



| ICAO | UNITING AVIATION

# Aerodrome Safety

**Yong Wang**

*Chief, Airport Operations and Infrastructure, ANB/ICAO*





# Presentation Outline

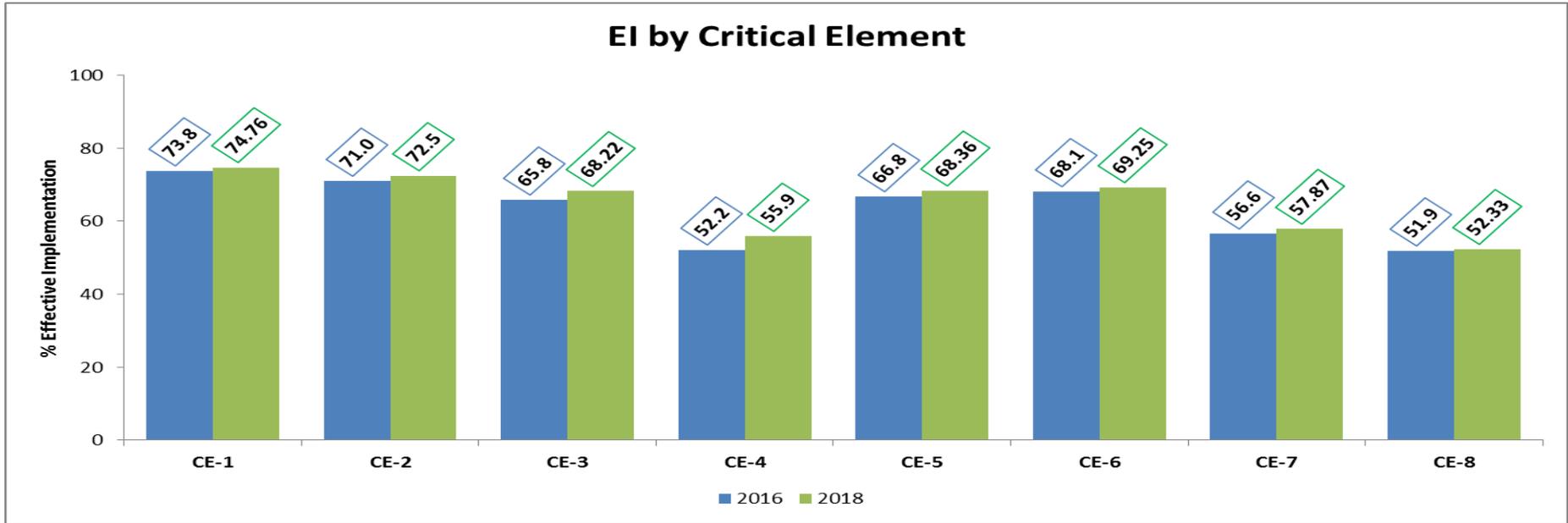
- Challenges we are facing
- Audit results
- Update on PANS-Aerodromes – new provisions on managing aerodrome safety
- Runway safety
- Wildlife strike hazard management

