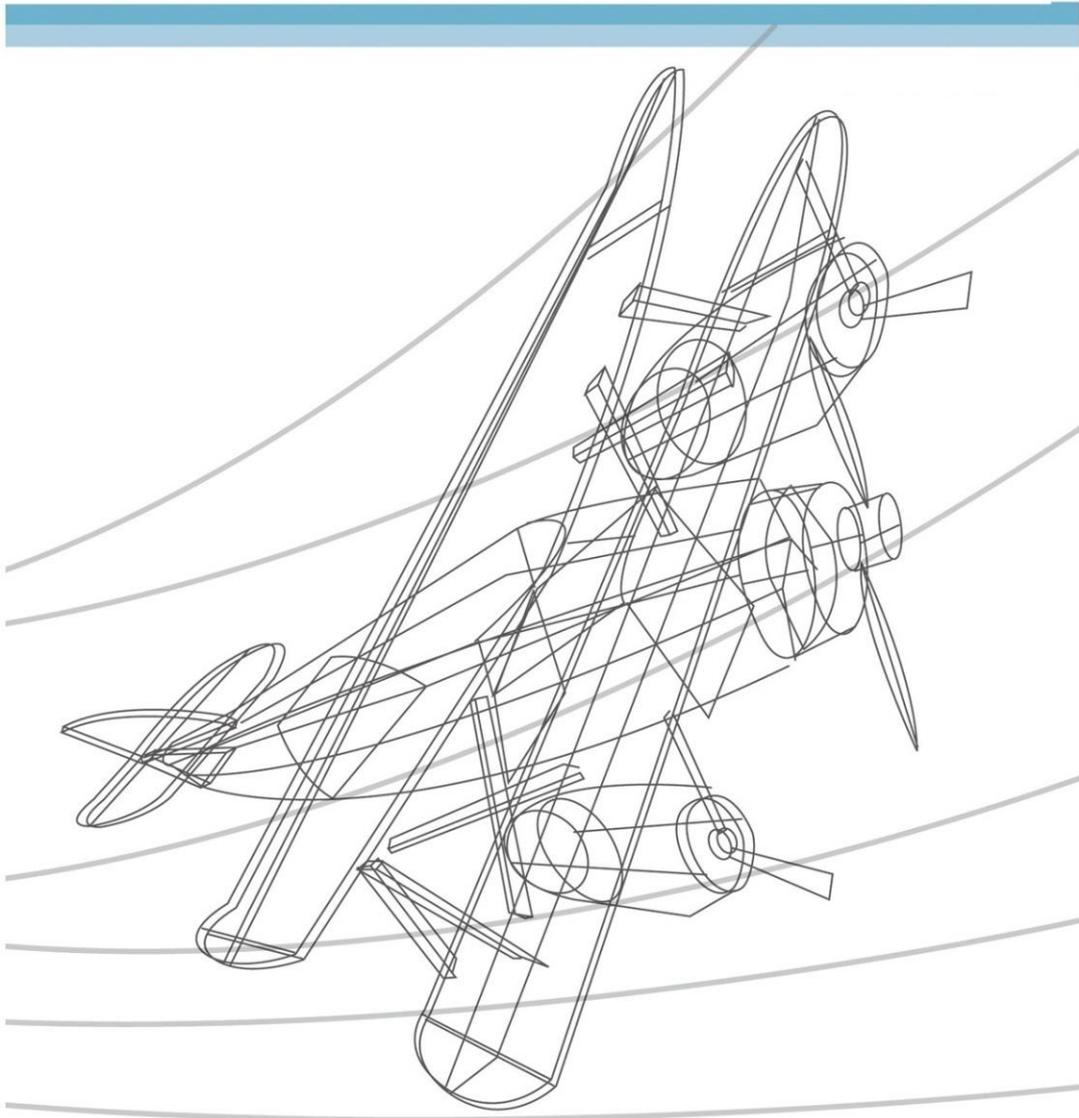


# Taiwan Aviation Occurrence Statistics 2015 – 2024



Taiwan Transportation Safety Board

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## **Abstract**

### **2024 Aviation Occurrence Statistics**

In 2024, nationally registered aircraft were involved in 5 major aviation occurrences, including 1 general aviation aircraft, 1 aircraft operated by the flight training institution, and 3 ultra-light vehicles. No major aviation occurrences were recorded for nationally registered civil air transport carriers, nationally registered helicopters, public aircraft, or drones.

### **Occurrence Statistics from Preceding Decade (2015 to 2024)**

In the preceding decade (2015 to 2024), nationally registered aircraft were involved in 64 major aviation occurrences; civil air transport carriers accounted for 27 of these occurrences, and the remaining were 6 general aviation carrier occurrences, 3 flight training institution occurrences, 17 ultra-light vehicle occurrences, 7 public aircraft occurrences, and 4 drone occurrences. These occurrences resulted in 68 fatalities.

In Taiwan, civil air transport turbojet airplanes have experienced no hull losses or fatalities over the preceding 10 years. Therefore, the 5-year moving averages for the hull loss rate and fatal occurrence rate both remained at 0 and were thus lower than the 2020-2024 global turbojet hull loss and fatal accident rates (which were 0.15 and 0.03, respectively) reported by the International Air Transport Association (IATA).

In Taiwan, one civil air transport turboprop airplane (TransAsia Airways GE235) occurrence led to hull loss and fatalities in 2015. Therefore, the 5-year moving average of the hull loss rate was 3.02 occurrences per million departures in 2019; the same is true for the fatal occurrence rate. Furthermore, since 2020, the 2015 GE235 occurrence has not been included in the moving average, and thus the 5-year moving average for 2016-2020 for both the total hull loss and fatal occurrence rates dropped to 0. Owing to the absence of hull loss or fatal occurrences from 2021 to 2024, the 5-year moving average for the 2017-2021, 2018-2022, 2019-2023, and 2020-2024 total hull loss and fatal occurrence rates remained at 0, better than the 5-year moving average for global turboprop hull loss and fatal accident rates reported by IATA for the same period. The 2020-2024 IATA hull loss rate was 1.37 occurrences per million departures, and the fatal occurrence rate for the same period was 0.67.

Over the past decade, of the 27 major aviation occurrences involving Taiwan's civil air transport carriers, 7 met the International Civil Aviation Organization's (ICAO) definition of an accident. Among these accidents, 4 involved turbojets and collectively resulted in severe injuries to 4 people; the other 3 involved turboprops and included 1 accident resulting in hull loss, 43 fatalities, and 14 people with severe injuries. In

addition, according to the ICAO flight phase taxonomy, 12 of these 27 major aviation occurrences took place in the en-route phase and 12 took place in the landing phase, both accounting for the highest number. According to the ICAO occurrence categories, the highest number by category was 6 that involved runway excursions (RE), followed by 5 that involved system/component failure to the non-powerplant (SCF-NP). Furthermore, according to the classification of occurrence causes/factors by the U.S. National Transportation Safety Board (NTSB), most of these occurrences had human-related causes (63%), followed by those with environment-related causes (40.7%) and then those with aircraft-related causes (25.9%).

In terms of nationally registered general aviation carrier aircraft, 2 hull loss occurrences, all resulting in fatalities, occurred in the preceding 10-year period. The 5-year moving average of hull loss and fatal occurrence rates exhibited a peak of 1.21 occurrences per 10,000 flights in 2019. From 2020, the moving average began to fall, and the 5-year moving average of hull loss and fatal occurrence rates dropped to 0 from 2022 to 2024.

Nationally registered helicopters<sup>1</sup> were involved in 2 hull loss occurrences in the 10-year period in question, both of which resulted in fatalities. The 5-year moving average of hull loss and fatal occurrence rates peaked during 2015-2019 at 2.86 occurrences per 10,000 flight hours, or 3.40 occurrences per 10,000 departures, and dropped to 1.42 occurrences per 10,000 flight hours, or 1.78 occurrences per 10,000 departures in 2016–2020. However, in 2021, the 5-year moving average rose slightly to 1.55 occurrences per 10,000 flight hours, or 1.91 occurrences per 10,000 departures due to a decrease in flying hours and departures. From 2022 to 2024, the 5-year moving average of hull loss and fatal occurrence rates fell to 0.

Taiwan's public aircraft were involved in 3 hull loss occurrences and 4 fatal occurrences in the 10-year period in question. The 5-year moving average of hull loss and fatal occurrence rates began rising in 2019. The hull loss rate in 2020 peaked at 0.93 occurrences per 10,000 flight hours, or 1.32 occurrences per 10,000 departures. Since then, it has declined every year and fell to 0.31 times per 10,000 flight hours, or 0.42 times per 10,000 departures, in 2024. The fatal occurrence rate increased slightly in 2019 and peaked at 1.24 occurrences per 10,000 flight hours, or 1.76 occurrences per 10,000 departures, in 2020. Since then, it has gradually declined every year. The 5-year moving average of fatal occurrence rates dropped to 0 from 2023 to 2024.

Taiwan's ultra-light vehicles were involved in 17 major aviation occurrences in the 10-year period in question. Of these occurrences, 14 led to hull loss, and 6 were fatal, resulting in 10 deaths in total. This demonstrates that the safety of ultra-light vehicles

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<sup>1</sup> These figures do not include public helicopters.

merits attention as a safety issue.

Taiwan's drones were incorporated into the investigative scope of the Taiwan Transportation Safety Board (TTSB) in April 2019. As of the end of 2024, 4 major aviation occurrences involving drones have taken place; 3 of these drones experienced total hull loss, and 1 was declared missing. None of these occurrences led to fatalities.

### **Safety Recommendation Statistics of Previous Years**

From the establishment of the Aviation Safety Council (the organization before restructuring to the TTSB) in 1998 to the end of 2024, 144 major aviation occurrence reports were published and 1,106 safety recommendations were proposed. The greatest proportion of the recommendations was targeted at government-affiliated agencies (approx. 52.8%), followed by aviation operators (approx. 36.3%) and then international institutions (approx. 10.9%). Of the 1,106 safety recommendations to improve transportation safety, 99.5% has been closed, and the remaining 0.5% are 3 cases with action plans under Executive Yuan supervision.

## Introduction

The first section of this report summarizes the operations of nationally registered aircraft in 2024 and over the preceding 10 years (2015-2024). The topics covered include domestic airlines and their numbers of aircraft, civil air transport carriers, general aviation carriers, ultra-light vehicles, drones, flight training organizations, free balloons, and public aircraft in Taiwan.

The second section, which is the focus of this year's aviation safety statistics report, offers a general overview of the statistics and analyses of aviation occurrences. The section begins with a basic introduction of the data sources, definitions, and classifications adopted in this report. The main content includes a summary of major aviation occurrences involving nationally registered aircraft in the preceding decade, as well as statistics related to major aviation occurrences involving nationally registered civil air transport carriers, nationally registered general aviation carriers, nationally registered helicopters, Taiwan's public aircraft, ultra-light vehicles, and drones.

The third section tracks and controls the progress of transportation safety recommendations and action plans and covers the categorization of historical improvement suggestions, their corresponding statistics, the handling status of action plans, etc.

This report was compiled using civil aviation jargon and statistical terms that are commonly used by international organizations; relevant definitions and descriptions are provided in the appended glossary.

## I. Operational Overview of Nationally Registered Aircraft<sup>2</sup>

### 1.1 Domestic Airlines and Numbers of Aircraft

In the past 10 years (2015-2024), from 9 Taiwan civil air transport carriers in operation in Taiwan in 2015, multiple domestic airlines have entered and exited the market since then. These activities include the deregistration of SunRise Airlines and V Air as civil air transport carriers in 2015 and 2017, respectively. In 2018, TransAsia Airlines declared bankruptcy, and Emerald Pacific Airlines was registered as a civil air transport carrier. Starlux Airlines was established in 2019. The MOTC revoked the air operator certificate of Far Eastern Air Transport in 2020. At the end of 2024, 8<sup>3</sup> domestic airlines were engaged in the civil air transport business (2<sup>4</sup> of which provided helicopter transportation services).

In the past 10 years, Taiwan's general aviation carriers numbered 11 in 2015. Market changes during the intervening years included the deregistration of SunRise Airline's general aviation license for civil aviation in 2017, the registration of TDA Air in 2019, the launch of Sky Vision in 2020, and the deregistration of TDA Air's general airlines license and the registration of Strong Aviation and RealWorld Aviation in 2021; the MOTC's cancellation of the aviation license of Lala Land, Great Wing Airline, and Roc Aviation Co. and the launch of APEX in 2022; and the registration of Ginger Aviation, MetaStar Airlines, and HeliService Taiwan in 2024. As of the end of 2024, 14<sup>5</sup> domestic airline were engaged in the general aviation business.

3 airlines<sup>6</sup> in Taiwan are both civil air transport carriers and general aviation carriers; therefore, Taiwan has 19 nationally registered airlines in total. The fluctuating number of nationally registered airlines from 2015 to 2024 in Taiwan is depicted in Figure 1. The operational overview indices over the preceding 10 years are presented in Appendix 1.

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<sup>2</sup> The statistics presented in this section mainly reference the Ministry of Transportation and Communications annual transportation reports, the Civil Aeronautics Administration's annual reports on civil air transportation statistics, and data provided by the National Airborne Service Corps.

<sup>3</sup> These carriers were China Airlines, EVA Air, Mandarin Airlines, Uni Air, Tigerair Taiwan, Starlux Airlines, Emerald Pacific Airlines, and Daily Air.

<sup>4</sup> In addition to operating scheduled and nonscheduled transport services on domestic offshore and outlying air routes, Daily Air operates scheduled and nonscheduled helicopter transport services on domestic routes. Emerald Pacific Airlines also operates helicopter transport services on domestic routes.

<sup>5</sup> These companies were Daily Air, Emerald Pacific Airlines, Aerospace Industrial Development Corporation, Win Air, Executive Aviation, EVA Air, SkyRainbow Airlines, Sky Vision, Strong Aviation, RealWorld Aviation, APEX, Ginger Aviation, MetaStar Airlines, and HeliService Taiwan.

<sup>6</sup> These three airlines are Daily Air, Emerald Pacific Airlines, and EVA Air.

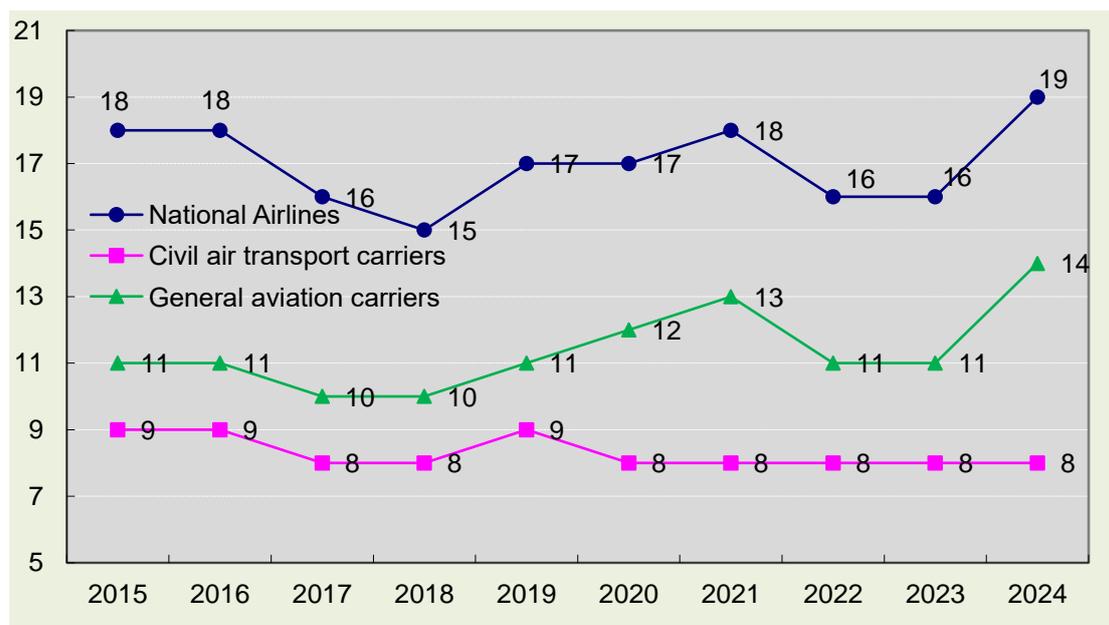


Figure 1 Numbers of civil air transport and general aviation carriers

Over the past 10 years, the number of airworthy aircraft registered in Taiwan has increased steadily mainly because of airlines expanding their fleets and the continual introduction of hot air balloons in Taiwan,<sup>7</sup> from 255 in 2015 to 278 in 2019. Subsequently, the closure of Far Eastern Air Transport in 2020 lowered the number of airworthy aircraft. In 2022 and 2024, 12 aircraft and 5 aircraft were registered by Starlux, respectively, increasing the number of airworthy aircraft, as shown in Figure 2. At the end 2024, Taiwan had 293 airworthy aircraft and 310 registered aircraft.

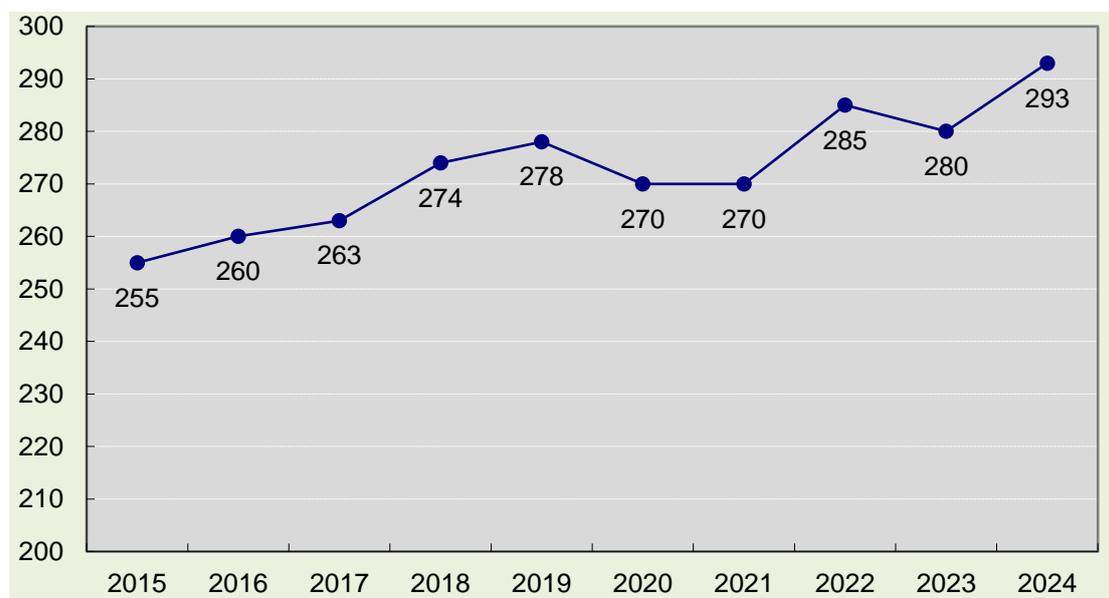


Figure 2 Number of airworthy aircraft in airline fleets

<sup>7</sup> This number covers only aircraft owned by civil air transport and general aviation carriers and does not include public aircraft, ultra-light vehicles, or drones.

