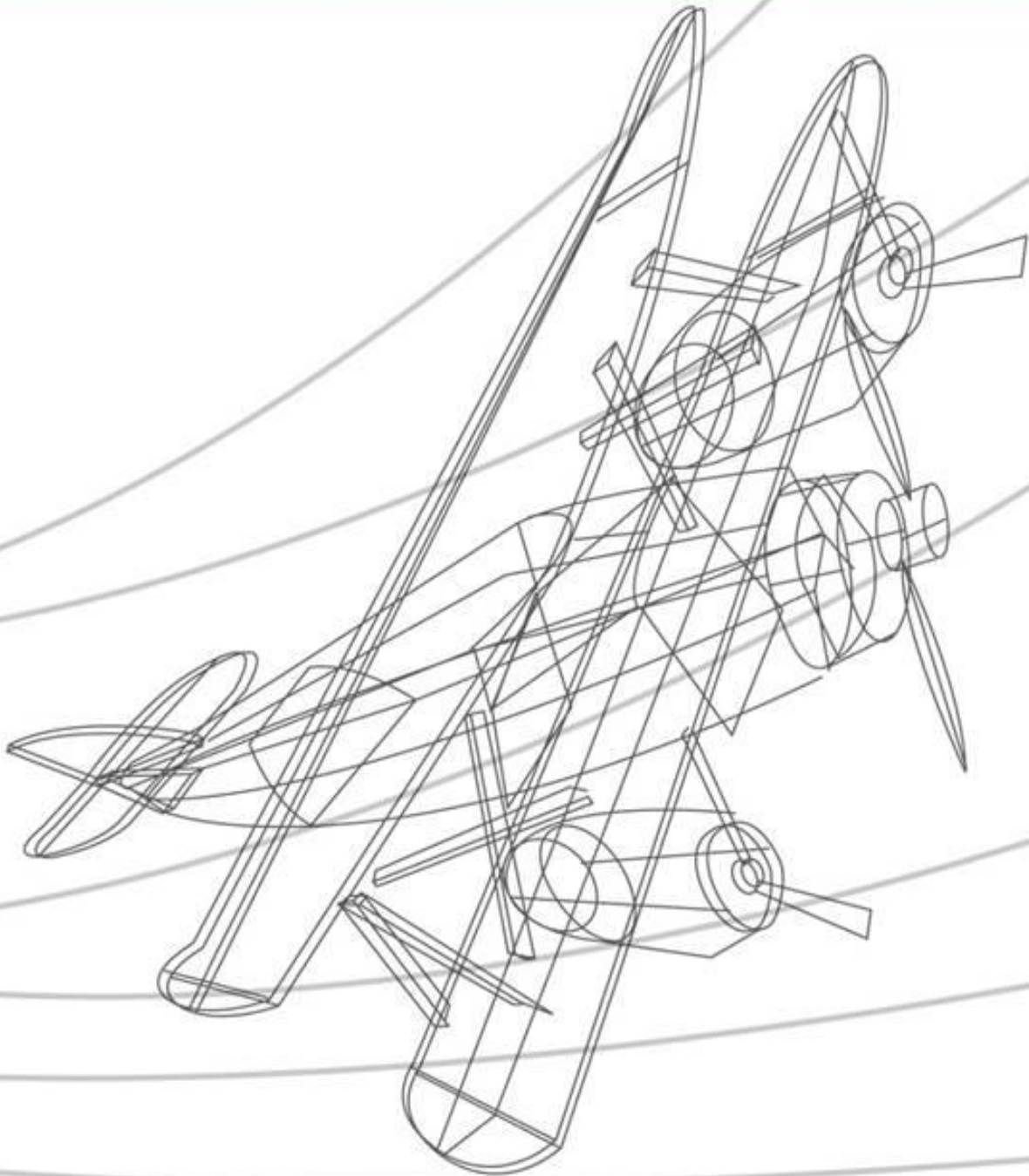


# Taiwan Aviation Occurrence Statistics 2005 to 2014



Aviation Safety Council

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## Abstract

Over the past decade (2005-2014), 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 56.3 percent, the cargo decreased 3.4 percent, and the numbers of flights increased 43.9 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 45 percent, the numbers of flights also decreased 38.9 percent; however the numbers of cargo services decreased year by year over the past decade.

From 2005 through 2014, there were 70 aviation occurrences in Taiwan totally, including those Taiwan air carriers' aircraft occurred outside the country. Transportation category aircraft occurrences accounted for the most (42). The remaining 28 occurrences were general aviation, public aircrafts, ultra-light vehicles or foreign-registered aircrafts. Of those 70 occurrences, 66 fatalities were resulted. There were 9 aviation occurrences occurred in 2014, including 5 national civil aviation transportation category aircrafts and 4 general aviation category aircrafts. One civil aviation transportation aircraft occurrence resulted in hull loss and 44 fatalities. There was no fatality or serious injury of general aviation aircrafts.

According to the occurrence rates for the airplanes in civil aviation transportation category over the last 10 years (2005-2014), the average rate of hull loss occurrences on commercial jet was 0.17 per million flight hours, or 0.58 per million departures. In addition to that, the hull loss occurrence rates on turboprop airplanes were 1.58 per million flight hours and 1.50 per million departures. Based on the 10-year moving average of hull loss occurrence rates on civil aviation transportation category, the rate of commercial jet rose in 2007, from 2008 to 2009 it returned to declination trend, the occurrence rate was constant from year 2009 to 2011, the rate decreased in 2012 and 2013, and the rate was constant in 2014. The hull loss rate on turboprop airplanes was zero in 2013; the rate rose due to a hull loss occurrence in 2014.

When focusing on the accident rates for each phase of flight, defined by International Civil Aviation Organization (ICAO), there were total 42 aviation occurrences happening at different flight phases over the last decade. Among all these accidents, 16 of them took place at landing phase, as the most prevalent, followed by 10 occurrences at cruising phase.

In accordance with the occurrence category used by ICAO, among all 42 civil transportation category airplane occurrences over the past ten years, the runway excursions overall were the most frequent with a total of 13 reported occurrences. The second most frequent occurrences were the SCF-NP

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(system/component failure or malfunction/ non-powerplant), accounting for 10.

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 54.7 percent (47.6 percent related to pilots, 7.1 percent related to maintenance/ATC personnel), of those occurrences as the largest percentage, following by aircraft related in 38.1 percent and environment related in 26.2 percent.

From 2005 to 2014, the rate of general aviation occurrence was 18.34 per 100,000 flight hours, fatal occurrence rate was 6.88 per 100,000 flight hours and hull loss occurrence rate was 9.17 per 100,000 flight hours. The general aviation between 2005 and 2007 and 2014 had no fatal accident nor Hull Loss accident, however there was 1 helicopter hull loss occurrence in 2008 and 1 fatal/hull loss occurrence in 2009. There was a fixed wing aircraft hull loss and fatality occurrence in year 2012 and 1 helicopter fatal/hull loss occurrence in 2013.

There were 6 occurrences involving public aircrafts during the period of 2005 to 2014. Of these occurrences, among the 6 occurrences, 4 occurrences repair cost exceeding the cost of the aircraft (one was fatal) and 2 were personnel injuries occurrences. There was no public aircraft occurrence in 2014.

According to the formal records of ultra-light vehicles occurrence, there were 10 occurrences from 2005 to 2014, including 4 fatal occurrences which resulted in 7 fatalities. Of the 10 occurrences were all hull losses. There was no ultra-light vehicle occurrence in 2014.

There were 106 occurrences been investigation since the establishment of the Aviation Safety Council to the end of 2014, preclude those foreign agencies investigated occurrences and incidents, a total of 87 occurrence investigations been closed. After finishing these 87 occurrences investigation, the Aviation Safety Council had issued 752 safety recommendations during the period from April, 1999 to December, 2014 after the investigations. At the time of this publication, the numbers of accepted action plans proposed to government related departments and others were 480 which account for 96.4 percent, while the numbers of plans/proposals still under supervision were 13 which account for 2.6 percent, and 5 items still under reviewed which account for 1.0 percent.

## **Introduction**

This report begins with the topic of social economy, which includes the critical changes in socioeconomic indicator systems in Taiwan over the last decade. Briefly reviews last year's (2014) status of civil aviation operations and then the status of civil aircrafts, public aircrafts and ultra-light vehicles of last decade. It will allow readers to observe the civil aviation operations change in view of the Taiwan social economy.

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, ASC's 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. The third part of the report includes the data and analysis related to the civil aviation transport category airplane. The end of this section will include safety recommendations made by the Aviation Safety Council 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, 2005-2014

The number of civil aviation companies in Taiwan was 10 in 2014. Eight<sup>2</sup> out of these 10 transportation category carriers operated on both international and domestic routes. Two<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 249<sup>5</sup> in 2014.

