



**Swedish  
Defence  
University**

Dedicated to innovation in aerospace

## **Simulation of the Deployment of Forward Arming and Refueling Points (FARP)**

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19/10/2023









Schrik, C. (2022, November 22). Falcon Autumn – mini-uitzending in eigen land. De Vliegende Hollander. [https://magazines.defensie.nl/vliegendehollander/2022/11/01\\_faloon-autumn](https://magazines.defensie.nl/vliegendehollander/2022/11/01_faloon-autumn)

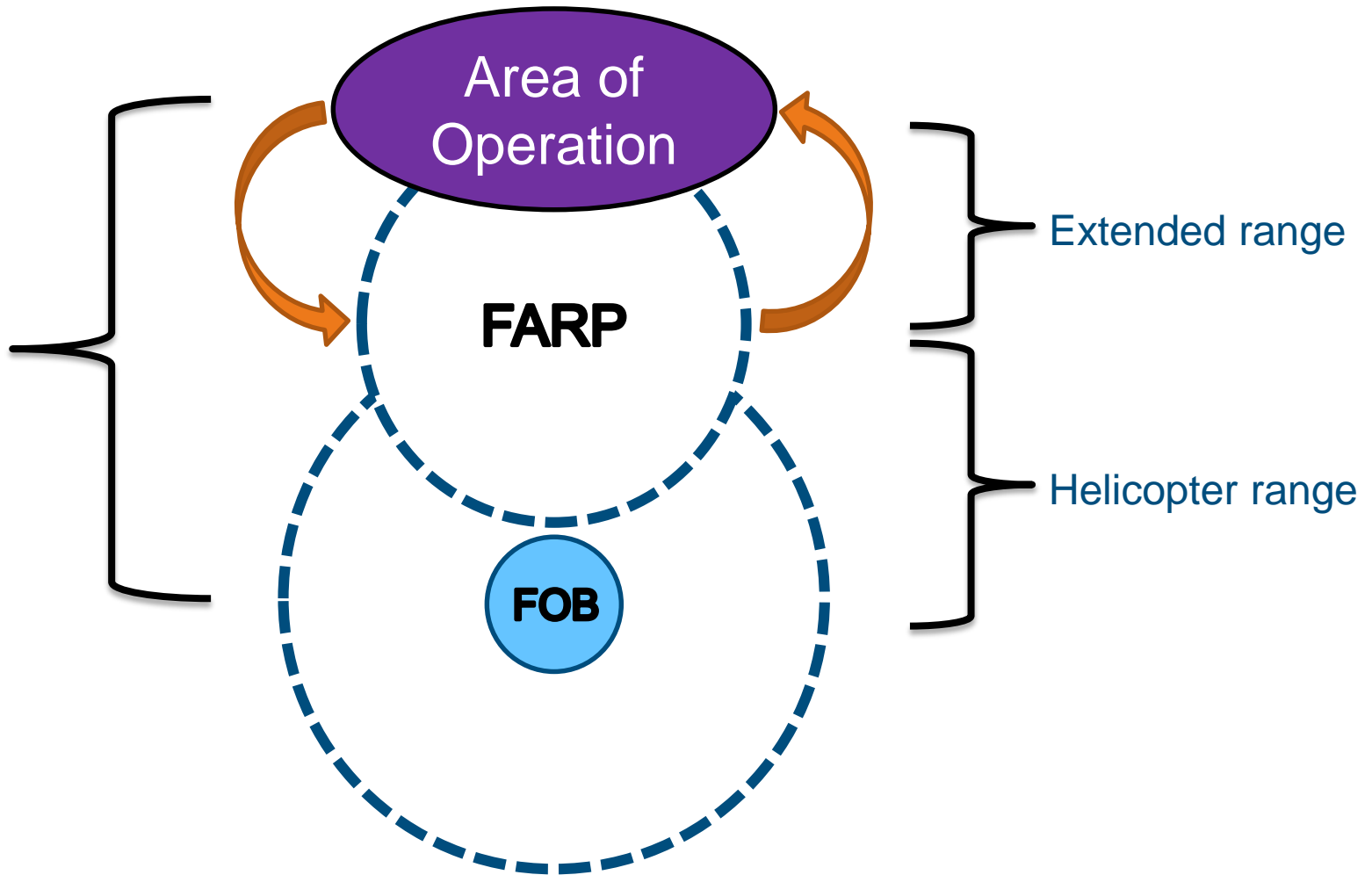


# Agenda

- FARP operations
- Modelling FARPs
- Simulation framework
- Use cases
- Discussion
- Future work



Mission  
range



# FARP mission planning

Helicopter mission planning and execution

FARP mission planning and execution



CSO. (2014). Mission planning meeting. Wikimedia Commons.  
[https://commons.wikimedia.org/wiki/File:Mission\\_planning\\_meeting\\_141622-Z-6J979-019.jpg](https://commons.wikimedia.org/wiki/File:Mission_planning_meeting_141622-Z-6J979-019.jpg)



