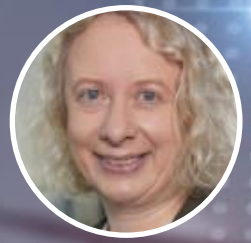

EASA
European Union Aviation Safety Agency
Welcome to the
EASA AI Days
High-Level Conference !
2nd and 3rd July 2024

Welcome to the EASA AI Days



Janet Northcote,
EASA Head of Communications

EASA AI Days
Opening Speech

Maria Rueda,
EASA Director - Strategy and Safety Management

Keynote speech
‘EU AI regulations’

Antoine-Alexandre André, Policy and Legal OfficerEuropean Commission – DG CNECT A/2

European Commission

SHAPING EUROPE'S DIGITAL FUTURE

The AI Act and its impact on the aviation sector

Antoine-Alexandre André – DG CNECT A.2 (AI Office)

The AI Act follows a risk-based approach

Unacceptable risk
e.g. social scoring, untargeted scraping

Prohibited

High risk
e.g. recruitment, medical devices

Permitted subject to compliance with AI requirements and ex-ante conformity assessment

*Not mutually exclusive

'Transparency' risk
'Impersonation' (chatbots), deep fakes

Permitted but subject to information/transparency obligations

Minimal or no risk

Permitted with no restrictions, voluntary codes of conduct possible

European Commission

A limited set of particularly harmful AI practices are banned

Unacceptable risk

Subliminal, manipulative techniques or exploitation of vulnerabilities	to manipulate people in harmful ways
Social scoring	for public and private purposes leading to detrimental or unfavourable treatment
Biometric categorisation	to deduce or infer race, political opinions, religious or philosophical beliefs or sexual orientation, exceptions for labelling in the area of law enforcement
Real-time remote biometric identification	in publicly accessible spaces for law enforcement purposes, -with narrow exceptions and with prior authorisation by a judicial or independent administrative authority
Individual predictive policing	assessing or predicting the risks of a natural person to commit a criminal offence based solely on this profiling without objective facts
Emotion recognition	in the workplace and education institutions, unless for medical or safety reasons
Untargeted scraping of the internet	or CCTV for facial images to build-up or expand biometric databases

High-risk AI systems will have to comply with certain rules

1. High-risk systems embedded in products covered by Annex I

- AI system shall be considered to be high-risk where both of the following conditions are fulfilled:

a) the AI system is intended to be used as a **safety component of a product, or the AI system is itself a product, covered by the Union harmonisation legislation** listed in Annex I;

b) the product whose safety component pursuant to point (a) is the AI system, or the AI system itself as a product, is **required to undergo a third-party conformity assessment**, with a view to the placing on the market or the putting into service of that product pursuant to the Union harmonisation legislation listed in Annex I.

Aviation legislation is included in the list!

High-risk AI systems will have to comply with certain rules

2. High-risk (stand-alone) use cases listed in Annex III

- **Biometrics:** Remote biometric identification, categorization, emotion recognition;
- **Critical infrastructures**: e.g. safety components of digital infrastructure, road traffic
- **Education**: e.g. to evaluate learning outcomes, assign students in educational institutions
- **Employment:** e.g. to analyse job applications or evaluate candidates, promote or fire workers
- **Essential private and public services**: determining eligibility to essential public benefits and services; credit-scoring and creditworthiness assessment, risk assessment and pricing in health and life insurance
- **Law enforcement**
- **Border management**
- **Administration of justice and democratic processes**

Filter mechanism:
Excludes systems from the high-risk list that:

- perform narrow procedural tasks,
- improve the result of previous human activities,
- do not influence human decisions or
- do purely preparatory tasks,

NB. Profiling of natural persons always high-risk

Obligations of providers and deployers of high-risk AI

Provider obligations

- **Risk management system** to minimise risks for deployers and affected persons
- **Trustworthy AI requirements:** data quality and management, documentation and traceability, transparency and information to deployers, human oversight, accuracy, cybersecurity and robustness
- **Conformity assessment** to demonstrate compliance prior to placing on the market
- **Quality management system**
- **Register** standalone AI system in EU database (listed in Annex II)
- Conduct **post-market monitoring** and report **serious incidents**
- Non-EU providers to appoint **authorized representative in the EU**

Deployer obligations

- Operate high-risk AI system in accordance with **instructions of use**
- Ensure **human oversight**: persons assigned must have the necessary competence, training and authority **Monitor** for possible risks and **report problems and any serious incident** to the provider or distributor
- Public authorities to **register the use in the EU database**
- **Inform affected workers** and their representatives
- **Inform people** subjected to decisions taken or informed by a high risk AI system and, upon request, provide them with **an explanation**

New special rules for General Purpose AI models (GPAI)

All GPAI
(lower tier)

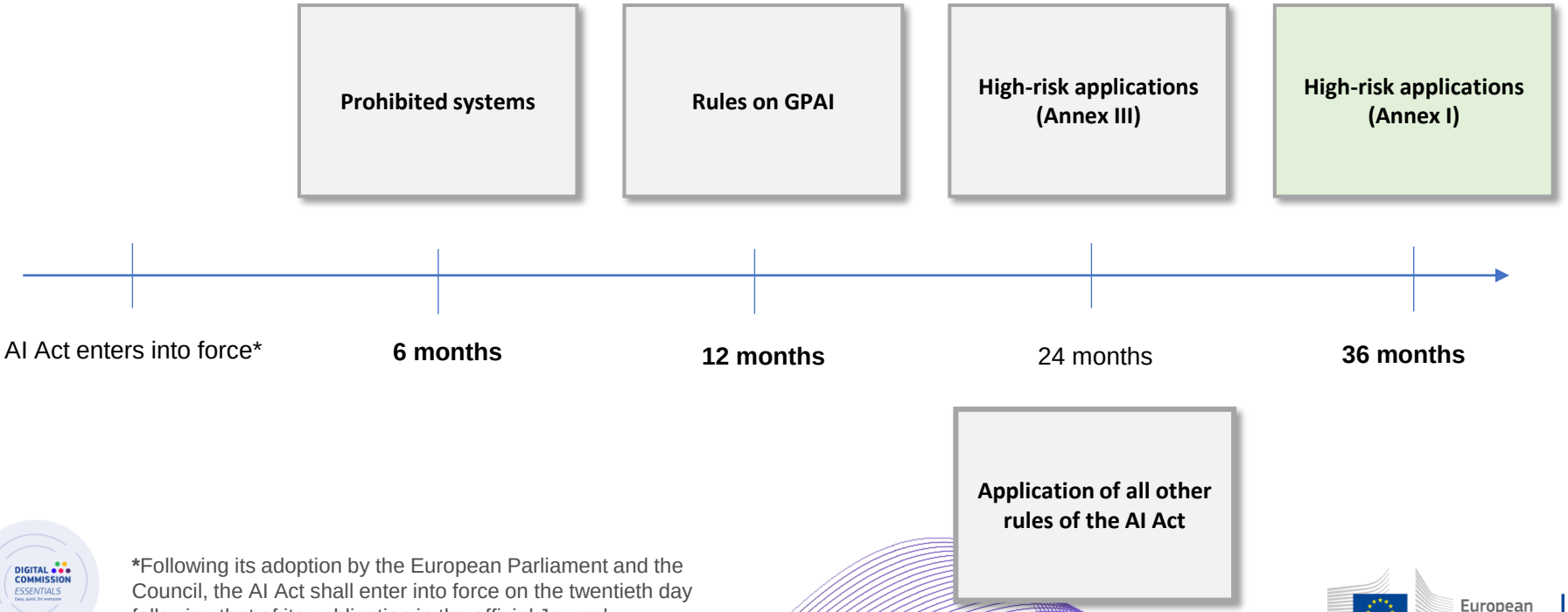
- Information and documentation requirements, mainly to achieve **transparency for downstream providers**
- Policy to respect copyright and a **summary of the content** used for training purposes
- **Free and open-source models are exempted** from transparency requirements, when they do not carry systemic risks except from the copyright-related obligations

GPAI with systemic risks
(higher tier)

- **at least 10^25 FLOPs** or **designated by the AI Office** (e.g. based on benc… for capabilities, user count)
- All obligations from the lower tier **+ state-of-the-art model evaluations** (including red teaming / adversarial testing**), risk assessment and mitigation, incident reporting, cybersecurity and additional documentation**

updateable via delegated acts

The AI Act enters into application in a gradual approach



*Following its adoption by the European Parliament and the Council, the AI Act shall enter into force on the twentieth day following that of its publication in the official Journal.

Thank you

antoine-alexandre.andre@ec.europa.eu

European Commission

Keynote speech
‘EASA Scientific Committee & AI Task Force’

Peter Hecker,
Chair of the EASA Scientific Committee

EASA Artificial Intelligence Days
High-Level Conference 2024

Prof. Peter Hecker Chairman EASA Scientific Committee

The EASA Scientific Committee

- Established 2022 to provide **advice to the EASA Executive Director** on scientific issues in **scientific and technical domains** linked to **research, innovation, and disruptive technologies**.
- 11 international experts been selected as committee members
- The current Work Programme covers 3 areas
  - Connecting Academia with EASA
  - Impact of Climate Change on Aviation
  - Artificial Intelligence and Automation
- Implementation via 3 Task Forces
- Annual reports released for 2022 and 2023

https://www.easa.europa.eu/en/domains/research-innovation/easas-scientific-committee-scicomm

Task Force on Artificial Intelligence and Automation

Established 2022 with a clear focus on supporting EASA in developing and implementing its strategy on AI

SciComm members

- Peter Hecker
- Marianna Jacyna
- Frances Brazier
- Nicholas Asher
- Marco Lovera

EASA members

- Renée Pelchen-Medwed
- Mathilde Labatut
- Andrew Kilner
- Ines Berlenga
- Guillaume Soudain
- Axel Werner
- Gilles Gardiol

Task Force on Artificial Intelligence and Automation

EASA AI strategy continuously developing and materializing, i.e. by developing

- **EASA AI Roadmap v2.0,** action plan to prepare the necessary ‘AI trustworthiness’ guidance and anticipate necessary regulation updates to accompany this innovation wave
- Concept Paper ‘**First usable guidance for Level 1&2 machine learning applications**’

Focus areas:

Human machine collaboration & teaming

- Definitions, Design principles, Roles, Use cases, Validation

Ethics in AI and automation

- Support of ethical AI survey for **aviation professionals**

Design principles for Level 3 AI

- Review of definitions and concepts, State-of-the-art review in aviation and other domains.

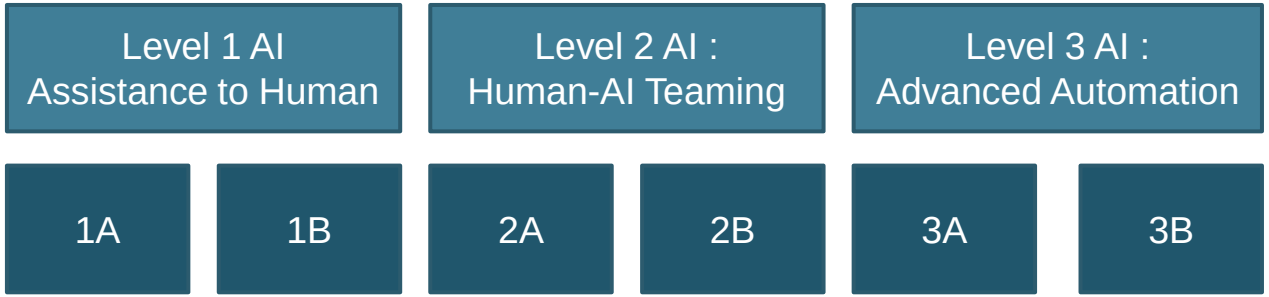
Focus 2024:

Work Package #6: Ethics based assessment	• Support to general public survey (Part II) • Support to update of guidance on ethics-based assessment in view of EASA Concept paper Issue 03
Work Package #7: Testing of the Human-AI teaming guidance	• Testing Level 2 AI Human Factors guidance with the identified use case • Further develop teaming concepts for Level 3A in view of EASA Concept paper Issue 03 • Support to final guidance development for the 'HF for AI' building block
Work Package #8: Anticipation of design principles for Level 3 AI applications	• Support development of design principles (Level 3 AI) in view of EASA Concept paper Issue 03 • Selection of use cases for Levels 3B to 3D AI.

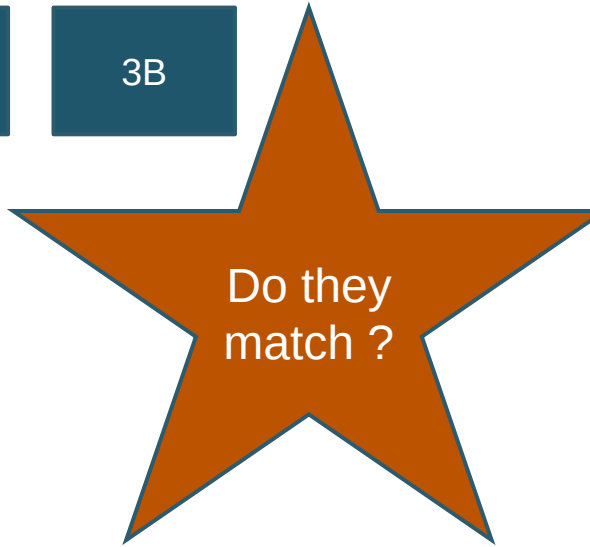
Key message #1: AI classification typology

The EASA AI Task Force studied classification schemes across domains:

- **EASA**



- **SESAR (higher) levels of automation (Masterplan 2020)**
- **JARUS AutoMethod 1.0 (UAS / UAM)**
- **SAE J3016 levels of driving automation (automotive)**
- **Rail Goals of Automation IEC 62290-1**
- **Classification for AI in medicine (ADAM framework)**
- **NIST ALFUS …**



Key message #1: AI classification typology

The EASA AI Task Force studied classification schemes across domains:

- Existing schemes do not match (easily)
- Comparing terms and definitions across domains may lead to misinterpretation
- Boundaries between levels not always clear and consistent

UAS/UAM (JARUS AutoMethod 1.0)	ATM/ANS (Master Plan 2020)	Medical ()	Railway GoA (IEC 62290-1)	Automotive (SAE J3016)	Level of AI (EASA AI Roadmap and Concept Paper)
Level 1 – Assisted operations	Level 0/ - Low automation / task execution support	Level 1 - Data presentation	GoA1 – Manual?	Level 0 – no driving automation	Level 1A - Human augmentation
-	Level 1 - Decision support	Level 2 - Clinical decision support	-	-	Level 1B - Human cognitive assistance
Level 2/3: Task reduction / *supervised* automation	Level 2/3 – Conditional automation	-	GoA2 – Semi-automatic (STO)	Level 1/2 – Assistance / Partial automation	Level 2A - Human-AI cooperation
-	-	-	-	-	Level 2B - Human-AI collaboration
Level 4: Manage by Exception	Level 4 – High automation (most tasks)	Level 3 – Conditional automation	GoA3 – Driverless (DTO)	Level 3 - Conditional automation	Level 3A – Supervised advanced automation
Level 5: Full automation	Level 5 – Full automation	Level 4/5 – High/full automation	GoA4 – Unattented (UTO)	Level 4 – High automation	Level 3B – Non-supervised advanced automation

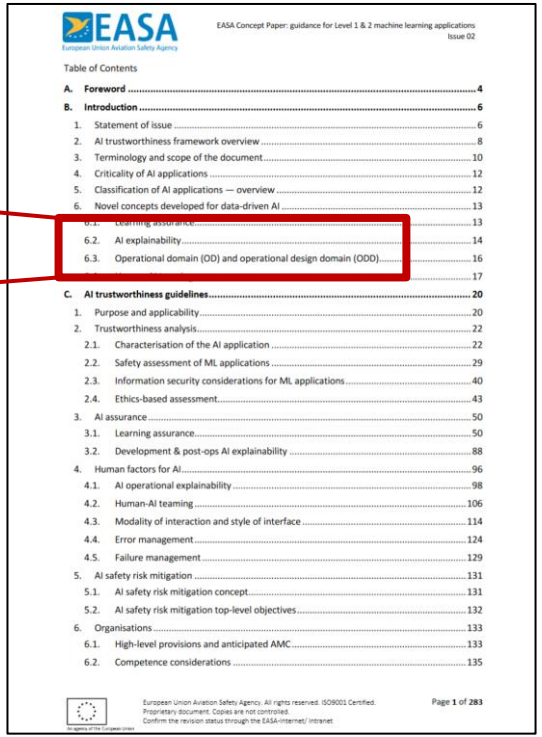
EASA AI classification typology

- **enables a coherent mapping to any domain automation scheme**
- **while providing clear boundaries**

Key message #2: Human-AI Teaming Concept

Important Elements of the EASA Concept Paper Guidance for Level 1 & 2 machine learning applications

- Learning Assurance
- AI Explainability
- **Human-AI Teaming**



EASA Concept Paper: guidance for Level 1 & 2 machine learning applications
Issue 02

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Level 2 AI applications require to augment the AI trustworthiness framework with additional human factors guidance

Differentiation between Human-AI cooperation (Level 2A AI) and collaboration (Level 2B AI) highly relevant

Testing along use cases (SciComm: “Proxima”) is crucial

Outlook: Need to define Teaming Concepts for Level 3 AI

Key message #3: Advanced Automation (Level 3 AI) - and beyond !

Perspectives on Advanced Automation (Level 3) are still a field of development

Areas to be discussed:

- Human centric approach, Extended AI Safety Risk Mitigation concept to be introduced.
- Notion of “complexity of the operations” to be integrated?
- Differentiation between “advanced automation” and “autonomy” needed.
- New AI level for autonomy ?
- Alignment with final EU AI Act – Article 14 on human oversight required (!)
  - Paragraph 1 introduces the notion of ”effective oversight by natural persons …”
  - Paragraph 3 may be the key to enable levels 3A/3B

Area of further investigation!

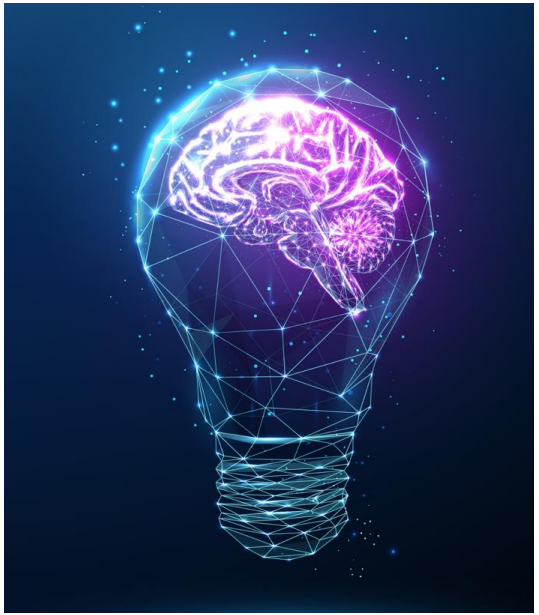
Conclusions

EASA has demonstrated a pro-active approach on paving the way for introducing AI in aviation

Approach of Levels of Automation is a major step towards structuring the application of AI in a clear and traceable manner

Roadmap and guidance material developed so far are an excellent basis for a unified understanding in the aviation community

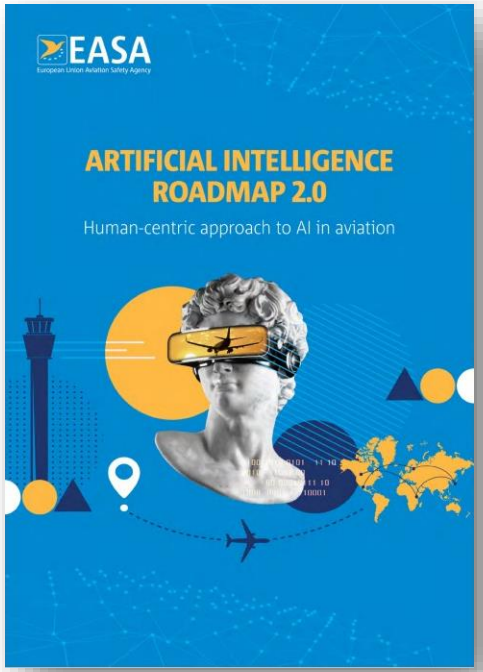
Aviation as front runner in structuring the levels of automation will support a harmonisation across domains

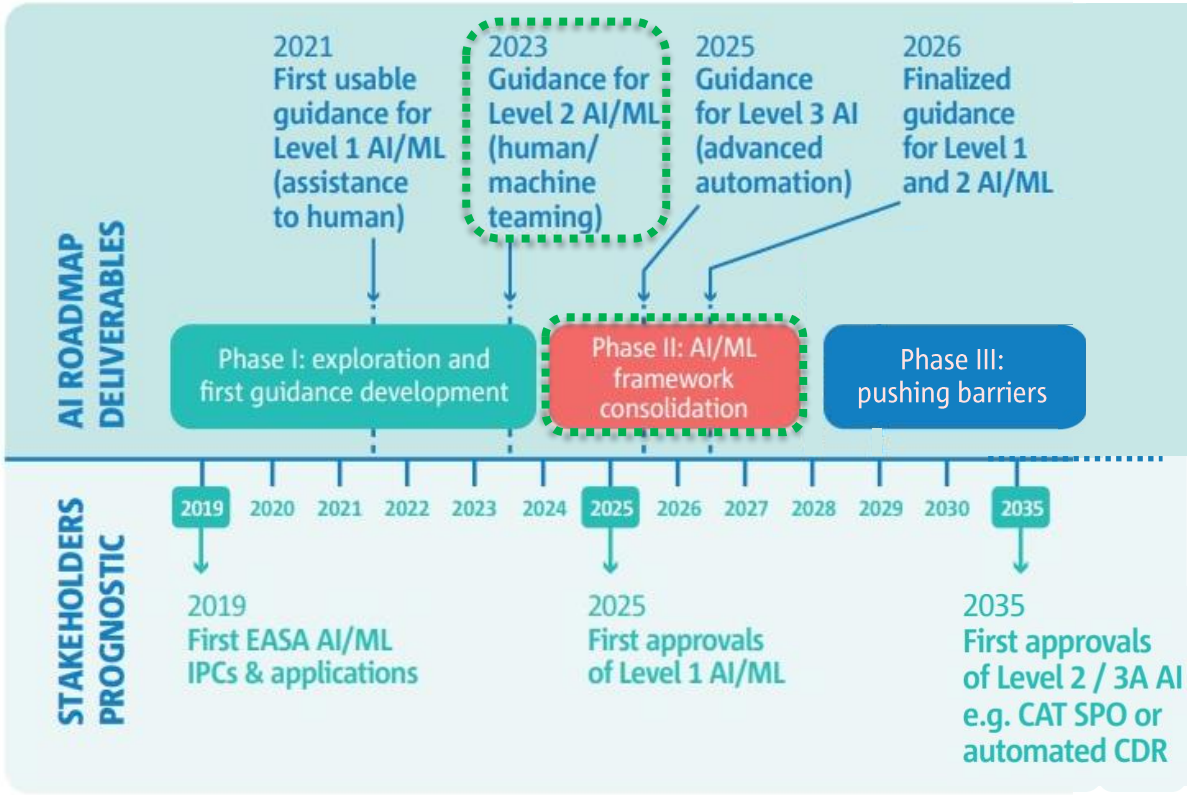


AI Roadmap Phase 2
‘Accelerating after initial exploration phase’

Guillaume Soudain,
EASA Artificial Intelligence Programme Manager

EASA AI Roadmap 2.0: entering consolidation phase

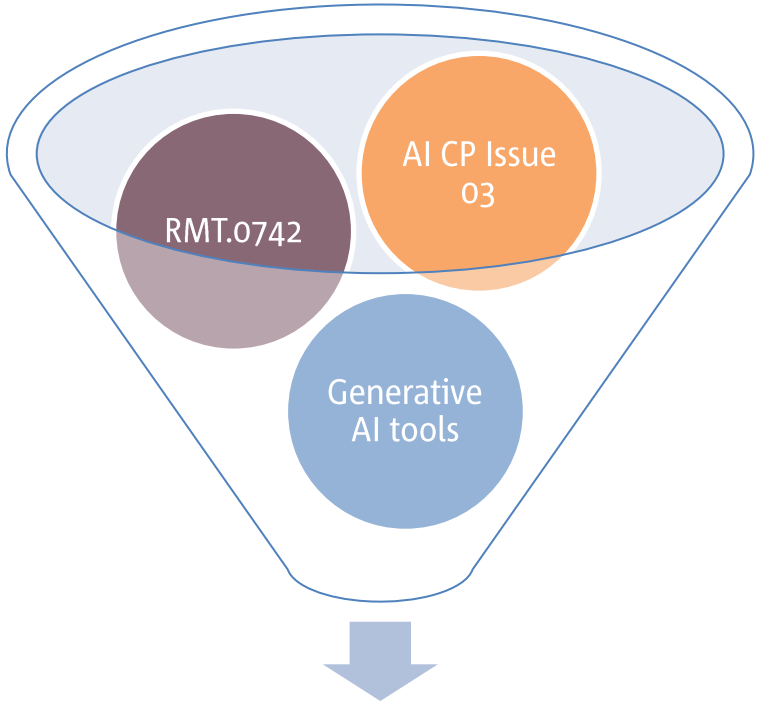




AI = Artificial Intelligence ML = machine learning

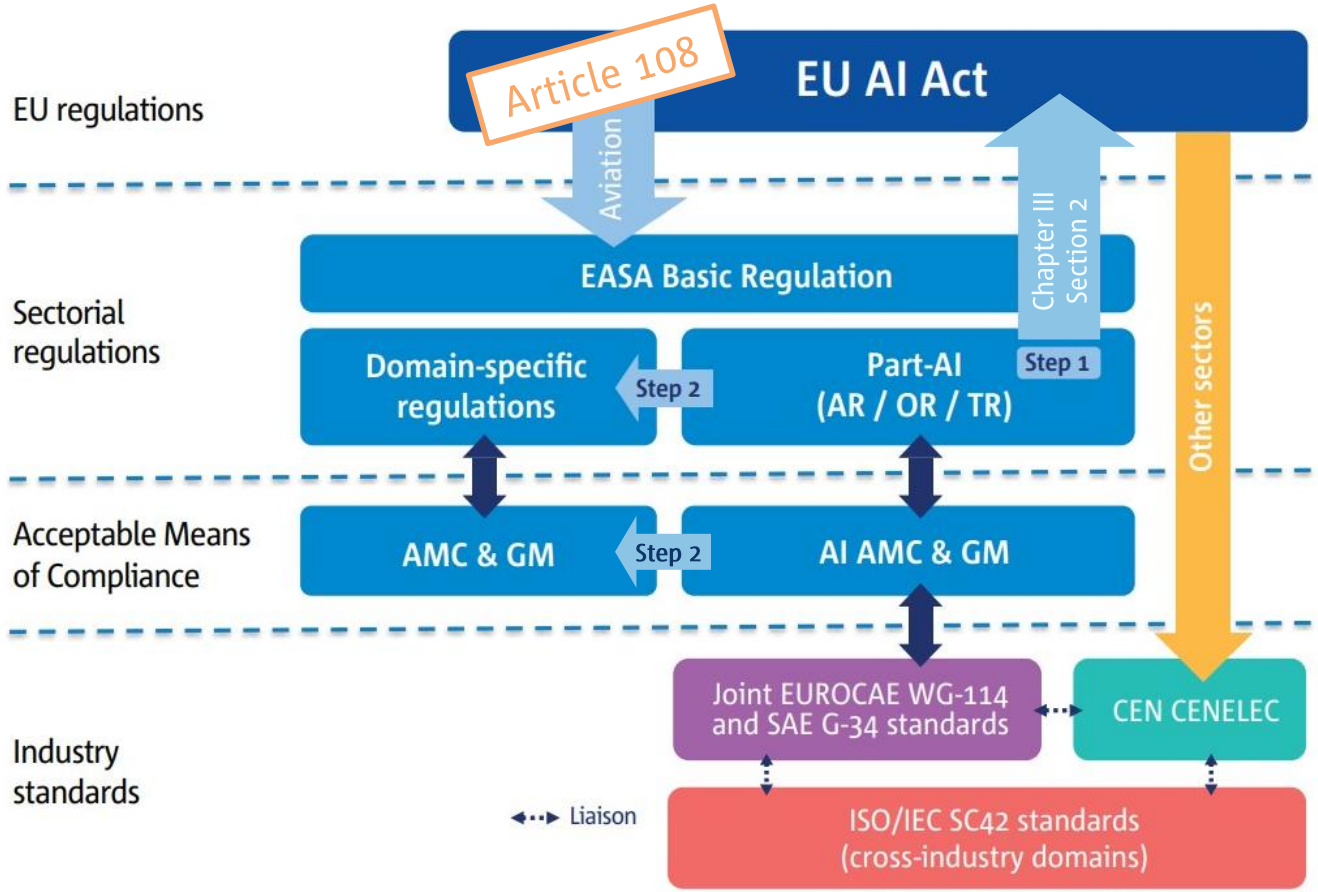
AI Roadmap ‘consolidation phase’ overview

- → Rulemaking
  - → RMT.0742
- → Continued exploration
  - → AI Assurance technical scope
  - → Human factors for AI
  - → Ethics-based assessment
  - → Advanced automation
- → Generative AI and tools
  - → Operational use

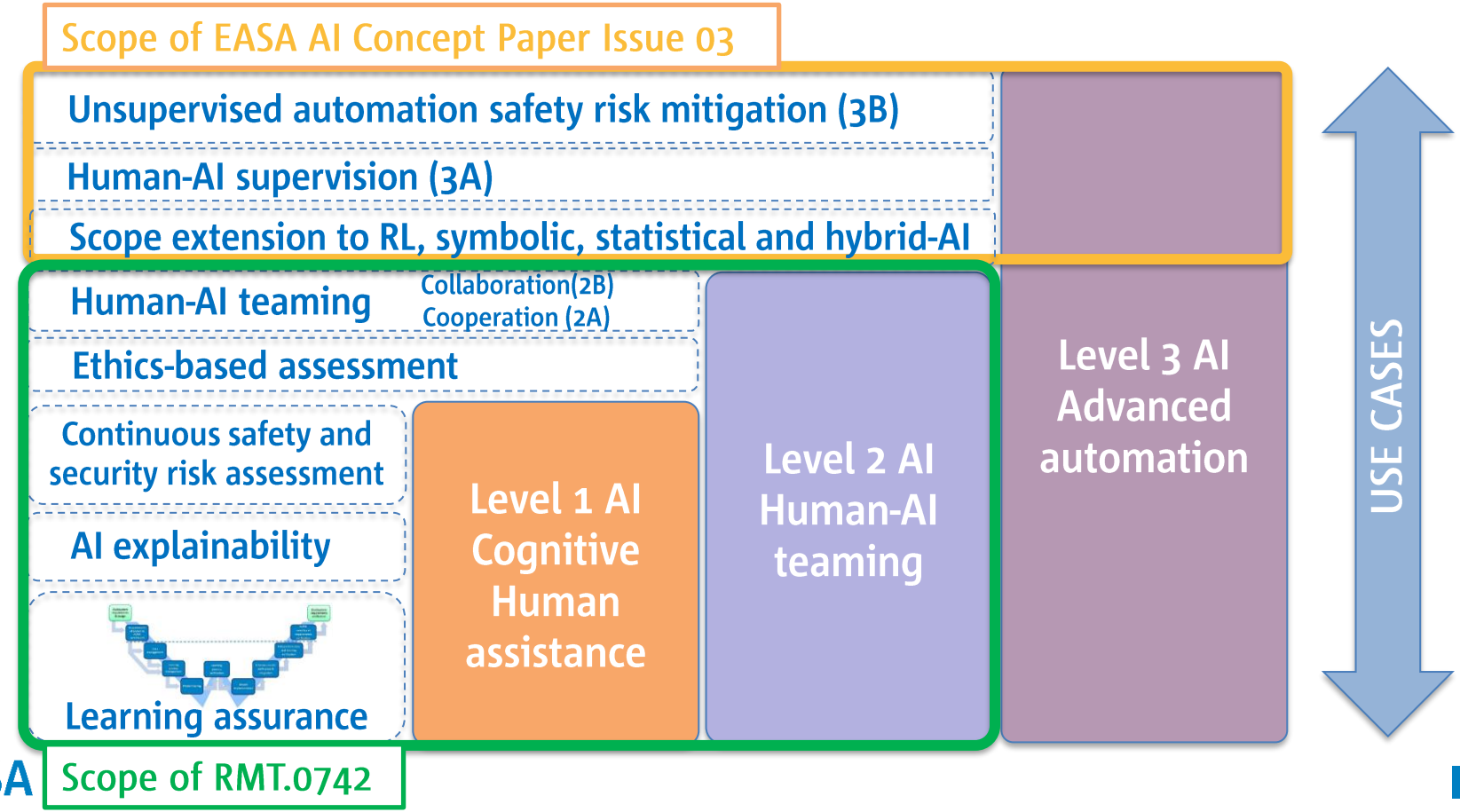


EASA Rulemaking plan for AI - EPAS RMT.0742

Timeframe RMT.0742 (step 1+2): Q2 2024 to Q4 2027



Main AI trustworthiness concepts



Use of (generative) AI for operational tools

Using public Generative AI

- Guidelines for non-sensitive applications
- E.g. FAQs on regulations

Prototyping in a sandbox

- Enabling a safe and secure environment for ConOps development
- E.g. safety reports analysis

Developing end-to-end applications

- Mastering the learning assurance pipeline
- E.g. fuel burn estimator in support of ReFuelEU regulation

Towards a « non-embedded AI trustworthy tools » label?