In year 2014 the transportation category air carrier in Taiwan carried a total of 31,970,000 passengers, a 9 percent higher than that in 2013. Among those, 83.5 percent were international passengers, 11 percent increase over the previous year, 16.5 percent were domestic passengers with a 9.9 percent decrease when compared to the year before. The total weights the air cargo carried in 2014 were 1,708,000 tons, a 4 percent higher when compared to 2013. Among them, the international air cargo accounted for 97.8 percent of the total weight in 2014, increased by 4.6 percent from 2013. The domestic air cargo accounted for 2.2 percent of the total weight, reduced 18.3 percent from 2013 to 2014. There were a total of 246,301 flights in the whole year, including 36.3 percent domestic flights, a 1.6 percent increase compared to the year before. International flights accounted for 63.7 percent of the total number of flights, 8.9 percent increase over the previous year. It was demonstrated from previous data that in 2014, the international passenger carried and international air cargo all showed higher growth rate. The domestic cargo showed continuously decreased rate while number of flights showed increased rate in year 2014. In 2014, the general aviation had a total of 2,797 flight hours, which was decreased by 0.3 percent from 2013 to 2014. The index of overall operations of national air carriers over the past ten years was showed in Appendix 1.

### Transportation Category

As shown in Figure 1, the number of air carriers operating in civil air transportation category was 8 in 2005. After some variations of aviation market, the number of carriers remained 10 in year 2014. Among those, the Far Eastern Airlines ceased its operation in May 17 of year 2008 and reopened in

<sup>1</sup> The listed statistical data mainly came from "CAA 2014 Annual Report".

<sup>2</sup> China Airlines, EVA Airways, TransAsia Airways, Uni Airways, Mandarin Airlines, Far Eastern Air Transport, V Air and Taiwan Tigerair.

<sup>3</sup> Sunrise Airlines and 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> Two fixed wing airplanes of the CAA are not counted.

year 2010. In year 2014 two low cost carriers, V Air and Taiwan Tigerair, commenced operations in Taiwan. V Air is a domestic low-cost airline based in Taipei. It is a franchise subsidiary of TransAsia Airways. Taiwan Tigerair was formed as a joint venture between China Airlines and Tigerair Singapore. As for the number of registered aircrafts, a fluctuating variation was shown in the early stage as shown in Figure 2. A decreasing trend was shown in year 2005. The number of registered aircrafts was 182 in year 2010 and increased annually and increased to 249 in year 2014. The reasons were due to the purchase of new aircrafts of some Airlines and the introduction of large numbers of hot air balloons.

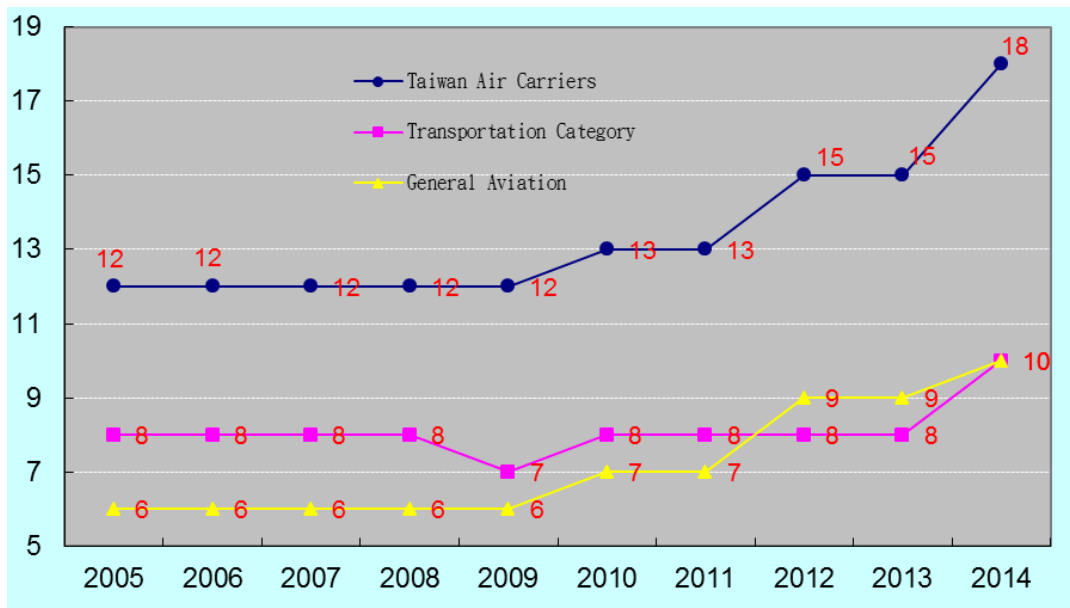


Figure1 : Taiwan air carriers, transportation and general aviation category, 2005-2014

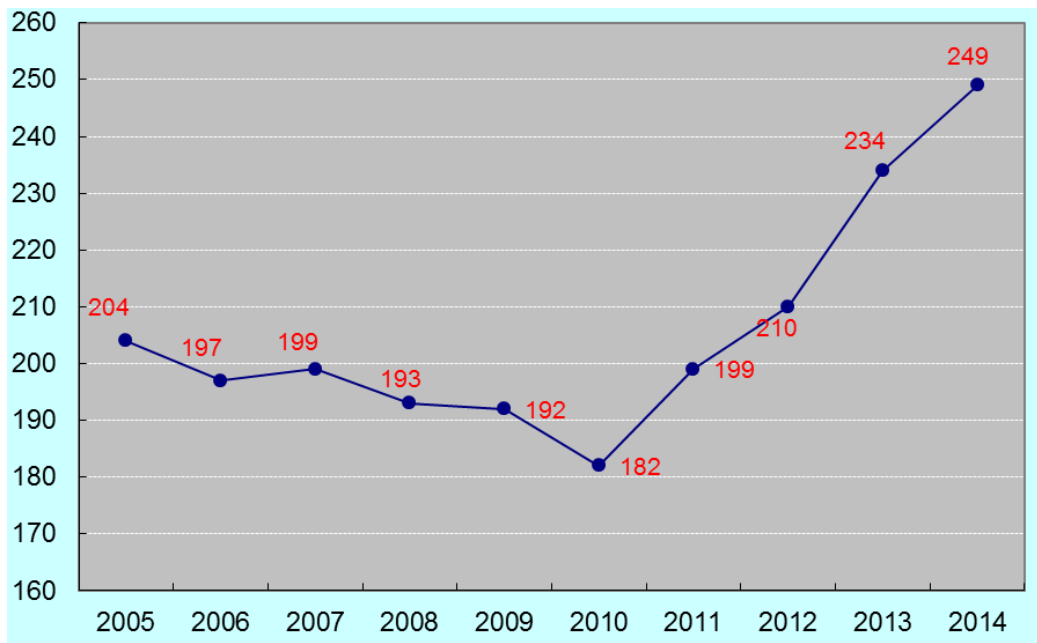


Figure2 : Taiwan registered civil aircraft, 2005-2014

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 17,081,000 in 2005 and increased gradually over the years, and reached the highest 26,705,000 in 2014. It showed a 56.3 percent increase over the past 10 year. Differently from the international routes, number of domestic passengers were decreased from 9,571,000 in 2005 to 4,825,000 in 2010 and then to 5,260,000 in 2014. Over the decade, the decreased rate of passengers was about 45 percent.

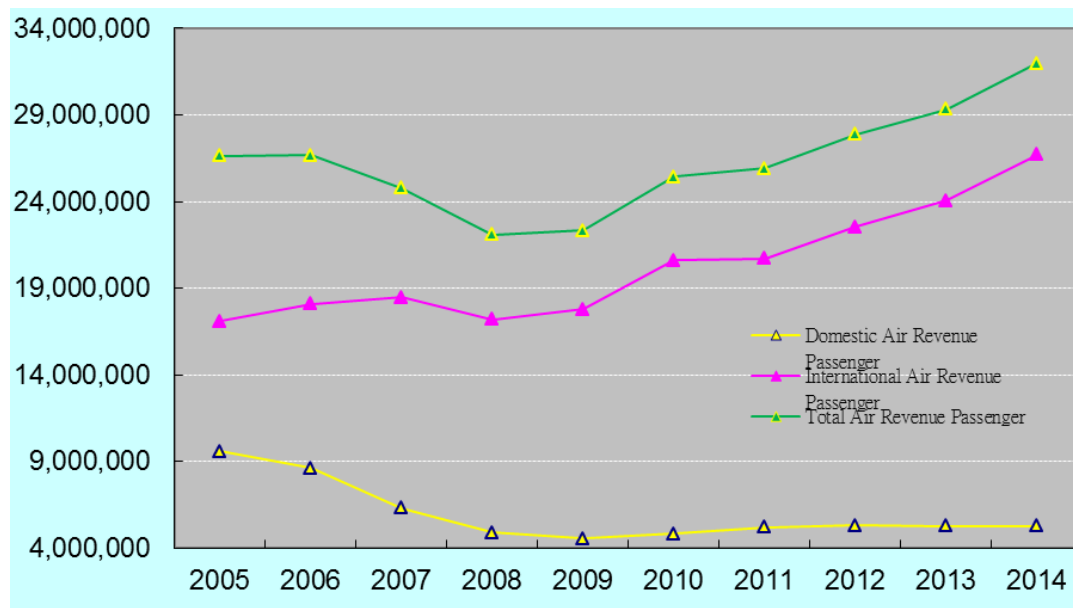


Figure3 : Taiwan air carriers revenue passengers of transportation category, 2005-2014

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 173 million tons in 2005. The air cargo reached a maximum of 187 million tons in 2010 and then reduced to 167 million tons in 2014. Accordingly, the number of air cargo decreased about 3.4 percent over the decade. As for the domestic air cargo, the numbers decreased annually from 55 thousand tons in 2005 and remained around 37 thousand tons in 2014. Taiwan air freight of transportation category air carrier over the period from 2005 to 2014 is shown in Figure 4.

