UNPACKING SESAR SOLUTIONS
REMOTE TOWER SERVICES
12-13 JUNE 2014, DUBLIN AIRPORT

09:00 Welcome
Florian Guillermet, SESAR Joint Undertaking

09:15 Remote Tower Services: The business perspective (I)
- Manufacturing Industry
  Per Ahl, SAAB
  Michael Ellinger, Frequentis
- Airports
  Andreas Eichinger, ACI Europe
- ANSPs
  Cristiano Baldoni, ENAV/A6

10:25 Coffee

10:55 Remote Tower Services: The business perspective (II)
- State and municipal
  Eamonn Brennan, Irish Aviation Authority (IAA)
  Ingrid Cherfils, Swedish Transport Agency
- Dialogue towards approval
  Anders Erzoll, Swedish Transport Agency
- Staff Associations
  Willem Zuidveld, International Federation of Air Traffic Controllers’ Associations (IFATCA)
- Implementing stakeholders
  Niclas Gustavsson, LFV
  Hans Hedde, DFS

12:45 The need for guidelines
Paul Adamson, Eurocontrol

13:05 Question and Answers
Michael Standard, SESAR Joint Undertaking

13:25 Eurocontrol strategic approach
Frank Brenner, Eurocontrol

13:50 Wrap up
Florian Guillermet, SESAR Joint Undertaking

14:00 End of meeting (Light lunch)
Remote Tower Services: The Business Perspective
Florian Guillermet
SESAR JU
Remote Tower Services: The business perspective

Manufacturing Industry

Per Ahl

SAAB Group
Remotely Operated Tower
- Saab Experiences and Challenges -

Per Ahl
Vice President
Head of Commercial Aerostructure, Civil Security, and Traffic Management
Market Area Europe and Greater Middle East
TIME FOR A NEW BUSINESS MODEL ???
Controlling Ängelholm Airport from Malmö-Sturup Airport, distance 100km

REMITELY OPERATED TOWER
Test system in Sweden since 2008
REMOTE OPERATED TOWER

The technical challenge

Airport

Delay 0.3 sec

RTC

Compression

400 Mb/s

2-4 Mb/s

32 Mb/s

Decompression

End-to-end delay < 1 sec

SAAB
Saab ATM - long time r-TWR experience

- 2006: r-TWR proof of concept project start
- 2007: ART project start
- 2008: Shadow mode validations at Sturup
- 2009: ART validations at Sturup
- 2010: The second remote tower symposium
- 2011: SESAR validation 2 single
- 2012: Delivery of SESAR r-TWR prototype Værøy - Bodø
- 2013: Delivery of r-TWR test system to Airservices

- 2006: r-TWR installed at Ängelholm airport
- 2009 & r-TWR rollout
- Start of SESAR r-TWR projects
- SESAR validation 1 single
- Delivery of 1st operational r-TWR system
- SESAR validation AFIS Værøy - Bodø
- Start of operational certification in Sweden
Environmentally-Protected Remote Sensor Housing

- 14 high-definition cameras
- Pan/tilt/zoom (PTZ) cameras… optical and infrared (IR)
- Signal light gun
- Acoustic sensor
Remote Tower – CWP

The Out The (Tower) Window (OTW) view is presented for the ATCO in the Controller Working Position (CWP)
Overlay of weather information

Wind rose

RVR-values
Sun light prevention with filters

With Filter

Without Filter
Remote Tower – CWP

- CWP Systems
R-TWR Pilot Implementation Project Sweden

- Contract rewarded in January 2011
- Two airports Sundsvall and Örnsköldsvik
- The RTC will be located in Sundsvall
- Delivered December 2013
- Operational validation 2013
- Final Validation report February, 2014
- Approval for Operational use in Q2 2014
REMOTE OPERATED TOWER

Airport

Remote Tower Center

Delay 0.3 sec

~ 100Mb/s

Compression

Decompression

End-to-end delay < 1 sec
The OTW view in RTC in Sundsvall
R-TWR test site to Airservices Australia

