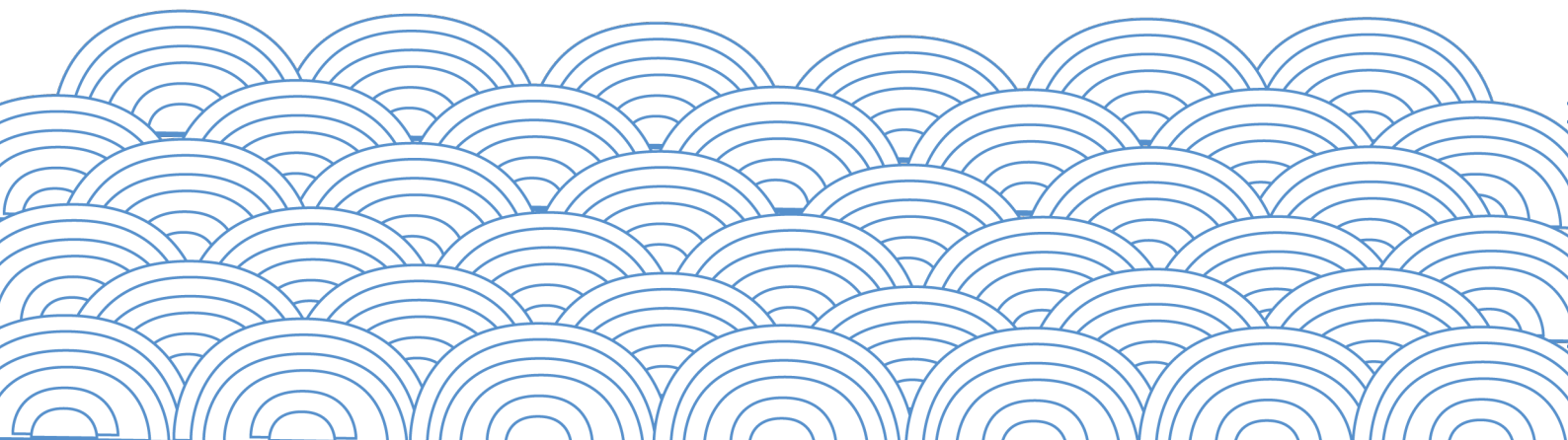


# Thailand Annual Safety Report 2021



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# Foreword

“

There have been some major changes within the Civil Aviation Authority of Thailand (CAAT), as the organisation has restructured with effect from April 1<sup>st</sup> 2022 onwards. Introducing to the industry; the Aviation Safety Management and Standards Assurance Office (SMO) whereby the two core functions of the organisation have been merged and managed as one ensuring safety and quality are concurrently moving in the same direction.

In this edition, I have laid down a comprehensive viewpoint of safety issues and emerging trends of Thailand in 2021. It features the key safety issues from the associated aviation sectors which are necessary to be prioritised by the industry and will be included as the targeted areas of CAAT surveillance programme. In 2021 aviation safety has been impacted due to the influences of prolonged COVID-19 pandemic affecting the overall performance of every sector, resulting in reduction of operations as well as manpower.

While the industry has been struggling to recover from this crisis, it has come with no surprise that human factors have been identified in most of safety occurrence reports. Notwithstanding the numbers of cases, organisations are accountable for promoting Just Culture and emphasising the safety policy in regards to reporting any

occurrences. This is where the post COVID-19 pandemic recovery plan plays an important role to proactively analyse potential risks and implement appropriate mitigations prior to safely returning to the full operations.

Thailand's State Safety Programme (SSP) and State Safety Policy have been updated to clarify and guide the regulation of operation processes aligned with good governance with an emphasis on effective management of safety supported by sufficient resources.

Improvements in the safety data we collect and analyse from occurrence reports will give us a more precise picture of the key safety issues that need to be tackled. I would like to take this opportunity to thank those of you who contribute in reporting of occurrences as well as CAAT Safety Key Personnel (SKP) and safety experts who have been dedicatedly involved with our safety team in the preparation of this report. I hope you will find it useful and encourage you to continue supporting us to improve Thailand's aviation safety.

”

*K Maklin*

Mr. Kajonpat Maklin  
Aviation Safety Management  
& Standards Assurance Manager



# Executive Summary

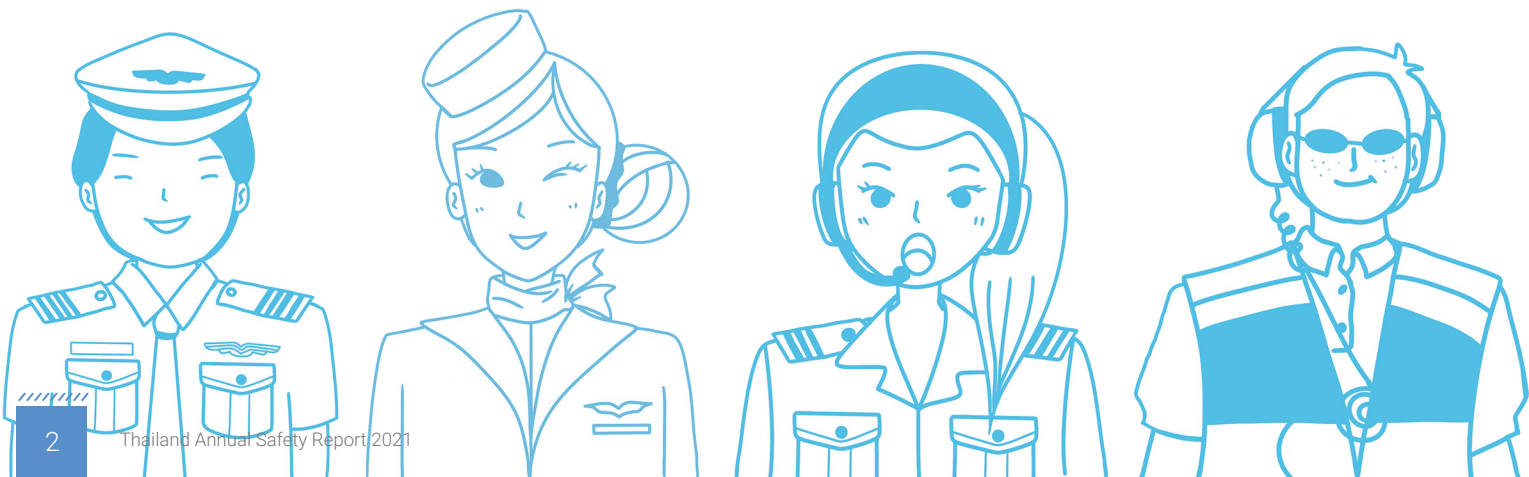
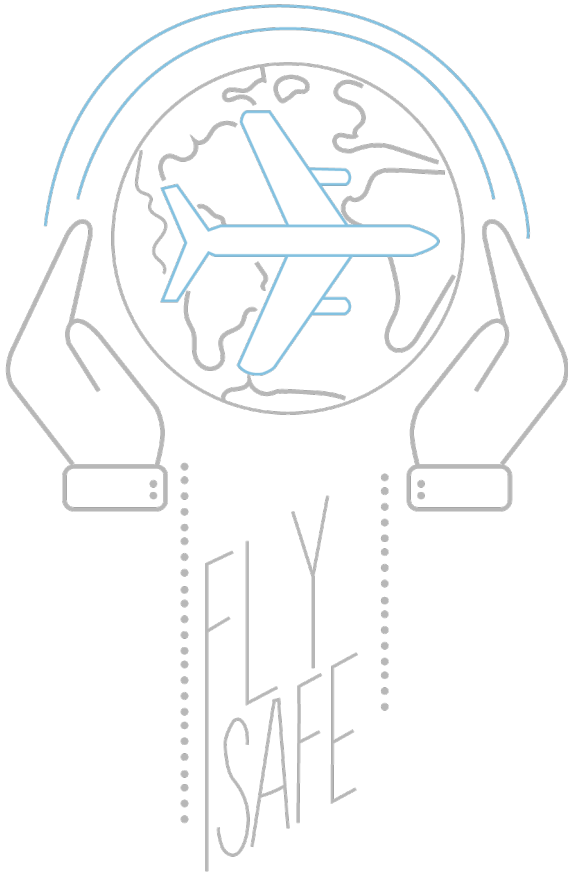
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This report provides a summary of the analysis of the occurrences reported to CAAT as well as accidents and serious incidents investigated by Aircraft Accident Investigation Committee of Thailand (AAIC) in 2021.

It identifies the key safety issues and safety performance of the Thai aviation industry. The structure has been categorised by different types of operation on each aviation sector as follows:

- Commercial Air Transport
  - Aeroplane
  - Helicopter
- General Aviation
- Approved Training Organisations
- Air Navigation Service Providers
- Aerodrome Operators, and
- State Aircraft

This report focuses on the occurrence categories with high potential of risk escalation into High-Risk Categories (HRCs). The occurrence categories along with the associated key safety issues are linked to the precursor events in the Thailand Aviation Safety Action Plan (TASAP). Such precursor events should be addressed as undesirable events in any organisation's Safety Management System (SMS).



# Introduction

It has been over 2 years since COVID-19 was declared as a global pandemic and the world came to a halt in efforts to control the spreading of the virus causing major disruptions in numerous industries, especially the aviation. In 2021 with the ongoing impact of the pandemic, Thailand aviation industry has endeavored to do its best to safely resume their normal operations.

One of the essential responsibilities of CAAT is to manage and continuously improve safety of the Thai aviation industry as a whole. In addition to conducting the regulatory safety oversight audits and inspections, the analysis of valuable safety data and safety information plays an important role in enabling Thailand enhanced safety intelligence that benefits the effectiveness of safety risk management and optimises the mitigation of safety risks.

Thailand Annual Safety report 2021 puts forward an aggregated summary of the safety data and safety information submitted to CAAT by the Civil Aviation Organisations (CAOs) with regards to safety issues. The collection of safety data gathered in this report also covers information received from AAIC.

## Thailand’s Aviation Safety Occurrence Reporting

The safety occurrence reporting of CAOs has increased within the period of 2019 - 2021. CAAT received 2,729 safety occurrence reports in 2021 which reflects 123% increase from 2020 and 395% from 2019 despite the reduction of aviation activities. The growth rate of safety occurrence reporting demonstrates a positive improvement in the reporting culture across the Thai aviation industry.

However, there is still a need to improve the way that just culture principles are applied which will give more confidence in people and CAOs reporting more safety occurrences.