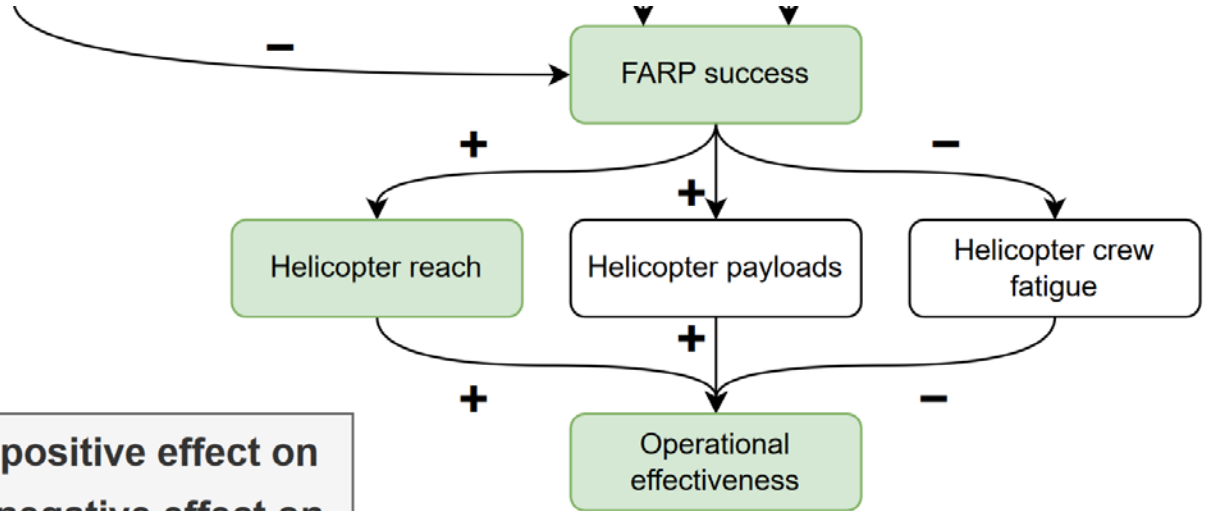
Dutch Ministry of Defense. (n.d.). Scania Gryphus-transportvoertuig. Defensie.  
<https://www.defensie.nl/onderwerpen/materieel/voertuigen/scania-gryphus-vrachtwagen>

*"To what extent can simulation support the decision-making process of FARP operations?"*





