EASA
European Union Aviation Safety Agency

PART 21 WORKSHOP CERTIFICATION CONFERENCE

SIDE MEETING
Artificial Intelligence in Aviation

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PART 21 WORKSHOP

November 26th 2024

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Workshop Guideline

- **Part I :** EASA AI Roadmap & deliverables overview
- **Part II :** AI-specific requirements to Approved Organisations
- **Part III :** Competence-related requirements to Approved Organisations

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EASA AI Roadmap 2.0

Phase II : consolidation

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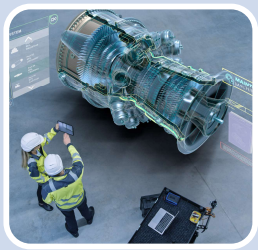
Overview of concrete AI/ML use cases in aviation

Airworthiness and air operations

Visual traffic detection

Computer vision



Maintenance

Visual inspection support

Computer vision

Flight training

Assessment of training performance

Computer vision

ATM/ANS

Conflict Detection and Resolution

Optimisation

+ Natural Language Processing

Aerodromes

Detection of Foreign Object Debris (FOD) on runway

Computer vision

Drones & Innovative Air Mobility

Detection of object on delivery pad

Computer vision

+ Reasoning element for Level 3 AI

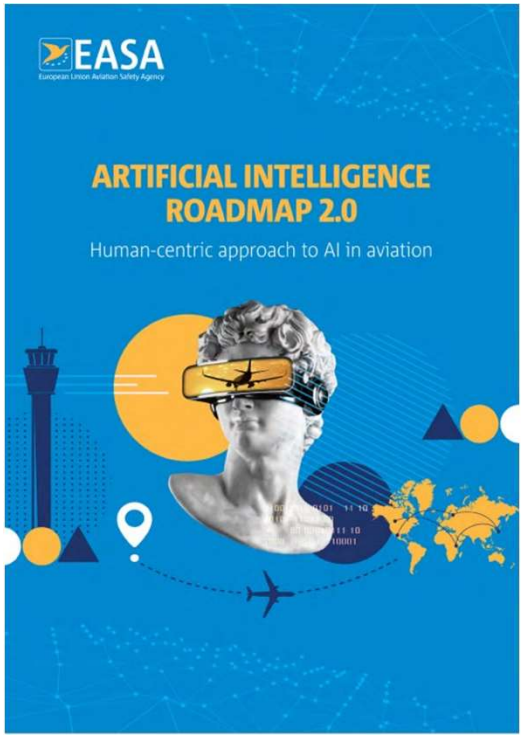
U-space

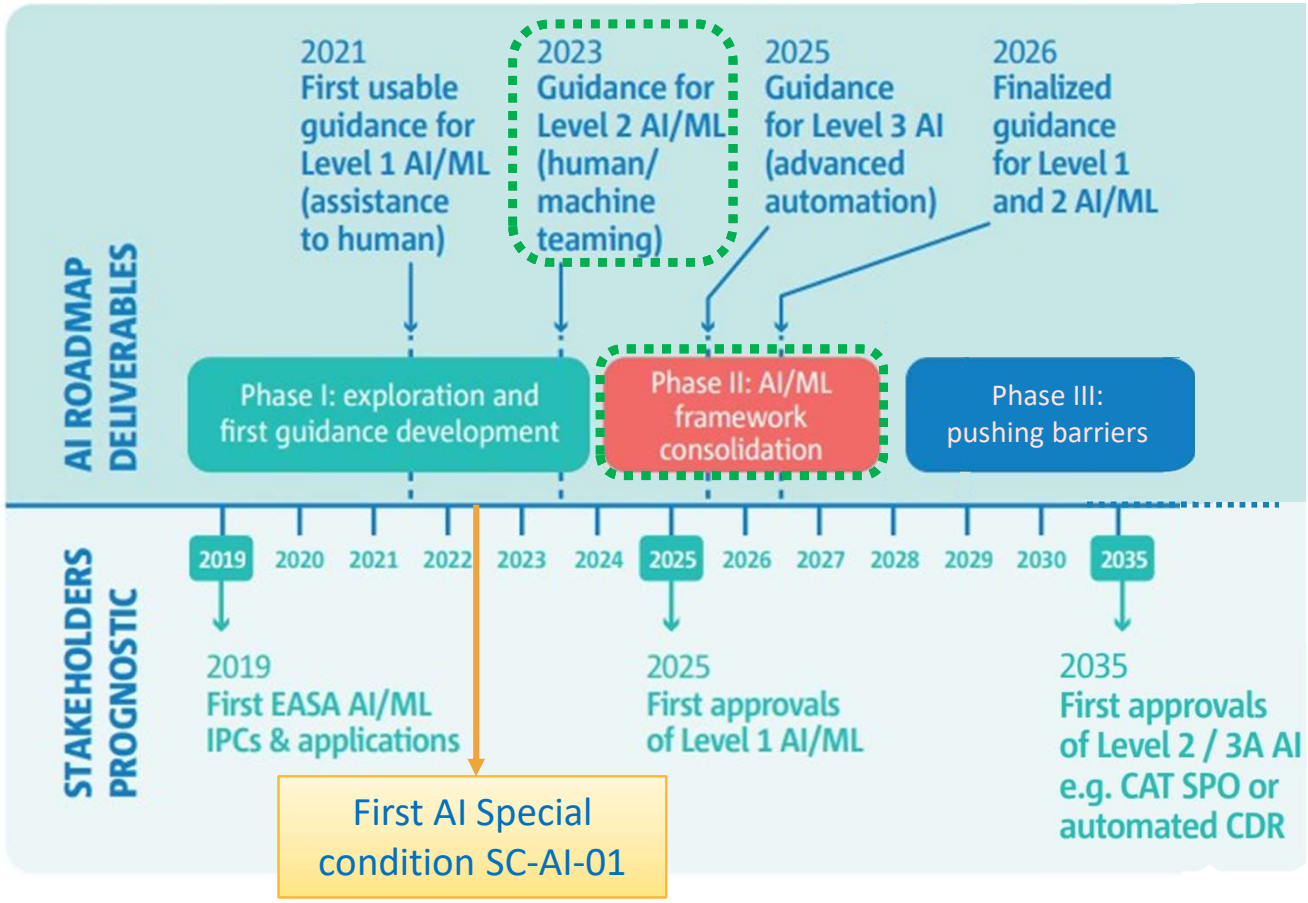
Support to U-space management

Optimisation

AI = Artificial Intelligence ML = machine learning

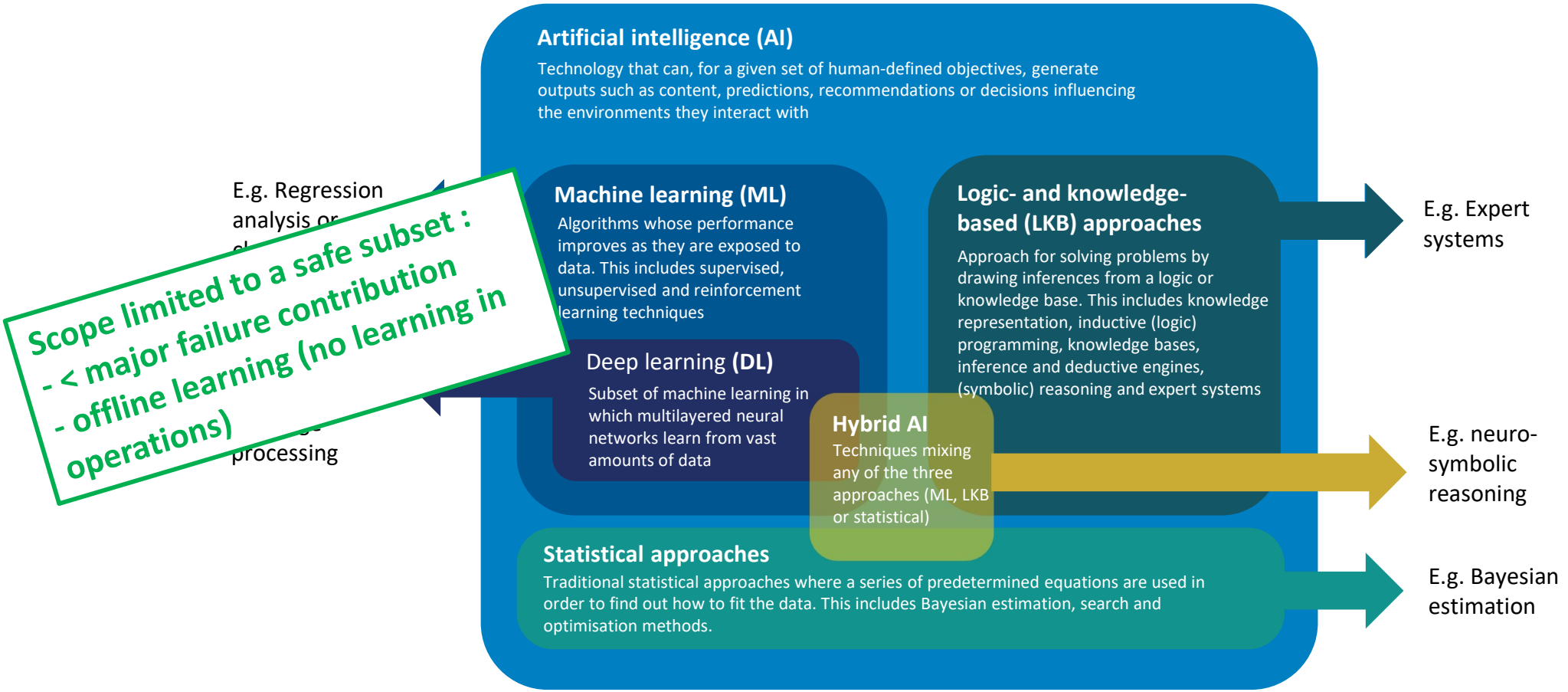
EASA AI Roadmap 2.0: entering consolidation phase





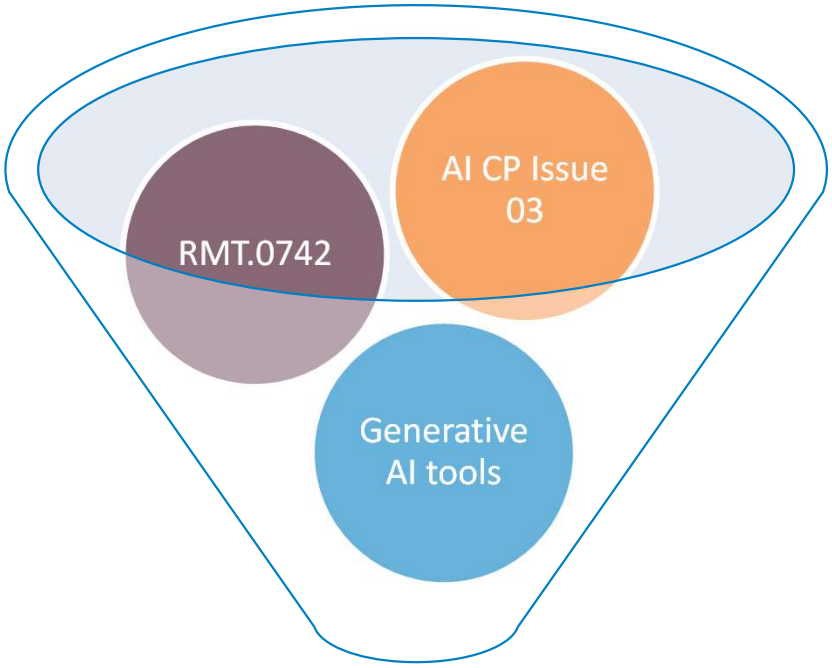
AI = Artificial Intelligence ML = machine learning

Scope of technology covered by Roadmap 2.0



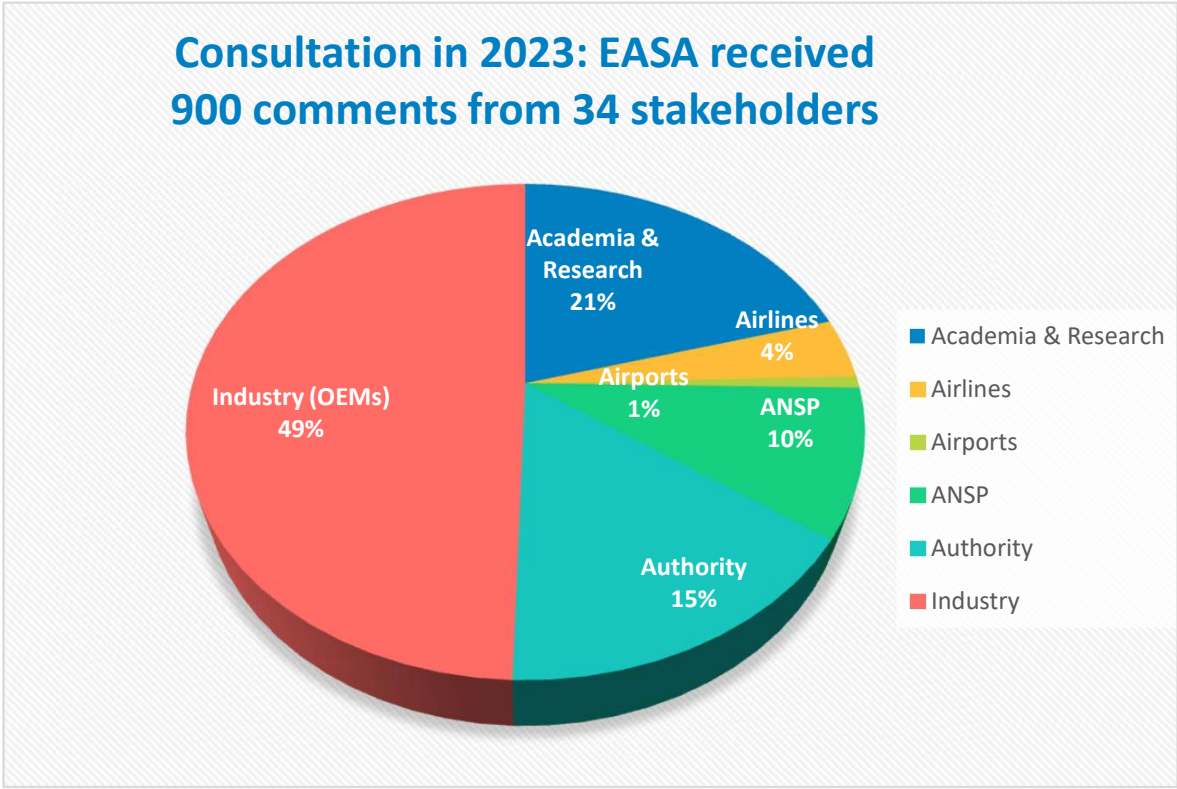
AI Roadmap ‘consolidation phase’ overview