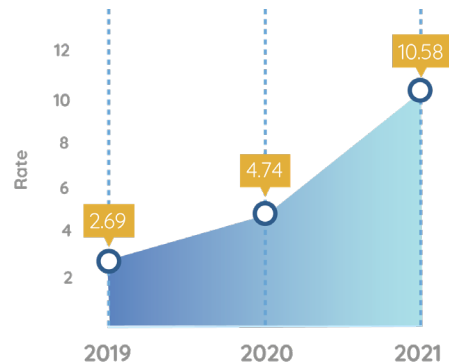
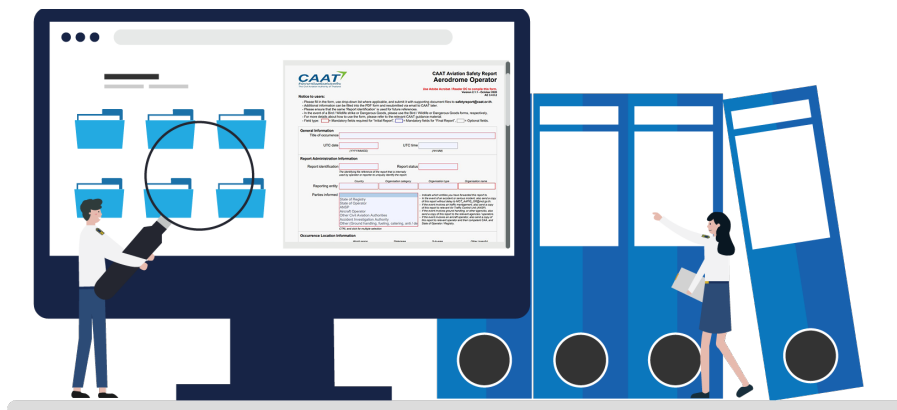


Chart 1: Occurrence reporting rate per 1,000 flight movements



# Aircraft Accidents & Serious Incidents

This edition includes updated information from AAIC investigations into accidents and serious incidents. The chart below shows the statistics involving *Thai and foreign registered aircraft operating in Thailand* over the previous 6 years. In 2021, there were 2 accidents and 2 serious incidents.

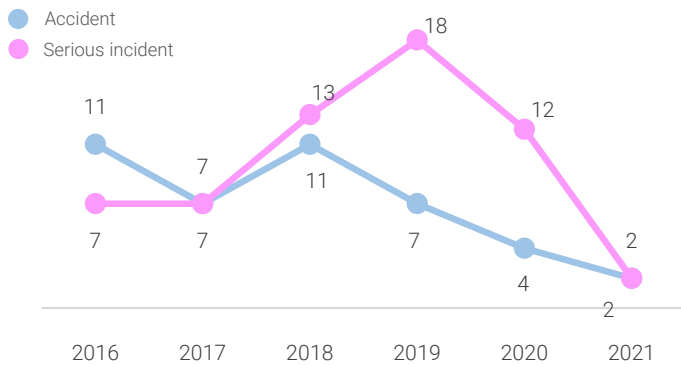


Chart 2: Number of accidents and serious incidents occurred with Thai and foreign registered aircraft operating in Thailand

In 2021, there was one fatal accident that occurred in general aviation activity. A person was hit by an aircraft during landing at a temporary take-off and landing area in Lamphun.

The number of aircraft accidents and serious incidents involving *Thai registered aircraft which occurred outside Thailand* are shown in Table 1. In 2021, there were 2 safety occurrences that have not been officially classified by the relevant accident investigation authority but are expected to be classified as serious incidents.

| Year         | Accidents | Serious Incidents |
|--------------|-----------|-------------------|
| 2016         | 0         | 0                 |
| 2017         | 0         | 3                 |
| 2018         | 1         | 3                 |
| 2019         | 0         | 1                 |
| 2020         | 1         | 2                 |
| 2021         | 0         | 2                 |
| <b>Total</b> | <b>2</b>  | <b>11</b>         |

Table 1: Number of accidents and serious incidents occurred with Thai registered aircraft outside Thailand

## Statistic of 2021 breakdown by type of operations

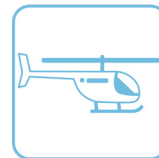
The illustration below shows the number of aircraft accidents and serious incidents involving *Thai and foreign registered aircraft that occurred within Thailand* and the number of accidents and serious incidents involving *Thai registered aircraft that occurred outside Thailand*. For more details, the list of accidents and serious incidents can be found in Appendix A.

### Commercial Air Transport



#### Aeroplane

Accident 0  
Serious Incident 3



#### Helicopter

Accident 0  
Serious Incident 0

### General Aviation



Accident 2  
Serious Incident 1

### Aerial Work



Accident 0  
Serious Incident 0

# Occurrence Categories

CAAT uses the aviation occurrence taxonomy which was developed by the Commercial Aviation Safety Team/ICAO Common Taxonomy Team (CICCT). This is applied to the safety occurrences to facilitate the safety data analysis by focusing on common safety issues of each occurrence. The occurrences mentioned in this report are those that occurred in Thai aviation industry and were reported to CAAT.

|  |  |  |  |
|--|--|--|--|
| <b>Abnormal Runway Contact (ARC)</b>     | Any landing or take-off involving abnormal runway or landing surface contact.  | <b>Icing (ICE)</b>   | Accumulation of snow, ice, freezing rain, or frost on aircraft surfaces that adversely affects aircraft control or performance.          |
| <b>Abrupt Maneuver (AMAN)</b>            | The intentional abrupt maneuvering of the aircraft by the flight crew.   | <b>Loss of Control - Ground (LOC-G)</b>                                  | Loss of aircraft control while the aircraft is on the ground.  |
| <b>Aerodrome (ADRM)</b>                  | Occurrences involving aerodrome design, service, or functionality issues.  | <b>Medical (MED)</b>   | Occurrences involving illnesses of persons on board the aircraft.  |
| <b>ATM/CNS (ATM)</b>                     | Occurrences involving Air Traffic Management (ATM) or Communication, Navigation, Surveillance (CNS) service issues.  | <b>Navigation Error (NAV)</b>  | Occurrences involving the incorrect navigation of aircraft on the ground or in the air.  |
| <b>Birdstrike (BIRD)</b>                 | Occurrences involving collisions/near collisions ingestion of one or several birds which may occur in any phase of flight.   | <b>Other (OTHR)<sup>1</sup></b>  | Any occurrence not covered under another category.   |
| <b>Cabin Safety Events (CABIN)</b>       | Miscellaneous occurrences in the passenger cabin of transport category aircraft.   | <b>Security related (SEC)</b>  | Criminal/Security acts which result in accidents or incidents.   |
| <b>Evacuation (EVAC)</b>                 | Occurrence where either; (a) person(s) are injured during an evacuation; (b) an unnecessary evacuation was performed; (c) evacuation equipment failed to perform as required; or (d) the evacuation contributed to the severity of the occurrence. | <b>System/Component Failure or Malfunction (Non-Powerplant) (SCF-NP)</b> | Failure or malfunction of an aircraft system or component other than the powerplant.   |
| <b>Fire/Smoke (Non-impact) (F-NI)</b>    | Fire or smoke in or on the aircraft, in flight, or on the ground, which is not the result of impact.   | <b>System/Component Failure or Malfunction (Powerplant) (SCF-PP)</b>     | Failure or malfunction of an aircraft system or component related to the powerplant.   |
| <b>Fire/Smoke (Post-impact) (F-POST)</b> | Fire or smoke resulting from an accident impact.   | <b>Turbulence Encounter (TURB)</b>                                       | In-flight turbulence encounter.  |
| <b>Fuel related (FUEL)</b>               | One or more powerplants experienced reduced or no power output due to fuel exhaustion, fuel starvation/mismanagement, fuel contamination/wrong fuel, or carburetor and/or induction icing.   | <b>Undershoot/Overshoot (USOS)</b>                                       | A touchdown off the runway/helipad/helideck surface.   |
| <b>Ground Collision (GCOL)</b>           | Collision while taxiing to or from a runway in use.  | <b>Unknown or Undetermined (UNK)<sup>1</sup></b>                         | Insufficient information exists to categorise the occurrence.  |
| <b>Ground Handling (RAMP)</b>            | Occurrences during (or as a result of) ground handling operations.   | <b>Wildlife (WILD)</b>   | Collision with, risk of collision, or evasive action taken by an aircraft to avoid wildlife on a runway or on a helipad/helideck in use. |
|  |  | <b>Wind shear or Thunderstorm (WSTRW)</b>                                | Flight into wind shear or thunderstorm.  |

<sup>1</sup> OTHR and UNK are not always shown in the annual safety report as they do not provide useful safety information.



## ICAO's High-Risk Categories (HRCs)

The Global HRCs are the most common occurrence categories related to fatal accidents (which are derived from the analysis of fatal accidents by ICAO over a 10 years period). HRCs need to be addressed to mitigate the risk of fatalities. The following occurrence categories have been identified as HRCs in the ICAO Global Aviation Safety Plan (GASP) 2020-2022 Edition and are considered relevant for Thailand.



### Controlled Flight into Terrain (CFIT)

In-flight collision or near collision with terrain, water, or obstacle without indication of loss of control.



### Loss of Control In-flight (LOC-I)

Loss of aircraft control while or deviation from intended flight path in flight.



### Mid-Air Collision (MAC)

Airprox, Airborne Collision Avoidance System (ACAS) alerts, loss of separation as well as near collisions or collisions between aircraft in flight.



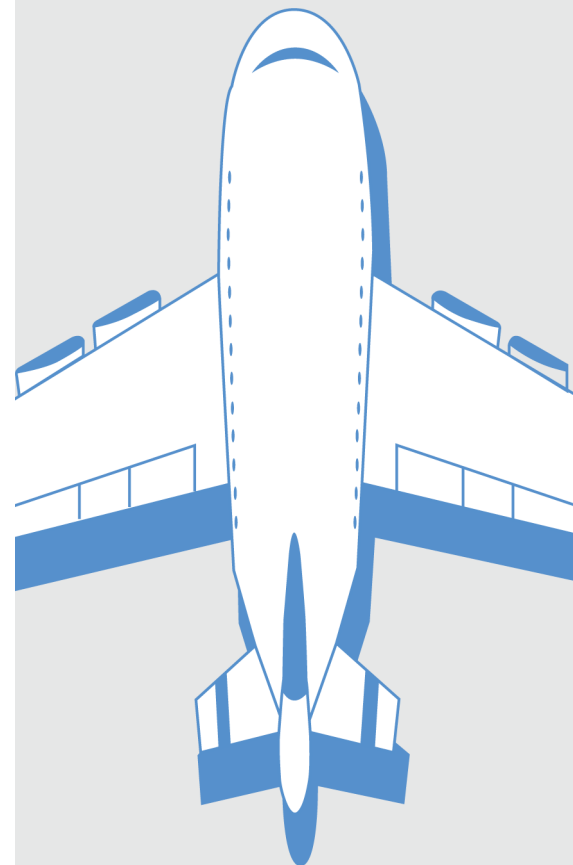
### Runway Excursion (RE)

A veer off or overrun off the runway surface.



