

# European Action Plans for Runway Safety

Polish National RST and Wildlife Forum  
25 November 2022

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Runway safety coordinator  
EUROCONTROL



Network  
Manager



Supporting European Aviation

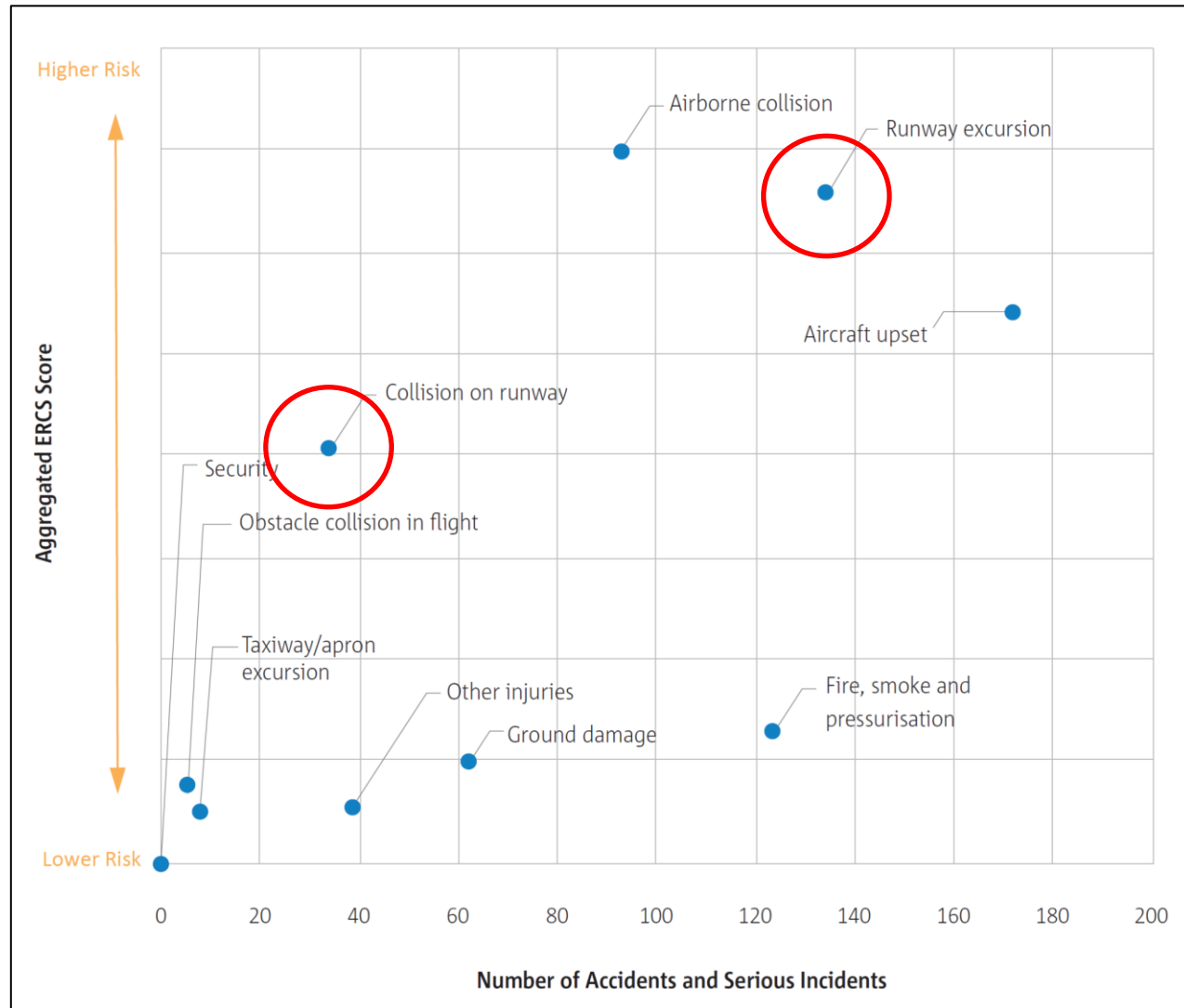
# Scoping runway safety – mitigating risk of:



- Runway collision
  - Runway incursion (precursor)
- Runway excursion
- Abnormal runway contact
- Runway undershoot / overshoot
- Wildlife hazards (e.g. bird strike)
- FOD

# EASA annual safety review 2021

## CAT & NCC business aircraft operations

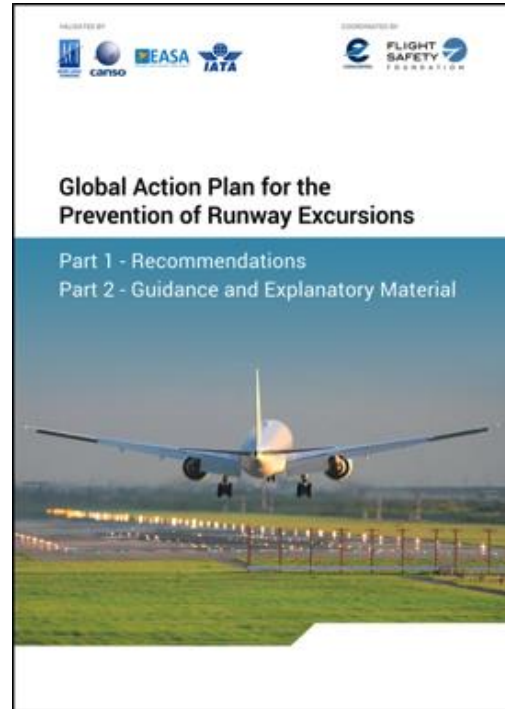


- Runway excursion - key risk area No 2
- Runway collision - key risk area No 4

# Runway Safety Improvement Strategy

- Runway safety addressed at 3 basic levels:
  - Global (ICAO GASP, GAPPRE)
  - Regional (EASA, EUROCONTROL and associations)
  - National (CA and aviation service providers)

# European Runway Safety Plans





# Action plans' Implementation Strategy



- State coordination
- National/Local Runway Safety Teams
- Promotion and support by EUROCONTROL and EASA

# Action plans' Implementation Principles



- Voluntary implementation but State (NSA, Regulator) may mandate it (through SSP & SPAS) and add further requirements
- Uniform and consistent application of ICAO and EU provisions
- Customisation to local conditions per risk stakeholder
- Recognition that training is key to prevention
- Integration with organisation's SMS

# EAPPRI and GAPPRE on SKYbrary

[www.skybrary.aero](http://www.skybrary.aero)



**Runway Incursion**

**Description**

ICAO defines a Runway Incursion as: "Any occurrence on the protected area of a surface designated for the movement of aircraft".

