SESAR 2020 PJ31-DIGITS

Situational awareness
EPP display to ATCO including ToC, ToD

Federico Ferrari ENAV
Preetam Singh Heeramun NATS

Webinar 1st December 2020

founding members
EUROPEAN UNION
EUROCONTROL

DFS, ENAV and NATS shadow mode demonstration exercise

The demonstration exercises consisted of two main threads:

1. The technical demonstration of the management of ADS-C with revenue flights (technical support by LEONARDO, INDRA & AIRTEL).

2. The operational assessment of the downlinked ADS-C data in order to verify the possible benefits on the operational working method.

The scope of the operational assessment is to evaluate (offline) the impact of the usage of the ADS-C reports in an operational environment aiming to verify possible benefits. These exercises aimed at breaking down the assessment into two functional areas:

- Display EPP on Controller Workstation.

- FMS trajectory conformance monitoring (waypoint list comparison & corridor check) and alert.

With these objectives, DFS, ENAV and NATS installed prototypes on operational sites and, for the analysis, used simulated and replayed data (including real surveillance data and operational data)

Situational awareness

General feedback is an enhancement of the situational awareness thanks to the ability to access to ADS-C/EPP data not available before.

A clear need will be to set up properly HMI to provide required information but avoiding information overload/redundancy.

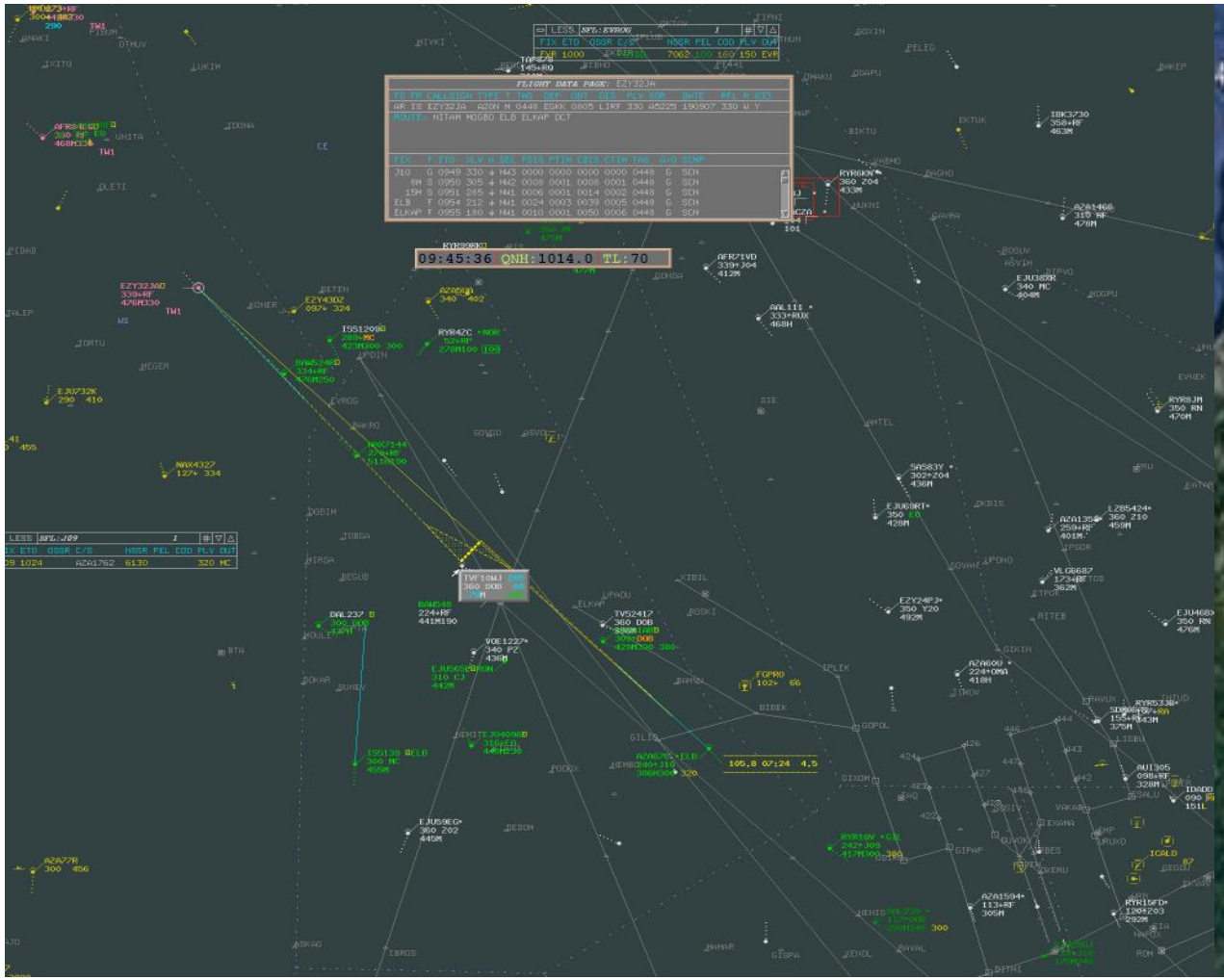
1. FMS trajectory displayed on HMI (graphical view) and ability to visualise on the trajectory significant vertical pseudo waypoints (e.g. TOC/TOD).

