EASA
European Union Aviation Safety Agency

Innovation @EASA

ANC Talk - 20 May 2020

Your safety is our mission.

An Agency of the European Union

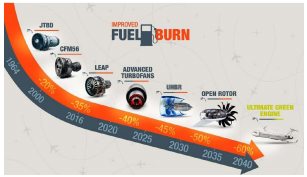
Outline

Facing new challenges

EASA Artificial Intelligence Roadmap

Urban Air Mobility

Innovations @EASA: Our experience



Runway Overrun Awareness & Alerting System

Link with ICAO & Conclusions

EASA
European Union Aviation Safety Agency

Facing new challenges

Luc Tytgat

EASA Strategy & Safety Management Director

The Challenges of Innovation

The aviation world is evolving at high pace…

every single day we hear about new, innovative products, technologies and services that will be on the market soon

Innovation creates high, multifaceted expectations:

the general public expect electric and hybrid propulsion to help having **cleaner skies**, urban air mobility to **relieve congestion in city centres**, artificial intelligence to **increase the safety level**, etc., while private investors see an opportunity to **develop new business**

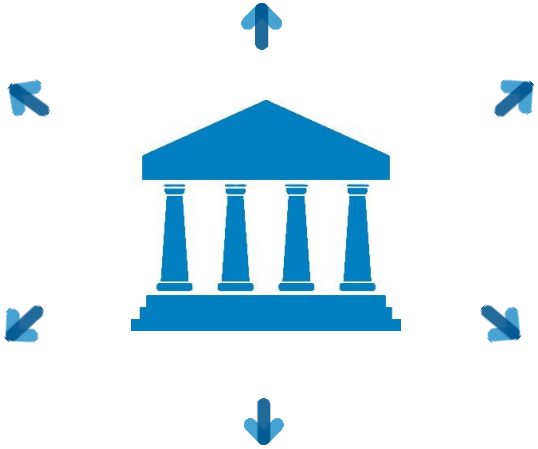
Innovation is a real challenge for regulatory activities…

how can we enable new, disruptive technologies but at the same time, how can we make sure that those new technologies are safe?

EASA Pillars of Innovation Management

Organise innovation as part of our business
EASA innovation cell

Innovation as a corporate value
EASA internal innovation network of 160 persons



Be technology agnostic
moving towards performance based rules

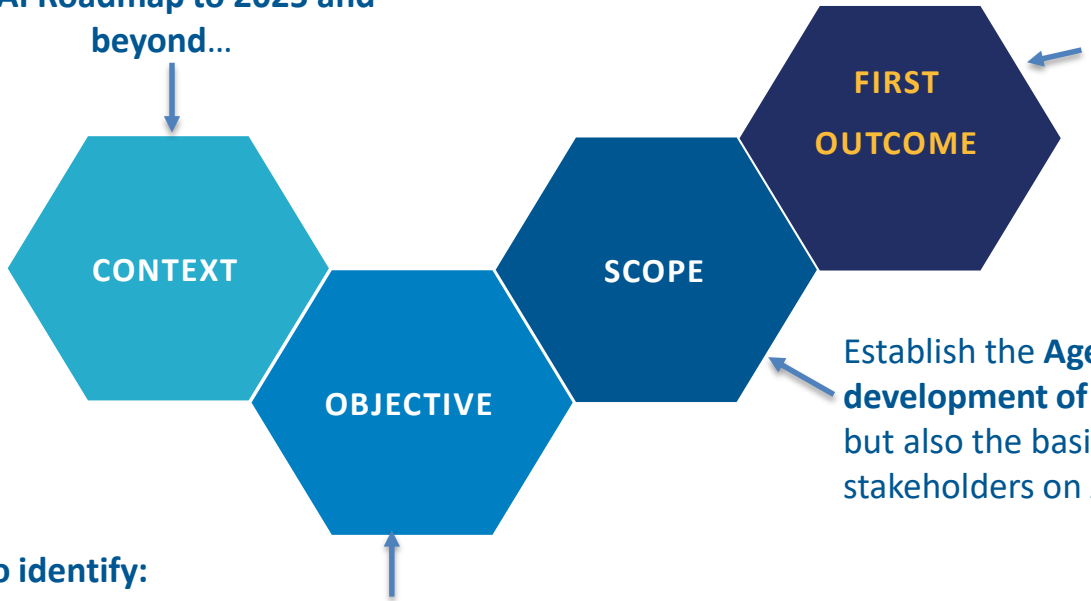
Learn from Industry
EASA experts joining innovative industry projects

Adapt Methodologies –
e.g. to prepare for Artificial Intelligence certification

Engage with new entrants
learning from cutting-edge technology by collaborating on innovation with Start-Ups

Focus on Artificial Intelligence (AI)

An **AI Roadmap to 2025 and beyond**…



Practical work started

1. Partnership Contract with Daedalean (AI for autonomous flights)
2. In-depth, hands-on work on Deep-Learning (in view of certifying it)

Establish the **Agency vision on the development of AI** in the aviation domain, but also the basis for interaction with its stakeholders on AI

To identify:

- Key **opportunities and challenges** created by introducing AI in aviation
- How this may **impact EASA** in terms of organisation, processes, and regulations
- The **courses of action** that EASA should undertake to meet those challenges

Focus on Single Pilot Operations

- **EASA approached by companies** interested in exploring the possibility of SPO
- **Equivalent level of safety** to be provided through compensation means (e.g. ground assistance, advanced cockpit with workload alleviation means, Artificial Intelligence, etc.)
- **EASA internal task force to pave the way for SPO introduction in 2030** (EU Industry Timeline) but **practical work has started**
- In-depth, hands-on work on SPO Concept of Operation and Cockpit of the Future through **Innovation Partnership Contracts with Industry**

Focus on Hybrid/Electric (H/E) Aviation

- Ongoing work to **certify small electric aircrafts** (e.g. Pipistrel)
- **The challenge** is the introduction of **H/E Commercial Passenger Transport aircraft. Industry timeline:** 2025+ for 10-seat commuter aircraft & 2035+ for 40-seat regional aircraft
- **Strong impact on the whole aviation eco-system** (manufacturers, maintainers, ADR, pilots, etc.)
- **EASA** discussing **partnership agreements/contracts with manufacturers**
- **EASA** supporting the **Norwegian Regional Aviation Electrification project**

Focus on Industry Partnership

Memorandums of Cooperation on innovation

Establish a formal framework enabling cooperation in the early stages of innovation

Possible related tasks & actions

- Specific Innovation Partnership Contracts
- Workshops
- Research cooperation (PhD thesis, …)
- Universities networking
- Exchanges of experts (limited period)
- Training

Innovation Partnership Contracts

Cover the supply of technical knowledge and support within an innovation project to encourage the development of:

- novel technologies
- new business models
- new services

Focus on the exchange of expertise on a multi-disciplinary scale (certification, operation, crew qualification, ATM, etc…)

Address the concept development phase (feasibility)

EASA
European Union Aviation Safety Agency

Questions?

ANC Talk

Innovation @EASA

Your safety is our mission.

