



aerodays2015

Aviation in Europe – Innovating for Growth

The 7th European Aeronautics Days



L O N D O N



20 – 23 OCTOBER 2015

Applying
Pilot
Models
for
Safer
Aircraft



A-PiMod



Motivation

Fundamental goal: Improve aviation safety

Human errors cause 60-80% of aviation accidents

Flightpath 2050
Europe's Vision
for Aviation

Report of the High Level Group
on Aviation Research

“Reduce occurrence and impact
of human error...

through technologies that support
decision making”

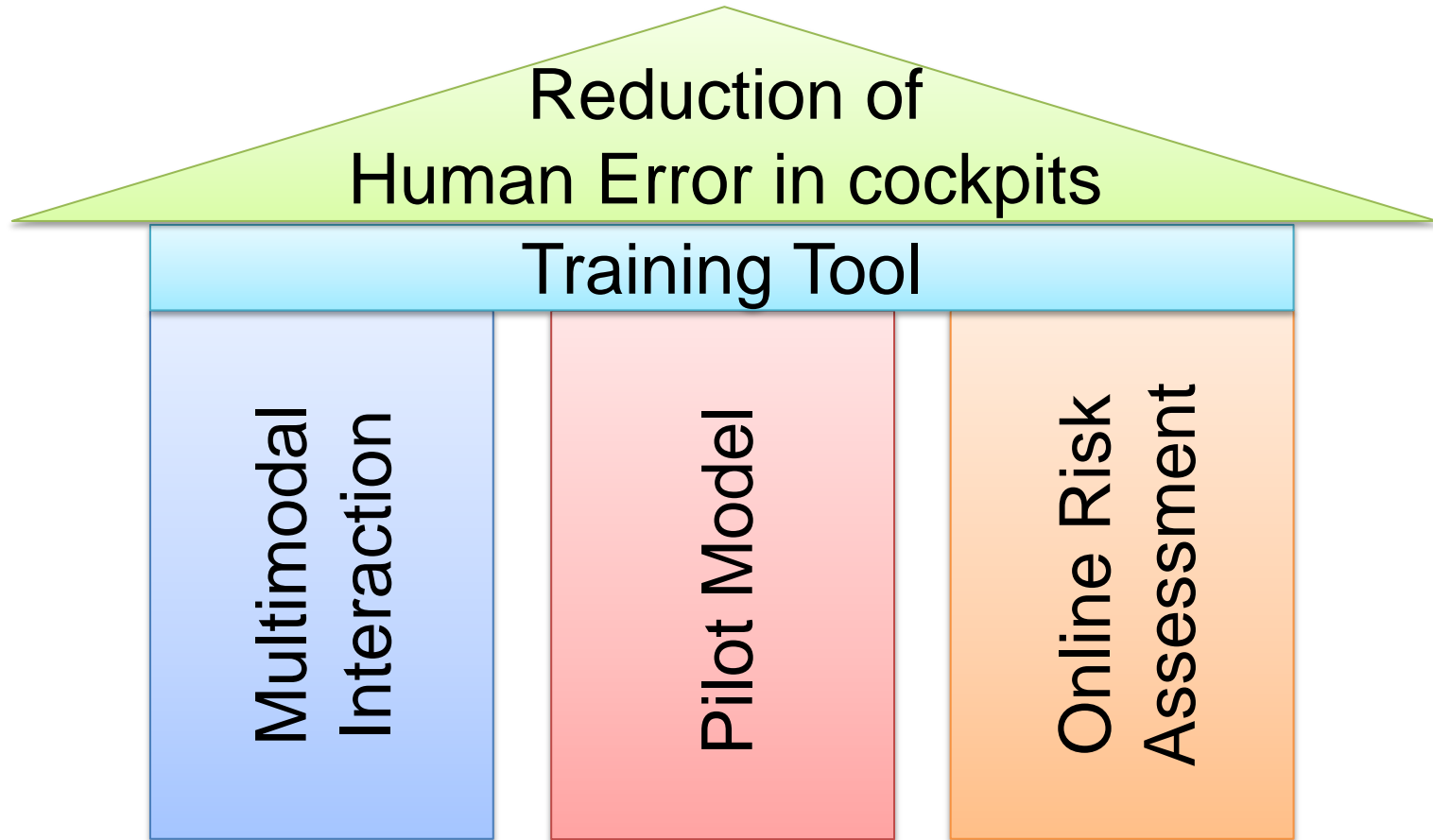
A-PiMod Solution for Airliner Cockpit



Assistance should

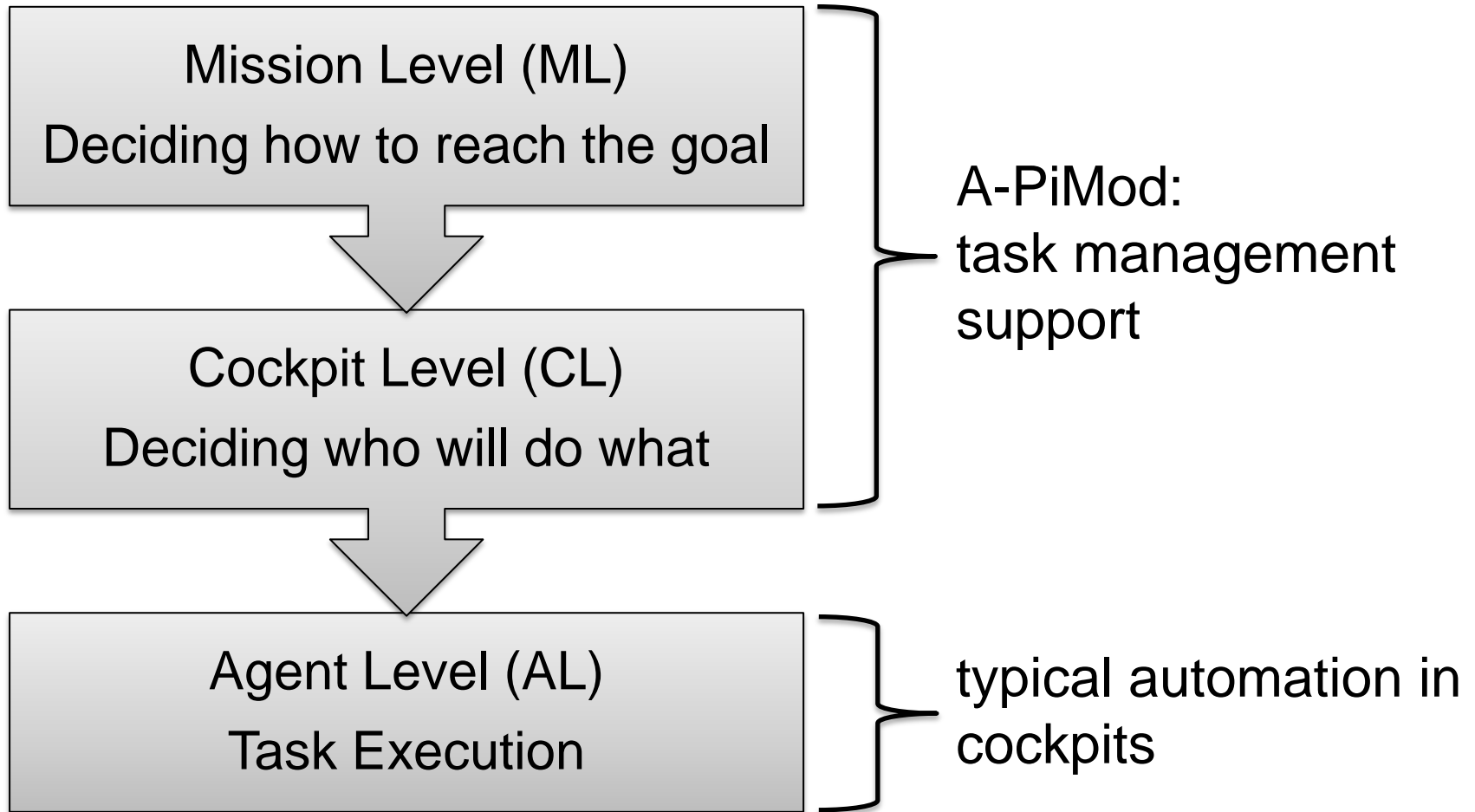
- know the crew's state
- adapt to the crew
- interact naturally