- Contract was signed on the 1st of June 2011
- Remotely control Alice Springs airport from Adelaide (1500 km)
- Site survey performed in Alice Springs 5-7 of June 2011
- Based on the Swedish implementation + visual tracking
- Delivery in Q4 2013
- FAT December 2013
- SAT February 2014
- Validation start Q3, 2014
Remote Tower - Norway

- Værøy heliport, RTC in Bodø
- SESAR Trials in Dec 2012
- Röst installed December 2013
Remote Tower Market Segments

Airport Movements

- > 50´
- 20´-50´
- 10´-20´
- 5´-10´
- < 5´

Product complexity

- Oil & Gas
- AFIS & Small airports
- Regional & Local airports
- Larger airports (Contingency operation)
r-TWR Training & Simulation

- A module that feeds ordinary r-TWR CWP position(s) with all necessary data for 1-N airports
- 1-M pilot positions
NEXT STEPS
r-TWR Switching

- Allows one CWP to be switched between different r-TWR airports. The One-To-One CWP is statically connected to a specific airport.
- Cost reductions for an ANSP, the RTC is equipped with a less number of CWPs.
- A disconnected airport is closed.
- Well fitted for locations with very low traffic density, such as military maintenance bases, oil rigs and heliports.
Multiple Airports in one CWP

3 examples of OTW (Out of The Window view) konfig. Side by side presentation

[Images of airport panoramas]
**SUMMARY:**

*Driving forces for Remote TWR*

- Survival opportunity for smaller airports with low traffic density
- More efficient and cost effective TWR service
  - Difficult to recruit to distant airports
  - Ability to sequenced control of small airports
  - Multi airport control
  - Possible shared use of the APP-resources
- Increase ATC operation by utilizing the staff in a more cost effective way
  - Lack of educated or trained people when expanding the operation
  - Multi airport control – one controller will be able to control up to 3 airports
- The ability to have 7/24 SAR operation
  - Flexibility to open up airfields
- Alternatives to new construction or refurbishment of the tower
- > 30 customers in queue.....
TIME FOR A NEW BUSINESS MODEL ???

- ATC ON DEMAND –
Experiences – Change Management
How does pixels affect operations?

- What is comparable to real life? 1080 p i.e. HD?
- Digital windows
- Video tracker accuracy
- Work environmental considerations
How does frame rate affect operations?

- Smoothness in picture – What is comparable to real life?
- Rapid moving targets requires high update rate i.e. frames per second [fps = Hz].
- Number of images photographed per second
- All in all, situation awareness
- Work environmental considerations
Considerations for visual & safety enhancement tools

- IR
- Trackers
- Additional cameras
- Overlay (met info, labels, etc.)
- Anomaly detection
- Technically possible vs “Legally” achievable…?
Issues to consider…

- How much do we need to see? Do we need to see at all? Requirements i.e. what level of quality?
- Does our operation require $360^\circ$ view?
- What vertical coverage do we need?
- Do we need to replace the binoculars? PTZ?
- In poor metrological conditions and darkness, how much do we need to see?
- Level of redundancy & traceability?
- What rules & regulation to certify against?
- Evolution rather than revolution
- KIS
Quality of image [pixels]

Quality of motion, frame rate [Hz]

Camera coverage 0 -360° (horizontal & vertical) [deg.]

Visual & safety enhancement tools (additional cameras, IR, tracking etc.)

Redundancy and traceability requirements

Operational

Footprint i.e. No of servers etc.

Bandwidth [Mb]

Data compression

Technical

CAA Requirements
Business Case $$$

- Footprint (i.e., no. of servers etc.)
- Bandwidth (#band)
- Data compression
- Quality of image [pixels]
- Quality of motion, frame rate, etc.
- Camera coverage 0-360° (horizontal & vertical) [deg.]
- Visual & safety enhancement tools (additional cameras, IR, tracking, etc.)
- Redundancy and traceability requirements
Experiences – Change Management

It’s not a Revolution – It’s an Evolution

- Applying today’s Rules & Regulation on new infrastructure
- Building the new basic platform to expand into the future

It’s not about Technology – It’s Change Management

- Technology is not an issue – leave it to the vendors

Home work

- How many airports - How to implement
- Operational context
- Build a Team
- COST BENEFIT ANALYSE !!!