Top 3 AI Programme priorities

1

- **Execute the AI rulemaking plan (RMT.0742) for Level 1 and 2 AI** (target end 2027)
- **Certify/approve first Level 1 AI applications** (target end 2025)

2

- **Initiate and develop Concept Paper Issue 03** (target end of 2025)
  - ✓Extend W-shaped process to reinforcement learning
  - ✓Extend technical guidance to knowledge-based and hybrid AI
  - ✓Anticipate guidance for Level 3 AI and extended Safety Risk Mitigation concept

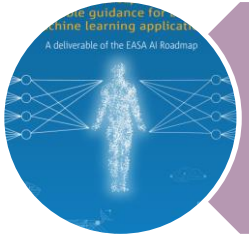
3

- **Enable safe and efficient use of AI in operational tools** (target end of 2025)
- **Investigate an « AI trustworthy tool » label under organisation approvals**

A human-centric approach to AI in aviation

EASA AI Roadmap deals both with AI and advanced automation (however not with autonomy, per definition!)

- Advanced automation is obviously enabled by AI.
- For ‘non-AI automation’, AI assurance does not apply however EASA anticipates the benefit of other AI guidance elements.
- Level 3B (unsupervised) comes with even more challenges!



Human agency and oversight (EU AI Act Article 14)

Development ⟺ Operations

Accountability principles for Level 2 and Level 3 AI

Authority ⟺ Responsibility

Ethics-based assessment objectives for Level 2/3 AI

Technical ⟺ Societal

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& raise your questions

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Coffee break

10:20 – 10:50

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AI Concept Paper
‘reference deliverable for the consolidation phase’

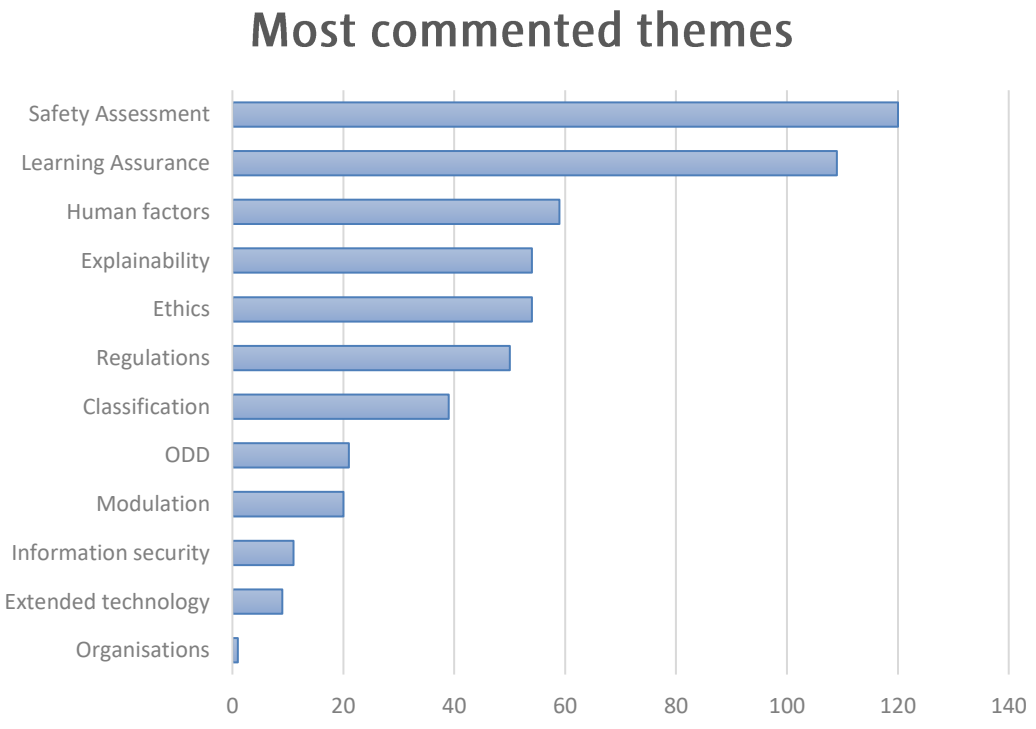
Renee Pelchen-Medwed,
Project Manager ‘HF for AI’

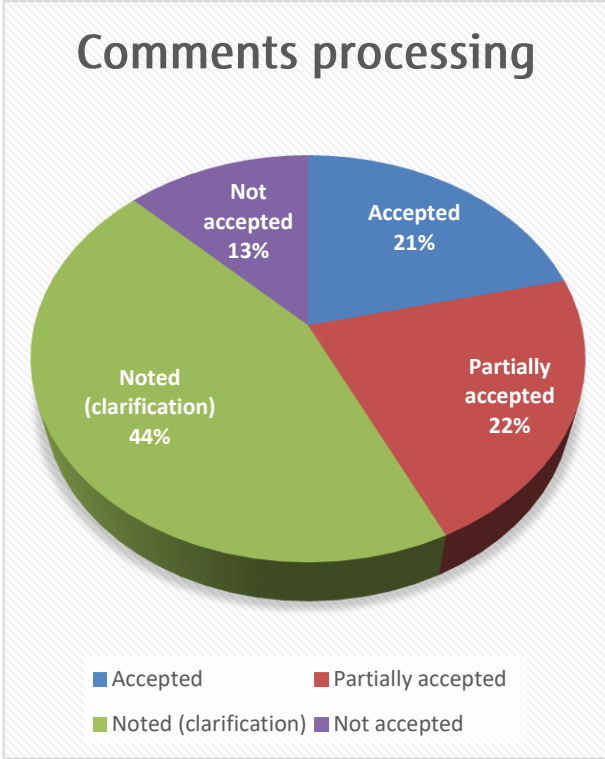
François Triboulet,
Project Manager ‘AI Assurance’

EASA AI Concept Paper – Publication of Issue 02

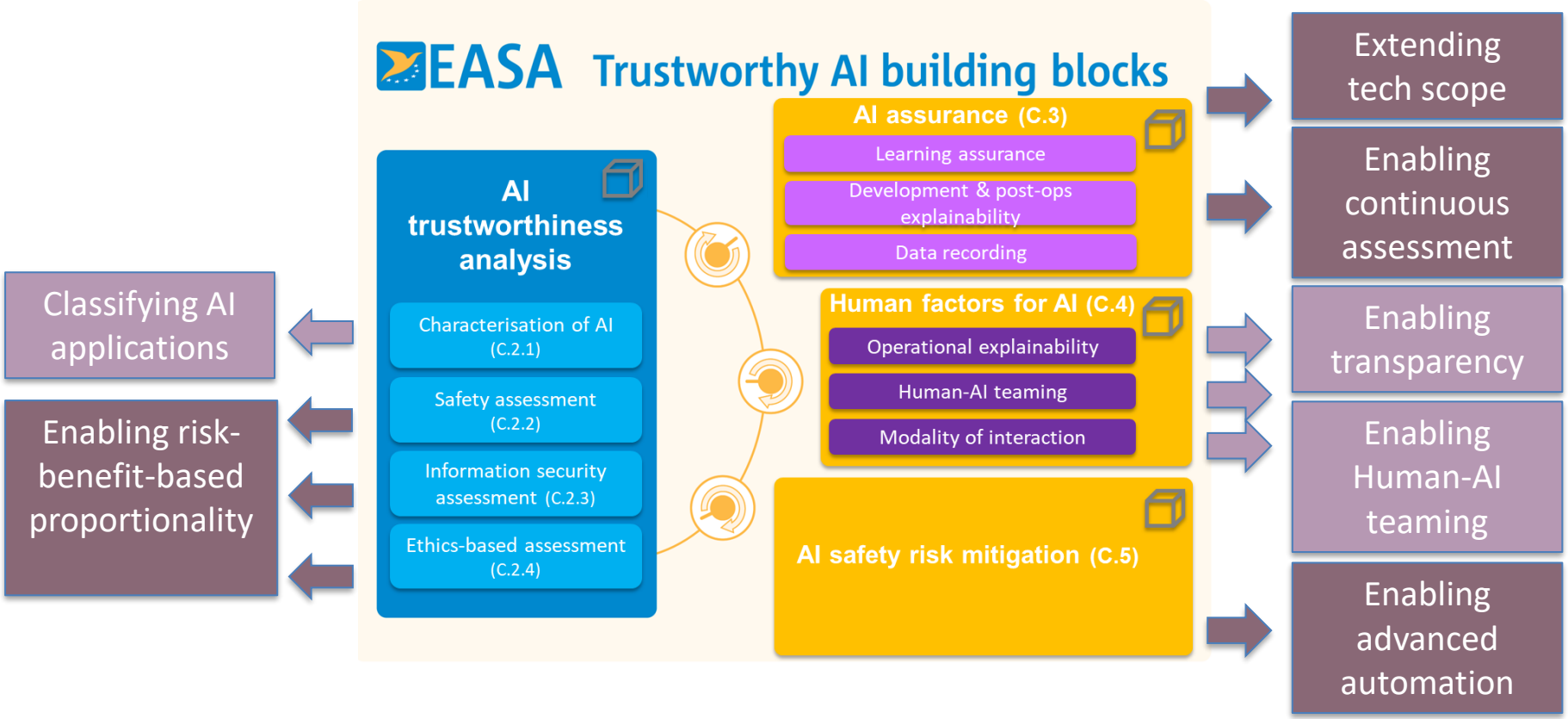
Published on 6 th March 2024
https://easa.europa.eu/ai

Debrief from the comments processing phase





AI trustworthiness reference concepts



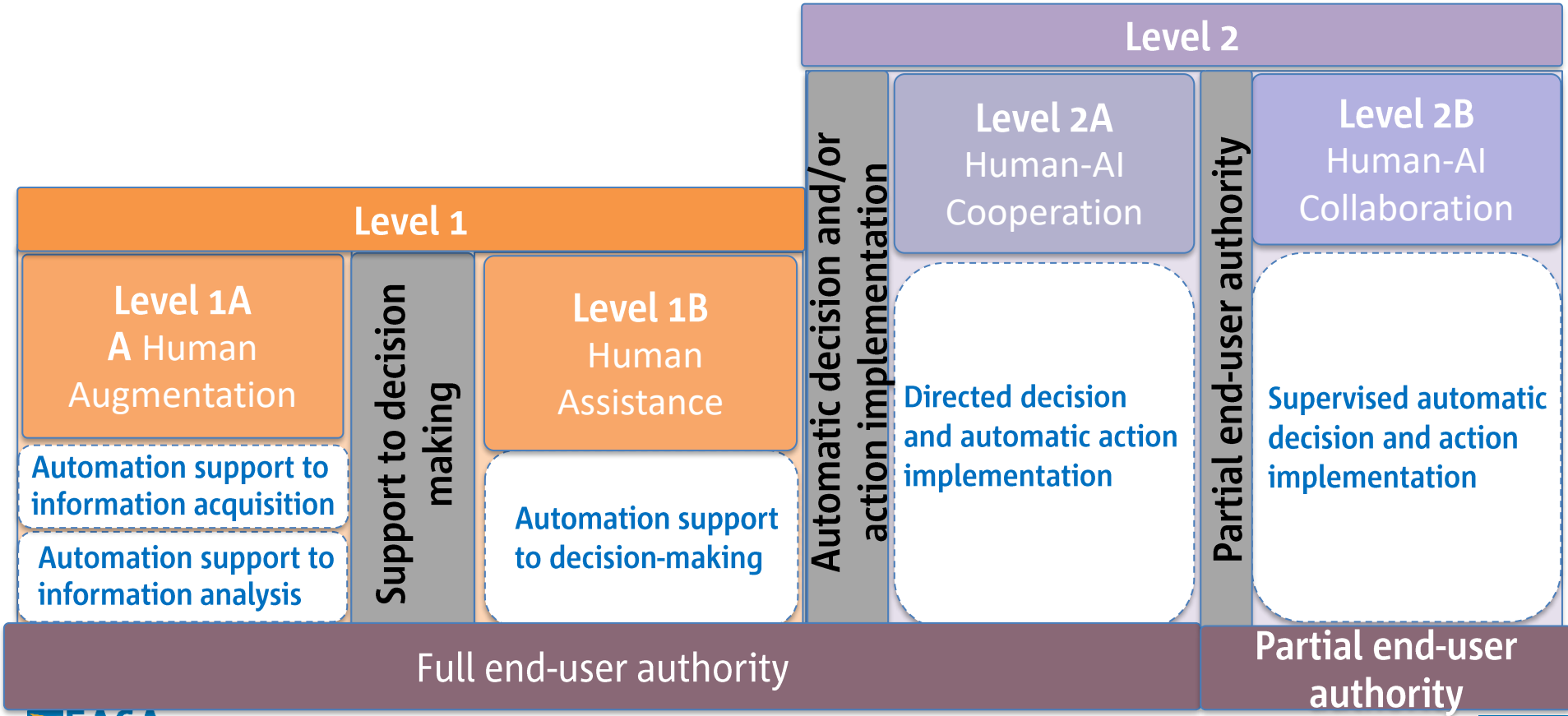
Classification of AI-based applications based on ConOps*

Generic mapping to various automation schemes ensured

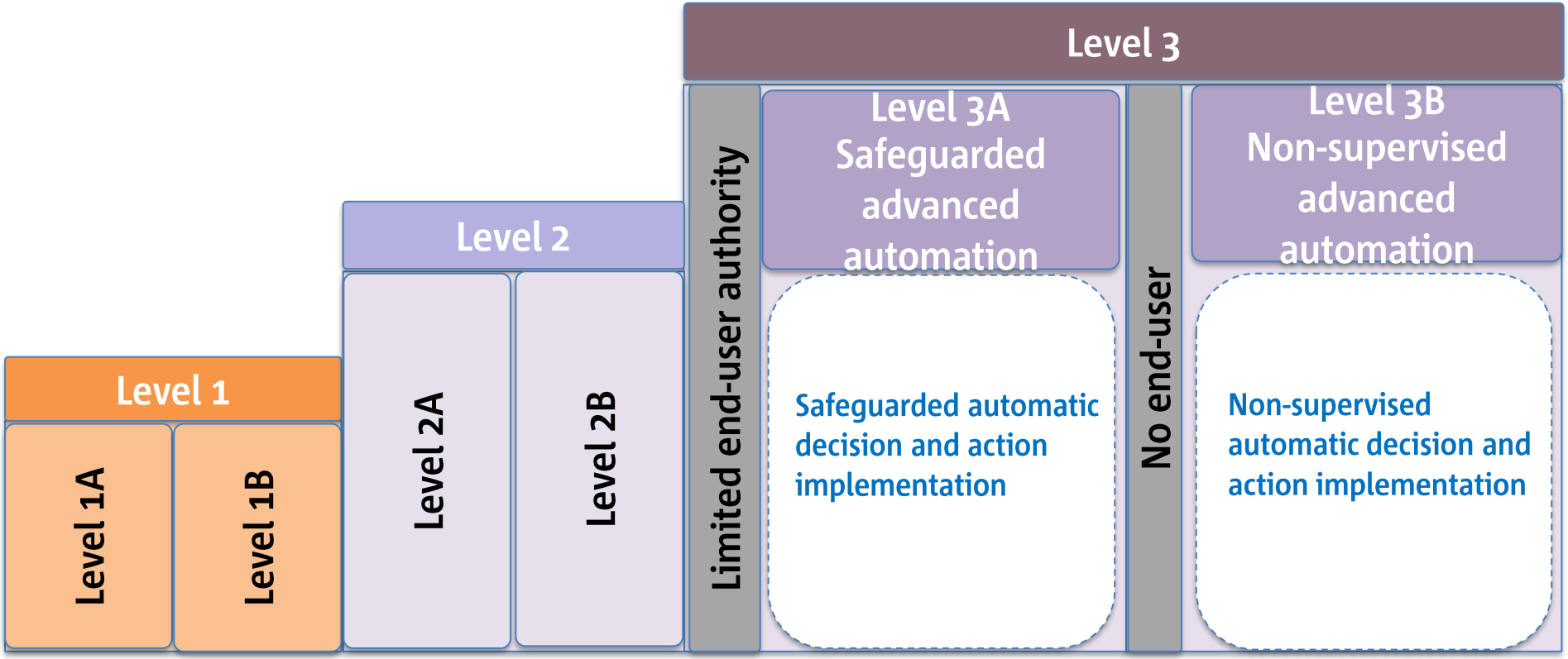
AI level	Function allocated to the system to contribute to the high-level task	Authority of the end user
Level 1A Human augmentation	Automation support to information acquisition	Full
	Automation support to information analysis	Full
Level 1B Human assistance	Automation support to decision-making	Full
Level 2A Human-AI cooperation	Directed decision and automatic action implementation	
Level 2B Human-AI collaboration	Supervised automatic decision and action implementation	
Level 3A Safeguarded advanced automation	Safeguarded a action implemer	
Level 3B Non-supervised advanced automation	Non-supervised action implemer	

*ConOps = Concept of Operations

Classification of AI-based applications (Level 1&2)



Classification of AI-based applications (Level 3)