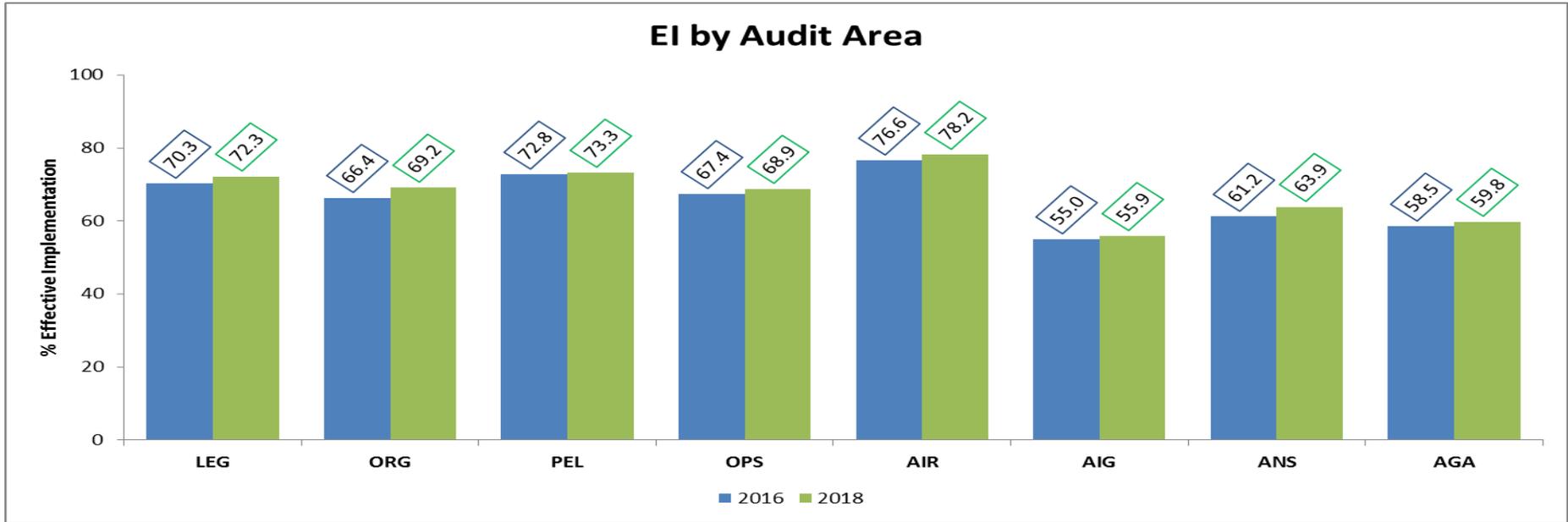


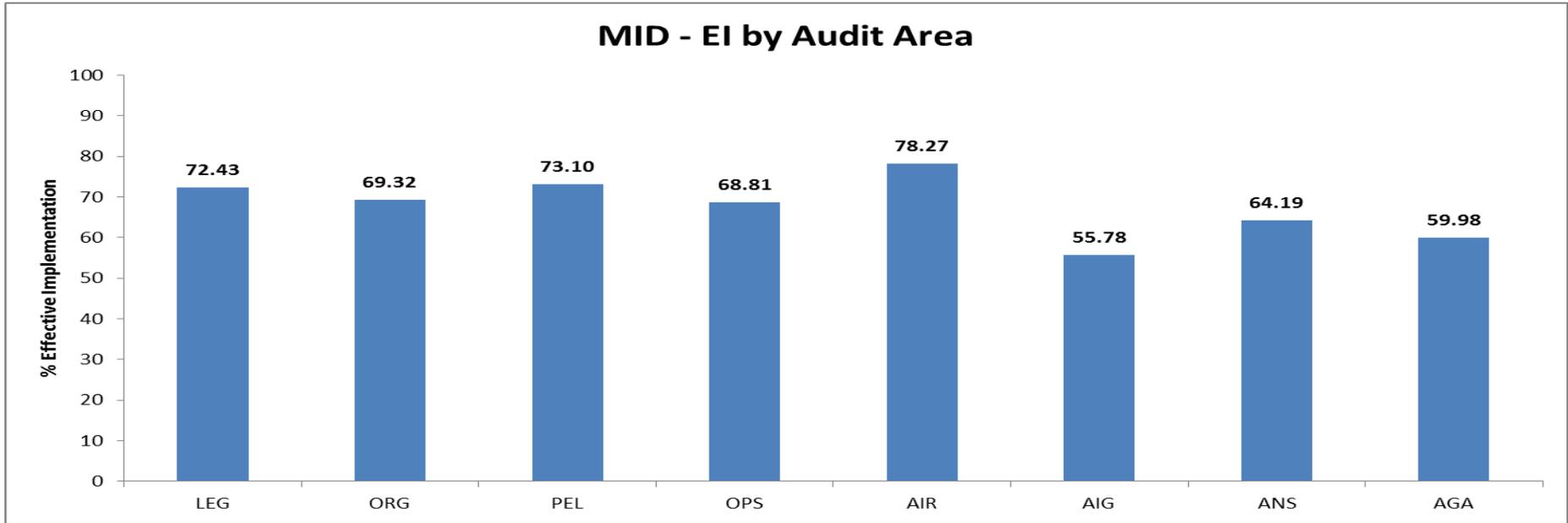


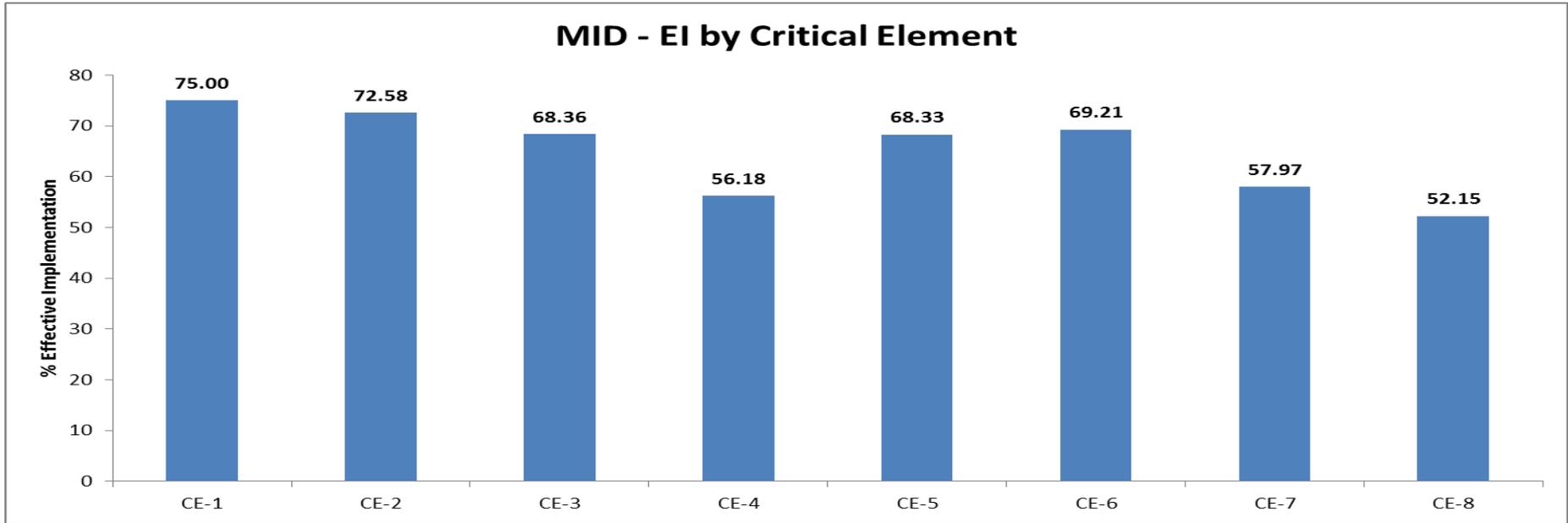
# Challenges

- **Aerodrome capacity demand**
  - Airport congestion at existing aerodromes
  - Continuing significant traffic increase in the next 15 years
- **Aerodrome Safety**
  - Airside accidents
  - Runway safety
  - Wildlife strikes
  - Apron safety
  - FOD
  - Obstacle control
  - ...
- **Challenges to accommodate new larger/type aircraft**

