Roberts Fire – UAS Flight and Data Collection Summary

Dates: 7/23-7/31, 2019

7/23-7/26: UAS Vendor (Bridger Aerospace), ICS Type 1 UAS mobilized from Bozeman, MT and arrived at the Roberts Fire on 7/26. The UAS Manager (UASM), UAS Data Specialist (UASD) and UASD (T), along with the Bridger crew, attended an initial briefing at Magdalena Forest Service office and established the following objectives:

- Update the fire perimeter
- Utilize infrared cameras to monitor/document fire spread
- Document fire effects/fire activity in relation to:
    - The San Mateo Lookout
    - Owl Priority Area for Conservation (PAC) areas
    - Management Action Points (MAP)
    - Burn severity in Roberts Canyon
- Interface with crews on the fire and provide information regarding the utilization of UAS on wildland fire incidents

7/27: The UAS team located a suitable launch and recovery zone (LRZ) and performed a viewshed analysis to ensure command and control (link) could be maintained with the aircraft. A successful test flight was performed, but was terminated due to severe thunderstorm activity.

7/28: The first operational flight was conducted. The entire fire perimeter was flown and monitored/documented with the gimbal mounted electro-optical (EO) and infrared (IR) camera system. Very little heat or fire movement was detected. Creeping fire activity was witnessed and documented one mile north of the San Mateo Lookout. A proprietary mapping system was utilized to collect the data required to update the fire perimeter map. Upon analysis of this data, it was determined that the fire mapping system was not compatible with conventional mapping software (Agisoft Photoscan and ESRI ArcMap) and the updated perimeter could not be determined. Afternoon thunderstorm activity precluded additional attempts to map the fire.

7/29: A morning recon/mapping flight was conducted. Fire activity was minimal with no observed spread. The fire mapping payload was used again to collect data necessary to derive a perimeter. This was not successful. The root of the problem with the mapping payload was the fact that it collected low resolution video and not still images. The collective decision was to replace the proprietary mapping payload with a fixed mount EO/IR camera that collected still images. The new camera was mounted that evening.

The video stream from the EO/IR gimbal was also inconsistent and difficult to see. Troubleshooting indicated the video data link was affected by antenna placement on the aircraft. The antenna configuration was changed during post flight maintenance.

7/30: A recon/mapping flight was conducted with the new mapping camera and video antennas. The video stream was excellent and had very little breakup. The mapping camera functioned properly and 3,000 EO and IR images were collected. After the flight, the still (mapping camera images) were transferred to the data team for processing. The IR images could not be

processed into the desired product which is attributed to the significant relief (terrain variation) of the fire/elevation of the camera relative to ground level. The EO images were processed into an ortho-image and used to derive the updated fire perimeter and document fire effects as requested. The vendor crew was released at 1400 hrs.

7/31: Federal UAS team closeout at Magdalena FS office (1300 hrs)

Date	Flights/Flight Time (h:m)	Comments
7/23	0/0	Travel to SLC
7/24	0/0	Travel to ABQ
7/25	0/0	Federal and vendor crew meet in ABQ
7/26	0/0	Inbrief, LRZ selection, viewshed analysis
7/27	1/1:24	Test flight, afternoon thunderstorms
7/28	1/4:50	Mapping/Recon, afternoon thunderstorms
7/29	1/6:59	Mapping/Recon, afternoon thunderstorms
7/30	1/2:49	Mapping/Recon, afternoon thunderstorms
7/31	0/0	Closeout/Demob
Totals	**4/16:02**	

Successes

- The FMO/IC/FAO and crews assigned to the incident were easy to work with. The overall support for UAS and UAS testing was exceptional.
- Significant information sharing occurred between the UAS team and incident personnel
- A remote terminal with gimbal video display was introduced and tested up to 5 miles. Sheltered areas (terrain/veg) negatively impacted the video signal.
- The Roberts LRZ was ideal for UAS operations
    - Viewshed analysis for the area allowed UAS coverage of the entire fire
    - TO/Landing area was more than adequate for takeoff and landing
    - Ground control station setup area allowed for an excellent view of UAS operations
- Communication with Albuquerque dispatch was excellent
- A reliable perimeter mapping workflow was designed and implemented. The nadir mapping camera captured an image set which enabled the Data Specialists to produce orthomosaic and fire perimeter maps.
- Valuable experience was gained by the entire UAS team; especially the Manager and Data Specialist trainees
- Thanks to the team/requesting unit for approving trainees

