ANNUAL SAFETY REPORT
ASIA PACIFIC REGION 2016

Contents

01 Foreword

Regional Aviation Safety Group—Asia Pacific (RASG—APAC) Background

The establishment of the Regional Aviation Safety Group—Asia Pacific (RASG—APAC) was endorsed at the 47th Directorate General of Civil Aviation (DGCA) conference as a focal point to ensure harmonisation and coordination of efforts aimed at reducing aviation safety risks for the Asia Pacific region.

RASG—APAC's primary role is to support the implementation of the International Civil Aviation Organization (ICAO) Global Aviation Safety Plan (GASP) and Global Aviation Safety Roadmap (GASR).

RASG—APAC membership includes representatives from the forty States/Administrations associated with the ICAO Asia Pacific regional office.

RASG—APAC has established the Asia Pacific Regional Aviation Safety Team (APRAST) to implement its work program. The objectives of the APRAST include recommending interventions to the RASG—APAC which will reduce aviation safety risks. To do so, APRAST will:

» review, for application within the Asia Pacific region, existing safety interventions which have already been developed through the efforts of well-established, multinational safety initiatives

» review, for application within the Asia Pacific region, the best practices and metrics defined in the GASP/GASR

» review regional accidents, significant incident trends and other areas of local concern to determine unique issues that may warrant locally developed interventions. The focus and priority for APRAST will be to introduce, support, and develop actions that have the potential to effectively and economically reduce regional aviation risks.

Supporting the work of the APRAST are two working groups:

a) Asia Pacific (APAC) Accident Investigation Working Group (APAC—AIG); and

b) Safety Reporting Program Working Group (SRP WG).

The APAC—AIG will review the Global Aviation Safety Plan/Roadmap (GASP/R) GSI 3 /Focus Area 3, 'Impediments to Reporting of Errors and Incidents', and GSI 4/Focus Area 4, 'Ineffective Incident and Accident Investigation' and propose the necessary recommendations to address these two focus areas.

The APAC—AIG will:

» review, for application within the Asia Pacific region, policies and procedures relating to accident investigation and the reporting of errors and incidents

» review, for application within the Asia Pacific region, the best practices and metrics defined in Global Safety Initiative/ Focus Areas 3 and 4 of the GASP/GASR

» review regional accidents and significant incident trends and other areas of local concern to determine unique issues that may warrant locally developed policies and procedures to effectively capture information for study and for the development of recommendations. The focus and priority for APAC—AIG will be to introduce, support, and develop actions that have the potential to effectively and economically reduce the regional aviation accident risk.

The SRP WG will gather safety information from various sources to determine the main aviation safety risks in the Asia Pacific region. These will be included in an Annual Safety Report that covers:

i) Reactive information

ii) Proactive information

iii) Predictive information

The Information Analysis Team (IAT) formed within the SRP WG will analyse the available safety information to identify risk areas. Recommendations for safety enhancement initiatives, based on the identified risk areas, will be made by the SRP WG to the RASG—APAC, through APRAST.

The organisational structure of the RASG—APAC and its subsidiary bodies is shown in Figure 1.1.The ICAO Asia Pacific regional office in Bangkok provides the secretariat support necessary for the RASG—APAC to function.

The 2016 Annual Safety Report, developed by the SRP WG and published by RASG—APAC, is the fourth edition of the exclusive safety report for the Asia Pacific region based on data provided by ICAO, CAST and IATA. Analysis of this aviation safety data was completed with the in-kind contributions of aviation safety personnel from RASG—APAC member States/Administrations and industry partners. This report is envisioned to be an annual publication providing appropriately updated aviation safety information.

Copies of this report can be downloaded from: www.icao.int/APAC
For clarification or additional information please email: rasgapac@bangkok.icao.int

Figure 1.1 RASG—APAC Organisation Structure
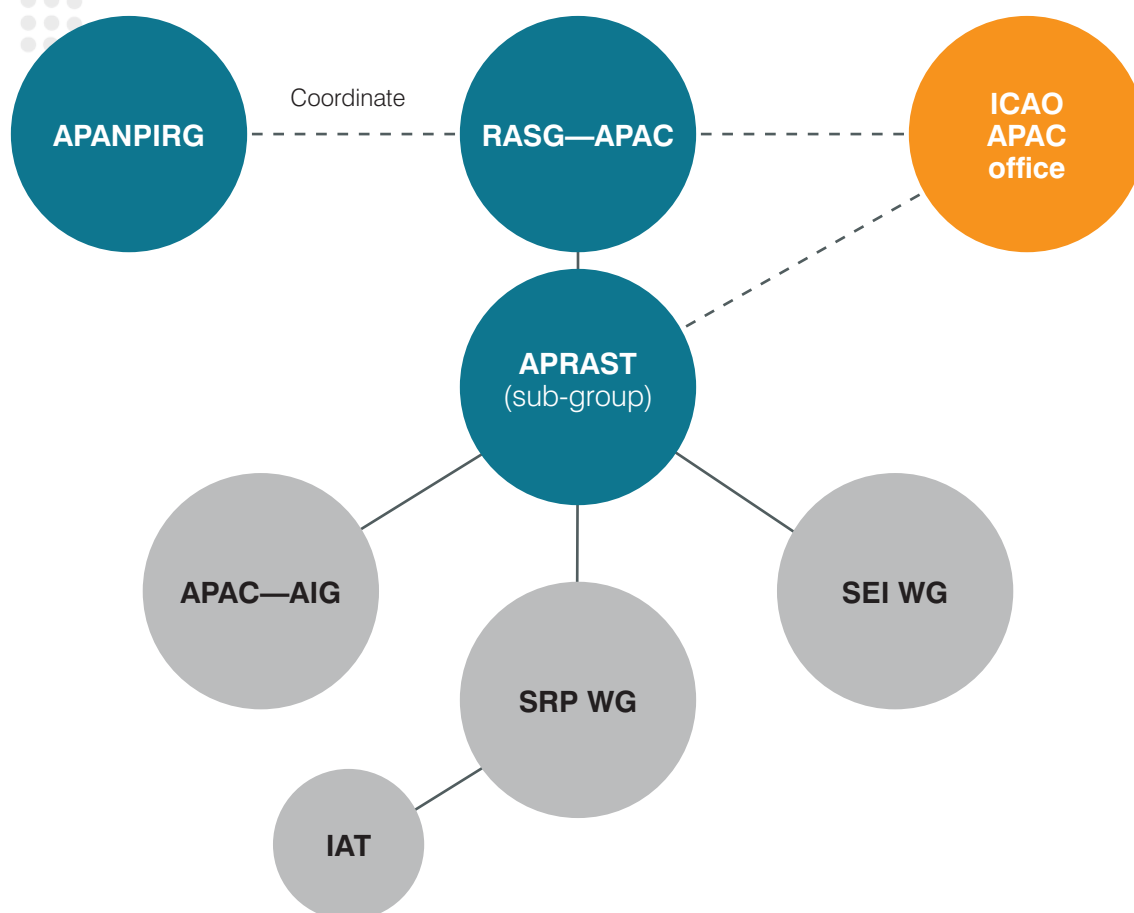
02 Introduction

The objectives of the Regional Aviation Safety Group—Asia Pacific (RASG—APAC) Annual Safety Report are to gather safety information from various stakeholders, analyse the main aviation safety risks in the Asia Pacific region and identify possible actions for enhancing aviation safety in a coordinated manner.

The safety information presented in this report is based on the compilation and analysis of data provided by ICAO, the International Air Transport Association (IATA) and Commercial Aviation Safety Team (CAST).

This fourth edition of the RASG—APAC Annual Safety Report contains reactive information relating to hull loss and fatal accidents, both on the ground and in flight, involving scheduled commercial aeroplanes with a MTOW greater than 5700 kg operated by (or registered with) the member States/Administrations of the RASG—APAC (i.e. States/Administrations associated with the ICAO Asia Pacific regional office). It will also include proactive information for the Asia Pacific region based on Universal Safety Oversight Audit Program (USOAP) Continuous Monitoring Approach (CMA).

In future, the Annual Safety Report will also include the compilation and analysis of predictive information so that effective mitigation measures can be developed and implemented to reduce/prevent accidents.

In this report, the most frequent accident categories (in accordance with ICAO/IATA/CAST taxonomy) relating to fatality risks, as well as other significant emerging safety categories in the Asia Pacific region, are identified.

The ICAO member states associated with the APAC regional office are illustrated in Figure 2.1 and listed in Table 2.1.

Figure 2.1 Asia Pacific region—countries associated with the ICAO Asia Pacific Regional Office

Table 2.1 Member States/Administrations associated with the ICAO Asia Pacific Office

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

image: © Dropu | Dreamstime.com

03 Executive summary

This edition of the RASG—APAC Annual Safety Report collates and presents the results of analysis carried out by members of the Information Analysis Team about aviation accidents in the Asia Pacific (APAC) region. The safety information was collected from ICAO, IATA and CAST.

Analysis of this information shows the following as being the top accident categories for the 2006–2015 period:

1. Controlled flight into terrain (CFIT), and
2. Runway safety (specifically runway excursion)

The accident category of Loss of Control in flight (LOC-I) remains the second highest accident category in terms of fatality risk, after CFIT.

It should be noted that over the last five years the accident category of In-Flight Damages has been trending upwards in the APAC region and has also resulted in some fatalities.

Table 3.1 Aviation accidents and fatalities in the Asia Pacific region (2010–2015)

Asia Pacific	Accidents[1]	Fatal Accidents	Fatalities	Accident Rates (per million departures)
2010	21	4	441	2.89
2011	19	4	48	2.44
2012	18	4	163	2.34
2013	20	2	52	2.47
2014[2]	26	3	699	2.99
2015[3]	23	2	55	2.44
2006–2015 avg	22	2.9	174.2	3.08

In the APAC region the number of accidents in 2015 was 23, three accidents less than that recorded in 2014; an 11.5 per cent reduction. The number of fatalities for 2015 was 55 compared to 699 recorded in 2014.

The APAC accident rate in 2015 was lower, at 2.44 accidents per million departures compared to the previous year's figure of 2.99 per million departures. This was also lower than the 2015 global accident rate of 2.79 accidents per million departures. The reduction in the APAC accident rate was a result of a 11.5 per cent decrease in the number of accidents (from 26 to 23) while the APAC's total departures increased by 8 per cent (from 8.70 million to 9.41 million departures).

The APAC five-year sliding average accident rate as at the end of 2015 was 2.54 per million departures, compared with the global five-year sliding average accident rate of 3.19 per million departures.

To support future development of the APAC Annual Safety Report, APAC States and Administrations should continue to, in accordance with obligations under ICAO Annex 13, notify (and submit relevant information to) ICAO about the occurrence of accidents. Information submitted should be accurate to ensure that information sourced from the ICAO iSTARS database will be more comprehensive and accurately reflect the aviation safety performance of the APAC region.

Analysis of the Universal Safety Oversight Audit Program Continuous Monitoring Approach (USOAP CMA) information revealed that the APAC region had an overall effective implementation (EI) score of 59.17 per cent, which was slightly lower than the global level of 63.40 per cent.

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[1] Source: ICAO iSTARS. Accidents as defined in ICAO Annex 13.

[2] The total accident count did not include TransAsia Airways of Taiwan ATR72 accident which resulted in 48 fatalities in Jul 2014.

[3] The total accident count did not include TransAsia Airways of Taiwan ATR72 accident which resulted in 43 fatalities in Feb 2015.

Analysis of EI by critical element (CE) revealed that, in comparison to the global average, the APAC region had a slightly lower EI for all categories except CE7 (Surveillance obligations), which had a slightly higher score than the global average.

Examining the EI by area revealed that the APAC region had lower scores for most categories compared to the global average except in air navigation systems.

For the 2016 Annual Safety Report, the information analysis team reviewed ASIAS information that was provided in accordance with an agreement signed between the United States (US) Commercial Aviation Safety Team (CAST) and RASG—APAC. The metrics review included Unstabilised Approach, LOC-I, TAWS and TCAS based on FOQA data provided by ASIAS member carriers.

The data available from ASIAS was limited to US carriers operating into the APAC region, except for LOC-I, which represented the ASIAS worldwide set. The metrics may not fully represent the regional level of occurrences, due to the limited number of flights available, but it demonstrated the usefulness of this type of information. Sharing APAC carrier's safety information from AAPA and IATA will broaden the data set for future editions of the report.

The analysis revealed that unstabilised approaches appeared to be trending down over the last three years, while LOC-I related metrics were stable.

Through the RASG—AP, a feasibility study will be conducted by MITRE and the Flight Safety Foundation on the establishment of a Regional Data Collection, Analysis, and Sharing system. It is hoped that a demonstration project will commence soon from which information could be incorporated into future Asia Pacific safety reports.
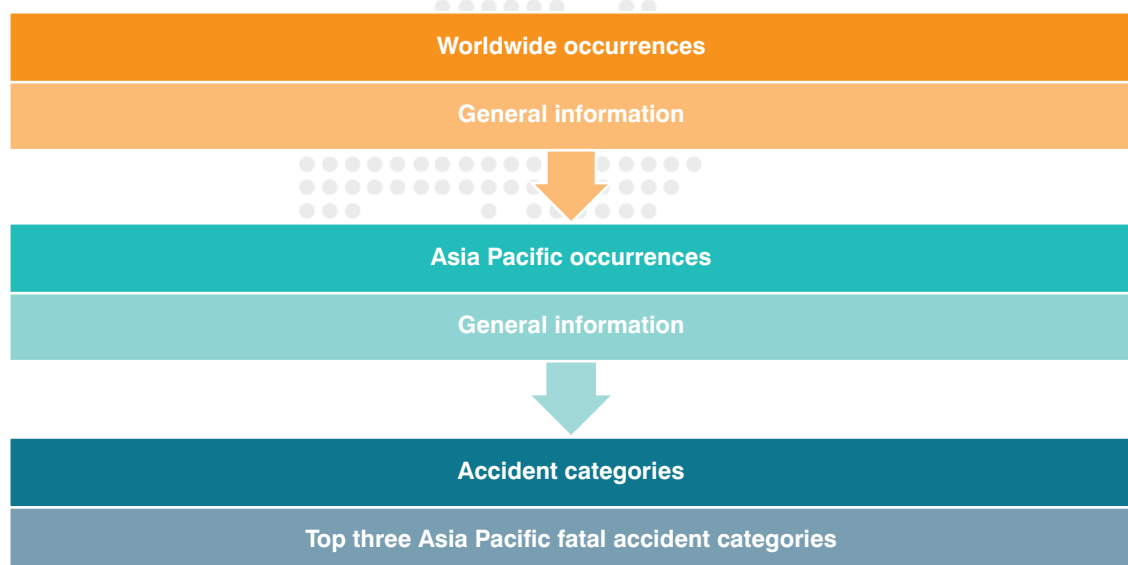
04 Safety information

Safety information is an important input for any safety management process. With adequate and accurate safety information, hazards can be identified through robust processing and critical analysis of this safety information. Identified hazards and their associated risk can then be prioritised and appropriate mitigation actions taken.

RASG—APAC can be viewed as a regional safety management process or a regional safety program (RSP) in the same way that a State Safety Program (SSP) is a national safety management process and a Safety Management System is a service provider's safety management program. Using safety information provided by ICAO, IATA and CAST helps the region to identify the areas of greater safety concerns and therefore be able to collectively focus on addressing these areas.

05 Approach for analysis

Our approach for the analysis is to process the accident information, provided by ICAO, IATA and CAST, involving commercial aircraft of MTOW greater than 5700 kg operated by (or registered with) the members States/Administrations of RASG—APAC. All reported information is for aircraft involved in scheduled commercial activities which are either validated or under validation. The analysis initially focuses on accident rates from a global perspective, then on the APAC region and finally on the sub-regions of North Asia, South Asia, South East Asia and the Pacific. The next step is to identify accident categories that are prevalent in the APAC region. The process is illustrated in Figure 5.1.

Figure 5.1 Approach for analysis

Worldwide occurrences
General information

Asia Pacific occurrences
General information

Accident categories
Top three Asia Pacific fatal accident categories

The grouping of States/Administrations into the four APAC sub-regions will firstly be based on their membership with the respective Cooperative Development of Operational Safety and Continuing Airworthiness Program (COSCAP) or, if there is no affiliated membership with any sub-regional body, on geographical association. The results of the analysis for each of the sub-regions can therefore be used by the various COSCAP or sub-regional groupings to identify work program. Moreover, each of the COSCAPs will be able to provide assistance in implementation and training in areas that are more relevant to their sub-regions.