Adaptive Multimodal Cockpit

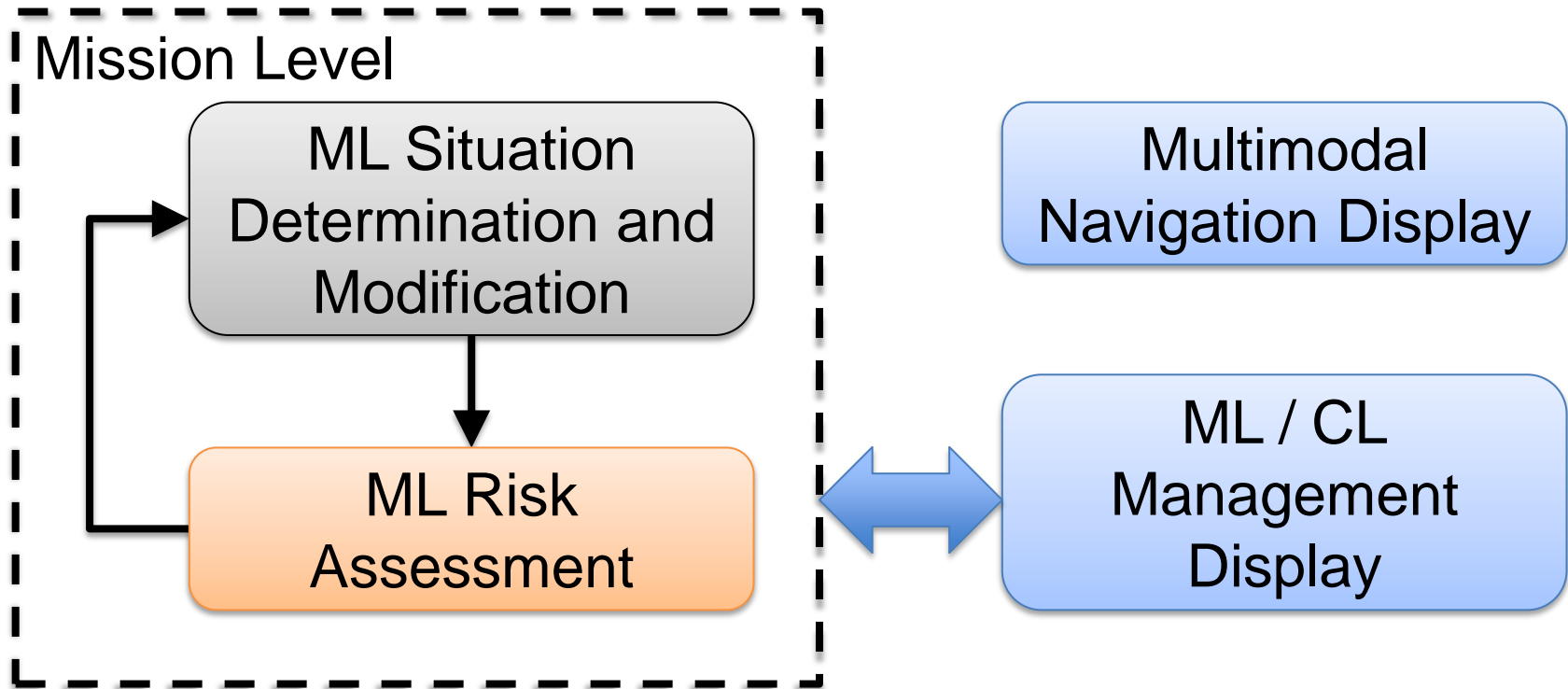


Key technologies of cockpit architecture

Architecture



Mission Level: How to reach the goal



Example: thunderstorm at destination airport

ML Risk Assessment

- Online risk assessment during flight
- Based on look-up table defined by company

