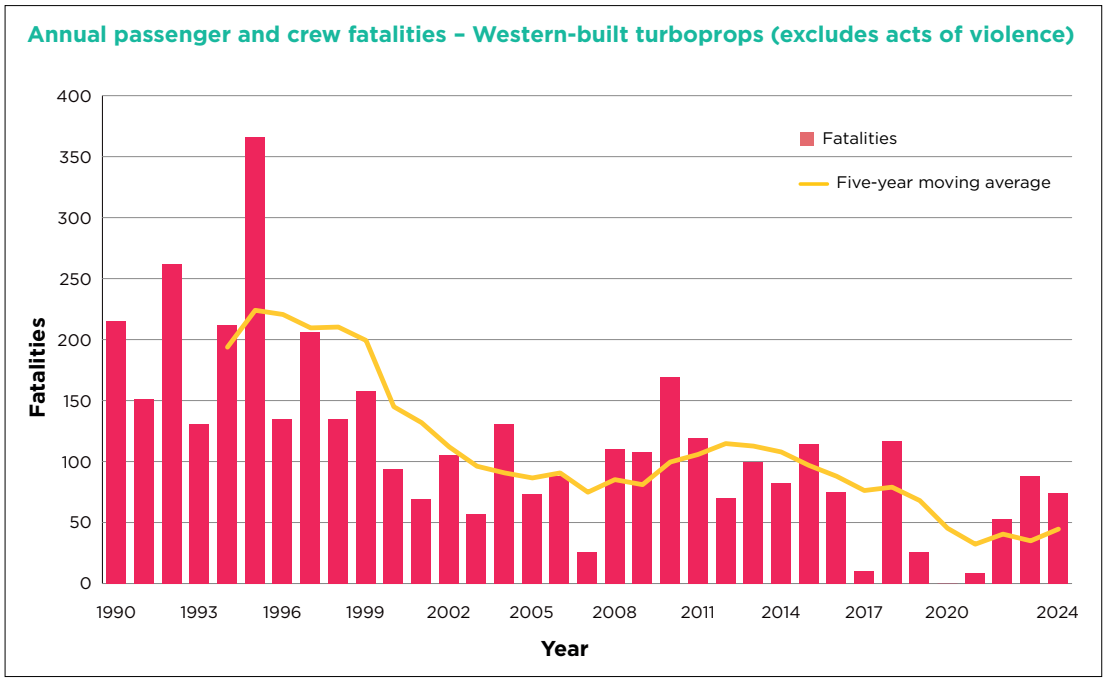
Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	258.9	199.1	197.1	86.1	88.2

Average passenger & crew fatalities per fatal accident (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Average fatalities	22.8	18.8	3.3	58.5	8.7	0	3.0	13.3	29.3	14.8

Passenger & crew fatalities per fatal accident (Western-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Average Fatalities	16.4	13.2	10.9	8.8	13.8



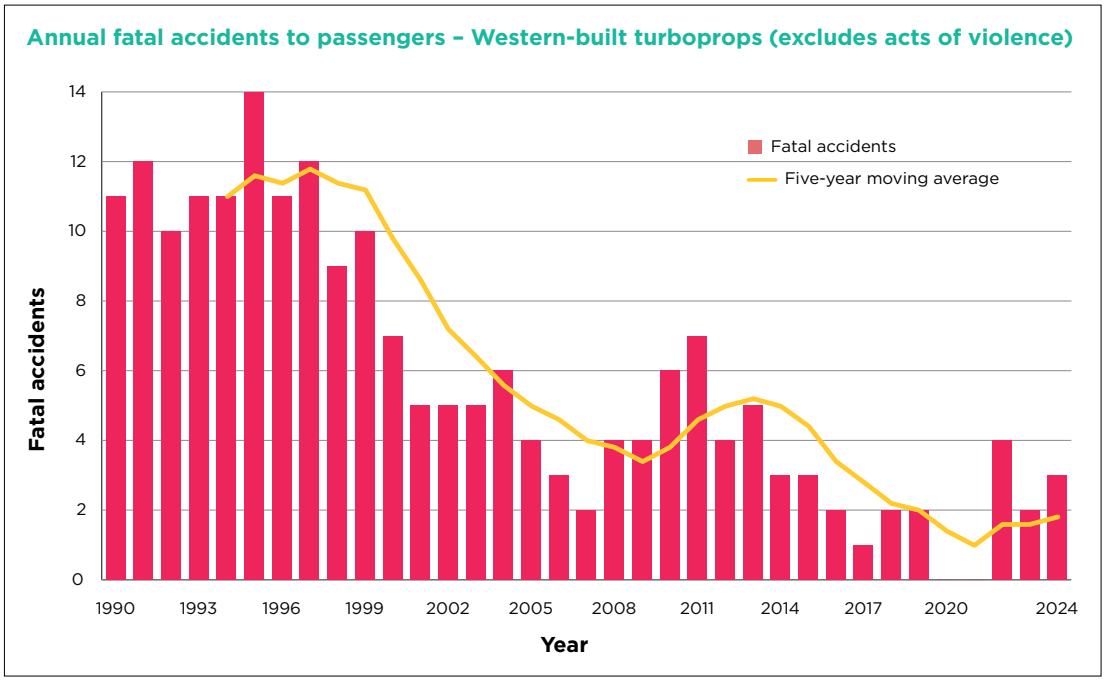
There were three fatal accidents to passengers on revenue passenger flights on Western-built turboprops during 2024. This was one more than in 2023, when there were two such accidents, but one less than in 2022. There were no fatal accidents to passengers on revenue passenger flights on Western-built turboprops in 2021 or 2020. The average annual number of fatal accidents over the last five years was 1.8. The average annual number of fatal accidents (to passengers) for the last decade (2020-2019) was 3.5, about 20% less than that for the previous decade, at 4.5. The average for the 1990s was 11.1.

