System of Systems Xploration Grand Challenge awaits

READY TO GET HANDS ON?

COLOSSUS
COLLABORATIVE SYSTEM OF SYSTEMS

Funded by the European Union

Wildfire growth over the past few years is reaching unprecedented and uncontrollable levels. Within 2023 alone, wildfires in Europe contributed to as much burnt area as twice that of Luxembourg [1] and it is predicted that by 2050, the frequency of significant heatwaves and wildfires are to grow up to +500% [2].

As a **group of researchers**, your task is to **design new aircraft** that can aid in the future of wildfire fighting whilst innovating on novel solutions that can be used alongside your aircraft. Develop creative solutions in a set of scenarios, representing an open-ended problem where there is no "one size fits all" and multiple, disparate solutions are possible!

Registrations open: February 2025
End of Challenge: August 2025

Earlier participation guarantees more time to work with the toolkit, develop aircraft designs and explore SoS solutions!
Start date of Grand Challenge will be set on a per University basis through bilateral discussions.

Team Composition
Max 10 pts
- BSc students = 1 point
- MSc students = 2 points
- PhD students = 3 points

Grand Challenge Tasks

- Conduct a preliminary design of one or more aircraft (airplane, rotorcraft, lighter-than-air vehicle or any other potential flying architecture) based on a set of constraints
- Construct a fleet of aircraft using those designed with a target budget of €100 million
- Expand the SoS in the provided COLOSSUS python built toolkit, expanding the COLOSSUS framework [3]
- Test the aircraft and SoS expansions within the COLOSSUS simulation toolkit using the given scenarios
- Summarize results and contributions in a report and a 30 mins presentation

Evaluation and Prize

The evaluation criteria include the assessment of aircraft design methodologies and principles, emphasizing realism and technical knowledge. It also considers contributions and improvements to the SoS toolkit, rewarding well-justified and impactful innovations. Finally, teams are compared using quantitative metrics such as simulation outputs on costs and emissions, with specific weightings to be provided later.

The winning team will be rewarded with a sponsored European conference invitation in the latter half of 2025.

Student teams can sign-up here

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[1] European Comission Joint Research Centre, "Widlfires: 2023 among the worst in the EU in this century," European Commission, 10 April 2024. [Online]. Available: https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/wildfires-2023-among-worst-eu-century-2024-04-10_en. [Accessed 10 December 2024].
[2] D. Domeisen, E. Eltahir, E. Fische, R. Knutti, S. Perkins-Kirkpatrick, C. Schar, S. Seneviratne, A. Weisheimer and H. Wernli, "Prediction and projection of heatwaves," Nature Reviews Earth & Environment, vol. 4, pp. 35-50, 2022.
[3] P. S. Prakash, N. Naeem, K. Amadori, G. Donelli, J. Akbari, F. Nicolosi, L. K. Franzén, M. Ruocco, T. Lefebvre e B. Nagel, "COLOSSUS EU Project - Collaborative SoS Exploration of Aviation Products, Services and Business Models: Overview and Approach", in Proceedings of the 34th Congress of the International Council of the Aeronautical Sciences (ICAS), Firenze, Italia, 2024.

COLOSSUS system of systems Grand Challenge

Duration: February – August 2025
Target Audience: BSc, M.Sc and Ph.D students