Input

- Aircraft performance
- Environment conditions
- Crew state



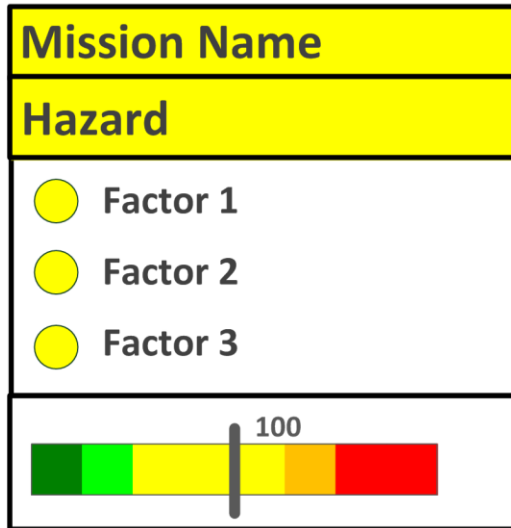
Output

- List of hazards
- Probability of occurrence
- Severity of consequences

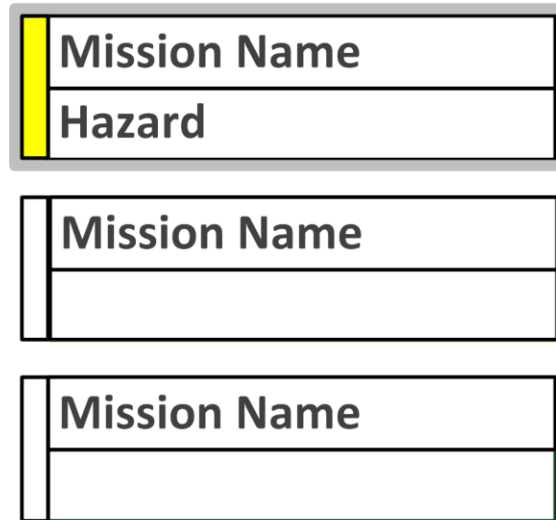
Example: risk of unstabilised landing is high



