



Dedicated to innovation in aerospace

safetyinstitute

Operational and safety information sharing for Unmanned Aircraft Systems

Lennaert Speijker, NLR, Netherlands
iSTARS User Group Meeting (UG/01), 17-19/12/2018, Montreal

- Background and needs
- UAS regulations, standards and guidance material
- Newly proposed approach for UAS data collection & analysis
- UAS operational & safety data study (for Netherlands Ministry)
- Future Sky Safety Risk Observatory (for European Commission)
- Incentives for operational & safety information sharing
- Outlook

Background



Opnieuw incident met droe Schiphol

LUCHTVAARTNIEUWS.NL

Plane in near miss with drone close to Glasgow Airport

'Near miss' A380 Lufthansa met drone

Drone came 100ft from crashing into Ryanair flight at Glasgow Airport

Lufthansa plane in near miss with THREE drones during Soanish airport landing in 'most serious incident to

Close call: Drone narrowly avoids 1km-high collision with plane over Canada

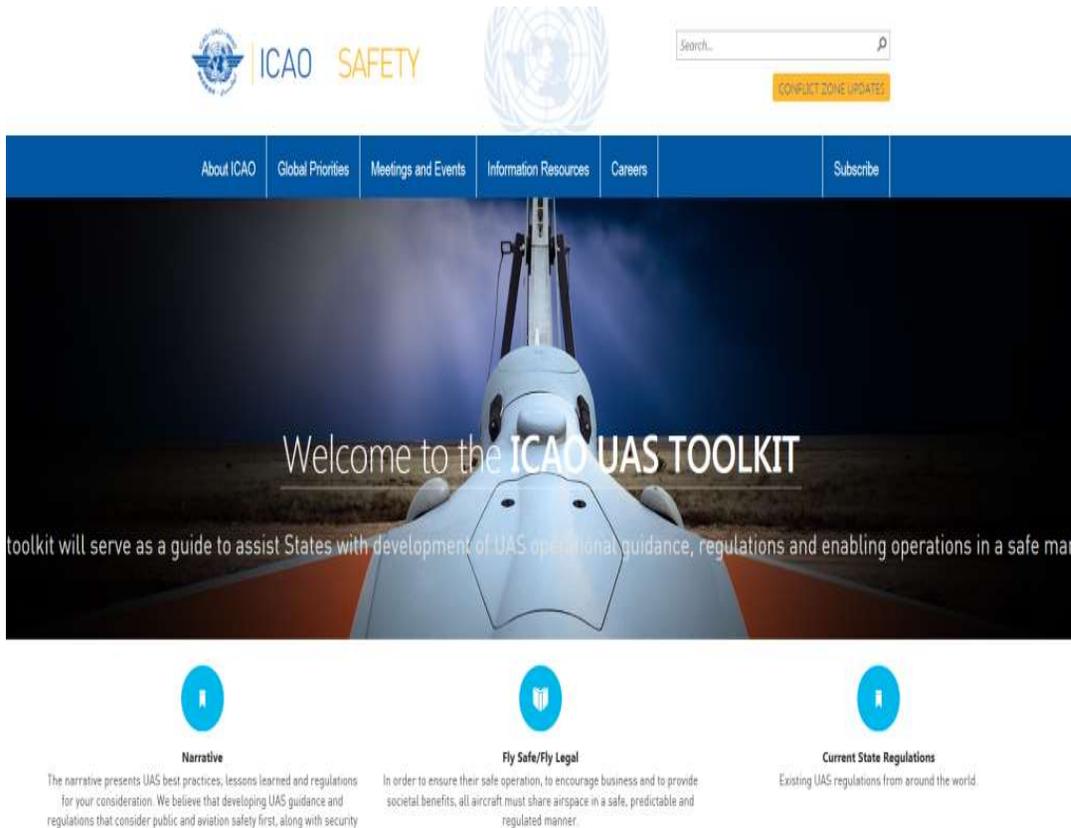
Drone interferes with passenger-plane's flight path



Needs and challenges

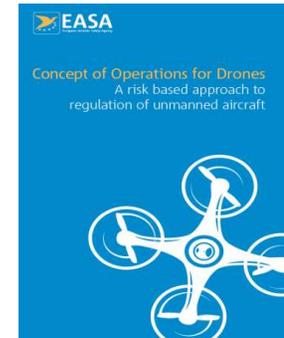
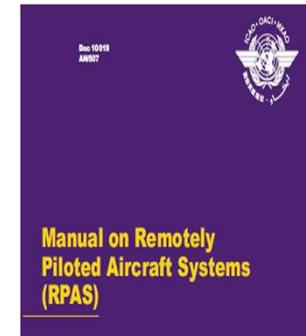
- Very little UAS operational and safety data available
 - Difficult to identify safety issues & perform oversight
 - Difficult to motivate changes in regulations for UAS
- Reporting systems from UAS operators to States often not commensurate with their size, thus not adequate
- Appropriate methods to support UAS operators with identification and assessment of hazards are needed
- Some countries develop rules to report UAS usage