Annual fatal accidents to passengers (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents	3	2	1	2	2	0	0	4	2	3

Fatal accidents to passengers (Western-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	10.6	10.0	11.1	4.5	3.5



There were 63 passengers killed on revenue passenger flights operated by Western-built turboprops in 2024. This compares with 80 in 2023 and 46 in 2022, versus none killed in either 2021 or 2020. There were 21 passenger fatalities in 2019 and 109 in 2018.

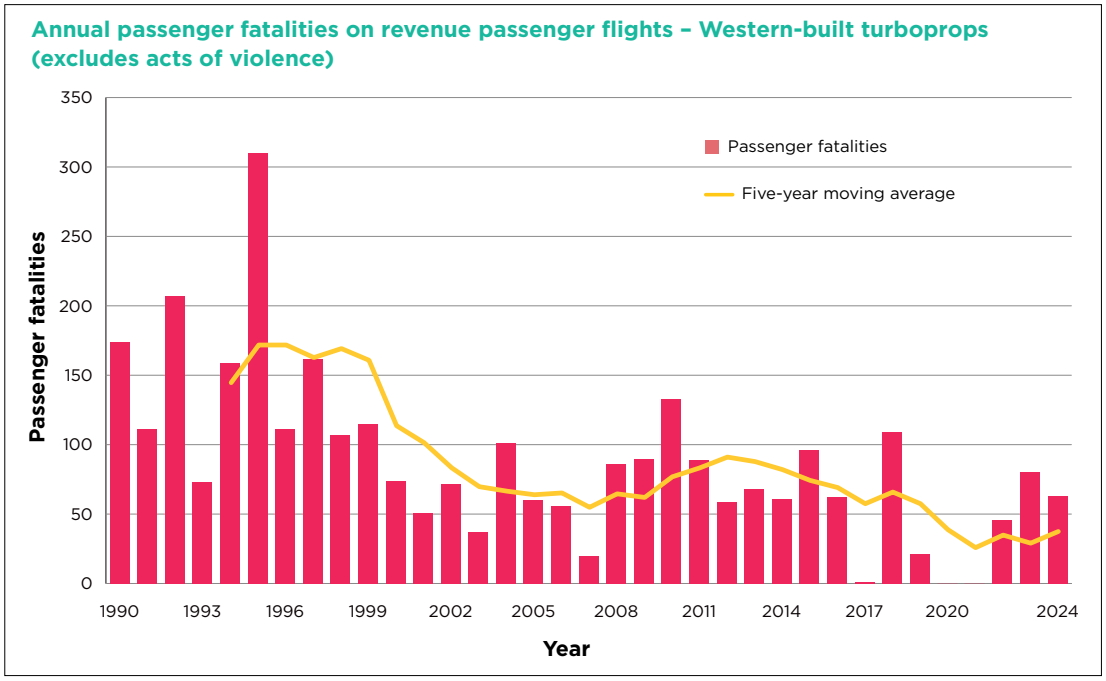
The annual average number of passenger fatalities over the last five years was 37.8. The average for the last decade (2010-2019) was 69.9. The annual average for the previous decade (2000-2009) was 64.7 and that for the 1990s was 152.9.