Grouping of the States/Administrations in the four APAC sub-regions is as follows:

North Asia (NA) sub-region

States/Administrations that are members of COSCAP—NA:

» China
» Democratic People's Republic of Korea
» Japan
» Mongolia
» Republic of Korea

South Asia (SA) sub-region

States/Administrations that are members of COSCAP—SA:

- » Afghanistan
- » Bangladesh
- » Bhutan
- » India
- » Maldives
- » Nepal
- » Pakistan
- » Sri Lanka

Southeast Asia (SEA) sub-region

States/Administrations that are members of COSCAP—SEA:

- » Brunei Darussalam
- » Cambodia
- » Hong Kong, China
- » Indonesia
- » Lao People's Democratic Republic
- » Macao, China
- » Malaysia
- » Myanmar
- » Philippines
- » Singapore
- » Thailand
- » Timor Leste
- » Vietnam

Pacific sub-region

States/Administrations that are members of the Pacific Aviation Safety Office (PASO):

- » Australia
- » Cook Islands
- » Fiji
- » Kiribati
- » Marshall Islands
- » Micronesia (Federated States of)
- » Nauru
- » New Zealand
- » Palau
- » Papua New Guinea
- » Samoa
- » Solomon Islands
- » Tonga
- » Vanuatu

06 Reporting culture and accidents in the Asia Pacific Region

This report will not focus on any analysis of the reporting culture of the APAC region, but this may be included in future editions.

image: © Kyle Taylor | Great Barrier Reef

07 Reactive safety Information

As defined in the third edition of the ICAO Document 9859, a reactive analysis method responds to events (such as incidents and accidents) that have already happened and about which information has been collected. In the context of this report, all the reactive safety information analysed relates to accidents involving aircraft operated by (or registered with) the member States/Administration within the APAC region.

The reactive safety information analysed in this report has been obtained from ICAO, IATA and CAST, and the organisation of this information will take these sources into account.

Please note:

1. ICAO's reactive safety information is derived from the integrated Safety Trend Analysis and Reporting System (iSTARS), which are essentially repositories of accident information supplied by member States' investigative bodies. The definition of 'accident' is based on ICAO Annex 13. For accidents recorded in 2015, only those incidents that are flagged as official information are used.

2. IATA's reactive safety information relates to accidents that result in hull loss, fatalities and substantial damage to aircraft.

7.1 Worldwide/Regional accident information—ICAO[4]

Global accident rates, APAC accident rates and the accident rates for the four APAC sub-regions were compiled using the ICAO iSTARS database. It should be noted that all the information presented below was extracted directly from iSTARS without manipulation and is dependent on accurate information being supplied by member States.

**Chart 7.1.1 Global accident rate versus APAC accident rate (2006–2015)**
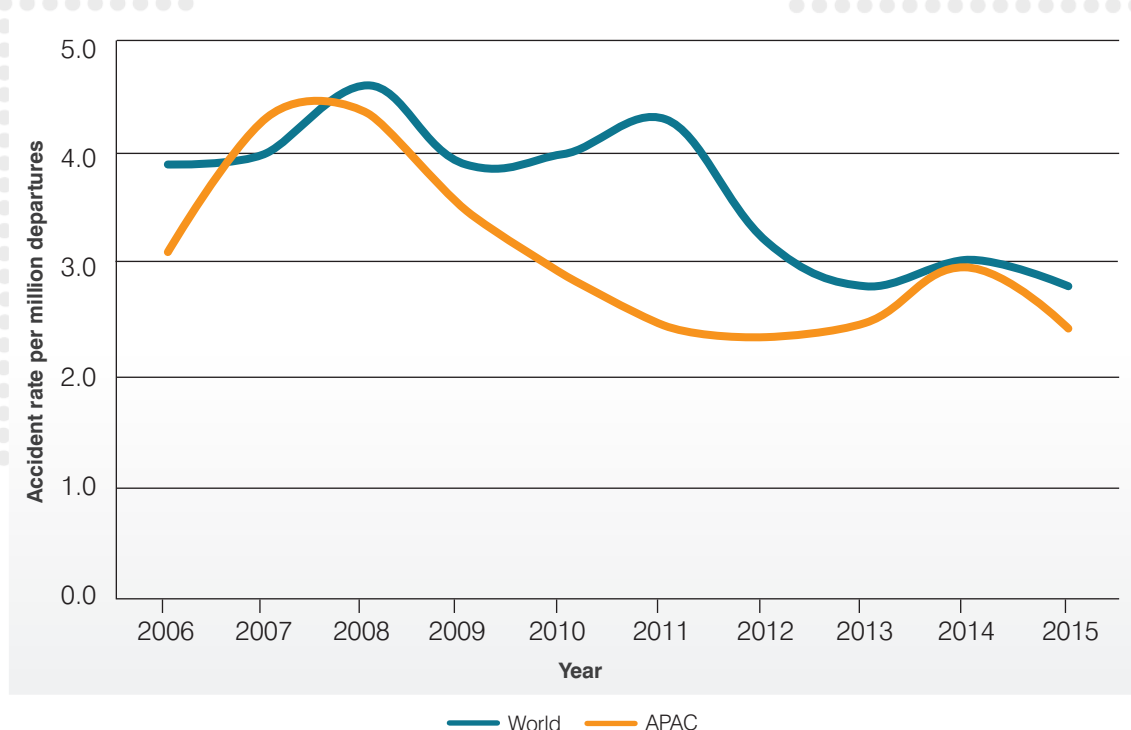
From Chart 7.1.1, it can be seen that the APAC accident rate has consistently been below that of the global rate, except in 2007. The rate in 2014 was also quite similar.

The APAC accident rate in 2014 was calculated at 2.99 accidents per million departures. This rate included unofficial accident data listed in iSTARS. In 2015, only official accident data recorded in iSTARS was used in the calculation. The APAC accident rate in 2015 was 2.44 accidents per million departures. This was much lower than the 2014 rate as well as the 2015 global accident rate of 2.79 per million departures.

Based on raw data, the APAC region has accounted for 25 per cent of the total number of accidents globally, while having more than 29 per cent of the world's total departures in 2015.

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[4] **Source:** The accident data and State traffic information were extracted from ICAO iSTARS on 20 July 2015.

Chart 7.1.2 Five-year sliding average of global accident rate versus APAC accident rate (2010–2015)
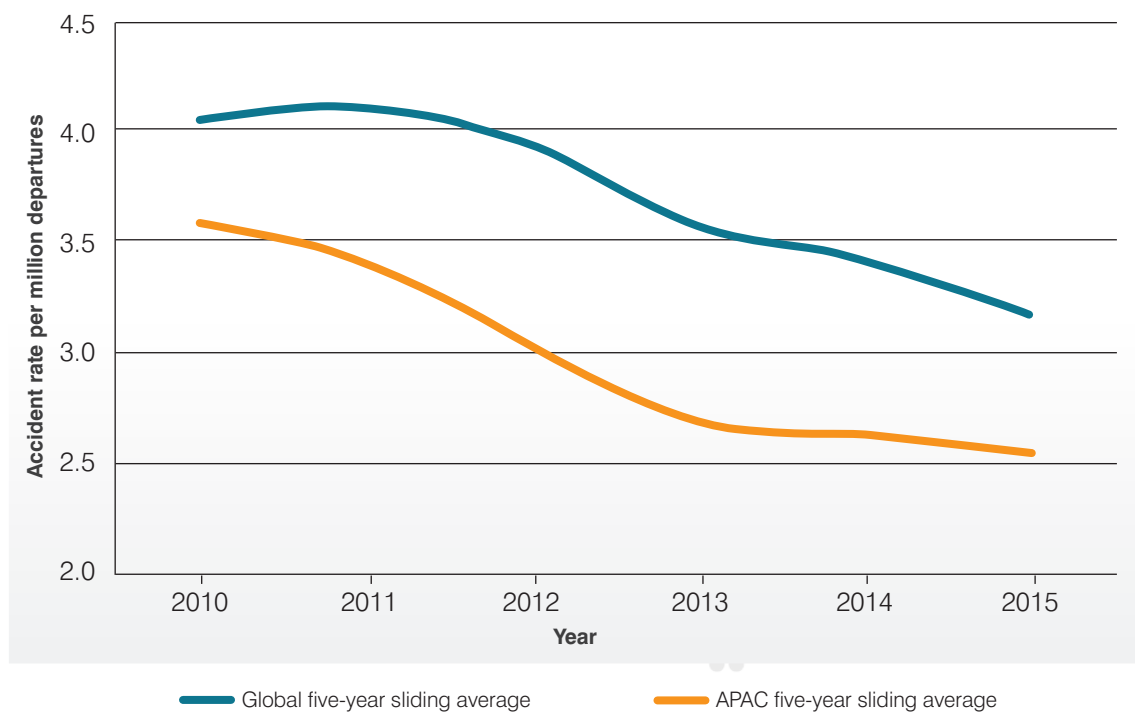
In Chart 7.1.2, the APAC five-year sliding average accident rate remains below that of the global sliding average. The APAC five-year sliding average accident rate continues to decrease but at a slower rate compared to the last two years.

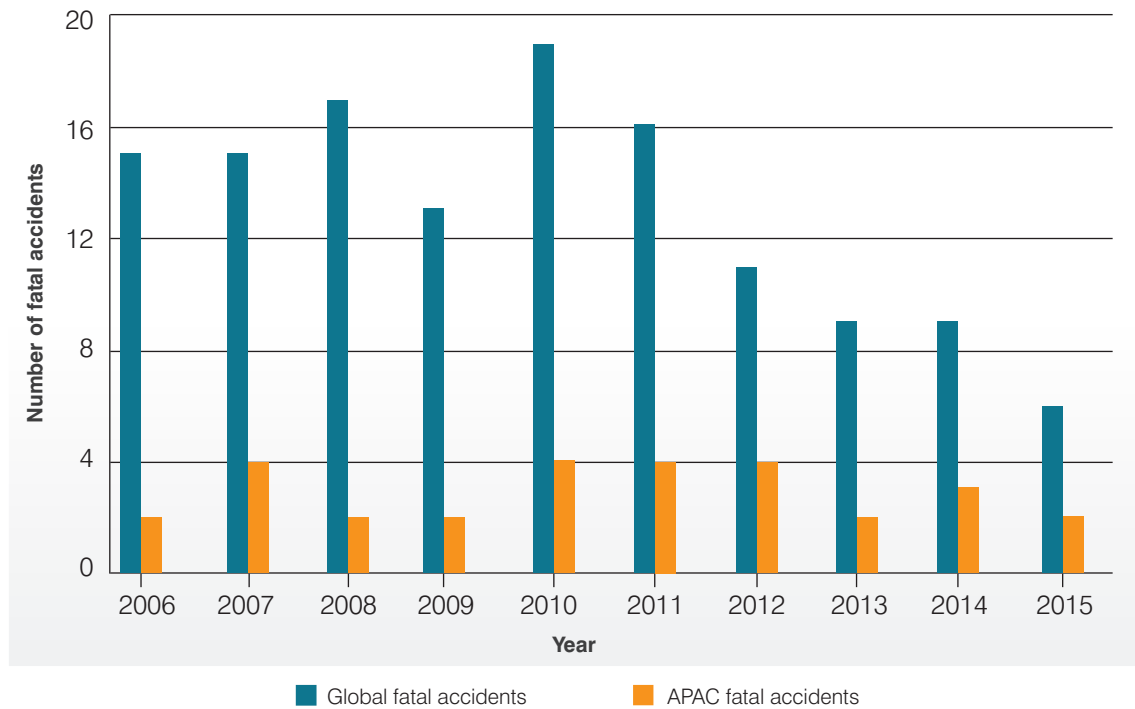**Chart 7.1.3 Number of global and APAC fatal accidents (2006–2015)**

Chart 7.1.3 shows that in 2015, there were two APAC fatal accidents resulting in 55 fatalities, compared to 2014 when there were three fatal accidents that resulted in 699 fatalities. Over the last 10 years, the number of fatal accidents in APAC has accounted for an average of 22 per cent of global fatal accidents. During the same period, 13 per cent of APAC accidents resulted in fatalities, equal to the global figure (in which 13 per cent of global accidents involved fatalities).

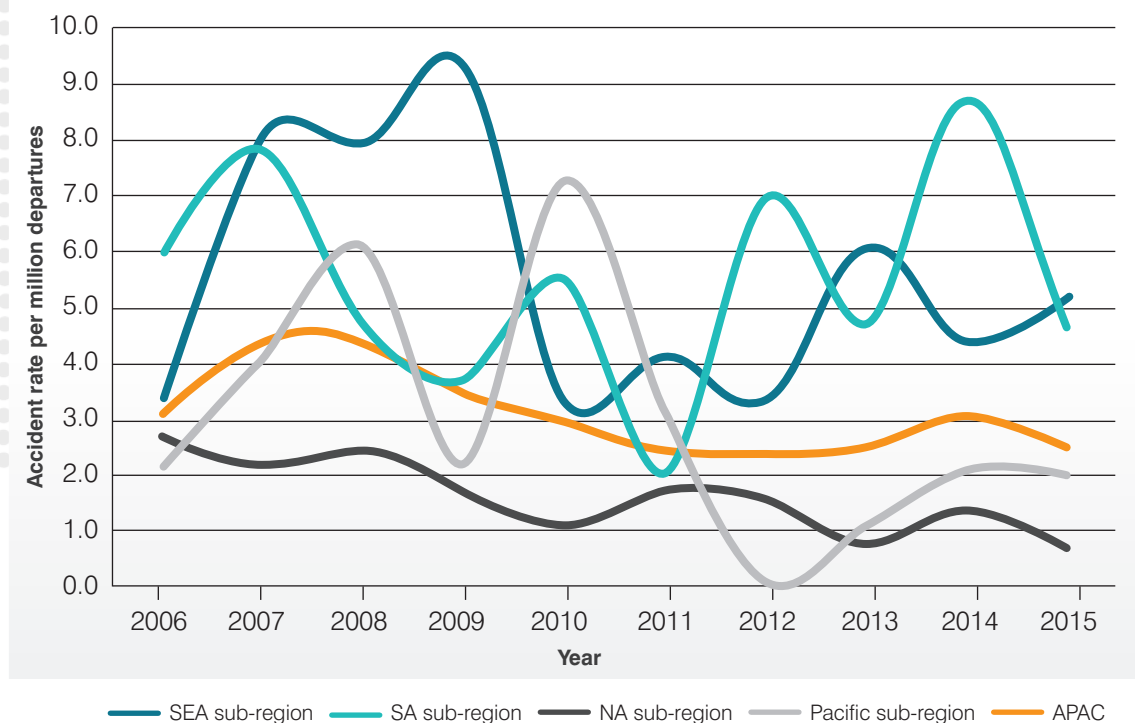**Chart 7.1.4** **APAC sub-regions accident rate (2006–2015)**

Chart 7.1.4 provides an illustration of the accidents rates within APAC by sub-region. The data indicates that there are no distinctive patterns between the sub-regions. However, it can be seen that for the last six years the accident rate for the North Asia (NA) sub-region has remained stable and trending downwards. The accident rates of both Southeast Asia (SEA) and South Asia (SA) sub-regions have been above the APAC rates for the past few years.

All sub-regions, other than SEA sub-region, have seen a decrease in the accident rate for 2015 compared to 2014. The increase in SEA sub-region accident rate from 4.34 accidents per million departures in 2014 to 5.11 accidents per million departures in 2015 is due to an increase in the number of accidents, from 10 accidents in 2014 to 13 in 2015, a 33 per cent increase, compared to a 10 per cent increase in number of departures for the same period.

The SA sub-region experienced the most considerable improvement in accident rates from 2014 to 2015 (from 8.66 to 4.61 accidents per million departures). This resulted from a 33 per cent decrease in the number of accidents (from eight to five between 2014 and 2015), while the increase in traffic was 17 per cent.

Applying a five-year sliding average to the accident rate of each sub-region (Chart 7.1.5), identified that all sub-regions experienced a downward trend, except for the SEA region. A 33 per cent increase in the number of accidents in the SEA region in 2015 resulted in an upward trend for the SEA sub-region's five-year sliding average accident rate between 2014 and 2015.

