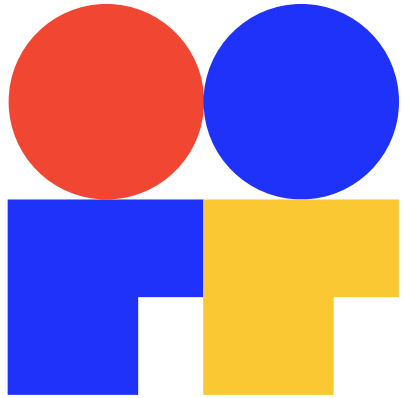
Analysis Loss of Control Inflight (LOC-I) Accidents

Presented by Blessing Kavai
Assistant Director Safety & Flight Operations-Africa & Middle East

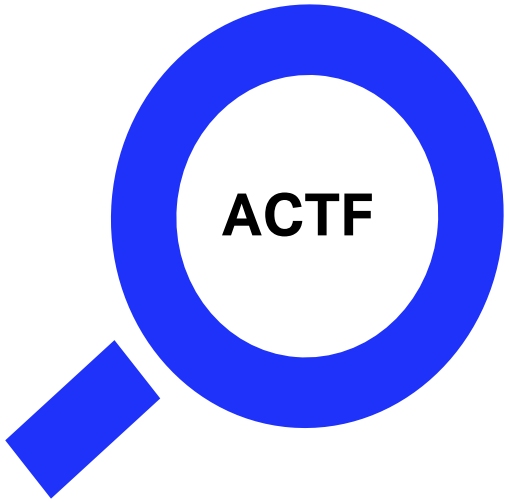
IATA Accident Classification Task Force

The ACTF is….

- Worldwide Safety Group with expert representation from:
  - Manufacturers
  - Airlines
  - Pilots Associations
  - Data Service providers
  - Equipment manufacturers, and
  - IATA
- Responsible, to IATA, for classifying accidents
- Charged with developing refined safety metrics and recommendations



IATA ACTF



How does the ACTF do its work?

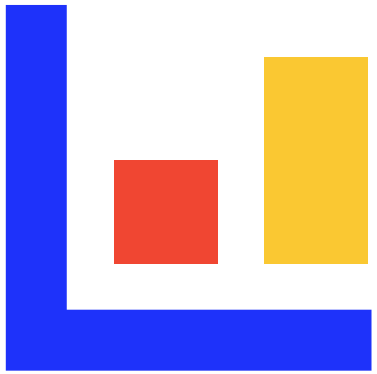
- Accident classification is based on
  - Threat and Error Management (TEM) taxonomy
  - Expert opinion
  - Use of assumptions
  - Processing the data
- Metrics and recommendations

- For a full list of TEM – refer to Safety Report 57th edition

Safety Performance

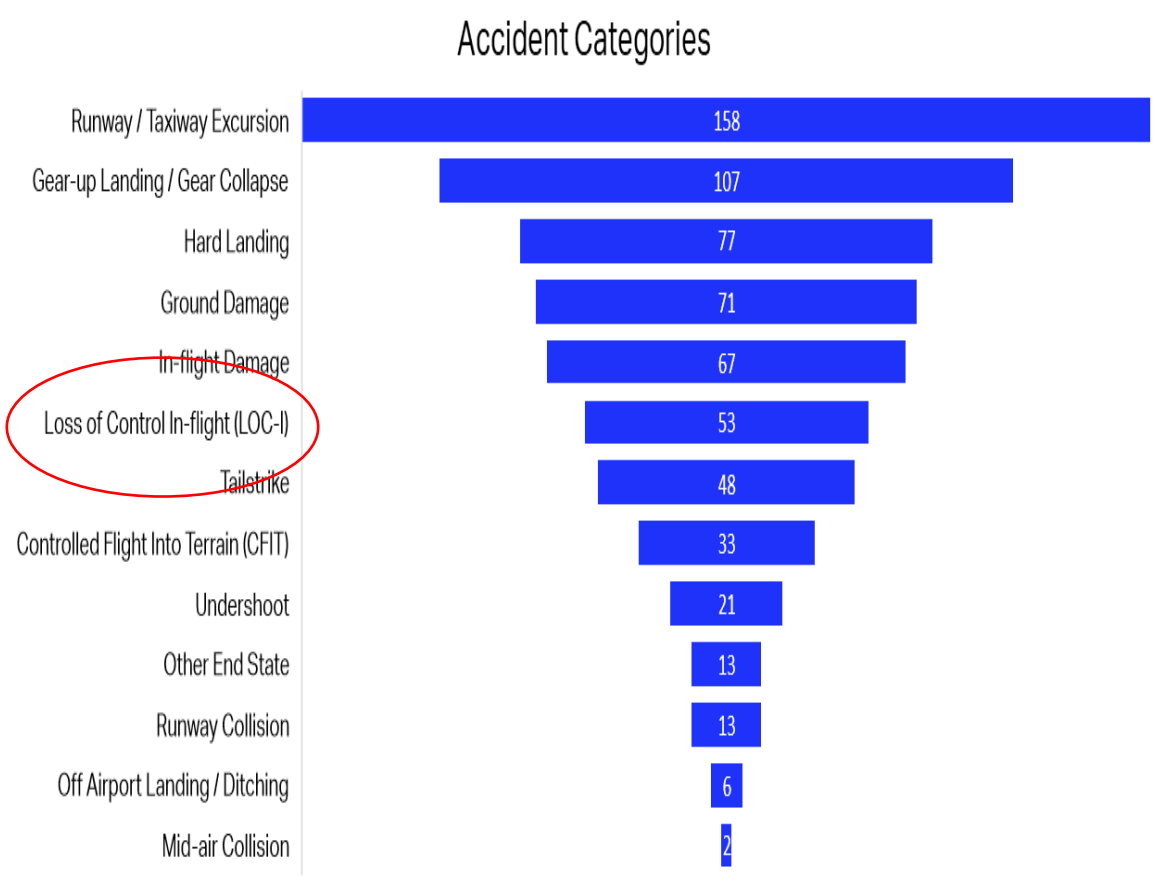
Review where safety performance is today compared with last 10 years

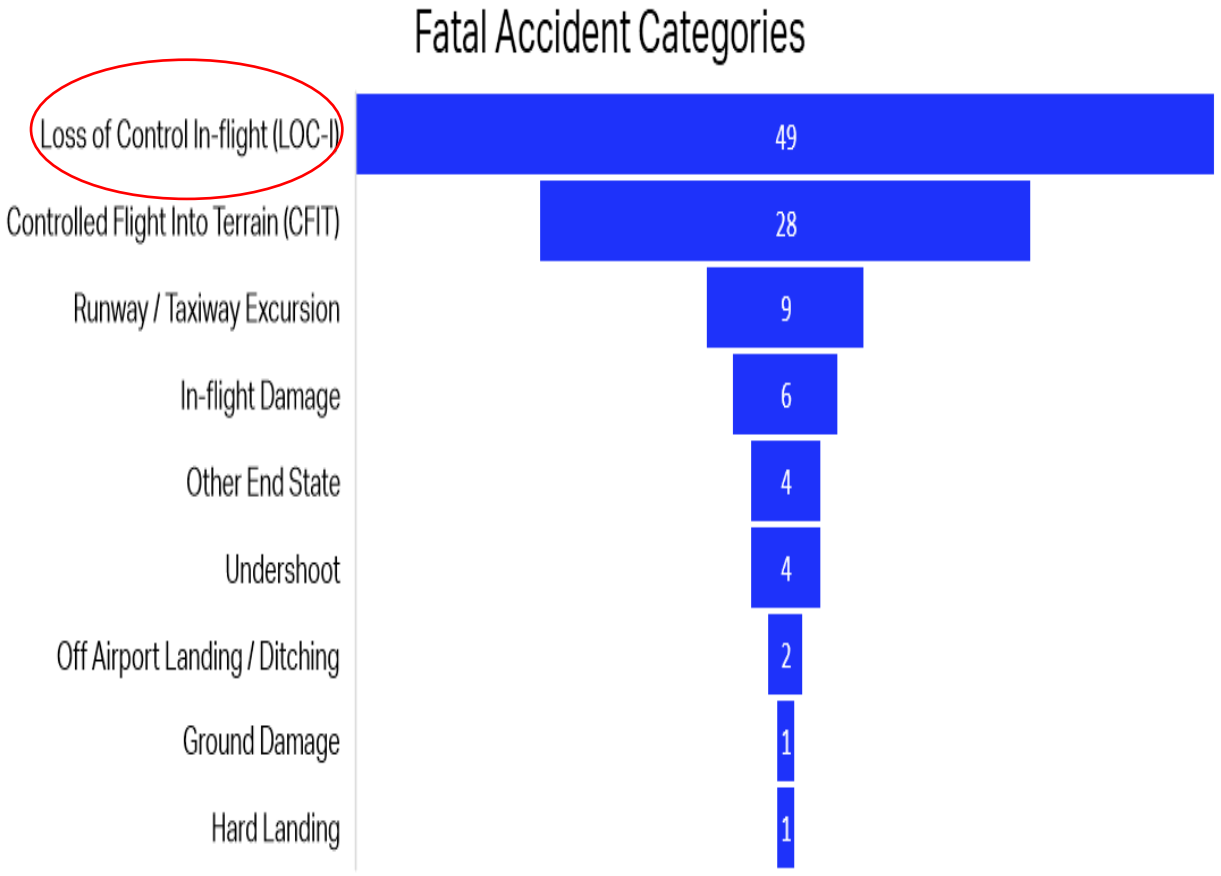
- Data analyzed from 2011-Half Year (HY) 2021 is used in this presentation
  - Data source: Global Aviation Data Management Accident Database eXchnage (GADM ADX)
- Loss of control inflight (LOC-I) and Controlled flight into terrain (CFIT) accidents continue to be the main source of fatal accidents
- This presentation focuses on analysis of LOC-I accidents from
  - Global perspective
  - AFI based operators