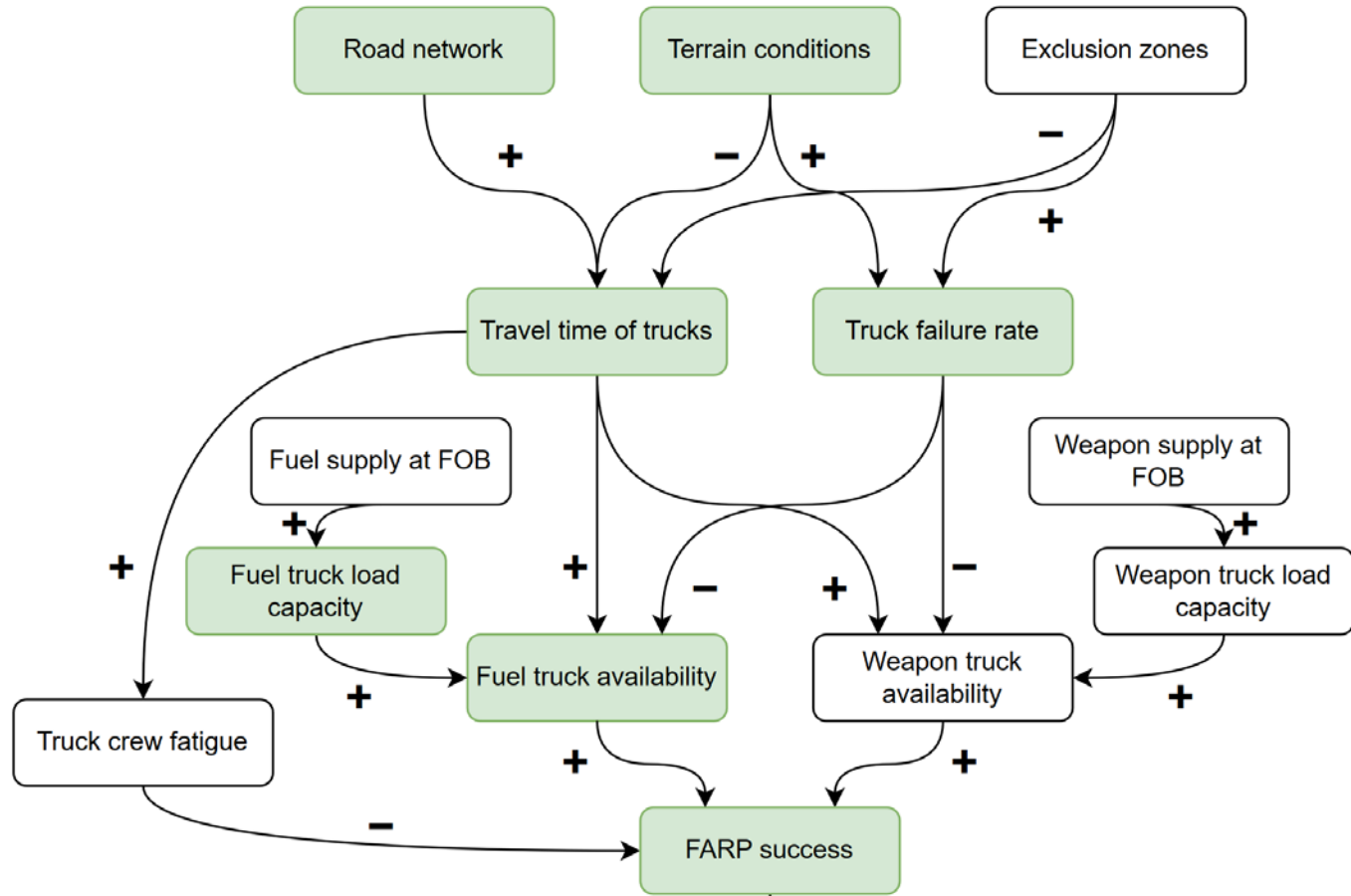
# Simulation framework



**+** has positive effect on  
**-** has negative effect on



# Simulation framework

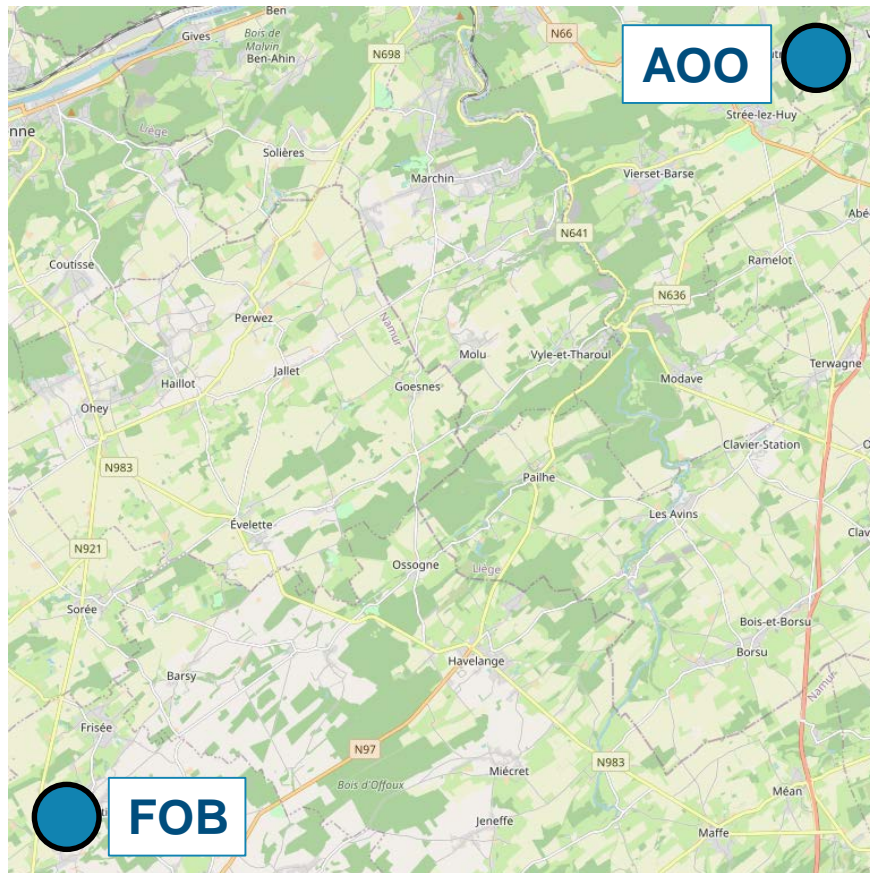