Invite your stakeholders

- Regulators, Controllers, Unions, Technical staff

Start with a test system

- Build trust
- Adopt operational procedures
- Experiences, knowledge
- Look at an implementation plan

It takes time – BUT YOU CAN START NOW
Remote Tower Services: The business perspective

Manufacturing Industry

Michael Ellinger

Frequentis
smartVISION
DESIGNED BY FREQUENTIS

New Approach for Remote Virtual Tower Solutions
More than 65 years of innovation & expertise in mission critical applications

We develop and market high reliable communication and information systems for mission critical applications in the fields of Air Traffic Management and Public Safety & Transport.

ATM
Air Traffic Management

PST
Public Safety & Transport

ATM Civil
Defence
Public Safety
Public Transport
Maritime

Worldwide Control Centres develop towards the same standards.
Frequentis and SESAR

Frequentis is one of the main contributors in SESAR RTO projects:

- Evaluation of new enabling technologies (Cameras, Video Tracking, Network, Compression…)
- Strong focus on working position design & human factors
- Involvement in Remote TWR Validation in Norway
- Planned Multi Remote TWR Validation with DFS

SESAR provides us a very good platform for cooperation with ANSPs & industry partners

SESAR enabled us to drive the remote tower technology to the next level!
Remote TWR - Market View & Challenges

A lot of interest from ANSPs & Airports in Remote Tower and similar usage scenarios

Main Motivation & Goals:
- Increase Efficiency
- Cost Savings

Questions from customers:

What is required to implement a remote TWR solution?
How to get acceptance from ATCOs / regulator?
How to increase efficiency?
What is required for RTO implementation?

Remote TWR is more than Visualisation!

Visualization & Surveillance Functions
- smartVision
  - Cameras, Alternative Surveillance Sensors

Information & Control
- smartTools
  - Sensors, Airfield Lights, Nav Aids

Communication
- VCS
  - Radios, Phone Lines, Backup Radios

Flight Data Handling
- smartStrips
  - FDP System, AFTN, etc.

smartRVT
Remote Virtual Tower

VCX
Infrastructure, Network & Recording

DIVOS
Network Infrastructure as key element

- Highly reliable / Security
  - Redundant links / separated routes / secure channels

- Contingency Concept (degraded modes)

- Transferring Voice, Data, Video via same network
  - Bridging legacy protocols

- Address high bandwidth demand for video
  - Optimize compression
  - Reduce data by selecting other camera technology

Provide high level of safety
but keep your infrastructure costs low!
How to get acceptance from the ATCOs and approval by regulator?

*Do not only a replacement the tower view – enhance it!*
Benefits of Thermal Infrared Cameras

- Better Ground / Sky Contrast allows detection of object even with lower resolution

- Enhanced Visibility in Heavy Rain, Snow/Sandstorm, Fog etc

- No sunlight reflection / Equivalent Day and Night Visibility

IR allows a significant reduction of bandwidth
Increase Situation Awareness
Object Detection & Information Augmentation

Wind / RVR Overlay

Multiple objects are marked and tracked
→ Increase Safety: Video based Safety Net
Enhanced binocular with automatic tracking

Select object in panorama view
get a close up in the binocular view

• verify landing gear up / down
• detect engine fire
• monitoring final approach
• monitor aircraft in control zone
Distance Measurement of Objects to compensate missing 3D view

report **distance**, **speed** and **altitude** of tracked object in real time
→ Provide an full integrated working position
How to increase efficiency?

Multi airport handling is a key enabler!

- Apply a new working method
- Support controller with additional support tools
- Increase Automation
- Close integration of all systems
- Introduce new planning tools for balancing workload
Further Questions ?
→ Civil Validation - Dresden (DFS)
Military Validation - Airpower Zeltweg (ÖBH)
Remote Tower Services: The business perspective

Airports

Andreas Eichinger
ACI Europe
Perspectives on Remote Tower Services

Remote Tower Services

- Operational
- Security
- Commercial
- Social
- Safety
- ...

