

EASA Concept Paper for AI

HUMAN AI Teaming and moving from
Level 1A to 2B

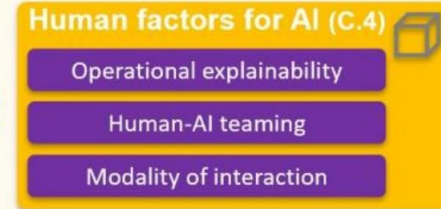
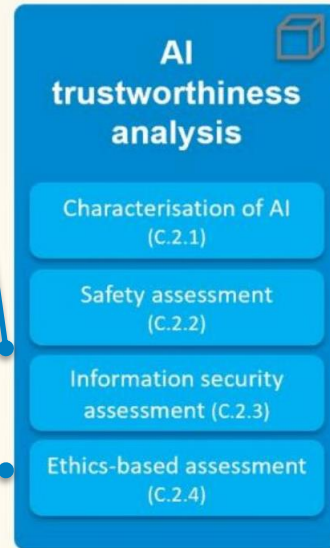
Or... 2B or not 2B... is that a question ?



EASA AI trustworthiness framework



EASA Trustworthy AI building blocks



AI classification scheme

- EASA describes three general AI levels
 - Based on industry regarding the types of use cases foreseen by AI-based systems,
 - Considering a staged approach that industrial stakeholders are planning for the deployment of AI applications,
 - Starting with **assisting functions** (Level 1 AI), then making a step towards more **human-AI teaming** (Level 2 AI) and at last seeking for **advanced automation** of the machine (Level 3 AI).

| Level 1 AI : assistance to human | Level 2 AI : human-AI teaming | Level 3 AI : advanced automation |
|--|---|---|
| <ul style="list-style-type: none">• Level 1A: Human augmentation• Level 1B: Human cognitive assistance in decision and action selection | <ul style="list-style-type: none">• Level 2A: Human and AI-based system cooperation• Level 2B: Human and AI-based system collaboration | <ul style="list-style-type: none">• 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. |

AI Classification scheme

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

Increasing authority of the machine

AI classification scheme

Anticipated MOC

- **Anticipated MOC-CL-01-2:** The following considerations support the delineation of boundaries between ‘AI levels’:
 - The boundary between level **1A** and level **1B** is based on the notion of decision-making.
 - Level **1A** covers the use of AI/ML for treating the information captured (by sensors for example) and presented to the end user for the purpose of augmenting human end-user perception and cognition.
 - Level **1B** addresses the step of support to decision-making, i.e. the process by the human end user of selecting one course of actions among several.
 - The boundary between level **1B** and level **2** is on the distinction between **support to decision-making** and **automatic decision-making and action implementation**
 - Level **1B** – Offers the choice of proceeding with a landing when reaching decision height or going around.
 - At level **2A** The system makes the choice but the pilot retains the right to override.

| 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 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 |

AI classification scheme

Anticipated MOC

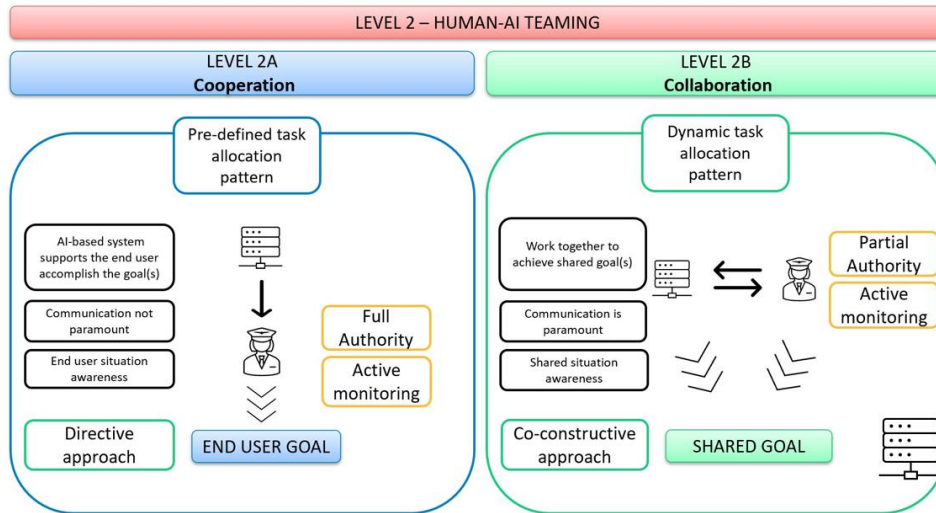
→ Anticipated MOC-CL-01-2 (continued):