# Simulating FARP Operations

Location  
analysis

Mission  
planning &  
execution



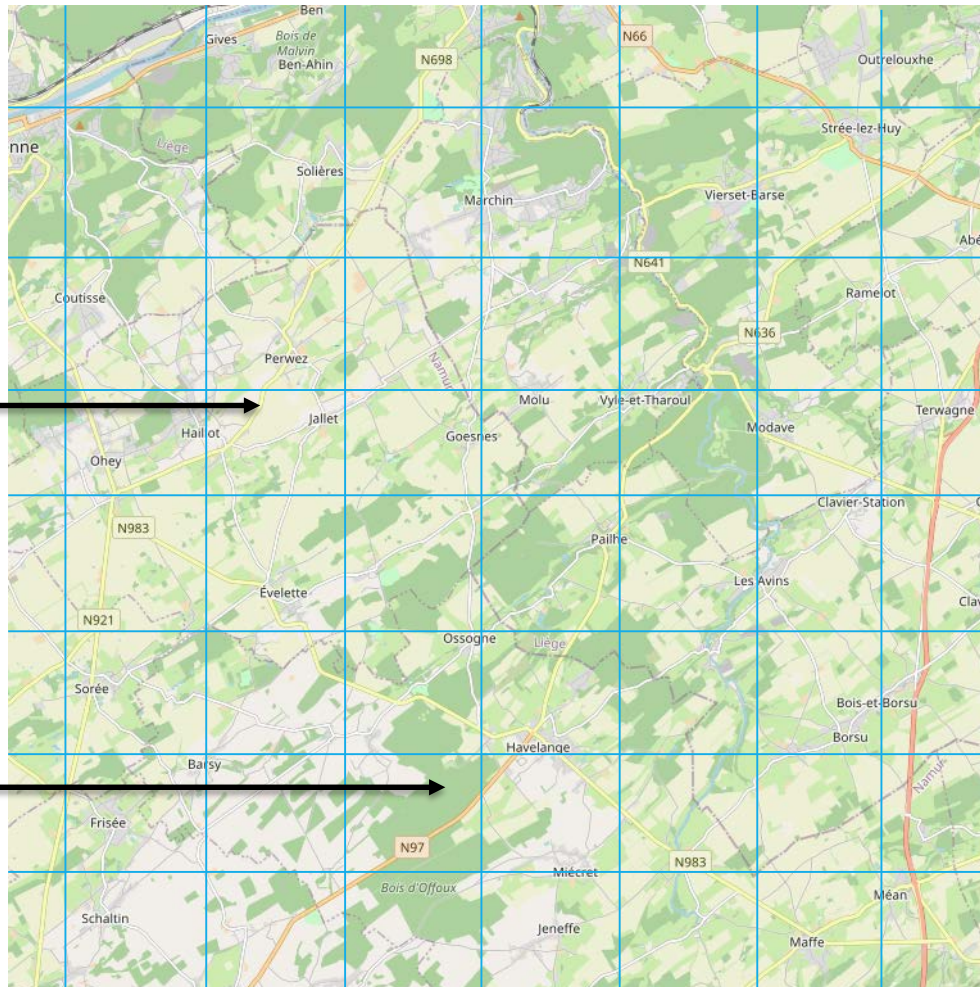
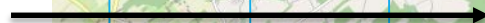