Chart 7.1.5 APAC sub-regions five-year sliding average accident rate (2008–2015)

SEA sub-region — SA sub-region — NA sub-region — Pacific sub-region — APAC
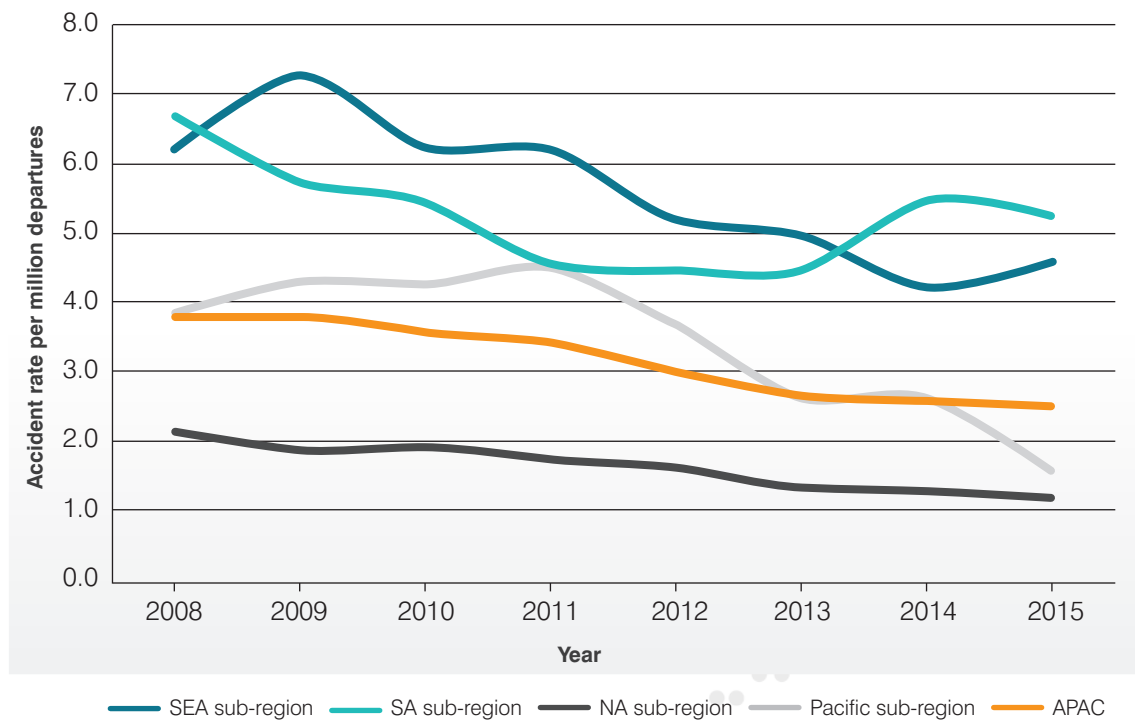
Chart 7.1.6 APAC sub-regions accident numbers (2006–2015)

SEA sub-region — SA sub-region — NA sub-region — Pacific sub-region
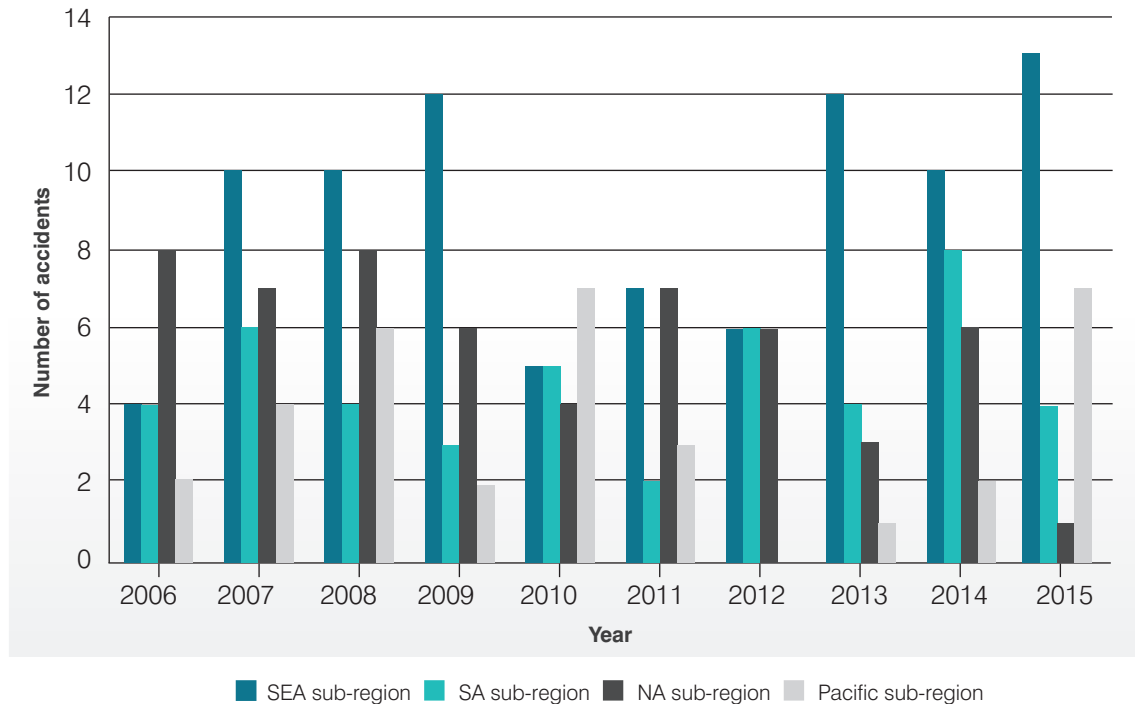
The distribution of the accidents shown in Chart 7.1.6 indicates that the SEA sub-region had the highest number of accidents recorded over the last ten years. They accounted for 40 per cent of the total number of accidents in the APAC region between 2006 and 2015. The NA sub-region accounted for about 26 per cent, while the SA and Pacific sub-regions accounted for 21 per cent and 13 per cent of the total number of APAC accidents over the same period.

Chart 7.1.7 APAC sub-regions fatal accident numbers (2006–2015)

Chart 7.1.7 shows the total number of fatal accidents between 2006 and 2015 for each of the APAC sub-regions. Over the 2006 to 2015 period, there were a total of 29 fatal accidents resulting in 1742 fatalities. The SEA sub-region accounted for the highest number of fatal accidents (48 per cent) followed by the SA sub-region (34 per cent), NA sub-region (10 per cent) and finally the Pacific sub-region (7 per cent).

7.2 Worldwide/Regional accident information—IATA

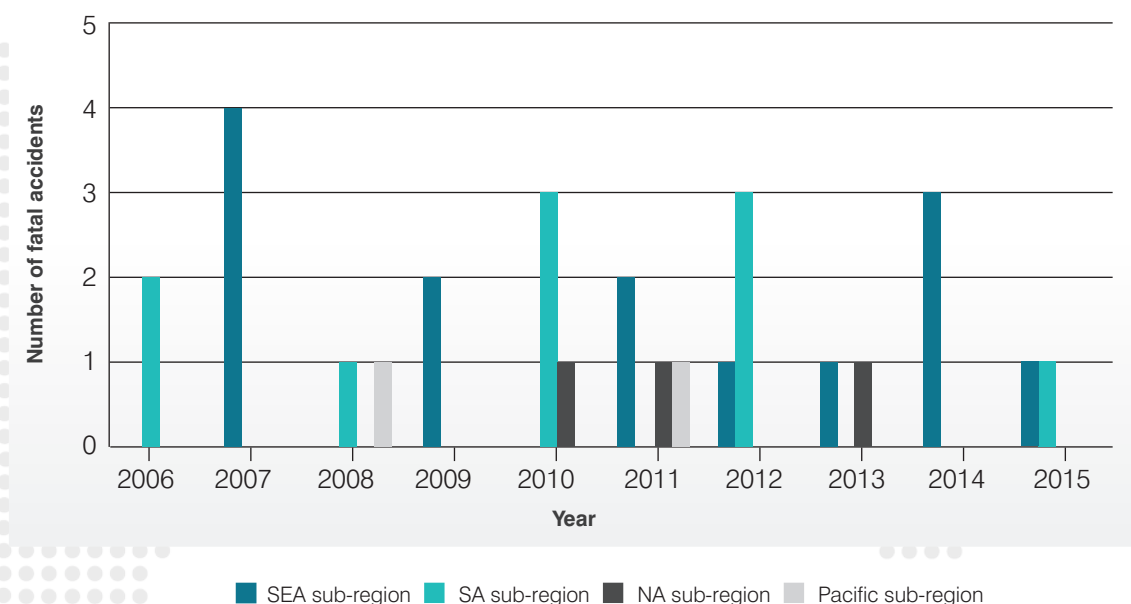The following breakdown depicts IATA's computation of the regional and global accidents rates and includes hull loss and substantial damage for all aircraft types (Eastern-built and Western-built jet and turboprop aircraft, unless otherwise stated) per million sectors flown. These rates are assigned by the State of the operator involved in the accident.

IATA's definition of an accident differs slightly from ICAO's in the sense that it focuses primarily on the extent of damage to the aircraft and does not include injury-only accidents without damage to aircraft. Only accidents of the following categories are part of the database:

» Controlled Flight Into Terrain (CFIT)

» Gear-up Landing/Gear Collapse Ground Damage

» Hard Landing

» In-flight Damage

» Loss of Control In-flight

» Mid-air Collision

» Off Airport Landing/Ditching

» Runway/Taxiway Excursion

» Runway Collision

» Tailstrike

» Undershoot

» Other (when the end state is unknown)

Note: IATA defines 'sector' as the operation of an aircraft between take-off at one location and landing at another location (other than a diversion).

IATA's North Asia (NASIA) and Asia Pacific (ASPAC) regions combined equate to ICAO's APAC region.

7.2.1 Global overview

The global accident rate continues its downward trend, not only in terms of overall accidents, but also for hull losses and fatal accidents (Figure 7.2.1). In 2015, accidents were at an all-time low:

» Overall Accidents: 1.81 accidents per 1 million sectors

» Hull Losses: 0.48 hull losses per 1 million sectors

» Fatal Accidents: 0.11 accidents per 1 million sector.

Figue 7.2.1 Global accident, hull loss and fatal accident rate trends (2006–2015)
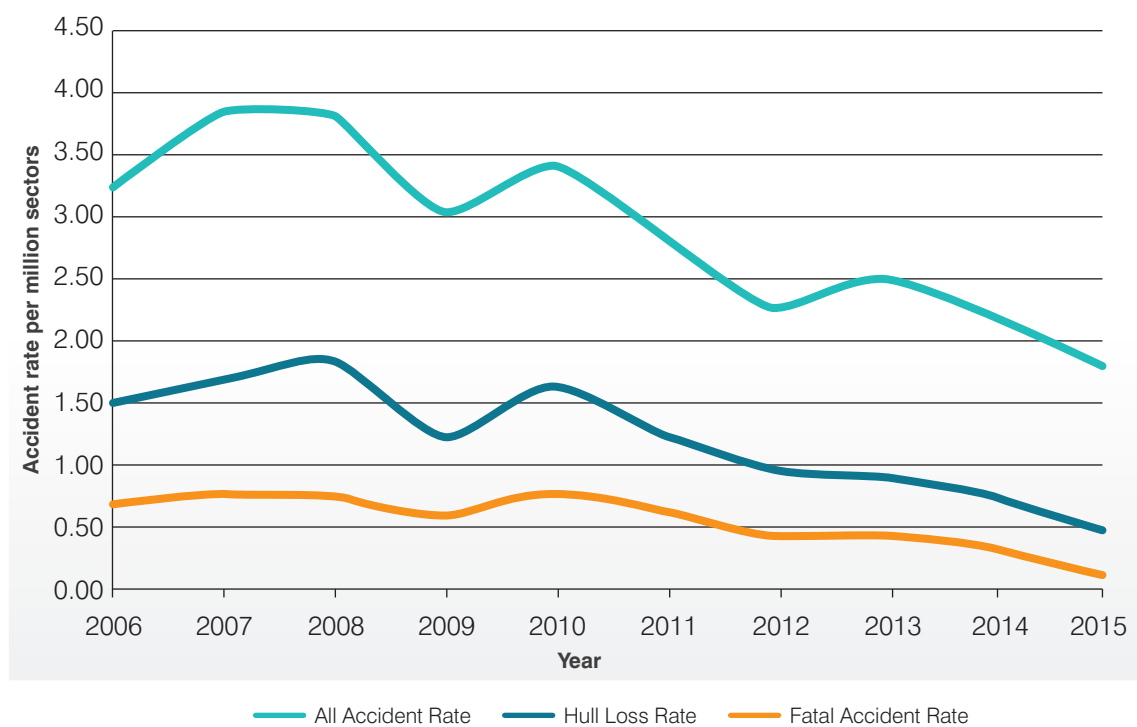
In terms of fatalities, 2015 saw the lowest number in the past 10 years, at 136. It is important to note this report only focuses on fatalities caused to people on board the aircraft, not on the ground or other aircraft not fitting into the accident criteria.

Also, it excludes accidents caused by acts of unlawful interference, as these are considered security issues, not safety issues. Germanwings Flight 9525 and Metrojet Flight 9268 are not included in the 2015 accident or fatality count. Germanwings was excluded for not classifying under the accident criteria definition and Metrojet for the uncertainty surrounding the facts that contributed to the accident. IATA is waiting for the final report to be released before taking a final position on Metrojet.

General information on different metrics comparing 2015, 2014 and the previous five years (2010–2014) is provided in table 7.2.1, below.

Table 7.2.1 Global accident and fatality numbers per million sectors flown

	Total number of accidents		Total accident rate		Hull loss rate		Fatal accident rate		Number of fatal accidents		Number of fatalities	
	JET	TP	JET	TP	JET	TP	JET	TP	JET	TP	JET	TP
2015	46	22	1.46	3.55	0.32	1.29	0.00	0.65	0	4	0	136
2014	40	37	1.35	6.10	0.27	3.13	0.10	1.48	3	9	517	124
Previous five-year average (2010–2014)	46	44	1.67	7.16	0.47	3.95	0.23	1.86	6	11	353	151

7.2.2 APAC Region

7.2.2.1 General performance

The overall performance in the APAC region has been consistently better than the global rate throughout the last 10 years. Accident rates in the APAC region, although remaining below the global average, increased slightly in 2012 and 2013 before easing in 2014 and 2015. The overall accident rate in 2015 was 2.21 accidents per million sectors, about 1.8 per cent lower than 2014.

Chart 7.2.2 IATA total accident rate by region (2006–2015)
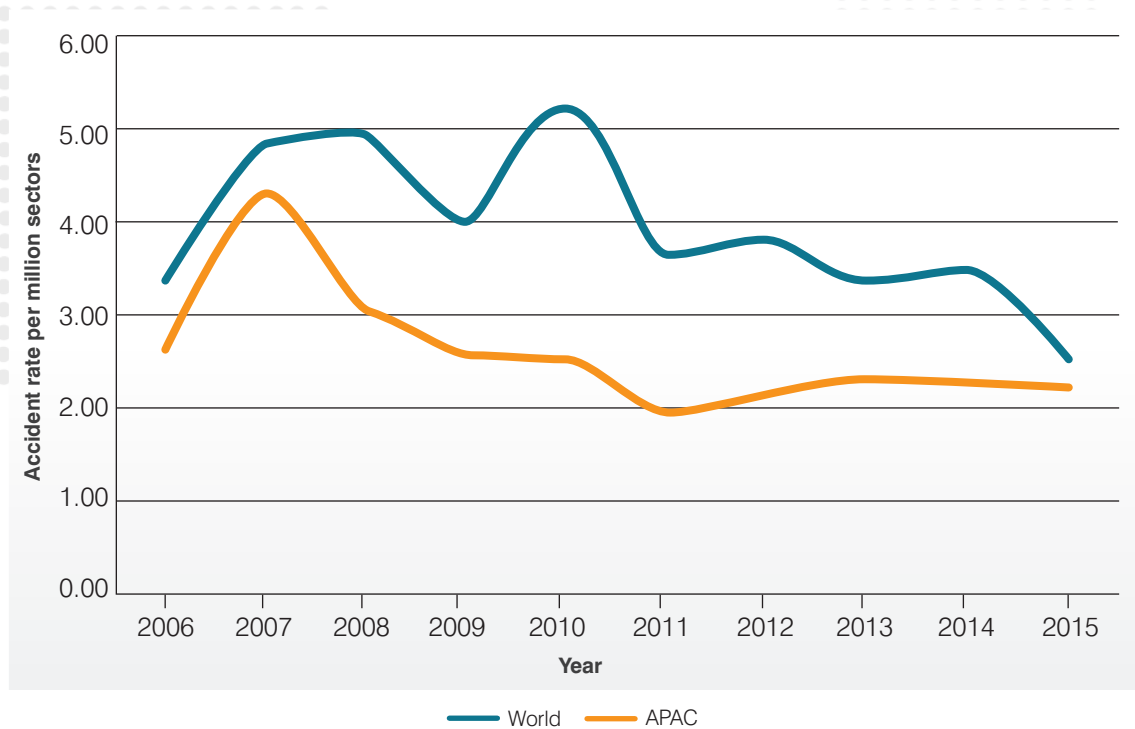
The tables below show a comparison amongst the different regions. Table 7.2.3 shows the overall accident count and Table 7.2.4 shows the overall accident rate.