An Agency of the European Union

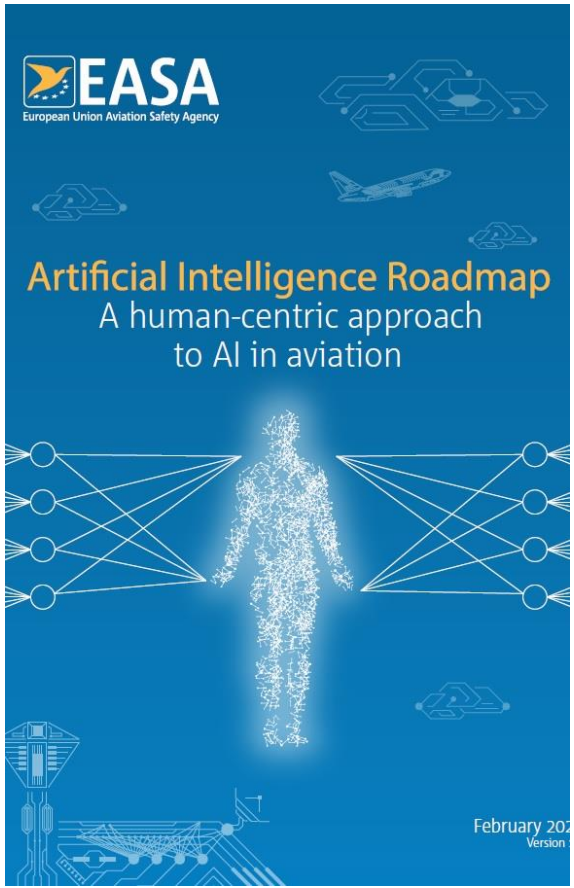
EASA
European Union Aviation Safety Agency

EASA Artificial Intelligence Roadmap

Jean-Marc Cluzeau

Principal Advisor to EASA Executive Director

EASA AI Roadmap - published February 2020

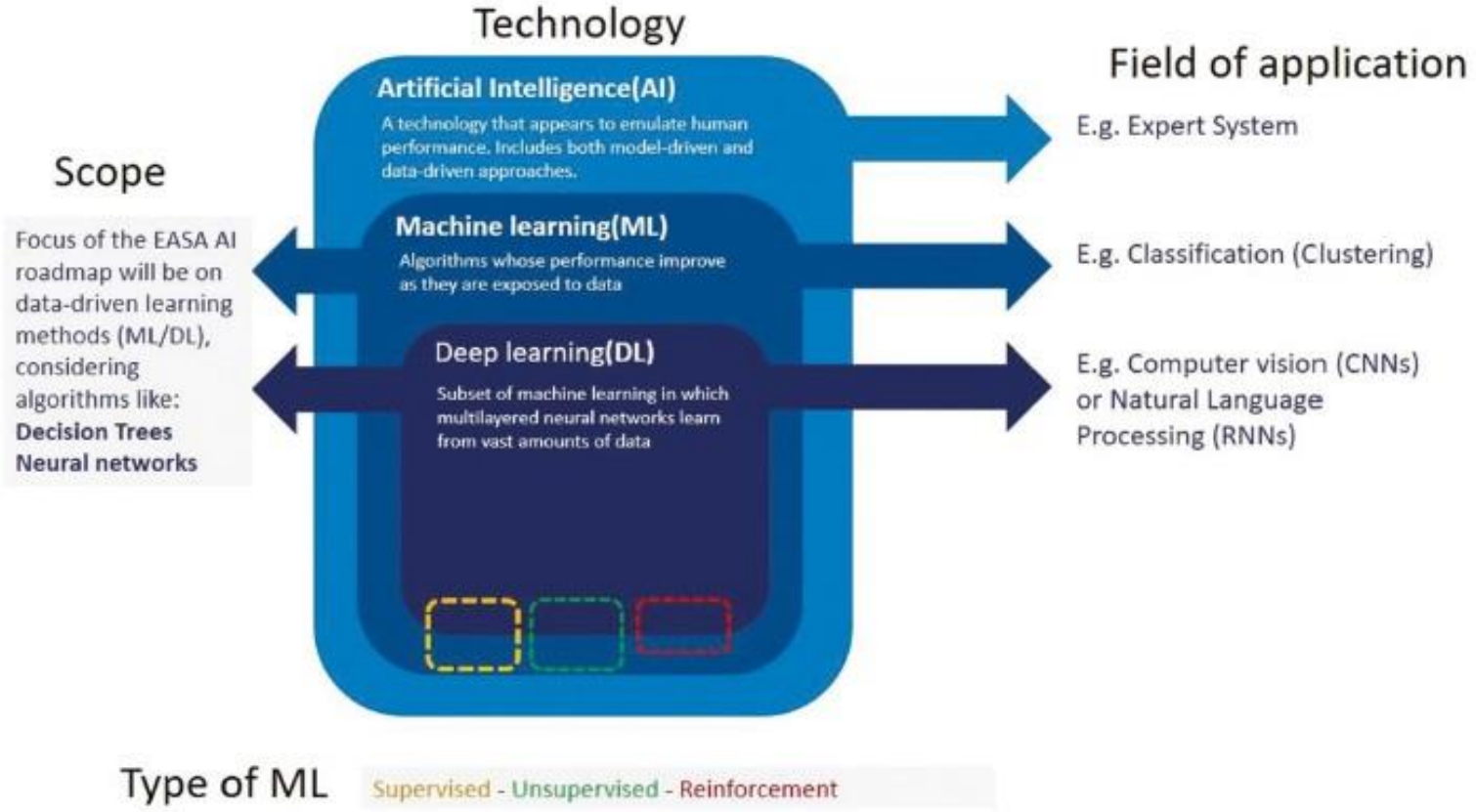


EASA AI Roadmap vision:

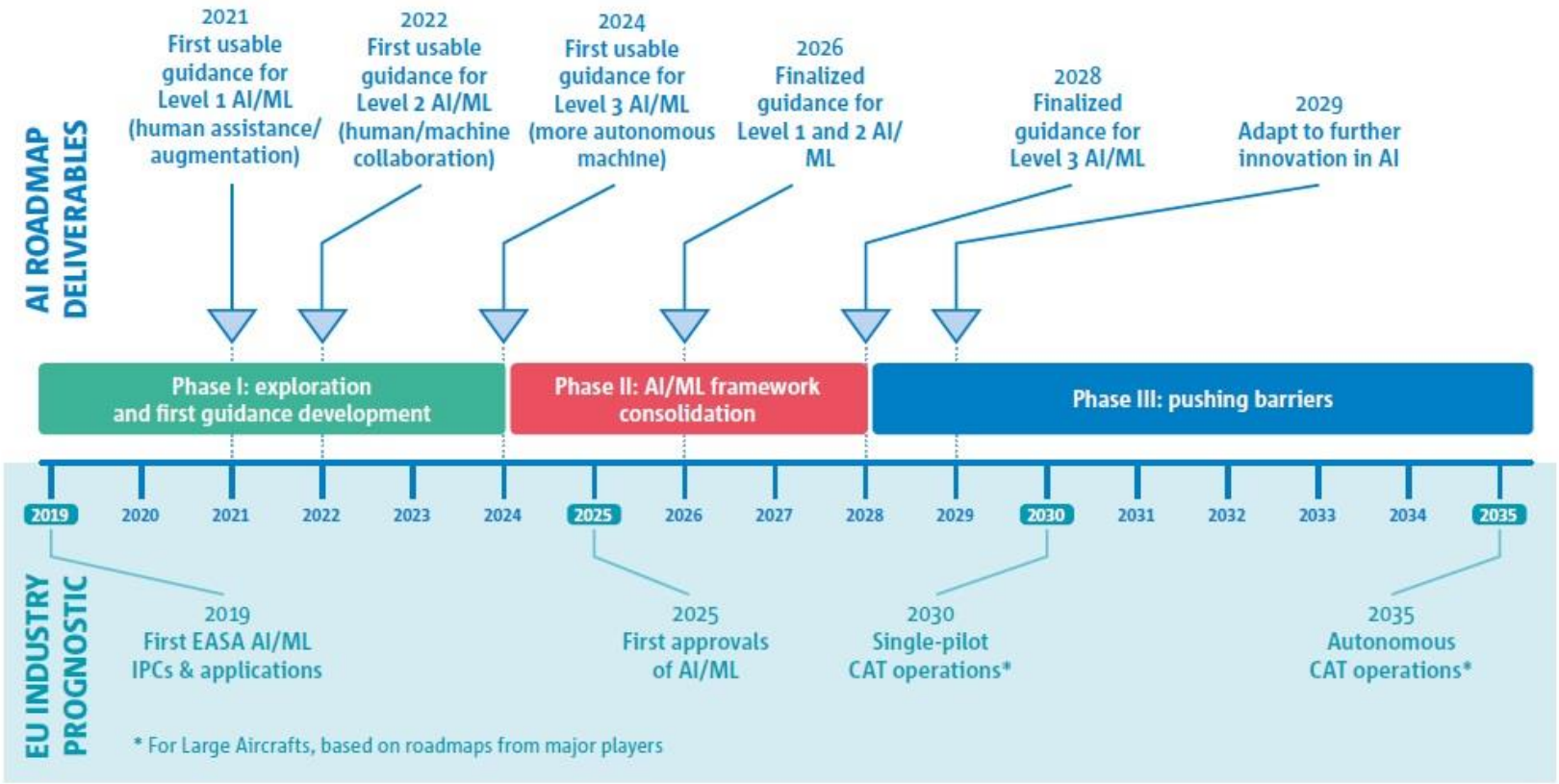
Create a consistent and risk-based 'AI trustworthiness' framework in view of approving safety-critical AI/ML applications

in any of the core domains of the Agency by the end of 2025.

Scope of the EASA AI Roadmap

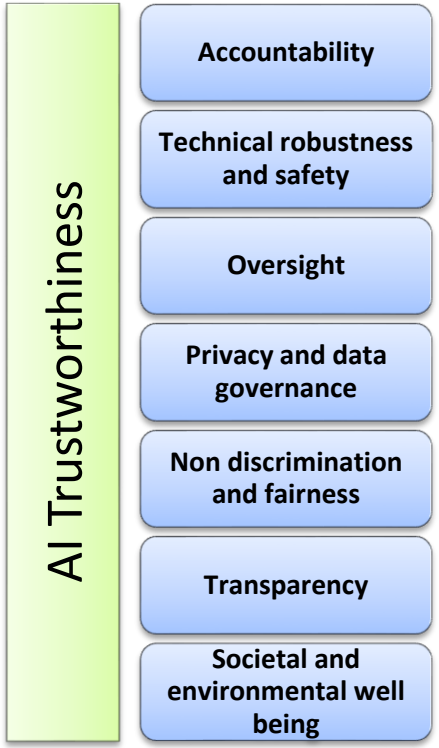


AI Roadmap timeframe and milestones



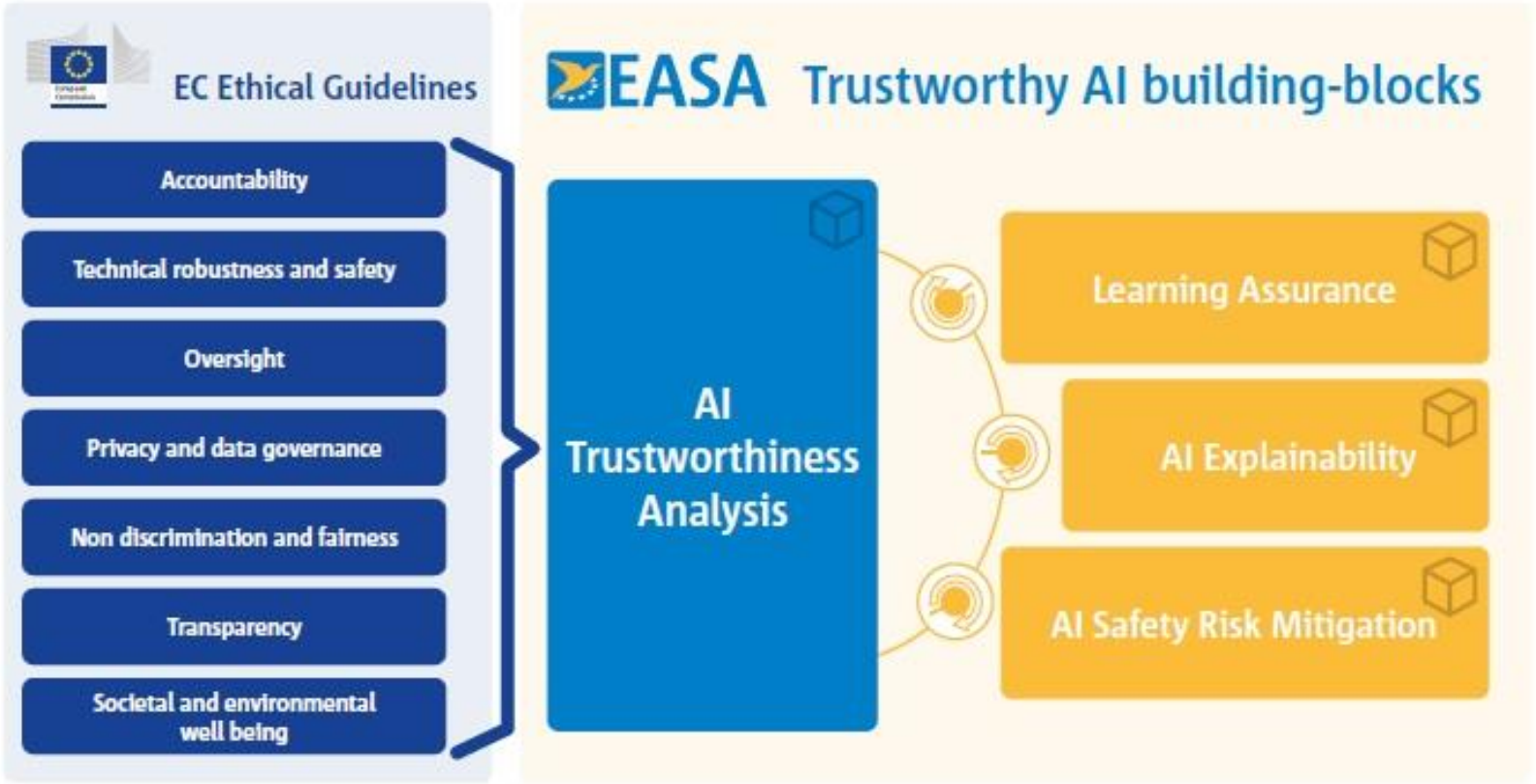
AI Trustworthiness as a Driving Factor

- The EU Commission High-Level Expert Group on AI has published a first set of Guidelines in April 2019*
  - EU approach is resolutely **human-centric**
  - **Trustworthiness** is a key driver to tackle ethical and societal issues around AI
- EASA sees this notion as essential for an Aviation AI Roadmap