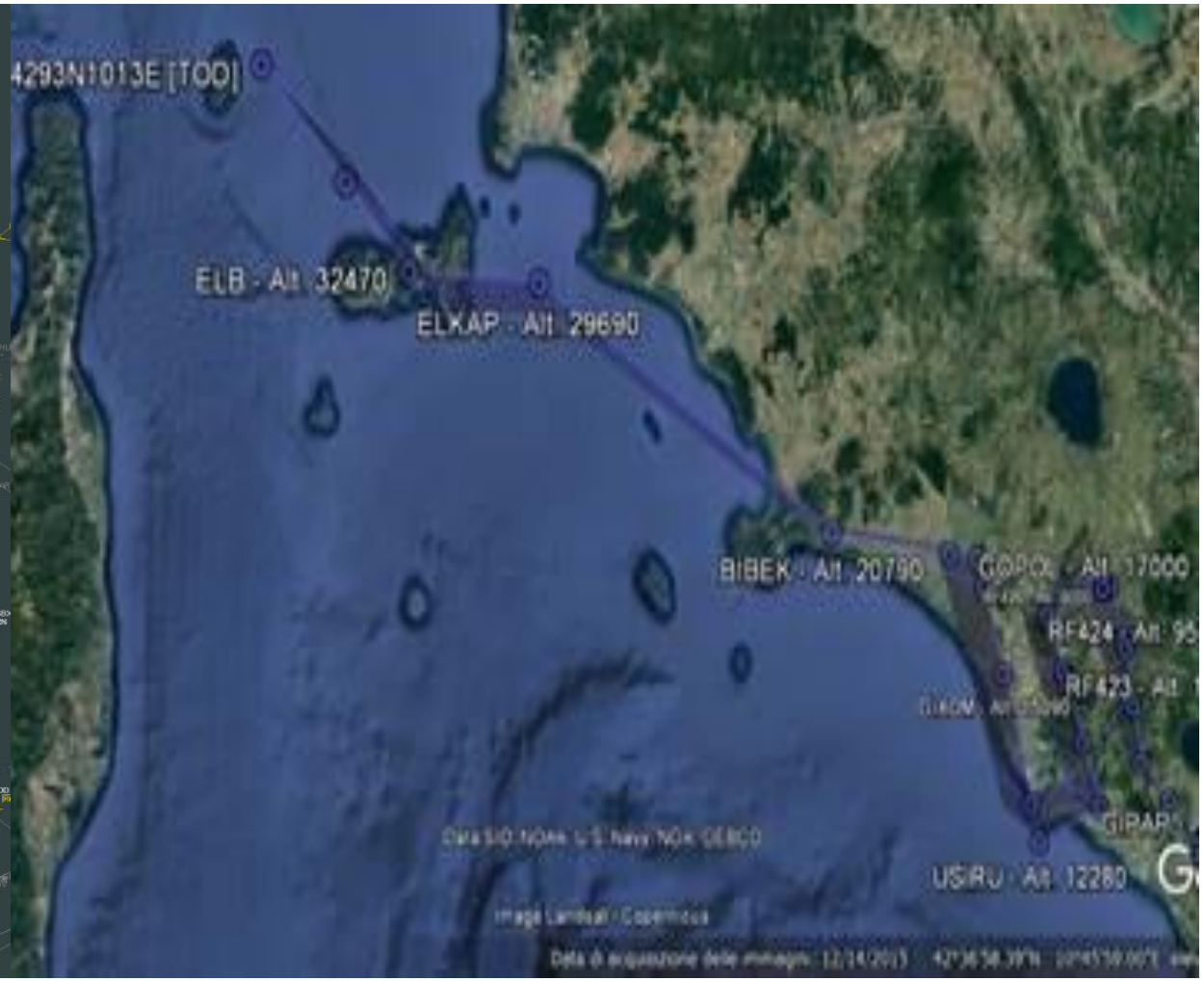
2. Ability to visualize EPP data in tabular format (e.g. will contain general information such as callsign and EPP computation time, per waypoint predictions which will include flight Level, ETA, Speed and constraints).

