WILDLIFE, URBAN AIR MOBILITY AND AIR TRAFFIC CONTROL – WHAT'S THE MATTER?

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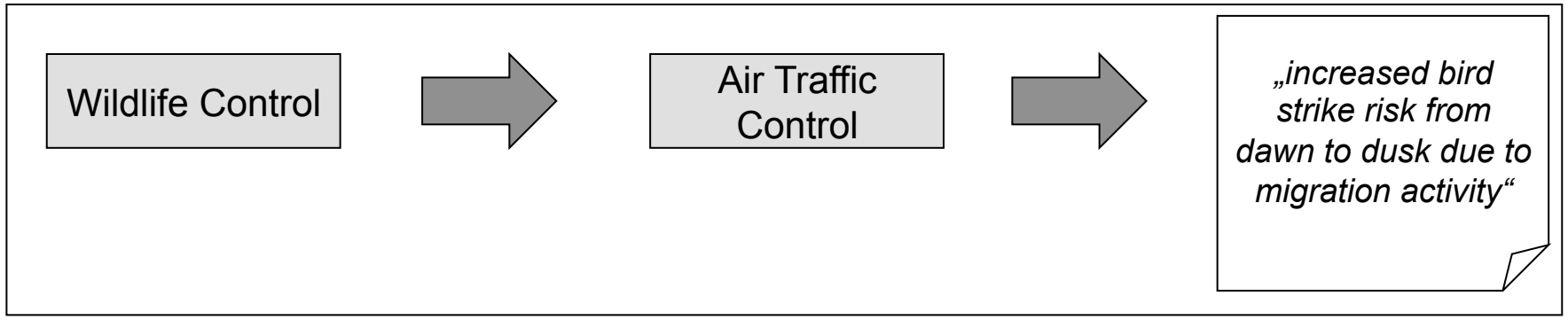
Motivation

In reality, wildlife strike risk is not an aerodrome problem.
It is a below 3000‘ AGL airspace problem
and thus
the primary responsibility for managing the problem
should reside with those managing and using the airspace

McKee, Shaw, Dekker and Patrick, 2016

Concept

Involving Air Traffic Control and Pilots



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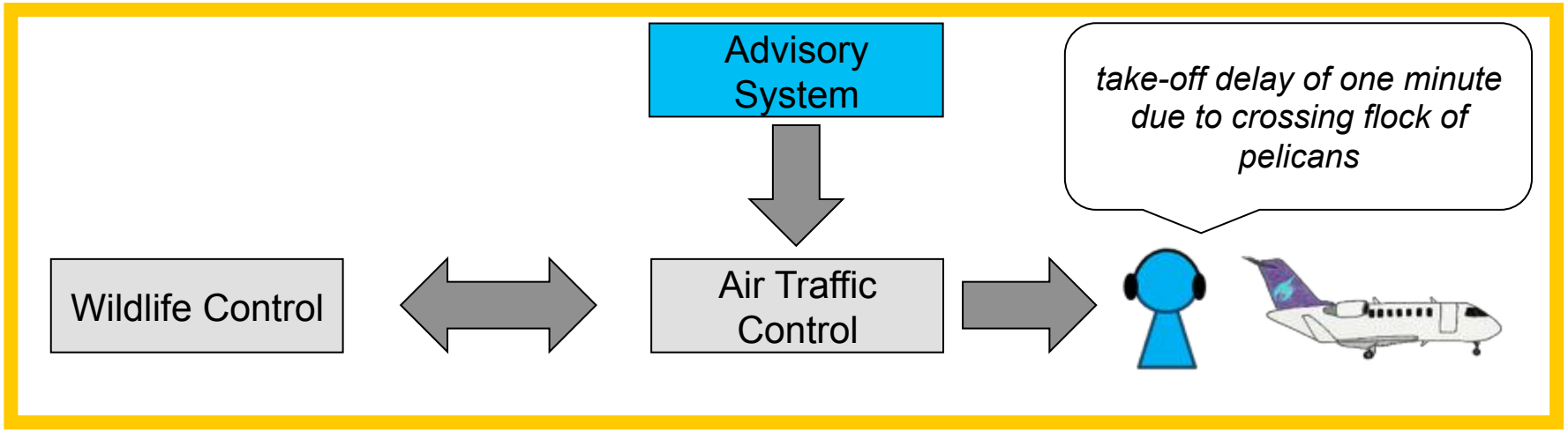