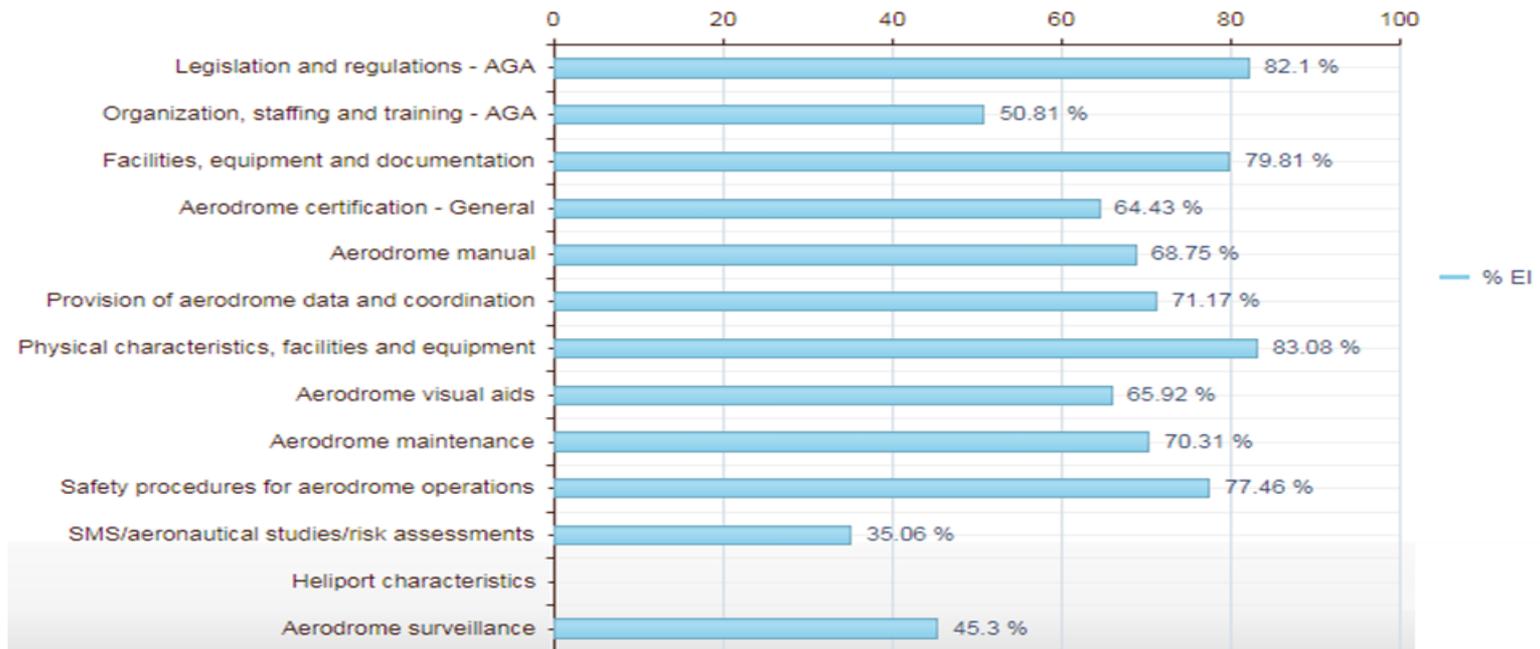








## MID – Current EI for AGA Sub-Groups





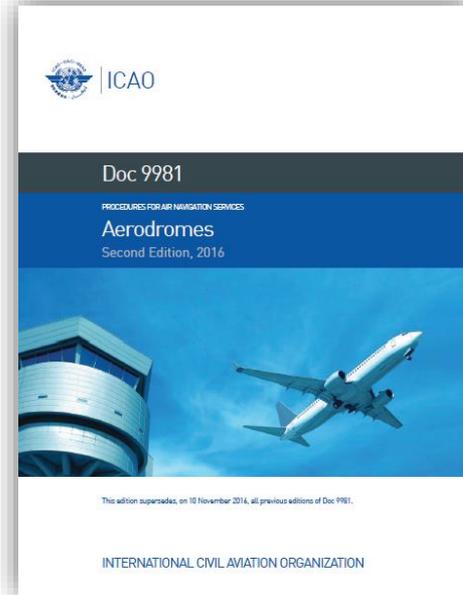
## Highlights of issues identified in the AGA area

- Implementing aerodrome certification requirements
- Ensuring that aerodrome operators receiving international flights have implemented an SMS acceptable to the State
- Establishing and implementing a formal surveillance programme for certified aerodromes, with associated procedures and plans
- Establishing and implementing integrated strategies, including Runway Safety Teams, for runway incursions and collisions avoidance at aerodromes
- Establishing and implementing a quality system to ensure the accuracy, consistency, protection and integrity of aerodrome-related safety data published in the State's AIP



# Update on PANS-Aerodromes

- PANS-Aerodromes (Doc 9981)
- Eight new chapters dealing with day-to-day operations
- Consultation with States (State letter AN 4/27-18/25)
- Applicability date for PANS-Aerodromes with consequential amendments to Annex 14, Vol I and Annex 11: 5 November 2020





