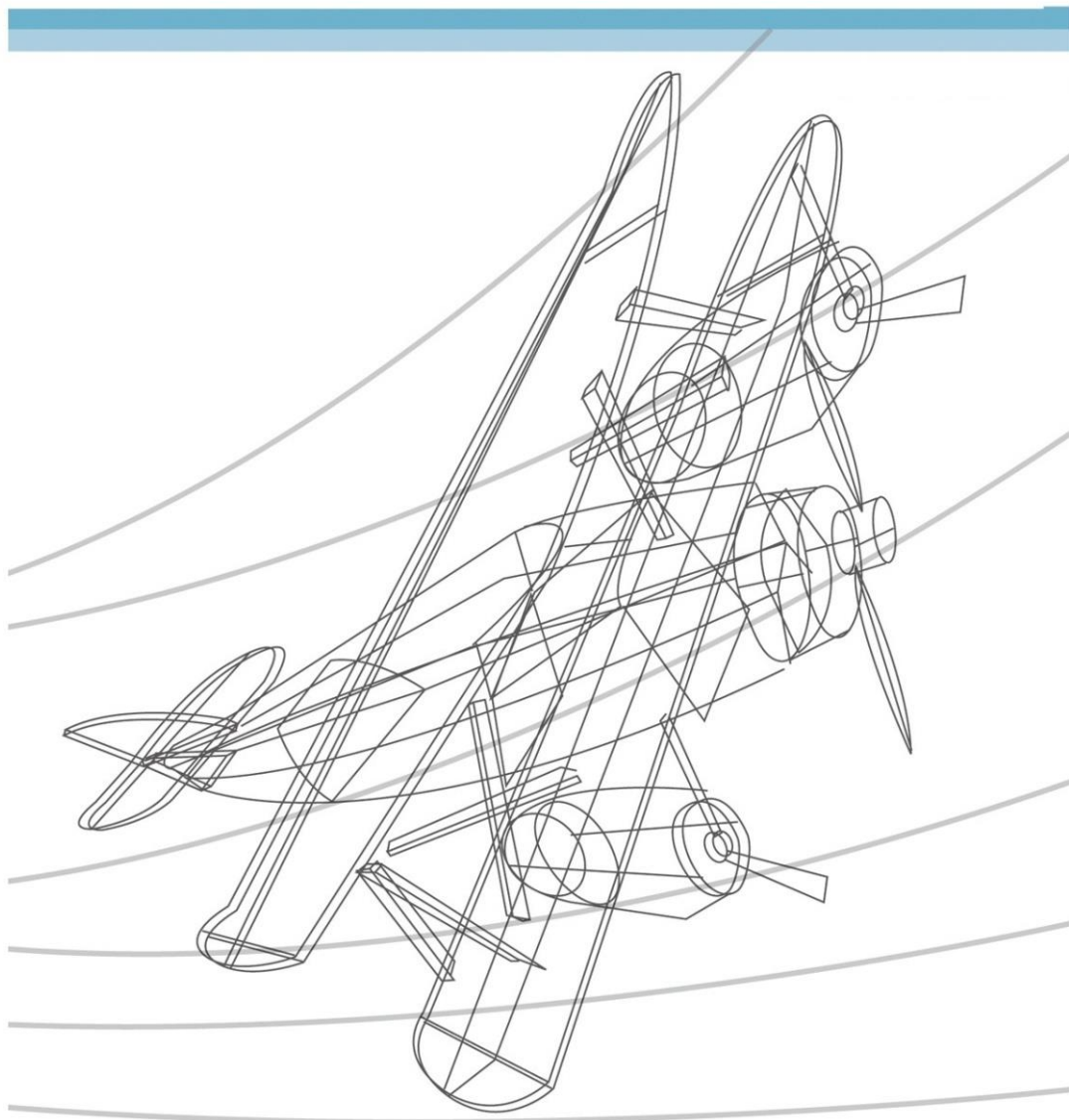


# Taiwan Aviation Occurrence Statistics 2007 to 2016



**Aviation Safety**

## TABLE OF CONTENTS

<b>Abstract</b> .....	<b>5</b>
<b>Introduction</b> .....	<b>7</b>
<b>The Operation of Civil Aircraft and Public Aircraft in Taiwan</b> .....	<b>8</b>
The Overview of Civil Aviation Operation, 2016 and the latest decade .....	8
Civil Aviation Transportation Category .....	8
General Aviation .....	12
Public Aircraft .....	13
Activities of Ultra-Light Vehicle .....	14
Activities of Free Balloon .....	14
The Establishment of Flight Training Center .....	14
<b>Statistics and Analysis of Aviation Occurrence data, 2007-2016</b> .....	<b>15</b>
Introduction to Aviation Occurrence Data .....	15
Overview of Taiwan Aviation Occurrences .....	18
Fatal/ Hull Loss Aviation Occurrences in Taiwan, 2016 .....	18
Occurrences Involving Civil Transportation Aircraft .....	20
Occurrences Involving General Aviation and Helicopter .....	28
Occurrences Involving Public Aircraft .....	29
Ultra-light Vehicle Occurrences .....	30
<b>Status of Tracking Safety Recommendations and associated action plans</b> .....	<b>31</b>
Safety Recommendations Statistics .....	31
Tracking of Action Plans/ Proposals for Aviation Safety Recommendations .....	32
The Statistics of Action Plans Status .....	32
<b>Definitions of Terms</b> .....	<b>33</b>
<b>Appendix</b> .....	<b>40</b>

## TABLE OF FIGURES

Figure1 :	Taiwan air carriers, transportation and general aviation category, 2007-2016 .....	9
Figure2 :	Taiwan airworthy civil aircraft, 2007-2016 .....	9
Figure3 :	Taiwan air carriers revenue passengers of transportation category, 2007-2016 .....	10
Figure4 :	Taiwan air freight of transportation category air carrier, 2007-2016.....	11
Figure5 :	Taiwan flight departures of transportation category, 2007-2016	12
Figure6 :	Taiwan air carriers flight hours of general aviation, 2007-2016.	12
Figure7 :	Total flight numbers and total flight hours of National Airborne Service Corps, 2007-2016 .....	13
Figure8 :	5-year moving average fatal occurrence rate by million departures, Taiwan transportation category airplane, 2007-2016.....	21
Figure9 :	5-year moving averages hull loss occurrence rates by million departures, Taiwan transportation category airplane, 2007-2016.....	22
Figure10 :	10-year moving averages hull loss occurrence rates of Taiwan commercial jet airplanes .....	23
Figure11 :	10-year moving averages hull loss occurrence rates of Taiwan turboprop airplanes .....	23
Figure12 :	Numbers and rates of transportation category airplane accidents (ICAO definition), 2007-2016 .....	24
Figure13 :	Occurrences distribution of transportation category airplane 2007-2016 by flight phase.....	25
Figure14 :	Occurrences distribution of transportation category airplane 2007-2016 by ICAO occurrence category .....	26
Figure15 :	Broad causes/factors for airplane of transport category, 2007-2016.....	27
Figure16 :	Occurrences statistics of public aircrafts, 2007-2016 .....	29
Figure17 :	Statistics of aviation safety recommendations, 1999-2016 .....	31
Figure18 :	Statistics of action plans status.....	32

## TABLE OF TABLES

Table 1 :	Types of Taiwan commercial jet airplanes.....	16
Table 2 :	Types of Taiwan commercial turboprop airplanes .....	16
Table 3 :	Types of Taiwan general aviation aircrafts .....	16
Table 4 :	Types of Taiwan public aircrafts .....	16
Table 5 :	Types of APEX training academy aircrafts .....	17
Table 6 :	Aviation occurrence statistics in Taiwan, 2007-2016 .....	18
Table 7 :	Aviation fatal/ hull loss occurrence statistics in Taiwan, 2016. ..	19
Table 8 :	Fatalities or injuries caused by transportation category aircrafts in Taiwan, 2016 .....	19
Table 9 :	Aviation safety performance of transportation category aircraft in Taiwan .....	20
Table 10 :	Number of transportation category airplanes accidents (ICAO definition), 2007-2016 .....	24
Table 11 :	Occurrence rate of general aviation / helicopter of transport category, 2007-2016 .....	28
Table 12 :	Ultra-light vehicle occurrences, 2007- 2016 .....	30

## APPENDIX

Appendix1:	The operations of airline companies in Taiwan, 2007-2016 ..	40
Appendix2:	The operation statistics of public aircraft, 2007-2016 .....	41
Appendix3:	Aviation occurrences and rates (by flight hours) of civil aviation transport category airplane, 2007-2016 .....	42
Appendix4:	Aviation occurrences/ rates (by departures) of civil aviation transport category airplane, 2007-2016 .....	43
Appendix5:	Aviation occurrences involving illegal actions in airlines (suicide, damaging on purpose, terrorists), 2007-2016.....	44
Appendix6:	Statistics of aviation safety recommendations, 1999-2016 ...	44

## Abstract

Over the past decade (2007-2016), the domestic and international transportation services showed different trends to the civil aviation industries. There was a significant increase on international air transport for passenger. The number of passenger increased 69.1 percent, the cargo decreased 1.2 percent, and the numbers of flights increased 50 percent over the period. The declination over the past decade happened in 2008. In 2009, the trend of declination was slowed down and returned to positive increasing trend in 2010. Meanwhile, the numbers of domestic air transport declined significantly since the number of passengers decreased almost 14.4 percent, the numbers of flights also decreased 22.5 percent; however the numbers of cargo services changed slightly over the past decade.

From 2007 through 2016, there were 75 aviation occurrences in Taiwan totally, including those Taiwan air carriers' aircraft occurred outside the country. Transportation category aircraft occurrences accounted for the most (43). The remaining 32 occurrences were general aviation, public aircrafts, ultra-light vehicles or foreign-registered aircrafts. Of those 75 occurrences, 113 fatalities were resulted. There were 9 aviation occurrences occurred in 2016, including 5 national civil aviation transportation category aircraft, 1 general aviation category aircrafts, 1 public aircraft and 2 ultra-light vehicles. The public aircraft occurrence resulted in hull loss and 2 fatalities.

According to the occurrence rates for the airplanes in civil aviation transportation category over the last 10 years (2007-2016), the average rate of hull loss occurrences on commercial jet was 0.17 per million flight hours, or 0.57 per million departures. In addition to that, the hull loss occurrence rates on turboprop airplanes were 3.55 per million flight hours and 3.16 per million departures. Based on the 10-year moving average of hull loss occurrence rates on civil aviation transportation category, the rate decreased gradually after 2007, and remained constant from 2013. The hull loss rates on turboprop airplanes rose due to 2 hull loss occurrences in 2014 and 2015, fortunately, no hull loss accident occurred in 2016.

When focusing on the accident rates for each phase of flight, defined by International Civil Aviation Organization (ICAO), there were total 43 aviation occurrences happening at different flight phases over the last decade. Among all these accidents, 15 of them took place at landing phase, as the most prevalent, followed by 12 occurrences at cruising phase.

In accordance with the occurrence category used by ICAO, among all 43 civil transportation category airplane occurrences over the past ten years, the runway excursions overall were the most frequent with a total of 12 reported occurrences. The second most frequent occurrences were the SCF-NP (system/component failure or malfunction/ non-powerplant), accounting for 11.

## Aviation Safety Council

---

The National Transportation Safety Board uses the personnel, environment, and aircraft related factors to classify occurrence cause and contributing factor. By using the similar approach to classify the civil transportation category airplane occurrence over the past ten years in Taiwan, personnel was cited as a cause/factor in 51.2 percent (44.2 percent related to pilots, 7.0 percent related to maintenance/ATC personnel), of those occurrences as the largest percentage, following by aircraft related in 44.2 percent and environment related in 18.6 percent.

From 2007 to 2016, the rate of general aviation occurrence was 30.11 per 100,000 flight hours, fatal occurrence rate was 10.04 per 100,000 flight hours and hull loss occurrence rate was 12.54 per 100,000 flight hours. There was 1 helicopter hull loss occurrence in 2008 and 1 helicopter fatal/hull loss occurrence in 2009. There was a fixed wing aircraft fatal/hull loss occurrence in year 2012, and 1 helicopter fatal/hull loss occurrence in 2013 and 2015 respectively.

There were 7 occurrences involving public aircrafts during the period of 2007 to 2016. Of these occurrences, among the 7 occurrences, 5 occurrences repair cost exceeding the cost of the aircraft (two was fatal) and 2 were personnel injuries occurrences. There was 1 public aircraft occurrence in 2016.

According to the formal records of ultra-light vehicles occurrence, there were 11 occurrences from 2007 to 2016, including 4 fatal occurrences which resulted in 7 fatalities. Of the 11 occurrences were all hull losses. There was 21 ultra-light vehicle occurrences in 2016.

There were 123 occurrence investigations since the establishment of the Aviation Safety Council to the end of 2016, preclude those foreign and Mainland China agencies investigated occurrences (14) and incidents (2), totally 99 occurrence investigations were closed. After finishing these 99 occurrence investigations, the Aviation Safety Council had issued 954 safety recommendations during the period from April, 1999 to December, 2016 after the investigations. And there were totally 489 action plans being submitted by related Taiwan government agencies in accordance with the Council's safety recommendations. At the time of this publication, the numbers of accepted action plans proposed to government related departments and others were 435 which account for 89 percent, while the numbers of plans/proposals still under supervision were 33 which account for 6.7 percent, and 21 items still under reviewed which account for 4.3 percent.

