In this presentation

Characteristics of Remote Tower
Impact on ATCos and choices to make
Human Factors research
• When, why, what
Example

What can Human Factors contribute to enhance a smooth transition from conventional to remote tower operations? Better understanding of HF aspects allows making better decisions upon a well informed base.

Human dimension in Remote tower

Some characteristics of Remote Tower

• Camera output and radar
• Out of the window view replaced by monitors
• More flexibility to arrange CWPs
• Discriminate between single and / or multiple remote
• Impact on operation
  – Arrival and departure management more important
• Options for additional features in the CWP to compensate for possible "limitations" (controller tools/software or special cameras)
• Often: no changes in operational procedures / working methods, still: multiple consequences for the ATCos

Impact on ATCos and choices to make

• Complex workload management
Impact on ATCo fatigue?
Design CWP
Positioning monitors out of window view
ATCo operational strategies

Human dimension in Remote tower
Prior to deployment of a Remote Tower

Establish the following:

• What scope will the operation cover: traffic type and volumes, complexity of airport layout, (special) areas covered?
• Will the current operation change: controller roles and responsibilities, multiple remote tower operations?
• How will the CWPs change? How will that impact requirements for:
  • Acceptable ATCo workload, SA or fatigue
  • Out-the-window view (position of cameras, angles, resolution)
  • Capture of areas under control
  • Additional controller tools (surveillance, safety nets, planning)

→ In other words: “What do I really need?” and “Will it be really safe?”
→ How to do that???

Human-in-the-Loop Simulations as a facilitator of operational changes

Human-in-the-Loop simulations provide valuable information and are a powerful tool for:

• Specifying requirements for desired operation and functions
• Determining impact of changes w.r.t. operational and functional aspects in working environment on human performance
• Identifying facts about existing (Human Factors) related concerns
• Validating desired operational improvement
• Testing potentially hazardous and workload intensive operations
• (Conversion) training controllers for new operations and use of functions
• All aimed at one particular airport / ANSP

Human Factors assessment – when and how

• Prior to deployment in simulation
• Or in real operation
• Ideally once the concept is clear, but not fixed yet
• Measurement in simulation and / or real operation
• Compare between conventional versus remote tower

Human Factors analysis techniques

Whole is more than the sum of the individual components
Human Factors studies provide data about:

- Situational Awareness
- Alertness
- ATCo scanning strategy
- Fatigue
- Mental Workload
- Stress
- Acceptance
- Eventually leading to capacity, efficiency or safety

Every airport is different!

Study at ATC The Netherlands (LVNL)

Demonstration Set-up

Remote Tower Demonstration for Groningen Eelde (live) and Maastricht-Aachen Beek (simulated with NARSIM) from one CWP with one ATCo

LVNL Remote Tower Centre (logistical)

Remote Tower System

From Simulation to Live Trial

Multiple Remote Tower Operations

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Human dimension in Remote tower

SESAR PJ-05 trials at LFV

Study at HungaroControl

Initial study

Compare TWR with new rTWR
• Division of attention over information elements
• Scanning strategies for information acquisition
• Levels of workload and stress
• Fatigue building up

Field study at HungaroControl in two phases:
1. Identification of the situation, applicability of Human Factors measurement tools in TWR and rTWR
2. Data acquisition
   – 3 ATCos in ground- and aerodrome position on TWR and rTWR

Applied

• Eye tracking
• Heart rate variability measurement
• Questionnaires
• Both in real tower as remote tower (in shadow mode)

First trends identified

• ATCos looked more at video wall than window
• ATCos used radar display more often in TWR than rTWR
• ATCos showed different scanning strategies in TWR and rTWR
   – Also differences between ATCos exist
• Symptoms of fatigue increased during shift in TWR and rTWR in a comparable way
Concluding

- Remote tower operations are introduced for various reasons
- They have impact on ATCos
  - Workload (multiple RTO), Attention
  - Information presentation / Situational Awareness
  - Usability of system
  - Etcetera
- Human factors studies qualify and quantify that impact
- Knowledge about this impact may lead to mitigations and a smoother change management during remote tower implementation
- Eventually it will protect you from making expensive mistakes to execute a HF study
  - Efficiency and/or safety