SESAR PJ05 validation
Multi Remote Towers

Open Day
7th March 2019
# Open Day schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker/Note</th>
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Welcome!

Elin Blakstad
Director, Tower Systems
Indra Navia
Avinor perspective on Multiple Remote Tower

Torbjørn Henriksen

Avinor
Validation Platforms

Martin Hasselknippe

Indra Navia
Project PJ05 Multiple Remote Towers

Solution 2: Remotely Provided ATS for Multiple Aerodromes for up to three airports

Solution 3: Highly Flexible Allocation of Aerodromes to Multiple Remote Tower Modules

Maturity level V3

Maturity level V2
Solution 2

Validation with focus on MRTM
Validation overview

SDM-0207 “Remotely Provided Air Traffic Service for Multiple Aerodromes (up to three Aerodromes)”

- Control of up to three medium sized aerodromes
- Real-time simulation
- Out the window view (Heads-Up) provided by three 3D TWR simulators
- MRTM provides an operational environment
- Operational scenarios of mixed traffic
- “Split and merge” of aerodromes
  - Move from three to two airports within an MRTM
  - Move from two to three airports within an MRTM
Røst Airport

- Røst - a small community on the island of Røst
  - Approx 600 inhabitants
- 1030 meters Runway
- Two exits to Apron with two stands
  - Backtrack on RWY is needed
- Served twice daily with Dash 8 by Widerøe
- Also served by rescue helicopters and GA traffic
- Approx 1500 movements per year
- In this validation traffic has been increased
Haugesund Airport

- International airport in SW Norway
- Mainly Boeing 737 scheduled traffic
- Also helicopter traffic to oil rigs and GA
- 2120 meters Runway
- Three taxiways to Apron – no parallel TWY
  - Backtrack on RWY is needed
- 5 stands with pushback – four stands for GA
- Approx 10 000 movements per year
Bodø

- International 24H Combined Civil and Military airport
  - Fighter base and base for Search and Rescue
- Scheduled traffic with mainly B737, helicopters and Dash 8
- 2794 meters runway
- Parallel taxiways on both sides of RWY
- No military traffic in the validation
- Approx 50,000 movements per year
Validation platform

Pseudo-pilots
Multi layout
Multiple Remote Tower Module

Heads-Up Display (HUD)
Indra 3D TWR Simulator

VCS
Indra GAREX 230 VCS

Heads-Down Display (HDD)
Indra InNOVA AIR
Multi layout HDD

- Traffic Situation Display (TSD) on background
- HUD and TSD have similar split
- EFS split side-by-side
- When B (Haugesund) move out, C will expand to cover the vacant space

A = Bodø
B = Haugesund
C = Røst
Heads-Down Display

Based on Indra InNOVA ATM system

- All ATM tools combined on a single 43” display
  - Traffic Situation Display (Air only)
  - Electronic Flight Strips
  - MET (wind, QNH)
  - Planning tool (timeline)

- Combined functions for up to three aerodromes

- Focus on HMI development to focus on important elements to increase Situational Awareness
HDD layout

- Background is the TSD (Traffic Situation Display)
- Dashboard is floating and contains
  - EFS
  - Timeline
- Additional functions appear as floating windows
Timeline – Short term planning tool

- Used by ATCO to plan traffic for the next period and assess the expected workload
- Indicating all flights on a timeline of a configurable period
- Same colour coding as flight strips and flight labels
- Length of line indicate the expected time the ATCO will work with flight
- When activating a flight strip in the EFS, the line will move to the ‘now’ line
- When selecting a flight in Timeline, EFS or TSD, the same flight will be highlighted everywhere
Electronic Flight Strips (EFS)

- Access to all flight plan data through a suitable strip layout
- Tailored layout for each type of flight (IFR, VFR, arrivals departures etc.)
- Separate EFS for each aerodrome - side by side
- Clearances given on strips
- Flight status flow through strip bays
- Provides ATCO with increased situational awareness
MET indications

Wind and QNH used in validation

- Wind presented
  - As numbers on both RWY thresholds on HUD
  - As optional wind rose on HDD

- QNH presented
  - On HUD
  - On top of EFS
Solution 3

Validation with focus on Supervisor Planning Tool for Remote Tower Centre
New operating methods

Previous operating method

• Single Remote Towers

New operating method

• New role: RTC Supervisor
• Remote Tower Planner tool
• Simultaneous operations
• Flexible allocation of aerodromes
Flexible allocation of aerodromes to MRTMs
Solution 3 validation

Remote Tower Planner (RTP)

- Supervisor tool for medium to long term planning
- Remote Tower Center (RTC) with Multiple Remote Tower Modules (MRTM)
- Tool provides proposed combination of aerodromes to each MRTM within the RTC
- Based on specific input
  - Planned traffic (flight plans)
  - Weather (present and forecasted)
  - Airport complexity
Validation

Three scenarios with various traffic load and weather conditions

15 airports (4 ATC, 11 AFIS)

