Fall Validation Demo

Objective	
System Integration and Validation for FVD	
Elements	Aerial Robotic Platform, State Estimation, Thermal Perception, GCS and Autonomy
Equipment	• Fully integrated Aerial Robotic Platform with State Estimation, Fire Perception, and GCS and Autonomy Subsystems • Portable Power Bank, HDMI cable, HDMI-DP Adapter, Portable Display, Keyboard, and Mouse • Router; Stable Internet Connection (for the online flight-log analysis tool) • RC Transmitter, Ground station Laptop with QGC • Telemetry Link to download the flight Logs • Diverse Fire Sources • Fire Extinguishers, Water Jug, Ash Bucket
Location	Gascola(Tentative)
Personnel	Whole Team

Procedure

1. Place the heat sources, and measure & record the fire pit locations from take-off (origin).
2. Switch on all heat sources and input fire pit locations into the ground station laptop.
3. Power on the RC Transmitter; make sure the kill switch is engaged on the RC transmitter during the on-ground setup phase to avoid unforeseen accidents.
4. Connect the batteries, and establish a wireless telemetry link between FCU and GCS.
5. Connect the portable display, keyboard, and mouse; start the sensor script on the mission, visualize the data on RViz, and enable ROS bag recording with necessary information.
6. Launch the autonomy stack, state-estimation, and fire perception station and disconnect all the I/O accessories from the Mission computer.**[V1][V2][V3]**
7. Begin a timer, perform safety checks, and arm the UAS.
8. Give a desired goal location and press start for UAS exploration from the UI
9. UAS autonomously navigates to the given location while avoiding obstacles.**[V4][V5]**
10. Mission progress is displayed on the UI, press Stop once the mission is complete.**[V6][V7][V8]**
11. Make sure the kill switch is engaged on the RC transmitter and turn down heat sources.
12. Reconnect I/O accessories to visualize and evaluate the fire map in a world frame.
13. Analyze the accuracy of hotspots displayed in UI compared to measured ground truth.

Verification Criteria

V1: Detect all hotspots with **at least 70%** accuracy.
V2: Localize fire positions up to **5m** of distance in front of the drone.
V3: Localize itself and fire with at least **10 Hz**.
V4: Localize itself within a drift of **4%**.
V5: Navigate trees with a separation of greater than **5 meters**.
V6: Have a flight time of more than **5 minutes.**
V7: Communicate with the drone up to **150 meters**.
V8: UI displays an updated fire map **throughout the duration** of the flight.