## 1.2 Civil Air Transport Carriers

### Passenger Transportation

In 2024, with the reduced impact of the COVID-19 pandemic, Taiwan's civil air transport carriers carried approximately 36.97 million passengers, up from approximately 31.36 million passengers in 2023, a 1.2-fold increase. In addition, approximately 31.77 million passengers traveled on international and cross-strait routes, accounting for 85.9% of all passengers in 2024, a 1.2-fold increase from 2023. 5.20 million passengers traveled on domestic routes in 2024, accounting for 14.1% of all passengers, a 5.3% increase from 2023.

Figure 3 presents trends related to Taiwan's civil air transport passengers from 2015 to 2024. During the 10-year period, the overall number of passengers increased from approximately 33.93 million in 2015 to a peak of approximately 38.52 million in 2019 before declining markedly to 10.22 million in 2020 as a result of the COVID-19 pandemic. This number then further dropped to 3.79 million passengers in 2021, but rose to 9.06 million in 2022, soared to 31.36 million in 2023, and further increased to 36.97 million in 2024. In the same period, passengers taking international and cross-strait routes increased on a yearly basis from approximately 29.04 million in 2015 to a peak of approximately 32.41 million in 2019. This number also declined markedly to 5.19 million in 2020 and plummeted to just 520,000 in 2021; the number rose to 4.22 million in 2022, soared to 25.86 million in 2023, and further increased to 31.77 million in 2024. Finally, approximately 4.89 million passengers traveled on domestic routes in 2015. This number rose to a peak of approximately 6.11 million in 2019 before dropping to 5.03 million in 2020 and 3.27 million in 2021, then rising to 4.85 million in 2022 and 5.49 million in 2023, and finally dropping to 5.2 million in 2024.

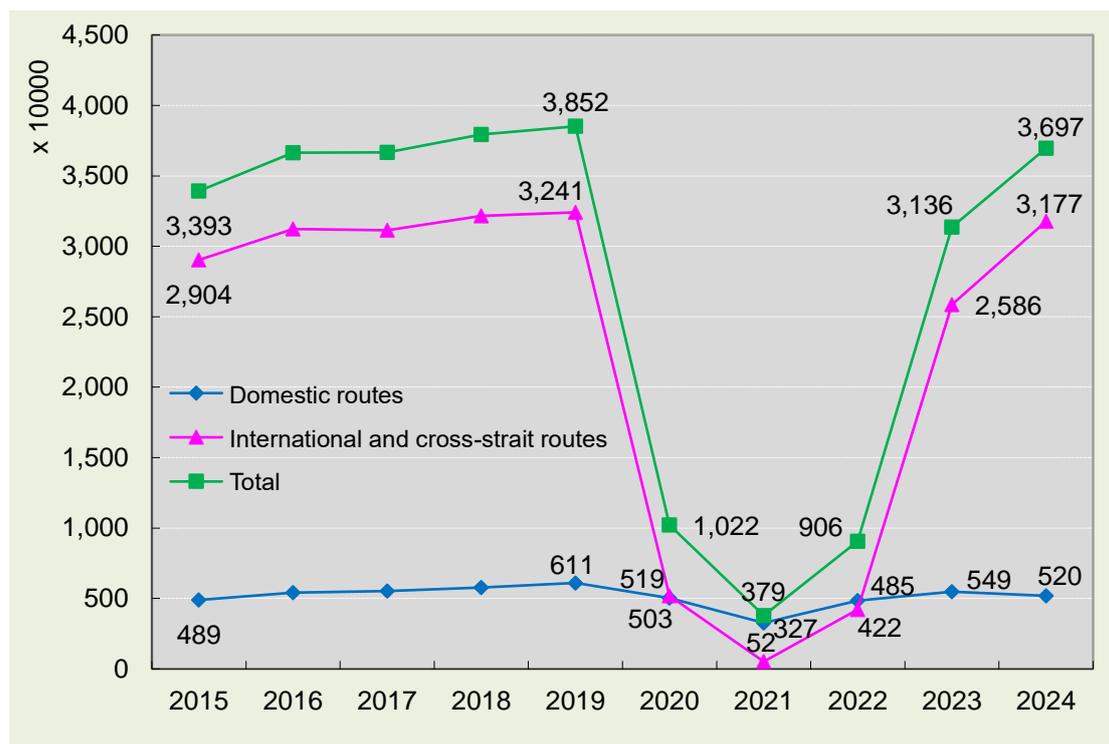


Figure 3 Civil air transport passenger numbers

### **Freight**

In 2024, Taiwan's civil air transport carriers transported approximately 21.83 million tons of air cargo, a 5% increase from 2023. Furthermore, approximately 21.35 million tons of air cargo was transported on international and cross-strait routes, far surpassing the amount of air cargo on domestic routes and accounting for 97.8% of all transported air cargo, a 5.2% increase from 2023. By contrast, only approximately 48,000 tons of air cargo were carried on domestic routes, accounting for 2.2% of all air cargo and resulting in a 4% decrease from 2023.

Figure 4 presents trends in air freight carried by Taiwan's civil air transport carriers from 2015 to 2024. The overall cargo load increased from approximately 16.44 million tons in 2015 to a peak of approximately 2.68 million tons in 2021, then dropped to approximately 2.08 million tons in 2023 and rose to approximately 2.183 million in 2024; the 10-year growth rate was 32.8%. International and cross-strait routes transported approximately 1.604 million tons of cargo in 2015. After substantial growth in 2017, an all-time high of approximately 2.647 million tons of air freight was transported in 2021, then dropped to approximately 2.03 million tons in 2023 and rose to approximately 2.135 million tons in 2024; the 10-year growth rate was 33.1%. After transporting approximately 40,000 tons of cargo in 2015, domestic routes exhibited a small decline but rose to approximately 50,000 tons in 2023, then fell to approximately 48,000 tons in 2024. The total cargo tonnage was comparable over the 10-year period.

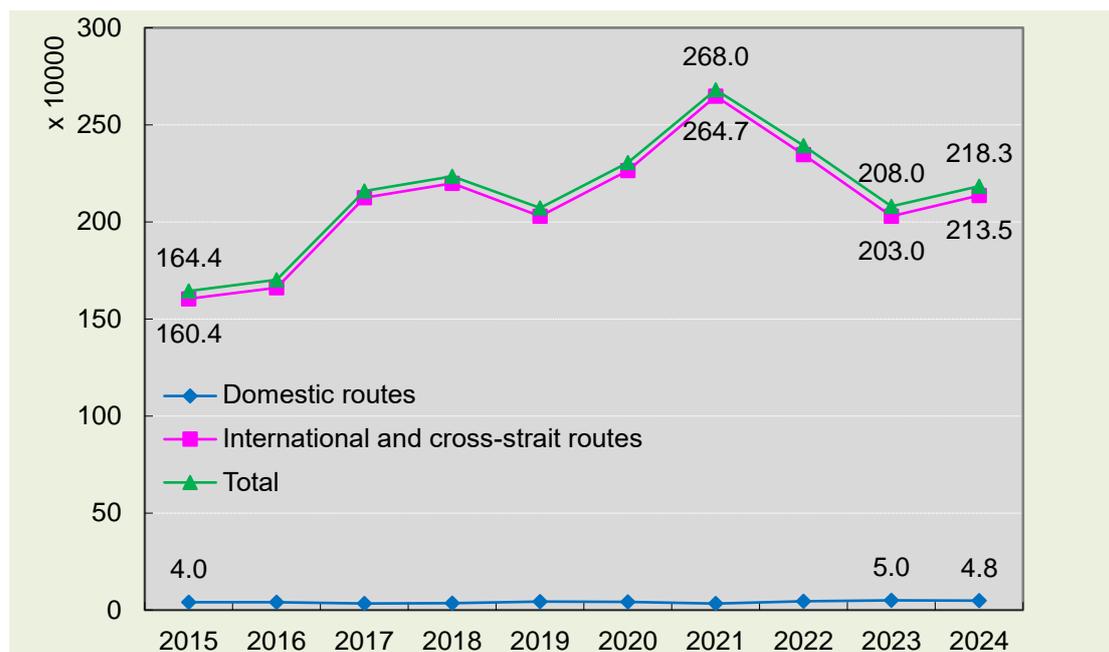


Figure 4 Air freight carried by national civil air transport carriers

### Number of Flights

Taiwan's civil air transport carriers operated approximately 248,900 flights in 2024, a 14.4% increase from 2023. Approximately 171,600 of these flights were international and cross-strait routes, which accounted for 68.9% of all flights, a 20.6% increase from 2023. Approximately 77,300 flights were operated on domestic routes, accounting for 31.1% of all flights, a 2.8% increase from 2023.

Next, Figure 5 depicts trends of flights operated by Taiwan's civil air transport carriers from 2015 to 2024. Over the 10-year period, the total number of flights amounted to approximately 252,500 flights in 2015, and increased steadily on a yearly basis prior to the pandemic period. Despite a decline in 2017, the total number of flights peaked at approximately 273,600 flights in 2019 before undergoing a massive drop to approximately 165,800 flights in 2020 due to the global pandemic. The number then dropped further to approximately 132,900 flights in 2021, increasing to approximately 157,100 flights in 2022, approximately 217,500 flights in 2023, and further to approximately 248,900 flights in 2024. The number of flights on international and cross-strait routes increased from approximately 168,100 in 2015 to a peak of approximately 178,800 flights in 2016 and then dropped to 86,100 flights in 2020. This number then further decreased to 77,500 flights in 2021. In 2022, the number increased to approximately 83,000 flights. In 2023, it rose to approximately 142,300 flights. In 2024, it further rose to approximately 171,600 flights. The number of flights operated on domestic routes was approximately 84,500 in 2015 and demonstrated an overall moderate upward trend prior to the COVID-19 pandemic, peaking at approximately 98,900 in 2019. This number then dropped to 79,700 in 2020 and 55,400 flights in 2021.

The number of flights rose to approximately 74,100 in 2022, approximately 75,200 in 2023, and further to approximately 77,300 in 2024.

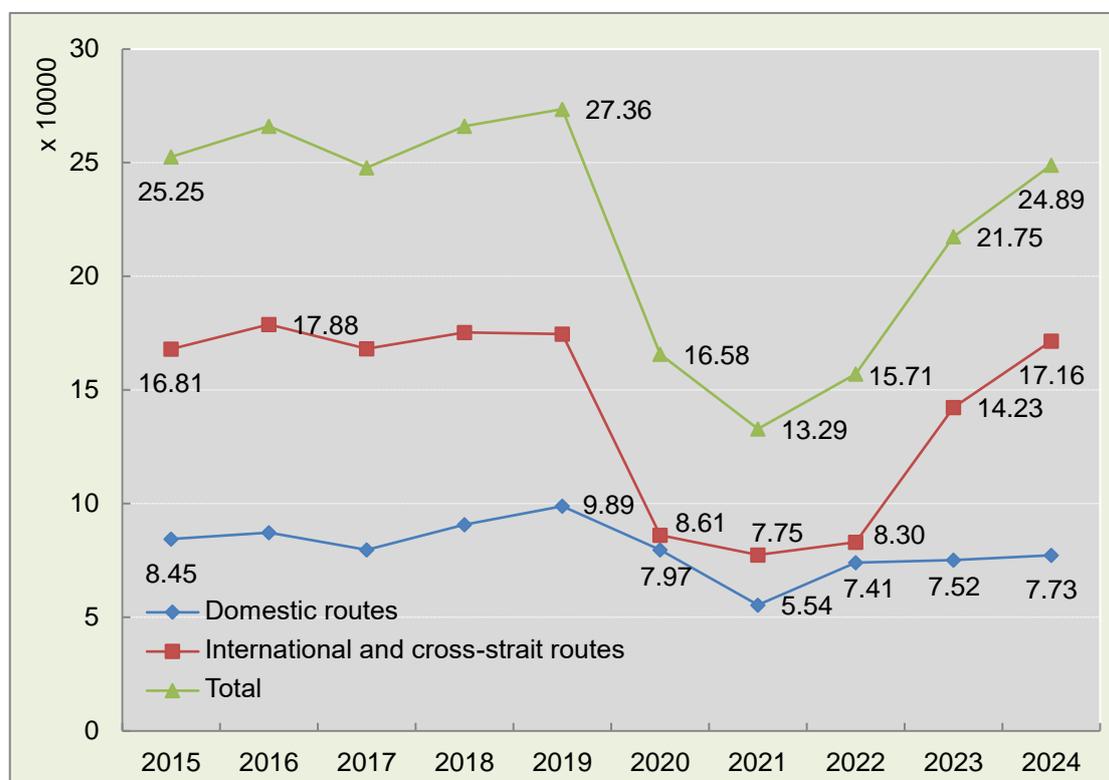


Figure 5 Flights operated by civil air transport carriers

### 1.3 General Aviation Carriers

Taiwan's general aviation carriers logged a total of 5,708.85 flight hours in 2024, an 18.9% increase from 2023. Trends in the flight hours of Taiwan's general aviation carriers from 2015 to 2024 is as shown in Figure 6<sup>8</sup>. Over the 10-year period in question, the number of flight hours of general aviation carriers plunged to the lowest value at 1,367.2 hours in 2017, followed by a sharp increase to a high of 5,476.7 hours in 2018 and then a modest decline over the 2 years that followed, before rising again. The overall 10-year increase rate is 177.7%.

<sup>8</sup> The general aviation carrier flight hours reported in the Civil Aeronautics Administration's (CAA) 2017 Civil Aviation Statistics listed only the flight hours of Daily Air and Emerald Pacific Airlines and not those of other general aviation carriers.

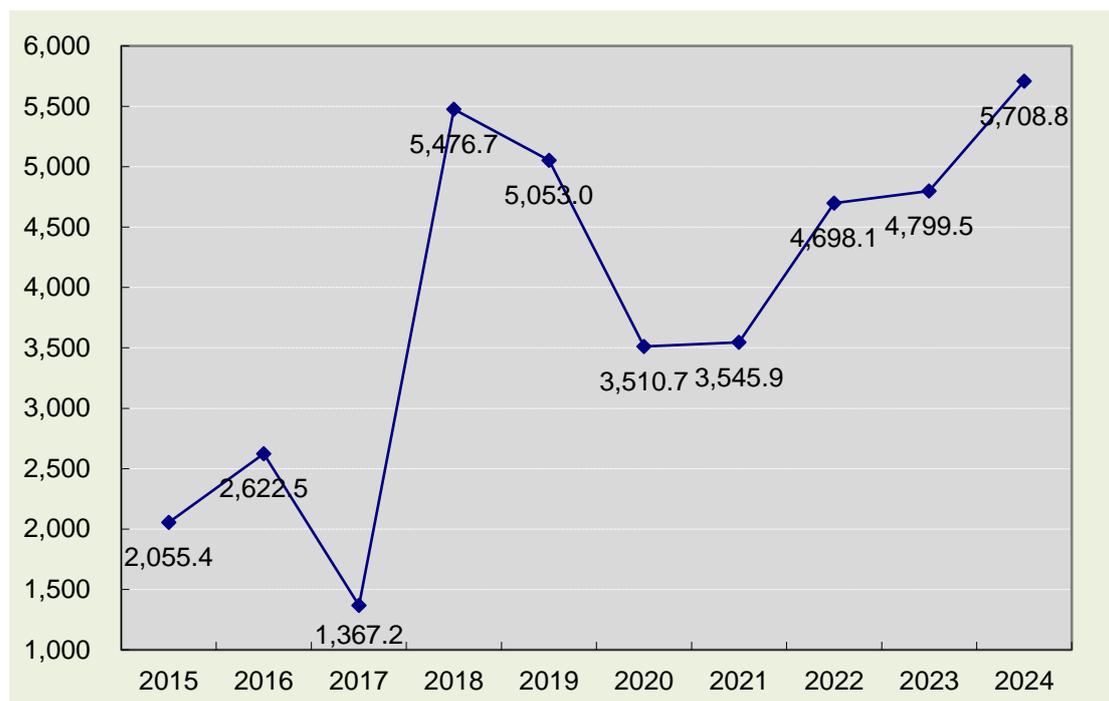


Figure 6 Flight hours logged by general aviation carriers

## 1.4 Ultra-Light Vehicles

The Ministry of Transportation and Communications amended the Civil Aviation Act in 2003 to include ultra-light vehicles. In 2004, regulations regarding ultra-light vehicles were promulgated to officially incorporate ultra-light vehicles into the ministry's oversight procedures.

By the end of 2024, the CAA had announced 21 airspaces for ultra-light vehicles, 10 approved active airspaces, 6<sup>9</sup> airfields available for legal flying activities, and 8<sup>10</sup> groups that could legally engage in flying activities with ultra-light vehicles. A total of 64 ultra-light vehicles passed inspection.

## 1.5 Drones

On April 25, 2018, the Ministry of Transportation and Communications amended the Civil Aviation Act to include drones to come into effect on March 31, 2020.