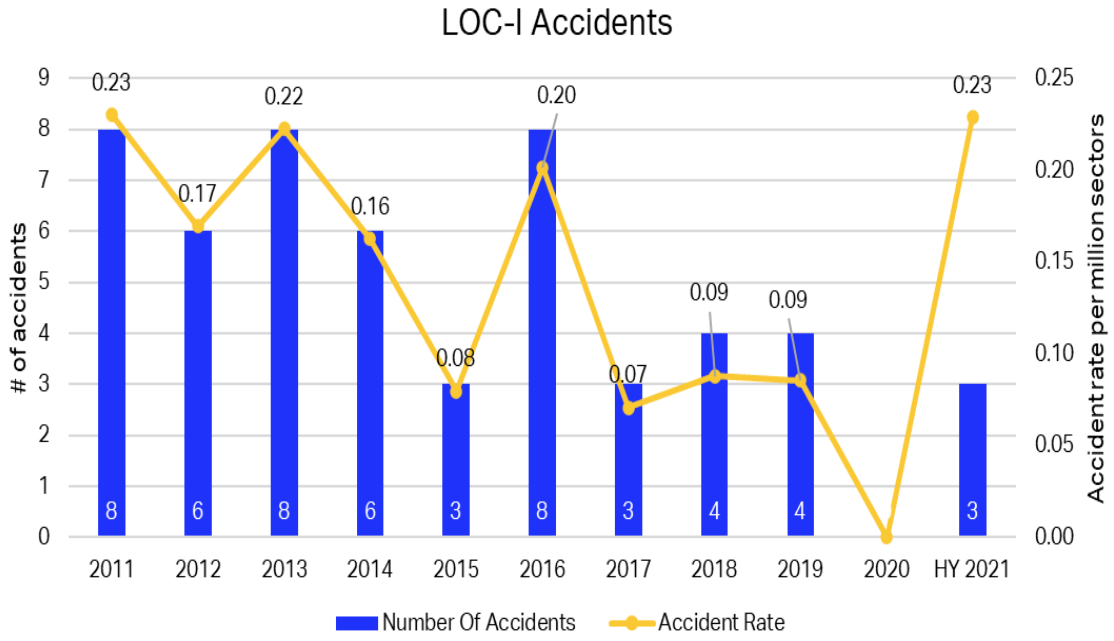
Accident Categories

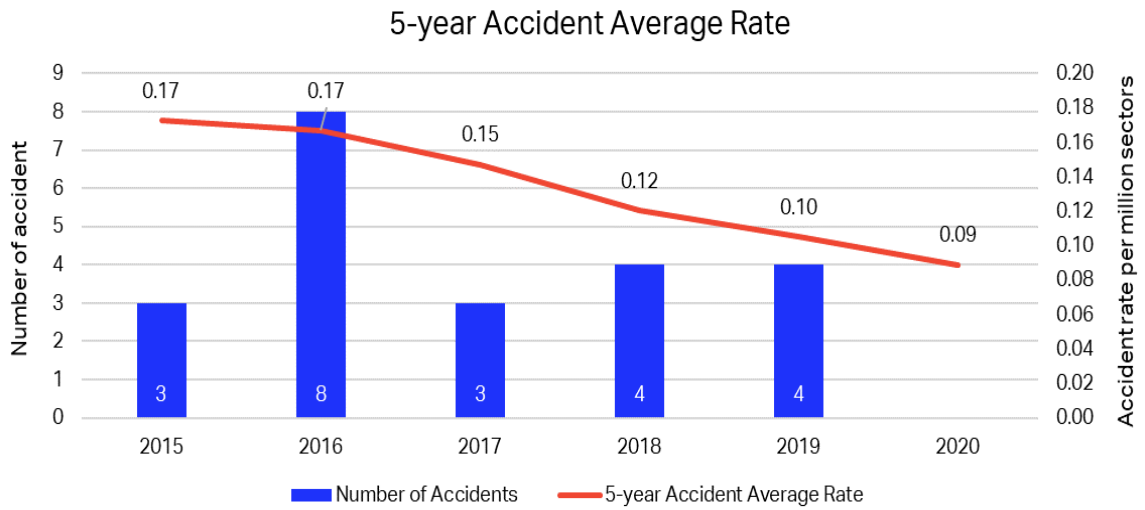
Accident Data: 2011-HY2021





LOC-I Accidents - 5-Year Rolling Average





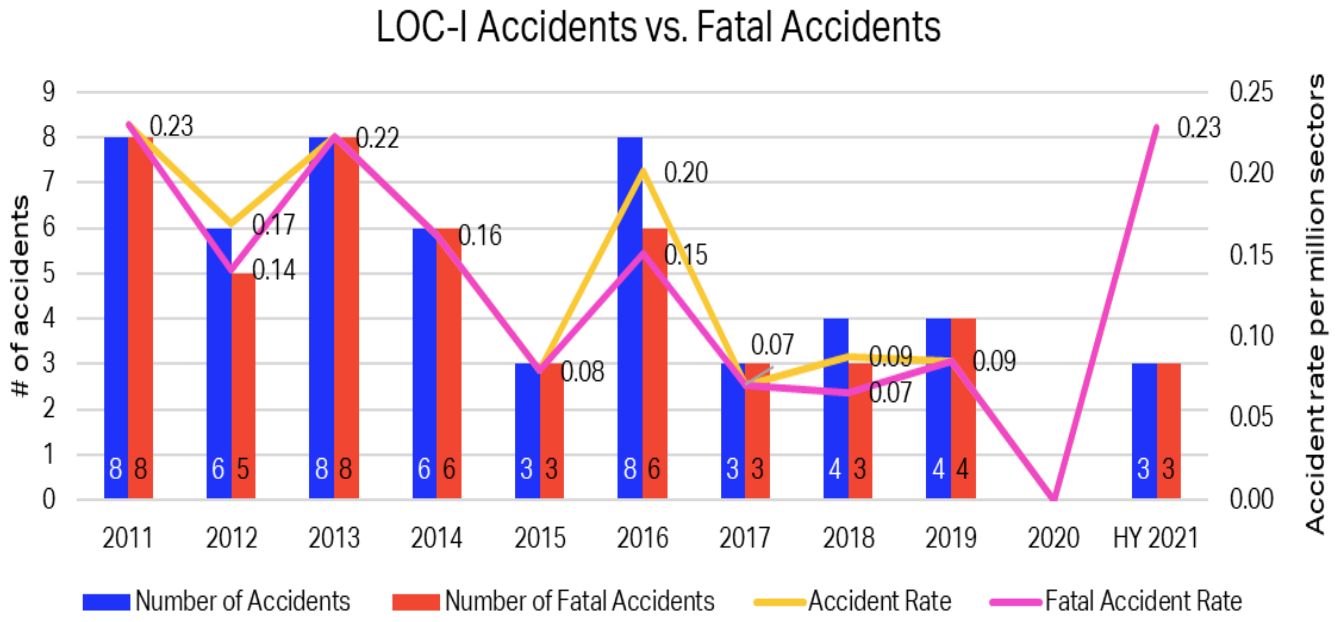
- 53 accidents from 2011-HY 2021
- 49 of which were fatal, resulting in 1,858 fatalities
- Zero LOC-I accidents in 2020
- 10 involved IATA members and 14 involved IOSA registered operators
- 36 operated on passenger flights and 16 on cargo flights

- Positive improvement if we look at the 5-year rolling average accident rate

- Insufficient data detracts from accurate safety analysis!
  - Need to encourage better data provision