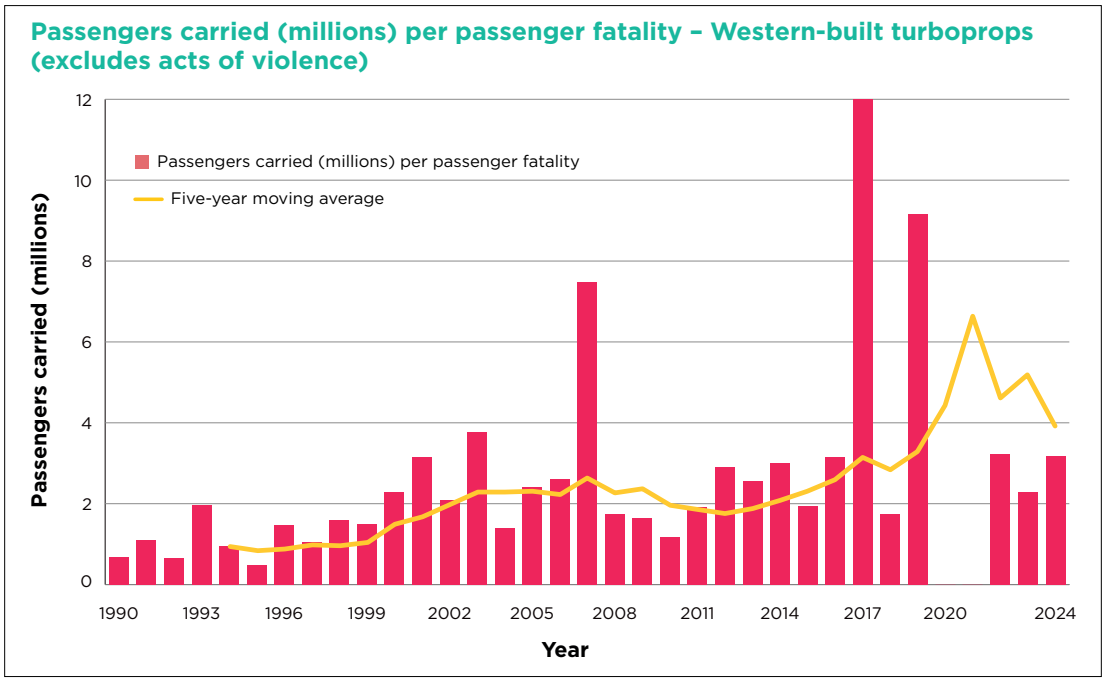
Annual passenger fatalities on revenue passenger flights (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities	96	62	1	109	21	0	0	46	80	63

Passenger fatalities on revenue passenger flights (Western-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average	213.4	155.2	152.9	64.7	69.9





Following two recent years (2020 and 2021) which recorded no revenue passenger fatalities on Western-built turboprops, the performance of the class during the last three years, 2022 through to 2024 is, disappointedly, "back to normal". The passenger fatality rate for the year was about one per 3.2 million carried. The five-year moving average gives a rate of one passenger fatality per 3.9 million carried.

The number of confirmed airline insurance total losses suffered by Western-built turboprops during the year, currently standing at 12, is four more than in 2023, but the same as in 2022. There were eight known total losses in 2021 and six in 2020.

Based on experience, it is thought likely that more total losses will be confirmed in the coming months and that the final figure for 2024 will probably increase. However, it should still remain considerably lower than the average for the last decade (2010-2019) and all previous decades.

