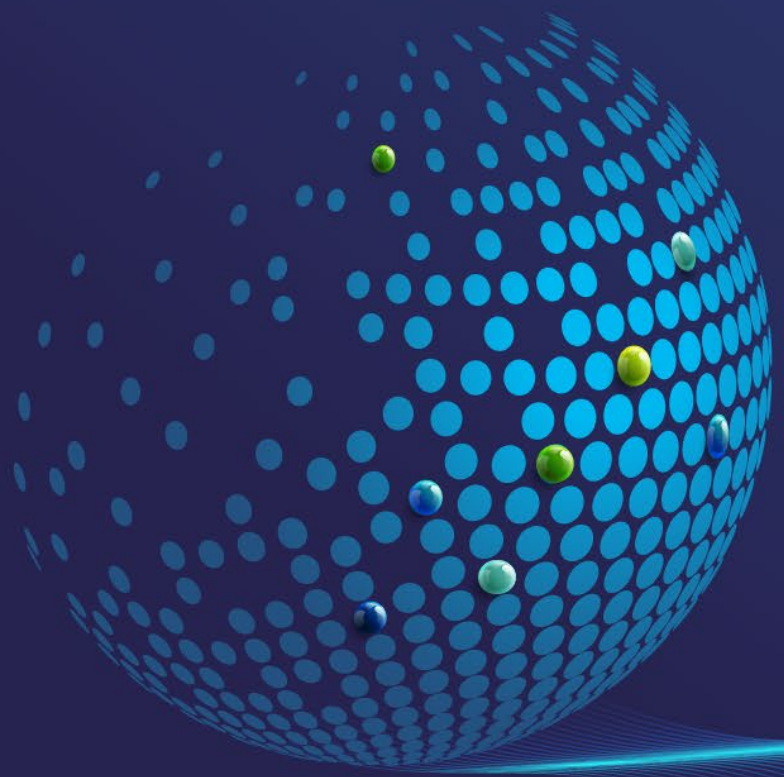

# Advanced conflict detection and resolution concepts

## Insight into an operational validation in the frame of 4DSkyway project

*Antonio Strano, Leonardo S.p.A.*

SESAR 2020 SHOWCASE

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# Operational validation overview



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# Exercise at-a-glance

V2 maturity level

## Title

Conflict detection & resolution tools enhancements through aircraft trajectory information downlinked via ADS-C and optimization factors

40% Traffic ADS-C equipped!

## Description

Real-time simulation in Italian en-route/approach airspace focussing on the assessment of enhanced conflict detection & resolution aid tools with:

- **detection of tactical conflicts between aircrafts** using Extended Projected Profile (EPP) trajectory information downlinked via ADS-C and with
- **suggestion of tactical conflict resolution advisories** to the controllers optimised with what-next system recommendations based on minimising aircraft fuel-burn and controller workload

LEONARDO enav deepblue



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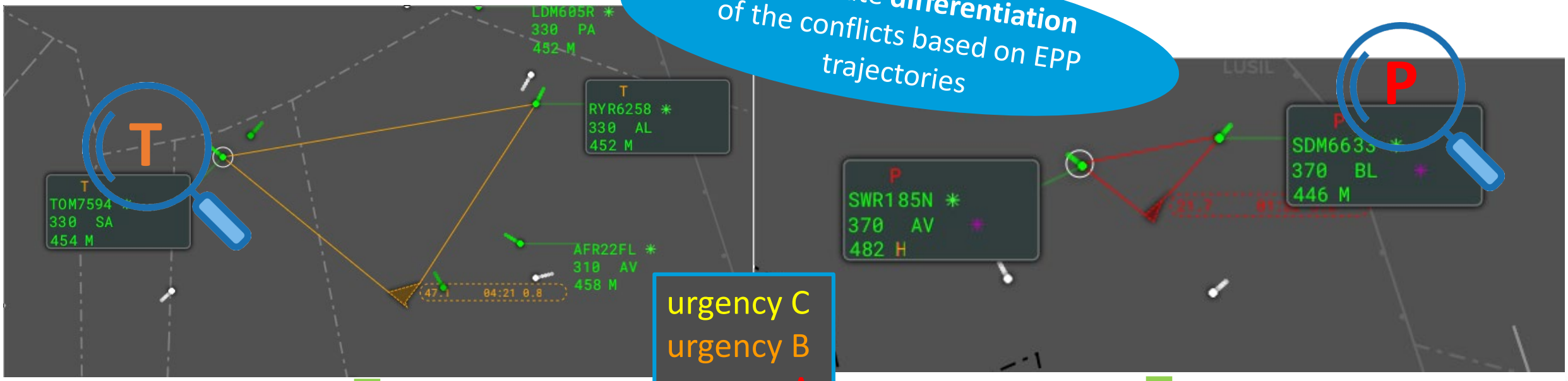
# Enhanced Conflict Detection