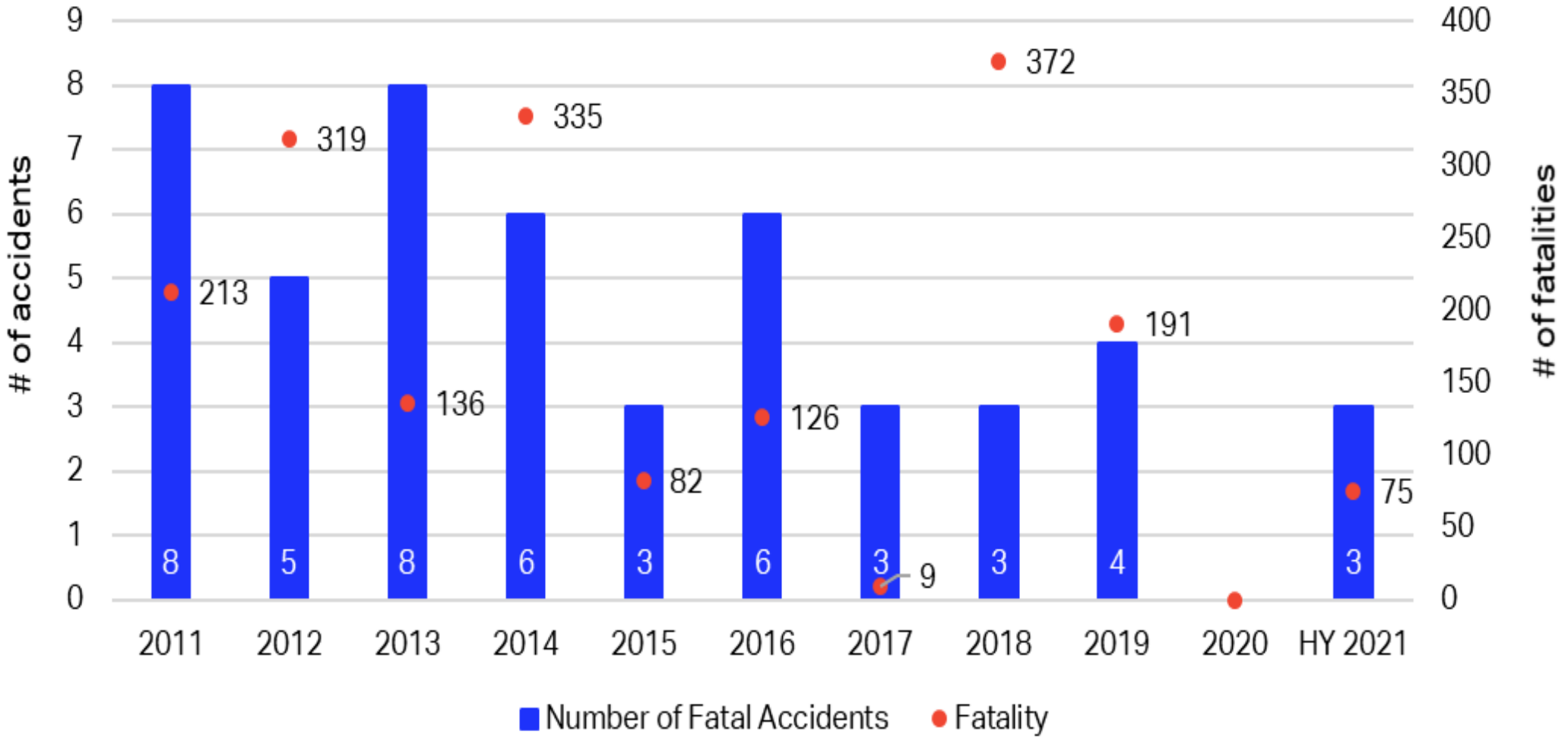
- 7 accidents (13%) could not be classified due to insufficient data

LOC-I Accidents vs. Fatal Accidents



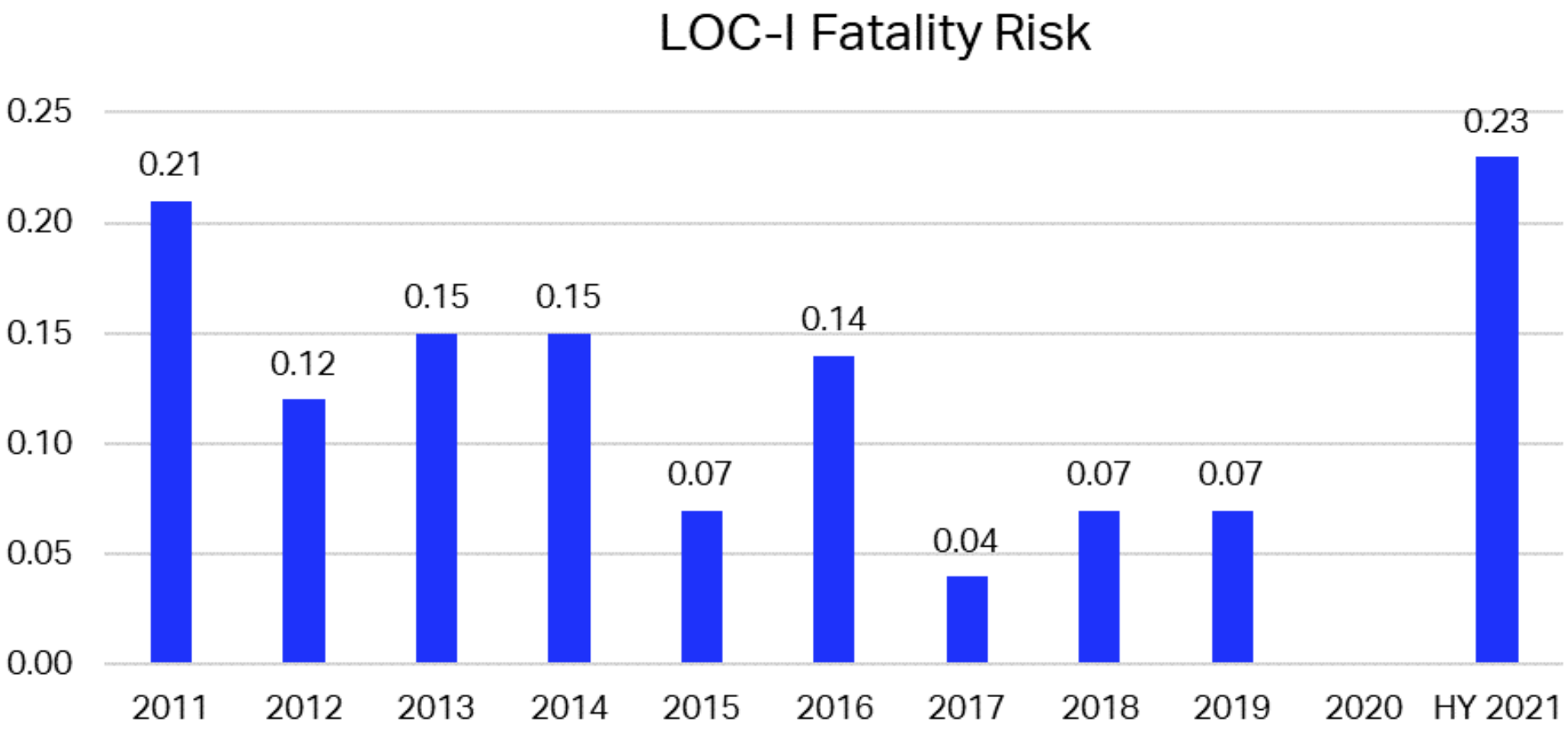
- All LOC-I accidents occurring in 2011, 2013, 2014, 2015, 2017, 2019 and HY2021 were fatal accidents
- There were zero LOC-I accidents in 2020
- In the first half year 2021, there were three fatal LOC-I accidents