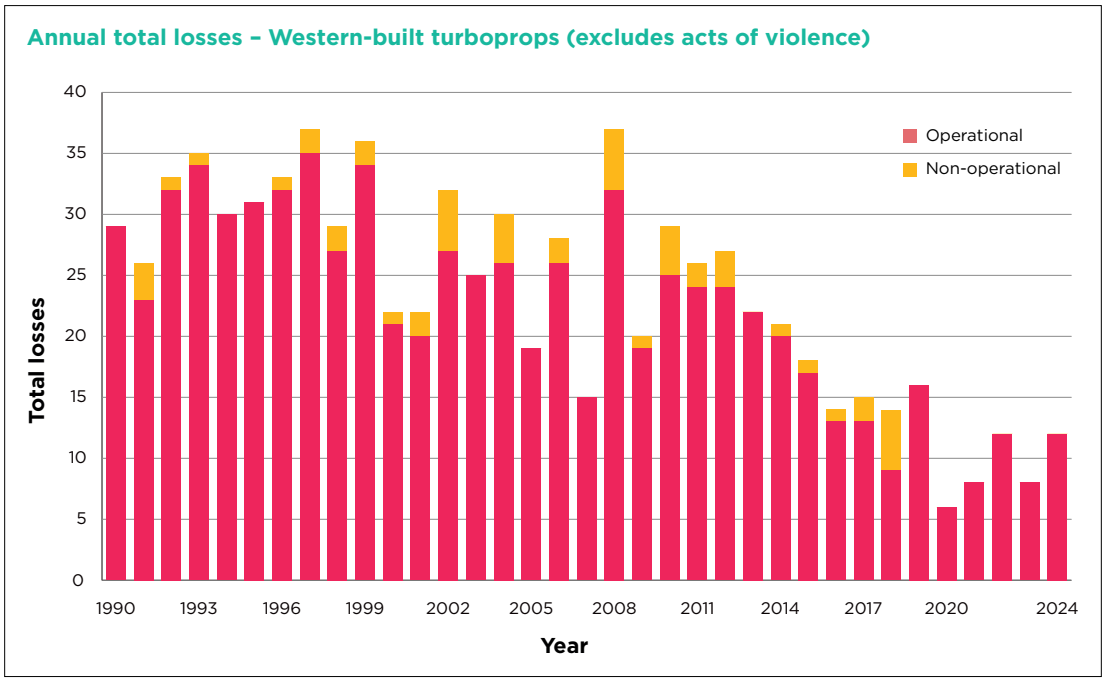
The annual average number of total losses for the last five years was 9.2. The annual average for the last decade was 18.2 (20.1 including non-operational losses), for the 2000s, 23.1 (25.1) and for the 1990s, 30.7 (31.9).

Annual total losses (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operational	17	13	13	9	16	6	8	12	8	12
Non-operational	1	1	2	5	0	0	0	0	0	0
All	**18**	**14**	**15**	**14**	**16**	**6**	**8**	**12**	**8**	**12**

Total losses (Western-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average operational	26.2	27.8	30.7	23.1	18.2
Annual average all	27.7	29.5	31.9	25.1	20.1



The estimated cost of hull claims (total and partial losses) for Western-built turboprops in 2024 is provisionally estimated at about $87 million. This is considerably more than the $22 million estimated for 2023 and is at least twice as much as recorded in other recent years. The annual average for turboprop hull claims for the last five years is $46.2 million, that for the previous decade (2010-2019), $106 million, and for the 2000-2009 decade, $79.2 million. The annual average for the 1990s was $96.5 million.

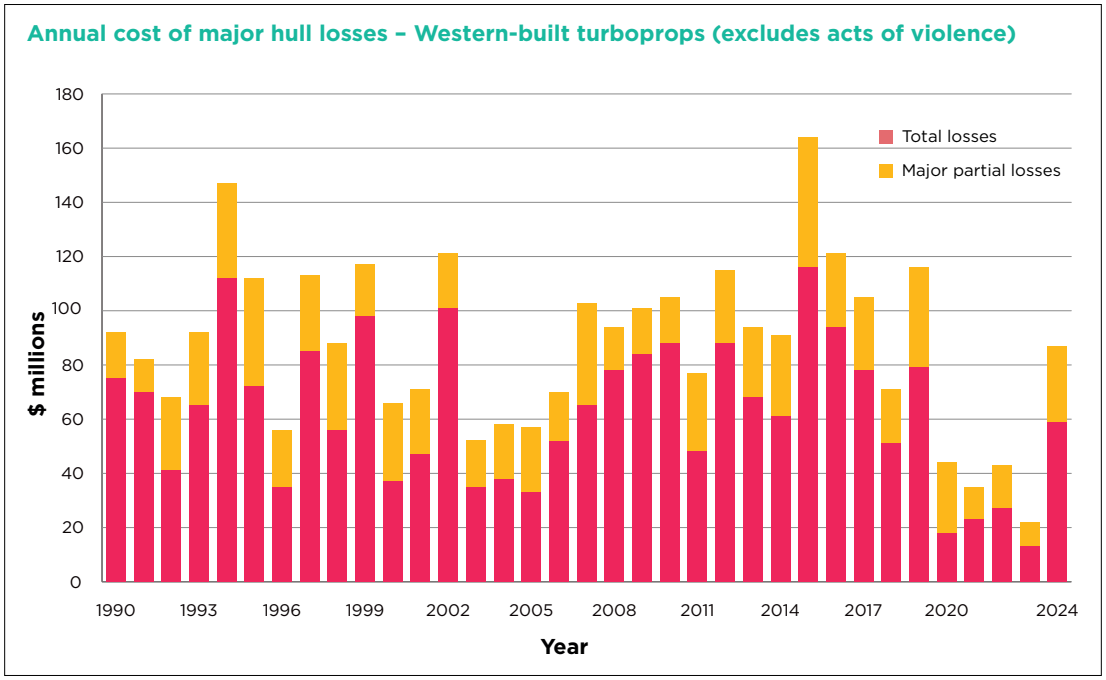
Annual cost of major hull losses $m (Western-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total losses	116	94	78	51	79	18	23	27	13	59
Major partial	48	27	27	20	37	26	12	16	9	28
Spares*	0	0	0	0	0	0	0	0	0	0
Total	**164**	**121**	**105**	**71**	**117**	**44**	**35**	**43**	**22**	**87**