# Location analysis

Desirable!



Not desirable!





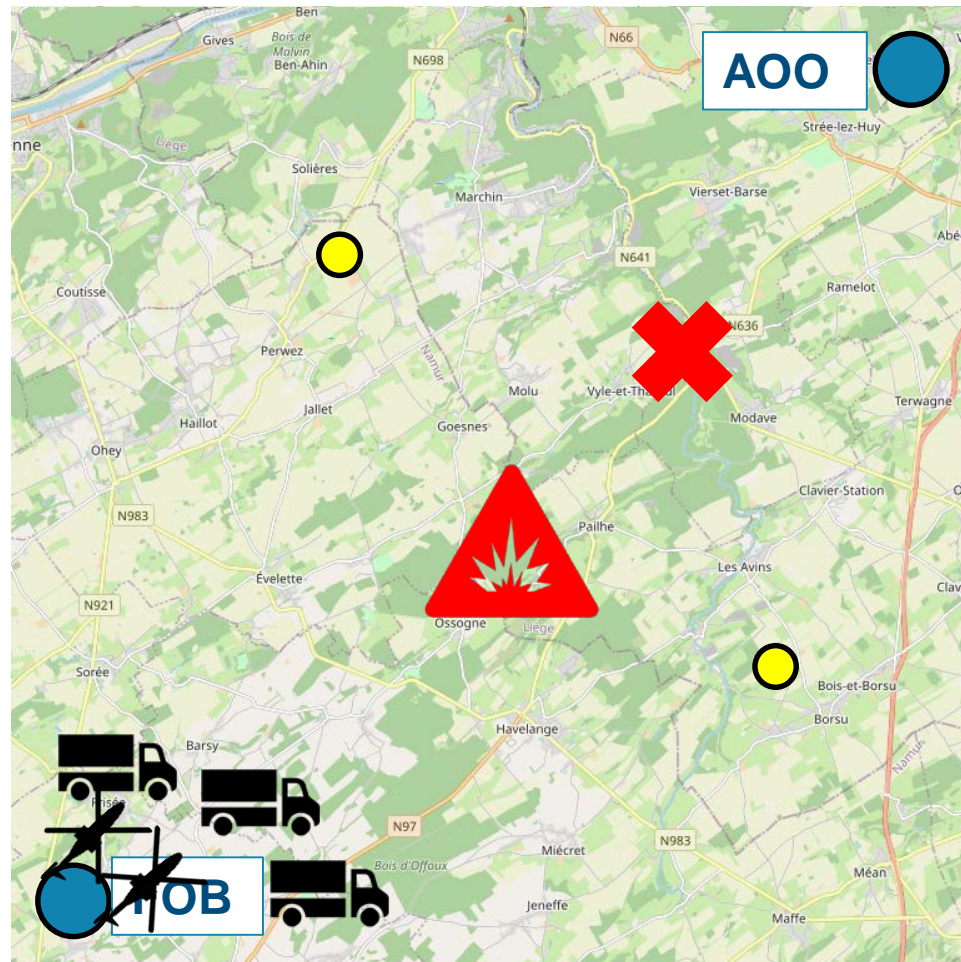


# Mission planning & execution



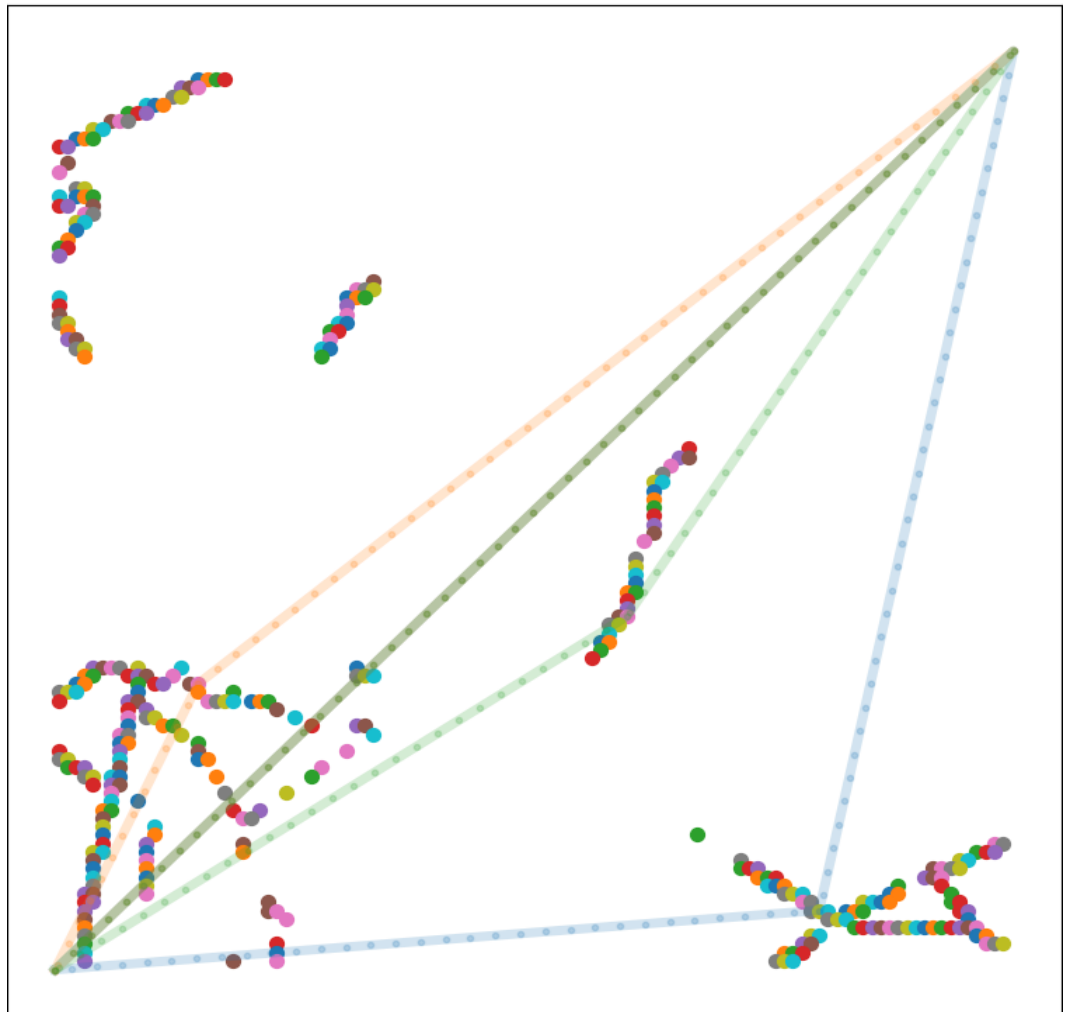
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- Dispersed/non-dispersed
- Output



# Example simulation process

| Colour | Desirability |
|--------|--------------|
| Yellow | Low          |
| Orange | Medium       |
| Red    | High         |