LOC-I Fatal Accidents & Fatalities



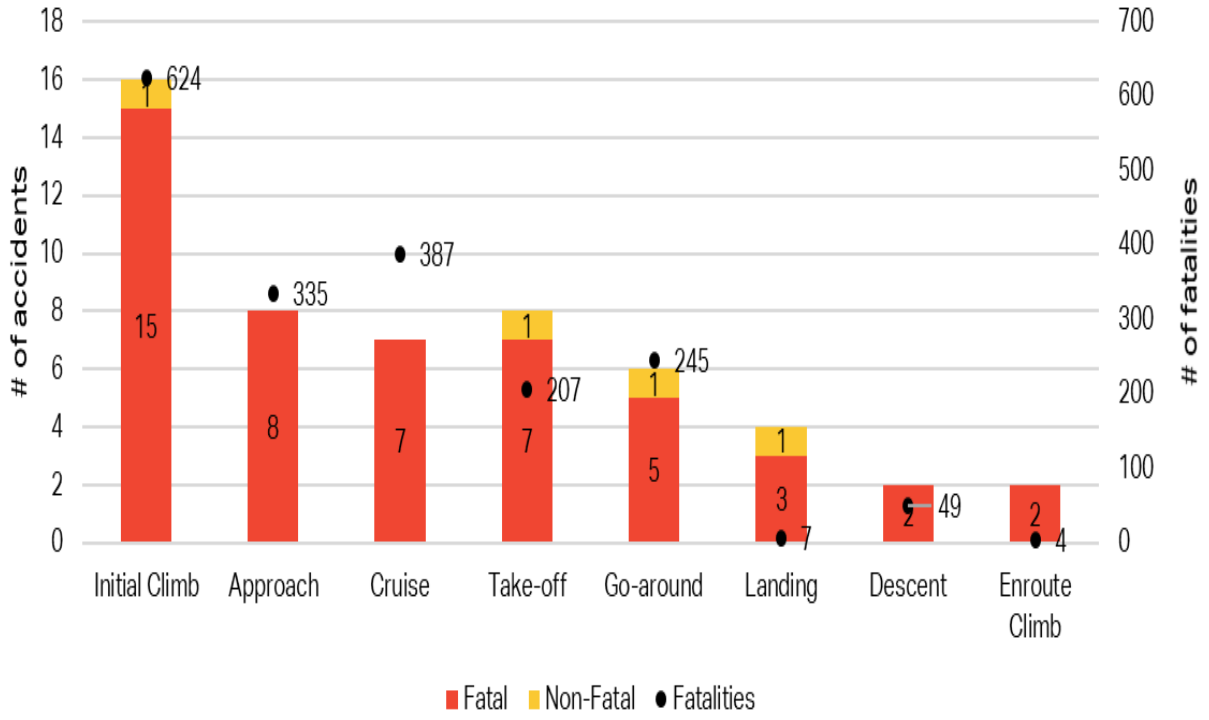
LOC-I Fatality Risk

Accident Data: 2011-HY2021

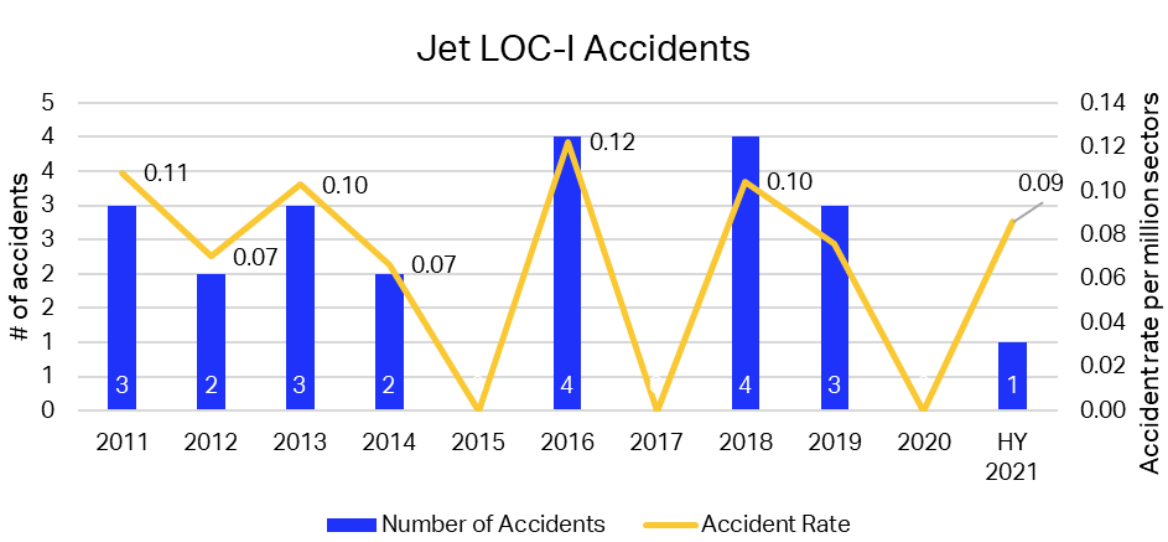


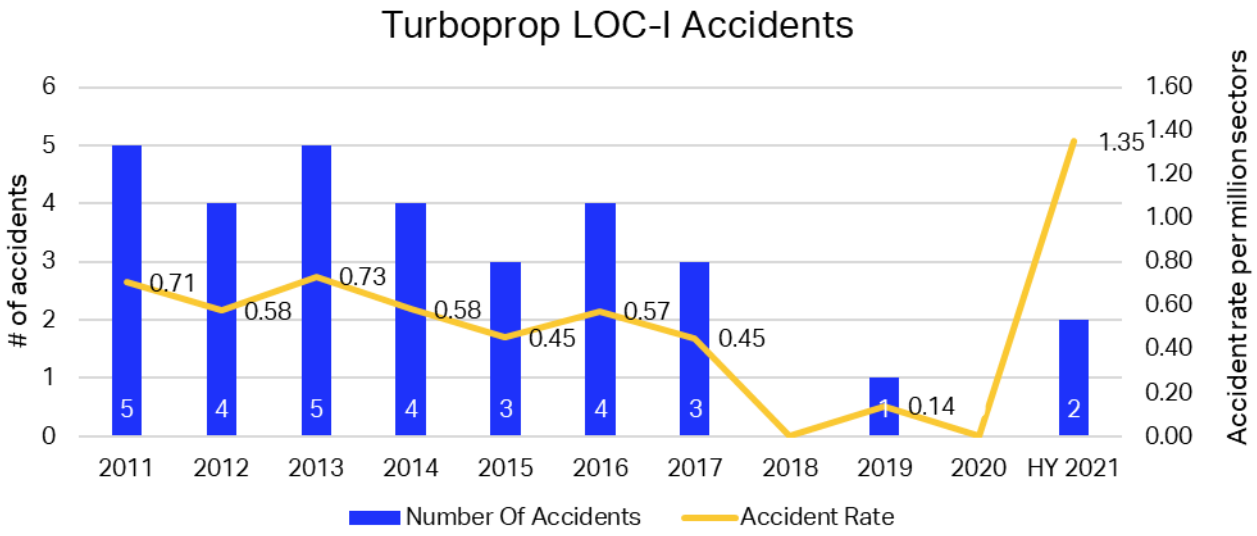
LOC-I by Flight Regime
Accident Data: 2011-HY2021

- Fatalities were identified in LOC-I accidents that occurred at the initial climb, approach, cruise, takeoff, go-around, landing, descent and en route climb
- Initial Climb incurred the highest fatal accidents and fatalities
- 9 LOC-I fatal accidents involved IATA members and 12 involved IOSA carriers
- 32 LOC-I fatal accidents involved passenger flights and 16 cargo flights



LOC-I Accidents

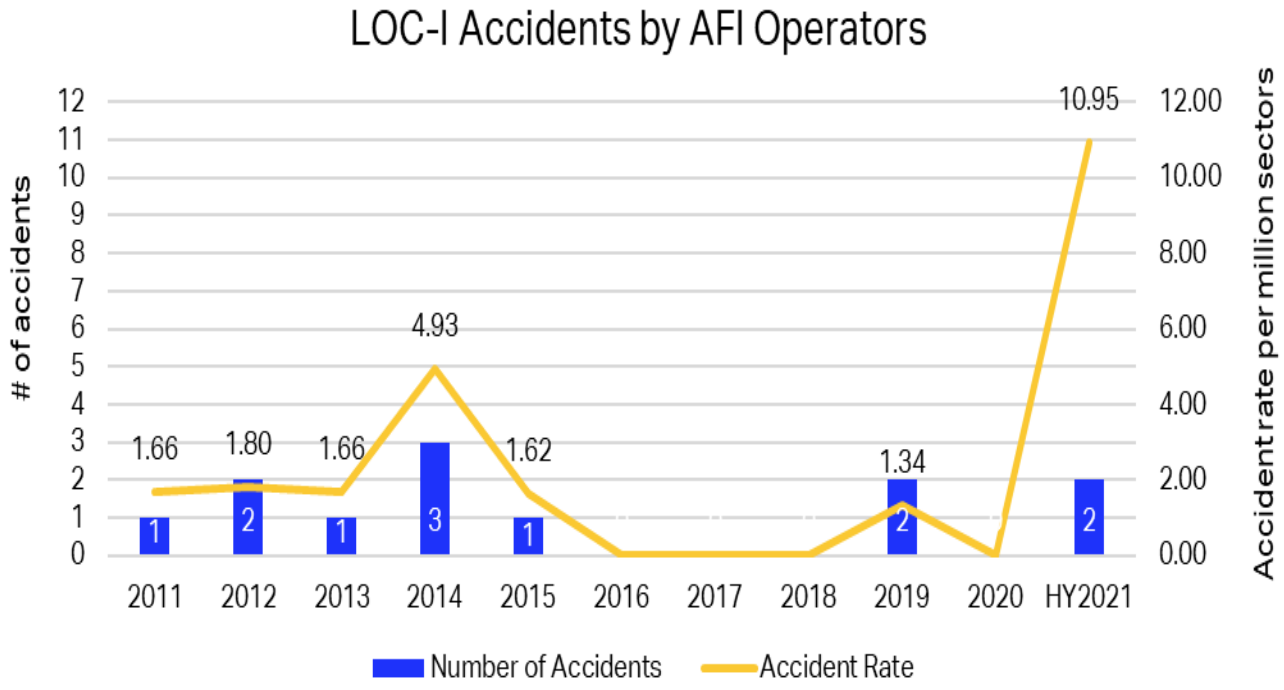




- 22 of LOC-I accidents involved jet flights
- 20 accidents were fatal, resulting in 1,447 fatalities
- 7 of which were IATA members and 10 IOSA carriers
- 4 of which were cargo flights and 18 Passenger flights

- 31 of LOC-I accidents involved turboprop fleet
- 29 accidents were fatal, resulting in 411 fatalities
- 3 of which were IATA members and 4 IOSA carriers
- 12 of which were cargo flights and 18 Passenger flights