## **Introduction**

The first part of the report introduces general status of domestic civil/public aircrafts. Briefly reviews last year's (2016) status of civil aviation operations. And then reviews the status of civil aircrafts, public aircrafts and ultra-light vehicles of last decade.

The second part of the report includes the statistics/analysis of aviation occurrences and safety recommendations. In order to give readers the general understanding of aviation occurrences statistics, the article will first introduce the basics and definition of statistical data, categorization of occurrence aircrafts, Aviation Safety Council's (ASC) investigation procedure and classification of occurrences. Then the report will focus on the statistics of aviation occurrences, including the overview of occurrences happened over the last decade, and different types of aircraft occurrences: the civil aviation transport category occurrences, general aviation occurrences, helicopter occurrences, public aircraft occurrences, and ultra-light vehicle occurrences. Then the data and analysis related to the civil aviation transport category airplane which includes safety recommendations made by the ASC and the status of its follow-up.

Several terminologies are used throughout this report that relate specifically to the civil aviation or International Civil Aviation Organization, for definitions of those terms, please refer to the Definitions of Terms as shown in the attachment.



## The Operation of Civil Aircraft and Public Aircraft in Taiwan<sup>1</sup>

### The Overview of Civil Aviation Operation, 2016 and the latest decade

The number of civil aviation companies in Taiwan was 9 in 2016. Eight<sup>2</sup> out of these 9 transportation category carriers operated on both international and domestic routes. One<sup>3</sup> operated in domestic routes only. The number of air carriers in the general aviation industry was 10<sup>4</sup>. Total number of aircraft operated in transport category and general aviation was 260<sup>5</sup> in 2016.

In year 2016 the transportation category air carrier in Taiwan carried a total of 36,640,000 passengers, a 8 percent higher than that in 2015. Among those, 85.2 percent were international passengers, 7.5 percent increase over the previous year, 14.8 percent were domestic passengers with a 10.7 percent increase when compared to the year before. The total weights the air cargo carried in 2016 were 1,701,000 tons, a 3.5 percent higher when compared to 2015. Among them, the international air cargo accounted for 97.6 percent of the total weight in 2016, increased by 3.5 percent from 2015. The domestic air cargo accounted for 2.4 percent of the total weight, increased 1.4 percent from 2015 to 2016. There were a total of 266,099 flights in the whole year, including 32.8 percent domestic flights, a 3.3 percent increase compared to the year before. International flights accounted for 67.2 percent of the total number of flights, 6.4 percent increase over the previous year.

It was demonstrated from previous data that in 2016, the domestic and international passenger/cargo carried both showed growth rates. In 2016, the general aviation had a total of 2,770 flight hours, which was increased by 26.3 percent from 2015 to 2016. The index of overall operations of national air carriers over the past ten years was showed in Appendix 1.

### Civil Aviation Transportation Category

As shown in Figure 1, the number of air carriers operating in civil air transportation category was 8 in 2007. After some variations of aviation market, the number of carriers was 9 in year 2016. Among those, the Far Eastern Airlines ceased its operation in May 17 of year 2008 and reopened in year 2010. In year 2014 two low cost carriers, V Air and Taiwan Tigerair,

<sup>1</sup> The listed statistical data mainly came from "CAA 2016 Annual Report".

<sup>2</sup> China Airlines, EVA Airways, TransAsia Airways, Uni Airways, Mandarin Airlines, Far Eastern Air Transport, V Air and Taiwan Tigerair. V Air and TransAsia Airways were counted as their civil aviation operation licences were still in effect at the end of 2016.

<sup>3</sup> Daily Air.

<sup>4</sup> Daily Air Corporation, Aerospace Industrial Development Corporation (AIDC), Emerald Pacific Airlines (EPA), ROC Aviation Company, Sunrise Airlines, Great Wing Airline, Win Air Business Jet, Executive Aviation Taiwan Corp. Avanti Aviation and Sky Rainbow Airlines.

<sup>5</sup> One fixed wing airplane of the CAA was not counted.

Aviation Safety Council

commenced operations in Taiwan. V Air is a domestic low cost airline based in Taipei. It is a franchise subsidiary of TransAsia Airways. Taiwan Tigarair was formed as a joint venture between China Airlines and Tigerair Singapore. Sunrise Airlines handed over its civil aviation operation licence in November 4, 2015. V Air and TransAsia Airways suspended operations in October 1 and November 22, 2016 respectively. As for the number of airworthy aircrafts, a fluctuating variation was shown in the early stage as shown in Figure 2. A decreasing trend was shown from year 2007. The number of registered aircrafts was 182 in year 2010 and increased annually and increased to 260 in year 2016. The reasons were due to the purchase of new aircrafts of some Airlines and the introduction of large numbers of hot air balloons.

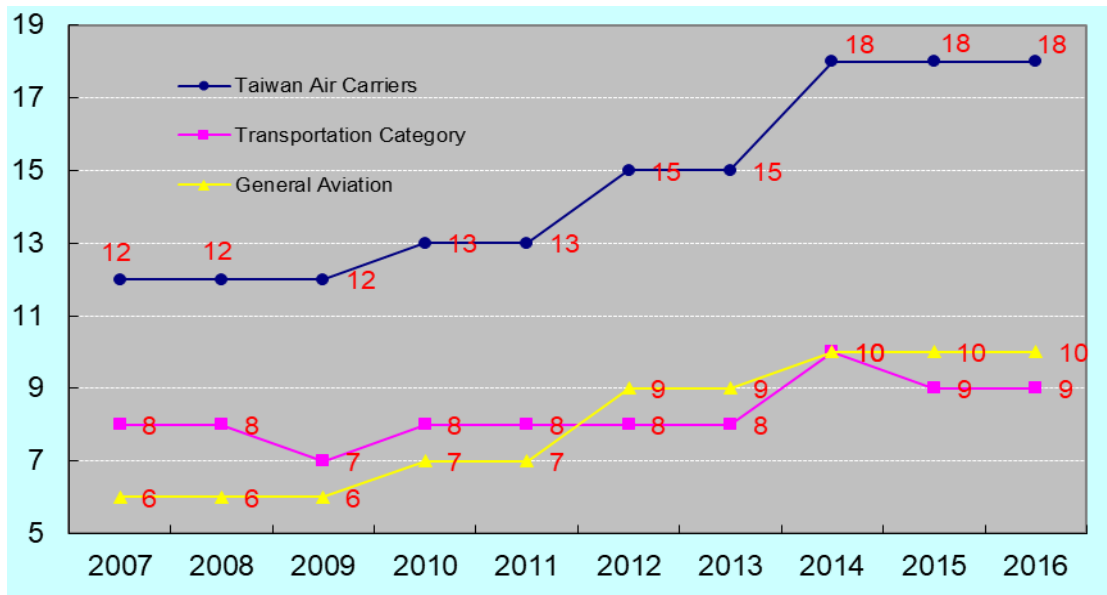


Figure1 : Taiwan air carriers, transportation and general aviation category, 2007-2016

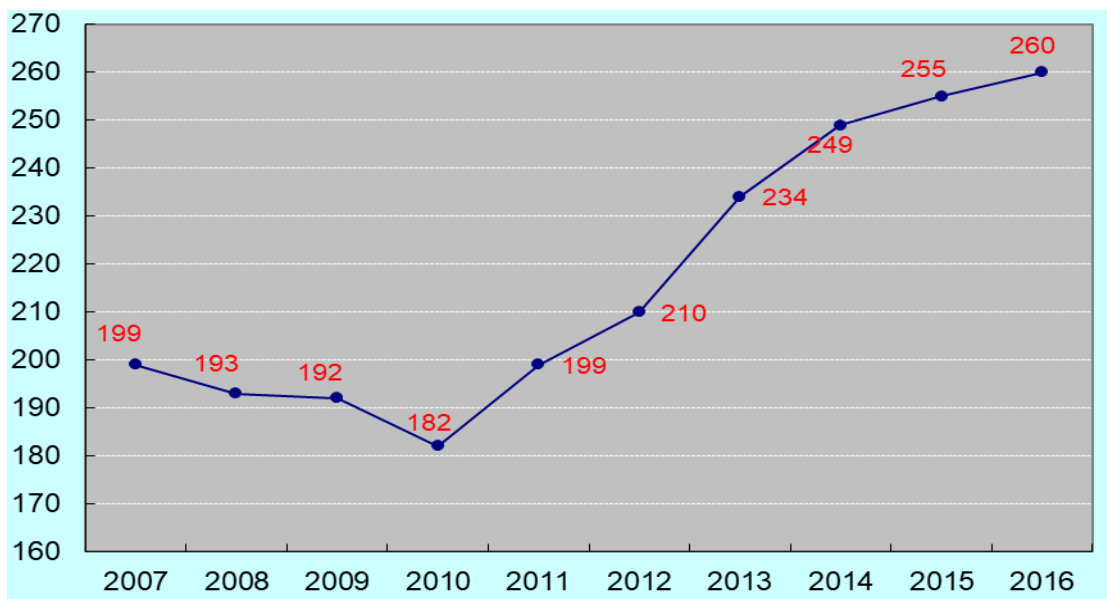


Figure2 : Taiwan airworthy civil aircraft, 2007-2016

Aviation Safety Council

For the numbers of passengers (Figure 3), the international air carriers and domestic air carriers showed two totally different trends. On international routes, apart from the negative growth in 2008, numbers of passengers were 17,775,000 in 2009 and increased gradually over the years, and reached the highest 31,226,000 in 2016. It showed a 69.1 percent increase over the past 10 year. Differently from the international routes, number of domestic passengers were decreased from 6,320,000 in 2007 to the lowest 4,565,000 in 2009. The number of passengers was increased gradually from 2010 to 5,413,000 in year 2016. Over the decade, the decreased rate of passengers was about 14.4 percent.

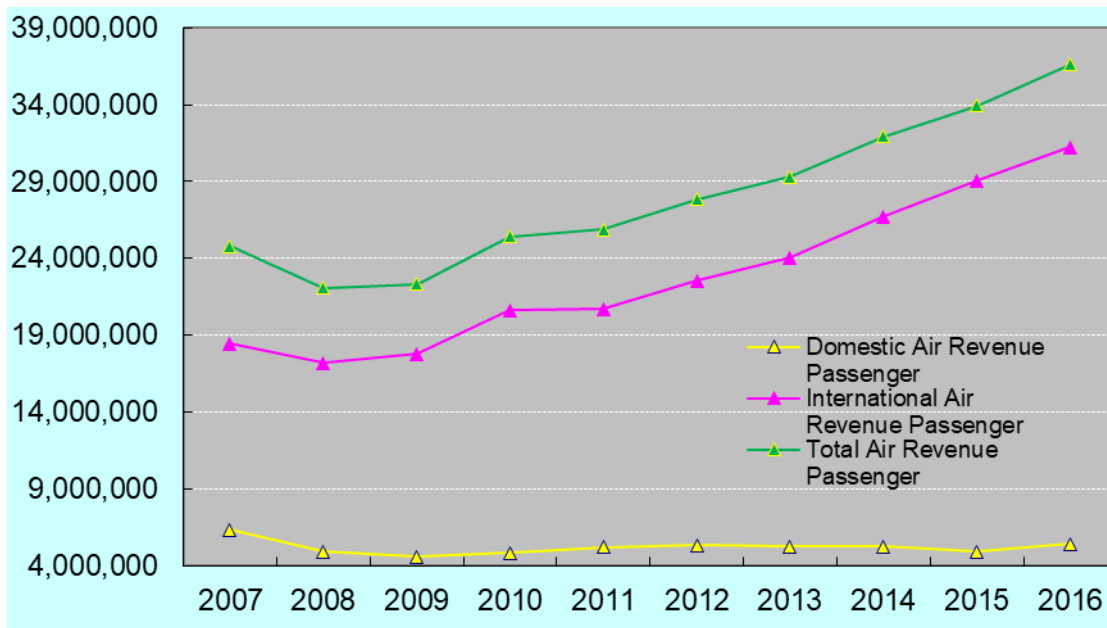


Figure3 : Taiwan air carriers revenue passengers of transportation category, 2007-2016

In terms of the air cargo, the international air cargo was more than domestic one. In the past ten years, the international air cargo took up about 97 percent of the total amount. The numbers of international air freight decreased gradually from 168 million tons in 2007. The air cargo reached a maximum of 187 million tons in 2010 and then reduced to 166 million tons in 2016. Accordingly, the number of air cargo decreased about 1.2 percent over the decade. As for the domestic air cargo, the numbers decreased annually from 52 thousand tons in 2007 and remained around 40 thousand tons in 2016. Taiwan air freight of transportation category air carrier over the period from 2007 to 2016 is shown in Figure 4.