3. Ability to check the 2D conformance (route) between the FMS and the ground ATC route.

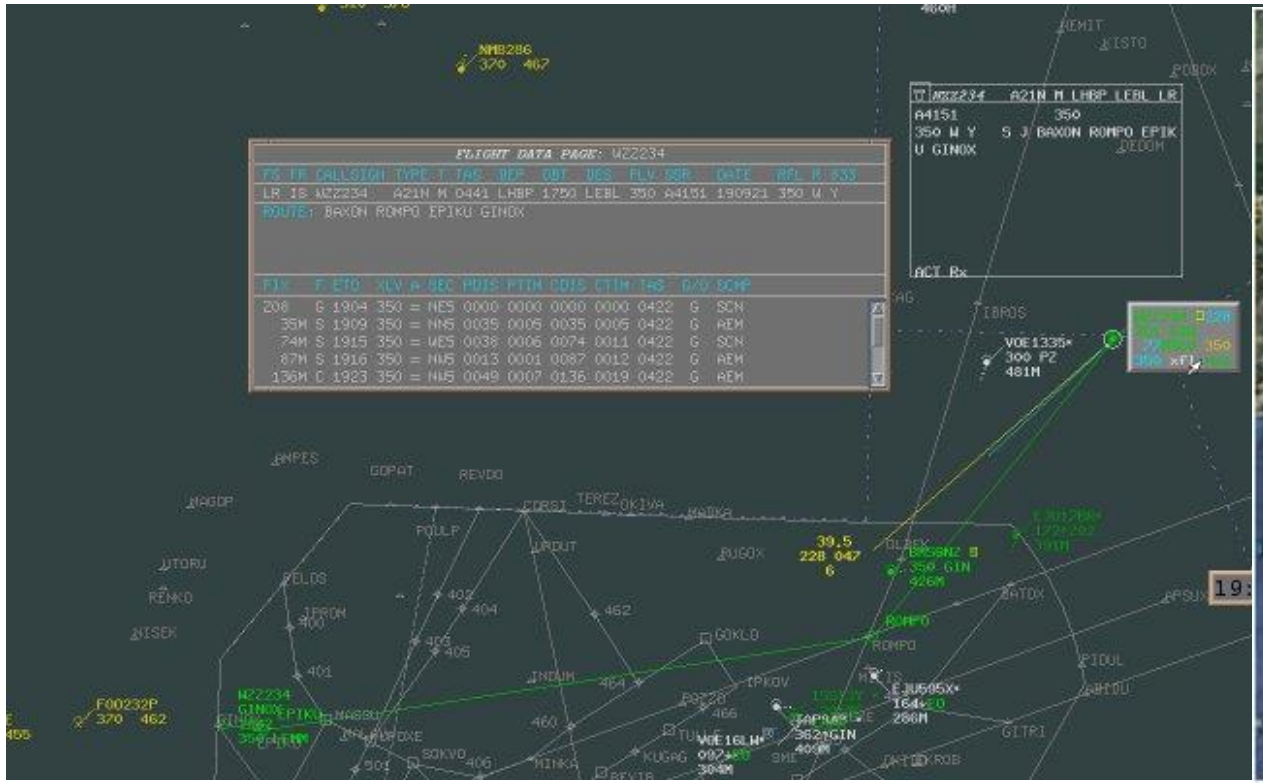
4. Ability to access ADS-C data (not part of EPP) such as spot wind to support other traffic requests, EPP ADS-C planned arrival runway to improve situation awareness and anticipate any need of coordination between Flight crew and ATC in case of changes.