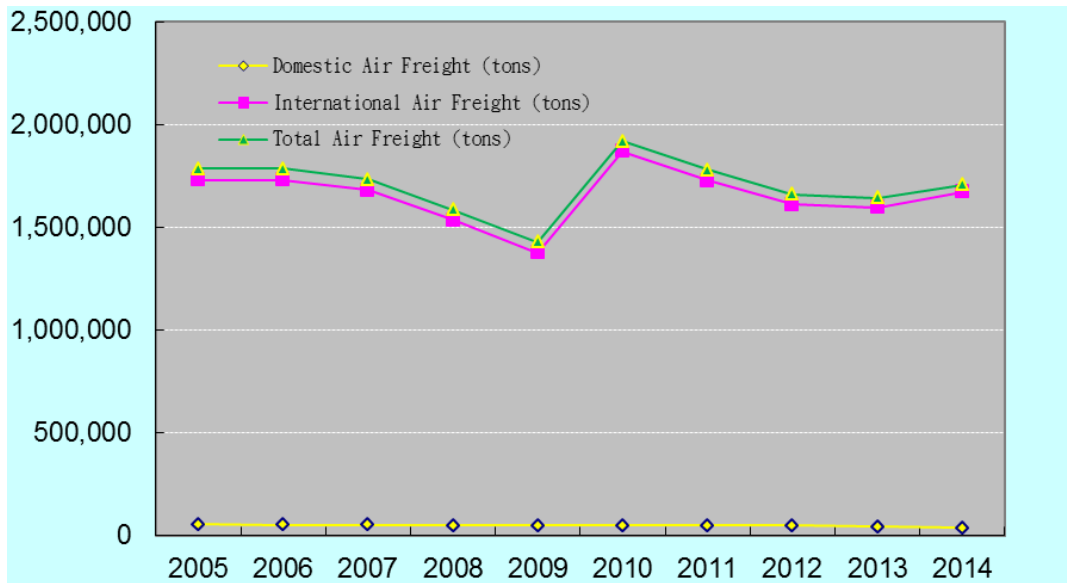


Figure4 : Taiwan air freight of transportation category air carrier, 2005-2014

In terms of the number of flights, the numbers of domestic flights were 1.33 times more than the numbers of the international flights in 2005 (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 2014 were 1.76 times more than the numbers of domestic flights. The domestic flights dropped from 146,000 flights in 2005 to 89,000 flights in 2014, a reduction of nearly 38.9 percent. Differently from the domestic routes, international airlines increased from 110,000 flights in 2005 to 157,000 flights in 2014, a 43.9 percent growth. The increase of international flights over the past 5 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 2005 to 2014 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 2005 to 2014. The number of passenger increased 56.3 percent, the cargo decreased 3.4 percent, and the numbers of flights increased 43.9 percent over the period. Meanwhile, the numbers of domestic air transport declined significantly since the number of passengers decreased almost 45 percent, the numbers of flights also decreased 38.9 percent, however the numbers of cargo services were gradually decreased ever since 2005.

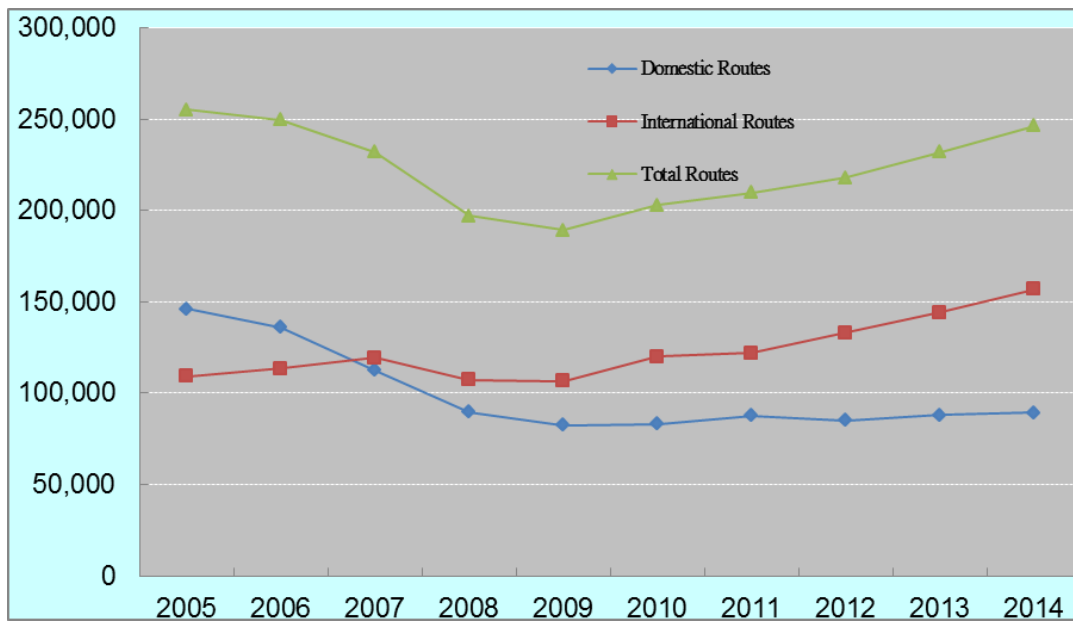


Figure5 : Taiwan flight departures of transportation category, 2005-2014

## 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 3,919 hours in 2005 to 2,797 hours in 2014. The variations of flight hours over the period from 2005 to 2014 are shown in Figure 6.

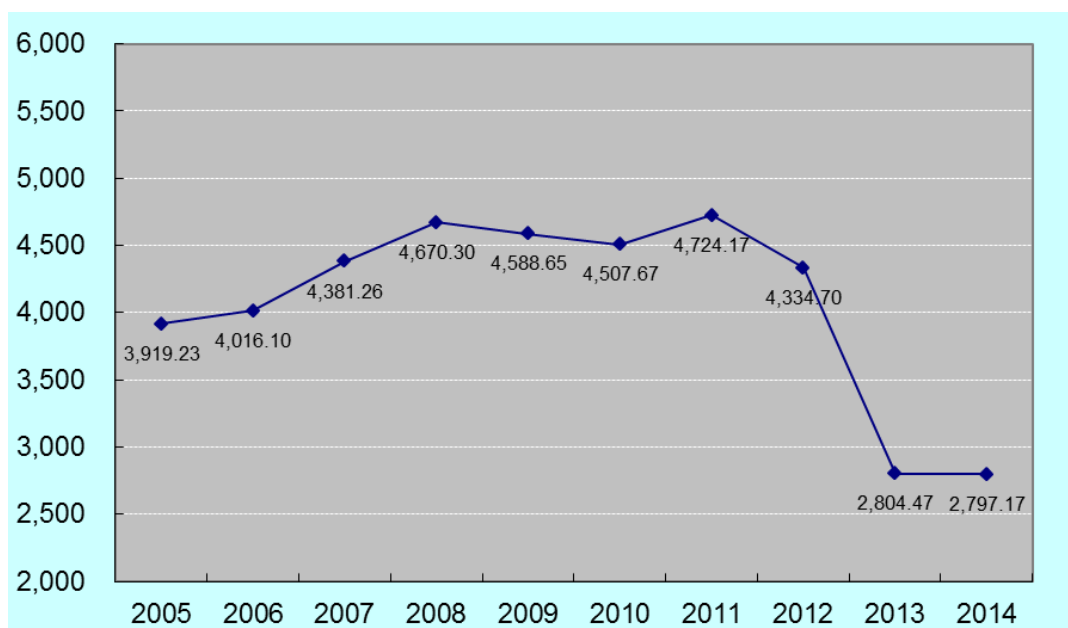


Figure6 : Taiwan air carriers flight hours of general aviation, 2005-2014

## 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 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 MOI 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 2014, there were 27 helicopters and 2 fixed-wing aircrafts currently running by the NASC. In addition, the Civil Aeronautics Administration owned 2 light aircraft in order to assist the airport navigation facilities flight test. One was newly purchased and registered on December 3, 2012.

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 2005 were about 9,358 hours, and then the total flight hours fluctuated over the years. In 2009, the total flight hours almost reached 10 thousand hours. In 2014, the total flight hours declined to 6,454 hours.



Figure7 : Total flight numbers and total flight hours of National Airborne Service Corps, 2005-2014

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### 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 2014, there are 21 available airspaces nowadays, and 7 of them were legal airspaces, among them, 1 is connected airspace (between DaPeng Bay activity area and SaiGia) and 6 airfields (DaPeng Bay, HoLong, HuaLien, SaiGia, BuLao hot spring and WanAnn activity field) could legally carried out ultra-light vehicle activities. Twelve 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 4 activity guidance manuals of ultra-light vehicle parties been approved by CAA. At present time, these 4 parties (R.O.C. ultralight development association, R.O.C. powered parachute association, HuaLien aeronautical 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 Civil Aeronautics Administration. To fulfill public people's recreational requirements of free balloon, the Civil Aeronautics Administration 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 nine related regulations were revised and drafted through public hearing processes.

Till the end of year 2014, the total number of registered hot air balloons was 16 which included 7 of Sky Rainbow, 4 of Taitung County government, 2 of Sunrise Airlines, 1 of Asia-Pacific Institute of Creativity and 2 of Hug Cloud Flying Media Co., Ltd.