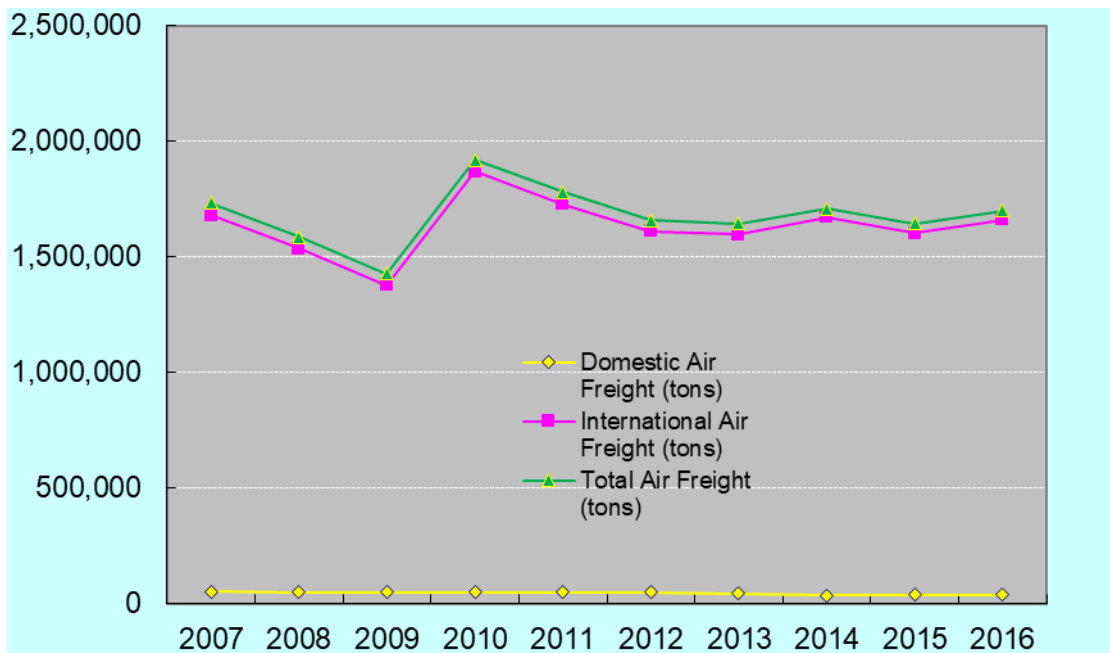


Figure4 : Taiwan air freight of transportation category air carrier, 2007-2016

In terms of the number of flights, the numbers of international flights exceeded those of the domestic flights in 2007 for the first time (figure 5). While through the expansion of international airlines and the downsizing of domestic flight over the last decade, the numbers of international flights in 2016 were 2 times more than the numbers of domestic flights. The domestic flights dropped from 113,000 flights in 2007 to 87,000 flights in 2016, a reduction of nearly 22.5 percent. Differently from the domestic routes, international airlines increased from 119,000 flights in 2007 to 179,000 flights in 2016, a 50 percent growth. The increase of international flights over the past 7 years was due to the open routes cross straits. The recession of domestic flights was due to the open service of Taiwan high speed rail in 2007. Taiwan flight departures of transportation category airplanes over the period from 2007 to 2016 are shown in Figure 5.

Overall speaking, the domestic and international transportation services showed contradictory trends to the civil aviation industries over the period from 2007 to 2016. The number of passenger of international flights increased 69.1 percent, the cargo decreased 1.1 percent, and the numbers of flights increased 50 percent over the period. Meanwhile, the numbers of domestic air transport declined significantly since the number of passengers decreased almost 14.4 percent, the numbers of flights also decreased 22.5 percent, however the numbers of cargo services were changed slightly.

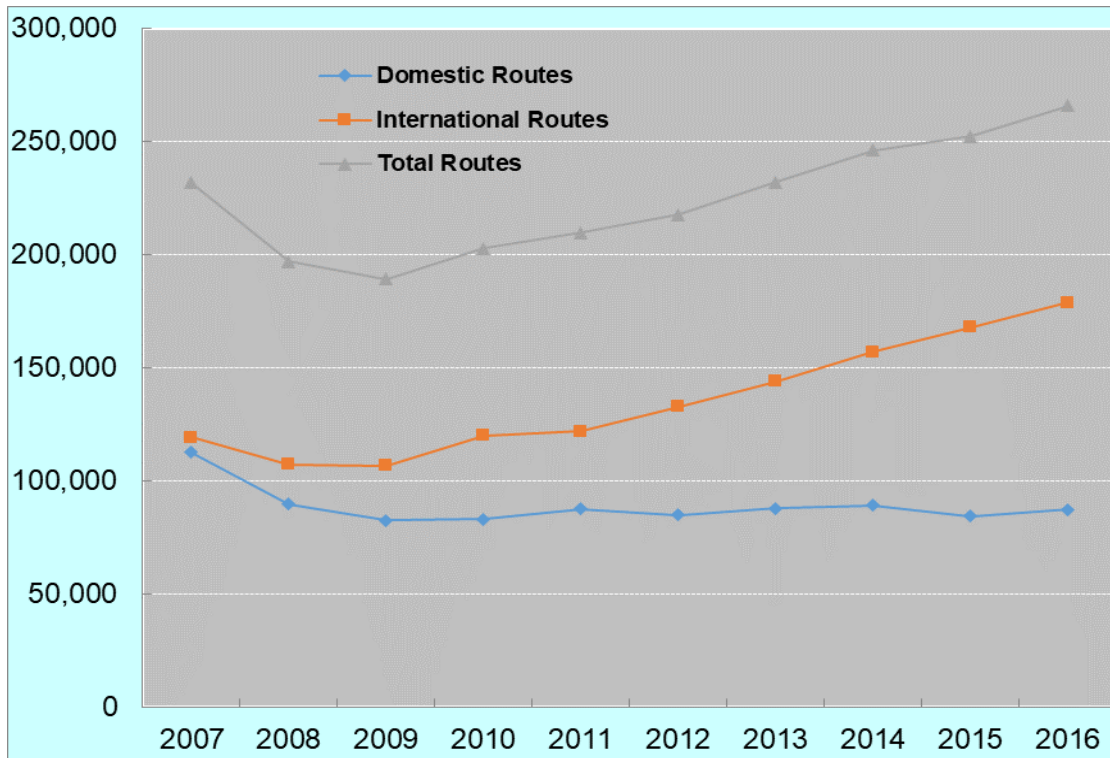


Figure5 : Taiwan flight departures of transportation category, 2007-2016

### General Aviation

As shown in Figure 1, air carriers running the general aviation were varied from 6 to 10 over the past ten years. The total flight hours of general aviation were decreased from 4,381 hours in 2007 to the lowest 2,055 hours in 2015, then returned to 2,623 hours in 2016. The variations of flight hours over the period from 2007 to 2016 are shown in Figure 6.

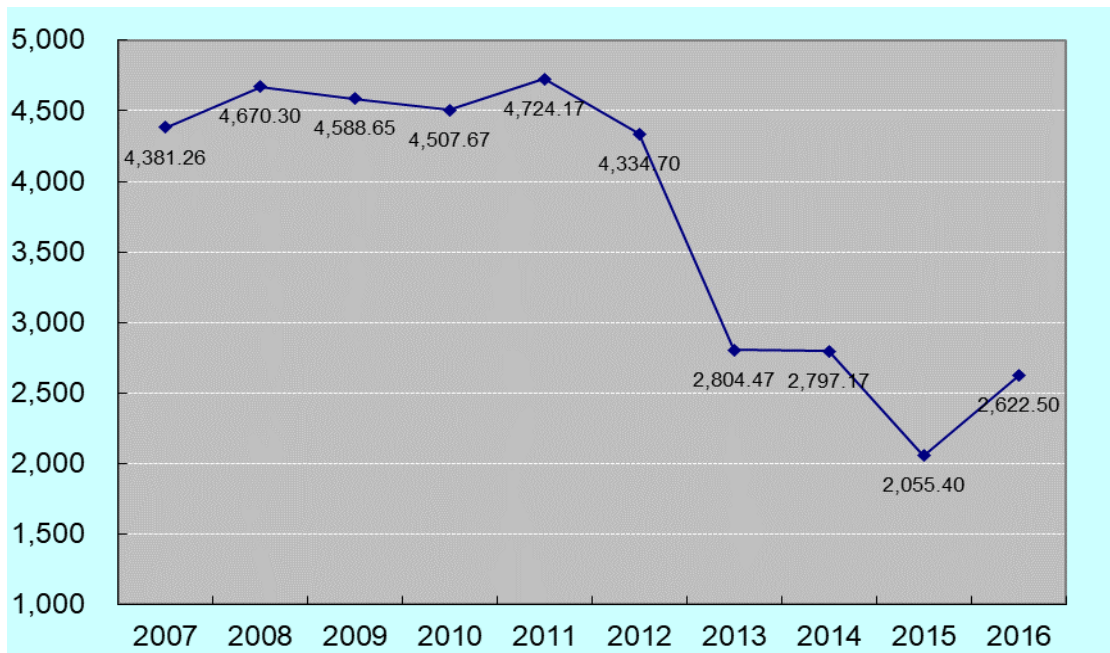


Figure6 : Taiwan air carriers flight hours of general aviation, 2007-2016

## Public Aircraft

Due to different requirement of assignments, public aircraft in the old days were under different units: the Aviation Team of Civil Aeronautics Administration (CAA) of Ministry of Transportation and Communications, the Airborne Squadron of National Police Agency, the Preparatory Office of the Airborne Fire Fighting Squadron of National Fire Agency and the Air Patrol Squadron of the Coast Guard Administration, Executive Yuan.

After the promulgation of Aviation Occurrence Investigation Act on June, 2004, investigations of public aviation aircrafts were then officially the responsibility of Aviation Safety Council, Executive Yuan. On June, 2005, the Organization Act of Airborne Services Corps of the Ministry of the Interior was passed, and National Airborne Service Corps (NASC) of the Ministry of the Interior was finally officially established. After the merging, there were 35 helicopters and 2 fixed wing aircrafts under the NASC command. Till the end of year 2016, there were 21 helicopters and 2 fixed wing aircrafts totally 23 aircrafts currently running by the NASC. There were 3 newly added UH-60M helicopters in 2015 and 2 in 2016. In addition, the CAA owned 1 light aircraft in order to assist the airport navigation facilities flight test.

According to the operation data (Appendix 2) of NASC, the total numbers of flights were plotted against the total flight hours in recent years as showing in Figure 7. From the graph, the flight hours of 2007 were about 9,324 hours, and then the total flight hours fluctuated over the years. In 2009, the total flight hours almost reached 10 thousand hours. In 2016, the total flight hours declined to 6,361 hours.

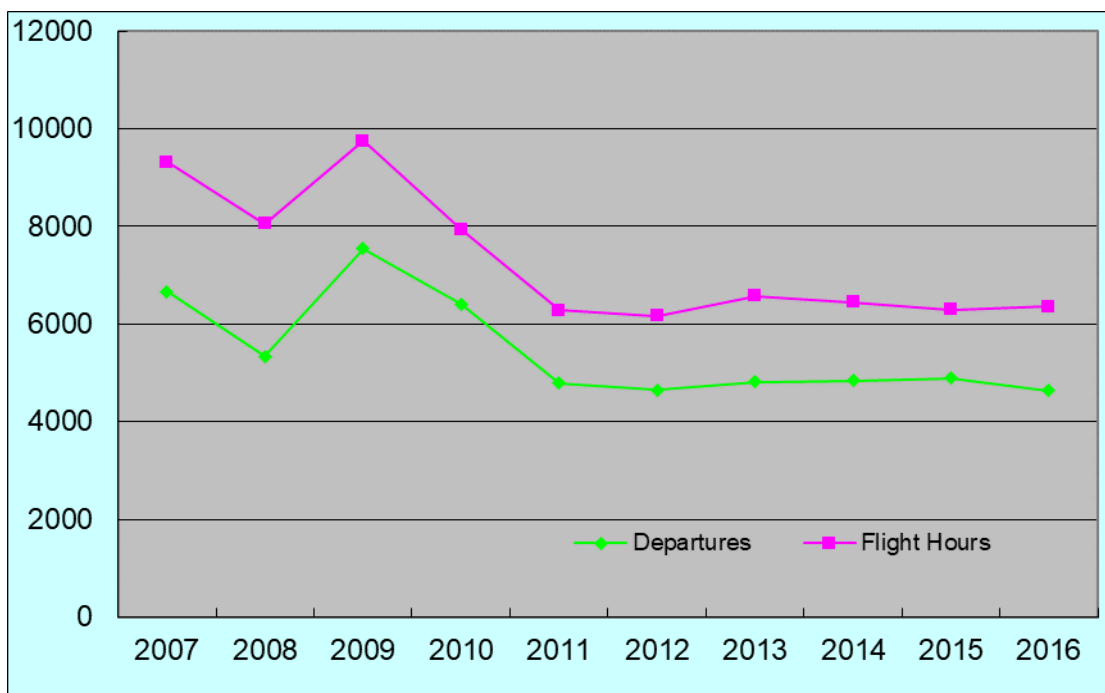


Figure7 : Total flight numbers and total flight hours of National Airborne Service Corps, 2007-2016

## Activities of Ultra-Light Vehicle

The Ministry of Transportation and Communications added related provisions to civil aviation acts in 2003, concluded “Ultra-light Vehicle Regulation” in the following year, ultra-light vehicle then formally under CAA’s supervision. Furthermore, according to the CAA data, till the end of year 2016, there are 21 available airspaces nowadays, and 12 of them were legal airspaces, among them, one is connected airspace (between DaPeng Bay activity area and SaiGia) and 6 airfields (DaPeng Bay, JaieHaour, HuaLien, Matai’an, Dali and WanAnn activity field) could legally carried out ultra-light vehicle activities. Twenty ultra-light vehicle activity associations were approved by the Ministry of the Interior based on Citizen’s Organization Law. There was no formal statistics of ultra-light vehicle number in Taiwan. There are 6 activity guidance manuals of ultra-light vehicle parties been approved by CAA. At present time, these 6 parties (R.O.C. ultra-light vehicle association, R.O.C. powered parachute association, HuaLien aeronautical association, HuaLien ultra-light sports association, Kaixiang Aviation Activity Enhancement Association and Taiwan recreational aviation association) can carry out activity legally.