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

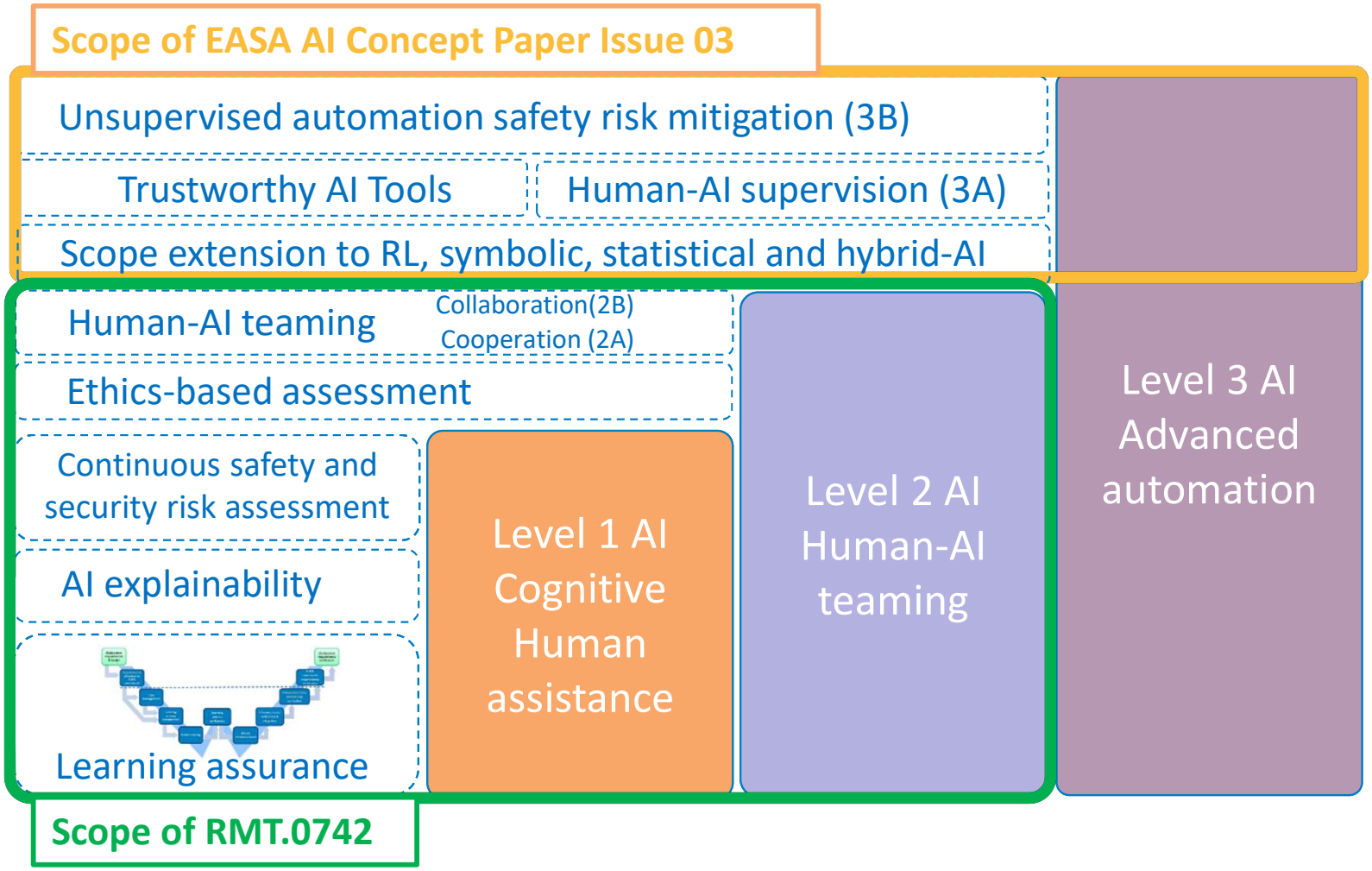


Consolidation Phase II (2024-2027)

