



**Remote tower – international seminar 2018**



Dedicated to innovation in aerospace

**Human dimension in Remote tower**

Rolf Zon, 10 October 2018



The Human in Remote Tower Operations



Human dimension in Remote tower



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



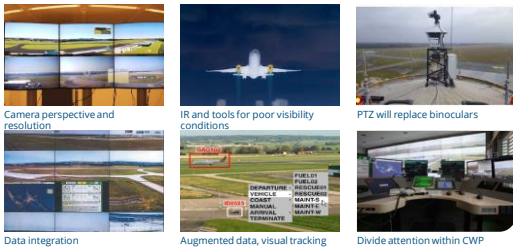
Some characteristics of Remote Tower

- Camera output and radar
- Out of the window view replaced by monitors
- More flexibility to arrange CWP's
- 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**

Human dimension in Remote tower



Impact on ATCos and choices to make



Camera perspective and resolution

IR and tools for poor visibility conditions

PTZ will replace binoculars

Data integration

Augmented data, visual tracking

Divide attention within CWP

Human dimension in Remote tower



Impact on ATCo and choices to make



Complicated workload management

Impact on ATCo fatigue?

Impact on teamwork

Design CWP

Positioning monitors out of window view

ATCo operational strategies

Human dimension in Remote tower





Human Factors studies provide data about

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

Human dimension in Remote tower



Human dimension in Remote tower



Study at ATC The Netherlands (LVNL)

Human dimension in Remote tower



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 (Schiphol-Oost)



Remote Tower System

Human dimension in Remote tower



From Simulation to Live Trial



Human dimension in Remote tower



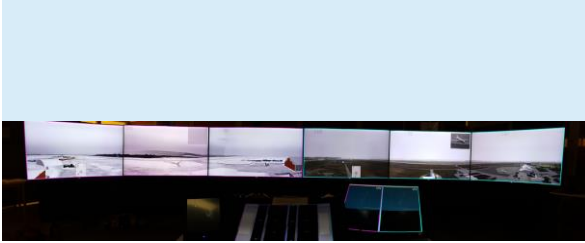
Multiple Remote Tower Operations



Human dimension in Remote tower



SESAR PJ-05 trials at LFV



Human dimension in Remote tower



Dedicated to innovation in aerospace



### Study at HungaroControl

Human dimension in Remote tower



Situation

Human dimension in Remote tower



### 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

Human dimension in Remote tower



### Applied

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



Human dimension in Remote tower



### 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



Human dimension in Remote tower



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

Human dimension in Remote tower |