Regulations, standards and guidance



The screenshot shows the ICAO UAS Toolkit website. At the top, there is a search bar and a 'CONFLICT ZONE UPDATES' button. Below the navigation bar, a large image of a drone is featured with the text 'Welcome to the ICAO UAS TOOLKIT'. Below this, three main sections are highlighted with circular icons:

- Narrative**: The narrative presents UAS best practices, lessons learned and regulations for your consideration. We believe that developing UAS guidance and regulations that consider public and aviation safety first, along with security.
- Fly Safe/Fly Legal**: In order to ensure their safe operation, to encourage business and to provide societal benefits, all aircraft must share airspace in a safe, predictable and regulated manner.
- Current State Regulations**: Existing UAS regulations from around the world.



Safety Management in UAS sector (anticipated)

- Operational limitations in *Low Risk Category* *
 - Safety Management System not required to be regulated
- Elements safety management in *Regulated Lower Risk Category* *
 - Risk assessment of proposed operations
 - Analysis of safety data
 - Sharing of safety information
 - Safety promotion
 - Occurrence reporting
- SMS (ref. ICAO Annex 19) for *Regulated Increased Risk category* *

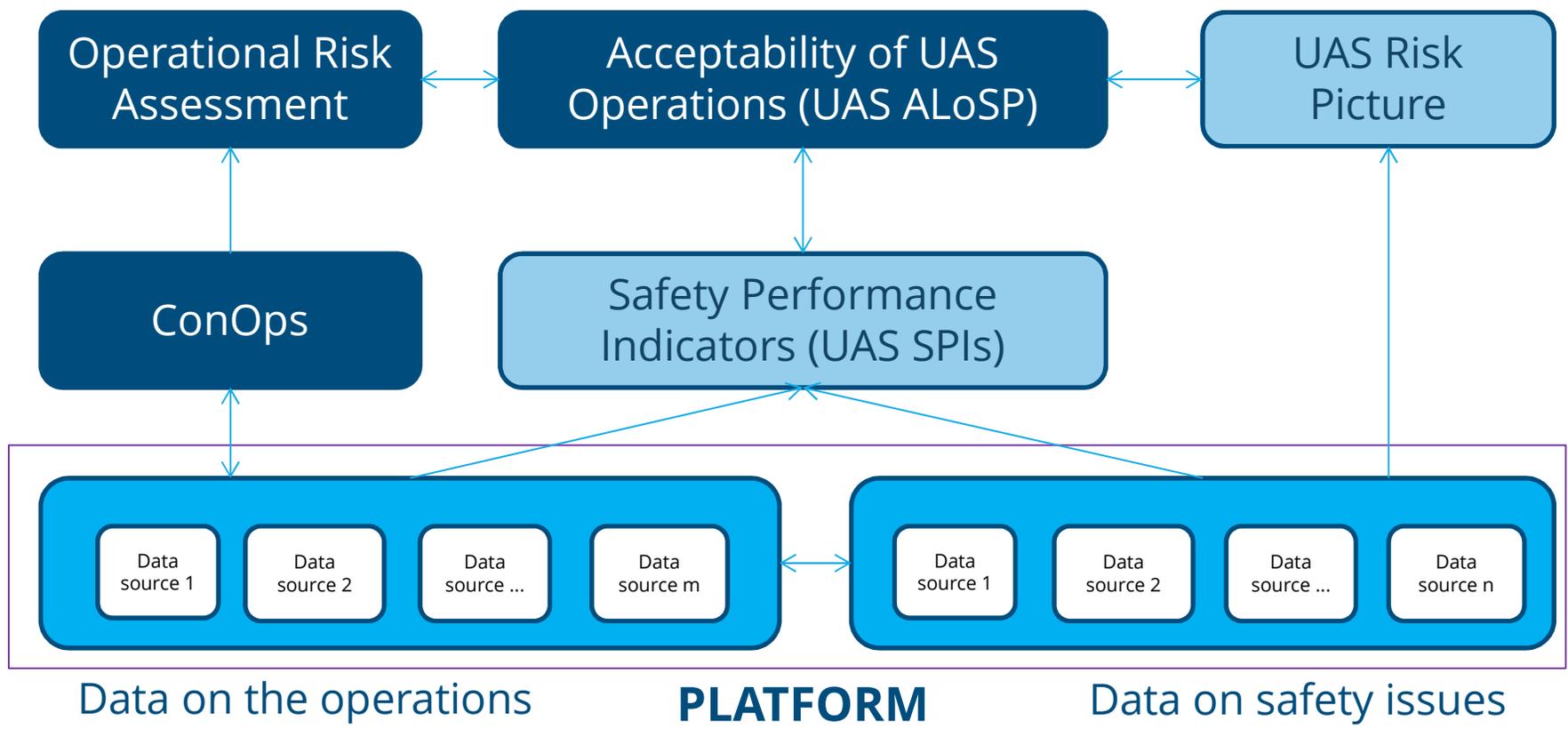
* *Three categories of operations are distinguished in ICAO's UAS Toolkit*

