Runway Incursions – A growing concern

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- Global increase in runway incursions.

- Large number of close call events in the U.S.

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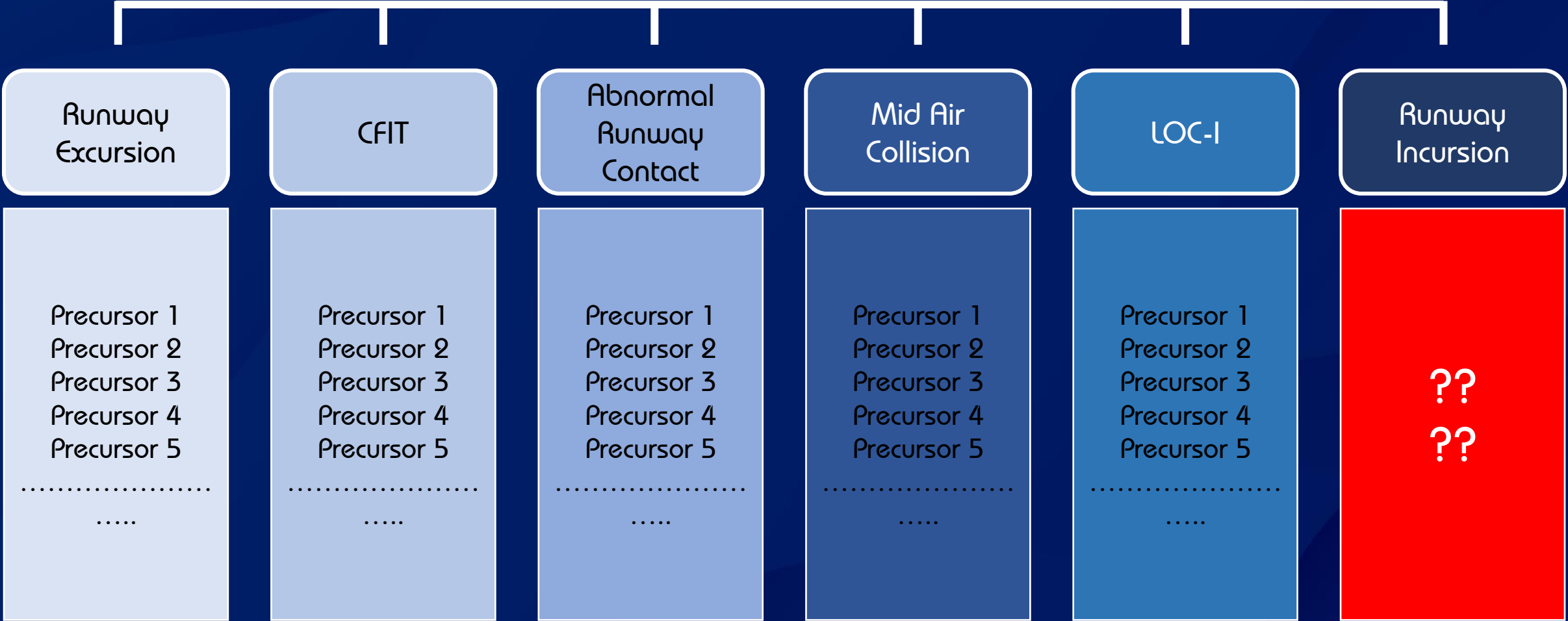## Airline Close Calls Happen Far More Often Than Previously Known

Airline Incidents Show a System Under Growing Stress

FAA Identifies 19 Serious Near Miss Incidents In 2023: The Most In 7 Years

Leading Indicators to High Risk Categories

High Risk Categories

Runway Excursion	CFIT	Abnormal Runway Contact	Mid Air Collision	LOC-I	Runway Incursion
Precursor 1 Precursor 2 Precursor 3 Precursor 4 Precursor 5	Precursor 1 Precursor 2 Precursor 3 Precursor 4 Precursor 5	Precursor 1 Precursor 2 Precursor 3 Precursor 4 Precursor 5	Precursor 1 Precursor 2 Precursor 3 Precursor 4 Precursor 5	Precursor 1 Precursor 2 Precursor 3 Precursor 4 Precursor 5	?? ??

GAPPRI Guidance

2. Guidance and Explanatory Material for Aircraft Operators

2.1 Safety Management (AO1, AO2, AO3)

Recommendation AO1: Aircraft operators should, through their safety management systems, ensure that information is collected on all runway and taxiway incursion incidents and perform analysis and risk assessments to identify risks and contributing factors.

Operators should develop and implement action plans to mitigate identified risks and monitor the implementation/effectiveness of those action plans.

Why should aircraft operators follow this recommendation?

Operators must optimise their internal safety management systems (SMS) to detect all indications of increased runway incursion (RI) risk. Each incursion or near incursion is unique and typically contains one or more latent hazards. These latent hazards, when combined with other factors internal and external to the flight crew, can lead to an undesired outcome.

Taxiway incursion incidents, while not as high risk, very often have the same causes and contributory factors as RIs. Taxiway incursion events are much more frequent, so operators should analyse and monitor all taxiway events to identify the risks for their ground operations.

Operators can use incident reports, pilot feedback, and data analysis to continuously improve procedures and training, enhancing the overall safety of their operations. Operators should support a reporting culture that highlights not only the need to report runway and taxiway incursions but also the threats and latent conditions identified by flight crews (or ground crews) before they became errors or incursions.

What can aircraft operators do to implement this recommendation?

- Establish runway and taxiway incursions (surface incidents) as safety performance indicators (SPIs).
- In addition to reporting incidents and accidents, promote reporting of "near miss" events that focuses on contributing conditions.

- Consider revisiting associated safety risk assessment(s) following any RI incident/accident.
- Synchronise data from safety reporting and investigations, as well as data from outside sources (runway safety teams [RSTs], information-sharing programs, other operator events) to determine prevalence of hazards for entry into the operator's SMS.
- Consider using International Civil Aviation Organisation (ICAO) Model Runway Incursion Causal Factors Identification Form (Doc 9870, App G) when conducting runway or taxiway incursion investigations.
- Consider adoption and implementation of Learning From All Operations methodology (more information below).
- Operators should discover and familiarise themselves with local, national, and regional RI risk reduction initiatives. For example, the Runway Incursion Mitigation (RIM) program is a U.S. Federal Aviation Administration (FAA) national initiative at airports with a history of runway incursions. The RIM program identifies airport-specific risk factors that might contribute to a runway incursion. These risk factors may include unclear taxiway markings, airport signage, and more complex issues such as runway or taxiway layout.
- Review the International Air Transport Association (IATA) Runway Safety webpage and Safety Issue Hub for support, documentation, and guidance. Attention is particularly drawn to the new Runway Incursion Bow Tie (June 2024) model available for aircraft operators.

Learning From All Operations

In an increasingly interconnected and complex aviation system, it is imperative to learn not only from things that rarely go wrong but also from things that go right. Data collection needs to expand from a focus on hazardous events to analysis of routine operational data. Accidents and serious incidents in the aviation industry are rare events, and to achieve continued improvements in aviation safety, it is necessary to learn from normal operations. This is especially applicable to safety data on RIs due to the low rate of related incidents.

While Learning From All Operations is a relatively new concept, the challenge for operators is to seek new ways to harvest everyday information from their operations and learn which measures work well and what workarounds or adaptations are necessary to make the system work.

Emphasising the significance of harnessing proactive and predictive data

It is important to recognize that while taxiway errors serve as precursors to RI events and have rightfully received attention in recommendations, they inherently remain reactive. Therefore, it is advisable to incorporate additional data streams to comprehensively assess the risk of surface incidents.

Incorporating observational programs such as line operations safety audit (LOSA) within the Learning From All Operations framework can prove instrumental in identifying precursors to surface incidents. Given the lack of alternative data streams serving as leading indicators, pinpointing threats and errors specific to In incidents becomes paramount. Examples of errors gleaned from a LOSA program (Figure 30), can serve as leading indicators, undetected in other programs.

Delving deeper, by scrutinising runway incursions and taxiway errors, each airline can ascertain the most common precursors in their events. Each airline's unique set of threats, errors, and competencies emerging from their events can then be analysed.

This understanding enables airlines to proactively assess the likelihood of surface events occurring within their operations. For instance, if deficient workload management consistently emerges from reactive data (runway incursions and taxiway errors), airlines can use this information to discern how workload management as a competency presents in 'normal observational' data — whether it is managed effectively or not. Subsequently, this insight can facilitate informed decision-making concerning policies and procedures.

Figure 30. **Example LOSA Errors (IndiGo)**
Omitted 'clear left/right' call
Fast taxi speed
Nonessential duties performed
Checklist errors
Wrong system settings

Reference Documents:

ICAO Global Runway Safety Site
ICAO Annex 19, Safety Management | SKYbrary Aviation Safety
ICAO Runway Safety Toolkit
Safety Promotion | SKYbrary Aviation Safety
Runway Incursion | SKYbrary Aviation Safety
Flight Safety Foundation, Learning From All Operations
IATA *Runway Safety webpage* and *Safety Issue Hub*

Recommendation AO2: Aircraft operators should actively participate in aerodrome local runway safety team (LRST) activities.

Why should aircraft operators follow this recommendation?