** Spares – significant losses falling on the airline's hull policy only*

Cost of major hull losses $m (Western-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average total losses	24.9	48.8	70.8	56.9	77.2
Annual average major partial	2.9	11.1	25.7	22.3	28.2
All (including spares)	27.8	59.9	96.5	79.2	106.0



Eastern-built jets

The airline-operated fleet of Eastern-built jets suffered one fatal accident during 2024. This is the first year since 2019 that the class has suffered a fatal accident. There was one fatal accident in 2019 and 2018. Prior to that, there were five years, 2013 through to 2017, without a fatal accident. However, the operational Eastern-built jet fleet has reduced very considerably over recent years and these aircraft now account for a very small part of the world's total airline operations. With so little exposure, it is not surprising that the fleet had been relatively loss free in recent years.

The average for the last decade (2010-2019) for the fleet was about one fatal accident per year and one accident about every two years where a revenue passenger was killed, but this mainly reflects the poor experience of the class in the early years of the period. This class has suffered one fatal accident so far during this decade.

Annual fatal accidents (Eastern-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents (all)	0	0	0	1	1	0	0	0	0	1
Fatal accidents (passengers)	0	0	0	1	1	0	0	0	0	0

Fatal accidents (Eastern-built jets) – decade averages

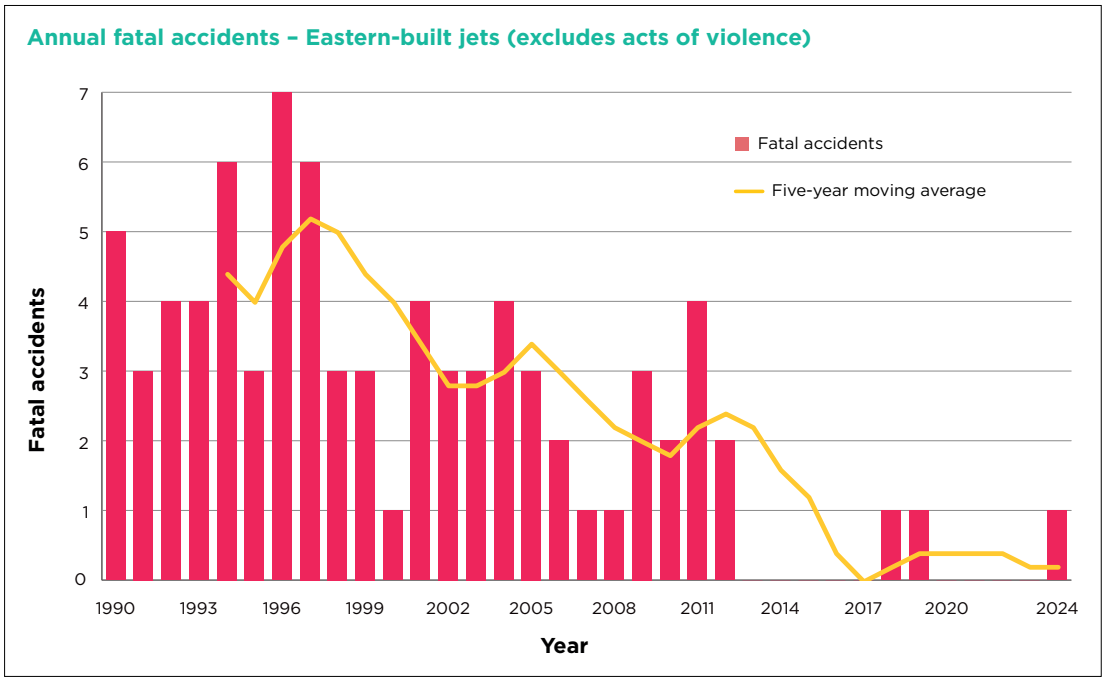
Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Annual average (all)	5.5	3.8	4.4	2.5	1.1
Passenger accidents	4.7	3.5	3.0	1.3	0.5