- Both levels **2A** and **2B** imply the capability of the AI-based system to undertake automatic decision-making and action implementation,
- Level **2B** AI-based systems take over some authority on decision-making, to share situation awareness and readjust task allocations in real time
 - e.g. virtual co-pilot in a reduced-crew operation aircraft; the pilot and the virtual co-pilot share tasks and have a common set of goals under a collaboration scheme
- The boundary between level **2B** and level **3A** lies in the high level of authority of the AI-based system and the limited oversight that is performed by the end user of the AI-based system.
 - In Level **2A and 2B** the end user retains the ability to **intervene** in every decision / action implementation of the AI-based system,
 - In level **3A** applications, the ability to **override** the authority of the AI-based system is **limited** to where it is necessary **to ensure safety** of the operations.

| AI level | Function allocated to the system to contribute to the overall task | Authority of the end user |
|--|---|---------------------------|
| Level 1A Human augmentation | Automation support to information acquisition 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 |
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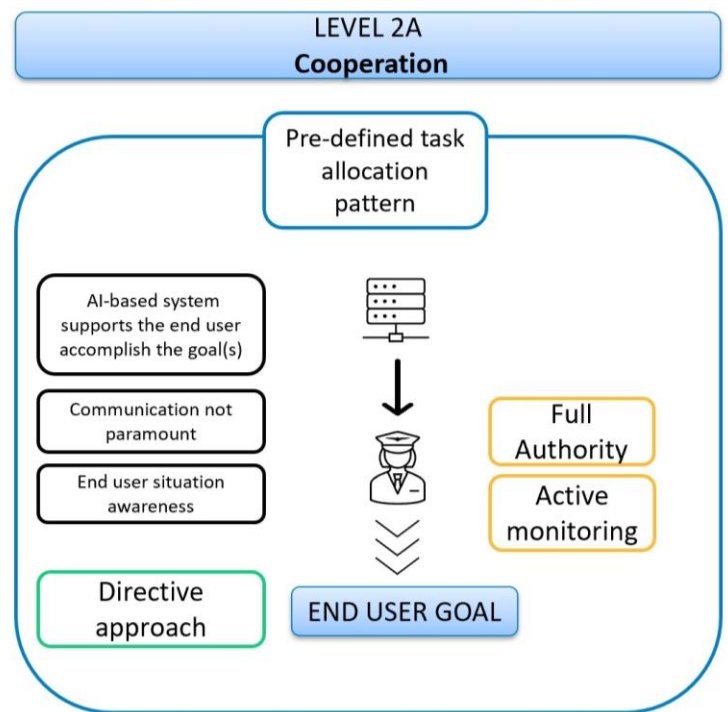
Human-AI teaming –Key aspects

- Human-human teams will become human – AI teams
- **Cooperation** – end user objectives and goals
- **Collaboration** – common goal