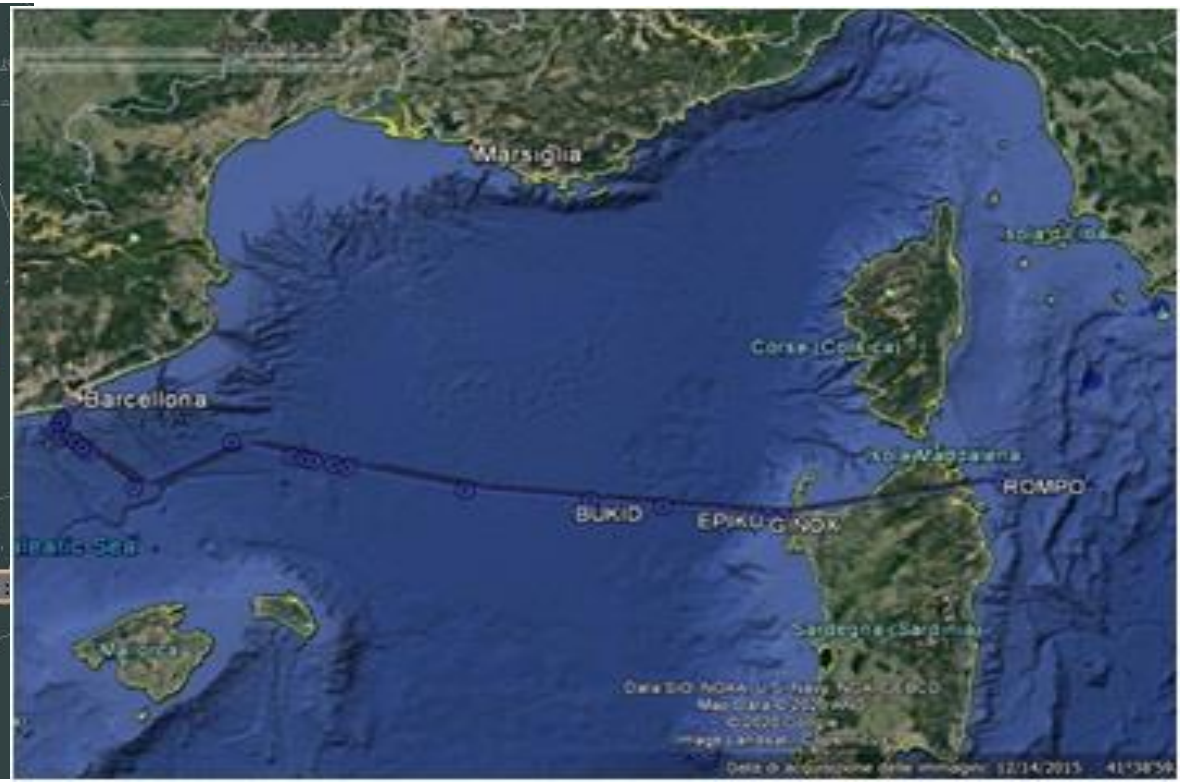
4D Predictions of Waypoints and Pseudo-Waypoints





2D Conformance Check





Situational awareness

Benefits and Opportunities

- Elements of the EPP message are displayed on the controller HMI, increasing the situational awareness of the ATCO team, and supporting their decision-making, for example planning more optimum coordination levels.
- Potential increase of accuracy in the planning process for sector occupancy thanks to more accurate expected trajectory.
- Potential reduction of R/T load in the tactical phase (ATC - Flight Crew)
- Potential reduction of human error and increased situation awareness (e.g. misunderstanding of ATC instructions).
- The 2D route included in the downlinked EPP is continually monitored, and any relevant discrepancy is highlighted in the CWP. This enables the team to communicate with the flight-crew to resolve the discrepancy before the flight deviates from its clearance.
- Potential reduction of likelihood of flights entering Danger Areas