Appropriate **differentiation** of the conflicts based on EPP trajectories




urgency C
urgency B
urgency A

Baseline behaviour using **tactical trajectories** to detect conflicts

Enhanced behaviour using **EPP trajectories** to detect conflicts



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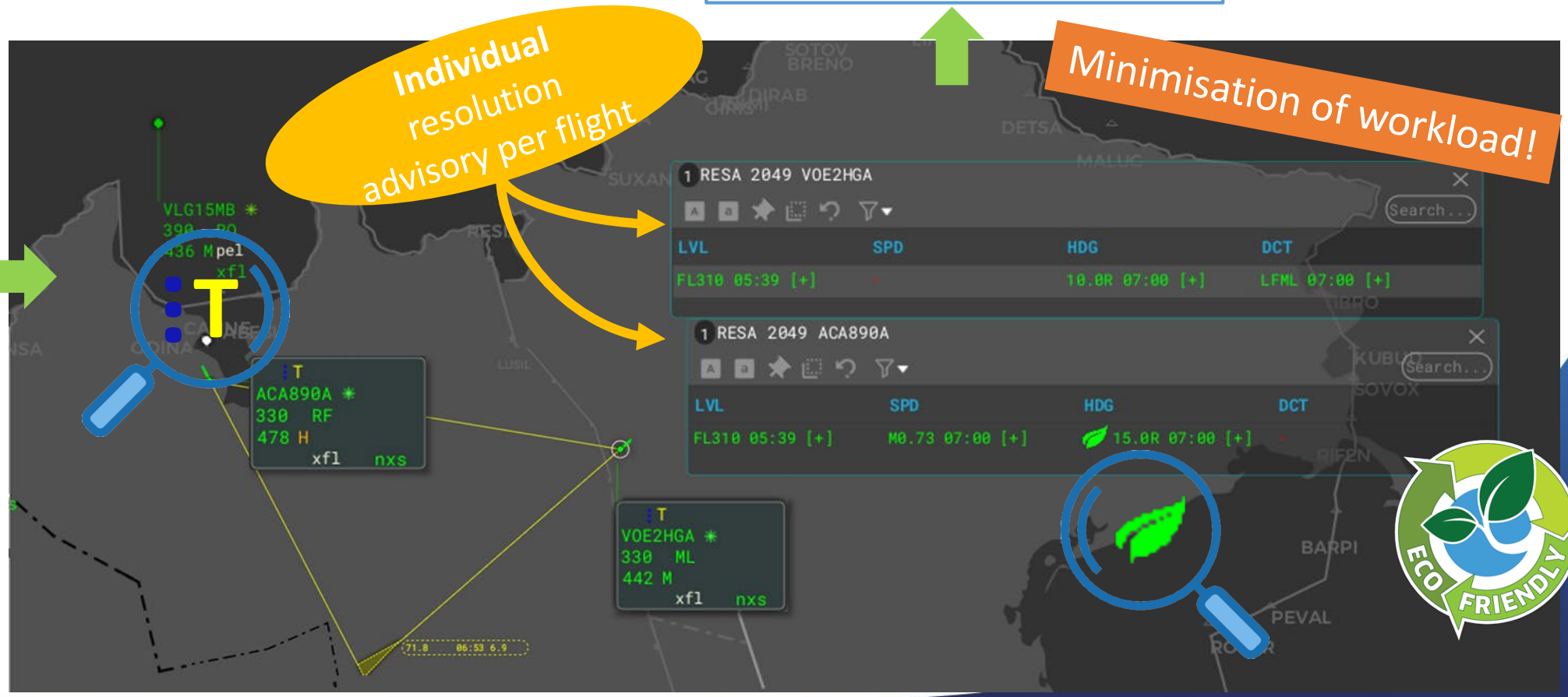
# Enhanced Conflict Resolution

