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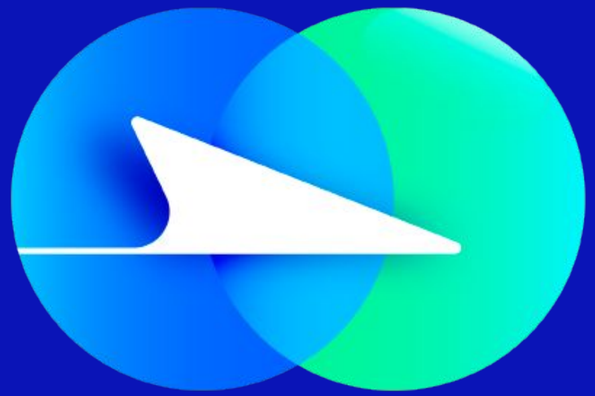

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Advancing Sustainable Aviation & Urban Air Mobility

Perceived Safety in U-Space Drone Usage

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KTH Royal Institute of Technology

ImAFUSA

sesar
JOINT UNDERTAKING

29–30 July 2025, Athens, Greece

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ImAFUSA – A Brief Description

- **Im**pact and Capacity **A**ssessment **F**ramework for **U**-Space **S**ocietal **A**cceptance
  - Mission: provide insights in three major areas influencing societal acceptance of Innovative Air Mobility (AIM).
    - Environmental impact
      - Noise, visual pollution and air quality
    - Safety
    - Socioeconomic impact
      - Affordability, accessibility, economic development, public space use and connectivity.

https://plus.nasa.gov/video/urban-air-mobility/

[1]**Drones & Air Mobility Basics explained**
https://www.easa.europa.eu/en/domains/drones-air-mobility/drones-air-mobility-landscape/basics-explained

Introduction to IAM/UAM

- Urban Air Mobility (UAM) is a new safe, secure and more sustainable air transportation system for passengers and cargo in urban environments, enabled by new technologies and integrated into multimodal transportation systems. The transportation is performed by electric aircraft taking off and landing vertically, remotely piloted or with a pilot on board[2]

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- Innovative Air Mobility (IAM) is the safe, secure and sustainable air mobility of passengers and cargo enabled by new-generation technologies integrated into a multimodal transportation system[1]

https://plus.nasa.gov/video/urban-air-mobility/

- Advanced Air Mobility (AAM) a collection of new and emerging technologies being applied to the aviation transportation system, particularly in new aircraft types… … which includes UAM and Regional Air Mobility (RAM), etc.. [3]

[1]**Drones & Air Mobility Basics explained**
https://www.easa.europa.eu/en/domains/drones-air-mobility/drones-air-mobility-landscape/basics-explained
[2]EASA Pro
https://www.easa.europa.eu/en/what-is-uam
[3]Section 6. Advanced Air Mobility
https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap11_section_6.html