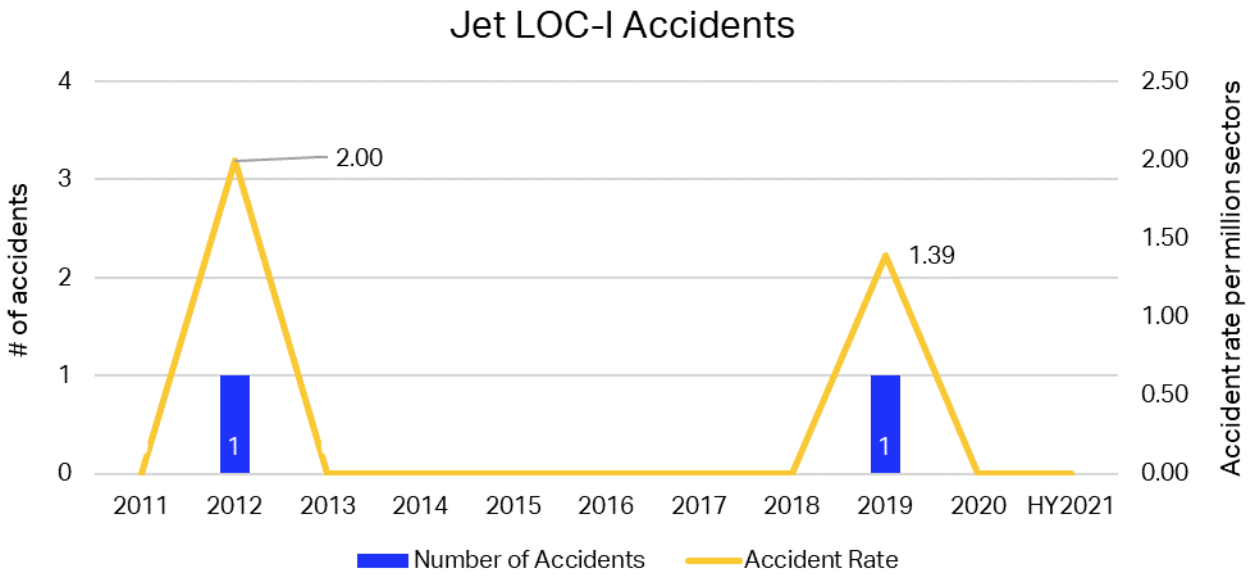
LOC-I Accidents – Operators based in Africa

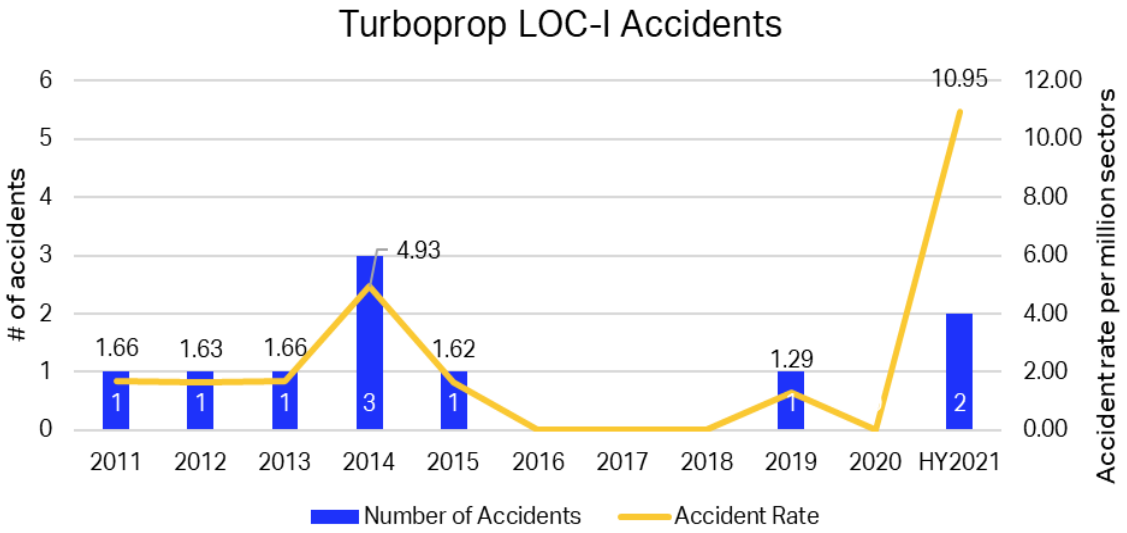


Note: 3 accidents could not be classified due to insufficient information

- 23% (12) of LOC-I accidents involved AFI Operators
- All 12 accidents were fatal, resulting in 411 fatalities
- Looking at the phase of flight, initial climb had the highest accident with 50% (6) of the accidents, resulting in 226 fatalities
- 1 of which was an IATA member and 1 an IOSA carrier
- 5 of which were cargo flights and 6 Passenger flights

LOC-I Accidents – Operators based in Africa





- 17% (2) of LOC-I accidents involved jet passenger flights
- The two accidents were fatal, resulting in 310 fatalities

- 83% (10) of LOC-I accidents involved turboprop fleet
- All 10 accidents were fatal, resulting in 101 fatalities
- They were neither IATA members nor IOSA Carriers
- 5 of which were cargo flights and 4 Passenger flights

Threat and Error Management (TEM)

T
E
M

Prevention

Prevention

Definition - Threats

An event or error that occurs outside the influence of the flight crew, but which requires crew attention and management if safety margins are to be maintained.

Mismanaged threat: A threat that is linked to or induces a flight crew error.

There are two types of threats:

- Environmental Threats – (e.g., methodology, lack of visual reference, birds and foreign objects, etc…)
- Airline Threats – such as aircraft malfunction, flight controls, MEL Items, etc…)

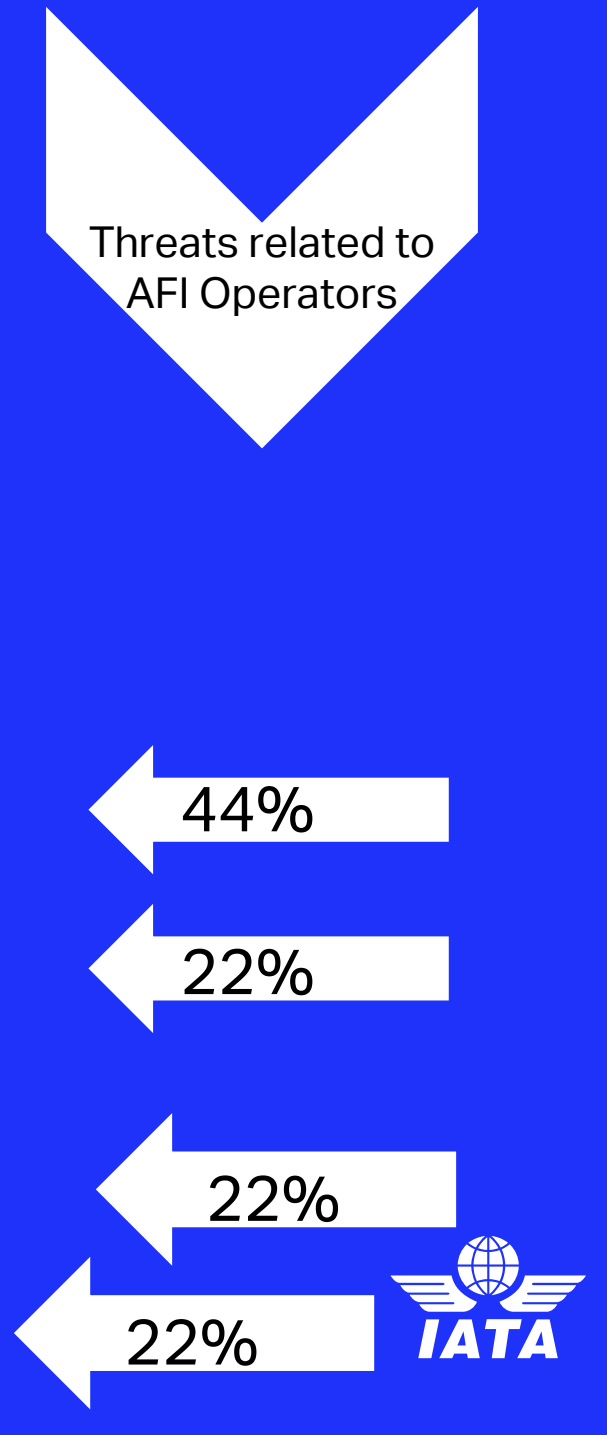
LOC-I Threats

Accident Data: 2011-HY2021

The top contributing factors under this category:

- Methodology (43% of total LOC-I accidents)
  - Icing Conditions (15% of total LOC-I accidents)
  - Poor visibility / IMC (15% of total LOC-I accidents)

- Aircraft Malfunction (39% of total LOC-I accidents)
  - Contained Engine Failure (include overheat and prop fail (24% of total LOC-I accidents)
  - Operation Pressure (13% of total LOC-I accidents)
  - Maintenance Events (13% of total LOC-I accidents)



Definition - Flight Crew Errors

An observed flight crew deviation from organizational expectations or crew intentions.