Remote Tower Services – The Airport Perspective
Perspectives on Remote Tower Services

Remote Tower Services

- Operational
- Commercial
- Safety
- Security
- Social
- ...
Operational Aspects

- Flexible opening hours to meet the requirements of the airport (or its customers respectively)

- Flexible provision of ATC services during the operating hours of the airport

- 24/7 emergency operations feasible even outside normal opening hours

- Trials proved operational reliability

- Further improvements might and trials will be required for multiple airport scenarios

➤ Improvements in service levels are possible
Commercial Aspects

- High percentage of an airport’s costs are fixed

- Not just capital costs for infrastructure but also operating costs, a significant proportion of which are driven either by regulatory requirements (safety and security), or by existing infrastructural requirements rather than traffic volumes

- Nowadays, the cost of providing ATC services at an airport is fairly inelastic

- Considering visiting costs at an airport the cost share of ATC is significant

- Shared investment and operating costs should lead to reduced investments and reduced and more elastic operating costs

Remote towers allow significant cost savings and lower visiting costs
Safety Aspects

- Timely implementation may be questioned by regulatory approval
  - Danger: Regulations and resulting concept of operation not harmonised and not consolidated across EU Member States
  - EASA Rulemaking Task ‘Technical Requirements for Remote Tower Operations’ (RMT.0624)
  - Eurocae working group WG-100 ‘Remote and Virtual Towers’
  - Requirements of the resulting regulation need to be proportionate and cost-efficient

- Solutions need to be found for some tasks that are currently carried out by ATCOs or AFISOs
  - Meteorological observation
  - Runway inspections

- Stored video and audio data may help accident and incident investigation
  - Chance to modernise ATC facilities with state-of-the-art technology
Conclusions

Remote tower services allow...

- Improvements in service levels
- Significant cost savings and lower visiting costs at airports and are a
- Chance to modernise air traffic control facilities with state-of-the-art technology

Shifting focus

- Initial focus was on low to medium density airports
- Focus now also on contingency towers at medium to high density airports
- Application of the technology for remote apron control?
Remote Tower Services: The business perspective

ANSPs

Cristiano Baldoni
ENAV/A6
1. Why to remote
2. Remote TWR as the solution
3. Same concept, several features
4. Expected benefits
5. Conclusions
Why to remote...

Need to comply with the enforced performance targets on cost-efficiency as per EC Regulation 691/2010 on Performance Scheme.

Significant and fairly inelastic costs of ATC services provision in small/medium airports, including costs for installing or maintaining manned TWR → several European regional airports have little chance of being commercially viable.

In certain EU regions, overcapacity of airport infrastructure relative to passenger current demand and airline needs.

Need to reconsider the traditional way to provide ATS/ATC services!!!
The SESAR Concept of Remote Tower for Single Aerodrome (SDM-0201) and its successor RT for Multiple Aerodromes (SDM-0205) represent an extremely modular and flexible solution for sharing ATS services across clusters of airports...

... Remote Tower as the Solution!
A single Remote Tower Centre (RTC) serving several remote airports through a set of Remote Tower Modules (RTMs)

The RTC could be located at any location that has a very high level of integrity that meets all the service continuity requirements of the cluster of airports that are under its control

Remote Tower Concept does not require any special training, neither new methods, nor procedures, nor airspace redesign → seamless solution to the users

Flexibility and adaptability of the solutions to several European operational scenarios

The Remote Tower concept is also suitable to provide service continuity at a major airport in a contingency situation (e.g. temporary unavailability of the local tower for refurbishing)
Expected Benefits

**Cost Efficiency**
- Staff optimisation
- Reduced costs of maintenance for local tower building
- More efficient/centralised training, based on available RTMs

**Access and Equity**
- Possibility to maintain ATS services for airports otherwise economically unsustainable.

Directly & Indirectly

- ANSP
- Airspace Users
- Airport Operators
- Regional Governments
- ATCOs
- Military
- Citizens
Conclusions

- To foster the large scale deployment of the Remote Tower concept:
  - Further investigations and demonstrations activities are required to prove the maturity and the feasibility of the concept
  - Standardization and regulatory (i.e. licensing and service certifications) issues still need to be addressed, developed and then harmonized at European and at global level

But …

Remote Tower concept is among the most promising SESAR solutions, well responding to the business needs of several stakeholders, which can effectively contribute to the sustainable development of the transport system in Europe!!!
Thank you!