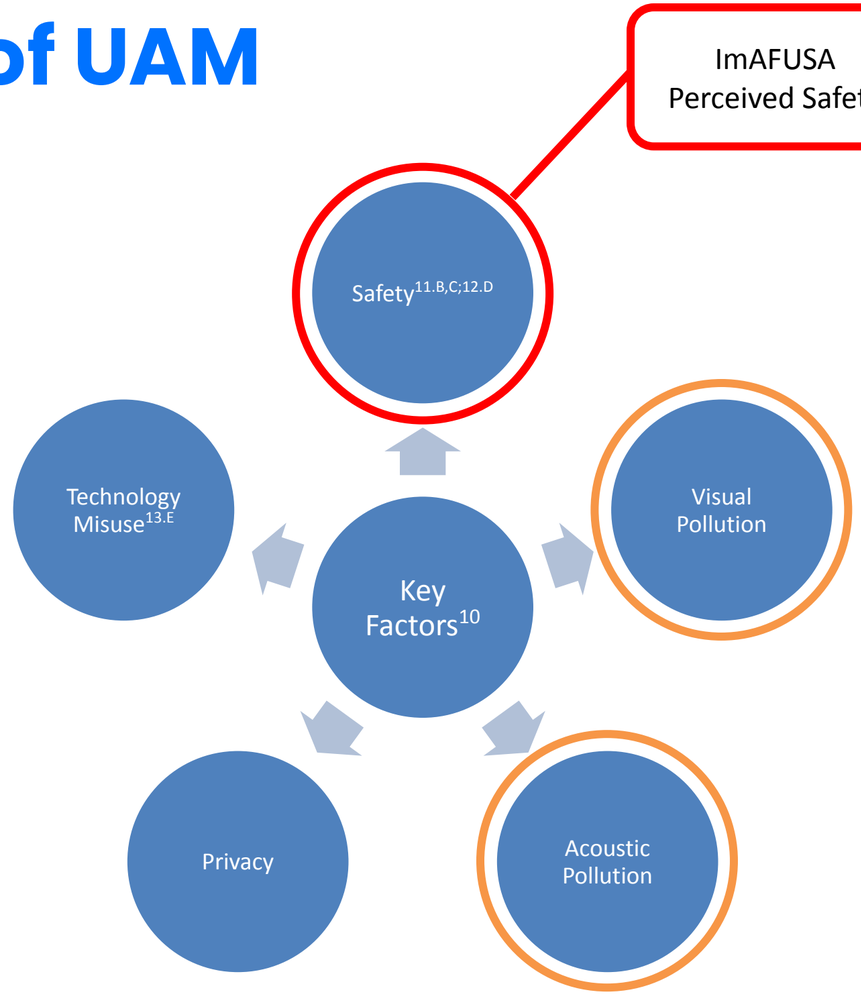
Safey and Public Acceptance of UAM

- ”**Safety** mainly refers to incidents resulting from a technical or human failure”[4]
  - **Perception of safety** can be increased if safety level are increased
    - Less likelyhood of accidents happening
  - Concerns on safety increased with increasing age
  - Safety perception potentially inflated by high aviation standards

- Korean Urban Air Mobility Act[5]
  - Focus on Safety, Sustainability, Acceptability, and Public conveniences main values
    - Current Safety Aviation Act was inadequate updated to include electric and battery safety
    - Flight safety and rules is part of the grand challenge
  - Safety concerns operations from technical point of view[6]
- Other large-scale-agency works works focus on public acceptance based on technical and operational aspects[7,8] or noise and visual public acceptance[9]

[4]Study on the social acceptance of Urban Air Mobility in Europe, EASA, May 19, 2021
[5]Korea’s Journey Towards the New Era with UAM, IFAR AAM WG Presentation
[6]K-UAM Concept of Operations 1.0 – UAM Team Korea
7THE USE OF WATER BASED IAM MULTI-MODAL HUBS AND OVERWATER ROUTES IN LARGE URBAN/METROPOLITAN AREAS, IFAR AAM WG Presentation
[8]Future Aviation Research – VTT, IFAR AAM WG Presentation