### Runway Incursion (RI)

Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft.







This section provides a detailed breakdown of occurrences by categories and the key safety issues. CAAT has a priority to reduce the risk of accidents in Commercial Air Transport (CAT), and those issues that have a high potential to escalate to HRCs. Chart 3 shows rate of safety occurrences in 2019-2021 with the top 10 occurrence categories which have high rate in 2021. It can be seen that there is an improvement of reporting culture from the CAT.

## Occurrences Classification

Rate per 10,000 flight movements

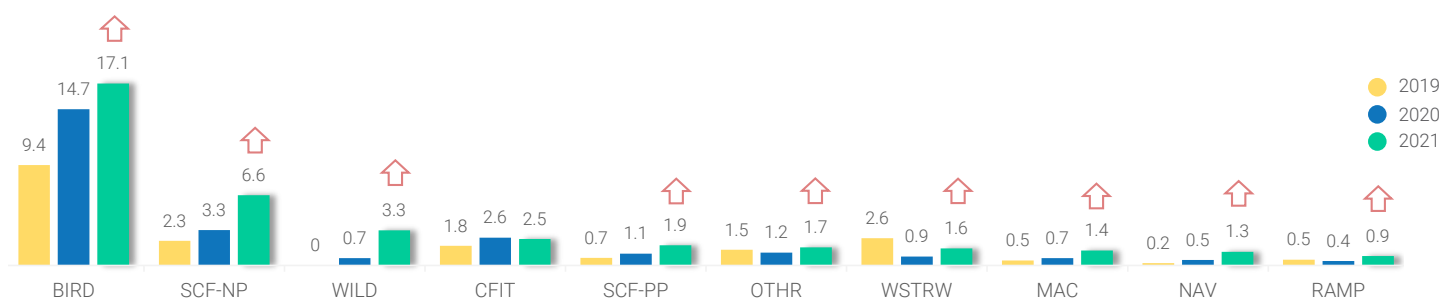


Chart 3: Rate of safety occurrences related to CAT - Aeroplane Operations

## Key Safety Issues

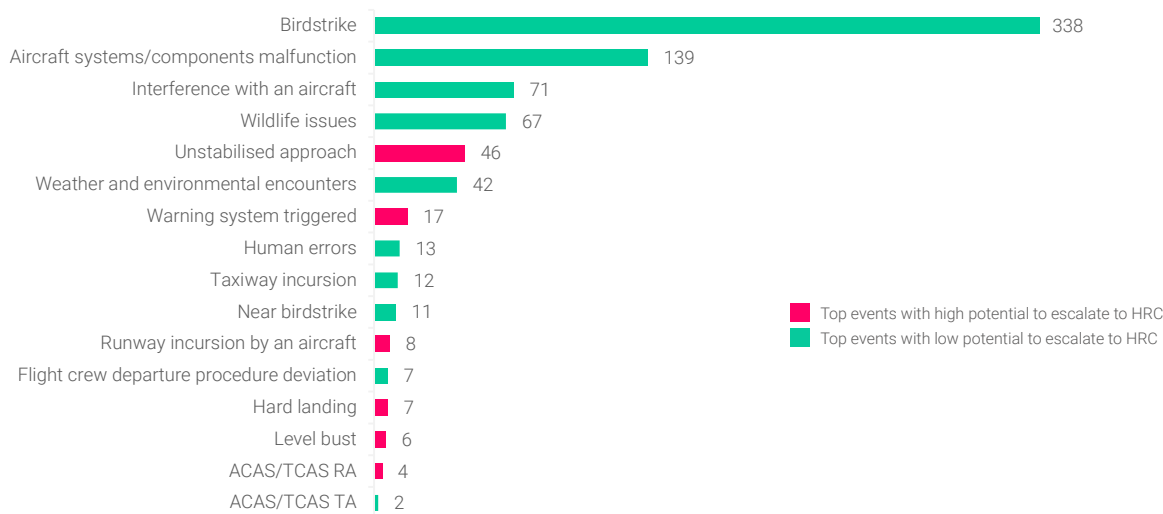


Chart 4: Number of key safety issues related to CAT - Aeroplane Operations

## 1. Birdstrike, Near Birdstrike and Wildlife Issues

In 2021, there was an increasing number of birdstrike and wildlife issues being reported. This may be related to the COVID-19 pandemic and wildlife inhabiting areas around the aerodrome due to lower levels of aviation activities. Although most birdstrikes do not result in significant safety events, this remains one of the top risks in the TASAP with actions to reduce the rate of birdstrikes with damage to aircraft parts. More details of birdstrikes are available in the Aerodrome section.

## 2. Aircraft systems/components malfunction

### 2.1 System/Component Failure or Malfunction (Non-Powerplant) (SCF-NP)

There were 108 System/Component Failure or Malfunction (Non- Powerplant) (SCF-NP) occurrences in 2021. Chart 5 is top 5 breakdown of the related ATA chapters. The most significant concerns are malfunctions of landing gear systems and air conditioning/pressurisation systems. The 2 occurrences have been under investigation by AAIC and CAAT.

From these occurrences, there are lessons to be learnt for other CAT operators considering the effectiveness of the maintenance programme to ensure their aircraft fleet reliability as well as task cards and maintenance instructions are suitable and correspond to the manufacturer instructions.

The air conditioning/pressurisation system malfunctions mainly consisted of pressurisation system failures that could escalate to cabin decompression. It is just as important to recognise that these technical failures can significantly increase the workload of the flight crew and increases the risk of a significant safety event.

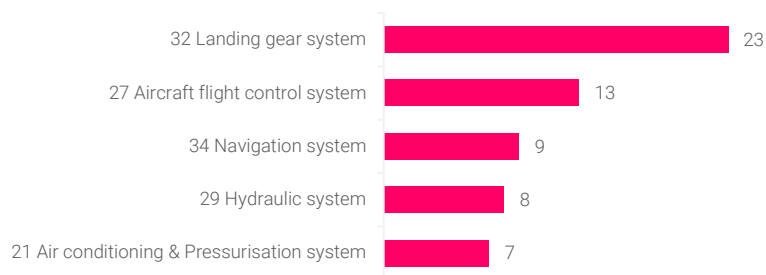


Chart 5: ATA chapter breakdown of SCF-NP occurrences

While some of SCF-NP occurrence resulted in significant damage. Damage to landing gear system occurred the most in 2021, the occurrences related to tyre burst and problem with retraction/extension of landing gear. As a result, it is recommended that the CAT operators ensure that they are aware of such occurrence and initiate the safety risk management in order to capture its relevant hazards, contributing factors, escalation factors to define preventive measures.

Chart 6 shows the operational impact from those occurrences where details were provided in the report. Most occurrence resulted in aircraft returns (Air turn backs).

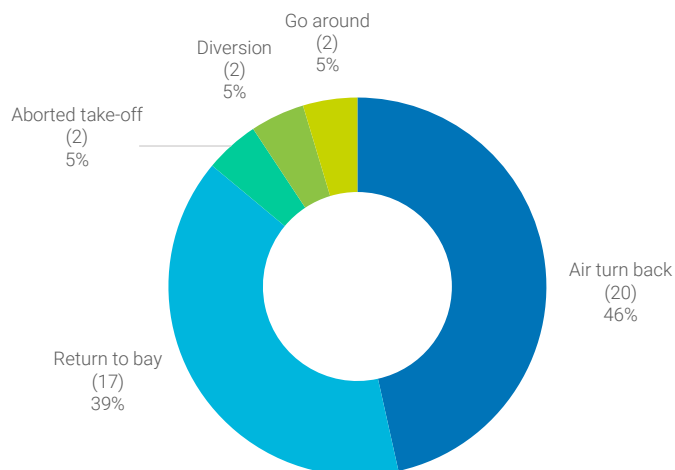


Chart 6: Consequences to aircraft operations resulted by SCF-NP occurrences



## 2.2 System/Component Failure or Malfunction (Powerplant) (SCF-PP)

In 2021, there were 20 engine malfunction occurrences. Chart 7 shows the operational impact from those occurrences where details provided in the report.

SCF-PP occurrences in 2021 did not result in significant damage and consequences to the aircraft. In conclusion, to help improving of the occurrences analysis regarding airworthiness in high-level perspective, CAAT would like to emphasise the CAT operators to provide the ATA chapter and the cause of failure in the occurrence report. The more data CAT operators provide, the more CAAT will be able to assess and monitor reliability throughout the commercial aircraft fleet operating in Thailand.

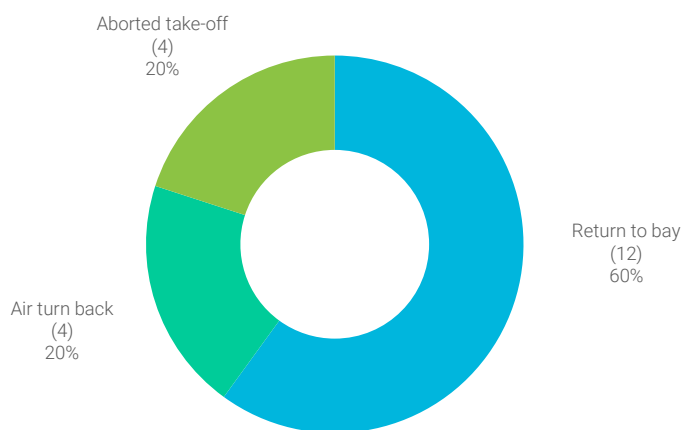


Chart 7: Consequences to aircraft operations resulted by aircraft engine malfunctions

## 3. Interference with an Aircraft

There were 71 occurrences of aircraft being interfered with lasers and other airborne objects. However, the number of such occurrences has dramatically increased since 2020. CAAT has concerns about the recurrences and it has been agreed by the National Civil Aviation Safety Board (NCASB) that it is necessary to reduce such occurrences. Consequently, CAAT has established a working team from the relevant domains to analyse best practices and develop more practical regulations and guidance. However, it requires collaboration between CAAT and the local authorities in term of educating the public to understand the significant safety impact caused by lasers and airborne objects such as visual impairment of the flight crew and a collision with sky rocket. Chart 8 shows the number of safety occurrences related to Interference with aircrafts in 2021.