EASA AI Concept Paper – Publication of Issue 02

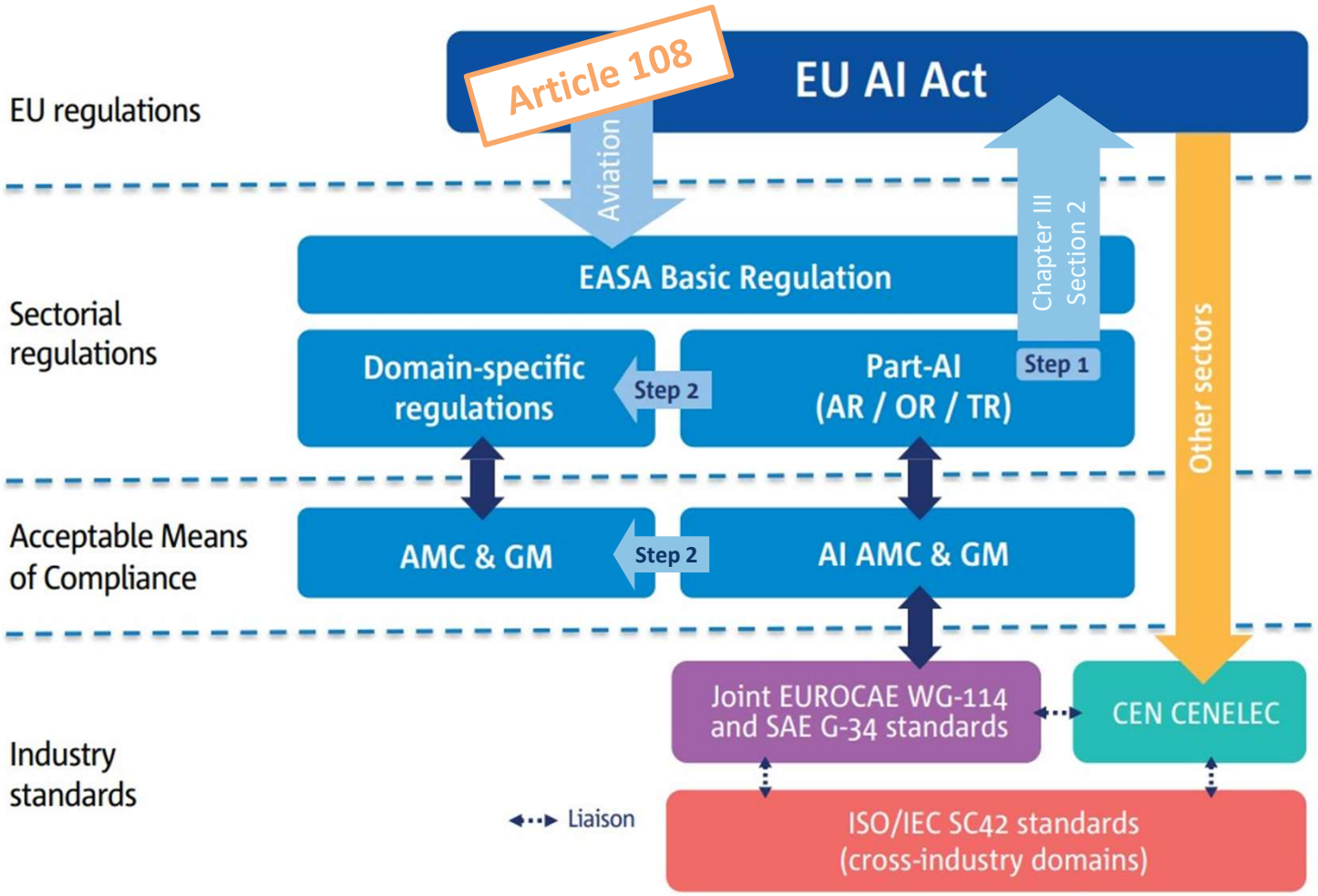


Main AI trustworthiness concepts



EASA Rulemaking plan for AI - EPAS RMT.0742

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



Use of (generative) AI for operational tools

Using public Generative AI

- Providing guidelines for non-sensitive applications

Encapsulated Off-The-Shelf AI

- Enabling requirements for safe, secure and private use of AI for approval of sensitive applications

Developing end-to-end applications

- Mastering the AI/ learning assurance pipeline

Towards a « trustworthy AI tools » label?

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Requirements to Approved Organisations

AI-specific requirements

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Context

- EASA AI Concept Paper Chapter C.6 sets the scene:
  - Prior to obtaining approval of AI applications in the field of civil aviation, organisations that are required to be approved as per the Basic Regulation (Regulation (EU) 2018/1139)
    - **need to introduce adaptations** in order to ensure the **adequate capability to meet the objectives defined within the AI trustworthiness** building blocks
    - and to **maintain the compliance** of the organisation **with the corresponding implementing rules**.
  - The introduction of the necessary changes to the organisation need to follow the process established by the applicable regulations.
    - For example, in the domain of initial airworthiness, the holder of a **DOA would need to apply to EASA for a significant change to its design assurance system** prior to the application for the certification project

Provisions anticipated in the EASA AI Concept Paper

- Chapter C.6 provides, as an example case, more detailed view on the affected processes for holders of a DOA.
  - **Certification processes** need obviously to be adapted
  - Design changes may require **new classification criteria** for AI-based systems
  - **Competence management** need to be adapted considering the new AI technologies and related new roles
  - **DOA scope** would need to reflect the capabilities of the organisation in relation to product certification and to privileges for the approval of related changes….

Design organisation case – anticipated impact

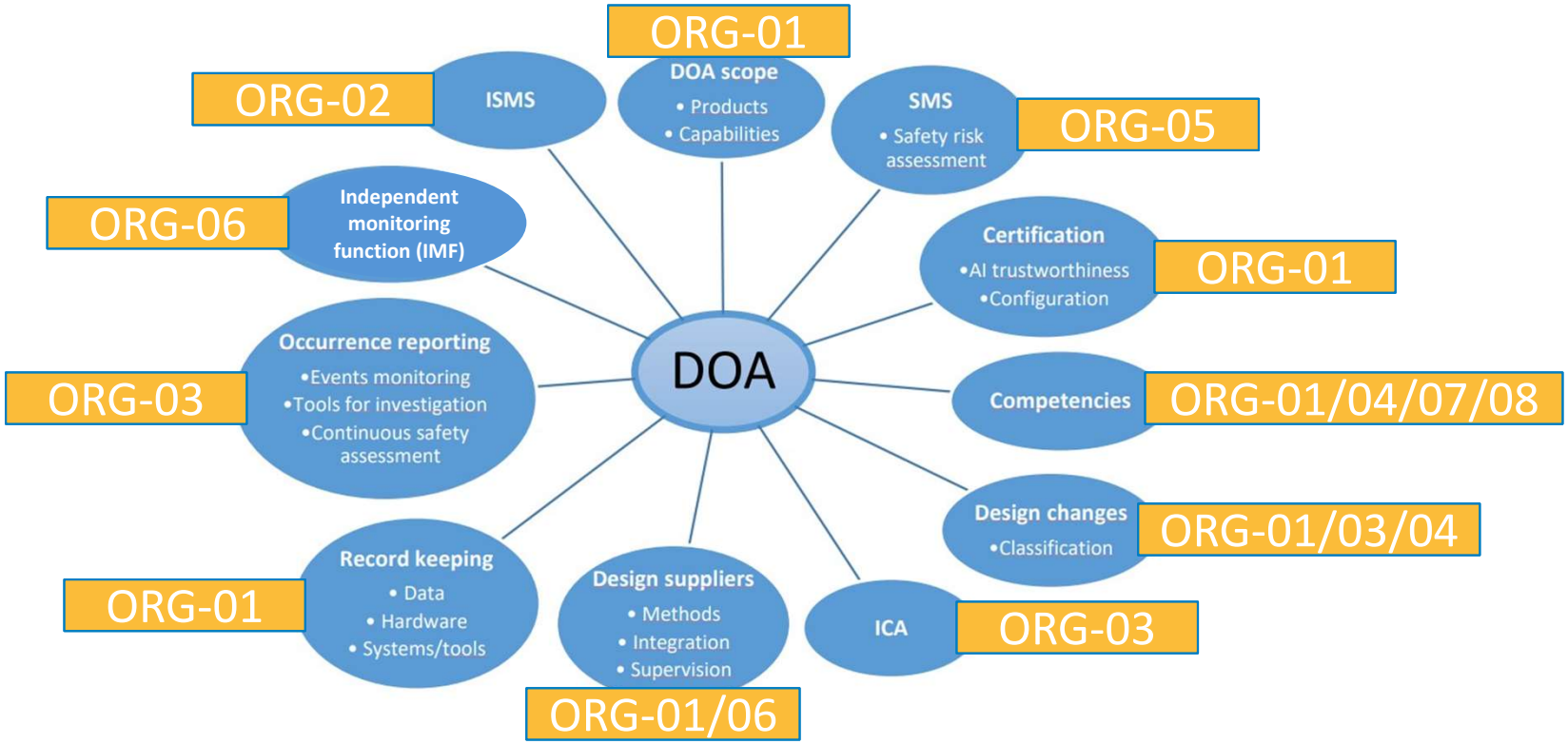


Figure 23 — DOA processes potentially affected by the introduction of AI/ML

ORG-01 - Processes review and adaptation

Provision ORG-01: The organisation should review its processes and adapt them to the introduction of AI technology.

→ This implies adapting processes and procedures to account for the **AI trustworthiness** framework developed in EASA AI concept Paper.