Safey and Public Acceptance of UAM



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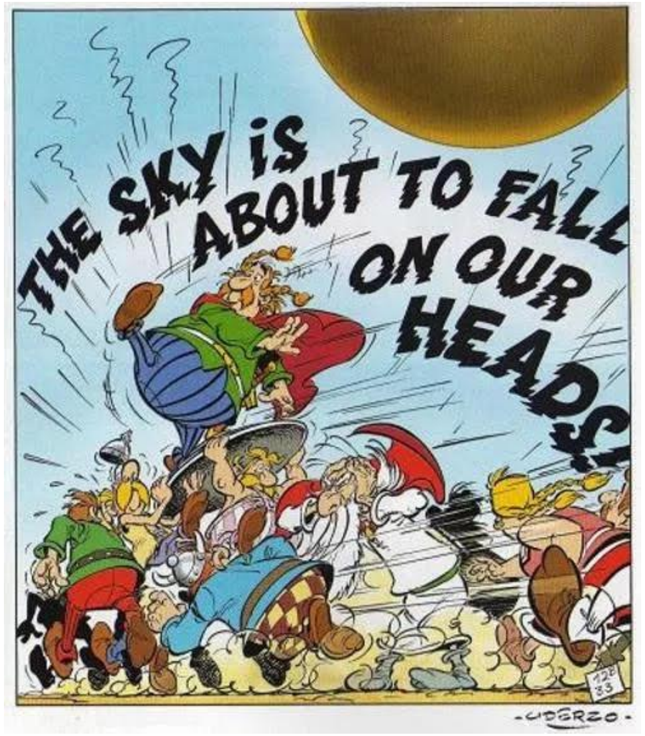
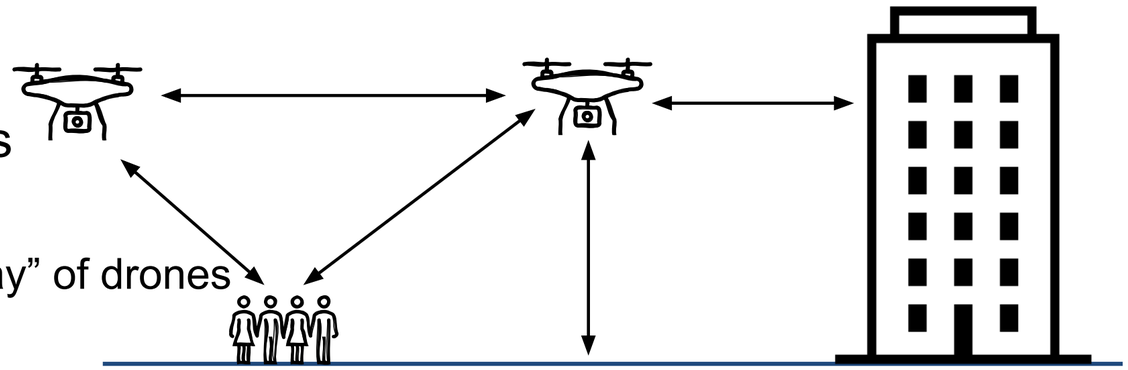
[10]**Ten questions concerning the use of drones in urban environment**, Watkins et al., Building and Environment, 167, (2020), 106458
[11]**General Public´s Privacy Concerns Regarding Drone Use in Residential and Public Areas**, Bajde et al., Empirical Research Report, May 2017, University of Southern Denmark
[12]**The public acceptance of drones – Challenges for advanced aerial mobility (AAM),** Eissfeldt and Biella, 34th Conference of the European Association for Aviation Authority, 2022
[13]**Public acceptance of drone applications in a highly urbanized environment**, Tan et al., Technology in Society, 64, (2021) 101 462

Perceived Safety – ImAFUSA Preliminary Results



- **Objective:** establish a correlation between parameters (of drone usage) influencing the perception of safety by the general public to be implemented in a framework for social acceptance of UAM
- **Indicators**
  - Flight velocity
  - Flight path altitude
  - Proximity to buildings
  - Flight structure
    - Structures ”Highway” of drones



