

CWN UAS Operations

El Dorado Fire, San Bernardino National Forest.

September 13-September24, 2020.

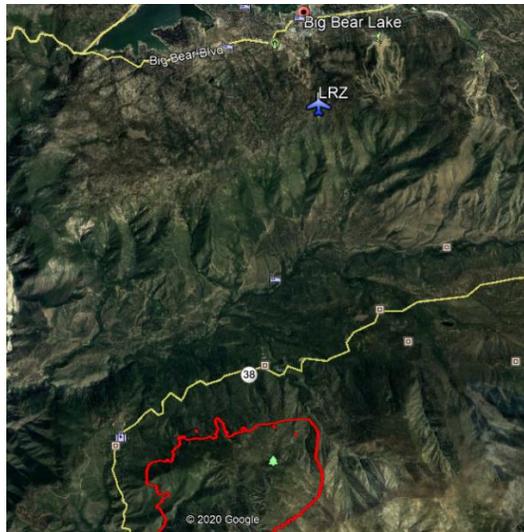
Vendor: Bridger Aerospace. Aircraft: FVR 90. Payload: Flir Duo Pro (mounted nadir) and Ascent Vision CM142 (Gimbal camera).

Government Staff: Shane Ralston (UASM), Lydia Rumachik (Trainee), Chris Yamasaki (UASD), Kyle Wright (UASDt)

9/13: Arrival at Big Bear Lake, First LRZ at Keller Peak found to have interference issues due to proximity to radio tower.

9/14: 2nd LRZ near Angelus Oaks (north of fire) not approved due to fire growth in the area.

9/15: 3rd LRZ chosen near ICP. Directional winds and interference found to cause launch/landing problems. Decision to move LRZ to higher ground out of the area, approx. 5 miles north of fire edge.



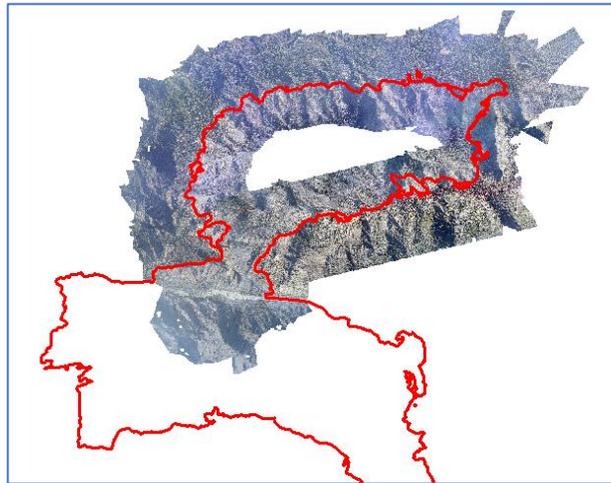
9/16: First flight. 1630-2200. Primary objective to provide live feed to ICP and capture photos and video segments of the north edge of fire. Gimbal camera images along with kml's and video segments were provided to the IMT. Uploaded to their TEAMS incident site.

9/17: No flight. Unpredictable gusting winds causing issues to launch.

9/18: 1800-2200. Primary objective to detect hot spots north of fire edge. Team was able to detect 3 hot spots and directed night operations to these locations. Tested FMV with live video feed. Connected but with limited functionality. IE ArcPro crashing, buttons grayed out when connectivity was not good. Frame capture with FMV can be done, but with varying results. Camera tilt angle tends to throw off accuracy by large distances. Images and video uploaded to TEAMS incident site.

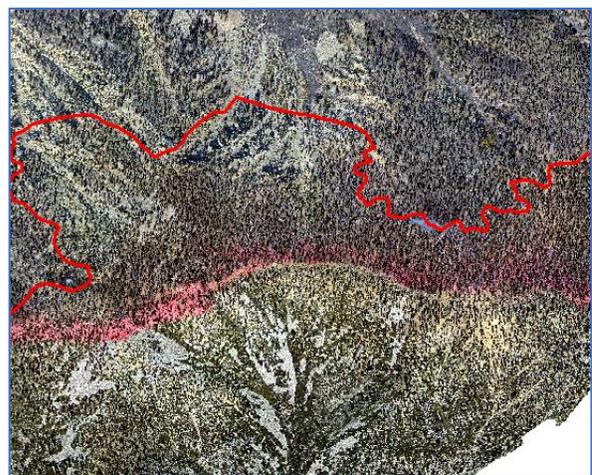
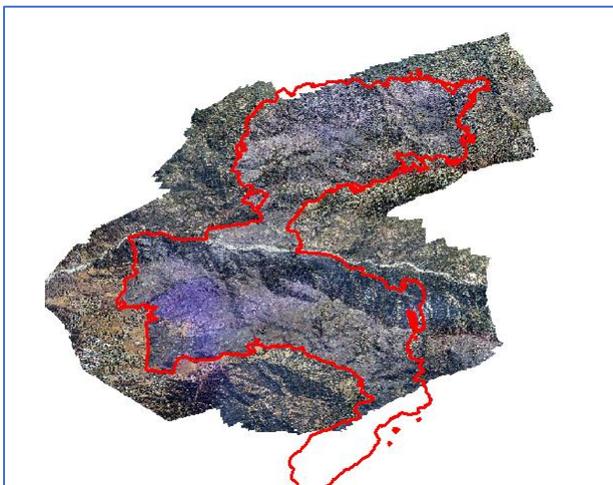
9/19-9/20: Aircraft engine issues. No flights.