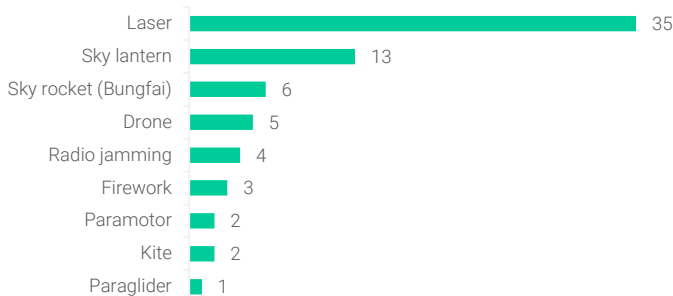
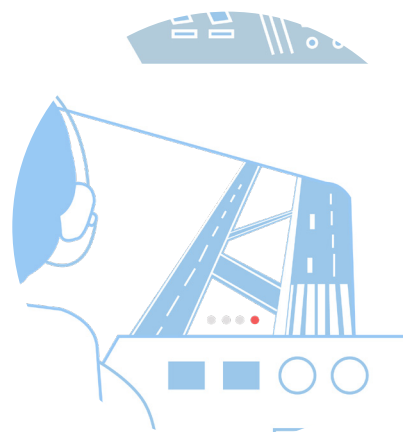


Chart 8: Interference with aircraft occurrences

## 4. Unstabilised Approach

Continuing to land after an unstabilised approach is still a significant issue and continues to occur frequently. This reflects a global trend that is likely to be related to the COVID-19 pandemic with pilot flying less frequently. CAAT will continue to monitor this trend and also focus on the training during the surveillance of operators.



## 5. Weather and Environmental Encounters

There were 42 Weather and Environmental Encounters where the aircraft encountered windshear/microburst, turbulence, tailwinds headwinds and crosswinds. These contributed to the decision of the pilot to a rejected take-off or go around.

## 6. Warning System Triggered

Chart 9 elaborates details on TAWS/GPWS cautions and warnings. Unstabilised approaches and adverse weather conditions are common contributing factors for these occurrences. Therefore, there is a need to reinforce the importance of pilots complying with stabilised approach criteria and initiating a go around should the approach not be stabilised. This should also be a focus for CAAT audits of operators.

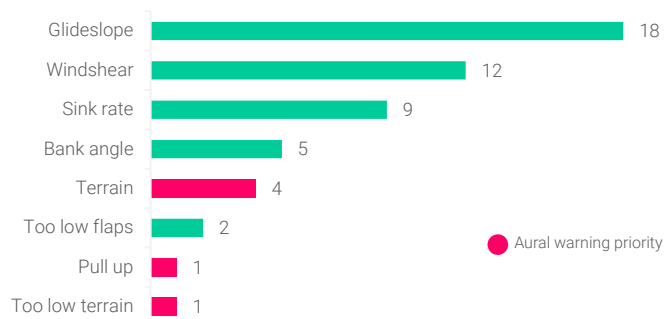
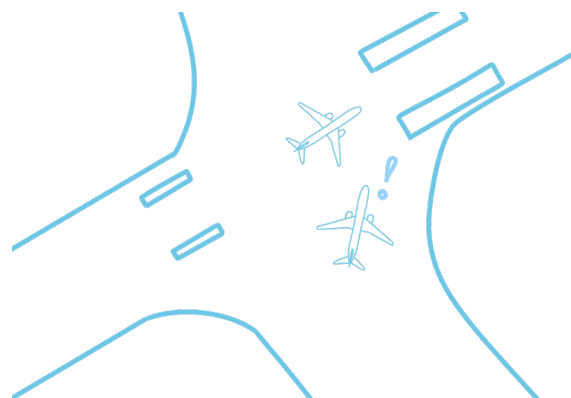


Chart 9: TAWS/GPWS cautions and warnings

## 7. Taxiway Incursion

There were 12 Taxiway Incursions in 2021. The most common contributing factor was a high workload of the flight crew. This resulted in a short-term loss of situational awareness. Another cause is that the flight crew were not familiar with the aerodrome layout and decided to deviate from Air Traffic Controller (ATC) clearance by mistake. This can be compounded when ATC provide multiple (complex) instructions to the flight crew. Reviewing the runway and taxiway layout as part of the flight crew briefing, sterile cockpit rules during the taxi and good Crew Resource Management (CRM) could reduce the likelihood of the occurrences.



## 8. Flight Crew Departure Procedure Deviation

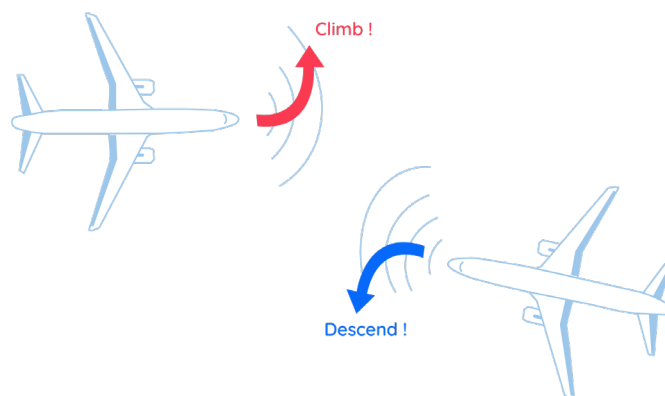
There were 7 occurrences caused by incorrect data input in Flight Management System (FMS) by the pilots. These safety occurrences are significant as they have a potential to result in a fatal accident.

## 9. Level Bust

There were 6 Level Bust occurrences in 2021 caused by pilot error, adverse weather encounters and using high-rate of descent. It is highly recommended that CAOs should ensure that CRM of the flight crew is effective to avoid any possible errors or mistakes. Meanwhile, one of contributing factors might be associated with ATC's instruction, so ATC should ensure that air traffic management has been done appropriately. Also, allocation of tasks should be done and managed properly.

## 10.. Airborne Collision Avoidance System (ACAS)/ Traffic Collision Avoidance System (TCAS) - Resolution Advisory (RA)

There were 4 TCAS RAs in 2021. 2 TCAS RAs occurred at Hong Kong's airspace due to traffic congestion, another 2 occurrences occurred in Thailand. There were TCAS RAs without loss of separation which caused by aircraft descending with high rate of descend. Flight crew should comply with the procedure published in Aeronautical Information Publication (AIP) to avoid unnecessary TCAS RA warning and strictly follow the advisory when receiving TCAS RA alert.





## Flight Operations Standards Department (OPS)

"The pandemic severely affected the air transport industry who suffered a severe reduction of activity. Airlines struggled for their survival and CAAT made its best effort to implement measures to allow continuation of operations in this context, as exemptions for the transport of cargo in the passenger compartment, Public Health measures for the transportation of passengers and other flexibility provisions. This allowed the movement of goods, medicines, and medical equipment (including spare parts/repair components) as necessary to fight this crisis. Despite all efforts made, some airlines could survive only at the cost of severe cuts in their fleets and active personnel.

The recovery is there, even stronger than expected and airlines, have to face a strong demand, with reduced fleets and personnel.

The Flight Operations Standards Department (OPS), in 2020, sent to commercial operators a tool to highlight the risks that may have evolved or emerged due to the pandemic and that need to be addressed before the resumption of operations (Post Covid-19 Operations Readiness Assessment Checklist). Most aircraft manufacturers, authorities and international bodies (ICAO, IATA, etc.) have also issued recommendations to operators for the resumption of their normal operations. This material shall be used by operators to ensure that new risks are properly addressed through their SMS to maintain an appropriate level of safety.

Demand for pilots is strong while the system has limited capacity to train additional pilots or retrain those who were inactive.

We also attract operators' attention on the fact that standard recurrent training as delivered before the pandemic may not be fully adapted to the situation operators are facing today, as these do not focus on the application of normal procedures. Due consideration should be made on the application of the refresher training procedures established to cover a temporary reduction or full interruption of crew activity.

This situation regarding pilots training has potentially a negative effect on safety, that has to be addressed by the SMS of the operators as well as the other risks that need to be reassessed in the new context.

Statistics from 2021 shows a significant amount of unstabilised approaches that continue for landing, which is a sign of inappropriate application of the normal procedures. Unstabilised approaches shall be considered very seriously as these have the potential to result in runway excursions and as the level of risk may be increased during the resumption of operations."



# Key Message from...

## Airworthiness and Aircraft Engineering Department (AIR)

During the COVID-19 pandemic, the aircraft operators have faced operational challenges. This has led to aircraft being removed from the operation for a long period of time and needed to be parked and stored. The Original Equipment Manufacturer (OEM) provides operators with detailed procedures for parking and storage. The operators must follow the OEM procedures to preserve the safety, airworthiness, and value of the aircraft.

The Airworthiness and Aircraft Engineering Department (AIR) of CAAT have emphasised the aircraft inspection requirements and launched the COVID-19 self-assessment inspection checklist. This checklist, which is to be completed by operators and submitted to CAAT, provides CAAT with an assurance that operators have taken all critical factors into consideration before each aircraft is returned to service.

To this end, AIR would like to take the opportunity to reiterate the importance of complying with long-term parking procedures and performing a COVID-19 self-assessment inspection. Any aircraft defects, unsafe conditions and unexpected findings found during the inspection must be eliminated before the aircraft return to service. This checklist is applicable for all aircraft which have the Maximum Take Off Weight (MTOW) more than 5,700 Kg. For more information, please contact us via [air-aoc@caat.or.th](mailto:air-aoc@caat.or.th).



# Helicopter

This section addresses the operational safety issues raised during helicopter operations. The total of occurrences during 2021 by occurrence categories is shown in chart 10. The most frequent occurrences were caused by System/Component Failure or Malfunction (Non-Powerplant) (SCF-NP) which have a potential to increase pilot workload and lead to fatal accidents.