### 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, 2005-2014**

### **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**

In the review of aircraft accident data released by the US National Transportation Safety Board, civil aircraft fall into several categories, including Part 121, Part 135, Commuters, On Demand Operations, and General Aviation, following the Federal Aviation Regulations (FARs). Briefly stated, Part121 applies to major airlines and cargo carriers that fly large transport category aircraft while Part 135 applies to commercial air carriers commonly referred to as commuter airlines and air taxis.

The statistics released by the International Civil Aviation Organization (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 Boeing Company (USA) has presented a statistical summary of commercial jet airplane accidents worldwide. The statistics is confined to worldwide commercial jet airplanes that were heavier than 60,000 pounds (or 27,000 kg) maximum gross weight, excluding those manufactured in the Commonwealth of Independent States (CIS) or the Union of Soviet Socialist Republics (USSR). In Britain, airplanes above 5,700 kg (12,500 lb.) are the major focus of the statistics of the fatal accident rate per 1,000,000 flight hours. If occurrence involved 2 or more aircrafts, the numbers of occurrences were counted based on the numbers of aircrafts in the occurrence.

The definitions of jets for statistics of the Civil Aeronautics Administration was referred to a Maximum takeoff Weight of more than 5,700 kg (turboprop) and 15,000 kg (turbojet), which were the same as the International Air Transport Association (IATA). Since then, it has been applied in annual reports and statistics of civil aircraft flight hours and departures released by the Civil Aeronautics Administration, Taiwan. If occurrence involved 2 or more aircrafts, the numbers of occurrences were counted based on the numbers of aircrafts in

the occurrence.

Judging from the above information, global aviation accident data mainly focus on the large aircrafts (Maximum takeoff Weight in excess of 15,000 kg or 27,000 kg). For local 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 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 aircraft (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	E-190 AR
747	MD-90	A310		
757	MD-11	A320		
767		A330		
777		A340		

Table 2 : Types of Taiwan commercial turboprop airplanes

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

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	ASTRA SPX	KA32A11BC	Hawker 400XP
GV-SP	P68C TC	400A	208B
BD-700-1A10	EMB-135BJ	Z-120	Z-140
Z-160	M-120	F-26	C-90
M-105	C-160		

Table 4 : Types of Taiwan public aircrafts

BELL	AEROSPATIALE	BOEING	SIKORSKY	BEECH
UH-1H	AS-365	B234	S76B	BE200
				BE350
				HBC-B300

Table 5 : Types of Apex training academy aircrafts

DA40-NG	DA42-NG		
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### **ASC Definition and Classification of Occurrences**

Aviation occurrence of the Aviation Occurrences Investigation Act (AOIA) 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 2005 through 2014, the total number of aviation occurrences in Taiwan was 70, including those Taiwan air carriers' aircraft occurred outside the country. In general, transportation category aircraft occurrences accounted for the most (42). The remaining 28 occurrences were general aviation, public aircrafts, ultra-light vehicles or foreign-registered aircrafts. Of those 70 occurrences, 66 fatalities were resulted. The details were shown in Table 6.

Table 6 : Aviation occurrence statistics in Taiwan, 2005-2014

	Number of Occurrence			Fatalities	
	Total	Fatal	Hull Losses	Total Fatalities	Aboard
Commercial Jet airplane	36	0	1	0	0
Turboprop airplane	6	1	1	48	48
Civil Aviation Transport Category total	42	1	2	48	48
General Aviation Aircraft	8	3	4	8	8
Public Aircraft	6	1	1	3	3
Ultra-light vehicle	10	4	10	7	7
Occurrences related to Sabotage, hijacking or terrorism	0	0	0	0	0
Foreign-Registered Aircraft Occurrence in Taiwan/ Occurrences Investigated by ASC	4	0	0	0	0
Total	70	9	17	66	66

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, 2014

As shown in the Table 7, the Aviation Safety Council conducted totally 9 aviation occurrence investigations in 2014, including 5 local civil aviation transportation category aircrafts and 4 general aviation category aircraft. Among the 9 civil aviation transportation category aircrafts occurrences, there was 1 hull loss and 48 fatalities. There was no fatality or serious injury of general aviation aircraft occurrences. The details were shown in Table 7.

Table 7 : Aviation fatal/ hull loss occurrence statistics in Taiwan, 2014.

	Number of Occurrence			Fatalities	
	All	Fatal	Hull Loss	Total Fatalities	Aboard
Commercial Jet airplane	4	0	0	0	0
Turboprop airplane	1	1	1	48	48
Civil Aviation Transportation Category total	5	1	1	48	48
General Aviation Aircraft	4	0	0	0	0
Government Aircraft	0	0	0	0	0
Ultra-light Aircraft	0	0	0	0	0
Occurrences of Foreign-Registered Aircrafts Occurred in Taiwan	0	0	0	0	0
Total Sum	9	1	1	48	48

For transportation category aircraft, none of the occurrence in 2014 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, 2014

Injuries Level	Flight Crew	Cabin Crew	Passengers	Other	Total
Fatal	2	2	44	0	48
Serious	0	0	10	0	10
Minor	0	0	0	5	5
Total	2	2	54	5	63

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 260 million passengers. Of the passengers on board, 66 passengers were reported fatal. The majority of fatalities were caused by the occurrences of domestic general aviation aircrafts, public aircrafts and ultra-light vehicles.

### By the Number of Passenger Fatalities Rate

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 (2005-2014), as shown in Table 9. The fatality rate involving transportation category aircraft occurrences was 0.17<sup>6</sup> 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
2005	0	0	26.65	607.94	0	0
2006	0	4	26.69	630.43	0	0
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	0.0605
Total	44	20	263.03	6269.1	0.17	0.0070

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 2.52 per million departures in the year 2006. The occurrence rates were all zero from year 2007 to 2013. In 2014, the 5-year moving average occurrence rate was increased to 3.15 per million departures. The 5-year moving average occurrence rates of turbojet airplanes were about 1.1 per million departures from 2005 to 2006. From the year 2007 to 2014, the occurrence rates were all zeros (0). Figure 8 is a 5-year moving

<sup>6</sup> The global fatalities rate of western built aircraft operation for 2012 was 0.08 (per million passengers) announced by IATA.

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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.

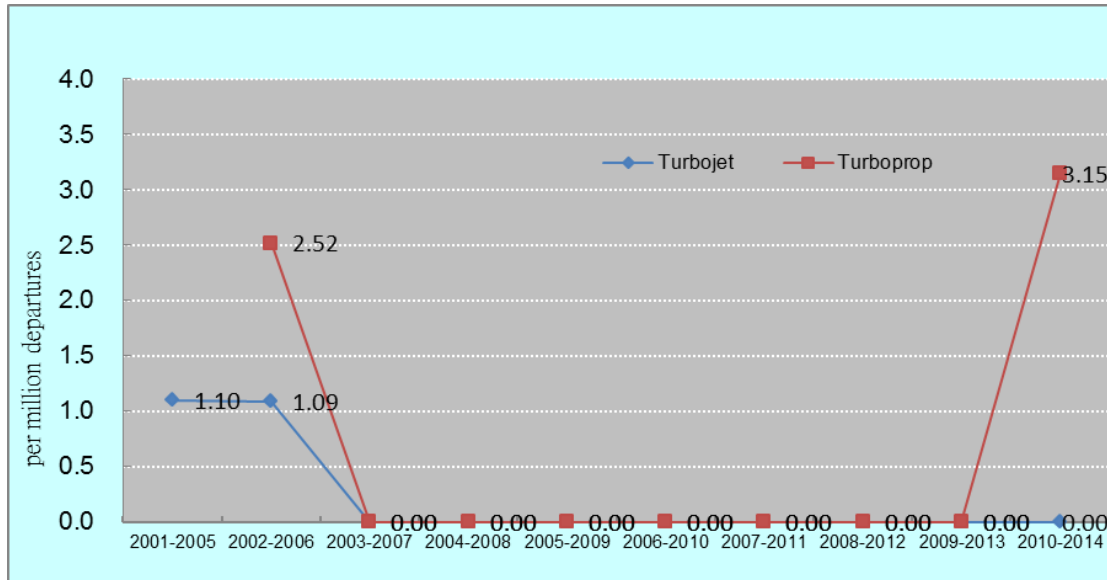


Figure8 : 5-year moving average fatal occurrence rate by million departures, Taiwan transportation category airplane, 2005-2014

**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 zero. In 2014, the 5-year moving average hull loss occurrence rate was increased to 3.15 per million departures. 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 hull loss occurrence resulted in hull loss, but without fatalities. The 5-year moving average hull loss occurrence rate of Taiwan transportation category airplanes from 2005 to 2014 was shown in Figure 9.