Table 7.2.3 IATA region accident numbers (2011–2015)

	2011	2012	2013	2014	2015	Total
AFI	10	15	7	14	7	53
APAC	16	18	21	22	24	101
EUR	29	22	30	16	16	113
PA	33	20	25	21	17	116
MID	8	3	5	4	4	24
WORLD	**96**	**78**	**88**	**77**	**68**	**407**

Table 7.2.4 IATA region accident rate per million departures (2011–2015)

	2011	2012	2013	2014	2015	Total
AFI	10.91	16.78	7.66	14.86	6.83	11.30
APAC	1.96	2.09	2.27	2.25	2.21	2.16
EUR	3.13	2.40	3.31	1.72	1.68	2.44
PA	2.34	1.41	1.77	1.48	1.16	1.63
MID	6.76	2.34	3.64	2.76	2.56	3.50
WORLD	**2.85**	**2.28**	**2.53**	**2.16**	**1.81**	**2.32**

7.2.2.2 Severity (damage to aircraft)

In terms of severity (extent of damage to aircraft) and when looking at the last five years of data, the APAC region ranks itself as having the second lowest accident rate for hull losses, at 0.60 hull losses per million sectors, and for substantial damage, at 1.56. When comparing them to the global rates, APAC's hull loss rate was 30 per cent lower than the global rate, while for substantial damage it was 6.8 per cent above the global rate.

Chart 7.2.5 Accident rate by region by severity (2011–2015)
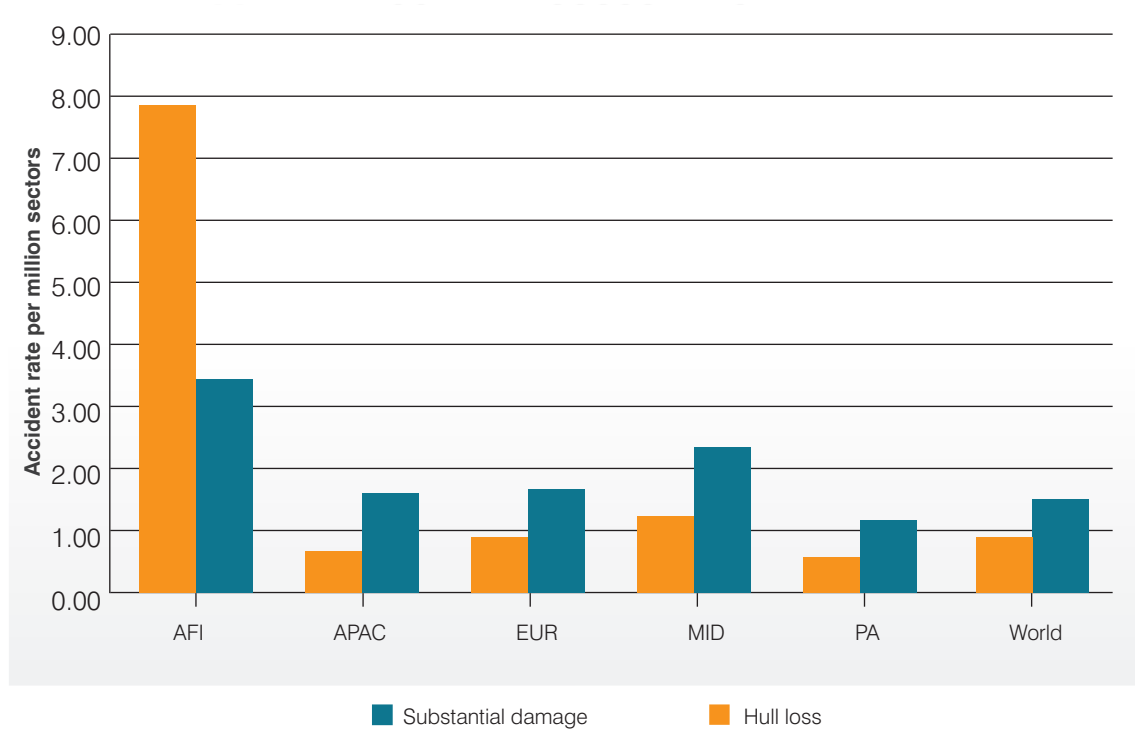
As illustrated in Chart 7.2.6, the hull loss rate in the APAC region was consistently lower than the global rate, reaching a frequency of 0.55 hull losses per million sectors in 2015. Although higher than in the previous year (0.41), it is below the five-year average of 0.73.

Chart 7.2.6 Accident yearly hull lose rate (APAC vs. World)
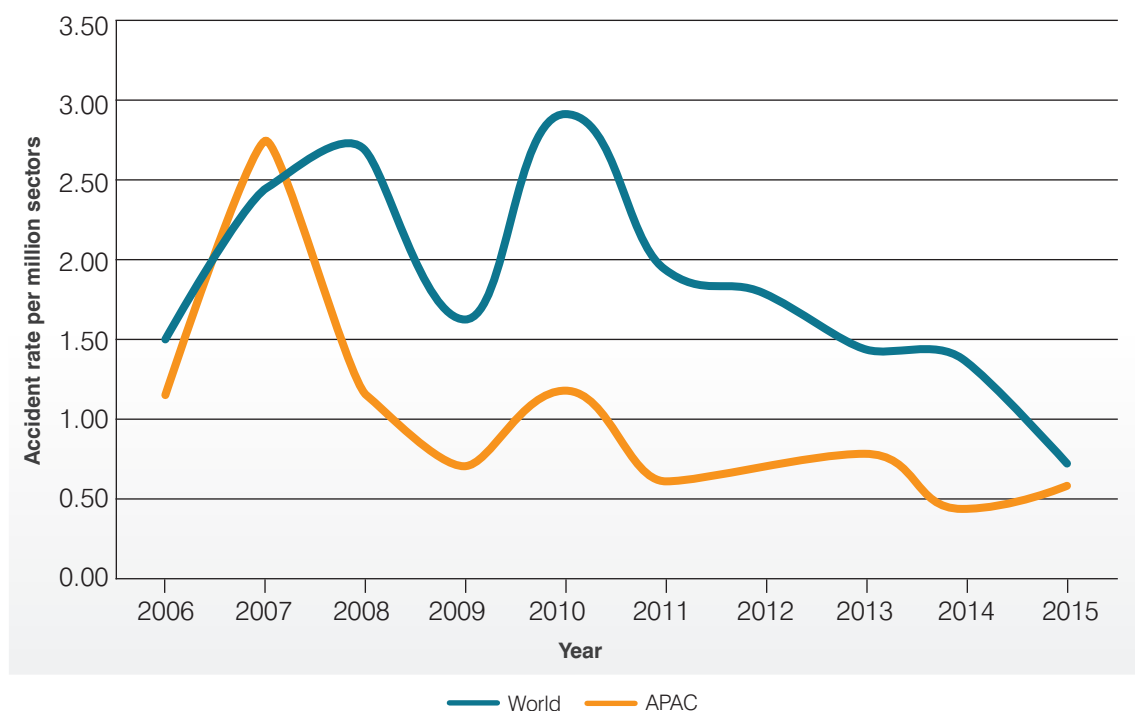
7.2.2.2 Fatalities

There were two fatal accidents in the APAC region in 2015, with a total number of 97 fatalities which accounts for 71.3 per cent of the total number of fatalities in the world. APAC's fatal accident rate in 2015 was 0.18 fatal accidents per 1 million flights, 79.8 per cent lower than the global rate. For the 2011–2015 period, APAC's fatal accident rate was 0.34, 92.5 per cent lower than the world's rate.

Tables 7.2.7, 7.2.8, and 7.2.9 respectively show the number of fatalities, the number of fatal accidents and the fatal accident rate per region for the 2011–2015 periods.

Table 7.2.7 Number of fatalities per region

	2011	2012	2013	2014	2015	Total
AFI	89	160	23	13	0	285
APAC	92	162	52	449	97	852
EUR	159	53	76	129	0	417
PA	72	7	26	2	2	109
MID	78	32	0	48	37	195
WORLD	**490**	**414**	**177**	**641**	**136**	**1858**

Table 7.2.8 Number of fatal accidents per region

	2011	2012	2013	2014	2015	Total
AFI	3	3	4	4	0	14
APAC	5	4	2	3	2	16
EUR	8	4	3	3	0	18
PA	5	3	6	1	1	16
MID	1	1	0	1	1	4
WORLD	**22**	**15**	**15**	**12**	**4**	**68**

Table 7.2.9 Fatal accident rate per region

	2011	2012	2013	2014	2015	Total
AFI	3.27	3.36	4.38	4.24	0.00	2.98
APAC	0.61	0.46	0.22	0.31	0.18	0.34
EUR	0.86	0.44	0.33	0.32	0.00	0.39
PA	0.35	0.21	0.42	0.07	0.07	0.22
MID	0.85	0.78	0.00	0.69	0.64	0.58
WORLD	**5.95**	**5.25**	**5.35**	**5.63**	**0.89**	**4.52**

7.2.2.3 High-risk accident categories

Controlled Flight Into Terrain (CFIT), Loss of Control In-Flight (LOC-I) and Runway/Taxiway Excursion have been considered the top three accident categories in the industry and subject of much work.

Charts 7.2.10, 7.2.11 and 7.2.12 show the performance of each of these categories in the APAC region for the last 10 years.

» The CFIT category had a significant decrease recorded in the last six years, reaching a rate of 0.09 accidents per 1 million flights in 2015. It is important to highlight that this is above the world's rate, which was 0.03 accidents per 1 million flights.

» LOC-I had an overall downward trend in the 10-year period, but the three-year sliding average rate indicates a slight upward trend in the last five years. The rate of occurrence in 2015 was 0.09 accidents per million flights, very close to the world rate of 0.08 accidents per million flights.

» Runway/Taxiway Excursion indicated an occurrence rate that was 60 per cent above the world's rate in 2015 (0.64 accidents per 1 million sectors compared to 0.40 accidents per 1 million sectors).

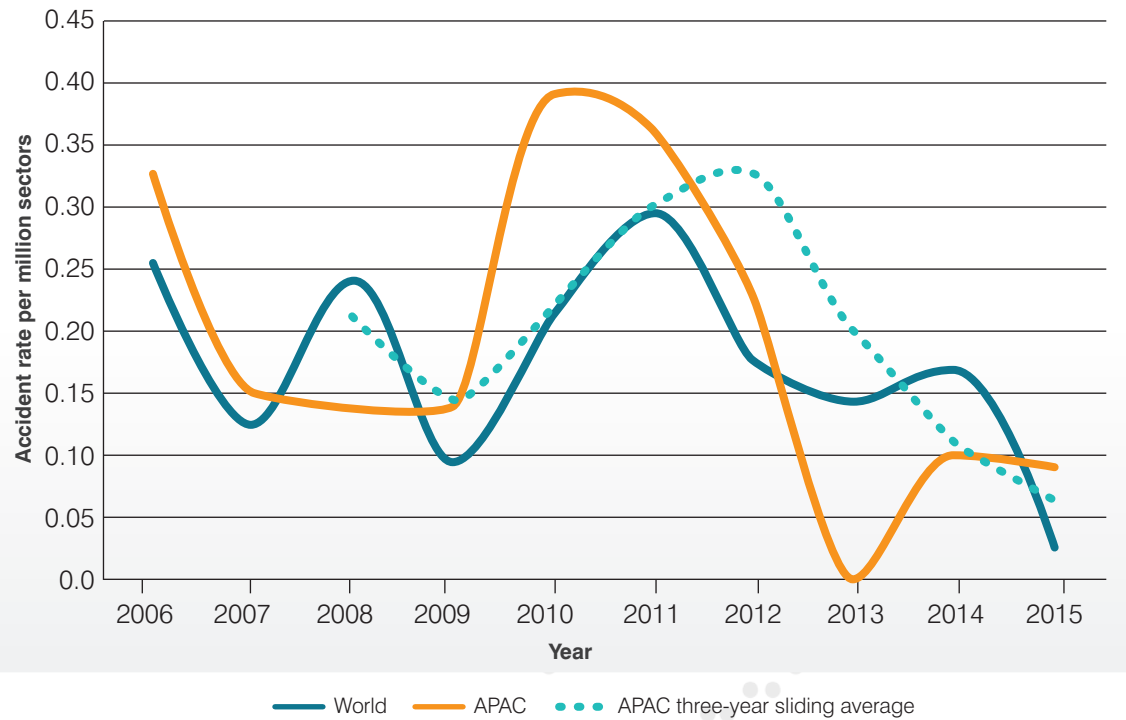**Chart 7.2.10 Annual controlled flight into terrain accident rate (APAC vs. World)**

Chart 7.2.11 Annual loss of control in-flight accident rate (APAC vs. World)
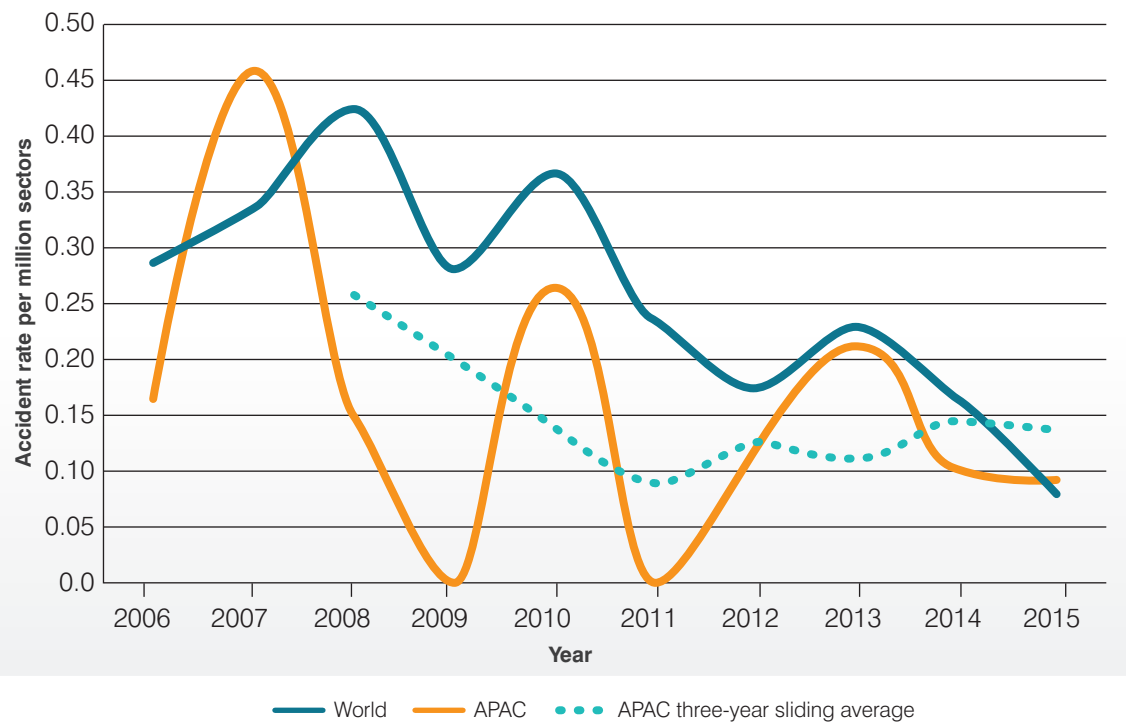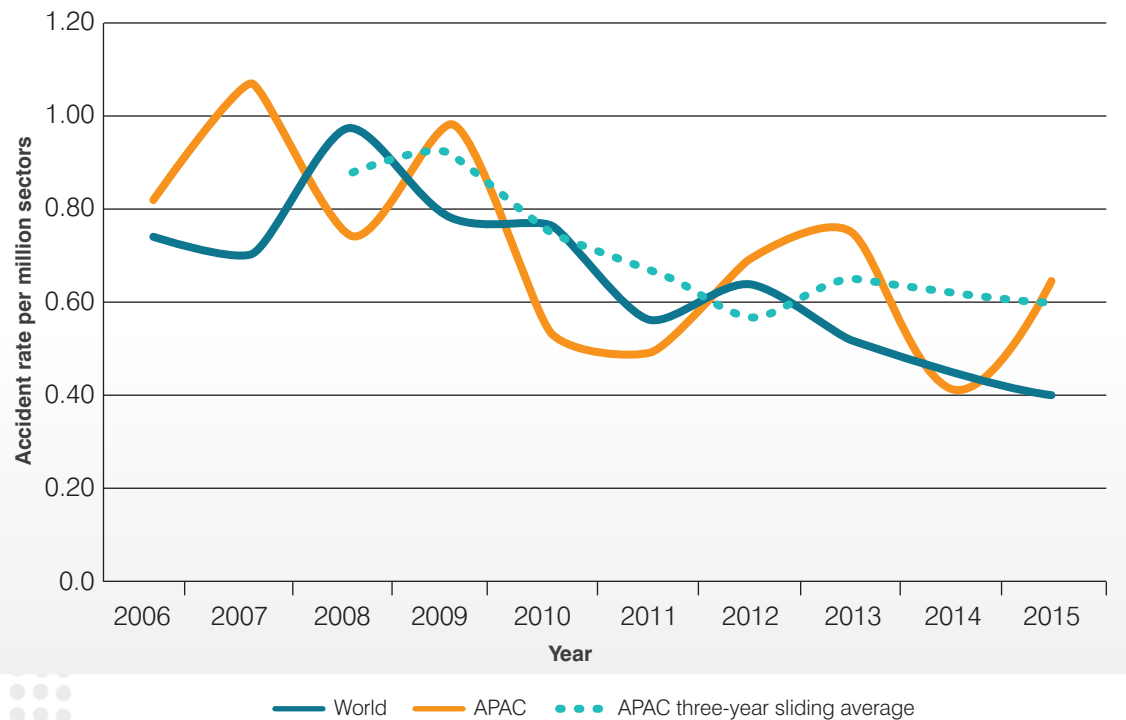
Chart 7.2.12 Annual runway/taxiway excursion accident rate (APAC vs. World)

Legend: World — APAC — APAC three-year sliding average

7.2.2.4 Accidents by phase of flight

Over the 2011–2015 period, most of the accidents in the APAC region occurred in the landing (LND), approach (APR), cruise (CRZ) and go-around (GOA) phases of flight. Of particular interest was the fact that 75 per cent of the approach accidents involved fatalities.