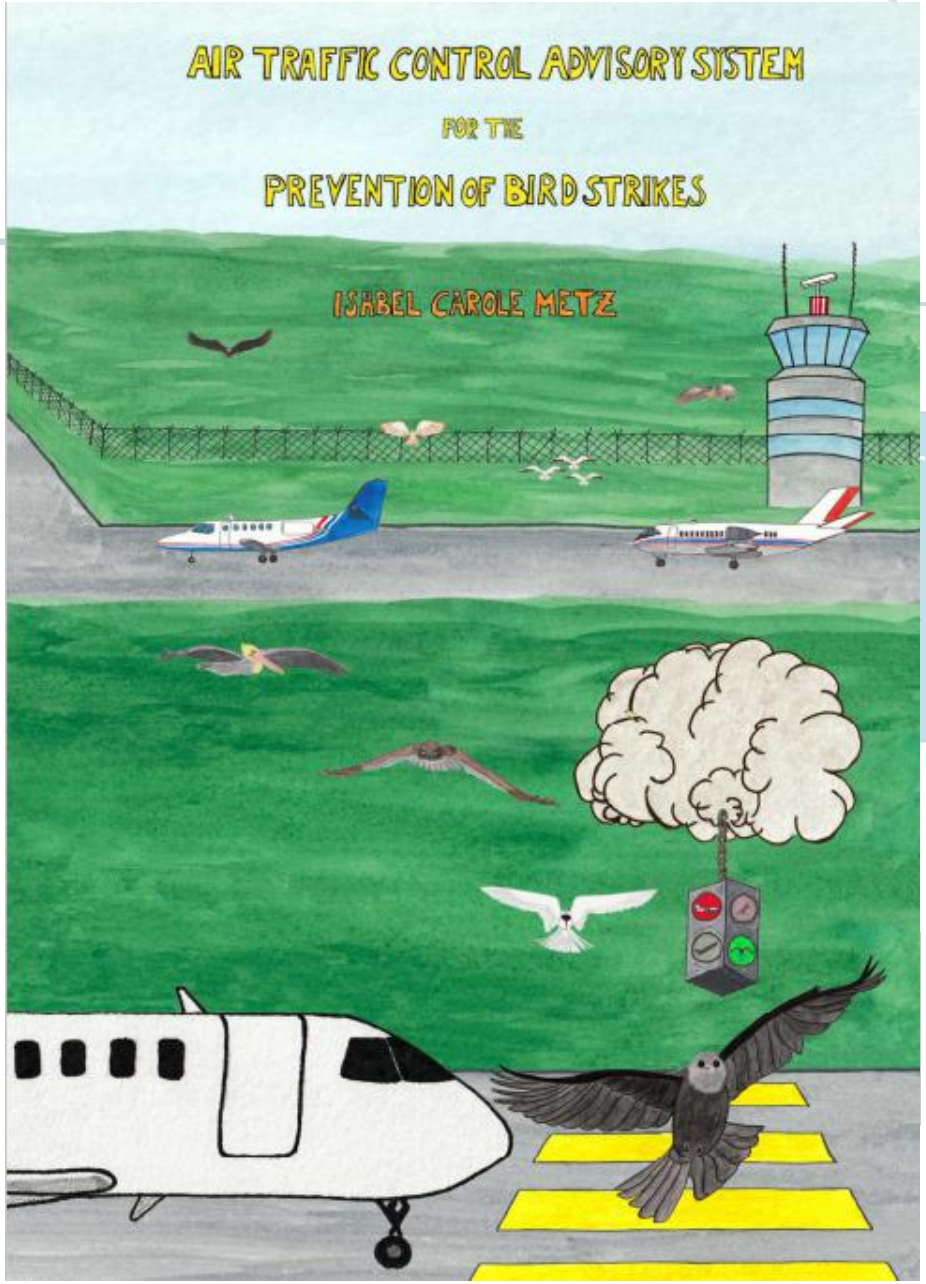
Process and Research Questions

Wildlife Strike Risk Advisory System

Track Prediction → Risk Assessment → Visualization

take-off delay of one minute due to crossing flock of pelicans

Process and Research Questions



Key Findings

- Take-off delays are feasible if
  - imposed for high-risk strikes only
  - bird movement can be predicted reliably
    → even at high-density airports