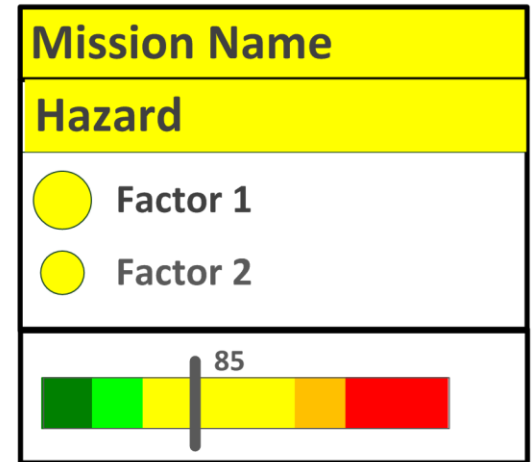
ML Management Display



Risk of current mission



Alternative missions



Risk of alternative missions

Example: crew requests risk for holding



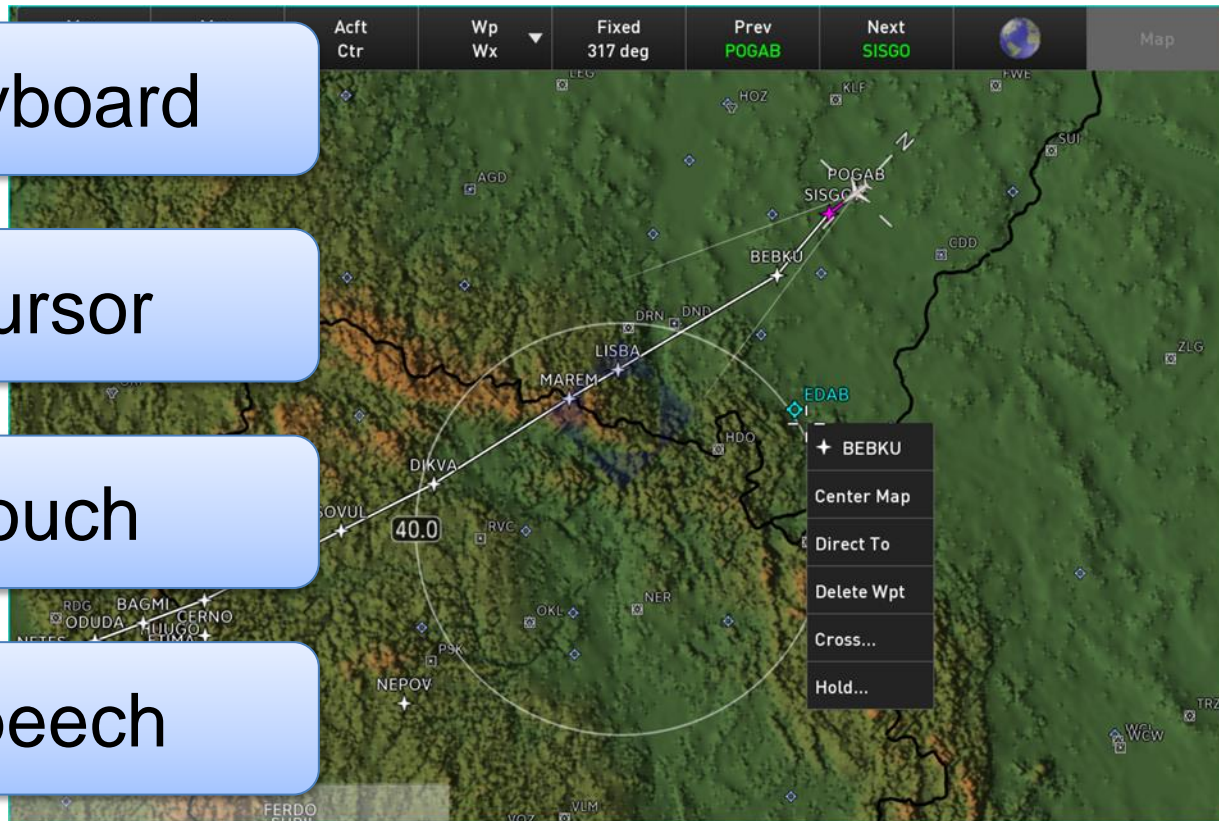
Multimodal Navigation Display

Keyboard

Cursor

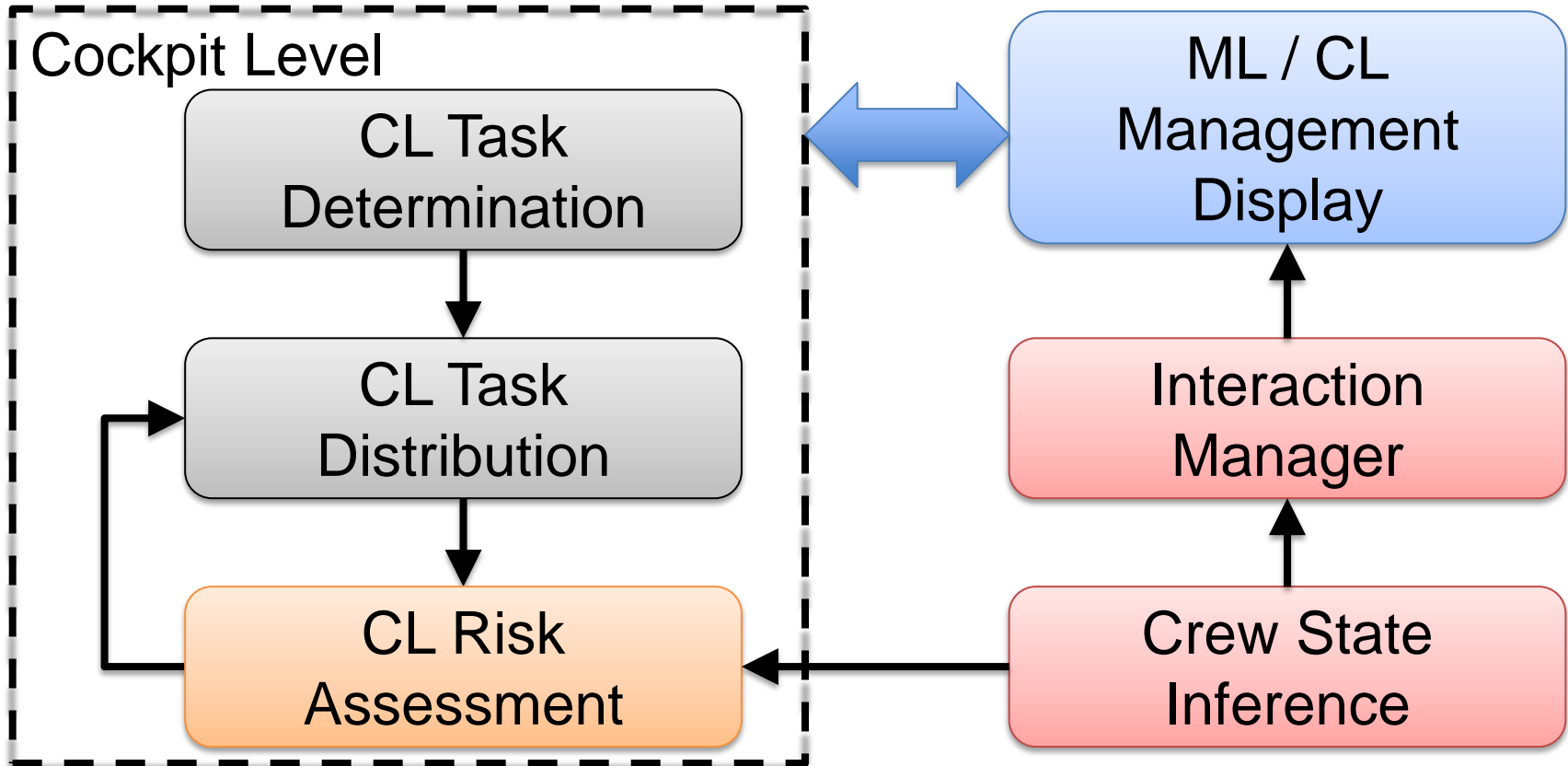
Touch

Speech



Example: “hold BEBKU as published“

Cockpit Level: Who should do what?



Example: lower landing gear

Crew State Inference

Situation Awareness

- Do intentions match the current task distribution?
- Is the Monitoring behaviour adequate?

Intentions

- Which tasks does the crew perform at the moment?