Chart 7.2.13 Accidents per phase of flight in the APAC region (2011–2015)
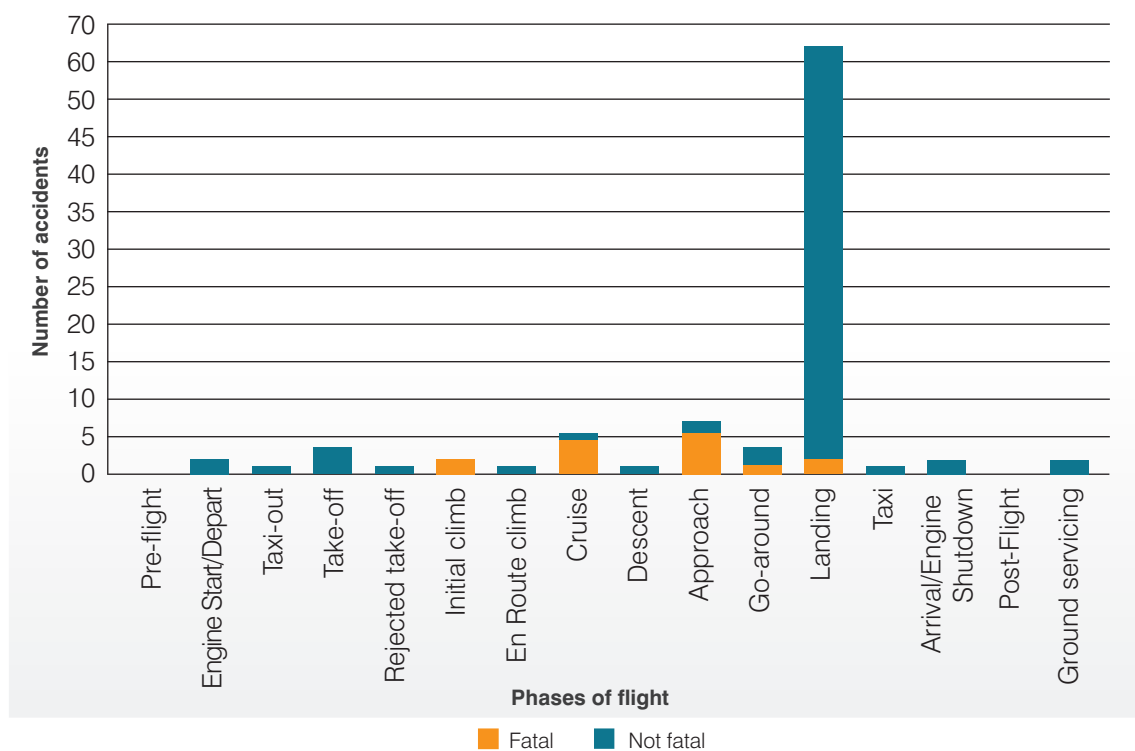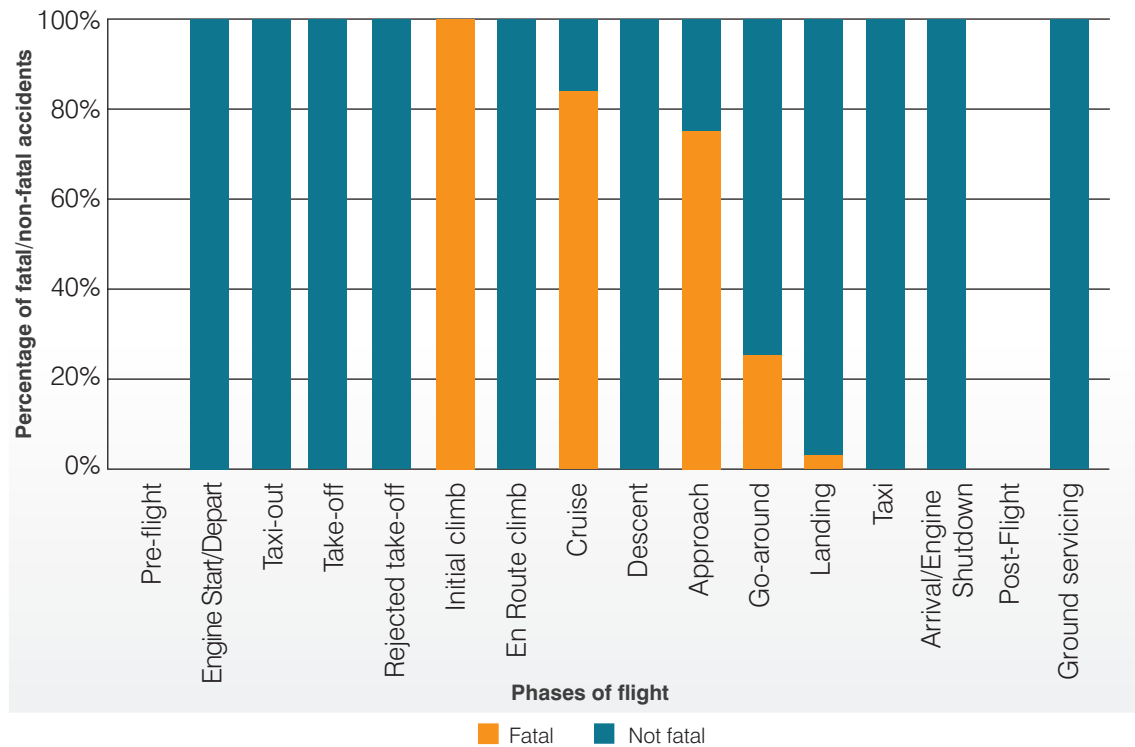

Legend: Fatal — Not fatal

7.3 APAC accident information—CAST

CAST was founded in 1998 and has developed an integrated, data-driven strategy to reduce commercial aviation fatality risk in the United States and to work with airlines and international aviation organisations to reduce the worldwide commercial aviation fatal accident rate. CAST has representatives from the following government organisations, industry associations, and aerospace companies:

Government

» Federal Aviation Administration
» National Aeronautics and Space Administration
» U.S. Department of Defence
» European Joint Aviation Authorities
» International Civil Aviation Organization

Industry

» Aerospace Industries Association
» Airbus Industrie
» Air Line Pilots Association
» Allied Pilots Association
» Air Transport Association
» The Boeing Company
» Flight Safety Foundation
» International Air Transport Association
» Pratt & Whitney (also representing General Electric and Rolls Royce)
» Regional Airline Association

Chart 7.3.1 Number of accidents for operators based in APAC
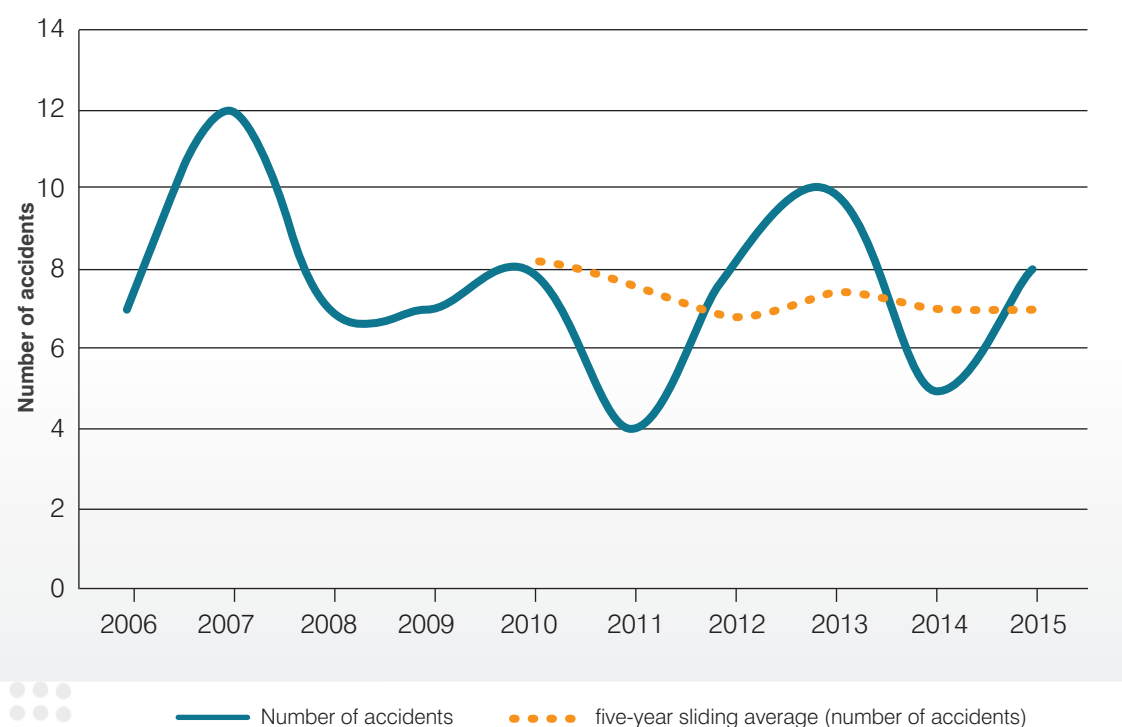
Note: Western-built airplanes, Part 121 equivalent operations

Chart 7.3.1 identifies the number of accidents involving western-built airplanes flown by operators that are based in APAC countries. While the annual numbers indicate a high degree of variability, the five-year sliding average has been relatively stable, hovering around 7.5 accidents, since 2012.

7.4 Most frequent accident categories within the Asia Pacific region—ICAO iSTARS

Table 7.4.1 illustrates the distribution of various accident categories from 2006 to 2015 in the APAC region.

In line with the worldwide top three accident categories identified by IATA, CFIT, LOC-I and RS were the three most common fatal accident categories in the APAC region. These three categories accounted for the majority of the total number of fatal accidents in the APAC region.

Table 7.4.1 APAC fatal accident categories (2006–2015)

Year	TURB	F-NI	UNK	OTH	SCF	RS	LOC-I	CFIT	Total
2006	0	0	0	0	1	0	0	1	2
2007	0	0	0	0	0	1	2	1	4
2008	0	0	0	0	0	1	0	1	2
2009	0	0	0	0	0	1	0	1	2
2010	0	0	0	0	0	1	0	3	4
2011	0	1	2	1	0	0	0	0	4
2012	0	0	1	0	1	0	0	2	4
2013	0	0	0	0	0	1	1	0	2
2014	0	0	1	1	0	0	1	0	3
2015	1	0	0	1	0	0	0	0	2
Total	**1**	**1**	**4**	**3**	**2**	**5**	**4**	**9**	**29**

Two fatal accidents were recorded in the APAC region in 2015. One accident involved an ATR aircraft and was classified under turbulence (TURB). The other was a ground accident which was classified under other (OTH).

Table 7.4.2 APAC sub-regions top three fatal accident categories (2006–2015)

Year	SEA sub-region				SA sub-region				NA sub-region				Pacific sub-region			
	RS	LOC-I	CFIT	Total	RS	LOC-I	CFIT	Total	RS	LOC-I	CFIT	Total	RS	LOC-I	CFIT	Total
2006	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
2007	1	2	1	4	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1
2009	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	1	0	2	3	0	0	1	1	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0
2013	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0
2014	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**2**	**4**	**3**	**9**	**2**	**0**	**4**	**6**	**1**	**0**	**1**	**2**	**0**	**0**	**1**	**1**

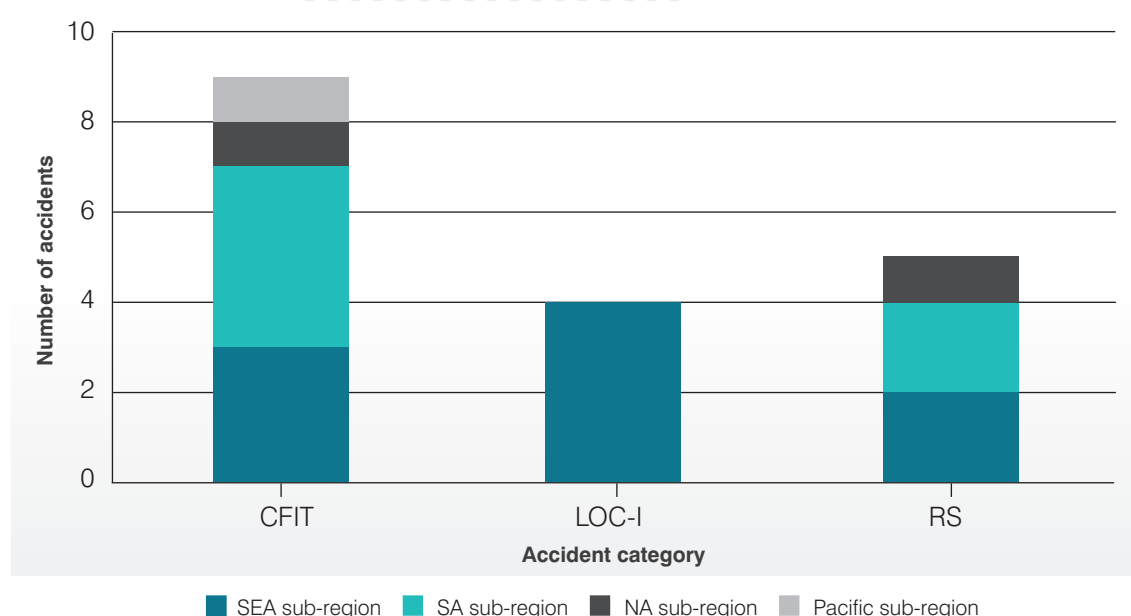**Chart 7.4.1** APAC sub-regions top three fatal accident categories (2006–2015)

Table 7.4.2 and Chart 7.4.1 display the breakdown of fatal accident categories by APAC sub-regions. The SEA sub-region had the most fatal accidents in the timeframe analysed, with four LOC-I, three CFIT and two RS recorded.

Over the last 10 years, fatal accidents associated with these three accident categories in the SEA sub-region, accounted for about half the total number of fatal accidents in the APAC. However, most of these occurred in the first half of the 10-year period, with only three occurring in the last five-years.

Table 7.4.3 APAC accident categories (2013–2015)

Year	TURB	F-NI	UNK	OTH	SCF	RS	LOC-I	CFIT	Total
2013	2	0	0	0	1	16	1	0	20
2014	5	0	2	2	4	12	1	0	26
2015	4	1	2	4	2	10	0	0	23
Total	**11**	**1**	**4**	**6**	**7**	**38**	**2**	**0**	**69**

Runway safety (RS) accidents were the most frequently occurring accident category in the APAC region over the last three years (2013–2015), as indicated in Table 7.4.3. The TURB accident category recorded 11 occurrences while there were seven occurrences of the SCF category over the same timeframe.

Given the high number of occurrences in these categories, RASG—APAC may potentially place additional focus on the TURB and SCF related accidents.