9/21: 1500-2130. Clearing smoke allowed for mapping of San Bernardino Mountain south facing ridge and single path transect along north edge of fire. Orthomosaics produced for IMT. Attempted to produce an IR product using the FLIR DUO Pro images but with no success. Continued to provide IMT with still images, kmIs, and video segments.



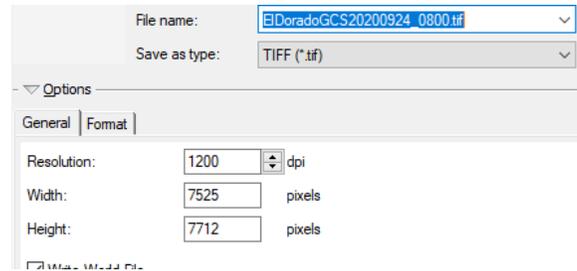
9/22: 1200-2000. Continued monitoring of north edge of fire. Mapping transects to produce orthomosaic of south half of fire. Fatality of firefighter on 9/17 prompted investigation of area. Post burn images of area sent to IMT. Stroud and Dutton on incident to capture images and video of incident area.

9/23: 1200-2000. Mapping transects completed to cover entire fire area within TFR. Orthomosaic produced for IMT and BAER efforts.



9/24. Final shift. Video segments edited for PIO group. Bucket Drops, retardant line, north edge of fire. Released and assigned to Castle Fire.

GCS Maps: GCS maps were created in ArcMap as well as ArcGIS Pro. In Pro, you can not define the dpi output so we matched the pixel width and height from a 1200 dpi map produced in ArcMap.



1200 dpi tif, prj file, world file, kml of the fire perimeter, and an updated pdf of the IMT produced Operations map, were given to the vendor prior to each shift, so they could load into the GCS. The geotiff needs to be converted to a **ctm1** file in order to be compatible with Bridger's GCS. Noticeable degradation of the file was observed due to this conversion. Need to figure out how to maintain quality of map with this conversion requirement. Bridger no longer needs to send the geotiff to their IT personnel for conversion. Conversion can be completed onsite.

Site Selection: A combination of Google Earth Viewshed and Visibility analysis within ArcGIS were used to determine possible LRZ locations.

Importing Photos into Metashape: Attempted to produce orthomosaics and IR outputs using the workflow listed in our UASD toolbox. Could not get a high percentage of IR photos to align. Most likely due to variation in AGL throughout flight, transect widths, and limitations of IR sensor. Like others have stated, camera specs for FLIR IR from manufacturer are not accurate and need to be manually entered. 25 mm focal length is currently what's onboard. Recommended they change this to the 13 mm focal length if possible. Important to note flight transect mapping timestamps so you can get only the images you want for processing.

Other Data Requests: We had several external requests for flight images, videos, and Metashape products. It's important to channel these requests through the IMT not only because of data sensitivity, but also to verify requestors are legitimate. Requests came through from individuals involved with the fatality investigation, ESRI staff in Redlands, and Calfire employees interested in what data products were being delivered.

Lessons Learned:

- 2 photogrammetry laptops provided by BLM were extremely helpful for processing. Advise using these strictly for Metashape processing and nothing else. Microsoft Office Suite licensing on these laptops were expired so that is something that needs attention.
- Having 2 UASD's is extremely helpful to manage workload and stagger shifts if needed.
- GCS does not have the ability to import Flight Planning Transects. This requires more attention when communicating to the pilot working on transect planning.
- Flir Duo Pro setup captures images on time intervals and cannot capture on distance interval. We consistently used a 5 second capture interval.
- Flir images only include one band, making stitching and alignment difficult.
- Images from gimbal camera can be immediately downloaded along with an attached kml file to be dropped into Google Earth. These proved to be useful but not always accurate depending on wind, flight altitude, and steep terrain.