# New provision in PANS-Aerodromes

- New Chapters for Part II
  - Training
  - Reporting format using standard runway condition report (approved)
  - Inspection of the movement area
  - Work in progress (WIP)
  - Foreign object debris (FOD) control
  - Wildlife hazard management
  - Apron safety
  - Runway safety
  - Airside driver permit scheme and vehicle/equipment



| ICAO

UNITING AVIATION

# Runway Safety



# Assembly Resolution A37-6

- Urges States to take measures to enhance runway safety
  - Runway excursion
  - Runway incursion
  - Other occurrences related to runway safety
- Establishment of runway safety programmes using a multidisciplinary approach
  - Regulators
  - Aircraft operators
  - ANSP
  - Aerodrome operators
  - Aircraft manufacturers



# Overview of ICAO Documentation

- Annexes 2, 6, 8, 11, 13, 14, 15, 19
- PANS-ATM (Doc 4444); PANS-OPS (Doc 8168); PANS-Aerodromes (Doc 9981)
- Guidance material in ICAO manuals and circulars, such as
  - Manual on the Prevention of Runway Incursions (Doc 9870)
  - Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual (Doc 9830)
  - Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643)
  - Aerodrome Design Manual, Part 4, Visual Aids (Doc 9157)
  - Circular 329 Runway Surface Condition Assessment, Measurement and Reporting
  - Safety Management Manual (SMM) (Doc 9859)



## Overview of ICAO Documentation (cont'd)

- Runway Safety Team Handbook 2nd Edition
- Runway Excursion Risk Reduction Toolkit (ICAO/IATA)
- ICAO Runway Safety Toolkit (ICAO / Embry-Riddle Aeronautical University)
- Runway Safety Go-Team Methodology
- Runway Incursion Severity Classification (RISC) (ICAO / FAA)



# New ICAO Provisions

- RESA and arresting systems
- Taxiway design
- Visual aids, including autonomous runway incursion warning systems (ARIWS)
- Global Reporting Format (GRF) for assessing and reporting runway surface conditions



# RESA and arresting systems

- Strengthened requirement for the provision of RESA
  - all types of runways are required to be provided with RESA, including non-instrument runways with code numbers 1 and 2
- The introduction of arresting systems in relation to the provision of RESA offers additional mitigating measures to address aircraft overruns
  - the length of a RESA may be reduced where an arresting system is installed, subject to acceptance by the State
- Requirement for publishing RESA and arresting system information in the AIP



# Taxiway Design

- New taxiway design guidance for minimizing potential for runway incursions
  - limit the number of runway crossings
  - provide pilots with enhanced unobstructed view of the entire runway
  - correct taxiways identified as hot spots



# Visual Aids

- Enhanced taxiway centre line markings and mandatory instruction signs
- Mandatory requirement, as of 26 November 2026, for increased conspicuity of runway-holding positions
- Autonomous runway incursion warning systems (ARIWS)