Process and Research Questions

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Theoretical Feasibility

Fast-time simulations

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Theoretical Feasibility

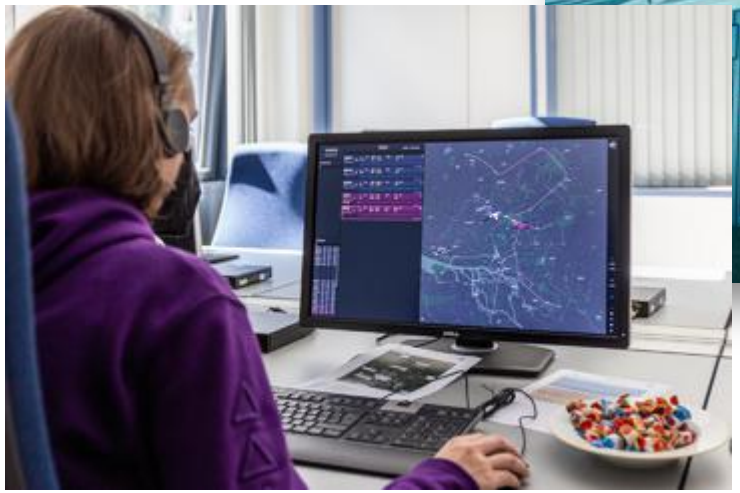
Fast-time simulations

Operational Feasibility

Real-time HIL simulations