Table 7.4.4 APAC accident categories (RS, LOC-I, CFIT) (2013–2015)

Year	SEA sub-region				SA sub-region				NA sub-region				Pacific sub-region			
	RS	LOC-I	CFIT	Total	RS	LOC-I	CFIT	Total	RS	LOC-I	CFIT	Total	RS	LOC-I	CFIT	Total
2013	10	1	0	11	3	0	0	3	2	0	0	2	1	0	0	1
2014	3	1	0	4	7	0	0	7	2	0	0	2	0	0	0	0
2015	6	0	0	6	1	0	0	1	3	0	0	3	0	0	0	0
Total	19	2	0	21	11	0	0	11	7	0	0	7	1	0	0	1

Table 7.4.4 shows that the SEA sub-region had the highest number of accidents related to RS, LOC-I and CFIT between the 2013–2015 timeframe. All of the accidents recorded in 2015 were associated with runway safety events.

The Pacific sub-region had no accidents recorded in the 2015 linked with RS, LOC-I and CFIT while the NA sub-region had three and the SA sub-region had one. All of the accidents were classified as runway safety.

7.5 Most frequent accident categories within Asia Pacific region–IATA

Runway excursion, hard landing and in-flight damage were amongst the top three accident categories in the APAC region for both the 2011–2015 timeframe and 2015 calendar year, as seen on Charts 7.5.1 and 7.5.2.

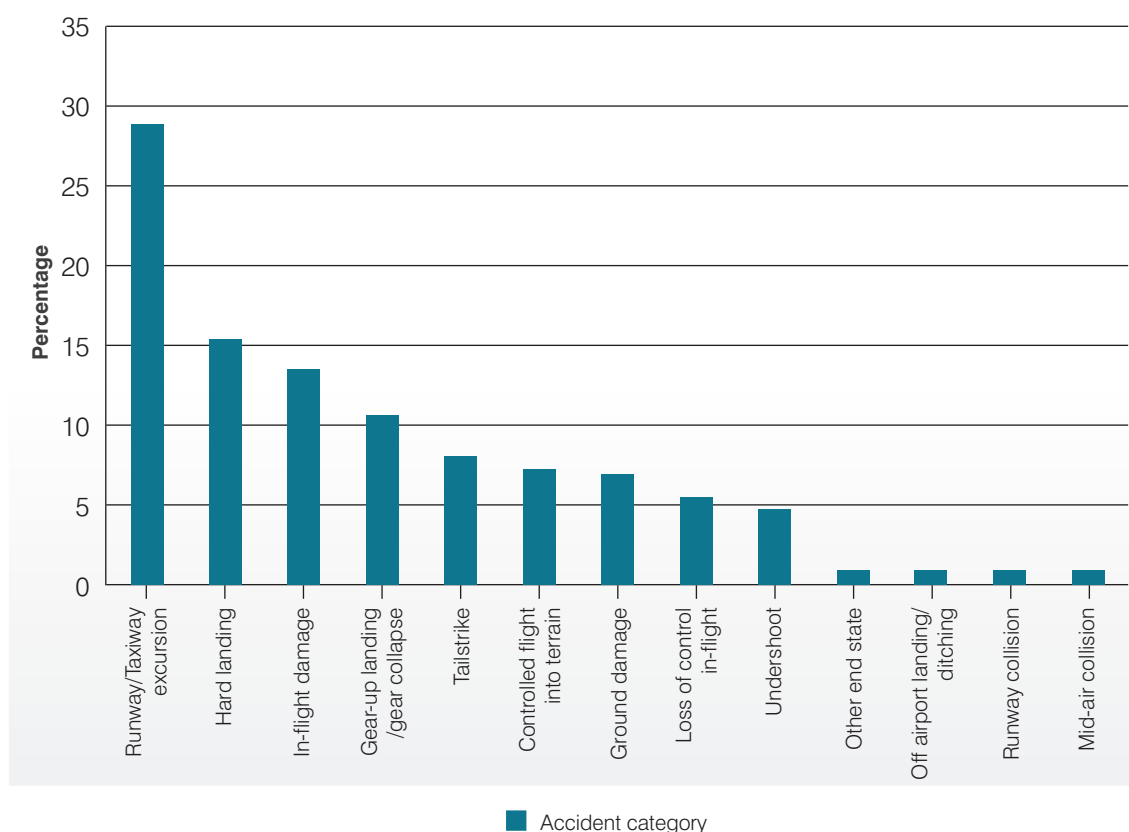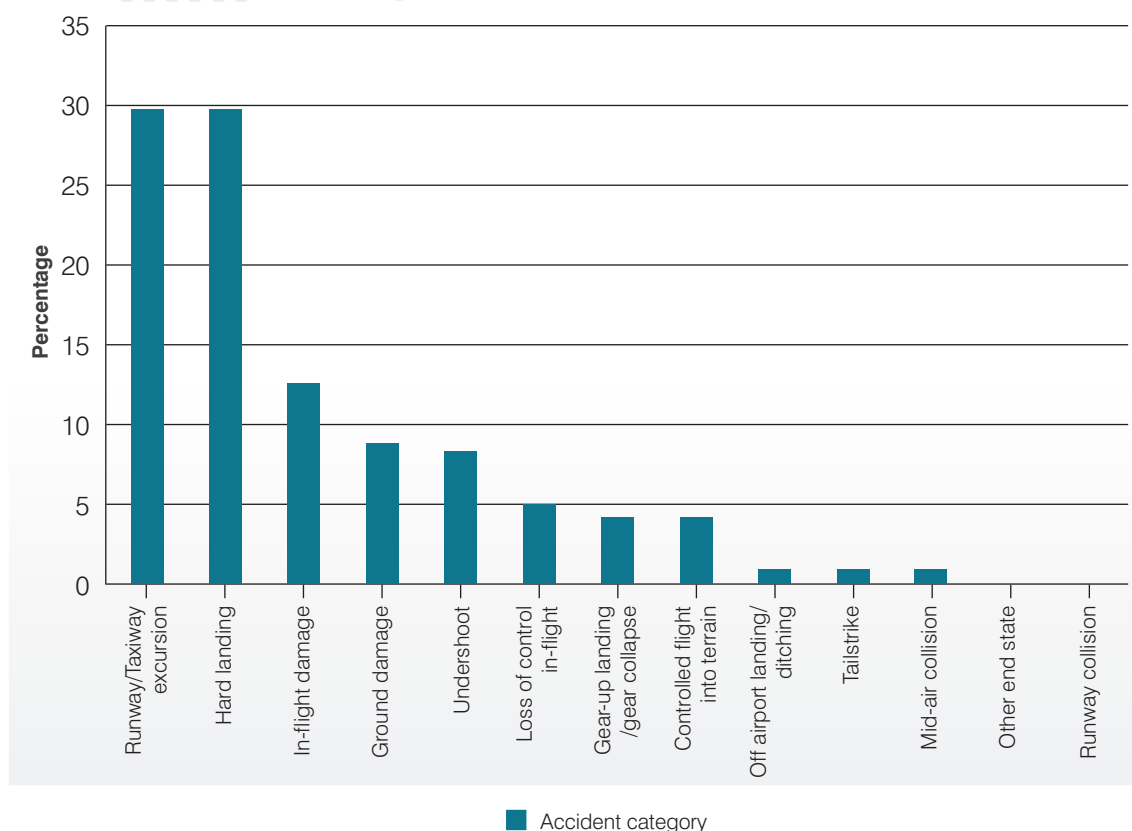**Chart 7.5.1 APAC accident category distribution (2011–2015)**

Chart 7.5.2 APAC accident category distribution (2015)

Percentage (y-axis: 0, 5, 10, 15, 20, 25, 30, 35)

Categories (x-axis): Runway/Taxiway excursion, Hard landing, In-flight damage, Ground damage, Undershoot, Loss of control in-flight, Gear-up landing /gear collapse, Controlled flight into terrain, Off airport landing/ ditching, Tailstrike, Mid-air collision, Other end state, Runway collision

■ Accident category

Simply comparing the percentage distribution for the accident categories doesn't provide a complete indicator of the risks associated with each of the occurrence types. Incorporating a measure of exposure provides a more complete picture.

Charts 7.5.3 and 7.5.4 provide the accident rate for each of the different categories occurring in the APAC region over the 2011–2015 timeframe and 2015 calendar year. The occurrence rate has not changed much in 2015 when compared to the five-year period. For example, the occurrence rate for Runway/Taxiway Excursion was of 0.64 accidents per million sectors in 2015 and 0.60 accidents per million sectors over the 2011–2015 period.

image: A Trans Maldivian Airways (TMA) floatplane to the north of Bathala island (Maldives).
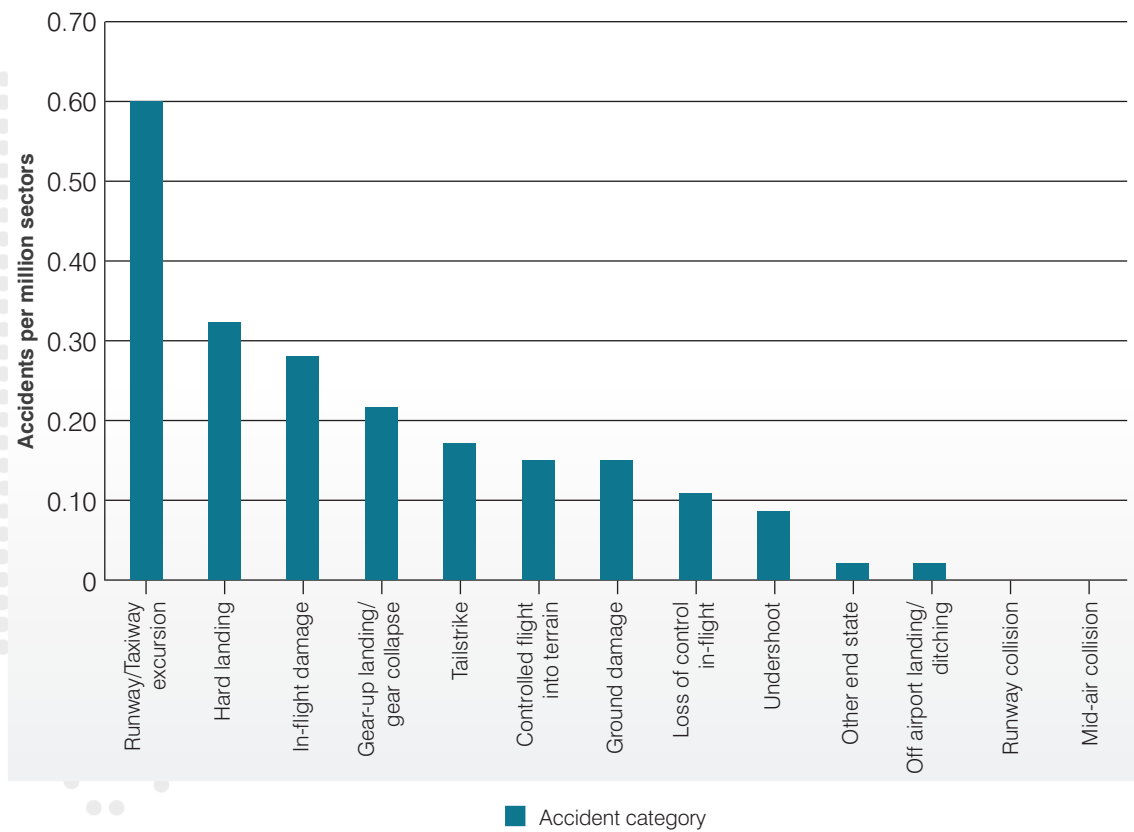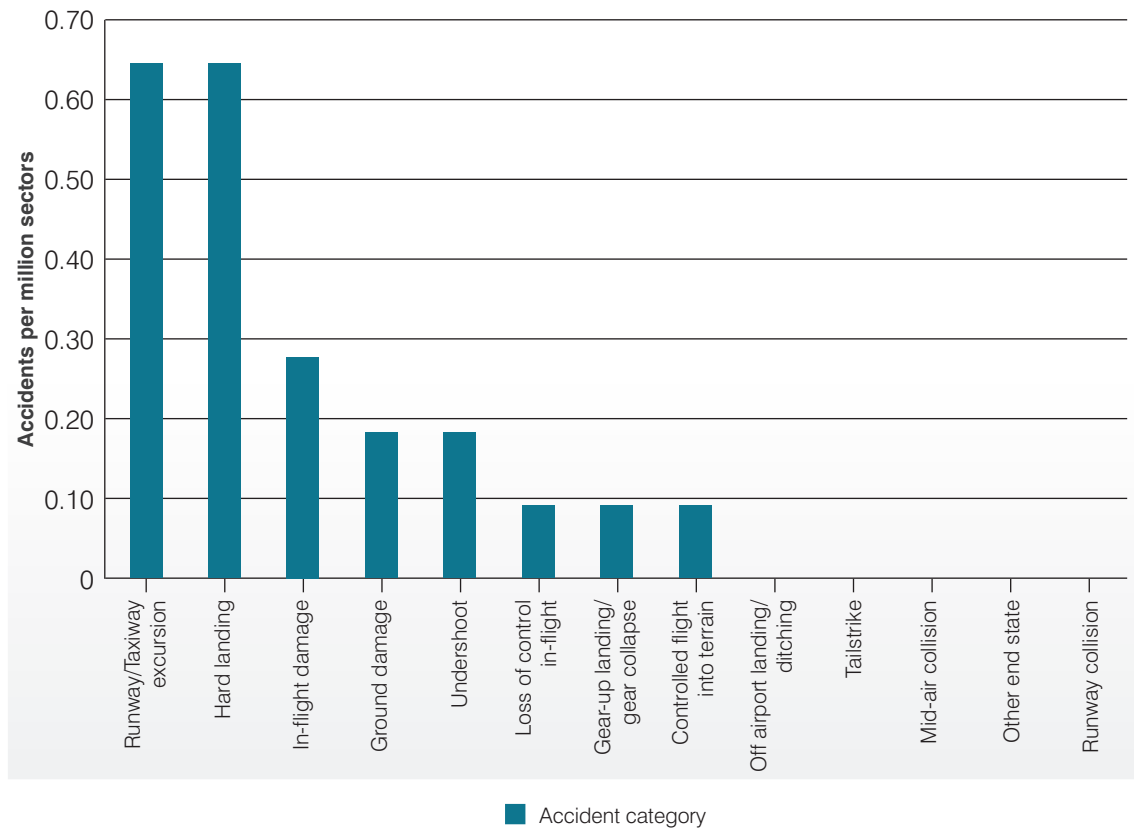
Chart 7.5.3 APAC accident category rate (2011–2015)

Accident category

Chart 7.5.4 APAC accident category rate (2015)

Accident category

When looking at the 10-year trend for these three accident categories, a slow but decreasing trend was noticeable for Runway/Taxiway Excursions (Chart 7.5.5). A similar pattern was also evident for the other two categories of Hard Landing and In-flight Damage, however, an upward trend in the last few years is for the APAC hard landing accidents (Chart 7.5.6 and Chart 7.5.7).
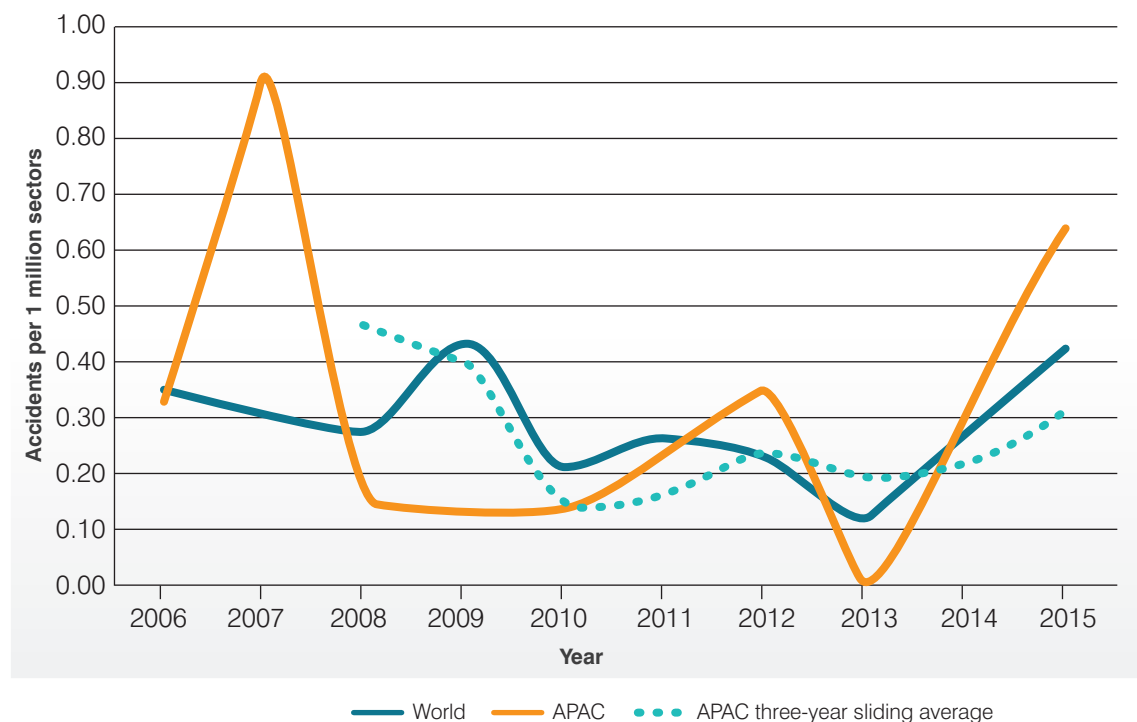
Runway/Taxiway Excursion

Chart 7.5.5 **Annual accident category rate (Runway/Taxiway Excursion—APAC vs. World)**

Hard Landing

Chart 7.5.6 **Annual accident category rate (Hard landing—APAC vs. World)**

In-Flight Damage

Figure 7.5.8 shows the relationships between accident rate (accidents per 1 million sectors) on the vertical axis, fatality risk (the number of 'Full-Loss Equivalents' per 1 million flights) on the horizontal axis and the number of fatalities (the bubble size) for each different accident category occurring in the APAC region between the 2011–2015 period. A more in-depth description of fatality risk is found on a dedicated chapter in the 2015 IATA Safety Report.