It is necessary that all aerodrome stakeholders work together and exchange safety-relevant information. In most runway incursion events, one group does not have the full picture of the circumstances or contributing factors that led to the event. This collaboration allows aircraft operators and other stakeholders to learn from each other, understand different perspectives, and create a shared picture of the threats and hazards that flight crews and air traffic controllers cope with in daily operation.

The requirement for airports to establish an RST is one of the main outcomes of the ICAO Global Runway Safety Symposium held in Montreal in 2011.

The RST should comprise representatives from aerodrome operations, air traffic controllers, airlines or aircraft operators, pilot and air traffic controller associations, and any other groups with direct involvement in runway operations.

Aircraft operators have a valuable source of information to gain knowledge about what works well and what needs improvement to mitigate runway incursion risks in daily operation — the flight crews. Aircraft operators should openly discuss events and identified trends in RSTs, as well as any mitigation and/or safety promotion efforts taken since the last RST meeting.

What can aircraft operators do to implement the recommendation?

Aircraft operators should actively seek to join RSTs at home bases and primary (hub) airports, and proactively participate to understand local issues and the viewpoints of other stakeholders, and to bring their own safety issues to the attention of other parties.
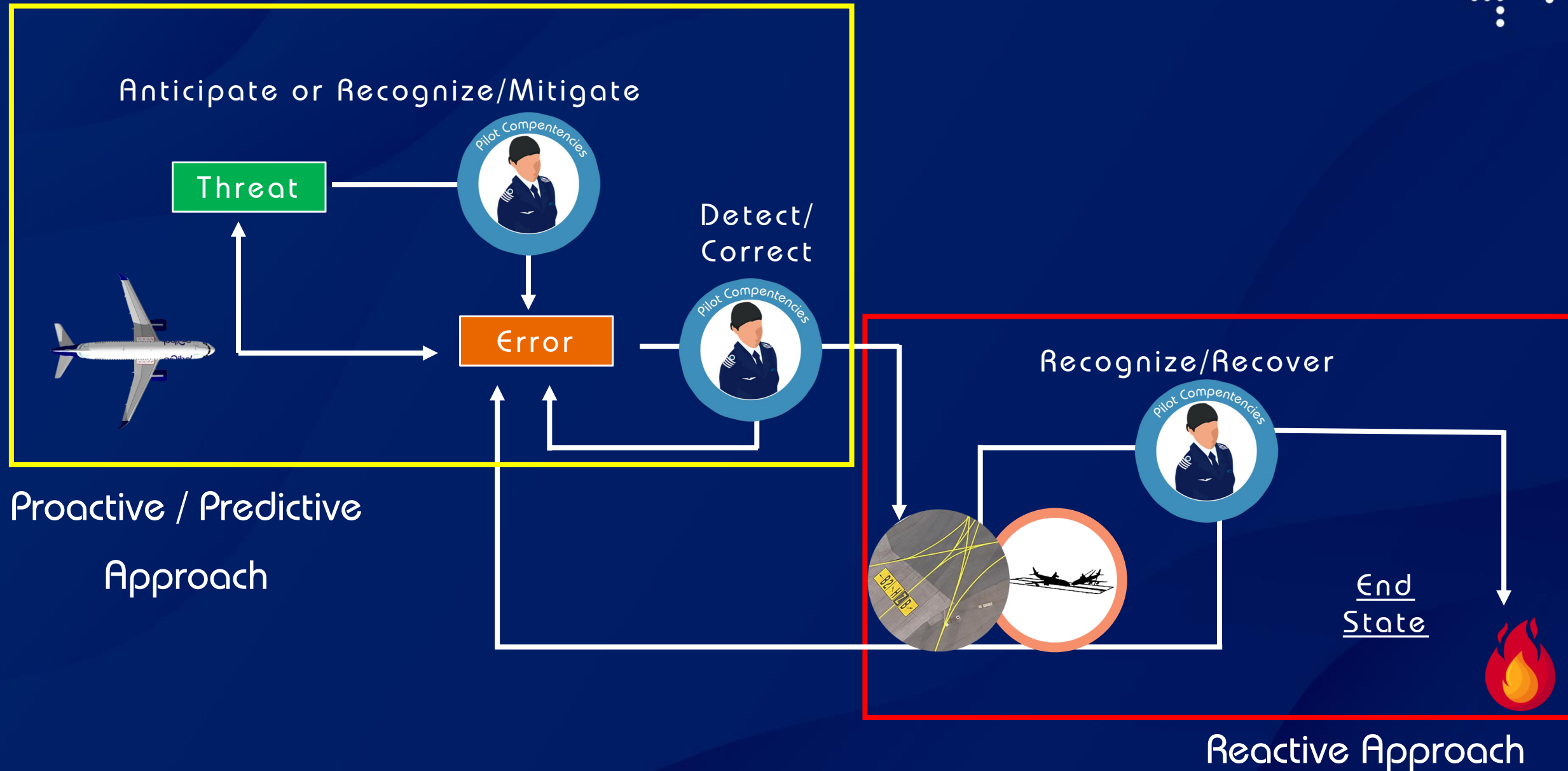
Where possible, operators should consider participation in non-home-base airports, particularly where they have significant operations and/or have experienced runway safety issues.

Ensure that data and information affecting runway safety is compiled from internal reporting systems and channelled to relevant RSTs. Likewise, any new risks or safety issues discovered through RST groups are methodically processed
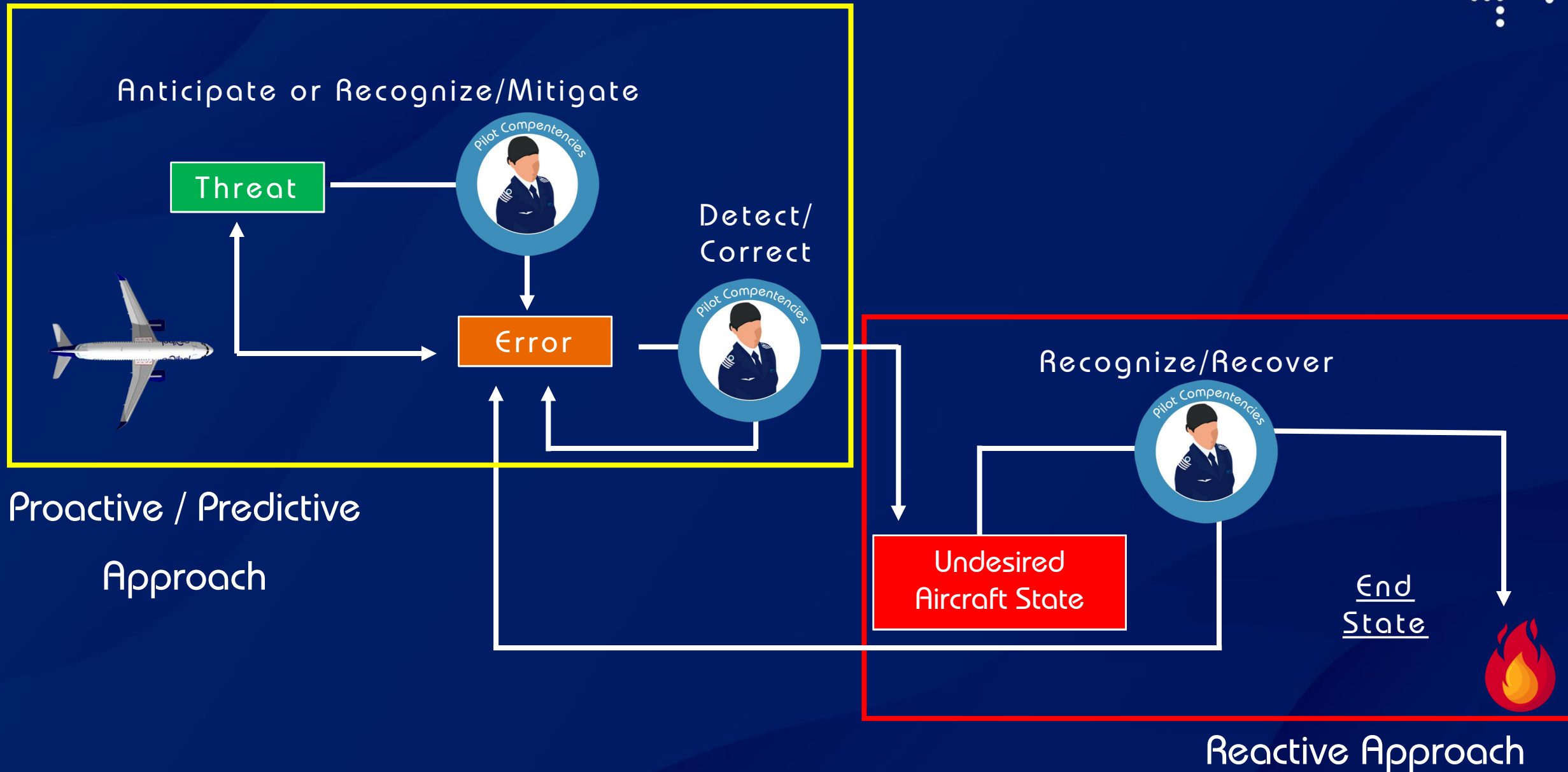
Taxiway Error Categorisation
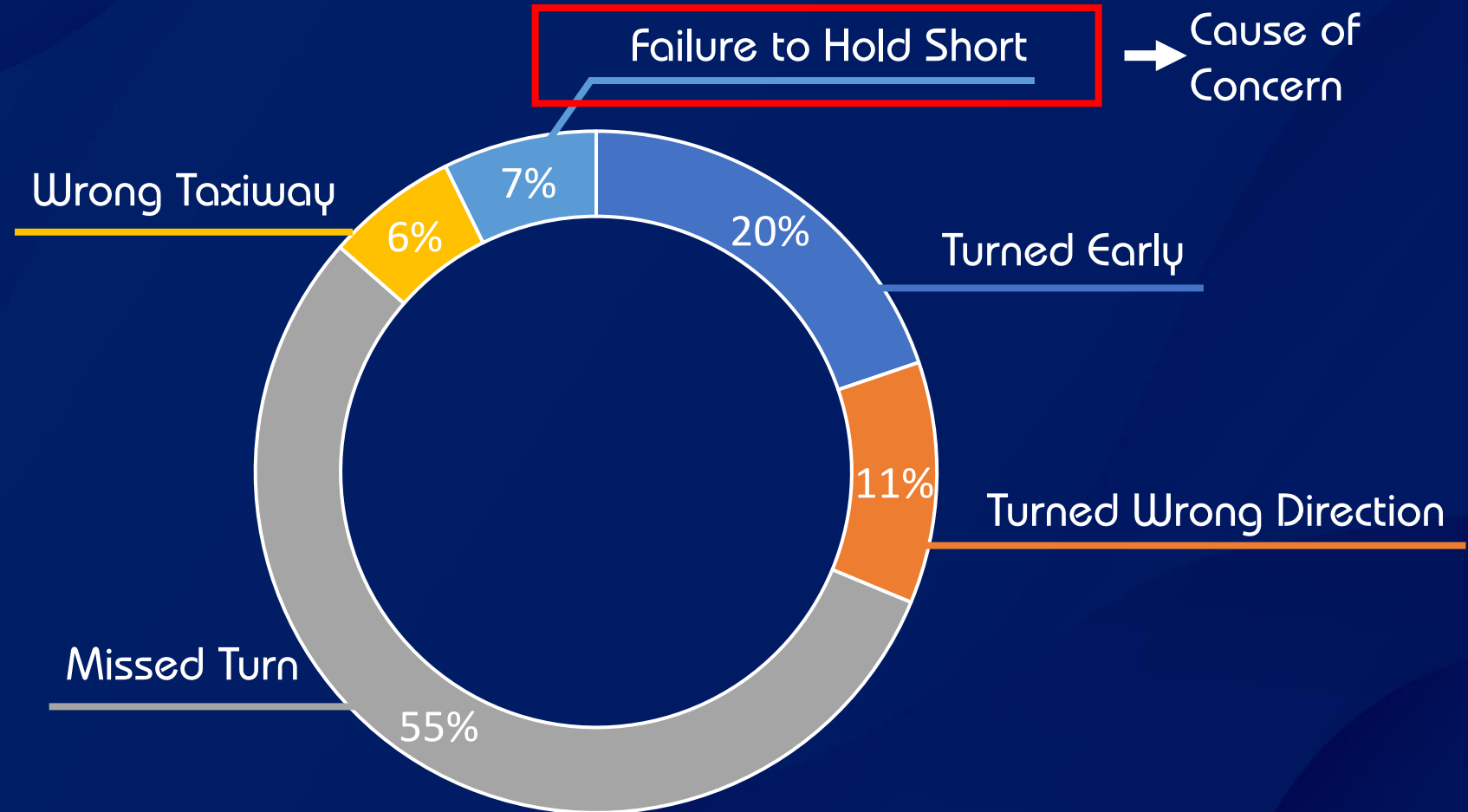
Learning from all operations through TEM and Competencies