(*) https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=58477

AI Roadmap building blocks

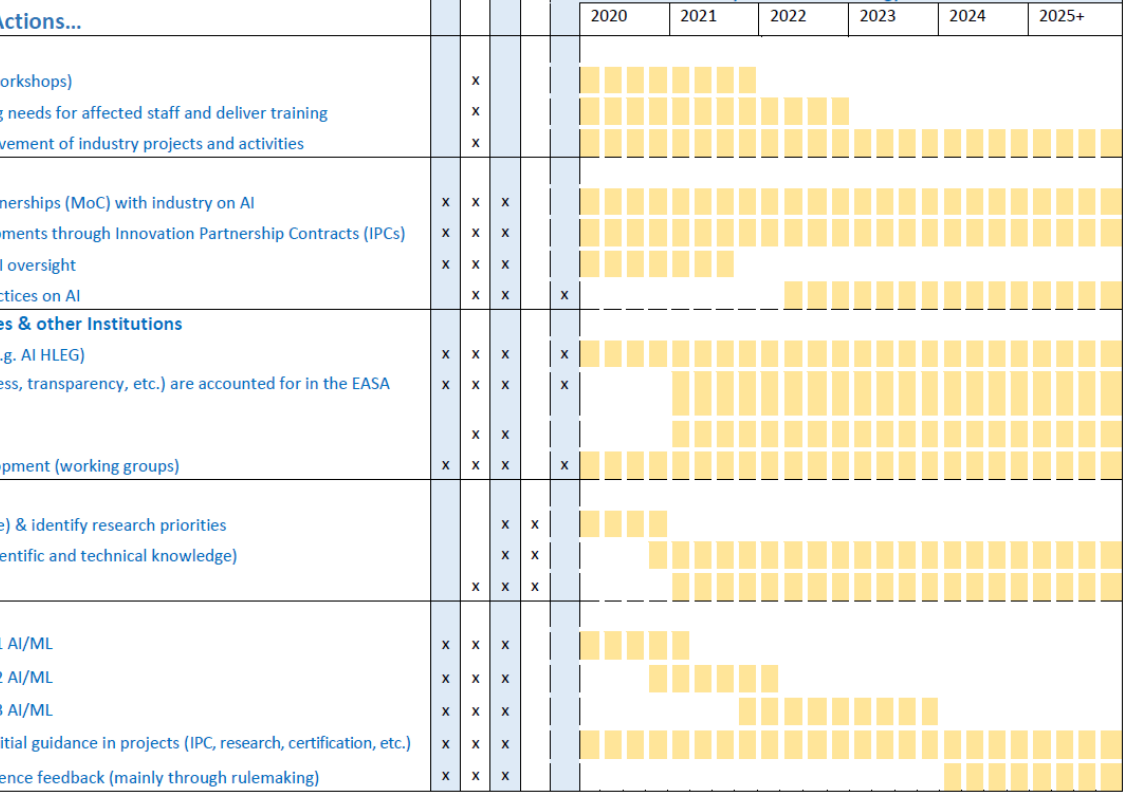


AI Roadmap top five objectives

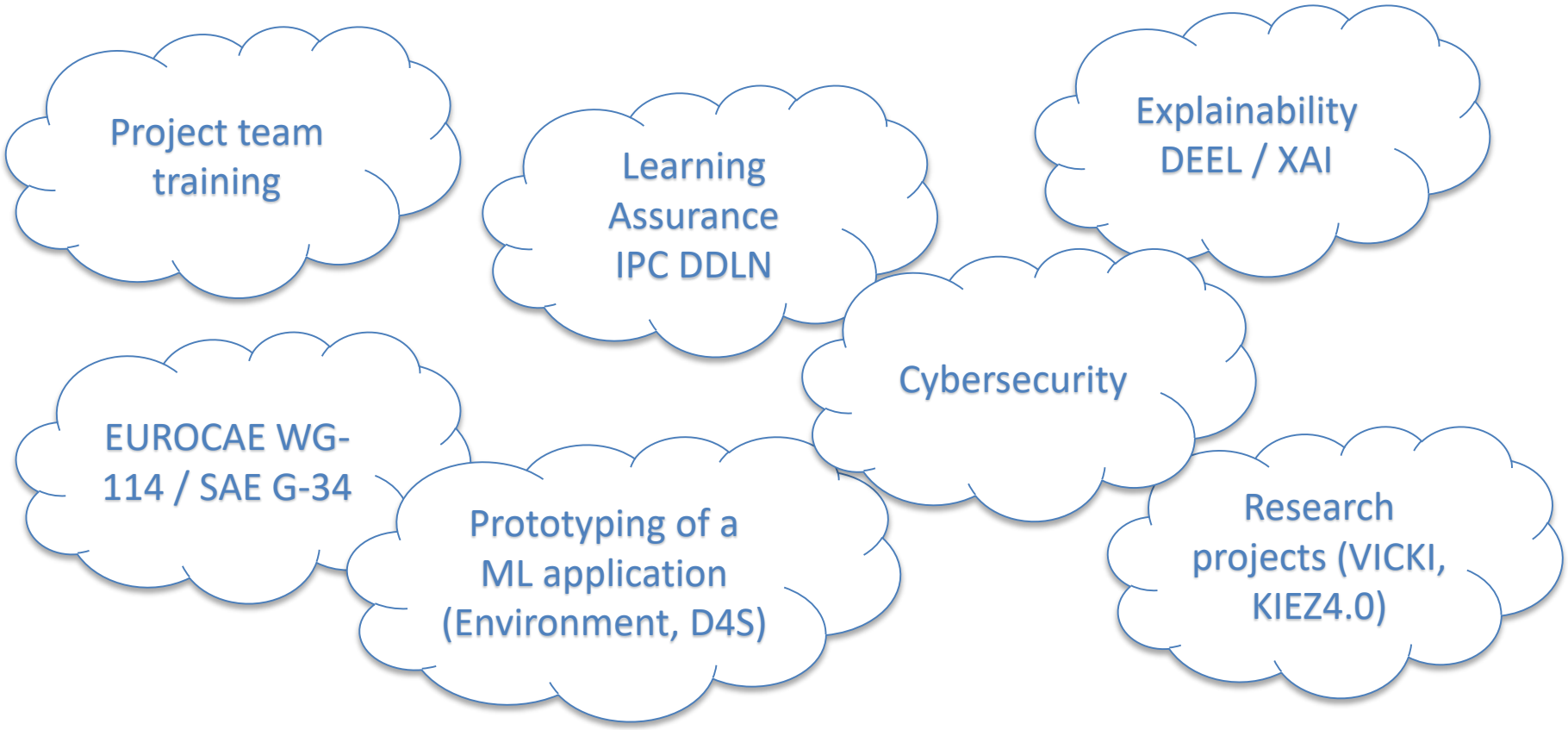
1. Develop a human-centric AI Trustworthiness framework
2. Make EASA a leading certification authority for AI
3. Support European Aviation leadership in AI
4. Contribute to an efficient European AI research agenda
5. Contribute actively to EU AI strategy and initiatives