Risk and Issues

- Risk of nuisance (e.g. if the consistency check does not consider a buffer time before highlighting the deviation)
- Need of adequate training on EPP trajectory new functionalities
- Risk of information overload and HMI clutter (applies to all EPP data – trajectory & pseudo-waypoints)

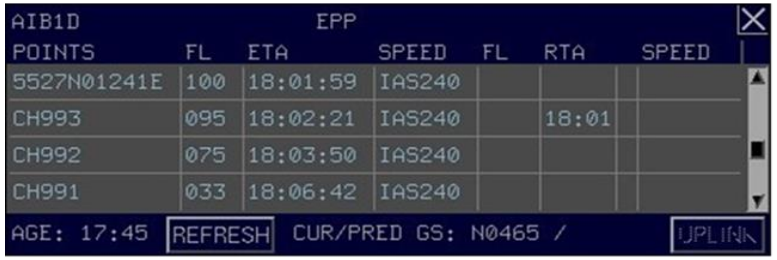
Situational awareness

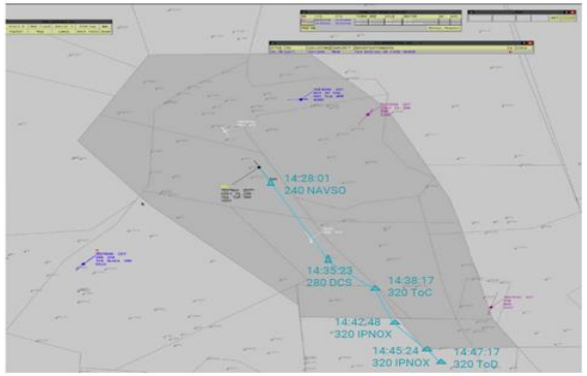
Operating Method and Daily Work	System, Interaction and HMI	Team and Communication
• No changes expected in operation method • Training Adapt the operational to give balanced consideration to the EPP trajectory in case of deviation against the FDP trajectory • Train for situations where Conformance Check will not work (e.g. in case of open vector)	• Ensure smooth integration of new HMI with existing HMI • Deviation highlighted on the CWP HMI after a buffer time in case of deviation to avoid nuisance • Deviation accessible on-demand after a warning highlighted on the HMI • The warning of the deviation should be visible and accessible to all the interested ATC actor. • Tabular display of the data should be avoided (based on ATCO feedback). It was less useful generally except for TOD.	• No changes are expected in the team structures • Potential reduction of R/T load in the tactical phase (ATC-Flight crew; e.g. in case of misunderstanding of instruction between flight crew and ATC there should be the conformance check warning without need of requesting R/T confirmation from flight crew)

EPP display to ATCO including ToC, ToD

ATCO tool HMI enhancements for EPP trajectory

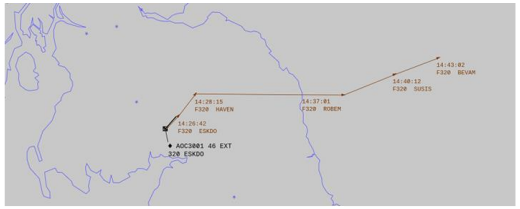
1. Ability to visualise the FMS flight plan on the Air Situation Window
2. Ability to visualise significant vertical pseudo waypoints
3. Ability to visualise EPP data in tabular format



