Multiple Remote Tower – Challenges and Solutions

Validation Exercise with ON
SESAR PJ.05.03

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Validation Context PJ.05.03

- Which impact does Multiple Remote Tower have on…
  - Human Performance
  - Safety
  - Capacity
  - Cost Efficiency?
Set-Up EXE-05.03.V2-3.1 – ON

Multiple Remote Tower module:
  • ATS provided to 3 small-sized airports
  • DLR real-time simulation platform
  • Frequentis smart strip planner prototype

Participants:
  • 6 ATCOs from Oro Navigacija (ON)

Split & Merge procedures:
  • Overload: split & merge of Kaunas
  • Emergency: split of Kaunas & Palanga
Hand-over procedures

Kaunas Airport

SUPPORT position

Palanga Airport

Kaunas Airport

Vilnius Airport

LEAD position
Key Parameters for PJ.05.03

Traffic volume
- ~ 25 + 3

Traffic complexity
- mainly IFR (90%)

Traffic distribution
- uneven (50% / 25% / 25%)

Operational modes
- normal operations
- unplanned RWY closure (bird strike)
- emergencies

Runway conditions
- good

Weather conditions
- visibility good (VMC, CAVOK no clouds)
- no wind changes

Time of day
- Daylight

ATCO positions
- 1 ATCO alone
- 2 ATCOs: Lead & Support (hand-over)
# Scenarios with Independent Variables

<table>
<thead>
<tr>
<th>Scenario ID</th>
<th>No. of ADs for LEAD</th>
<th>Time</th>
<th>Hand-Over</th>
<th>Type of Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>3 - 2</td>
<td>00:40</td>
<td>Split</td>
<td>none</td>
</tr>
<tr>
<td>SCN 1</td>
<td>3 - 2 - 3</td>
<td>01:00</td>
<td>Split &amp; Merge</td>
<td>high traffic load, bird strike</td>
</tr>
<tr>
<td>SCN2</td>
<td>3</td>
<td>01:00</td>
<td>none</td>
<td>high traffic load, bird strike</td>
</tr>
<tr>
<td>SCN3</td>
<td>3 - 1</td>
<td>00:40</td>
<td>Split</td>
<td>emergency</td>
</tr>
<tr>
<td>SCN4</td>
<td>3</td>
<td>00:40</td>
<td>none</td>
<td>emergency</td>
</tr>
</tbody>
</table>
# Agenda for the Exercise Days

<table>
<thead>
<tr>
<th>Begin</th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Briefing</td>
<td>Run 2</td>
</tr>
<tr>
<td>09:30</td>
<td>Training</td>
<td>Run 3</td>
</tr>
<tr>
<td>10:30</td>
<td>Training</td>
<td>Run 3</td>
</tr>
<tr>
<td>11:30</td>
<td>Run 1</td>
<td>Lunch</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch</td>
<td>Run 4</td>
</tr>
<tr>
<td>13:30</td>
<td>Run 1</td>
<td>Run 4</td>
</tr>
<tr>
<td>14:30</td>
<td>Run 2</td>
<td></td>
</tr>
<tr>
<td>15:30</td>
<td>Debrief</td>
<td>Debrief</td>
</tr>
<tr>
<td>16:30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## ATCO Task

- active ATC as usual
- workload rating every 5min (ISA scale)

<table>
<thead>
<tr>
<th>Workload Heading</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spare Capacity</td>
<td>Under-Utilised</td>
<td>Relaxed</td>
<td>Comfortable Busy Pace</td>
<td>High</td>
<td>Excessive</td>
</tr>
<tr>
<td>Description</td>
<td>Nothing to do. Rather boring. More than enough time for all tasks. Active on ATC task less than 50 % of the time</td>
<td>All tasks well in hand. Busy but stimulating pace. Could keep going continuously at this level.</td>
<td>Non-essential tasks suffering. Could not work at this level very long.</td>
<td>Behind on tasks; losing track of the full picture.</td>
<td></td>
</tr>
</tbody>
</table>
Communication

- ATCOs and pseudo-pilots: use airport designator in every initial call
  → additional safety measure to enhance situational awareness

- radio communication collected to analyse:
  - airport designator usage
  - length and frequency of calls
Eyetracking

- discover scanning patterns
- correlate safety critical clearances with information gathered

Questionnaire Data & Debriefing

Questionnaires after each scenario and after the simulation covering...

- **human performance**
  - ID | Question
  - PE01 | I was generally able to perform the necessary ATC tasks.
  - PE02 | My situational awareness was sufficient at any time.
  - PE03 | I was generally able to prioritize tasks.
  - PE04 | I was generally able to set up a traffic sequence (e.g. VFR into IFR; sequence on final).
  - PE05 | I was able to identify all relevant aircraft.

- **safety**
- **capacity**
- **cost efficiency**

... and additional debriefing interviews
Questionnaire: Challenging Situations

1. Can the situation be solved without major impairment?
   - Yes
   - No

2. Can the situation be solved by measures reducing capacity?
   - Yes
   - No
   - ATC influences capacity

3. Can the situation be solved by measures reducing safety?
   - Yes
   - No
   - ATC workload is too high and should be reduced

Impairment of efficiency

- Minor Unpleasant delays
- Moderate Disturbing delays
- High Very disturbing delays

Impairment of safety

- Impairments in prediction of traffic development
- Impairments due to information processing
- Impairments due to information gathering
- Major Impairment
Challenging Situations: First Results

N = 6
min. = 1
max. = 6

Emergency | Overload

alone  | Lead  | alone  | Lead

0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10

N = 6
min. = 1
max. = 6
Thank you for your attention!

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