Enabling transparency

Operational explainability

Elements of Operational Explainability

- Timeliness
- Understandability
- Level of abstraction
- Validity

Supports the end user

Predicting AI behaviour

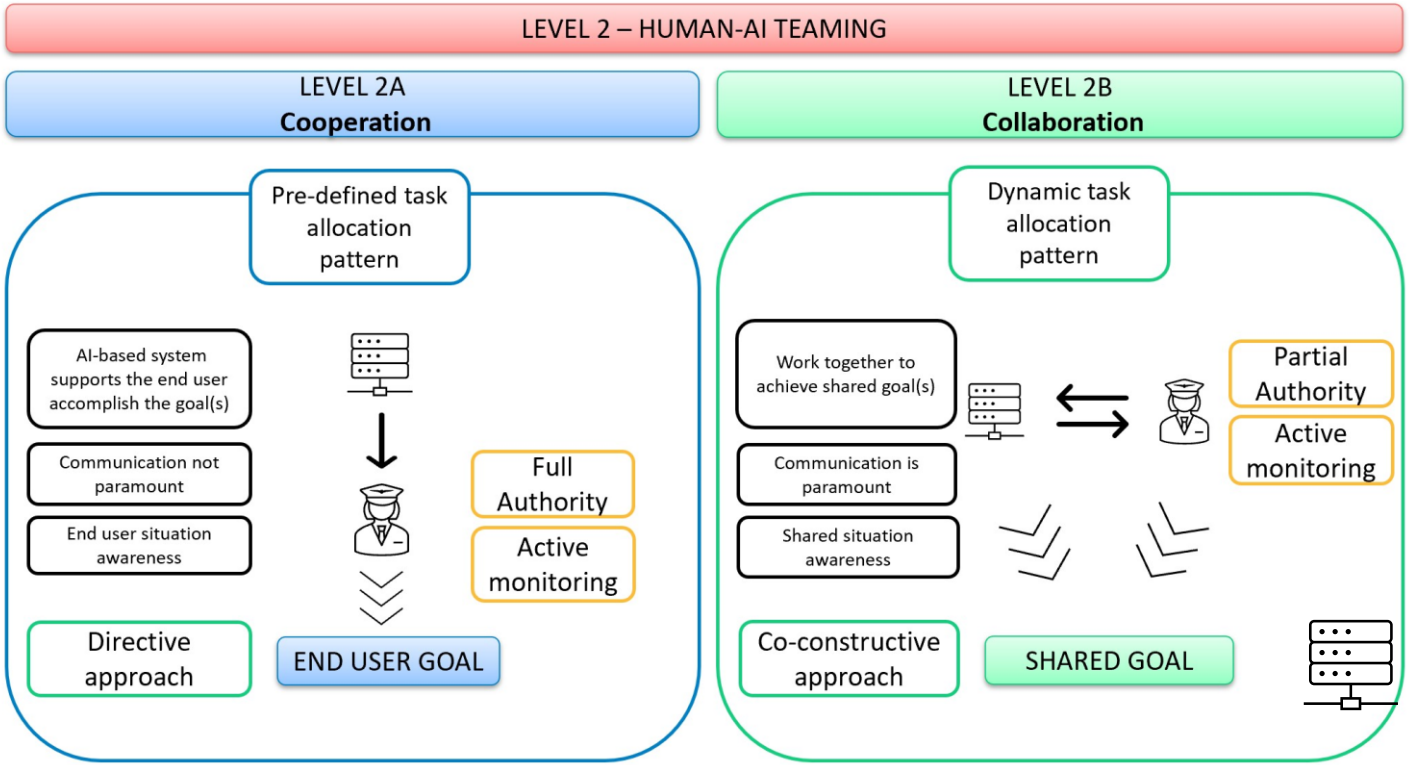
Understanding decisions

Contributes to

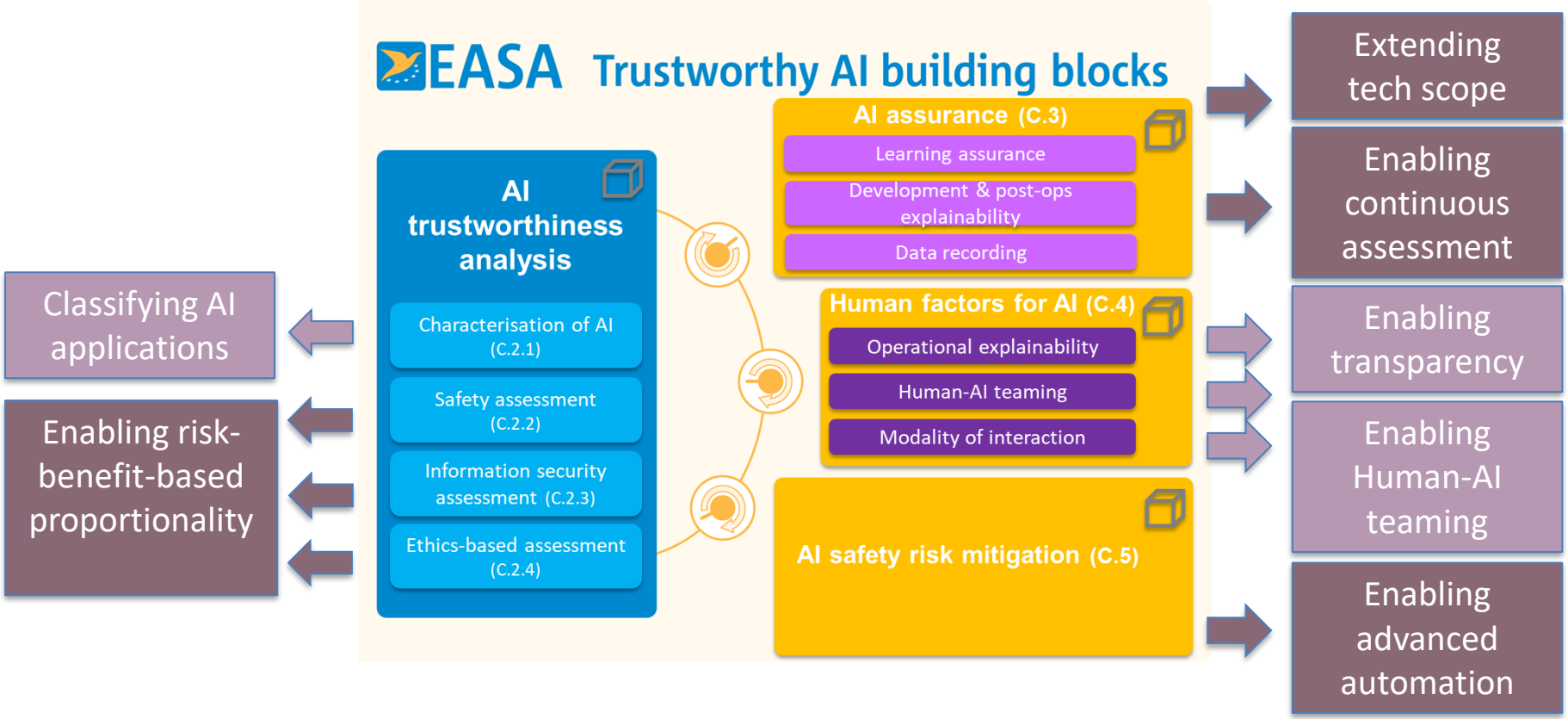
Building trust

Human Machine Interface Design

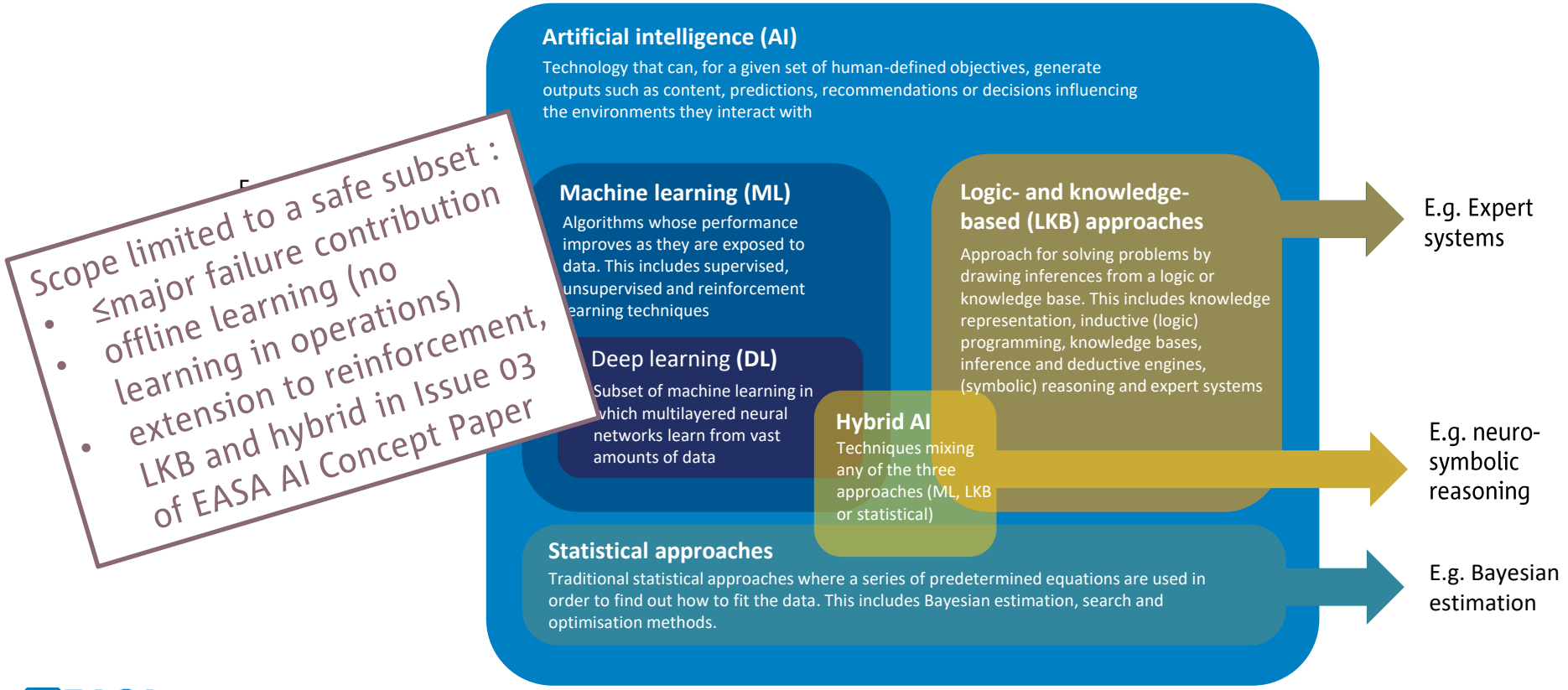
Enabling the Human-AI teaming concept



AI trustworthiness reference concepts

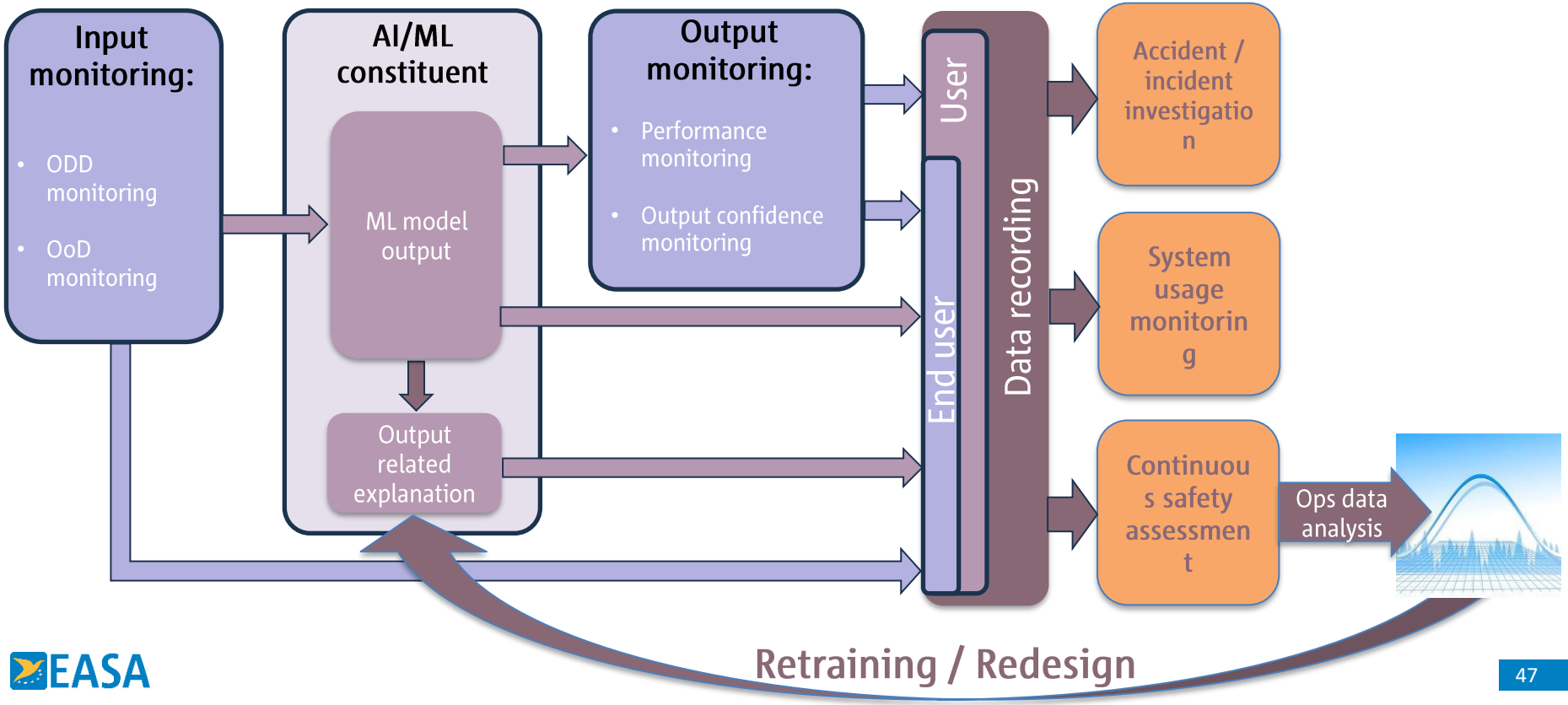


Scope of technology covered by AI Roadmap 2.0

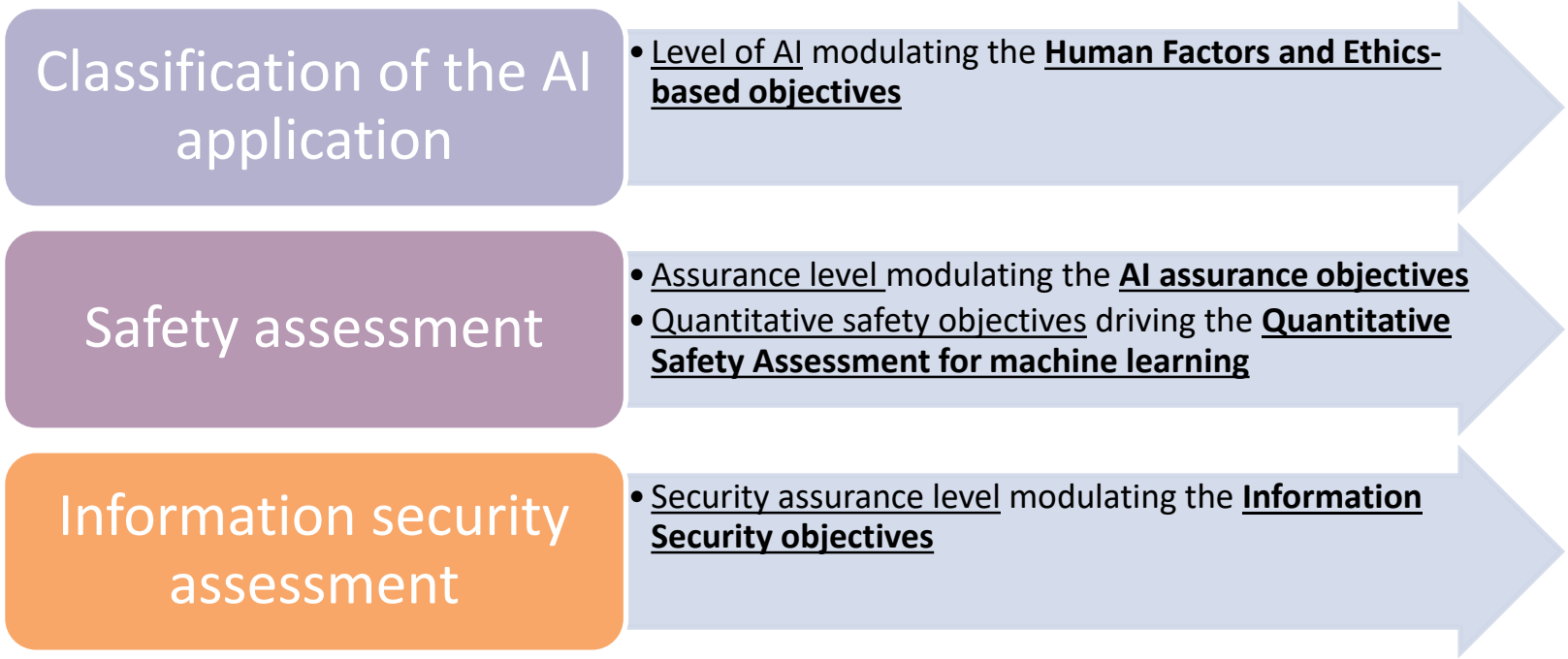


Monitoring and data recording capabilities

Enabling a continuous risk assessment



Risk-benefit based proportionality



Ethics-based assessment

Safety benefit consideration

Level 3 guidance safety risk mitigation

EASA
European Union Aviation Safety Agency

Flash Talk
‘FAA AI Roadmap’

Trung Pham,
FAA Artificial Intelligence Chief Scientist

FAA Roadmap on Artificial Intelligence Safety

Dr. Trung Pham
Chief Scientist & Technical Advisor in AI/ML

EASA's AI Day in Cologne, Germany
July 2, 2024

Federal Aviation Administration

STEP SENIOR TECHNICAL EXPERTS PROGRAM
ADVANCING SAFETY THROUGH SCIENCE

Outline

- FAA’s Roadmap on AI Safety
- Guiding Principles
- Relationship to Other Policies
- Supporting Research
- Conclusion

FAA's Roadmap on AI Safety

- **FAA's Research, Engineering, & Development Advisory Committee recommended that the FAA start working on AI Assurance in 2022**
  - **Hired a CSTA in AI/ML in June 2022**
  - **Initiated the Roadmap on AI Safety in May 2023**
    - **first industry discussion October 2023**
    - **second industry discussion in March 2024**
- **Release of final Roadmap expected July 2024**

Guiding Principles

- **Focus on Safety**
  - **The FAA only has authority to regulate Safety**
- **Do NOT Personify AI**
  - **AI is viewed as a tool, not an intelligent being**
- **Differentiate between Learned AI and Learning AI**
  - ***Learned AI creates* deterministic algorithms, *Learning AI* can continue learning during operation**
- **Use as Much Existing Regulation as Possible**
  - **Apply system safety, SW Development Assurance, human factors, etc.**

Guiding Principles (continued)

- **Incremental Approach**
  - **From specific projects to generalized understanding**
  - **Address learned AI, premature to consider learning AI**
- **Leverage the Safety Continuum**
  - **Gain experience from low level of criticality to high level of criticality on the safety continuum**
- **Leverage Industry Consensus Standards**

Relationship to Other US Policies

AI EO: Guiding Principles

- AI must be safe and secure
- Promote responsible innovation, competition and collaboration
- Support American workers
- Advance equity and civil rights
- Protect interests of those who use AI
- Privacy and civil liberties must be protected
- Manage risks of USG use of AI
- Federal government should lead

FAA Strategy: GOALS

- Innovation
- Workforce Development
- Adoption and Support
- Governance and Trustworthy AI

FAA Safety Assurance Roadmap

Guiding Principles (safety)

- Focus on safety
- Use as much existing regulation as possible
- Incremental approach – learn and apply experience
- Avoid personification
- Leverage the safety continuum
- Leverage industry standards

Roadmap: Initiatives

- Use of AI for Safety
- FAA Workforce Readiness
- Collaboration
- Assuring the Safety of AI
- Aviation Safety Research

Supporting Research

VISION

- ***Artificial Intelligence (AI)*** is a transformative technology that can accelerate innovation and enable computers to accomplish new tasks
- Understanding ***how to assure the safety of AI*** systems opens new opportunities to apply this rapidly-developing technology to the challenge of aviation safety.
- Can AI be used to assure the safety of AI systems?

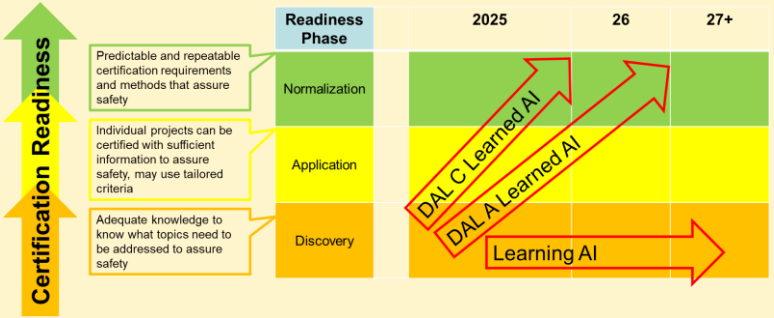
OBJECTIVES

- To identify and evaluate the ***effectiveness of methods*** to assure the safety of AI systems
- To ***use AI*** to assure and improve safety of AI systems

STRATEGY

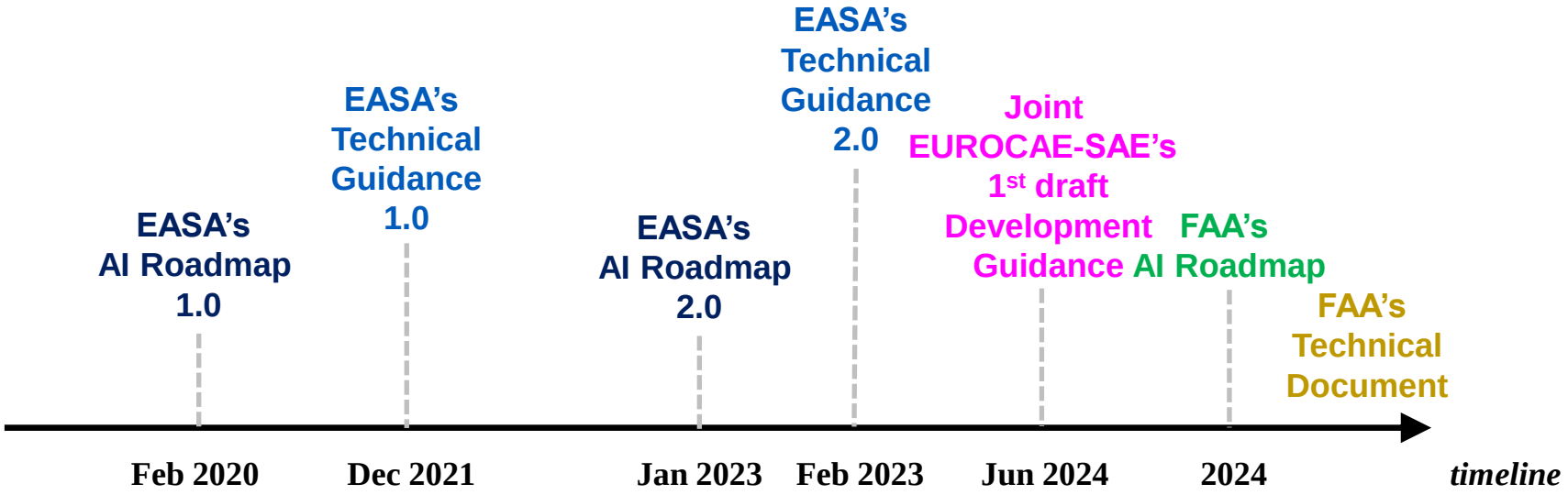
- To ***collaborate*** with other government agencies & industry stakeholders to conduct R&D for guidance for AI systems' assurance
- To explore ***alternative framework*** in SW Assurance for inclusion of AI
- To use ***Computational Data Analytics*** to support specific verification of OP's

EXPECTED OUTCOMES



Developing the Roadmap

- **EASA's pioneering effort and contribution in the areas of Artificial Intelligence and Machine Learning, and ensuing industry feedback and experience, helped inform the development of the FAA Roadmap**



Conclusion

- **The Roadmap will guide further FAA actions in research, policy development, standards priorities and workforce competence**
- **Feedback on the Roadmap is valuable: this is an evolving technology, and we expect to learn and evolve our strategy and plans**
  - **We will learn from the initial projects**
  - **We will learn from research**
  - **We will learn from each other**
- **FAA will work with EASA and other authorities with the goal of mutually-acceptance of design approvals**

Thank you very much

Merci beaucoup

Muchas gracias

Cám ơn rất nhiều

非常感謝

Grazie mille

Muito obrigado

Moltes gràcies

आपका बहुत बहुत धन्यवाद

EASA
European Union Aviation Safety Agency

Flash Talk

‘Joint EUROCAE WG-114 / SAE G-34 working group on AI standards’

Christophe Gabreau,
EUROCAE WG-114 Chairman

EUROCAE
SAE INTERNATIONAL

JOINT EUROCAE WG-114 / SAE G-34 WORKING GROUPS ON AI STANDARDS

EASA AI Days (2-3 July 2024)

EUROCAE WG114 – SAE G34

- **Creation: June 2019**
- **Co-Chairs**
  - Christophe Gabreau (Airbus)
  - Fateh Kaakai (Thales)
  - Secretary: Radek Zakrzewski (Collins)
  - Mark Roboff (SkyThread)
  - Paula Olivio (Embraer)
  - Secretary: Gary Brown (Airbus)

G-34/WG-114 focuses on implementation and certification related to AI technologies for the safer operation of aerospace systems and aerospace vehicles.

G-34/WG-114 (comprised of 600+ members) promotes and standardizes Artificial Intelligence in the entire aviation eco-system (both Airborne and Ground) addressing both manned and UAS.

G-34/WG-114's Global contributors: Boeing, Airbus, ATR, Embraer, Textron, Gulfstream, Dassault, Mitsubishi, KBR, ADIABATIC, TUM, Lockheed, Northrop Grumman, GA-ASI, HondaJet, Daher, IAI, ICAO, FAA, EASA, TCCA, ANAC, DGAC, CAA UK, CAA NZ, JCAB, ENAC, FOCA, DOD, EDA, Lilium, Aerion Supersonic, Amazon, DXC, SAP, IBM, Joby, EUROCONTROL, NASA, EDA, Honeywell, Collins, Thales, GE, P&W, RR, Safran, Raytheon, BAE, Elbit, L3Harris, Iridium, Japan Manned Space Systems, FedEx, UPS, AF-KLM, Nodein, Lufthansa, Audi, Toyota, IATA, Leonardo, Leidos, NVIDIA, Intel, Saab, Volocopter, ANSPs, Skyguide, Searidge, Woodward, Vertical Aerospace, Diehl, ADB Safegate, AVSI, ANSYS, BNAE, ONERA, Copenhagen Airports, D-Risq, Daedalean AI, KIAST, Infosys, Afuzion, Patmos Engineering, QinetiQ, RelmaTech, Rockdale Systems, DLR, drR2, Federated Safety, MathWorks, SRI, Oak Ridge National Lab, etc.

Published Standards:

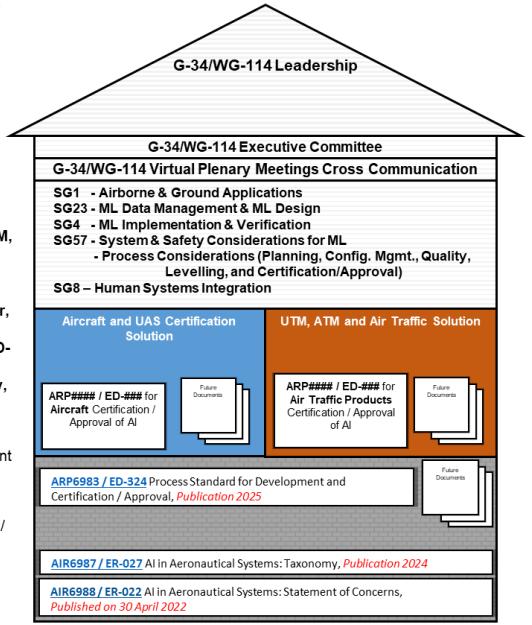
AIR6988 / ER-022 Artificial Intelligence in Aeronautical Systems: Statement of Concerns (Published on 30 April 2021)

Works In Progress and deliverables:

ARP6983 / ED-324 Process Standard for Development and Certification / Approval of Aeronautical Safety-Related Products Implementing AI

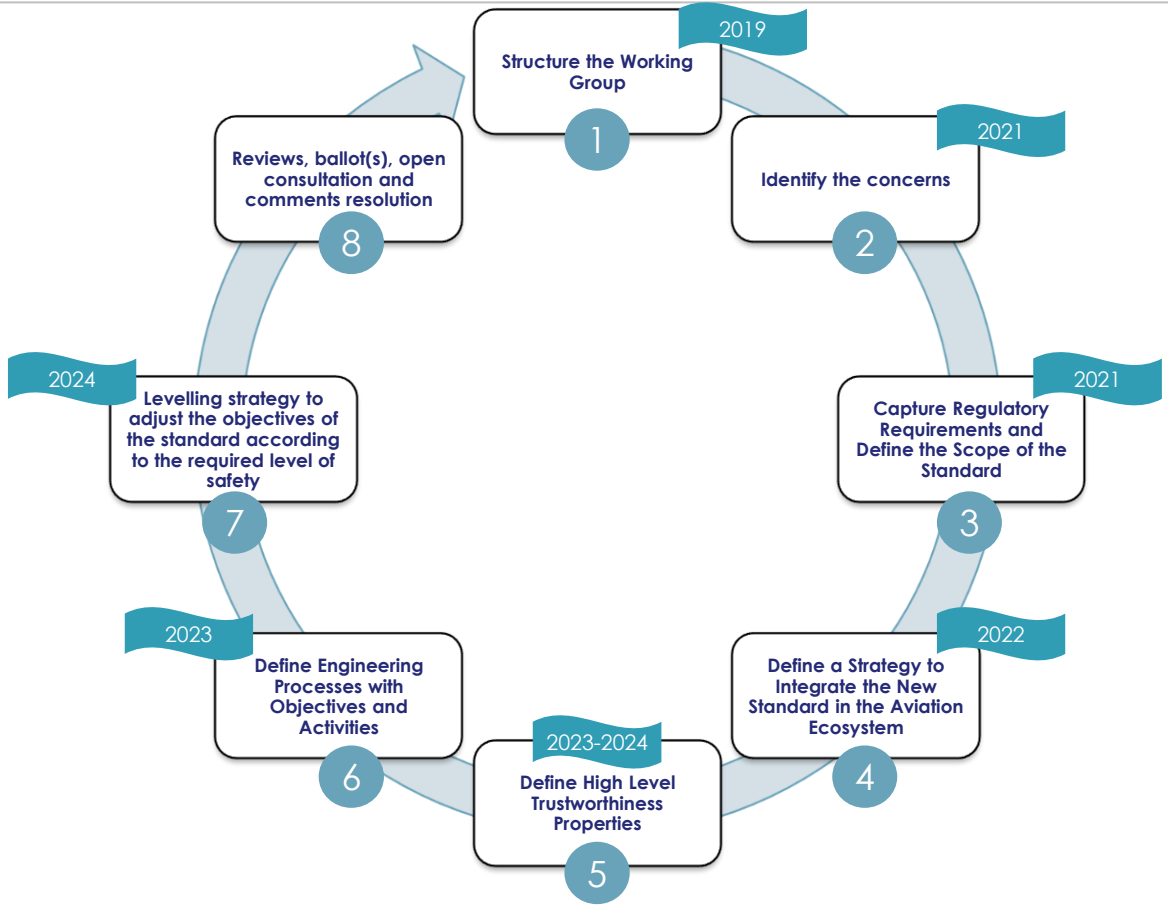
AIR6987 / ER-027 Artificial Intelligence in Aeronautical Systems: Taxonomy

AIR6994 / ER-xxx Artificial Intelligence in Aeronautical Systems: Use Cases Considerations

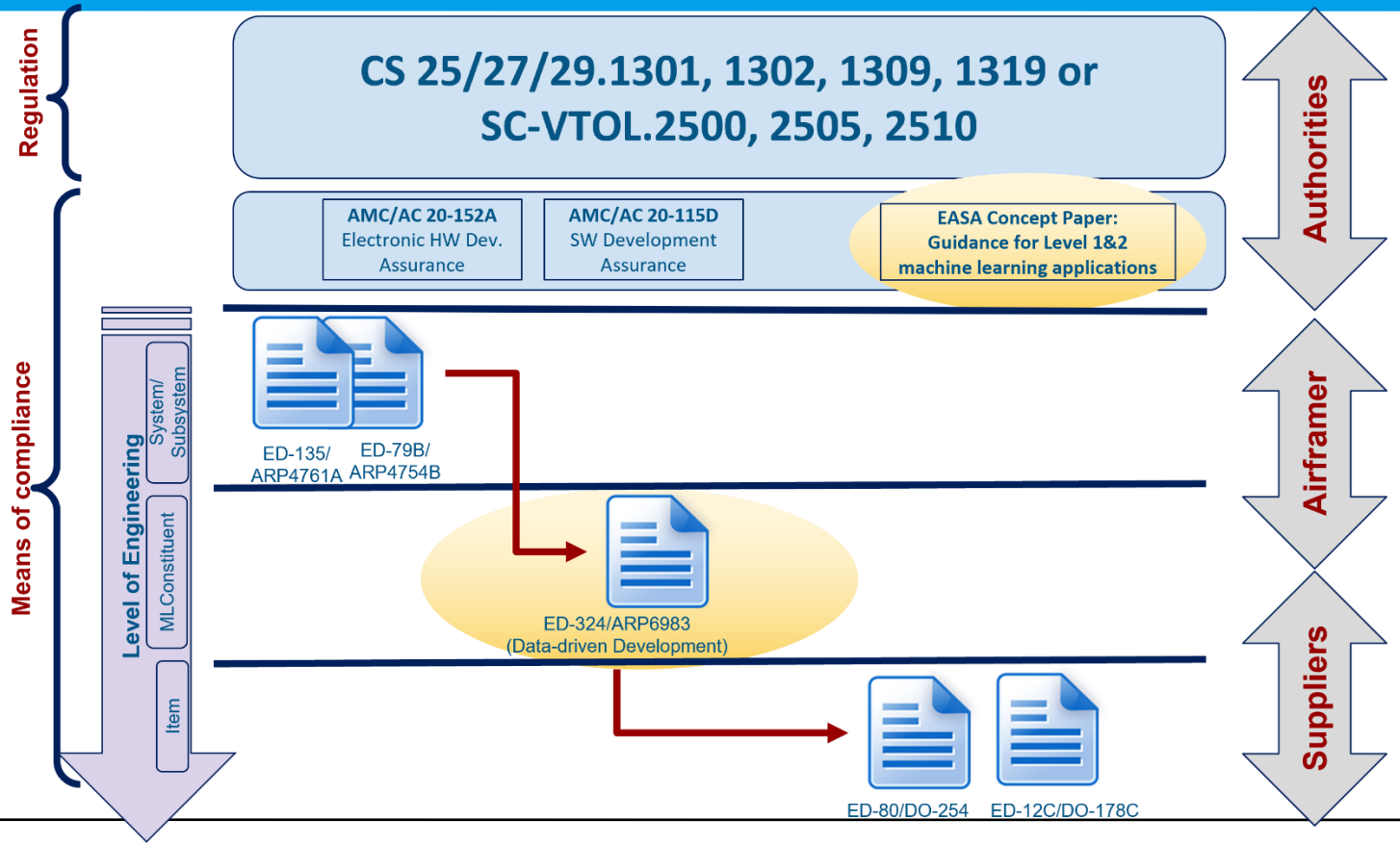


- Objective:
  - Establish common standards to support the development and the certification/approval of aeronautical products based on AI-technology
- Scope:
  - Airborne & ATM/ANS domains (manned & unmanned A/Cs)
  - Scope of Issue 1: Offline Supervised Machine Learning
  - Release date: First standard issue 2025

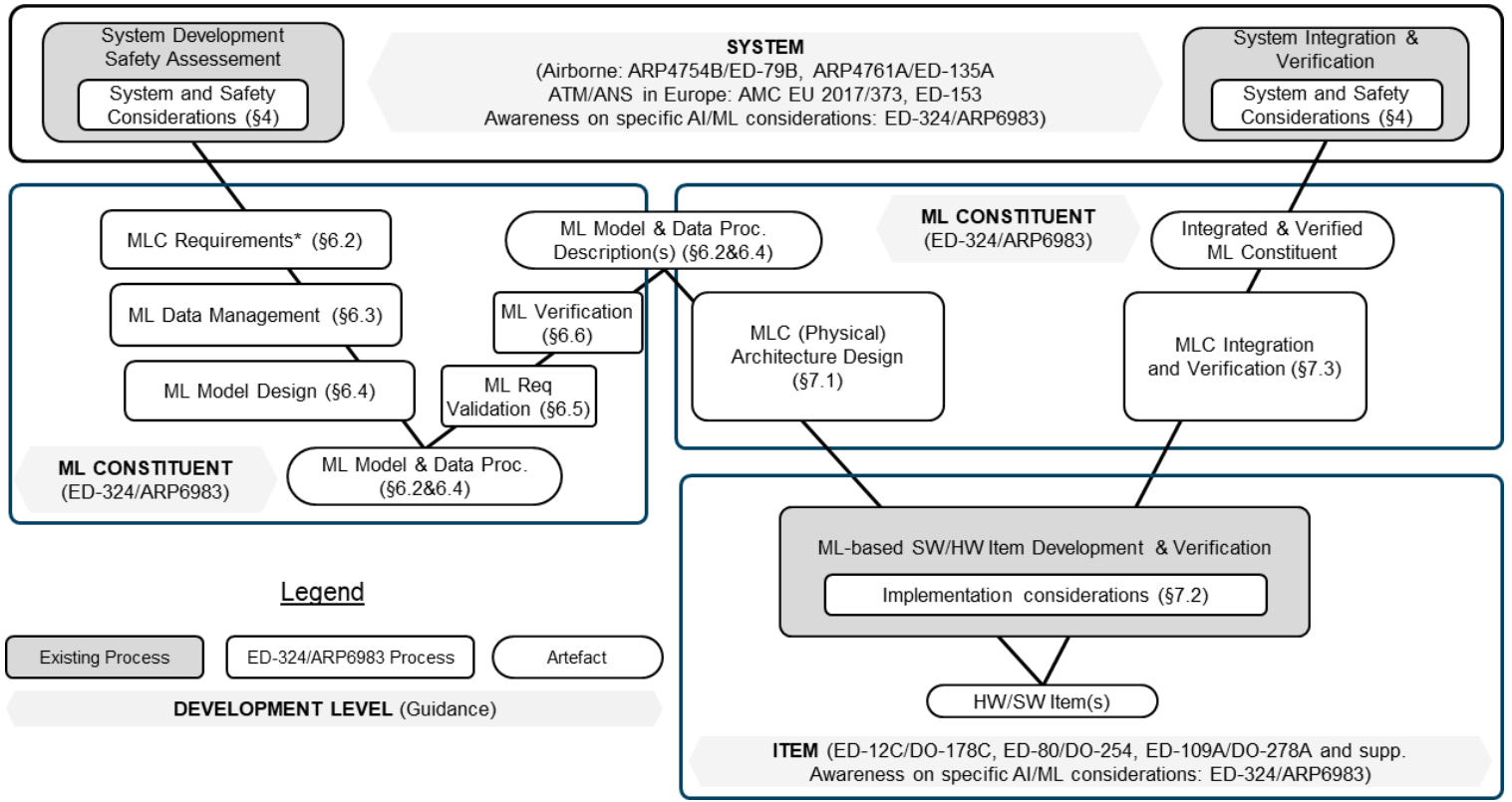
High level methodology to build the standard



Airborne future certification framework



ED-324/ARP6983 “W Shape” Development Lifecycle



Main take-aways

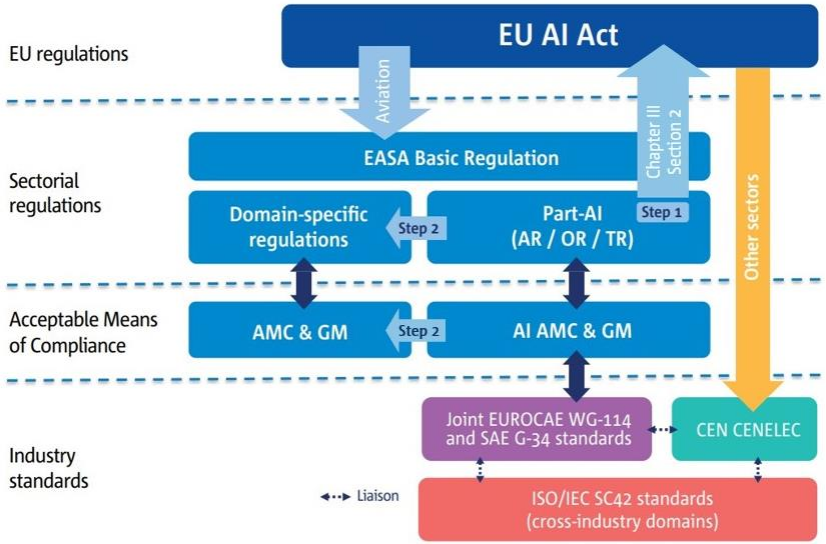
- This unique committee involves the best international experts of the aeronautical Industry in the fields of AI/ML, Safety, System Engineering, Software and Hardware engineering, and Certification. This is the DNA of standardization working group to create the conditions of cross-fertilization between so many disciplines and so much expertise.
- A very fruitful cooperation and cross-fertilization with EASA since the creation of the Committee (2019)
- EASA Concept paper and ED-324/ARP6983 have a very good level of alignment. Last consistency issues already identified and resolution in progress
- The committee is working with FAA to align the future standard with FAA roadmap
- The new standard called ED-324/ARP6983 will be the cornerstone of the integration of AI in aeronautical products. It has been built by the Industry for the Industry with a permanent constructive and fruitful dialogue with representatives from the Certification Authorities such as EASA, FAA, ANAC, and others. We are also very interested by sharing our experience with other fields such as Automotive, Defense, Railway, and Space.