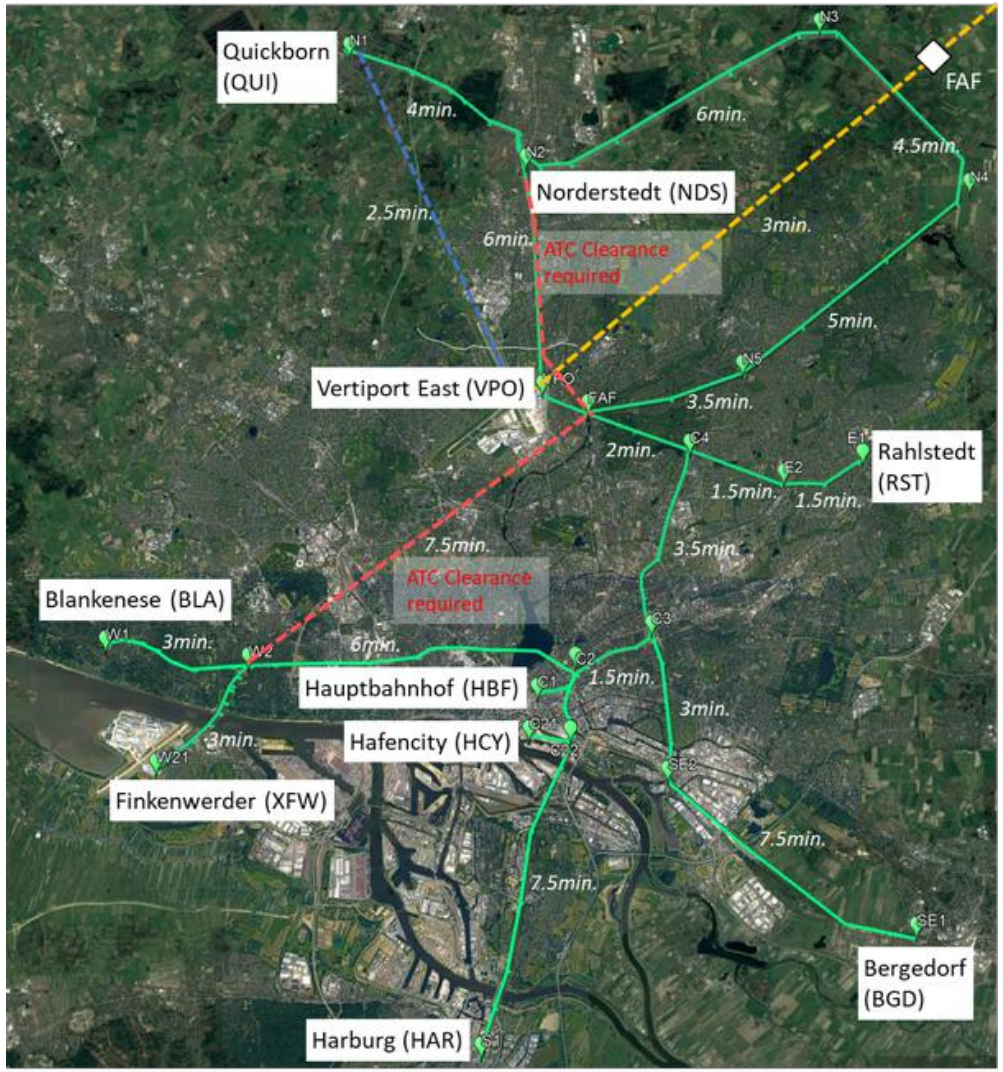
Operational Feasibility

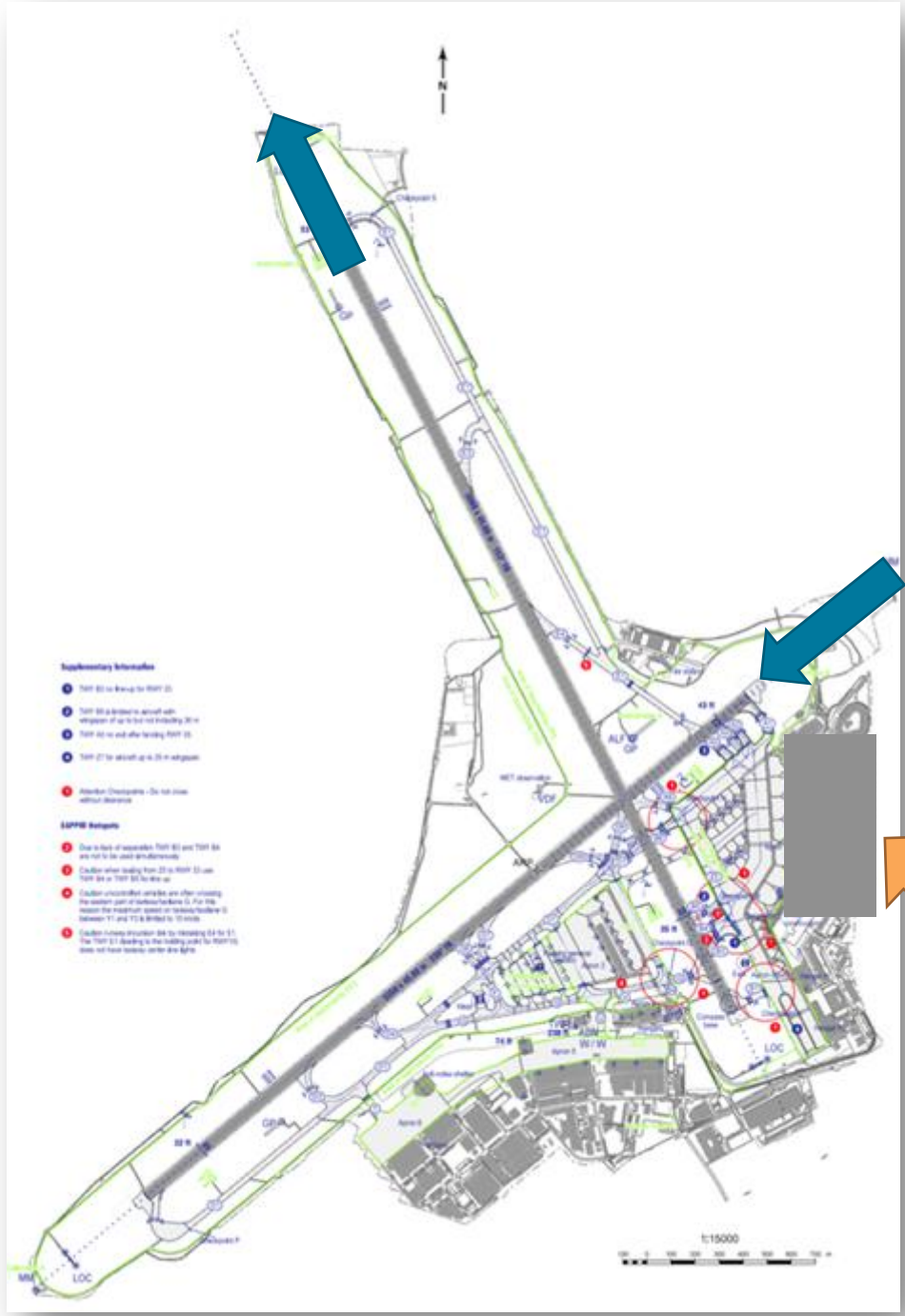
Real-Time Human-in-the-Loop Simulations



Simulation Environment

Hamburg Airport EDDH





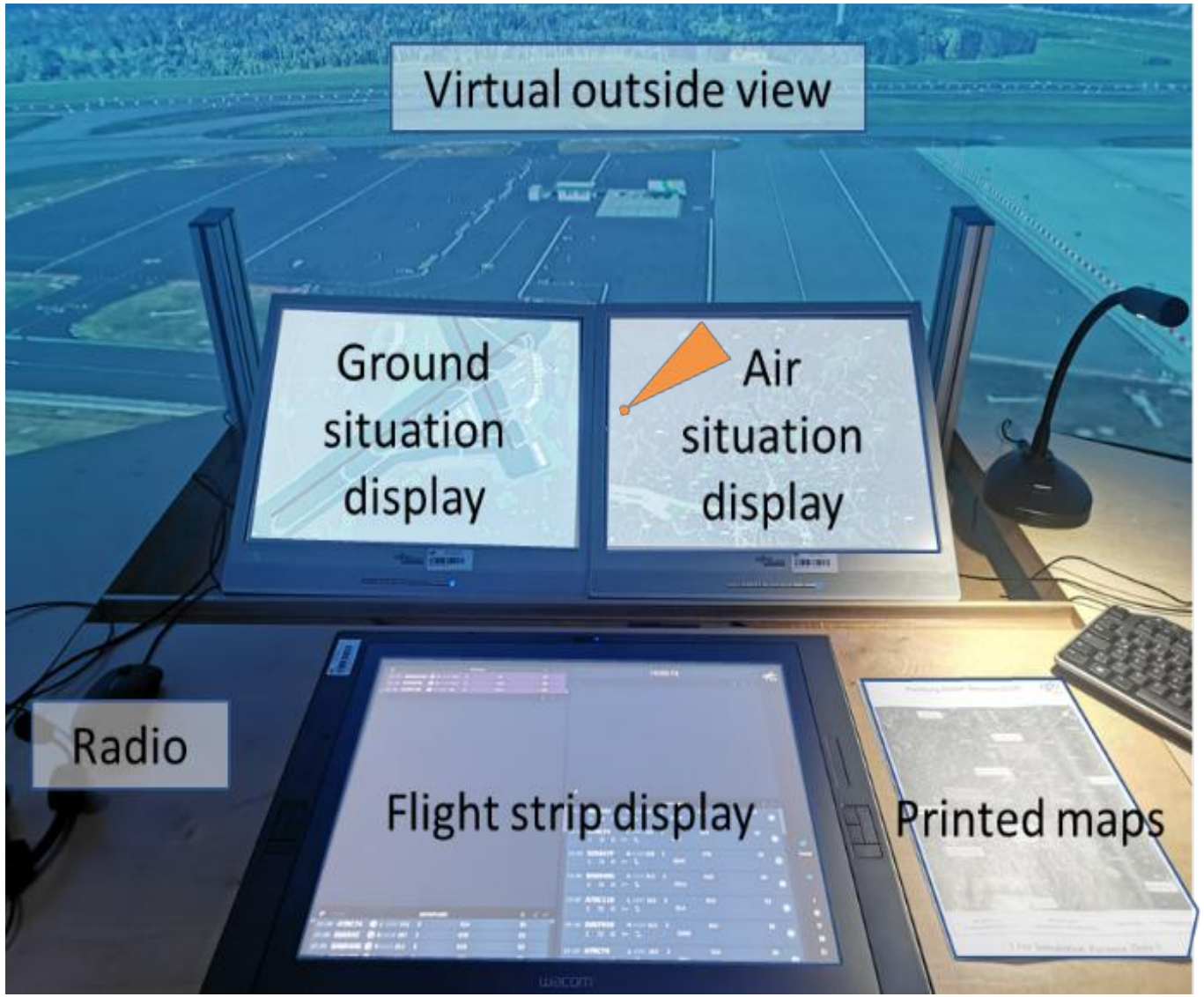
airtaxi route (independet from IFR) | airtaxi route (separation to IFR required) | IFR arrivals | IFR departures