## Occurrences Classification

Rate per 1,000 flight movements

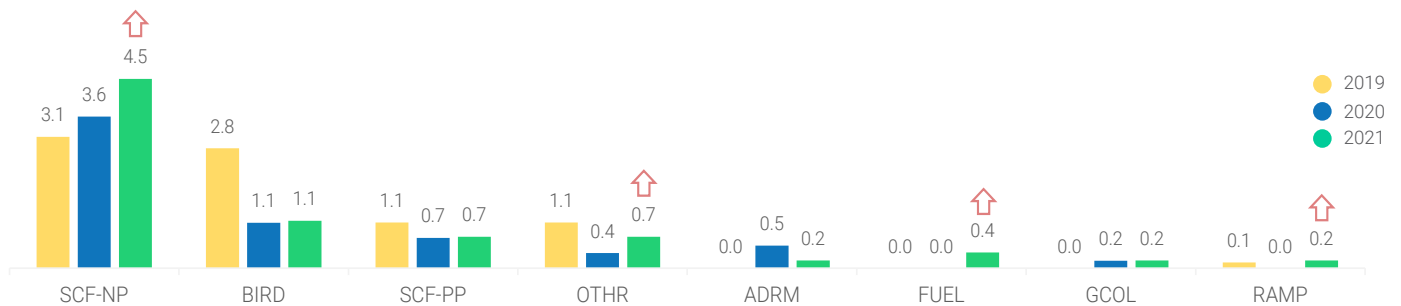


Chart 10: Rate of safety occurrences related to CAT - Helicopter Operations

## Key Safety Issues

The operational safety issues for helicopter operations are broken down further by key safety issues to provide a deeper understanding of the events involved in the reports are shown in chart 11.

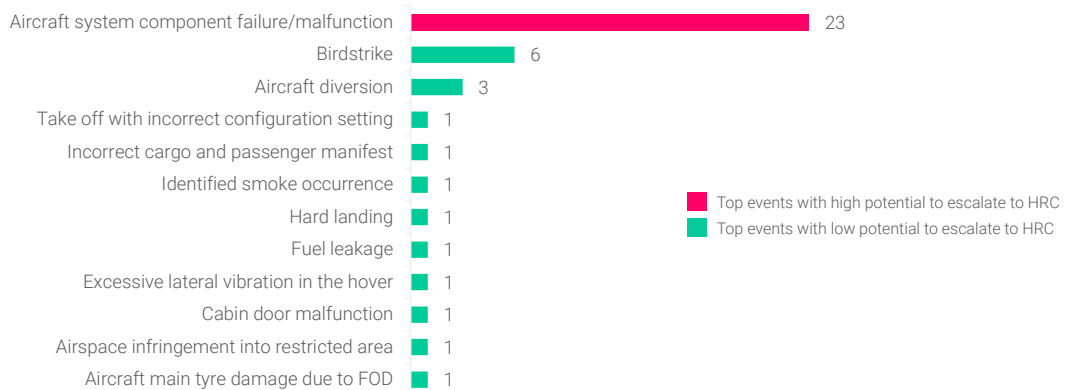


Chart 11: Number of key safety issues related to CAT - Helicopter Operations





This section addresses the operational safety issues raised during general aviation operations. The total of occurrences during 2021 by occurrence categories is shown in chart 12 which shows an increase in occurrences being reported compared to 2019-2021. The most frequent occurrences categories reported in 2021 were System/Component Failure or Malfunction (Non-Powerplant) (SCF-NP), Navigation Error (NAV), Wildlife (WILD) and System/Component Failure or Malfunction (Powerplant) (SCF-PP) respectively.

However, the highest severity occurrence was a fatal ground collision accident that occurred after sunset during VFR operation. A safety bulletin reminding the requirements for VFR operations at night will be published by CAAT.

## Occurrences Classification

Rate per 1,000 flight movements

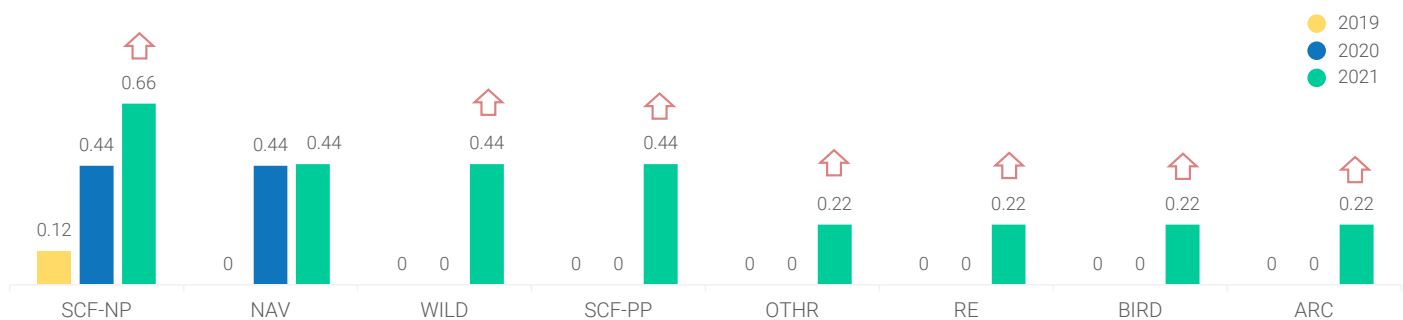


Chart 12: Rate of safety occurrences related to General Aviation Operations

## Key Safety Issues

The operational safety issues for general aviation are broken down further by key safety issues to provide a deeper understanding of the events involved in the report are shown in chart 13.

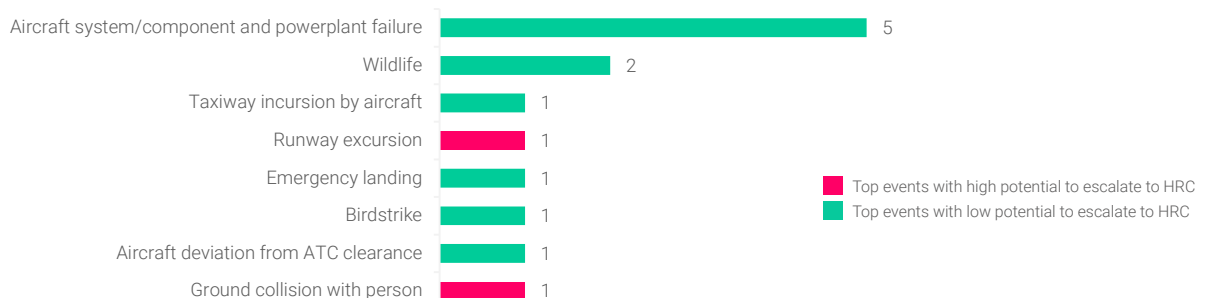


Chart 13: Number of key safety issues related to General Aviation Operations



# Approved Training Organisations



This section addresses the operational safety issues raised during Approved Training Organisation (ATO) operations. The number of occurrences received between 2019-2021 by occurrence categories is shown in chart 14 which shows an increase in occurrences being reported compared to 2019-2021. The most frequent occurrence categories reported in 2021 were Birdstrike (BIRD), System/Component Failure or Malfunction (Non-Powerplant) (SCF-NP), and System/Component Failure or Malfunction (Powerplant) (SCF-PP).

## Occurrences Classification

Rate per 10,000 flight movements

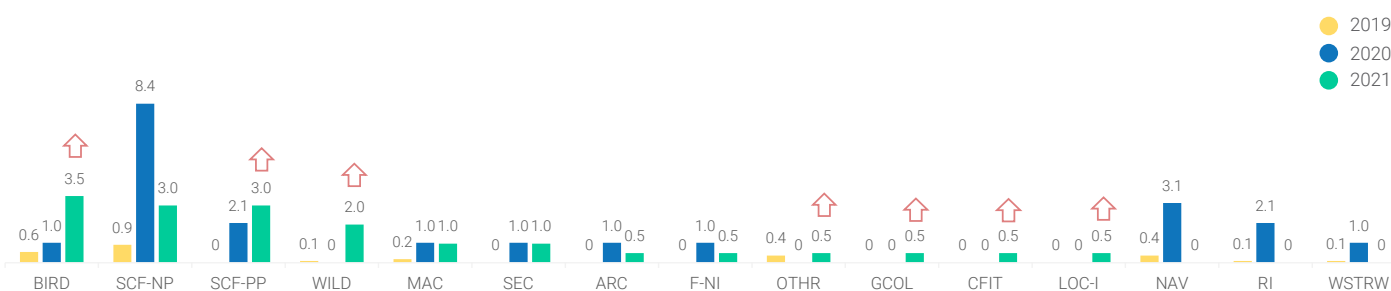


Chart 14: Rate of safety occurrences related to ATO's activities

## Key Safety Issues

The operational safety issues for approved training organisations are broken down further by key safety issues to provide a deeper understanding of the events involved in the reports are shown in chart 15.

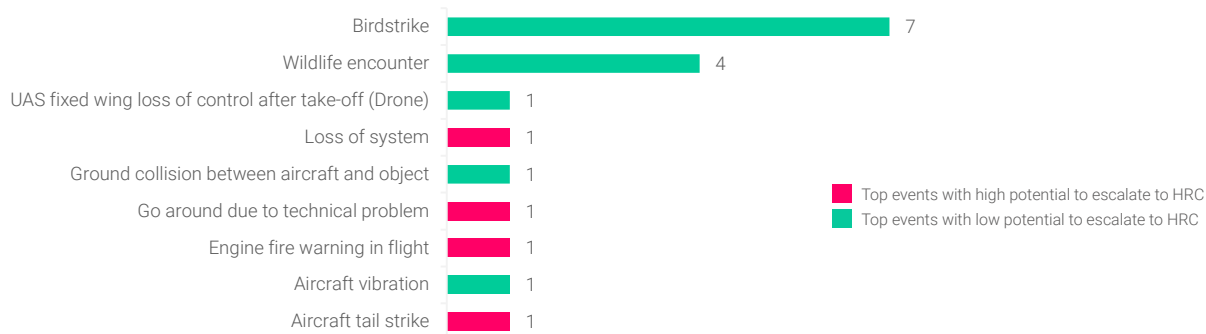


Chart 15: Number of key safety issues related to ATO's activities

# Air Navigation Service Providers

This section addresses the occurrences related to Air Navigation Services. This includes occurrences of domestic and overfly flights in Thailand airspace (BKK FIR). The number of occurrences received between 2019-2021 by occurrence categories is shown in chart 16. The most frequent occurrence categories were Mid-Air Collision (MAC), Navigation Error (NAV) and Runway Incursion (RI). Most of the Mid-Air Collision related occurrences are linked to interference with the aircraft by sky lanterns. These often occur in north of Thailand during the sky lantern festival between November and December. Most Navigation Error occurrences are linked to taxiway incursions by aircraft. Most Runway Incursion occurrences are linked to runway incursion by vehicle which result of non-compliance with airside driving rules.