## Activities of Free Balloon

Free balloon (including free air balloon and hot air balloon) is defined as a vehicle that can carry passengers which derived its support from the reactions of the air in the atmosphere other than the reactions propelled by machine. As international rule, free balloon is regarded as a 「standard aviation vehicle」. According to the characteristics of operations, free balloon operations divide into 「free balloon flight operation」 and 「free balloon tethered activity」 that specified in 「Aircraft Flight Operation Regulations」 of the CAA. To fulfill public people's recreational requirements of free balloon, the CAA has commenced survey and amended related regulations since year 2012. Free balloon related organizations and operators were invited to attend meetings and discussion twice. Totally 9 related regulations were revised and drafted through public hearing processes.

Till the end of year 2016, the total number of registered hot air balloons was 15 which included 3 of Sky Rainbow, 9 of Taitung County government, 1 of Asia-Pacific Institute of Creativity and 2 of Hug Cloud Flying Media.

## The Establishment of Flight Training Center

APEX Flight Academy, established on September 24, 2014, is the first flight training academy that passed the 5-stage review by the CAA. APEX's flight training and maintenance facilities are based in Taitung FongNien airport. The training flight imported including single and twin engines airplane. In addition, there are training classrooms and a Fixed Base Trainer which can provide ground and flight training courses to training students.

## **Statistics and Analysis of Aviation Occurrence data, 2007-2016**

### **Introduction to Aviation Occurrence Data**

#### **Data Source**

The contents presented in this chapter are a statistical compilation of the Taiwan air carriers' operation and aviation occurrences. Major data sources include the statistics of operation/flight safety from CAA, the Aviation Safety Council aviation occurrences investigation reports, and the data from the National Airborne Service Corps. The government official documents and press accounts provide additional information of the few aviation occurrence statistics on the early days.

#### **Definitions and Categories**

The statistics released by the ICAO covers a wide range of aircraft, including those of various maximum takeoff weight, number of engine installed, types of engine thrust, scheduled and non-scheduled, and General Aviation. The focus, however, is on the fatal accidents of scheduled and non-scheduled flights of transport category aircraft.

The statistics data of the International Air Transport Association (IATA) was based on a maximum takeoff weight of more than 5,700 kg for turbine powered aircraft to calculate single year and 5 years moving average hull loss and fatal occurrence rates per 1,000,000 departures<sup>6</sup>.

The Boeing Company and the Airbus Company have presented statistical summaries of commercial jet airplane accident rates per 1,000,000 departures worldwide. The statistics are confined to western-built commercial jet airplanes that were heavier than 60,000 pounds (or 27,000 kg) maximum gross weight, or above 40 passengers respectively.

The Taiwan CAA publishes hull loss occurrence rate by referring to the IATA, but 1,000,000 flight hour statistics data also included. The ASC adopted the same classification of aircraft weight and flight data of CAA except that the ASC calculated 5 years moving average fatal and hull loss occurrence rates and 10 years moving average hull loss occurrence rate.

Judging from the above information, global aviation accident data mainly focus on the large aircrafts. For Taiwan aviation accident data statistics, all size of aircrafts are accounted and categorized. Taking advantage of sharing the same pool of flight operation data from CAA, the statistics of this report adapts the definition of aircraft category used by CAA. The aviation occurrence data presented in this report are confined to all Taiwan domestic aircraft (except

---

<sup>6</sup> IATA hasn't provided flight hour data since 2015.



Aviation Safety Council

military airplanes and unmanned aerial vehicles), including:

- Aircraft of transportation category
  - Commercial Jet airplanes (models listed in Table 1)
  - Turboprop airplanes (models listed in Table 2)
- General Aviation (models and hot air balloons are listed in Table 3)
- Public aircrafts (models listed in Table 4, hot air balloons are not repeatedly listed in this table)
- Ultra-light vehicles
- Private owned vehicle
- APEX training academy (models listed in Table 5)

A glossary of aviation and technical terms used in this document can be found in appendix 1. The major references are from the Civil Aviation Act of the Republic of China, Aviation Occurrences Investigation Act (AOIA), Regulations Governing the Investigation of Aviation Occurrence of Civil and Public Aircraft, the Aviation Occurrence Investigation Standard Operation Procedure, and ICAO publications etc.

Table 1 : Types of Taiwan commercial jet airplanes

BOEING	BOEING	AIRBUS	FOKKER	EMBRAER
737	MD-80	A300-600	F-100	ERJ-190
747	MD-90	A310		
757	MD-11	A320		
767		A330		
777		A340		
		A350		

Table 2 : Types of Taiwan commercial turboprop airplanes

ATR	FOKKER	DORNIER	DE HAVILLAND	SAAB
ATR72	F-50	Do-228	DHC-8	340
			DHC-6	

Table 3 : Types of Taiwan general aviation aircrafts

AEROSPATIALE	BELL	KAWASAKI	HILLER
AS-365	Bell 206	BK117	UH-12E
	Bell 412		
	Bell 430		
Others			
BN-2	Hawker 400XP	P68C TC	DA40-NG
ASTRA SPX	MB-135BJ	400A	KA32A
BD-700-1A10	208B	G550	G200
G280	Z-90	Z-120	Z-140
Z-160	M-77	M-105	M-120
C160			

Table 4 : Types of Taiwan public aircrafts

BELL	AEROSPATIAL	BOEIN	SIKORSK	BEECH	ULTRA
------	-------------	-------	---------	-------	-------

	E	G	Y		MAGIC
UH-1H	AS-365	B234	S76B	BE200	C-90
			UH-60M	BE350	M105
				HBC-B300	M120
					F-26
					Z160

Table 5 : Types of APEX training academy aircrafts

DA40-NG	DA42-NG		
---------	---------	--	--

### **ASC Definition and Classification of Occurrences**

Aviation occurrence of the Aviation Occurrences Investigation Act is defined as 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 person sustains death or serious injuries, The aircraft sustains substantial damage or missing; or an occurrence of the aircraft nearly occurred.

## Overview of Taiwan Aviation Occurrences

From 2007 through 2016, the total number of aviation occurrences in Taiwan was 75, including those Taiwan air carriers' aircraft occurred outside the country. In general, transportation category aircraft occurrences accounted for the most (43). The remaining 32 occurrences were general aviation, public aircrafts, ultra-light vehicles or foreign-registered aircrafts. Of those 75 occurrences, 113 fatalities were resulted. The details were shown in Table 6.

Table 6 : Aviation occurrence statistics in Taiwan, 2007-2016

	Number of Occurrence			Fatalities	
	Total	Fatal	Hull Losses	Total Fatalities	Aboard
Commercial Jet airplane	37	0	1	0	0
Turboprop airplane	6	2	2	91	91
Civil Aviation Transport Category total	43	2	3	91	91
General Aviation Aircraft	12	4	5	10	10
Public Aircraft	7	2	2	5	5
Ultra-light vehicle	11	4	11	7	7
Occurrences related to Sabotage, hijacking or terrorism	0	0	0	0	0
Foreign-Registered Aircraft Occurrence in Taiwan/ Occurrences Investigated by ASC	2	0	0	0	0
<b>Total</b>	<b>75</b>	<b>12</b>	<b>21</b>	<b>113</b>	<b>113</b>
Note : When an occurrence involved two aircraft, for example: midair collision, airprox, or ground collision; although it was one occurrence investigation, would be counted twice when compiled the statistic data.					

## Fatal/ Hull Loss Aviation Occurrences in Taiwan, 2016

As shown in the Table 7, the Aviation Safety Council conducted totally 9 aviation occurrence investigations in 2016, including 5 local civil aviation transportation category aircrafts, 1 general aviation category aircraft, 1 public aircraft and 2 ultra-light vehicles. Of the public category aircraft occurrence, there was 1 hull loss and 2 fatalities. The details were shown in Table 7.

Table 7 : Aviation fatal/ hull loss occurrence statistics in Taiwan, 2016.

	Number of Occurrence			Fatalities	
	All	Fatal	Hull Loss	Total Fatalities	Aboard
Commercial Jet airplane	5	0	0	0	0
Turboprop airplane	0	0	0	0	0
Civil Aviation Transportation Category total	5	0	0	0	0
General Aviation Aircraft	1	0	0	0	0
Government Aircraft	1	1	1	2	2
Ultra-light Aircraft	2	0	2	0	0
Occurrences of Foreign-Registered Aircrafts Occurred in Taiwan	0	0	0	0	0
Total Sum	9	1	3	2	2

For transportation category aircraft, none of the occurrence in 2016 resulted in crew/passenger fatal or injured or aircraft hull loss, as shown in the Table 8.

Table 8 : Fatalities or injuries caused by transportation category aircrafts in Taiwan, 2016

Injuries Level	Flight Crew	Cabin Crew	Passengers	Other	Total
Fatal	0	0	0	0	0
Serious	0	0	0	0	0
Minor	0	0	0	0	0
Total	0	0	0	0	0

Note: According to the ICAO definition, number of fatality is counted as the death within 30 days after the occurrence.

## Occurrences Involving Civil Transportation Aircraft

The cumulative numbers of passengers over the past 10 years were 280 million passengers. Of the passengers on board, 83 passengers were reported fatal.

### Number of Passenger Fatalities

Cumulative data of fatal occurrences, fatalities and injuries of passenger involving transportation category aircraft in Taiwan have been listed and summed over the last decade (2007-2016), as shown in Table 9. The fatality rate involving transportation category aircraft occurrences was 0.30 fatalities per million passengers over the past decade.

Table 9 : Aviation safety performance of transportation category aircraft in Taiwan

Year	Fatalities	Serious Injured	Total Aboard (Millions)	100 million Passenger-km	Death/Million Passenger Aboard	Death/100 million passenger-km
2007	0	0	24.79	632.87	0	0
2008	0	6	22.1	585.06	0	0
2009	0	0	22.3	569.2	0	0
2010	0	0	25.4	600.5	0	0
2011	0	0	25.9	601.2	0	0
2012	0	0	27.9	638.7	0	0
2013	0	0	29.3	676	0	0
2014	44	10	32	727.2	1.38	0.06
2015	39	13	33.9	800.5	1.15	0.05
2016	0	0	36.6	893.4	0	0
Total	83	33	280.2	6,724.7	0.30	0.01

Note: Fatalities not including flight crew and cabin crew.

### Fatal Occurrence Rate with 5-year Moving Average

The 5-year moving average occurrence rates of local turboprop airplanes of civil transportation category airplane were all zero from year 2007 to 2013. The rates were increased to 3.15 and 6.22 per million departures in 2014 and 2015 respectively. In 2016, the rate was 6.18. The 5-year moving average occurrence rates of turbojet airplanes were all zeros per million departures from the year 2007 to 2016. Figure 8 is a 5-year moving average of fatal occurrence rate by million departures of Taiwan transportation category airplanes. From the figure, it showed clearly the fatal occurrence rates per million departures of domestic transportation category airplanes over the past decade.

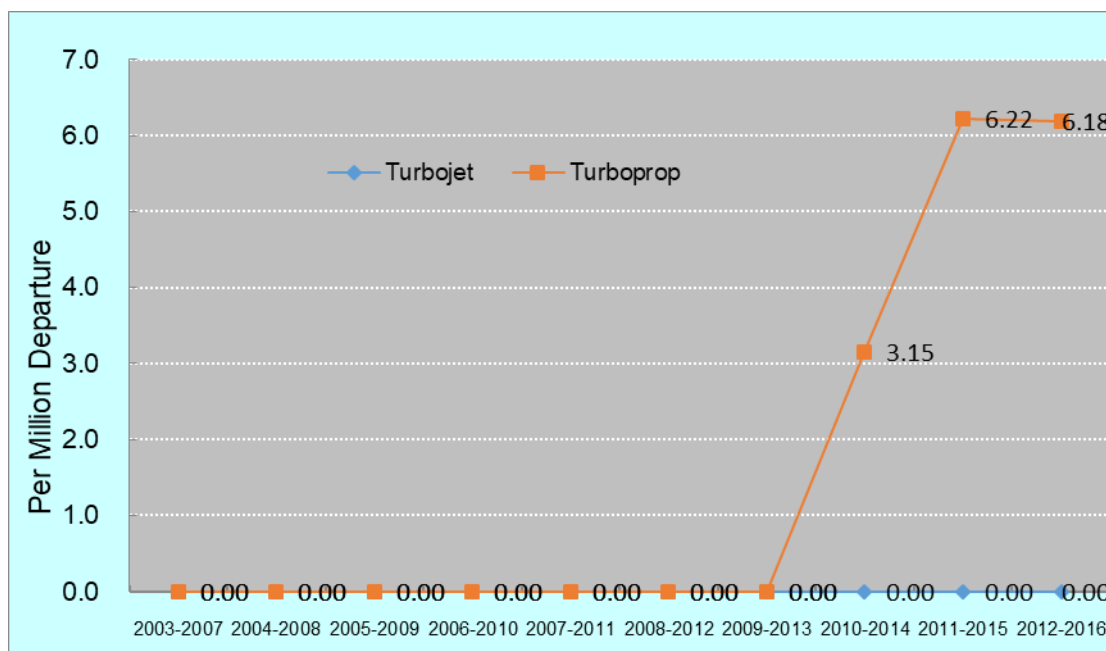


Figure8 : 5-year moving average fatal occurrence rate by million departures, Taiwan transportation category airplane, 2007-2016

### **Hull Loss Occurrence Rate with 5-year Moving Average**

From 2007 through 2013, 5-year moving average hull loss occurrence rate of turboprop airplanes in Taiwan were all zeros. The rates were increased to 3.15 and 6.22 per million departures in 2014 and 2015 respectively. The rate was 6.18 per million departures in 2016. The commercial jet airplanes had a higher hull loss occurrence rate than fatal occurrence rates. This difference suggested that there were some occurrences where commercial jet airplanes occurrence resulted in hull loss, but without fatalities. The 5-year moving average hull loss occurrence rate of turbojet airplanes was 1.26 in year 2011, and declined to zero from year 2012 to 2016. The 5-year moving average hull loss occurrence rate of Taiwan transportation category airplanes from 2007 to 2016 was shown in Figure 9.