A general overview of the topic can be found in the following publications:

Based on the specific aspects of runway incursion, this document provides guidance on Airport Design and Infrastructure, Preventing Runway Incursions, and Defences Against Runway Incursion and Wildlife.

To select a sub-category use the filter in the right data block.

**Filter by subcategory**

- Overrun on Take Off
- Overrun on Landing
- Veer Off

**Related resources**

**GAPPRE**

**SKYclips**

**Changing Departure Runway While Taxiing**

**Changing Runways (SKYclip)**

**Runway Excursion**

**Description**

Runway excursions can occur on takeoff or on landing as well as during taxi. They consist of two types of events:

- Veer-Off:** Excursion in which an aircraft departs the physical edges of a runway/taxiway.
- Overrun:** Excursion in which an aircraft departs the end of a runway

In view of the above, the articles related to runway excursions have been assigned to the following sub-categories:

- Overrun on Take Off:** A departing aircraft fails to become airborne or successfully reject the take off before reaching the end of the runway.
- Overrun on Landing:** A landing aircraft is unable to stop before the end of the runway is reached.
- Veer Off:** An aircraft departs the side of the runway after touchdown on landing or departs the side of the runway during line-up or the take off run.

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**GAPPRE**

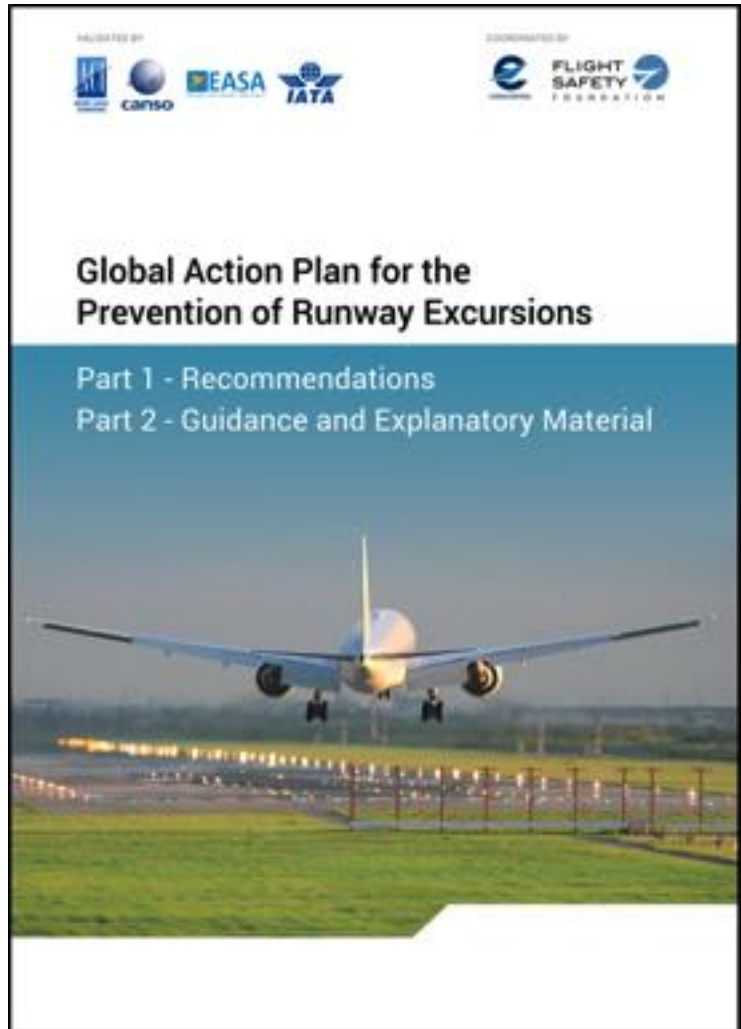
**SKYclips**

**Changing Departure Runway While Taxiing**

**Changing Runways (SKYclip)**



# GAPPRE Part 1 and Part 2



- Published on 5 May 2021
- Collaboration between industry and regulators;
  - 40+ organisations
  - 100+ professionals
- Data driven;
- 101 consensus-based recommendations;
- Beyond regulatory compliance

# GAPPRE Implementation Over 3 Time-horizons

## SHORT-TERM

Existing technology, SOPs and Training

- D-ATIS
- Runway overrun awareness and alerting system
- Touch-down point limit
- Cross wind landing
- RWY centreline lights used together with the runway edge lights
- Safe RWY change
- Airlines cross- and tailwind limits
- Independent performance calculations
- Go-around and safe landing policies

## NEAR FUTURE

Scale-up the existing technology and strategies

- Function for 3-d a/c trajectory accuracy with regard to the RWY
- TDZ lighting, RWY centerlines, TWY centerline lights as a standard
- RWY edge and centerline lights confusion strategy
- Automatic a/c braking action report
- Real time take-off performance monitoring
- Flight path and energy awareness
- EFB auto-cross check

## MID-TERM

Enhance the existing strategies

- Lateral deviations awareness and alerting system
- Automatic RWY conditions monitoring
- Autoland for all RWYs
- Assess RWY microtexture
- Flight path and energy management functions
- Models to assess RWY wetness
- Improve graded area of wet RWY to mitigate when veering off

# GAPPRE Recommendations and Guidance for 6 Target Groups



# GAPPRE Recommendations for Aerodrome Operators (1)



- RWYs constructed, resurfaced and repaired to recommended design targets
- Programme for removal of contaminants
- Radio navigation and visual aids maintained to ICAO SARPS
- RWY HP clearly marked; TORA signs at intersections
- Procedures for temporary reduced declared distances calculation; proper marking, lighting and signs
- Proactive and reactive RWY surface condition assessment and reporting according to GRF

# GAPPRE Recommendations for Aerodrome Operators (2)



- Appropriate designation of RWY entry/exits
- Use of RWY centreline lights
- Digital transmission of ATIS
- Coordination with MET provider, ANSP and AOs for regular assessment of weather data
- Publish info about local hazards and specifics
- Approach path management in collaboration with ATC and AOs



# Recommendations for ANSPs



Stabilised approach and correct departure performance calculation and aircraft set up (safe RWY change)

Learning from data analysis and safety information exchange

Provision of safety critical information to flight crews: RWY conditions, D-ATIS, MET, TORA, LDA, Intersection TOF entries

Correct alignment on the runway: use of centerline lights with edge lights (when switched on)

# Recommendations for Aircraft Operators



**GEN:** Challenging clearances, safe RWY change, wind limitations, cross-wind ops, technical solutions, DL, FDM/FOQA, current vs. planned conditions...