## Occurrences Classification

Rate per 100,000 flight movements in BKK FIR

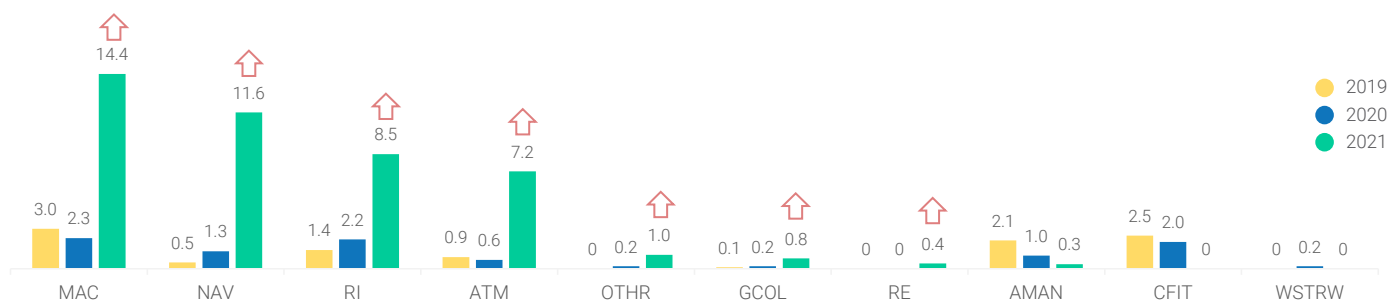


Chart 16: Rate of safety occurrences related to Air Navigation Services

## Key Safety Issues

When the occurrence reports are broken down further by key safety issues, this provides a deeper understanding of the events involved in the reports. The number of key safety issues related to Air Navigation Services are shown in chart 17.

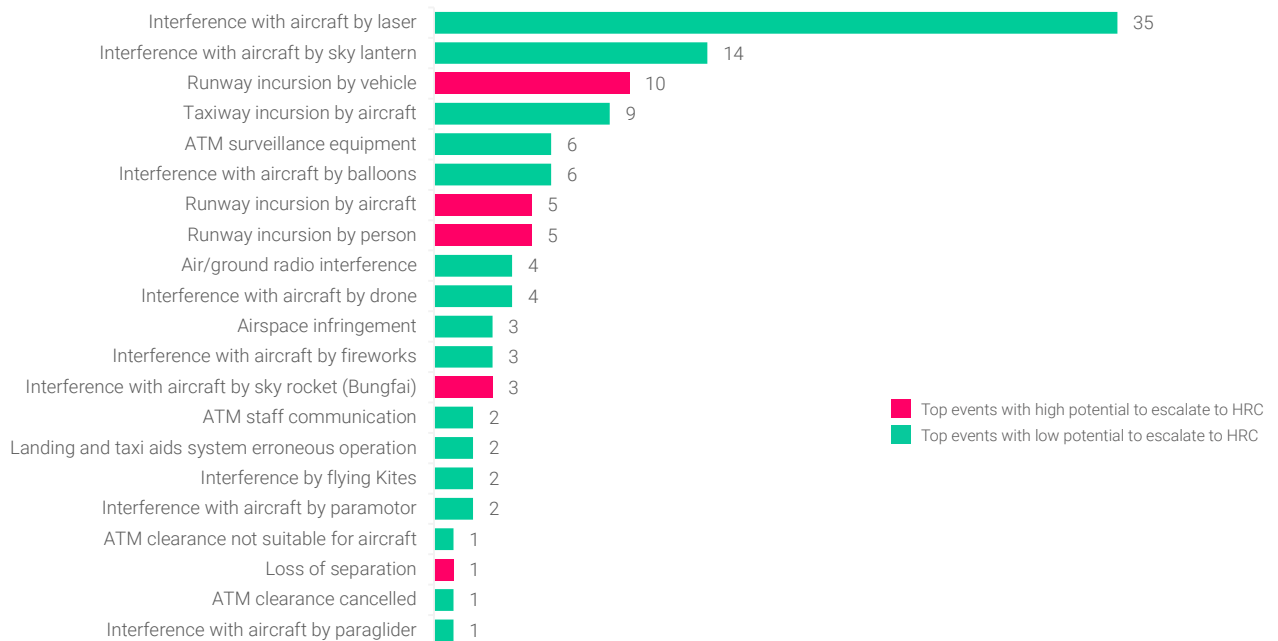


Chart 17: Number of key safety issues related to Air Navigation Services

The most significant safety issues that Air Navigation Service Providers (ANSPs) should focus on are runway incursions by aircraft and vehicles as well as taxiway incursions by aircraft. These key safety issues have the potential to result in ground collision accidents with a high number of fatalities.

Most runway incursions by vehicle events occurred at the same location where the runway is under maintenance. Drivers of construction vehicle do not comply with the ATC instructions before crossing or entering the runway. This can result in an aircraft go around or sudden maneuvering to avoid the vehicle which could lead to an accident. The aerodrome operator is responsible for managing the construction activities including how construction workers access the airside area.

Most taxiway incursions by aircraft occur because the pilot is not familiar with the aerodrome layout and does not comply with the procedures addressed in Electronic Aeronautical Information Publication (e-AIP) Thailand. ATC should provide clear and unambiguous instructions to pilots. However, it is the responsibility of pilots to familiarise themselves with the aerodrome layout as part of the flight planning and crew briefings.

# Aerodrome Operators

This section addresses the operational safety issues that arose during aerodrome operations. The rate of safety occurrences reported between 2019-2021 by occurrence categories is shown in chart 18.

## Occurrences Classification

Rate per 10,000 aircraft movements

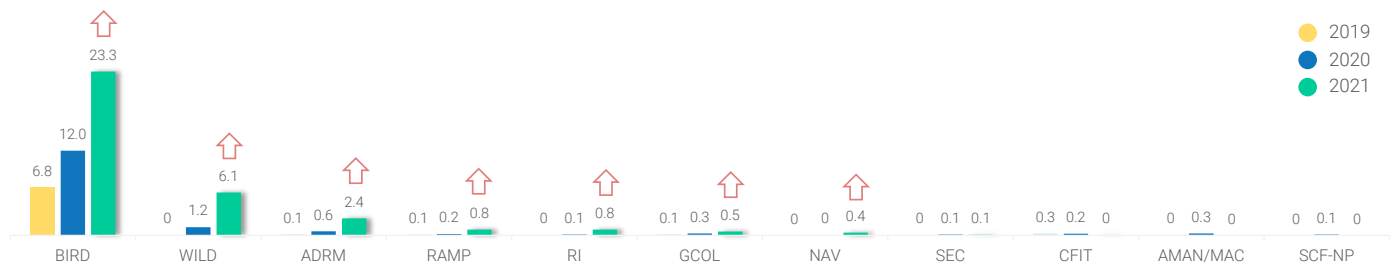


Chart 18: Rate of safety occurrences related to Aerodrome Operations

## Key Safety Issues

The operational safety issues are broken down further to provide intensive understanding of the occurrence involved in the aerodrome operations. The highest frequency operational safety risks are Birdstrikes followed by Wildlife issues, Interference with aircraft by airborne object and laser issues, FOD issues and Ground vehicle operation issues respectively.

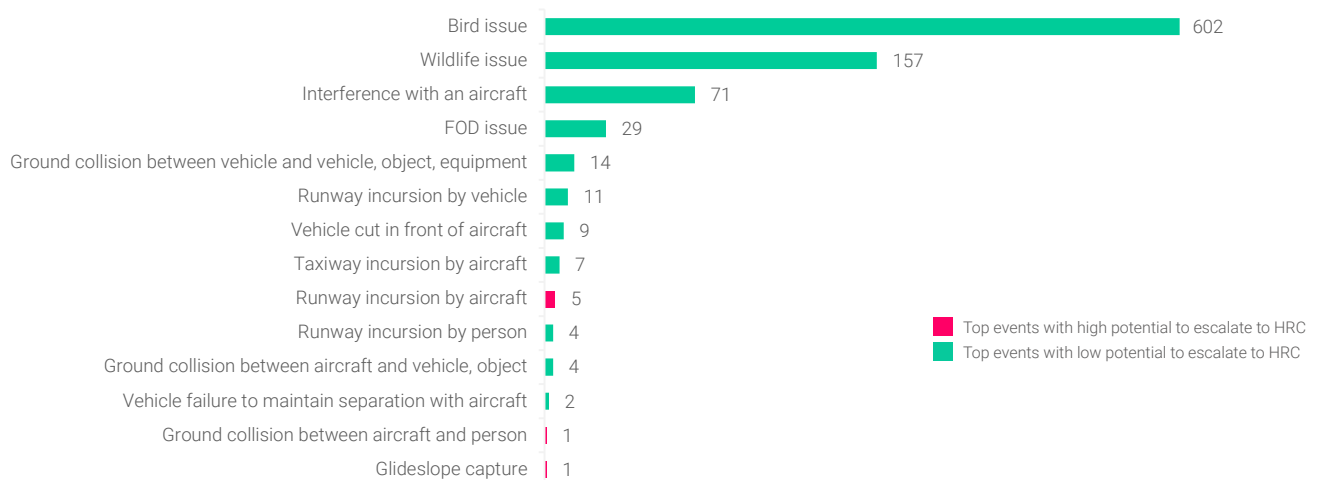


Chart 19: Number of key safety issues related to Aerodrome Operations

Most runway incursions by vehicle events occurred at the same location where the runway is under maintenance. Driver of construction vehicle do not comply with airside driving rules before crossing or entering the runway. This can result in an aircraft go around or sudden maneuvering to avoid the vehicle which could lead to an accident. The aerodrome operator is responsible for managing the construction activities.

In addition, chart 20 addresses that even though most of these occurrences are precursor events to low consequence incidents. Some occurrences may lead to fatal accidents, the Interference with aircraft by airborne object, Runway incursions by aircraft and vehicles although relatively low in number have the greatest potential to result in fatal accidents.

Moreover, there was a fatal ground collision accident involving GA operation at temporary take-off and landing area. CAAT is utterly concerned regarding this accident, leading to irreplaceable casualties. CAAT remains firmly committed to ensure aviation safety and as a result, is currently in the development process of a safety bulletin to ensure that this kind of accident is not reoccurred.