The TTSB amended the Transportation Occurrences Investigation Act on April 24, 2019, to incorporate national drones into its scope of investigation. Matters to be reported by the owner or operator of the drone to government authorities are stipulated

<sup>9</sup> These spaces are located in Huatong, Hualien County; Jiho, Pingtung County; Wang'an, Penghu County; Matai'an River, Hualien County; Wuri, Taichung City; and Shunfeng, Changhua County.

<sup>10</sup> These groups are the Hualien Ultra-light Sports Association, Taiwan Recreational Aviation Association, Chinese Taipei Aviation League, Chinese Taipei Aerosports Federation, Chinese Taipei Powered Paragliding Association, Hualien Aeronautic Association, Taiwan Taiya Aeronautical Tourism and Development Association, and Shun Feng Flying Club.

in the Regulation Governing the Handling of Investigation Procedures for Drone Occurrence, promulgated March 4, 2020.

As of the end of 2024, 38,683 drones had been registered with the CAA, of which 10,176 belonged to legal entities and 28,507 belonged to natural persons.

## **1.6 Flight Training Institutions**

APEX Flight Academy was established on September 24, 2014, and was Taiwan's first flight academy to pass the CAA's five-stage review process. APEX's flight operations and maintenance base and training facilities are located at Taitung Fongnien Airport and feature academic and technical training facilities. Moreover, the flight academy employs single- and twin-engine flight training airplanes and flight simulators to provide its students with comprehensive academic and technical training.

APEX Flight Academy was renamed Apex Aviation Co., Ltd. in 2022, and the flight academy became its affiliated unit. As of the end of 2024, APEX had 11 registered aircraft, and all 11 were airworthy.

## **1.7 Free Balloons**

Free balloons (including free air balloons and hot air balloons) are lighter-than-air passenger vehicles that are not propelled by machinery and whose ascent and descent are controlled by ballast and buoyant gas. Consistent with international practices, free balloons are considered "standard aircraft," and in the Aircraft Flight Operation Regulations, the CAA further distinguishes free balloons by operation mode into "free balloon flight operations" and "free balloon tethered activities."

As of the end of 2024, 26 free balloons had received certificates of registration in Taiwan; 19 of these balloons were airworthy.

## **1.8 Public Aircraft**

In the past, according to variations in mission requirements, public aircraft used by Taiwan's government agencies belonged to the Ministry of Transportation and Communications (MOTC), the Ministry of the Interior, or the Coast Guard Administration. In June 2005, the National Airborne Service Corps (NASC) was formally established under the Executive Yuan, merging the Airborne Squadron of the National Police Agency, the Preparatory Office of the Airborne Fire Fighting Squadron of the National Fire Agency, the Aviation Team of the CAA of the MOTC, and the Air Patrol Squadron of the Coast Guard Administration. The NASC consolidates the planning and implementation of air search and rescue, disaster relief, emergency medical services, reconnaissance and patrol, and transportation over both land and sea.

As of the end of 2024, the NASC had 23 aircraft, namely 22 helicopters and 1

fixed-wing aircraft. The number of flights and flight hours logged by the NASC over the 10-year period in question, based on statistics provided by the NASC (Appendix 2), are shown in Figure 7. Over the past 10 years, the number of flight hours and the number of flights show a fluctuating trend; both the number of flights and flight hours decreased in 2024 compared to 2023.

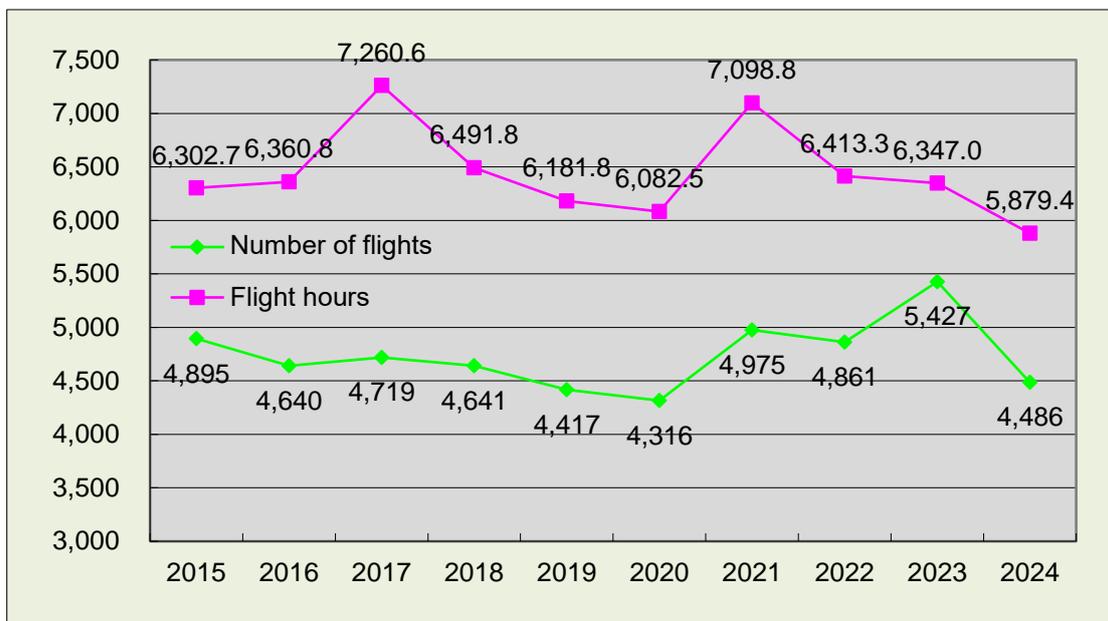


Figure 7 Number of flights and flight hours logged by NASC aircraft

## II. Statistical Analysis of Major Aviation Occurrences Involving Nationally Registered Aircraft

### 2.1 Basic Description

#### Data Source

The data presented in this section were derived from the TTSB's investigational reports on major aviation occurrences, statistics related to aviation safety reported by the CAA, statistics compiled by the NASC, annual safety reports released by the International Air Transport Association (IATA), and annual safety reports published by the International Civil Aviation Organization (ICAO).

#### Definitions and Classifications

The aviation terminology used in this report is defined mainly based on reference to the Civil Aviation Act, the Aircraft Flight Operation Regulations, the Transportation Occurrences Investigation Act, the Regulation Governing the Handling of Investigation Procedures for Civil and Public Aircraft Occurrence, the standard operating procedures for investigation of major aviation occurrences, and IATA and ICAO documents (see appendices).

To facilitate comparisons with international occurrence statistics, statistical analyses of civil air transport occurrences were performed according to the classification methods of the IATA<sup>11</sup>, ICAO, and U.S. National Transportation Safety Board (NTSB) as detailed as follows:

- IATA guidelines were used to calculate the hull loss and fatal occurrence rates of civil air transportation turbojet and turboprop aircraft with a maximum takeoff weight of 5,700 kg or above, using per million departures<sup>12</sup> over 5 consecutive years as the statistical basis.
- According to the IATA, "hull loss" refers to destruction or substantial damage to an aircraft that is deemed too costly to repair and the cost of repairs exceeds the commercial value of the aircraft. A "fatal accident" is an accident that results in the death of at least one person on board.
- In-flight deaths attributed to natural causes or illness were not included in the calculation of passenger fatalities.
- The ICAO's definitions of "accident," "flight phase," and "occurrence

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<sup>11</sup> Data on incident rates released by the CAA use the same categories as those released by the IATA alongside a 5-year moving average to calculate the hull loss rate of civil air transport turbojet and turboprop airplanes with a maximum takeoff weight of 5,700 kg.

<sup>12</sup> Since 2015, the IATA has provided only data related to global departures, not those related to flight times. From 2022, IATA provides combined departures for turbojet and turboprop airplanes globally, not separate departure figures.

taxonomy" were employed for the classification and statistical analysis of Taiwan's major aviation occurrences during the 10-year period in question.

- The NTSB's classification for causes and factors of accidents was used in the categorization and statistical analysis of Taiwan's major aviation occurrences during the 10-year period in question.

This section includes the 5-year moving averages of hull loss and fatal occurrence rates for Taiwan's public aircraft, general aviation carriers, and nationally registered helicopters. No comparative international statistics were available; thus, these aviation categories are discussed in this paper mainly on the basis of observed trends.

The aviation occurrence rates presented in this report are limited to nationally registered aircraft, including the following:

- Nationally registered civil air transport turbojet airplanes (Maximum takeoff weight of 5,700 kg or above; see Table 1)
- Nationally registered civil air transport turboprop airplanes (Maximum takeoff weight of 5,700 kg or above; see Table 2)
- Nationally registered general aviation aircraft (Excluding hot air balloons, see Table 3)
- Nationally registered helicopters (See Table 4)
- Public aircraft (See Table 5)

Table 1 Civil air transport turbojet airplane models

AIRBUS	BOEING
A320/321	737
A330	747
A350	777
	787
	MD-82/83

Table 2 Civil air transport turboprop airplane models

ATR	DE HAVILLAND (BOMBARDIER)
ATR72	DHC-6

Table 3 General aviation carrier aircraft models

Airplanes		Helicopter
A318/319	DA-40NG/42NG	AW169
ASTRA-SPX	EMB-505	BELL-206
BD-700	G550	BELL-407
BEECH SUPER KING AIR 350/360	G650	BK-117
BN-2	CL-605	
Cessna 208B	P2012	
CE-525	P68C	

Table 4 Nationally registered helicopter models

AW169	BELL-206	BELL-407	BK-117
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Table 5 Public Aircraft Models

Airplanes	Helicopter
BEECH-350	AS-365
	UH-60M

## 2.2 Overview of Major Aviation Occurrences

Nationally registered aircraft were involved in 5 major aviation occurrences in 2024, without causing any fatalities. Among these, there were 1 general aviation carrier; 1 flight training institutions; and 3 ultra-light vehicles. 2 vehicles suffered substantial damage and 1 vehicle experienced total hull loss, as shown in Table 6.

Table 6 Major aviation occurrences involving nationally registered aircraft in 2024

Category	Aviation occurrences			Fatalities	
	Total cases	Fatal occurrences	Hull loss or missing	Total people	People on board
Nationally registered civil air transport turbojet airplanes	0	0	0	0	0
Nationally registered civil air transport turboprop airplanes	0	0	0	0	0
Nationally registered civil air transport aircraft (total)	0	0	0	0	0
Nationally registered general aviation aircraft	1	0	0	0	0
Flight training institutions	1	0	0	0	0
Free balloons	0	0	0	0	0
Ultra-light vehicles	3	0	1	0	0
Public aircraft	0	0	0	0	0
Drones	0	0	0	0	0
<b>Total</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>

From 2015 to 2024, nationally registered aircraft were involved in 64 major aviation occurrences. Aircraft in the civil aviation transport category accounted for 27 occurrences (the majority), followed by 6 general aviation carriers occurrences, 3 flight training institution occurrences, 17 ultra-light vehicle occurrences, 7 public aircraft occurrences, and 4 drone occurrences. These occurrences resulted in 68 fatalities (see Table 7). More details regarding these aviation occurrences can be found in Appendix 3.

Table 7 Statistics of major aviation occurrences involving nationally registered aircraft over the preceding 10 years

Category	Major flight occurrences			Fatalities	
	Total cases	Fatal	Hull loss or missing	Total people	People on board
Nationally registered civil air transport turbojet airplanes	19	0	0	0	0
Nationally registered civil air transport turboprop airplanes	8	1	1	43	43
Nationally registered civil air transport aircraft (total)	27	1	1	43	43
<hr/>					
Nationally registered general aviation aircraft	6	2	2	5	5
Flight training institutions	3	0	1	0	0
Ultra-light vehicles	17	6	14	10	10
Public aircraft	7	4	3	10	10
Drones	4	0	4	0	0
<hr/>					
Total	64	13	25	68	68

## 2.3 Major Occurrences Involving Civil Air Transport Aircraft

### 2.3.1 Five-Year Moving Occurrence Rates of Turbojet Airplanes

#### Five-Year Moving Averages of the Hull Loss Rate

The TTSB calculates occurrence rates in Taiwan according to their 5-year moving averages to observe flight safety trends and to compare civil air transport occurrence rates with global data from the IATA<sup>13</sup>.

Turbojet airplanes operated by Taiwan's civil air transport carriers have been involved in no hull loss occurrences in the preceding 10 years. The 5-year moving average for hull loss remained at 0 throughout the period in question. The IATA's 5-year moving average for the global turbojet airplane hull loss rate exhibited a downward trend, dropping from 0.23 occurrences per million departures in 2015–2019 to 0.14 occurrences per million departures in 2019–2023, then slightly increasing to 0.15 occurrences per million departures in 2020-2024 (see Figure 8). Please see Appendix 4 for more detailed statistics.

<sup>13</sup> Reference source: 2024 IATA Safety Fact Sheet.

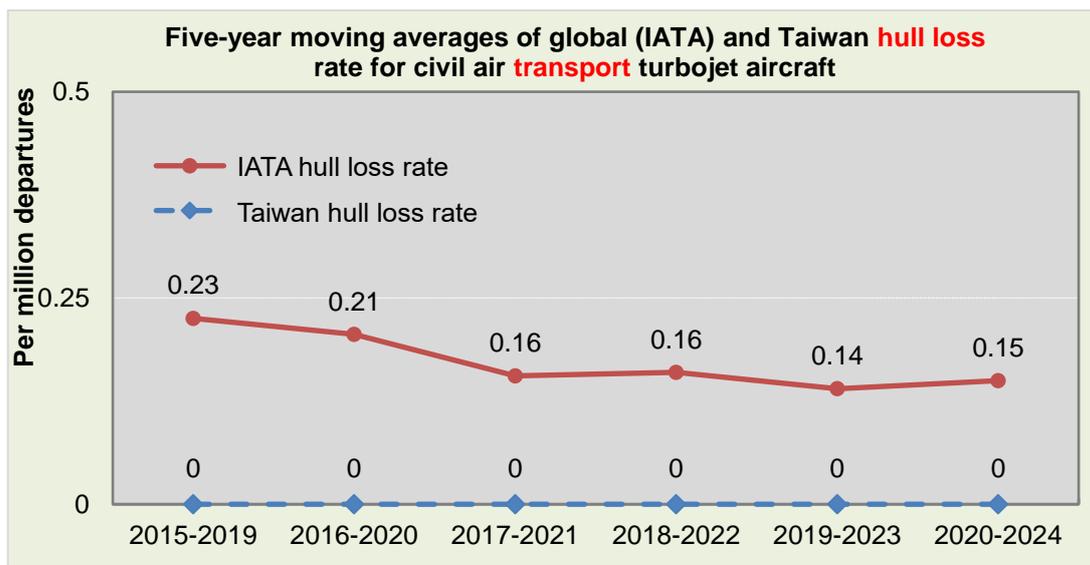


Figure 8 IATA and Taiwan hull loss rates for civil air transport turbojet aircraft

**Five-Year Moving Average of the Fatal Occurrence Rate**

Civil air transport turbojet airplanes in Taiwan were involved in no fatalities within the preceding 10 years; the corresponding 5-year moving average remained at 0 throughout the period in question. The IATA's 5-year moving average for the global rate of fatalities involving turbojet airplanes was 0.09 occurrences per million departures in 2015-2019, increased to 0.12 occurrences per million departures in 2016-2020, then decreased steadily to 0.03 occurrences per million departures in 2020-2024 (see Figure 9). Please see Appendix 4 for more detailed statistics.

The statistics demonstrated that turbojet airplanes had a slightly higher hull loss rate than fatal occurrence rate given that some cases resulted in hull loss, whereas no cases resulted in fatalities.

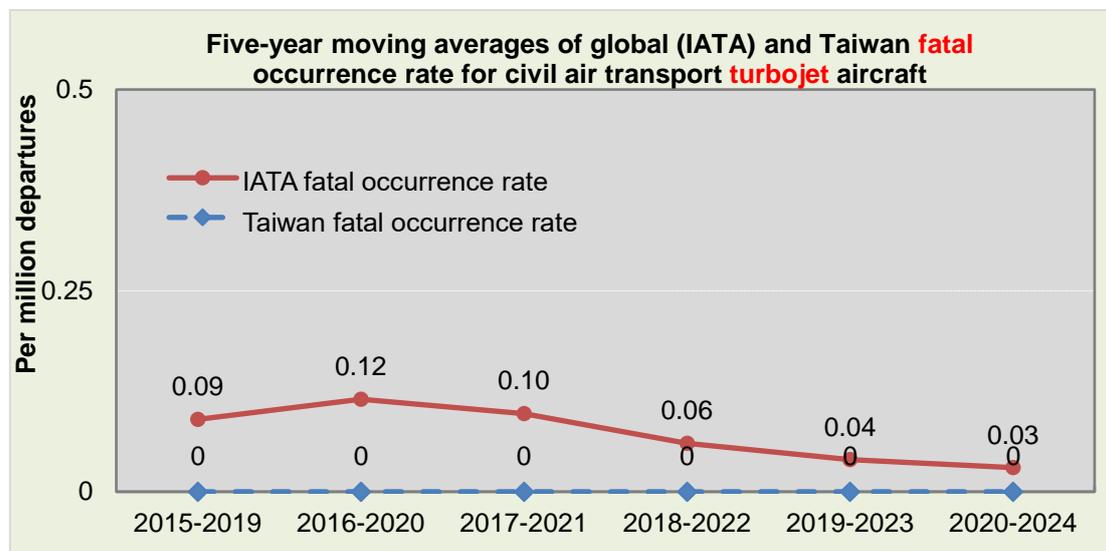


Figure 9 IATA and Taiwan fatal occurrence rates for civil air transport turbojet aircraft

### 2.3.2 Five-Year Moving Occurrence Rates of Turboprop Airplanes Five-Year Moving Averages of the Hull Loss Rate

Following 1 aviation occurrence in 2015 that resulted in total hull loss (TransAsia Airways GE235), the 5-year moving average of hull loss occurrences for national civil air transport turboprop airplanes for 2015–2019 in Taiwan amounted to 3.02 occurrences per million departures. Furthermore, as of 2020, the total hull loss of TransAsia flight GE235 in 2015 is no longer included in the occurrence rate; therefore, the 2016-2020 5-year moving average for hull loss occurrences dropped to 0. No civil air transport turboprop airplanes were involved in hull loss, and thus the 5-year moving average for hull loss occurrences remained at 0.