This figure highlights in-flight damage as one accident category requiring attention. It was the third most frequent accident in the region, with a rate of 0.28 accidents per 1 million sectors, it also had the third highest fatality risk, at 0.04 full-loss equivalents per 1 million sectors, being responsible for 21 deaths. As seen previously, it also had an increasing trend over the last four years.

While the accidents involving fatalities date back to 2011 and 2012, the upward trend in the accident rate for this category should be a cause for concern.

Chart 7.5.8 Accident risk in the APAC region (2011–2015)
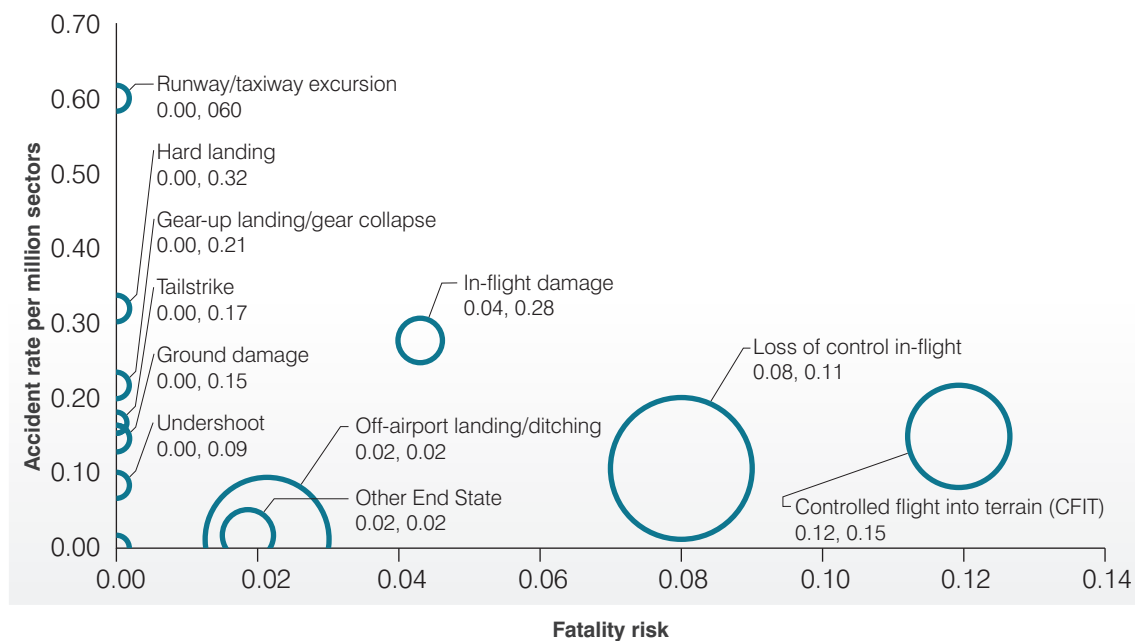
7.6 Most frequent accident categories within Asia Pacific region—CAST

Data from CAST, as shown in Chart 7.6.1, identified CFIT, RE-Landing and LOC-I as the three most common accident categories resulting in hull loss or fatalities within the APAC region for the period between 1987 and 2015.

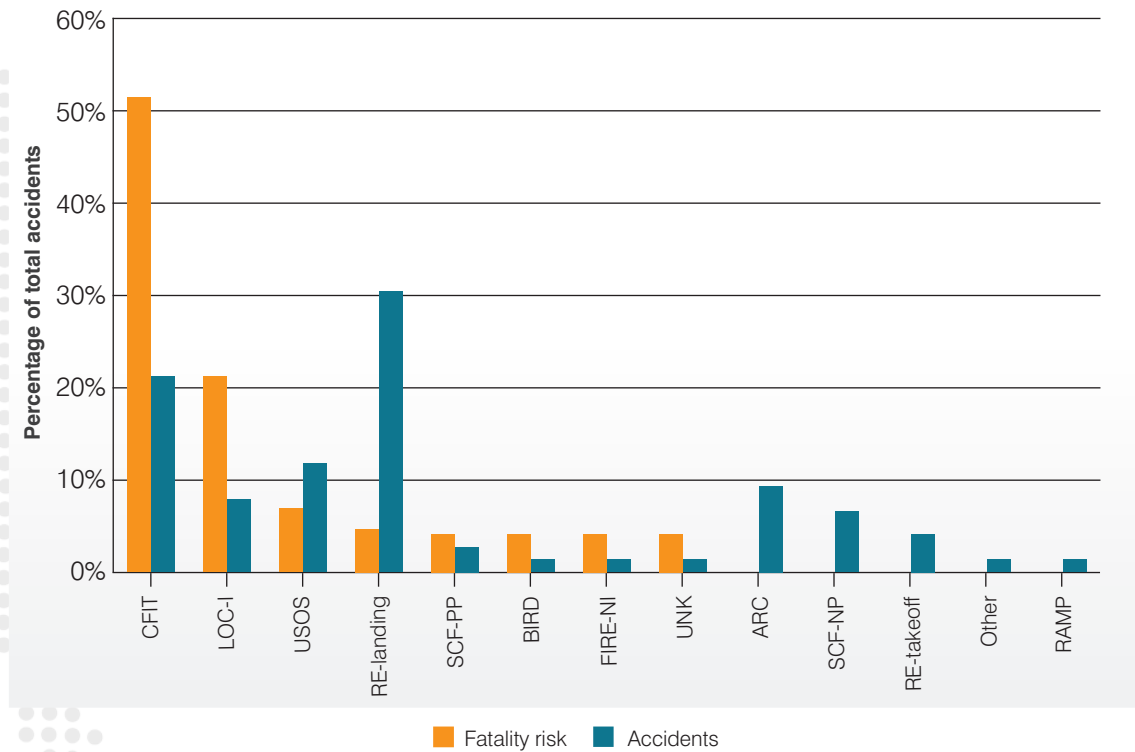**Chart 7.6.1 Accident categories by percentage of APAC region total (1987–2015)**
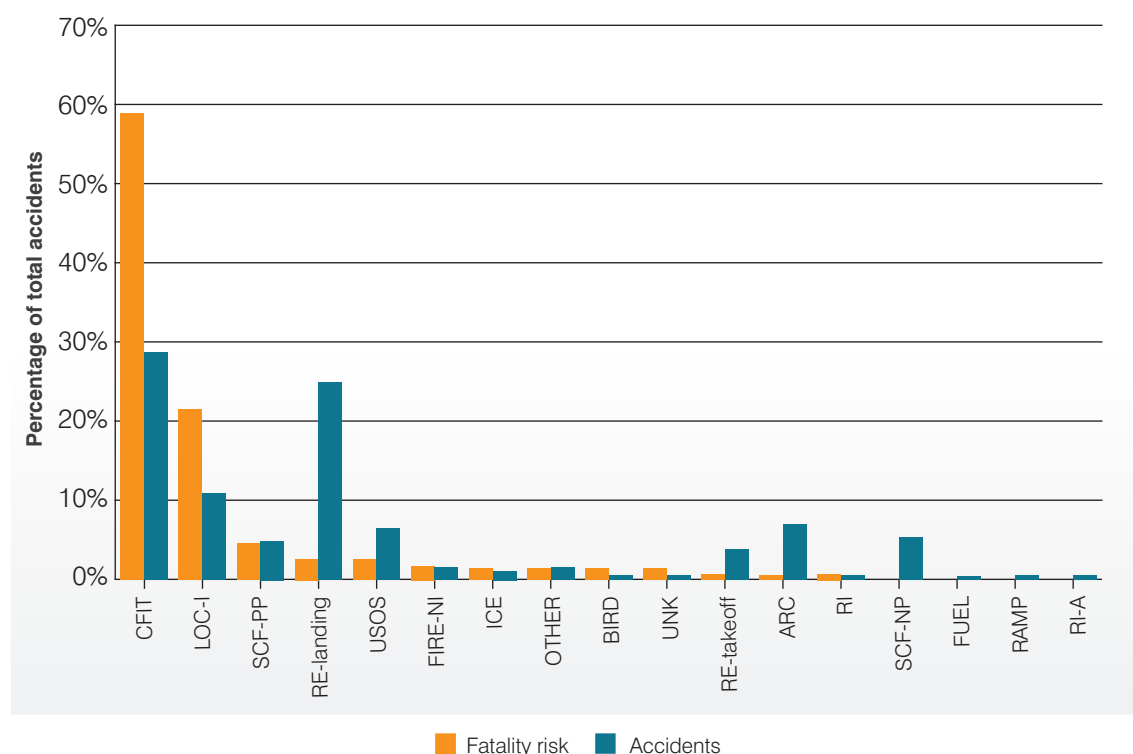
Note: Western-built airplanes, Part 121 equivalent operations 184 Accidents Total, 72.3 Full Loss Equivalents

Analysing the more recent 10-year data, as shown in Chart 7.6.2, reveals that CFIT and RE-Landing continue to be the top occurrence accident category while USOS (Undershoot/overshoot) was the third most frequent.

In terms of fatality risk, it was CFIT, LOC-I and USOS which were the top three accident categories.

Chart 7.6.2 Accident categories by percentage of APAC region total (2006–2015)

Note: Western-built airplanes, Part 121 equivalent operations 76 Accidents Total, 24.4 Full Loss Equivalents

Chart 7.6.3, which depicts RS-related accident occurrences, shows that over the years of review (1987 to 2015) most occurrences were related to RE-landing. Since 2004, this accident category has featured at least once a year, with the most number recorded in 2007 when there were five captured.

Chart 7.6.3 Accident categories related to runway safety
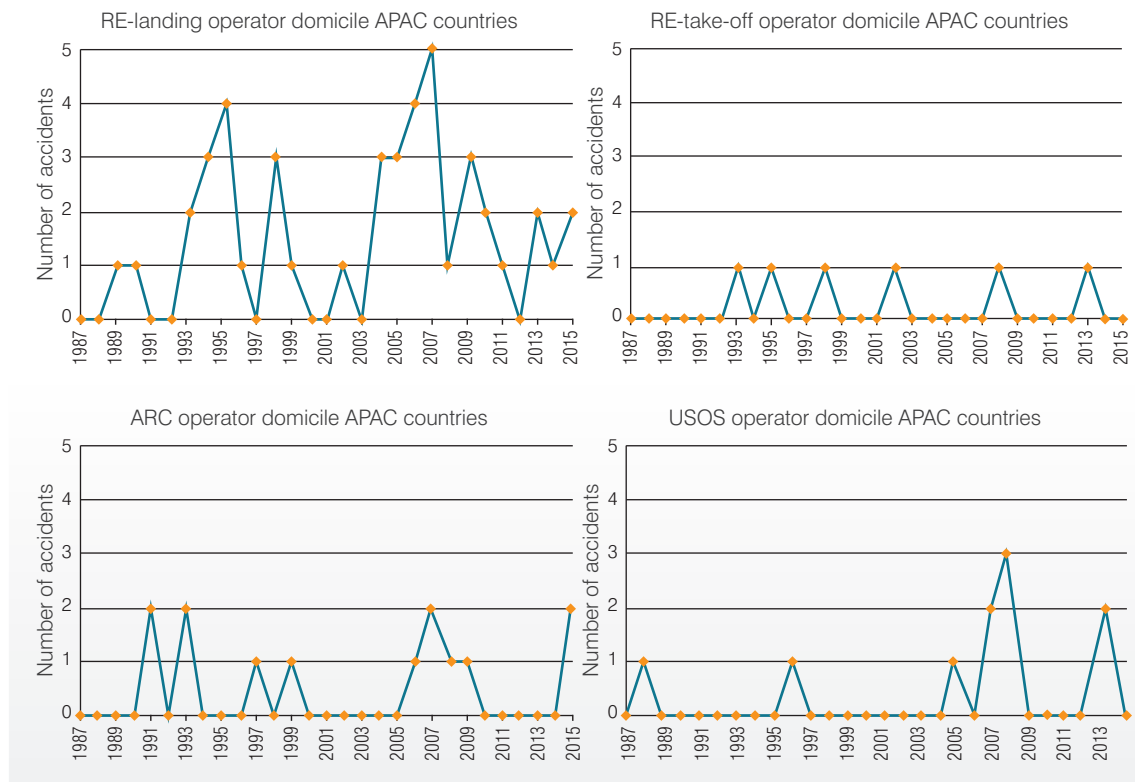
7.7 Most frequent accident categories within the Asia Pacific region

Collating the information from IATA and CAST, it can be concluded that the two most frequent accident categories in the APAC region were:

» Controlled flight into terrain (CFIT); and

» Runway safety (RS—specifically runway excursion)

For the past 10 years, runway safety occurrences were the most frequent accident category in the APAC. This was consistent with the results recorded in 2015. As indicated by the data obtained from IATA and CAST, most runway safety related accidents occurred during the landing phase of flight and resulted in a runway excursion.

Both IATA and CAST safety information concludes that accidents due to LOC-I was the second highest in terms of fatality risk, after CFIT.

7.8 Other emerging accident category

Safety information from IATA (Figure 7.5.8) indicates that the accident category of In-flight damages has been occurring more frequently and resulted in some fatalities over the last five years. Chart 7.5.7 also shows an upward trend for this accident category.

image: © Kyle Taylor | Great Barrier Reef

08 Proactive safety information

Proactive safety information is gathered through analysis of existing or real-time situations, a primary function of the safety assurance team with its audits, evaluations, employee reporting, and associated analysis and assessment processes. These involve actively seeking hazards in the existing processes (ICAO Doc 9859).

This information can be obtained from a number of sources, but this report focuses on the information obtained from ICAO's universal safety oversight audit program continuous monitoring approach (USOAP CMA).

8.1 ICAO universal oversight audit program continuous monitoring approach (USOAP CMA)

USOAP audits focus on a State's capability to provide safety oversight by assessing whether it has effectively and consistently implemented the critical elements of a safety oversight system and determining the State's level of implementation of ICAO's safety-related standards and recommended practices (SARPs), associated procedures and guidance material. Eight critical elements (CE) are evaluated:

1. Primary aviation legislation
2. Specific operating regulations
3. State civil aviation system and safety oversight functions
4. Technical personnel qualifications and training
5. Technical guidance, tools and the provision of safety-critical information
6. Licensing, certification, authorisation and approval obligations
7. Surveillance obligations
8. Resolution of safety concerns.

The USOAP CMA program was launched in January 2013. Comprehensive information relating to USOAP CMA is available on the USOAP CMA online framework at www.icao.int/usoap

The overall effective implementation (EI) for the RASG—APAC region in 2016 was 59.17 per cent (as shown in Chart 8.1.1), reasonably below the global level of 63.40 per cent.