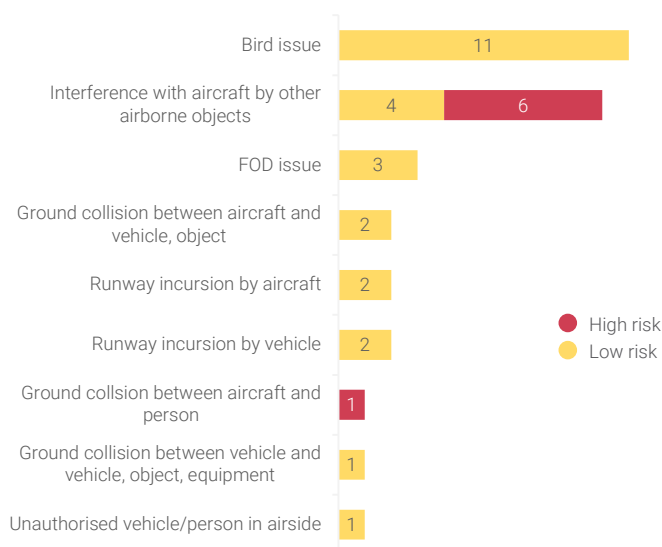


Chart 20: Number of high-risk occurrences by event type

## 1. Bird/wildlife

The number of bird and wildlife issues has been increasing from 2019 as a result of the COVID-19 pandemic with reduced aviation activity that has led to wildlife encroaching into airside areas.

Moreover, The increase of bird and wildlife occurrences at aerodrome or around aerodrome vicinity are likely to be as a result of:

- Grassland and grass management at or close to the aerodrome;
- Food sources and surrounding water sources around the aerodrome;
- Weeds, bushes and trees which offer attractive shelter;
- Bird overflying the aerodrome or its approaches; and
- Incomplete perimeter fence resulting into wildlife roaming into the airside area.

In addition, another primary latent factor leading to animal intruding into airside area is joint-use aerodrome between military and civil operations which includes the loose house dogs and cats from the military-base area. It was addressed by the NCASB that the risk control measures are required in order to reduce the likelihood of occurrences. However, the coordination between the civil and military will be crucial in reducing the safety risks of wildlife occurrences.

Further to that, the following preventive and corrective actions should be taken into account so as to reduce the number of bird/wildlife strike occurrences:

- Removing food sources such as open garbage bins;
- Controlling weeds, bushes and trees which offer attractive shelter;
- Maintaining an appropriate grass height;
- Covering ponds and other water sources with netting to keep away birds and reptiles;
- Implementing wildlife management programmes; and
- Maintenance of perimeter fences.

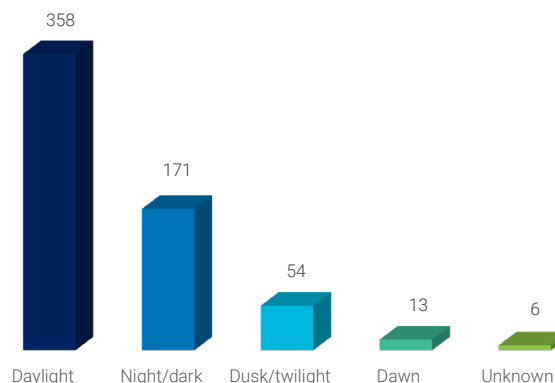


Chart 21: Number of birdstrike occurrences by light condition

## Rate of birdstrike occurrences by aerodrome

Rate per 1,000 aircraft movements

The aerodrome shown in the table below are the top 10 aerodrome that have the highest rates of birdstrike occurrences in 2021.

| Aerodrome                               | 2019 | 2020 | 2021 | Trend |
|---|------|------|------|-------|
| VTPH (HHQ): Prachuap Khiri Khan/Hua Hin | 8.5  | 2.9  | 46.2 | ↑     |
| VTPO (THS): Sukhothai                   | 2.3  | 1.7  | 13.5 | ↑     |
| VTBO (TDX): Trat                        | 0.4  | 1.1  | 11.5 | ↑     |
| VTSR (UNN): Ranong                      | 1.4  | 1.5  | 5.7  | ↑     |
| VTST (TST): Trang                       | 0.7  | 1.3  | 4.9  | ↑     |
| VTPP (PHS): Phitsanulok                 | 2.3  | 2.6  | 4.7  | ↑     |
| VTBU (UTP): Rayong/U-tapao              | 0.4  | 0.6  | 3.0  | ↑     |
| VTBS (BKK): Suvarnabhumi Bangkok/Intl   | 0.7  | 2.0  | 2.7  | ↑     |
| VTUK (KKC): Khon kaen                   | 1.0  | 0.5  | 2.6  | ↑     |
| VTUI (SNO): Sakhon Nakhon/Bankhai       | 0.3  | 2.8  | 2.5  | ↓     |



Table 2: Rate of birdstrike occurrences by aerodrome

## Rate of wildlife occurrences by aerodrome

Rate per 1,000 aircraft movements

The aerodrome shown in the table below are the top 10 aerodrome that have the highest rate of wildlife occurrences in 2021.

| Aerodrome                               | 2019 | 2020 | 2021 | Trend |
|---|------|------|------|-------|
| VTPH (HHQ): Prachuap Khiri Khan/Hua Hin | 1.2  | 0.0  | 17.3 | ↑     |
| VTUD (UTH): Udon thani                  | 0.0  | 1.0  | 6.0  | ↑     |
| VTUL (LOE): Loei                        | 0.4  | 0.0  | 3.6  | ↑     |
| VTUV (ROI): Roi et                      | 0.0  | 1.1  | 3.1  | ↑     |
| VTSC (NAW): Narathiwat                  | 0.0  | 0.8  | 2.8  | ↑     |
| VTUO (BFV): Buriram                     | 0.0  | 0.0  | 2.6  | ↑     |
| VTUW (KOP): Nakhon Phanom               | 0.0  | 0.0  | 2.3  | ↑     |
| VTUI (SNO): Sakhon Nakhon/Bankhai       | 0.0  | 0.8  | 1.7  | ↑     |
| VTBD (DMK): Don Mueang/Intl             | 0.0  | 0.1  | 1.2  | ↑     |
| VTST (TST): Trang                       | 0.0  | 0.5  | 1.1  | ↑     |

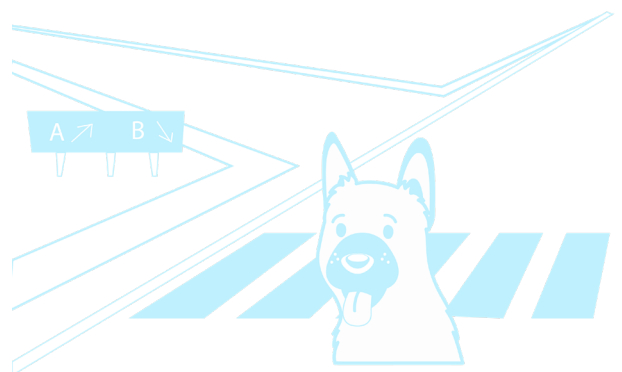


Table 3: Rate of wildlife occurrences by aerodrome



## 2. Interference with an aircraft

Refer to chart 5 for CAT operators, most of these occurrences are related to the release of sky lantern in northern Thailand. These occur during the sky lantern festival between November and December.

The following events are related to sky rocket (Bungfai) releasing in Northeastern of Thailand. Although these occurrences are lower in number than other safety issues, they have the highest potential to result in aircraft accidents.

CAAT has concerns about these occurrences and has been agreed by the NCASB that actions are needed to reduce the number of such occurrences. Consequently, CAAT has established a task force with the relevant domains to study best practices and develop more practical regulations and guidance.

However, it requires collaboration between CAAT and the local authorities to increase the awareness of significant safety impact caused by lasers and other airborne objects such as visual impairment of the flight crew and a collision with sky rocket (Bungfai)

In addition, so as to reduce and prevent these occurrences, if you notice either illegal usage of laser or releasing of any airborne objects,

- Contact local police as soon as possible; and
- Report to CAAT as soon as possible.

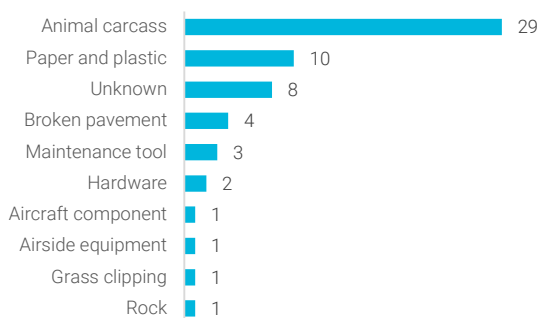


Chart 22: Number of FOD encounter occurrences by FOD type

## 3. Foreign Object Debris (FOD)

The Foreign Object Debris (FOD) is one of the key safety issues at aerodrome which can cause injury or damage to aircraft. Most FOD reported are the carcass of bird/wildlife followed by plastic, broken pavement surface, maintenance tool respectively.

FOD issues are caused by a variety of factors but primarily as a result of inadequate maintenance of objects, facilities, equipment or aircraft. Therefore, the aerodrome operators should implement a FOD management programme to promote FOD prevention to all personnel operating in the airside area. Since FOD preventive actions are the responsibility of all aerodrome users to ensure that the airside area is clear of FOD by;

- Disposing of any rubbish or loose items;
- Picking up any FOD during their activities;
- Performing daily inspections of the movement area; and
- Reporting if you notice FOD in airside area.





In addition, the largest number of FOD occurrences are found on runway followed by taxiway and apron respectively. The location of FOD on runway have the greatest potential risks to result in aircraft accidents or serious incidents while taking off or landing on runway.

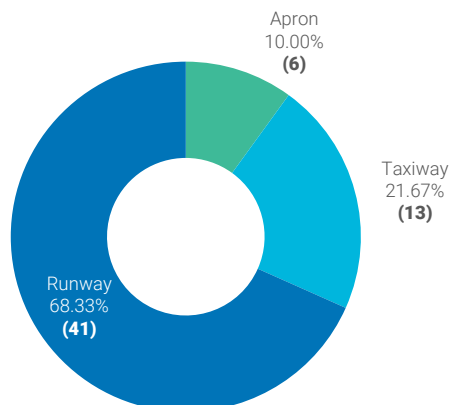


Chart 23: Number of FOD encounter occurrences by location

#### 4. Ground vehicle operation issues

Most of ground vehicle occurrences are caused by non-compliance with standard operating procedure (SOP) or with airside driving rules. The most significant risk is where drivers do not follow ATC instructions or lose situation awareness that could cause a runway/taxiway incursion or ground collision. Other occurrences could result in injury to passengers or airside staff, and damage to equipment and aircraft. The aerodrome operator has primary responsibility for developing the driver training programme, airside driving rules and to ensure these are complied with standard.

