Low-Cost Rapid Response Rocket Launched UAV for Wildfire Hotspot Detection

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The 2023 Canadian wildfire season, marked by a quintupling of damage relative to the past decade’s average and the tragic loss of four firefighters, underscores the urgent need for advancements in wildfire monitoring. This project aims to fill the need for a faster and safer wildfire monitoring system using a rocket-launched drone system. Compared to helicopters, the proposed system is faster, can be launched from any field, and it is unmanned, keeping firefighters out of harm's way. First, a prototype rocket was designed, utilizing 3D printing for accelerated production, precision, and cost-efficiency. Simulations were conducted to validate the strength and performance of 3D printed parts prior to flight. Finite Element Analysis simulations were used to validate strength, while Computational Fluid Dynamics simulations optimized fin shape for reduced drag. The first prototype achieved an apogee of 2.6km. Post-flight analysis informed the use of additive manufacturing techniques, leading to a second prototype rocket. The second prototype rocket reduced costs, simplified setup, and increased performance, achieving an apogee of 3.1km. A foldable-arm drone was designed to fit inside the rocket. Its deployment was successfully tested, and the drone was flown achieving a 15-minute flight time. This study showed the potential for a rocket-launched drone system, enhanced by additive manufacturing, for faster and safer wildfire monitoring. Future designs will increase the size, endurance, and features of the drone. In its current state, both the rocket and the drone were successfully tested, showcasing the effectiveness of the proposed system to enhance wildfire monitoring capabilities.

Awards Won:
Second Award of $2,000
China Association for Science and Technology (CAST): Award of $1,200