Perceived Safety – ImAFUSA Preliminary Results

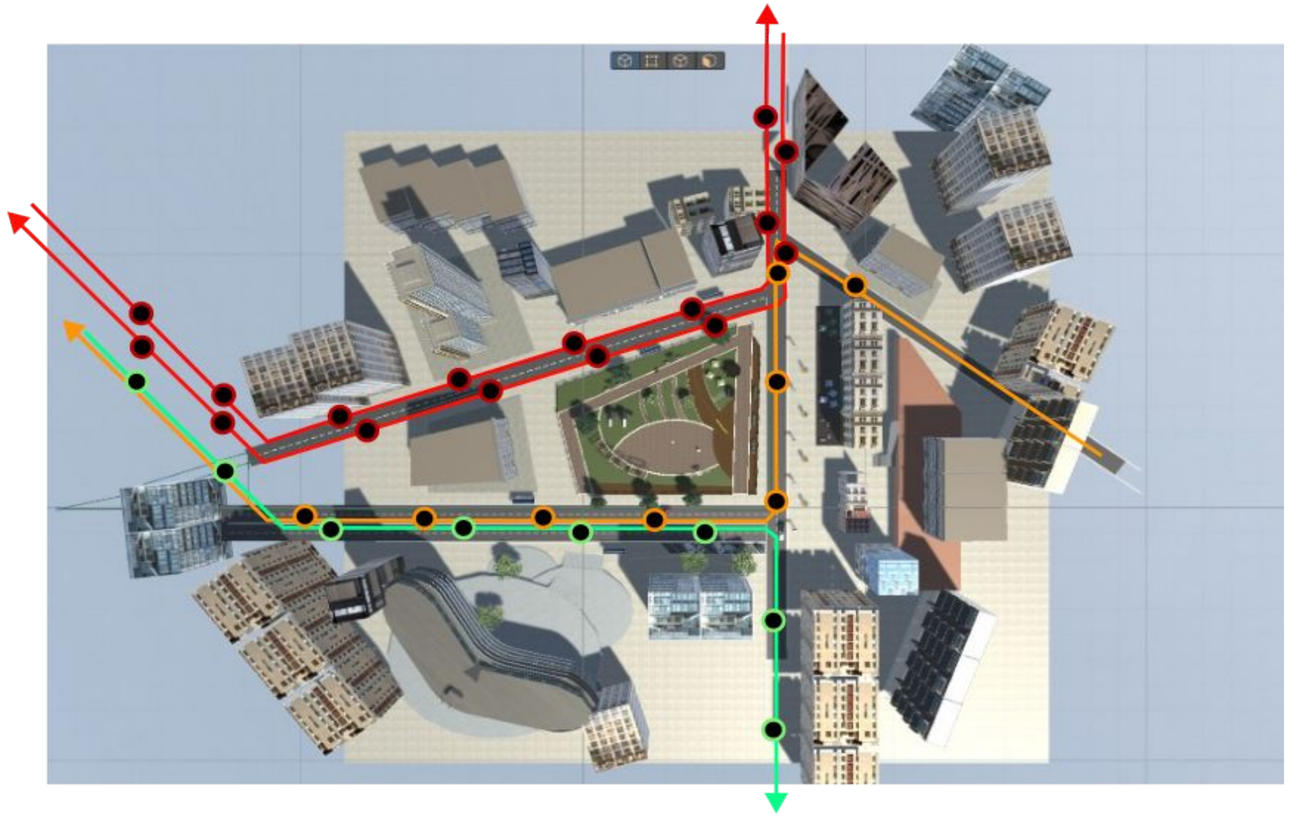
- Four case scenarios
  - Based on existing drone regulations
  - Only one case with structured flight paths

Case 1 – High Density at Low Altitude			
Flight Path Altitude [H]	20 m	H+10 m	H+20 m
Distance between Drones	30m	30m	30m
Flight Path Velocity	23 m/s	23 m/s	23 m/s

Case 2 – High Density at Low Altitude			
Flight Path Altitude [H]	20 m	H+10 m	H+20 m
Distance between Drones	30m	30m	30m
Flight Path Velocity	15 m/s	15 m/s	15 m/s