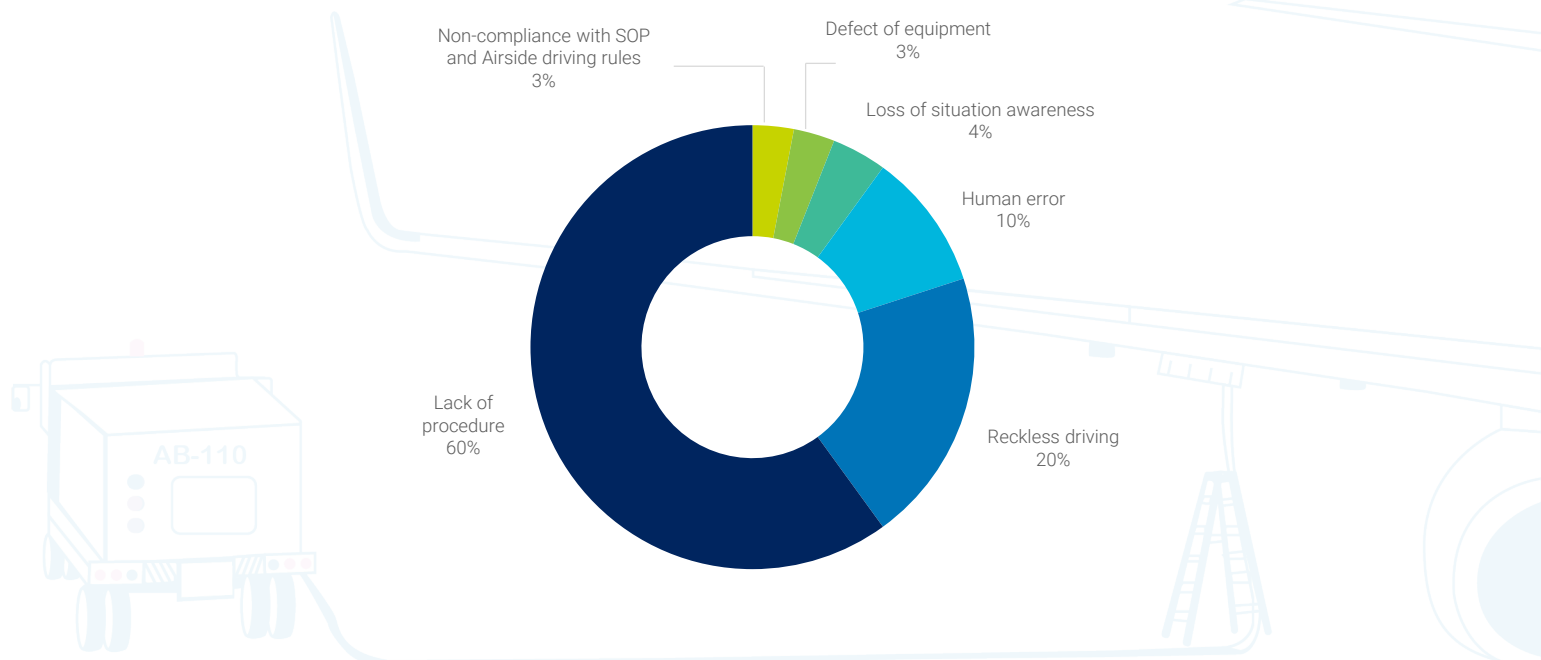


Chart 24: Number of RAMP occurrences by contributing factor



Although CAAT has no responsibility for the safety oversight of the State Aircraft, the occurrences during State aircraft operations have been voluntarily submitted to CAAT. Chart 25 shows a summary of these occurrences as they are part of the Thailand State Safety Programme and are reviewed by the National Civil Aviation Safety Board (NCASB).

## Occurrences Classification



Chart 25: Number of occurrences related to State Aircraft Operations

## Key Safety Issues

Chart 26 shows the key safety issues related to State aircraft operations. Those occurrences highlighted in red are the operations from the State aircraft that affected the civil aircraft operations. All 3 occurrences of Runway incursion by State aircraft resulted in the approaching aircraft to go around.

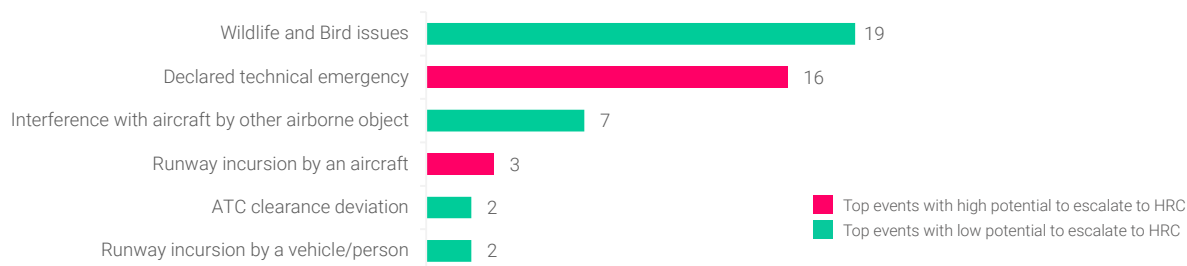


Chart 26: Number of key safety issues related to State Aircraft Operations

## List of Accidents & Serious Incidents

### 1. Thai and foreign registered aircraft involving accident/serious incident occurred within Thailand

#### ▶ Thai Registered Aircraft

| Local date | Location name | Injury level | Occurrence category | Occurrence class | Narrative text   |
|------------|---------------|--------------|---------------------|------------------|--|
| 18-Jul-21  | Samut Sakhon  | None         | LOC-G               | Serious Incident | During conducting touch-and-go on runway, the aircraft ran off the right side of the runway. |
| 28-Oct-21  | Lamphun       | Fatal        | RI                  | Accident         | The aircraft crashed into a person during landing.   |
| 20-Nov-21  | Samut Sakhon  | Minor        | SCF-PP              | Accident         | Engine lost power during flight. The aircraft landed outside the airport                     |

#### ▶ Foreign Registered Aircraft

| Local date | Location name | Injury level | Occurrence category | Occurrence class | Narrative text   |
|------------|---------------|--------------|---------------------|------------------|--|
| 15-Oct-21  | Thailand      | None         | SCF-NP              | Serious Incident | Cabin altitude warning occurred, requiring the flight crew to follow non-normal checklist which included an emergency use of oxygen. |

### 2. Thai registered aircraft involving accident/serious incident occurred outside Thailand

| Local date | Location name         | Injury level | Occurrence category | Occurrence class                                | Narrative text  |
|------------|-----------------------|--------------|---------------------|---|---|
| 28-Sep-21  | WSSS, Changi Airport  | None         | SCF-NP              | Incident investigation by TSIB, Singapore       | The aircraft had two left main landing gear tires burst during take-off. The aircraft continued its flight to Jakarta but was stranded on the taxiway after landing.                  |
| 18-Oct-21  | VOMM, Chennai Airport | None         | RI                  | On the process of coordination with DGCA, India | The aircraft was instructed to hold at holding point runway 25 on taxiway J but the aircraft entered taxiway C and crossed the holding point runway 25 which led to runway incursion. |

# List of acronyms

## A

|             |   |
|-------------|---|
| <b>AAIC</b> | Aircraft Accident Investigation Committee of Thailand |
| <b>ACAS</b> | Airborne Collision Avoidance System                   |
| <b>AIP</b>  | Aeronautical Information Publication                  |
| <b>AIR</b>  | Airworthiness and Aircraft Engineering Department     |
| <b>ANSP</b> | Air Navigation Service Provider                       |
| <b>ATA</b>  | Air Transport Association                             |
| <b>ATC</b>  | Air Traffic Controller                                |
| <b>ATO</b>  | Approved Training Organisation                        |

## C

|              |   |
|--------------|---|
| <b>CAT</b>   | Commercial Air Transport                                  |
| <b>CAAT</b>  | Civil Aviation Authority of Thailand                      |
| <b>CAOs</b>  | Civil Aviation Organisations                              |
| <b>CICTT</b> | Commercial Aviation Safety Team/ICAO Common Taxonomy Team |
| <b>CRM</b>   | Crew Resource Management                                  |

## E

|              |   |
|--------------|---|
| <b>e-AIP</b> | Electronic Aeronautical Information Publication |
|--------------|---|

## F

|            |                           |
|------------|---------------------------|
| <b>FIR</b> | Flight Information Region |
| <b>FMS</b> | Flight Management System  |
| <b>FOD</b> | Foreign Object Debris     |

## G

|             |                                 |
|-------------|---------------------------------|
| <b>GA</b>   | General Aviation                |
| <b>GASP</b> | Global Aviation Safety Plan     |
| <b>GPWS</b> | Ground Proximity Warning System |

## H

|             |                      |
|-------------|----------------------|
| <b>HRCs</b> | High-Risk Categories |
|-------------|----------------------|

## I

|             |   |
|-------------|---|
| <b>ICAO</b> | International Civil Aviation Organisation |
|-------------|---|

## M

|             |                         |
|-------------|-------------------------|
| <b>MTOW</b> | Maximum Take Off Weight |
|-------------|-------------------------|

## N

|              |                                      |
|--------------|--------------------------------------|
| <b>NCASB</b> | National Civil Aviation Safety Board |
|--------------|--------------------------------------|

## O

|            |                                 |
|------------|---------------------------------|
| <b>OEM</b> | Original Equipment Manufacturer |
|------------|---------------------------------|

## S

|            |   |
|------------|---|
| <b>SKP</b> | Safety Key Personnel                                      |
| <b>SMO</b> | Aviation Safety Management and Standards Assurance Office |
| <b>SMS</b> | Safety Management System                                  |
| <b>SOP</b> | Standard Operating Procedure                              |
| <b>SSP</b> | State Safety Programme                                    |

## T

|                |  |
|----------------|--|
| <b>TASAP</b>   | Thailand Aviation Safety Action Plan                     |
| <b>TAWS</b>    | Terrain Avoidance Warning System                         |
| <b>TCAS TA</b> | Traffic Collision Avoidance System – Traffic Advisory    |
| <b>TCAS RA</b> | Traffic Collision Avoidance System – Resolution Advisory |

## V

|            |                    |
|------------|--------------------|
| <b>VFR</b> | Visual Flight Rule |
|------------|--------------------|

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