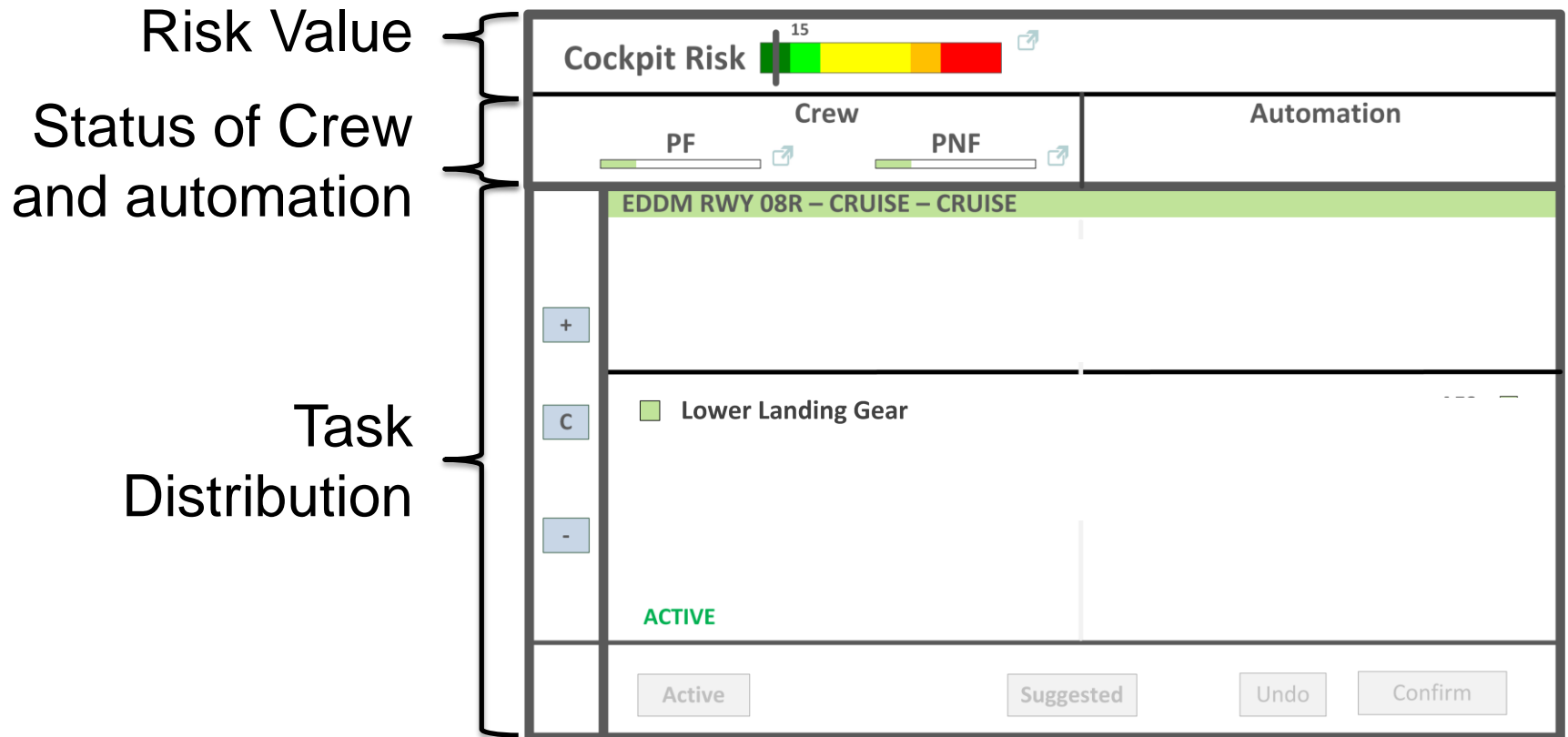
Pilot State

Workload

- Is the Crew under- or overloaded?