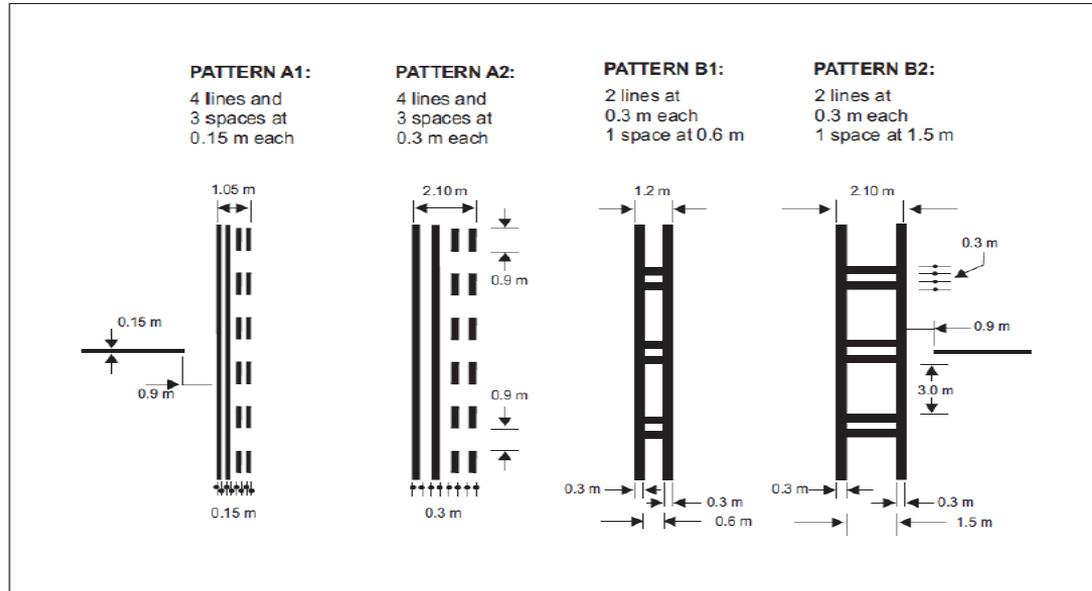


Figure 5-8. Runway-holding position markings

*Note.— Patterns A1 and B1 are no longer valid after 2026.*





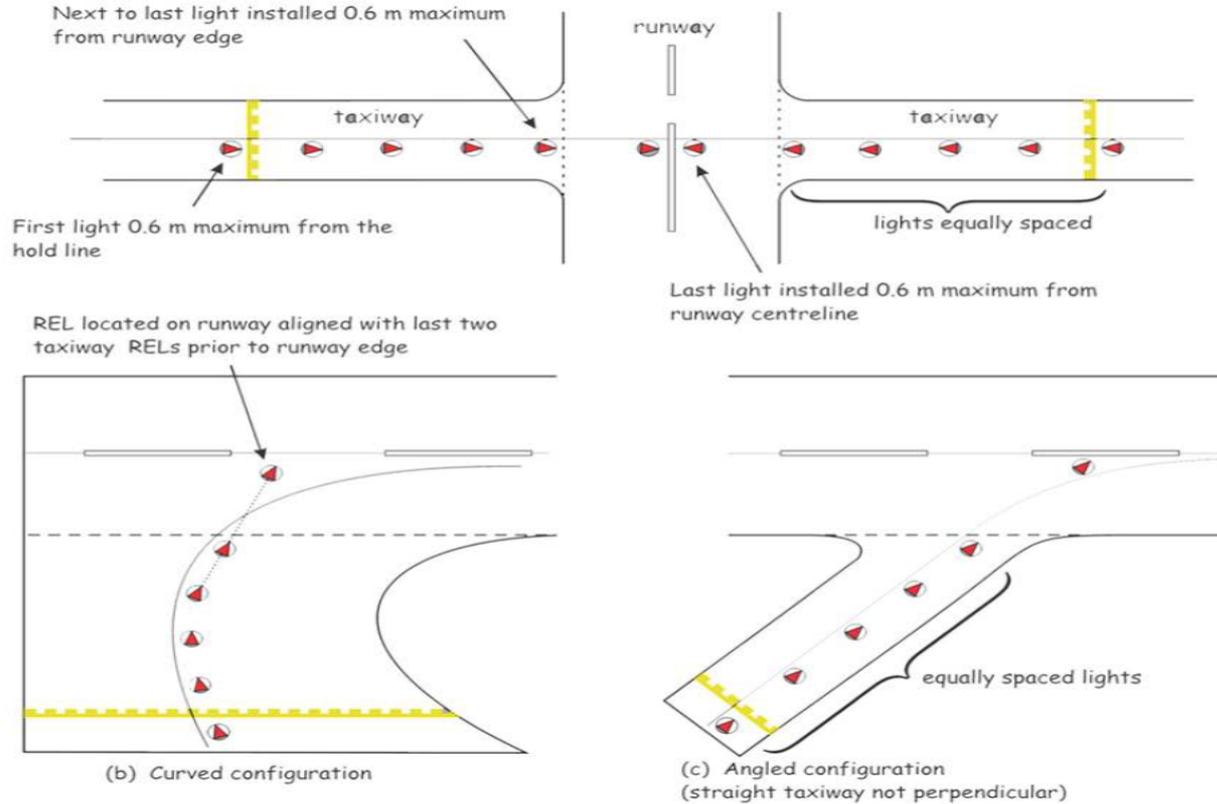
## **Autonomous runway incursion warning system (ARIWS)**

- Not mandatory
- If installed, it shall be compliant with the location and characteristics provisions in Annex 14, Volume I
- Standardized visual aids – runway status lights (RWSL)
- Procedures in PANS-ATM (Doc 4444) for flight crew and vehicle drivers in the event of an ARIWS warning

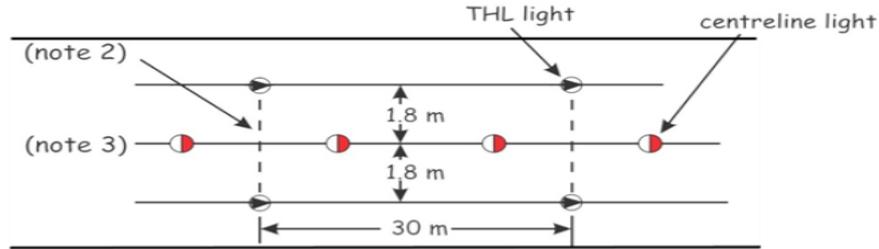
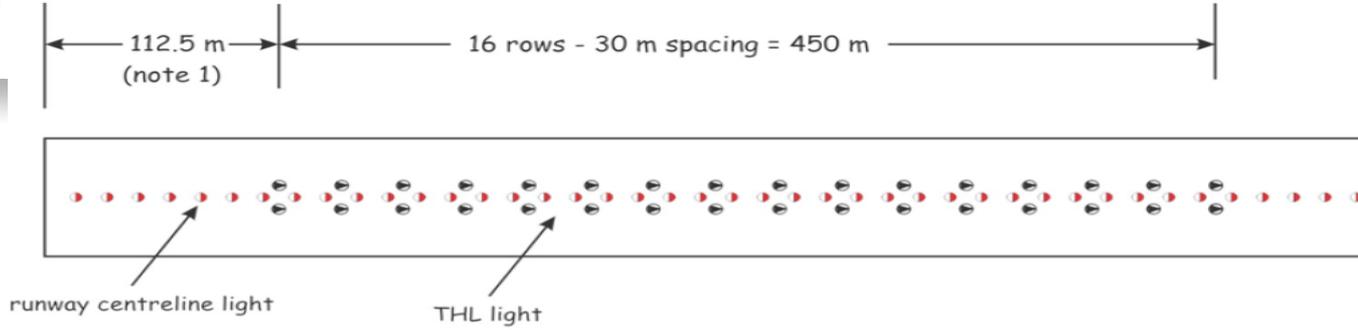


### 5.3.30 Runway status lights

*Introductory Note.— Runway status lights (RWSL) is a type of autonomous runway incursion warning system (ARIWS). The two basic visual components of RWSL are runway entrance lights (RELs) and take-off hold lights (THLs). Either may be installed by itself, but the two components are designed to be complementary to each other.*



LIMITING AVIATION



Notes:

- (1) 7 1/2 centreline light spacings.
- (2) Preferably the THL is positioned such that a line formed by two THL lights will be near the mid-point between two centreline lights.
- (3) If the runway centreline lights are offset from the physical centreline, the THL lights are similarly offset to maintain the 1.8 m dimension.