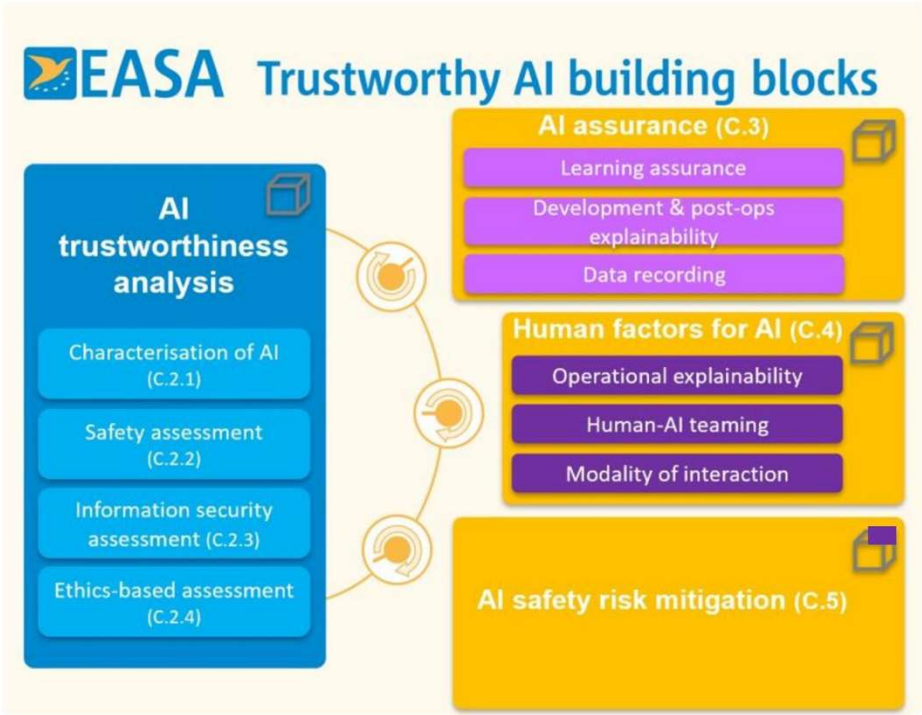
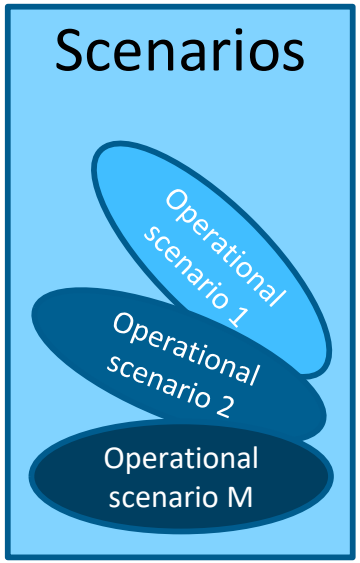
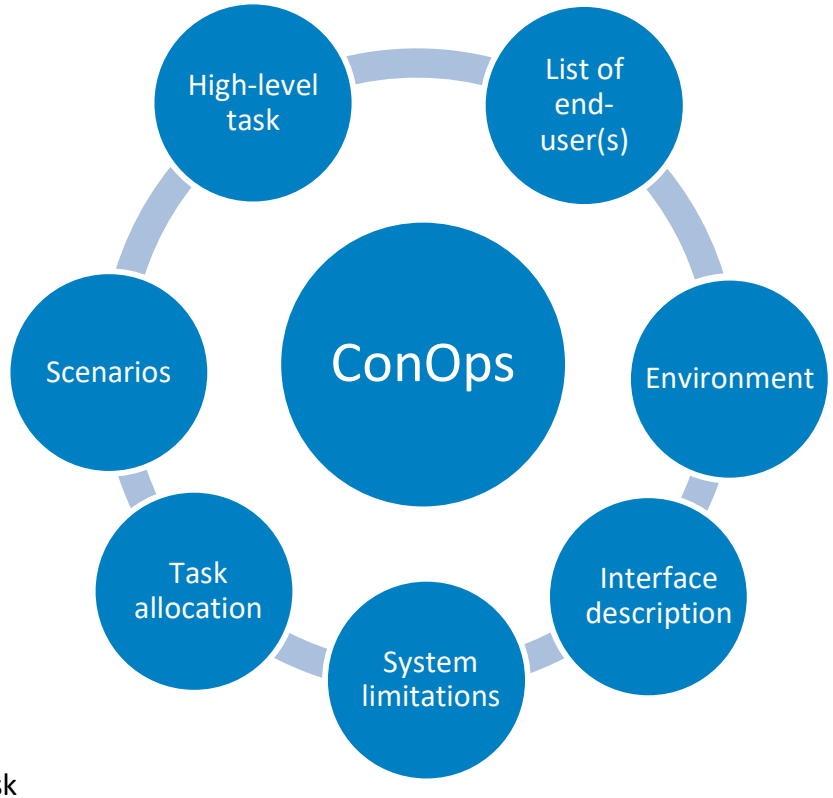
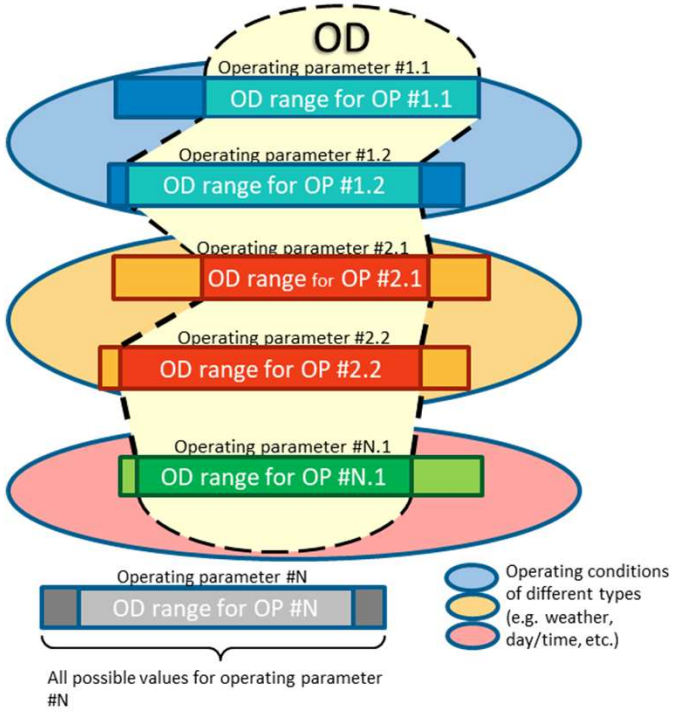


Figure 3 — EASA AI trustworthiness building blocks

Characterisation of the AI application







Definition of scenario:

- in a given environment,
- in response to a triggering event,
- a sequence of actions
- that aims at fulfilling a high-level task