AI Roadmap consolidated action plan

Actions…	1. Develop a human-centric AI trustworthiness framework	2. Make EASA a leading certification authority for AI	3. Support European aviation leadership in AI	4. Contribute to an efficient European AI research agenda	5. Contribute actively to the EU AI strategy and initiatives
A. …with EASA staff					
1. Create internal awareness (seminars, workshops)		x			
2. Identify the necessary skills and training needs for affected staff and deliver training		x			
3. Gain practical experience through involvement of industry projects and activities		x			
B. …with EASA stakeholders					
1. Develop and implement long-term partnerships (MoC) with industry on AI	x	x	x		
2. Collaborate with industry on AI developments through Innovation Partnership Contracts (IPCs)	x	x	x		
3. Evaluate worldwide best practices on AI oversight	x	x	x		
4. Promote EU policies and EASA best practices on AI		x	x		x
C. …with EU Commission, Members States & other Institutions					
1. Liaise with EU Commission initiatives (e.g. AI HLEG)	x	x	x		x
2. Ensure that EU guidelines (e.g. on fairness, transparency, etc.) are accounted for in the EASA policy	x	x	x		x
3. Involve innovation networks of NAAs		x	x		
4. Participate in industry standards development (working groups)	x	x	x		x
D. …with Research Institutes					
1. Map research measures (existing/future) & identify research priorities			x	x	
2. Engage with research organisations (scientific and technical knowledge)			x	x	
3. Participate in research activities		x	x	x	
E. …on Deliverables					
1. Develop first usable guidance for level 1 AI/ML	x	x	x		
2. Develop first usable guidance for level 2 AI/ML	x	x	x		
3. Develop first usable guidance for level 3 AI/ML	x	x	x		
4. Capitalise on return of experience on initial guidance in projects (IPC, research, certification, etc.)	x	x	x		
5. Develop final guidance based on experience feedback (mainly through rulemaking)	x	x	x		



Current activity streams



EASA
European Union Aviation Safety Agency

Questions?

ANC Talk

Innovation @EASA

Your safety is our mission.

An Agency of the European Union

EASA
European Union Aviation Safety Agency

EASA's activities to enable Urban Air Mobility (UAM)

Maria Algar Ruiz

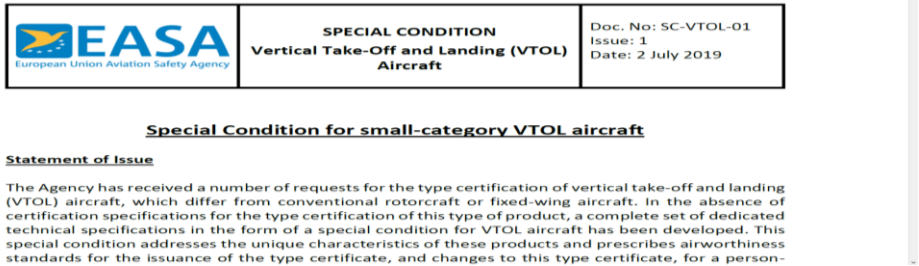
Programme Manager Drones

What will Urban Air Mobility look like? – photos taken from internet

Some predictions of UAM operations – Source Airbus

And what does EASA do to allow safe UAM?

- **Building blocks:**
  - **Aircraft safety → through stringent certification requirements e.g. SC-VTOL**



EASA
European Union Aviation Safety Agency

SPECIAL CONDITION
Vertical Take-Off and Landing (VTOL) Aircraft

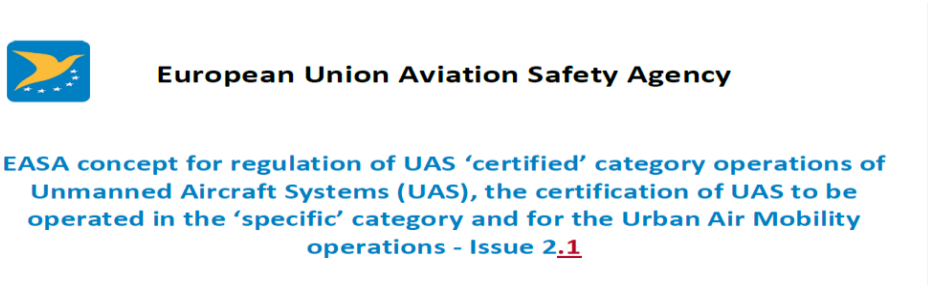
Doc. No: SC-VTOL-01
Issue: 1
Date: 2 July 2019

Special Condition for small-category VTOL aircraft

Statement of Issue

The Agency has received a number of requests for the type certification of vertical take-off and landing (VTOL) aircraft, which differ from conventional rotorcraft or fixed-wing aircraft. In the absence of certification specifications for the type certification of this type of product, a complete set of dedicated technical specifications in the form of a special condition for VTOL aircraft has been developed. This special condition addresses the unique characteristics of these products and prescribes airworthiness standards for the issuance of the type certificate, and changes to this type certificate, for a person-

  - **Aircraft operations safety → development of operational requirements in EASA's proposals for UAS certified category**



European Union Aviation Safety Agency

EASA concept for regulation of UAS 'certified' category operations of Unmanned Aircraft Systems (UAS), the certification of UAS to be operated in the 'specific' category and for the Urban Air Mobility operations - Issue 2.1

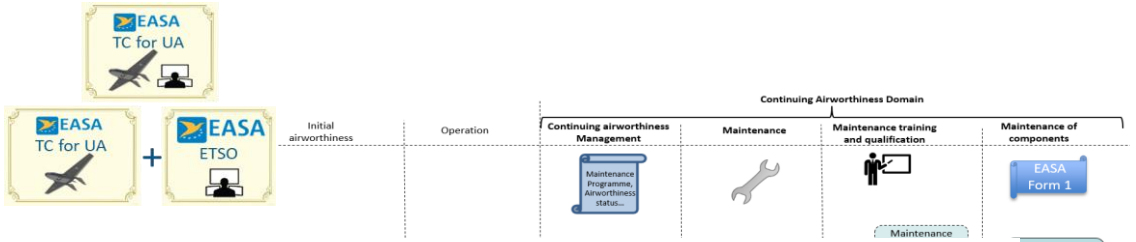
Scope of EASA 1st proposal on UAM

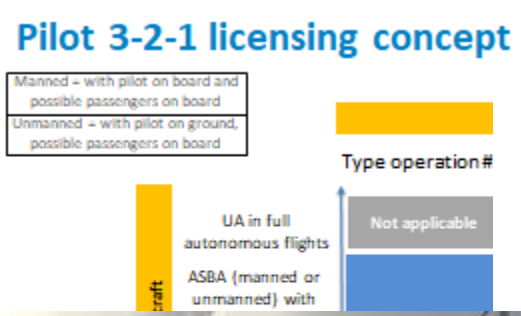
Operations type #2: UAS Operations in congested (e.g. urban) or non-congested (e.g. rural) environment using pre-defined routes in volume of airspaces where U-space (UTM) services are provided. This includes operations of unmanned automation system – based aircraft (ASBA), carrying passengers (e.g. VTOL air taxis) or cargo.

