



Complementary Operational Analysis

Hendrik Oberheid

DFS DIGITS Project Lead

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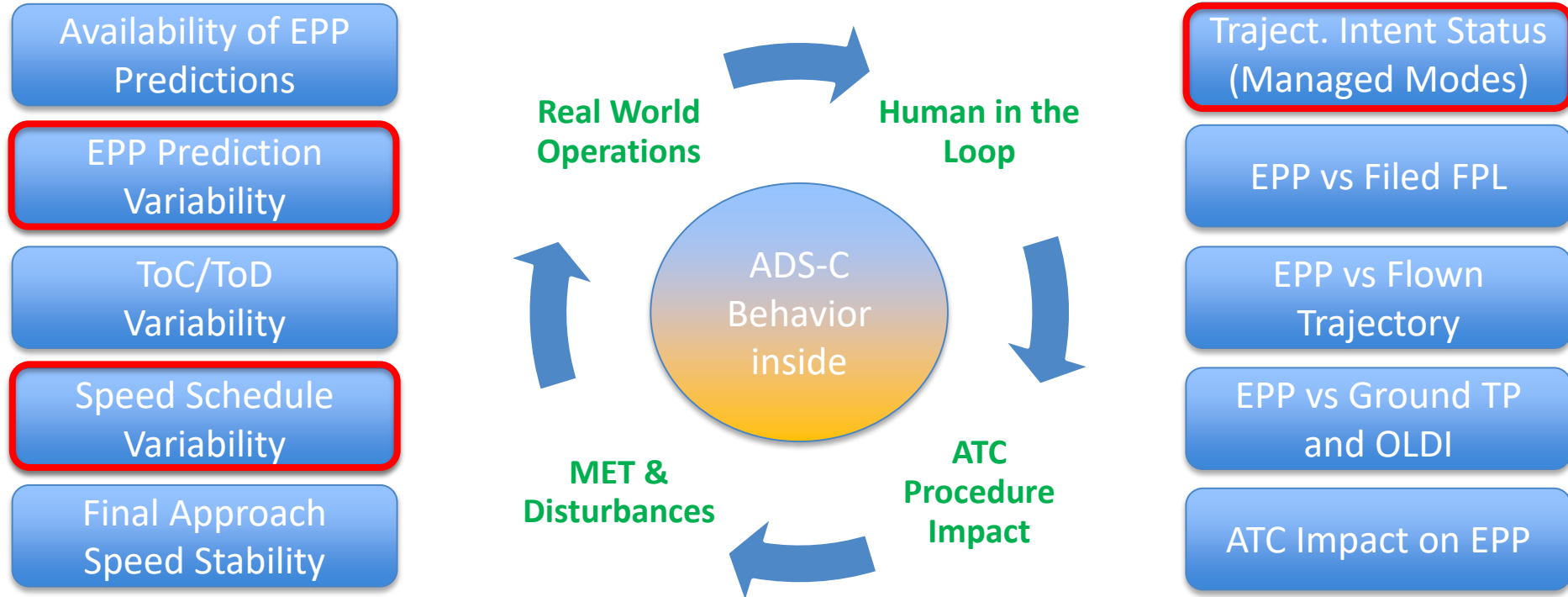
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Operational Analysis – Purpose and Topics

complementary to ATC applications studied above



see also Demonstration Report Annex N for more details

Usage of Managed Modes (Trajectory Intent Status)



Background

- FMS „Managed Modes“ (Lateral, Vertical, Speed, Time) -> ADS-C „Trajectory Intent status“
- Influences the reliability/usefulness of the predictions

Questions

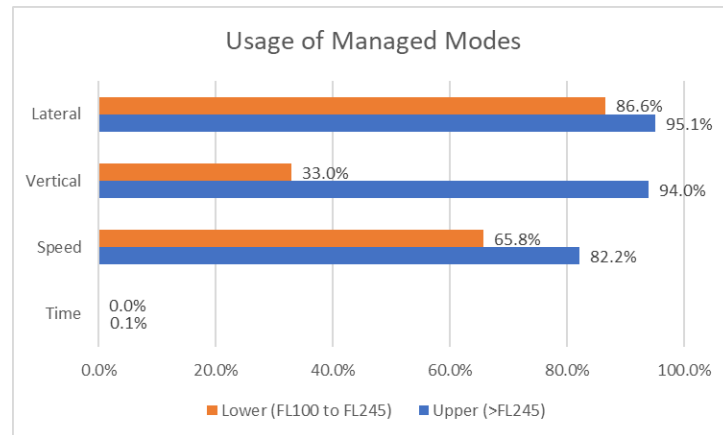
- Split between managed & selected modes?
- Influence of flight situation/environment?