**Departure considerations:** TOF performance and use of EFB, rejected TOF decision process, correct line up for departure

**Arrival considerations:** safe descent, approach, landing and go-around policies, landing performance, correct assessment and implications for aircraft stopping, touch-down point limits, GA decision and PM duties, bounced landing recovery...

# Recommendations for Aircraft Manufacturers



**Information provision:** take off and landing performance, deceleration means best use, ldg distances calculations, x-wind and ldg techniques, use of automatic braking on wet/cont. RWY, automatic braking action reporting

**On-board functionalities (1):** real time performance monitoring and alerting for landing/go-around, 3-d a/c trajectory accuracy with regard to RWY, flight path and energy state awareness, real time stabilized approach monitoring

**On-board functionalities (2):** real time performance monitoring for take-off for RE and wrong position performance, real time position awareness on final approach for incorrect RWY, TWY or incorrect intersection for departure

**EFB HMI** minimizing errors, enabling independent calculations, consistent terminology and symbols and SOPs for cross checks

# Recommendations for Regulators



Ensure RE is reflected the State Safety Plan, training for operational personnel, oversight, safety promotions activities and noise mitigation hazard assessment

Foster collaboration: establish national runway safety forum, collaborative development of KPIs, safety information sharing

Simple TDZ lighting as standard, enhance TDZ lighting and marking, RWY centerlines enhanced use, TWY centerline lights as a standard, RWY edge and centerline lights confusion strategy

Support the development of: SBAS models to allow certification of automatic landing on LPV 200 and video based navigation

# Recommendations for R&D Establishments



**On-board functionalities:** Awareness and alerting system for lateral deviation during final stages of the landing, flight path and energy information, real time stabilized approach monitor, extend automatic landing for any RWY states

**RWY:** methods to assess RWY wetness and microtexture, ways to improve RWY graded area of wet RWY strips, automatic RWY condition reporting



# GAPPRE Implementation Guidance Material



## Runway Excursion

**Description**

Runway excursions can occur on takeoff or on landing as well as during taxi. They consist of two types of events:

- **Veer-Off:** Excursion in which an aircraft departs the physical edges of a runway/taxiway.
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To select a sub-category use the filter in the right data block. Because of their nature, some articles are listed in more than one sub-category.

Showing below 73 results in range #1 to #73.

**A**

Accident and Serious Incident Reports: RE	AIBN Surface Friction Study - The 30 Reviewed Events
Aircraft Load and Trim	Approach and Landing Accidents (ALA)
Aquaplaning	

**B**

Balked Landing: Guidance for Flight Crew	Beyond the Runway End Safety Area
Brake Problems: Guidance for Controllers	

**C**

**Filter by subcategory**

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- Veer Off

**Related resources**

**GAPPRE**

**SKYclips**

Changing Departure Runway While Taxiing

Changing Runways (SKYclip)

<https://skybrary.aero/operational-issues/runway-excursion>



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# Further RE Prevention Guidance Material

**Runway Safety Programme**  
Working together to solve a complex problem  
Select a partner link below to see additional Runway Safety Material.

ICAO | IATA | IFALPA | EUROCONTROL

Welcome

Click the ICAO logo in the top left to return to the Runway Safety Programme

**FLIGHT SAFETY FOUNDATION** Reducing the Risk of **RUNWAY EXCURSIONS**

## Runway Excursion Risk Awareness Tool

Elements of this tool should be integrated, as appropriate, with the standard approach and departure briefings to improve awareness of factors that can increase the risk of a runway excursion. The number of warning symbols indicates a relative measure of risk. Generally, the higher the number of warning symbols the risk presented by that factor. Flight crews should consider carefully the effects of multiple factors and be prepared to take appropriate action.

**Failure to recognize the need for and to properly execute a Rejected Takeoff (RTO).** Failure to recognize the need for and to properly execute a Rejected Takeoff (RTO). Failure to recognize the need for and to properly execute a Rejected Takeoff (RTO). Failure to recognize the need for and to properly execute a Rejected Takeoff (RTO). Failure to recognize the need for and to properly execute a Rejected Takeoff (RTO).

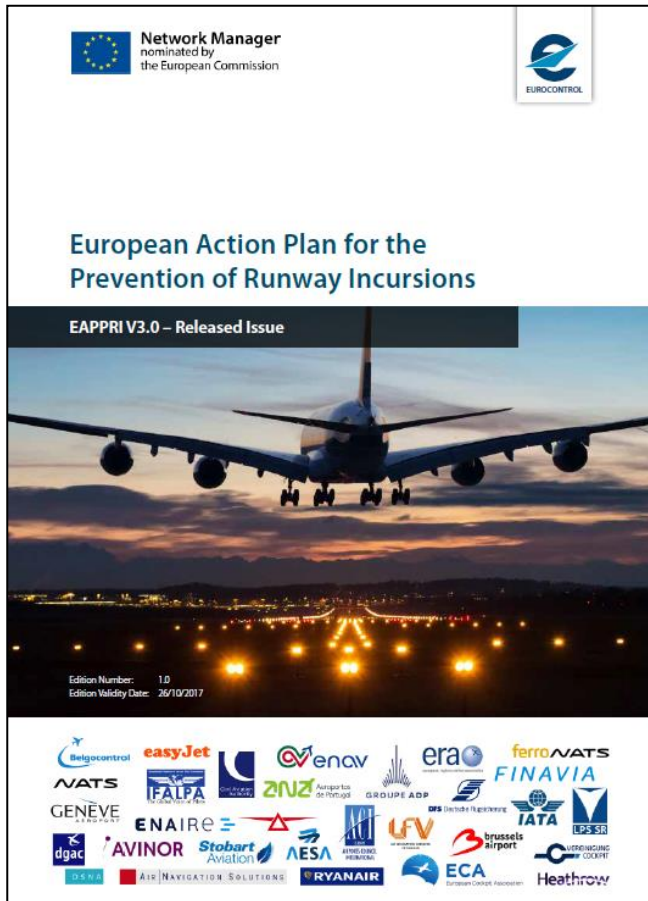
Type of Operation	Risk Level
Nonscheduled/air taxi/freight	⚠️⚠️
Training/observation	⚠️
Flight Crew	
Reduced state of alertness — long duty period, fatigue	⚠️⚠️
Single-pilot operation	⚠️⚠️
Airport	
No current/accurate weather/runway condition information	⚠️⚠️
Unfamiliar airport or unfamiliar procedures	⚠️⚠️
Environment	
Visibility restrictions — e.g. fog, low clouds, IMC, low light	⚠️
Contaminated runway — e.g. snow, slush, ice	⚠️
Tail wind greater than 5 kt	⚠️
High crosswinds/gusty winds	⚠️
Heavy rain/thunderstorm	⚠️
Aircraft Equipment	
No wind shear warning system	⚠️