Operations type #3: Operations as in type #2 conducted with manned VTOL. Also in airspace where U-space (UTM) services are not available

Topics being addressed by EASA's proposal

- Initial airworthiness
- Continuing airworthiness
- Air Operations
- Crew licensing/training
- ATM/UTM-U-space
- Vertiports/operating sites





Urban Air Mobility projects around the World

European UAM projects

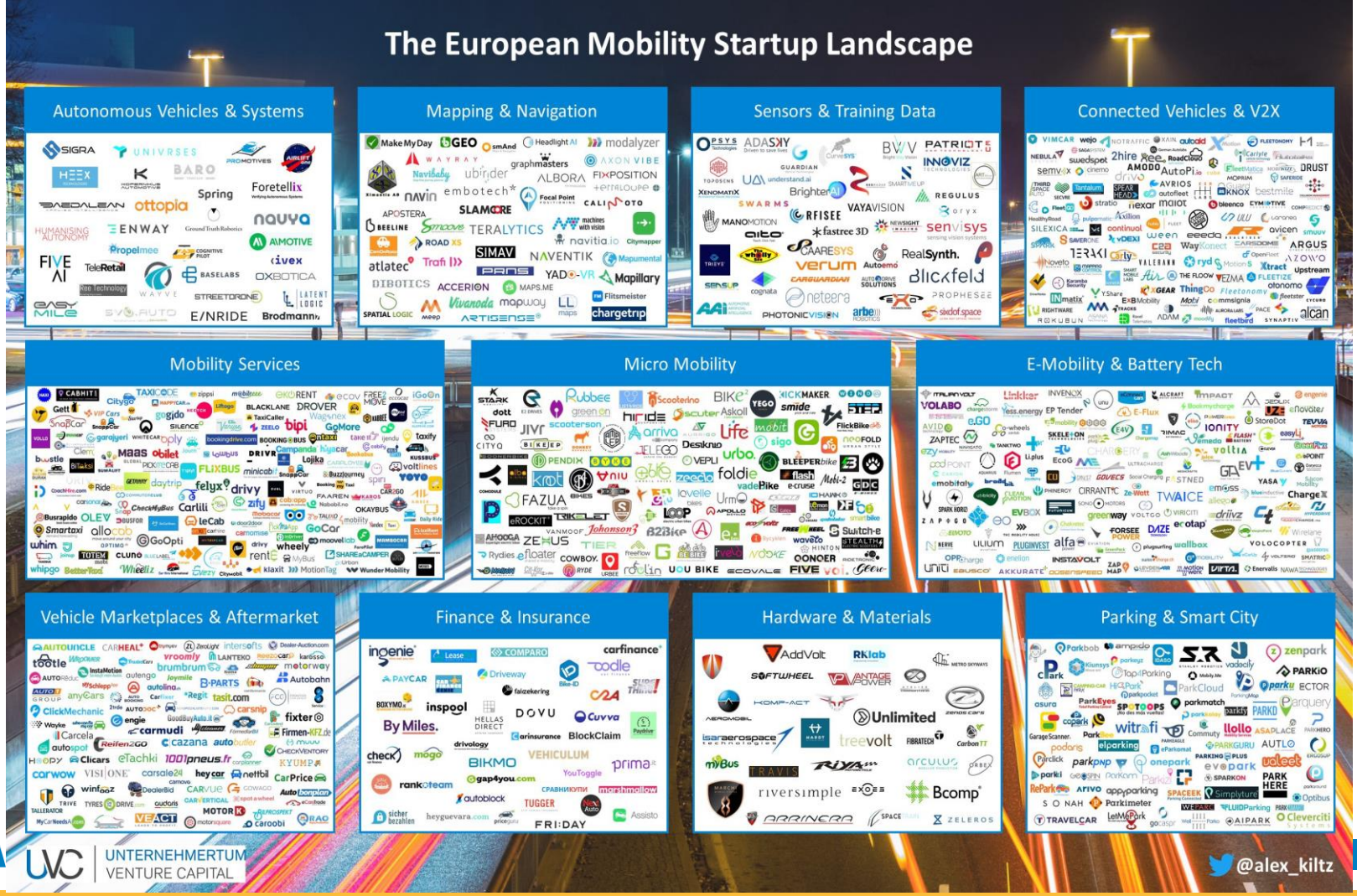
- **EASA is involved!**
  - Signed manifesto of:
    Maastricht, Aachen, Hasselt, Heerlen, Lüttich
  - Will conclude IPC with Toulouse Metropole on their UAM project, support Danish UAM and Galicia's UAM projects as much as we can!!!

UAM URBAN AIR MOBILITY INGOLSTADT

HAMBURG AVIATION

EASA

The European Mobility Startup Landscape



Challenges

- Many stakeholders with different background and interests;
- Many different authorities: local-city, regional, national, EASA;
- The needed involvement of citizens: do they want to see aircraft over their heads?
- The involvement of police and law enforcement: higher risk of air terrorism…
- Traditional aviation stakeholders … also want to have their part in this new paradigm.

EASA
European Union Aviation Safety Agency

Questions?

ANC Talk

Innovation @EASA

Your safety is our mission.

An Agency of the European Union

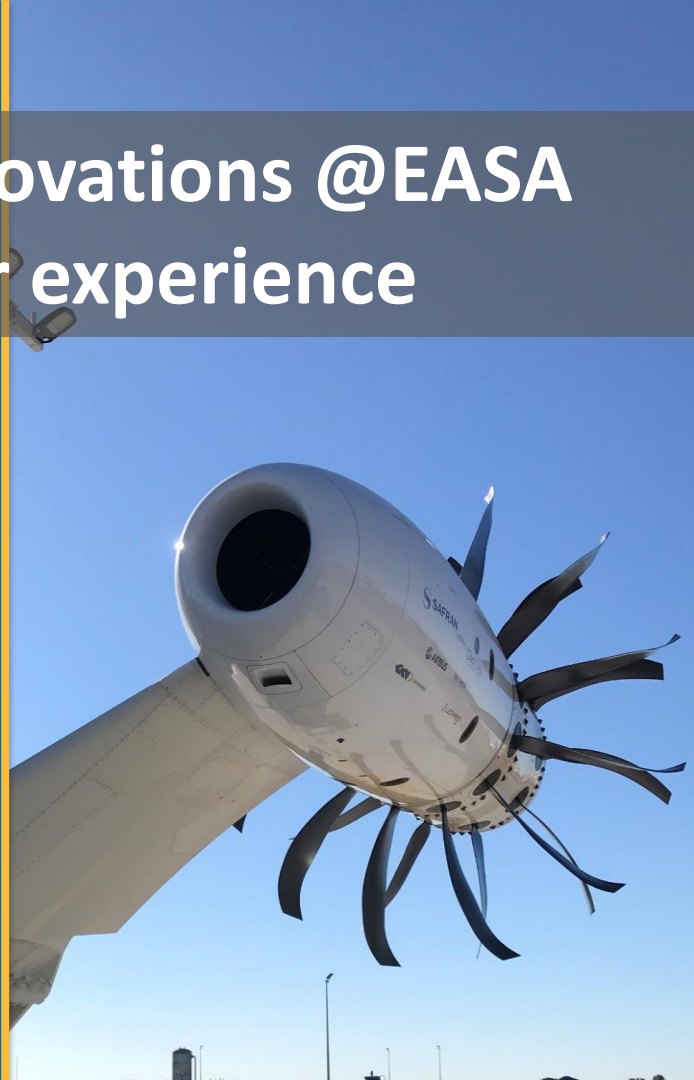
EASA
European Union Aviation Safety Agency

Innovations @EASA
Our experience

Technology - Certification Specifications for open rotor engine and its airframe integration

Laurent Gruz

EASA Representative ICAO & Canada



Open rotor

« An engine shall be considered an open rotor (open fan) if the primary propulsive component (fan/propeller/rotor) is open and exposed e.g. not surrounded by a containment ring »

Open Rotor certification - issues

Interface: involve engine (CS-E/FAR 33) and aircraft (CS-25/FAR 25)

Environmental - noise level

Safety & certification issues

- No containment
- Reference: turboprop, turbofan, or ??