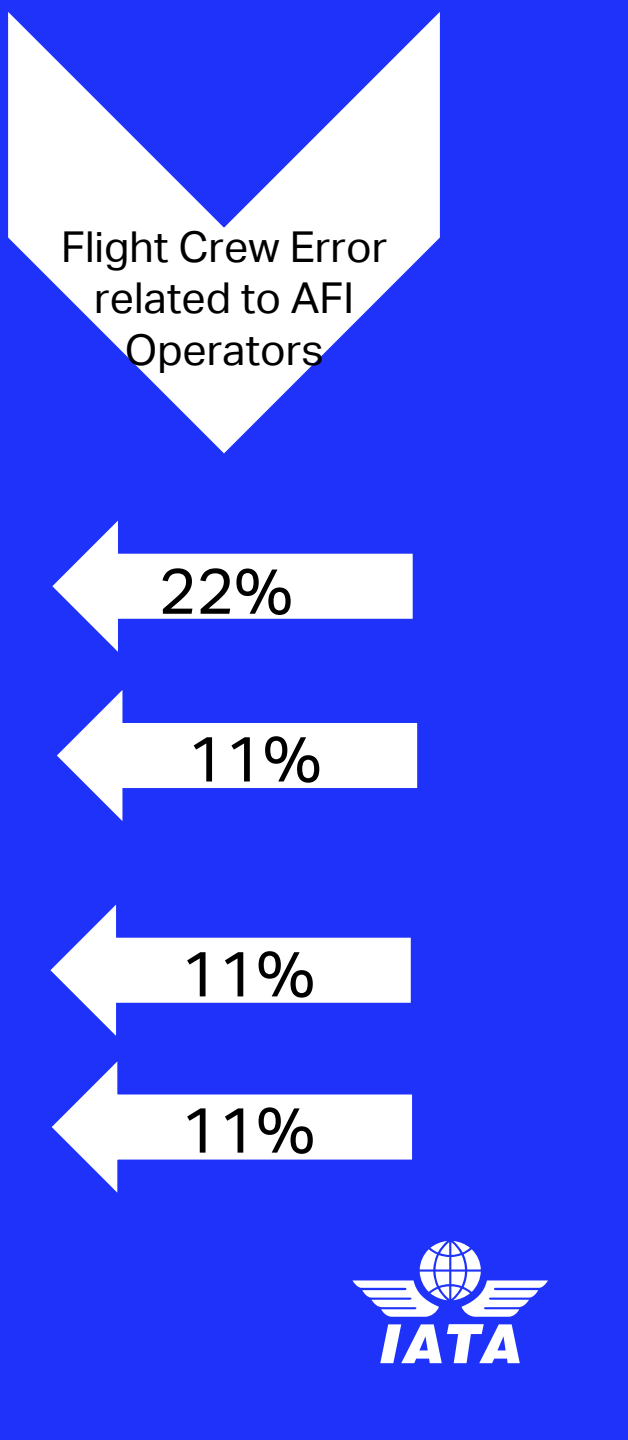
Mismanaged error: An error that is linked to or induces additional error or an undesired aircraft state.

LOC-I Flight Crew Errors
Accident Data: 2011-HY2021

The top contributing factors are:

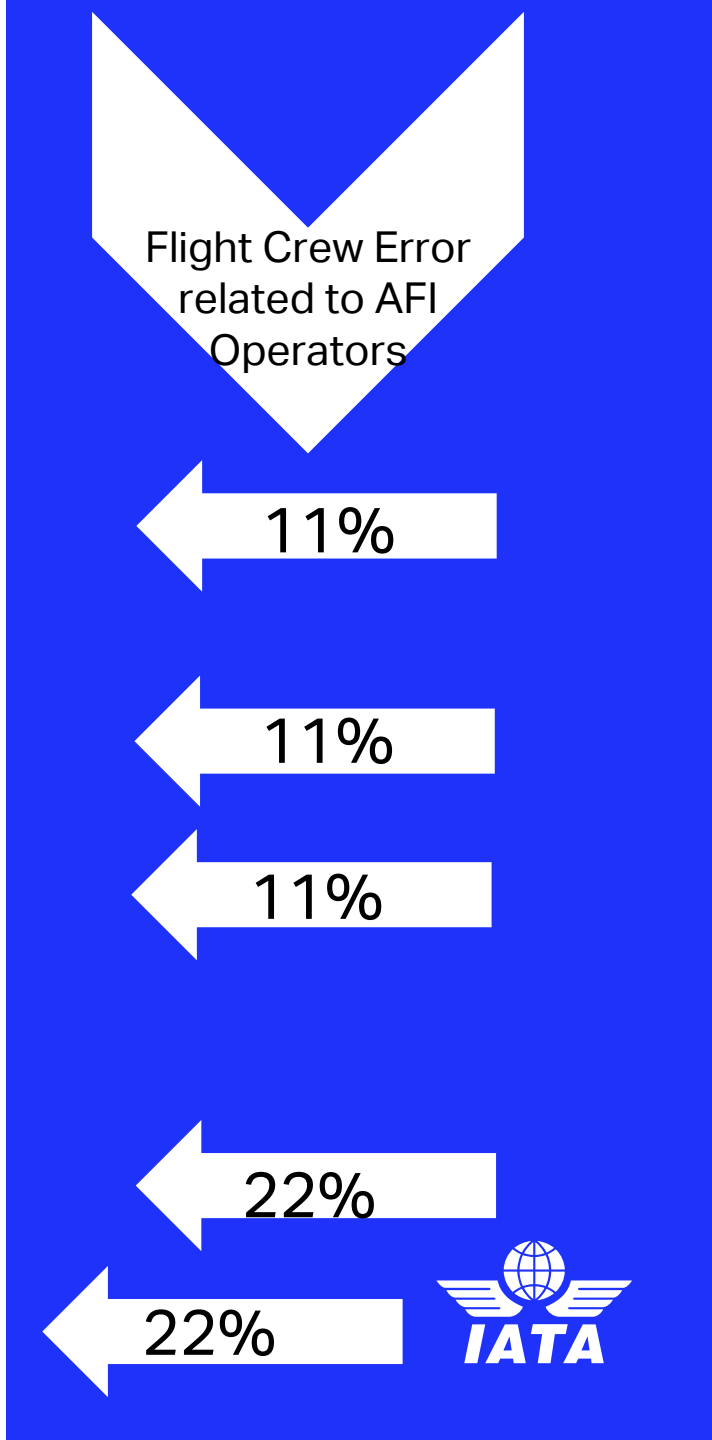
- Aircraft Handling Errors
  - Manual handling / Flight Controls Errors (41% of total LOC-I accidents)
  - Systems/Radios/Instruments: incorrect packs, altimeter, fuel switch settings, or radio frequency dialed

- Noncompliance to Standard Operating Procedures (39% of total LOC-I accidents)
  - Intentional failure to follow SOPs (26% of total LOC-I accidents)
  - Unintentional failure to follow SOPs (13% of total LOC-I accidents)



Flight Crew Errors
Accident Data: 2011-HY2021

- Communication Errors
  - Pilot to Pilot communication (22% of total LOC-I accidents)
- Checklist (15% of total LOC-I accidents)
  - Abnormal checklist (13% of total LOC-I accidents)
- Callouts (13% of total LOC-I accidents)
- Documentation (7% of total LOC-I accidents)
  - Incorrect Weight and Balance / Fuel information (7% of total LOC-I accidents)



Definition - Undesired Aircraft State (UAS)

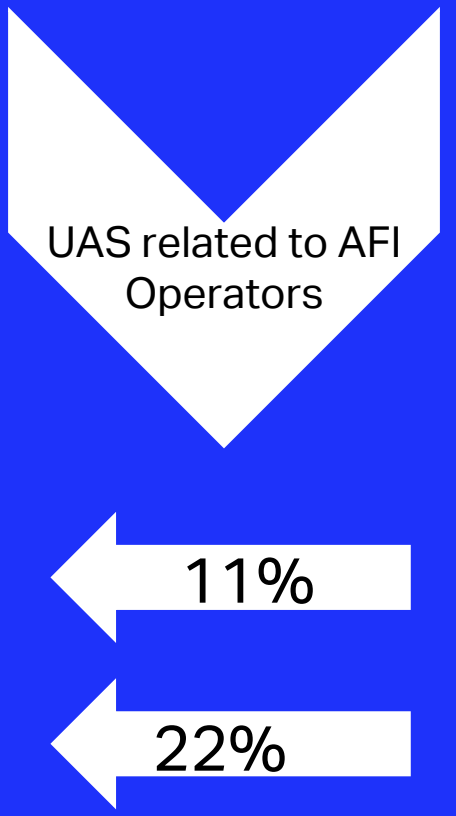
Flight-crew-induced aircraft state that clearly reduces safety margins; a safety-compromising situation that results from ineffective error management