Example: crew did not lower landing gear

CL Management Display



Example: "lower landing gear" is assigned to crew

Interaction Manager

Ensures that information is perceived

Input

- Task Distribution
- Crew state



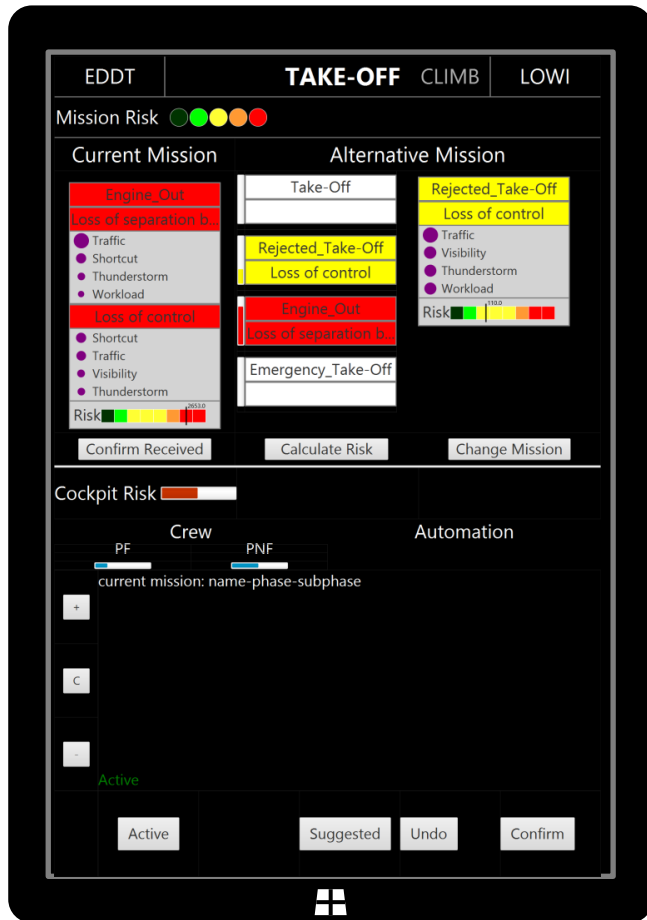
Output

- Visual and audio warnings



Example: “lower landing gear” is highlighted

ML/CL Management Display



Mission Level

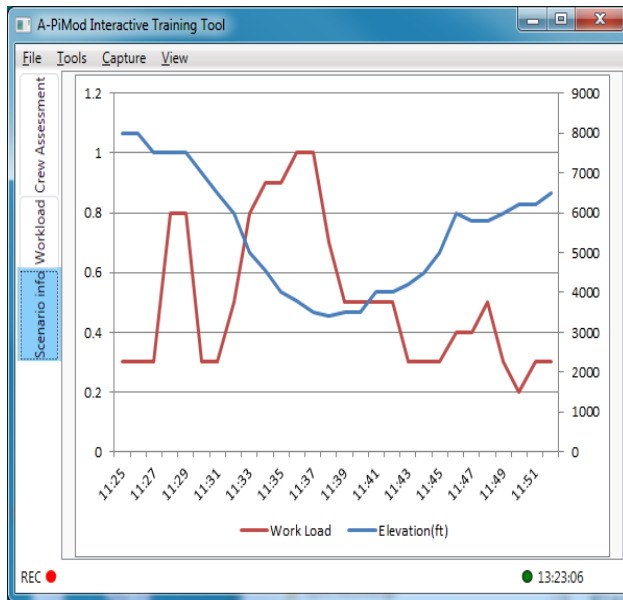
- Mission
- Flight phase
- Risks

Cockpit Level

- Crew state
- Automation state
- Tasks and distribution

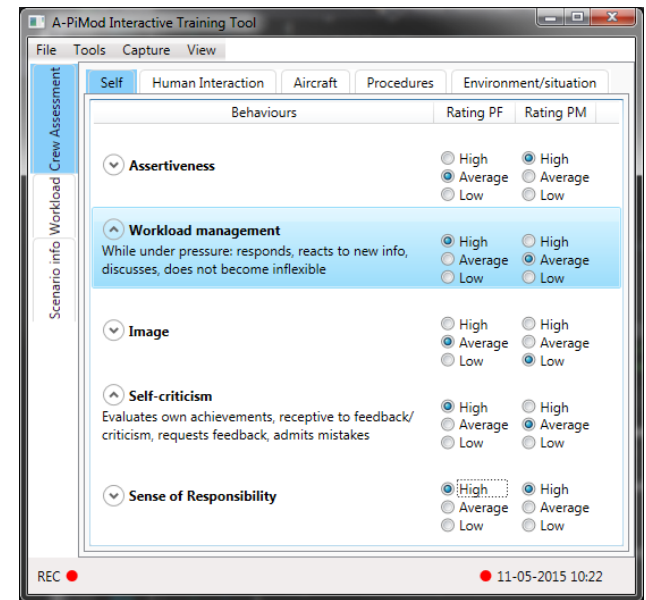
Spin-Off: Training Tool

- Enhance cockpit crew training
- Tool an tablet used by instructor during simulation
- Based on capabilities of the A-PiMod architecture

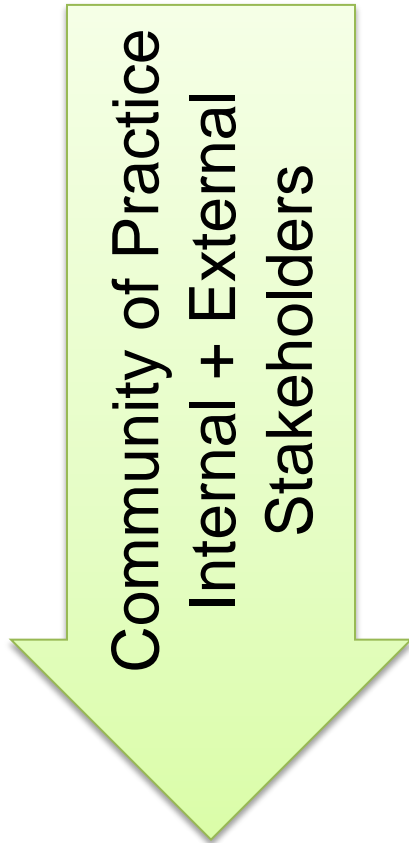


← Monitor flight parameter, automation and crew status

Assess the crew →



Validation Method



09/2013

Start of Project

03/2014

Initial specification of requirements

10/2014

Validation cycle 1: individual systems and explorative simulator evaluation

05/2015

Validation cycle 2, integrated systems and scenario run in simulator

08/2016

Final validation of safety and operational impact



A superior crew is the one which uses superior knowledge and experience to avoid situations which require superior knowledge and experiences.

A-PiMod's multimodal and adaptive cockpit is the third member of a superior crew



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Thank you for your attention



Honeywell



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