The 5-year moving average of the IATA's global turboprop hull loss occurrence rates trended downward at 0.98 occurrences per million departures in 2015–2019 and 2016-2020 before rising to 1.02 occurrences per million departures in 2017-2021, then increasing further to 1.37 occurrences per million departures in 2020-2024 (see Figure 10). Please see Appendix 5 for more detailed statistics.

According to the IATA, turboprop airplanes exhibited approximately a 9.1-fold hull loss occurrence rate compared to turbojet airplanes in 2020-2024.

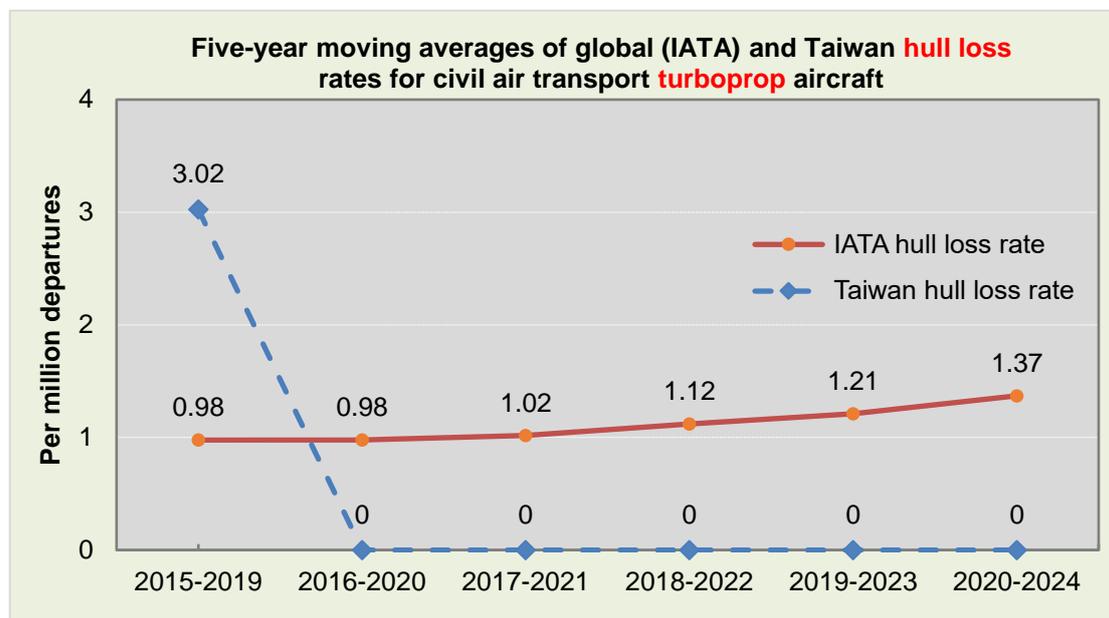


Figure 10 IATA and Taiwan hull loss rates for civil air transport turboprop aircraft

### Five-Year Moving Average of the Fatal Occurrence Rate

Following 1 aviation occurrence in 2015 that resulted in fatalities (TransAsia Airways GE235), the 2015–2019 5-year moving average of fatal occurrences for

national civil air transport turboprop airplanes in Taiwan was 3.02 occurrences per million departures.

Furthermore, as of 2020, the crash of TransAsia flight GE235 in 2015 is no longer included in the occurrence rate; therefore, the 2016-2020 5-year moving average of fatal occurrences dropped to 0. No civil air transport turboprop airplanes were involved in fatal occurrences subsequently, and thus the 5-year moving average for fatal occurrences remained at 0.

The 5-year moving average of the IATA's global turboprop fatal occurrence rate fluctuated, rising from 0.64 occurrences per million departures in 2015-2019 and 2016-2020 to 0.77 occurrences per million departures in 2017-2021. This average then dropped to 0.67 occurrences per million departures in 2018-2022, then further to 0.65 occurrences per million departures in 2019-2023. In 2020-2024, this average rose slightly to 0.67 occurrences per million departures (see Figure 11). Please see Appendix 5 for more detailed statistics.

According to the IATA, turboprop airplanes exhibited approximately a 22.3-fold fatal occurrence rate compared turbojet airplanes in 2020-2024.

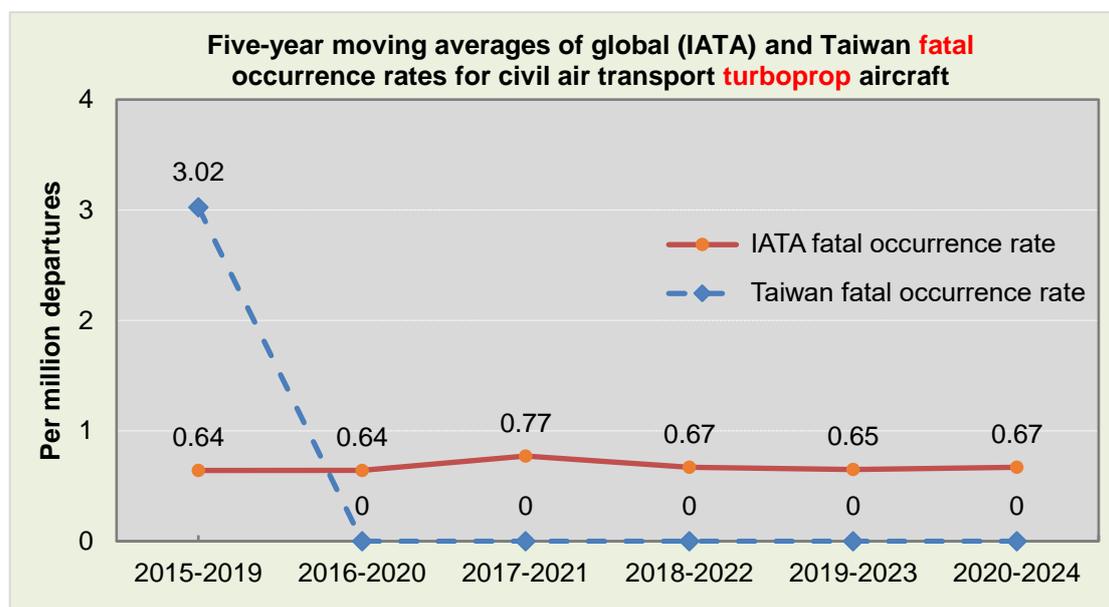


Figure 11 IATA and Taiwan fatal occurrence rates for civil air transport turboprop aircraft

### 2.3.3 Annual Airplane Accident Rates

According to the ICAO's definition of an accident (see appendix)<sup>14</sup>, 7<sup>15</sup> of the major aviation occurrences involving national civil aviation aircraft in the preceding 10 years (2015-2024) are considered accidents (see Table 8). Among these accidents, 4 involved turbojets and collectively resulted in severe injuries to 4 people; the other 3 involved turboprops and included 1 accident resulting in hull loss, 43 fatalities, and 14 people with severe injuries.

Table 8 Civil air transport accidents involving national registered aircraft over the preceding 10 years

No.	Date	Aircraft model		Occurrence location	Flight phase	Damage to aircraft	Fatalities	Serious injuries
1	2015.02.04	Turboprop	ATR72-600	Keelung River, Nangan (Taipei)	Enroute	Hull loss	43	14
2	2016.10.01	Turbojet	A330-300	Taoyuan International Airport	Landing	Substantial damage	0	0
3	2017.04.13	Turboprop	DHC-6-400	Lanyu Airport, Orchid Island, Taitung (KYD)	Landing	Substantial damage	0	0
4	2017.11.22	Turbojet	B777-300ER	Japanese-controlled airspace	Enroute	None	0	2
5	2017.12.02	Turbojet	B777-300ER	Toronto Pearson International Airport	Taxi	Substantial damage	0	0
6	2019.12.25	Turbojet	A320-200	Airspace above the east coast of Kyushu, Japan	Enroute	None	0	2
7	2021.05.10	Turboprop	ATR72-600	Matsu Nangan Airport	Landing	Substantial damage	0	0

Figure 12 illustrates the number of accidents involving national civil air transport aircraft, the rate of occurrences per million departures, and the ICAO's global civil aviation accident rate for 2015 to 2024; please refer to Appendix 6 for more details. Accidents resulting in substantial hull loss or passenger injuries occurred thrice in 2017, causing the occurrence rate of Taiwan's civil air transport aircraft to be higher than the ICAO global average. One occurrence in 2021 resulted in substantial damage to the aircraft, leading to a sharp rise in the occurrence rate against a drastic decline in departures due to the global pandemic. Since there were no accidents in 2022, 2023, and 2024, the incident rate was 0.

<sup>14</sup> The ICAO includes only fixed commercial flights for profit (including passenger, cargo, and mail services) by fixed-wing aircraft with a maximum takeoff weight of 5,700 kg or above in their calculations of the accident rates of civil aviation carriers.

<sup>15</sup> These occurrences include incidents involving nationally registered aircraft that occurred and were investigated overseas, except for 1 incident that happened during a training flight.

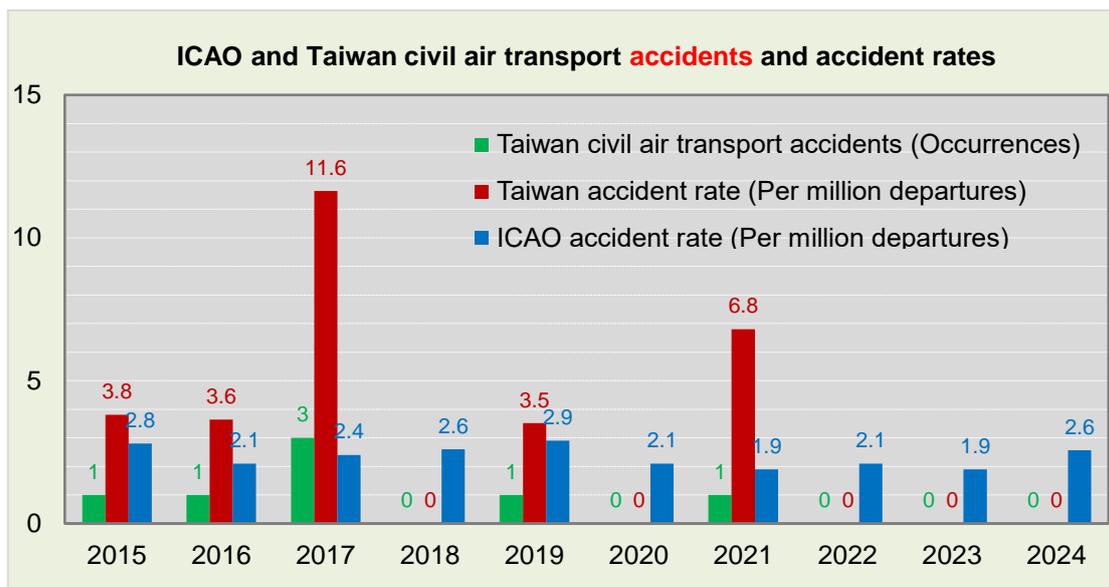


Figure 12 ICAO and Taiwan statistics on civil air transport accidents

### 2.3.4 Classification of Occurrences by Flight Phase

According to the flight phases defined by the ICAO (see the appendix), of the 27 major civil air transport occurrences in the preceding 10 years, 12 happened during the en route phase; these occurrences involved abnormal cabin pressure, smoke, turbulence, and engine malfunction. Additionally, 12 occurrences took place during the landing phase and involved runway excursions, tail strikes, and hard landings. Both of these accounted for the largest proportion. The numbers of occurrences by flight phase are shown in Figure 13.

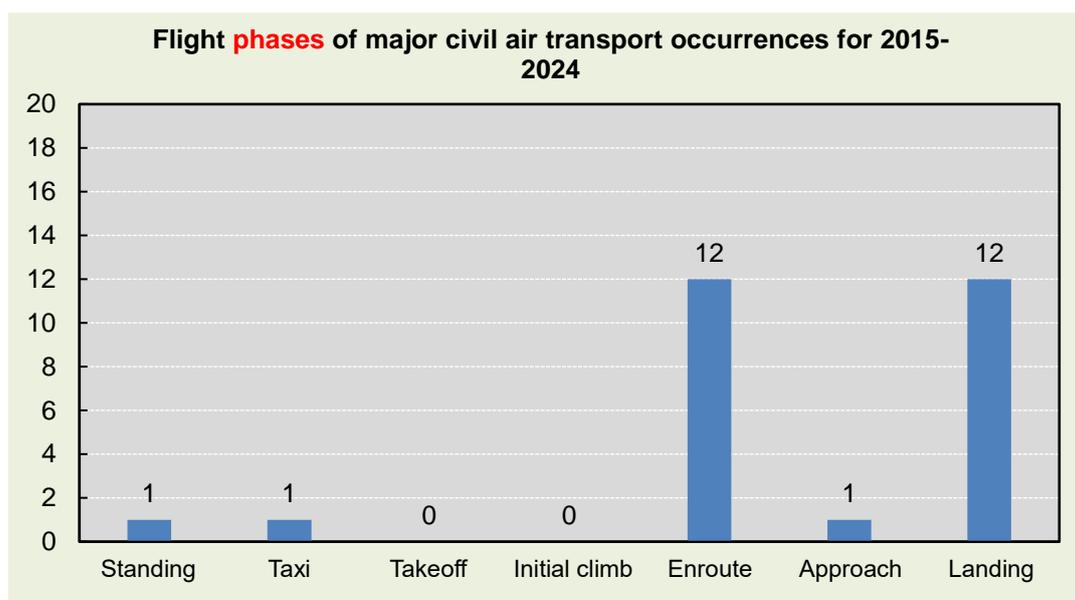


Figure 13 Flight phases of major civil air transport occurrences

### 2.3.5 Occurrence Categories

The ICAO's occurrence categories are listed in the appendix. Depending on its nature, an aviation occurrence may fit into more than one category; for instance, an engine fire may be categorized as a system/component failure or malfunction of the powerplant (SCF-PP) and a fire smoke non-impact (F-NI). An aircraft crash resulting from a loss of control can be categorized as both a system/component failure or malfunction of the non-powerplant (SCF-NP) and a loss of control in-flight (LOC-I).

For the preceding 10 years, the categories of the aforementioned 27 major civil air transport occurrences are as shown in Figure 14. The statistical results revealed that from 2015 to 2024, runway excursion (RE) had the highest occurrence rate, with 6 occurrences, followed by 5 occurrences involving system/component failure or malfunction (non-powerplant) (SCF-NP).

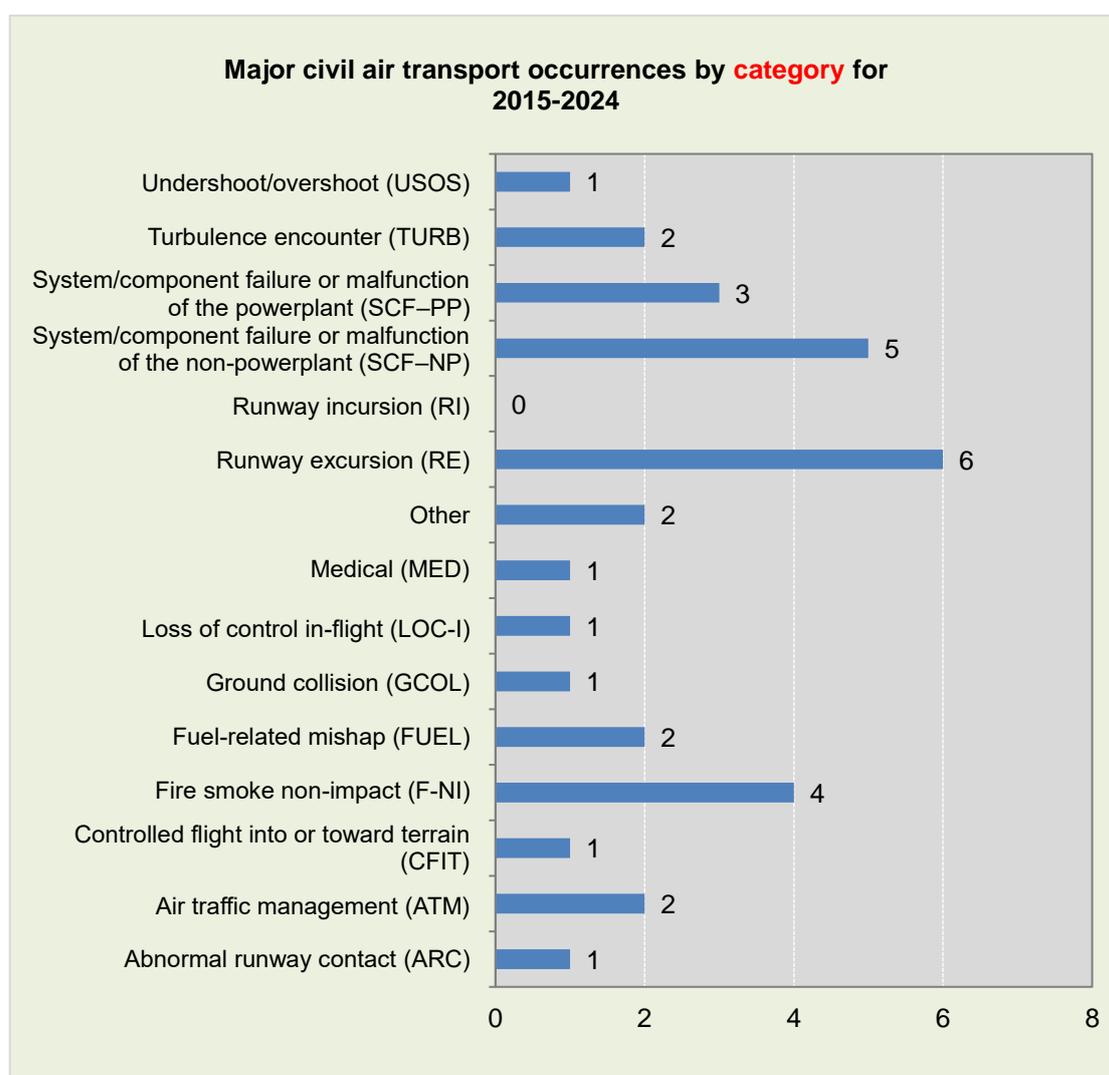


Figure 14 Major civil air transport occurrences by category

### 2.3.6 Occurrence Causes and Factors

The NTSB has three main categories of causes and factors for aviation occurrences, namely human-related, environment-related, and aircraft-related causes. Human-related causes are mainly factors involving pilots and other personnel (e.g., maintenance workers, organization managers etc.). Environment-related causes and factors are those involving weather; airport, ATC, or navigation facilities; ATC and services; time of day; and terrain. Aircraft-related causes and factors include those involving systems and equipment, engines, structures, and performance.