Optimisation factors

On-request **display** of resolution advisories

**Automatic resolution** advisories for detected tactical conflicts







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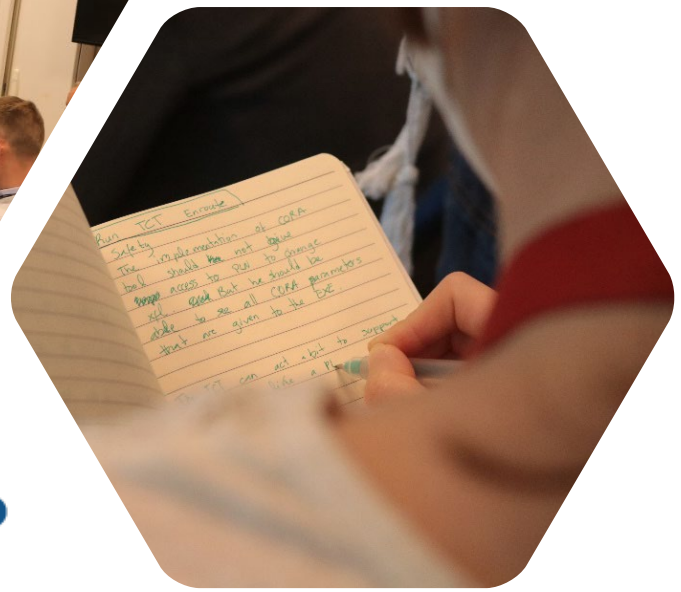
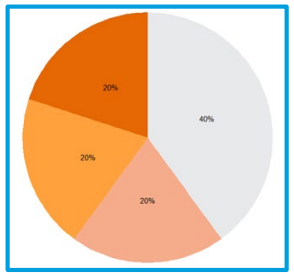


# Validation results

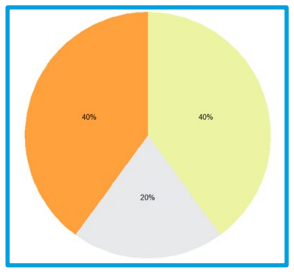
# Operational & technical feasibility

## Operational

Conflict Detection

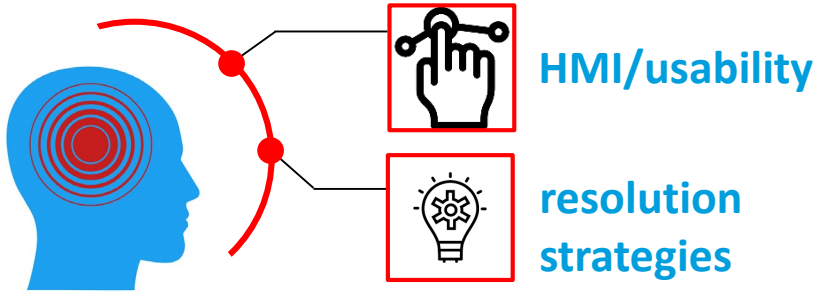



Conflict Resolution



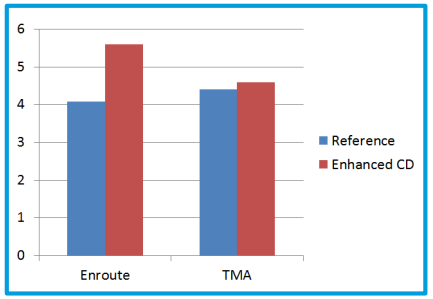

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

**Pain points**

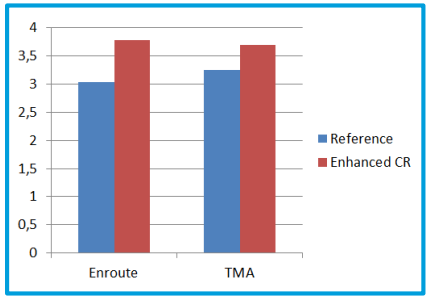



## Technical

Conflict Detection




Conflict Resolution




**Anticipation in conflict detection & resolution**

**+20%**

**on average**



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# Performance assessment

## Capacity

| | Detection | Resolution |
|---|---|---|
| ER | n.a. | |
| TMA | +2,96% | |

## Safety

| | Detection | Resolution |
|---|---|---|
| ER | mantained | |
| TMA | mantained | |

## Cost Efficiency

| | Detection | Resolution |
|---|---|---|
| ER | neutral | +15,08% |
| TMA | | +2,88% |

## Operational Efficiency

| | Detection | Resolution |
|---|---|---|
| ER | n.a. | -157,90 kg per flight |
| TMA | | -34,29 kg per flight |

## Human Performance

| | workload & situation awareness | usability & utility | trust | HMI | skills | operating methods | tasks |
|---|---|---|---|---|---|---|---|
| CD | ★★★★★ | ★★ | ★★ | ★★ | ★★★★ | ★★ | ★★★★★ |
| CR | ★★★★★ | ★★★ | ★★ | ★★ | ★★★★ | ★★★★ | ★★★ |

# Way forward

Live data
LIVE
Wider scale
HMI/Usability
Machine Learning
SESAR 3

# Thank you for your attention!

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