Chart 8.1.1 RASG—APAC Overall implementation

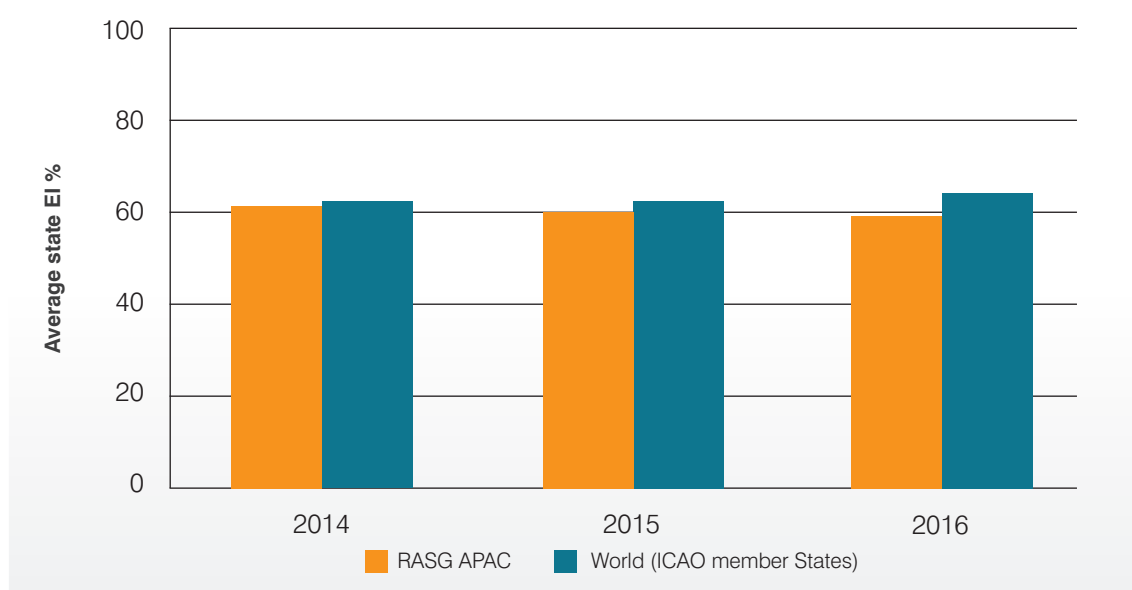*Legend: RASG APAC, World (ICAO member States)*

Chart 8.1.2 illustrates the overall EI by State. It should be noted that any changes or improvements to a State's EI can only be reflected after one of the following is conducted:

» Comprehensive systems approach (CSA) audit

» ICAO coordinated validated mission

» Integrated validated mission

» Off-site monitoring activity

» Off-site Safety System Concern (SSC) protocol questions management activity

Chart 8.1.2 Overall EI for RASG—APAC States
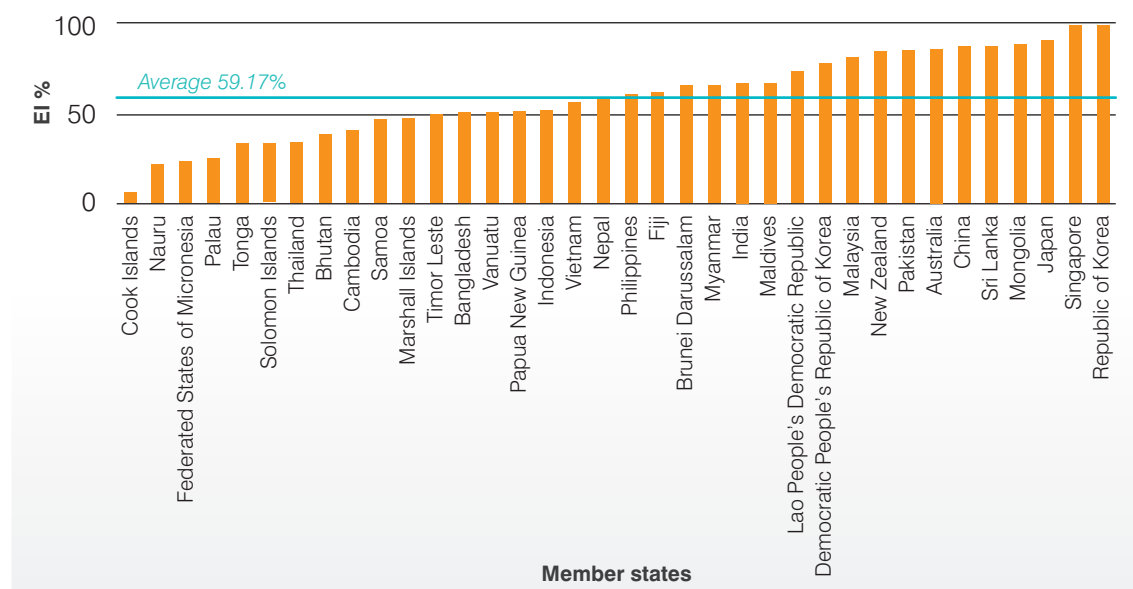
The EI by critical element (CE) in Chart 8.1.3 reveals that CE4 and CE8 have the lowest implementation within RASG—APAC, with 46.7 per cent and 49.5 per cent respectively. In comparison to all ICAO member States, RASG—APAC has a slightly lower EI for all categories except for CE7, which is slightly higher than the global average.

Chart 8.1.3 Overall EI by critical element RASG—APAC States compared to all ICAO member States

RASG APAC   World (ICAO member States)
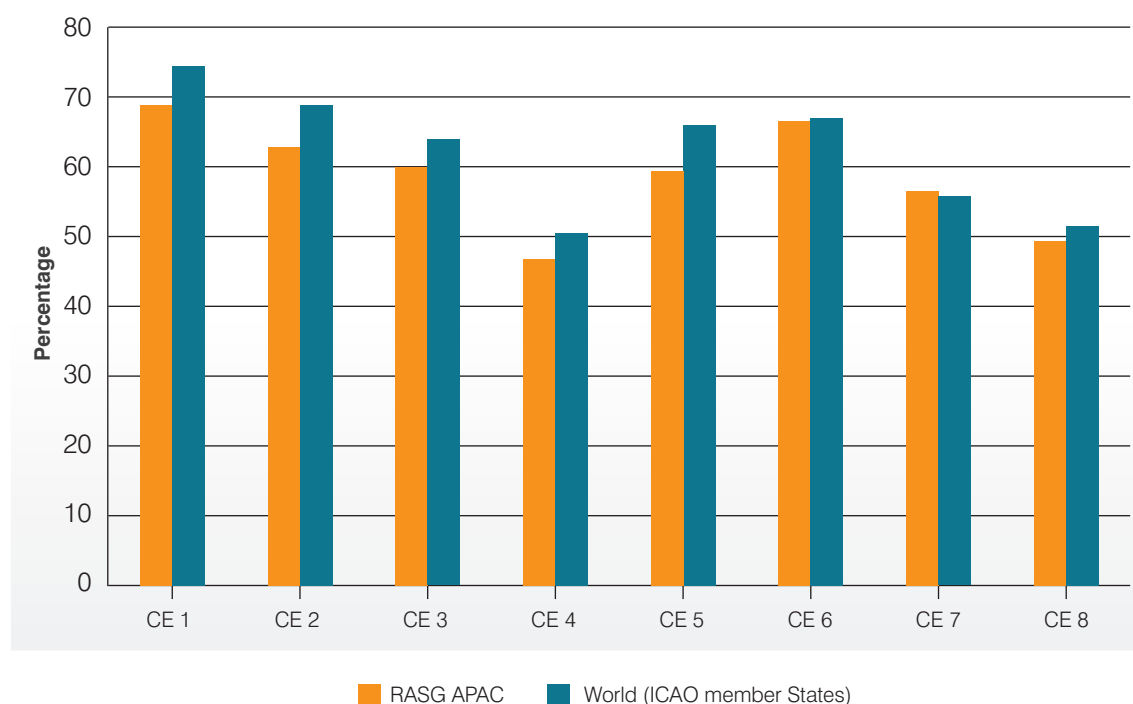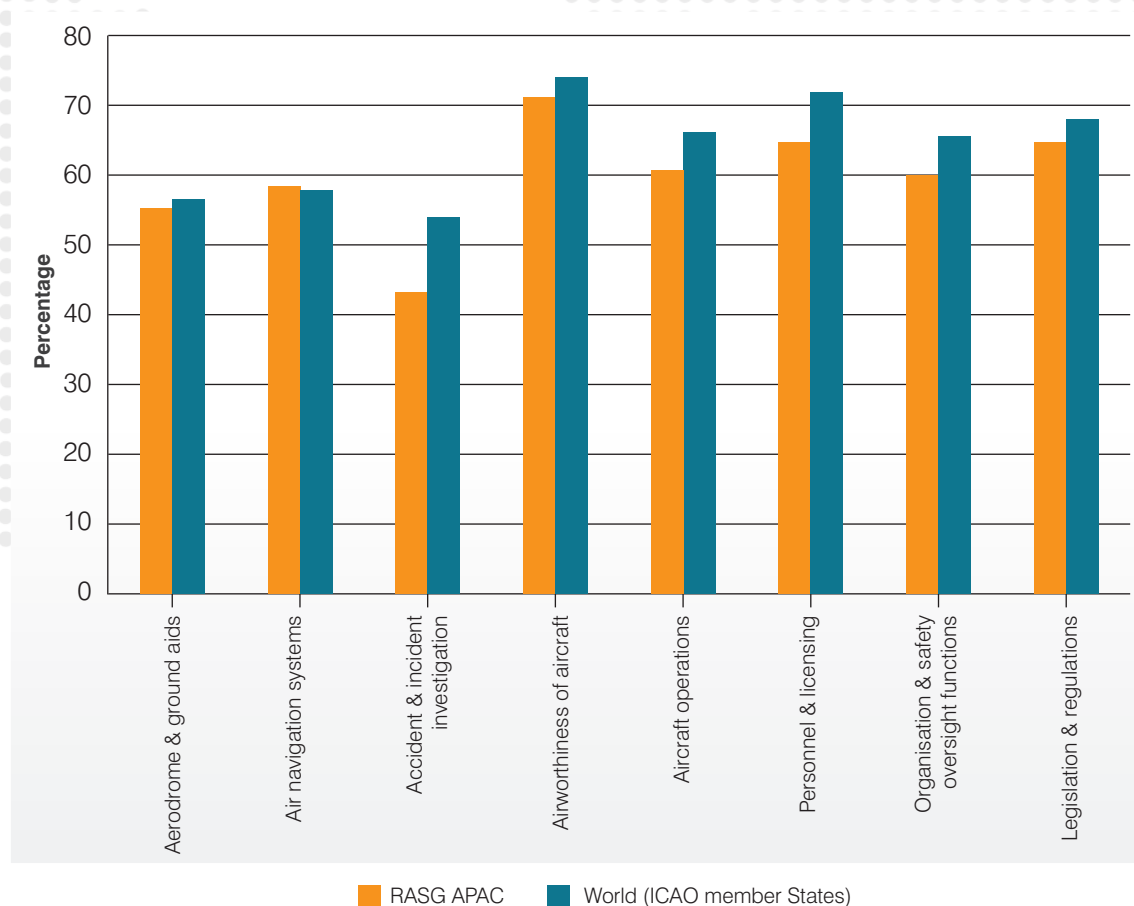
Chart 8.1.4 displays the overall EI by area compared to all ICAO member States. It can be seen that RASG—APAC is lower for most categories, with air navigation systems being the only category with a higher score compared to all ICAO member states.

Chart 8.1.4 Overall EI by area RASG—APAC States compared to all ICAO member States

Legend: RASG APAC / World (ICAO member States)

09 Conclusions

Reactive safety information

Analysis of the reactive safety information provided by ICAO, IATA and CAST determined that the most common accident categories in the APAC region between 2006 and 2015 were:

» Controlled flight into terrain; and

» Runway safety (specifically runway excursion)

Safety information from IATA and CAST safety information concludes that the accident category of LOC-I is the second highest in term of fatality risk, after CFIT.

The APAC region should continue to focus its efforts on mitigating and minimising occurrences relating to these categories. Noting that CFIT and LOC-I related accidents resulted in a higher number of fatalities.

Accidents relating to runway safety events (runway excursion, hard landing etc) were also a major cause of accidents in the APAC region, and should be examined for possible solutions.

Based on IATA safety information, the accident category of In-flight damages has been trending upwards in APAC region for the last five years and also resulted in fatalities. Effort could be channelled into promoting mitigation measures to reduce such occurrences.

image: © Grafner | Dreamstime.com

Proactive safety information

The effective implementation (EI) score for the RASG—APAC region slightly decreased in 2016 (59.17) compared to 2015 (60.25).

Low levels of EI (below 60 per cent) exist for four critical elements. Of these, technical personnel qualifications and training were the lowest at 46.7 per cent, followed by resolution of safety concerns at 49.5 per cent. Both of these critical elements also contain low scores across the global averages, suggesting that they appear to be a consistent issue across the world.

image: © Slrphotography | Dreamstime.com

10 List of acronyms

ACAS	Airborne collision avoidance systems
ADRM	Aerodrome
AFI	Africa (IATA Region)
AIS	Aeronautical information service
AMAN	Abrupt manoeuver
ANSP	Air navigation service provider
AOC	Air operator certificate
APAC	Asia Pacific
APANPIRG	Asia Pacific Air Navigation Planning and Implementation Regional Group.
APR	Approach
ARC	Abnormal runway contact
ASIA PAC	Asia/Pacific (ICAO Region)
ASPAC	Asia/Pacific (IATA Region)
ATC	Air traffic control
ATM	Air traffic management
BIRD	Birdstrike
CABIN	Cabin safety events
CAST	Commercial aviation safety team
CFIT	Controlled flight into terrain
CICTT	CAST/ICAO Common Taxonomy Team
CIS	Commonwealth of Independent States (IATA Region)
CMA	Continuous monitoring approach
CRM	Crew resource management
CRZ	Cruise
CVR	Cockpit voice recorder
DFDR	Digital flight data recorder
DGAC	Directorate general of civil aviation
DH	Decision height
EDTO	Extended Diversion Time Operations (replaces ETOPS)
E-GPWS	Enhanced ground proximity warning system

ETOPS	Extended range operations by turbine-engined aeroplanes
EUR	Europe (ICAO and IATA Region)
EVAC	Evacuation
FDA	Flight data analysis
FLP	Flight planning (IATA)
FMS	Flight management system
F-NI	Fire/smoke (none- impact)
FOQA	Flight operations quality assurance
F-POST	Fire/smoke (post-impact)
FUEL	Fuel related
GASP	ICAO global aviation safety plan
GCOL	Ground collision
GNSS	Global navigation satellite system
GOA	Go-around
GPWS	Ground proximity warning system
GSI	Global safety initiative
HL	Hull loss. Aircraft destroyed, or damaged and not repaired
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICE	Icing
ICL	Initial Climb
IMC	Instrument meteorological conditions
INOP	Inoperative
IOSA	IATA operational safety audit
LALT	Low altitude operations
LATAM	Latin America and the Caribbean (IATA Region)
LEI	Lack of effective implementation
LND	Landing
LOC-G	Loss of control-ground
LOC-I	Loss of control-inflight

LOSA	Line operations safety audit
MAC	AIRPROX/TCAS alert/loss of separation/near miss collisions/ mid-air collisions
MDA	Minimum descent altitude
MEL	Minimum equipment list
MENA	Middle East and North Africa (IATA REGION)
MID	Middle East
NAM	North America (ICAO and IATA Region)
NASIA	North Asia (IATA Region)
NAVAIDS	Navigational aids
NOTAM	Notice to airman
OTH	Other
PA	Pan America
RA	Resolution advisory
RAMP	Ground handling operations
RASG	Regional Aviation Safety Group
RE	Runway excursion (departure or landing)
RE-Landing	Runway excursion-Landing
Re-Take-off	Runway excursion-Take-off
RI	Runway incursion
RI-A	Runway incursion – animal
RI-VAP	Runway incursion – vehicle, aircraft or person
RS	Runway safety
RTO	Rejected Take-off
SAM	South America (ICAO Region)
SARPS	Standards and recommended practices (ICAO)
SCF-NP	System/component failure or malfunction - Non-powerplant
SCF-PP	System/component failure or malfunction - Powerplant
SD	Substantial damage
SEC	Security-related
SMS	Safety management system
SOP	Standard operating procedure
SRVSOP	Regional safety oversight system
SSP	State safety program

TAWS	Terrain awareness warning system
TCAS	Traffic collision and avoidance system
TCAS RA	Traffic collision and avoidance system - Resolution advisory
TEM	Threat and error management
TOF	Take-off
TURB	Turbulence encounter
TXI	Taxi
UAS	Undesirable aircraft state
UNK	Unknown or undetermined
USOAP	Universal safety oversight audit program
USOS	Undershoot/overshoot
WSTRW	Windshear or thunderstorm