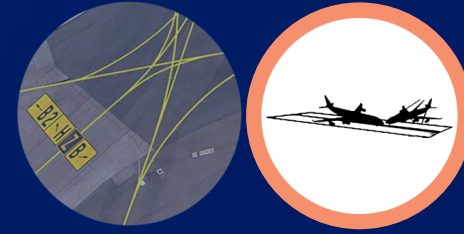# Learning from all operations through TEM and Competencies

Anticipate or Recognize/Mitigate

Threat

Pilot Compentencies

Detect/Correct

Pilot Compentencies

Error

Proactive / Predictive

Approach

Recognize/Recover

Pilot Compentencies

Undesired Aircraft State

End State

Reactive Approach

Threat → Error →

Airport	Prevalence 50%	• Complex / confusing markings or infrastructure • Faded Markings or signage • Insufficient lighting
ATC	Prevalence 34%	• Challenging Clearances • Controller Error
Flight Crew (Internal Threat)	Prevalence 30%	• Expectation BIAS

TEM Analysis of Runway and Taxiway Incursions

Threat → Error → **Pilot Compentencies**

Airport — Taxi Errors

Root Cause of Errors (Competency)

Communi-cation
- Active listening
- Intervention

Situational Awareness
- Checks for gross errors
- Monitors the environment

Workload Management
- Plans and prioritize task
- Manages Distractions
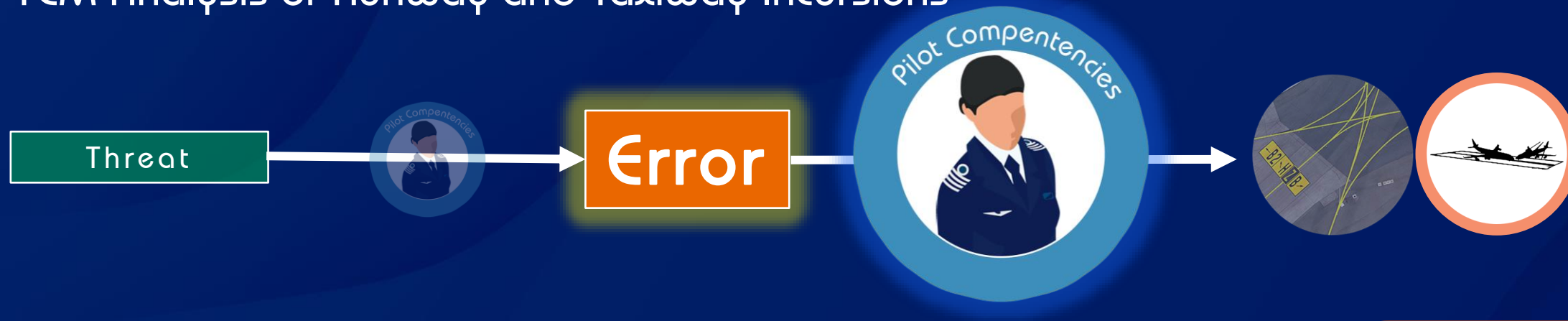
Summary of Runway and Taxiway Incursion TEM analysis

Threat → **Error** → **Undesired Aircraft State**

Pilot Compentencies

Error Prevalence during taxi – 66% of flights had 3 or more Errors during Taxi

- Omitted 'clear left /right' call
- Fast taxi speed
- Nonessential duties performed
- Checklist Errors
- Wrong system settings

Root Cause

20%

Predictive data driver: Error Prevalence during Taxi

Workload Management

- Distraction Management
- Rushing
- Prioritizing tasks

Determining Predictive Precursors to Runway Safety – LOSA data (Understanding ATC Threat Management)

20% Of all Threats during Taxi were ATC related threats.

60%

40%
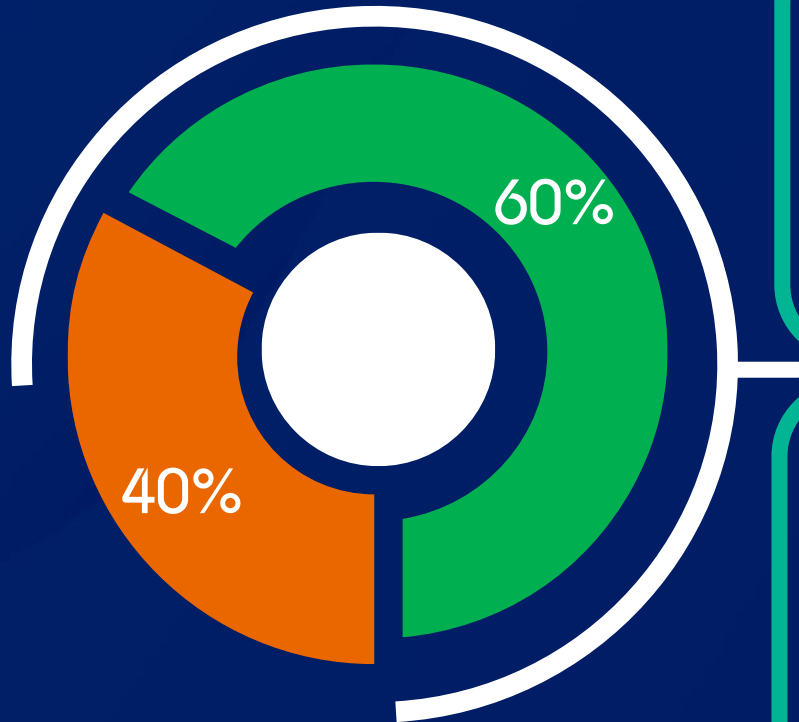
Workload Management

Communication

Predictive Data driver: The Management of ATC threats

Determining Predictive Precursors to Runway Safety – LOSA data (How are crew dealing with Airport threats?)

