Inlednings-/avslutningsbild av presentationen.

NY POWERPOINTMALL.
Format: 16:9 (widescreen) för att passa nya datorskärmar, projektorer och motsvara filmformat.

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Färger: I färgpaletten är LFVs färger fördefinierade i toppraden och toningar följer vertikalt under respektive färg. Använd enbart dessa.

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An Empiric Approach to Risk Assessment of Human Error in Multi Remote Tower

DATS – WORKSHOP ON DIGITAL AIR TRAFFIC SERVICES

Speaker: Lothar Meyer
Team: Lothar Meyer, Maximilian Peukert, Marcus Filipp, Billy Josefsson, Jonas Lundberg
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LFV Multi Remote Tower
Safety Assessment of Socio Technical Systems

- Safety Workshop
- Are identified hazards relevant?
- Subjective influence from personal experience
- Empiric evidence needed
- Human In The Loop Simulations

Source: Decadi 2016
The MERASSA Concept

✓ Experimental verification
  of the safety-relevance
  of identified hazards
Test Procedures

✓ Visual Testing
  – Car on Runway
  – Moose on Runway
  – VFR flying into CTR without permission

✓ Equipment handling
  – Finding the helicopter on the backside
  – Push emergency button
  – Push frequency button

✓ Situational Awareness Test
  – Wind
  – Braking Action
  – Position of A/C
  – QNH
  – Vehicle on Runway

Primary Dependent Metrics
- Reaction Time and
- Error Rate
Hazard Relation
Testing Procedure Theory
Statistic Test Methods

✓ **Paired Testing** means that the test person is compared with itself (Single vs Multi)

\[ \Delta RT = RT_{Multi} - RT_{Single} \]

✓ Test on difference in the distribution of the RT pair samples
  – Is there a significant shift in the reaction time? Mann-Whitney-U-Test.
  – **NO**? Thats fine. Thank you for your cooperation!
  – **YES**? The test person tries to compensate something. Which direction?
    • **Multi slower**: The test person tries to cope with uncertainty or deficiencies
    • **Multi faster**: The test person feels challenged. Competitive behaviour.

✓ Test significance of correlation RT vs Error Rate
  – Fitts Law!
Results Second Iteration (Sep 2018)
Results First Iteration (Dec 2017)
Work Speed vs Human Error (Dec 2017)

The graph illustrates the relationship between work speed and human error rate. The x-axis represents work speed in mHz, while the y-axis represents error rate in percent. Two scenarios are compared: Scenario Pair 1 and Scenario Pair 2. The graph shows that as work speed increases, the error rate also increases. The line for Multi-tasking shows a steeper increase compared to Single-tasking. The safety benchmark is indicated by a horizontal line at 1.5% error rate. The graph suggests that higher work speed may lead to increased human error unless managed carefully.

Key points:
- Work Speed [mHz] vs Error Rate [%]
- Multi-tasking vs Single-tasking
- Safety Benchmark at 1.5% error rate

Analysis:
- The increase in error rate with increasing work speed is evident.
- Multi-tasking scenarios show a higher error rate compared to Single-tasking.
- Optimal work speed may need to be determined to maintain error rates within acceptable limits.
Workload

✓ ISA scale 1 – 5

✓ No significant differences found
Post Questionnaire (2nd iteration)

1. I think that the artificiality of the simulation had an impacted on my behavior.
2. In general, I could predict the events more than in reality.
3. I prepared for the events because I could predict the occurrence.
4. I’m of the opinion that the tests treat single and multi-remote tower unfair.
5. I’m of the opinion that my attention was significantly impacted by the need to control two airports.

1 – don’t agree at all.................5 – Totally agree
Self Evaluation

✓ Post Questionnaire
✓ Test the satisfaction with the own performance
Conclusions from MERASSA

- SPAM tests were most successful because of the accuracy of the test
- Equipment handling was mostly OK but suffered of “queuing tactics”
- Conflict tests were sometimes not responded according to the test procedure
  - Test persons regarded any car and moose appearance without prior notice as unrealistic
- Multi mode operations regarded as stressfull
  - Visual scanning and mental efforts were regarded as higher
  - Incompatibility due to the working methods complying to the single remote tower
  - Visual separation regarded as not possible due to limited FoV
- Lack of training
- During the 2nd iteration only one error in the QNH SPAM test!!!!!!
The Learning Curve

Experience

Time

I did it!

Did I just do that?

Wait. That made sense.

I know nothing.

Oh hey! I get it!

Awww! I don’t know what I’m doing but I’m doing it.

Ok, this seems fun.

What was I thinking? This is hard.
Evaluation of Safety Assessment Methodology

✓ Development of Safety Performance Indicators for simulator studies
✓ Use of eye tracking technologies
Thank you!

Lothar Meyer (lothar.meyer@lfv.se)
Maximilian Peukert (maximilian.peukert@lfv.se)
Marcus Filipp (marcus.filipp@lfv.se)
Billy Josefsson (billy.josefsson@lfv.se)
Jonas Lundberg (jonas.lundberg@liu.se)
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