What is ‘Multiple’ Remote Tower?

‘multiple mode of operation’ means the provision of ATS from one remote tower/remote tower module for two or more aerodromes at the same time (i.e. simultaneously);

EASA, Annex I to ED Decision 2019/004/R
Past ‘Multiple’ Research

First DLR Multiple trials (2010)  SESAR P06.09.03 & P06.08.04 (2014)
PJ05 Remote Tower for Multiple Airports

WP2 Solution PJ.05-02
Multiple Remote Tower Module

WP3 Solution PJ.05-03
RTC with Flexible Allocation of Aerodromes to MRTMs
Validation Set Up
### Typical Traffic Scenario

<table>
<thead>
<tr>
<th>TIME</th>
<th>CALLSIGN</th>
<th>AC</th>
<th>DESTINATION</th>
<th>SID</th>
<th>SQK</th>
<th>STAND</th>
<th>RWY</th>
<th>REMARKS</th>
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<tr>
<td>08:02:00</td>
<td>BMI77E</td>
<td>A321</td>
<td>Sofia (LBSF)</td>
<td>ERL051D</td>
<td>2177</td>
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<td>1733</td>
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<td>C550</td>
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<td>B737</td>
<td>Rotterdam (EHDRD)</td>
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<td>SF34</td>
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<td>Support EIN8NM, Standby in TWY C</td>
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<td>Frankfurt (EDDF)</td>
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<td>AIRSIDE1</td>
<td>F01</td>
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</table>
- Mid - Run
  - ISA – Scale

- Post – Run
  - NASA-TLX
  - SASHA
  - AIM
  - Safety
  - Tailored questions

- Debriefing
  - open questions to:
    - acceptance and
    - recommendations for improvement
# Safety Assessment

Can the situation be solved without major impairment?

- **YES**: No impairment
  - Good
    - ATCO workload is low to easily achieve the desired performance.
  - Fair
    - ATCO workload is adequate to achieve the desired performance.
- **NO**: Minor Impairment
  - ATCO requires a minor increased workload to achieve the desired performance.

Can the situation be solved by measures reducing capacity?

- **YES**: ATC influences capacity
- **NO**: ATC workload is too high and should be reduced

Can the situation be solved by measures reducing safety?

- **YES**: Impairments in prediction of traffic development
  - ATCO directs traffic sporadically, abruptly and does no longer plans ahead.
- **NO**: Impairments due to information processing
  - ATCO cannot build a complete picture of the traffic situation, confuses information and corrects himself/herself often.
  - Impairments due to information gathering
    - ATCO must neglect areas/information while monitoring and therefore misses aircraft.
  - Major Impairment
    - ATCO cannot longer control the traffic situation.
Safety Results

Cooper-Harper Scale

N = 35
M = 3.80
SD = 1.24
Splitting & Merging

Diagram showing the process of splitting and merging in a system with AD A, AD B, AD C, MRTM 1, and MRTM 2.
CHECKLIST Handover

1. REQUEST from ATCO-HANOVER to ATCO-TAKEOVER to take control of Aerodrome X (Y)
   ATCO-HANOVER Handover Aerodrome X (Y)
   ATCO-TAKEOVER Go Ahead / Standby

2. ATCO-HANOVER provides following information:
   * Relevant weather information (visibility, wind, etc.)
   * Runway in use (Runway condition)
   * Equipment failure (only if failures exist)
   * Aerodrome restrictions/closures (if any)
   * Traffic on Frequency (VFR/IFR) including
     * position
     * intentions
     * clearances

3. Actual HANOVER
   ATCO-TAKEOVER Information copied. Taking over
   ATCO-HANOVER Roger

*Handover of an aerodrome should happen best in a "clean configuration", that is, most probably no need to intervene for the next 30 seconds.
I.S.A. Workload over the time

- BASELINE - 3 Airports 100% [Emergency]
- SPLIT - 1 Airport 50% [Emergency]
- SPLIT - 2 Airports 50%
I.S.A. Workload over the time

Baseline - 3 Airports 100%

Split: 2 Airports 75%

Split: 1 Airport 25%
Radio Transmission [duration]

RT sec per hour

A+C 75% Overload
A 50% Emergency
A+B+C 100% Overload
A+B+C 100% emergency

3 airports = 30mov/h
Airport A = 50%
Airport B = 25%
Airport C = 25%
Radio Transmission [number]

#RT per hour

A+C 75% Overload
A 50% Emergency
A+B+C 100% Overload
A+B+C 100% emergency

3 airports = 30mov/h
Airport A = 50%
Airport B = 25%
Airport C = 25%
Myths to Multiple Remote Tower

- An ACTO is not able to work multiple
- *Multiple* needs new procedures
- *Multiple* only works with additional ground surveillance
- ATCOs do not like working *multiple*
Be prepared for the future!
Jörn Jakobi (PJ05 Project Coordinator)
DLR Institute of Flight Guidance
Braunschweig, Germany
Joern.Jakobi@dlr.de

www.remote-tower.eu
Remote Tower

The modernisation of air traffic management is one of the main challenges of current aeronautics research. The Single European Sky ATM Research (SESAR) project defines, develops and deploys what is needed to increase ATM performance and build Europe’s intelligent air transport system.

Part of SESAR are the projects PJ05 ”Remote Tower for Multiple Airports” and PJ05-W2 “Digital Technologies for Tower”, which focus on the safe and efficient airport of the future. By bringing the concept of remotely controlling multiple airports as well as HMI interaction modes for airport towers to higher maturity levels, the SESAR projects aim at providing small and medium sized airports with more cost-efficient and service tailored air traffic services.

The current programme is SESAR 2020 supports projects to deliver solutions in four key areas, namely airport operations, network operations, air traffic services and technology enablers. It is running from 2016 to 2024 with a budget of 1.6 billion Euro.

Recent News

- Ever wondered whether Multiple Remote Tower can also solve your problems? 5. October 2020
- Article about Remote Tower Results on CORSIS website 13. May 2020

These projects have received funding from the SESAR Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730195 and No 874470.
Remote ATS for non-controlled Airports

- PTZ-Camera: 3,500 €
- 2 Panorama-Cams: 1,500 € each
- Bandwidth: ca. 17 Mbit/s (would match 4G bandwidth)
- VR-Brille: from 500 €
- Computer: ca. 2,000 €


Supporting small airports using virtual reality - DLR Portal