ICAO | UNITING AVIATION



29 October 2018



ICAO

UNITING AVIATION





ICAO | UNITING AVIATION





## Global reporting format for runway surface conditions

- A globally-harmonized methodology for runway surface condition assessment and reporting
- Covers several Annexes, two PANS and some guidance materials.
- Aimed at reducing runway excursions
- Applicable on 5 November 2020



## Global reporting format for runway surface conditions

- Annex 14, Volume I
  - requires the aerodrome operator undertake an *in-situ* assessment of the runway surface conditions
  - Using Runway Condition Assessment Matrix (RCAM) and runway condition code (RWYCC, ranging from 0 to 6)



# Global reporting format for runway surface conditions

- PANS-Aerodromes
  - contains procedures on the assignment of the RWYCC in accordance with the RCAM
- Annex 8
  - contains provisions requiring aircraft manufacturers to use the matrix to determine what data to provide to aeroplane operators and how to calculate the aeroplane performance for specific surface conditions



# Global reporting format for runway surface conditions

- Annex 6
  - Flight crew, using the matrix information supplied by the airport and the associated manufacturer-provided performance data, to conduct performance calculation and to determine if the aircraft can safely land with the conditions present at the airport



# Global reporting format for runway surface conditions

- Annex 15
  - Methodology to distribute the runway surface condition information through a revised SNOWTAM format
- Annex 3
  - the reporting of the state of the runway in the METAR/SPECI will no longer be required



# Global reporting format for runway surface conditions

- PANS-ATM
  - Alignment and addition of air-ground radiotelephony phraseologies which correlate with the use of the associated terms proposed in Annex 14, Volume I and other documents



# The I

Runway condition assessment matrix (RCAM)				
Runway condition code	Assessment criteria		Downgrade assessment criteria	
	Runway surface description	Aeroplane deceleration or directional control observation	Pilot report of runway braking action	
6	<ul style="list-style-type: none"> <li>• DRY</li> </ul>	---	---	
5	<ul style="list-style-type: none"> <li>• FROST</li> <li>• WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)</li> </ul> <p><b>Up to and including 3 mm depth:</b></p> <ul style="list-style-type: none"> <li>• SLUSH</li> <li>• DRY SNOW</li> <li>• WET SNOW</li> </ul>	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD	
4	<p><b>-15°C and Lower outside air temperature:</b></p> <ul style="list-style-type: none"> <li>• COMPACTED SNOW</li> </ul>	Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM	
3	<ul style="list-style-type: none"> <li>• WET ("slippery wet" runway)</li> <li>• DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW</li> </ul> <p><b>More than 3 mm depth:</b></p> <ul style="list-style-type: none"> <li>• DRY SNOW</li> <li>• WET SNOW</li> </ul> <p><b>Higher than -15°C outside air temperature<sup>1</sup>:</b></p> <ul style="list-style-type: none"> <li>• COMPACTED SNOW</li> </ul>	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM	
2	<p><b>More than 3 mm depth of water or slush:</b></p> <ul style="list-style-type: none"> <li>• STANDING WATER</li> <li>• SLUSH</li> </ul>	Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR	
1	<ul style="list-style-type: none"> <li>• ICE <sup>2</sup></li> </ul>	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	POOR	
0	<ul style="list-style-type: none"> <li>• WET ICE <sup>2</sup></li> <li>• WATER ON TOP OF COMPACTED SNOW <sup>2</sup></li> <li>• DRY SNOW or WET SNOW ON TOP OF ICE <sup>2</sup></li> </ul>	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR	



ICAO | UNITING AVIATION



ICAO



AIRPORTS COUNCIL  
INTERNATIONAL



# ICAO/ACI Symposium on Implementation of the New Global Reporting Format for Runway Surface Conditions (GRF2019)

26-28 March 2019, duration 2.5 days, at ICAO HQ, Montréal, Canada.

[www.icao.int/Meetings/grf2019](http://www.icao.int/Meetings/grf2019)



# Global Symposium

- ICAO Global Reporting Format (GRF) Implementation Symposium: *Improving runway safety through the assessment and reporting of runway surface conditions*
- Montreal 26-28 March 2019
- Aims
  - Introduction for regulators and industry on the system and Format for the Runway Condition Report
  - Increase awareness and knowledge
  - Understand ICAO SARPS, training needs and capacity
  - Awareness of implementation challenges
  - Exchange of best practice
- Supported by training workshop
- Follow-up through regional seminars in 2019-2020

# Ongoing Work at ICAO

- PANS-Aerodromes (Doc 9981)
  - Dedicated chapter on Runway Safety
  - Several other Chapters contributing to runway safety, in the areas of FOD control, inspection of the movement area and work in progress, etc..



This edition supersedes, on 10 November 2016, all previous editions of Doc 9981.

