



Real-time Condition-based Maintenance
for Adaptive Aircraft Maintenance Planning



www.h2020-remap.eu

CBM for Adaptive Aircraft Maintenance Planning

ADVANCED AIRCRAFT MAINTENANCE DISSEMINATION
EVENT / Hamburg, 19-20 November, 2019



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769288



EU VISION

ACARE

By 2035 – the CBM philosophy will be accepted as a standard approach

→ For aircraft health monitoring & maintenance planning

By 2050 - all new aircraft will be designed for CBM.



Challenges

Current CBM practice

Military applications

Commercial aviation

→ Engines

→ Isolated efforts in non-critical systems.

But...

Focus on predictive maintenance (= CBM ?)

No systematic or E2E vision provided

Structural health monitoring is neglected

Current solutions are 'closed'.



Our Vision

CBM will be part of the adaptive and efficient future aircraft maintenance practices

CBM will consider the aircraft as a whole, including **structures and systems** health monitoring

CBM goes beyond prognostics – it requires an efficient fleet management approach (**prognostics 2 actions**)

CBM will be used for thousands of systems and structural elements – a **systematic E2E approach** will be needed

CBM practices will be reliable if **airlines, MROs and OEMs cooperate** together

CBM will be an effective and reliable approach, following strict **regulations and safety requirements**.



ReMAP – Real –time Condition-based Maintenance to Adaptive Aircraft Maintenance Planning

Project Number :	769288
Starting Date :	01/06/2018
Duration :	4 years
Action Type :	Research & Innovation (max TRL 5)
Budget :	6.8 million euros
Number of Partners :	13
Coordination :	Delft University of Technology (TU Delft)



ReMAP Goal

Develop an Integrated Fleet Management solution that aims at replacing fixed-interval inspections with adaptive condition-based interventions



Our Approach

Safety Risk Assessment

Integrated Fleet Health Management Solution

Reinforcement learning
(data-driven)
maintenance schedule
tool

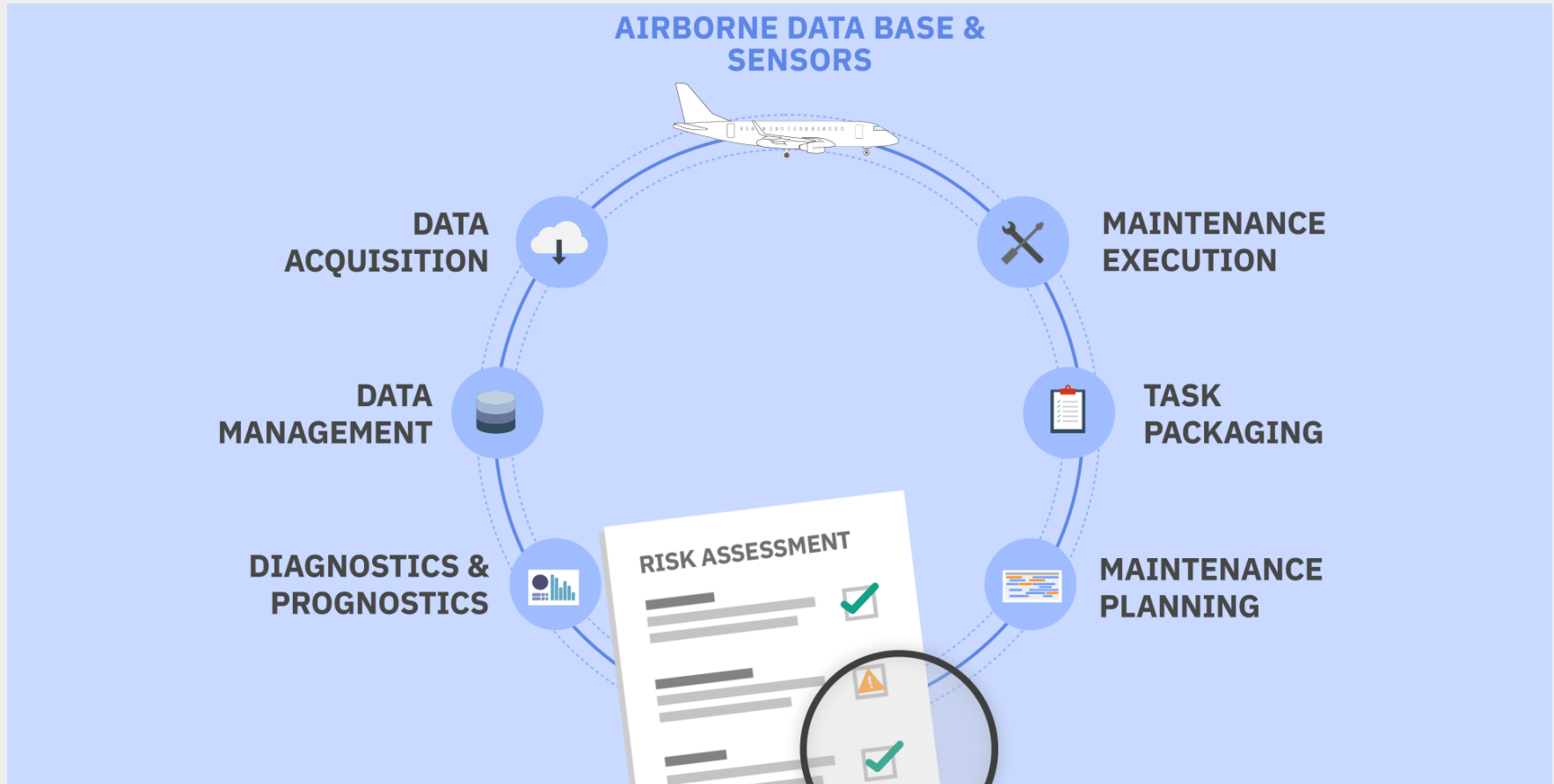
Hybrid data-drive &
physics-based
algorithms for systems