Drone Operational Repository for Safety *DORSEY*

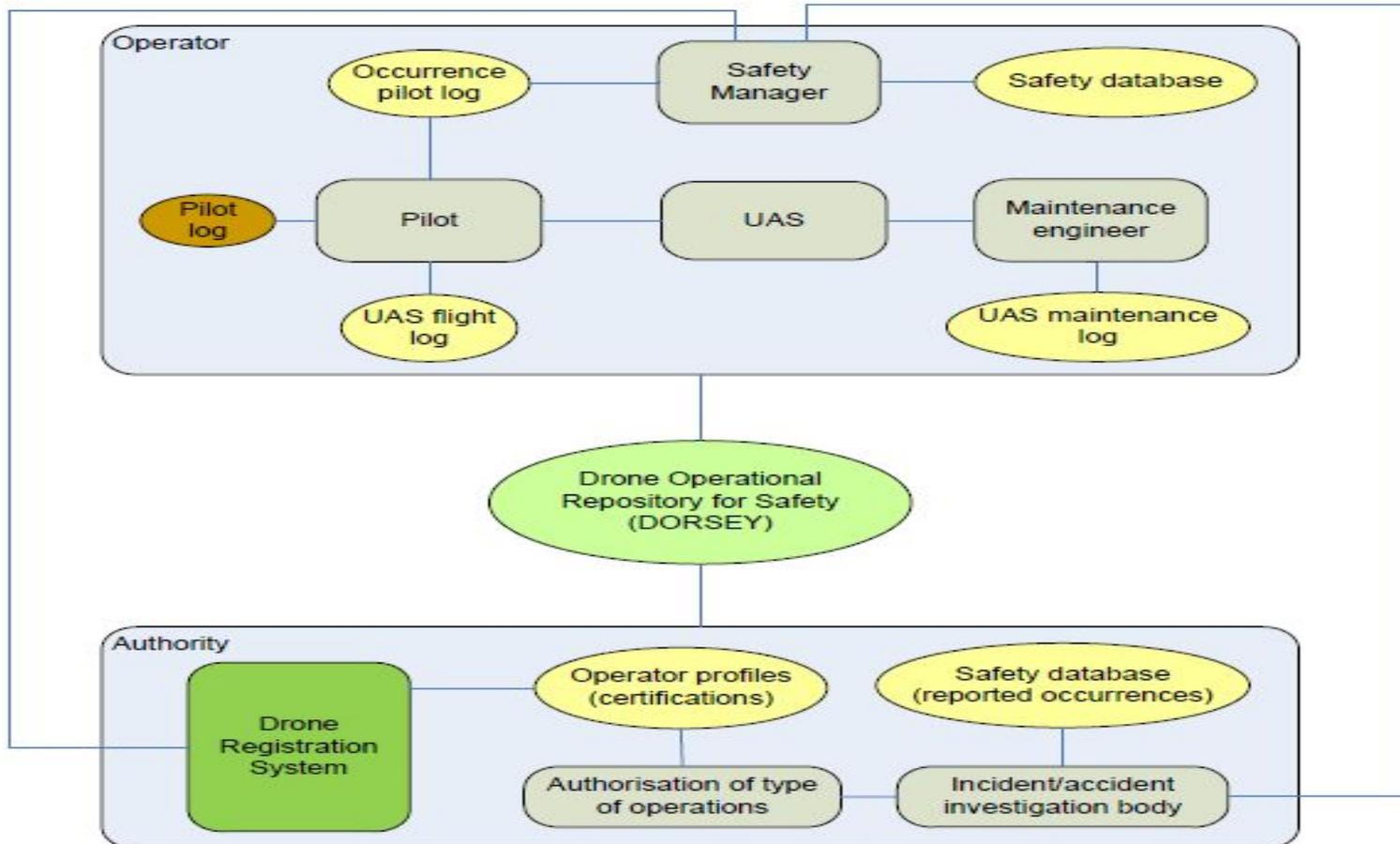
- Study for Dutch Ministry of Infrastructure and Water Management
 - What UAS data and information is useful and required?
 - How to gather data from operators in a user-friendly way?
 - How to visualize data and provide feedback to operators?
 - What are appropriate user and system requirements?
 - How to use data to support safe introduction of UAS operations?
- Involvement certified Dutch operator associations (DARPAS, DCRO)
- ICAO is informed through Information Papers for the ICAO RPASP



Concept for UAS data analysis



DORSEY - Approach



Example safety issues

Operational
issues



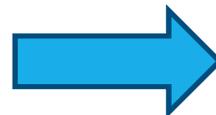
Airspace infringement
Proximity to other aircraft
Visual loss of UAS
Loss of control