**Welcome**  
to the Runway Excursion Risk Reduction Toolkit

2nd EDITION

EUROCONTROL

# EAPPRI 3.0



November 2017

## 104 recommendations for action

- General/Local Runway Safety Teams (10)
- Communications (8)
- Aerodrome Operators (17)
- Aircraft Operators (19)
- Air Navigation Service Providers (14)
- Regulators/Oversight (9)
- Data collection and lesson sharing (2)
- AIM (6)
- Technology (2)
- Civil/Military joint use of aerodromes (13)
- Future work (4)

# EAPPRI Recommendations for Aerodrome Operators (1)

European Action Plan for the Prevention of Runway Incursions v3.0 (EAPPRI v3.0) new Recommendations



SECTION

## Aerodrome Operator (Ad Op)

<p><b>Ad Op 1</b></p> <p>Ensure briefing and supervision of external aerodrome construction contractors' drivers and other personnel working on the airfield</p> <p><b>Rationale:</b> External contractors may not be runway safety 'aware'; important to ensure that they are properly briefed and supervised</p>	<p><b>Ad Op 2</b></p> <p>Carry out regular audits of airside driving permits (e.g. check 'recency' of use) in particular those allowing access to the runways, which should be as few as possible</p> <p><b>Rationale:</b> Best practice to ensure access to runways is kept as low as possible</p>	<p><b>Ad Op 3</b></p> <p>Promote the adoption of 'sterile cab' procedures when on the manoeuvring area</p> <p><b>Rationale:</b> Aerodrome local RST should have been established in line with ICAO guidance and EU regulation; however, in the spirit of continuous improvement, confirm that working arrangements are optimal. Check role, terms of reference, composition, frequency, tasks and outputs</p>
<p><b>Ad Op 4</b></p> <p>Identify aerodrome Protected Areas and produce a map for drivers</p> <p><b>Rationale:</b> Improve drivers' situational awareness. Assist in interpretation of runway incursion definition</p>	<p><b>Ad Op 5</b></p> <p>Assess the numbering/naming policy for aerodrome vehicles and consider assignment of unique numbers/names for each airside vehicle</p> <p><b>Rationale:</b> Best practice measure to clarify the role of airside vehicles (e.g. Fire One (or similar) to always be the Chief Fire Officer) and reduce risk of vehicle related call sign confusion</p>	<p><b>Ad Op 6</b></p> <p><b>Recommendation AD Op 6:</b> Closely spaced multiple parallel runway holding positions on the same taxiway should be avoided.</p> <p><b>Rationale:</b> Wide (nonstandard) taxiway entrances reduce the effectiveness of signs and markings as aids to prevent ground routing error and the infringement of the runway protections</p>



- Aerodrome contractors briefing and supervision
- Runway driver audit checks
- Formal RTF communications training and assessment for drivers
- “Sterile” cab
- “Operation normal” calls (with ATC)
- Vehicle naming/numbering policy
- Tracking of vehicle movements on the maneuvering area.



# EAPPRI Recommendations for Aerodrome Operators (2)

European Action Plan for the Prevention of Runway Incursions v3.0 (EAPPRI v3.0) new Recommendations



SECTION  
**Aerodrome Operator (Ad Op)**

**Ad Op 1**  
Ensure briefing and supervision of external aerodrome construction contractors' drivers and other personnel working on the airfield

**Rationale:**  
External contractors may not be runway safety 'aware'; important to ensure that they are properly briefed and supervised

**Ad Op 2**  
Carry out regular audits of airside driving permits (e.g. check 'recency' of use) in particular those allowing access to the runways, which should be as few as possible

**Rationale:**  
Best practice to ensure access to runways is kept as low as possible

**Ad Op 3**  
Promote the adoption of 'sterile cab' procedures when on the manoeuvring area

**Rationale:**  
Aerodrome local RST should have been established in line with ICAO guidance and EU regulation; however, in the spirit of continuous improvement, confirm that working arrangements are optimal. Check role, terms of reference, composition, frequency, tasks and outputs

**Ad Op 4**  
Identify aerodrome Protected Areas and produce a map for drivers

**Rationale:**  
Improve drivers' situational awareness. Assist in interpretation of runway incursion definition

**Ad Op 5**  
Assess the numbering/naming policy for aerodrome vehicles and consider assignment of unique numbers/names for each airside vehicle

**Rationale:**  
Best practice measure to clarify the role of airside vehicles (e.g. Fire One (or similar)) to always the Chief Fire Officer) and reduce risk of vehicle related call sign confusion

**Ad Op 6**  
**Recommendation AD Op 6:** Closely spaced multiple parallel runway holding positions on the same taxiway should be avoided.

**Rationale:**  
Wide (nonstandard) taxiway entrances reduce the effectiveness of signs and markings as aids to prevent ground routing error and the infringement of the runway protections