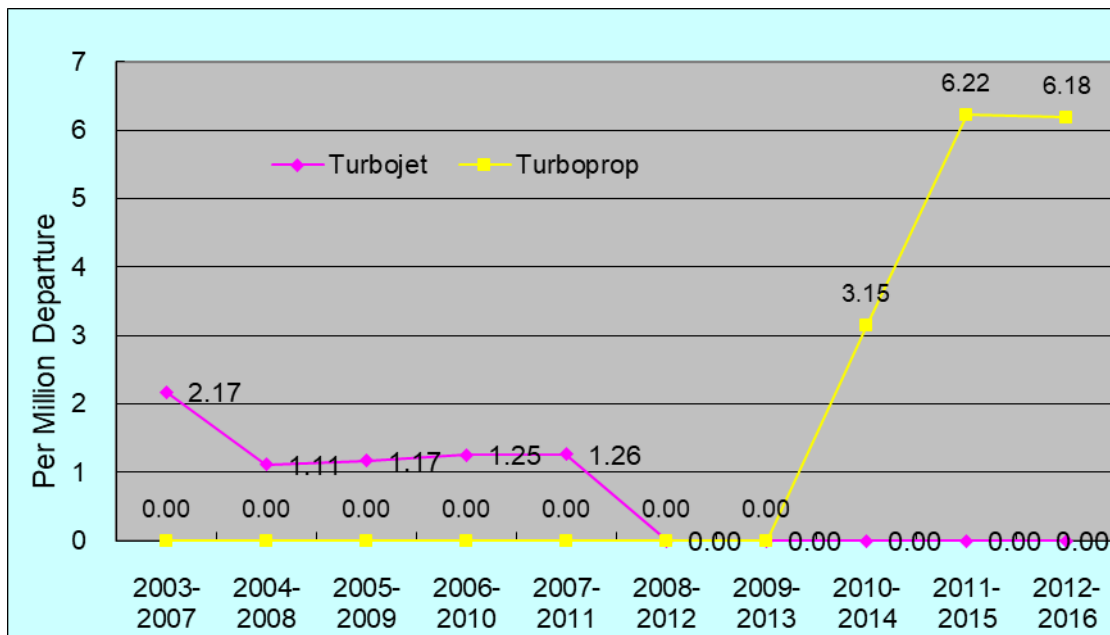


Figure9 : 5-year moving averages hull loss occurrence rates by million departures, Taiwan transportation category airplane, 2007-2016

### **Hull Loss Occurrence Rate with 10-year Moving Average**

The 10-year (2007-2016) moving averages hull loss occurrence rates of transportation category airplanes were illustrated in Figure 10. In recent 10 year, the hull loss occurrence rate of commercial jet airplane was 0.17 per million flight hours or 0.57 per million departures. In figure 11, the 10-year moving average hull loss occurrence rate of turboprop airplane were 3.55 per million flight hours or 3.16 per million departures. From 2007 to 2016, the hull loss occurrence rate of commercial jet airplane decreased annually from 2007. The 10-year moving average hull loss occurrence rates of turboprop airplanes were increased due to the hull loss occurrences in 2014 and 2015<sup>7</sup>.

<sup>7</sup> The annual flight hours and flight departures data of turboprop aircraft with maximum takeoff weight more than 5,700 kg were revised by CAA in 2016. The revised database only included flight data after year 2002. Flight data before 2002 was referenced to those of old database.

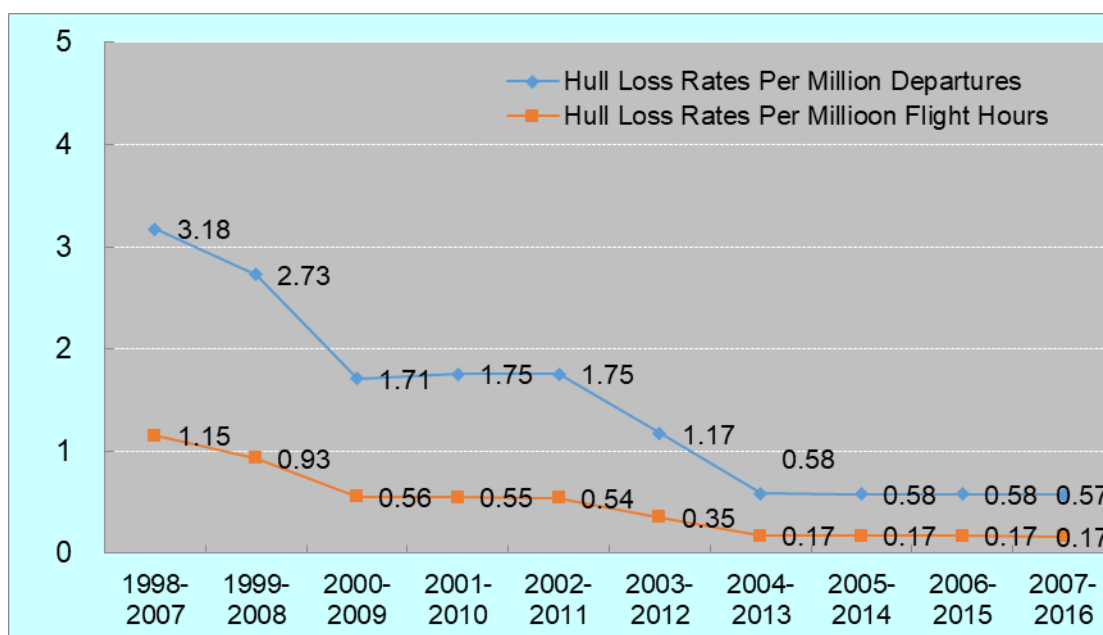


Figure10 : 10-year moving averages hull loss occurrence rates of Taiwan commercial jet airplanes

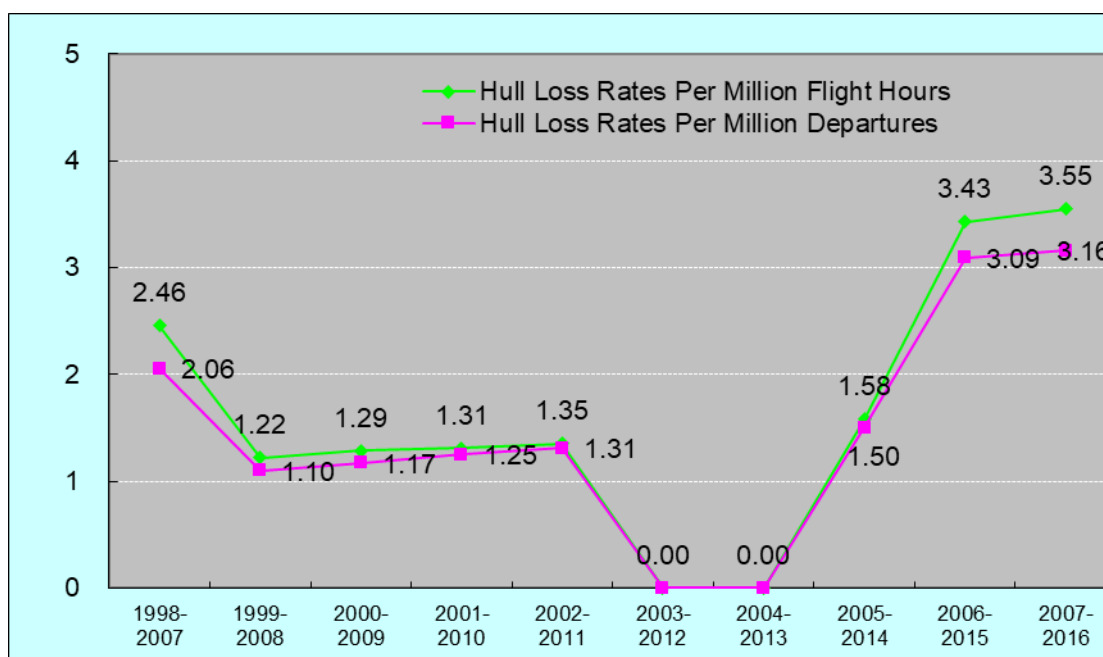


Figure11 : 10-year moving averages hull loss occurrence rates of Taiwan turboprop airplanes

### Aviation Accident Rate (by ICAO Definition)

Referring to the “Accident” definition of ICAO, the number of aviation accidents involving transportation category airplane in Taiwan was 12<sup>8</sup> over

<sup>8</sup> Include those occurrences of domestic aircrafts occurred outside the territory and investigated by foreign agencies.



Aviation Safety Council

the past 10 years (2007-2016). The average accident rate was 1.84 per million flight hours, or 5.05 per million departures. The yearly number and rate distribution of accidents was shown in Figure 12.

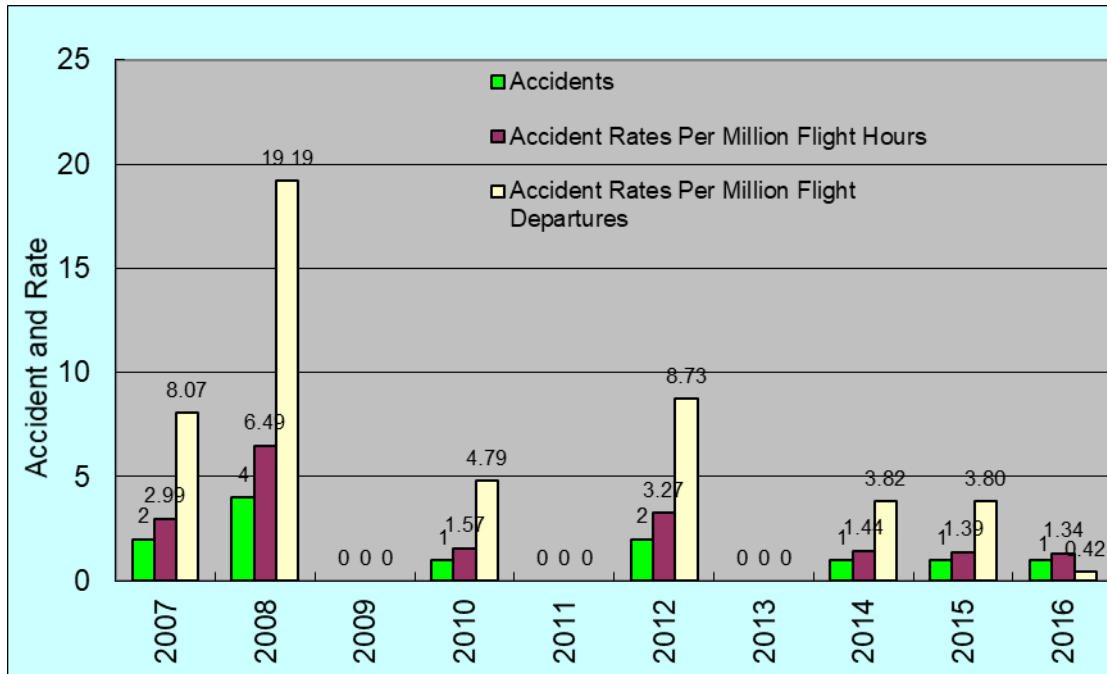


Figure12 : Numbers and rates of transportation category airplane accidents (ICAO definition), 2007-2016

Of the total 12 domestic accidents (ICAO definition) during the period 2007 to 2016, 9 of them were related to commercial turbojet airplanes. Of these 9 commercial turbojet accidents, 1 resulted in hull losses. There were 3 accidents involving turboprop airplanes. Of the turboprop accidents, 2 resulted in hull loss and fatalities. The details were shown in Table 10.

Table 10 : Number of transportation category airplanes accidents (ICAO definition), 2007-2016

	Total number of accidents	Numbers of hull loss or fatal accidents	Fatalities
Commercial turbojet airplanes	9	1	0
Commercial turboprop airplanes	3	2	91
Total	12	3	91

From the severity level of injury and aircraft damage, a total of 12 accidents were distributed to different levels of severity. Most of the occurrences during that period were “injuries w/o aircraft substantial damage” and “aircraft substantial damage without injuries and fatalities”, which included 3 and 6 cases respectively. There were 1 “hull loss w/o injury or fatality” and 2 “hull loss with injury and fatality” accident over the past decade.

### Statistical Analysis of Transport Category Occurrences

#### Phase of Flight

When focusing at the occurrence numbers for each phase of flight, which was defined by ICAO, there were total 43 transportation category occurrences happening at different phases over the last decade as shown on Figure 13. Among all these occurrences, 15 of them were the most prevalent cited occurrences taken place at landing phase. The second most were taken place at cruising phase which accounted for 12 cases.