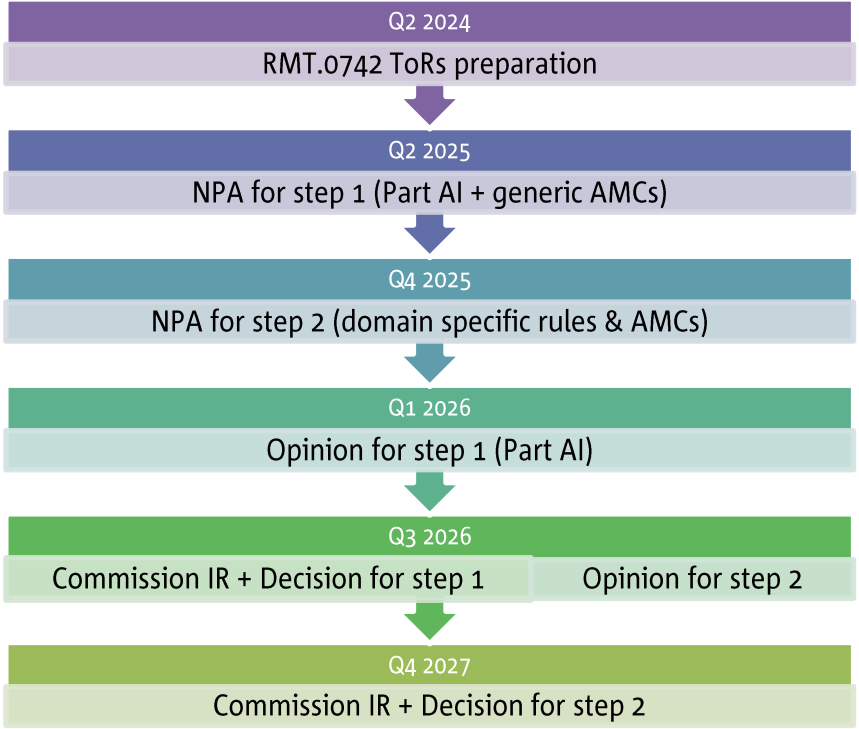
EASA
European Union Aviation Safety Agency

AI Rulemaking: ‘AI trustworthiness framework consolidation’

Giovanni Cima,
Project Manager ‘AI use cases and domain consolidation

Rulemaking plan for AI



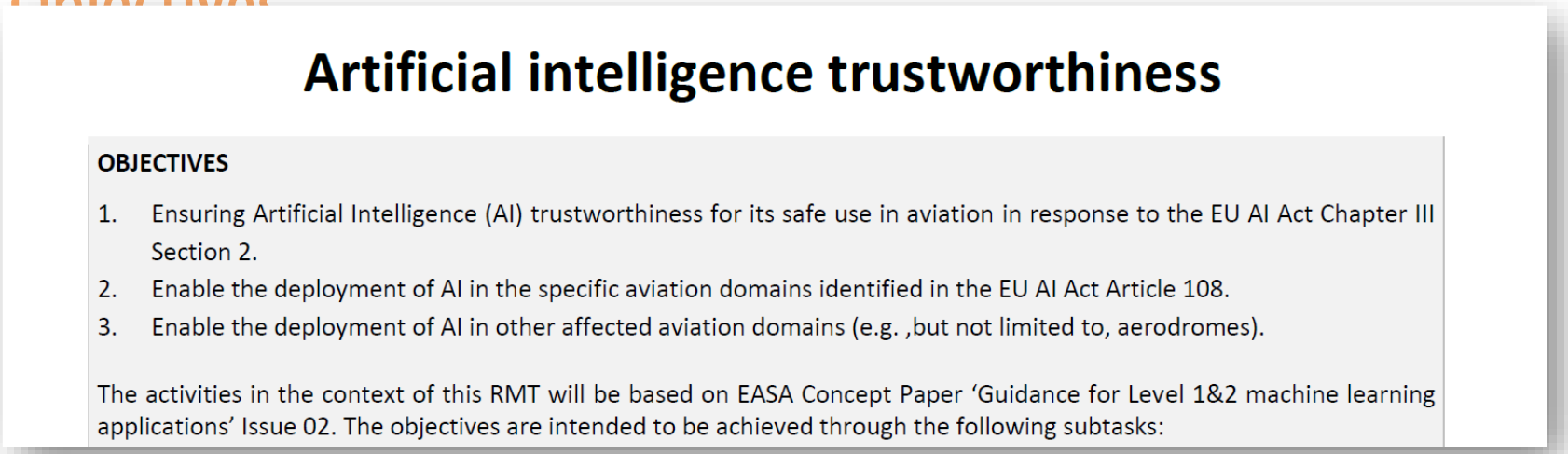


RMT.0742 – Terms of Reference

→ ToR RMT.0742 Issue 1 published on 19.06.2024

→ ToR RMT.0742 - Artificial intelligence trustworthiness | EASA (europa.eu)

→ Objectives



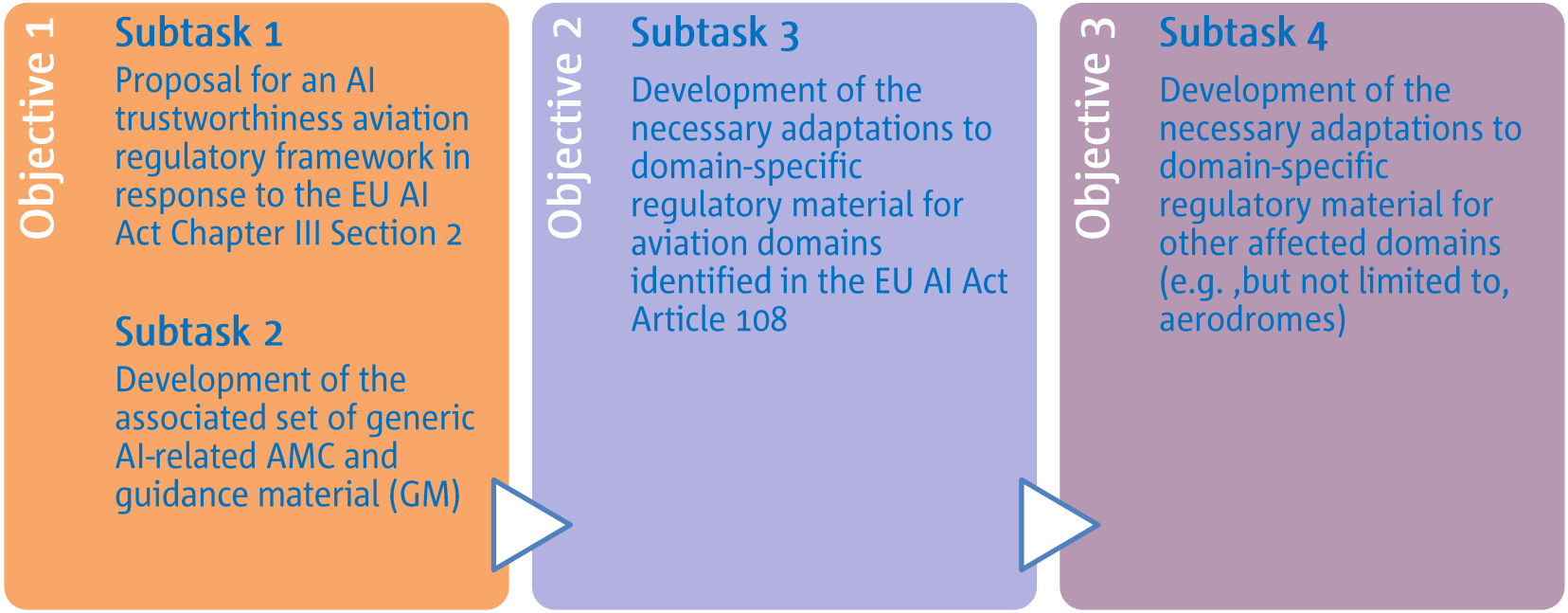
Artificial intelligence trustworthiness

OBJECTIVES

1. Ensuring Artificial Intelligence (AI) trustworthiness for its safe use in aviation in response to the EU AI Act Chapter III Section 2.
2. Enable the deployment of AI in the specific aviation domains identified in the EU AI Act Article 108.
3. Enable the deployment of AI in other affected aviation domains (e.g. ,but not limited to, aerodromes).

The activities in the context of this RMT will be based on EASA Concept Paper 'Guidance for Level 1&2 machine learning applications' Issue 02. The objectives are intended to be achieved through the following subtasks:

RMT.0742 – Subtasks



RMT.0742 – Affected Reg./Working method

→ Regulations impacted

REGULATIONS INTENDED TO BE AMENDED

- Regulation (EU) No 748/2012 (Initial Airworthiness)
- Regulation (EU) No 1321/2014 (Continuing Airworthiness)
- Regulation (EU) 2024/1107 (UAS airworthiness and organisation requirements)
- Regulation (EU) No 965/2012 (Air Operations)
- Regulation (EU) 2019/945 (Unmanned aircraft systems)
- Regulation (EU) 2019/947 (Operation of unmanned aircraft)
- Regulatory framework for the operation of VTOL and air taxis
- Regulation (EU) No 1178/2011 (Aircrew and Medical)
- Regulation (EU) 2015/340 (ATCO licensing)
- Regulation (EU) 2017/373 (ATM/ANS)
- Regulation (EU) 2023/1768 (Conformity assessment DPO)
- Regulation (EU) 2023/1769 (Ground equipment)
- Regulation (EU) 2021/664 (U-space)
- Regulation (EU) No 139/2014 (Aerodromes)
- Regulatory framework for safety-related aerodromes equipment
- Regulatory framework for the provision of ground handling services
- Regulation (EU) 2023/203 (Part-IS)

→ Development

- → By EASA with external support (Rulemaking Group)

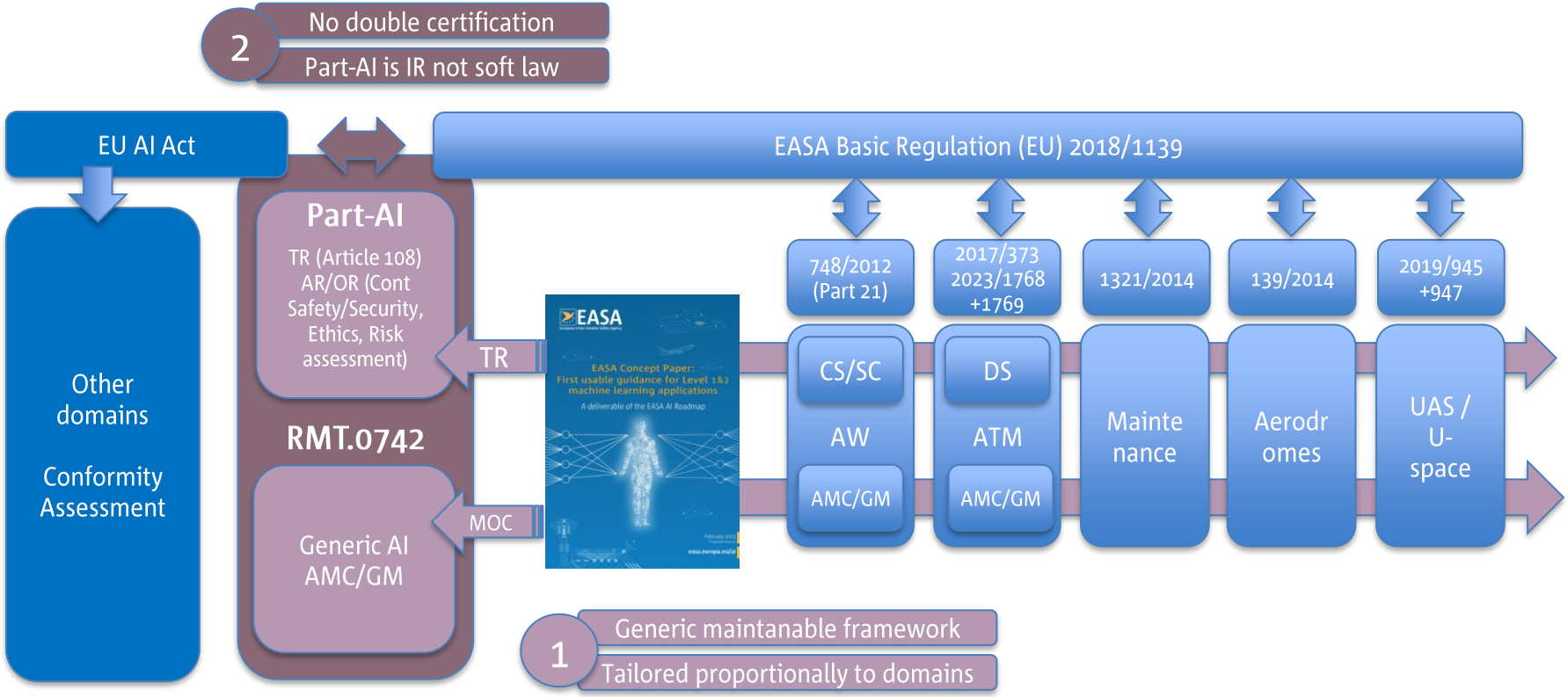
→ Impact assessment

- → Light

→ Consultation

- → Public - NPA

RMT.0742 – Anticipated structure



RMT.0742 Rulemaking Group

- → Rulemaking Group established to cover:
  - → **Impacted aviation domains** (airworthiness, air operations, air traffic management, drones, maintenance and aerodromes)
  - → **Impacted disciplines** (artificial intelligence, development assurance, safety assessment, information security, ethics, human factors, structures health monitoring
- → Initial list of experts was proposed to the EASA Advisory Bodies (MAB & SAB)
- → ABs Feedback is being processed to finalise the RG composition and kick off the activity in September.

EASA AI Days
Q&A session

www.sli.do
#AIDays
Passcode: hmkota

EASA
European Union Aviation Safety Agency

Lunch break

12:30 – 13:30

www.sli.do

#AIDays

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EASA
European Union Aviation Safety Agency

Please use Slido
& raise your questions

www.sli.do
#AIDays
Passcode: hmkota

Discussion Panel
‘AI Use Cases in Aviation’

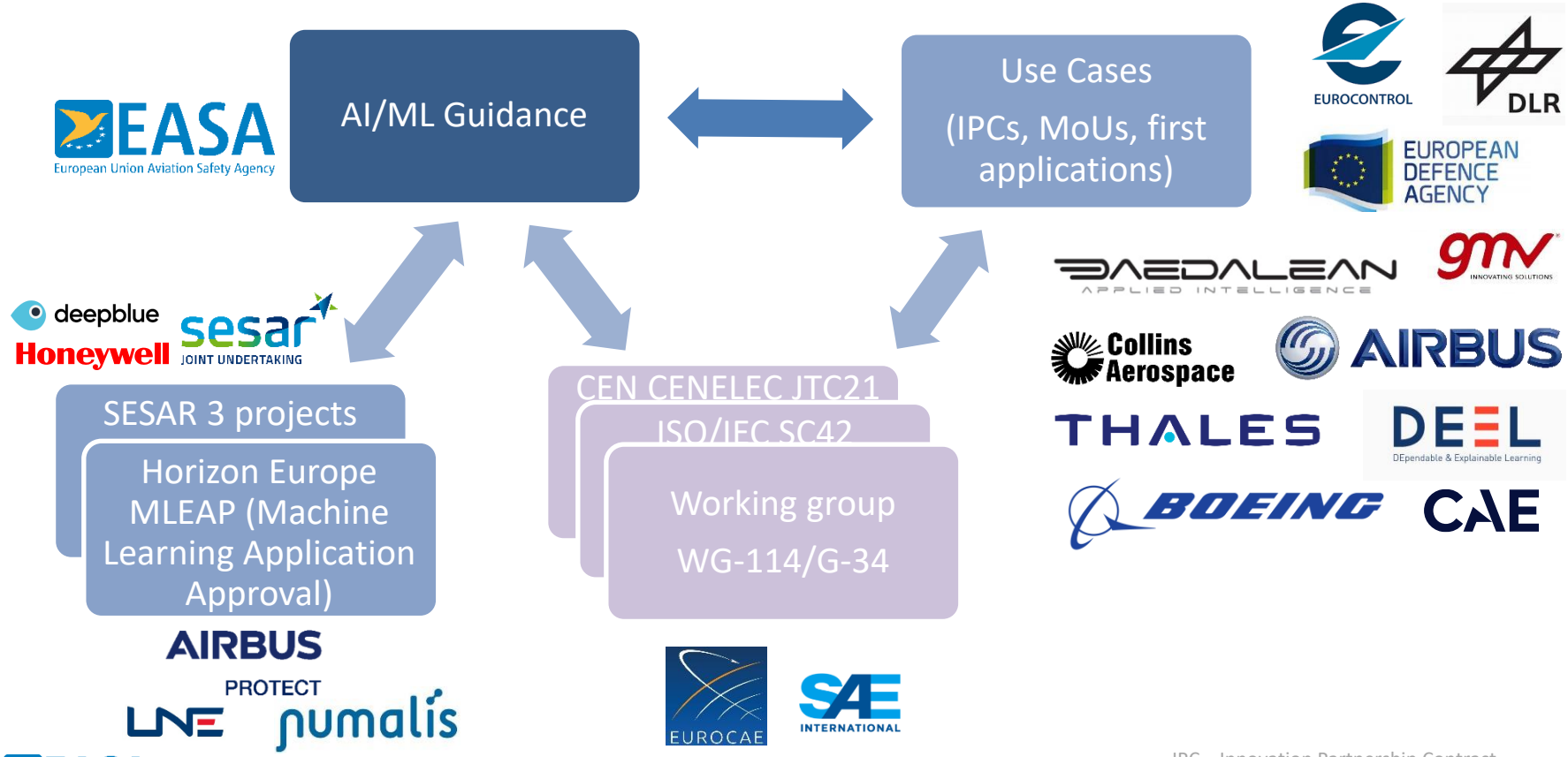
Moderator

Giovanni Cima,
Project Manager ‘AI use cases and domain consolidation’

Speakers

Frédéric Barbaresco, Thales LAS
Pavel Kolčárek, Honeywell
Simone Pozzi & Vanessa Arrigoni, Deep Blue
Emmanuel Levitte, CAE
Matt Jahn & Dragos Mangineantu, Boeing

Use cases: a collaborative approach with Stakeholders



IPC = Innovation Partnership Contract
MoU = Memorandum of Understanding

Discussion Panel
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THALES
Building a future we can all trust

Thales Land & Air AI use cases

Frédéric BARBARESCO
Thales AI Senior Expert
THALES LAS Technical Directorate

www.thalesgroup.com

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Use-Case 1 RL-based CDR: Conflict Detection & Resolution by Reinforcement Learning

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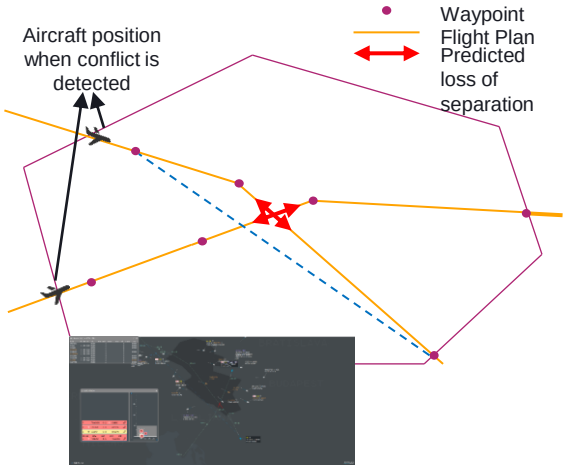
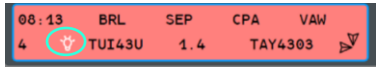
CDR using RL

> Medium Term Conflict Detection (MTCD)

- **Uses 4D Flight Plan based estimated trajectories**
- **Minimum separation**
  - Horizontal: 5NM
  - Vertical 1000 feet



Signal solution availability

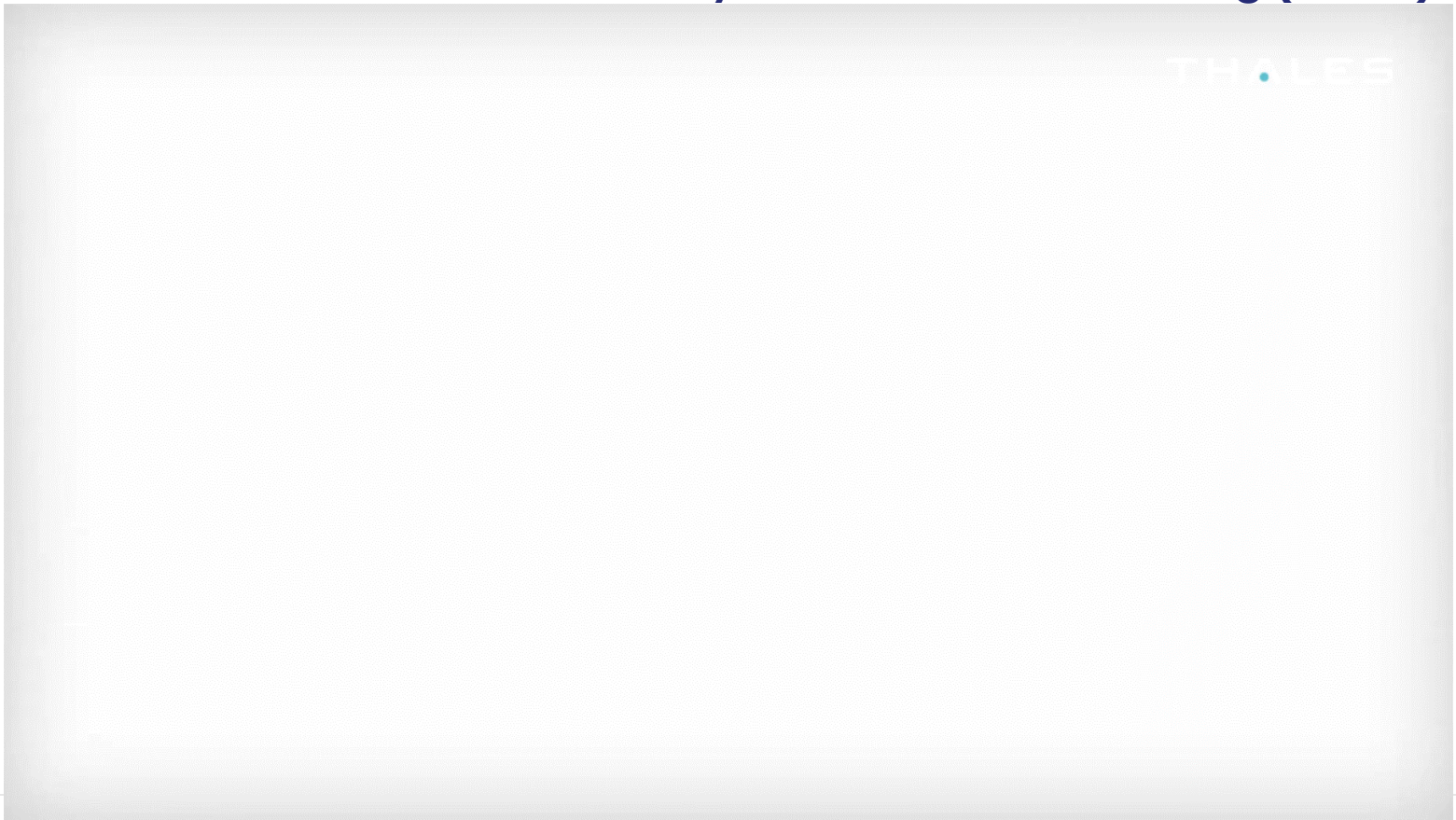


Display alternative trajectory for human validation

> Conflict Resolution advisory

- **Classical AI approach ⇨ tree search**
  - "More" explainable and configurable
  - Slow depending on situation
- **Deep RL (Reinforcement Learning)**
  - Fast inference (several resolutions per second)
  - Potential to achieve "more" optimal solutions with enough development
- **Goal: hybrid approach & safe AI**

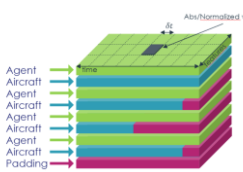
Conflict Detection & Resolution by Reinforcement Learning (video)

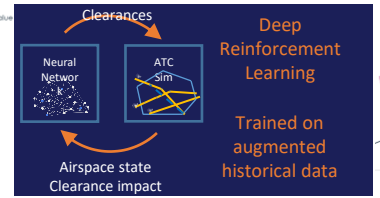


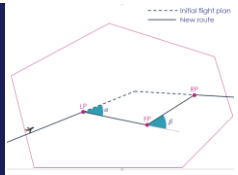
RL approach to Conflict Resolution

> Concept:

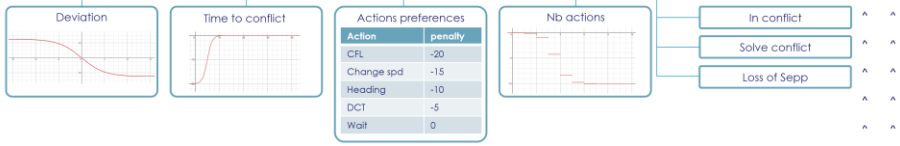
- Train a network to find clearances from system states
- Simulate the clearance in an ATC sim
- Model the impact of the clearance as a cost function
- Learn to maximize the function using RL







$$R_{tot} = \phi(r_{dev}, r_{time}, r_{pref}, r_{nb}, r_{inconf}, r_{solved}, r_{sepp\_loss})$$

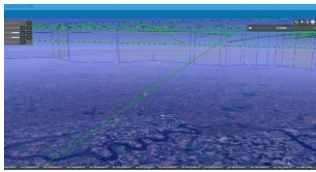


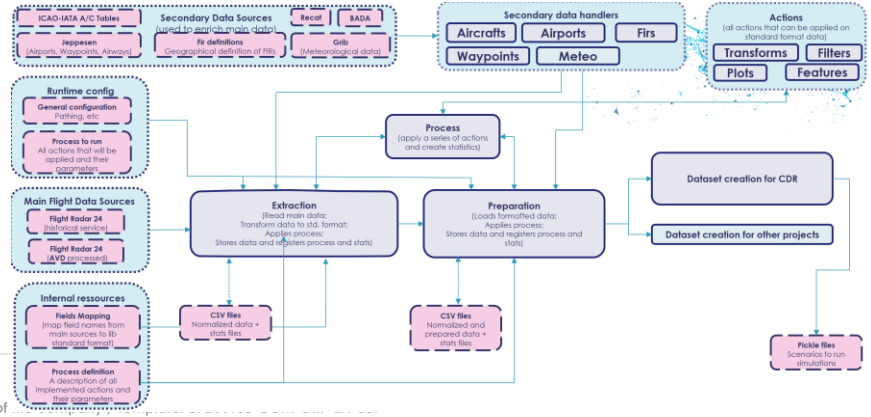
> Data:

- Build ~1000s of realistic training scenarios using historical data
- Use a traceable and reproducible data pipeline
- Compute minimal statistics after each data processing step
- Minimal data augmentation to ensure presence of separation loss

> Simulation:

- Ensure consistency between simulation and operational environment
- Parallel computing fast sim environment
- Initialize simulation using the initial state of each scenario