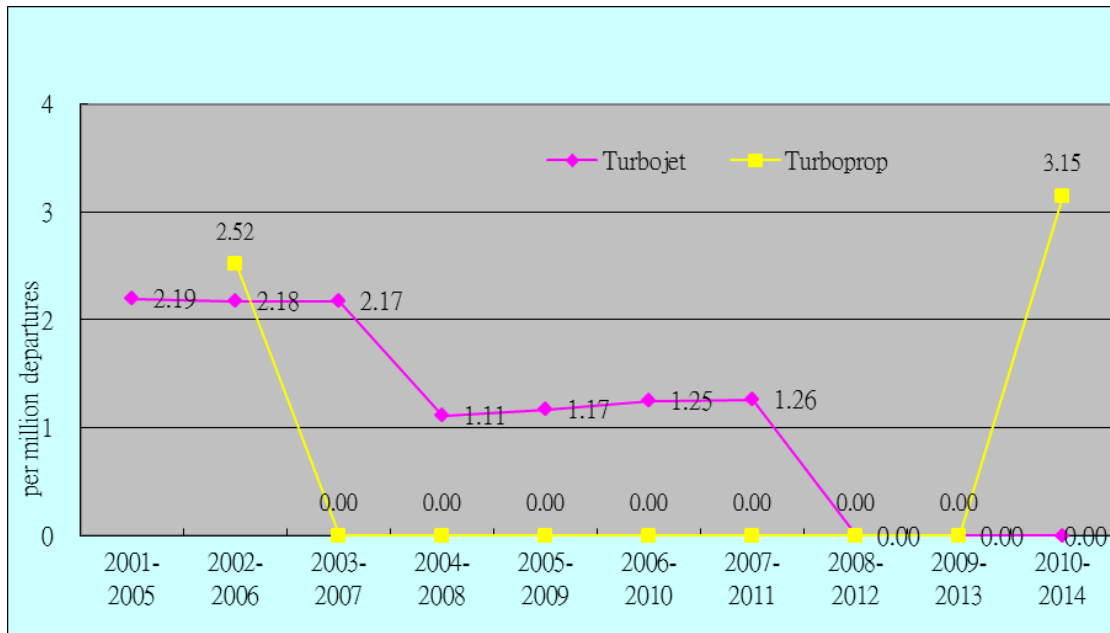


Figure9 : 5-year moving averages hull loss occurrence rates by million departures, Taiwan transportation category airplane, 2005-2014

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

The 10-year 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 0.58 per million departures. In figure 11, the 10-year moving average hull loss occurrence rate of turboprop airplane were 1.58 per million flight hours or 1.50 per million departures. From 2005 to 2014, the hull loss occurrence rate of commercial jet airplane was rising in year 2007 and then little decrease annually. The 10-year moving average hull loss occurrence rates of turboprop airplanes was increased due to one hull loss occurrence<sup>7</sup> in 2014.

<sup>7</sup> The 10-year moving average hull loss occurrence rates of turboprop airplanes only contain recent two 10-year moving average data.



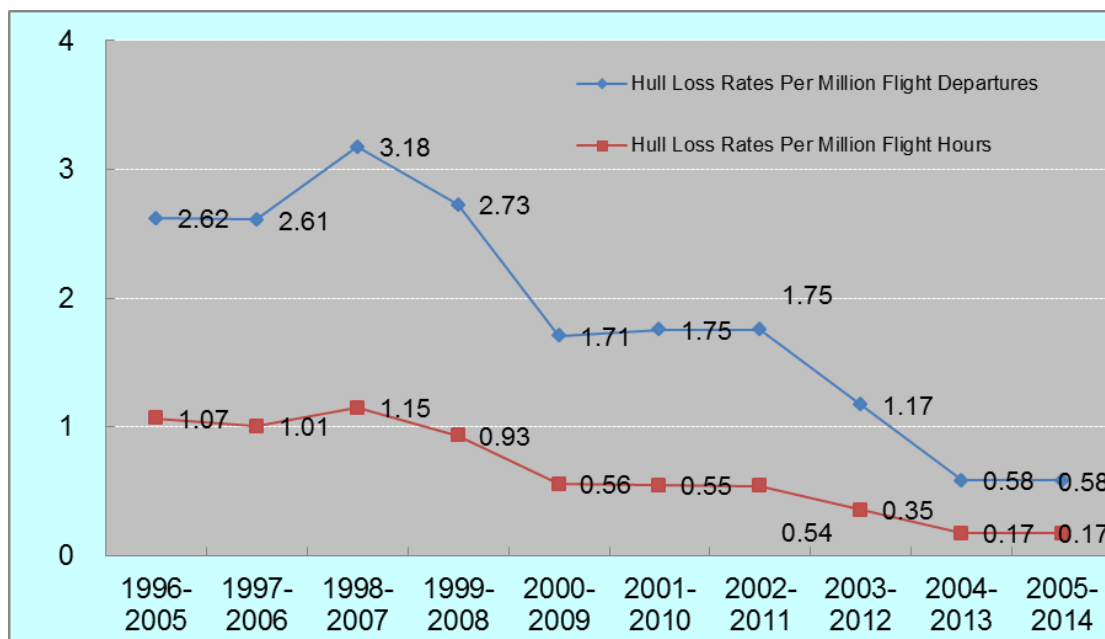


Figure10 : 10-year moving averages hull loss occurrence rates of Taiwan commercial jet airplanes

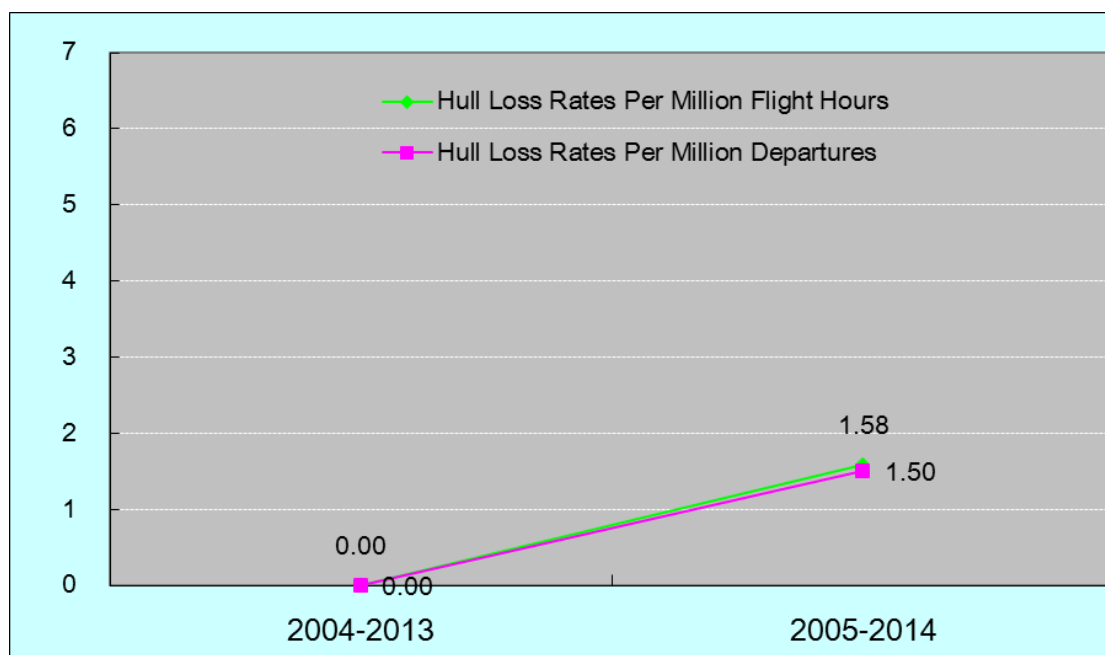


Figure11 : 10-year moving averages hull loss occurrence rates of Taiwan turboprop airplanes

### **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 14<sup>8</sup> over

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

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the past 10 years. The average accident rate was 2.15 per million flight hours, or 5.84 per million departures. The yearly number and rate distribution of accidents was shown in Figure 12.

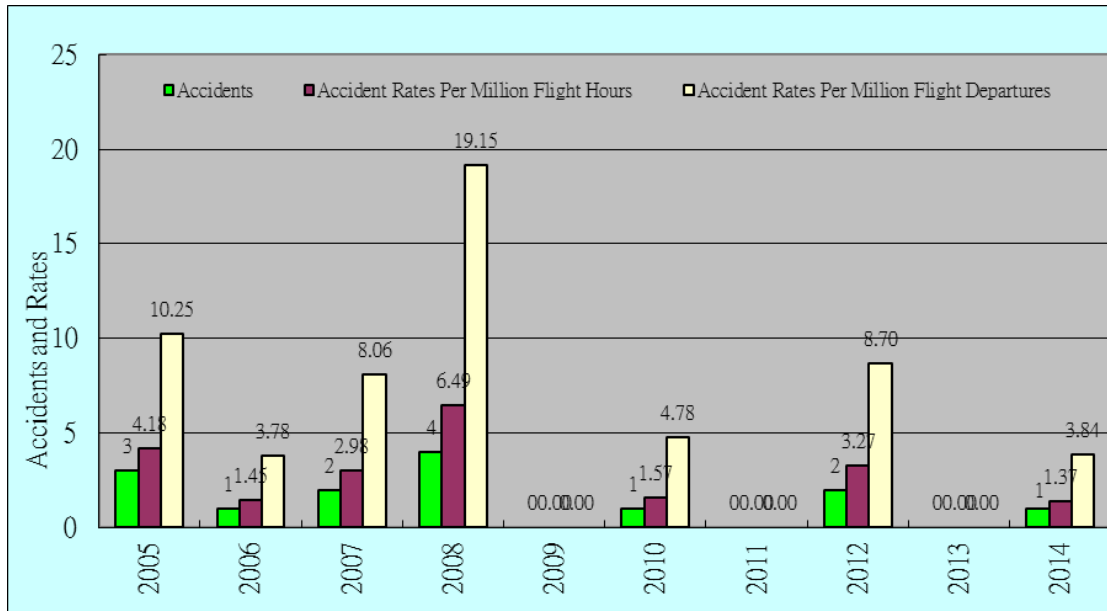


Figure12 : Numbers and rates of transportation category airplane accidents (ICAO definition), 2005-2014

Of the total 14 domestic accidents (ICAO definition), 11 of them were related to commercial turbojet airplanes. Of these 11 commercial turbojet accidents, 1 resulted in hull losses. There were 3 accidents involving turboprop airplanes. Of the turboprop accidents, 1 resulted in hull loss and fatalities. The details were shown in Table 10.