An UAS is recoverable

Undesired Aircraft State (UAS)
Accident Data: 2011-HY2021

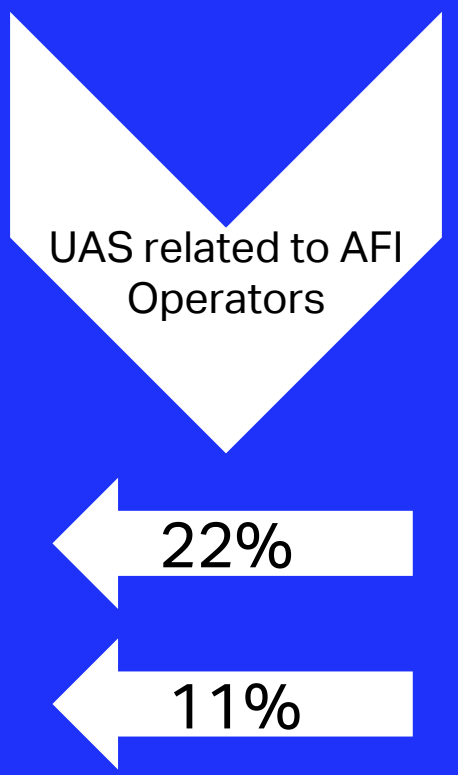
The top contributing factors:

- Aircraft Handling
  - Vertical, Lateral or speed deviation (30% of total LOC-I accidents)
  - Operation outside Aircraft Limitation (28% of total LOC-I accidents)
  - Unnecessary weather penetration (17% of total LOC-I accidents)
  - Abrupt Aircraft Control (15% of total LOC-I accidents)
  - Unstable Approach (9% of total LOC-I accidents)
  - Continued landing after unstable approach (4% of total LOC-I accidents)

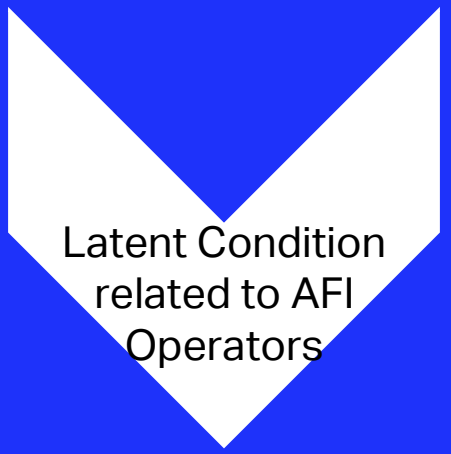


LOC-I Undesired Aircraft State
Accident Data: 2011-HY2021

- Incorrect Aircraft Configuration
  - Flight Controls / Automation (13% of total LOC-I accidents)
  - Engine (7% of total LOC-I accidents)
  - Weight & Balance (4% of total LOC-I accidents)



LOC-I Latent Condition
Accident Data: 2011-HY2021



The top contributing factors:

- Absent or deficient Safety Management (52% of total LOC-I accidents)

67%

- Deficient regulatory oversight by the state or lack thereof (43% of total LOC-I accidents)

67%

- Inadequate Management decision, including cost cutting, stringent fuel policy, etc… (24% of total LOC-I accidents)

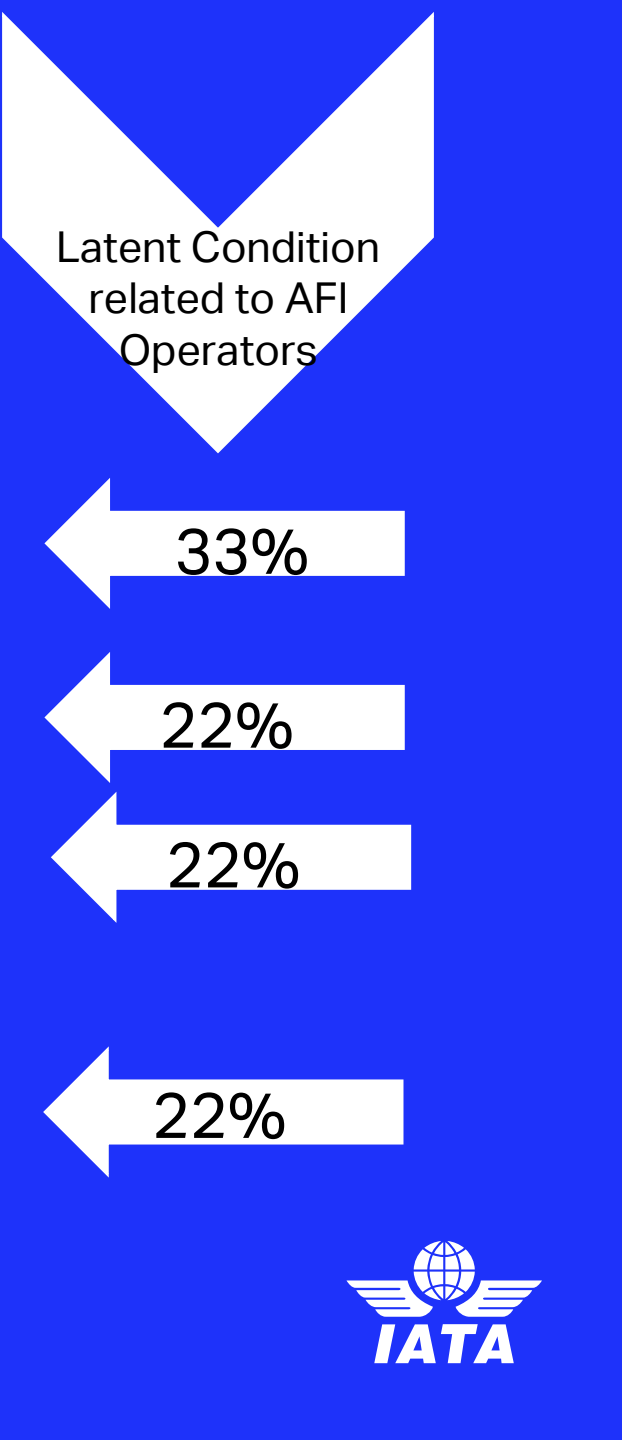
56%

LOC-I Latent Condition
Accident Data: 2011-HY2021

- Deficient or absent selection standards (26% of total LOC-I accidents)

- Flight Operations (39% of total LOC-I accidents)
  - Deficient or absent SOPs, company policy, etc… (28% of total LOC-I accidents)

  - Omitted training, language skills deficiencies, crews, operational needs leading to training reductions, deficiencies in assessment qualifications and experience of flight of training or training resources such as manuals or CBT devices (28% of total LOC-I accidents)

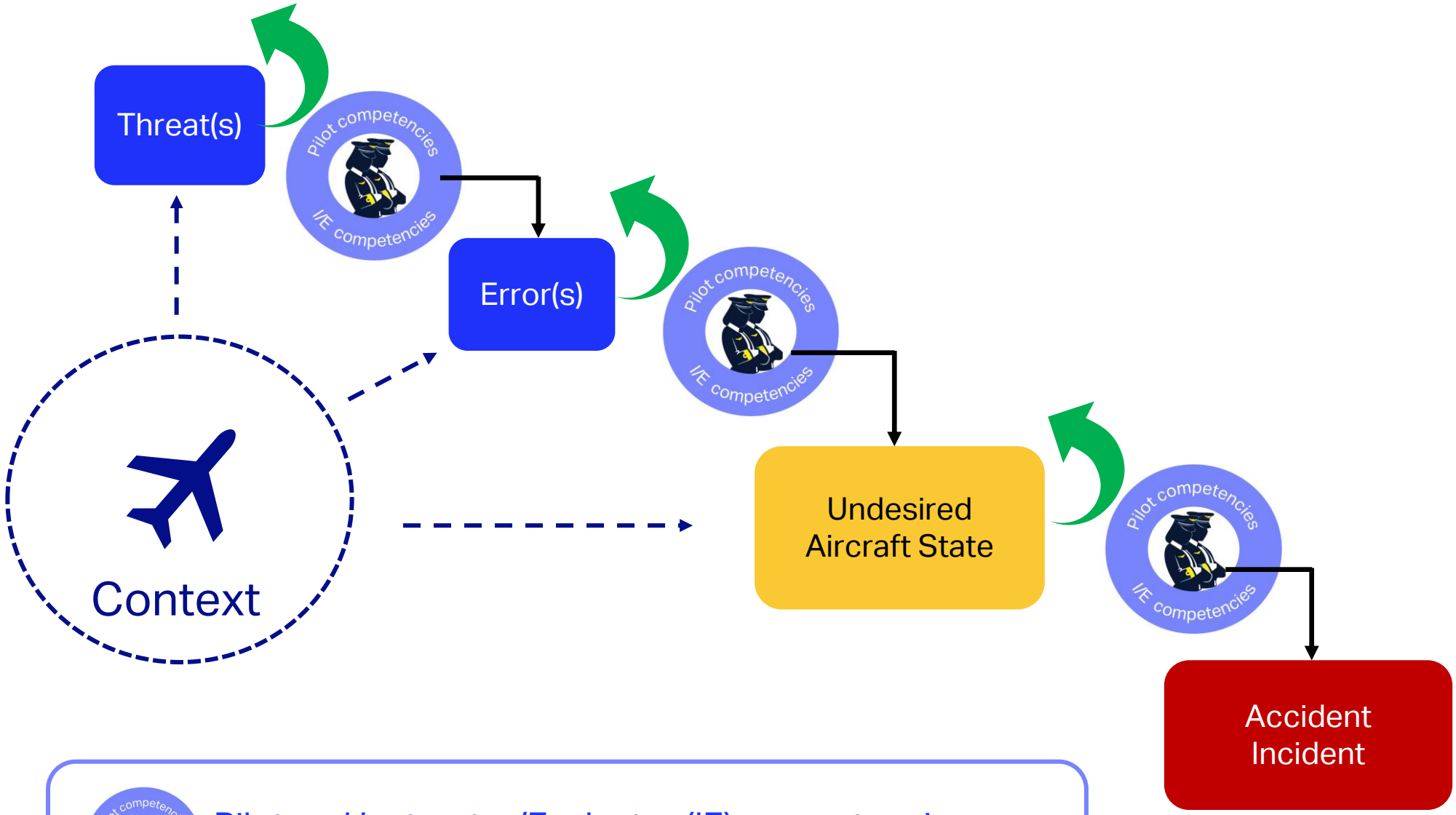


Definition – Flight Crew Countermeasures

Countermeasures that the flight crew can take. Countermeasures from other areas, such as ATC, ground operations personnel and maintenance staff, are not considered at this time.