INTERNATIONAL CIVIL AVIATION ORGANIZATION



## Ongoing Work at ICAO (cont'd)

- More guidance on for the implementation of GRF for assessing and reporting of runway surface conditions
- To be ready for the global symposium on GRF in March 2019



ICAO

UNITING AVIATION

ICAO SAFETY

**Runway Safety Programme – Global Runway Safety Action Plan**  
November 2017

Global Runway Safety Action Plan

**Contents**

Background	2
Runway Safety Teams	2
Other ICAO Initiatives	2
Global Priorities for Runway Safety	3
Runway Excursion and Runway Incursion Top Contributing Factors	4
Runway Excursion Top Contributing Factors (2012-2016)	4
Runway Incursion Top Contributing Factors	6
Runway Safety Recommended Actions	7
ICAO	8
Runway Safety Programme Partners	9
Regional Safety Oversight Organisations (RSOCs), Regional Aviation Safety Groups (RASGs)	10
State Civil Aviation Authorities, Aircraft Operators, Air Navigation Service Providers, Aerodrome Operators, Aircraft Manufacturers	11
State Civil Aviation Authorities	13
Aircraft Operators	15
Air Navigation Service Providers	18
Aerodrome Operators	21
Aircraft Manufacturers	24
Appendix 1 – ICAO Runway Safety Accident Category Definitions	26
Appendix 2 – Runway Safety Accident and Serious Incident Statistics	27
Runway Incursions	30
Runway Safety Risk Index	31
Appendix 3 – References	32

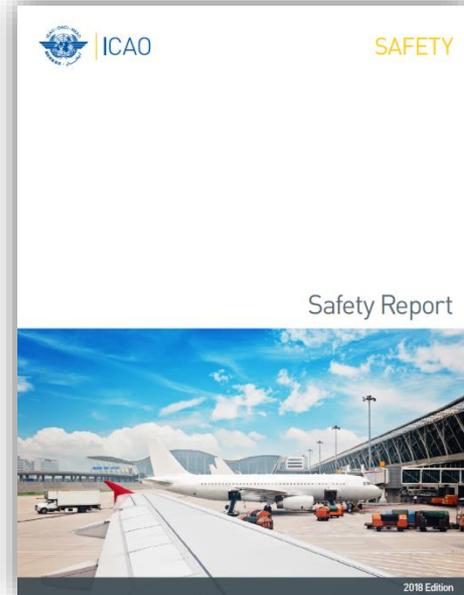


# Wildlife Hazard Management



# ICAO Safety initiative

- Presence of wildlife on and in the vicinity of aerodromes poses a serious threat to aircraft operational safety.
- Wildlife strikes can cause accidents and serious incidents, costing the aviation industry billions in losses due to aircraft damage, flight delays and other operational impacts.
- ICAO has been undertaking various initiatives to help States reduce wildlife strike hazard to aviation.
- Wildlife Strike Hazard Reduction is an ICAO Safety initiative





## ICAO/ACI Wildlife Strike Hazard Reduction Symposium (May 2017)

- Increase the international awareness of the wildlife strike hazard to aircraft operational safety;
- Build an international community to exchange ideas, experiences and cooperative efforts;
- Advance new technologies; and
- Formulate effective strategies in preventing and mitigating the risk of wildlife strikes to aircraft.

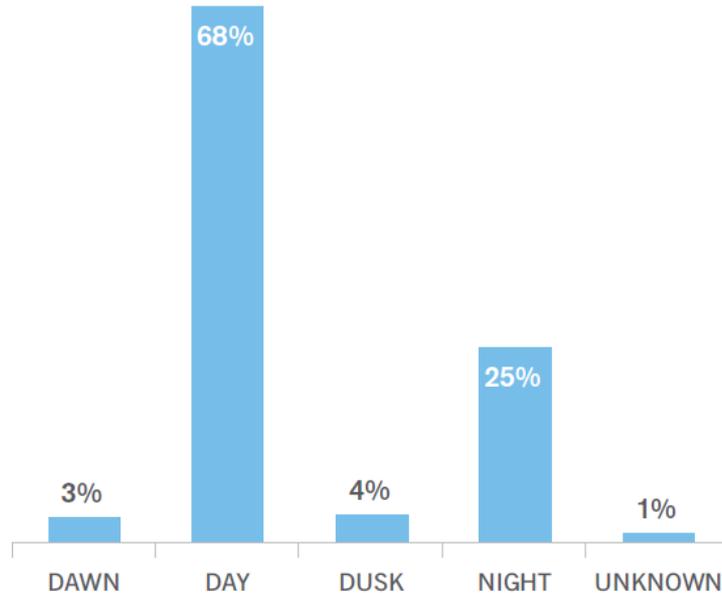


# International awareness

- Comprehensive analysis of wildlife strike reports (2008-2015)
- Use of the ICAO Bird/Wildlife Strike Information System (IBIS)
- 97 751 reports were received from 91 States on strikes occurring in 105 States and territories
- 2 501 reports had an indication of an effect on the flight:
  - precautionary landings (49%); and
  - aborted take offs (28%).