Technical issues



Failure of guidance & control system
Loss of command & control link
Auto-flight system failure
Instable or non-functioning batteries

Human factor
issues



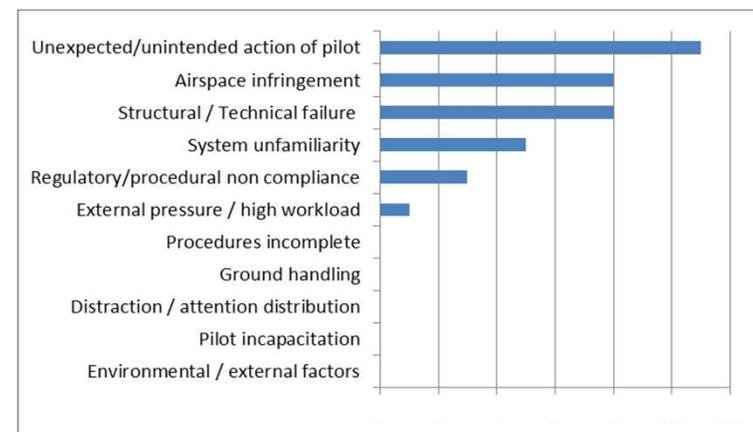
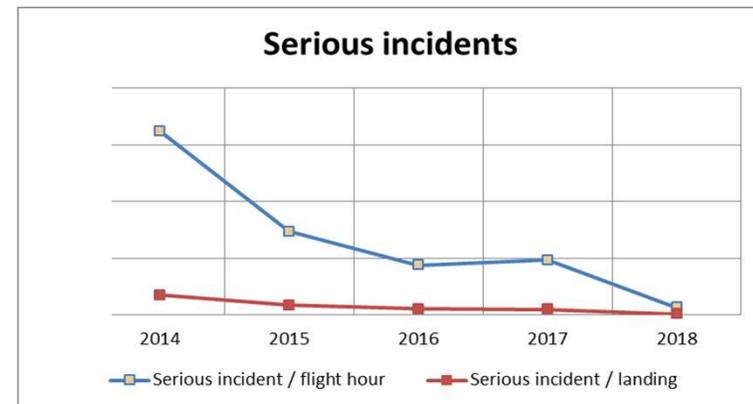
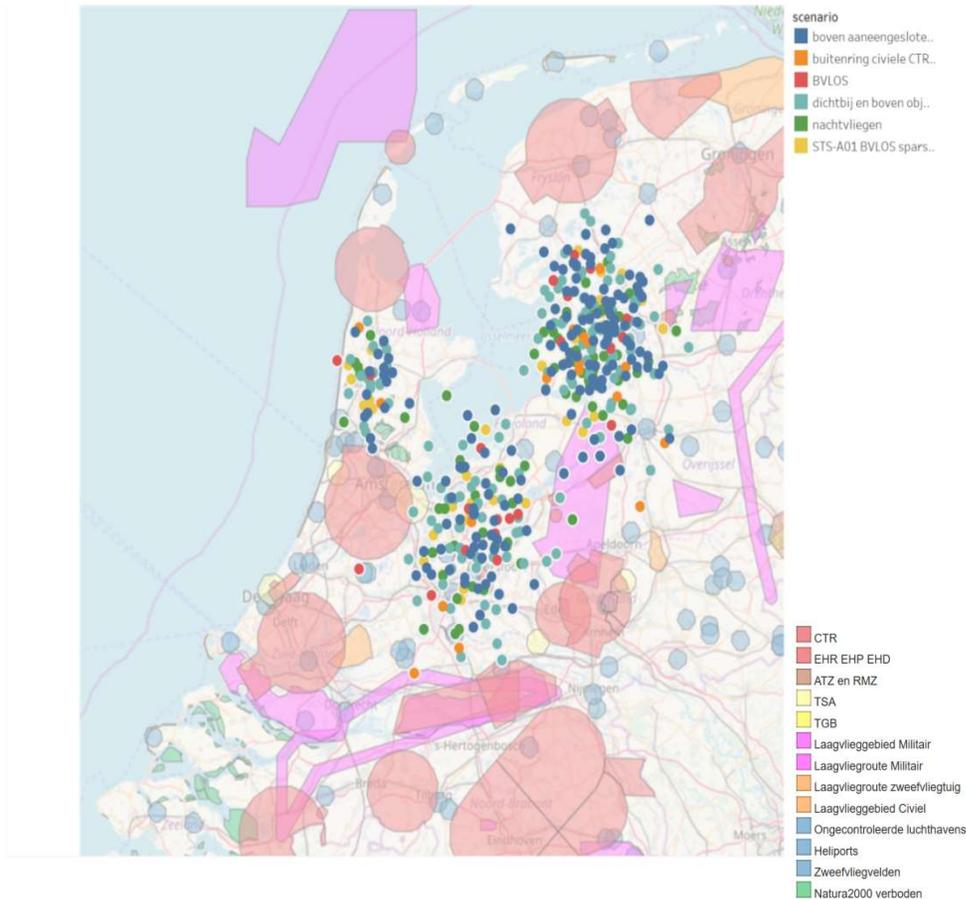
Insufficient knowledge of aviation
Unexpected adverse weather
Pilot errors with link procedures
Task management issues (control vs payload)