37%
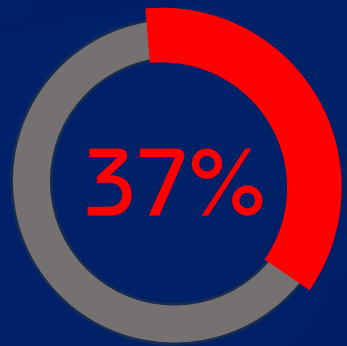
Of all Threats during Taxi were Airport related threats.

Management

Positive Management

66%

When Anticipated

Predictive Data driver: A measure of the 'Anticipation' of Airport threats.

Determining Predictive Precursors to Runway Safety – LOSA data (How are crew dealing with Airport threats?)

37%
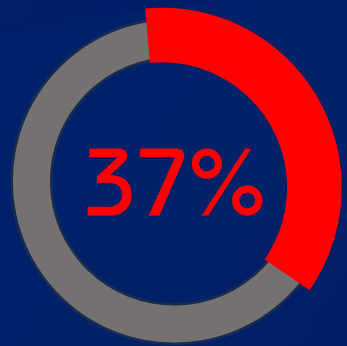
Of all Threats during Taxi were Airport related threats.

Management

Positive Management

81%

When Anticipated

▲15%

Predictive Data driver: A measure of the 'Anticipation' of Airport threats.