Trade-offs

- Engine <> aircraft
- Safety <> Efficiency
- Safety <> Environment
- Noise <> Emissions

Open Rotor certification - methodology

- Approach through bilateral engagements with individual OEMs proved unsuitable.
- EASA launched a rulemaking task, allowing participation of all industries and regulators.
- Group chaired by Industry with full EASA support, and active participation of regulators.

Open Rotor certification - outcome

- Better understanding of technologies and regulatory background allowed significant progress.
- Arbitration on risk level performed by regulator.
- Engagement of WG participants allowed EASA to publish a set of proposed rules (NPA 2015-22).
- Projects did not materialize, final rules were not published, but reference material will remain on record.

EASA
European Union Aviation Safety Agency

Questions?

ANC Talk

Innovation @EASA

Your safety is our mission.

An Agency of the European Union

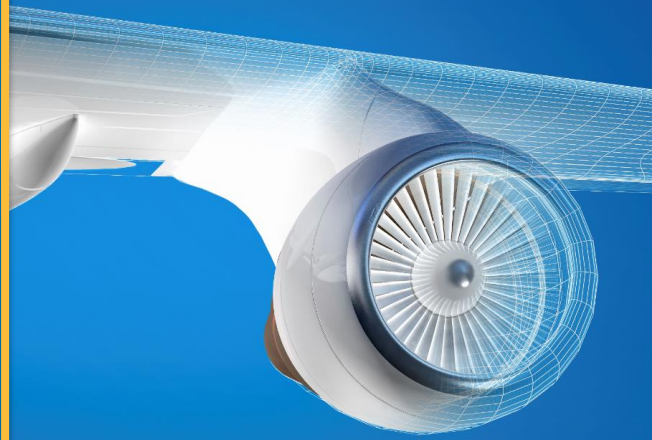
EASA
European Union Aviation Safety Agency

Innovations @EASA
Our experience

Process – Design Organisation Approval & Level of Involvement

Laurent Gruz

EASA Representative ICAO & Canada



Design Organisation Approval

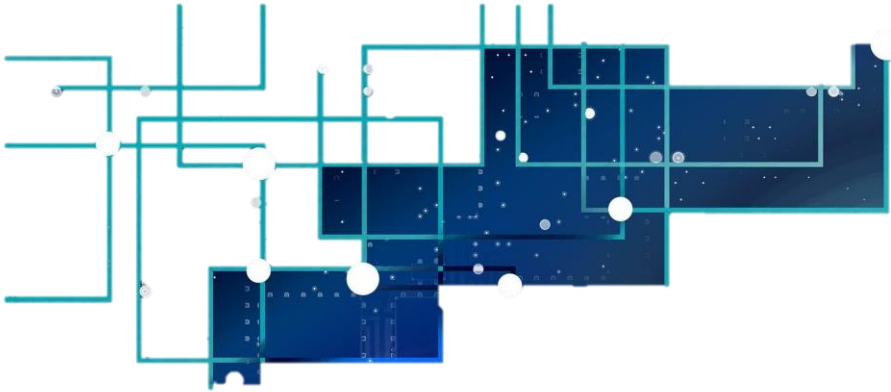
- In the 1990s, it became clear industry growth could not be matched by regulatory bodies.

- JAA came forward with the **Design Organisation Approval (DOA)** concept, giving under conditions privileges to organisations rather than individuals.

Level of Involvement

- EASA further developed DOA by introducing the LOI **Level of Involvement** concept, to rationalise and standardise its involvement.

- The actual LOI is based upon:
  - Novelty
  - Complexity
  - Performance of the DOA holder



- LOI is a complex process currently being rolled out.

EASA
European Union Aviation Safety Agency

Questions?

ANC Talk

Innovation @EASA

Your safety is our mission.

An Agency of the European Union

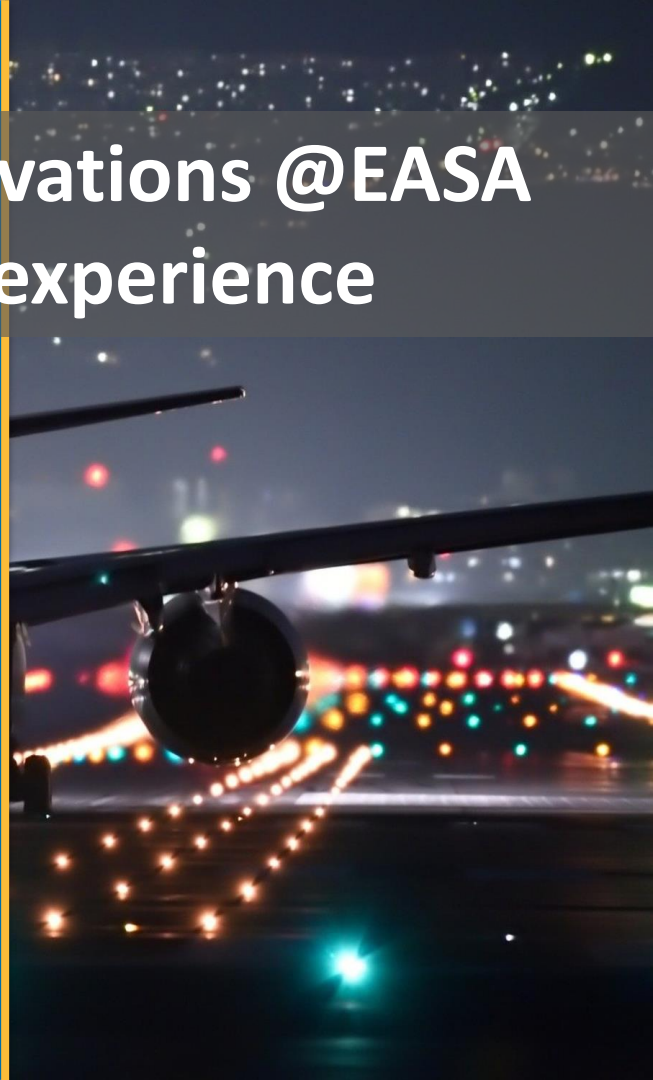
EASA
European Union Aviation Safety Agency

Innovations @EASA
Our experience

Runway Overrun Awareness and Alerting System (ROAAS)