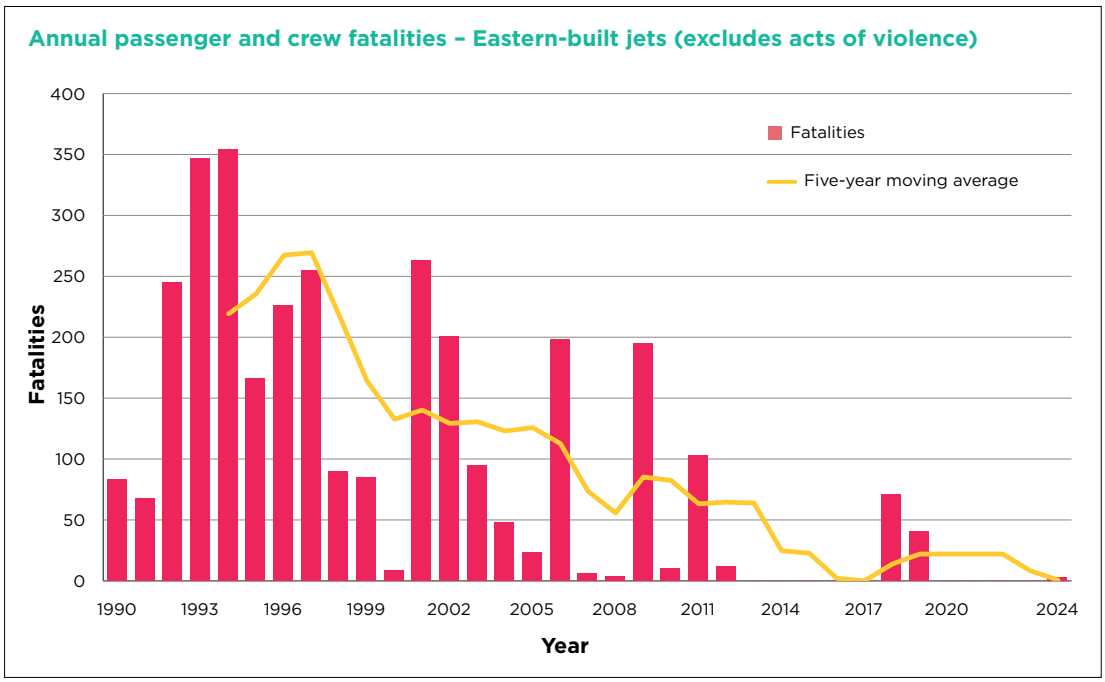
Annual fatalities (Eastern-built jets) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities (all)	0	0	0	71	41	0	0	0	0	3
Fatalities (passenger)	0	0	0	65	40	0	0	0	0	0

Annual fatalities (Eastern-built jets) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
All accidents	234.6	219.7	191.9	104.2	22.9
Passenger accidents	207.0	200.5	155.9	84.5	18.6


Annual fatal accidents – Eastern-built jets (excludes acts of violence)
Fatal accidents
Five-year moving average
Fatal accidents
0
1
2
3
4
5
6
7
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2024
Year


Annual passenger and crew fatalities – Eastern-built jets (excludes acts of violence)
Fatalities
Five-year moving average
Fatalities
0
50
100
150
200
250
300
350
400
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2024
Year

Eastern-built turboprops

Eastern-built turboprops in airline service suffered no known fatal accidents during 2024. This is the second year running that the class has achieved this. These last two years are the first since at least 1970 that the class has not recorded any fatal accidents. In 2022, there were four fatal accidents, six in 2021 and two in 2020. The annual average for the last five years (2020-2024) was 2.4. The annual average for the last decade (2010-2019) was 4.0 and that for the previous decade (2000-2009) was 7.4.