Simulation Conditions

CONV_NO-WL (Baseline)	
• conventional traffic	• conventional ATC tools

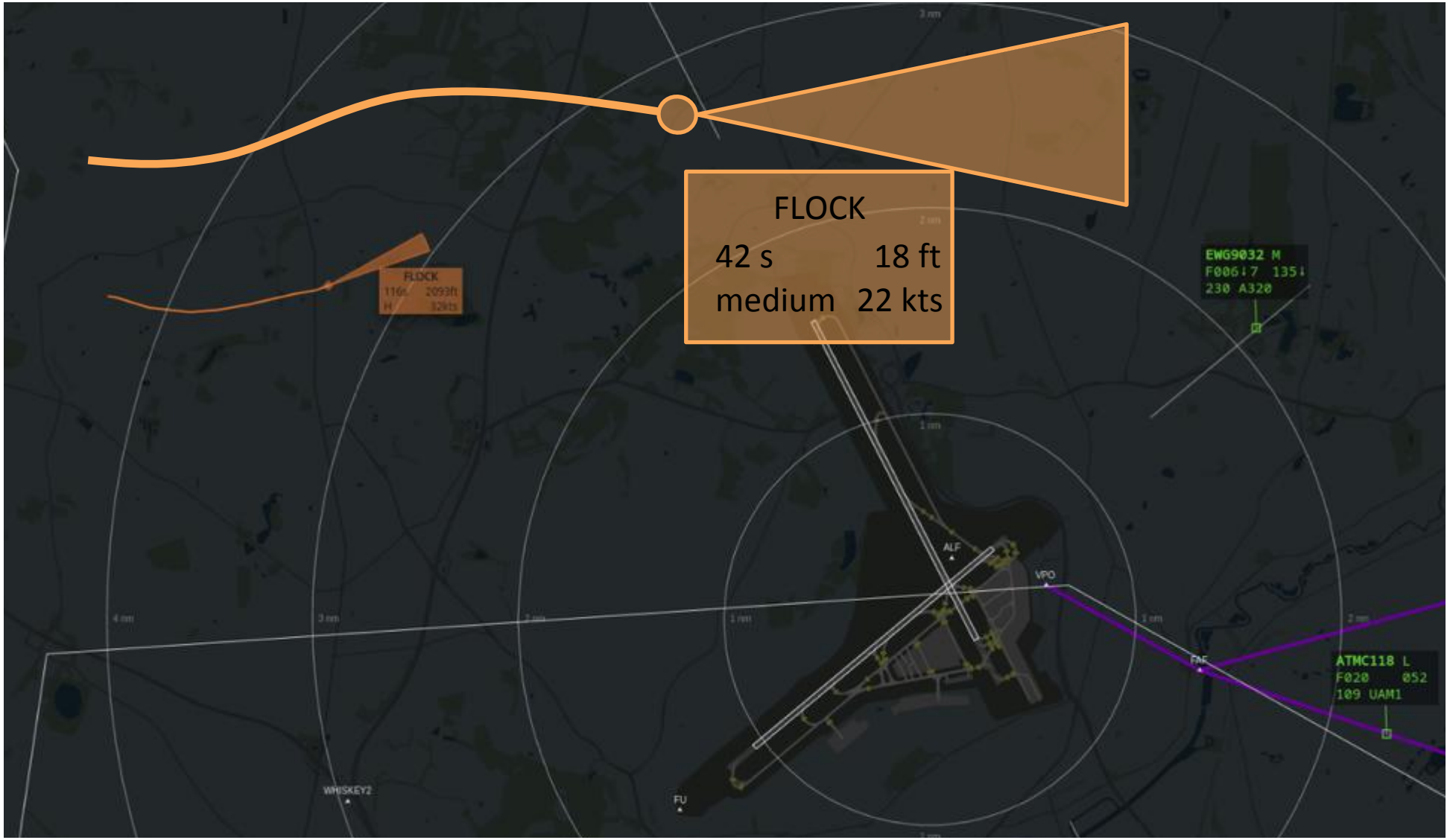
CONV_WL-OR	
• conventional traffic • eVTOLs • wildlife	• conventional ATC tools • communication with wildlife control

CONV_WL-VS	
• conventional traffic • eVTOLs • wildlife	• conventional ATC tools • enhanced radar display



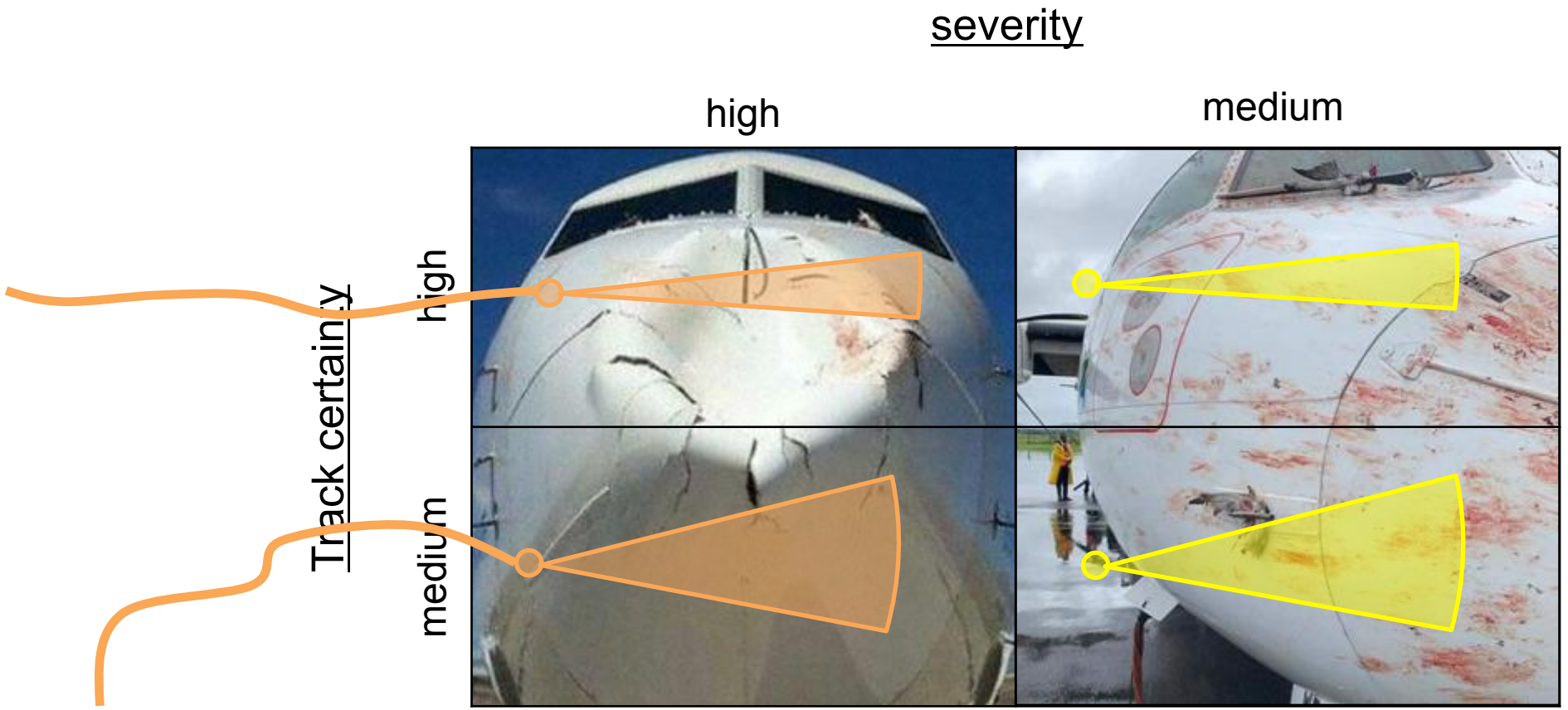
Enhanced Radar Display

Wildlife Strike Risk Information



Enhanced Radar Tool

Wildlife Strike Risk Information



Simulation Conditions and Participants

CONV_NO-WL (Baseline)	
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CONV_WL-OR	
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CONV_WL-VS	
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10 controllers