Classification of AI-based systems

No automatic decision-making at high-level task

Increasing Automation with cooperation or collaboration

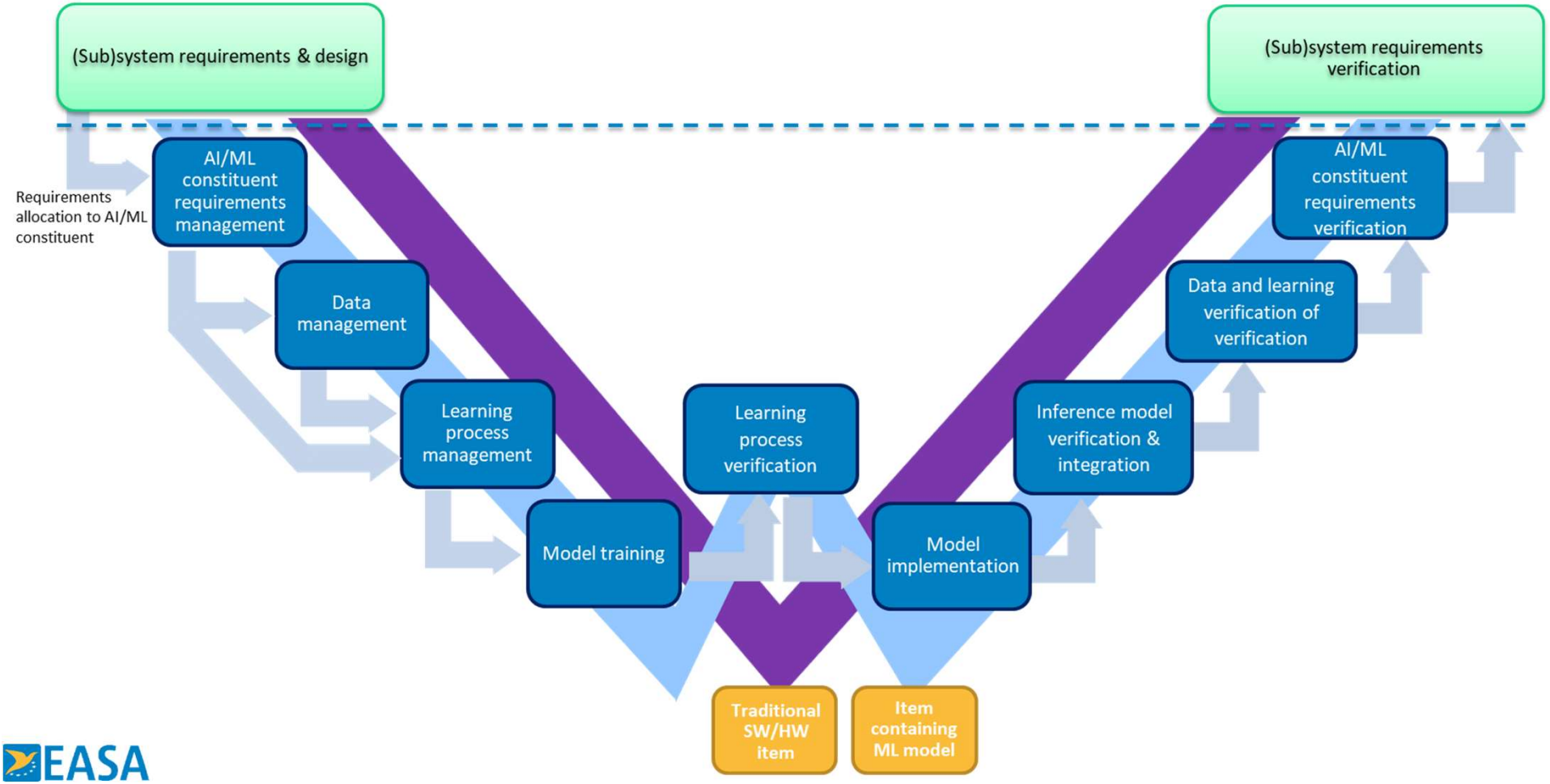
Advanced automation

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	Full
Level 2B Human-AI collaboration	Supervised automatic decision and action implementation	Partial
Level 3A Safeguarded advanced automation	Safeguarded automatic decision and action implementation	Limited, upon alerting
Level 3B Non-supervised advanced automation	Non-supervised automatic decision and action implementation	Not applicable

Ensures mapping to any domain automation scheme (ATM, drones, automotive, railway, medical…), while providing clear boundaries.

Increased authority of the machine

Learning assurance - W-shaped process



ORG-02 – Continuous Information Security

Provision ORG-02: In preparation of the Commission Delegated Regulation (EU) 2022/1645 and Commission Implementing Regulation (EU) 2023/203 applicability, the organisation should continuously assess the information security risks related to the design, production and operation phases of an AI/ML application.

→ This implies adapting processes and procedures to account for specific AI threat scenarios as identified in EASA AI concept Paper.