With no fatal accidents in 2024, there were no passenger or crew fatalities in the year. There were also no passenger or crew fatalities in 2023. In 2022, there were 14 passenger and crew fatalities, in 2021, 59 people were killed and in 2020, 12. The annual average for the last five years (2020-2024) was 17.0 fatalities, for the last decade (2010-2019) it was 40.6 and that for 2000-2009, 90.6.

There were no fatal accidents where a revenue passenger was killed in 2024, the same as in 2023, 2022 and 2020. There were 33 passenger fatalities in 2021. The annual average for passenger fatalities for the last five years (2020-2024) was 6.6, for the decade 2010-2019 it was 22.3 and for 2000-2009, 58.6.

Annual fatal accidents (Eastern-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatal accidents (all)	3	2	5	2	3	2	6	4	0	0
Fatal accidents (passengers)	0	0	1	1	0	0	3	0	0	0

Fatal accidents (Eastern-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Fatal accidents (all)	6.6	3.7	5.4	7.4	4.0
Passenger accidents	4.4	2.6	2.4	3.4	1.6

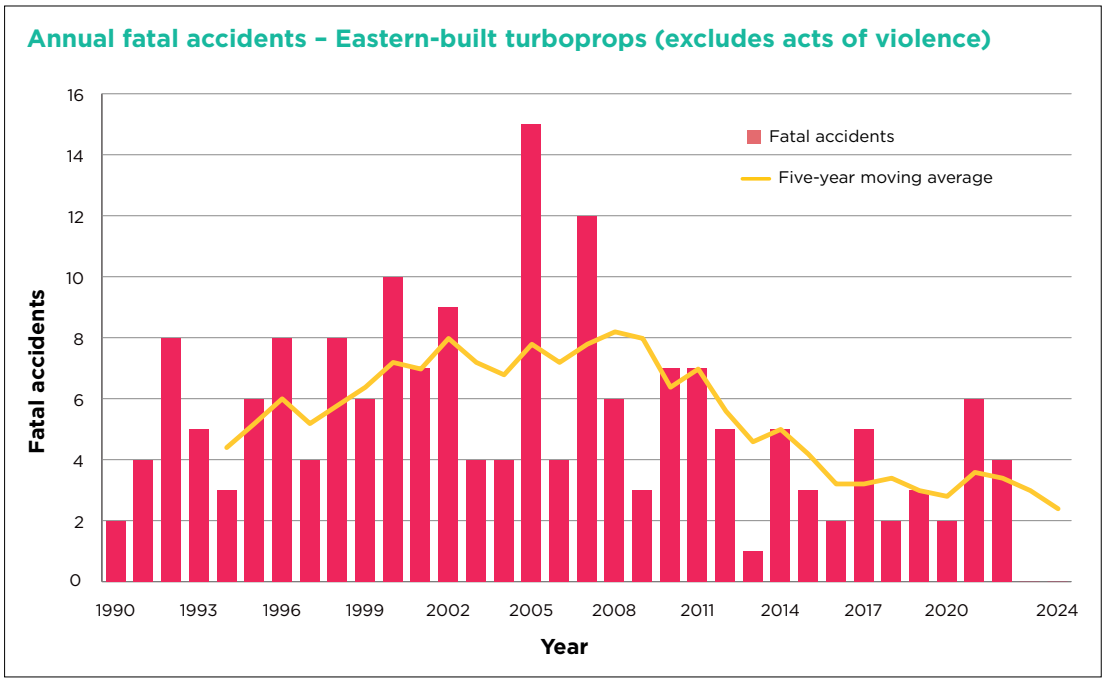
Annual fatalities (Eastern-built turboprops) – 2015-2024

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fatalities (all)	44	10	25	23	8	12	59	14	0	0
Fatalities (passenger)	0	0	4	16	0	0	33	0	0	0