A joint EUROCAE-EASA success story

Xavier Vergez - EASA
Christian Schleifer - EUROCAE



EUROCAE

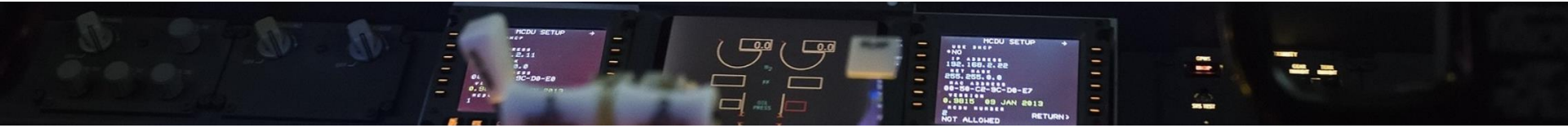
Background

- Need for new on board technologies to reduce the rate of runway excursions

- Runway excursion identified as one of the main causes for large aeroplane accidents in commercial air transport, e.g.:
  - ICAO Global Aviation Safety Plan
  - EASA Annual Safety Review

A340 F-GLZQ in Toronto – photo from the investigation report

Background



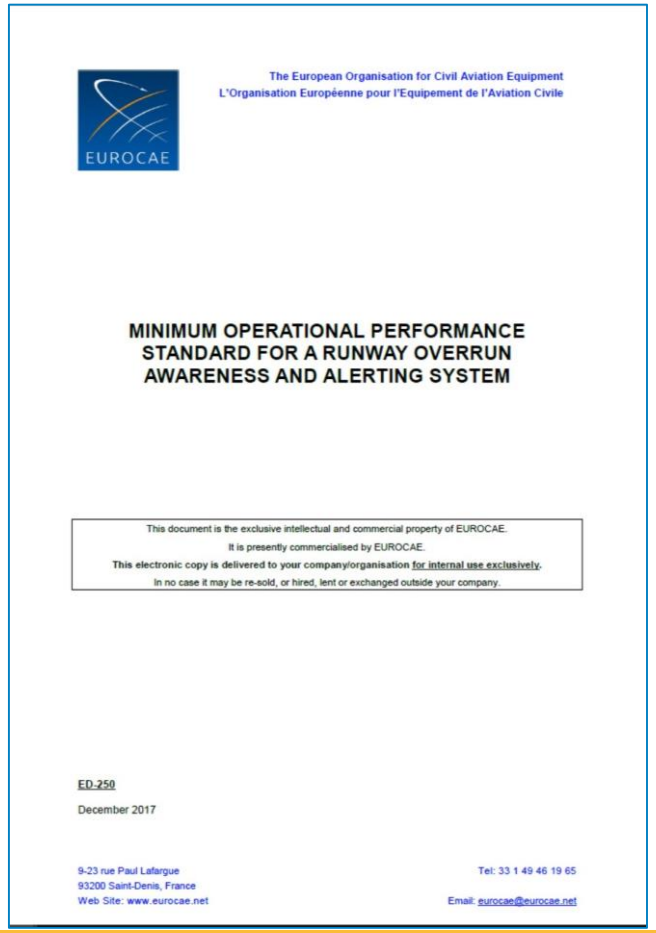
- Some aeroplane and avionics manufacturers proactively started to design new on board systems to address this issue

- In 2013: European Working Group for Runway Safety (EUROCONTROL, EASA, ECAST...) published the European Action Plan for the Prevention of Runway Excursions (EAPPRE)
  - recommendation to manufacturers to make on board real time monitoring and alerting systems widely available

Development of Industry standard

MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR A RUNWAY OVERRUN AWARENESS AND ALERTING SYSTEM

EUROCAE



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Equipement de l'Aviation Civile

EUROCAE

MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR A RUNWAY OVERRUN AWARENESS AND ALERTING SYSTEM

ED-250

December 2017

9-23 rue Paul Lafargue
93200 Saint-Denis, France
Web Site: www.eurocae.net

Tel: 33 1 49 46 19 65
Email: eurocae@eurocae.net

EASA

Industry standard

- EASA proposed to mandate ROAAS in 2013 (NPA 2013-09): principle supported, but: concerns from industry on some prescriptive aspects and on commercial availability
- In 2014, all stakeholders recognised the need to first define minimum performance standards to ensure worldwide harmonisation and ease the certification processes
- In 2015, EUROCAE accepted the task and published the Terms of Reference for WG-101 to develop a MOPS for appropriate awareness and alerting to the crew when the landing distance is estimated insufficient for a safe landing

Industry standard

International group:

- Airbus
- ATR
- BAE Systems
- Boeing
- Bombardier
- Dassault Aviation
- EASA
- Embraer
- Eurocae
- Eurocontrol
- European cockpit association
- FAA
- Garmin
- General Electric
- Gulfstream
- Honeywell
- IANS
- IATA/ Air France
- IFALPA
- Lufthansa
- Lufthansa Technik
- Rockwell Collins
- RTCA
- Thales Avionics
- Zodiac Aerospace

Industry standard

- ED-250 standard published end 2017
  - Consensus on minimum requirements, leaving some flexibility to ROAAS manufacturers and integrators;
  - Baseline for ROAAS manufacturers to ease the development and design;
  - Support for the certification process.

EASA Rulemaking: building on the standard

EASA NPA 2018-12: proposes to require the installation of ROAAS on new large aeroplane designs (CS-25), and on certain new large aeroplanes operated in commercial air transportation (CAT), and manufactured after a predetermined date (Part-26/CS-26)

- Objective based and non prescriptive requirements
  - Energy based calculations of the predicted landing stopping point,
  - Real-time alerts to the flight crew (in-flight and on ground) when aeroplane at risk of not being able to stop within the available runway distance,
- **Certification supported by EUROCAE ED-250** 'MOPS for a Runway Overrun Awareness and Alerting System' by reference in the **acceptable means of compliance (AMC)**

EASA rulemaking (cont.)

- **Opinion 04-2019 (Oct 2019):** proposed mandate for CAT large aeroplanes manufactured after a certain date – process on going at the European Commission
- **CS-25 amdt 24 (Jan 2020):** new CS and AMC 25.705: for new aeroplane designs
- **New ETSO-2C518** to be issued soon (NPA 2019-06)

Next….

- Take-Off Monitoring Parameters (TOMP).
- Repeated in-service events linked to incorrect take-off performance, typically resulting from incorrect parameter(s) for FMS entries, runway, etc.
- EASA reviewing the best options to address the issue.

EASA

EASA
European Union Aviation Safety Agency

Questions?

ANC Talk

Innovation @EASA

Your safety is our mission.

An Agency of the European Union

EASA
European Union Aviation Safety Agency

The link with “ICAO/camera ready SARPS”

Daniela Defossar

Senior ICAO Coordinator

The link with “ICAO/camera ready SARPS”

- ECTL/EASA/EC/SJU/EUROCAE proposed a process at the last Standards Round Table meeting in fall 2019
- It provides operationally validated packages enabling implementation including the following elements, as relevant
  - Camera Ready SARPs, Safety cases, CBA, Standards developed through SDO’s/ Industry standards
- Involves a wide range of stakeholder groups including regulators
  - Buy-in and global applicability/harmonisation
- Ensures involvement and final SARPS decision-making at ICAO level

Lessons learned…

- Innovation in aviation is constant and multiform.
- Drivers are technology, market demand, safety, process, etc., and combinations of all the above.
- Cooperation between industries and regulators is essential.
- Most innovations benefit from an integrated approach, from design to operations, including environment.
- Not all innovations succeed; prioritisation might be necessary.

Aviation is innovation!

EASA
European Union Aviation Safety Agency

Thank you for your attention!

Innovation @EASA

ANC Talk, 20 May 2020

Your safety is our mission.

An Agency of the European Union