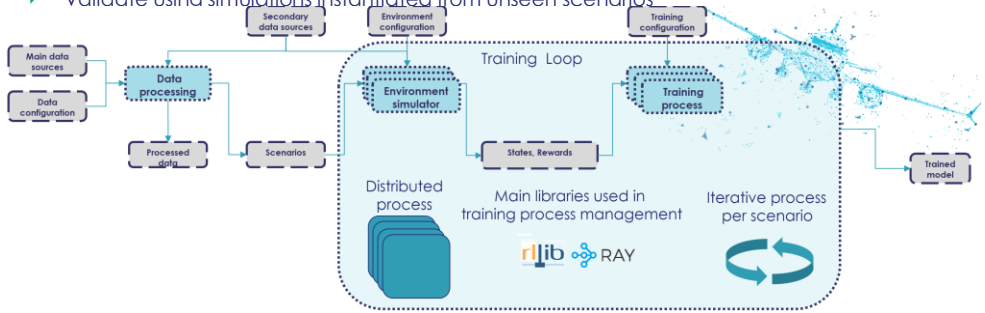


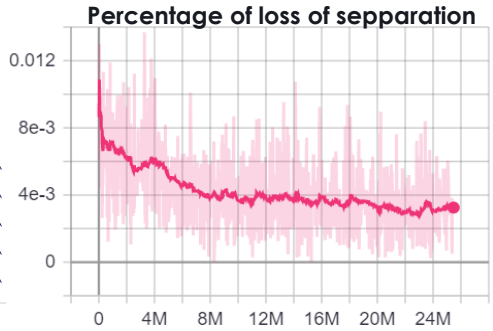


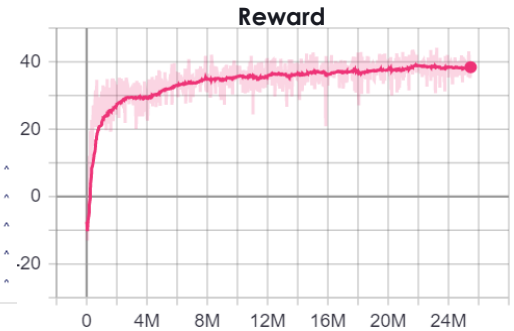
RL (Reinforcement Learning) approach to Conflict Resolution

> Training:

- Reproducible training pipeline from historical data to trained model
- Use parallel simulation environments that continuously run scenarios
- Monitor more than a dozen KPIs live during training using tensorboard
- Keep complete logs of all clearances detected conflicts and metrics computed in each sim
- Validate usina simulations instantiated from unseen scenarios

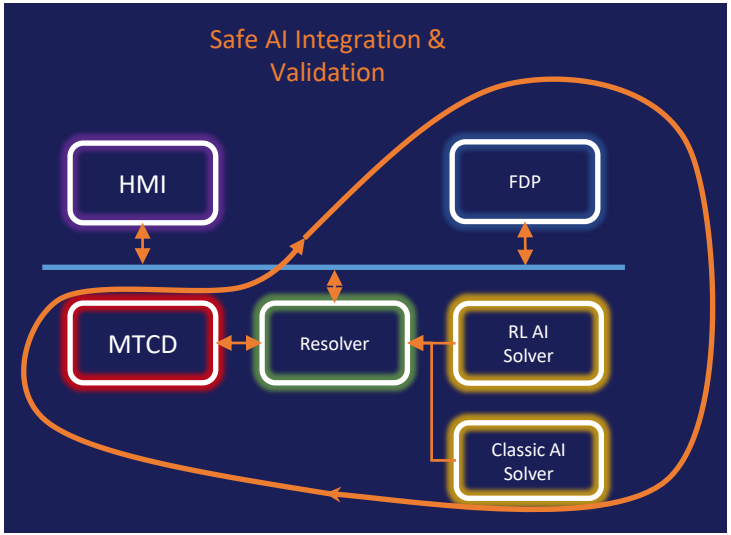






> System integration:

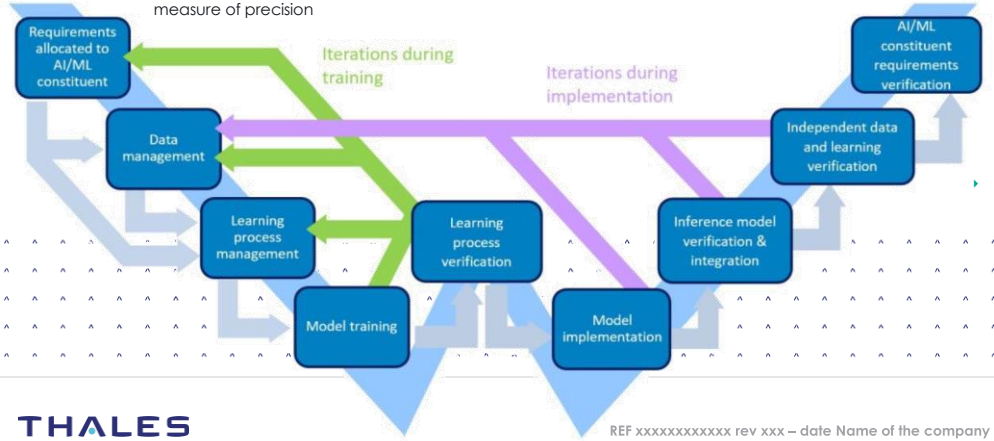
- Deploy the trained model and connect to existing CDR component
- Use the trained model as an additional solver
- Keep classical solver as a fall back system
- Validate clearances by using the system probe function
- Only display validated solutions
- Continuously check solution validity in time



A view into certification of RL

> Parallel with existing guidelines for ML development:

- **The same development steps are also present in RL**
  - We are still using a ML model
  - we can use historical data
  - we still need to objectively measure the model performance and robustness
  - We still need to test the trained model
- **Some requirements may be outside of RL scope e.g.:**
  - Historical data is not always used to initiate a simulation
  - Validation datasets are not always available
    - Inference level validation using independent data requires testing in an operational like environment
  - Requirements should be expressed as a measure of the desired outcome rather than a measure of precision



> RL specific points:

- **A new type of validation is required to qualify the simulation environment (simulation alignment with operational requirements):**
  - The simulator needs to be aligned with the deployment environment
  - Given that RL requires exploration the simulator should by design limit the space of possibilities to the pre-defined ODD
  - The impact of an action should be measurable in the sim and defined with respect to the desired outcome
- **Data related:**
  - RL may use 3 types of data:
    - 1) Initial states -> to initialize the simulation
    - 2) Transition examples: states – actions – costs -> can be used to perform an initial training that mimics a behavior
    - 3) LiveSim data -> data produced during training by the simulation environment
  - Data requirements of current guidelines are mostly/partially applicable to 1) and 2)
  - 3rd data type depends on the simulation environment validation
- **Thales CDR AI use-case specific advantages:**
  - System allows clearance probing to validate human or algo generated clearances using certified components
  - Human in the loop - AI clearances are displayed for human validation
  - Human validation is performed only on clearances that are also validated using the probe function

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Use-Case 2 DL-based Digital Sequencer: Arrival Manager (AMAN) by Deep Learning

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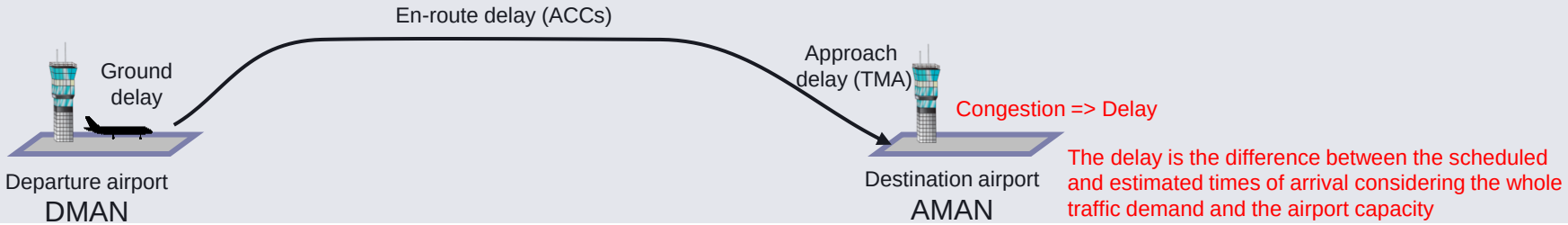
TopSky Sequencer – Operational purpose



- **The operational goal is to allocate flight delays across the different collaborative control centers wrt:**
  - **Ensuring the optimal flow of traffic from & to the airport,**
  - **Distributing the tower, en-route and approach controllers workload,**
  - **Ensuring that the various control centers (Area Control Centers (ACC) and Terminal Manoeuvring Area (TMA)) operate at optimum capacity,**
  - **Favouring ground delay followed by linear delay absorption along the flight's route,**
  - **Avoiding holding stack patterns.**

TopSky Sequencer is a decision making tool aimed at minimizing aircraft delays and excessive fuel consumption by providing the controllers with advisories to properly expedite the traffic

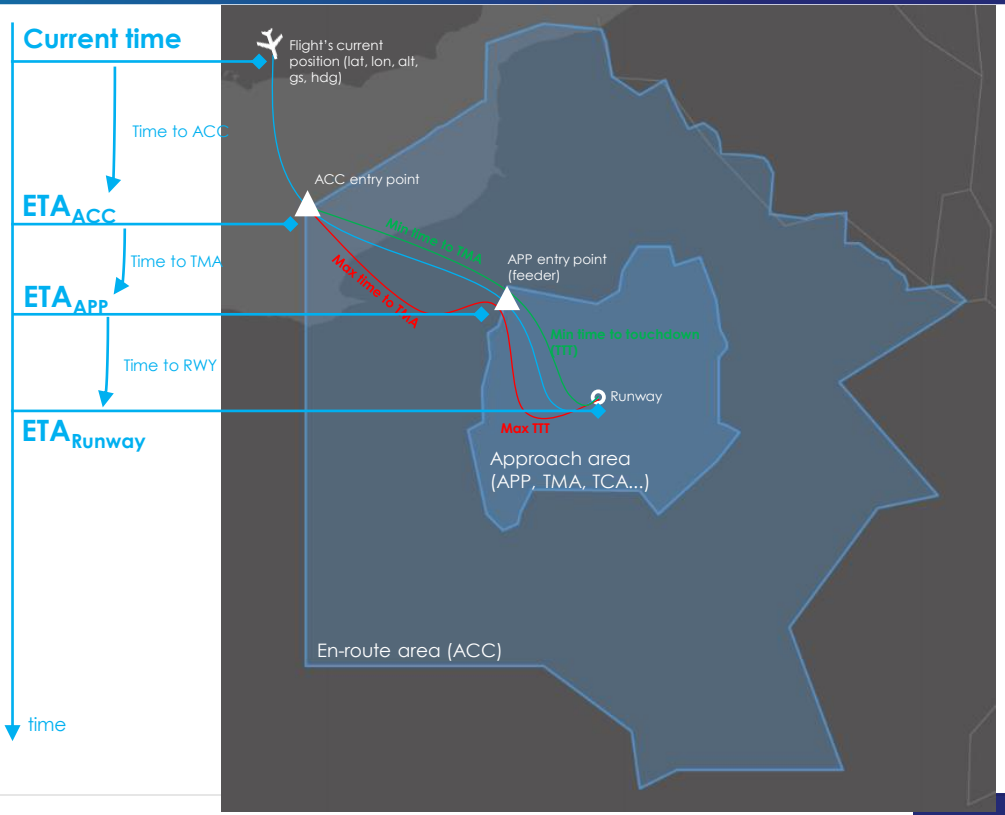
Predicted ETAs & Flexibility Windows

From flight's current position, **ACCEP model** predicts:
- ACC entry point
- **Time-to-fly** from current position to ACC boundary

- **Time-to-fly** from ACC to APP boundary

From ACC entry point position, **TMAEP model** predicts:
- APP entry point
- Flex Window in ACC given by [min_{TTTMA},max_{TTTMA}]

From APP entry point position and the flight's allocated runway, **FLEXWIN model** predicts:
- **Time-to-fly** from APP boundary to runway
- Flex Window in APP given by [min_{TTT},max_{TTT}]



TopSky Sequencer Tools

> Engineering tools

- **Tensorflow**: Library developed by Google to build and train ML models
- **SkyData**: Internal library used to prepare aeronautical data
- **Mlflow**: Exposes a web interface to monitor evaluation metrics during training and tests results. Also enables models versioning.
- **Airflow**: A task scheduler that executes preparation, dataset building, models training and evaluation. All tasks are defined in a DAG (Directed Acyclic Graph)
- **Monitoring**: We developed our own monitoring solution based on a python script run by a cron job 4 times a day and that logs results in an elastic search index. We use Grafana dashboards to visualize concept drift evolution.
- **Certifai:** Test library that we develop to ease tests implementation. It allows use to test a model both by directly loading it in tensorflow or by requesting the http API of a tensorflow server using the same code.

> Methodologies / practices

- Guidelines EASA and standard draft ARP6983-ED324
- Independance of the core solution and the predictions provider
- Follow MLOPs best practices to handle models lifecycle

How to add trust in AI based systems ?

> Application in anticipation of the EASA guidance and the EUROCAE WG-114 guidance

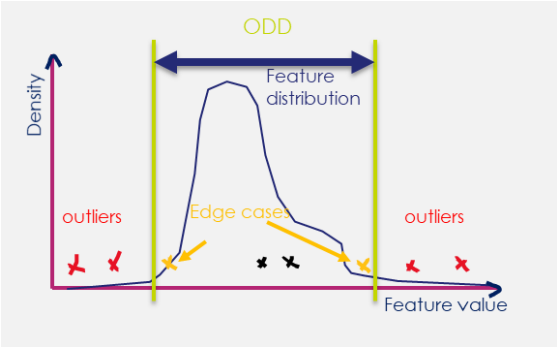
1) Define the Operational Domain Design (ODD)

– What to do in case of a storm ?

– What is the impact on the model output ?

2) Specify the MLC requirements including DQRs (~70 reqs)

- Refine the solution requirements into ML constituent requirements (functional and non-functional requirements, including safety, software assurance and cybersecurity)
- Data quality attribute of the test dataset
  - Edge cases
  - Feasible/infeasible corner cases
  - Outliers (out of ODD)
- High level properties the model must satisfy (stability, robustness, …)
  - Definition of a solution architecture with an independent monitor able to detect concept drift
  - Monitoring models performances (concept drift)



> Example of MLC requirement:

- TTT error must be less than 90 seconds for a horizon of 15 minutes.
- Neural network must predict a TTT for aircrafts with a ground speed between MIN_GS and MAX_GS

CONFIANCE.AI Modules list identified for Digital Sequencer Validation/Qualification

Modules

CONFIANCE.AI

Deellip
For neural network stability

SHAP and/or **AIX360**
For explicability

CAUTIONER
For uncertainty estimation

Nnenum
For network verification

AI Algo Engineering Guidelines
To validate/complete our current approach

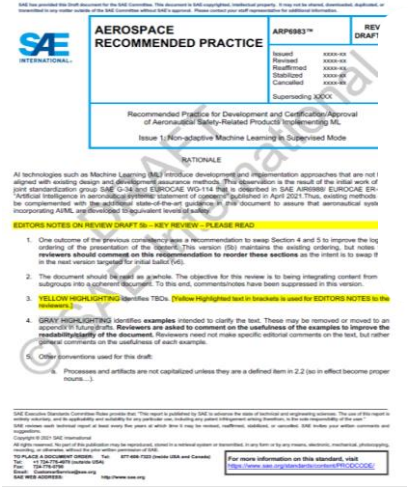
ODD Guidelines
To validate/complete our current approach

EC2 Methodological guidelines for thrustworthy AI assessment
To validate/complete our current approach

{OPEN}

Thales Contributions in Validation/Qualification of AI

- Thales is recognized by the aviation community (EASA, Airbus, DGA, etc.) as one of the most active contributor in WG-114/G34
- The future standard ED-324/ARP6983 is planned to be submitted to SAE ballot and EUROCAE Open Consultation and published in 2025
- ED 324/ARP6983 draft 5B is already at an advanced level of alignment with the EASA AI Concept Paper Issue 02, however there are still some alignment issues that are under discussion
- ED-324/ARP6983 has served as a source of inspiration for the French research projects DEEL and Confiance.ai


AEROSPACE RECOMMENDED PRACTICE

ARP6983™

Recommended Practice for Development and Certification/Approval of Aeronautical Safety-Related Products Implementing ML

Issue 1: Non-adaptive Machine Learning in Supervised Mode

RATIONALE

EDITORS NOTES ON REVIEW DRAFT 5b – KEY REVIEW – PLEASE READ

G34/WG114

- SG1: Use Cases
- SG23: Machine Learning Development Lifecycle
- SG4: Implementation
- SG57: System, safety and process considerations
- SG8: Human Factors (HF)

Confiance.ai

DEEL

Dependable, Explainable & Embeddable Learning

THALES
Building a future we can all trust

Use-Case 3 GINN/PINN Contrails & Green Operations: Geometry & Physics Informed Neural Networks

www.thalesgroup.com

A focus on 4 pillars of the Green Operations project

Build solutions for airlines, ATC and institutions,
based on state-of-the-art science

FlightsFootprint

Orchestration of eco-friendly trajectories

Multi-source analysis

AI for Green

Model-Informed HYBRID AI FOR CONTRAILS: Geometry-Informed/Physics-Informed/Thermodynamics-Informed NN

$$\dot{z}_t = \boldsymbol{L}(z_t)\nabla E(z_t) + \boldsymbol{M}\nabla S(z_t), \quad z(0) = z_0$$

Poisson matrix: reversibility

Friction matrix: irreversibility

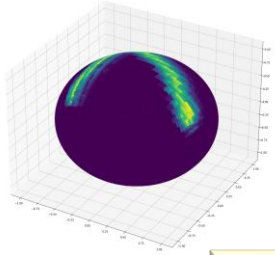
with $\boldsymbol{L}(z)\cdot\nabla S(z) = 0$, $\boldsymbol{M}(z)\cdot\nabla E(z) = 0$.

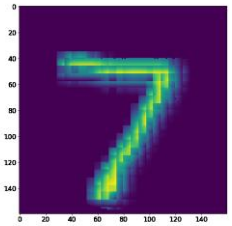
CONTRAILS MODELING

Thermodynamics-Informed NN

1st Principle: Energy/Moment preservation
2nd Principle: Entropy production (dissipation)

$$\forall g \in G, \quad \psi_G(g) = (f \star_G K)(g) = \int_G K(h^{-1}g) f(h) d\mu^G(h)$$



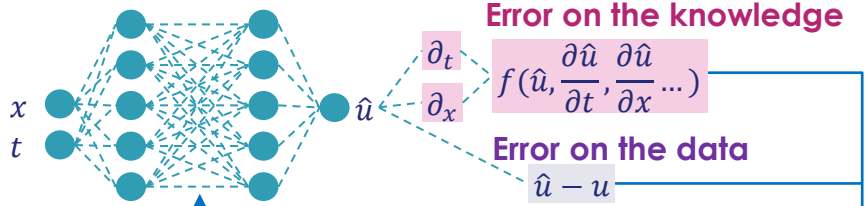


Geometry-Informed NN

CONTRAILS DETECTION

Symmetries: Lie Group Equivariance
Noether Th.: Preservation of Moment Map

Physical Model: Universal Approximation
Differential Invariant: PDE Symmetries



CONTRAILS MODELING

Physics-Informed NN

Several initiatives aim to exploit observations for contrail verification and mitigation through enhanced AI algorithms

contrails

CONTRAILS in the Climate System: from Observation to Impact Modeling and Prediction

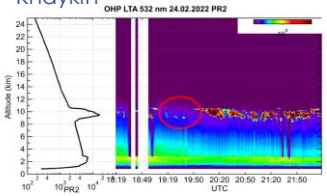
THALES Reuniwatt DLR LATMOS cnrs

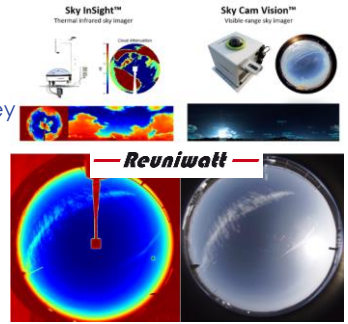
Project objectives: coupling trustworthy AI and physical models to improve contrail forecasting, numerical models and data assimilation

Contrail verification-related Objectives

- Collocated observations Lidar & Ground Cameras In OHP, Fr for contrail analysis
- Robust AI algorithms (Neural Nets: working in native geometries, physics-informed)

LATMOS: LIDAR images
Courtesy Ph. Keckhut & Sergey Khaykin





Horizon Europe

BeCoM

Better Contrails Mitigation

TUDelft DLR ECATS LATMOS cnrs THALES envisa

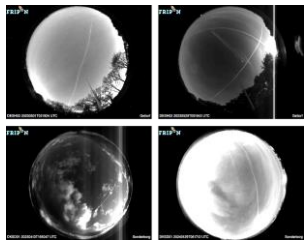
in Advisory Board EUROCONTROL

Project objectives: enhance humidity measurements and ice-super saturated regions in weather prediction models, algorithms for verification and data assimilation, climate-optimized trajectories

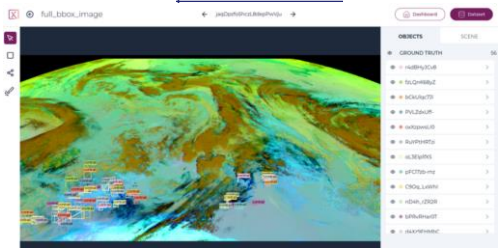
Contrail verification-related Objectives

- Robust AI algorithms for contrail detection in ground and satellite images (Europe) & Validation Methodologies

©FRIPON (www.fripon.org)



EUMETSAT/MSG ash color scheme, annotated with pixano · GitHub



Thales: ~1000 fisheye images annotated for contrail classification
~500 SEVIRI images for contrail segmentation

CONCERTO
sesar JOINT UNDERTAKING
THALES Building a future we can all trust

dynamiC cOllaboration to GeNeralize eCo-friEndly tRajecTOries

THALES AIRFRANCE DSNA Avenav IDS AirNav
Focus on CO2 reduction

NAVIAIR NATS TUDelft AVINOR IAA Fintraffic LFV CANSO LGS THALES novair DLR PPS ICELANDAIR
CO2/non-CO2 trade offs

Contrail verification and mitigation in the entire Green Operations Flow For Big-Hits and Echo Areas

{OPEN}

Discussion Panel
‘AI Use Cases in Aviation’

Moderator

Giovanni Cima,
Project Manager ‘AI use cases and domain consolidation’

Speakers

Frédéric Barbaresco, Thales LAS
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Emmanuel Levitte, CAE
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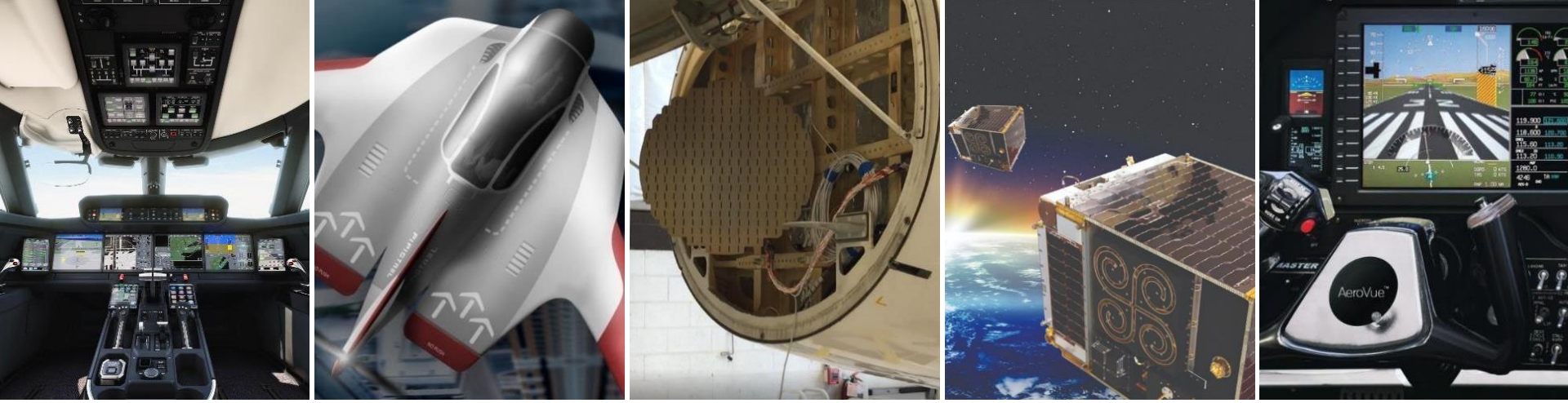

EASA AI DAYS 2024

DARWIN – Digital Assistants for Reducing Workload and Increasing Cooperation

PAVEL KOLČÁREK

JULY 2, 2024

Honeywell DLR PIPISTREL EUROCONTROL EASA European Aviation Safety Agency SLOVENIA CONTROL

Acknowledgement

The project is supported by the SESAR 3 Joint Undertaking and its founding members.

Disclaimer

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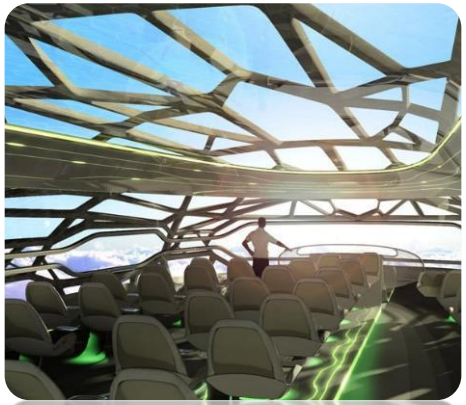
WHAT TRENDS SHALL CURRENT AVIATION AI RESEARCH ADDRESS?

Autonomy



Digitalization

AI & Trust

Welcome to a new era of flight — while safety still comes first!

EXPECTED SAFETY BENEFITS FOR SIMPLIFIED COCKPIT OPERATIONS

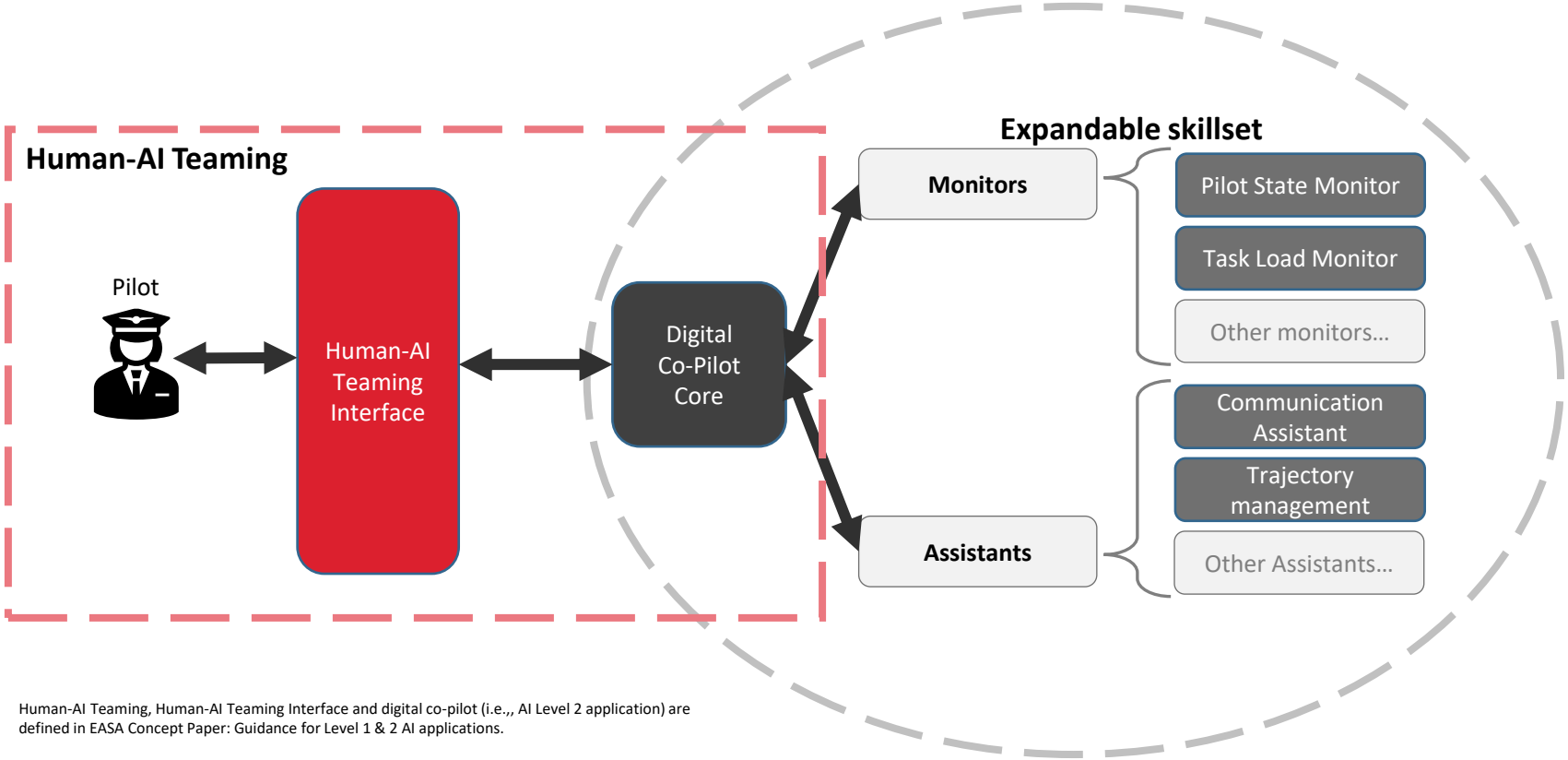
Detect and mitigate pilot incapacitation

Manage pilot workload, especially during non-normal and emergency situations

Support cross check by the automation

Build trust and social acceptance of new technology

DIGITAL CO-PILOT: HUMAN-AI TEAMING



Human-AI Teaming, Human-AI Teaming Interface and digital co-pilot (i.e.,, AI Level 2 application) are defined in EASA Concept Paper: Guidance for Level 1 & 2 AI applications.

