

Extinguishing Wildfires with Guided Airdrops

Abstract: This project aims to develop a specialized payload to be ferried by a fixed-wing unmanned aerial vehicle (UAV) that can be used to suppress a wildfire detected at its very early stages after ignition. The envisioned payload shall be released by the ferrying UAV at high speeds and using control surfaces (but no propulsion) shall guide itself accurately to drop on the desired point of the fire area. Upon impact, the payload shall release specialized fire retardant or other technologies with the goal of eliminating the early-detected small wildfire area using a limited number of such airdrops.

Tasks:

- Study airdrop methods.
- Study fire suppression methods and concepts.
- Study the problem of designing a guided airdrop with a focus on robust response in windy/turbulent conditions.
- Study modeling and control of guided airdrop through control surfaces.
- Design prototype airdrop with consideration on the volume and weight needed for the mechanism to suppress the fire.
- Develop and implement control methods for guided airdrop.
- Integrate the airdrop on a fixed-wing UAV and test guided airdrop on specific GPS location.



Literature (indicative):

- [1] Mathisen, S.G., Leira, F.S., Helgesen, H.H., Gryte, K. and Johansen, T.A., 2020. Autonomous ballistic airdrop of objects from a small fixed-wing unmanned aerial vehicle. *Autonomous Robots*, 44, pp.859-875.
- [2] Joshua, M. and Eaton, A.N., 2013, April. Point of impact: Delivering mission essential supplies to the warfighter through the joint precision airdrop system. In *2013 IEEE International Systems Conference (SysCon)* (pp. 783-790). IEEE.
- [3] Wright, R., Benney, R. and McHugh, J., 2005, May. Precision airdrop system. In *18th AIAA aerodynamic decelerator systems technology conference and seminar* (p. 1644).

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Project relevance: XPRIZE Wildfire Challenge