Analyses – Managed Mode Usage e.g. as function of...

- Flight level bands
- Flight Phase
- ATC actions (clearance types)

Exemplary Findings/Conclusions...

- High Usage in Upper Airspace (Lateral ~ Vertical > Speed Managed, Time Managed ~0)
- Significant impact of specific environment in Lower Airspace (requires more specific analysis)
- Impact on design of systems and procedures to make best use of predictions





Variability of Speed Schedule

Background

- Provides CAS/Mach values based on current Cost Index (CI) → input for Ground TP enhancements
- Speed targets for the aircraft only applied in speed managed mode
- Stable from avionics perspective, but can be altered by CI or Cruise FL settings

Questions

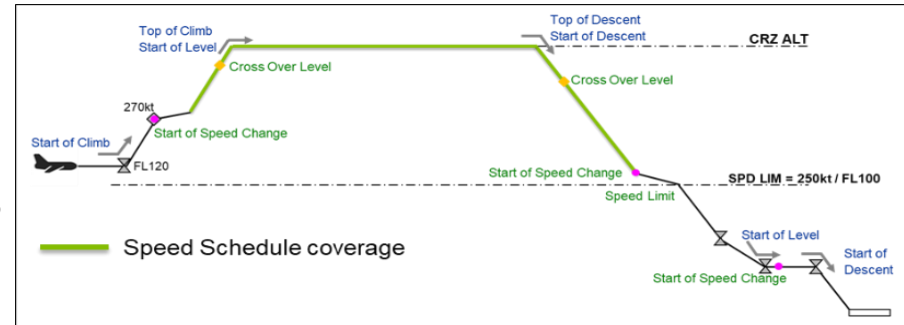
- Quantify variability over flight
- Understand root causes

Analyses

- % flights with climb/crz/descent speed changes
- Threshold 5/10/15 kt or 0.01/0.03/0.05 Mach
- Individual flights reconstruction

Exemplary Findings/Conclusions:

- Variations in the order of ~20% of flights → Speed Schedule Tuning is a „regular procedure“
- Recognize in ground tools design and OPS practice
- Underlines the value of in-flight data updates by ADS-C as opposed to pre-flight data





Variability of EPP Predictions

Background

- EPP predicts Estimated Time Over (ETO), Altitude and Speed per WP
- Use in ground assistance tools, directly or as input to enhanced TP

Questions

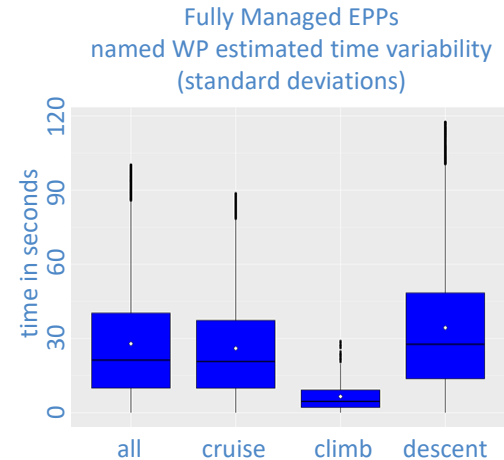
- Quantify variability/shifts over flight (assuming stable plan)
- Influence of flight intent status/managed modes

Analyses

- Predicted Altitudes, Speeds and ETOs over named WPs and ToC/ToD
- Geographical shifts of ToC/ToD (1st and last)
- Quantification in Standard Deviations

Exemplary Findings/Conclusions

- Predictions show generally high stability and precision for stable plans (without interventions)
- Significant positive influence of Managed Modes (e.g. StDevs for WP predictions 30s vs 60s)
- Encourage use of manage modes and seek early synchronization on constraints





Conclusions

- Collection of a very significant dataset, ADS-C and beyond
- Used to analyze list of topics (ADS-C characteristics), subject to real-world operational influence and conditions, pilot and ATCO interaction, weather...
- Lab-work and Specs Study are no alternative - > VLD value
- High value for requirements work on way to deployment
- Many expectations on the data positively confirmed already
- This is more the beginning than the end ...
- PJ38 is ready to follow-up and continue this work with support from even more partners

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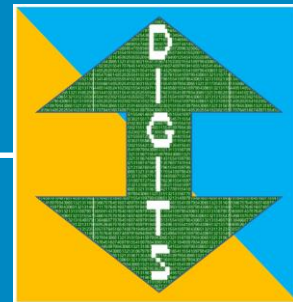
Airlines

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Thank you very much for your attention!

ANSPs

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