Why address flight crew behaviours ....
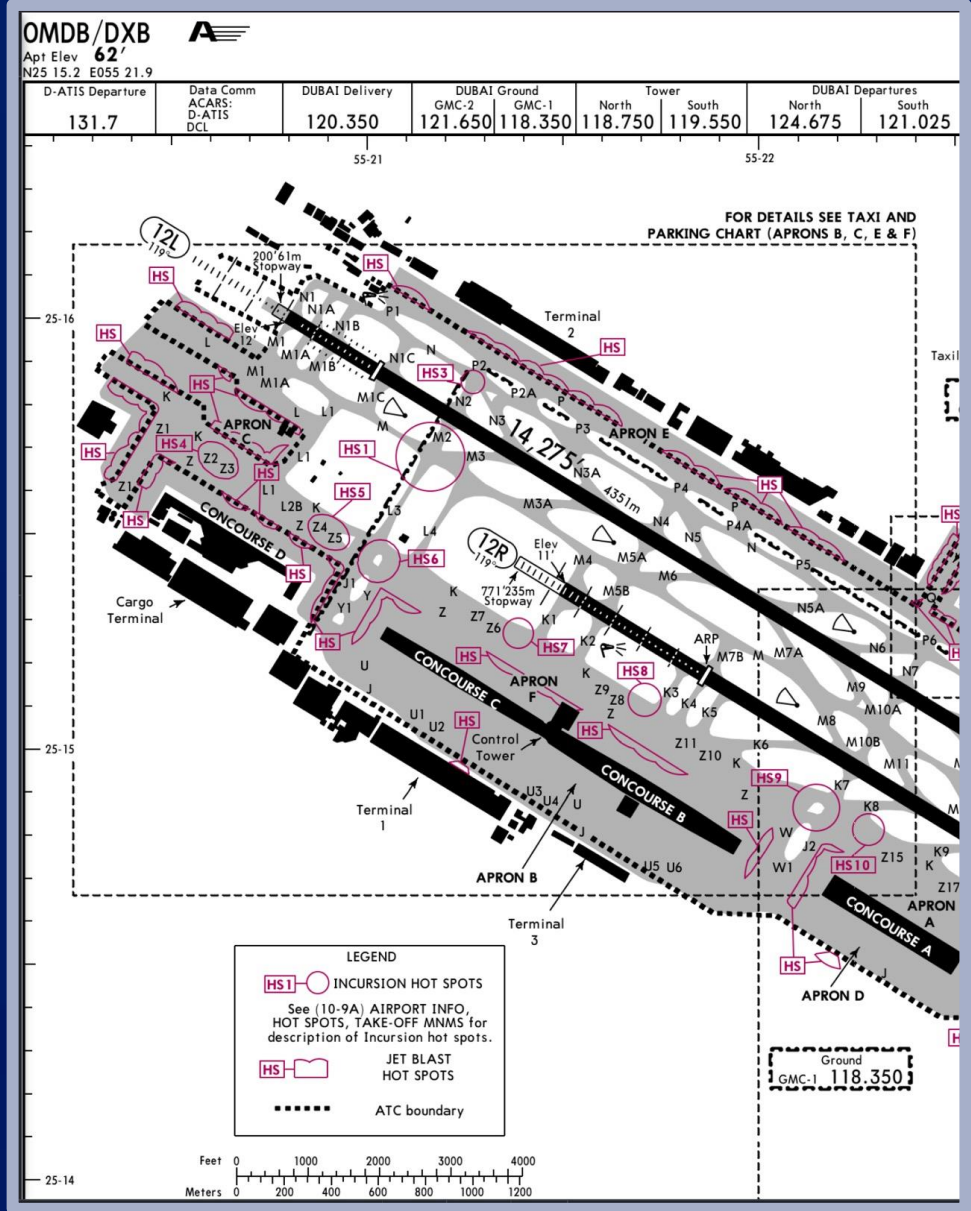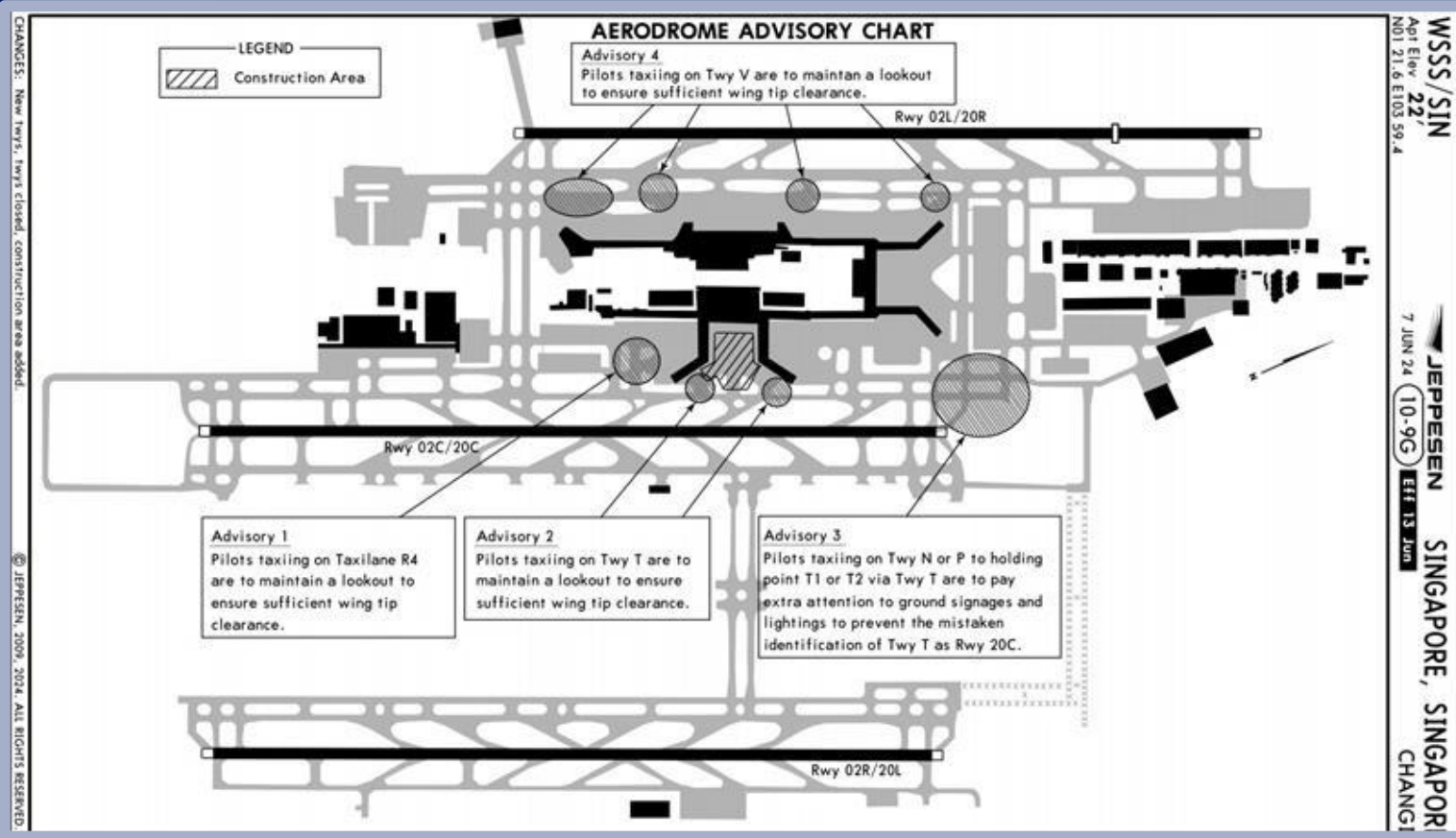
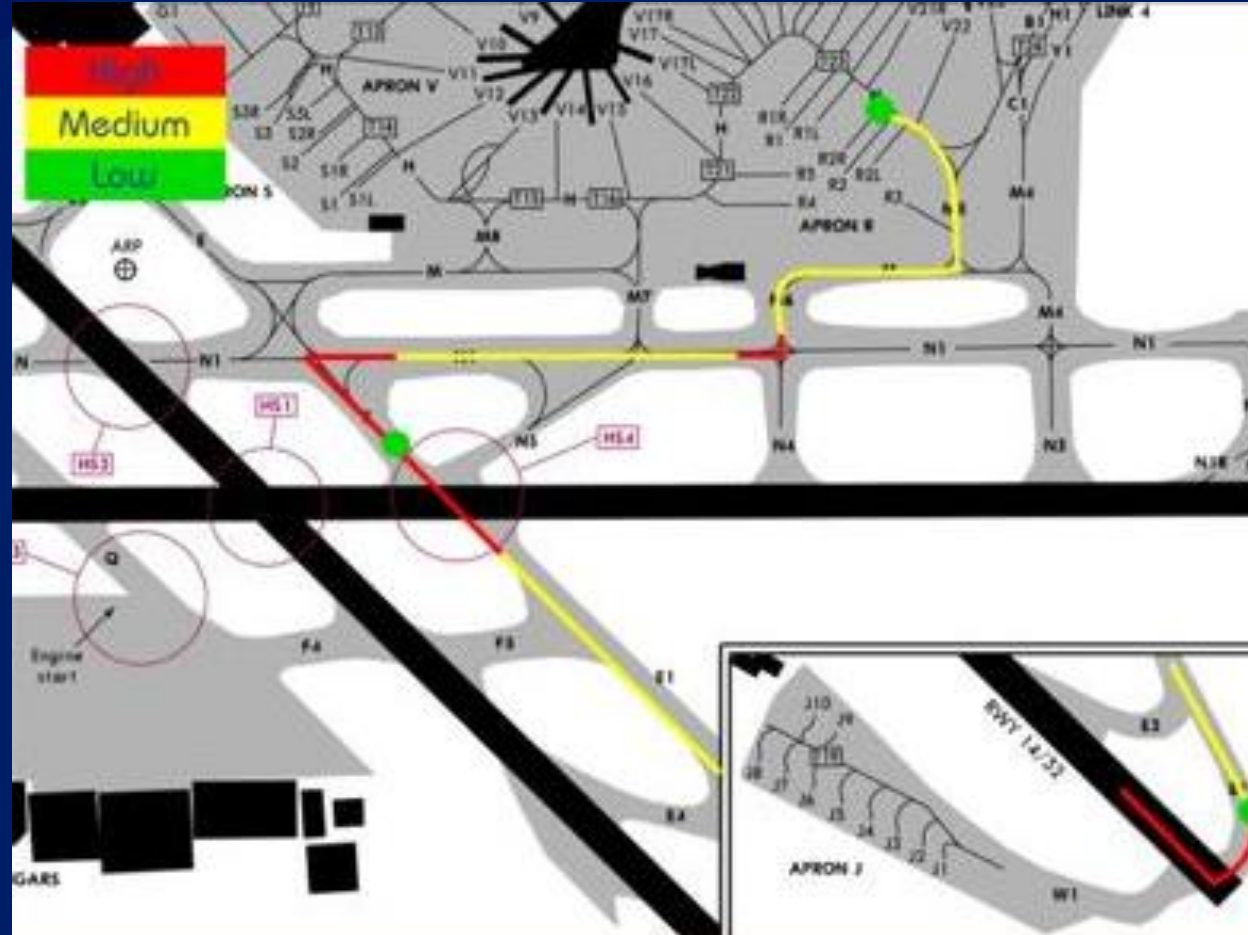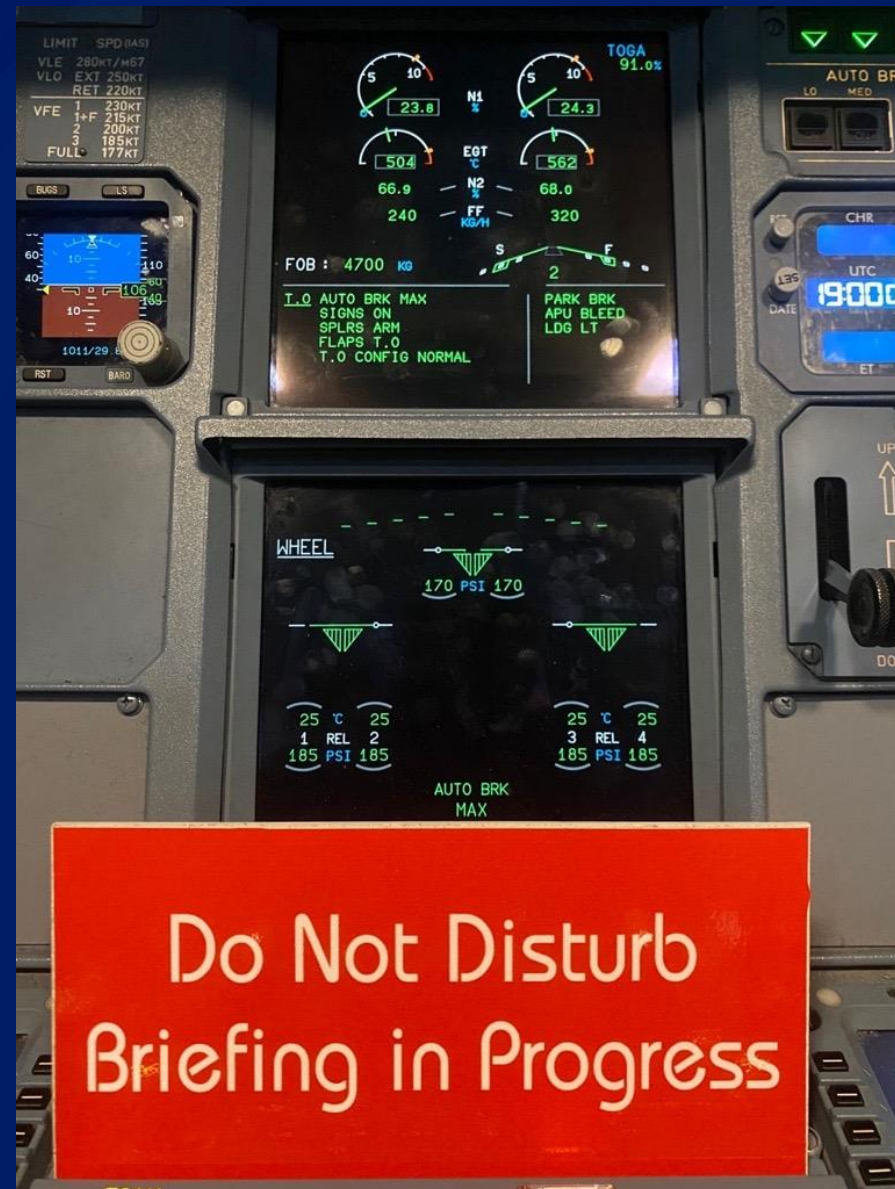# Addressing Workload Management
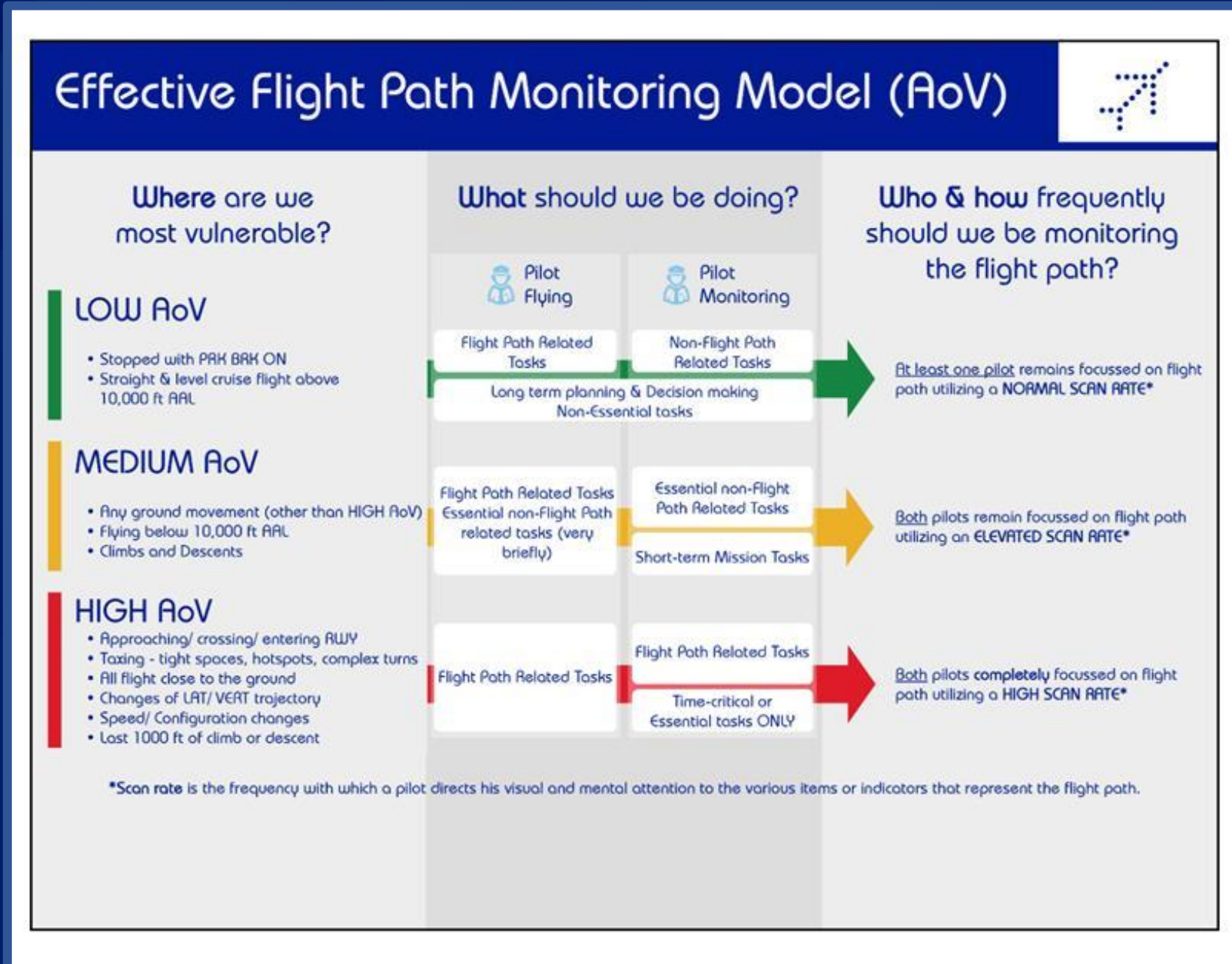
Addressing Expectation Bias