- 2x female, 8x male
- average age 35.1 years, std 7.2 years
- 9x civil, 1x military

from Germany, Austria and Poland

Analysis

Influence on Safety and Efficiency

Subjective Parameters

- Mental Workload
- Situational Awareness

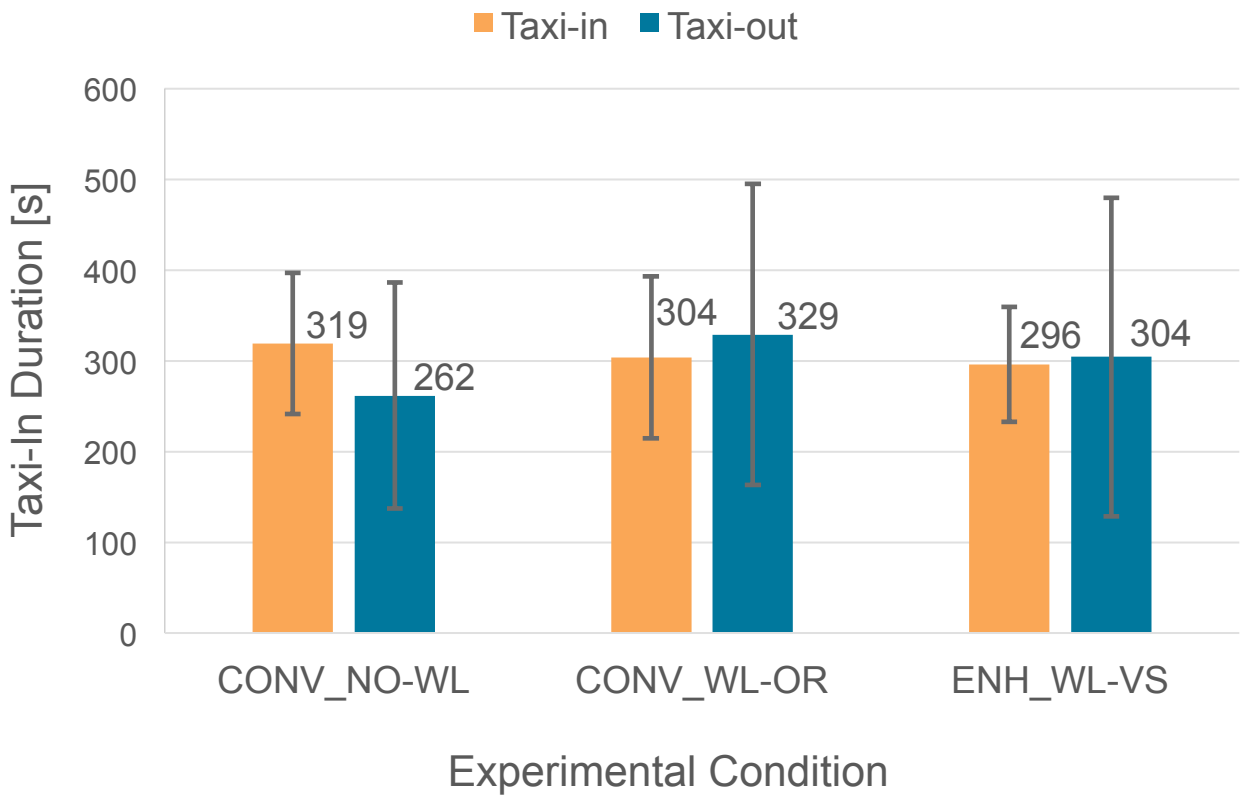
- Display Design

Objective Parameters

- Capacity and Traffic Flow
  - Throughput
  - Taxi Times

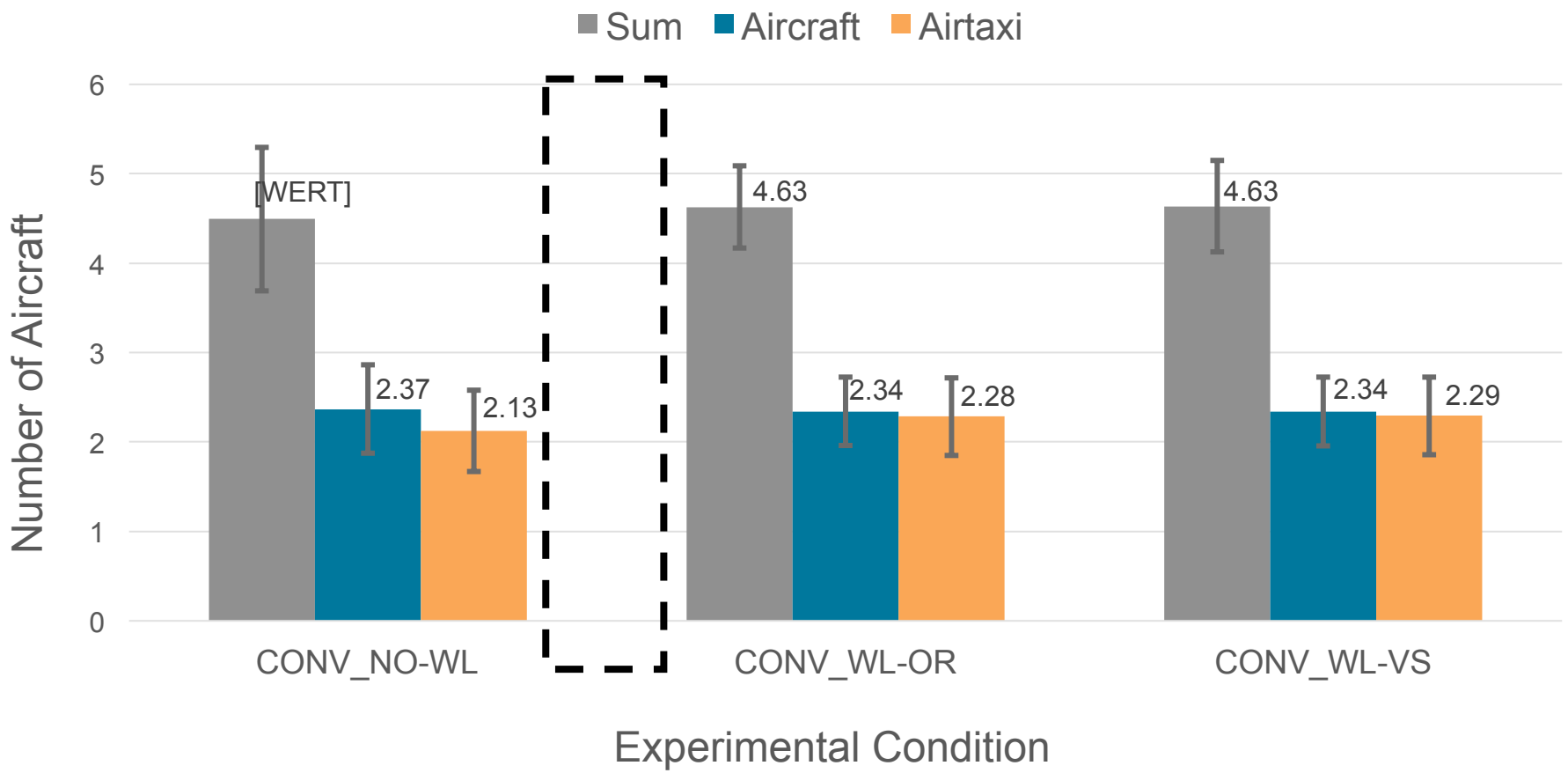
Results

Capacity and Traffic Flow – Taxi Times



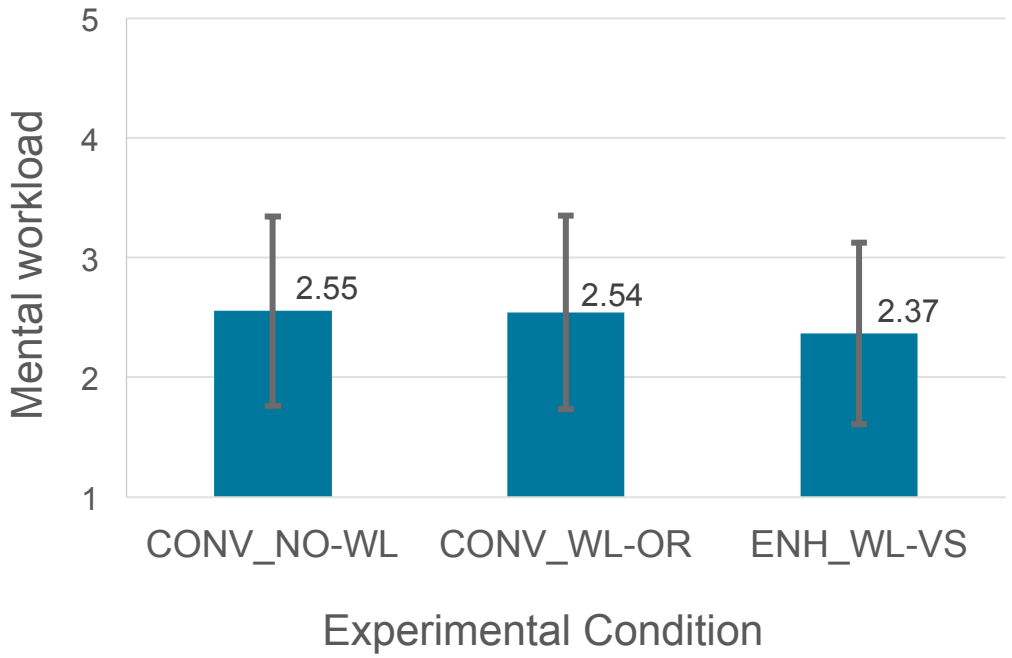
Results

Capacity and Traffic Flow