ARTIFICIAL INTELLIGENCE ENABLERS

Pilot State and Task Load Monitor

- Monitor the condition of the pilot and identify drowsiness, sleep, or incapacitation
- Predict periods of increased task load along the planned flight route, leading to an optimal distribution of work in the cockpit

AI Machine Learning

AI Level 1: Assistance to human

Human-AI Teaming

- Dynamically distribute tasks based on pilot health state and task load
- Provide collaborative capabilities for pilot interaction with adaptable automation and assistants
- Ensure the pilot stays in the loop and in charge even in demanding situations

AI Level 2: Human and AI-based system cooperation & collaboration

Trustworthy Machine Reasoning Platform

- Provide capabilities for rule-based, and transparent decision support or decision making
- Provide operational explainability

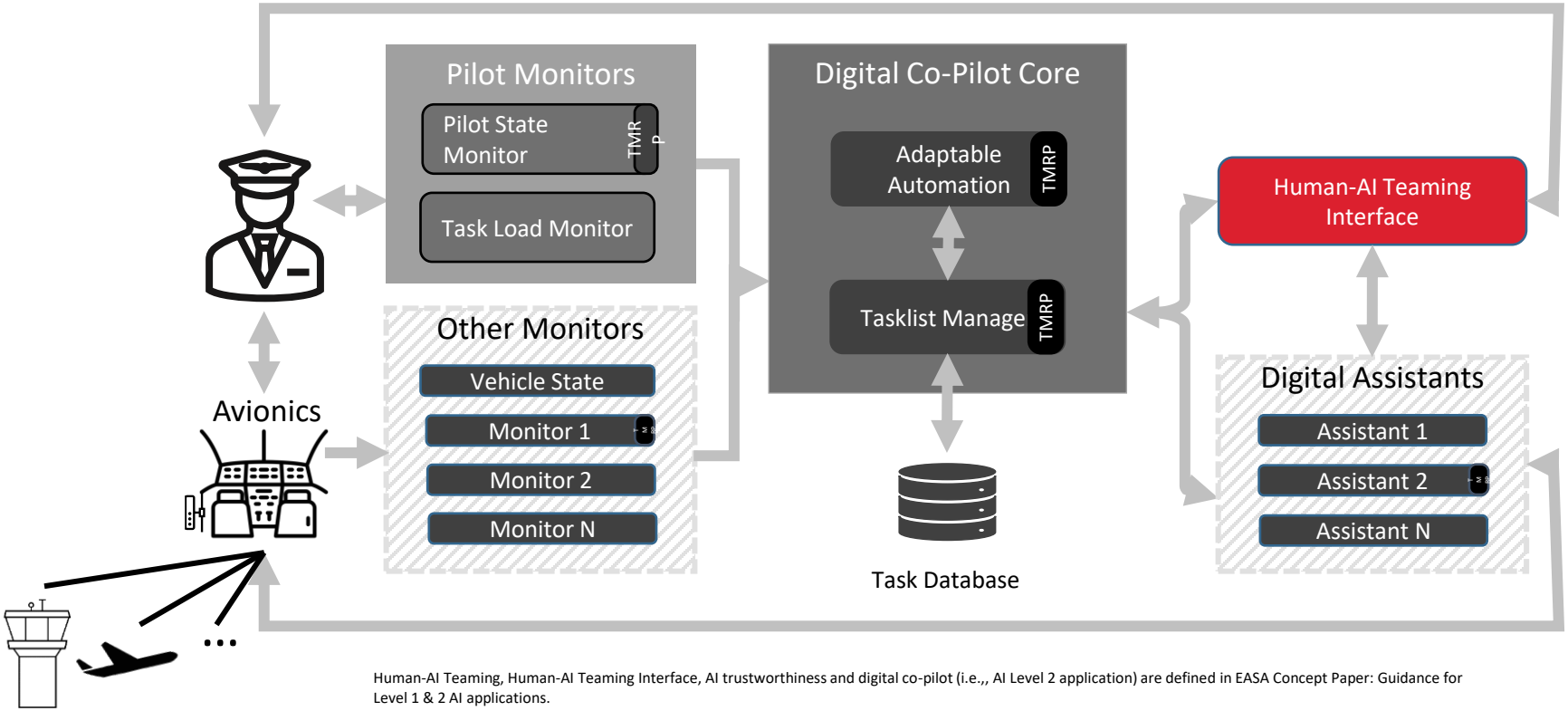
Symbolic AI

Human-AI Teaming and AI trustworthiness are defined in EASA Concept Paper: Guidance for Level 1 & 2 AI applications.

Enabler : Pilot State & Task Load Monitor

Enabler : Human-AI Teaming

Enabler : Trustworthy Machine Reasoning Platform



Human-AI Teaming, Human-AI Teaming Interface, AI trustworthiness and digital co-pilot (i.e.,, AI Level 2 application) are defined in EASA Concept Paper: Guidance for Level 1 & 2 AI applications.

DARWIN

sesar JOINT UNDERTAKING

- Project duration: 06/2023 – 05/2026
- Objective: Demonstration on Pipistrel's Miniliner precursor
- Technology enablers
  - Pilot State Monitor, Task Load Monitor
  - Trustworthy Machine Reasoning Platform (Certifiable AI / MR)
  - Human-AI Teaming (AI Level 2)
- Agile & iterative development CS-23, technology elements applicable to CS-25
- Cooperation with EASA on AI Level 2 definition

Partner	Focus Areas
Honeywell	Project lead, Digital co-pilot, PSM, Human-AI Teaming, Validations
PIPISTREL	ConOps, Scenarios, Integration into avionics, Flight tests
DLR	Task analysis, Task Load Monitor, Human-AI Teaming, Validations
EUROCONTROL, SLOVENIA CONTROL	ConOps, Interoperability requirements, Validation support
EASA	Certification path, Standardization & Regulatory inputs

THANK YOU!

PAVEL KOLČÁREK
PAVEL.KOLCAREK@HONEYWELL.COM

SAFE HARBOR STATEMENT

Statements in this presentation relating to Honeywell's future plans, expectations, beliefs, intentions, and prospects may contain "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are based on management's current expectations and assumptions and are susceptible to a number of risks and uncertainties, many of which involve factors beyond our control. Actual outcomes and results may differ materially from these expectations and assumptions.

These factors include—but are not limited to—risks associated with developing and delivering new features, the adoption and successful deployment of our products or services, slower than expected market expansion, cybersecurity incidents, interruptions or performance problems (including service outages), inability to retain key personnel, failure to integrate any new business, and worse than expected global economic conditions. Further information on potential factors that could affect our business is included our most recent Form 10-K and Form 10-Q filings. These filings are available on the SEC's website or at Honeywell's Investor Relations website at https://honeywell.gcs-web.com/.

Any products, features, or functionality referenced in this material that are not currently generally available may not be delivered on time or at all. The sale, development, release, or timing of any such products, updates, features, or functions is at our sole discretion. Product roadmaps are for informational purposes only and are not binding commitments on us. You should only make purchase decisions based on currently available features. Honeywell assumes no obligation to update any forward-looking information.

Honeywell

Discussion Panel
‘AI Use Cases in Aviation’

Moderator

Giovanni Cima,
Project Manager ‘AI use cases and domain consolidation’

Speakers

Frédéric Barbaresco, Thales LAS
Pavel Kolčárek, Honeywell
Simone Pozzi & Vanessa Arrigoni, Deep Blue
Emmanuel Levitte, CAE
Matt Jahn & Dragos Mangineantu, Boeing

Haiku
Human AI teaming Knowledge and Understanding for aviation safety

Overview of the project

(HORIZON Europe Project | September 2022 – August 2025)

Simone Pozzi & Vanessa Arrigoni (Deep Blue)

July 2nd, 2024

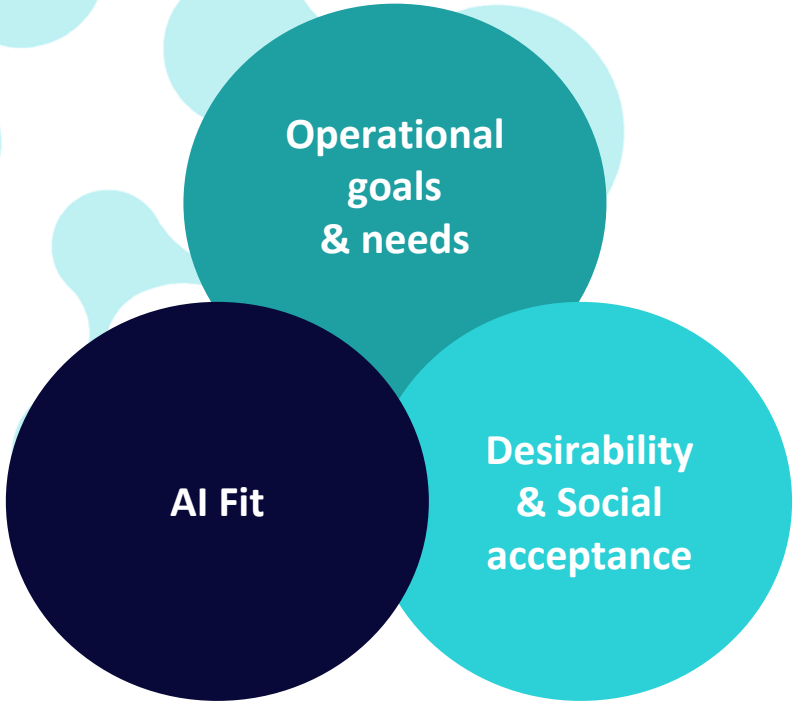
This project has received funding by the European Union's Horizon Europe research and innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 101075332

Our goal

Developing **Human-Centred AI-Based Intelligent Assistants** for **safe**, **secure**, **trustworthy** and **effective** **Human-AI partnerships** in **aviation** systems.

Key challenge: **human-centric Intelligent Assistants**, integrating **human values**, **needs**, **abilities** and **limitations**.

Our approach



- **Human-centred approach**
  starting from users' needs and pain points
- **Analysis of how technology changes human activity**
  doing the same job with a digital assistant is not "doing the same job"

This project has received funding by the European Union's Horizon Europe research and innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 101075332

Our mix of expertise

15 Partners from 10 different countries

Three communities: **Human Factors**, **end-users, technology** suppliers

deepblue
PROJECT COORDINATOR

EUROCONTROL

CHPR

EMBRAER

ENAC

LFV

LINKÖPING UNIVERSITY

skyway

THALES

BORDEAUX INP

CATIE

Suite5
We Deliver Intelligence

DFKI

ENGINEERING
THE DIGITAL TRANSFORMATION COMPANY

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

END-USERS

London Luton Airport

ADVISOR

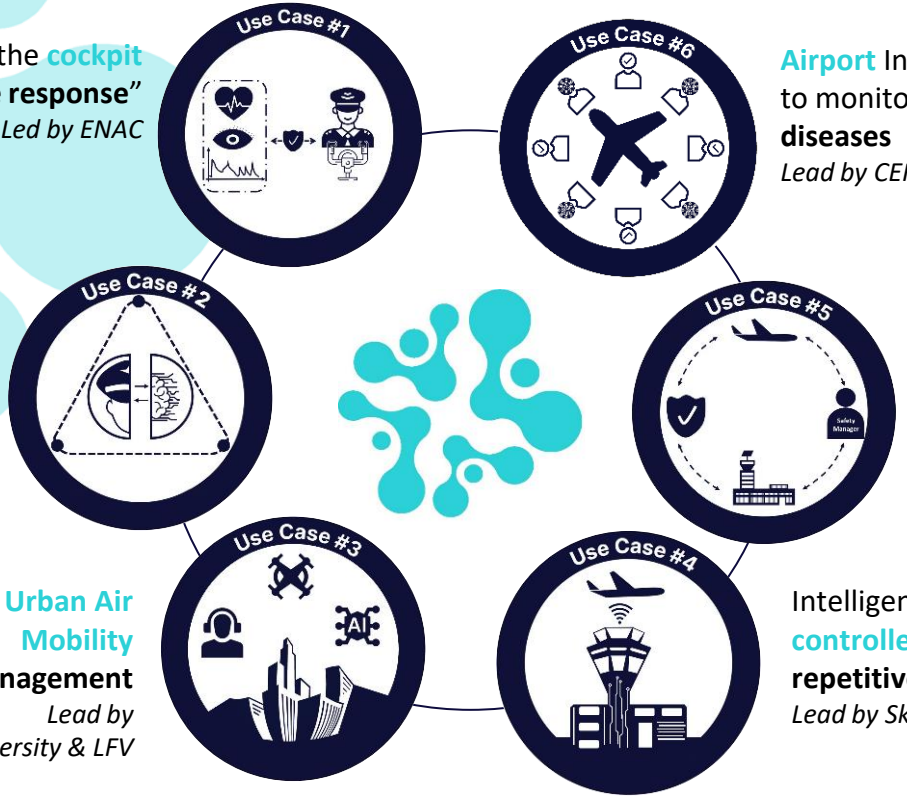
EASA
European Aviation Safety Agency

Our 6 use cases

Intelligent Assistant in the **cockpit** to assist in "**startle response**"
Led by ENAC

Intelligent Assistant in the **cockpit** to assist in **route planning/replanning**
Led by THALES & EMBRAER

Intelligent Assistant for **Urban Air Mobility** to assist in **traffic management**
Lead by Linköping University & LFV



Airport Intelligent Assistant to monitor indoor **spread of infectious diseases**
Lead by CERTH

Intelligent Assistant to improve **airport safety** through data analysis
Lead by EUROCONTROL & ENGINEERING + London Luton Airport

Intelligent Assistant for **tower controllers** to assist in **routine and repetitive tasks**
Lead by Skyway

This project has received funding by the European Union's Horizon Europe research and innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 101075332

Scan for our website

HAIKU USE CASE#1

Lead by ENAC

How can **AI** support **pilots** during **startling and surprising events**?

The **FOCUS**
Intelligent Assistant

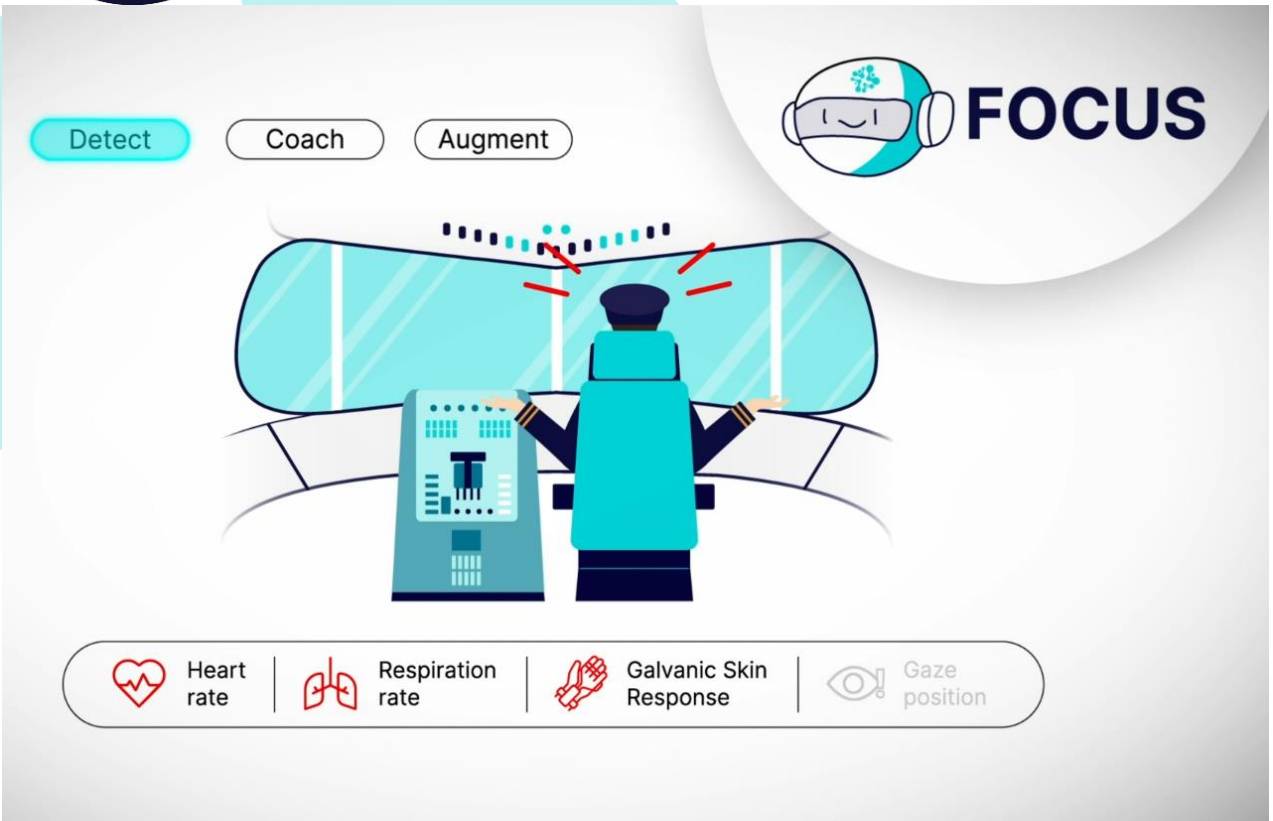
Flight **O**perational **C**ompanion for **U**nexpected **S**ituations

This project has received funding by the European Union's Horizon Europe research and innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 101075332


Use Case #1
HAIKU UC#1
Martin, pilot
Scan to watch the
UC#1 Video

HAIKU UC#1

The IA TASKS



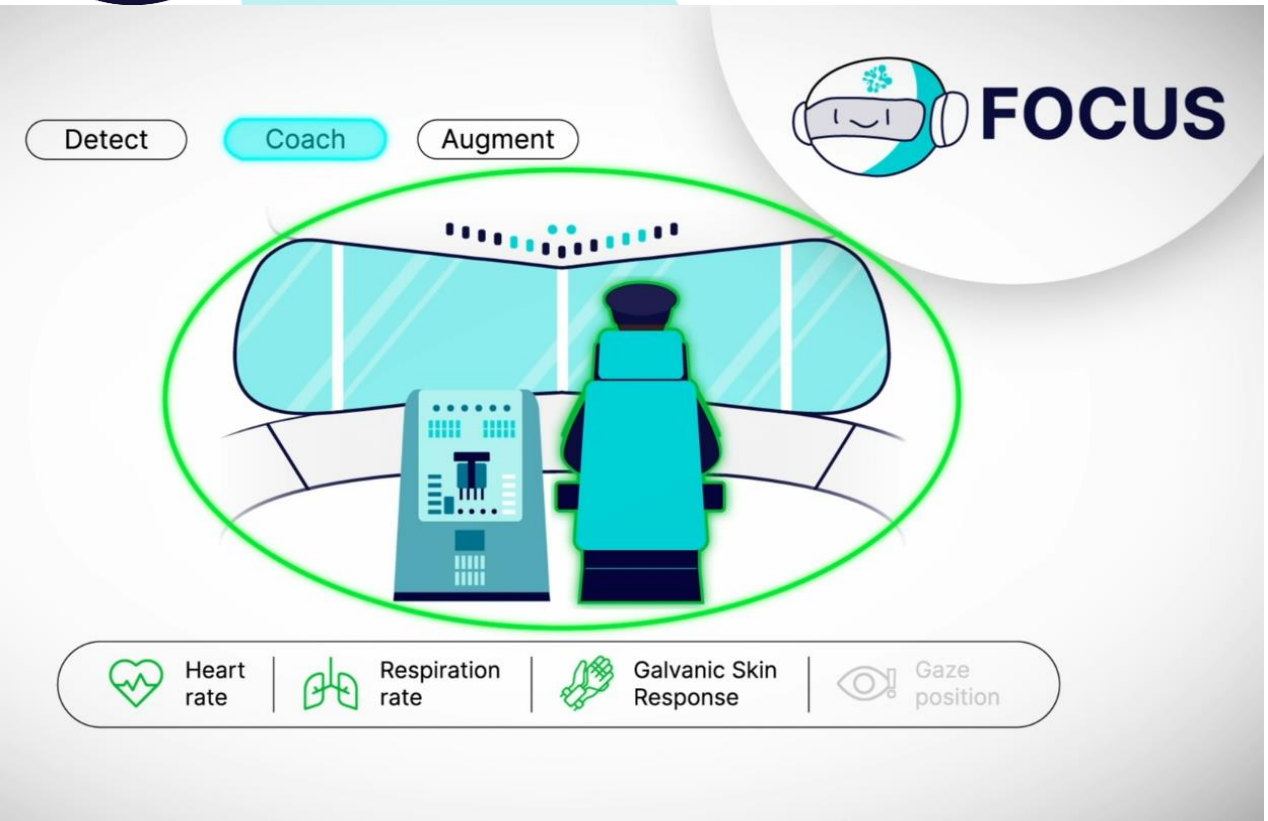
Detection of cases of **startle** and **surprise** in Single Pilots operations

...

... via **physiological parameters**

HAIKU UC#1

The IA TASKS



Supporting Single Pilots in **managing emotion and stress** during startling and surprise events …

… Through **biofeedback**

HAIKU UC#1

The IA TASKS

Augmenting Single Pilots **situational awareness**…

… By **drawing attention** towards important parameters

Our outputs

INTELLIGENT ASSISTANTS

Developed and validated for:

- Airline operations
- ATM
- Urban Air Mobility
- Airport Operations

HUMAN FACTORS APPROACHES for AI

- Explainability framework
- Human Factors Assurance process

SOCIETY

- Analysis of Liability and Ethics
- Design and assessment of new human roles
- Safety Culture Safeguards for Aviation Organisations

This project has received funding by the European Union's Horizon Europe research and innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 101075332

Development of Safety, HF and security approaches for Human IA Systems

This project has received funding by the European Union's Horizon Europe research an
innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 1010

HAIKU UC#1

Overview of Saf-HF-Liability results

Potential critical event

The IA inaccurately assesses the need for the startle procedure, leading to a **notification when it is unnecessary**

Safety: Overload due to unnecessary notification

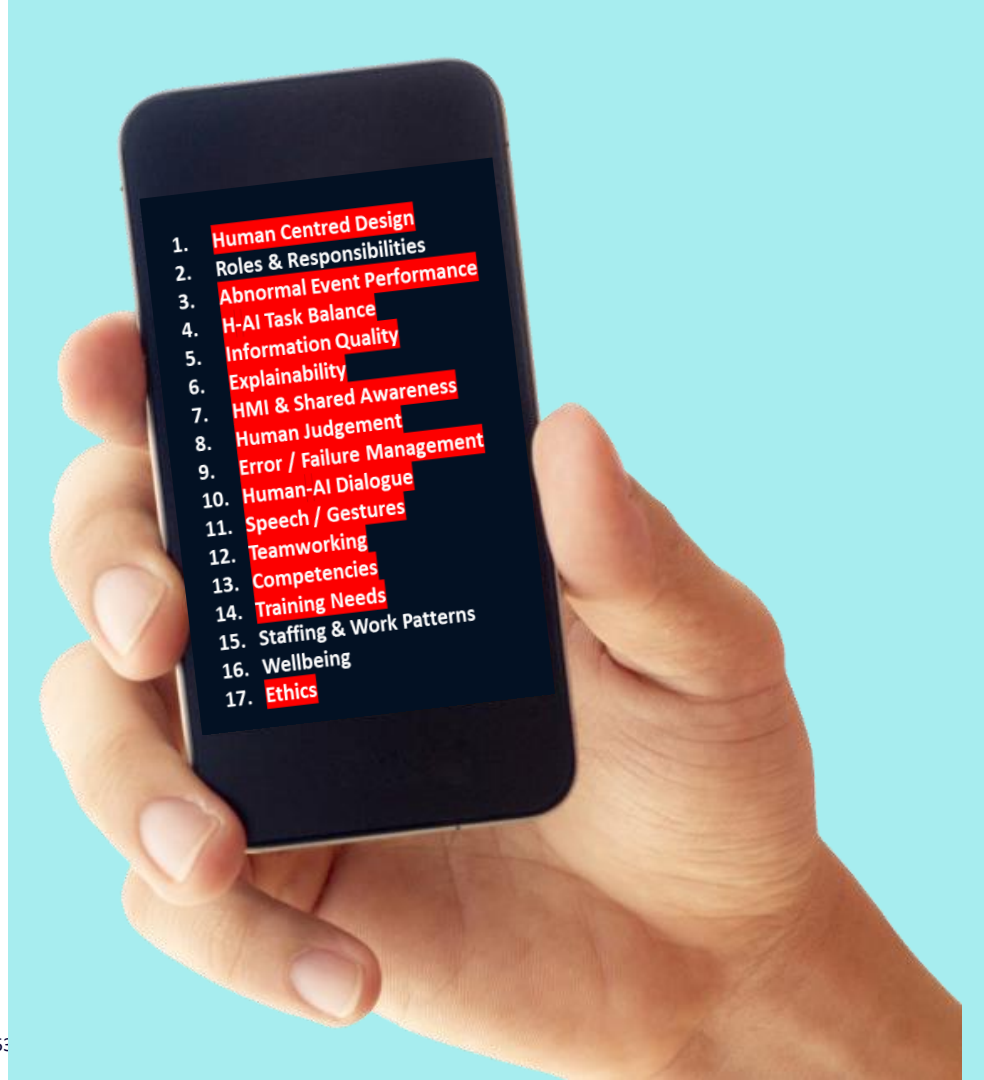
HF: Inconsistent warnings may erode the pilot's trust

Liability:

- Product Liability risk for AI providers
- Corporate Liability risk: end-users training

An App for Evaluating Human-AI Teaming systems

- 170 Guidelines
- Includes EASA Guidelines
- Builds on SESAR Human Performance Assessment Process
- Already trialed on 2 HAIKU Use Cases



This project has received funding by the European Union's Horizon Europe research and innovation programme HORIZON-CL5-2021-D6-01-13 under Grant Agreement no 101075

What is the impact on human role?

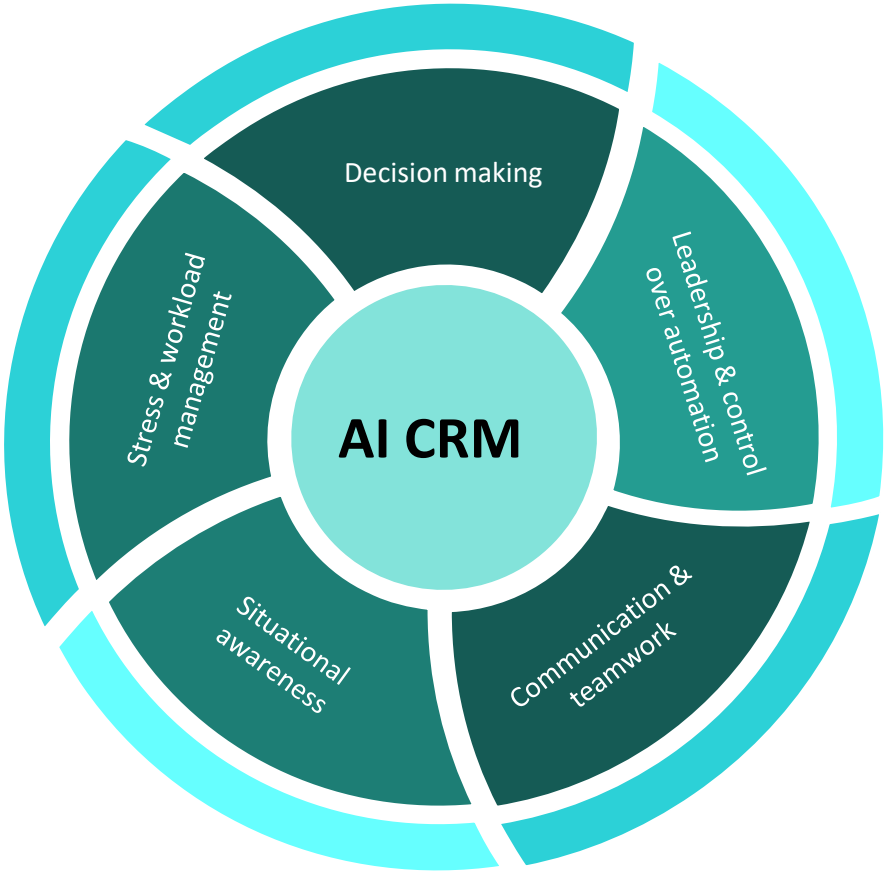
Future interactions between pilots and their environment

↓

Revised skill-set

↓

New training requirements for pilots



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THANK YOU!

Haiku
Human AI teaming Knowledge and Understanding for aviation safety

FOLLOW US

WEBSITE
https://haikuproject.eu/

LINKEDIN
HAIKU EU Project

X
@HAIKUproject_EU

Scan for our website

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deepblue
consulting & research
www.dblue.it

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CAERise™

EASA AI days

Emmanuel Levitte
Vice President, Global Product Management

July 2024

CAERise™ Training System

Enhancing aviation safety by integrating **training**, **telemetry**, **biometric**, and **flight-data** into pilot training for real-world outcomes.