Communication
issues



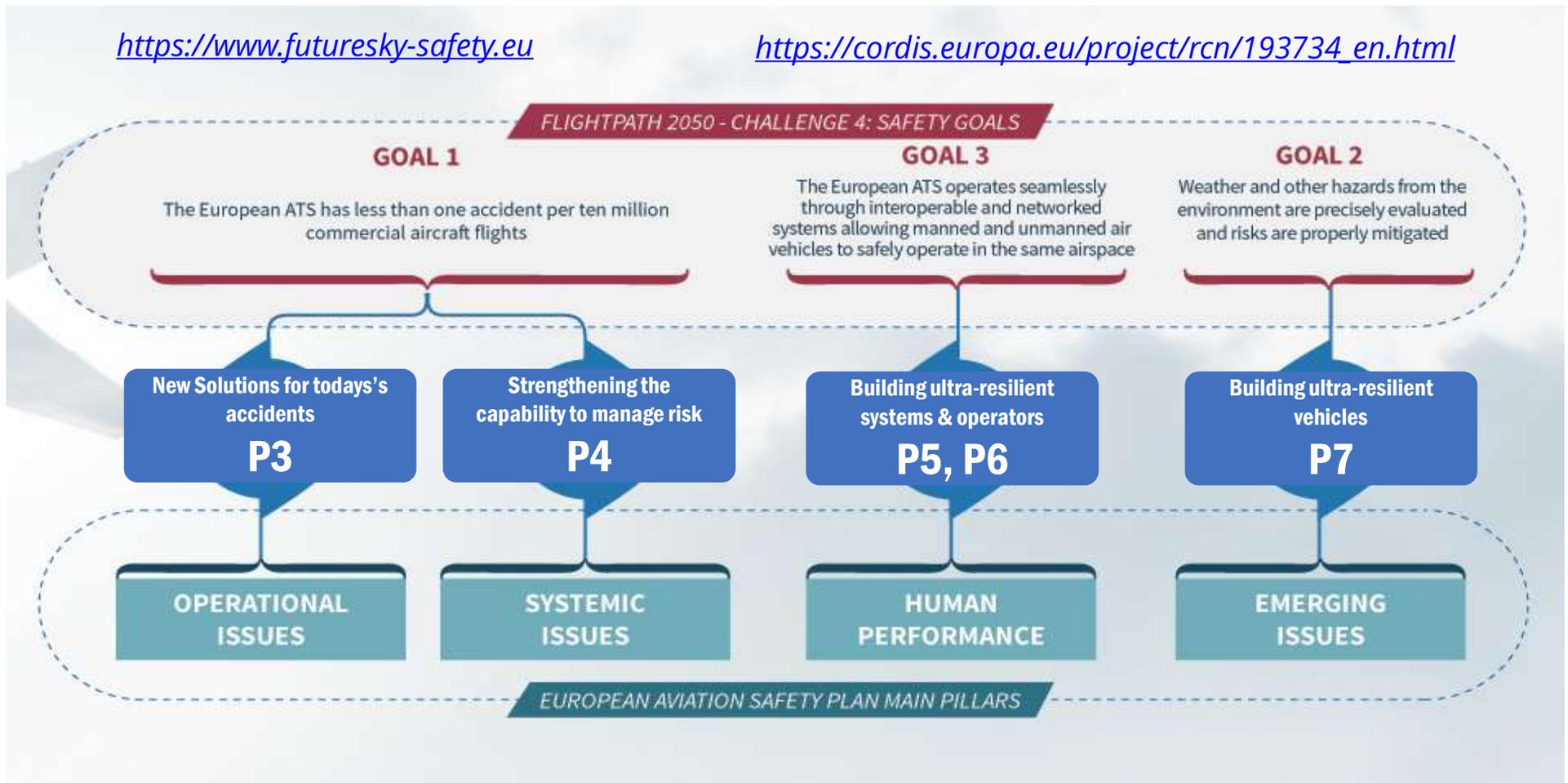
Radio frequency spectrum issues
Loss of voice communication with ATC
Jamming/spoofing of frequencies used

UAS Data Visualization



<https://www.futuresky-safety.eu>

https://cordis.europa.eu/project/rcn/193734_en.html

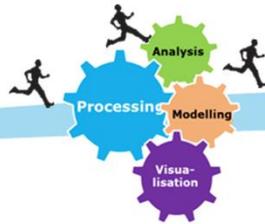


- Study performed for European Commission (EC), coordinator NLR
- Consortium of 35 partners, budget 30 MEuro, duration 2015–2019



Why P4? Why Risk Observatory? How?