Sensing technology
& Data-driven
probabilistic
algorithms for
structures

Open IT ecosystem



Our Approach



Testing on operational environment

Systems

ReMAP IFHM solution in a 6-month operational environment, evolving more than 12 systems in two different aircraft fleets

Structures

Health prognostics will be demonstrated in a laboratory setting, using representative structural composite subcomponents

Expected Impact

More than 700 million Euro/year for the European Aviation market

Data



- Generate around 1GB of health monitoring data per flight
- Edge computing and air-to-ground communication
 - Pre-diagnostics
 - Alerts

Wi-fi Communication with MCC



- Improved Health knowledge
- Improved safety
 - False alarms reduced to 1×10^{-6} /FH*
 - Missed failures reduced to 10%*

Health monitoring updated

Diagnostics / Prognostics / Alerts



- 20% unscheduled maintenance*
- 4% less technical delay events

€68 000 cost reduction per year

Optimized maintenance schedule and packing



- 8% less maintenance checks*
- 2,5% lower maintenance elapse times
- 10% less unscheduled removals per year*

€42 000 cost reduction per year

Updated and improved aircraft availability



- 1.2 extra days of operations
- 140 minutes of less delay per year

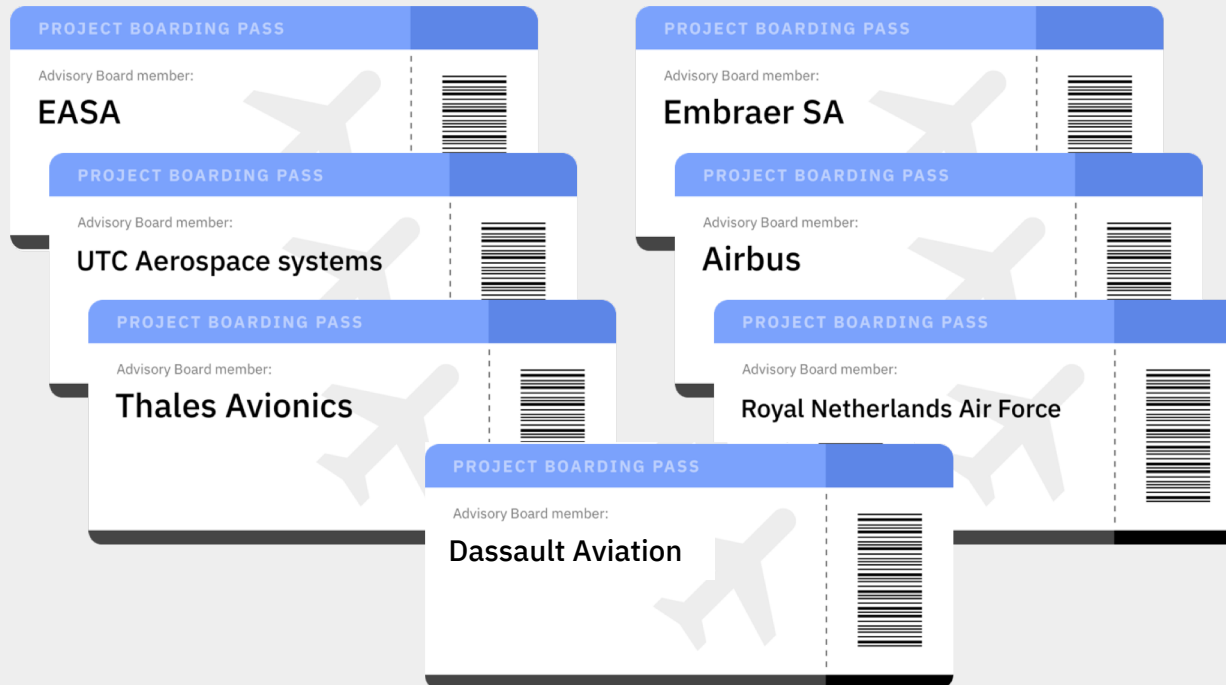
€160 000 extra revenue and lower costs per day

The Consortium



Building the ecosystem

ReMAP joins together relevant stakeholders from different fields towards the future adoption of CBM in European aviation.



With an ambitions vision, we are
creating an **European roadmap**
towards CBM in aviation

Join us!



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Paving the way for the future
of CBM in aviation.

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Join us in this path.



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