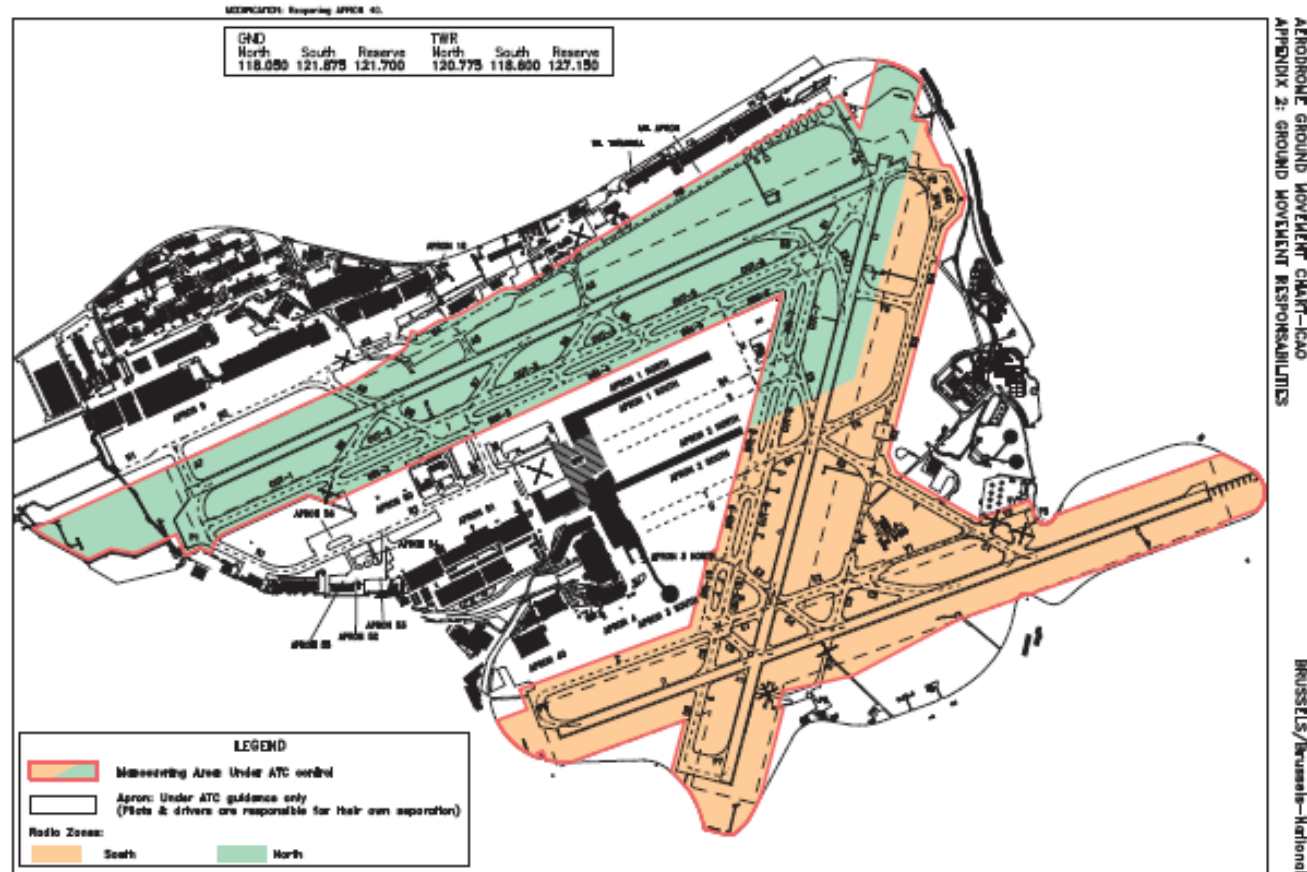
- H24 stop bars or equivalent means (with ATC)
- Closely spaced parallel holding positions
- RWY inspection in the opposite direction to RWY movements
- RWY protected area map
- Design short- and long-term solutions to avoid infringing lines of sight from the ATC Tower



# “Triple One” Principle

## One Runway, One Frequency, One Language

Ground movement responsibility map



Courtesy Brussels Airport



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# Aerodrome Work In Progress

CDG - “*Orange is the new black*”

## 7. Concept and applications

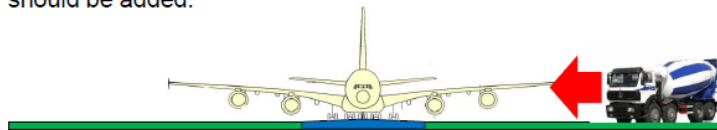
### 7.3 Construction ahead

This sign should be provided when the configuration of the construction works requires a higher vigilance from the crews (without requiring a specific limitation or restriction).

Two typical applications:

- Reduction of the taxiway strip (not requiring a reduction of the maximum wingspan allowed).
- Non aviation trucks and personnel: today, there is no information provided for increasing the situational awareness and catch the attention of the crew.

When the construction site is long or when the end of the constructions is not clearly visible, a sign « END CONSTRUCTION » should be added.



Many trucks (driven by non aviation staff) have to cross the taxiway.

PUBLIC DOCUMENT

 AÉROPORTS DE PARIS

55



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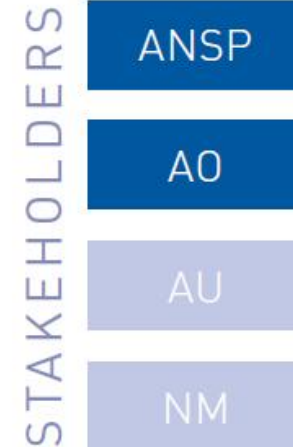
# Runway Status Lights at Paris CDG



## VISUAL SIGNALS TO SAFEGUARD RUNWAY USERS

### Runway status lights

SJU references:  
#01/Release 5



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# EAPPRI 3.0 – New AO recommendations

European Action Plan for the Prevention of Runway Incursions v3.0 (EAPPRI v3.0) new Recommendations



## SECTION Aircraft Operator

**AO1**  
If received significantly early, flight crew should confirm with ATC the line-up/take-off or crossing clearance when approaching the runway holding position.  
**Rationale:**  
Aims to reduce IIRs caused by pilots not remembering if they have clearance (or not) to enter the runway. Complementary Recommendation for ANSPs not to give clearance too early.

**AO2**  
Flight crew should consider to confirm Landing clearance on short final, if ATC issued it more than 5 nautical miles from touch down.  
**Rationale:**  
Aims to reduce IIRs caused by pilots not remembering if they have clearance (or not) to land. Complementary Recommendation for ANSPs not to give clearance too early.

**AO3**  
Ensure that crews are aware of the significance of red lights (e.g. stop bars and other red lights) used in line with alerting systems to prevent incorrect entry onto a runway and to enhance situational awareness.  
**Rationale:**  
Taken account of introduction of runway status lights in Europe.




**AO4**  
Pilots shall only apply EOT procedure after careful consideration of local and operational circumstances so as to avoid a conflict with the sterile cockpit procedures.  
**Rationale:**  
EOT could potentially be a distraction; aim is to maintain a sterile cockpit as far as practicable.