“What is normal performance?”
 “We would like to prioritise hazards”
 “Ensure the interfaces are working together effectively”



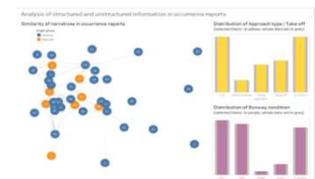
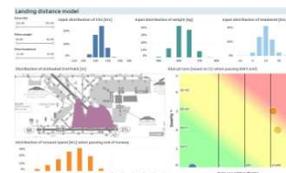
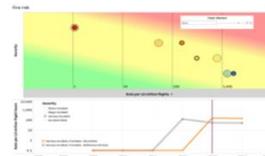
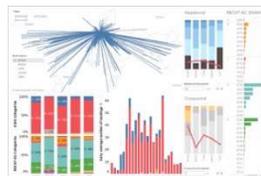
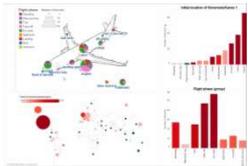
Monitoring

Prediction

Data

Techniques

Applications/Information



Occurrence data

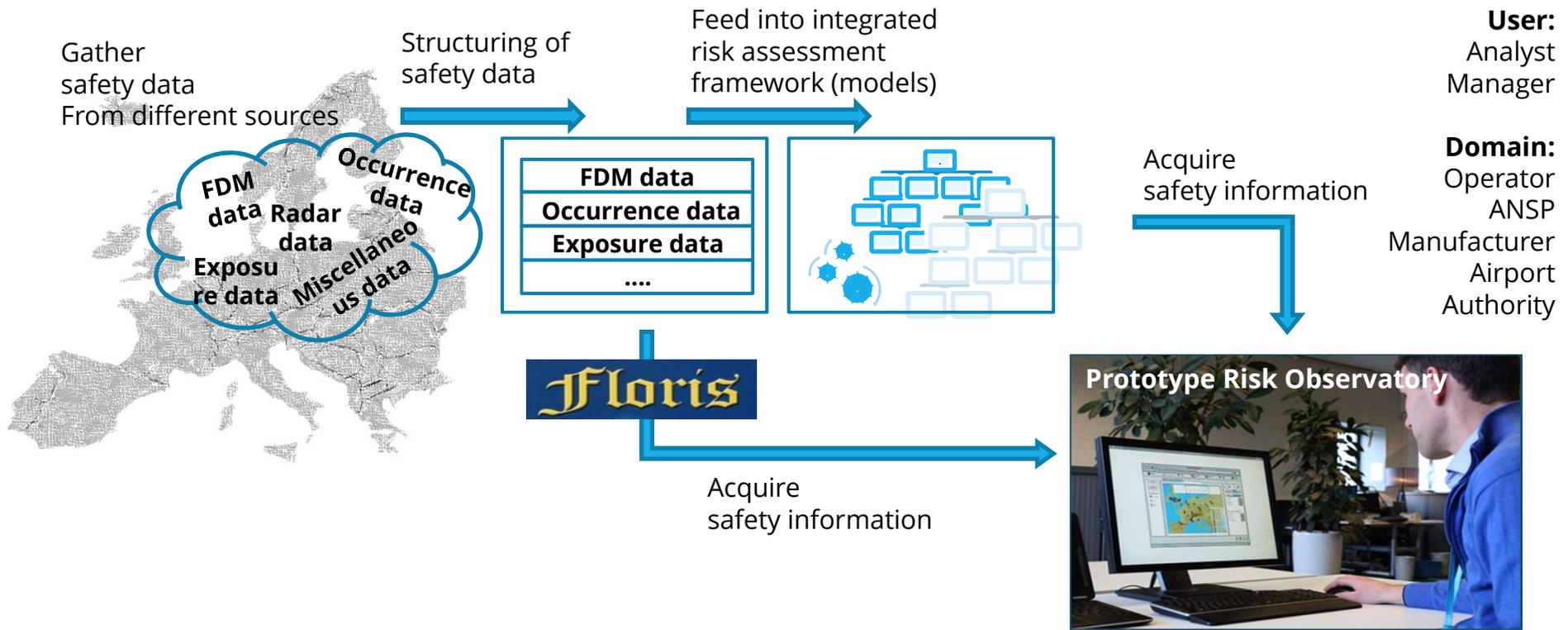
Exposure data

Risk modelling

Prediction

Text/Data mining

Introducing the Risk Observatory

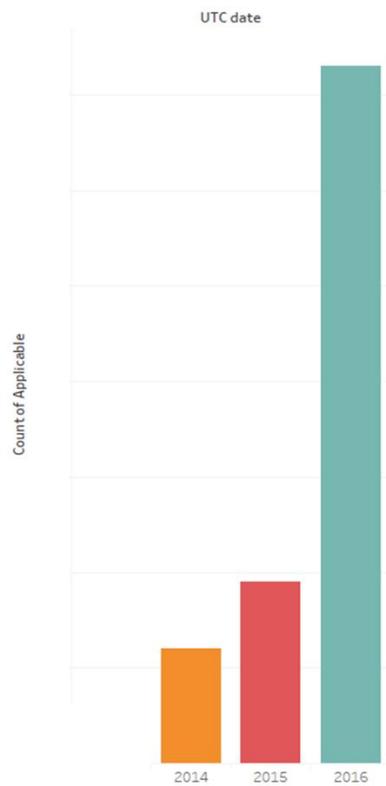


The risk observatory acquires, fuses and structures safety data and translates it into actionable safety intelligence