Digital Delivery Platform

Launched in **2018** with Airline Partners

Real-time Insights for Standardized Evaluations

CAE Digital Ecosystem

CAE

CAE Rise Footprint

CAT BAT D&S

Gulfstream	Embraer	Dassault	Beechcraft	Airbus	Boeing	Bombardier
G280	Phenom 100/300	Falcon 7X	King Air 350	A320	B737MAX	CRJ900
G450/G550	ERJ 145	Falcon 8X	C122	A330	B737NG	Challenger 300/350
G650				A350	B777	Challenger 605/650
					B787	Global 5000/6000
						Global XRS
						Global 7500

22
Aircraft Types

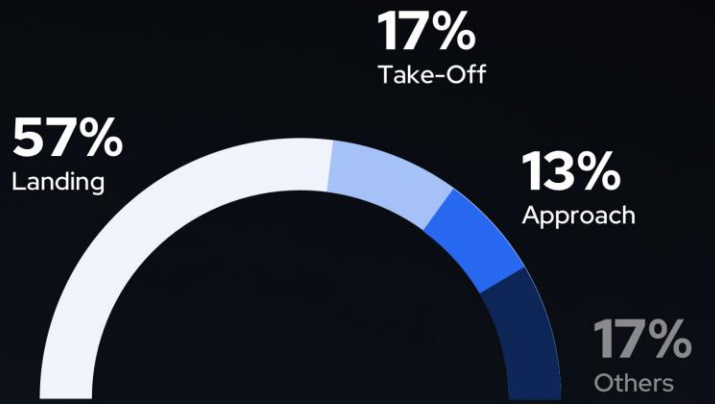
100
Full Flight Simulators

2,000+
Airlines & Operators

300k+
Hours of Training

CAE

Industry safety statistics reveal that most of the accidents occur during **take-off**, **approach**, and **landing**

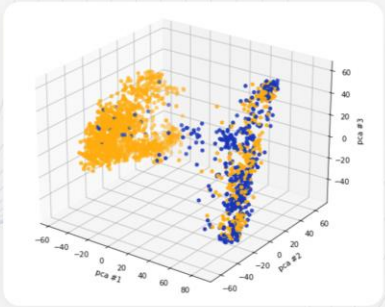


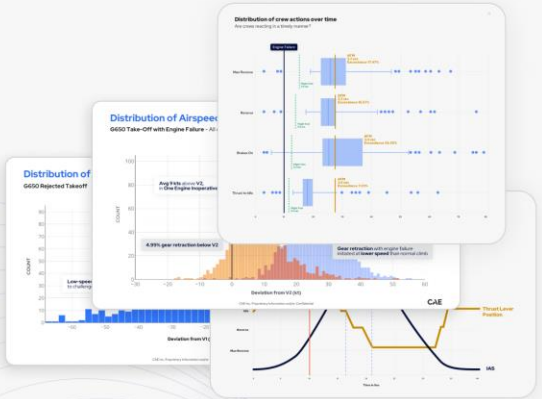
ICAO IATA canso ICCAIA FLIGHT SAFETY FOUNDATION

CAE

AI to Make the Training Data Talk in its Context

Delivering detailed and integrated training insights, ensuring a complete understanding and optimization of training outcomes.





Simulator Training Curriculum & Context

Big Data Clustering "let the data talk"

Clusters:

- Rejected Takeoff (with & without low visibility)
- Takeoff with Engine Failure
- Main Contributors

Big Picture Holistic Training Insights

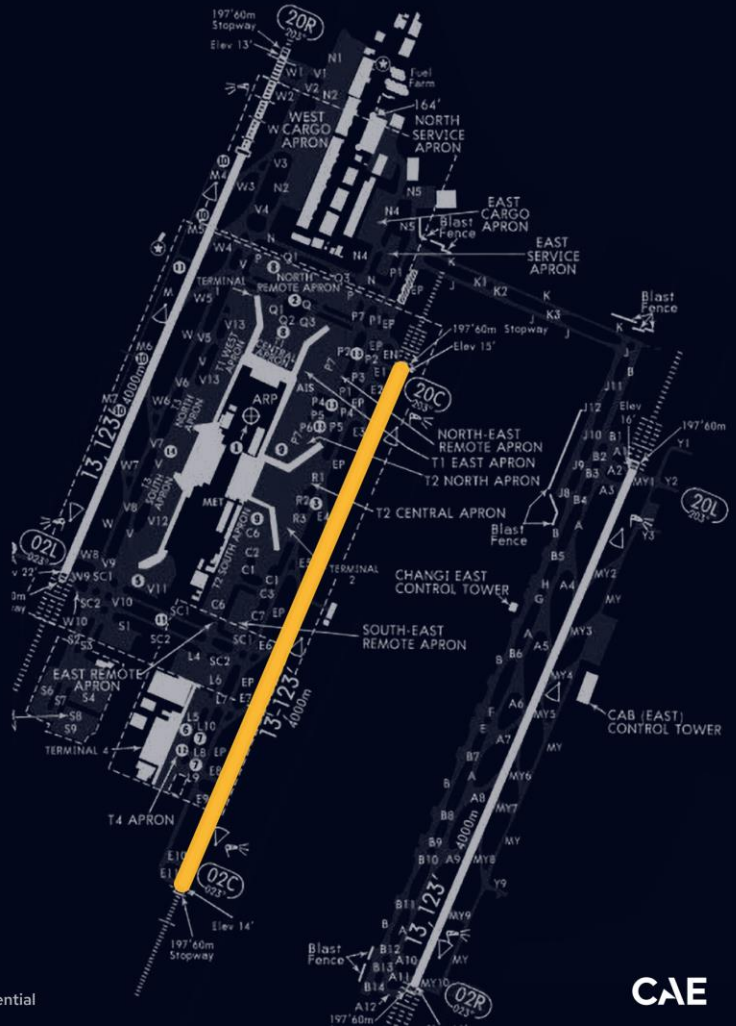
CAE

CAE Partnership with Singapore Airlines

Competency-Based Training

300 pilots underwent more than **150 sessions** in B777 recurrent training, constituting one of the richest data set collection effort on airline crew performance.

The following video exemplifies **gaze-tracking** capture during an **approach & landing** at Singapore Changi Airport with one engine inoperative, providing valuable insights into pilot behaviour and decision-making.



CAE

CAE | SINGAPORE AIRLINES

Thank you

Discussion Panel
‘AI Use Cases in Aviation’

Moderator

Giovanni Cima,
Project Manager ‘AI use cases and domain consolidation’

Speakers

Frédéric Barbaresco, Thales LAS
Pavel Kolčárek, Honeywell
Simone Pozzi & Vanessa Arrigoni, Deep Blue
Emmanuel Levitte, CAE
Matt Jahn & Dragos Mangineantu, Boeing

BOEING

Engineering, Test & Technology

Chief Aerospace Safety Office

The BEACON Project: Boeing & EASA Innovation Partnership Contract

Matt Jahn
Dragos Margineantu

July 2nd, 2024

Agenda

- Acknowledgements

- Boeing & EASA AI/ML IPC
  - IPC Overview
  - IPC Focus Areas
  - Key Learnings So far
  - The automated taxi system

Acknowledgments

WHAT DO WE DO?

Boeing coordinates the enterprise's regulatory-innovation engagements with global regulatory authorities.

We work with authorities to find solutions that address open industry-wide regulatory challenges associated with innovation and emerging technologies.

We share what we are learning to advance the realization of aerospace innovation globally, in a safe and harmonized way.

HOW WILL WE WORK?

- With a safety mindset
- Collaboratively
- Respectfully
- Transparently
- Inquisitively
- Flexibly

WHAT ARE OUR STRATEGIC OBJECTIVES?

STRENGTHEN

regulatory relationships

INFORM

the regulatory ecosystem

FOSTER

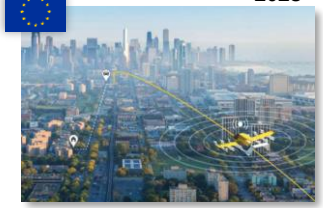
global regulatory alignment

BUILD

Boeing's regulatory knowledge & capability

Collaboration Snapshot

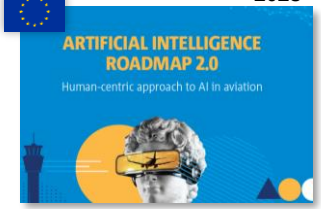
2023 +



Advanced Air Mobility Regulatory Pathways

Innovation Partnership Contract undertaking a regulatory gap assessment for self-flying remotely supervised Urban Air Mobility passenger carrying operations.

2023+



Artificial Intelligence Certification Pathways

Innovation Partnership Contract exploring a Boeing use case application to inform future EASA AI Guidance Material.

2019+

UK CAA Airspace Modernisation Goals

UK Sandbox collaboration informing routine Beyond Visual Line of Sight Operations in Class G Airspace via a use case application.

2023+

CASA Airspace Integration

Collaboration exploring routine pathways towards integrated uncrewed operations in Controlled Airspace, informing future Digital Flight Rules.

2022+

Oceania Safety Information Sharing

An industry initiative to design and implement an aviation safety data sharing program in the Oceania region.

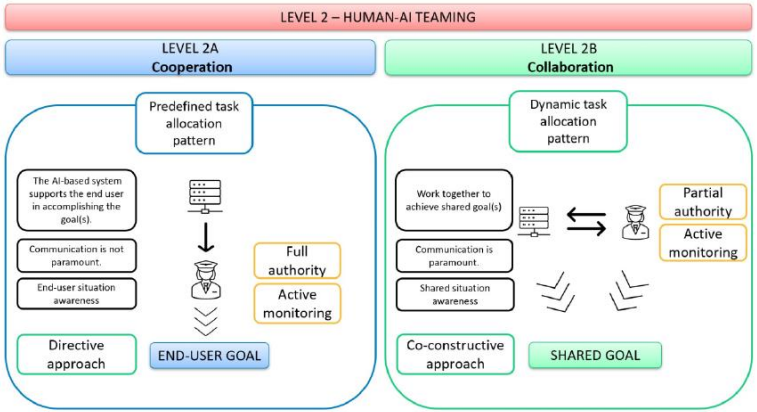
IPC Overview

IPC Overview

The IPC will:

- In collaboration with EASA, establish the regulatory requirements, means of compliance, and V&V strategy for an ML-based system
  - The effort will use the EASA Artificial Intelligence Concept Paper issue 2 as the basis for these requirements and MOCs
- Use Boeing's experimental automated taxi system as the surrogate for the certification process
- Consider both a level 2A (human/machine teaming) system and a level 3A (more autonomous machine) system, per EASA's leveling scheme
- Begin June 2023, and last approximately 18-20 months
  - Expected deliverable: a published report which documents the efforts and findings

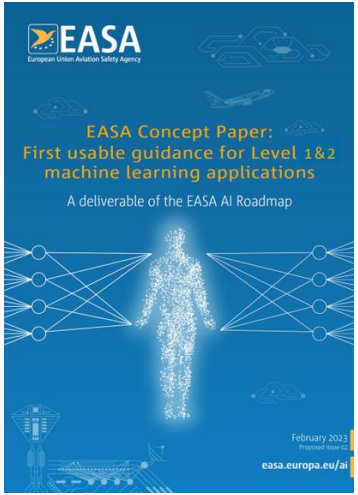
Level 1 AI : assistance to human	Level 2 AI : human-AI teaming	Level 3 AI : advanced automation
•Level 1A: Human augmentation •Level 1B: Human cognitive assistance in decision and action selection	•Level 2A: Human and AI-based system cooperation •Level 2B: Human and AI-based system collaboration	• Level 3A: The AI-based system makes decisions and performs actions, safeguarded by the human. •Level 3B: The AI-based system makes non-supervised decisions and performs non-supervised actions.



IPC Overview

Why did Boeing propose this IPC?

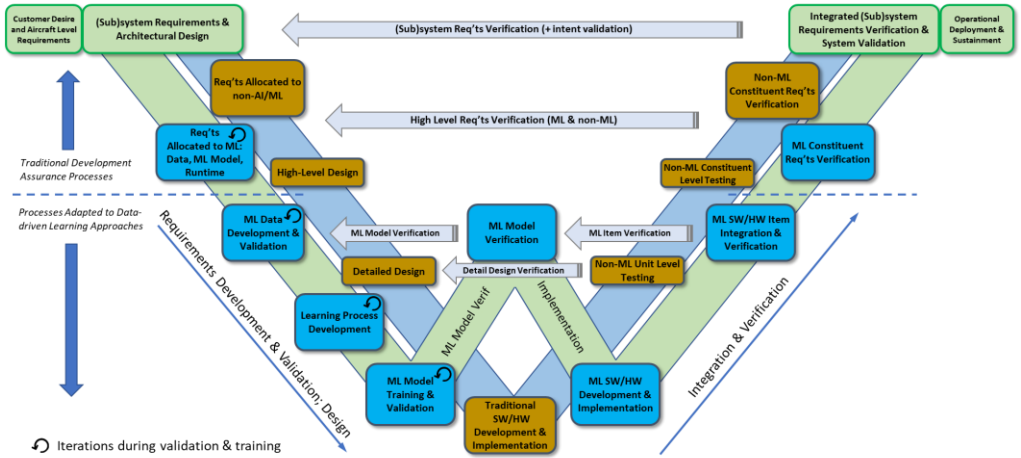
- The exercise of applying the Concept Paper to a level 2A and 3A system, off the critical path of certification, will allow exploration of topics of interest
- The work will also highlight potential areas of refinement for future issues of the Concept Paper
- The IPC will lay the groundwork for future certified AI systems
- It will also allow Boeing to help contribute to and build upon the body of work that has been created in other IPCs
- We hope to leverage the IPC work to facilitate harmonization amongst regulatory agencies and Standards Orgs including EASA, FAA and others.



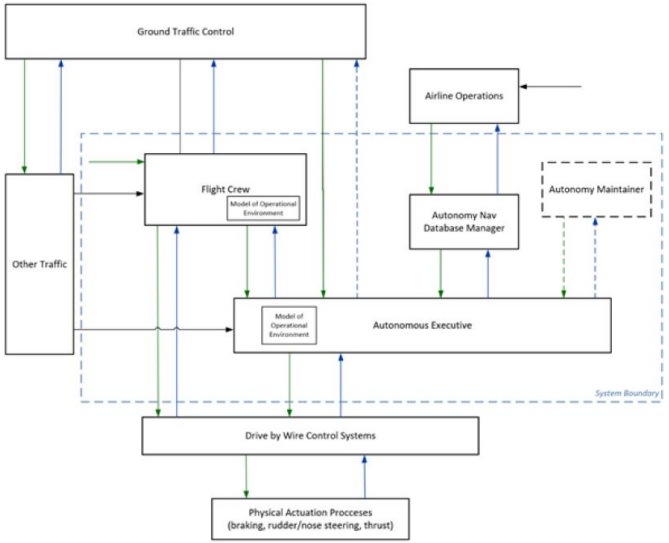
IPC Focus Areas

- Application of Concept Paper Objectives and MOCs
- Validation and Verification approach
- Human Factors, and the use of System-Theoretic Process Analysis (STPA)

AI/ML V-W Development Lifecycle (MLDL) in context with traditional Engineering "V"



High Level Control Structure for existing system



Key Takeaways and Upcoming Schedule

- Key takeaways So Far
  - EASA has been an excellent partner in this IPC
  - Exploration of the Concept Paper has highlighted potential areas of refinement
  - The Concept Paper seems to be a viable approach to the certification of AI Systems

- Upcoming Schedule
  - Second Half 2024
    - Automated taxi system demonstration
    - Phase 1 completion
    - Phase 2 kickoff
  - First Half 2025
    - Phase 2 completion
  - Mid-2025
    - Final Report published

The automated taxi system

Automated taxi system Overview

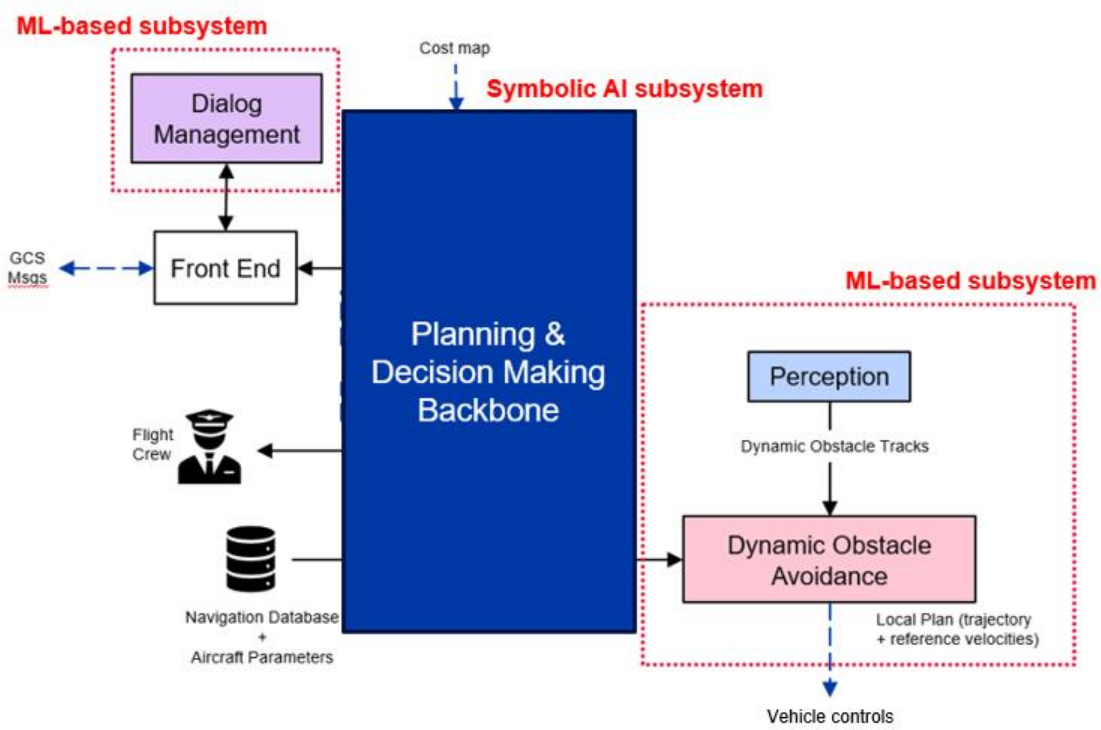
- The automated taxi system is an experimental system being researched by Boeing
- It is capable of:
  - Receiving a taxi clearance via radio
  - Parsing that clearance, planning a taxi route, and providing a readback
  - Executing the taxi plan to autonomously taxi the aircraft from one location to another
  - Using its perception system to localize itself on the airport map
  - Using its perception system to sense, classify, and avoid obstacles
- The flight crew monitors the automated taxi system and retains the ability to override and disconnect the system at any time.

Flight Crew Oversight

- The crew will be responsible for:
  - Activation of the system
  - Monitoring the execution (through the provided interfaces)
  - If needed, entering the taxi destination and specific route requirements
  - Monitoring all aspects of the system
  - Overriding the system if abnormal operation or hazards are identified by the crew

- The automated taxi system will provide the flight crew the necessary information in order to monitor the system
  - This information display will be handled by the systems interface with the flight crew

Automated taxi system overview



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Focus on AI Risks:

(1) Object detection for collision avoidance

(2) Localization

- Employ sensor perception to compute location in navigation database
  - Environment features that are detectable and exist in the database
  - Airport cartesian reference frame
  - Measurements fused in evidence grid
  - Pose correction: match perceived features with navigation database

Q&A

Discussion Panel
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Moderator

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Speakers

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Emmanuel Levitte, CAE
Matt Jahn & Dragos Mangineantu, Boeing

EASA AI Days : Use cases discussion panel

Q&A session

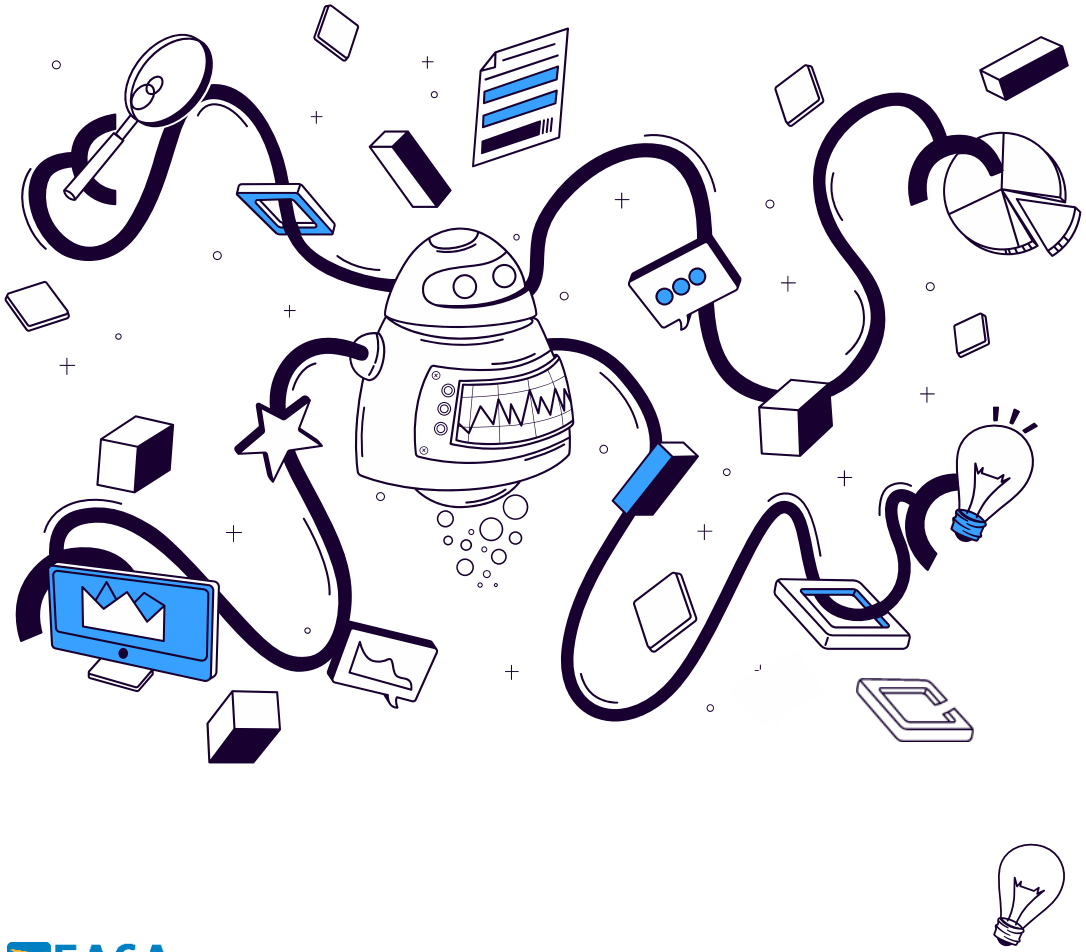
www.sli.do

#AIDays

Passcode: hmkota

AI Ethics in Aviation
‘Survey results’

Ines Berlenga,
EASA Project Manager ‘Ethics for AI



1. Why Ethics in AI for Aviation?
2. How do we approach Ethics in Aviation?
3. What was our starting point?
4. What research did we do?
5. What was this survey about?
6. How did we put the survey together?
7. What were the main results?
8. What are the next step?

1. Why Ethics in AI for Aviation?

EASA Artificial Intelligence Programme saw the need to work beyond the technical areas of AI for aviation.

It was important to observe the possible consequences on the humans impacted by these systems.

How do the humans perceive those systems and if they are ethically acceptable was a question in need of answer and the main motive to develop the present study.

2. How do we approach Ethics in Aviation?

The Agency took an *artifact or tool* approach to ethics meaning that AI technologies are considered as tools that support people.

Once these technologies are incorporated into aviation practices, they will bring new impacts to those practices and in particular to the people involved.

By applying certain key ethical concepts, listen to the opinion of the aviation professionals and drafting guidance we contribute to the prevention of eventual injustices or infringements of human rights.

Chapter 2 Article 9

Risk management system health and fundamental rights

…the identification and analysis of the known and ***the reasonably*** foreseeable risks ***that the high-risk AI system can pose to health, safety or fundamental rights when the*** high-risk AI system ***is used in accordance with its intended purpose;***

Chapter 2 Article 10

Data and data governance

…Training, validation and testing data sets shall be subject to data governance and management…(b) **data collection processes and the origin of data, and in the case of personal data, the original purpose of the data collection**; **(f) examination in view of possible biases that are likely to affect the health and safety of persons, have a negative impact on fundamental rights or lead to discrimination…**

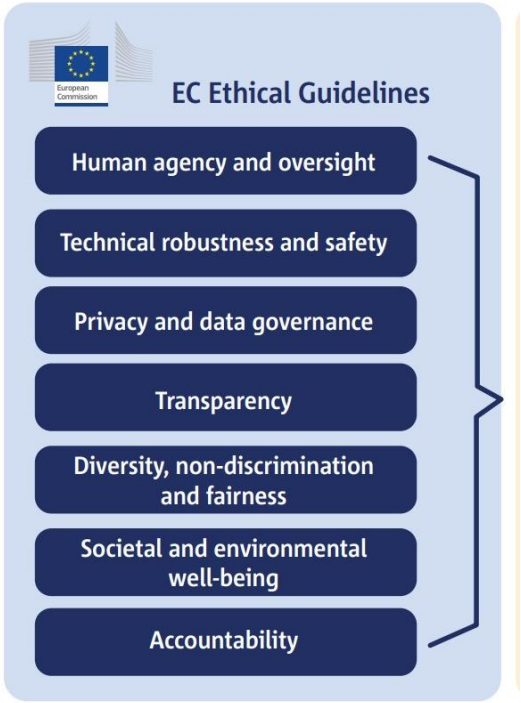
Chapter 2 Article 14

Human oversight

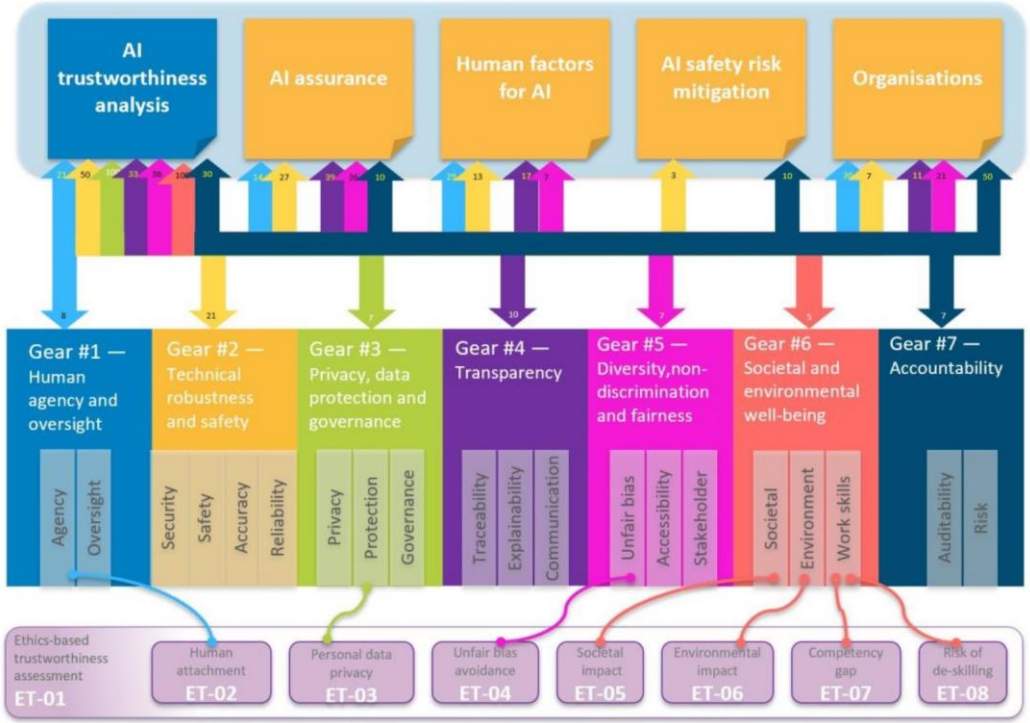
4 (b) to remain aware of the **possible tendency of automatically relying or over-relying on the output produced by a high-risk AI system (automation bias)**, in particular for high-risk AI systems **used to provide information or recommendations for decisions to be taken by natural persons;**

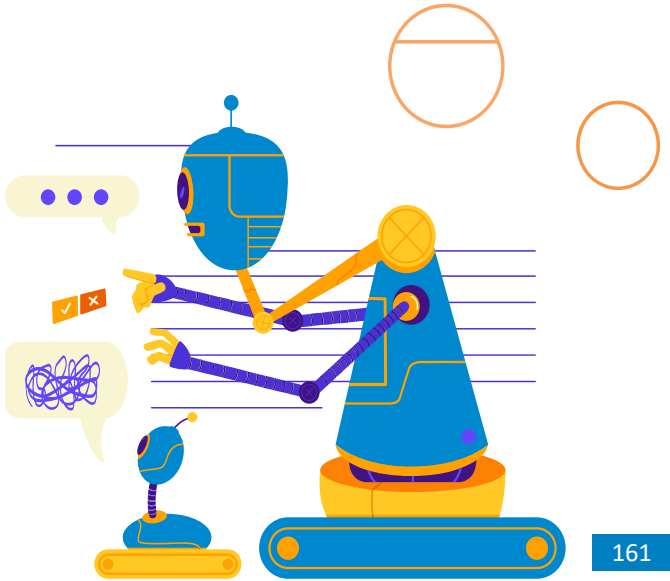
3. What was our starting point?

Assessment List for Trustworthy Artificial Intelligence (ALTAI) for self-assessment



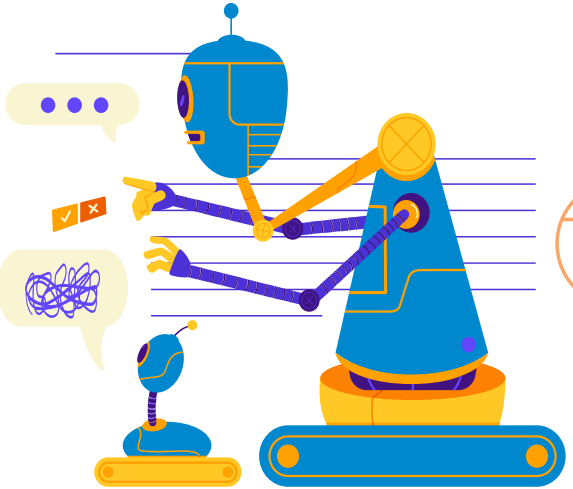
3. What was our starting point?