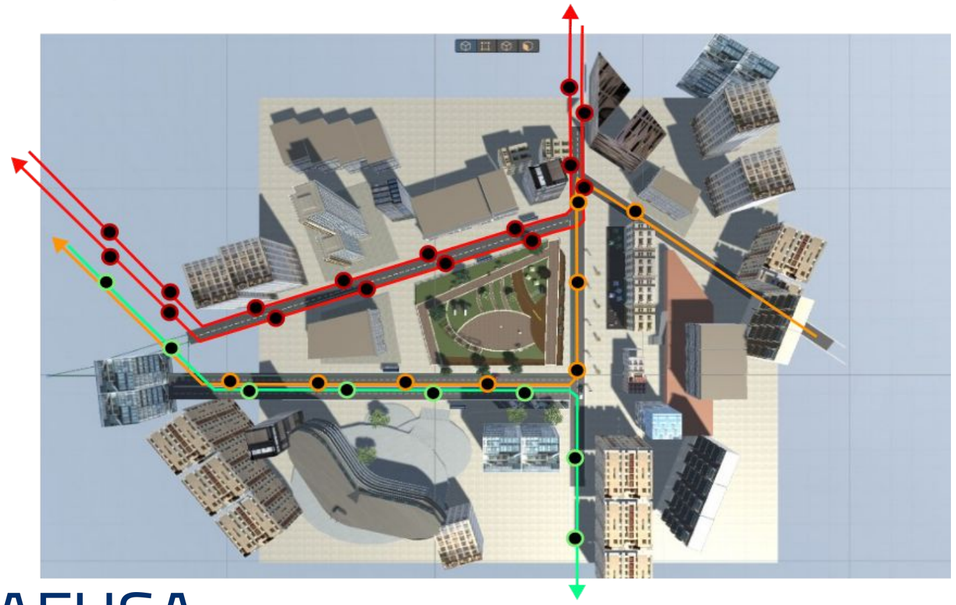
Case 3 – High Density at Low Altitude			
Flight Path Altitude [H]	20 m	H+10 m	H+20 m
Distance between Drones	30m	30m	30m
Flight Path Velocity	7 m/s	7 m/s	7 m/s

Case 4 – High Density at High Altitude			
Flight Path Altitude [H]	70 m	H+10 m	H+20 m
Distance between Drones	30m	30m	30m
Flight Path Velocity	23 m/s	23 m/s	23 m/s



Perceived Safety – ImAFUSA Preliminary Results

- **Method:** Virtual Reality (VR) tool coupled with survey



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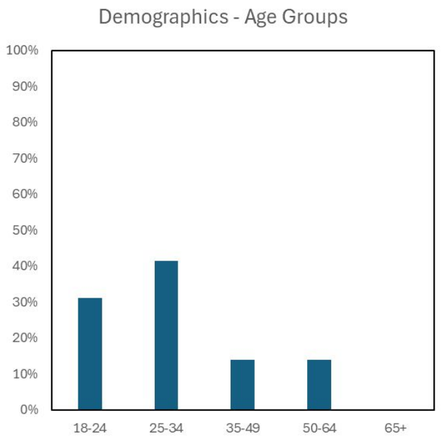
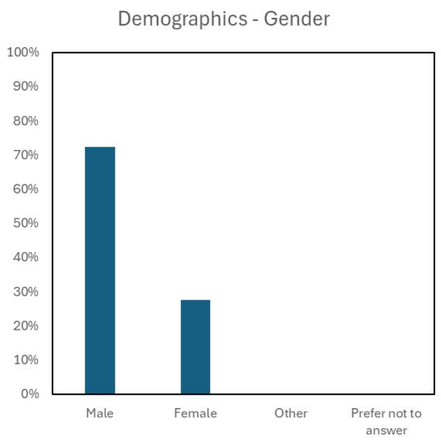
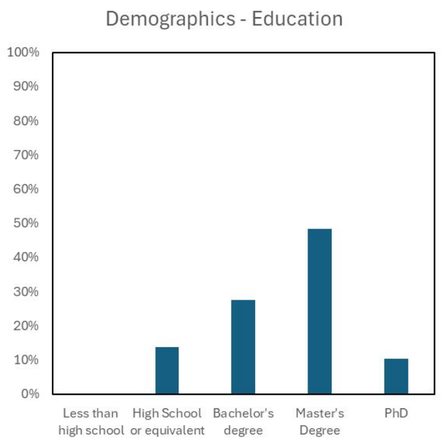
VR Tool created by: James McLeod, Margarida Lopes, and Sofia Kalakou, iscte, Lisbon, Portugal

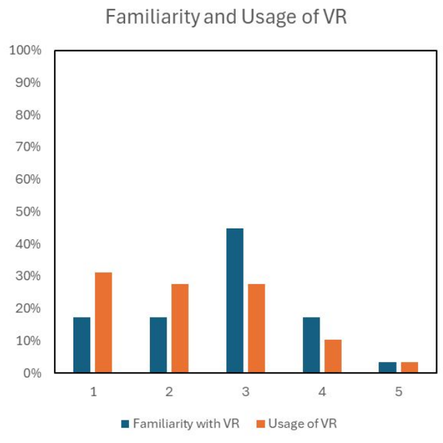
Perceived Safety – ImAFUSA Preliminary Results