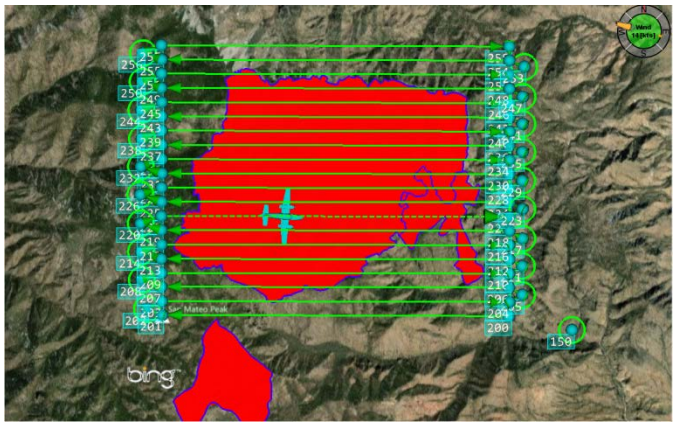
Challenges

- The proprietary (vendor) mapping payload is not compatible with federal mapping software.
- The aircraft/gimbal video system was not transmitting a clear image to the ground station
- Orthophoto processing from still images on a 5000 acre fire takes 6-10 hours.
- Weather impacted flight operations and logistical (spike camp) plans.

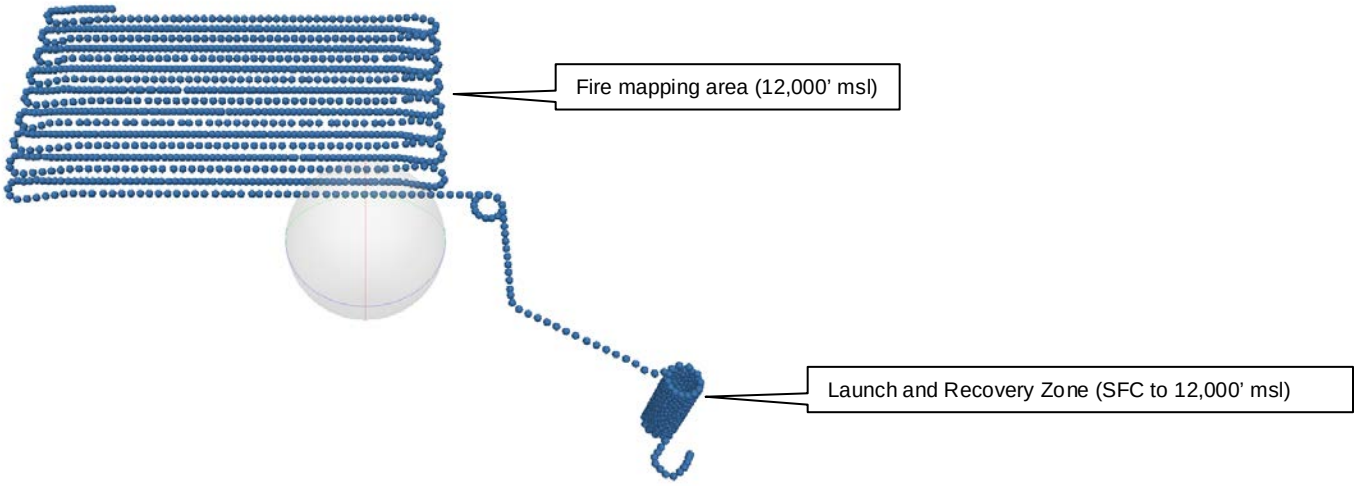
- 3 V22 Ospreys' overflew the LRZ on 7/29. SAFECOM filed on 7/30.

Path Forward

- Refine the perimeter mapping process. It takes too long if a daily perimeter is requested.
- Test the IR side of the mapping camera and determine/document environmental operations parameters.
- The UAS team could provide sample data products at the initial briefing with the IMT
- UAS mission objectives and IMT/UAS team roles should be identified on a daily basis as priorities change (operational vs. logistical).
- Ensure daily mission priorities are discussed and agreed upon by Ops, Plans, and the UAS team.
- Verify data objectives and data quality daily.
- Data delivery/sharing method/location must be validated daily.



Roberts Fire: Latitude FVR transect flight plan (ortho/fire perimeter derivation)



Roberts Fire: Photo locations depicted in Agisoft Photoscan (orthophoto processing)