From a competency-based training and assessment perspective, the competencies of the approved adapted competency model provide individual and team countermeasures to threats and errors and undesired aircraft states. CRM skills are embedded in the approved adapted competency model. Therefore, the CRM training supports the development of the competencies as countermeasures in the TEM concept.
ICAO PANS TRG- see the next slide for illustration

Threat and Error Management Model



IATA

Pilot competencies
I/E competencies

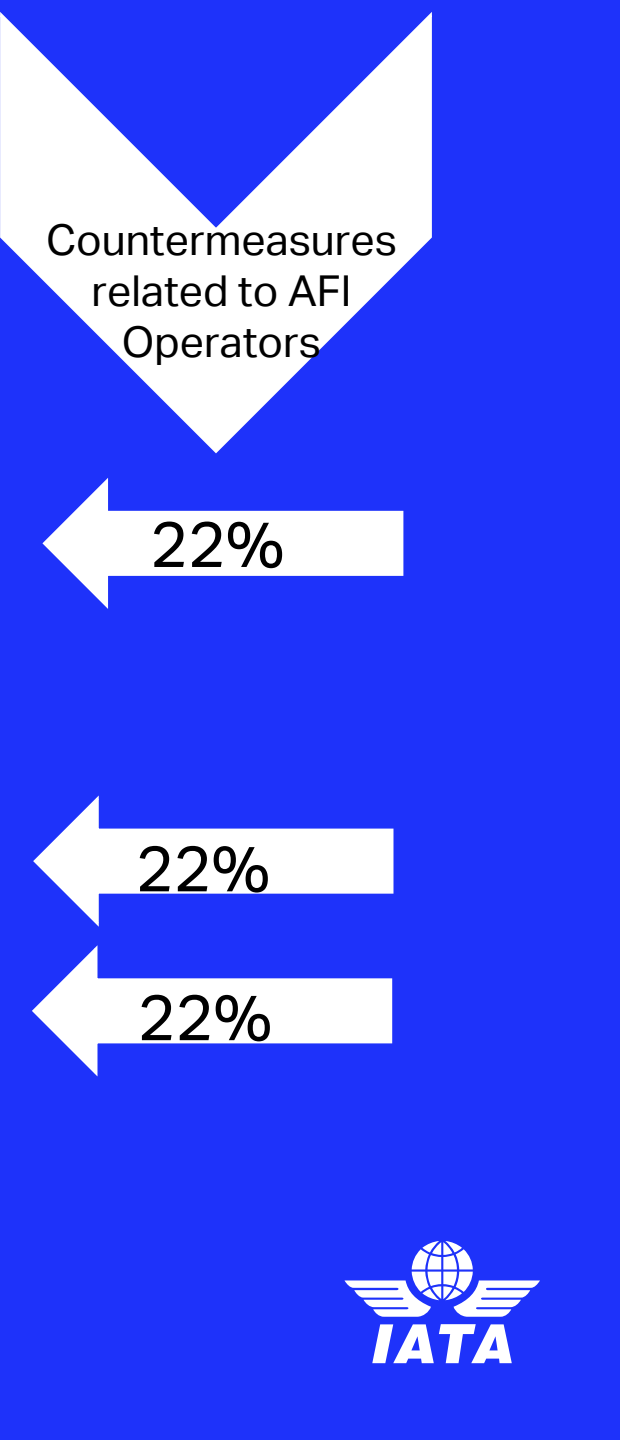
Pilot and Instructor/Evaluator (IE) competencies are the individual and team counter measures

LOC-I Countermeasures
Accident Data: 2011-HY2021

The top contributing factors:

- Overall Crew Performance where crew members should perform well as risk managers (46% of total LOC-I accidents)

- Leadership (28% of total LOC-I accidents)
  - Captain should show leadership and coordinate flight deck activities (26% of total LOC-I accidents)
  - or First Officer (FO) is assertive when necessary and is able to take over as the leader (11% of total LOC-I accidents)



LOC-I Countermeasures

Accident Data: 2011-HY2021

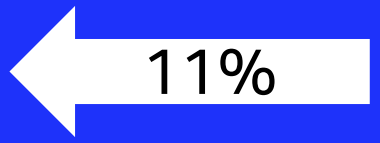
- Communication Environment where open communication is established and maintained (13% of total LOC-I accidents)
- Automation Management, is where automation should be properly managed to balance situational and/or workload requirements. Pilots should demonstrate effective recovery techniques from anomalies (11% of total LOC-I accidents)

LOC-I Countermeasures
Accident Data: 2011-HY2021

- Planning
  - Inflight Decision making /contingency management where the crew members should develop effective strategies to manage threats to safety: (24% of total LOC-I accidents)
    - Proactive: In-flight decision-making (2% of total LOC-I accidents)
    - Reactive: Contingency management (2% of total LOC-I accidents)

LOC-I Countermeasures

Accident Data: 2011-HY2021



- Workload management where operational tasks should be prioritized and properly managed to handle primary flight duties (11% of total LOC-I accidents)

- Execution
  - Monitor/Cross check where crew members should actively monitor and cross-check flight path, aircraft performance, systems and other crew members (26% of total LOC-I accidents)

Breaking the Accident Chain

Pilots should:

- Have the knowledge of the contributing factor that could lead to UAS
- Apply the TEM principles during all the phases of the flight
- Continuously and systematically perform a TEM assessment of the operational context of the flight.

Note The TEM assessment may conduct a specific briefing and The TEM assessment is a pre-requisite to all technical briefing

- Emphasize the briefing on pre-flight and, in certain phases, impending night or Instrument Meteorological Conditions (IMC) entries that complicate situational awareness and recovery.

Breaking the Accident Chain

- Exercise all their competencies to mitigate the threats, to detect and correct their errors and to recognize and recover from any UAS.

ICAO Pilot competencies	
• Application of Procedures and Compliance with Regulations [PRO] • Aeroplane Flight Path Management, automation [FPA] • Aeroplane Flight Path Management, manual control [FPM]	• Communication [COM] • Situation Awareness and Management of Information [SAW] • Leadership and Teamwork [LTW] • Workload Management [WLM] • Problem Solving and Decision Making [PSD]

Breaking the Accident Chain

Operators should enhance flight crew training by:

- Implementing Competency-based Training and Assessment (CBTA) to include Evidence Based Training program
- Ensuring Upset Prevention and Recovery Training (UPRT) programs compliance with latest ICAO standards and industry best practices
- Ensuring sufficient time is dedicated to manual flying and management of different level of automation
- Conducting training on energy management in a variety of scenarios and flight phases
- Developing Crew Resource Management skills

Breaking the Accident Chain

Operators should establish an airline policy that cover the following

- **TEM concept** including,
  - Definitions the concept and definition of Threats, Errors and Undesired Aircraft State
  - Role of pilot competencies as countermeasures
  - Applicability of TEM in operations, (all flight phase, briefing, debriefing etc.)
- **Automation and manual flying**, where pilots
  - Decide level of automation according to operational context (risk assessment)
  - Maintain competence by using all level of automation including manual flying
  - Are ready to change level of automation at all time, if necessary
  - Have clear visibility on operator limitation that could apply
- **Monitoring,** including
  - Definition of monitoring
  - Definition of the PF and PM roles
  - Definition of Area of Vulnerability (AOV) including PF and PM duties depending on AOVs

Breaking the Accident Chain

- Operators should provide to flight crew effective SOPs integrating TEM principles
- Improve safety management, with risk assessment and the application of SOPs
- Positive Safety Culture: operators should develop an engagement strategy to promote the development of a positive safety culture
  - Learning and improving from events is an important part of a positive safety culture
  - Apply non-punitive culture

Breaking the Accident Chain

For States

- States together with investigation bodies should improve investigation and accident/incident reporting with the main objective of accident prevention.
- The lack of data is a serious impediment to improvement.