> INTELLIGENT ASSISTANTS IN AVIATION

Augmenting to Achieve



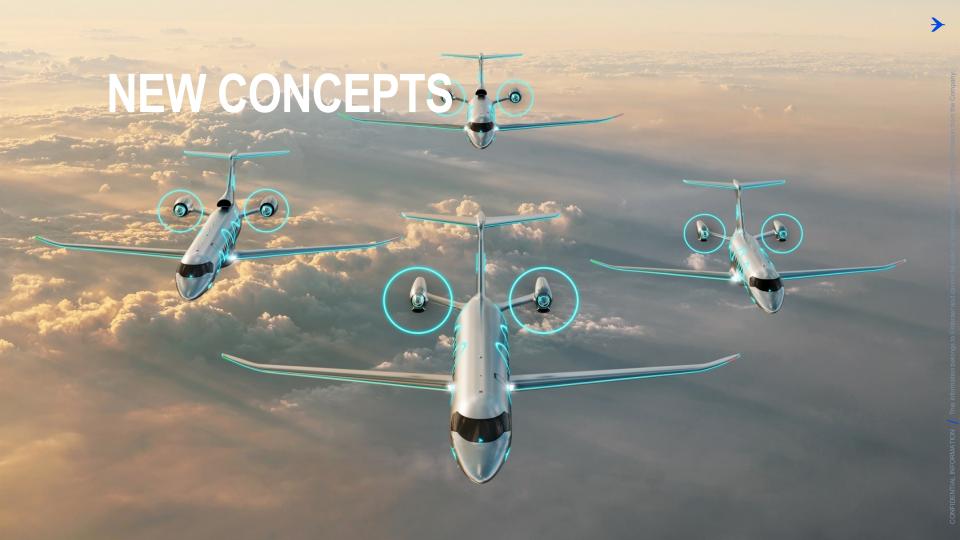


DISCLAIMER Ø Ø 🛱

PRIVATE INFORMATION: This presentation contains information for internal corporate use. For this reason, it must be limited to the Embraer internal public (employees, partners, and third parties) and must not be disclosed in the partial or total form to the external public. Screenshots or photos of this material are not allowed. If needed, a copy of this content must be requested to the responsible person in Embraer.

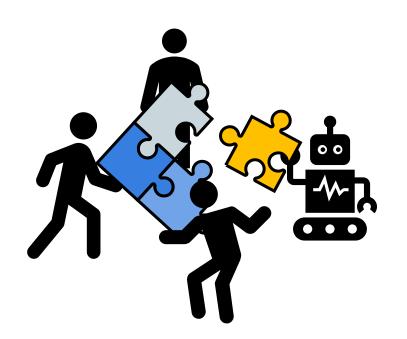
Some images in this document were captured before the Covid-19 pandemic, showing people without masks and in crowded situations.







WHAT IS "INTELLIGENT ASSISTANT"



Al enabled entity able to contribute to the human cognitive abilities.

VALUE IN ASSISTANCE

- Safety improvement
- Operational Effectiveness and Efficiency
- New Operational Paradigms

HOW?

- Situational Awareness Increase
- Release of human cognitive resources
- Improved focusing
- Increased understanding

DESIGN PHILOSOPHY



SAFE

ETHICAL

TODAY: AUTOMATED ASSISTANCE



Additional **surveillance**, enhanced **situational awareness** and **peace of mind** during the most crucial stage of flight

AUGMENTATION:

- Aircraft energy monitoring
- Clear picture of landing conditions
- Clear instructions to avoid overrun



FUTURE: TEAMING-UP?

ADAPTION

Adjustment of strategies & behaviours in response to changes in circumstances¹

COORDINATION

Organization of knowledge, skills & behaviours to meet a goal¹

TEAMWORK COMPETENCIES1

COMMUNICATION

Information exchange between teammates¹

UNIDIRECTIONAL

Effective presentation of Perception/Analysis/ Recommendation output

NAL TRANSPARENT

Explanations allow teammate to comprehend agent's plans, performance, reasoning and/or intent.

Bi-directional communication may be

established

TEAMMATE MODELING

Recognition/anticipation of teammates' intentions, goals, and likely behaviours

SITUATION FRAMING

Recognition/anticipation of events that demand changes in strategy or task allocation

CONTEXT KNOWLEDGE

Inference of information/ action relevance & timeliness contributes to behaviour effectiveness

DETECTION OF CONTEXT CUES

Inference of teammate
knowledge & behaviour
improves actions synchronisation,
and improves task sharing/transferring

FLUENT

Teammate information acquisition, intent capture, inference of teammate comprehension of received information, turn-taking improves bi-directional communication

FUTURE: TEAMING-UP?