- Early take-off/landing clearance
- Aerodrome red lights (e.g. RWSL)
- Engine Out Taxi



# EAPPRI 3.0 – New ANSP recommendations

European Action Plan for the Prevention of Runway Incursions v3.0 (EAPPRI v3.0) new Recommendations



## SECTION ANSPs

(also applies to Aerodrome Operator for ANSP 1, 2 and 3)

### ANSP 1

Consider implementation of H24 stop bars (and associated no crossing illuminated stop bar procedures)

**Rationale:** The world SSG studies consistently show that if H24 stop bars available then many reported RI could/would most likely have been avoided

**Note:** Important to acknowledge potential cost and drawbacks, e.g. potential increase in controller workload (tower ergonomics and stop bar ops need to be optimized/automated)

### ANSP 2

Assess conditional clearance operational procedures and practices. Consider if the operational use of conditional clearances can be removed or reduced

**Rationale:** Safety studies have demonstrated that the misapplication and misinterpretation of conditional clearances can be a contributing factor in runway incursions

### ANSP 3

Controllers should only issue line-up and/or take-off or crossing clearance when the aircraft is approaching the runway holding point


**Rationale:** Early passing of line-up and/or take-off clearance, which has no capacity related benefits, has been a contributing factor in some RIs

### ANSP 4

Controllers should avoid issuing landing clearance earlier than necessary

**Rationale:** Early passing of landing clearance has been a contributing factor in some RIs

**Note:** This should be established as local best practice and can normally be defined as a distance from touchdown



- H24 Stop Bars or equivalent means
  - Review contingency
- “HOLD POSITION” phraseology
- Runway occupancy status
- Ops Normal” calls (with ATC)
- Conditional clearances
- Early take-off and landing clearances
- HMI and Controller Working Positions
  - Facilitate improved scanning & “Heads up”
  - Vacating aircraft

# EAPPRI 3.0 – New AIM recommendations



- Simplify NOTAM information/data
  - Enhance readability/usability
- Move to digitise data for graphical display of NOTAM

# EAPPRI 3.0 – New NCA recommendations

European Action Plan for the Prevention of Runway Incursions v3.0 (EAPPRI v3.0) new Recommendations



## SECTION Regulator

(also applies to Aerodrome Operator for ANSP 1, 2 and 3)

### Reg 1

National agencies charged with the oversight of aviation safety should consider how they discharge their responsibilities for runway safety which may include:

- 1a The establishment and coordination of a national/state runway safety group/team
- 1b Including prevention of runway incursions in national runway safety plans/State Safety Plans
- 1c Supporting the state-wide promotion and coordinated implementation of (EAPPRI v3.0)
- 1d Participating in aerodrome local Runway Safety Teams (at their invitation)

**Rationale:**  
Regulator involvement bolsters, support and improves coordination of national runway safety activities

### Reg 2

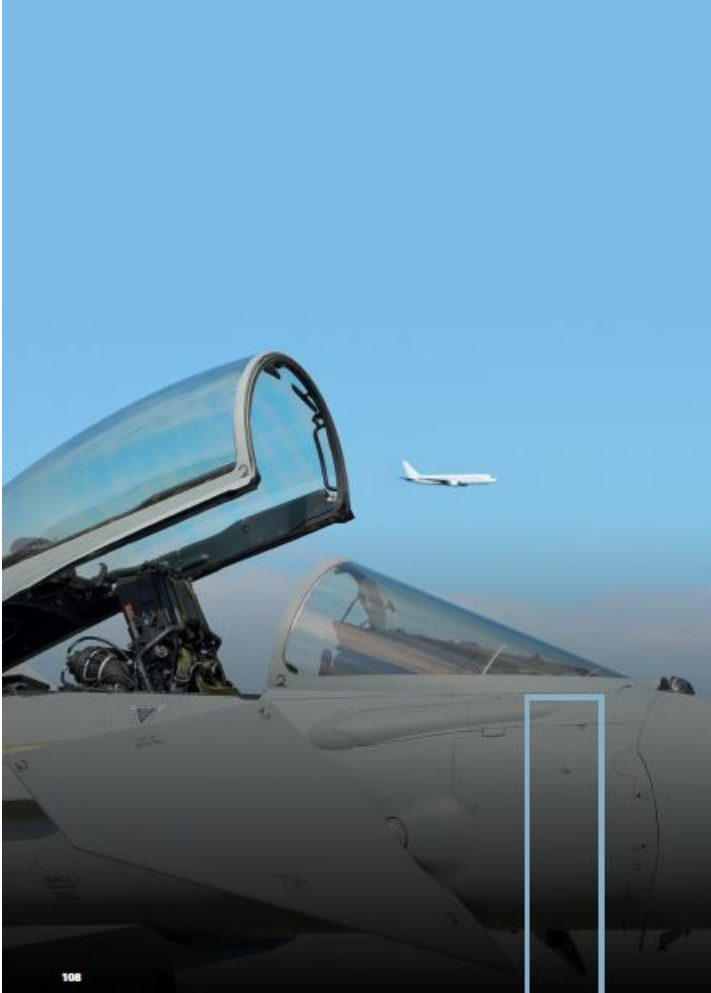
Assess the operator's SMS performances and its risk exposure related to runway incursions and use this assessment to adjust the oversight accordingly on a risk and performance-based approach

**Rationale:**  
Improve national oversight of runway incursion prevention activities of all stakeholders.



- Assess operators' SMS
  - Performance and risk based
- RI prevention in State Safety Plans
- National runway safety teams
- Promotion of EAPPRI v3.0
- Aerodrome local runway safety team

# EAPPRI 3.0 – New civil-military recommendations



- Wherever practicable military aircraft should use on-board lights in accordance with ICAO Annex 2
  - a. If required, additional procedures should be applied to maintain the required level of situational awareness at joint-use aerodromes.
- EAPPRI recommendations on infrastructure should be implemented at civil/military joint-use aerodrome at least where civil aircraft operations are permitted.

# EAPPRI 3.0 – New technology recommendations

European Action Plan for the Prevention of Runway Incursions v3.0 (EAPPRI v3.0) new Recommendations



## SECTION Future Work

(Applies to EUROCONTROL but other stakeholders' views are welcome)

**FW 1**  
Monitor and evaluate emerging technologies that may affect future aerodrome operations. Consider potential implications concerning runway safety and provide appropriate guidance, for example

**FW 1a**  
Authorised Remotely Piloted Aerial Systems (RPAS)/drones and autonomous vehicle operations on and around the aerodrome

**FW 1b**  
Remote Tower (rTWR) operations

**Rationale:**  
Emerging technologies may impact on runway incursion prevention. There is a need to monitor potential effects, e.g. enhanced rTWR services may benefit controllers but how will rTWR operations affect ANSP participation in local RSTI

How might future/authorised drone use, e.g. for infrastructure inspections, including aerodrome surfaces, and instrument flight checks/calibrations affect runway safety/runway incursion prevention?