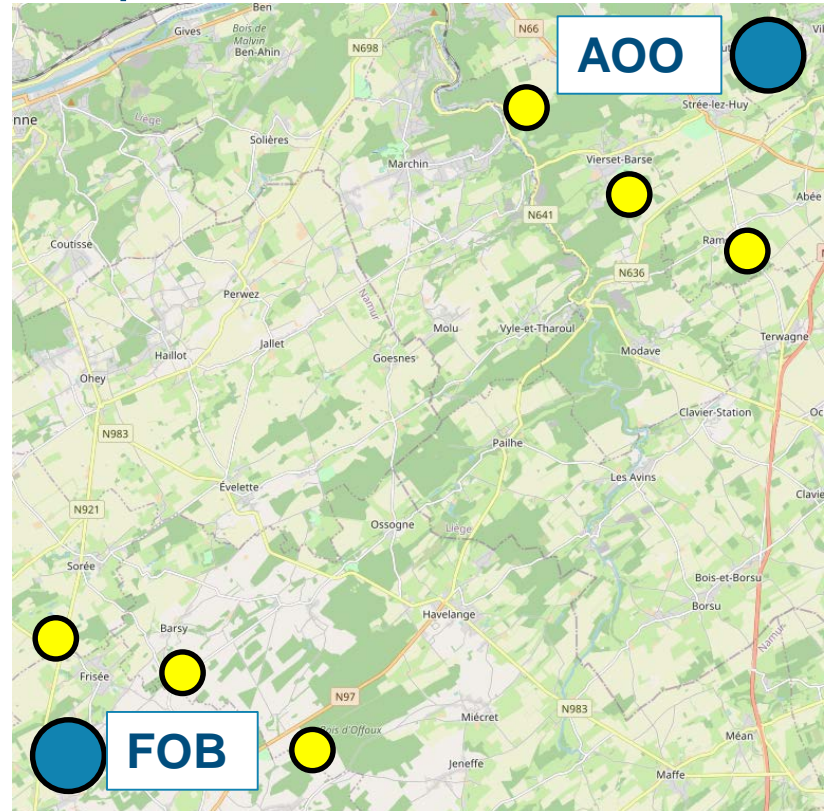




# Decision support use cases

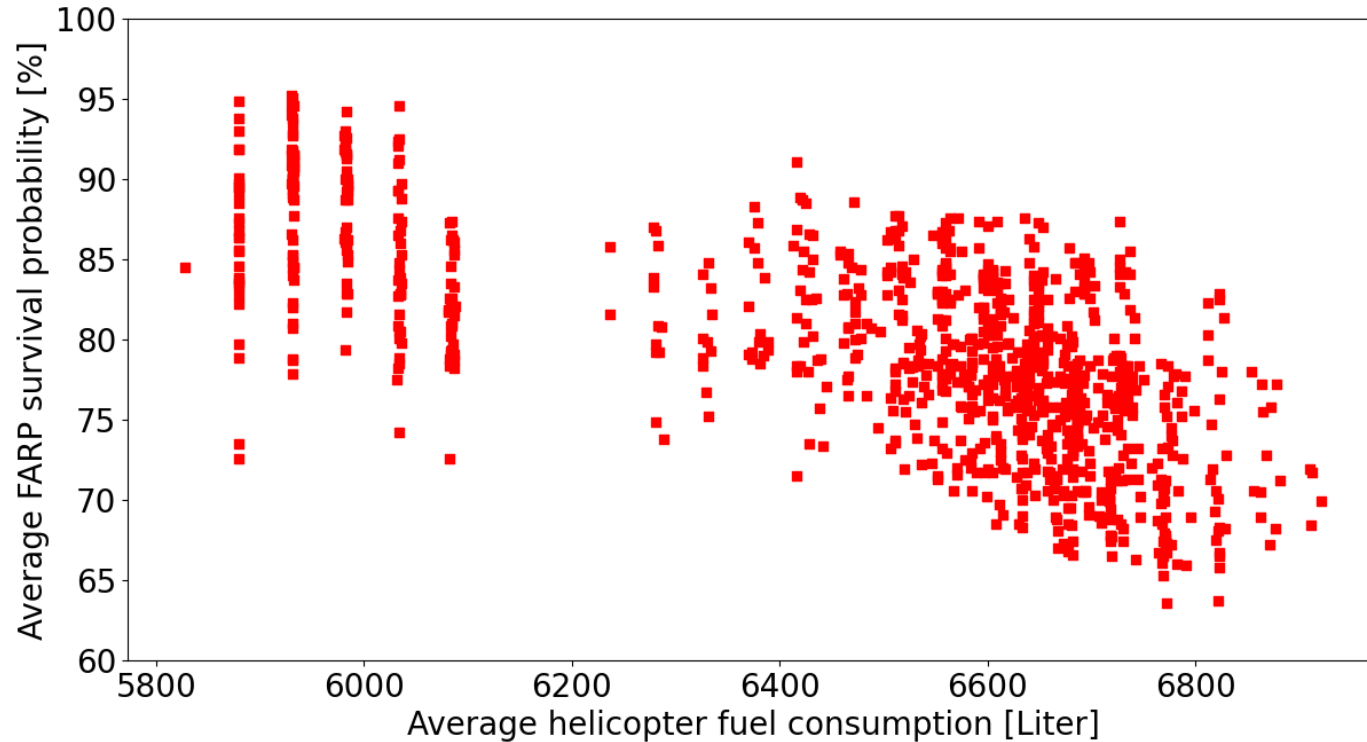
- FARP mission planner perspective
  - Use case 1: Trade-off fuel consumption and FARP survivability
  - Use case 2: Fuel use in dispersed versus non-dispersed FARP operations