Table 10 : Number of transportation category airplanes accidents (by ICAO definition), 2005-2014

	Total number of accidents	Numbers of hull loss or fatal accidents	Fatalities
Commercial jet airplanes	11	1	0
Turboprop airplanes	3	1	48
Total	14	2	48

From the severity level of injury and aircraft damage, a total of 14 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」, each had 6 cases respectively. There were 1「hull loss w/o injury or fatality」 and 1「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 International Civil Aviation Organization (ICAO), there were total 42 transportation category occurrences happening at different phases over the last decade as shown on Figure 13. Among all these occurrences, 16 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 10 cases.

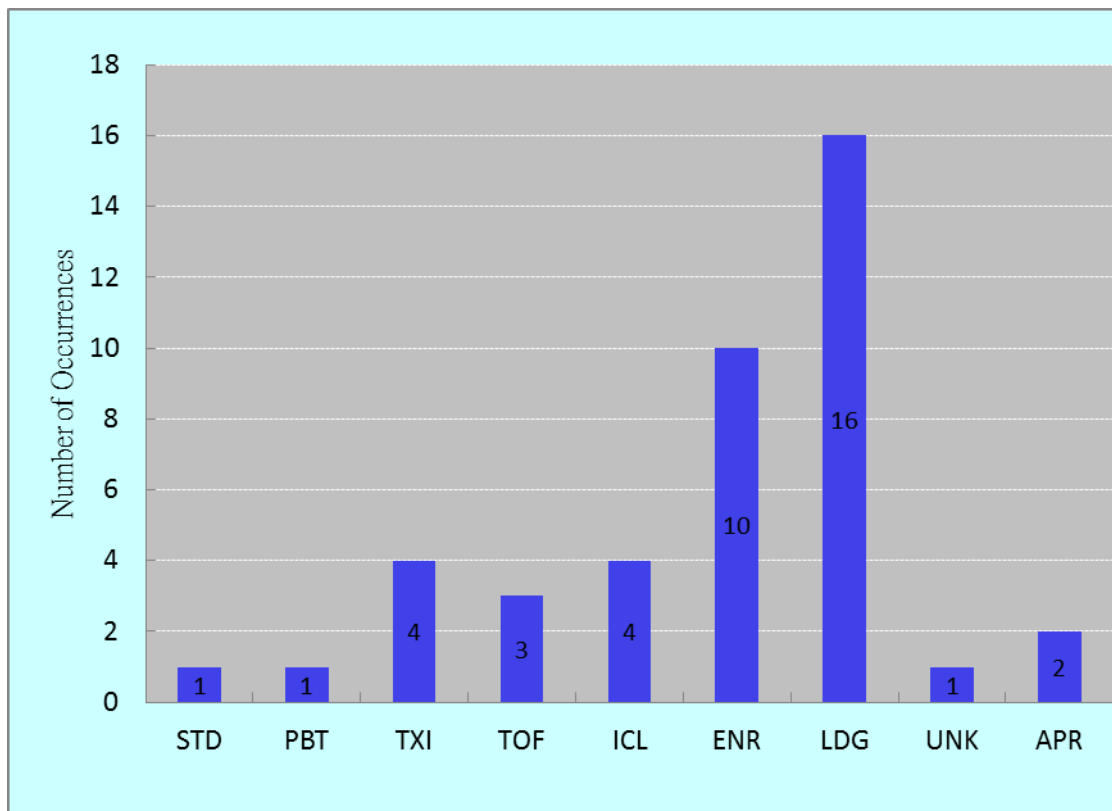


Figure13 : Occurrences distribution of transportation category airplane 2005-2014 by flight phase

**Occurrence Category by ICAO Definition**

There were total 42 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 13 occurrences were reported. The second most frequent occurrences were the SCF-NP (system/component failure or malfunction/ non-powerplant), accounting for 10.

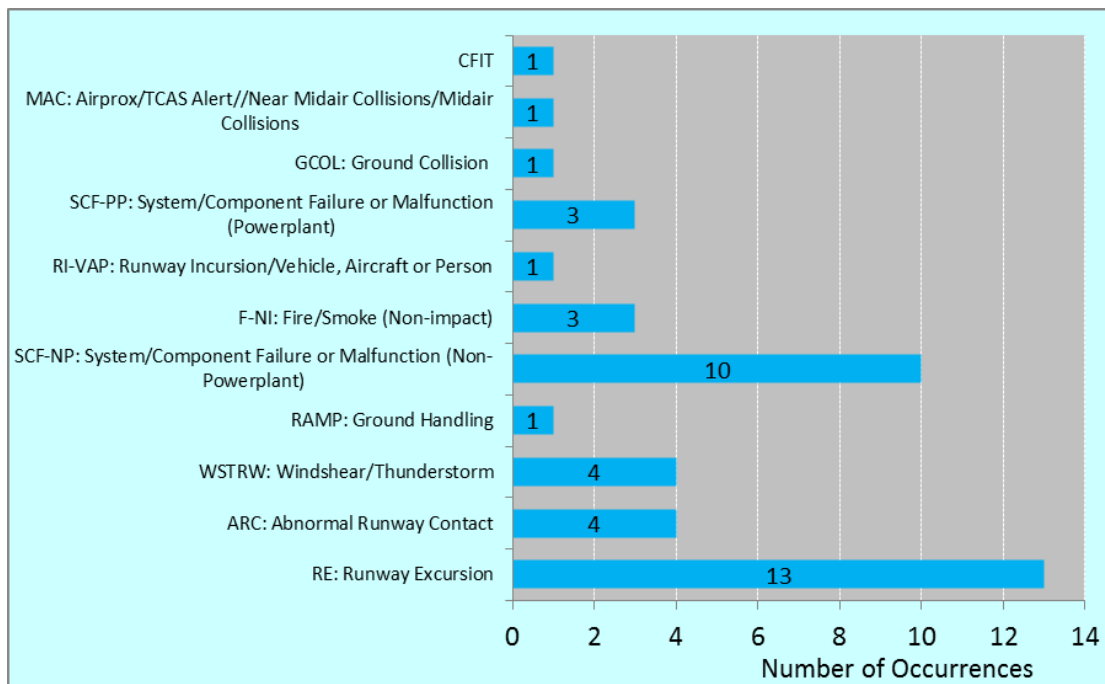


Figure14 : Occurrences distribution of transportation category airplane 2005-2014 by ICAO occurrence category

### 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 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 54.7 percent (47.6 percent were pilot related, 7.1 percent were other personnel such as maintenance personnel and air traffic controller related), followed by 38.1 percent of aircraft-related causes/factors and by 26.2 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.

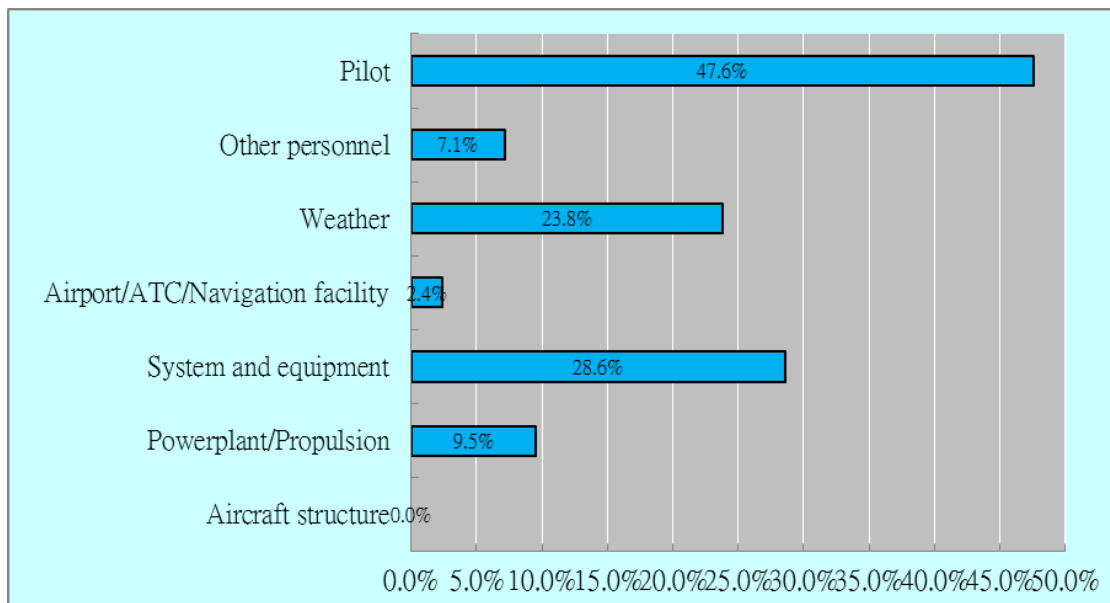


Figure15 : Broad causes/factors for airplane of transport category, 2005-2014.