Managing Expectation Bias

Expectation Bias

View 1 →
- Take it as it comes !!
- Don't Brief = No expectation = No BIAS

View 2 →
- Brief for a Shared Mental Model
- Address BIAS as Threat
- Active Listening
- Check Understanding
- Verbalize Changes

Figure 32. Example of interactive, threat-based briefing format (Source: IndiGo Airlines)
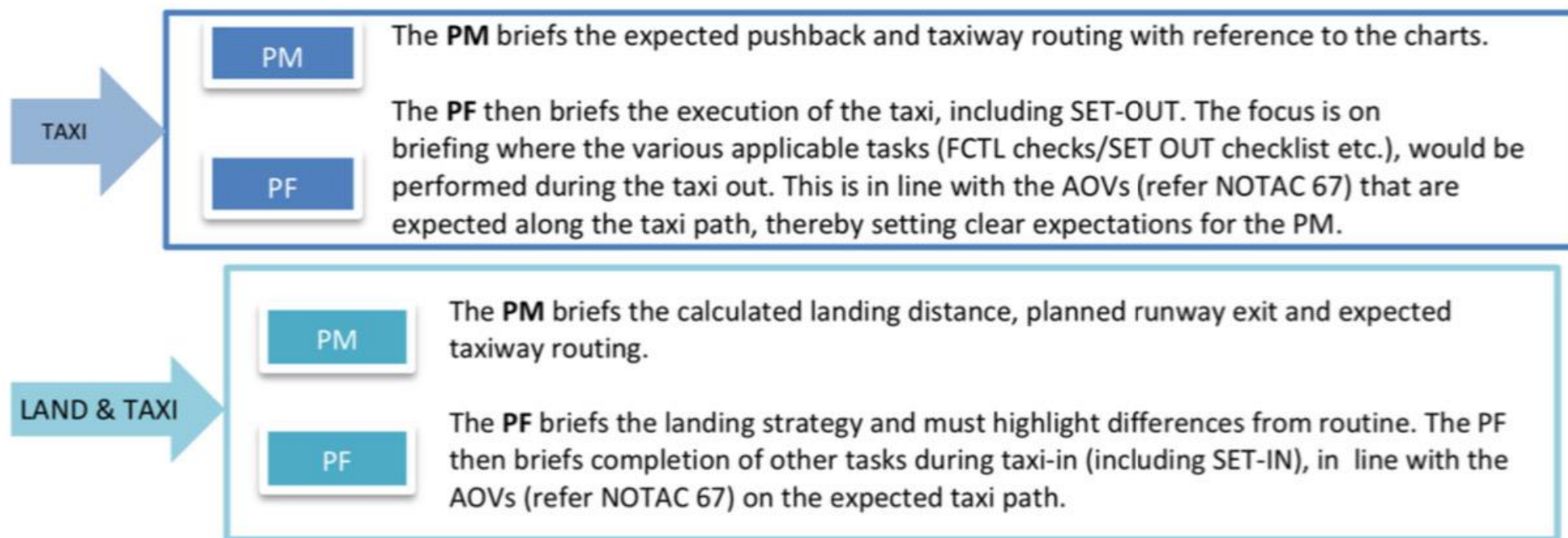
TAXI

PM

The **PM** briefs the expected pushback and taxiway routing with reference to the charts.

PF

The **PF** then briefs the execution of the taxi, including SET-OUT. The focus is on briefing where the various applicable tasks (FCTL checks/SET OUT checklist etc.), would be performed during the taxi out. This is in line with the AOVs (refer NOTAC 67) that are expected along the taxi path, thereby setting clear expectations for the PM.

LAND & TAXI

PM

The **PM** briefs the calculated landing distance, planned runway exit and expected taxiway routing.

PF

The **PF** briefs the landing strategy and must highlight differences from routine. The PF then briefs completion of other tasks during taxi-in (including SET-IN), in line with the AOVs (refer NOTAC 67) on the expected taxi path.

Managing Expectation Bias

Figure 37. **Safe taxi procedure (Aer Lingus)**

Safe Taxi Procedure:

The safe processing and implementing of taxi clearances should be given priority over all other tasks. Checklists and task flows should be delayed or positively held until the taxi clearance has been received, recorded, understood, and agreed. All taxi clearances (initial, changes, or onward clearances) require the same level of caution and attention from crew members.

Any ambiguity or uncertainty by a crew member regarding the aircraft current position, cleared taxi route or clearance limit must be resolved immediately. If necessary, the aircraft should be stopped at soonest, safe opportunity and clear of runways. Ensure clearance limit is clearly defined by crew and ATC.

Task sharing:

| PF	PM
Listen out	Receives and records ATC taxi instruction. *- Clearance to be written on Operational Flight Plan, include routing and clearance limit.*
Understands and agrees taxi <u>route and limit</u>.	Confirm and verbalise taxi <u>route and limit</u> using AMM (AGC if AMM not available). *- Particular attention should be given to crossing runways* *- Be alert to taxi-as-expected bias.* *- Share/mirror taxi chart with PF as required.*
Manoeuvres aircraft. Calls for any switching and taxi guidance, including display of charts, when aircraft moving.	Continually monitor the progress of the taxi *- Taxi threats, eg Runway Crossing, should be clearly identified and mitigated* *- Where necessary, provide the PF with information on the next turn*