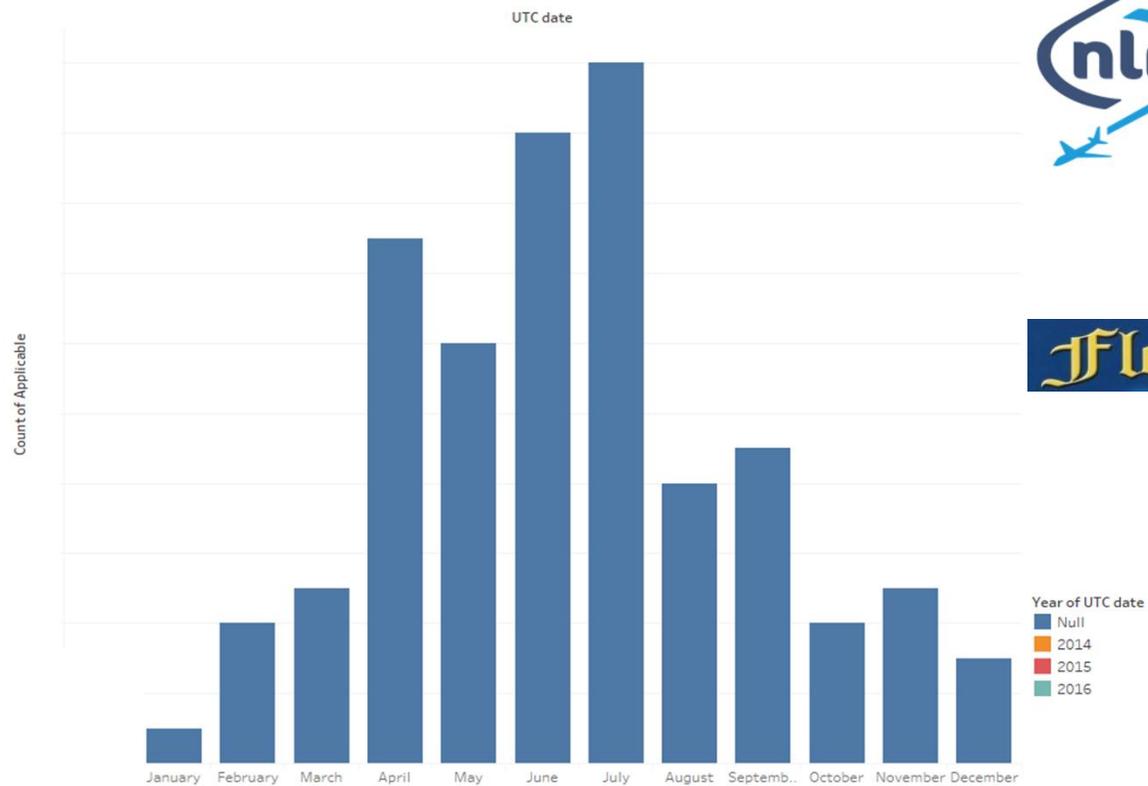
Risk Observatory – Use Case UAS

Spread of drone sightings over the year

Incidents per Year

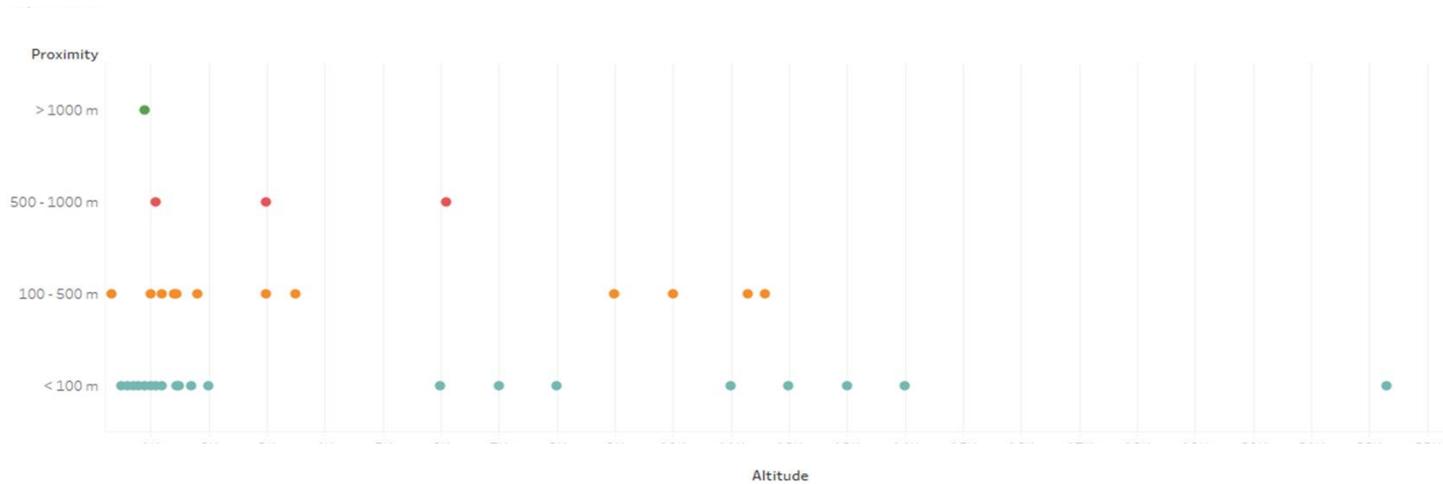


Incidents per Month



Risk Observatory – Use Case UAS

Drone sightings – Proximity to other aircraft



Count of Proximity



Count of Proximity

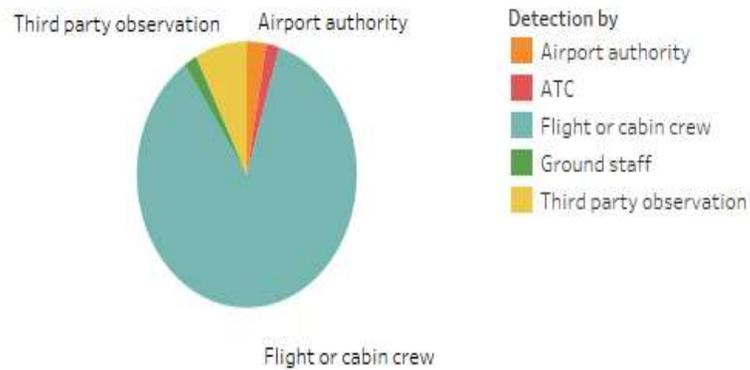


Risk Observatory – Use Case UAS

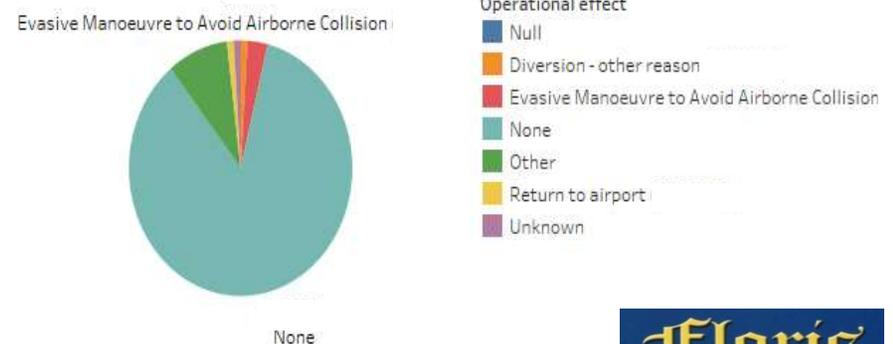
Drone sightings - Reporting & operational effect



Count of Detection By



Count of Operational Effect



Need for new approach for UAS

- UAS operations growing significantly. Wide variety applications. Surveillance, aerial work, inspections & agricultural purposes, ...
- New challenges for safety assurance of UAS operations
- A key step towards increased integration in airspace is to collect basic operational and safety information about UAS operations
- This makes it easier for authorities to approve (specific) safe UAS operations under certain conditions and requirements
- This will enable UAS operators/industry to perform more flights

Incentives for voluntary data sharing

- Intelligence in risks and causal factors of safety events enables predictive risk analysis & defining safety performance indicators
- Compare safety performance between operators and States
- Access to data that is difficult to get on its own from own sources
- Demonstrate that safety is taken seriously and in a pro-active way
- Protect data against misuse for purposes other than safety
- Possible benefits in return for sharing operational/safety data

- Need for validation of new UAS rulemaking proposals with data
- Some countries already developed rules to report UAS usage
- New approach for UAS data collection & analysis is needed
- Test Case with DORSEY in the Netherlands (2018/2019)
- Future Sky Safety Risk Observatory Use Case (2018/2019)
- Alignment with iSTARS and possibly SIMS (new UAS module?)
- Prepare for ICAO UAS SMS standards (*in new Annex 6 Part 4 & Annex 19*)



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Fully engaged

Netherlands Aerospace Centre

Your contribution to this work:

- **Possible cooperation?**
- **Sharing of information or ideas?**

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