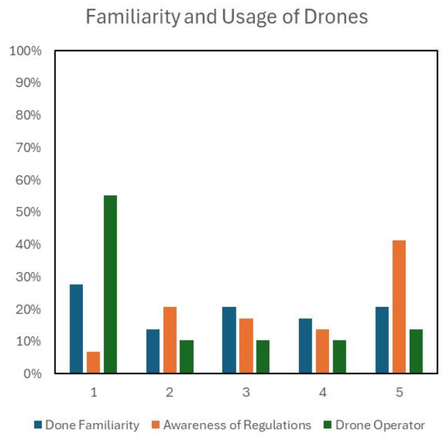
- Participants Demographics
  - Objective: correlation of demographic data with safety perception levels
- Familiarity with drones and VR
  - Objective: correlation of familiarity of tools with safety perception











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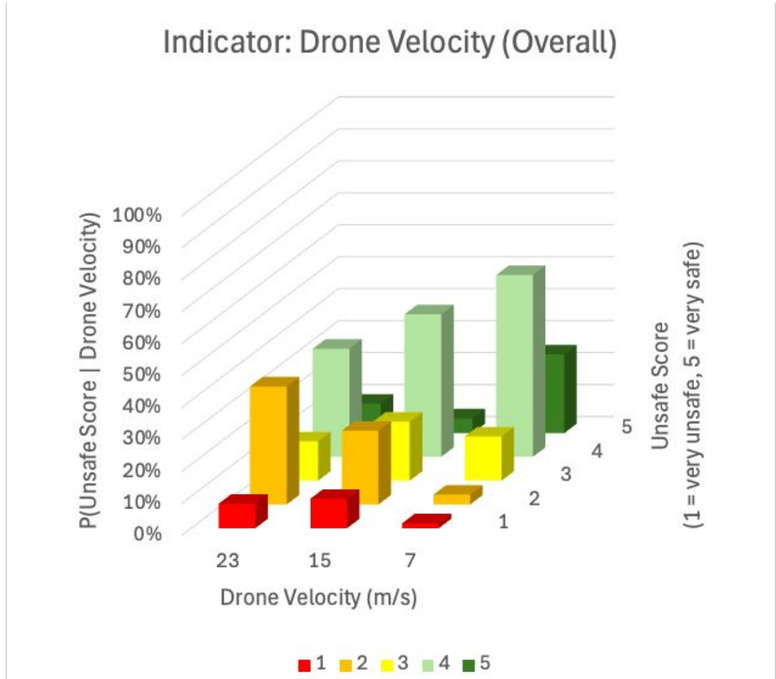
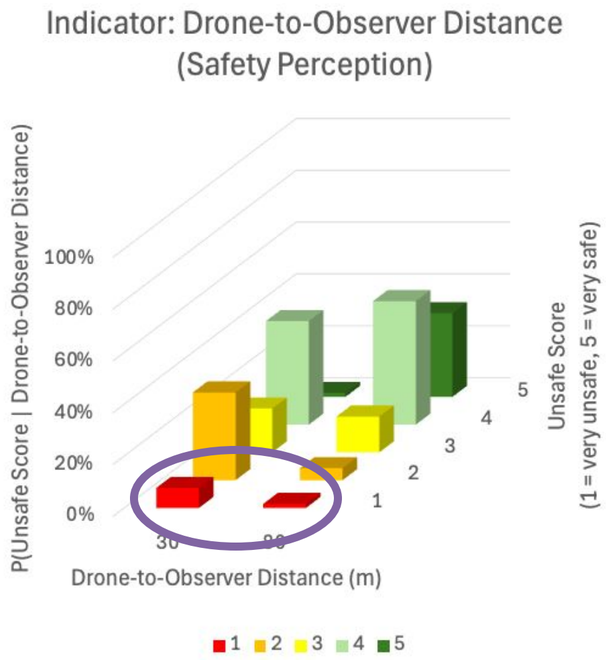
Ongoing Analysis