Management of distraction during taxi phase is critical:
- Minimise non-operational conversation.
- Strictly no personal use of mobile phones. If mobile phone is required for operational reasons, it should be used with aircraft stopped and parking brake set.
- Minimise heads down; at all times, primary task for PM is monitoring aircraft path.
- Minimise pilot off-air; any ATC clearances should be re-confirmed and recorded by the PM.
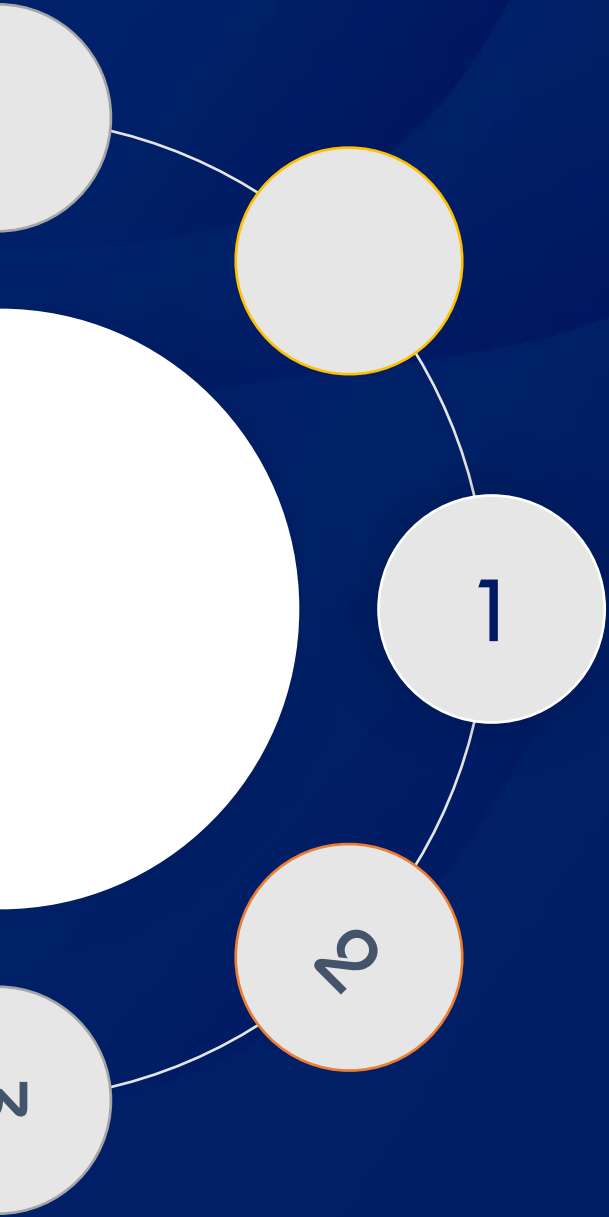
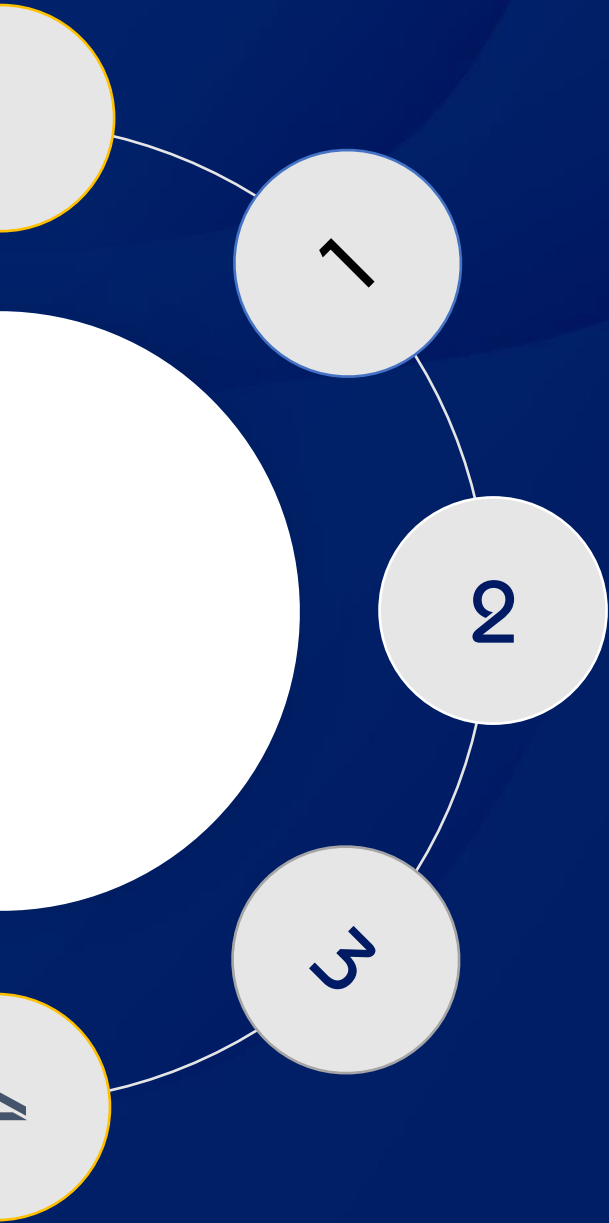# Addressing Communication (Intervention)
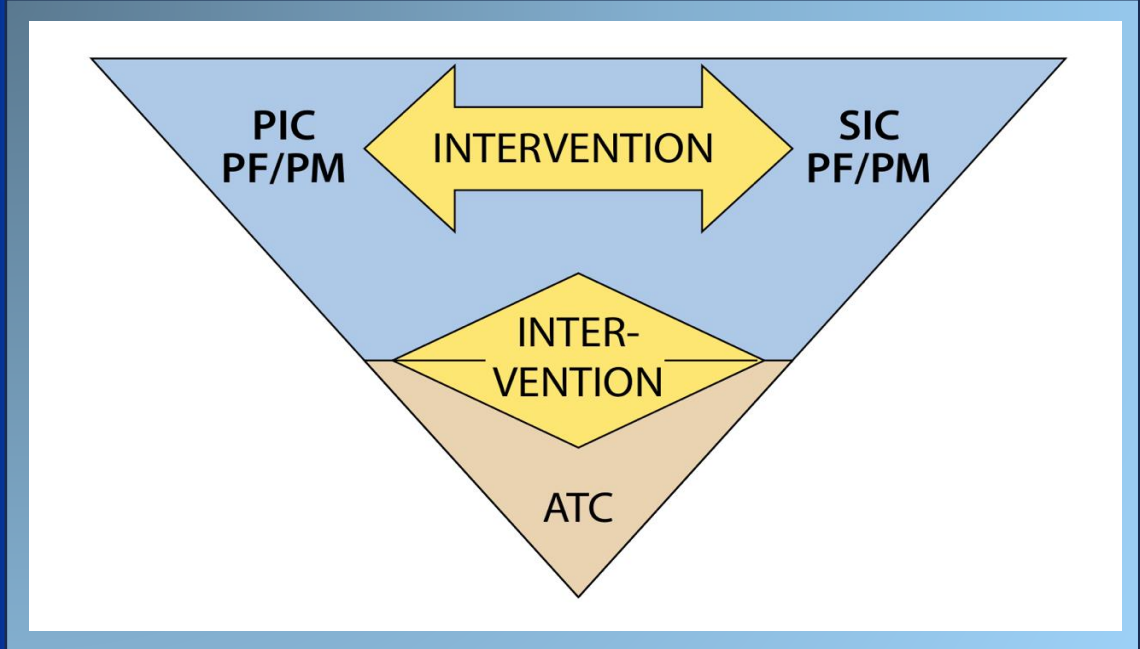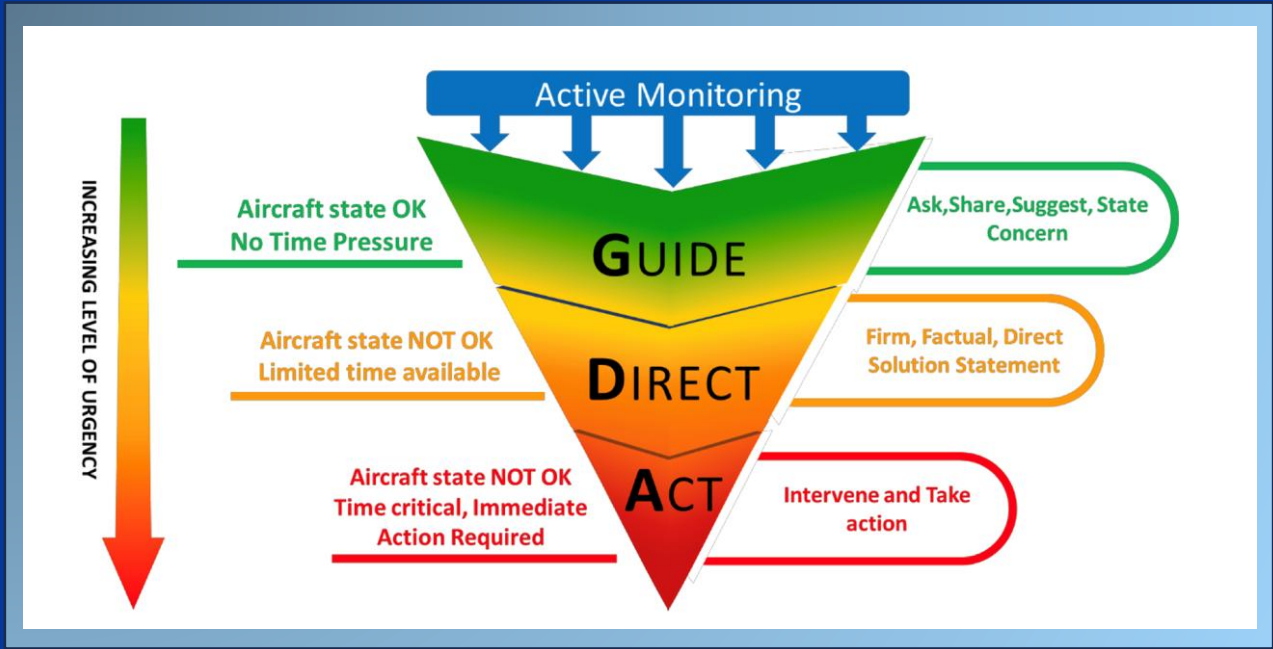
Conclusion

