

Improving Aerial Wildfire Fighting Effectiveness Using Future Climate Sensitivities and Novel Aircraft Concepts

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Abstract:

Due to global warming, the prevalence and severity of wildfires is increasing, even outside of the wildfire season. If a fire is not controlled within the first few hours, the surrounding dry areas support rapid spread, giving rise to megafires, which contribute to 97% of the wildfire burnt area annually [1]. It is thereby essential to ensure a sufficient rapid response is maintained with the rising climate change impacts. EU initiatives such as the RescEU and projects like COLOSSUS aim to tackle this problem. The objective of this work is to aid in the solution approach by incorporating the evolving wildfire environment in the design and evaluation of an aerial wildfire fighting system of systems (SoS). Using an Agent Based Simulation with a Cellular-Automata wildfire model, a set of aircraft fleets will be examined in several scenarios with varying weather sensitivities, reflecting the potential changes to the climate. The goal of the study is to investigate how a given SoS can be evolved over time to meet the changing needs of the environment. In this regard, the TLAR of novel aircraft, and the fleet composition are varied to design an SoS with the future needs in mind. The fleet definitions and aircraft concepts are a combination of the EU natural disaster initiative (RescEU) fleet and the novel concepts from the COLOSSUS Project, consisting of seaplane and advanced air mobility (AAM) concepts. Thus, the research aims to answer two main research questions: 1) How do climate change forecasts impact the future of wildfire fighting in Europe 2) How can the corresponding SoS requirements be formulated to accommodate the changing wildfire environments? The framework described in Figure 1 is employed to answer the research questions.

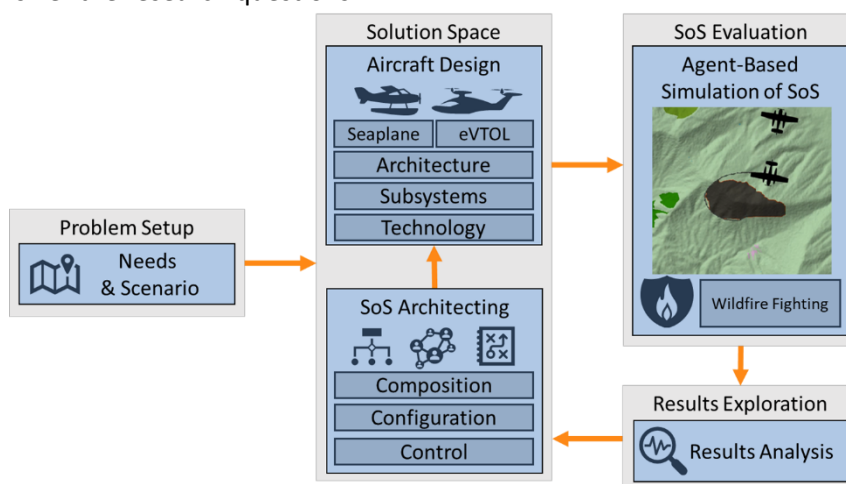


Figure 1: SoS Design and Assessment Framework including the wildfire simulation and novel aircraft concepts

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References:

[1] S. El Garroussi, F. Di Giuseppe, C. Barnard and F. Wetterhall, "Europe faces up to tenfold increase in extreme fires in a warming climate", *npj Climate and Atmospheric Science*, vol. 7, no. 1, 2024, doi: 10.1038/s41612-024-00575-8.