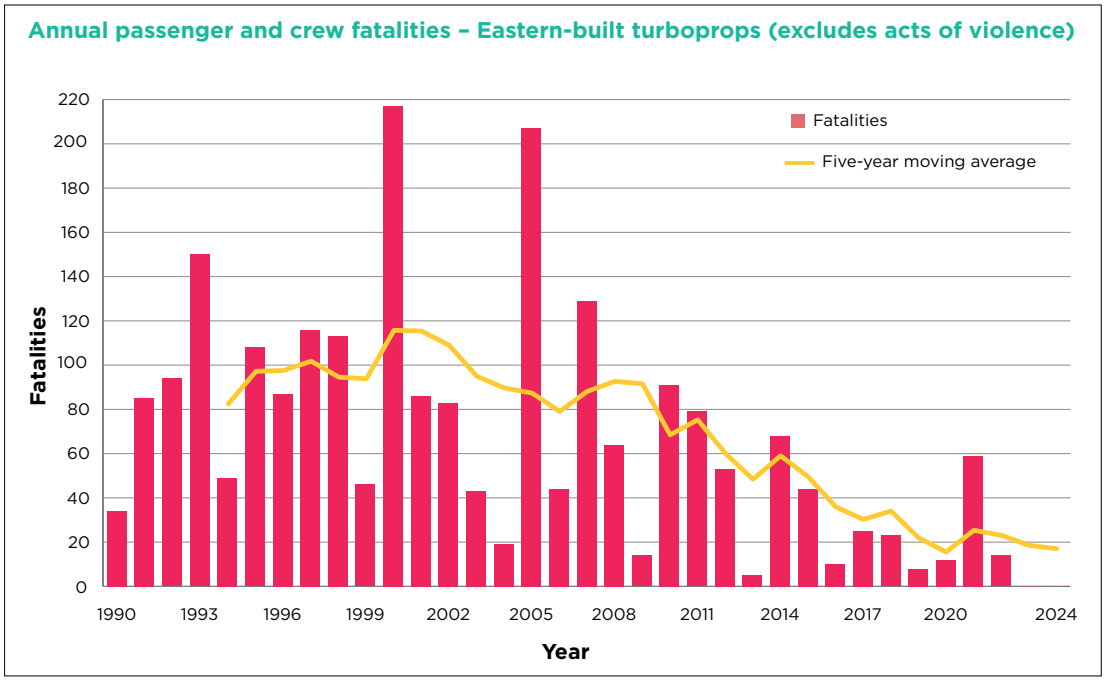
Annual fatalities (Eastern-built turboprops) – decade averages

Period	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
All accidents	212.4	66.4	88.2	90.6	40.6
Passenger accidents	173.6	49.7	55.2	58.6	22.3

Annual fatal accidents – Eastern-built turboprops (excludes acts of violence)



Annual passenger and crew fatalities – Eastern-built turboprops (excludes acts of violence)



War-risk losses

The worst act of violence against civil aviation during the year was the apparent accidental shooting down of an Azerbaijan Airlines Embraer E190 AR (4K-AZ65) by Russian air defence forces in the vicinity of Grozny, Chechnya, Russia. Although badly damaged, the crew were initially able to maintain some control of the aircraft and diverted towards Aktau, Kazakhstan. Unfortunately, control was finally lost while attempting to land at Aktau and the aircraft crashed, killing three of the five crew and 35 of the 62 passengers on board.

Another major event was the attack on Modibo Keita international airport, at Bamako in Mali, allegedly by elements of the self-styled Jama'at Nusrat al-Islam wal Muslimin (Group for the Support of Islam and Muslims) on 17 September. The attack badly damaged a number of aircraft including Mali Presidential Boeing 737 BBJ1 (TZ-PRM) and Awesome Flight Services Beech 1900 (ZS-JAG).

There were also a number of minor events, fortunately without injury, where aircraft were struck by small arms fire, particularly in Haiti, during the year including:

- 17 February – A **Wings Air** ATR 72 (PK-WJT) was struck by small arms fire while on final approach to Dekai, Papua, Indonesia, sustaining minor damage.
- 29 February – A **Sunrise Airways** Airbus A321 (9H-AME) was struck by small arms fire while parked at the gate at Toussaint Louverture international airport, Port-au-Prince, Haiti.
- 11 November – Three aircraft were struck by small arms fire at Port-au-Prince, Haiti sustaining minor damage: an **American Airlines** Boeing 737 Max (N302SA) while landing, a **JetBlue** Airbus A320 (N623JB) during take-off and a **Spirit Airlines** Airbus A320 (N966NK) on approach.
- 15 November – A **Southwest Airlines** Boeing 737 Max (N8744B) was struck by small arms fire during take-off at Love Field, Dallas, Texas.

PAUL HAYES, LONDON, 14 JANUARY 2025

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