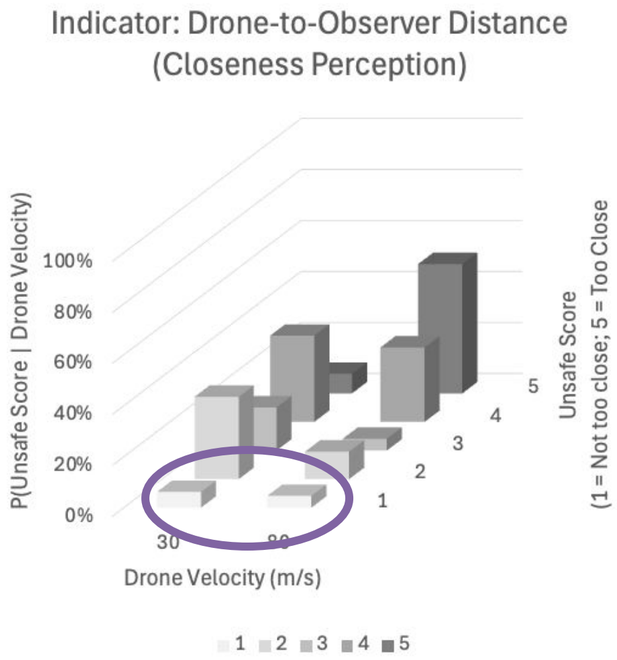
Perceived Safety – ImAFUSA Preliminary Results