According to findings of the TTSB investigations into possible causes and the NTSB's classification of causes and factors, each occurrence has at least one major cause, and some have two or more causes. For instance, a runway excursion occurrence may include the factors termed "pilot," "weather," and "airport facilities," whereas a cabin pressure failure occurrence may result from "system and equipment" and "maintenance worker" factors.

The statistical results indicate that over the preceding 10 years, of all 27 cases, human-related causes and factors were the most prevalent in major civil air transport occurrences in Taiwan, accounting for the highest percentage at 63% or 17 cases (48.2% pilot-related and 14.8% related to maintenance workers, ground crew, cabin crew, or other personnel). Environment-related factors were involved in 11 cases, accounting for 40.7% of all causes (25.9% related to the weather, 11.1% related to airport, air traffic control (ATC), or navigation facilities, and 3.7% related to ATC and services). Aircraft-related causes and factors were present in 6 cases, accounting for 25.9% of all causes (22.2% system and equipment-related and 3.7% engine-related). Other factors were involved in 3 cases, accounting for 11.1% as shown in Figure 15.

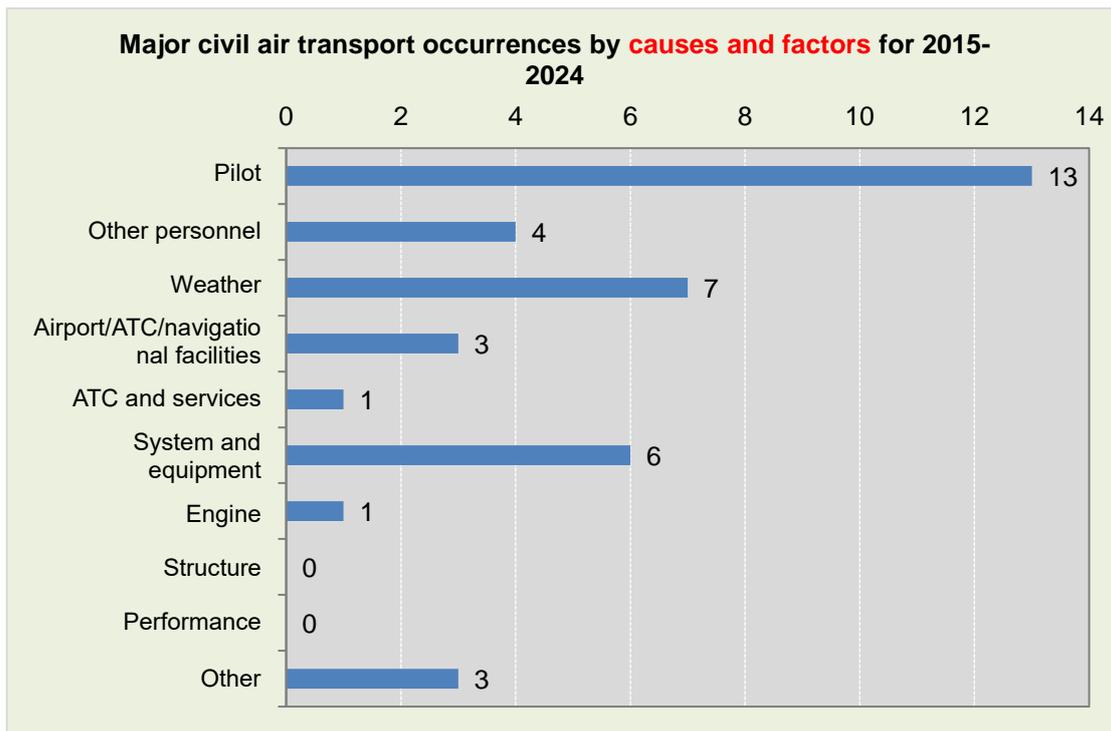


Figure 15 Major civil air transport occurrences by causes and factors

## 2.4 Major Aviation Occurrences in General Aviation Aircraft

### Five-Year Moving Average of the Hull Loss and Fatal Occurrence Rates

In the preceding 10 years, 2 occurrences of hull loss were recorded in 2015 and 2017, respectively. These 2 occurrences resulted in fatalities and were considered fatal occurrences; the details are presented in Appendix 3.

The 5-year moving average of the hull loss and fatal occurrence rates for nationally registered general aviation aircraft peaked at 1.21 occurrences per 10,000 flight hours in 2019. From 2020, the moving average continued to decline, and from 2022 to 2024, the 5-year moving average of the hull loss and fatal occurrence rates had dropped to 0 occurrences, as shown in Figure 16. The details are presented in Appendix 7.

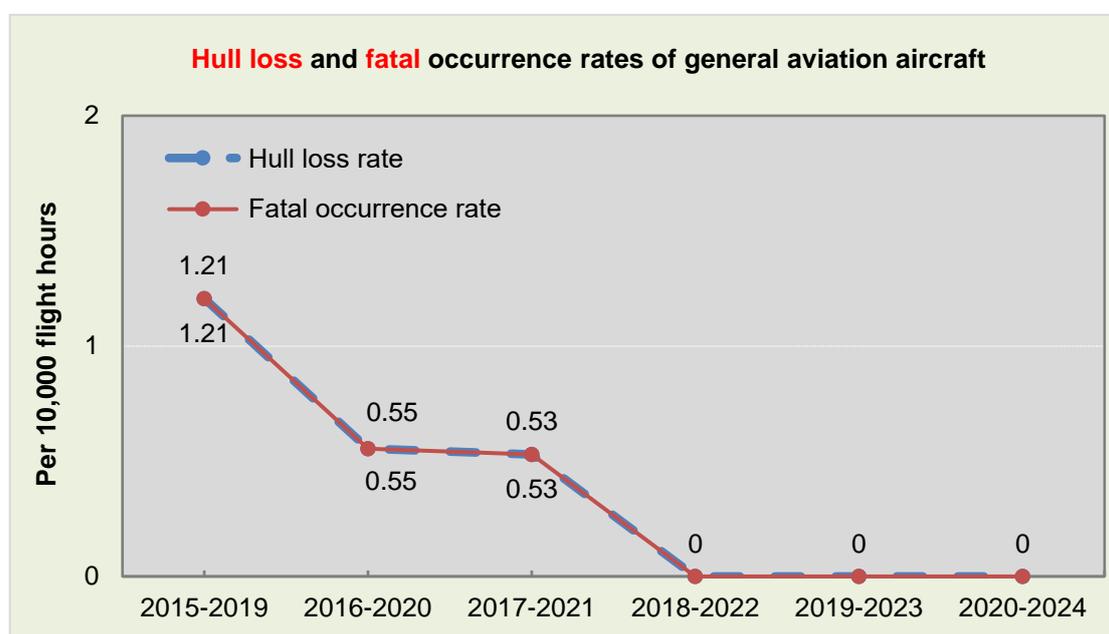


Figure 16 Hull loss and fatal occurrence rates of general aviation aircraft

## 2.5 Major Occurrences Involving Helicopters

### Five-Year Moving Average of the Hull Loss and Fatal Occurrence Rates

In the preceding 10 years, 2 occurrences of hull loss were recorded in 2015 and 2017. These 2 occurrences resulted in fatalities and were considered fatal occurrences; the details are presented in Appendix 3.

The 5-year moving average for hull loss and fatal occurrence rates of nationally registered helicopters peaked at 2.86 occurrences per 10,000 flight hours, or 3.40 occurrences per 10,000 departures, in 2019, then declined to 1.42 occurrences per 10,000 flight hours, or 1.78 occurrences per 10,000 departures, in 2020. Despite the lack of helicopter occurrences since 2017, owing to a decline in flight hours and departures in the preceding 5 years, the 2021 moving average rose to 1.55 occurrences per 10,000 flight hours, or 1.91 occurrences per 10,000 departures; From 2022 to 2024, the moving average fell to 0 occurrences per 10,000 flight hours, or 0 per 10,000 departures, as shown in Figure 17. The details are presented in Appendix 8.

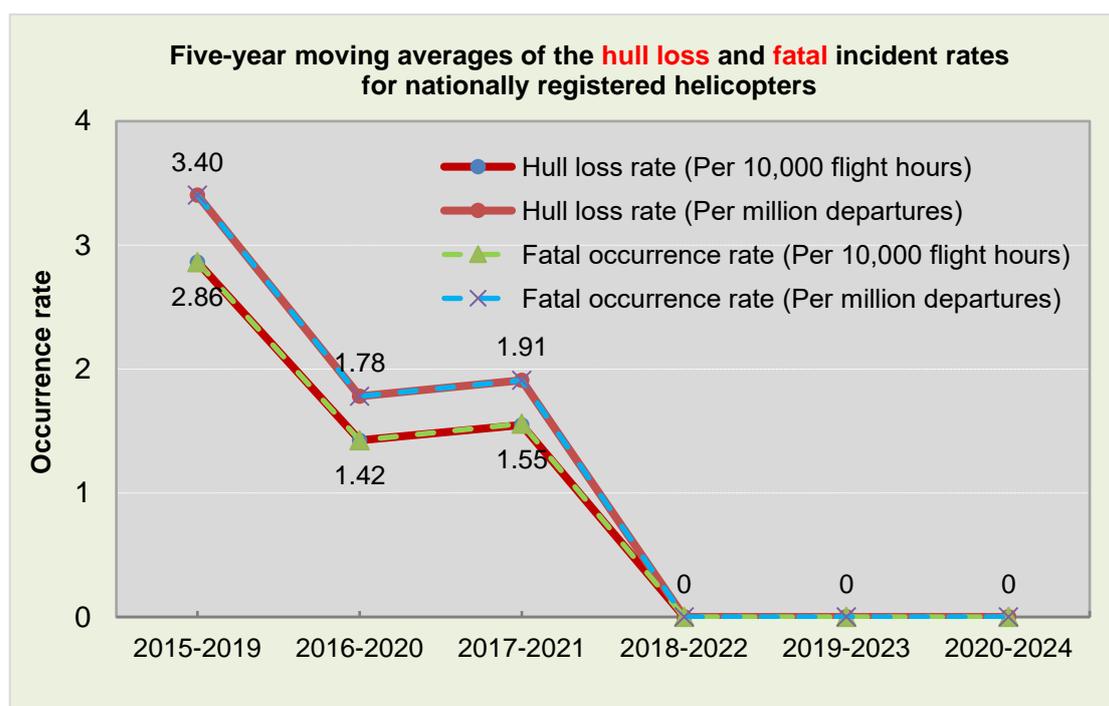


Figure 17 Hull loss and fatal occurrence rates for nationally registered helicopters

## 2.6 Major Occurrences Involving Public Aircraft

For Taiwan's public aircraft, over the preceding 10 years, hull loss occurred 3 times in 2016, 2018, and 2020, respectively, with 1 fatality in 2016 and 3 in 2018, respectively. The details are provided in Appendix 3.

### Five-Year Moving Average of the Hull Loss Rate

The 5-year moving average of the hull loss rate for Taiwan's public aircraft in 2015-2019 was 0.61 occurrences per 10,000 flight hours, or 0.86 occurrences per 10,000 departures. Subsequently, the moving average exhibited an upward trend, reaching a peak in 2020 of 0.93 occurrences per 10,000 flight hours, or 1.32 occurrences per 10,000 departures, before falling to 0.60 occurrences per 10,000 flight hours, or 0.87 occurrences per 10,000 departures in 2021. The 5-year moving average of 0.62 occurrences per 10,000 flight hours or 0.86 per 10,000 departures in 2022 was comparable to 2021. The moving average fell to 0.31 occurrences per 10,000 flight hours, or 0.42 per 10,000 departures, in 2023 and 2024, as shown in Figure 18. The details are presented in Appendix 9.

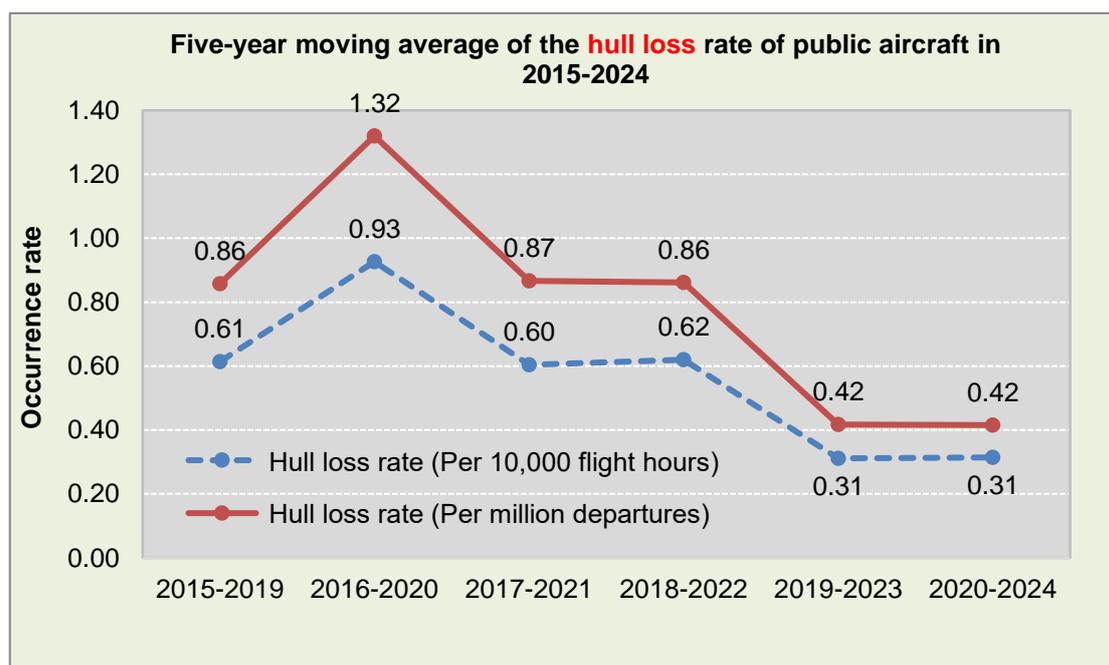


Figure 18 Hull loss rate for public aircraft

### Five-Year Moving Average of the Fatal Occurrence Rate

The 5-year moving average of the fatal occurrence rate for Taiwan's public aircraft amounted to 1.23 occurrences per 10,000 flight hours, or 1.72 occurrences per 10,000 departures, in 2015–2019, and reached a peak of 1.24 occurrences per 10,000 flight hours, or 1.76 occurrences per 10,000 departures, in 2020. The 5-year moving average then declined to 0.91 occurrences per 10,000 flight hours, or 1.30 occurrences per 10,000 departures, in 2021, which was comparable to 0.93 occurrences per 10,000 flight

hours, or 1.29 per 10,000 departures, in 2022. The moving average fell to 0 occurrences per 10,000 flight hours, or 0 per 10,000 departures, in 2023 and 2024, as shown in Figure 19. The details are presented in Appendix 9.

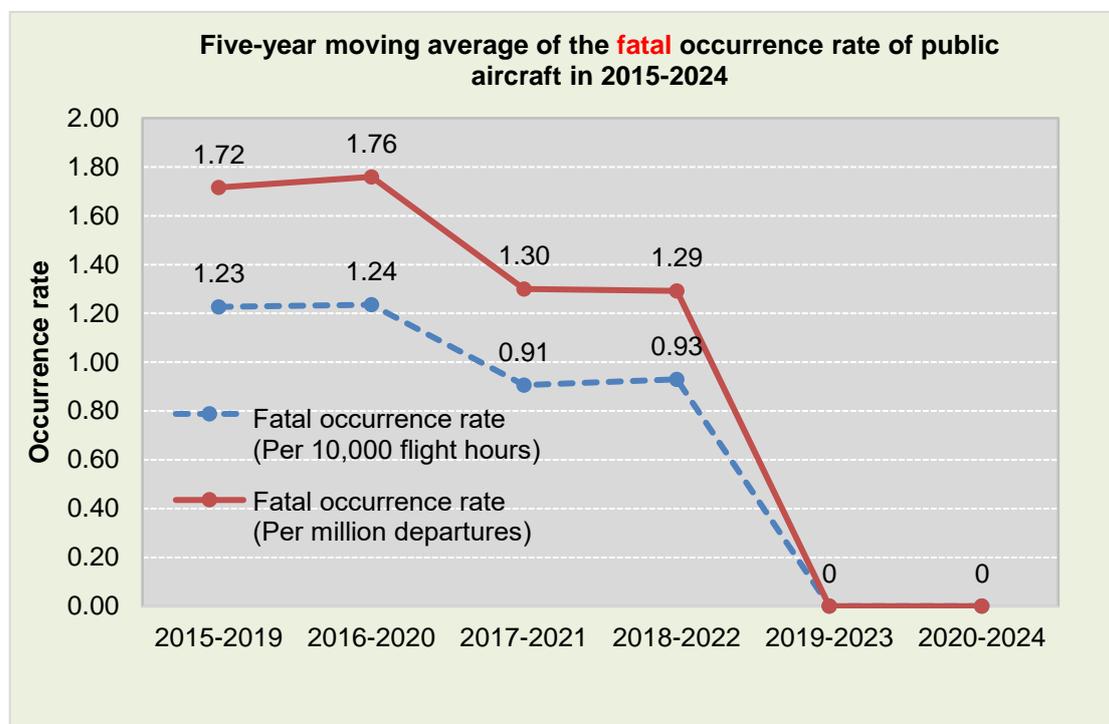


Figure 19 Fatal occurrence rate for public aircraft

## 2.7 Major Occurrences Involving Ultra-Light Vehicles

In 2004, ultra-light vehicles were formally incorporated into the Civil Aviation Act, and major occurrences involving these aircraft were incorporated into the investigative jurisdiction of the TTSB.

