**EQUIPMENT**

The following equipment owned by the University of Idaho (UI) is available to aid projects using the proposed Unmanned Aerial System (UAS) Lidar system or for maintenance and repair of the proposed UAS Lidar system:

**Unmanned Aerial Systems (UAS, i.e., Drones)**

The UI owns the following UAS that are registered with the Federal Aviation Administration and fully-insured for liability through the State of Idaho:

* (1) DJI Matrice 600 with the M600 A3 series controller: maximum flight time 40 minutes, payload capacity 5.5kg
* (1) DJI Matrice M300 Real-Time Kinematic: maximum flight time 55 minutes, payload capacity 2.7kg
* (1) DJI Matrice M210: maximum flight time 30 minutes, payload capacity 2.3kg
* (2) DJI Mavic 2 Pro with 20MP RGB camera: maximum flight time 30 minutes
* (5) DJI Phantom 4 Pro with 20MP RGB camera: maximum flight time 30 minutes
* (1) DJI Spark with 12MP RGB camera: maximum flight time 16 minutes
* (1) Sensefly eBeeX fixed-wing UAS: maximum flight time 90 minutes
* (1) Autel Evo II DuoR with 12MP RGB and 620x480 FLIR thermal cameras: maximum flight time 40 minutes
* (4) Custom-built multi-rotor UAS
* (6) Custom-built fixed wing drones used primarily for flight training purposes

**Sensors**

Most of the UAS listed above have integrated true-color (Red, Green, Blue, RGB) cameras. In addition, the UI has the following sensors designed to be mounted on a UAS:

* DJI X5S 20MP RGB camera with interchangeable 4/3 micro camera lens
* (2) Micasense Rededge-M multispectral imaging sensor: 3.6MP, 5 spectral bands (B, G, R, Red Edge, NIR)
* Micasense Altum multispectral and thermal imaging sensor: 3.6MP, 5 spectral bands (B, G, R, Red edge, NIR) plus 1 thermal band.
* ADC Micro multispectral imaging sensor: 3.2MP, 3 spectral bands (G, R, NIR)
* Bayspec OCI-F hyperspectral imaging sensor: push-broom sensor, wavelength range 400-1000nm, spectral resolution ~5nm, 120 spectral bands.

**Surveying Equipment**

The following UI surveying equipment is available for use in UAS-related projects

* (4) Emlid Reach RS+ Real-Time Kinematic GNSS systems each consisting of a base station and rover unit for high-precision (~2-3cm) geolocation
* Tripods and surveying poles
* (42) black and white ground-control targets for precise georeferencing of UAS-collected imagery

**Supporting Equipment**

The following UI supporting equipment is available for enabling successful UAS data collection

* (5) Samsung Android tablets for UAS mission planning, flight telemetry monitoring, and GNSS surveying in the field
* (2) iPad minis
* (2) Samsung field laptops running Windows 10
* (1) EcoFlow Delta 1.3 KWh portable solar generators for charging UAS and sensor batteries in the field
* Calibrated spectral reflectance panels
* Extra batteries, chargers, and propellors for the UAS listed above

**Computing Equipment**

Computing resources are described in detail in the Facilities and Resources document.

**Software**

Through the UI Drone Lab, the UI College of Natural Resources Geospatial Lab, or other UI computer labs, the UI has licenses for the following relevant commercial software:

* ESRI ArcGIS – University-wide site license
* Trimble Geospatial eCognition (25-seat license)
* ENVI (25-seat license)
* Agisoft Metashape – 20-seat floating license

**Maintenance and Repair Equipment**

The UI Drone Lab on the Moscow campus and the UI iDrone Lab on the Boise campus have the following equipment used for drone maintenance and repair and for prototyping and manufacturing drone-related parts such as sensor mounts:

* Prussa i3 MK3S 3D printers
* Light manufacturing equipment, including a drill press, table saw
* Hand tools

Additionally, through the UI College of Engineering, we have access to the following equipment for prototyping and manufacturing:

* Laser cutter/engraver
* Plasma cutter
* CNC router
* Circuit-board milling machine
* Industrial-quality, large-volume 3D printer