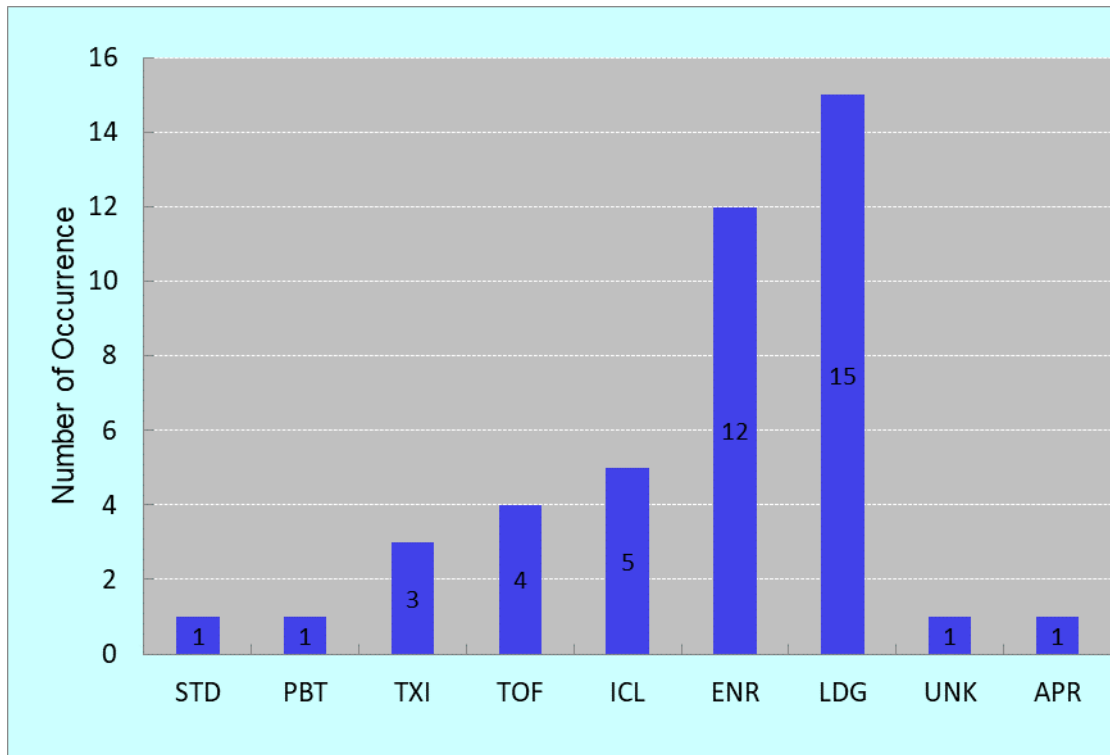


Figure13 : Occurrences distribution of transportation category airplane 2007-2016 by flight phase

#### Occurrence Category by ICAO Definition

There were total 43 transportation category national airplane occurrences happening over the last ten years as shown in Figure 14. The runway excursions overall were the most frequent and a total of 12 occurrences were reported. The second most frequent occurrences were the SCF-NP (system/component failure or malfunction/ non-powerplant), accounting for 11.

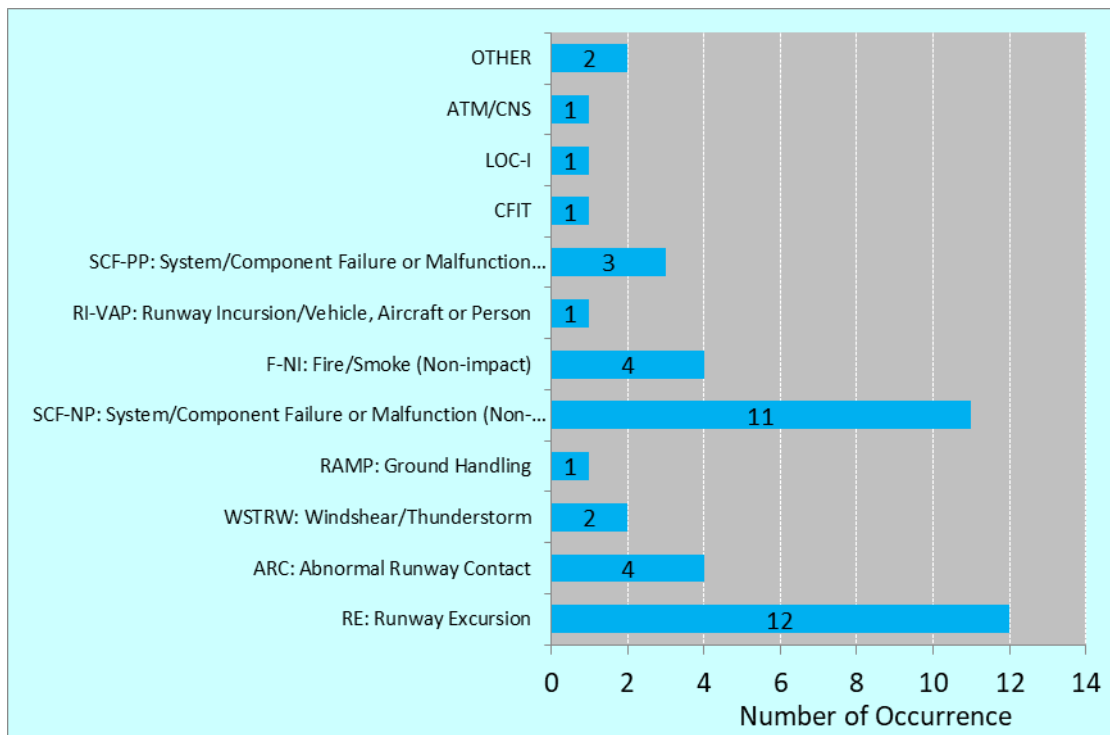


Figure14 : Occurrences distribution of transportation category airplane 2007-2016 by ICAO occurrence category

### Causes/Factors of Occurrences

The National Transportation Safety Board (NTSB) often established more than one cause or factor to an aviation accident using three broad categories: personnel, environment, and aircraft related. Personnel related classification included pilot and other personnel such as: maintenance personnel, air traffic controller, and management personnel. Environmental related categories included those causes related to weather, airport facilities, air traffic facilities, time of the accident (day or at night), and terrain conditions. Then in the category of aircraft related cause or factors, failures of aircraft system and equipment, engines, and structure or performance of the aircraft were all belonging to this category.

According to the findings of ASC's investigation reports and referencing to NTSB's cause/factor classifications, there was at least one cause that explained why the occurrence had happened within each occurrence, and some might have two or even more causes and factors. Personnel were cited as causes/factors in 51.2 percent (44.2 percent were pilot related, 7.0 percent were other personnel such as maintenance personnel and air traffic controller related), followed by 44.2 percent of aircraft-related causes/factors and by 18.6 percent of environment-related causes/factors. Broad causes and/or factors for airplane of transport category occurrences over the last ten years were shown in Figure 15.

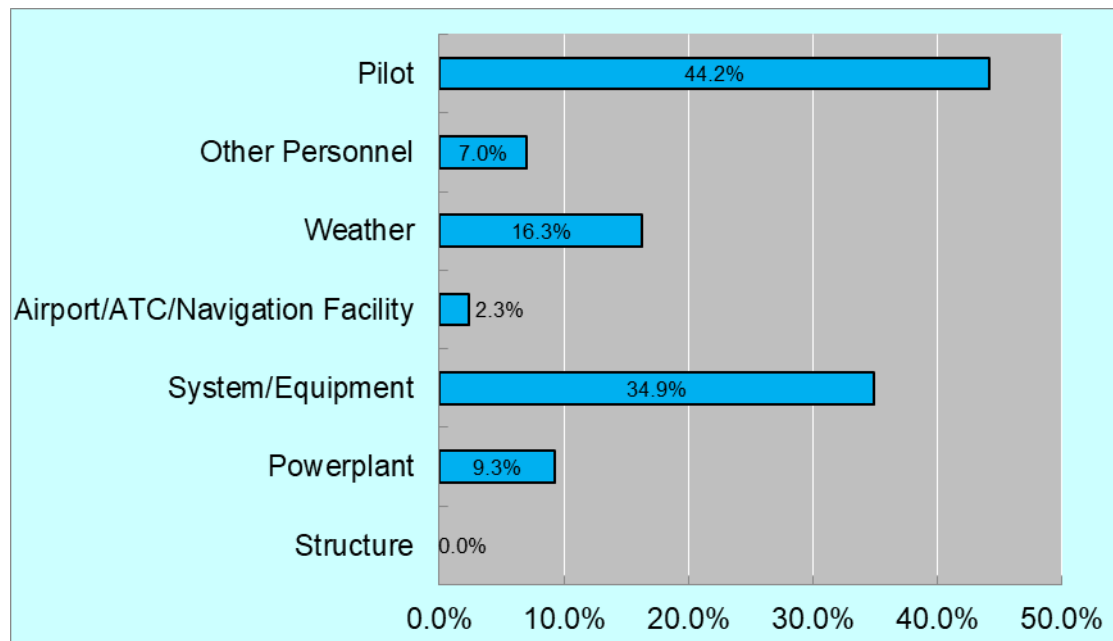


Figure15 : Broad causes/factors for airplane of transport category, 2007-2016.

## Occurrences Involving General Aviation and Helicopter

In the general aviation (GA) industry, the majority of operation is carried out by helicopters with the exception of few propeller airplanes. The ASC classified the occurrence of general aviation aircraft as Class IV occurrence. At present time, only Daily Air Corporation provides both transportation service and GA service. The following statistics were all related to general aviation service aircraft and helicopters. As indicated in Table 11, 12 general aviation / helicopter of transport category occurrences occurred over the past ten years, 4 of them were fatal occurrences which resulted in 10 fatalities. Of those 4 fatal occurrences, 3 were helicopters and 1 was fixed wing airplane. Totally 10 fatalities were resulted. This then led to an average of 30.11 occurrences per 100 thousands hours, 10.04 fatal occurrences per 100 thousands hours and 12.54 hull loss occurrences per 100 thousands hours over the past decade. The fatal occurrences occurred in 2009, 2012, 2013 and 2015 respectively.

Table 11 : Occurrence rate of general aviation / helicopter of transport category, 2007-2016

Year	Number of occurrences			Aboard Fatalities	Total Flight Hours	Accident Per 100 Thousands Hours		
	All	Fatal	Hull Losses			Accident Rate	Fatalities Rate	Aircraft Hull Loss Rate
2007	0	0	0	0	4,961	0.00	0.00	0.00
2008	1	0	1	0	5,032	19.87	0.00	19.87
2009	1	1	1	2	4,859	20.58	20.58	20.58
2010	0	0	0	0	4,753	0.00	0.00	0.00
2011	0	0	0	0	4,956	0.00	0.00	0.00
2012	1	1	1	3	4,478	22.33	22.33	22.33
2013	1	1	1	3	2,892	34.58	34.58	34.58
2014	4	0	0	0	2,964	134.95	0.00	0.00
2015	3	1	1	2	2,193	136.80	45.60	45.60
2016	1	0	0	0	2,770	36.10	0.00	0.00
Total	12	4	5	10	39,858	30.11	10.04	12.54

### Occurrences Involving Public Aircraft

From 2007 to 2016, there were a total of 7 public aircraft occurrences, which resulted in 2 fatal occurrence and 5 hull loss (including 2 fatal occurrence) occurrences. There were 2 occurrences related to personnel injuries. The statistics chart was shown as Figure 16.

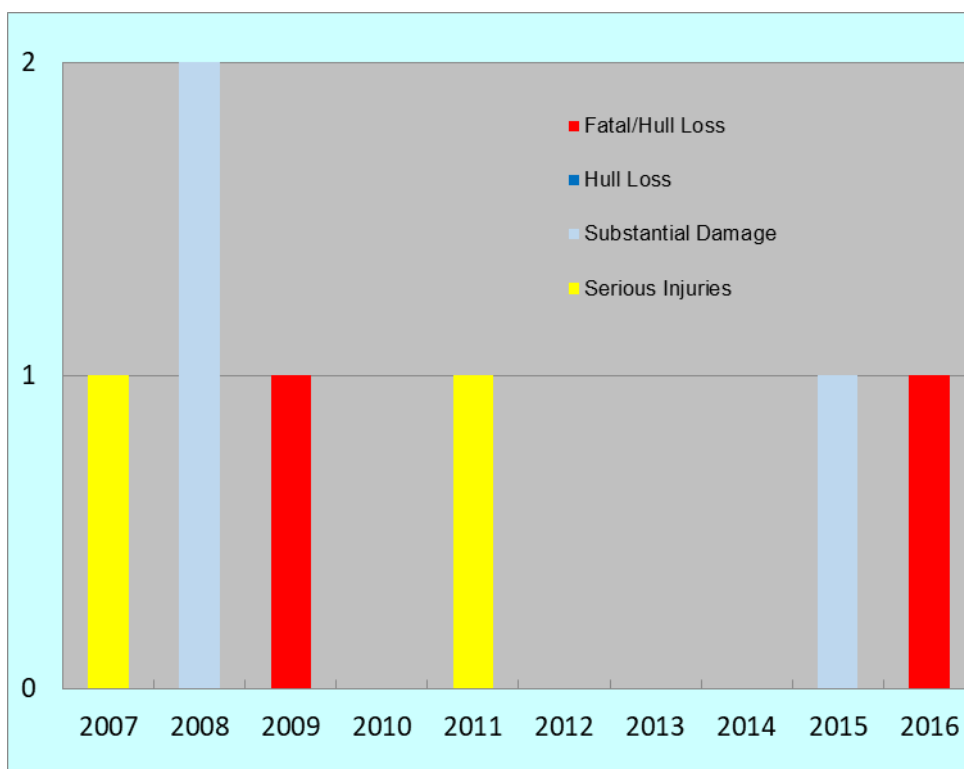


Figure16 : Occurrences statistics of public aircrafts, 2007-2016

## Ultra-light Vehicle Occurrences

The ultra-light vehicles were not under supervision of Civil Aviation Act of the Republic of China until 2004. Later in the same year of 2004, in June, the investigation of any occurrences of ultra-light vehicle has formally been part of the investigation scope of Aviation Safety Council. There were only limited documented accident data on ultra-light vehicle and the official record on ultra-light vehicle accidents only showed the data from 2004 to 2016. As indicated in Table 12, a total of 11 occurrences occurred during the past decade, and 4 of them were fatal accidents resulting in 7 fatalities. All 11 occurrences were resulted in hull loss. There was no ultra-light vehicle occurrence from year 2012 to 2014. The detail is shown in Table 12.