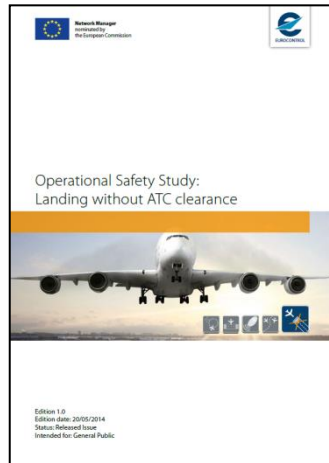


- Emerging technologies
  - Authorised RPAS/drone use on airports
  - Remote Towers

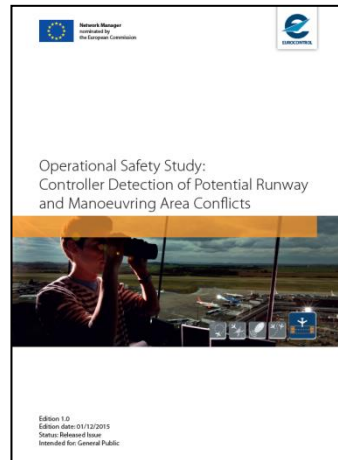


# Action Plan Implementation Support – ECTL Safety Studies

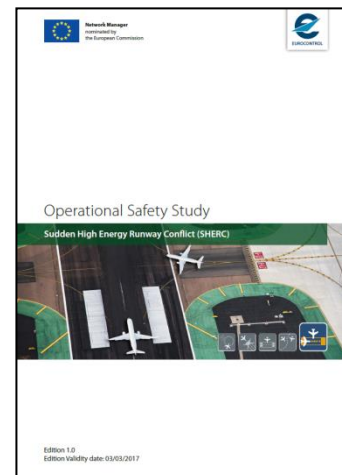
## Landing without ATC clearance



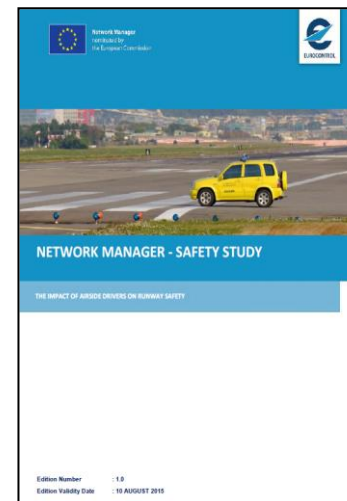
## ATCO detection of RWY conflicts



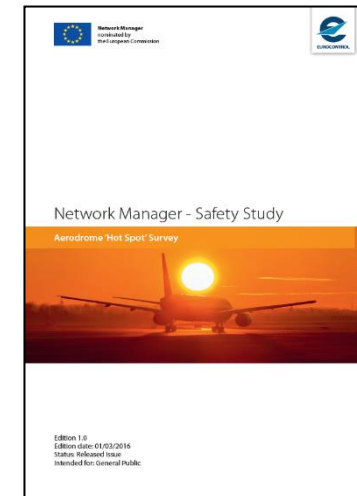
## Sudden high energy runway conflict



## Airside driving



## Aerodrome Hot Spots



<https://www.skybrary.aero/articles/eurocontrol-top-5-operational-safety-priorities>

# Action Plan Implementation Support – SKYclips



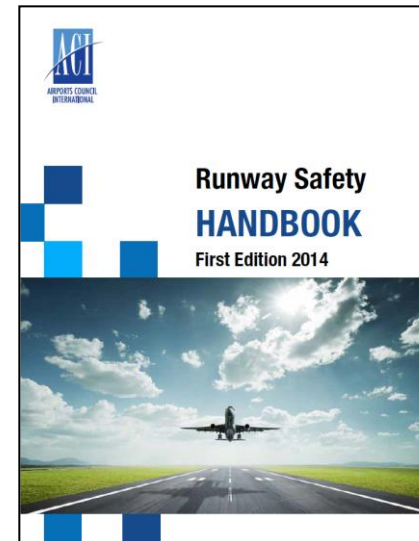
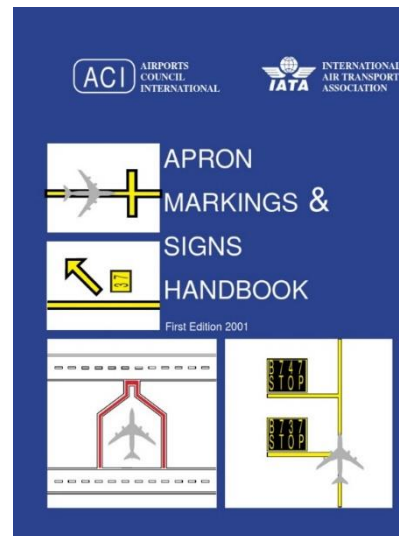
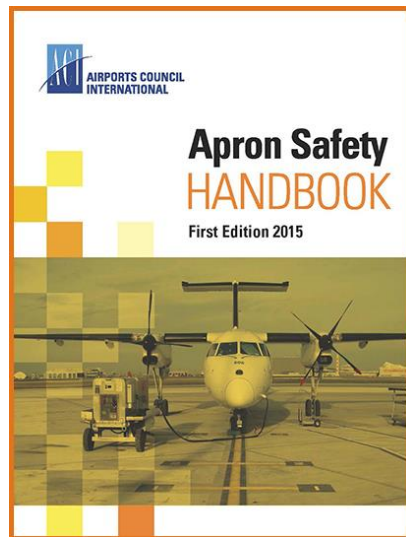
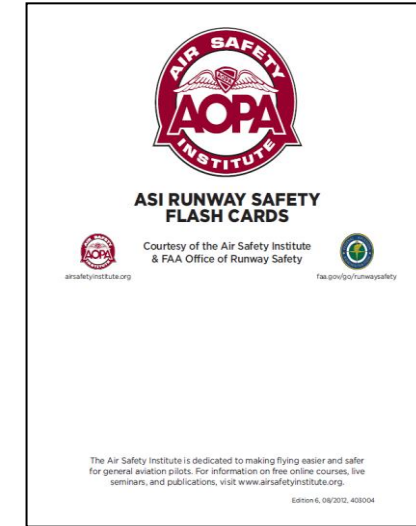
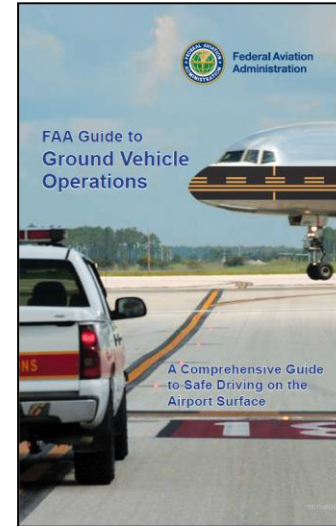
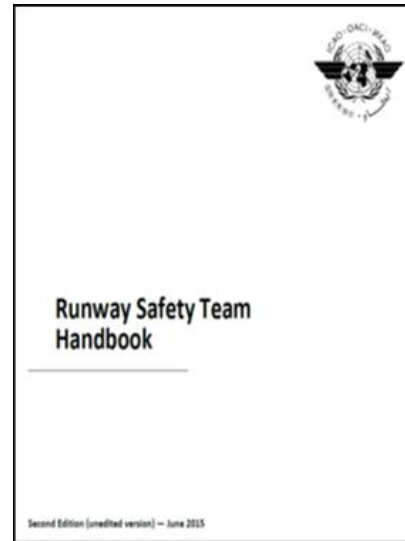
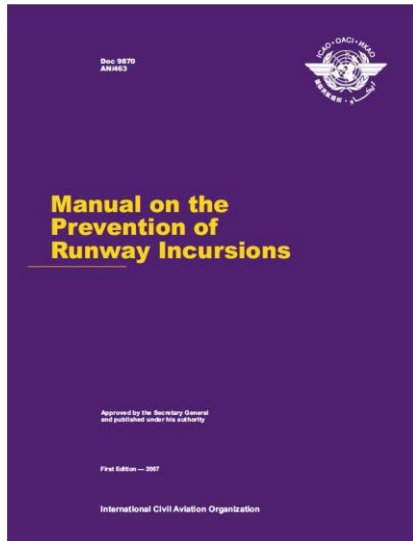
<https://www.skybrary.aero/tutorials/skyclips>