For ultra-light vehicles, 17 major aviation occurrences were reported over the preceding 10 years; 14 involved hull loss and 6 were fatal, resulting in 10 deaths as shown in Figure 20. The details are presented in Appendix 3.

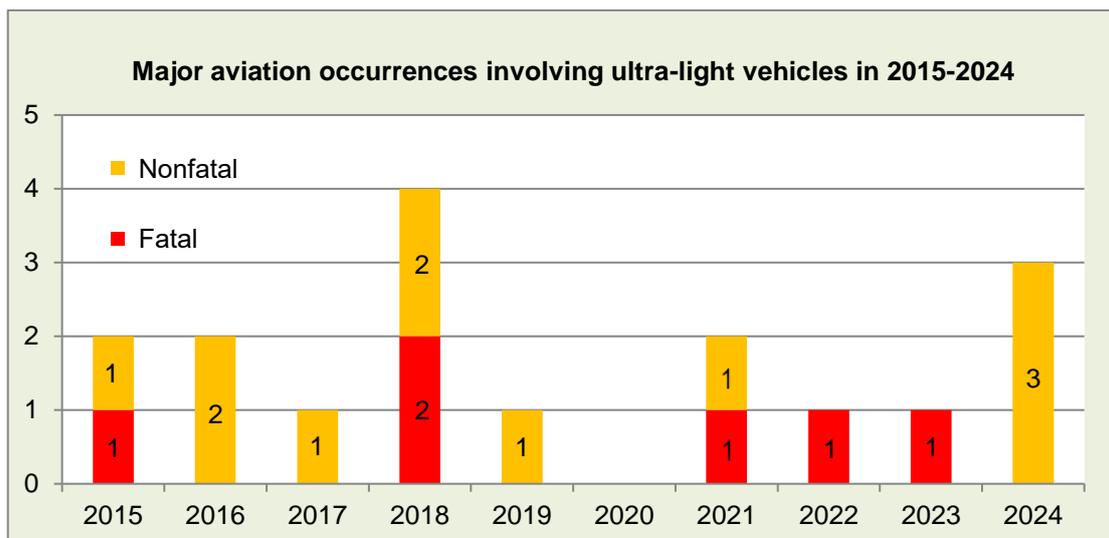


Figure 20 Major occurrences involving ultra-light vehicles

## 2.8 Major Occurrences Involving Drones

The chapter on drones in the Civil Aviation Act came into effect on March 31, 2020, and the major aviation accidents were included in the scope of investigation by the TTSB in April 2019.

Between the incorporation of drones into the investigative jurisdiction of the TTSB (April 2019) and the end of 2024, 4 major aviation occurrences took place; 3 drones experienced total hull loss, and the other drone was declared missing. However, no persons were injured in either occurrence as shown in Figure 21. The details are presented in Appendix 3.

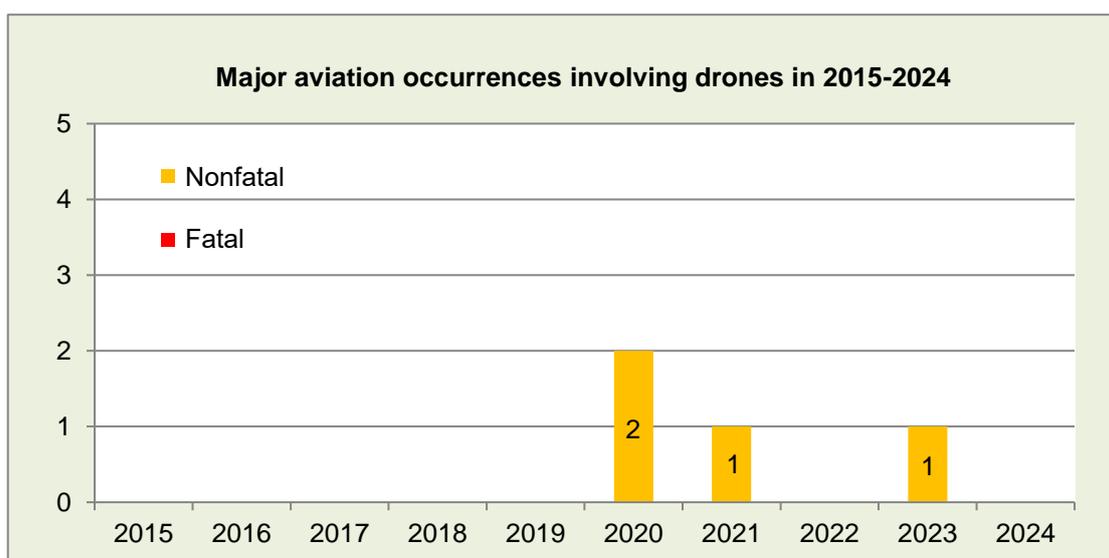


Figure 21 Major occurrences involving drones

### III. Transportation Safety Recommendation Follow-Up and Oversight Statistical Analysis

#### 3.1 Historical Statistics on Transportation Safety Recommendations by Type

The purpose of systematically investigating transportation occurrences is to determine their causes through systematic investigation and provide appropriate recommendations to relevant agencies in order to prevent similar occurrences. Since the establishment of our predecessor, the Aviation Safety Council (1998), as of the end of 2024, the TTSB had investigated 144 major aviation occurrences, we provided 1,106 recommendations to improve transportation safety.

If categorized by the recipient, the highest proportion of safety recommendations was made to government-affiliated agencies/institutions (584 items; approximately 52.8%), followed by aviation businesses (402 items; approximately 36.3%). International institutions received the fewest recommendations (120 items; approximately 10.9%).

Regarding operational categories, civil air transport carriers received the highest proportion of recommendations (657 items; approximately 59.4%), followed by general aviation carriers (217 items; approximately 19.6%), public aircraft (142 items; 12.8%), ultra-light vehicles (80 items; 7.3%), and finally, drones (10 items; 0.9%), as shown in Table 9 and Figure 22.

Table 9 Historical Transportation Safety Recommendations by Type

<b>Recipient</b> <b>Operational type</b>	<b>Government-affiliated agencies</b>	<b>Airlines</b>	<b>International institutions</b>	<b>Total</b>	<b>Percentage</b>
Civil air transport carriers	304	244	109	657	59.4%
General aviation carriers	102	110	5	217	19.6%
Public aircraft	130	8	4	142	12.8%
Ultra-light vehicles	45	33	2	80	7.3%
Drones	3	7	0	10	0.9%
Total	584	402	120	1,106	100%
Percentage	52.8%	36.3%	10.9%	100%	—

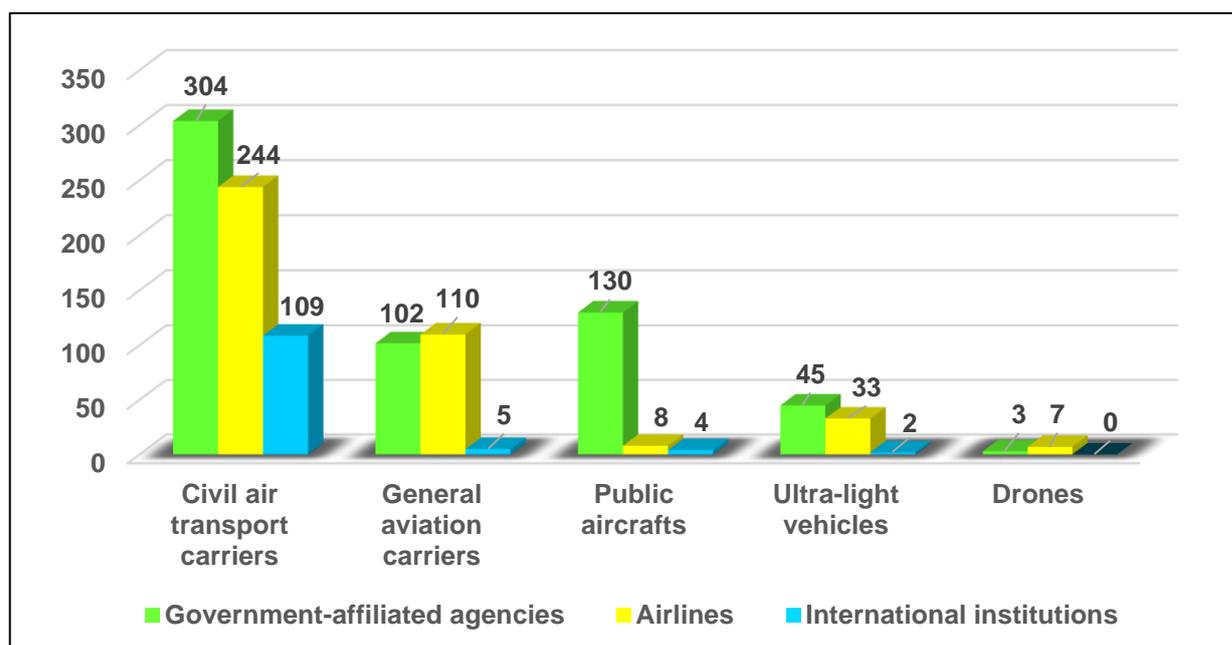


Figure 22 Historical statistics on transportation safety recommendations by type

### 3.2 Statistics on the Implementation Status of Action Plans for Transportation Safety Recommendations

According to Article 27 of the Transportation Occurrences Investigation Act, "*The government authorities concerned shall submit a management report to the Executive Yuan within 90 days after the receipt of the transportation occurrence investigation report and send a copy to the TTSB. The management report shall contain detailed and concrete implementation plans responding to the transportation safety recommendations that are considered practicable. In response to the recommendations considered impracticable, detailed reasons shall also be stated. The execution of the detailed implementation plans, mentioned in Paragraph 1, shall be supervised by the Executive Yuan and tracked by the TTSB.*"

Upon receiving the copy of action plans from government authorities, the TTSB shall suggest that the Executive Yuan accept implementation plans that are concrete, actionable, and completed, and then close the case in question. For implementation plans that fail to achieve their improvement targets, the affiliated agencies/institutions will be asked to resubmit a new plan or supplemental information. If the action plan has a long schedule or must be completed in stages, the TTSB suggests the plan be supervised by the Executive Yuan and that its status be tracked every 6 months until improvements are completed so that the case may then be closed.

As of December 31, 2024, the TTSB has published 144 aviation occurrence investigation reports and issued 1,106 transportation safety recommendations, among which 3 action plans remain under Executive Yuan supervision (see Table 10). Thus,

the percentage of concluded recommendations is 99.5%, with 0.5% of remaining recommendations still under Executive Yuan supervision (Figure 23).

Table 10 Table of safety recommendations from action plans under supervision

No.	Major flight occurrences	Safety recommendation	Recommendation recipient
1	Mandarin Airlines AE788 aviation occurrence	Coordinate with and cooperate with the CAA to develop a plan to improve the cross slope of the runway at Taichung Airport.	Air Force Headquarters, MND
2	Mandarin Airlines AE788 aviation occurrence	Coordinate and cooperate with the CAA to research the installation of runway centerline lights at Taichung Airport.	Air Force Headquarters, MND
3	1120117 Coast Guard Administration B-AAA01397 drone crash incident during flight test in Dulan, Taitung	Supervise that AVIX strengthens the design and modification of drones to ensure compliance with applicable inspection standards.	Maritime and Port Bureau, MOTC

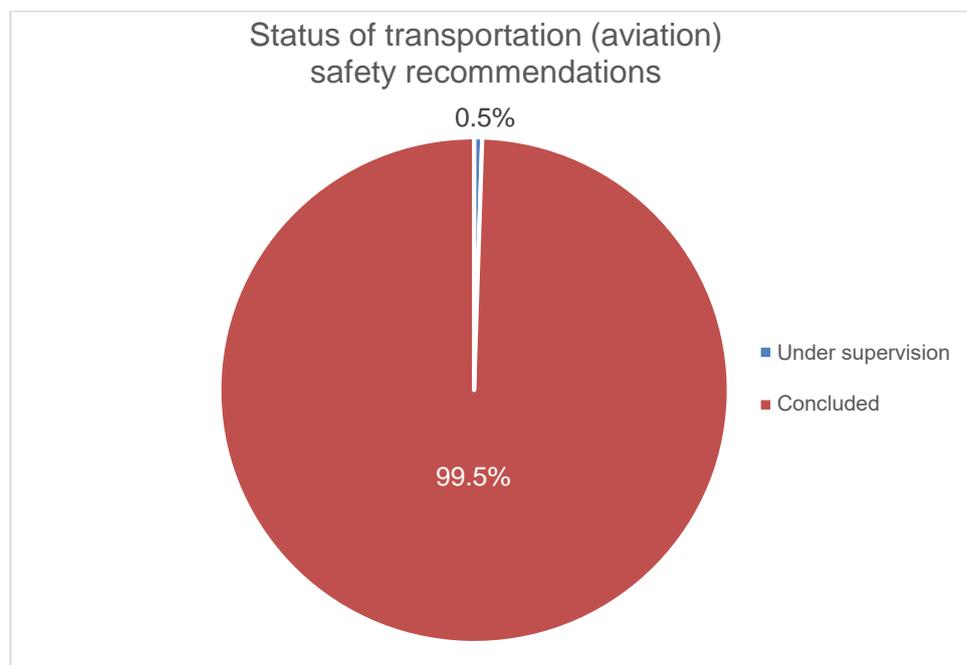


Figure 23 Status of transportation (aviation) safety recommendation handling

## Appendix Glossary

### Definition of Terms Used in the Civil Aviation Act

Aircraft: any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aeroplane: a power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Helicopter: a heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Drone: the unmanned aerial vehicle, the flight control of which is operated by way of signal link through a remote control device or which is operated by autopilot, or other aircraft without human pilot aboard as announced by CAA.

Ultra-light vehicle: a powered airplane, powered glider, gyroplane, powered glider/parachute, or weight-shift-control aircraft (commonly called trikes), which is used for manned operations and meets the following criteria:

1. Single reciprocating engine.
2. A maximum takeoff weight not exceeding 600 kilograms.
3. A maximum seating capacity not exceeding two persons, including the pilot.
4. A maximum airspeed in level flight with maximum continuous power not exceeding 222 kilometers per hour under standard atmospheric conditions at sea level.
5. A maximum stalling speed, without the use of lift-enhancing devices, not exceeding 83 kilometers per hour at the aircraft's maximum certificated takeoff weight.
6. A fixed or ground-adjustable propeller other than a powered glider. A fixed or feathering propeller system if a powered glider.
7. A fixed-pitch, teetering and semi-rigid two-blade rotor system if a gyroplane.
8. A non-pressurized cabin, if equipped with a cabin.
9. Fixed landing gear, if installed, other than a powered glider.

Civil air transport enterprise: an undertaking directly engaging in the transportation by aircraft of passengers, cargo and mail for compensation or hire.

General aviation enterprise: an enterprise engaging in the aviation business other than Civil Air Transport Enterprise for compensation, including aerial tourism, survey,

photographing, fire-fighting, searching, paramedic, hauling and lifting, spraying and dusting, drone-hauling service, business charter, as well as other authorized aviation service.

Private aircraft activity: a not-for-profit aviation with a privately owned aircraft.

Aircraft accident: an occurrence associated with the operation of aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or associated with the operation of the drone which takes place between the time the propelling system is initiated in preparation for movement with the intention of flight until such time when the flight ends with propelling system being turned off, in which a person, either within or without the aircraft, is fatally or seriously injured or the aircraft sustains substantial damage or structural failure, is missing or completely inaccessible.

Aircraft serious incident: an occurrence associated with the operation of aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all persons aboard have disembarked, or associated with the operation of the drone which takes place between the time the propelling system is initiated in preparation for movement with the intention of flight until such time when the flight ends with propelling system being turned off, which almost result in an accident.

### **Definition of Terms Used in the Aircraft Flight Operation Regulations**

Large aircraft :

1. Airplane: an airplane of a maximum certificated take-off mass of over 5700 kg.
2. Helicopter: a helicopter of a maximum certificated take-off mass of over 3175 kg.

Small aircraft :

1. Airplane: an airplane of a maximum certificated take-off mass of 5700 kg or less.
2. Helicopter: a helicopter of a maximum certificated take-off mass of 3175 kg or less.

Free balloon flight operation : a flight carried out by free balloon involving the transport of passengers.

Free balloon tethered activity : a free balloon which is moored to the surface of the earth or an object.

### **Definition of Terms Used in the Rules of the Air**

Free balloon<sup>16</sup> : non-power-driven, one lighter-than-air aircraft, includes inflatable

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<sup>16</sup> Terminology and definition in accordance with Article 2 of the Rules of the Air.

free balloon and hot-air free balloon.

Hot air balloon<sup>17</sup> : A lighter-than-air aircraft that is not engine-driven and uses hot air for lift. It must pass the certification of the Civil Aviation Administration and has an airworthiness certificate before fly.

### **Definition of Terms Used in the Transportation Occurrences Investigation Act**

Major transportation occurrence: major aviation occurrences, railway occurrences, marine occurrences, and highway occurrences that have caused a certain number of injuries, casualties, or property damage or that have caused social concerns and have been identified by the TTSB.

Transportation occurrence investigation: a process consisting of transportation occurrence identification, factual data gathering, compiling, analysis, probable cause identification, submission of safety recommendations, and investigation report writing.

Investigation report: a report prepared by the Investigator-in-Charge (IIC) compiling submissions from all technical subgroups in accordance with the format administered by the International Civil Aviation Organization and other relevant domestic/foreign organizations, containing factual information, analyses, conclusions, and safety recommendations reviewed and approved under this Act.

Civil aircraft: an aircraft that is used for the purposes of civil air transportation services, general aviation services, pilot training, or private aircraft activities and has completed the process of registration and airworthiness inspection under the civil aviation authorities.

Public aircraft: an aircraft owned or used by a government agency to carry out official duties, excluding military aircraft administered by the Ministry of Defense.

### **Definition of Terms Used in the Regulation Governing the Handling of Investigation Procedures for Civil and Public Aircraft Occurrence**

Major aviation occurrence: the major aviation occurrences (civil aircraft and public aircraft) specified in the scope of the major transportation occurrences prescribed in the first paragraph of Article 1 of the Act.