- ENRS - Røst
- ENRO - Røros
- ENMH - Mehmann
- ENBV - Berlevåg
- ENHK - Hasvik
- ENNM - Namsos
- ENRM - Røvik
- ENSG - Sogndal
- ENBL - Førde
- ENSS - Vardø
- ENSH - Svolvær
- ENML - Molde
- ENHD - Haugesund
- ENBO - Bodø
- ENNA - Lakselv

Traffic: Simultaneous movements mix of VFR, IFR and Vehicles
Validation

- Two experienced Avinor Supervisors in validation
  - One from large TWR operations
  - One from ACC operations
- Tool configured for 15 aerodromes and 15 MRTMs
- Three scenarios with variable traffic load and weather conditions
- One day validation with run-through of the scenarios
- Observations, questionnaires, interviews, brainstorming
RTP tool
Validation Execution

Espen Stokkeland, Avinor
Key Parameters

- **Time of day**: Daytime in all APTs
- **Visibility conditions**: VMC
- **Wind conditions**: Variable
- **Traffic Volume**: 25 mv/h, 6-8 simultaneous
- **Mainly IFR, VFR, helicopter, vehicles**: Traffic complexity
- **One APT (>70%)**: Traffic distribution
- **Normal operations**: Operational modes
- **Variable (Two without taxiway)**: Runway complexity
- **Similar + change of runway**
- **Runway directions**

Operational modes: Runway complexity
Validation Objectives – Human Performance

- **Situation Awareness** when providing ATS to multiple aerodromes
- **Workload** when providing ATS to multiple aerodromes
- **Usability and Utility of Human-Machine Interface** when providing ATS to multiple aerodromes
- **Acceptance of operating methods** when providing ATS to multiple aerodromes
- **Safety** and the capability to achieve tasks in a **safe** manner; Potential threats to Safety

...through Observations, Questionnaires, Debriefings
Validation execution

- Four Avinor ATCOs
- One Training Day with all ATCOs
- One Validation Day for each ATCO
  - Three Runs per day
  - Each Run lasts one hour
  - Various traffic and situations per run

<table>
<thead>
<tr>
<th>Run</th>
<th>Details</th>
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</table>
| 1   | Three aerodromes  
IFR, VFR, Helicopter, Vehicles  
QNH and wind changes  
Local helicopter operations at ENRS |
| 2   | Three aerodromes – split out one  
IFR, VFR, Helicopter, Vehicles  
Wind change leads to RWY change  
Aircraft need to return due to technical |
| 3   | Two aerodromes – merge in third  
IFR, VFR, Vehicles  
QNH changes  
VFR doing circuit training on ENRS  
VFR not following clearance |
Conduct

Run 1, 2, 3

- Focus on the run as if under realistic conditions
- Over-the-Shoulder Observers
- No “conversation”, but point out malfunction/issue, situation to debrief
- Video Recording as back-up (consulted as needed)
- Data handled confidentially, reported in an aggregated way

Run 1: 3 AD
Run 2: 3 AD → 2 AD
Run 3: 2 AD → 3 AD

Post-run questionnaire
- Workload & SA: fill in directly after
- Short break
Debriefing HF & OPS

After Run 3: Post-exercise questionnaire
- More general and additional feedback
- Controller Acceptance Rating Scale
- Safety Questionnaire
Split and Merge

Move one airport to another MRTM while maintaining operations

- Receiving MRTM opens Aerodrome in “View only” mode, monitors traffic and comms
- When ready, contacts Giving RTM to initiate process
- Handover checklist of information
  - Runway status, traffic, weather etc.
- Receiving MRTM takes control
- Giving MRTM keep aerodrome in “view only” for a while before removing aerodrome from MRTM
Practicalities
Bus leaves for Indra Navia at 11:45
Limited parking

If car is needed, use parking house by railway station
Please note

- Wardrobe available
  - Room is not locked – storage on own responsibility

- Light lunch served
  - Will be available all through the demonstrations
  - In case of allergies or other there are items to be purchased in the restaurant

- Photographs will be taken during the day

- A participant list will be distributed after the event
Demonstrations

- Three possible demonstrations will run in parallel
  - Each demonstration lasts approx. 20 minutes
- Three groups with approx. 25 persons in each
  - See colour coding on your badge
- Rotates among the demonstrations every 30 minutes
Demonstrations

Solution 2 – Multiple Remote Tower Module
- Real-time simulation with three airports
- 20 minute scenario with Avinor ATCO controlling traffic

Solution 3 – Remote Tower Planner tool
- Demonstration of RTP tool
- Planning for a Remote center with 15 MRTMs and 15 airports

Ground Routing and Guidance (SESAR PJ03)
- Demonstration of routing and guidance
- Strip-free operation. Clearances given on labels.
- Optional attendance
Groups and demo schedule

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<td>Green</td>
<td>Solution 2</td>
<td>Solution 3</td>
<td>Lunch/demo</td>
</tr>
<tr>
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<td>Red</td>
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Routing & Guidance
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