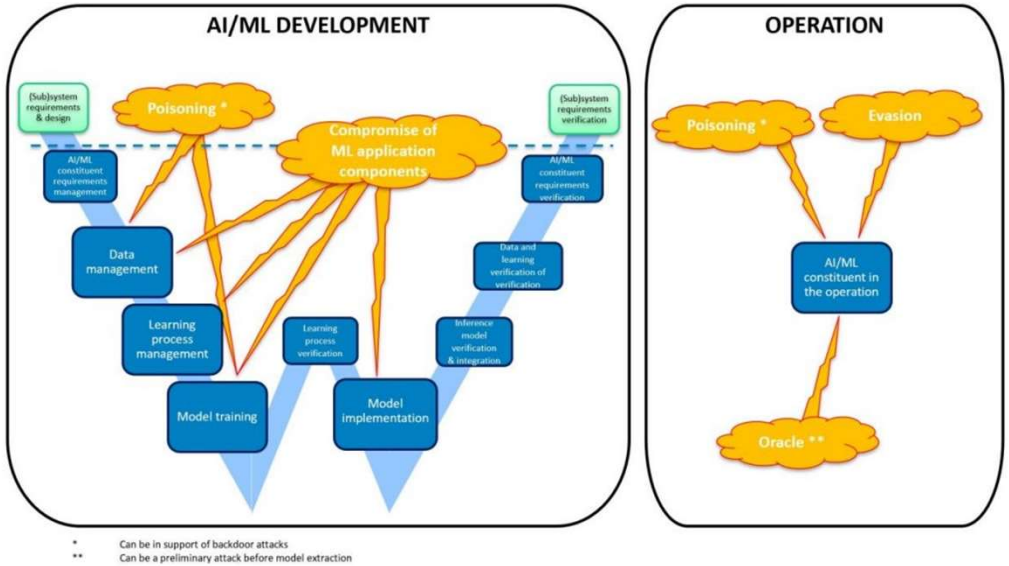


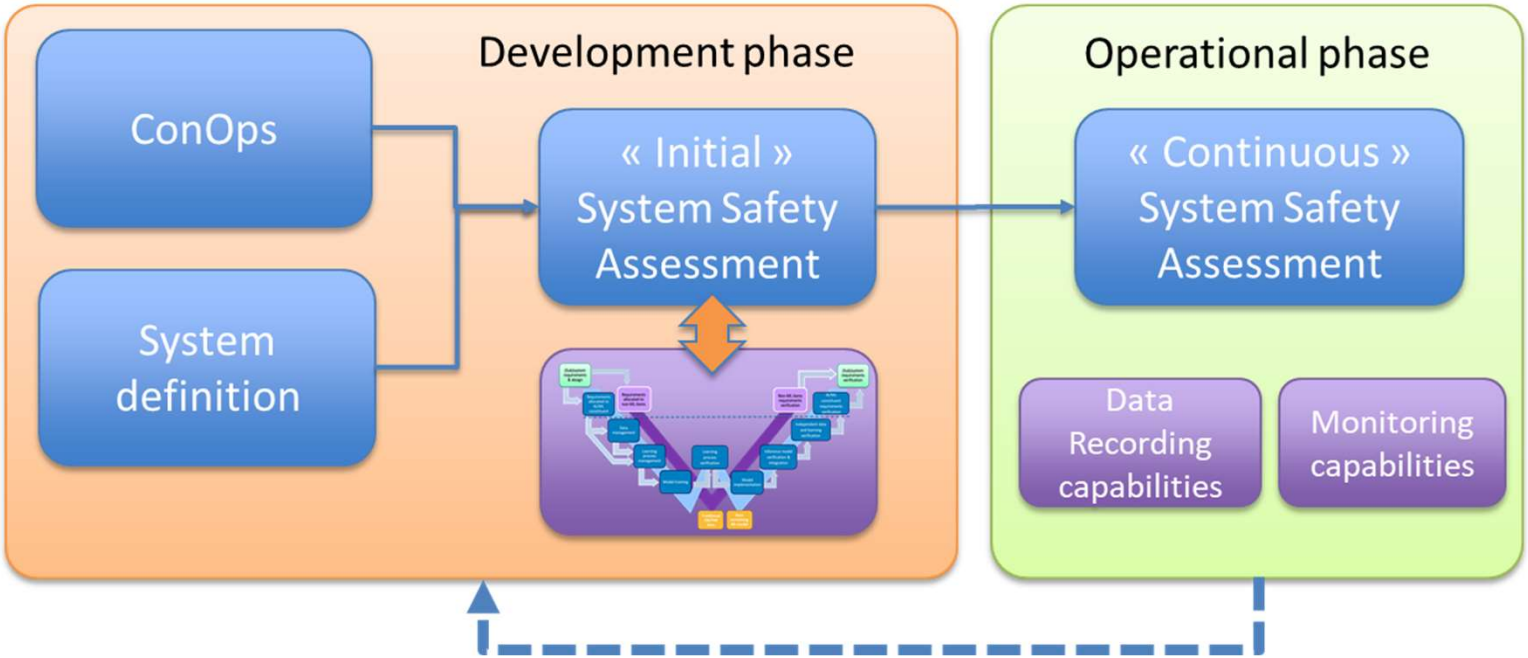
Figure 8 — Threats during the life cycle of the AI/ML constituent

ORG-03 – Continuous Safety Assessment

Provision ORG-03: Implement a data-driven 'AI continuous safety assessment' process based on operational data and in-service events.

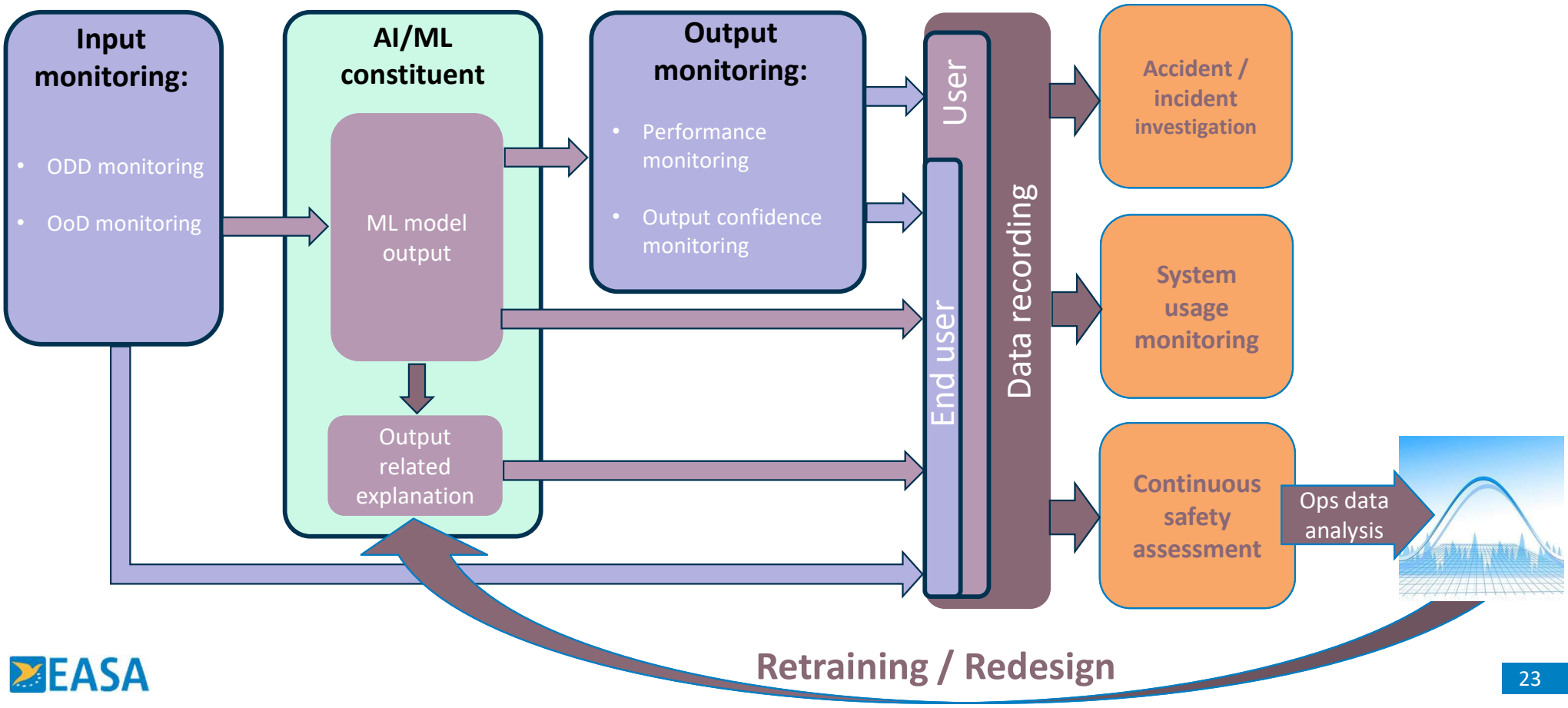
- This implies adapting processes and procedures to account for:
  - AI specific monitoring, identifying in-service events to support detection of potential issues or suboptimal performance trends that might contribute to safety margin erosion
  - Recording of data on safety-relevant areas for the AI-bases systems
  - Analysis to support the identification of in-service risks, based on:
    - The organisation scope
    - A set of safety-related metrics
    - Available relevant data
  - Identification of risks based on interaction with the AI-based system,
    - incorporating the end-users evaluation inputs
  - Resolution of identified events, shorcomings or issues

AI Trustworthiness analysis – Safety Assessment



Initial Safety (Support) Assessment	**Continuous Safety Assessment**
One single objective SA-01 and 8 MoCs	Two new objectives: SA-02 and SA-03.