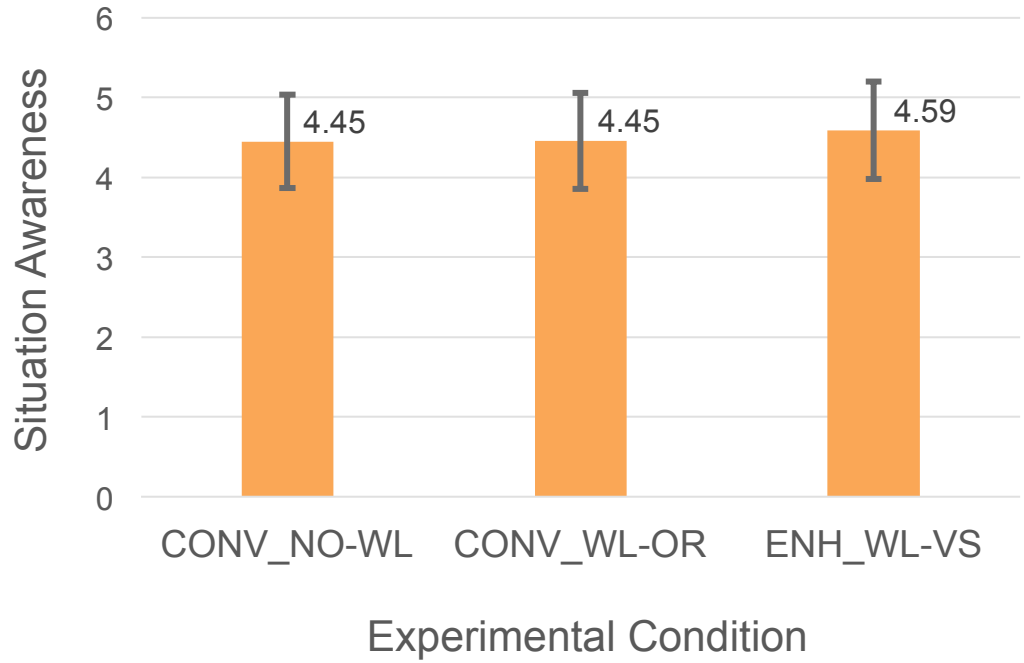


Results

Mental Workload and Situational Awareness



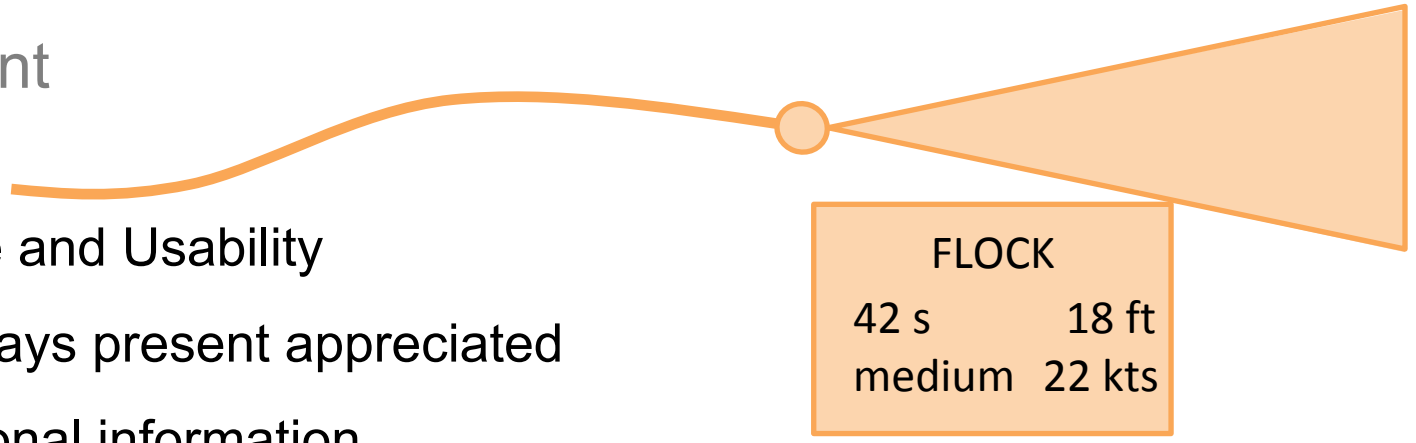
reported every five minutes during every run



reported once after every run

Results

Display Assessment

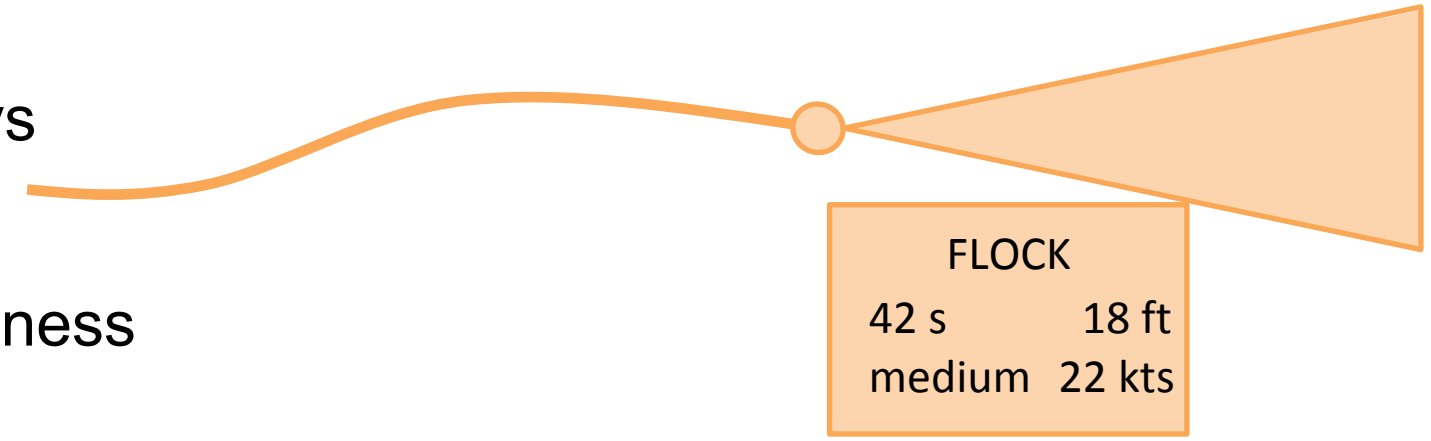


- High scorings in Acceptance and Usability
- Limitation of information always present appreciated
- Different relevance of additional information

parameter	very high importance	high importance	medium importance
Height			
Bird type			
Previous part of track			
Velocity			
Risk			
Time to intersect			

Summary

- reasonable departure delays
- increased throughput
- increased situational awareness
- reduced workload



What next?

Wildlife Strike Advisory System Elements

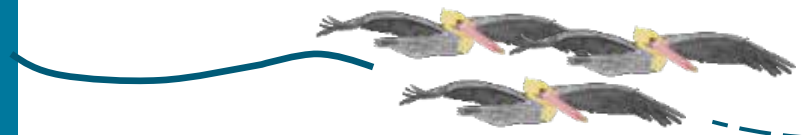
Wildlife Strike Risk Advisory System

Track Prediction → Risk Assessment → Visualization

take-off delay of one minute due to crossing flock of pelicans

PhD candidate wanted!

That‘s it…



Wildlife Strike Risk Advisory System

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…for now