Death: the person is in the aircraft, in direct contact with any part of the aircraft, or directly exposed to the airflow caused or caused by the aircraft, and it is not resulting from natural causes, self-induced behaviors, intrusion by another person, or concealment in non-passenger and non-crew seated areas for purposes of illegal

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<sup>17</sup> Advisory circular AC91-005D, Mooring and Operations of Hot-Air Balloons, by the CAA Flight Standards Division.

immigration. As a result, those who die on the spot or within 30 days of being injured.

Injury: the person is in the aircraft, in direct contact with any part of the aircraft, or directly exposed to the airflow caused or caused by the aircraft, and it is not resulting from natural causes, self-induced behaviors, intrusion by another person, or concealment in non-passenger and non-crew seated areas for purposes of illegal immigration, who may have one of the following situations:

1. Hospitalization for more than forty-eight (48) hours is required within seven (7) days upon occurrence of the injury.
2. Fracture, excluding that of any finger, toe or nose.
3. Serious bleeding or damage to nerves, muscles or tendons due to laceration.
4. Any harm to an internal organ.
5. Burns of Grade 2 or 3, or more than 5 percent of burns on the skin of the whole body.
6. Confirmed exposure to contaminated substances or harmful radiation.

Substantial damage: adversely affects the structural strength, performance or flight characteristics of the aircraft, and would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome).

Missing: Fail to recover the wreckage of the aircraft at the conclusion of the search efforts as determined by the TTSB.

### **Scope of Major Aviation Occurrences<sup>18</sup>**

- A. Civil aircraft and public aircraft: associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, and in one of the following situations:
1. Death or injury of any person;
  2. The aircraft sustains substantial damage, is missing, or is completely inaccessible;

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<sup>18</sup> Defined by the TTSB in conjunction with the MOTC and then submitted to the Executive Yuan for approval, effective August 1, 2019.

3. Any other situations that may result in fatalities or injuries, or an aircraft occurrence nearly occurred, and are found necessary to be investigated by the TTSB.
- B. Ultra-light vehicle: associated with the operation of an ultra-light vehicle which takes place between the time any person boards the ultra-light vehicle with the intention of flight until such time as all such persons have disembarked, and in one of the following situations:
1. Death or injury of any person.
  2. The ultra-light vehicle sustains substantial damage, is missing, or is completely inaccessible;
  3. Other situations that may significantly affect the lives or properties of civilians, and are found necessary to be investigated by the TTSB.
- C. Drone: associated with the operation of a drone which takes place between the time the propelling system is initiated in preparation for movement with the intention of flight until such time when the flight ends with the propelling system being turned off and in one of the following situations:
1. Death or injury of any person.
  2. A drone with maximum takeoff weight exceeding 25 kilograms sustains substantial damage;

Other situations that may significantly affect the lives or properties of civilians, and are found necessary to be investigate by the TTSB.

### **Definition of Terms Used in the Standard Operating Procedures of Major Aviation Occurrences**

Transportation safety recommendations: after a transportation (aviation) occurrence investigation, the TTSB proposes recommendations in the investigation report to address transportation safety (aviation safety) concerns discovered in the investigation.

### **IATA Terms and Definitions**

IATA defines an accident as an event where ALL of the following criteria are satisfied:

- Person(s) have boarded the aircraft with the intention of flight (either flight crew or passengers).
- The intention of the flight is limited to normal commercial aviation activities, specifically scheduled/charter passenger or cargo service. Executive jet operations, training, and maintenance/test flights are all excluded.
- The aircraft is turbine-powered and has a certificated maximum takeoff weight of at least 5,700 kg (12,540 lbs.).
- The aircraft has sustained major structural damage exceeding \$1 million or 10% of the aircraft's hull reserve value, whichever is lower, or has been declared a hull loss.

IATA defines hull loss as an accident in which the aircraft is destroyed or substantially damaged and is not subsequently repaired for whatever reason, including a financial decision of the owner.

IATA defines a fatal incident as an accident where at least one passenger or crewmember is killed or later dies of their injuries, resulting from an operational accident. Events such as slips, trips and falls, food poisoning, or injuries resulting from turbulence or involving onboard equipment, which may involve fatalities, but where the aircraft sustains minor or no damage, are excluded.

## **ICAO Terms and Definitions**

### Accident

An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

- a) a person is fatally or seriously injured as a result of
  - being in the aircraft, or- direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
  - direct exposure to jet blast,

**except** when the injuries are from natural causes, self inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew: or

- b) the aircraft sustains damage or structural failure which:
  - adversely affects the structural strength, performance or flight characteristics of the aircraft, and
  - would normally require major repair or replacement of the affected component,

**except** for engine failure or damage. when the damage is limited to the engine, its cowlings or accessories: or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin: or

- c) the aircraft is missing or is completely inaccessible.

Note 1. For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.

Note 2. An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

### Categorization of Flight Phases

- STANDING (STD) : Prior to pushback or taxi, or after arrival, at the gate, ramp, or parking area, while the aircraft is stationary.
- PUSHBACK/TOWING (PBT) : Aircraft is moving in the gate, ramp, or parking area, assisted by a tow vehicle [tug].
- TAXI (TXI) : The aircraft is moving on the aerodrome surface under its own power prior to takeoff or after landing.
- TAKEOFF (TOF) : From the application of takeoff power, through rotation and to an altitude of 35 feet above runway elevation.
- INITIAL CLIMB (ICL) : From the end of the Takeoff sub-phase to the first prescribed power reduction, or until reaching 1000 feet above runway elevation or the VFR pattern, whichever comes first
- EN ROUTE (ENR) : From completion of Initial Climb through cruise altitude and completion of controlled descent to the Initial Approach Fix (IAF).
- Instrument Flight Rules (IFR) : A set of rules governing the conduct of flight under instrument
- Visual Flight Rules (VFR) : From completion of Initial Climb through cruise and controlled descent to the VFR pattern altitude or 1000 feet above runway elevation, whichever comes first.
- MANEUVERING (MNV) : Low altitude/aerobatic flight operations
- APPROACH (APR) Instrument Flight Rules (IFR) : From the Initial Approach Fix (IAF) to the beginning of the landing flare. Visual Flight Rules (VFR): From the point of VFR pattern entry, or 1000 feet above the runway elevation, to the beginning of the landing flare.
- LANDING (LDG) : From the beginning of the landing flare until aircraft exits the landing runway, comes to a stop on the runway, or when power is applied for takeoff in the case of a touch-and-go landing
- EMERGENCY DESCENT (EMG) : A controlled descent during any airborne phase in response to a perceived emergency situation.
- UNCONTROLLED DESCENT (UND) : A descent during any airborne phase in which the aircraft does not sustain controlled flight.
- POST-IMPACT (PIM) : Any of that portion of the Flight which occurs after impact with a person, object, obstacle or terrain.
- UNKNOWN (UNK) : Phase of flight is not discernable from the information available.

### Occurrence Category<sup>19</sup>

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<sup>19</sup> As of 2018, occurrence categories refer to the 2017 version, not the 2004 version.

- ABNORMAL RUNWAY CONTACT (ARC)
- ABRUPT MANEUVER (AMAN)
- AERODROME (ADRM)
- AIRPROX/TCAS ALERT/LOSS OF SEPARATION/NEAR MIDAIR COLLISIONS/ MIDAIR COLLISIONS (MAC)
- ATM/CNS (ATM)
- BIRD (BIRD)
- CABIN SAFETY EVENTS (CABIN)
- COLLISION WITH OBSTACLE(S) DURING TAKEOFF AND LANDING (CTOL)
- CONTROLLED FLIGHT INTO OR TOWARD TERRAIN (CFIT)
- EVACUATION (EVAC)
- EXTERNAL LOAD RELATED OCCURRENCES (EXTL)
- FIRE/SMOKE (NON-IMPACT) (F-NI)
- FIRE/SMOKE (POST-IMPACT) (F-POST)
- FUEL RELATED (FUEL)
- GLIDER TOWING RELATED EVENTS (GTOW)
- GROUND COLLISION (GCOL)
- GROUND HANDLING (RAMP)
- ICING (ICE)
- LOSS OF CONTROL-GROUND (LOC-G)
- LOSS OF CONTROL-INFLIGHT (LOC-I)
- LOSS OF LIFTING CONDITIONS EN ROUTE (LOLI)
- LOW ALTITUDE OPERATIONS (LALT)
- MEDICAL (MED)
- NAVIGATION ERRORS (NAV)
- OTHER (OTHR)
- RUNWAY EXCURSION (RE)
- RUNWAY INCURSION (RI)
- SECURITY RELATED (SEC)
- SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT) (SCF-NP)
- SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT) (SCF-PP)
- TURBULENCE ENCOUNTER (TURB)
- UNDERSHOOT/OVERSHOOT (USOS)

- UNINTENDED FLIGHT IN IMC (UIMC)
- UNKNOWN OR UNDETERMINED (UNK)
- WILDLIFE (WILD)
- WIND SHEAR OR THUNDERSTORM (WSTRW)

## Appendix 1 Operational overview and indicators of nationally registered airlines

Time		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Nationally registered Airlines	Number of airlines	18	18	16	15	17	17	18	16	16	19	
	Civil air transport carriers	9	9	8	8	9	8	8	8	8	8	
	General aviation carriers	11	11	10	10	11	12	13	11	11	14	
	Number of airworthy aircraft	255	260	263	274	278	270	270	285	280	293	
Civil air transport carriers	Passenger count	Domestic routes	4,891,621	5,413,680	5,537,976	5,783,596	6,106,070	5,034,365	3,269,669	4,847,237	5,491,806	5,196,573
		International and cross-strait routes	29,042,002	31,226,905	31,135,769	32,147,492	32,411,419	5,185,437	521,058	4,217,694	25,863,910	31,774,265
		Total	33,933,623	36,640,585	36,673,745	37,931,088	38,517,489	10,219,802	3,790,727	9,064,931	31,355,716	36,970,838
	Cargo weight in tons	Domestic routes	39,941	40,491	34,498	35,407	43,009	42,054	33,319	45,766	49,820	48,109
		International and cross-strait routes	1,603,637	1,660,477	2,125,051	2,198,730	2,029,288	2,263,684	2,647,098	2,346,574	2,029,790	2,135,125
		Total	1,643,578	1,700,968	2,159,549	2,234,137	2,072,297	2,305,738	2,680,417	2,392,341	2,079,610	2,183,234
	Number of flights	Domestic routes	84,455	87,257	79,638	90,731	98,887	79,666	55,440	74,120	75,164	77,343
		International and cross-strait routes	168,089	178,842	168,158	175,390	174,695	86,087	77,462	82,974	142,321	171,597
		Total	252,544	266,099	247,796	266,121	273,582	165,753	132,902	157,094	217,485	248,940
	Passenger helicopters	Flight hours	137.8	148.1	211.3	193.3	122.1	137.4	86.5	196.6	154.9	95.0
		Number of flights	383	468	646	246	102	268	82	168	158	94
		Passenger count	1,852	2,287	3,204	2,735	1,009	1,415	852	1,853	1,708	1,056
General aviation carriers	Flight hours	2,055.4	2,622.5	1,367.2**	5,476.7	5,053.0	3,510.7	3,545.9	4,698.1	4,799.5	5,708.8	
Nationally registered helicopters	Flight hours	1,317	1,675	1,587	1,058	1,347	1,351	1,102	1,035	1,452	2,079	
	Number of flights	1,134	1,152	1,463	1,147	979	871	781	815	1,286	968	

\*The 2017 civil aviation statistics report only listed flight hours by Daily Air and Emerald Pacific Airlines and no other data on general aviation carriers.

## Appendix 2 National airborne service corps flights and aircraft

Year	Mission type	Total number of flights	Total flight hours	Aircraft type/inventory count
2015	Air disaster relief Air search and rescue Air emergency medical services Air reconnaissance and patrol Air transportation	4,895	6,302:40	AS-365 10, UH-60M 3 BEECH 2, S-76B 2 B-234 2, UH-1H 13
2016		4,640	6,360:50	AS-365 9, UH-60M 5 BEECH 2, UH-1H 6
2017		4,719	7,260:35	AS-365 9, UH-60M 9 BEECH 1, UH-1H 6
2018		4,641	6,491:50	AS-365 9, UH-60M 8 BEECH 1
2019		4,417	6,181:45	AS-365 9, UH-60M 8 BEECH 1
2020		4,316	6,082:27	AS-365 9, UH-60M 8 BEECH 1
2021		4,975	7,098:45	AS-365 8, UH-60M 14 BEECH 1
2022		4,861	6,413:20	AS-365 8, UH-60M 14 BEECH 1
2023		5,427	6,347.00	AS-365 8, UH-60M 14 BEECH 1
2024		4,486	5,879.25	AS-365 8, UH-60M 14 BEECH 1

## Notes:

- I. This fleet is a consolidation of the Airborne Squadron of the National Police Agency, the Preparatory Office of the Airborne Fire Fighting Squadron of the National Fire Agency, the Aviation Team of the CAA of the MOTC, and the Air Patrol Squadron of the Coast Guard Administration into a single agency, the National Airborne Service Corps, established on March 10, 2004, and formalized on November 9, 2005.
- II. This table does not include the number of flight and flight hours by helicopters rented by the Air Patrol Squadron of the Coast Guard Administration.
- III. The 2019 inventory of aircraft only includes serviceable aircraft as of December 31.

## Appendix 3 Basic data on major aviation occurrences involving nationally registered aircraft

## Civil air transport carriers

No.	Date	Airline	Aircraft model	Registration number	Flight number	Damage to aircraft	Fatalities	Serious injuries	Flight phase	Incident category	Incident cause	Report title
1	2015.02.04	TransAsia Airways	ATR72-600	B-22816	GE235	Hull loss	43	14	Enroute	SCF-NP, LOC-I	Pilot, system, equipment	Loss of control 3 nautical miles east of Songshan Airport and crashing into Keelung River
2	2015.02.05	Daily Air	DO-228	B-55565	DA7507	None	0	0	Landing	RE	Pilot, weather	Runway excursion while landing at Lanyu Airport
3	2016.04.17	China Airlines	B737-800	B-18609	CI025	None	0	0	Enroute	SCF-PP	System and equipment	Turning back because of abnormal cabin pressure approximately 150 nautical miles northwest of Guam
4	2016.05.06	V Air	A321-200	B-22610	ZV252	None	0	0	Enroute	OTHER, F-NI	Other	Fire and smoke from a passenger's power bank while en route
5	2016.07.24	TransAsia Airways	A320-200	B-22317	GE367	None	0	0	Enroute	SCF-NP, F-NI	System and equipment	Smoke from the water heater in galley behind the passenger cabin while climbing
6	2016.10.01	China Airlines	A330-300	B-18609	CI704	Substantial damage	0	0	Landing	ARC	Pilot	Tail strike while landing on runway 23R at Taoyuan International Airport
7	2016.12.07	China Airlines	B737-800	B-18605	CI027	None	0	0	Enroute	OTHER, F-NI	Other	Smoke from a passenger's cell phone during en route phase
8	2016.12.16	EVA Air	B777-300ER	B-16726	BR015	None	0	0	Enroute	ATM	Other persons-ATC	Near collision with ground barriers when instructed by air traffic control to turn left after taking off from Los Angeles Airport
9	2017.04.13	Daily Air	DHC-6-400	B-55571	DA7511	Substantial damage	0	0	Landing	RE	Pilot, weather, airport facilities	Substantial damage to aircraft due to a runway excursion while landing on runway 13 of Lanyu Airport
10	2017.11.22	EVA Air	B777-300ER	B-16718	BR56	None	0	2	Enroute	TURB	Weather, other persons - passenger cabin	Strong turbulence while en route 42 nautical miles northeast of Miyazaki Airport

No.	Date	Airline	Aircraft model	Registration number	Flight number	Damage to aircraft	Fatalities	Serious injuries	Flight phase	Incident category	Incident cause	Report title
11	2017.12.02	EVA Air	B777-300ER	B-16718	BR35	Substantial damage	0	0	Taxi	GCOL	Pilot, airport facilities	While taxiing onto the departure runway at Toronto Pearson International Airport, right wing collided with a lamppost, resulting in damage to front edge of wing
12	2018.04.23	Daily Air	DHC-6-400	B-55573	DA7012	None	0	0	Landing	RE	Pilot	Runway excursion while landing on runway 09 at Kaohsiung International Airport
13	2018.06.21	China Airlines	B747-400F	B-18711	CI5148	None	0	0	Landing	RE	Pilot, navigation facility	Runway excursion and go-around while landing at O'Hare International Airport
14	2018.07.02	Far Eastern Air Transport	MD-82	B-28035	FE8026	Light Damage	0	0	Enroute	SCF-PP	Engine	Left engine malfunctioning approximately 10 nautical miles from Songshan Airport while on approach
15	2018.07.08	China Airlines	B737-800	B-18667	CI170	None	0	0	Approach	FUEL	Pilot, weather	Declaration of emergency after 3 go-arounds while approaching Toyama Airport and then rerouted to Nagoya Airport
16	2018.08.22	Mandarin Airlines	ATR72-600	B-16852	AE788	None	0	0	Landing	RE	Pilot, weather	Runway excursion during landing at Taichung International Airport
17	2018.10.19	China Airlines	B747-400F	B-18719	CI5880	None	0	0	Standing	SCF-NP	System and equipment, other persons - upkeep	Tire explosion when performing tire pressurization at Singapore Changi Airport
18	2018.12.14	China Airlines	B747-400F	B-18717	CI6844	None	0	0	Landing	USOS	Pilot	Undershot runway while landing on runway 05L of Taoyuan International Airport
19	2018.12.22	EVA Air	B777-300ER	B-16716	BR61	None	0	0	Enroute	ATM	ATC and services	Approached flights NCR840 and KLM875 while in airspace under control of Delhi, India