Continuous Safety Assessment

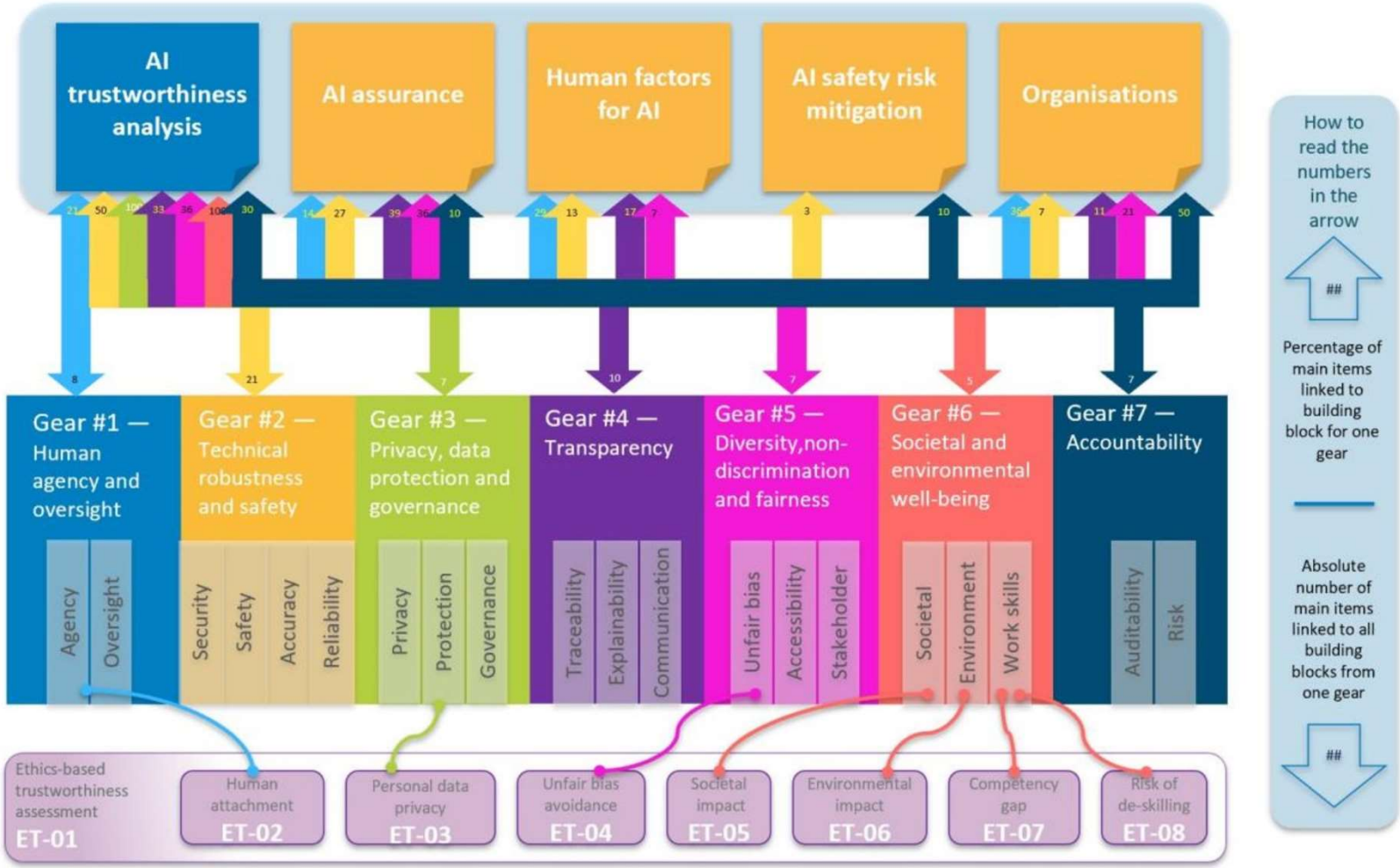


ORG-04 – Continuous Ethics-based Assessment

Provision ORG-04: The organisation should establish means (e.g. processes) to continuously assess ethics-based aspects for the trustworthiness of an AI-based system with the same scope as for **Objective ET-01**.

- In particular, the applicant should put in place:
  - An ethics review board
  - A process to discuss and continuously monitor and assess the AI-based system's adherence to the ethics-based assessment guidance

Ethics-based assessment – overall framework



ORG-05 – Continuous Risk Management

Provision ORG-05: The organisation should adapt the continuous risk management process to accommodate the specificities of AI, including interaction with all relevant stakeholders.

- In particular, the applicant should put in place a process for third parties (e.g. suppliers, end users, subjects, distributors/vendors or workers) to report potential vulnerabilities, risks or bias in the AI-based system.
- This relates in particular to Safety Management System (SMS) but anticipates also the impact of the AI-specific Safety Risk Management building block (residual risk assessment and independent oversight).

ORG-06 – AI auditability

Provision ORG-06: The organisation should ensure that the safety-related AI-based systems are auditable by internal and external parties, including especially the approving authorities.

→ This requirement build on all of the previous provisions, and to a wider extent to all requirements from the AI trustworthiness framework.

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Requirements to Approved Organisations

Competence requirements

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Competence considerations for AI trustworthiness

- Along with the advantages coming from the progress in AI/ML technology, **new areas of threats become active**, and it is essential to give consideration to **training as a means of mitigation to the threats related to the lack of awareness** on AI-based system features.
- It is important that **every actor in the chain of design, production and operation of aviation systems using AI-based technology receives appropriate information** on all topics related to the AI trustworthiness framework and requirements.
- At organisation level, **each type of organisation should review the threats** connected with the use of AI pertaining to the scope activity and develop initial and recurrent programmes aimed to build awareness of their personnel on such topics.
- **The awareness training should be delivered to all users** (all levels of personnel, including top management), to ensure the correct approach to the introduction of AI-based technology in the organization.

ORG-07 & 08 – Training and licensing

Provision ORG-07: The organisation should adapt the training processes to accommodate the specificities of AI, including interaction with all relevant stakeholders (users and end users).

Provision ORG-08: The organisations operating the AI-based systems should ensure that end users' licensing and certificates account for the specificities of AI, including interaction with all relevant stakeholders.

- In particular, the applicant should put in place for all identified users and/or end users:
  - the competencies needed to deal with the AI-based systems;
  - the adaptations to the training syllabus to take into account the specificities of AI.

Further brainstorming

→ Any requirements missing for adapting DOAs to AI deployment?

→ Any other debate or consideration?

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SIDE MEETING HIGHLIGHTS
Artificial Intelligence in Aviation

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EASA

Certification Conference

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HIGHLIGHTS - Side meeting on AI (Group 1)

Process adaptations (ORG-01)	Continuous IS (ORG-02)	Continuous SA (ORG-03)	Continous Ethics (ORG-04)
Issue	Issue	Issue	Issue
Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit
Continuous Risk Mgt (ORG-05)	**AI auditability (ORG-06)**	**Training & Licensing (ORG-07 & 08)**	**Miscellaneous**
Issue	Issue	Issue	Issue
Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit

HIGHLIGHTS - Side meeting on AI (Group 2)

Process adaptations (ORG-01)	Continuous IS (ORG-02)	Continuous SA (ORG-03)	Continous Ethics (ORG-04)
Issue	Issue	Issue	Issue
Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit	Outcome: Lorem ipsum dolor sit amet, consectetuer adipiscing elit
Continuous Risk Mgt (ORG-05)	**AI auditability (ORG-06)**	**Training & Licensing (ORG-07 & 08)**	**Miscellaneous**
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Involved panels

→ The review of compliance to the AI trustworthiness framework requires a cross-discipline team of Experts rather than a specific AI panel:

Requirement	Topic	Panel
SC-AI-01.01	Concept of Operations and OD	1 + 6
SC-AI-01.02	AI Level classification	1 + 6
SC-AI-01.03	Safety Assessment	12
SC-AI-01.04	Information Security	6
SC-AI-01.05	Ethics-based Assessment (L2+)	1 (TBD)
SC-AI.01.06	ODD and AI Assurance	10
SC-AI.01.07	Continuous Safety Assessment	12 + 6 + 10
SC-AI.01.08	AI Explainability	1 + 6 + 10
SC-AI.01.09	Human factors for AI (L2+)	1