4. What research did we do?

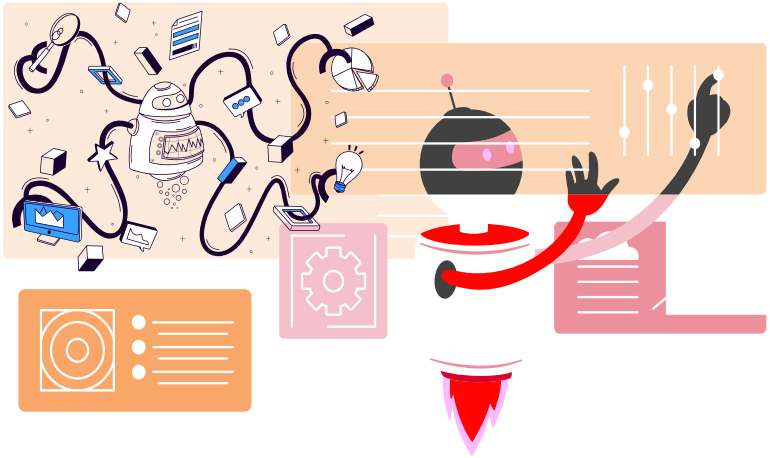
EASA Scientific Committee
German Aerospace Centre
(LOKI & ELSA)
Lisbon University
(Faculty of Psychology)
Politecnico di Torino
EASA HF for AI Project Team



4. What research did we do?

Key ethical concepts were applied and evaluated in a survey sent to aviation professionals

- **Equal opportunities**
- **Non-discrimination and fairness**
- **Data protection**
- **Right for privacy**
- **Transparency**
- **Accountability and**
- **Labour protection and professional development**



5. What was this survey about?

To listen to the people directly.

People's consideration about Ethics kye concepts in AI for certain specific concrete situations in the Aviation context.

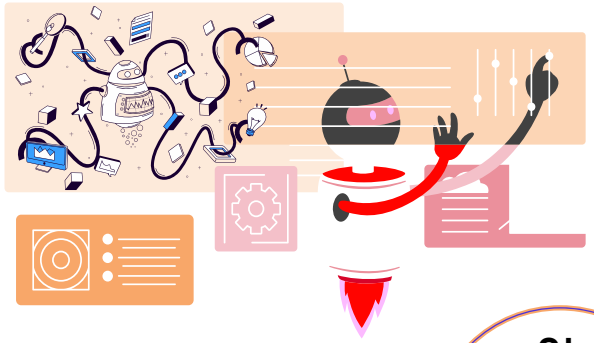
- **Comfort**: How much are we comfortable with the situation meaning *comfort* as the feeling of being relaxed and free from tension and negative thoughts,
- **Trust**: How much do we trust on it meaning *trust* the belief that something is safe and reliable, and
- **Acceptance**: How much will we be willing to accept the situation meaning *acceptance* as the fact that you can agree and approve something.

1 Pilot physiological data monitoring

2 Pilot support in ‘go-around’ situations

3 Maintaining aircraft structures

4 Airport allocation of airlines to a terminal



EASA survey on Ethics in Artificial Intelligence for Aviation

Fields marked with * are mandatory.

Welcome to the EASA survey about Ethics in Artificial Intelligence for Aviation

EASA
European Union Aviation Safety Agency

EASA is preparing the second edition of the AI Concept Paper for future applications concerning the certification or approval of AI-based products for aviation. Safety assurance remains the most important stream of action, and now new areas of interest can be discussed such as the ethical impact of the introduction of such products.

We count on you to share your position and thoughts about the topic by replying to this survey. All your replies are anonymous and confidential, and we are very interested in your honest and personal opinion.

The survey is divided on two sections: the first section with a set of situational cases, and the second section with a set of social, psychological and demographic indicators. It will take circa 60 minutes of your time.

The conclusions of this study will be published on the EASA website at https://www.easa.europa.eu/ai and will be incorporated in the drafting of the AI Concept Paper to be published in 2024.

If you want to have more information, please drop us an email to ai@easa.europa.eu.
We thank you in advance for your participation.

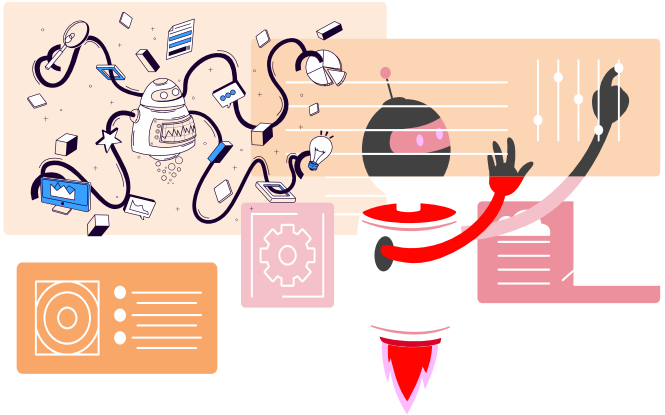
5 Airline crew members attribution to flights

8b Responsibility & accountability when teaming with AI

8a New competencies when teaming with AI

7 Risk of de-skilling

6 Speech recognition in voice communication



7. How did we put the survey together ? &

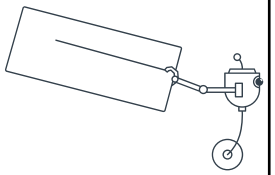
8. What are the main results

Quantitate and qualitative questions

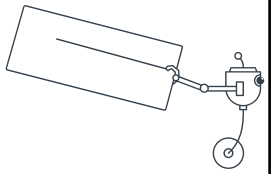
Two conditions for participation to the survey were defined: a) to be an aviation professional and b) to have a link to AI.

The survey was open to the professionals for 3 weeks from December 2023 to January 2024, when closing we considered valid 231 replies.

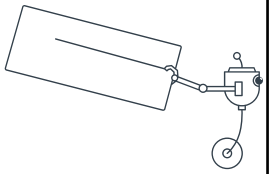
COMFORT results:

		Pilot physiological data monitoring CASE 01	Pilot support in 'go-around' situations CASE 02	Maintaining aircraft structures CASE 03	Airport allocation of airlines to a terminal CASE 04	Airline crew members attribution to flights CASE 05	Speech recognition in voice communication CASE 06	Risk of de-skilling CASE 07	New competencies when teaming with AI CASE 08
N	Valid	192	198	207	208	200	201	204	205
	missing	39	33	24	23	31	30	27	26
Mean		4,22	4,63	4,63	5,17	4,82	4,89	3,52	4,78
Median		4,00	5,00	5,00	5,00	5,00	5,00	3,00	5,00
St.Dev		2,048	1,988	1,898	1,531	1,875	1,778	1,840	1,734
Min		1	1	1	1	1	1	1	1
Max		7	7	7	7	7	7	7	7
Rate position		7	5	5	1	3	2	8	4

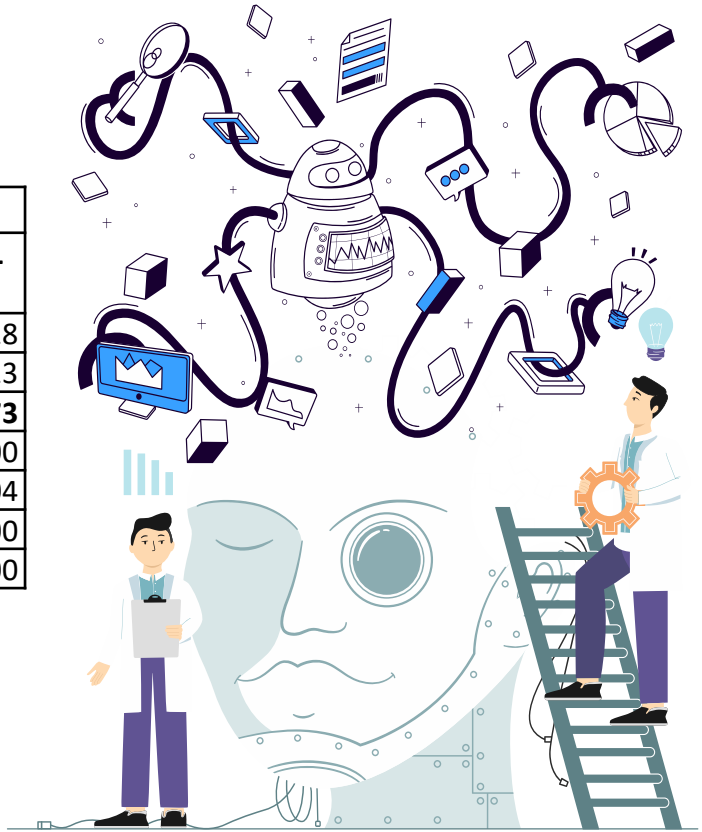
TRUST results:

			Pilot physiological data monitoring CASE 01	Pilot support in 'go-around' situations CASE 02	Maintaining aircraft structures CASE 03	Airport allocation of airlines to a terminal CASE 04	Airline crew members attribution to flights CASE 05	Speech recognition in voice communication CASE 06	Risk of de-skilling CASE 07	New competencies when teaming with AI CASE 08
N	Valid		174	200	203	208	200	199	205	206
	missing		57	31	28	23	31	32	26	25
Mean			3,86	4,50	4,19	4,67	4,68	4,11	3,69	4,59
Median			4,00	5,00	4,00	5,00	5,00	4,00	4,00	5,00
St.Dev			1,816	1,785	1,810	1,691	1,785	1,879	1,799	1,730
Min			1	1	1	1	1	1	1	1
Max			7	7	7	7	7	7	7	7
Rate position			7	4	5	2	1	6	8	3

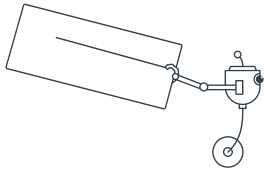
ACCEPTANCE results:

		 Pilot physiological data monitoring CASE 01	Pilot support in 'go-around' situations CASE 02	Maintaining aircraft structures CASE 03	Airport allocation of airlines to a terminal CASE 04	Airline crew members attribution to flights CASE 05	Speech recognition in voice communication CASE 06	Risk of de-skilling CASE 07	New competencies when teaming with AI CASE 08
N	Valid	182	188	199	203	194	192	206	201
	missing	49	43	32	28	37	39	25	30
Mean		4,47	4,27	4,28	4,82	4,20	4,30	3,65	4,78
Median		5,00	4,50	4,00	5,00	4,00	4,00	4,00	5,00
St.Dev		1,937	1,919	1,952	1,755	2,068	1,716	1,830	1,687
Min		1	1	1	1	1	1	1	1
Max		7	7	7	7	7	7	7	7
Rate position		3	6	5	1	7	4	8	2

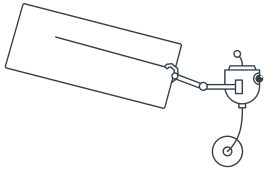
All cases results:				
		COMFORT ALL CASES	**TRUST ALL CASES**	**ACCEPTANCE ALL CASES**
N	Valid	219	219	218
	missing	12	12	13
Mean		**4,4534**	**4,1662**	**4,2173**
Median		4,6250	4,2500	4,2500
St.Dev		1,40325	1,33112	1,39004
Min		1,00	1,00	1,00
Max		7,00	7,00	7,00



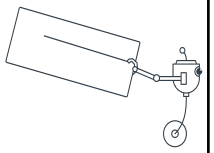
need for Regulation % results:

	Pilot physiological data monitoring CASE 01	Airport allocation of airlines to a terminal CASE 04	Airline crew members attribution to flights CASE 05	Speech recognition in voice communication CASE 06	Risk of de-skilling CASE 07	Teaming with AI CASE 08
NO	6,9	19,5	17,3	12,1	10,8	1,7
YES	**93,1**	**80,5**	**82,7**	**87,9**	**89,2**	**98,3**
Total	100,0	100,0	100,0	100,0	100,0	100,0
EASA doing oversight	**60,1**	**58,6**	**51,8**	**58,8**	**76,5**	**68,0**

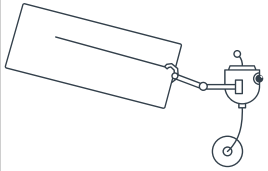
% of non acceptance results:

	Pilot physiological data monitoring CASE 01	Pilot support in 'go-around' situations CASE 02	Maintaining aircraft structures CASE 03	Airport allocation of airlines to a terminal CASE 04	Airline crew members attribution to flights CASE 05	Speech recognition in voice communication CASE 06	Risk of de-skilling CASE 07	New competencies when teaming with AI CASE 08
% of replies indicating non acceptance	35,1	34,0	35,2	24,1	38,1	28,7	48,9	20,0
Question	your level of acceptance having an AI system measuring your physiological reaction to workload?	your level of acceptance allowing an AI system to automatically take over and initiate a go-around manoeuvre in a challenging situation like approach and landing?	Your level of acceptance to rely on the AI-based assessment as an integrated element of the check process you are responsible for?	your level of acceptance letting an AI system take over the allocation of location and gates without human intervention to change the AI decision?	your level of acceptance having an AI-based system analysing and using your personal data related to family conditions, social habits, and free time preferences?	your level of acceptance using an AI system which performs differently depending on individual characteristics (gender, dialect, voice frequency, and voice tone)?	your level of acceptance that you are ready to perform without the AI-based system support? (after having a considerable time having an AI doing the job)	your level of acceptance using an AI-based system teaming with you?

changing your position to acceptable/what ethical issues do you see?

	Pilot physiological data monitoring CASE 01 (601)	Pilot support in 'go-around' situations CASE 02 (306)	Maintaining aircraft structures CASE 03 (263)	Airport allocation of airlines to a terminal CASE 04 (204)	Airline crew members attribution to flights CASE 05 (318)	Speech recognition in voice communication CASE 06 (216)	Risk of de-skilling CASE 07 (261)	Teaming with AI CASE 08 (157)
Examples: (2326 total contents)	"Health and physiological data is sensitive, is similar to being naked. I would use example as being stripped naked and being photographed for statistical or measuring reasons. With such exposure I would feel insecure."	"Pilots may become overly reliant on automated systems, situational awareness lost, technical malfunctions, cyber-attacks, unpredictable AI behavior."	"The meaning of my sign-off must be very clearly defined. I can sign-off that the automated check has been done, but not the quality of the result. Is not totally fair to sign off the airworthiness of the aircraft in the cases when I am not implied in the process."	"To ensure fairness in AI decisions. To lower fees to those airlines affected by biased decisions of AI."	"Family status, constraints due to medical appointments, care times, family times, and personal interests are totally private topics which should never be used by any company under any circumstance."	"Such system could lead to pressure all non-native, non-standard individuals (as analyzed by the AI) and make them feel less worthy of their job through constant negative feedback."	"It is really difficult to feel safe and capable of doing fluently a task that you don´t do regularly. Occasional training can´t replace at all a more regular practice (which think should be required)."	"It is unacceptable to refer to AI as a teammate. I will not attribute human characteristics to it. It is a data driven decision system providing an output to my team. I would no more consider it a teammate than I do any other automated warning system currently in place."

type of new competencies needed to team up with an AI-Based system?

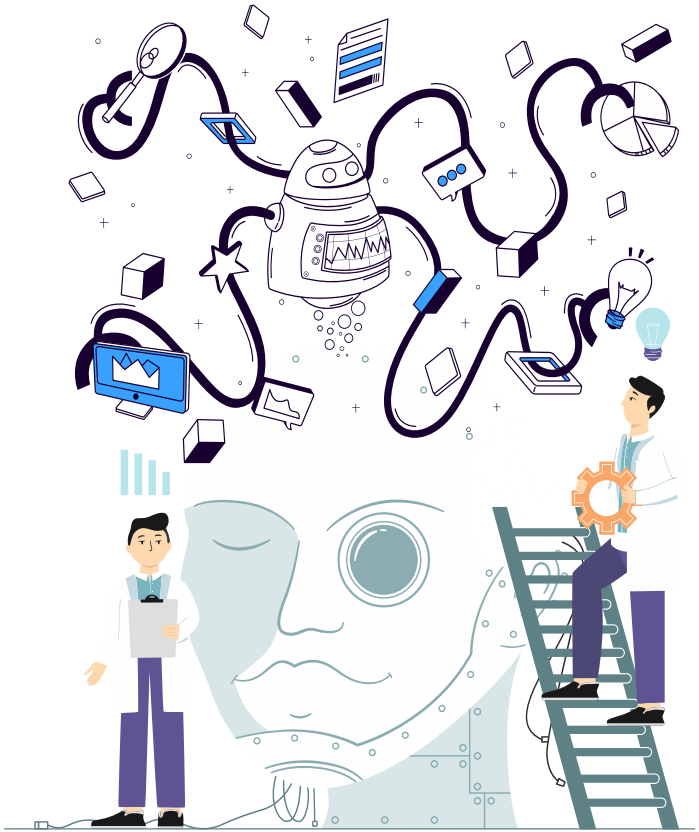
			General AI Knowledge	Data Literacy	Cognitive Skills	IT Competences	Communication Skills	Sensory Competences	Social Skills	Physical Skills
N	Valid		231	231	231	231	231	231	231	231
	missing		0	0	0	0	0	0	0	0
Mean			**5,53**	**5,52**	**5,47**	**5,34**	**5,09**	**4,84**	**4,10**	**3,43**
Median			6,00	6,00	6,00	6,00	5,00	5,00	4,00	3,00
St.Dev			1,686	1,576	1,744	1,754	1,772	1,744	1,981	1,905
Rating place			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

What other competences that would be important for the future teaming with AI-based systems?

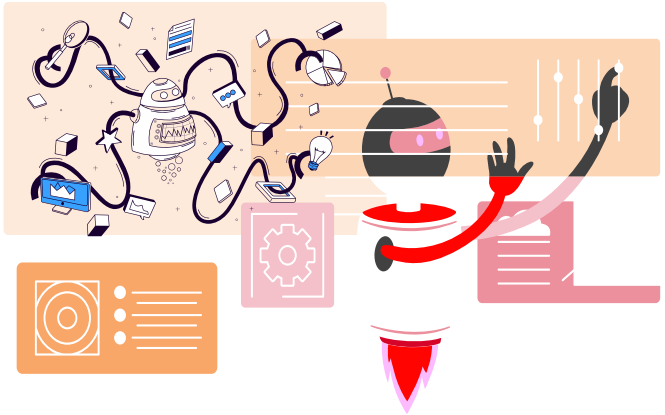
As a reply we could found **25 new suggestions**.

- technical competencies directly linked with the AI-based system,
- emotional intelligence and how to deal with error,
- how to interact with the machine, being resilient, keeping human autonomy
- problem solving, cybersecurity matters and ethical awareness.

Highlight: **emotional intelligence:**
need for assertiveness,
need for emotion regulation,
need for deal with boredom, and
need to gain trust in the system.



What other type of initiatives EASA can develop concerning ethics in AI for aviation?



- Delivering **regulation** and **guidance materials**,
- **Ethical awareness** by dynamic activities and written materials,
- **Interacting with stakeholder** on a more close and systematic way, (establishment of working groups, means to listen directly to professional and experts, and liaise at an early stage with the operational teams)
- Promoting **training, competence development** initiatives and knowledge and information sharing and
- **Certification** process for such AI-based systems: assuring **reliability and safety**.

Sociodemographic characteristics:

circa 80% male, 20% female,

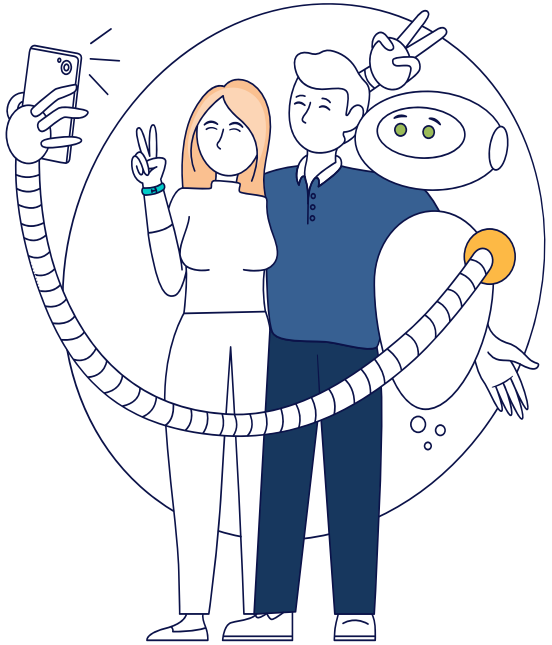
62% between 40 to 59 years old.

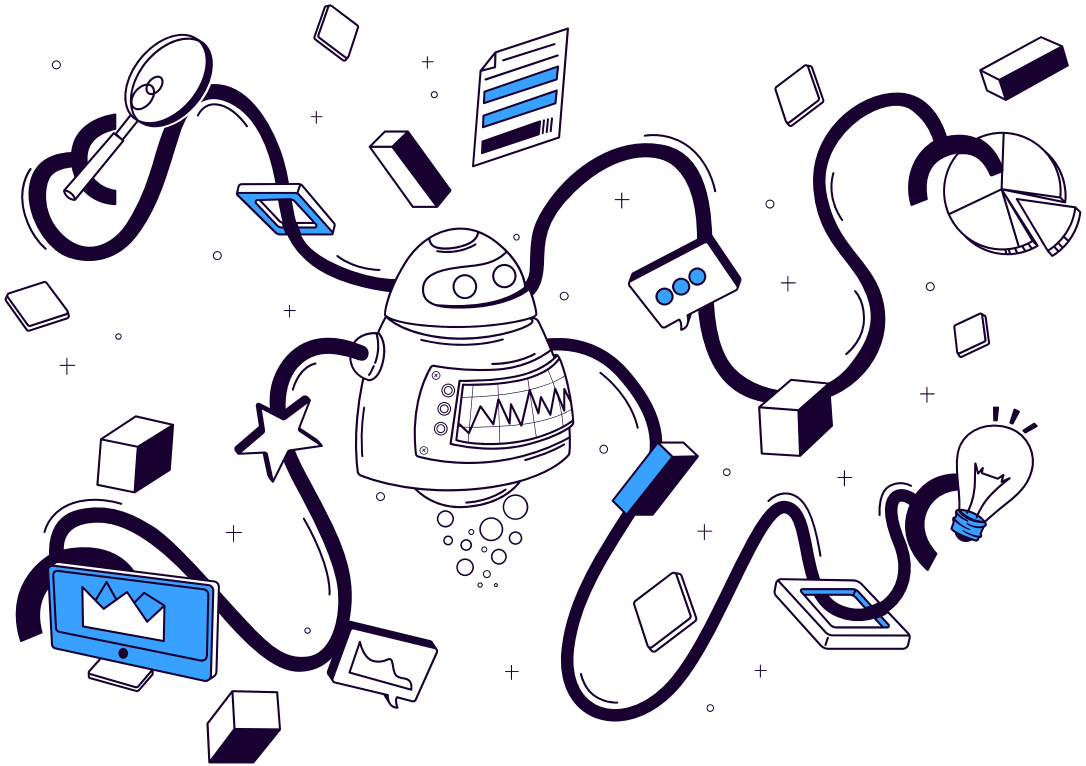
Mainly seniors meaning with more than 10 years of professional experience, considering themselves as having a good understanding of AI for aviation, and saying that their teams detain a medium understanding of AI in Aviation.

Circa 80% work in different technical aviation domains and 20% belong to the National Aviation Authorities.

Working directly with AI-based systems 76,2% (being the biggest group 20% users of AI-based systems).

Feeling quite satisfied with their own work.





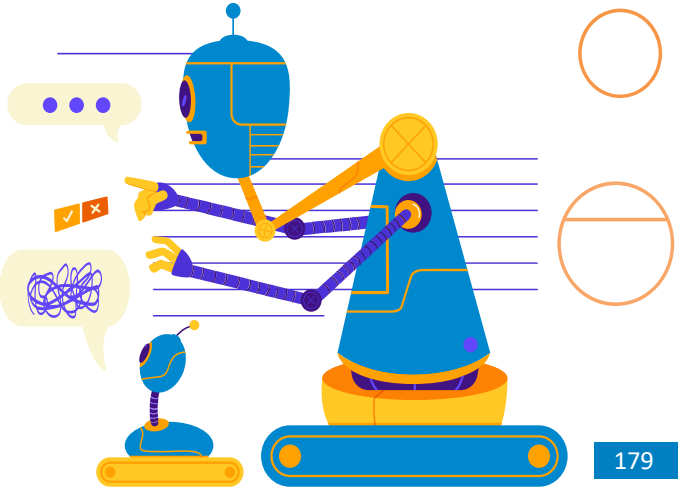
8. What are the next steps?

- Report to be issued end August
- Workshops on Ethics for AI in Aviation (in discussion)
- Survey to the general public to be prepared and launched end 2024/beginning 2025

Thanks!

Axel Werner

Guillaume Soudain



Thanks for your interest
Comments are very welcome

Ines Berlenga
ines.berlenga@easa.europa.eu

EASA
European Union Aviation Safety Agency

Coffee break
15:45 – 16:15

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EASA
European Union Aviation Safety Agency

Please use Slido
& raise your questions

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Discussion Panel
‘AI ethics in Aviation rules’

Moderator

Jesper Rasmussen,
EASA Director - Flight Standards

Speakers

Peter Hecker, TU Braunschweig
Romaric Redon, ANITI
Thomas Krüger, DLR
Fateh Kaakai, Thales
Sergei Bobrovski, Airbus
Ines Berlenga, EASA

Peter Hecker,
TU Braunschweig,
Vice President Research

Data protection and data privacy

- Which data will be involved?
- How (and where) will they be processed and used ?

Change making

- How to pave the way for traceable and responsible data usage?
- How to involve society?

How to implement Open Science in aviation?

- Limited availability of relevant data limits technological progress!
- AI will be even more about “data” … what to do?

Romaric Redon,
ANITI
Director of Operations

EASA
European Union Aviation Safety Agency

ANITI – Toulouse AI Cluster →Performant AND Trustworthy AI 300 researchers 90M€

1. Human Agency and Oversight
   - How human judge machines *C. Hidalgo*
   - Oversight not only by human ! – Out Of Distribution – DEEL OODEEL
2. Technical Robustness and Safety
   - Formal methods, 1-Lipschitz Network – DEEL DECOMON, DEELIP
3. Privacy data protection and Governance
4. Transparency
   - Explainability methods : concept based explainability DEEL XPLIQUE
5. Diversity non-discrimination and Fairness
   - Optimal Transport Fairness measures - *J.M. Loubes*
   - The Moral Machine Experiment – Moral AI – *J.F. Bonnefon*
6. Societal and Environmental well being
7. Accountability

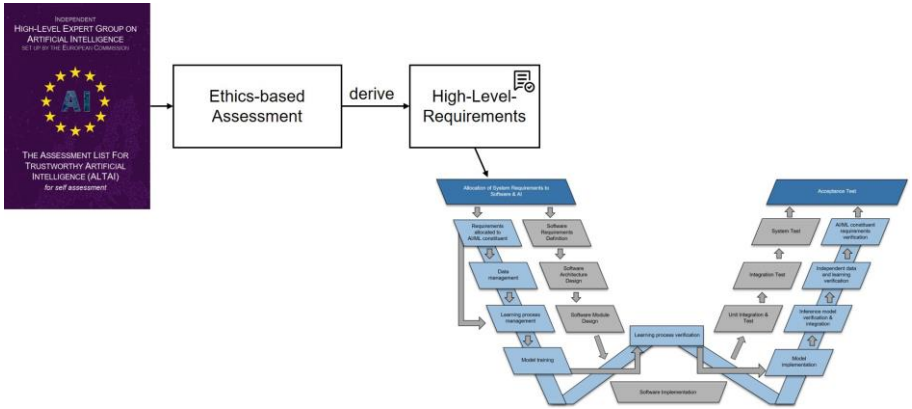
DEEL
DEpendable & Explainable Learning

GEMS-AI
Globally Explaining Models under Stress

Conflicting objectives ahead!

Thomas Krüger,
DLR Institute for AI Safety and Security Deputy Director

- Ethical requirements necessary for the acceptance of AI systems
- What is the right balance with regard to the complexity of AI functions?
- Can we derive more specific guidelines for different AI criticality levels?



Fateh Kaakai,
Thales,
Safety Expert & Researcher on Trusworthy AI,
Co-chair of Eurocae WG-114

- The aviation industry views AI as a powerful technology to enhance the automation of aviation systems, introducing innovation for new services and usages, but also new concerns that may have impact on AI Ethic requirements.
  - Ex. of new service & usage: decision support systems based on deep neural networks for computer vision (Level 1 AI), more native and interactive AI-human collaboration based on advanced NLP models (Level 2 AI), etc.
  - Ex. of new concerns impacting safety: lack of explainability, data & concept drift, etc.
  - Ex. of new concerns impacting security: deepfakes-based attack vector, etc.
- To address applicable AI Ethic requirements, it is important to clearly identify what aspects fall under existing regulations, such as “safety” and “information security”
- Areas not fully covered by existing regulations and standards need to be assessed either using a risk-based approach or a performance-based approach
  - Ensure compliance by design,
  - Align the cost of implementing AI-based systems proportionally with the associated risks and/or performance targets
  - Maintaining an acceptable balance between innovation and ethical requirements

Sergei Bobrovskyi,
Airbus Expert in Artificial Intelligence

- **Should aviation rules embrace AI ethics?**
  - Implicitly always part of consideration in aviation
  - Ethics cannot be circumvented
  - First questions on novel AI tools concern ethics
- **AI ethics is a steering wheel and not a brake**
  - The goal should be to create better products
- **How to implement AI ethics in practice**
  - Investigation of ethics-by-design processes
  - One example is a recent white paper by AI4People
  - Extension of the risk-based approach

Ines Berlenga,
EASA Project Manager ‘Ethics for AI’

Risk of deskilling

- What are the AI specific impacts?
- What are mitigations?

New competences

- Emotional intelligence
- Keeping human autonomy

Responsibility and Accountability

- What are the implications?
- What is the professionals opinion?

Discussion Panel
‘AI ethics in Aviation rules’

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EASA Director - Flight Standards

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Sergei Bobrovski, Airbus
Ines Berlenga, EASA

EASA AI Days : AI ethics in Aviation rules

Q&A session

www.sli.do

#AIDays

Passcode: hmkota

EASA AI Day #1
‘Wrap up and perspectives’

Alain Leroy,
EASA Chief Engineer

EASA AI Days

Thank you for your participation!

Let’s continue the discussion…

Get together @ Gaffel am Dom 19:00 – 23:00

Bahnhofsvorplatz 1 · 50667 Cologne