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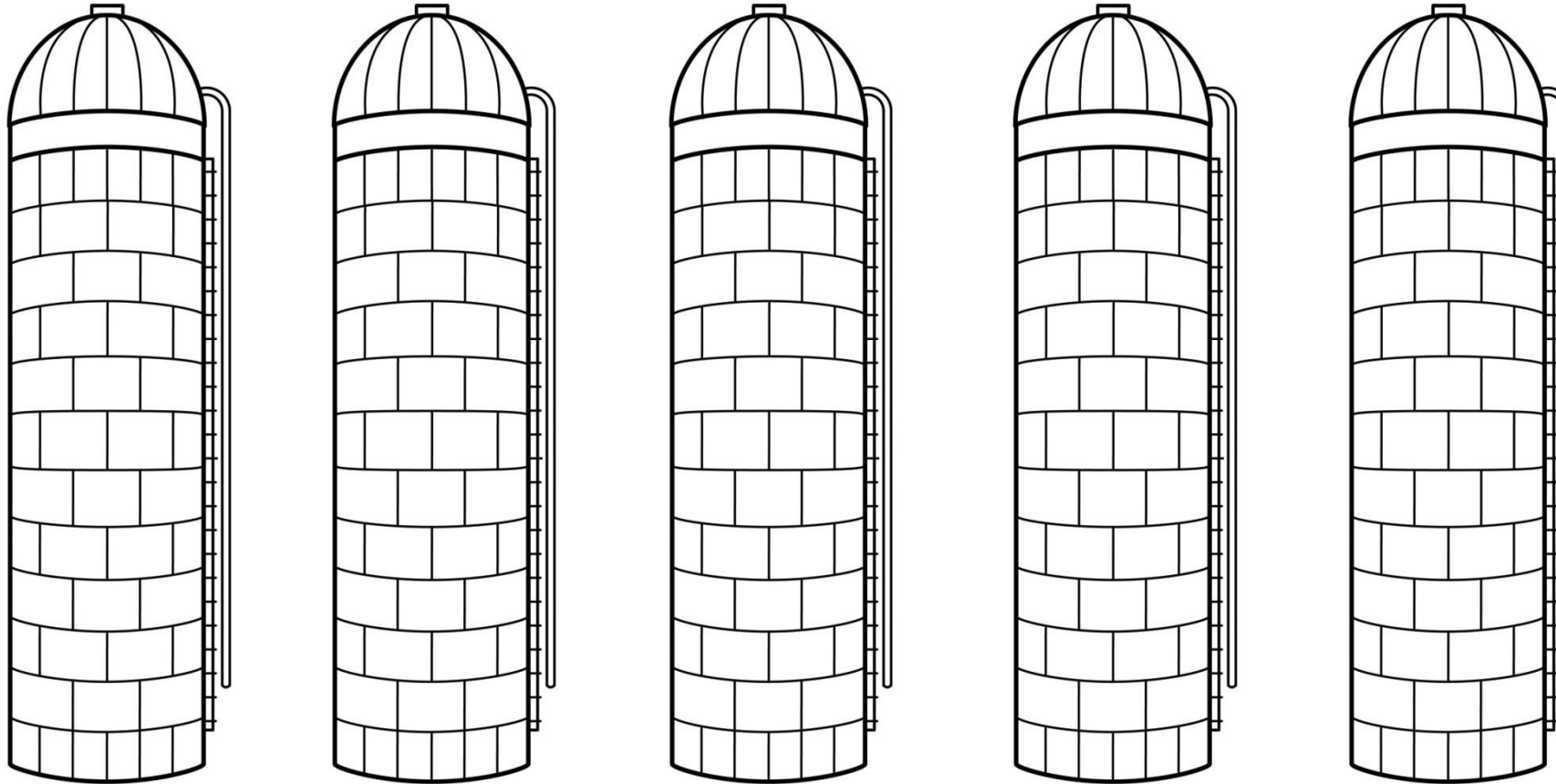
# Further Guidance Material for Aerodrome Operators



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Manager



# Action Plan Implementation - The Key Challenge



ANSP

Airport operator

Aircraft operator

Regulator

Military

**COOPERATION of ALL STAKEHOLDERS**



Network  
Manager



