Remote Towers

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Agenda:

- Background
- Remotely Operated Tower Project – Proof of Concept
- R-TWR Pilot Implementation Project Sweden
- R-TWR test site to Airservices Australia
- R-TWR Norway
- R-TWR development
- Technical support in an incident situation
WHY DID SAAB GO INTO THE REMOTE TWR BUSINESS?

- In 2006 LFV invited us into a partnership in the research of a Remote TWR validation platform.
  - Saab develops the technical platform
  - LFV is responsible for operational concepts, validation and safety assessment

- A close relationship between industry, ANSP, ATCO:s/AFISO’s and Safety Authorities was the critical success factor for launching this revolutionary concept.

- The customers have an obvious business case in:
  - Cost reductions for smaller airports
  - Low cost alternative for building new towers or refurbishment
  - Multi airport control
  - High capacity contingency for larger airports
  - Enhanced local operations
The concept – to control a number of towers from a centre
Remotely Operated Tower Project
Proof of Concept
The remote tower (Ängelholm) is controlled from Malmö airport (approx. 100 km).
The Technical Challenge #1
- to replicate the ATCO/AFISO situational awareness
The Technical Challenge #2
- to remotely control all the airport equipment

- Runway light control, ILS/NAV
- Emergency radio, Signal light gun
- Alarms from NAV, Radio, Power etc
- Switch from remote to local ATC

TWR

Remote Tower Centre
Video transmission

Airport

Delay 0.3 sec

RTC

400 Mb/s

Compression

2-4 Mb/s

32 Mb/s

Decompression

End-to-end delay < 1 sec
The airport sound is captured with 2 mics
Service and installation
All the cables are connected
Support work OK!
Remote TWR Centre, Test system in Sweden
The “binocular”

- A zoom camera replaces the ATCO/AFISO binocular
- Easy and smooth to handle
The zoom camera
Controller Working Position
Validations by ATCOs

- Passive shadow mode
- Active shadow mode
- Advanced shadow mode
R-TWR Pilot Implementation Project Sweden

- Contract rewarded in January 2011
- Two airports Sundsvall and Örnsköldsvik
- The RTC will be located in Sundsvall
- Delivery in Q3/Q4 2012
- Certification of the concept
- Operational in 2013
R-TWR Sundsvall
360 OTW view
360 OTW view

- The platform is built on many different HW components
Redundancies

- No significant single point of failure
- All safety critical hardware are redundant, such as:
  - Hot stand bye computers
  - Extra OTW screen in the RTC CWP
  - Two PTZ cameras and signal light guns
  - One PTZ camera can replays any OTW display
  - Redundant independent WAN
- Software surveillance features
  - Automatic restart of important features
  - Alert to technical supervision position
- Maintainability
Various environmental conditions
Camera house – environment control

Camera house capabilities, prevents:

- Rain/Snow/Hail/Moisture/Dust
- High/Low temperatures
- Sunlight
- Insects
- Birds
Rain Prevention
Rain Prevention
Automatic digital brightness adjustment
Automatic digital brightness adjustment
Sun light prevention with filters

With Filter

Without Filter
Problem with salt on the camera window
Bird prevention
1 – 1 configuration

- All staff at the same site is more efficient
- Combine APP/TWR role
High - low density configuration

- Higher efficiency during low density

Local/remote airport switch

Sequential multiple airport control
Simultaneously multiple airport configuration

- During SESAR development
Simultaneously Multiple Airport Configuration

- During SESAR development

Local/remote airport control
Clustering
Switching airports

From Sundsvall to .....
Switching airports

..., Ängelholm
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 2012
- Supported by Saab Aus
R-TWR test site to Airservices Australia
Validation site at Værøy (Nov/Dec 2012)

Værøy heliport, RTC in Bodø
SESAR Trials in Dec 2012
R-TWR development
New technical features

To increase safety and ATCO/AFISO situational awareness:

- Cameras in new positions
- Night vision camera
- Target tracking
- Runway incursion warnings
- FOD warnings
- Overlays
Alternative cameras

Surveillance at interesting spots (combined with IR, VET ..)
Alternative cameras, tracking & overlay
Alternative camera – fog situation
**Infrared camera**

- Infrared imaging provides a thermo graphic representation of the focused area. This could be used as a supplement to the regular cameras in a remote tower OTW view, to be used in darkness or in fog.
Infrared camera

- Increased safety, possibility for the ATCO/AFISO to see in darkness
Tracking & Labels
Labels

Radar track

Video track

Fused track
Overlays

- Picture-in-picture display
- Geographical overlays
Overlay of weather information

Wind rose

RVR-values
Target recognition and anomaly detection

Alert to the ATCO/AFISO
Target recognition and anomaly detection

Alert to the ATCO/AFISO
Multiple controlled Remote Tower

**Multiple controlled airport** functionality enlargement of remote tower centre with network infrastructure and redesigned controller working position with regards to controller input devices, status monitoring displays and panorama presentation alternatives.

**THE CHALLENGE:**
Develop the CWP from a 1-to-1 position (one CWP controlling one airport) to a 1-to-2 or 1-to-3 CWP
Multiple controlled Remote Tower - Simulations

Simulations are planned to September 2012, DATS simulator
Technical surveillance (technology and technical supervisor position) and redundancy design and assessment. Upgrading of system and network infrastructure to a robust and reliable level, with full technical health and status monitoring and control.
Contingency tower

Remote Tower technology installation
One or several masts combined with additional camera locations
Contingency Tower supporting local operations

Enhanced local operations by providing the ATCOs with camera feed from the contingency tower mast and additional cameras.
Information sharing possibilities with digitized video and tracking, spreading the filtered knowledge to airport users such as:
- more detailed information to ground handlers of airplane position
- maintenance personnel to view aircraft from distance
- visual de-ice requirement checks
- security
What can I do if I’m located in a remote location far away from the airport?

- Radio communication lost with the pilot
- Emergency alarm
- Incident investigation
Signal Light Gun – backup for radio
Signal Light Gun – backup for radio
Emergency alarm

The emergency alarm is covered by a “protection glass”
Emergency alarm

The operator slides down the “protection glass”
Emergency alarm

- Activation of the emergency alarm
Incident investigation

- All video data are recorded and stored for 30 days
- It includes all the 14 OTW cameras and the zoom cameras
- Video sequences can be replayed and further analyzed in case of an incident or for training purposes
Replay of video