Table 12 : Ultra-light vehicle occurrences, 2007- 2016

Year	Number of occurrences	Fatal occurrences	Hull losses occurrences	Fatalities
2007	3	1	3	2
2008	0	0	0	0
2009	1	1	1	2
2010	1	0	1	0
2011	2	1	2	1
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	2	1	1	2
2016	2	0	2	0
Total	11	4	11	7

## Status of Tracking Safety Recommendations and associated action plans

### Safety Recommendations Statistics

The purpose of the safety investigation for aviation occurrences is to prevent similar occurrences from happening again. When probable causes and contribution factors of occurrences were found through systematic investigation, the council would provide appropriate recommendations to each associated units. The recommendations recipients would draft corrective actions and execution plan to solve potential safety problems.

From the establishment of ASC (April 1999) to December 2016, there were 123 aviation occurrences investigated by the ASC. Preclude those occurrences investigated by foreign agencies (13) and incidents (2), a total of 99 occurrence investigations been closed. In total, the council has issued 954 aviation safety recommendations. Within these recommendations, a maximum of 51.3 percent were issued to associated organizations of Taiwan government agencies, approximately 36.9 percent were presented to aviation industries, and approximately 11.8 percent were presented to foreign associated organizations (as shown in Figure 17).

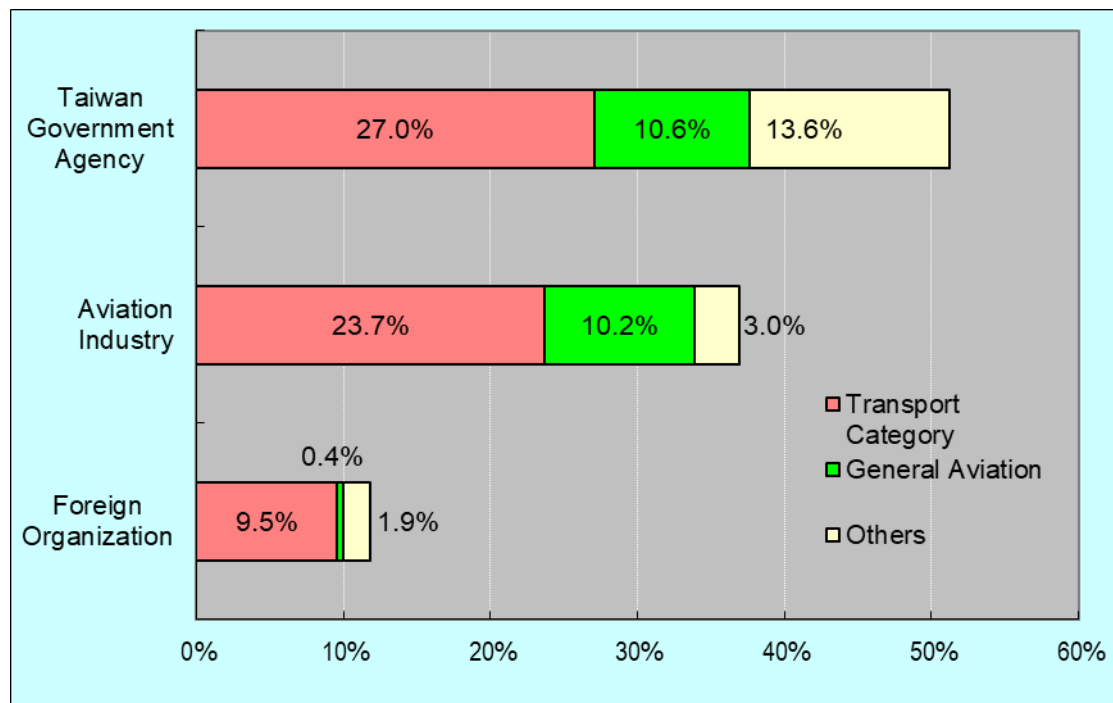


Figure17 : Statistics of aviation safety recommendations, 1999-2016



## Tracking of Action Plans/ Proposals for Aviation Safety Recommendations

In order to positively solve the investigation discovered aviation safety issues, if the safety recommendation recipient was part of Taiwan government, the recipient should then establish corresponding action plans and/or proposals. These action plans/ proposals will be supervised by the Executive Yuan. The tracking and reviewing of those action plans/proposals were done by ASC.

After reviewing each action plan/ proposal, ASC will then categorize these plans into three statuses: “accepted”, “under supervision”, and “under evaluation”. ASC then will submit the different review status to the Executive Yuan. Action plans with profound content and already been taken after the Council’s reviewing, the plan will be classified as “accepted”. If the action plans required longer time, usually over years, to complete, the Council will recommend the Executive Yuan classified the item as “under supervision” and continuously supervised by the Executive Yuan and tracking every six months until the item was closed. For the rest of the plans/ proposals, during the process of examination or organizing by other associated units, these plans will be labeled as “under evaluation”.

### The Statistics of Action Plans Status

From April 1999 to December 2016, there were total 489<sup>9</sup> action plans being submitted by related Taiwan government agencies in accordance with the Council’s safety recommendations. Of all the plans, 435 (89 percent) plans were classified as “accepted”. 33 (6.7 percent) were classified as “under supervision”, with 21 (4.3 percent) were in the status of “under review”. The statistics is shown in Figure 18.

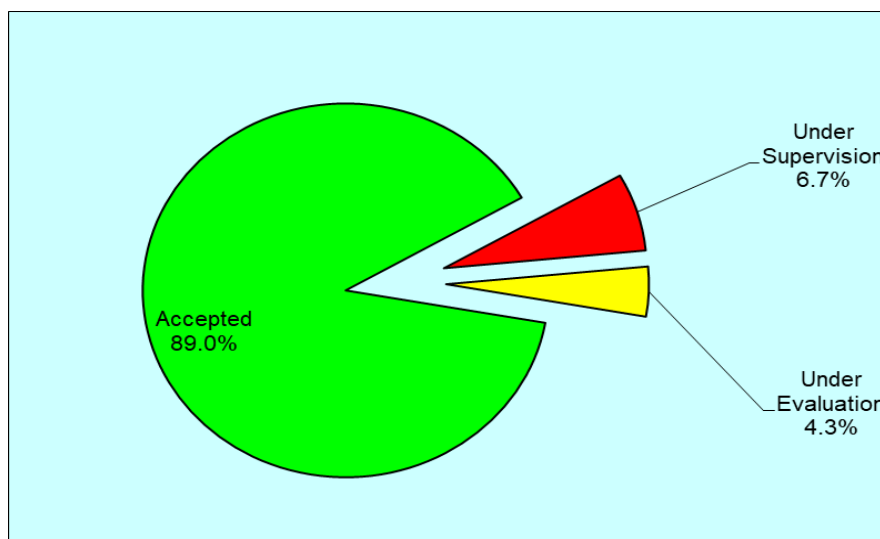


Figure18 : Statistics of action plans status

<sup>9</sup> A total of 954 safety recommendations were made by ASC. These safety recommendations were issued to Taiwan government agencies, aviation industries and foreign organizations.

## Definitions of Terms

### Definitions of Civil Aviation Legal Terms

**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.

**Civil Air Transport Enterprise** : An enterprise engaged in the carriage of passengers, baggage, cargo and mail with civil aircraft to earn profits. (Here in this document the aircraft operated by Civil Air Transport Enterprise is used to called "transport category aircraft" or "transportation category aircraft")

**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.

**Ultra-light vehicle** : A powered airplane, powered glider, gyroplane, powered glider/parachute and 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 six hundred 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 two hundred and twenty two kilometers per hour under standard atmospheric conditions at sea level.
- (5) A maximum stalling speed, without use of lift-enhancing devices, not exceeding eighty three 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.

**Accident** : An aircraft accident means 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 such person is fatally or seriously injured or in which the aircraft is substantially damaged or missing.

**Serious Incident** : A serious incident means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the

## Aviation Safety Council

---

aircraft with the intention of flight until such time as all such persons have disembarked, which may cause aviation accidents.

Incident : Any events 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 are not belong to aircraft accident or serious incident mentioned above.

### **Definition of Terms in Aviation Occurrence Investigation Act and ASC internal Standard Operation Procedures :**

Aviation occurrence: 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

- (1) A person sustains death or serious injuries;
- (2) The aircraft sustains substantial damage or missing or
- (3) Death or serious injuries of a person or substantial damage of the aircraft nearly occurred.

Investigation Report : A report prepared by the Investigator-in-Charge (IIC) compiling submissions from all technical sub-groups in accordance with the format administered by the International Civil Aviation Organization (ICAO), containing factual information, analysis, conclusions, and aviation safety recommendations reviewed and approved under this Act.

Aviation Occurrence Investigation : A process consisting of aviation occurrence identification, gathering, compiling, and analysis of factual data, probable causes identification, submission of safety recommendations, and investigation report preparation

Civil aircraft : An aircraft that is used for the purposes of civil air transportation services or general aviation services has completed the process of registration and airworthiness inspection in the civil aeronautics administration authorities.

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

### **Terms in Aviation Occurrence Investigation Standard Operation Procedures for Civil Aircraft and Public Aircraft :**

Death or serious injuries : A person is killed or injured as a result of any of the following :

- (I) Person being in the aircraft;
- (II) Person directly contacts with any part of the aircraft, including the parts that have been detached from it, or
- (III) Person directly exposed to jet blast,

With exception 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.

Injury : Any of which in the following :

## Aviation Safety Council

---

- (I) Requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received;
- (II) Results in a fracture of any bone (except simple fractures of fingers, toes, or nose);
- (III) Causes severe hemorrhage, nerve, muscle, or tendon damage;
- (IV) Involves any internal organ;
- (V) Involves second- or third-degree burns, or any burns affecting more than 5% of the body surface;
- (VI) Proved to be exposed to radiation, or contaminated with radioactive material.

**Substantial Damaged** : Damage or Failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent fairings or cowling, dented skin, small puncture holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered “substantial damage” for the purpose of this part.

**Missing** : When the official search, so designated by the ASC, is terminated and the wreckage has not been located, or has been located but found to be inaccessible or impossible to retrieve the evidence essential to the investigation.

**Accredited Representative, AR** : A person who is designated by the foreign country to which the aircraft involved in an occurrence is registered, the country that owns the aircraft, the country where the designer and/or manufacturer of the aircraft is located, the country whose nationalities are casualties of the occurrence, or the country that in any case is involved in the occurrence to participate in the investigation led by ROC.

### **Definitions of Terms for Aviation Occurrence Investigation Standard Operation Procedures used by the Aviation Safety Council :**

**Preliminary Report** : The report written within 30 days of the occurrence, based on the data and limited information obtained during the early stages.

**Factual Data Report** : The report is the basis for follow-up analysis and composition of investigation reports. Factual data report is the factual information consented by the entire investigation team. The investigating director composed the report according to the information from each groups, and also integrating proposals by specialized conveners and the members of other investigation teams.

**Preliminary Draft Report** : It is the initial draft composed by the investigating director and it is the earlier stage of the final draft report. The content includes factual information, an analysis, and non-categorized conclusions. The purpose of this report is to organize the ideas and suggestions from the associated units for the final draft report.

**Final Draft Report** : After the investigation, the investigating director combines and organizes all the information proposed by each specialized teams. The content of this report includes several key subjects, such as factual information, an analysis, finalized conclusions, and a list of aviation safety recommendations.

## Aviation Safety Council

---

**Final Report** : After the final draft report is approved by the council, it will become an official final report.

**Interim Flight Safety Bulletin** : For anything found during the process of investigation that affects the aviation safeties, which should be reported to the associated organizations and industries as soon as possible.

**Finding** : The conclusion acquired from the factual information and analysis of the investigation of aviation accidents.

**Safety Recommendation** : Recommendations which are based on findings of the investigation, may address deficiencies that do not pertain directly to what is ultimately determined to be the cause of the accident.

**Findings related to Probable Causes** : The findings related to probable causes identify elements that have been shown to have operated in the occurrence, or almost certainly operated in the occurrence. These findings are associated with unsafe acts, unsafe conditions, or safety deficiencies associated with safety significant events that played a major role in the circumstances leading to the occurrence.

**Findings related to Risk** : The findings related to risk identify elements of risk that have the potential to degrade aviation safety. Some of the findings in this category identify unsafe acts, unsafe conditions, and safety deficiencies including organizational and systemic risks, that made this occurrence more likely; however, they cannot be clearly shown to have operated in the occurrence alone. Furthermore, some of the findings in this category identify risks that are unlikely to be related to the occurrence but, nonetheless, were safety deficiencies that may warrant future safety actions.

**Other Findings** : Other findings identify elements that have the potential to enhance aviation safety, resolve a controversial issue, or clarify an ambiguity point which remains to be resolved. Some of these findings are of general interests that are often included in the ICAO format accident reports for informational, safety awareness, education, and improvement purposes.