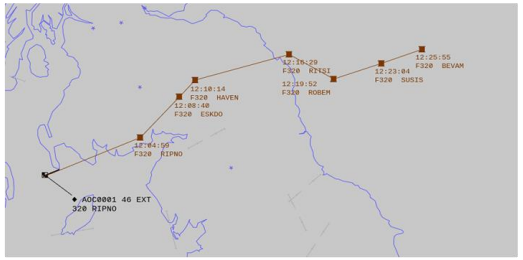


NATS

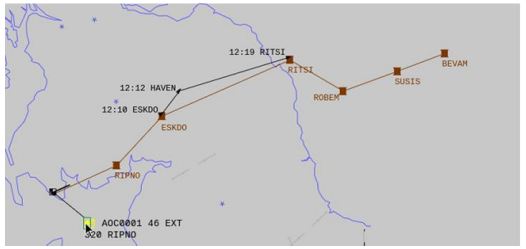
DFS Deutsche Flugsicherung



New EPP (Enhanced Projected Profile) received on ADS-C tool

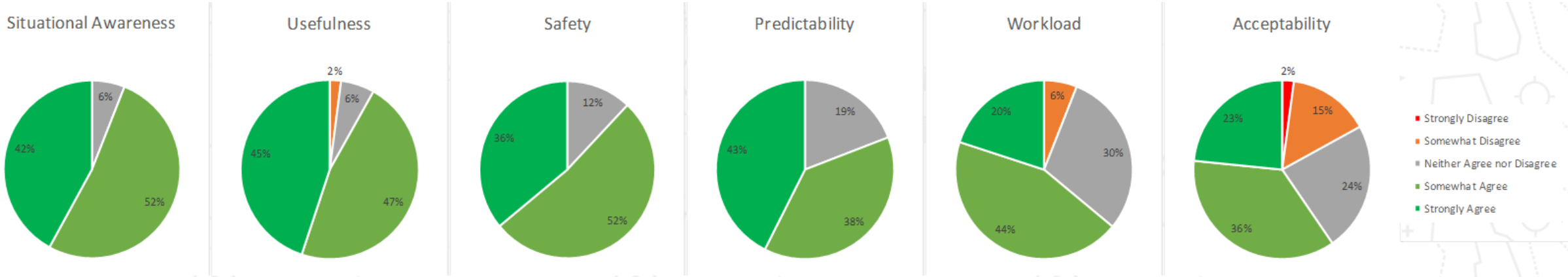


Display of EPP with no discrepancy



Display of EPP with discrepancy

EPP display to ATCO including ToC, ToD



% Positive Responses:

94%	92%	88%	81%	64%	59%

"This means that you don't have to rely on what the pilot says they are going to do. There's a lot of potential in this. "

"Reduced oceanic separation requires much more accurate entry point arrival time prediction. EPP could be of good use."

"It's definitely useful, the speed schedule is good... Display of trajectory info is good, in particular the ocean exit, speeds and discrepancies."

"It seems quite intuitive."

"The tabular data is less useful, except for the ToD. Although it could be useful to some controllers. We care more about knowing which level an aircraft will reach by a defined point. I.e. will they meet a standing agreement?"

EPP display to ATCO including ToC, ToD

Feedback gathered from NATS demonstration exercise regarding ToC and ToD

1. In terms of Situational Awareness, some of the surveyed controllers indicated that they already know where the ToC/ToD are, so they did not think the display would really help them.
2. The tabular data proved to be less useful, except for the ToD information. It was however perceived that this could be useful to some controllers.
3. In terms of Predictability, they shared that they recently had an issue where some aircraft types were not being modelled correctly in BADA, leading to ToDs being predicted to occur in the wrong sector by iTEC.
4. Some other observations from the feedback received included:

"It would be really useful to see whether flights would meet SID/STAR constraints. This would save coordinations, particularly when if an aircraft is climbing and you are sure that they would make it. This would make our job a little bit easier. Accurate ToCs are important for separation. If they are going to be slower to make a ToC and this leads to an interaction, you want to know."

"Standing agreement info is useful for checks. Can be caught out by the ToD sometimes, this would be useful to have from the FMS. Need to be cautious of displaying irrelevant trajectories."

"Not something that we would use massively but it's a nice comfort blanket."

"The tabular data is less useful, except for the ToD. Although it could be useful to some controllers. We care more about knowing which level an aircraft will reach by a defined point. I.e. will they meet a standing agreement?"

Airlines

Demonstration of ATM Improvements generated by initial Trajectory Sharing

Industry

ANSPs

founding members