ADAPTION

Adjustment of strategies & behaviours in response to changes in circumstances1

COORDINATION

Organization of knowledge, skills & behaviours to meet a goal¹

TEAMWORK COMPETENCIES1

COMMUNICATION

Information exchange between teammates¹

UNIDIRECTIONAL

Effective presentation of Perception/Analysis/ Recommendation outr

TRANSPARENT

Explanation allow teammate to enend agent's plans, performance, reasoning and/or intent.

CONTEXT

KNOWLEDGE

Inference of information/

action relevance &

timeliness contributes to behaviour effectiveness

Bi-directional communication may be established

TEAMMATE MODELING

Recognition/anticipation of teamr ates' intentions, goals, and likely be' aviours

SITUATION FRAMING

Recognition/anticipation of events that demand changes in strategy or task docation

DETECTION OF CONTEXT CUES

Inference of teammate knc liedge & behaviour improves actions synchronisation, and improves task sharing/transferring

FLUENT

Teammate information acquisition, intent capture, inference of teammate comprehension of received information, turn-taking improves bi-directional communication

HUMAN-AI TEAM (HAT) CHALLENGES

- Socio-technical challenges in the life cycle
- Integration into "living" Systems of Systems
- New Operations and Sustaining: Human Centred Concept and Development

OPERATING WITH HAT

COOPERATION

COLLABORATION

TASK ALLOCATION

EFFECTIVE HAT USER TRAINING

DYNAMIC TASK **SHARING**

HUMAN-MACHINE

MODELS

ALIGNEMENT

OPERATIONAL XAI

CONTEXT **PERCEPTION**

CONTEXT **ADAPTIVENESS**

SHARED SITUATIONAL **AWARENESS**

HANDLING FAILURES

> **ROBUST & FLUID** INTERACTION MODES

INTENT COMMUNICATION **HAT CRM**

EFFECTIVE NEGOTIATION

CREATING HAT

- Metrics: effectiveness, performance (Human, AI)
- Architecting: trade-offs, attribution, design
- HAT Requirements: e.g., XAI, trust calibration, data, Human SKA
- Al risk analysis: tools, methods, approaches
- V&V: HITL, processes

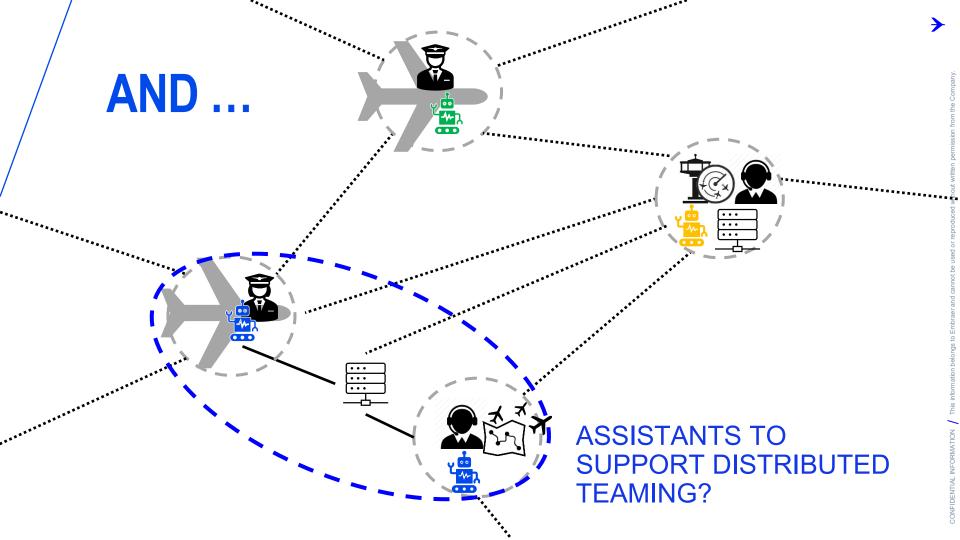
EVOLVING HAT

- Governance of learning systems
- Transitioning new roles, co-existence
- Monitoring and managing for emerging unknownsunknows (black swans)
- Evolving Safety Management System

AND ...



PILOT + ASSISTANT: LOCAL HAT



FINAL THOUGHTS

- Promising world: flexibility and complexity management
- Challenges at all system levels: the "product", the life cycle, transition
- Crawl, Walk, Run, Fly...
 - before being able to "team", we need proper "assistant capability"
 - but!, "assistant capability" must be driven by teaming needs.

TEAMMATES CAPABILITIES...



Illus. in: Thomas Dilworth, A New Guide to the English Tongue, Part IV?, 17, p. 209



Detail of "Cats Suggested As The Fifty-three Stations of the Tōkaidō", Utagawa Kuniyoshi, 1850

FOOD FOR THOUGHT....

"We become what we behold. We shape our tools and then our tools shape us."

Marshall McLuhan



THANK YOU