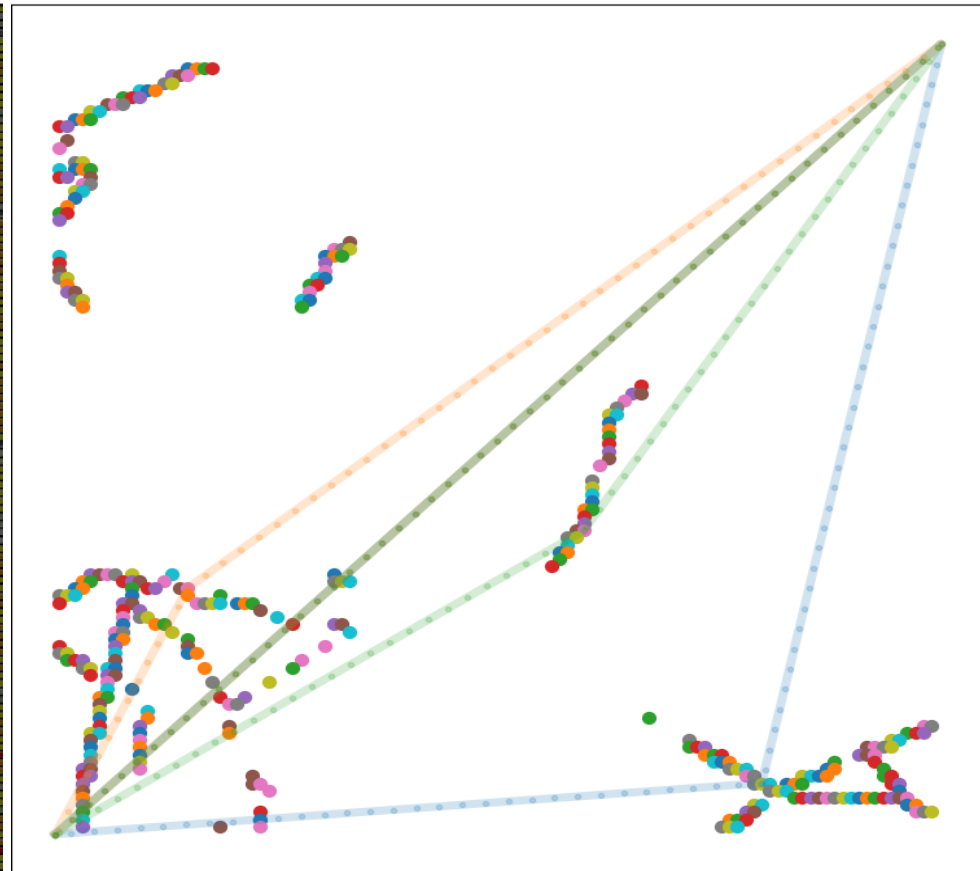
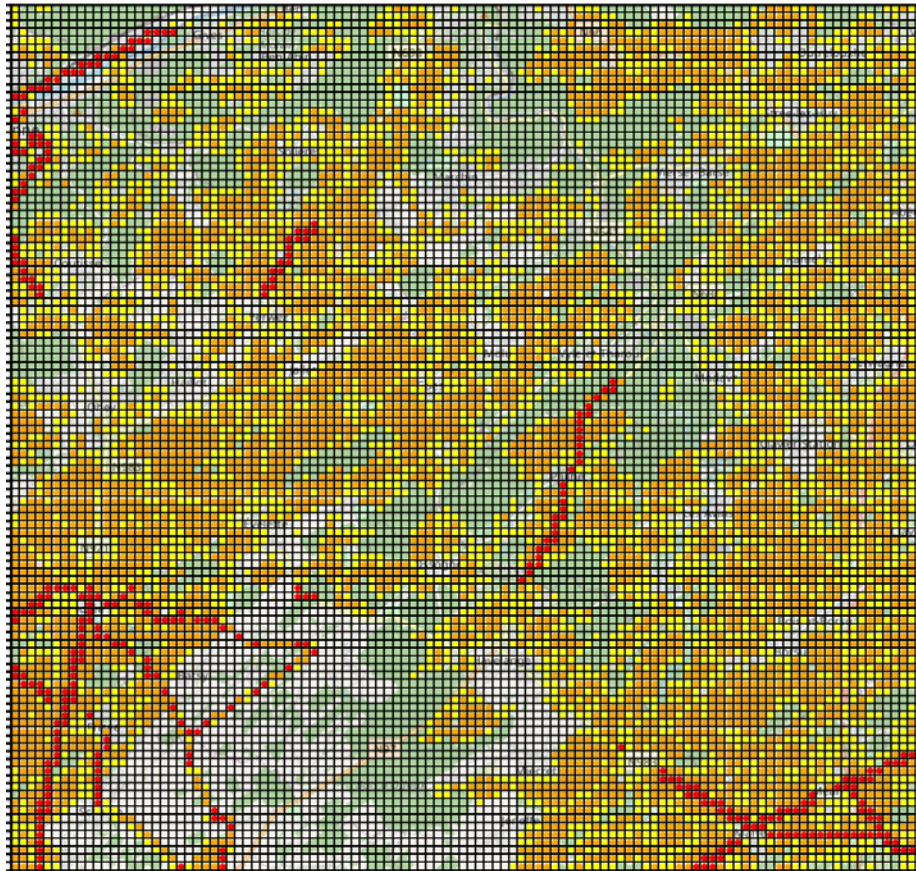
# Use case 1: Trade-off fuel consumption and FARP survivability





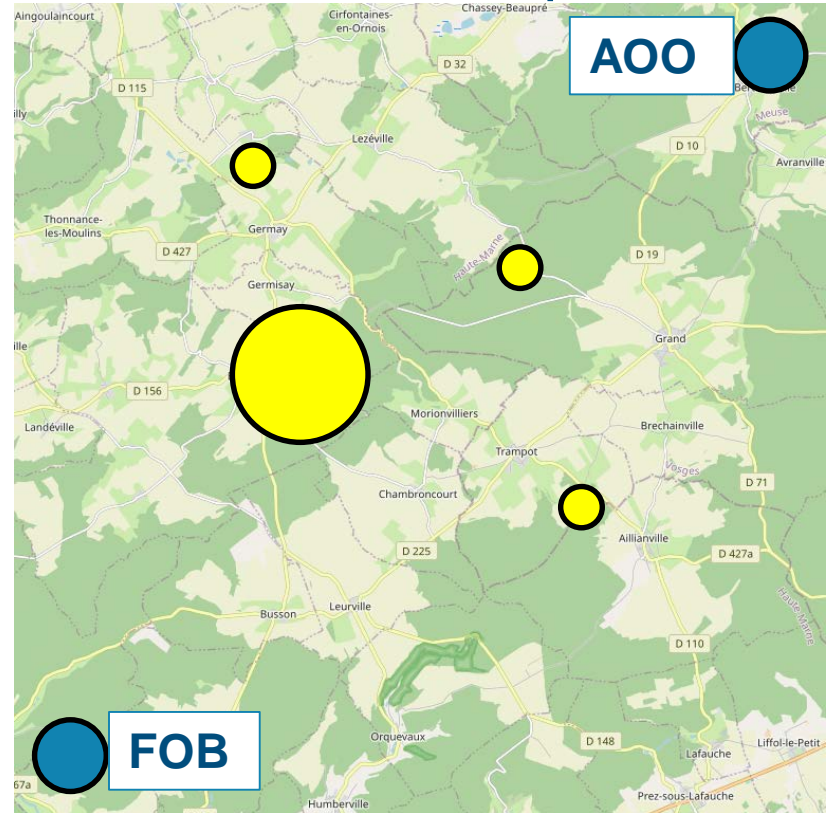
# Use case 1: Trade-off fuel consumption and FARP survivability