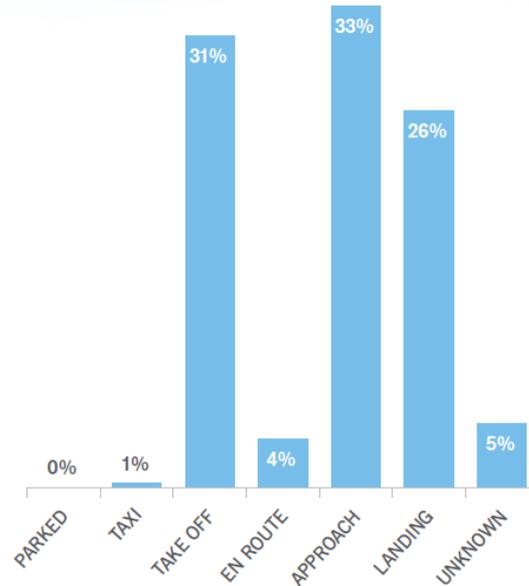


## Wildlife Strike Occurrences by Light Conditions (2008–2015)



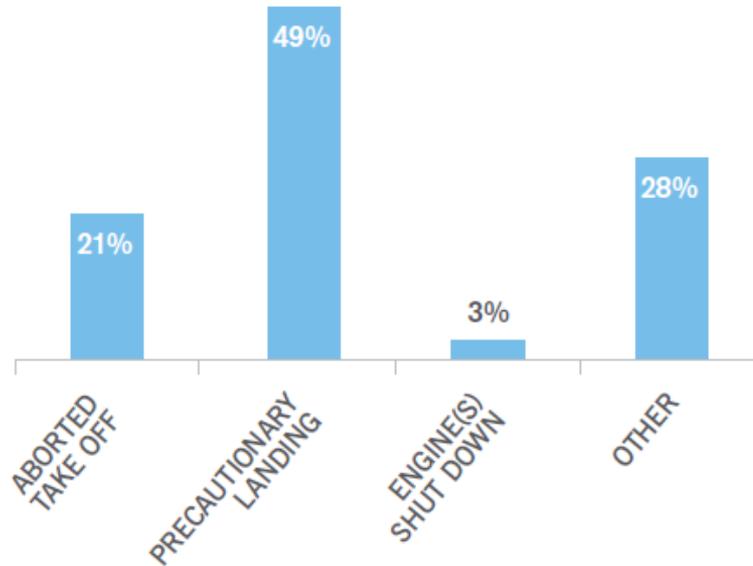


## Wildlife Strike Occurrences by Flight Phase (2008-2015)





## Wildlife Strike Effects on Flight (2008-2015)





## **Outputs of the Wildlife Symposium - Importance of cooperation**

- Involvement of multiple stakeholders;
- Importance of Local Runway Safety Team;
- Focus on Airport Wildlife Committee;
- Importance to work with local communities.



## **Outputs of the Wildlife Symposium - Strengthening regulatory requirements**

- Need of appropriate legislation and regulation;
- Importance of a national procedure for recording and reporting wildlife strikes;
- An ongoing evaluation of the hazard by competent personnel.



## Outputs of the Wildlife Symposium - Use of new technology

- More effective habitat management;
- Possibility to inform go/ no-go advice from the tower and decisions by pilots;
- Newer and better technologies to disperse birds away from aerodromes.



## Effective strategies in preventing and mitigating the risk

- No one-size-fits-all solution for all states
  - Wildlife control programme based on a wildlife survey of the airport and local area;
  - Risk assessment based on the probability and severity of strikes by the types of birds and wildlife found at the airport;
  - Control measures to be weighed and evaluated against the requirements;
- Production of a Wildlife Hazard Management Programme



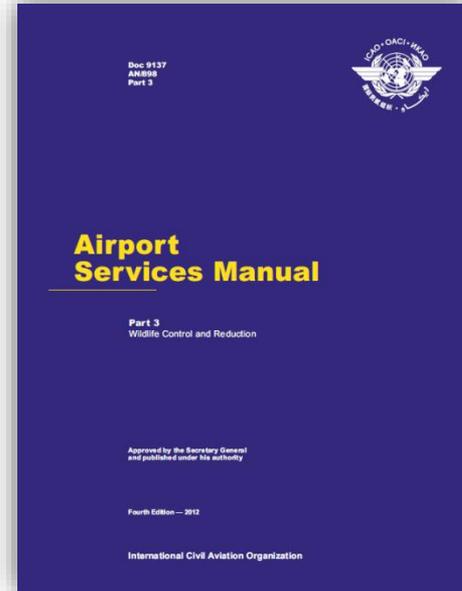
# PANS-Aerodromes (Doc 9981) objectives

- To have a wildlife safety risk assessment being conducted, covering the aerodrome and its vicinity;
- To establish a Wildlife Hazard Management Programme (WHMP) tailored to the local environment and be commensurate with the wildlife safety risk assessment;
- To include within the WHMP, procedures and measures for reducing the wildlife risk at the aerodrome to an acceptable level.
- To integrate wildlife hazard reduction measures and procedures into the aerodrome operator's safety management system (SMS).



# Ongoing work at ICAO

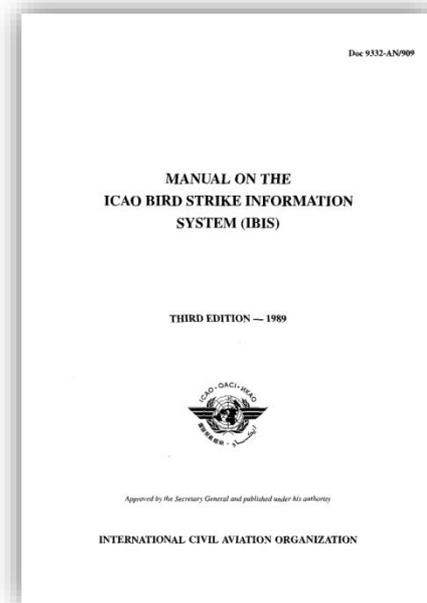
- Review of the Airport Services manual - Part 3 “Wildlife Hazard Management” (new title)
- Objectives:
  - to be consistent with the new PANS-Aerodromes;
  - to reflect the evolution and current practices pertaining to wildlife hazards management;
  - To include guidance on training.





# Ongoing work at ICAO (Cont'd)

- Review of the Manual on the ICAO Bird/wildlife Strike information system (Doc 9332)
- To be consistent with the new ECCAIRS platform
- An ICAO reporting portal is under development
- A dedicated email address to send report: **wildlife@icao.int**





ICAO

UNITING AVIATION

More information will be provided:

<https://www.icao.int/ibis>



**THANK YOU!**