- Are we Data rich but information poor? – Invest in Learning from 'normal work'.
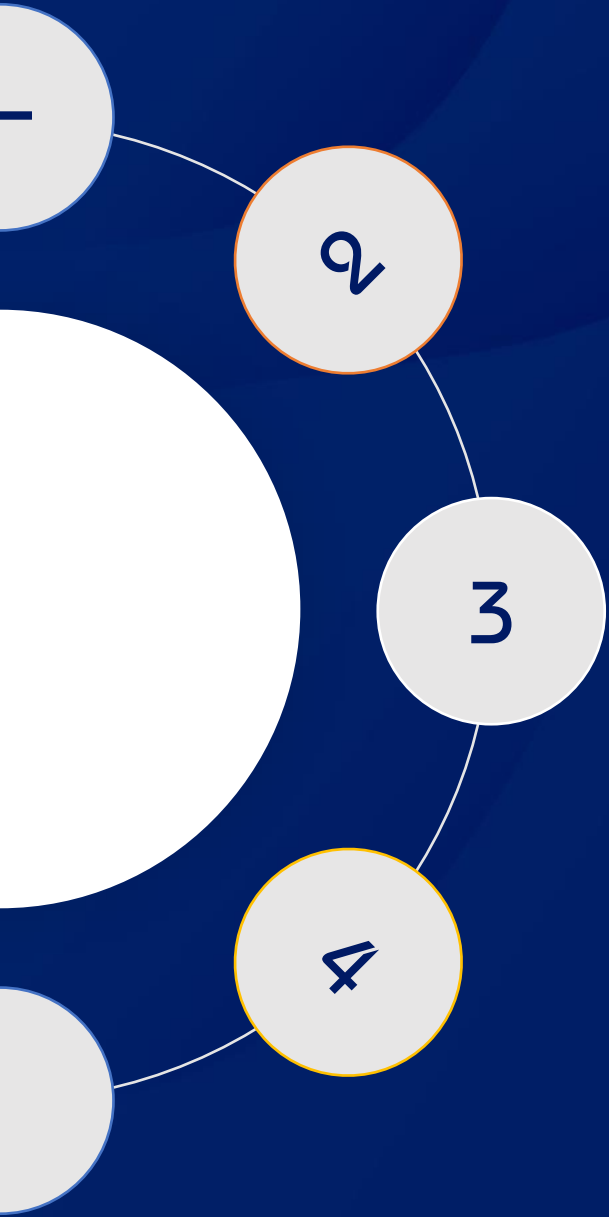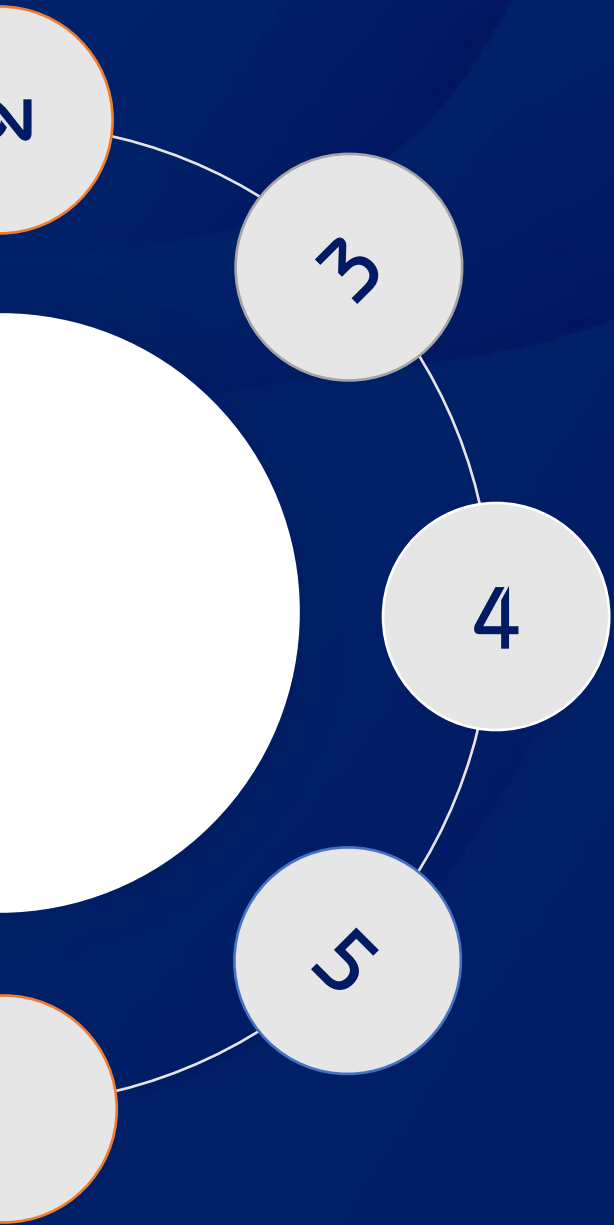
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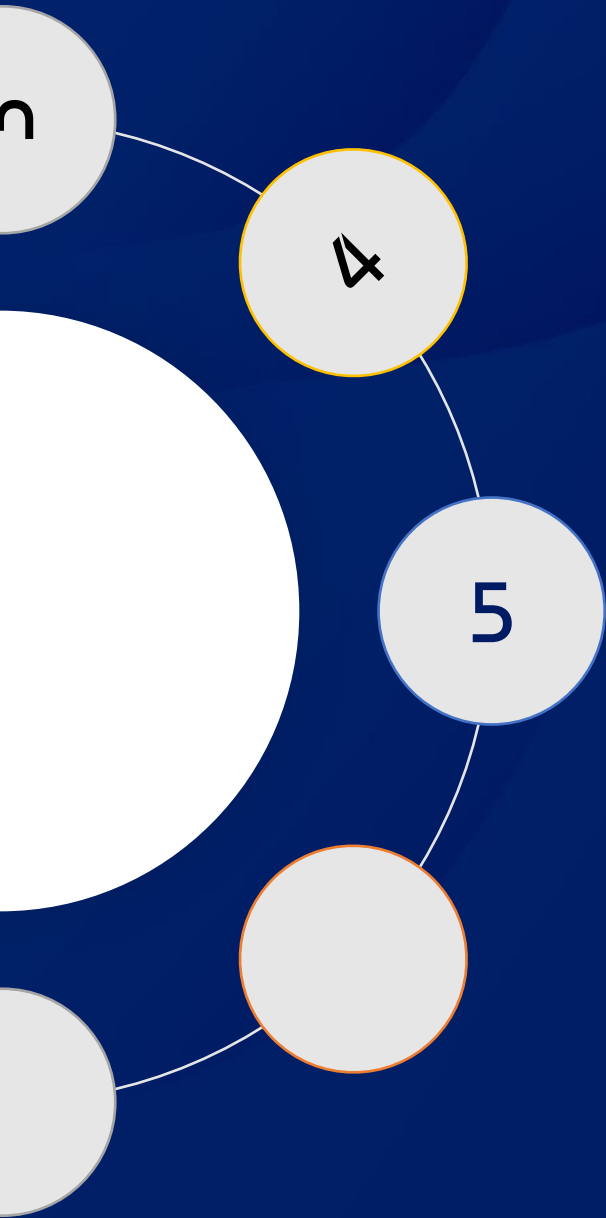
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- Use Predictive Data as 'Strength of Knowledge'.

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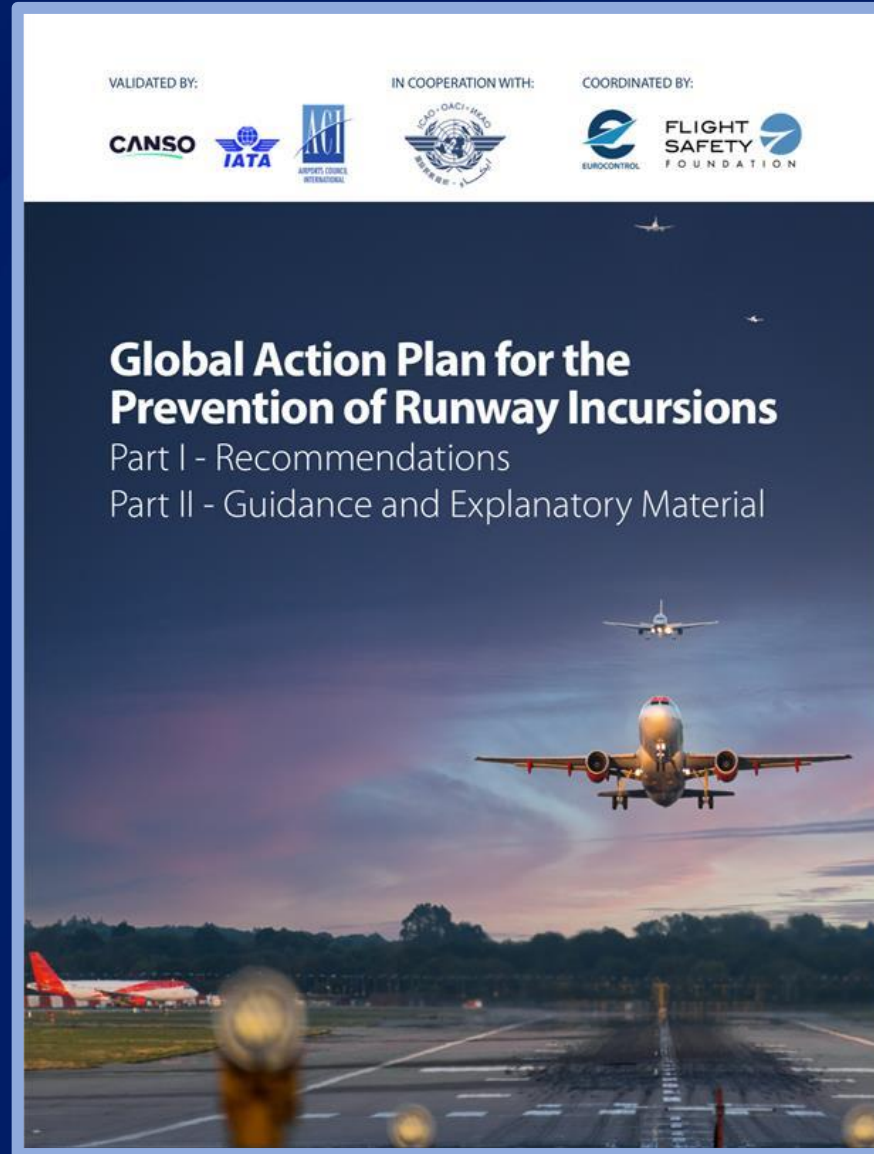
3

4

5

Conclusion

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- Enhance industry collaboration

GAPPRI is a good place to start