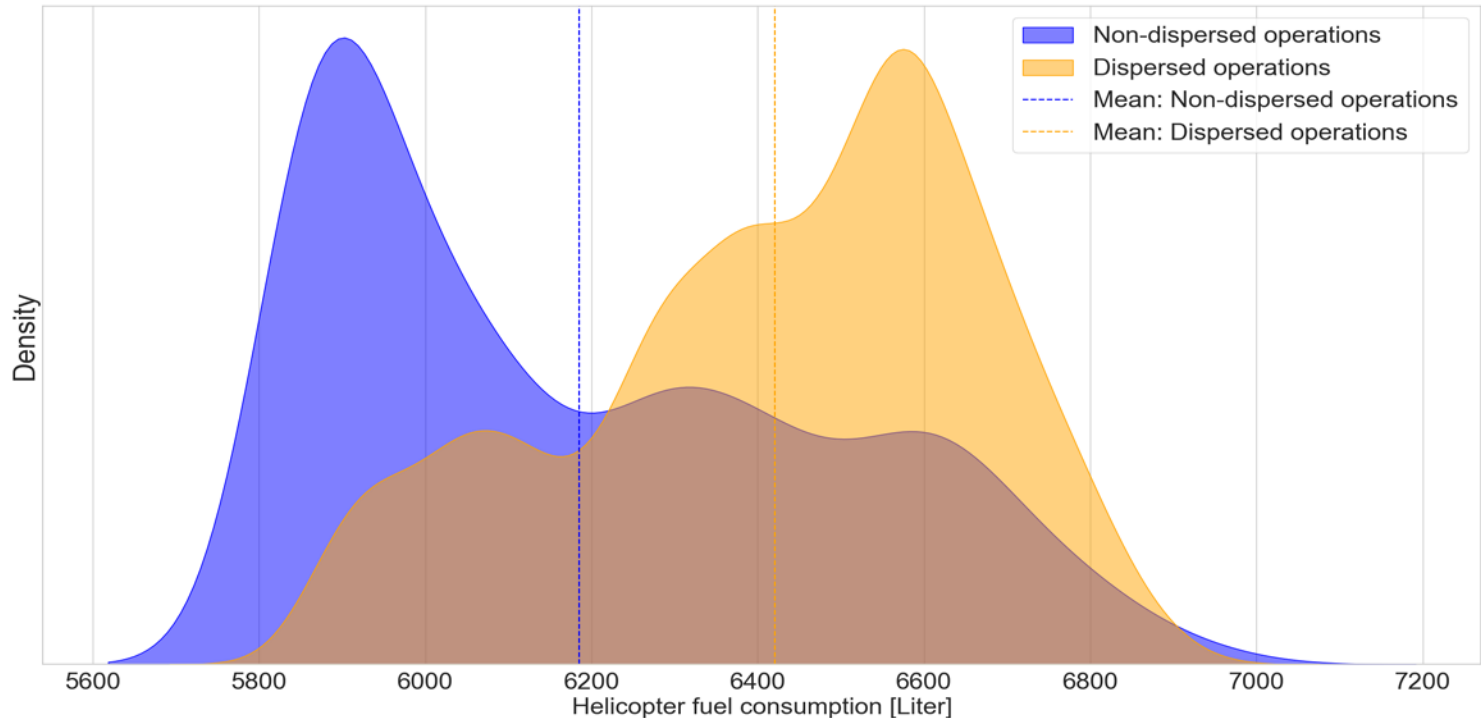




# Use case 2: Fuel use in dispersed versus non-dispersed FARP operations



## Use case 2: Fuel use in dispersed versus non-dispersed FARP operations







## Discussion and concluding remarks

*"To what extent can simulation support the decision-making process of FARP operations?"*

- FARPs are useful, complex operations under constant time pressure
- Simulation helps to demonstrate the relations in different situations
- Simple statistical analyses helps to make sense of the relations, and provide decision support

## Future work

- Additional elements: Ammunition, human factors, different helicopter and mission types
- More realistic mission environments: realistic and up-to-date input data
- Geographical Information System application





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# Fully engaged

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