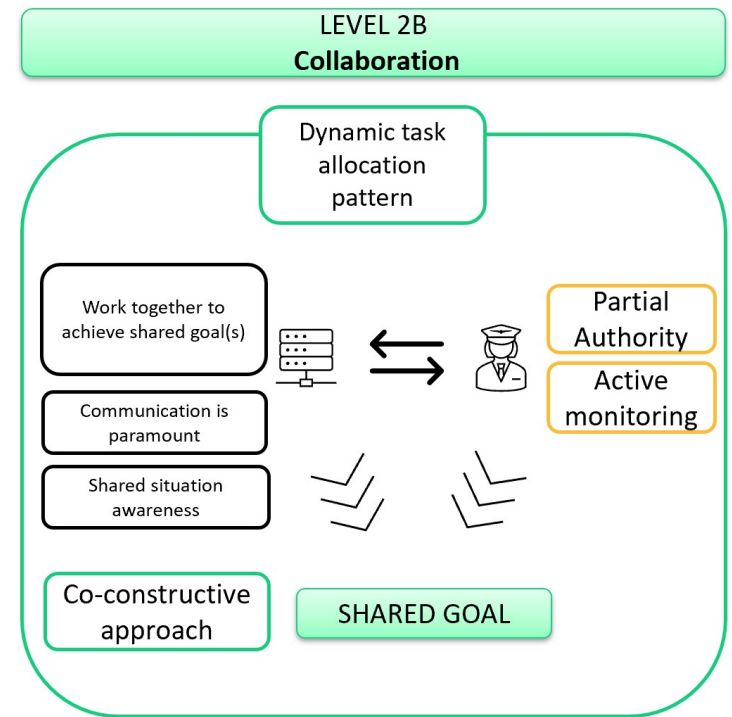
Cooperation - Level 2A

- Cooperation is a process in which the AI-based system works to help accomplish the end user's goal.
- The AI-based system works according to a predefined task allocation pattern with informative feedback to the end user on the decisions and/or actions implementation.
- The cooperation process follows a directive approach.
- Cooperation does not imply a shared situation awareness between the end user and the AI-based system.
- Communication is not a paramount capability for cooperation.



Collaboration - Level 2B

- Collaboration is a process in which the end user and the AI-based system work together and jointly to achieve a predefined shared goal and solve a problem through co-constructive approach.
- Collaboration implies the capability to share situation awareness and to readjust strategies and task allocation in real time.
- Communication is paramount to share valuable information needed to achieve the goal.

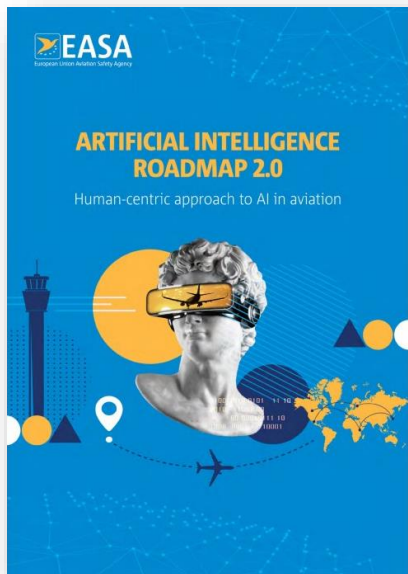


The Allocation Pattern & Scheme

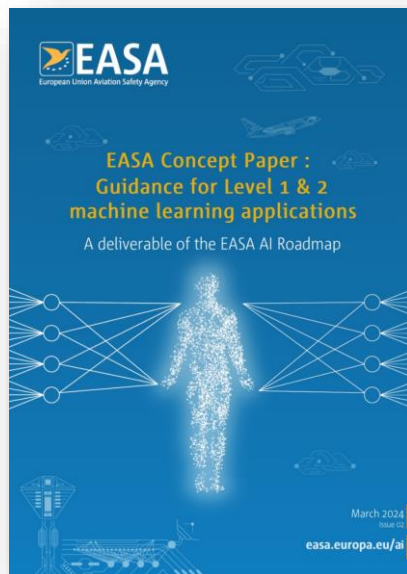
- An allocation pattern refers to the set of tasks that are allocated to the AI-based system at a specific time
- The allocation pattern will constrain the use of flight control systems to either flaps or throttle or airbrakes at any one time.
- Allocation schemes refer to the overall envelope of tasks which can be allocated to either the end user or the AI-based system
- An allocation scheme could be 'flight control systems' which would include; throttles, flaps and airbrakes.

Both for Level 2A and 2B the allocation scheme is fixed. The allocation pattern within **2A is predefined**, whereas within Level **2B it is dynamic**, that is the schemes can be moved between as the situation and context demands without reference to the human.

EASA documentation on AI




<https://www.easa.europa.eu/en/document-library/general-publications/easa-artificial-intelligence-roadmap-20#group-easa-downloads>



<https://www.easa.europa.eu/en/document-library/general-publications/easa-artificial-intelligence-concept-paper-issue-2#group-easa-downloads>



<https://www.easa.europa.eu/en/research-projects/machine-learning-application-approval#group-downloads>

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|--|-------------------|---|
|  European Union Aviation Safety Agency | Special Condition | Doc. No. : SC-AI-01 |
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| | | Proposed <input type="checkbox"/> Final <input checked="" type="checkbox"/> |
| | | Deadline for comments: N/A |

<https://www.easa.europa.eu/en/document-library/product-certification-consultations/final-special-condition-sc-ai-01#group-easa-downloads>