## 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 turboprop airplanes. The ASC classified the occurrence of general aviation aircraft as Class IV occurrence. Few corporations provide both transportation service and GA service. The following statistics were all related to general aviation service aircraft and helicopters. As indicated in Table 11, 8 general aviation / helicopter of transport category occurrences occurred over the past ten years, 3 of them were fatal occurrences, resulting in 3 helicopters and 1 fixed wing airplane hull losses and 8 fatalities. This then led to an average of 18.34 occurrences per 100 thousands hours, 9.17 hull loss occurrences per 100 thousands hours and 6.88 fatal occurrences per 100 thousands hours over the past decade. The fatal occurrences occurred in 2009, 2012 and 2013 respectively.

Table 11 : Occurrence rate of general aviation / helicopter of transport category, 2005-2014

Year	Number of occurrences			Aboard Fatalities	Total Flight Hours	Accident Per 10 Thousands Hours		
	All	Fatal	Hull Losses			Accident Rate	Fatalities Rate	Aircraft Hull Loss Rate
2005	0	0	0	0	4,319	0.00	0.00	0.00
2006	0	0	0	0	4,404	0.00	0.00	0.00
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
Total	8	3	4	8	43618	18.34	6.88	9.17

### Occurrences Involving Public Aircraft

From 2005 to 2014, there were a total of 6 public aircraft occurrences, which resulted in 1 fatal occurrence and 4 hull loss (including 1 fatal occurrence) occurrences. The statistics chart was shown as Figure 16.

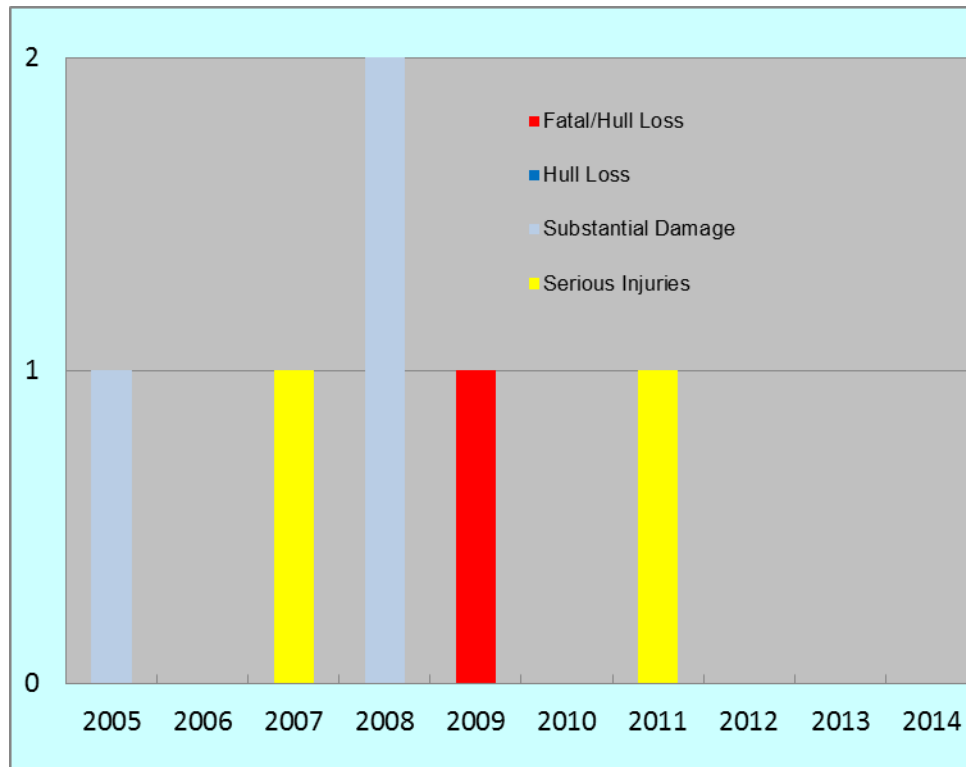


Figure16 : Occurrences statistics of public aircrafts, 2005-2014

## 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 2014. As indicated in Table 12, a total of 10 occurrences occurred during the past decade, and 4 of them were fatal accidents resulting in 7 fatalities. All 10 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, 2005- 2014

Year	Number of occurrences	Fatal occurrences	Hull losses occurrences	Fatalities
2005	2	1	2	2
2006	1	0	0	1
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
Total	10	4	10	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 April 1999 to December 2014, there were 106 aviation occurrences investigated by the ASC. Preclude those occurrences investigated by foreign agencies and incidents, a total of 87 occurrence investigations been closed. In total, the council has issued 752 aviation safety recommendations. Within these recommendations, a maximum of 50.3% were issued to associated organizations of Taiwan government agencies, approximately 36.0% were presented to aviation industries, and approximately 13.7% were presented to foreign associated organizations (as shown in Figure 17).

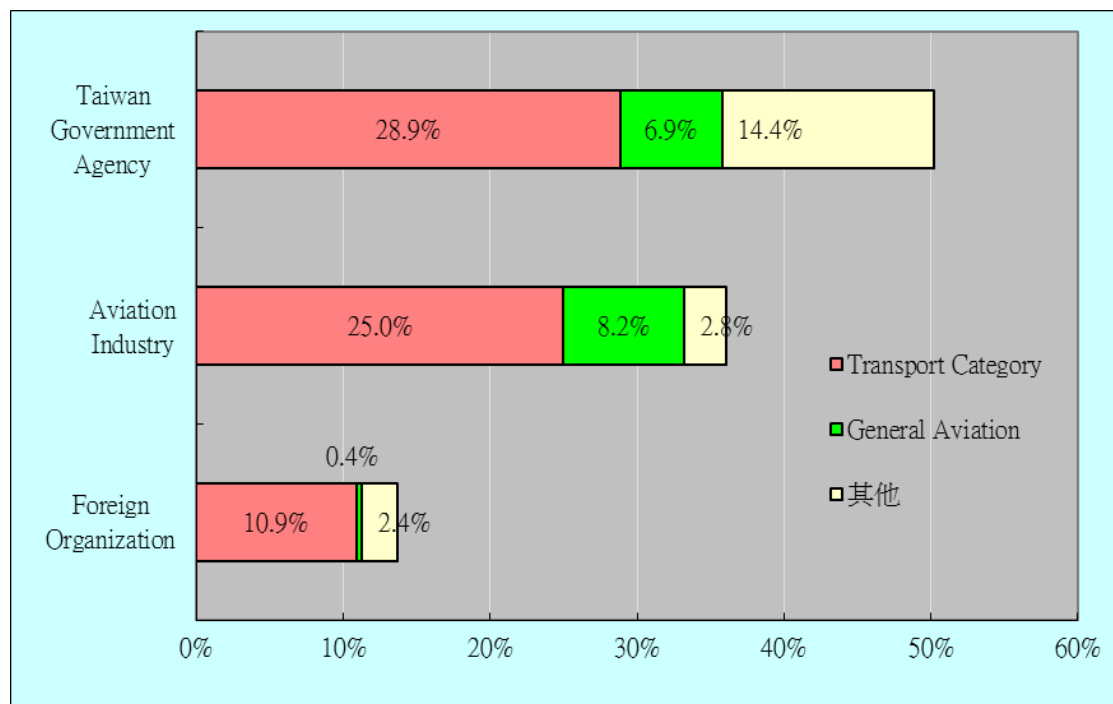


Figure17 : Statistics of aviation safety recommendations, 1999.4-2014.12

## 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 2014, there were total 498 action plans being submitted by related Taiwan government agencies in accordance with the Council’s safety recommendations. Of all the plans, 480 (96.4 percent) plans were classified as “accepted”. Thirteen (2.6 percent) were classified as “under supervision”, with only 5 (1.0 percent) were in the status of “under review”. The statistics is shown in Figure 18.

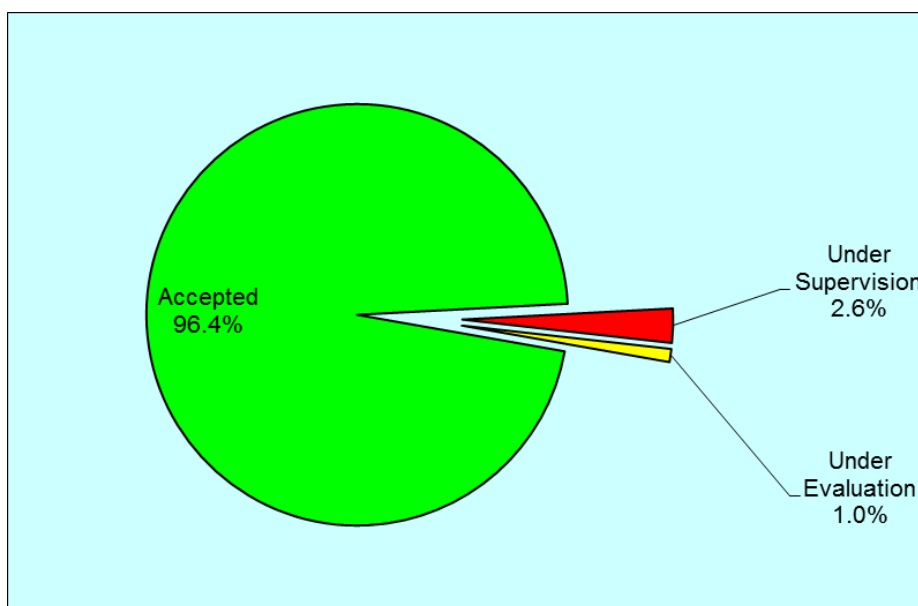


Figure18 : Statistics of action plans status

## 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.

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**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 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.