### **Definitions of Terms Used by the International Civil Aviation Organizations :**

**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

## Aviation Safety Council

---

- 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.

Causes: Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident.

### **Aviation Accidents Database of the International Civil Aviation Organization Has Categorized Each Aviation Process Into the Following :**

- 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 those portions of the Flight which occurs after impact with a person, object, obstacle or terrain.
- Unknown (UNK) : Phase of flight is not discernible from the information

available.

**Aviation Accidents Database of the International Civil Aviation Organization Has Categorized Each Accident Into the Following:**

- Abnormal Runway Contact (ARC)
- Abrupt Maneuver (AMAN)
- Aerodrome (ADRM)
- ATM/CANS
- Cabin Safety Events (CABIN)
- Controlled Flight Into or Toward Terrain (CFIT)
- Evacuation (EVAC)
- Fire/Smoke (Non-Impact) (F-NI)
- Fuel Related (FUEL)
- Ground Handling (RAMP)
- Ground Collision (GCOL)
- Icing (ICE)
- Loss of Control-Ground (LOC-G)
- Loss of Control-In-flight (LOC-I)
- Low Altitude Operations (LALT)
- Airprox/TCAS Alert/Loss of Separation/Near Midair Collisions/Midair Collisions (MAC)
- Other (OTHR)
- Runway Excursion (RE)
- Runway Incursion/ Animal (RI-A)
- Runway Incursion/ Vehicle, Aircraft or Person (RI-VAP)
- 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)
- Unknown/Undetermined (UNK)
- Windshear/Thunderstorm (WSTRW)

**Definition of Other Terms :**

Fatal Occurrence : Accidents where one or more passengers die during the flight from causes of the following: a) a deliberate act by another passenger on the flight; b) a directly hit by any parts of the aircraft, including the sub-part of the aircraft body; c) a directly exposure to turbulent which was caused by the aircraft. These events exclude deaths due to natural factors, self-behavior, others invasion, or hidings of stowaways at non-passengers/crews area on the aircraft in order to travel without paying or without being detected.

Hull Loss Occurrence : An aircraft damaged to the extent that is not economically feasible to repair it. This would include aircraft that are Hull Loss or aircraft that are missing, including the wreckage of unknown position or wreckage that are seriously damaged and unreachable.

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.



## Appendix

Appendix1: The operations of airline companies in Taiwan, 2007-2016

Year		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
The Nationality of Airlines	Number of Companies	12	12	12	13	13	15	15	18	18	18	
	Operations of Civil Aviation Transporting Industry	8	8	7	8	8	8	8	10	9	9	
	General Aviation Industry Operators	6	6	6	7	7	9	9	10	10	10	
	Number of Airworthy Aircrafts	199	193	192	182	199	210	234	249	255	260	
Aircraft of Civil Air Transport Enterprise	Domestic Passenger Flight	Passengers aboard	6320000	4908889	4564516	4824917	5192341	5,323,750	5,265,923	5,260,693	4,891,621	5,413,680
		Passenger- Kilometers	1973000	1473750	1268615	1238689	1361636	1,504,482	1,472,993	1,520,742	1,468,925	1,654,531
	International Passenger Flight	Passengers aboard	18470000	17192364	17775123	20603129	20708375	22,546,135	24,061,087	26,704,903	29,042,002	31,226,905
		Passenger- Kilometers	61314000	57032361	55649773	58812536	58761490	62,370,466	66,128,230	71,199,036	78,585,906	87,687,543
	Total Number of Passenger Flight	Passengers aboard	24790000	22101253	22339639	25428046	25900716	27,869,885	29,327,010	31,965,596	33,933,623	36,640,585
		Passenger- Kilometers	63287000	58506111	56918388	60051226	60123127	63,874,948	67,601,223	72,719,778	80,054,831	89,342,074
	Domestic Cargo Flight	Tonnage	52383	49911	51076	50981	51462	49,034	45,651	37,318	39,941	40,491
		Passenger- Kilometers	6450	6314	5626	5298	4886	4,916	4,687	4,675	4,436	4,121
	International Cargo Flight	Tonnage	1679542	1536589	1376553	1868875	1728436	1,610,732	1,597,279	1,670,959	1,603,637	1,660,477
		Passenger- Kilometers	11139070	9488982	8598983	11868040	10585121	9,338,588	9,190,938	9,438,501	9,073,577	8,933,389
	Total Sum of Cargo Flights	Tonnage	1731925	1586500	1427629	1919856	1779898	1,659,166	1,642,930	1,708,277	1,643,578	1,700,968
		Passenger- Kilometers	11145520	9495296	8604609	11873339	10590007	9,343,505	9,195,626	9,443,176	9,078,012	8,937,510
	Flight Routes	Domestic Routes	112528	89813	82447	83019	87703	84,933	87,939	89,316	84,455	87,257
		International Routes	119369	107210	106761	119982	121989	132,913	144,135	156,985	168,089	178,842
		Total	231897	197023	189208	203001	209692	217,846	232,074	246,301	252,544	266,099
Helicopter for Civil Air Transport Enterprise	Flight Hours	580.22	361.22	270.35	244.93	231.72	142.85	87.57	167.22	137.8	148.1	
	Number of Flights	461	460	630	484	67	364	184	440	383	468	
	Passengers Aboard	4606	2088	2709	2517	698	1,573	972	2,010	1,852	2,287	
Helicopter for General Aviation	Flight Hours	4381.26	4670.30	4588.65	4507.67	4724.17	4,334.70	2,804.47	2,797.17	2,055.4	2,622.5	

Appendix2: The operation statistics of public aircraft, 2007-2016

Year	Government units	Types of Operation	Total flights	Total Flight Hours	Aircraft Type · Number of Aircraft
2007	National Airborne Service Corps (NASC) of the Ministry of the Interior	Search and Rescue, Disaster Relief, Emergency Medical Services, Reconnaissance and Patrol, and Transportation (Training)	6663	9324:06	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 3, UH-1H 20
2008			5338	8061:02	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 3, UH-1H 20
2009			7547	9756:15	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 2, UH-1H 15
2010			6408	7944:27	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 2, UH-1H 15
2011			4796	6285:50	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 2, UH-1H 15
2012			4645	6164:00	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 2, UH-1H 15
2013			4814	6579:55	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 2, UH-1H 13
2014			4847	6454:05	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 2, UH-1H 13
2015			4892	6297:05	AS-365 10, UH-60M 3 BEECH 2, S-76B 2 B-234 2, UH-1H 13
2016			4640	6360:50	AS-365 9, UH-60M 5 BEECH 2, UH-1H 6

Note :

- I. The National Airborne Service Corps (NASC) preparatory office is established on Mar 10, 2004 by merging 4 government agencies including the Air Patrol Corps of the Coast Guard Administration, the Aviation Corps of Civil Aeronautics Administration of Ministry of Transportation and Communications, the Aviation Police Corps of National Police Agency and the Aviation Fire Corps of National Fire Agency. The National Airborne Service Corps officially established on Nov 9, 2005 by the order of Executive Yuan.
- II. This statistical table does not include the number of flights and flying hours on helicopter rental by the Air Patrol Corps of Coast Guard Administration, Executive Yuan.
- III. Number of aircraft in 2016 only counted serviceable aircrafts.

Appendix3: Aviation occurrences and rates (by flight hours) of civil aviation transport category airplane, 2007-2016

Year	Fatal Aviation Occurrences of Jet Transport Aircraft						Fatal Aviation Occurrences of Turboprop Aircraft						Fatal Occurrences for All Aircrafts in National Civil Air Transport Enterprise								
	Fatal Occurrence	Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Flight Hours	Fatal Rate Per Million Flight Hours	Hull Loss Rate Per Million Flight Hours	Fatal/Hull Loss Rate Per Million Flight Hours	Fatal Occurrences	Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Flight Hours	Fatal Rate Per Million Flight Hours	Hull Loss Rate Per Million Flight Hours	Fatal/Hull Loss Rate Per Million Flight Hours	Total Fatal Occurrences	Total Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Flight Hours	Fatal Rate Per Million Flight Hours	Hull Loss Rate Per Million Flight Hours	Fatal/Hull Loss Rate Per Million Flight Hours
2007	0	1	0	525,157	0.00	1.90	0.00	0	0	0	65,512	0.00	0.00	0.00	0	1	0	669,622	0.00	1.49	0.00
2008	0	0	0	414,579	0.00	0.00	0.00	0	0	0	67,076	0.00	0.00	0.00	0	0	0	615,986	0.00	0.00	0.00
2009	0	0	0	369,210	0.00	0.00	0.00	0	0	0	61,167	0.00	0.00	0.00	0	0	0	579,593	0.00	0.00	0.00
2010	0	0	0	571,651	0.00	0.00	0.00	0	0	0	65,613	0.00	0.00	0.00	0	0	0	637,264	0.00	0.00	0.00
2011	0	0	0	550,665	0.00	0.00	0.00	0	0	0	40,902	0.00	0.00	0.00	0	0	0	591,567	0.00	0.00	0.00
2012	0	0	0	569,829	0.00	0.00	0.00	0	0	0	41,237	0.00	0.00	0.00	0	0	0	611,066	0.00	0.00	0.00
2013	0	0	0	613,012	0.00	0.00	0.00	0	0	0	55,096	0.00	0.00	0.00	0	0	0	668,108	0.00	0.00	0.00
2014	0	0	0	634,288	0.00	0.00	0.00	0	0	1	61,186	0.00	0.00	16.34	0	0	1	695,474	0.00	0.00	1.44
2015	0	0	0	667,450	0.00	0.00	0.00	0	0	1	52,096	0.00	0.00	19.20	0	0	1	718,151	0.00	0.00	1.39
2016	0	0	0	693,323	0.00	0.00	0.00	0	0	0	54,130	0.00	0.00	0.00	0	0	0	744,453	0.00	0.00	0.00
Total	0	1	0	5,970,269	0.00	0.17	0.00	0	0	2	564,015	0.00	0.00	3.55	0	1	2	6,534,284	0.00	0.15	0.31

Appendix4: Aviation occurrences/ rates (by departures) of civil aviation transport category airplane, 2007-2016

Year	Fatal Aviation Occurrences of Commercial Jet						Fatal Aviation Occurrences of Turboprop Aircraft						Fatal Occurrences for All Aircrafts in National Civil Air Transport Enterprise								
	Fatal Occurrences	Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Number of Departures	Fatal Rate Per Million Departures	Hull Loss Rate Per Million Departures	Fatal/Hull Loss Rate Per Million Departures	Fatal Occurrences	Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Number of Departures	Hull Loss Rate Per Million Departures	Fatal/Hull Loss Rate Per Million Departures	Total Fatal Occurrences	Total Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Fatal/Hull Loss Occurrences	Number of Departures	Fatal Rate Per Million Departures	Hull Loss Rate Per Million Departure	Fatal/ Hull Loss Rate Per Million Departures
2007	0	1	0	177,861	0.00	5.62	0.00	0	0	0	69,873	0.00	0.00	0.00	0	1	0	247,734	0.00	4.04	0.00
2008	0	0	0	146,272	0.00	0.00	0.00	0	0	0	62,162	0.00	0.00	0.00	0	0	0	208,434	0.00	0.00	0.00
2009	0	0	0	136,526	0.00	0.00	0.00	0	0	0	58,515	0.00	0.00	0.00	0	0	0	195,041	0.00	0.00	0.00
2010	0	0	0	150,402	0.00	0.00	0.00	0	0	0	58,159	0.00	0.00	0.00	0	0	0	208,561	0.00	0.00	0.00
2011	0	0	0	180,667	0.00	0.00	0.00	0	0	0	61,016	0.00	0.00	0.00	0	0	0	241,683	0.00	0.00	0.00
2012	0	0	0	170,011	0.00	0.00	0.00	0	0	0	59,010	0.00	0.00	0.00	0	0	0	229,021	0.00	0.00	0.00
2013	0	0	0	175,518	0.00	0.00	0.00	0	0	0	69,615	0.00	0.00	0.00	0	0	0	245,133	0.00	0.00	0.00
2014	0	0	0	192,202	0.00	0.00	0.00	0	0	1	69,595	0.00	0.00	14.37	0	0	1	261,797	0.00	0.00	3.82
2015	0	0	0	200,610	0.00	0.00	0.00	0	0	1	62,389	0.00	0.00	16.03	0	0	1	262,999	0.00	0.00	3.80
2016	0	0	0	212,403	0.00	0.00	0.00	0	0	0	62,838	0.00	0.00	0.00	0	0	0	275,241	0.00	0.00	0.00
Total	0	1	0	1,742,472	0.00	0.57	0.00	0	0	2	633,172	0.00	0.00	3.16	0	1	2	2,375,644	0.00	0.42	0.84

Appendix5: Aviation occurrences involving illegal actions in airlines (suicide, damaging on purpose, terrorists), 2007-2016

Category	Date	Place	Airline Companies	Total Fatalities	
				Total Number	Total Number
Civil Air Transport Enterprise	N/A	N/A	N/A	0	0
General Aviation Enterprise	N/A	N/A	N/A	0	0

Appendix6: Statistics of aviation safety recommendations, 1999-2016

Accepted by Type of Aircrafts	International Organization	Aviation Industry	Government Related Agency	Total	Percentage
Civil Air Transport Enterprise	91	226	258	575	60.3%
General aviation Enterprise	4	97	101	202	21.2%
Others	18	29	130	177	18.5%
Total	113	352	489	954	100%
Percentage	11.8%	36.9%	51.3%	100%	

Note : Others include public aircrafts and ultra-light vehicle etc.