No.	Date	Airline	Aircraft model	Registration number	Flight number	Damage to aircraft	Fatalities	Serious injuries	Flight phase	Incident category	Incident cause	Report title
20	2019.03.09	China Airlines	B747-400	B-18211	CI122	None	0	0	Enroute	FUEL	Pilot	Fuel distress before landing at Taoyuan International Airport
21	2019.04.20	Far Eastern Air Transport	ATR72-600	B-28082	FE3060	None	0	0	Landing	RE	Pilot	Brief runway excursion during landing at Taichung International Airport
22	2019.05.02	Mandarin Airlines	ATR72-600	B-16851	AE7931	None	0	0	Enroute	SCF-NP	System and equipment	Temporary loss of pressure in passenger cabin during the descent
23	2019.05.30	China Airlines	A330-300	B-18352	CI922	None	0	0	Enroute	SCF-PP, F-NI	Other persons-maintenance	Engine fire alarm at cruising level 250 after departing Hong Kong International Airport and return to Hong Kong
24	2019.12.25	Tigerair Taiwan	A320-200	B-50001	IT237	None	0	2	Enroute	TURB	Weather	Encountered turbulence while passing through the airspace above the eastern shore of Kyushu, Japan, resulting in severe injuries to 2 cabin crew members
25	2020.06.14	China Airlines	A330-300	B-18302	CI202	None	0	0	Landing	SCF-NP	System and equipment	Multiple system failures while landing at Songshan Airport
26	2021.05.10	UNI Air	ATR72-600	B-17010	B79091	Substantial damage	0	0	Landing	CFIT	Pilot	Go around at Matsu Nangan Airport after main wheels and tail skid collided with the top outer edge of the pre-threshold area of runway 21 and return to Songshan Airport
27	2023.08.07	Tigerair Taiwan	A320-200	B-50023	IT237	None	0	0	Landing	MED	Other	Temporary disability of flight crew members after landing at Taoyuan Airport

## General aviation carriers

No.	Date	Airline	Aircraft model	Registration number	Operation	Damage to aircraft	Fatalities	Serious injuries	Report title
1	2015.04.16	Roc Aviation Company	BN-2B-20	B-68802	Other	None	0	0	Returning to Taitung Airport because of engine failure after take off
2	2015.11.22	Emerald Pacific Airlines	Bell-206B3	B-31127	Other	Hull loss	2	0	Crashed during an electric tower obstacle sweeping in the Taishan District of New Taipei City
3	2017.06.10	Emerald Pacific Airlines	Bell-206B	B-31118	Photographing	Hull loss	3	0	Crashed during aerial photography in Fengbin Township, Hualien County
4	2018.03.15	Aerospace Industrial Development Corporation	Astra-SPX	B-20001	Tow target	None	0	0	Brief runway excursion during landing at Taichung International Airport
5	2023.08.07	Daily Air	BK117-B2	B-55507	Hauling and lifting	None	0	0	External load fell off in Dongpu, Nantou County.
6	2024.11.04	APEX	P2012	B-86002	Medical	Substantial damage	0	0	Substantial structural damage was discovered upon landing at Kinmen Airport

## Nationally registered helicopters

No.	Date	Airline	Aircraft model	Registration number	Operation	Damage to aircraft	Fatalities	Serious injuries	Report title
1	2015.11.22	Emerald Pacific Airlines	Bell-206B3	B-31127	Other	Hull loss	2	0	Crashed during an electric tower obstacle sweeping in the Taishan District of New Taipei City
2	2017.06.10	Emerald Pacific Airlines	Bell-206B	B-31118	Photographing	Hull loss	3	0	Crashed during aerial photography in Fengbin Township, Hualien County
3	2023.08.07	Daily Air	BK117-B2	B-55507	Other	None	0	0	External load fell off in Dongpu, Nantou County.

## Flight training institutions

No.	Date	Organization	Aircraft model	Registration number	Flight number	Operation	Damage to aircraft	Fatalities	Serious injuries	Report title
1	2016.05.05	APEX	DA-40NG	B-88002	AFA21	Training	Substantial damage	0	0	Damage to the aircraft while landing and bouncing at Taitung Airport
2	2018.07.09	APEX	DA-40NG	B-88123	AFA72	Training	Hull loss	0	0	Crash landing approximately 12 nautical miles southwest of Kaohsiung International Airport due to engine failure during landing phase
3	2024.08.24	APEX	DA-40NG	B-88003	AFA72	Training	None	0	0	Landing on an undesignated runway at Tainan Airport

## Public aircraft

No.	Date	Activity Group	Aircraft model	Registration number	Operation	Damage to aircraft	Fatalities	Serious injuries	Report title
1	2015.11.07	NASC	King Air BE-350	NA-302	Aerial photography	Substantial damage	0	0	Damage to aircraft from landing on belly after landing gear collapsed while landing at Taichung International Airport
2	2016.03.11	NASC	AS365N3	NA-107	Supply	Hull loss	2	3	Sea crash while performing suspension operations offshore in Shimen District, New Taipei City
3	2017.06.30	NASC	UH-60M	NA-703	Training	None	0	1	Personnel injury from falling into the ocean during training at Taichung Port
4	2018.02.05	NASC	UH-60M	NA-706	Medical evacuation	Hull loss	6	0	Crashing into ocean after taking off from Lanyu Airport
5	2018.11.04	NASC	AS365N2	NA-104	Suspension rescue	None	1	0	Personnel falling into the ocean during suspension operations approximately 2.5 nautical miles outside Kaohsiung Port
6	2018.12.05	NASC	AS365N3	NA-106	Suspension rescue	None	1	0	Death of personnel from injuries while performing suspension operations
7	2020.04.07	NASC	AS365N2	NA-103	Training	Hull loss	0	0	Crash during tail rotor failure protocol simulation

## Ultra-light vehicles

No.	Date	Activity Group	Aircraft model	Registration number	Damage to aircraft	Fatalities	Serious injuries
1	2015.03.16	Taiwan Ultra-light Flights Development Association	RANS S-6 COYOTE II	PA-2002	Hull loss	2	0
2	2015.06.21	Taiwan Aviators Sports Association	HAWK ARROW II	None	Hull loss	0	1
3	2016.02.20	None	Super Bingo	None	Hull loss	0	0
4	2016.11.17	KaiXiang Aerosports Association	Remos GX	AJ-2666	Hull loss	0	1
5	2017.03.11	None	Storch	None	Hull loss	0	1
6	2018.01.06	None	N/A	None	Hull loss	0	0
7	2018.07.08	None	Skylark IIS	None	Hull loss	0	2
8	2018.09.02	None	N/A	None	Hull loss	1	0
9	2018.09.14	Chinese Taipei Powered Paragliding Association	APCO LIFT M	PM-1052	Hull loss	1	0
10	2019.01.27	None	APCO LIFT EZ S	None	Hull loss	0	1
11	2021.01.07	KaiXiang Aerosports Association	Flight Design CTLSi	AJ-2199	Hull loss	2	0
12	2021.04.23	None	APCO THRUST HP S	None	Light damage	0	1
13	2022.08.06	Chinese Taipei Aviation League	Ikarus C42B	AL2816	Hull loss	2	0
14	2023.03.16	Shun Feng Flying Club	Shark LSA	SF2555	Hull loss	2	0
15	2024.07.01	Taiwan Taiya Aviation Tourism and Leisure Development Association	Savannah S	WR2711	Substantial damage	0	1
16	2024.08.03	Chinese Taipei Aerosports Federation	Sling LSA	SA2022	Substantial damage	0	0
17	2024.12.09	Taiwan Aviators Sports Association	STORCH CL	JJ2258	Hull loss	0	1

## Drones

No.	Date	Activity Group	Aircraft model	Registration number	Damage to aircraft	Fatalities	Serious injuries
1	2020.02.07	GEOSAT Aerospace & Technology Inc.	Sky Arrow 55	Not applicable*	Hull loss	0	0
2	2020.06.17	Southern Branch, Coast Guard Administration of the Ocean Affairs Council	AVIX AXH-E230RS	B-AAA01403	Missing	0	0
3	2021.03.09	Northern Branch, Coast Guard Administration of the Ocean Affairs Council	AVIX AXH-E230RS	B-AAA01408	Hull loss	0	0
4	2023.01.17	Eastern Branch, Coast Guard Administration of the Ocean Affairs Council	AVIX AXH-E230RS	B-AAA01397	Hull loss	0	0

\*This incident took place before the implementation of the special chapter on drones of the Civil Aviation Act (March 31, 2020).

## Appendix 4 IATA and Taiwan hull loss rates and fatal occurrences rate for civil air transport turbojet airplanes

Year	Global (IATA)					Taiwan				
	Departure	Hull loss	Hull loss rate	Fatal incident	Fatal Occurrences rate	Departure <sup>20</sup>	Hull loss	Taiwan hull loss rate	Fatal incident	Fatal Occurrences rate
	Million occurrences	Occurrences	Per million departures	Occurrences	Per million departures	Occurrences	Occurrences	Per million departures	Occurrences	Per million departures
2015	31.40	10	0.32	0	0.00	200,610	0	0.00	0	0.00
2016	33.80	13	0.39	5	0.15	212,403	0	0.00	0	0.00
2017	35.00	4	0.11	1	0.03	205,955	0	0.00	0	0.00
2018	37.70	7	0.19	6	0.16	209,582	0	0.00	0	0.00
2019	39.60	6	0.15	4	0.10	200,666	0	0.00	0	0.00
2020	19.10	4	0.21	3	0.06	110,240	0	0.00	0	0.00
2021	22.90	3	0.13	1	0.04	99,980	0	0.00	0	0.00
2022	N/A <sup>21</sup>	5	0.17	1	0.03	106,375	0	0.00	0	0.00
2023		0	0.00	0	0.00	168,430	0	0.00	0	0.00
2024		N/A	0.14	5	0.03	177,345	0	0.00	0	0.00
2015-2019	177.50	40	0.23	16	0.09	1,029,216	0	0.00	0	0.00
2016-2020	165.20	34	0.21	19	0.12	938,846	0	0.00	0	0.00
2017-2021	154.30	24	0.16	15	0.10	826,423	0	0.00	0	0.00
2018-2022	N/A	25	0.16	15	0.06	726,843	0	0.00	0	0.00
2019-2023		18	0.14	9	0.04	685,691	0	0.00	0	0.00
2020-2024		N/A	0.15	10	0.03	662,370	0	0.00	0	0.00

<sup>20</sup> Source: [Aviation safety statistics](#) for Taiwan's civil aviation turbojet airplane departures, released on the official CAA website.

<sup>21</sup> Since 2022, IATA doesn't release the data for the number of departures for turbojet airplanes. Since 2024, IATA only releases the number of fatal accidents, not the number of hull loss accidents.

## Appendix 5 IATA and Taiwan hull loss rates and fatal occurrences rates for civil air transport turboprop airplanes

Year	Global (IATA)					Taiwan				
	Departure	Hull loss	Hull loss rate	Fatal incident	Fatal Occurrences rate	Departure <sup>22</sup>	Hull loss	Taiwan hull loss rate	Fatal incident	Fatal Occurrences rate
	Million occurrences	Occurrences	Per million departures	Occurrences	Per million departures	Occurrences	Occurrences	Per million departures	Occurrences	Per million departures
2015	6.20	8	1.29	4	0.65	62,389	1	16.03	1	16.03
2016	7.00	8	1.15	5	0.71	62,838	0	0.00	0	0.00
2017	6.90	9	1.30	5	0.72	51,841	0	0.00	0	0.00
2018	8.40	5	0.60	5	0.60	69,349	0	0.00	0	0.00
2019	7.30	5	0.69	4	0.55	84,229	0	0.00	0	0.00
2020	3.10	5	1.61	2	0.33	64,067	0	0.00	0	0.00
2021	2.80	5	1.79	6	1.72	47,425	0	0.00	0	0.00
2022	N/A <sup>23</sup>	5	1.47	4	0.74	59,864	0	0.00	0	0.00
2023		2	0.57	1	0.28	58,946	0	0.00	0	0.00
2024		N/A	1.12	2	0.28	66,814	0	0.00	0	0.00
2015-2019	35.80	35	0.98	23	0.64	330,646	1	3.02	1	3.02
2016-2020	32.70	32	0.98	21	0.64	332,324	0	0.00	0	0.00
2017-2021	28.5	29	1.02	22	0.77	316,911	0	0.00	0	0.00
2018-2022	N/A	25	1.12	21	0.67	324,934	0	0.00	0	0.00
2019-2023		22	1.21	17	0.65	314,531	0	0.00	0	0.00
2020-2024		N/A	1.37	15	0.67	297,116	0	0.00	0	0.00

<sup>22</sup> Source: [Aviation safety statistics](#) for Taiwan's civil aviation turboprop airplane departures, released on the official CAA website.

<sup>23</sup> Since 2022, IATA doesn't release the data for the number of departures for turbojet airplanes. Since 2024, IATA only releases the number of fatal accidents, not the number of hull loss accidents.

## Appendix 6 Statistics on civil air transport accidents compiled by the ICAO and Taiwan

Year	ICAO	Taiwan		
	Incident rate	Departure <sup>24</sup>	Accident	Incident rate
	Per million departures	Occurrences	Occurrences	Per million departures
2015	2.8	262,999	1	3.8
2016	2.1	275,241	1	3.6
2017	2.4	257,796	3	11.6
2018	2.6	278,931	0	0
2019	2.9	284,895	1	3.5
2020	2.1	174,307	0	0
2021	1.9	147,405	1	6.8
2022	2.1	166,239	0	0
2023	1.9	227,376	0	0
2024	2.6	244,159	0	0

<sup>24</sup> Source: [Aviation safety statistics](#) for Taiwan civil aviation turboprop and turbojet airplane total departures, released on the official CAA website.

## Appendix 7 Hull loss and fatal occurrence rates in Taiwan's general aviation carriers

Year	Flight hour <sup>25</sup>	Hull loss	Hull loss rate	Fatal incident	Fatal occurrence rate
	Hours	Occurrences	Per 10,000 flight hours	Occurrences	Per 10,000 flight hours
2015	2,055	1	4.87	1	4.87
2016	2,623	0	0.00	0	0.00
2017	1,367	1	7.31	1	7.31
2018	5,477	0	0.00	0	0.00
2019	5,053	0	0.00	0	0.00
2020	3,511	0	0.00	0	0.00
2021	3,459	0	0.00	0	0.00
2022	3,702	0	0.00	0	0.00
2023	4,645	0	0.00	0	0.00
2024	5,614	0	0.00	0	0.00
2015-2019	16,575	2	1.21	2	1.21
2016-2020	18,030	1	0.55	1	0.55
2017-2021	18,867	1	0.53	1	0.53
2018-2022	21,202	0	0	0	0
2019-2023	20,370	0	0	0	0
2020-2024	20,931	0	0	0	0

<sup>25</sup> Source: Aviation safety statistics for total flight hours, except for flight hours by helicopter passenger services, in Table 66 of the [Civil Aviation Statistical Yearbook](#) on the official CAA website.

## Appendix 8 Hull loss and fatal occurrence rates of nationally registered helicopters

Year	Flight hour <sup>26</sup>	Departure <sup>20</sup>	Hull loss	Hull loss rate		Fatal incident	Fatal occurrence rate	
	Hours	Occurrences	Occurrences	Per 10,000 flight hours	Per million departures	Occurrences	Per 10,000 flight hours	Per million departures
2015	1,317	1,134	1	7.59	8.82	1	7.59	8.82
2016	1,675	1,152	0	0.00	0.00	0	0.00	0.00
2017	1,587	1,463	1	6.30	6.84	1	6.30	6.84
2018	1,058	1,147	0	0.00	0.00	0	0.00	0.00
2019	1,347	979	0	0.00	0.00	0	0.00	0.00
2020	1,351	871	0	0.00	0.00	0	0.00	0.00
2021	1,102	781	0	0.00	0.00	0	0.00	0.00
2022	1,035	815	0	0.00	0.00	0	0.00	0.00
2023	1,452	1,286	0	0.00	0.00	0	0.00	0.00
2024	2,079	968	0	0.00	0.00	0	0.00	0.00
2015-2019	6,984	5,875	2	2.86	3.40	2	2.86	3.40
2016-2020	7,018	5,612	1	1.42	1.78	1	1.42	1.78
2017-2021	6,445	5,241	1	1.55	1.91	1	1	1.91
2018-2022	5,893	4,593	0	0.00	0.00	0	0.00	0.00
2019-2023	6,287	4,732	0	0.00	0.00	0	0.00	0.00
2020-2024	7,019	4,721	0	0.00	0.00	0	0.00	0.00

<sup>26</sup> Source: [Aviation safety statistics](#) for nationally registered helicopter flight hours and departures, released on the official CAA website.

## Appendix 9 Hull loss and fatal occurrence rates of Taiwan's public aircraft

Year	Flight hour	Departure	Hull loss	Hull loss rate		Fatal incident	Fatal occurrence rate	
	Hours	Occurrences	Occurrences	Per 10,000 flight hours	Per million departures	Occurrences	Per 10,000 flight hours	Per million departures
2015	6,302.7	4,895	0	0.00	0.00	0	0.00	0.00
2016	6,360.8	4,640	1	1.57	2.16	1	1.57	2.16
2017	7,260.6	4,719	0	0.00	0.00	0	0.00	0.00
2018	6,491.8	4,641	1	1.54	2.15	3	4.62	6.46
2019	6,181.8	4,417	0	0.00	0.00	0	0.00	0.00
2020	6,082.5	4,316	1	1.64	2.32	0	0.00	0.00
2021	7,098.8	4,975	0	0.00	0.00	0	0.00	0.00
2022	6,413.3	4,861	0	0.00	0.00	0	0.00	0.00
2023	6,347.0	5,427	0	0.00	0.00	0	0.00	0.00
2024	5,879.4	4,486	0	0.00	0.00	0	0.00	0.00
2015-2019	32,598	23,312	2	0.61	0.86	4	1.23	1.72
2016-2020	32,378	22,733	3	0.93	1.32	4	1.24	1.76
2017-2021	33,116	23,068	2	0.60	0.87	3	0.91	1.30
2018-2022	32,268	23,210	2	0.62	0.86	3	0.93	1.29
2019-2023	32,123	23,996	1	0.31	0.42	0	0.00	0.00
2020-2024	31,821	24,065	1	0.31	0.42	0	0.00	0.00