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Injury : Any of which in the following :

- (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

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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.

**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 accident, or almost certainly operated in the accident. 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 accident.

**Findings related to Risk** : The findings identify elements of risk that have the potential to degrade aviation safety. Some of the findings in this class identify unsafe acts, unsafe conditions, and safety deficiencies, including organizational and systemic risks that made this accident more likely; however, they cannot be clearly shown to have operated in the accident alone. Further, some of the findings in this class identify risks that are unrelated to this accident, 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 an issue of controversy, or clarify an issue of unresolved ambiguity. 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

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- 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.

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.

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- 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, 2005-2014

Year		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
The Nationality of Airlines	Number of Companies	12	12	12	12	12	13	13	15	15	18	
	Operations of Civil Aviation Transporting Industry	8	8	8	8	7	8	8	8	8	10	
	General Aviation Industry Operators	6	6	6	6	6	7	7	9	9	10	
	Number of Registered Aircrafts	204	197	199	193	192	182	199	210	234	249	
Aircraft of Civil Air Transport Enterprise	Domestic Passenger Flight	Passengers aboard	9571448	8606339	6320000	4908889	4564516	4824917	5192341	5,323,750	5,265,923	5,260,693
		Passenger- Kilometers	3020943	2748635	1973000	1473750	1268615	1238689	1361636	1,504,482	1,472,993	1,520,742
	International Passenger Flight	Passengers aboard	17081082	18085793	18470000	17192364	17775123	20603129	20708375	22,546,135	24,061,087	26,704,903
		Passenger- Kilometers	57772630	60294197	61314000	57032361	55649773	58812536	58761490	62,370,466	66,128,230	71,199,036
	Total Number of Passenger Flight	Passengers aboard	26652530	26692132	24790000	22101253	22339639	25428046	25900716	27,869,885	29,327,010	31,965,596
		Passenger- Kilometers	60793574	63042833	63287000	58506111	56918388	60051226	60123127	63,874,948	67,601,223	72,719,778
	Domestic Cargo Flight	Tonnage	54555	53621	52383	49911	51076	50981	51462	49,034	45,651	37,318
		Passenger- Kilometers	7023	6975	6450	6314	5626	5298	4886	4,916	4,687	4,675
	International Cargo Flight	Tonnage	1730241	1731481	1679542	1536589	1376553	1868875	1728436	1,610,732	1,597,279	1,670,959
		Passenger- Kilometers	11391722	11489345	11139070	9488982	8598983	11868040	10585121	9,338,588	9,190,938	9,438,501
	Total Sum of Cargo Flights	Tonnage	1784796	1785102	1731925	1586500	1427629	1919856	1779898	1,659,166	1,642,930	1,708,277
		Passenger- Kilometers	11398744	11496320	11145520	9495296	8604609	11873339	10590007	9,343,505	9,195,626	9,443,176
	Flight Routes	Domestic Routes	146114	135943	112528	89813	82447	83019	87703	84,933	87,939	89,316
		International Routes	109094	113546	119369	107210	106761	119982	121989	132,913	144,135	156,985
		Total	255208	249489	231897	197023	189208	203001	209692	217,846	232,074	246,301
Helicopter for Civil Air Transport Enterprise	Flight Hours	399.57	387.88	580.22	361.22	270.35	244.93	231.72	142.85	87.57	167.22	
	Number of Flights	1140	1012	461	460	630	484	67	364	184	440	
	Passengers Aboard	6137	5007	4606	2088	2709	2517	698	1,573	972	2,010	
Helicopter for General Aviation	Flight Hours	3919.23	4016.10	4381.26	4670.30	4588.65	4507.67	4724.17	4,334.70	2,804.47	2,797.17	

Appendix2: The operation statistics of public aircraft, 2005-2014

Year	Government units	Types of Operation	Total flights	Total Flight Hours	Aircraft Type · Number of Aircraft
2005	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)	7187	9358 : 09	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 3, UH-1H 20
2006			6518	9577 : 54	AS-365 10, BE-200 1 BE-350 1, S-76B 2 B-234 3, UH-1H 20
2007			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

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 2014 only counted serviceable aircraft.

Appendix3: Aviation occurrences and rates (by flight hours) of civil aviation transport category airplane, 2005-2014

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
2005	0	0	0	590,792	0.00	0.00	0.00	0	0	0	120,821	0.00	0.00	0.00	0	0	0	711,613	0.00	0.00	0.00
2006	0	0	0	597,757	0.00	0.00	0.00	0	0	0	107,510	0.00	0.00	0.00	0	0	0	705,267	0.00	0.00	0.00
2007	0	1	0	525,157	0.00	1.90	0.00	0	0	0	96,504	0.00	0.00	0.00	0	1	0	621,661	0.00	1.61	0.00
2008	0	0	0	414,579	0.00	0.00	0.00	0	0	0	106,752	0.00	0.00	0.00	0	0	0	521,331	0.00	0.00	0.00
2009	0	0	0	369,210	0.00	0.00	0.00	0	0	0	98,755	0.00	0.00	0.00	0	0	0	467,965	0.00	0.00	0.00
2010	0	0	0	571,651	0.00	0.00	0.00	0	0	0	66,234	0.00	0.00	0.00	0	0	0	637,885	0.00	0.00	0.00
2011	0	0	0	550,665	0.00	0.00	0.00	0	0	0	41,629	0.00	0.00	0.00	0	0	0	592,294	0.00	0.00	0.00
2012	0	0	0	569,829	0.00	0.00	0.00	0	0	0	42,048	0.00	0.00	0.00	0	0	0	611,877	0.00	0.00	0.00
2013	0	0	0	613,012	0.00	0.00	0.00	0	0	0	56,416	0.00	0.00	0.00	0	0	0	669,428	0.00	0.00	0.00
2014	0	0	0	667,120	0.00	0.00	0.00	0	0	1	63,317	0.00	0.00	15.79	0	0	1	730,437	0.00	0.00	1.37
Total	0	1	0	5,856,369	0.00	0.17	0.00	0	0	1	660,997	0.00	0.00	1.51	0	1	1	6,517,366	0.00	0.15	0.15

Appendix4: Aviation occurrences/ rates (by departures) of civil aviation transport category airplane, 2005-2014

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
2005	0	0	0	203,874	0.00	0.00	0.00	0	0	0	85,144	0.00	0.00	0.00	0	0	0	289,018	0.00	0.00	0.00
2006	0	0	0	188,679	0.00	0.00	0.00	0	0	0	98,818	0.00	0.00	0.00	0	0	0	287,497	0.00	0.00	0.00
2007	0	1	0	152,503	0.00	6.56	0.00	0	0	0	94,283	0.00	0.00	0.00	0	1	0	246,786	0.00	4.05	0.00
2008	0	0	0	109,321	0.00	0.00	0.00	0	0	0	87,641	0.00	0.00	0.00	0	0	0	196,962	0.00	0.00	0.00
2009	0	0	0	91,891	0.00	0.00	0.00	0	0	0	113,157	0.00	0.00	0.00	0	0	0	205,048	0.00	0.00	0.00
2010	0	0	0	150,402	0.00	0.00	0.00	0	0	0	58,979	0.00	0.00	0.00	0	0	0	209,381	0.00	0.00	0.00
2011	0	0	0	180,667	0.00	0.00	0.00	0	0	0	61,824	0.00	0.00	0.00	0	0	0	242,491	0.00	0.00	0.00
2012	0	0	0	170,011	0.00	0.00	0.00	0	0	0	59,846	0.00	0.00	0.00	0	0	0	229,857	0.00	0.00	0.00
2013	0	0	0	175,518	0.00	0.00	0.00	0	0	0	70,627	0.00	0.00	0.00	0	0	0	246,145	0.00	0.00	0.00
2014	0	0	0	189,932	0.00	0.00	0.00	0	0	1	70,574	0.00	0.00	14.17	0	0	1	260,506	0.00	0.00	3.84
Total	0	1	0	1,722,116	0.00	0.58	0.00	0	0	1	676,148	0.00	0.00	1.48	0	1	1	2,398,264	0.00	0.42	0.42

Appendix5: Aviation occurrences involving illegal actions in airlines (suicide, damaging on purpose, terrorists), 2005-2014

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, 1999-2014.12

Accepted by Type of Aircrafts	International Organization	Aviation Industry	Government Related Agency	Total	Percentage
Civil Air Transport Enterprise	82	188	217	487	64.80%
General aviation Enterprise	3	62	52	117	15.60%
Other	18	21	109	148	19.60%
Total	103	271	378	752	100%
Percentage	13.70%	36.00%	50.30%	100%	

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