- Indicator 1 – Drone Velocity Variation



- Indicator 2 – Drone-to-Observer Distance





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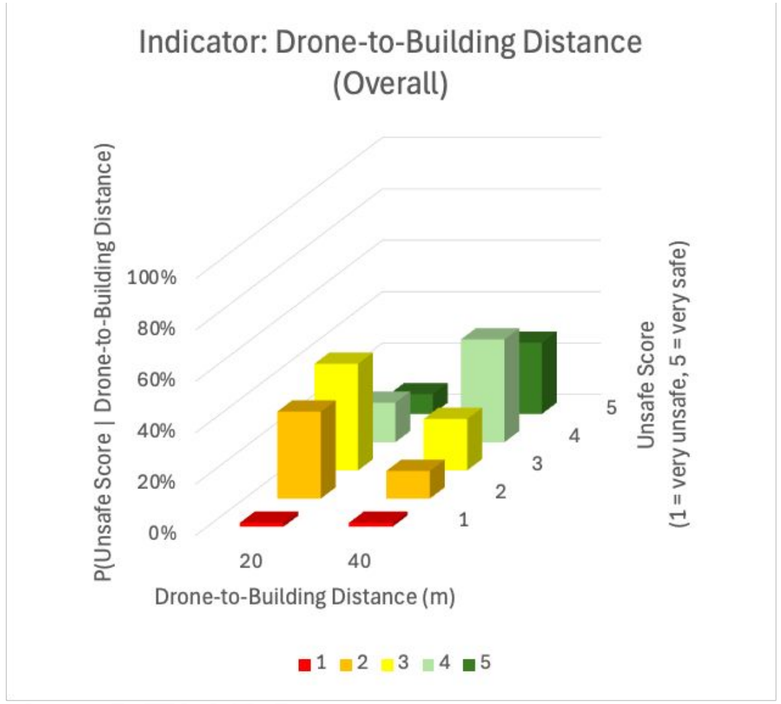
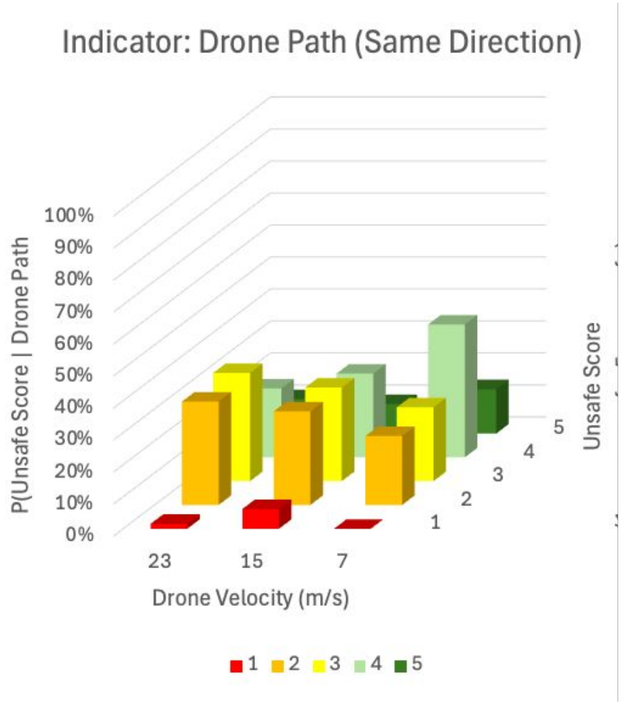
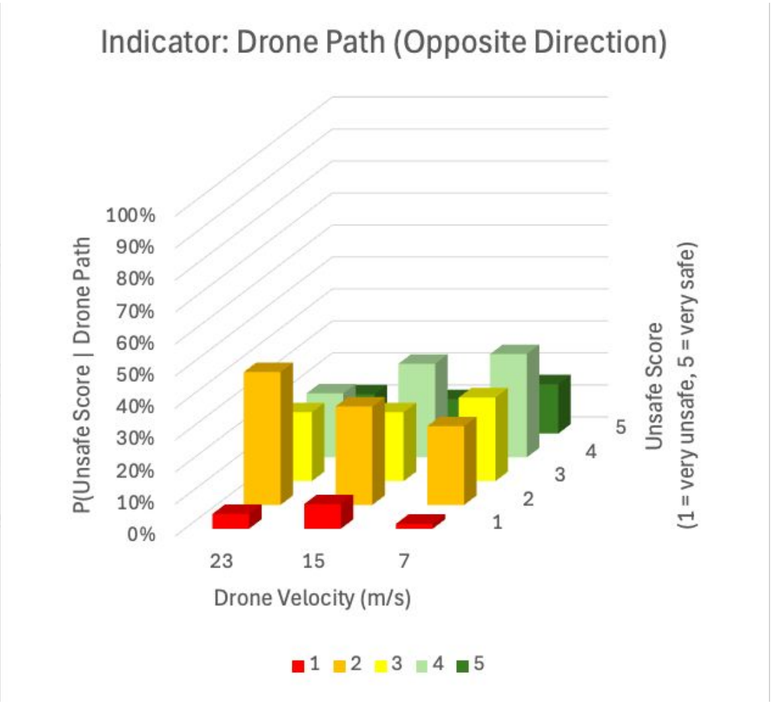
- Indicator 3 – Drone-to-Building Distance



- Indicator 4 – Path Direction





Conclusions

- Preliminary results indicate (based on the tested case scenarios) a general sense of (positive) perceived safety
- LET'S ALSO CONSIDER:
  - The majority of participants stated that their level of perceived safety would increase if regulations were in place

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thank you
for your attention!

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Q&A / Closing

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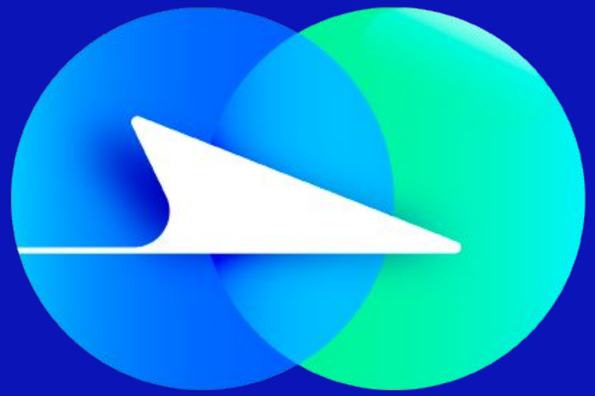

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