Validation of the OPTA-IN™ - SA Tool

Supporting Optimized Profile Descent Approach
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CDOs are type of descent operations that aim to deliver lower fuel burn, pollution and noise through the use of idle thrust during the descent.
OPTA - Features

In order to enable the use of CDOs in medium traffic density, the OPTA project (promoted by ENAIRE) with the collaboration of Boeing developed a concept based on following key features:

- A common TMA entry speed
- SLPs, FL constrains and wind conditions
- Definition of Tie Points to apply SRATs
OPTA - Scenario

1. High/medium density traffic condition
2. Hub of several airlines
3. Main flows are segregated from the rest operations in TMA
4. No relevant FL restrictions
5. Availability of ATCOs in winter season (ENAIRE)

CONTRAINTS

- ATC Sectorization vs Flows: LORES, TOLSO, and KENAS/LUNIK
- Barcelona ACC could be involved in the application of OPTA procedure
- Scope reduced only for RWY 24 configuration
- FL restriction at IAF
- SRATs for 5 and 10 NM were required
- Due to the lateral limits of Palma TMA, RWY 24L

1. ATCos would monitor the traffic to the TMA entry points (280 knots) and select the a/c potentially performing the OPTA procedure, designate it as AC1 and the follower in the sequence as AC2.

2. Once AC1 had reached its TIE Point (T1), ATCo would manually measure on the CWP the distance between AC2 and its own TIE point (T2).

3. At this point ATCo would check the SRAT table and, depending on the separation required at the IAF, communicate the speed adjustment to AC2.

4. The result of the complete set of actions carried out, delivered a safe sequence of a/c, arriving at the same IAF with the required spacing.

### Speed Reduction Advisory Tables (SRAT)

<table>
<thead>
<tr>
<th>Distance offset [NM]</th>
<th>IAS [kts]</th>
<th>Distance offset [NM]</th>
<th>IAS [kts]</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 7.6</td>
<td>280</td>
<td>&gt; 16.0</td>
<td>280</td>
</tr>
<tr>
<td>7.3 — 7.6</td>
<td>270</td>
<td>15.2 — 16.0</td>
<td>270</td>
</tr>
<tr>
<td>6.3 — 7.3</td>
<td>260</td>
<td>14.2 — 15.2</td>
<td>260</td>
</tr>
<tr>
<td>5.6 — 6.3</td>
<td>250</td>
<td>13.3 — 14.2</td>
<td>250</td>
</tr>
<tr>
<td>4.7 — 5.6</td>
<td>240</td>
<td>12.0 — 13.3</td>
<td>240</td>
</tr>
<tr>
<td>3.8 — 4.7</td>
<td>230</td>
<td>10.6 — 12.0</td>
<td>230</td>
</tr>
<tr>
<td>3.0 — 3.8</td>
<td>220</td>
<td>9.4 — 10.6</td>
<td>220</td>
</tr>
</tbody>
</table>
OPTA- Main Outcomes

Benefits

• ATCos were able to organize a safe sequence at the merging point.
• Aircrafts were allowed to perform an optimal descent (CDO), obtaining further results: enhanced flight predictability; fuel burn reduction; a positive business and environmental case.

Nonetheless, some issues were identified:
• The identification of AC1 and AC2 was not always easy.
• Cumbersome measurement of distance between flights and TIE points.
• Visualization and knowledge of required SRAT tables.
OPTA-IN (Optimised Profile Descent Approaches Implementing Window) method of operation:
OPTAIN-SA Tool

- The main objective was to create a tool to assist ATCos in using the SRATs. OPTA-IN’s ATCo tool eases the operational information needed when applying the OPTA procedure.

- Although this tool was designed to be integrated in the executive controller position, it was decided not to do so and to use it in shadow mode. With this regard the tool was offered on a portable PC, only available to the ATCos involved and the support team.
OPTAIN-SA Tool

Traffic sequence

Buttons
TECHNICAL & Operational Validation

- **Operational Validation (Procedure):**
  To check that the operational circumstances were achieved: TMA entry speed, FL, Separation, situational awareness, etc.

- **Technical Validation (Tool):**
  To validate the OPTAIN-SA tool operational and technical setup.
**TECHNICAL & Operational Validation**

**Validation Exercises**

Assessment based on the analysis of surveillance and OPTAIN-SA tool data

Radar tracks analysis of the flights performing the demonstration

Vertical profiles (including FDR) were also checked to confirm CDOs
TECHNICAL & Operational Validation

Evolution of the situation with no more indications after the speed adjustment

Aircraft fly their optimized approaches until the Merging Point (POS) and separation is maintained after traffic evolution
RESULTS

<table>
<thead>
<tr>
<th>Flight Procedure</th>
<th>Nº.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single CDO</td>
<td>63</td>
</tr>
<tr>
<td>Sequenced CDOs</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>doublets</td>
</tr>
<tr>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Total number of flights</td>
<td>104</td>
</tr>
</tbody>
</table>

Doublets

Triplets
CONCLUSIONS

RADAR

FOQA

Crew

ATCo daily Feedback

OPTA-IN Tool Report
MATURITY CYCLE STAND

Feasibility Analysis
- Montecarlo (SRAT)
- FTS
- RTS

OPTA CONCEPT

- OPTAIN-SA Tool
- Flight trials
- Shadow mode
- Integrated mockup

CDO Night time
OPTA
OPTAIN
FUTURE WORK

- Develop a methodology to elaborate SRATs considering any scenario, fleet mix, flows and RWY configuration
- Further development for supporting consecutive flights
- Inclusion of new technologies as Mode-S, ADS-B and data Link
THANK YOU

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